

Reference: 20190125-L05_stormwater report [B].docx

Date: November 16, 2020

Paul Mitchell
Director, Major Projects
City Plan Strategy & Development
Suite 6.02, 120 Sussex St
Sydney NSW 2000

Dear Sir,

**RE: MOTO X DOME'S EVENT CARPARK & PIT AREA
STORMWATER DRAINAGE REPORT**

1. Introduction and purpose of report

I, Sam Haddad of S&G Consultants Pty Ltd (SGC) have been engaged by Malcolm Murray solicitor and Garry Holt of Eastern Creek Karts Pty Ltd to prepare a stormwater drainage report for the area upstream and adjacent to the constructed Event Carpark & Pit Area in the south east corner of Lot 4 DP 1079897 located at 50 Peter Brock Drive, Eastern Creek.

The purpose of this report is to support a modification application with respect to a development consent granted by the Minister for Urban Affairs and Planning in 1997 (**1997 Consent**).

This report addresses:

- the stormwater drainage infrastructure approved by the 1997 Consent (**section 2**);
- the works carried out to date between 2017 and 2019 and in particular whether newly constructed Event Carpark & Pit Area has resulted in increased flooding at 10 Raceway Place, Eastern Creek (the adjacent property) (**section 3**); and
- proposed additional stormwater infrastructure as part of the Modification Application (**section 4**).

This report has been revised in November 2020 to address a suggestion from the court to size the pipe system under the Event Car Park & Pit Area to cater for the PMF storm event and prevent water from flowing in a south/south-easterly direction when the runoff from the upstream catchment reaches the rear boundary.

This upgrade is for the north western upstream catchment (13192m²) that naturally falls towards No.50 Peter Brock Drive and the Event Carpark and Pit Area catchment within N.50 Peter Brock Drive. Reference is made to Figure 3 below for details.

A stormwater drainage system is proposed for The Event Carpark and Pit Area catchment (13272m²) that collects the runoff from the car park area and drains it in a north-westerly direction away from 10 Raceway Place and into the wetland adjacent to the go-karts racecourse (Figure 3).

The proposed infrastructure is able to convey the runoff from a total area of 26464m².

In preparing this report, I have read and agree to comply with the expert witness code of conduct in the Uniform Civil Procedure Rules.

I am a qualified practising civil engineer registered with Engineers Australia (MIEAust CPEng NER 2247040).

In preparing this report, I have:

- Conducted a site visit;
- Reviewed topographical maps of the area surrounding Lot 4 DP 1079897 over time; and
- Carried out calculations in accordance with Australian Rainfall & Runoff.

2. The 1997 Consent

The Event Carpark & Pit Area is subject to the 1997 Consent. I have reviewed the conditions of consent and approved plans incorporated into the consent by condition 2.

The stormwater drainage controls imposed by the 1997 Consent are limited. The conditions of consent are silent as to how the runoff from the upstream catchment is to be managed.

The exception is condition 10 that requires erosion control to be established during construction and condition 12 that requires water that leaves the site to be better quality than or equivalent to the water

quality that existed prior to the earthworks. Neither of these conditions address the management of runoff quantities, and how the runoff is to be directed, where it is to be discharged, or the event that the stormwater drainage system is designed for.

The approved drawings under the 1997 consent do not address how the site runoff would be managed, with the exception of a Silt and Sediment Control Plan which shows a swale off site that collects the runoff from the Event/ Carpark & Pit Area. This swale would now be located within or adjacent to 10 Raceway Place. Clearly, the proposed swale referred to in the approved plans in the 1997 Consent cannot be retained or reinstated because the area has been subdivided and redeveloped since 1997 for industrial purposes in a manner inconsistent with the retention of the swale as originally designed.

It is also concluded that, by referring to the conditions and plans, there is no approved stormwater drainage infrastructure on the face of the documents that directly controls stormwater flows in the area of the Event Carpark & Pit Area and presents its discharge to the east.

Given that the surrounding land to the east of the site has now been developed, the limited stormwater controls envisaged by the 1997 Consent are of questionable utility or effectiveness.

3. Pre-Existing Condition prior to Event Carpark & Pit Area Works and Effect of the Carpark Works

I am instructed that works have been carried out to the Event Carpark over the course of late 2018 and 2019 to improve the land and raise the landform by approximately 3.5m.

Figure 1 below shows the existing gradient of the land upstream of the sites at 50 Peter Brock Drive and 10 Raceway Place, Eastern Creek (October 2018) prior to the fill being deposited on the land.

Figure 2 below is an aerial image of the precinct and both sites that is marked with the location of the existing stormwater pipes under the Event Car Park and the swale to the east of the Event Car Park.

Figure 3 below is a catchment plan that shows the upstream areas that naturally drain at the rear of 50 Peter Brock Drive (13192m²) and 10 Raceway Place, Eastern Creek (5381m²).

Based on the contours in Figures 1 & 3 below, it appears that 10 Raceway Place is located within a natural low-lying gully that would naturally convey upstream runoff from 5381m² catchment area (refer Figure 3 below). The area between the Event Carpark and the site at 10 Raceway Place represented in thin mustard colour (Figure 3) is the batter between the carpark and the adjacent site. The runoff from this area is picked up by the swale constructed along the boundary.

As stated above, given that the area to the east of the Event Carpark & Pit Area has been developed for industrial purposes, it is clear that the stormwater discharge will no longer occur as originally intended by the 1997 consent.



Figure 1 The pre-existing condition and contours before the construction of the Event Carpark and Pit Area

Figure 1 above shows the existing contours of the terrain upstream and surrounding the overflow Event Carpark & Pit Area and 10 Raceway Place, Eastern Creek. It shows three high points surround the site as shown in figure 1 identified in red. Notably, 10 Raceway Place lies in between two of the high points.



Figure 2 Aerial image of Event Carpark & Pit Area post-construction; area shaded green has been filled approximately up to 3.5m

I have reviewed the planning report prepared by City Plan dated October 2020 and the contamination report prepared by Zoic dated 25 September 2020 submitted with the subject modification application.

The works that have been carried out are identified in the green area above (Figure 2) and were carried out in approximately December 2018 – June 2019. In general, in the south-eastern corner of the site, the land has been improved and raised into a three tiered carpark, approximately 3.5m metres above the height of the land as it was in 2017.

In particular, the following has been constructed:-

1. The entire Event Carpark & Pit Area has been constructed on fill with grades below 10%;
2. Two 300mm uPVC pipes have been installed at the low point. These pipes have been installed to retain the nature flow of water and facilitate the continued flow of water beneath the Event Carpark & Pit Area; and
3. An emergency overflow route has been provided via a newly constructed swale along the eastern boundary of the Event Carpark & Pit Area at 50 Peter Brock Drive.

List of Assumptions/Estimates

I attended the Event Carpark & Pit Area and ascertained the following assumptions/estimations from this site visit:-

1. The emergency overflow swale shown in Figure 2 has a width of 2.5m and a depth of 0.4m;
2. It was clear at the site that the entire Event Carpark & Pit Area has been graded down and in a northerly direction and generally away from neighbouring properties towards 50 Peter Brock Drive; and
3. Two 300mm uPVC pipes were inaccessible during the site visit but we have sighted them from the upstream end. We have assumed the pipes have been laid at a 1% grade for calculation purposes.

Flows Affecting Subject Site

As shown in Figure 3 below, a 5381m² catchment naturally drains to the rear of 10 Raceway Place identified in mustard colour. This catchment discharges at the rear of 10 Raceway Place regardless of the fill to construct the Event Carpark & Pit Area.

The Event Carpark and Pit Area has an upstream catchment of 13192m² identified in green in Figure 3. The existing catchment draining at the rear of 10 Raceway Place and remains unchanged after the works carried out at 50 Peter Brock Dr.

The works carried out have obstructed the catchment. It is now draining through the constructed two 300mm uPVC pipes installed beneath the Event Carpark and Pit Area referred to in Figure 2, at the low point of the natural gully. These pipes drain the minor flows which occur frequently during any given year. In the event these pipes fail or block and in large storm events that exceed the pipes capacity, an emergency overflow swale has been constructed along the eastern boundary of 50 Peter Brock Drive as shown in Figure 2.

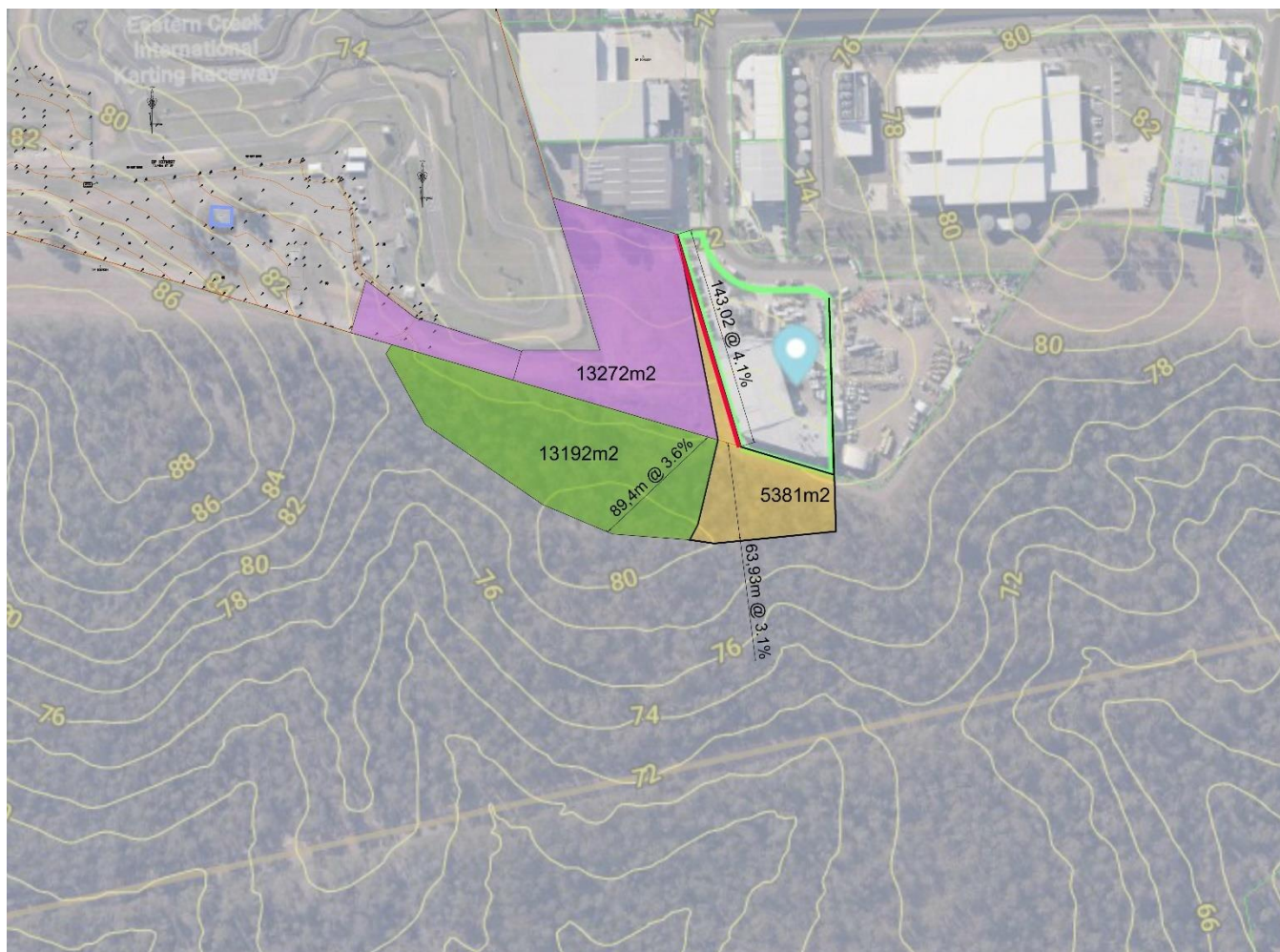


Figure 3 Existing catchment (orange hatch) draining to 10 Raceway, and obstructed catchment (green) by Event Carpark & Pit Area

The catchment on the Event Car Park and Pit Area is drained separately in series of pits and pipes installed in the car park area. The surface of the area is graded towards the Karting raceway area.

Peak runoff event – 1:100

I have calculated the expected peak runoff of both catchments in the 1% AEP storm. The runoff in 1% AEP storm from catchment 1 (5381m²) generates a peak runoff of 92.67L/s and catchment 2 (13192m²) generates a peak runoff of 205.21L/s. The two 300mm uPVC pipes installed have a calculated capacity of 288.91L/s assuming they are unblocked and free of any silt accumulation at the bottom of the pipes (ie fully open and unblocked). This capacity is obviously reduced when the pipes are partially blocked.

In addition, the constructed swale has been modelled (see figure 4) and has an expected capacity of 1117.24 L/s. This is based on the swale being maintained and cleared of any silt accumulation at the base and debris.

Inputs				Results			
Bottom width	0	m	X	Flow area	0.5000	m ²	X
Side slope 1 (horiz./vert.)	3.125		X	Wetted perimeter	2.6249	m	X
Side slope 2 (horiz./vert.)	3.125		X	Hydraulic radius	0.1905	m	X
Manning roughness, n ?	0.03		X	Velocity, v	2.2345	m/s	X
Channel slope	4.1	% rise/run	X	Flow, Q	1117.2429	l/s	X
Flow depth	0.4	m	X	Velocity head, h _v	0.2546	m	X
Bend Angle? (for riprap sizing)			X	Top width, T	2.5000	m	X
Stone specific gravity (2.65)			X	Froude number, F	1.60		X
				Shear stress (tractive force), tau	0.0000		X
				Implied design ? riprap size based on n	0.0643	m	X
				Required bottom angular riprap size, D50, Maricopa County	0.1054	m	X
				Required side slope 1 angular riprap size, D50, Maricopa County	0.1054	m	X
				Required side slope 2 angular riprap size, D50, Maricopa County	0.1054	m	X
				Required angular riprap size, D50, per Maynard, Ruff, and Abt (1989)	NaN	m	X
				Required angular riprap size, D50, per Searcy (1967)	0.1098	m	X

Printable version (reload/refresh to restore)

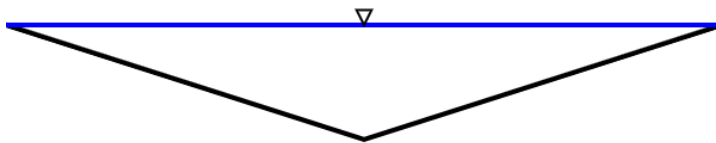


Figure 4 Calculated capacity of the constructed grass swale along the eastern boundary of 50 Peter Brock Drive

Findings on works carried out to date

Based on the above, I believe that the flood mitigation measures put in place (two 300mm uPVC pipes and emergency overflow swale) are generally adequate to handle the 1% AEP storm flows (1in100yr) and would not lead to increased flooding within 10 Raceway Place, Eastern Creek provided that the pipes and the swale are clear of blockages and silt deposit.

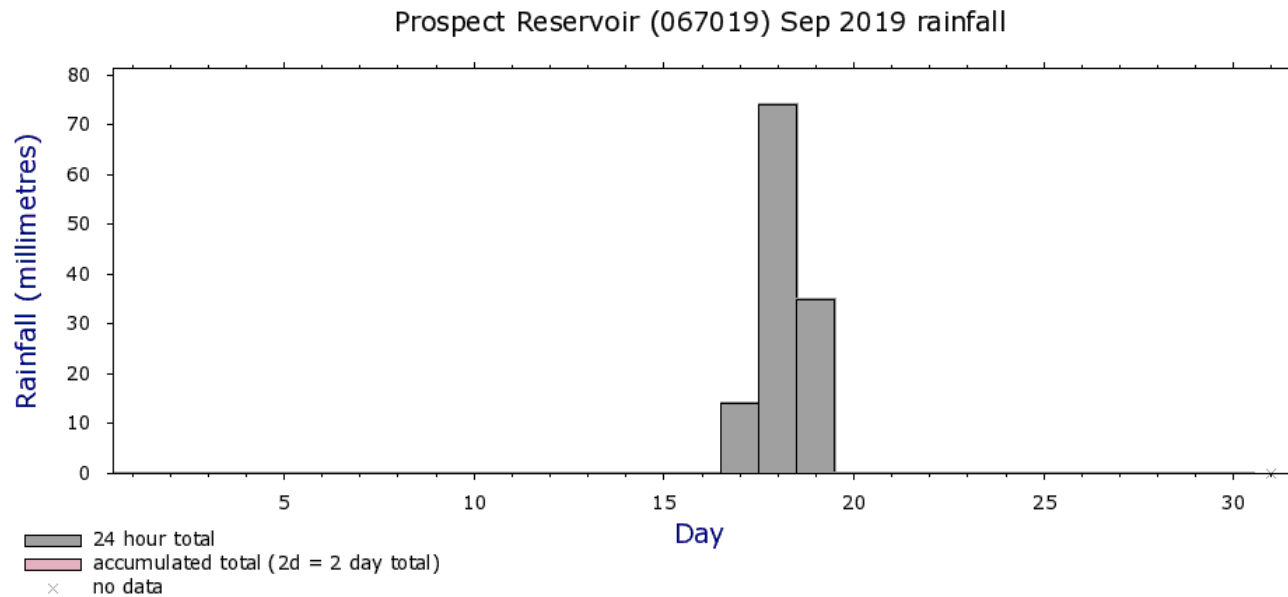
Instead, given the constructed infrastructure is capable of conveying 1406L/s (1117 L/s + 288.91 L/s), flooding impacts on 10 Raceway Place will likely be reduced and limited to the catchment directly upstream that the works within 50 Peter Brock Drive.

The constructed pipes under the crossing and the swale along the eastern boundary with 10 Raceway Place convey the flows from the upstream catchment up to the 1% AEP storm event (1in100yr) away from 10 Raceway Place.

The works carried out to date do not cater for the PMF.

Comments on previous flooding events

According to the data recorded by the Bureau of Meteorology, the 18th of September storm generated 74mm of rainfall, this was the record high for the month and year. The prospect reservoir data recording station only takes readings once per day, as such we are unable to determine the duration of the storm and hence unable to determine the peak runoff that would have been generated on the day.



Note: Data may not have completed quality control.

Climate Data Online, Bureau of Meteorology
Copyright Commonwealth of Australia, 2020

Figure 5 Prospect Reservoir rainfall Data





Figure 6 Photo of Swale Drain at Boundary with No.10 Raceway Place

With regards to the cause of flooding within 10 Raceway Place Eastern Creek in September 2020, subject to the assumptions made above, I am of the opinion that this is most likely due to the building being constructed in cut.

As I indicate above, 10 Raceway Place is constructed in an overland flowpath.

As shown in Figure 6 above taken along the south east boundary of the Site and looking at the warehouse at 10 Raceway Place, the ground floor of the warehouse has been constructed lower than natural ground within what appears to be an overland flow channel. I note an open steel staircase and retaining wall have been constructed to prevent the ingress of overland flow into the building).

I would recommend the existing structure to be inspected by a structural/remedial engineer to ensure that the precast panels of 10 Raceway Place, Eastern Creek have been adequately made watertight and that no leak points exist along the constructed channel.

4. Modification Application

As I stated above, the constructed stormwater infrastructure associated with the Event Carpark & Pit Area conveys the minor flows from the upstream catchment in the 2x300mm pipes from the rear of the site towards the Karting land away from 10 Raceway Place. The constructed swale conveys the major storms away from 10 Raceway Place towards Raceway Place road.

14 October 2020 (rev C) plans

Revision C engineering plans were prepared to support the modification application in October 2020. These are C201, C202, C203 & C204 dated 14 October 2020.

These plans show:

(a) Drawing C201:

- construction of a proposed swale and installation of a 450mm stormwater pipe in the west and north west of the carpark (Western Pipe);
- stormwater drainage infrastructure in the north of the event carpark including PVC pipes and drainage pits, directing stormwater towards the Western Pipe;
- construction of a retaining wall in the north-east of the event carpark and some minor fill to direct water away from the NE boundary;
- landscaping earth batters with turf;
- the sealing of the carpark to be 2-coat bitumen; and
- the retention and cleaning/clearing out of the existing drainage swale along the eastern boundary

(b) Drawings C202 and C203:

- the continuation of the Western Pipe in a north westerly direction to a proposed headwall with riprap to discharge to wetland.

These plans demonstrate that if the infrastructure is constructed in accordance with the Rev C plans, the stormwater runoff from the Event Carpark & Pit Area drains away from 10 Raceway Place and be

collected in two separate sumps (one at each level of the Event Carpark & Pit Area) and drain separately towards the karting area. No runoff from the Event Carpark & Pit Area would discharge towards the neighbouring sites including the embankment along the eastern boundary that is collected in the swale already constructed up to the 1% AEP event.

The Event Carpark & Pit Area are already graded to meet the requirements of the standards (AS2890) and embankments have been provided between the Event Carpark & Pit Area. The flows from the upstream catchment collected in the 2x300mm pipes have been extended to the existing basin off Peter Brock Drive with a combined pipe and swale arrangement.

The constructed stormwater infrastructure for the Event Carpark & Pit Area is capable of collecting and conveying the flows towards 50 Peter Brock Drive to current industry practice.

The combination of pipes under the link to the Event Carpark & Pit Area and the swale to the east will be capable of conveying the flows that are generated in a 1% AEP storm event (1in100yr) away from 10 Raceway Place. This meets current industry practice.

There would not be any flows from the upstream catchment and from the Event Carpark & Pit Area that will discharge into No.10 raceway Place in 1 in 100yr ARI storm event.

13 November 2020 (Rev D) plans

Following a suggestion by the Court, I have been requested to design the stormwater drainage infrastructure for the probable maximum flood (**PMF**).

As part of this redesign, I have also been asked to design the drainage infrastructure so that it captures all stormwater collected in the upstream catchment and in the Event Carpark Area & Pit Area and divert it away from 10 Raceway Place.

Peak runoff event – PMF

The runoff generated from the upstream catchment in a PMF event is assessed below. Using the Generalised Short-Duration Method, the critical time duration adopted is 15mins. The relevant rainfall depth is 172mm and an equivalent density of 688mm/hr. The peak flow generated in a PMF event is calculated at 2521L/s.

15 Minutes		
Duration	Intensity	Depth
0	877.2	0
5	835.92	73.1
10	688	139.32
15		172.00

Figure 7 Extract of GSDM Rainfall Intensity Calculations

Formula		
$Q = C \times I \times A / 3600$		
C =	1	
I =	688	mm/hr
A =	13192	m ²
Q =	2521.14	L/s
or	2.52	cums

Figure 8 Peak Flow Calculation in PMF Event

For this peak flow, additional infrastructure is required under the fill in the form of a concrete culvert. This involves the construction of a concrete headwall and a culvert 2400x600mm that is capable of conveying the runoff from the upstream catchment in a PMF event. The inlet of the culvert would be lowered below the existing levels on the upstream end by 800mm to allow for ponding to occur at the inlet up to this depth. The headwall will be recessed into the site to allow for the ponding to occur on the site and not extend in a south easterly direction to prevent water from reaching the site at No.10 Raceway. Reference is made to images below and to the amended civil plans rev. D dated 16 November 2020.

It is also proposed to construct a swale along the rear boundary of the site to allow for runoff to be directed towards the inlet of the culvert. This will ensure that the runoff from the upstream catchment will not reach the rear of the property at No.10 Raceway.

The effect of these works once completed, will be that all of the rainfall on and upstream of the Event Carpark and Pit Area will be captured and diverted away from 10 Raceway Place including in the PMF. There will be no discharge in a south, south easterly, easterly or north easterly direction onto 10 Raceway Place up to and including the PMF from the carpark and the “green” upstream catchment area (refer

Figure 9). The total area for which stormwater is captured and diverted away from 10 Raceway Place including in the PMF is shown at Figure 9. This includes the thin mustard colour in Figure 9 which represents the batter that falls onto the swale along the boundary of 10 Raceway Place.

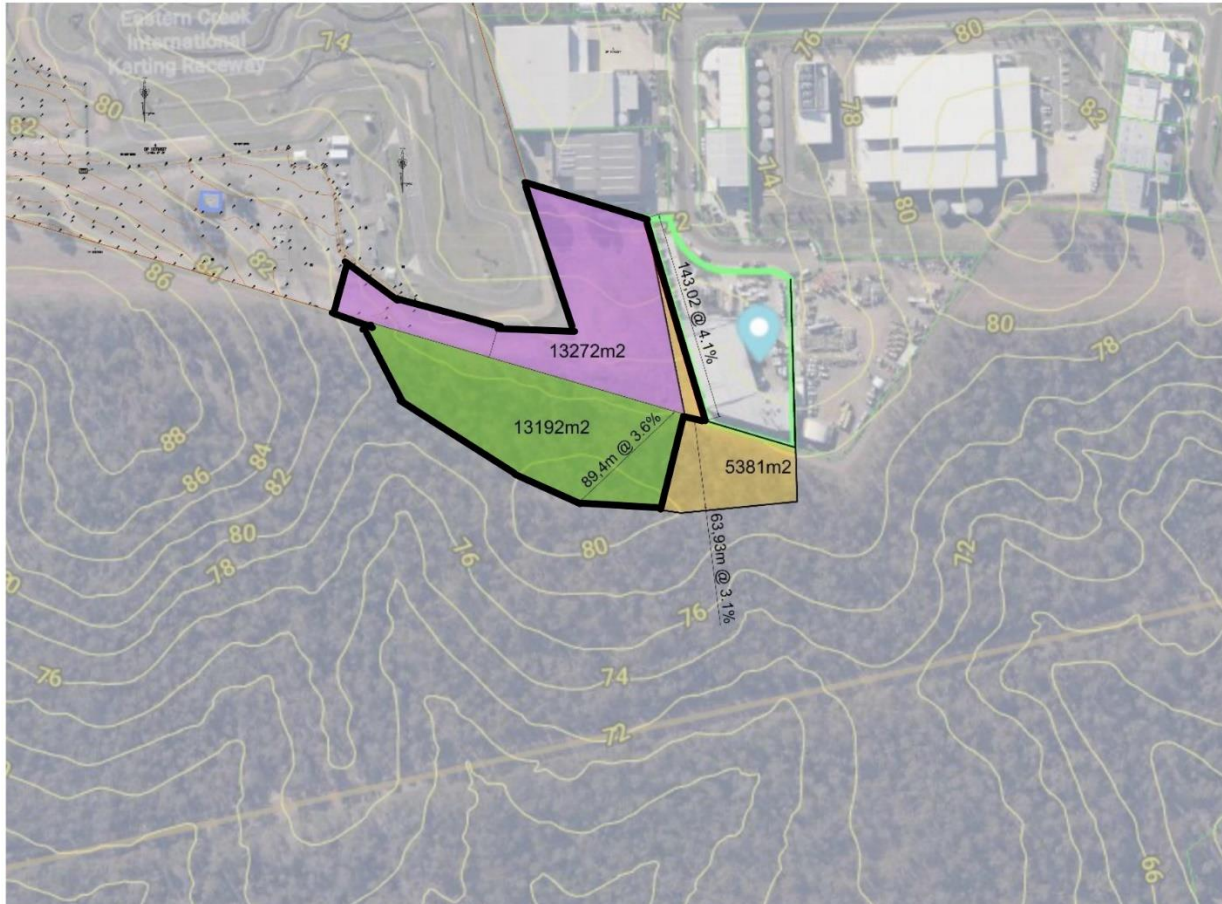


Figure 9 Total Catchment Area drained through site up to PMF Event

The revision D plans show:

(a) Drawing C201:

- construction of a proposed inlet structure at the upstream site boundary and installation of a concrete headwall to capture the runoff;
- Construction of a 2400x600mm culvert under the fill and through the Karts land down into the wetland;
- Catch drains on each side of the inlet structure to convey the flows to the inlet and the culvert;

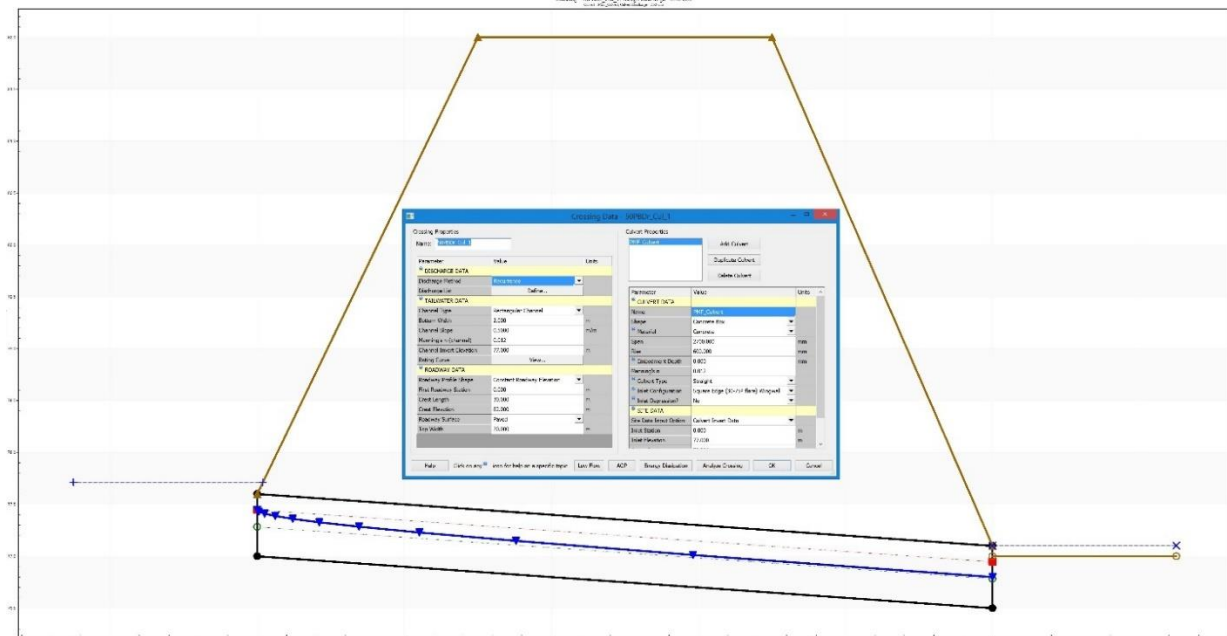
- Construction of an earth mound along the perimeter of the car park to prevent any spill of sheet flows towards No.10 Raceway Place;
- Grading of the car park surface away from the neighbouring sites at 1% minimum grade;
- the sealing of the carpark to be 2-coat bitumen; and
- the retention and cleaning/clearing out of the existing drainage swale along the eastern boundary.

(b) Drawings C202 and C203:

- Demonstrate the continuation of the culvert in a north westerly direction to a proposed headwall with riprap to discharge to wetland.

(c) Drawing C204:

- Demonstrate the discharge from the basin associated with the development of MOTO-X.



Crossing Data - 50PBDr_Cul_1

Crossing Properties

Name: 50PBDr_Cul_1

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Recurrence	
Discharge List	Define...	
TAILWATER DATA		
Channel Type	Rectangular Channel	
Bottom Width	2.000	m
Channel Slope	0.5000	m/m
Manning's n (channel)	0.012	
Channel Invert Elevation	77.000	m
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Constant Roadway Elevation	
First Roadway Station	0.000	m
Crest Length	30.000	m
Crest Elevation	82.000	m
Roadway Surface	Paved	
Top Width	20.000	m

Culvert Properties

PMF Culvert

Add Culvert
Duplicate Culvert
Delete Culvert

Parameter	Value	Units
CULVERT DATA		
Name	PMF_Culvert	
Shape	Concrete Box	
Material	Concrete	
Span	2400.000	mm
Rise	600.000	mm
Embedment Depth	0.000	mm
Manning's n	0.012	
Culvert Type	Straight	
Inlet Configuration	Square Edge (30-75° flare) Wingwall	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	m
Inlet Elevation	77.000	m

Help Click on any icon for help on a specific topic Low Flow AOP Energy Dissipation Analyze Crossing OK Cancel

Figure 10 Culvert Sizing for the PMF flow

5. Conclusion

The stormwater infrastructure associated with the Event Carpark & Pit Area and the modification application (both rev C and rev D plans) is capable of collecting and conveying the flows towards 50 Peter Brock Drive to current industry practice.

The proposed stormwater infrastructure associated with the Event Car Park & Pit Area results in a significant improvement from the perspective of stormwater drainage and performance to adjoining neighbours and to the site itself.

Following a suggestion by the Court, I am instructed that that the applicant for the modification intends to proceed with the Rev D plans and this is what should be assessed by the consent authority.

The intended outcome to discharge the stormwater to the east in the 1997 Consent would have impacted the industrial development at 10 Raceway Place in an adverse way and resulted in inundation to the premises frequently.

I am of the opinion that the stormwater drainage infrastructure solution provided with the Event Carpark & Pit Area is a significant improvement to what has been approved in the 1997 Consent. The revision D plans should resolve the issue of stormwater discharge from the Site onto the adjoining land at 10 Raceway Place completely.

My CV is enclosed.

For & On Behalf of S&G Consultants Pty Ltd



Sam Haddad

MIEAust CPEng NER 2247040



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Sam Haddad

Sam established S&G Consultants Pty Ltd in 2003, a civil engineering consultancy firm specialising in: -

- Pavement design;
- Road and grading design;
- Subdivision design;
- Stormwater drainage design;
- Flood studies;
- Catchment management studies;
- Water sensitive urban design; and
- Erosion and sediment control.

Sam has extensive experience in the civil design of residential, commercial, and industrial projects. His strength lies in hydrology, hydraulics, and flood management. The expertise of Sam extends to road and subdivision including grading and pavement designs.

Sam started his career as a site engineer in 1997 and then progressed to become a project engineer in 2002 when he moved to Australia and started his local career as a civil designer working with the LHO Group and then a senior Civil Engineer with GHD Group. Sam established SGC in 2003 at the same time and carried out several civil and structural design projects.

Employment History

2003-Present	Director, S&G Consultants Pty Limited
2005-2007	Senior Civil Design Engineer, GHD Pty Ltd
2002-2005	Senior Design Engineer, LHO Group
2001-2002	Project Engineer, Associated Consulting Engineers (ACE)
2000-2001	Site Engineer, NSE
1999	Site Engineer, NECSO
1997-1999	Graduate Site Engineer, CMC

Education

B.E. Civil Engineering;
M.E.M. Masters of Engineering Management;
Accredited Provisional Designer for Sydney Water Corporation; and
Registered Designer with RailCorp (stormwater infrastructure).

Affiliation

Chartered Member of Engineers Australia (MIEAust CPEng 2247040);
Registered Professional Engineer NER 3 – Civil;
Queensland Board of Professional Engineers RPEQ 18399.

S&G CV Sam.docx

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