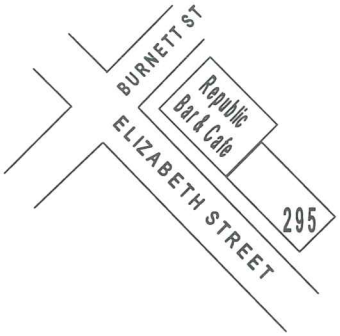
NICK GRIGGS & CO.
LAND SURVEYORS

ABN: 19 791 307 875

CADASTRAL SURVEYING
ENGINEERING SURVEYING
DRAUGHSTMEN

N. GRIGGS, B.Sc., L.S., F.I.S. AUST.



295 ELIZABETH STREET
NORTH HOBART, TAS 7000
PH: 03 6234 5022
FX: 03 6231 2412
EMAIL: nickgriggs@netspace.net.au
MOBILE: 0418 129 301

September 12, 2019 Ref No 3757

The General Manager
Glamorgan Spring Bay Council
Vicary Street
TRIABUNNA TAS 7190
Email: shane.wells@freycinet.tas.gov.au

Attention: Shane Wells – Council Planner

Dear Shane,

Re: Plan of Subdivision
66 Alma Road, Orford
AMNS Pty Ltd Owner

Please treat with this Application as a new Application for a subdivision of this property. The previous application SA 2016/00012 provided a Bushfire Management Plan which could be used by Council for the new Application.

The following information is enclosed.

1. Plan of Subdivision
2. Council Application Form
3. Stormwater Management Design Report prepared by Consulting Engineer Ross Cumming.
4. Copy of C.T. 35054/1

Please advise if you require any further information.

Please forward the Council Tax Invoice for the Application to this office.

Yours faithfully
NICK GRIGGS & CO

NICHOLAS GRIGGS
Encl.

Copy: Tony McCulloch
Ross Cumming

Office: 9 Melbourne Street,
Postal: PO Box 6 Triabunna 7190
Phone: 6256 4777 Fax: 6256 4774
Email: planning@freycinet.tas.gov.au
Web: www.gsbc.tas.gov.au
ABN: 95 641 533 778

GLAMORGAN SPRING BAY COUNCIL

Application for Planning Approval

OFFICE USE ONLY	
DATE RECEIVED:	PID:
FEE	RECEIPT No:
DA:	PROPERTY FILE:

Advice:

Use this form for all no permit required, permitted and discretionary planning applications including subdivision as well as for planning scheme amendment & minor amendments to permits.

If you are applying for a change of use to visitor accommodation in the General Residential, Low Density Residential, Rural Living, Environmental Living or Village Zone, the *Visitor Accommodation Use in Existing Habitable Buildings Standard Application Package* must be used. This is available on the Council website.

Completing this form in full will help ensure that all necessary information is provided and avoid any delay. The planning scheme provides details of what other information may be required at clause 8.1 and in each applicable Code.

Please provide the relevant details in each applicable section by providing the information or circling Yes or No as appropriate. If relevant details are provided on plans or documents please refer to the drawing number or other documents in this form.

Often, it is beneficial to provide a separate written submission explaining in general terms what is proposed and why and to justify the proposal against any applicable performance criteria.

If you have any queries with the form or what information is required please contact the office.

Details of Applicant & Owner

Applicant:	Nick Griggs & Co.			
Contact person: (if different from applicant)	Nicholas Griggs			
Address:	295 Elizabeth Street		Phone	62345022
	North Hobart	TAS 7000	Fax:	
Email:			Mobile:	0418 129 301
Do you wish for all correspondence to be sent solely by email?			Yes ☑	No ☐

Owner: (if different from applicant)	AMNS Pty Ltd.			
Address:			Phone:	
			Fax:	
Email:	tmcculloch@getrealgroup.net.au		Mobile:	

Application for Planning Approval

Details of Site and Application

Please note, if your application is discretionary the following will be placed on public exhibition.

Site Details

Address / Location of Proposal:	66 Alma Road		
	Orford	Suburb	Post Code 7190
Size of site	m^2	or	Ha
Certificate of Title(s):	C.T. 35054/1		

Current use of site:	Vacant

General Application Details

Complete for All Applications

☐	New Dwelling	☐	Change of use
☐	Additions / Alterations to Dwelling	☐	Intensification or modification of use
☐	New Outbuilding or Addition	☑	Subdivision or boundary adjustment
☐	New Agricultural Building	☐	Minor amendment to existing permit DA ..... / .....
☐	Commercial / Industrial Building	☐	Planning Scheme Amendment

Estimated value of works (design & construction)	$

Describe the order and timing of any staged works:	or N/A

General Background Information

Please state the name of any Council officers that you have discussed this proposal with:	Officer's name : N/A	or
Is the site listed on the Tasmanian Heritage Register?	Yes ☐	No ☐
Have any potentially contaminating activities ever occurred on the site? *If yes, please provide a separate written description of those activities.*	Yes ☐	No ☐
Is the proposal consistent with any restrictive covenants or Part 5 agreements that apply to the site?	Yes ☐	No ☐

Does the proposal involve any of the following?		
Type of development		**Brief written description if not clearly shown on the plans:**
Partial or full demolition	☐ **Yes** ☐ **No**	
Fencing	☐ **Yes** ☐ **No**	
New or upgraded vehicle / pedestrian access	☐ **Yes** ☐ **No**	
New or modified water, sewer, electrical or telecommunications connection	☐ **Yes** ☐ **No**	
Retaining walls	☐ **Yes** ☐ **No**	
Cut or fill	☐ **Yes** ☐ **No**	
Signage	☐ **Yes** ☐ **No**	
New car parking	☐ **Yes** ☐ **No**	
Vegetation removal	☐ **Yes** ☐ **No**	

Existing floor area . m^2	Proposed floor area .m^2

Number of existing car parking on site	Number of proposed car parking on site

Describe the width & surfacing of vehicular access (existing or proposed) and how drainage/runoff is collected and discharged:	
If vehicular access is from a road sign-posted at more than 60 km/hr, please state the sight distance in both directions:	or N/A

Please note, if a gravel driveway is proposed from a sealed public road please address the following clause (E6.7.6 P1):

Parking spaces and vehicle circulation roadways must not unreasonably detract from the amenity of users, adjoining occupiers or the quality of the environment through dust or mud generation or sediment transport, having regard to all of the following:

(i) the suitability of the surface treatment;
(ii) the characteristics of the use or development;
(iii) measures to mitigate mud or dust generation or sediment transport.

Will stormwater from buildings and hardstand areas be managed by: (details should be clearly	Discharge to a main:	Yes ☐
	Discharge to kerb & gutter:	Yes ☐
	Discharge to roadside table drain:...	Yes ☐
	Discharge to natural watercourse: ..	Yes ☐

shown / noted on plans)	Retained on site:	Yes ☐

Materials				
External building material	Walls:		Roof:	
External building colours	Walls:		Roof:	
Fencing materials:		Retailing wall materials:		

For all outbuildings

Describe for what purpose the building is to be used:	
Describe any intended toilet, shower, cooking or heating to be installed:	
If the building is to be used wholly or partly as a domestic workshop, what type of tools and machines will be used?	

For all non-residential applications

Hours of Operation						
Current hours of operation	Monday to Friday:		Saturday:		Sunday & Public holidays:	
Proposed hours of operation	Monday to Friday:		Saturday:		Sunday & Public holidays:	

Number of Employees			
Current Employees Total:		Maximum at any one time:	
Proposed Employees Total:		Maximum at any one time:	

Describe any delivery of goods to and from the site, including the types of vehicles used and the estimated average weekly frequency:	or N/A
Describe current traffic movements into the site, including the type & timing of heavy vehicle movements & any proposed change:	or N/A
Describe any hazardous materials to be used or stored on site:	or N/A
Describe the type & location of any large plant or machinery used (refrigeration, generators)	or N/A
Describe any retail and/or storage of goods or equipment in outdoor areas:	or N/A
Describe any external lighting proposed:	or N/A

Personal Information Protection Statement:

The personal information requested is personal information for the purposes of the *Personal Information Protection Act 2004* and will be managed in accordance with that Act. The personal information is being collected by Glamorgan Spring Bay Council for the purposes of managing, assessing, advising on and determining the relevant application in accordance with the *Land Use Planning and Approvals Act 1993* (LUPPA) and other related purposes, including for the purpose of data collection.

The intended recipients of personal information collected by Council may include its officers, agents or contractors or data service providers and contractors engaged by the Council from time to time.

The information may also be made publically available on the Council's website and available for any person to inspect in accordance with LUPAA. The supply of this information is voluntary. However, if you cannot or do not provide the information sought, the Council will be unable to accept and/or process your application.

Declaration:

I/we hereby apply for planning approval to carry out the use or development described in this application and the accompanying documents and declare that: -

- The information in this application is true and correct.
- I/we authorise Council employees or consultants to enter the site in order to assess the application.
- I/we have obtained all copy licences and permission from the copyright owner for the publication, communication and reproduction of the application and reports, plans and materials provided as part of the application and for the purposes of managing, assessing, advising on and determining the application.
- I/we authorise the Council to:
  - Make available the application and any and all information, reports, plans and materials provided with or as part of the application in electronic form on the Council's website and in hard copy at the Council's office and other locations for public exhibition if and as required;
  - Make such copies of the application and any and all information, reports, plans and materials provided with or as part of the application which are, in the Council's opinion, necessary to facilitate a consideration of the application; and
  - Publish and or reproduce the application and any and all information, reports, plans and materials provided with or as part of the application in Council agendas, for representors, referral agencies and other persons interested in the application.
- You indemnify the Council for any claim or action taken against the Council for breach of copyright in respect of the application and any and all information, report, plan and material provided with or as part of the application.
- I/we authorise Council to provide a copy of any documents relating to this application to any person for the purpose of assessment or public consultation and agree to arrange for the permission of the copyright owner of any part of this application to be obtained.
- I/We declare that the Owner has been notified of the intention to make this application in accordance with section 52(1) of the *Land Use Planning and Approvals Act 1993*.

Signature:		Date:	12/9/2019

If applicant is not the owner

If the applicant is not the owner, please list all persons who were notified of this application pursuant to section 52 of the *Land Use Planning and Approvals Act 1993*.

Name:	Method of notification:	Date of notification:
TONY McCULLOCH (AMNS P/L)	EMAIL	12/9/2019
ROSS CUMMING (ENGINEER)	E MAIL	12/9/2019

If application is on or affect Council or Crown owned or administered land

If land affected by this application is owned or administered by the Crown or Council then the written permission of the relevant Minister (or their delegate) and/or the General Manager must provided and that person must also sign this application form below:

I being responsible for the administration of land at
declare that I have given permission for the making of this application by for use and/or development involving

Signature: Date:

RESULT OF SEARCH

RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

Tasmanian Government

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
35054	1
EDITION	DATE OF ISSUE
10	14-May-2019

SEARCH DATE : 18-Nov-2019
SEARCH TIME : 12.00 PM

DESCRIPTION OF LAND

Parish of TRIABUNNA, Land District of PEMBROKE
Lot 1 on Diagram 35054
Derivation : Part of Lot 9974 Gtd to R Budd
Prior CT 4505/39

SCHEDULE 1

C935127 TRANSFER to AMNS PTY LTD Registered 05-Nov-2009 at 12.01 PM

SCHEDULE 2

Reservations and conditions in the Crown Grant if any

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

Owner: HOLKHAM ESTATES PTY LTD. & D.G.POTTER.

Title Reference: ~~C.T. 3864-41~~ C.T.4460/47

Grantee: Part of Lot 9974 (55-3-0) Gtd. to Anna Rosa Rudd

PLAN OF SURVEY

by Surveyor.... D. G. POTTER.....

of land situated in the

LAND DISTRICT OF PEMBROKE

PARISH OF TRIABUNNA

SCALE 1: 2000 MEASUREMENTS IN METRES

Registered Number: **D35054**

Approved

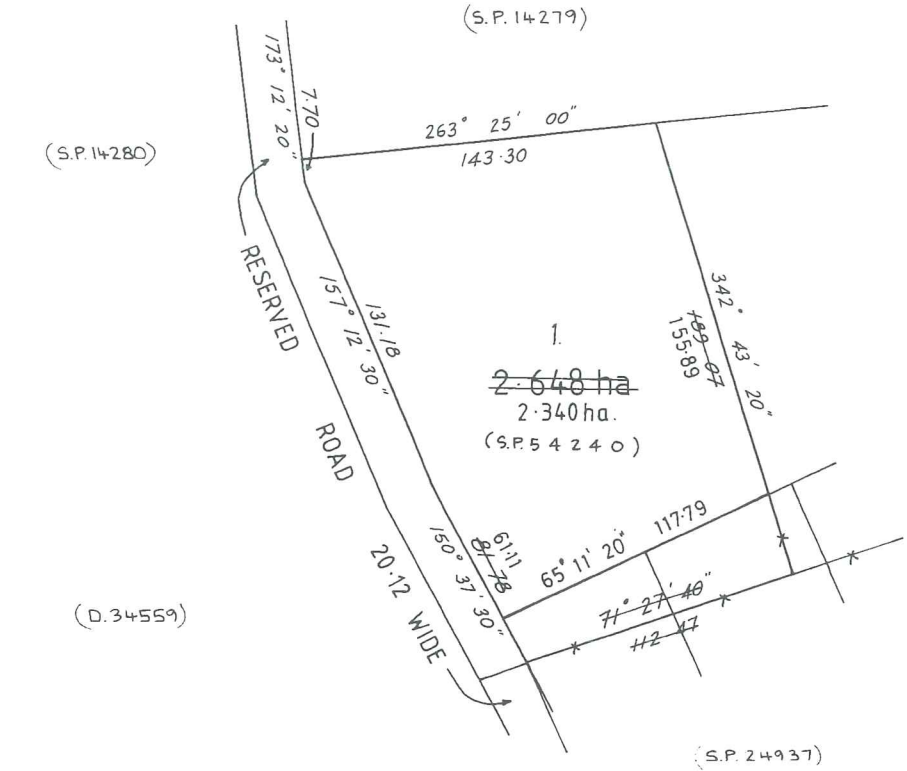
Effective from: .....

Recorder of Titles

DIAGRAM AMENDED BY ME PURSUANT TO APPN. No B313487 UNDER SECTION 142. OF THE LAND TITLES ACT 1980.

RECORDER OF TITLES

16·11·89



ROSS CUMMING ENGINEERING

ABN 30 619 277 446
32 SUMMERHILL ROAD
WEST HOBART
TASMANIA 7000
grc@netspace.net.au
PHONE: 0407 870 015
(0362 345 398)
REF: Alma Rd REV 0
DATE: 31 Oct 2019
ISSUE: REVISION 2

THE GENERAL MANAGER
GLAMORGAN SPRING BAY COUNCIL
PO BOX 6
TRIABUNNA TAS 7190

ATTENTION: Council Planner

SA -16012 - 66 ALMA ROAD, ORFORD SUBDIVISION STORMWATER MANAGEMENT DESIGN REPORT

1. INTRODUCTION

Ross Cumming Engineering (RCE) undertook preliminary design of the subdivision services layout including stormwater management for AMNS Pty Ltd. The subdivision comprises 14 lots accessed from both Alma Road and a proposed new Cul-de-Sac from Alma Road opposite Fieldwick Lane. This report summarizes the design of stormwater aspects at the Permit application stage of the project.

The reference drawing for the proposed layout was prepared by surveyor Nick Griggs & Co. reference File No. 375709 first draft was dated 08/08/2019 but then dated 10/09/2019 when first lodged and further updated on 04/10/2019. The updates have no bearing on the stormwater hydraulics as the lot layouts are all identical. (13 new lots + balance lot)

2. EXISTING STORMWATER ARRANGEMENT

The proposed subdivision is approximately 2.4Ha in area and is contained within a 100Ha hillside catchment that terminates approximately 700m further downstream at the Tasman Highway at Raspins Beach.

The lower point of the 2.4Ha subdivision catchment is contained within a 30Ha catchment that extends upstream into the steep hills to the west.

The catchment includes a single ephemeral creek that is well defined through the proposed subdivision. The creek profile is approximately 700mm deep and 1.2m wide with a floor width of 600mm. This creek is currently piped with a 750mm diameter culvert only where it crosses Alma Road at the western edge of the proposed subdivision. The grade (8%) and condition of this channel through the subject property indicates a capacity flowing full in an AEP (Annual Exceedence Probability) 5% to 1% storm event of approximately 2 cumec (2,000 L/sec).

There are no nearby piped Council stormwater systems.

The stormwater catchment plan is attached to this report as Attachment A.

3. PROPOSED ROAD & STORMWATER LAYOUT

3.1 ROAD

The subdivision proposes 14 lots varying between 1,000m2 and 3,000m2 in area. Three lots would be accessed off Alma Road and a cul-de-sac road approximately 100m long is proposed to provide access to 11 lots.

The new road would junction onto Alma Road opposite the junction of Fieldwick Lane and generally follow the course of the existing creek line. This will require the creek to be piped for the full length of the new road to where it can be transitioned back to the natural creek profile within the public open space between Lots 6 & 8.

Reticulation pipework is proposed to connect lots by piped drains to the piped creek or in the case of the lots to the south of the new road to a piped drain connecting to the creek within the subdivision boundaries.

3.2 STORMWATER

The proposal for control of stormwater is as follows:

1) Creek is to be piped for AEP 5% (20 year) storm event with transition to rock-lined channel in the POS area and transition back to existing creek profile prior to the subdivision boundary
2) Lots are to be provided with a 150mm piped connections for the AEP 5% storm event
3) Controlled overflow path is to be provided for AEP1% (100 year) event by way of road cross-section (flow path between kerbs) and a shallow channel within the POS area
4) Roof runoff tanks are to be included to reduce peak flash roof storm flows so as to not exceed the current flow that would occur from the existing undeveloped land and also to allow recycling of roof runoff in accordance with WSUD principles.
5) Lot accesses are not to drain to piped systems but instead, to shallow infiltration swales so as to achieve reduced runoff and environmental benefit in accordance WSUD principles

By adopting the above approach to stormwater control and because the area modified by the subdivision only amounts to 2.4Ha of the total 30Ha upstream catchment there will be no change to the peak runoff flows from this catchment.

4. HYDROLOGY & STORMWATER DRAINAGE DESIGN

4.1 General

Design is in accordance with Australian Rainfall & Runoff (ARR) procedures with rainfall data extracted from BOM in accordance with latest 2016 data. Attachment B shows the Intensity/Frequency /Duration (IFD) data from BOM applicable to the stormwater catchment.

Analysis of the catchment was undertaken to determine peak storm flows for design of the piped system. Design is based on providing piped control of flood flows at the Annual Exceedence Probability (AEP) 5% level (ie the 1 in 20 year probability) and limited control via overland flow paths at the AEP 1% level (1 in 100 year probability).

The total catchment of the subdivision to the lowest, eastern boundary including the upstream area of the hillside above it to the west, is approximately 30ha.

Attachment Item C shows the calculation summary for the peak design flows for the catchment. The AEP 5% design flow is estimated at 2.2 cumec and the AEP 1% at 3.5cumec.

4.2 Drainage System Main Drain

The main drain located under the new road will be a 750mm diameter concrete piped system. Attachment D shows the flow capabilities of a 750mm pipe at various pipe flow depths.

The stormwater pipe has a high flow velocity (4.8m/sec) and it is therefore necessary to reduce this velocity before discharging the flow back to an open channel . This will be achieved by providing a level section (0.25% grade) of 900mm diameter pipe in the POS area and a concrete block or gabion rock energy dissipater at the point where the 900mm pipe discharges to a rock lined channel. The channel will then transition back to the existing creek profile before the channel discharges from the subdivision.

The hydraulic grade of the main 750/900mm pipe drain has been analysed with StormCad software and a plot of the results for the AEP 5% & 1% are attached as Attachments E & F. The analysis indicates that the pipe system will accommodate the AEP 5% and the AEP 1% storms.

4.3 Roof Drainage & Roof Storage Tank

To prevent local flash flooding due to peak storm runoff from roofs of individual houses it is proposed to require the installation of roof storage tanks. An analysis has been done for a 5KL tank with 2.5KL reserved for collection of storm flow. The analysis shows that for a 6 minute flash storm event the peak runoff flow is 7.6L/sec and total volume of 2.7m3 of runoff would result from a 300m2 roof area. The analysis also shows that the peak runoff for the currently undeveloped pasture would be 2.7L/sec. (See Attachment G). Further analysis indicates that when the top 2.5KL of a roof tank is used for storm storage then the storm runoff can be accommodated within the 2.5KL volume provided and the peak outflow from the tank during the storm would be limited to 2.7L/sec. This assumes that the tank is fitted with a with a 40mm outlet pipe at the point where the 2.5KL storage volume starts. Thus a minimum tank size of 5KL is recommended with 2.5KL reserved for peak storm collection. A larger tank would allow a higher permanent storage volume for more garden re-use if desired. Detention storage calculations are summarized in Attachment H.

5. WATER SENSITIVE URBAN DESIGN (WSUD)

WSUD elements included in the design for this this subdivision are:

- Roof tank allowing re-use and reduction of runoff peak flow and quantity to the creek
- Swale drains to collect runoff from lot accesses and avoid flow concentration and to allow for infiltration and groundwater re-charge
- A section of rock-lined channel after the piped creek section prior to return to the existing creek allowing for silt collection and some groundwater re-charge.

Assessment of the WSUD effectiveness using MUSIC software indicates that performance exceeds the requirements of the Tasmania State Stormwater Strategy. A summary of the WSUD modeling showing the effectiveness of the treatment is included under Attachment I.

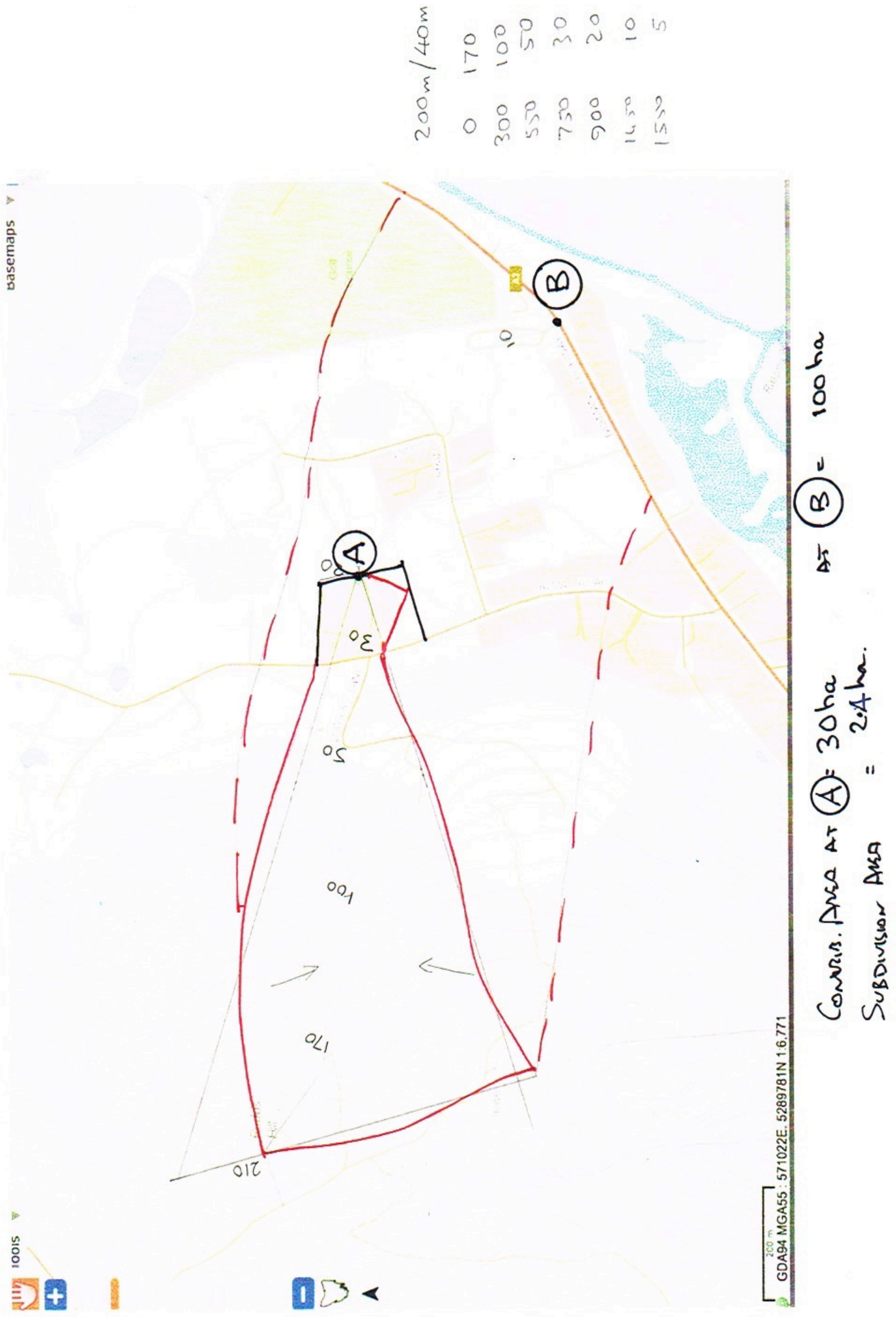
8. ATTACHMENTS

The following attachments are included with this report as follows:

A. Stormwater catchment plan for total catchment including the subdivision catchment
B. IFD chart for Orford per ARR 2016 rainfall data
C. Summary calculations for total peak catchment design flows at the lower extremity of the subdivision catchment. (Q1.5 to Q100)
D. Flow characteristics (depth /flow) for DN750 main drain
E. Hydraulic grade profile DN750/DN900 main drain arrangement at Q20
F. Hydraulic grade profile DN750/DN900 main drain arrangement at Q100
G. Summary calculations for peak Q20 flow from a single 300m2 roof
H. Detention summary for a 2.5Kl storage (5Kl total tank)
I. WSUD model output summary of treatment train effectiveness (tanks & swales)

Yours faithfully,

Ross Cumming
BEng, FIEAust, CPEng, IPWEA, AWA 31/10/2019


200m/40m
0 170
300 100
550 50
750 30
900 20
1450 10
1550 5
Basemaps
Tools
A
B
10
30
50
100
170
210
GDA94 MGA55 : 571022E, 5289781N 1:6,771
200 m
CONTRIB. AREA AT (A) = 30ha AT (B) = 100ha
SUBDIVISION AREA = 2.4ha.

A

PROJECT: STORMWATER RUNOFF TO ARR 2016 REF: 2/4/19

RAINFALL INTENSITIES & POLYNOMIAL COEFFICIENTS PER AUSTRALIAN RAINFALL & RUNOFF, 2016 VERSION

LOCATION: ALMA RD ORFORD

LATITUDE: 42.5375 S LONG 147.8625 E

INTENSITY/FREQUENCY/DURATION (IFD) CHART I mm/hr (d/60T)

DURATION HR	0.083	0.100	0.167	0.333	0.500	1	2	3	6	12	24	48	72
MIN	5	6	10	20	30	60	120	180	360	720	1440	2880	4320
AEP %													
63.2%	44.7	41.5	32.7	22.7	18.1	12.3	8.57	7.00	5.00	3.51	2.33	1.43	1.03
50%	50	46.8	37.0	25.6	20.4	13.9	9.67	7.92	5.70	4.04	2.71	1.66	1.20
20%	69	65	52	35.7	28.2	19.0	13.1	10.8	7.84	5.67	3.88	2.40	1.73
10%	83	78	63	43.2	34.0	22.6	15.5	12.7	9.24	6.76	4.68	2.91	2.09
5%	97	92	74	51	40.1	26.3	17.8	14.5	10.6	7.79	5.45	3.41	2.44
2%	117	111	91	63	48.8	31.3	20.8	16.9	12.3	9.18	6.51	4.10	2.93
1%	133	127	105	73	56	35.3	23.1	18.6	13.6	10.2	7.33	4.64	3.31

INTENSITY/FREQUENCY/DURATION (IFD) CHART d mm

DURATION HR	0.083	0.100	0.167	0.333	0.500	1	2	3	6	12	24	48	72
T MINUTES	5	6	10	20	30	60	120	180	360	720	1440	2880	4320
AEP %													
63.2%	3.72	4.15	5.46	7.57	9.05	12.3	17.1	21.0	30.0	42.1	56	69	74
50%	4.20	4.68	6.17	8.55	10.2	13.9	19.3	23.8	34.2	48.5	65	80	86
20%	5.78	6.47	8.60	11.9	14.1	19.0	26.2	32.3	47.0	68	93	115	124
10%	6.92	7.78	10.4	14.4	17.0	22.6	30.9	38.0	55	81	112	140	150
5%	8.11	9.15	12.4	17.1	20.1	26.3	35.5	43.5	63	94	131	164	176
2%	9.77	11.1	15.2	20.9	24.4	31.3	41.6	51	74	110	156	197	211
1%	11.1	12.7	17.5	24.2	28.0	35.3	46.3	56	82	123	176	223	238

TRANSPOSE IMPORT FROM BOM POLYNOMIAL COEFFICIENTS FOR AEP 63.2% to 1% (ARI= 1.6 to 100 YEARS)

YR	Coefficient	C0	C1	C2	C3	C4	C5	C6
1.58	63.2%	.17197	.73590	.07342	-.08566	.02222	-.00232	.00009
2	50%	.29333	.70980	.10664	-.10075	.02529	-.00260	.00010
5	20%	.61910	.60128	.23654	-.15587	.03576	-.00351	.00012
10	10%	.80660	.51480	.33723	-.19718	.04332	-.00415	.00014
20	5%	.97147	.42491	.44097	-.23923	.05091	-.00477	.00016
50	2%	1.16836	.27874	.61035	-.30848	.06357	-.00584	.00020
100	1%	1.30618	.16575	.74089	-.36161	.07324	-.00665	.00022

NOTE: AR&R recommends that I values be rounded for use as follows:
<= 9.99 mm/hr : 2 decimal places
10.0 to 49.9 mm/hr : 1 " "
=> 50 mm/hr : 0 " "

d=e^(C0+C1*ln(T) + C2*ln(T)^2 + C3*ln(T)^3 + C4*ln(T)^4 + C5*ln(T)^5 + C6*ln(T)^6) : I mm/hr & t hours

IMPORT FROM BOM

IFD Design Rainfall Coefficients
Issued: 26-Mar-19
Location Label:
Requested coo Latitude -42.5375 Longitude 147.8625
Nearest grid ce Latitude 42.5375 (S) Longitude 147.8625 (E)

Coefficient	63.20%	50%	20%	10%	5%	2%	1%
C0	0.17197143	0.29332954	0.61910266	0.80659729	0.97147101	1.1683599	1.3061836
C1	0.7359035	0.70980126	0.60127753	0.51480162	0.4249053	0.27874008	0.16574723
C2	0.073420458	0.10664487	0.23653907	0.33723161	0.44096848	0.61035287	0.74088943
C3	-0.085659325	-0.10075426	-0.15587334	-0.19717614	-0.2392342	-0.3084799	-0.3616099
C4	0.022223786	0.025294175	0.035764489	0.043318667	0.05090604	0.06357256	0.07323756
C5	-0.002322788	-0.002604623	-0.00351259	-0.004145351	-0.0047726	-0.0058403	-0.0066506
C6	8.55E-05	9.51E-05	0.000124378	0.00014418	0.00016357	0.00019743	0.00022298

HYDROLOGICAL REPORT -

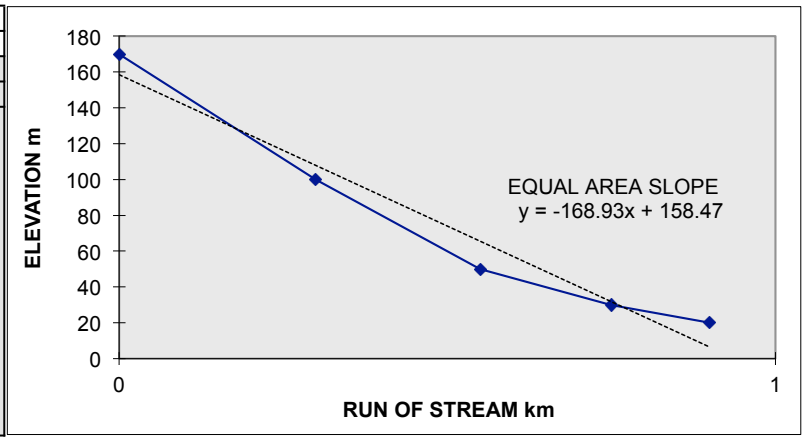
LOCATION REF: **ALMA RD PRE D'MT TOTAL CATCHMENT TO POINT A USING BRANSBY WILLIAMS METHOD**

A1. For a stream flow, use BRANSBY WILLIAMS formula to estimate the Time of Concentration.

tc= (58*L)/(A^0.1*Se^0.2)= **29** minutes incl + t_0 — REF: ARR 1992-IV-3 FORMULA 1.3

L=	0.90	km	Mainstream length
Se=	168.9	m/km	Equal area slope

AREA SLOPE SECTION	
distance	elevation
km	m
0.000	170
0.300	100
0.550	50
0.750	30
0.900	20



A2. For overland flow use Kinemetic Wave Equation for Time of Concentration.

tc = 6.94*(L*n)^0.6/($I_{v,tc}$^0.4*Se^0.3) +t_o minutes — REF: ARR 1992-VIII-12 FORMULA 1.2

L=	200	m	Overland flow path length
Se=	0.20	m/m	Slope
n=	0.10	friction coeff: conc/HM=.01 gravel=.02 grass=.10 lawn=.3	
t_o=	8.0	minutes	To run overland 200m into creek

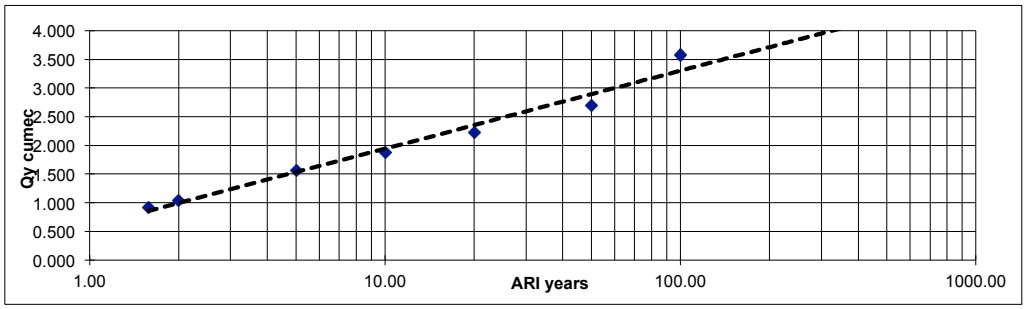
B. Use RATIONAL METHOD to estimate the 1% to 100% AEP (100 to 1 yr ARI) floods

Qy= 0.278*Cy*$I_{v,tc}$*A

REF: ARR 1992 VIII-15
REF: ARR 1987 Table 5.7
REF: IFD 2016 Coeffs
REF: LIST MAP

Cy=	(C_I+C_{catch})/100	C_{catch}=	0.5	Runoff Coef
$I_{v,tc}$=		mm/hr		Rainfall intensity
A=	0.3	km2		Area
	30	ha		

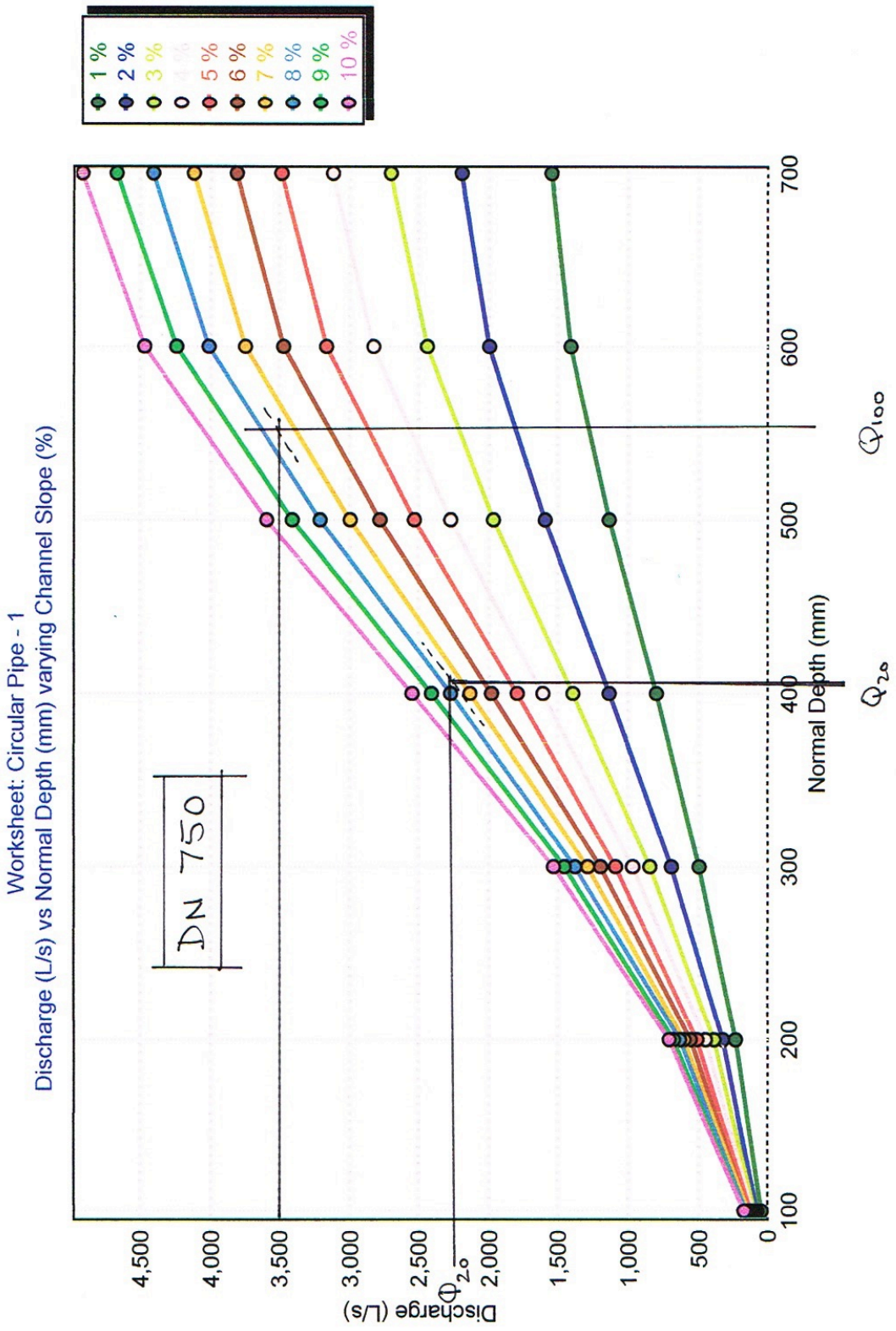
ARI YR	AEP %	tc minutes	Qy,tc cumec	$I_{y,tc}$ mm/hr	Cy C_I +C_{catch}	Runoff Volume m3	I for C_I mm/hr	C_I=
1.58	63.2%	29	0.922	18.4	0.60	1,608	0	0
2	20%	29	1.040	20.8	0.60	1,814	12	10
5	50%	29	1.558	28.7	0.65	2,718	25	15
10	10%	29	1.878	34.6	0.65	3,278	50	25
20	5%	29	2.215	40.9	0.65	3,865	75	30
50	2%	29	2.697	49.7	0.65	4,706	100	35
100	1%	29	3.572	57.1	0.75	6,233	500	35



C. ADOPT DESIGN FLOOD

Q1.5	1,000 L/s
Q20	2,200 L/s
Q100	3,500 L/s

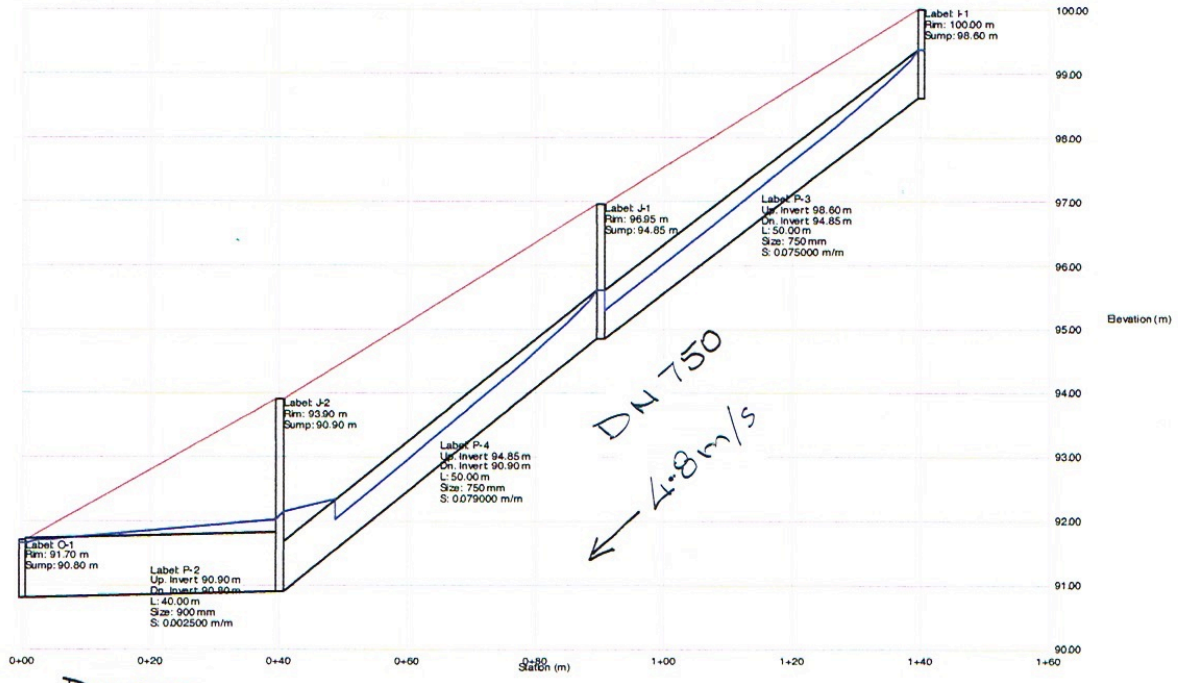
Flood ARR 2016 ALMA AT A PRE.xlsx PRINTED: 4/9/19


Worksheet: Circular Pipe - 1
Discharge (L/s) vs Normal Depth (mm) varying Channel Slope (%)
1 %
2 %
3 %
5 %
6 %
7 %
8 %
9 %
10 %
DN 750
Discharge (L/s)
Normal Depth (mm)
Q20
Q100
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
100
200
300
400
500
600
700

Profile
Scenario: Base

Q20

2.2CUMEC



DN 750

4.8m/s

DN 900

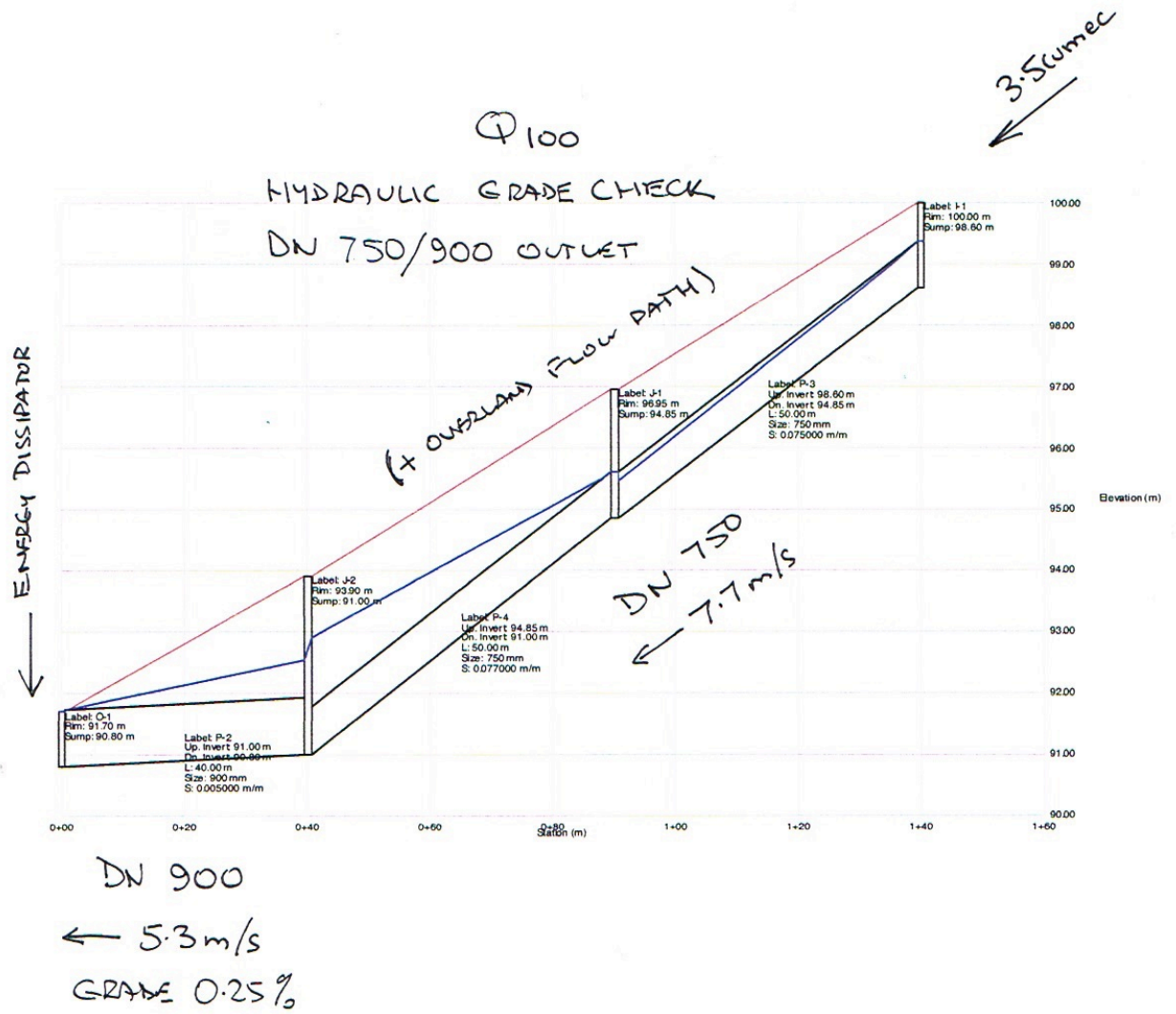
3.4m/s

GRADE 0.25%

Title: ALMA ROAD STORMWATER MAIN
z:\...\alma rd\design\alma rd dn750 q20 a.stm
02/08/19 11:31:49 AM © Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Project Engineer: Ross Cumming
StormCAD v4.1.1 [4.2014a]
Page 1 of 1

Profile
Scenario: Base



Title: ALMA ROAD STORMWATER MAIN
z:\..\alma rd\design\alma rd dn750 q20 a.stm
04/09/19 10:38:18 AM © Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Project Engineer: Ross Cumming
StormCAD v4.1.1 [4.2014a]
Page 1 of 1

HYDROLOGICAL REPORT -

LOCATION REF:

LOT SCALE RUNOFF FROM ROOF 300m2
USING OVERLAND FLOW METHOD

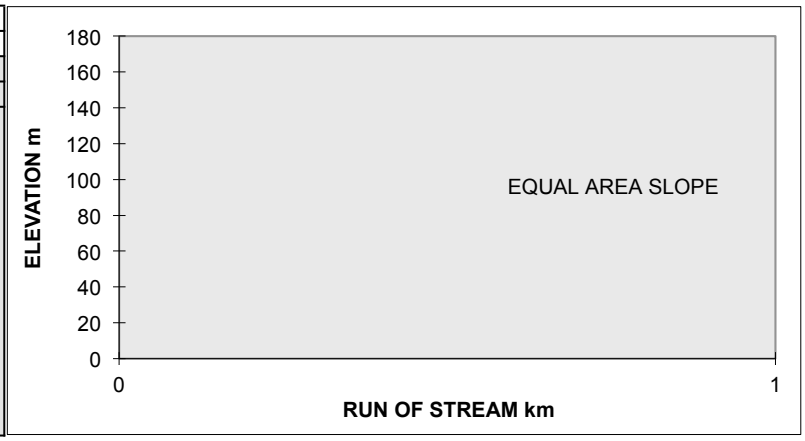
A1. For a stream flow, use BRANSBY WILLIAMS formula to estimate the Time of Concentration.

tc= (58*L)/(A^0.1*Se^0.2)= **N/A** minutes incl + t_0

REF: ARR 1992-IV-3
FORMULA 1.3

L=	0.00	km	Mainstream length
Se=	N/A	m/km	Equal area slope

AREA SLOPE SECTION	
distance	elevation
km	m



A2. For overland flow use Kinemetic Wave Equation for Time of Concentration.

tc = 6.94*(L*n)^0.6/($I_{v,tc}$^0.4*Se^0.3) +t_o minutes

REF: ARR 1992-VIII-12
FORMULA 1.2

L=	10	m	Overland flow path length
Se=	0.10	m/m	Slope
n=	0.01	friction coeff: conc/HM=.01 gravel=.02 grass=.10 lawn=.3	
t_o=	0.0	minutes	

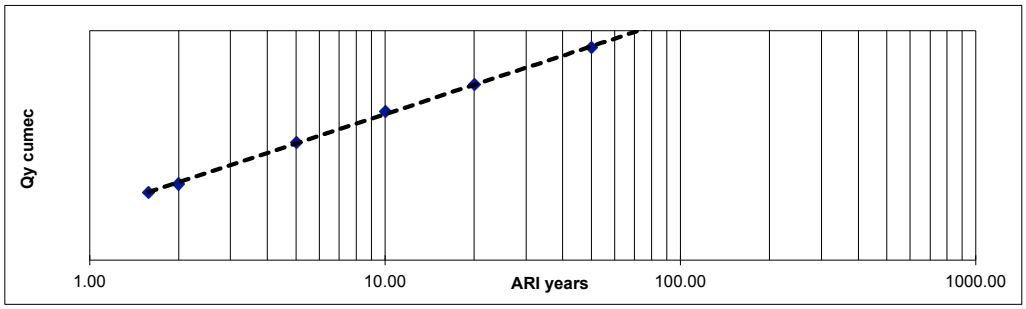
B. Use RATIONAL METHOD to estimate the 1% to 100% AEP (100 to 1 yr ARI) floods

Qy= 0.278*Cy*$I_{v,tc}$*A

REF: ARR 1992 VIII-15
REF: ARR 1987 Table 5.7
REF: IFD 2016 Coeffs
REF: LIST MAP

Cy=	(C_l+C_{catch})/100	C_{catch}=	0.7	Runoff Coef	
$I_{v,tc}$=		mm/hr		Rainfall intensity	
A=	0.0003	km2		Area	
	0.03	ha		(300m2)	

ARI YR	AEP %	tc minutes	Qy,tc cumec	$I_{y,tc}$ mm/hr	Cy C_l +C_{catch}	Runoff Volume m3	I for C_l mm/hr	C_l=
1.58	63.2%	6	0.0029	41.5	0.85	1.1	0	0
2	20%	6	0.0033	46.8	0.85	1.2	12	10
5	50%	6	0.0051	64.7	0.95	1.8	25	15
10	10%	6	0.0065	77.8	1.00	2.3	50	25
20	5%	6	0.0076	91.5	1.00	2.7	75	30
50	2%	6	0.0093	111.0	1.00	3.3	100	35
100	1%	6	0.0106	126.9	1.00	3.8	500	35



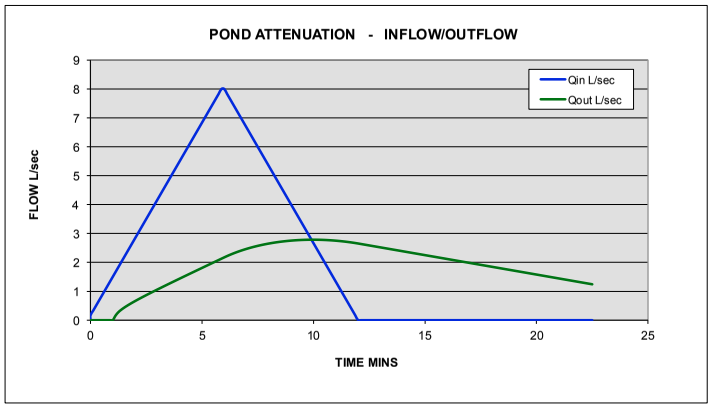
C. ADOPT DESIGN FLOOD

Q1.5	2.9L/sec	Flow for pre-development is 7.6x0.35 = 2.7L/sec
Q20	7.6L/sec	(for runoff factor 35% cf 100% for roof)
Q100	10.6L/sec	

Flood ARR 2016 LOT SCALE ROOF.xlsx PRINTED: 5/9/19

POND HYDRAULIC ATTENUATION PERFORMANCE
2.5 KL ROOF TANK ROOF 300m2

ROSS CUMMING ENGINEERING



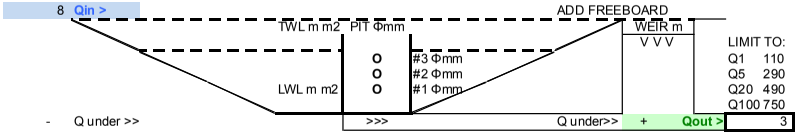
INPUT DATA		Pond Area	RL/IL m	DIA mm	No.
SPILL	TWL	2.50	1.000		
IL #3		2.50	0.000	0	1
IL #2		2.50	0.000	0	1
IL #1 &	LWL	2.50	0.000	40	1
	Silt storage	-	0.000		

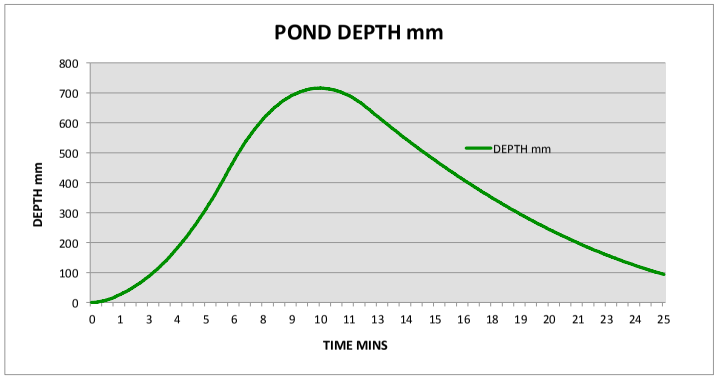
AREA	TOTAL CATCHMENT 00L/sec	UNDERFLOW		
Qi max L/sec	Q20	8	Peaks at	6
Time step min		0.125		

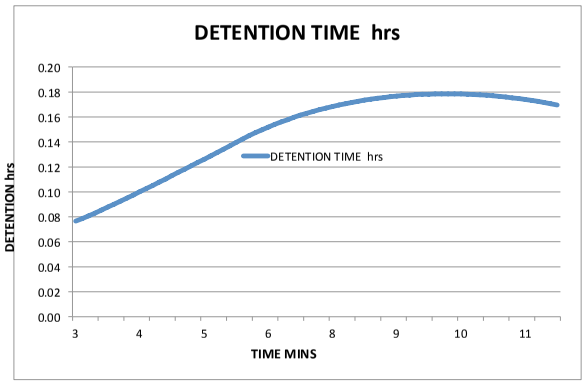
START WITH POND DEPTH AT RL:	-	m
START WITH POND AREA AT:	5	m2
PIT SPILL	100	DIA mm
WEIR SPILL	-	m
BYPASS FLOW UNDER POND	0	L/sec

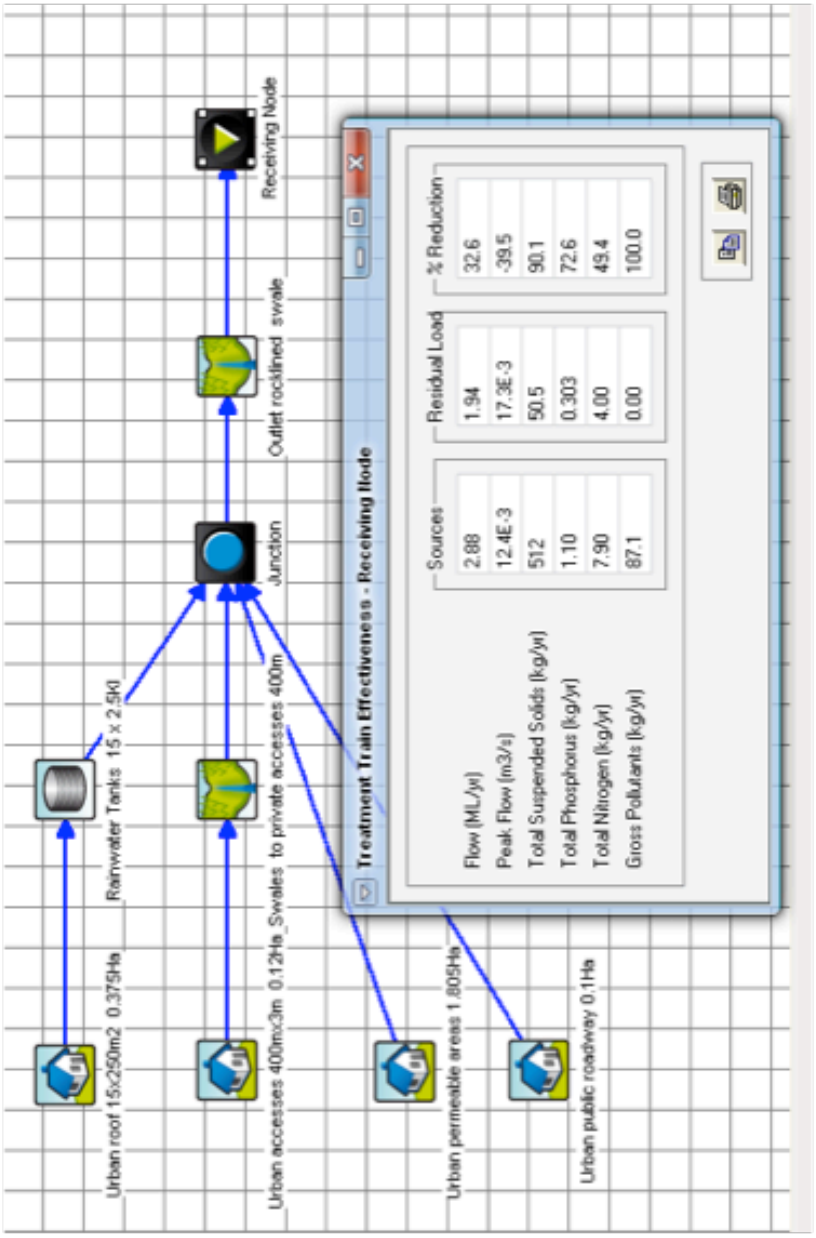
FLOW CONDITION Q20 TOTAL CATCHMENT 00L/sec UNDERFLOW

START CONDITION LEVEL	0.000	m
POND SPILL RL	1.000	m
POND SURFACE AREA AT SPILL	2.5	m2
POND VOLUME AT SPILL	2.5	m3
MAX DEPTH IN POND	0.716	m
MAX SPILL DEPTH -	0.284	m
MAX SPILL FLOW	0.000	cumec
MINIMUM DETENTION TIME	0.103	hrs








Receiving Node
Outlet rocklined swale
Junction
Rainwater Tanks 15 x 2.5Kl
Urban roof 15x250m2 0.375Ha
Urban accesses 400m x3m 0.12Ha_Swales to private accesses 400m
Urban permeable areas 1.805Ha
Urban public roadway 0.1Ha
Treatment Train Effectiveness - Receiving Node
Sources
Residual Load
% Reduction
Flow (ML/yr) 2.88 1.94 32.6
Peak Flow (m3/s) 12.4E-3 17.3E-3 -39.5
Total Suspended Solids (kg/yr) 512 50.5 90.1
Total Phosphorus (kg/yr) 1.10 0.303 72.6
Total Nitrogen (kg/yr) 7.90 4.00 49.4
Gross Pollutants (kg/yr) 87.1 0.00 100.0

Nick Griggs & Co.

Land Surveyors, 295 Elizabeth Street, North Hobart 7000
Phone: 6234 5022 Fax: 6231 2412

PLAN OF SUBDIVISION

OWNER: AMNS PTY LTD

LOCATION: 66 ALMA RD ORFORD TAS 7190

MUNICIPALITY: Parish of TRIABUNNA, Land District of PEMBROKE

Important Note:
This plan was prepared as a proposed subdivision to accompany a subdivision application to Glamorgan-Spring Bay Council and should not be used for any other purpose. The dimensions, areas and total number of lots shown hereon are subject to field survey and also to the requirements of Council and any other authority which may have requirements under any relevant legislation. In particular, no reliance should be for any financial dealings involving the land. This note is an integral part of this plan.

MEASUREMENTS ARE IN METRES AND SUBJECT TO FINAL SURVEY

SCALE: 1:1000 @ A3	CONTOUR INT: 0.5m	DATE: 04/10/2019	REF. No: C.T. 35054/1	File No: 375710

OWNER: L.N. MCCONNON
C.T.52131/1

15
BALANCE
2832 m²

14
1099 m²

13
1070 m²

12
1383 m²

11
2474 m²

10
2006 m²

9
1739 m²

8
1375 m²

6
1291 m²

5
1088 m²

4
1635 m²

3
1000 m²

2
1000 m²

1
1000 m²

100 ROAD
2014 m²

101 PUBLIC OPEN SPACE
402 m²

LEGEND
EXISTING SEWER
PROPOSED SEWER
EXISTING STORMWATER
PROPOSED STORMWATER
EXISTING WATER
PROPOSED WATER

STAGING
STAGE 1: LOTS 1-3
STAGE 2: ALL REMAINING LOTS

No. 59 HOLKHAM COURT
OWNER: P & V NAIDOO
C.T.51844/1

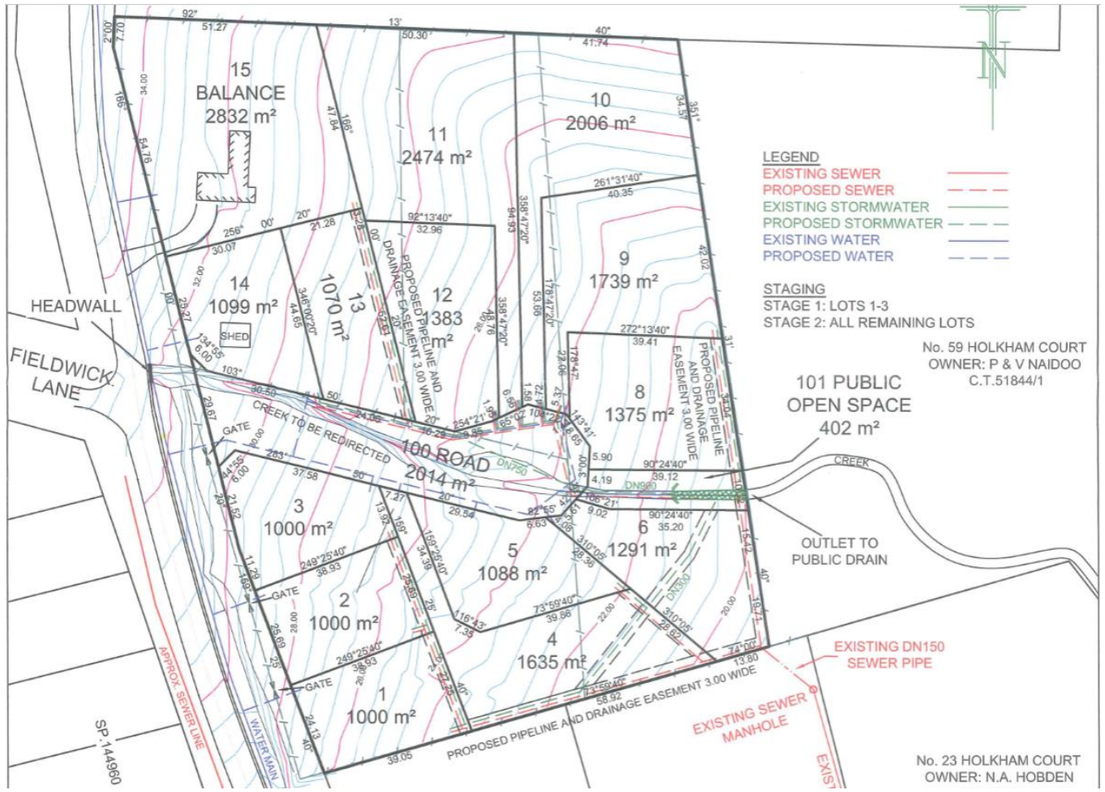
HEADWALL
FIELDWICK LANE
SHED
GATE
CREEK TO BE REDIRECTED
PROPOSED PIPELINE AND DRAINAGE EASEMENT 3.00 WIDE
PROPOSED PIPELINE AND DRAINAGE EASEMENT 3.00 WIDE
DN750
DN900
DN300
CREEK
OUTLET TO PUBLIC DRAIN
EXISTING DN150 SEWER PIPE
EXISTING SEWER MANHOLE
EXISTING DN150 SEWER MAIN
PROPOSED PIPELINE AND DRAINAGE EASEMENT 3.00 WIDE
APPROX. SEWER LINE
WATER MAIN
ALMA ROAD
SP.144960
No. 23 HOLKHAM COURT
OWNER: N.A. HOBDEN
C.T.24937/48
No. 11 HOLKHAM COURT
OWNER: T.A. RALPH
C.T.24937/49
No.3 HOLKHAM COURT
OWNERS: D.G. & J.D. BLYTH
C.T.24937/50
SEWER MANHOLE
LID=11.53
INV=10.29
HOLKHAM COURT

BUSHFIRE MANAGEMENT PLAN – 66 ALMA ROAD, ORFORD, TAS 7190

Prepared by Ian Abernethy – BFP 124

Signed 

Date 05/11/2019



RECOMMENDATIONS

ROADS – Subdivision roads to be constructed to Council Standards – as a minimum:

• Two-wheel drive, all weather construction;

• Load capacity of at least 20 tonnes, including for bridges and culverts;

• A minimum carriageway width of 7 metres for a through road, or 5.5 metres for a dead end or cul-de-sac road;

• A minimum vertical clearance of 4 metres;

• A minimum horizontal clearance of 2 metres from the edge of the carriageway;

• Crossfalls of less than 3 degrees (1:20 or 5%);

• Maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads;

• Curves have a minimum inner radius of 10 metres;

• Dead-end or cul-de-sac roads are not more than 200 metres in length unless the carriageway is 7 metres in width;

• Dead-end or cul-de-sac roads have a turning circle with a minimum 12 metre outer radius; and carriageways less than 7 metres wide have ‘No Parking’ zones.

WATER – Distance to property

• The building area to be protected must be located within 120 metres of a fire hydrant; and

• The distance must be measured as a hose lay, between the water connection point and the furthest part of the building area.

Design of Hydrants

• Fire hydrant system must be designed and constructed in accordance with TasWater Supplement to Water Supply Code of Australia WSA 03 – 2011-3.1 MRWA Edition 2.0; and

• Fire hydrants are not installed in parking areas.

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Wagga Wagga

5 November 2019

Nick Griggs
Land Surveyors
295 Elizabeth St
North Hobart TAS 7055

Dear Nick

Re: Subject – 66 Alma Road, Orford – AMNS Pty Ltd

You have asked me to provide a bushfire assessment relative to the subdivision of the above property within the Orford township.

The title details are:

Property Address – 66 Alma Road, Orford TAS 7190

Property ID – 7637944

Title Reference – 35054/1

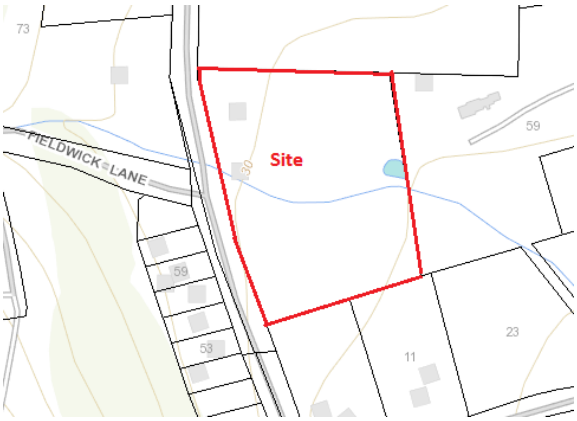


Figure 1 – general locality

Figure 2 – location plan

It is proposed to subdivide the lot into 15 lots plus a road and a POS area. The lots will have the following areas:

Lot No	Area (sqm)	Lot No	Area (sqm)	Lot No	Area (sqm)
1	1000	2	1000	3	1000
4	1635	5	1088	6	1291
7	No Lot 7	8	1375	9	1739

10	2006	11	2474	12	1383
13	1070	14	1099	15 (balance) – contains dwelling	2873
100 (road)	2014	101 (POS)	402		

Apart from a grouping of trees around a water course, the land is cleared and used for rough grazing. There is a dwelling on the northern section of the site and some shedding/shelter to the centre.

The subject site currently fronts a sealed, kerb and channelled roadway (Alma Road) which is 7.5m wide set in a 24m wide carriageway. The new subdivision road will be sealed and will become a Council maintained roadway (once it is formed) built to Council standards. In terms of access, the proposal complies with the required standards.

Figure 3: Alma Road outside the site.

Fire Hydrants are evident in Alma Road, with two outside the subject site, with reticulated water running past the subject site. Fire Hydrants will be required to service the proposed lots.

Figure 4 Fire Plug/hydrant outside subject site

The site slopes NW to SE at 4.1 degrees.

Figure 5 Fall across site

The surrounding land slopes west to east at 6.5 degrees.

Figure 6 fall across neighbouring land

The site and the land to the east and south are zoned Low Density Residential use under the local planning scheme. Land to the west is zoned General Residential use and land to the north is zoned Rural Living use.

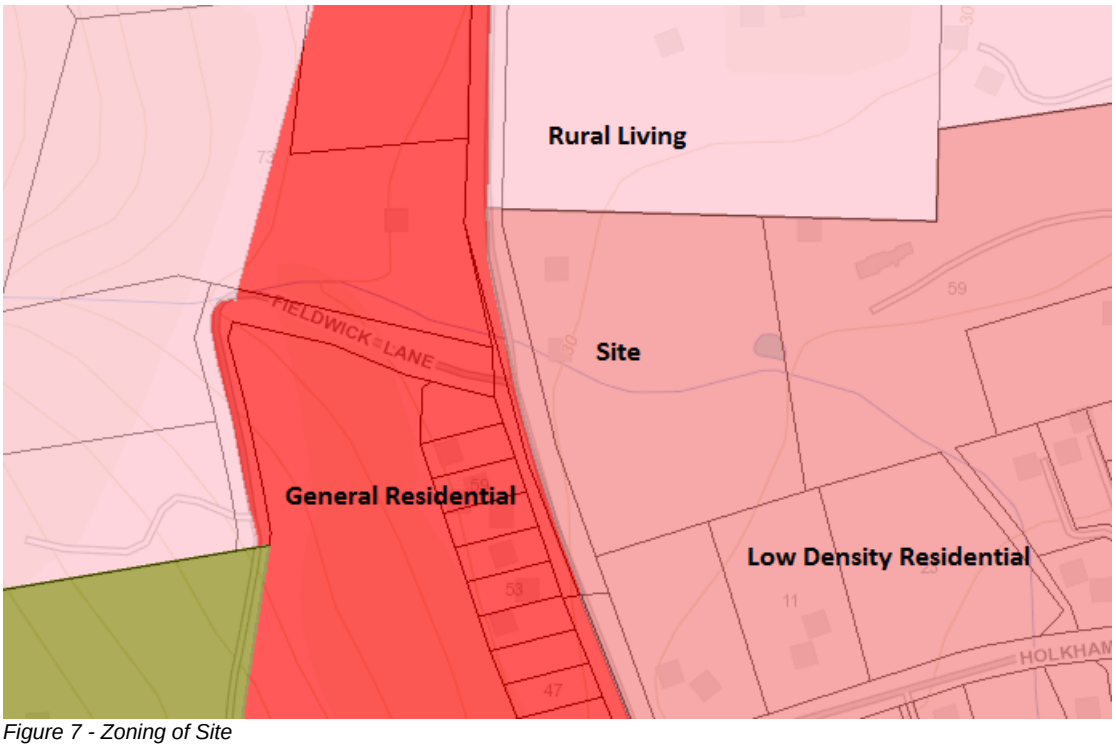


Figure 7 - Zoning of Site

The land in the General Residential zone which is fully subdivided can be dismissed from further assessment due to Bushfire Prone Areas Advisory Note V 3.0 – 2014. That eliminates all lots to the west fronting Amla Road.

There is one overlay within the Planning Scheme impacting this site – Waterway and Coastal Protection (covering the creek). This will not impact on Bushfire Assessment.

In determining whether the remainder of the study area is in a bushfire prone area reference is made to the

definition – Bushfire Prone Areas. The definition of bushfire prone areas is:

Bushfire-prone areas

1. For the purposes of the Act, land is a bushfire-prone area if –
   a) the land is within the boundary of a bushfire-prone area on a planning scheme overlay map; or
   b) where the relevant planning scheme overlay map for the land does not show any land within the relevant municipal area as being within the boundary of a bushfire-prone area, the land is within 100 metres of an area of bushfire-prone vegetation that is equal to or greater than one hectare.
2. For the purposes of sub regulation (1)(b), vegetation is bushfire-prone vegetation if the vegetation is contiguous vegetation that includes grasses and shrubs but does not include maintained lawns, parks or gardens, nature strips, plant nurseries, golf courses, vineyards, orchards or vegetation on land that is used for horticultural purposes.

Outside of the immediate lots surrounding the subject site the assessment has to consider land within 100m radius as shown in figure 5 below:

Figure 8 Bushfire Prone Areas

Assessment of Risk

In assessing the risk from bushfire a number of matters have to be considered:

1. Access – the access to the site complies with requirements. The new subdivision road will have to be built to Council Standards and will thus comply.
2. Water supply – the water supply will comply with requirements once fire hydrants are extended intothe new subdivison.
3. Zoning – lands zoned General Residential can be dismissed from further consideration having regard to Bushfire Prone Areas Advisory Note No 01 – 2014 - Having regard to the objectives of all of the applicable standards in the Bushfire-Prone Area Code, there is insufficient increase in risk to the development from bushfire to warrant any specific bushfire protection measures if: a) the risk arises from vegetation located on land zoned as inner residential, general residential or village.
4. Bushfire Prone vegetation – the area of bushfire vegetation within the 100m radius zone is forest located behind part of the subdivided and developed land. The fuel load in this area is high – but there is a 10m wide cleared area between the forest and the existing dwellings which can be access by fire fighting vehicles.

Figure 9 The bushfire prone vegetation behind the existing row od dwellings fronting Alma Road

	North	South	East	West
Vegetation	Urban	Urban	Urban	Woodland/forest
Slope	Flat Contour	4.1 degrees	6.5 degrees	Upslope
Distance to Bushfire Prone Vegetation	N/a	N/a	N/a	71m

TasVeg 3.0 classifies the Bushfire Prone Vegetation as (DPU) Eucalyptus pulchella forest and woodland. The area is highlighted as a long, narrow strip of vegetation between urban areas.

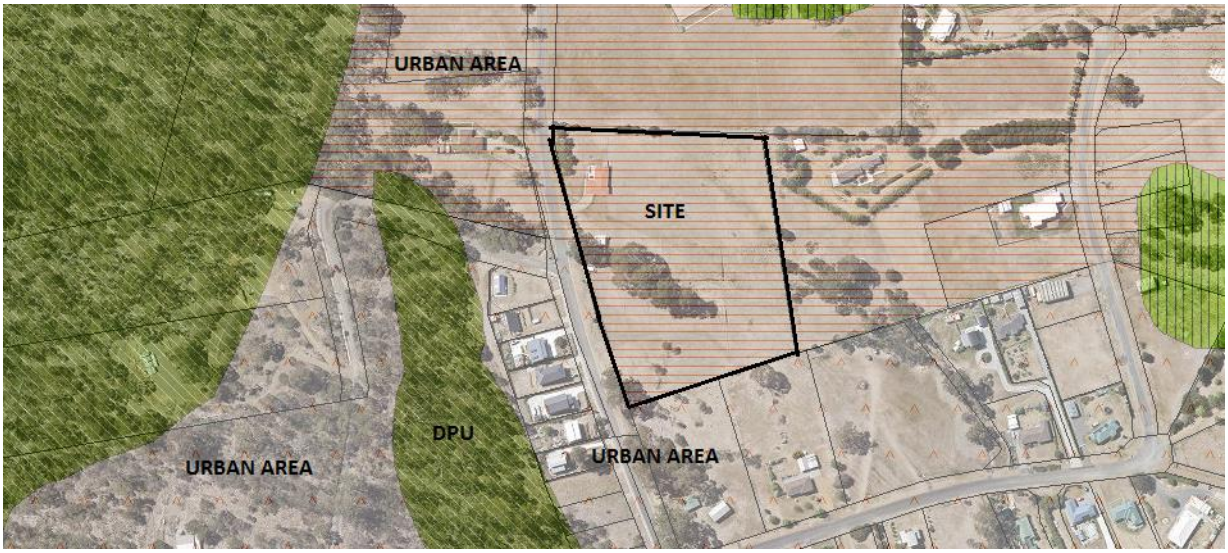


Figure 10 – TasVeg 3.0 mapping – source theLIST

The consequence of a bushfire impacting on the subject site is low given the narrow nature of the bushfire prone vegetation and the existence of urban development further to the west.

At the distances from the site to Bushfire Prone Vegetation the site can be rated BAL12.5.

Given the site will be fully serviced in terms of access and fire hydrants there are no further requirements in terms of bushfire management for the site.

Yours sincerely

Ian Abernethy
Principal Planner and Bushfire Assessor 124

Enc. Planning Certificate and Bushfire Management Plan

ENGINEERING REPORT

DA#:	**SA 2019 / 024**
Applicant:	**Nick Griggs & Co**
Proposal:	**Subdivision (13 lots + balance)**
Address:	**66 Alma Road, Orford**
Zone:	**Low Density Residential**
Report completed by (Name & date):	**Leigh Wighton** **13 February 2020**

Brief Description	
General	Development involves the subdivision of a parcel of land at 66 Alma Road into 14 Lots with a short cul-de-sac. Lot 15 contains an existing dwelling. The applicant proposes to stage the subdivision, with lots 1-3 fronting Alma Rd forming stage 1 and the remaining lots being stage 2.
Roadworks and access	The land has frontage to Alma Road. Lots 1, 2 and 15 will have frontage only to Alma Road. A new cul de sac will be constructed to provide frontage to the remaining lots. Lots 3 and 14 will have frontage to both Alma Road and the new cul de sac. Lots 1 to 3 form stage 1 and will all have access from Alma Road. The applicant proposes a road reservation width of 18m for the new road but only a 25m reservation at the cul de sac head. The BHMP requires a 24m dia carriageway at the turning head. As such the reservation at the cul de sac will need to be increased to a minimum width of 31m. Lots 8 -12 are of sufficient size to be reduced in area to accommodate the larger reservation. Lots 4, 9, 10 and 11 are internal lots. Sealed driveways will need to be provided for the full length of the access strips. The BHMP states that these driveways require a minimum carriageway width of 4m. A Traffic Impact Assessment (TIA) was not submitted with the application. It is not expected that the increase in traffic generated by the subdivision will result in any safety issues and is well within the capacity of Alma Road.
Stormwater	The proposed subdivision is located within a small catchment of an unnamed minor ephemeral watercourse. The catchment runs from Rudds Hill to an outfall at Raspins Beach, and is generally referred to as the Holkham Court Catchment. The lower portion of the catchment comprises residential land, a caravan park, a golf course and the Tasman Highway. Some of these areas have been subject to inundation in recent, large rainfall events.

As a result of proposed and potential development within the catchment, and a history of inundation, Council commissioned the Holkham Court Stormwater Assessment, and associated modelling. The report examines the existing conditions, identifies issues and areas of interest, models possible scenarios and provides some insight into possible solutions.

A draft of the Holkham Court Stormwater Assessment along with a Draft Implementation Strategy Draft Implementation Strategy was presented to Council at the August 2019 Ordinary Council Meeting and the following resolutions were made:

A Council accept and notes the draft Holkham Court Stormwater Assessment from Anna Wilson at Brighton Council marked as for review 2/10/2018 (or as amended) (the Report) and as presented in this Agenda.

B Council has regards to allocating funding from its Annual Budget from 2020/2021 to 2022/2023 inclusive and places approved funding to a reserve titled Holkham Court Orford Stormwater Development Works (the Reserve).

C Council adopts an infrastructure contribution charge of $3,500 per new lot created or multiple dwelling permit issued within the Holkham Court Orford Stormwater Catchment area and places these contributions to the Reserve.

D Works are implemented in accordance with the table shown on page 19, 20 and 21 of the Report subject to sufficient funds being held in the Reserve.

E Council directs the General Manager to write to the Minister for Infrastructure to advise the identified priority works for the Tasman Highway as listed in the Report and requests the works are designed, costed and constructed as soon as possible.

The report has subsequently been finalised and a copy of the final report (Holkham Court Stormwater Assessment, Glamorgan Spring Bay Council 2019, revision 3, prepared by Anna Wilson, dated 10/9/2019) and summary of the variations between the draft and the final report is attached.

Proposal

The applicant proposes to direct stormwater from the subdivision to the existing watercourse, which generally runs from the west to the east through the land. This watercourse currently drains stormwater from Alma Road and the catchment above and, as such, forms part of the public stormwater system. It is proposed to pipe the majority of the watercourse through the subdivision to near the eastern boundary of the subject land. A Stormwater Management Design Report (Revision 2) prepared by Ross Cumming Engineering, dated 31 Oct 2019 was submitted with the application.

The report included the following:

"3.2 STORMWATER

The proposal for control of stormwater is as follows:

1) *Creek is to be piped for AEP 5% (20 year) storm event with transition to rock-lined channel in the POS area and transition back to existing creek profile prior to the subdivision boundary*
2) *Lots are to be provided with a 150mm piped connections for the AEP 5% storm event*
3) *Controlled overflow path is to be provided for AEP1% (100 year) event by way of road cross-section (flow path between kerbs) and a shallow channel within the POS area*

4) *Roof runoff tanks are to be included to reduce peak flash roof storm flows so as to not exceed the current flow that would occur from the existing undeveloped land and also to allow recycling of roof runoff in accordance with WSUD principles.*
5) *Lot accesses are not to drain to piped systems but instead, to shallow infiltration swales so as to achieve reduced runoff and environmental benefit in accordance WSUD principles*

By adopting the above approach to stormwater control and because the area modified by the subdivision only amounts to 2.4Ha of the total 30Ha upstream catchment there will be no change to the peak runoff flows from this catchment. "

Whilst the stormwater management controls specified in the report and the resultant outcome of limiting stormwater runoff to pre-existing meets the acceptable solution in the Planning Scheme, there are some discrepancies between the hydrological assessment undertaken by the applicant and the report commissioned by Council "Holkham Court Stormwater Assessment, Glamorgan Spring Bay Council 2019, revision 3, prepared by Anna Wilson, dated 10/9/2019.

It is recommended that the stormwater system for the proposed subdivision be generally in accordance with section 3.2 of the Stormwater Management Design Report (Revision 2) prepared by Ross Cumming Engineering, dated 31 Oct 2019 and in accordance with Holkham Court Stormwater Assessment, Glamorgan Spring Bay Council 2019, revision 3, prepared by Anna Wilson, dated 10/9/2019.

Water Sensitive Urban Design
The application involves more than 5 lots. As such, Water Sensitive Urban Design (WSUD) principles are required for the treatment and disposal of stormwater. A condition to this effect is recommended.

Stormwater Infrastructure Contribution
A condition requiring payment of the $3500 Infrastructure Contribution per new lot created, as per the earlier resolution of Council, is recommended.

Subdivision Development Standards
The subdivision development standards for the Low Density Residential zone in the Planning Scheme require that:
12.5.4 Services A3 Each lot must be connected to a stormwater system able to service the building area by gravity.

The proposed stormwater line through Lots 4 and 6 cannot service the entirety of these lots. A condition requiring a building area be defined on these lots is recommended to limit future development of impervious areas to within the building areas. It is expected that the building areas will be north of the proposed stormwater line through these lots (i.e. uphill of the main). This in turn addresses a concern raised by one of the representors relating to future buildings being constructed adjacent their boundary.

Summary
Several representations objecting to the approval of the subdivision based on stormwater issues have been received. It is clear from the Holkham Court Stormwater Assessment and

	the representations that there are substantial issues within the Holkham Court catchment relating both adequacy of the existing stormwater system and inundation. Whilst Council has commissioned the report to assess the catchment and identify remedial works no physical works have yet been undertaken. The payment of an infrastructure contribution alone is insufficient for any one development within the catchment to fund the upgrades required to the downstream stormwater infrastructure. The applicant, through the Stormwater Management Design Report, has demonstrated a methodology for stormwater disposal that is able to meet the acceptable solutions in E7.7.1 Stormwater Drainage and Disposal of the Planning Scheme. Whilst there are discrepancies between the applicant's report and the Holkham Court Stormwater Assessment commissioned by Council the applicants engineer has advised that they can still limit runoff from the subdivision to pre-existing. Recommended conditions reinforce the requirement to meet the acceptable solution based on the Holkham Court Stormwater Assessment, Glamorgan Spring Bay Council 2019, revision 3, prepared by Anna Wilson, dated 10/9/2019.
Sewer and Water	Sewer and water services are available to the land. The application was referred to TasWater who have imposed conditions.
Power, Telco, etc	Power should be provided underground. NBN is available in the area.
Codes	**E5 Road and Railways Assets** Alma Road has no posted speed limit and the default urban speed limit of 50km/h would apply. Preliminary investigations indicate that sight distances from the proposed new subdivision road intersection would be in excess of the minimum required by the scheme. **E7 Stormwater Management** See above

Representations	
Rep 1	Refer to Stormwater section in report
Rep 2 1. *The owner AMNS Pty ltd does not have permission to include a perceived easement for sewerage over our Land to service the sub-division.*	The applicant provided information stating that: *"The updated plan shows information obtained from LIST and field survey and indicates there is an existing 150mm diameter sewer connecting to the boundary of C.T 35054 /1 being our client's property.* *On this basis it is proposed that an easement is not required through C.Ts 24937/48 and 24937/49."*

2. *We will not grant such easement, therefore the subdivision is unserviceable, and the lot sizes are too small for onsite waste water treatment plants.* 3. *The Stormwater design for lot 4 and lot 6 now show an easement through lot 4 and lot 6 which splits lot 6 in half requiring all the proposed built structure to be placed near our rear boundary which will have an adverse effect on our existing amenity. We ask for the stormwater easement moved downslope to contour 21.00 which will allow all structure to be built upslope and still achieve gravity fall.* 4. *The proposed allotments 4 and 6 will have an unreasonable impact on our amenity as the allotments are so small and the longest boundary adjoins ours, structures will have to be built within 4.0 metres of our boundary which will be discretionary under the planning scheme.* 5. *The current developer has no access to our property, they have no easement and we will not grant approval for them to place an easement over our property. The sewer line from last inspection is a dn 100 and we will not give approval to excavate and replace with a dn 150 needed to service the sub-division.*	The size of the sewer has been confirmed on site as being DN150. The application, including the above information, was referred to TasWater as the relevant sewer and water authority. TasWater advised that it does not object to the granting of the permit subject to the inclusion of TasWater conditions. Points 3 – Refer to Stormwater section in report Point 4 – refer to planning report
Rep 3	Refer to Stormwater section in report
Rep 4	Refer to Stormwater section in report
Rep 5	Refer to Stormwater section in report

Recommended Conditions to any permit:

General

1. The subdivision layout or development must be carried out substantially in accordance with the application for planning approval, the endorsed drawings and with the conditions of this permit and must not be altered or extended without the further written approval of Council.

2. All conditions of this permit, including either the completion of all works and maintenance or payment of security in accordance with this permit, must be satisfied before the Council seals the final plan of survey for each stage. It is the subdivider's responsibility to notify Council in writing that the conditions of the permit have been satisfied and to arrange any required inspections.

3. The development must be in accordance with the Bushfire Assessment prepared by Ian Abbernathy (Pitt & Sherry Pty Ltd), dated 20 November 2019, and submitted with the application, or as otherwise required by this permit, whichever standard is greater.

4. Prior to sealing the plan of survey for any stage the developer must pay an Infrastructure Contribution to the Glamorgan Spring Bay Council for stormwater upgrades in the amount of $3,500 per new lot, or as otherwise specified in Council's Schedule of Fees.

5. All land noted as roadway, footway, open space or similar must be transferred to Council. Complete transfer documents that have been assessed for stamp duty, must be submitted with the final plan of survey.

6. The final plan of survey must include easements over all drains, pipelines, wayleaves and services to the satisfaction of Council's General Manager.

7. A building area must be shown on the final plan of survey for any lot where the entirety of the lot cannot be serviced by gravity to the stormwater property connection.

8. A restrictive covenant, to which Council is to be made a party, must be created on all lots containing building areas prohibiting the creation of any impervious surface (including rooves) outside the defined building area.

9. The corners of the property boundaries at the road intersection with Alma Road (Lots 3 and 14 on the Plan of Subdivision) must be splayed or rounded by chords of a circle with a radius of not less than 6.00 metres in accordance with Sections 85(d)(viii) and 108 of the *Local Government (Building & Miscellaneous Provisions) Act 1993* and the requirements of Council's General Manager.

Part 5 Agreements

10. An agreement pursuant to Part 5 of the *Land Use Planning and Approvals Act 1993* must be entered into prior to the sealing of the final plan of survey to manage the installation and maintenance of any on site stormwater disposal and detention on each lot to the effect that:

    a. The owners of each lot must install rainwater detention tanks to collect all stormwater runoff from roofed areas, of a size and type to be determined by detailed design, and approved by Council's General Manager.

    b. The owners of each lot must maintain all rainwater detention tanks and any other stormwater detention and disposal systems on that lot to the satisfaction of Council's General Manager.

The subdivider must include typical design details for the sizing and arrangement of tanks for the individual lots to accompany the Part 5 Agreement. These design details must be submitted for approval by Council's General Manager in conjunction with the subdivision engineering plans.

11. Agreement(s) made pursuant to Part 5 of the Land Use Planning and Approvals Act 1993 must bind the current owner and his/her successors in title and must be prepared on a blank instrument form and registered with the Recorder of Titles in accordance with Section 78 of the Land Use Planning and Approvals Act 1993 by the applicant at no cost to Council.

Landscaping

12. The road reserves and public open space must be landscaped by trees or plants in accordance with a landscape plan prepared by a landscape architect or other person approved by Council, and submitted to Council for endorsement with the engineering drawings. The landscape plan must show the areas to be landscaped, the form of landscaping, and the species of plants and estimates of the cost of the works.

Services

13. Property services must be contained wholly within each lots served or an easement to the satisfaction of the Council's General Manager or responsible authority.

14. The Subdivider must pay the cost of any alterations and/or reinstatement to existing services, Council infrastructure or private property incurred as a result of the proposed subdivision works. Any work required is to be specified or undertaken by the authority concerned.

15. Property services to internal lots must be extended to the lot proper to the satisfaction of Council's General Manager.

Drainage

16. Stormwater management must be generally in accordance with Section 3.2 of the document "SA-16012 – 66 Alma Road Orford Subdivision, Stormwater Management Design Report, Revision 2" prepared by Ross Cumming Engineering, dated 31 October 2019, or as otherwise required by conditions of this permit, and to the satisfaction of Council's General Manager.

17. The stormwater system for the development must be designed in accordance with the "Holkham Court Stormwater Assesment, Glamorgan Spring Bay Council 2019, revision 3, prepared by Anna Wilson, dated 10/9/2019 **(attached)** or as otherwise required by conditions of this permit, and to the satisfaction of Council's General Manager.

18. The developer is to upgrade the existing stormwater culvert under Alma Road at the proposed subdivision intersection. The sizing of the culvert is to be based on the "Holkham Court Stormwater Assesment, Glamorgan Spring Bay Council 2019, revision 3, prepared by Anna Wilson, dated 10/9/2019.

19. The developer is to provide a piped stormwater property connection to each lot capable of servicing the building area of each lot by gravity in accordance with Council standards and to the satisfaction of Council's General Manager.

Advice: Lots 4 and 6 cannot be serviced in their entirety and will require a building area defined on the final plan of survey.

20. The developer is to provide a piped stormwater drainage system capable of accommodating a storm with an ARI of 20 years, when the land serviced by the system is fully developed.

21. The minor stormwater drainage system must be designed to comply with all of the following:

(a) be able to accommodate a storm with an ARI of 20 years, when the land serviced by the system is fully developed;

(b) stormwater runoff will be no greater than pre-existing runoff or any increase can be accommodated within existing or upgraded public stormwater infrastructure.

22. The developer is to provide a major stormwater drainage system designed to accommodate a storm with an ARI of 100 years.

23. Water Sensitive Urban Design Principles must be incorporated into the development. These Principles will be in accordance with, and meet the treatment targets specified within, the Water Sensitive Urban Design Procedures for Stormwater Management in Southern Tasmania and to the satisfaction of the Council's General Manager.

24. Prior to, or in conjunction with, the submission of Engineering Design Drawings the developer must submit an amended Stormwater Management Design Report, including detailed calculations, clearly demonstrating compliance with the conditions of this permit, for approval by Council's General Manager. The report must be prepared and certified by an experienced and practicing Civil Engineer. Once approved the amended report will form part of the endorsed documents.

25. Upon completion of works the engineer certifying the Stormwater Management Design Report must provide certification that the stormwater system has been constructed in accordance with the approved report.

Tas Water

26. The development must meet all required Conditions of approval specified by Tas Water Submission to Planning Authority Notice, TWDA 2019/01352-GSB, dated 13/02/2020.

Telecommunications and electrical reticulation

27. Electrical and telecommunications services must be provided to each lot in accordance with the requirements of the responsible authority and to the satisfaction of Council's General Manager.

28. Street Lighting must be provided in accordance with the requirements of the responsible authority and to the satisfaction of Council's General Manager.

29. New electrical and fixed line telecommunications services must be installed underground to the requirements of the responsible authority unless approved otherwise by Council's General Manager.

30. Prior to sealing the final plan of survey the developer must submit to Council:

(a) A "Provisioning of Telecommunications Infrastructure – Confirmation of final payment" or "Certificate of Practical Completion of Developer's Activities" from NBN Co.

(b) A Letter of Release from TasNetworks confirming that all conditions of the Agreement between the Owner and authority have been complied with and/or that future lot owners will not be liable for network extension or upgrade costs, other than individual property connections at the time each lot is further developed.

Roads and Access

31. Roadworks and drainage must be constructed in accordance with the standard drawings prepared by the IPWE Aust. (Tasmania Division) and to the requirements of Council's General Manager.

32. Unless approved otherwise by Council's General Manager roadworks must include -

    a) Minimum road reserve of 18 metres and 31 metres at the cul de sac;

    b) Fully paved, sealed and drained carriageway with a minimum carriageway width (face of kerb to face of kerb) of 6.9 metres and 12m radius at the cul de sac;

    c) Tee style turning head;

    d) Concrete kerb and channel;

    e) Concrete footpath 1.50 metres wide on one side;

    f) Underground stormwater drainage

33. All carriageway surface courses must be constructed with a 10 mm nominal size hotmix asphalt with a minimum compacted depth of 35 mm in accordance with standard drawings and specifications prepared by the IPWE Aust. (Tasmania Division) and the requirements of Council's General Manager.

Vehicular Access

34. A reinforced concrete vehicle access must be provided from the road carriageway to each lot in accordance with Council's Standard Drawings and to the satisfaction of Council's General Manager.

35. All shared accesses must be constructed for the entire length of the shared access and include:

    (a) Provision for 2 way access

    (b) Constructed with a durable all weather pavement

    (c) Sealed Surfaced (The surfacing material must be concrete, asphalt, pavers or other equivalent approved material.)

    (d) Stormwater drainage; and

    (e) As required by an Approved Bushfire Hazard Management Plan.

36. To the satisfaction of Council's General Manager, the vehicular access to Lots 4, 9 10 and 11 must be constructed for the entire length of the access strip. The internal driveway must be provided in accordance with Standards Australia (2004): Australian Standard AS 2890.1 - 2004 – Parking Facilities Part 1: Off Street Car Parking; Standards Australia, Sydney and must include:

(a) 4 metre min. width carriageway located at least 0.5m from any side boundary

(b) Constructed with a durable all weather pavement

(c) Sealed Surfaced (The surfacing material must be concrete, asphalt, pavers or other equivalent approved material.)

(d) Stormwater drainage.

Engineering

37. The subdivision must be carried out in accordance with the *Tasmanian Subdivision Guidelines October 2013,* or as otherwise required by the conditions of this permit.

Advice: The guidelines can be downloaded from the Loocal Government Assocciation of Tasmania website http://www.lgat.tas.gov.au/page.aspx?u=658

38. Engineering design drawings to the satisfaction of the Council's General Manager must be submitted to and approved by the Glamorgan Spring Bay Council before development of the land commences.

39. Engineering design drawings are to be prepared by a qualified and experienced civil engineer, or other person approved by Council's General Manager, and must show -

(a) all existing and proposed services required by this permit;

(b) all existing and proposed roadwork required by this permit;

(c) measures to be taken to provide sight distance in accordance with the relevant standards of the planning scheme;

(d) measures to be taken to limit or control erosion and sedimentation;

(e) any other work required by this permit.

40. Approved engineering design drawings will remain valid for a period of 2 years from the date of approval of the engineering drawings.

Water quality

41. A soil and water management plan (here referred to as a **'SWMP'**) prepared in accordance with the guidelines Soil and Water Management on Building and Construction Sites, by the Derwent Estuary Programme and NRM South, must be approved by Council's General Manager before development of the land commences.

42. Temporary run-off, erosion and sediment controls must be installed in accordance with the approved SWMP and must be maintained at full operational capacity to the satisfaction of Council's General Manager until the land is effectively rehabilitated and stabilised after completion of the development.

43. The topsoil on any areas required to be disturbed must be stripped and stockpiled in an approved location shown on the detailed soil and water management plan for reuse in the rehabilitation of the site. Topsoil must not be removed from the site until the completion of all works unless approved otherwise by the Council's General Manager.

44. All disturbed surfaces on the land, except those set aside for roadways, footways and driveways, must be covered with top soil and, where appropriate, re-vegetated and stabilised to the satisfaction of the Council's General Manager.

Construction

45. The subdivider must provide not less than forty eight (48) hours written notice to Council's General Manager before commencing construction works on-site or within a council roadway.

46. The subdivider must provide not less than forty eight (48) hours written notice to Council's General Manager before reaching any stage of works requiring inspection by Council unless otherwise agreed by the Council's General Manager.

47. Subdivision works must be carried out under the direct supervision of an approved practising professional civil engineer engaged by the subdivider and approved by the Council's General Manager.

'As constructed' drawings

48. Prior to the works being placed on the maintenance and defects liability period an "as constructed" drawing of all engineering works provided as part of this approval must be provided to Council to the satisfaction of the Council's General Manager. These drawings and data sheets must be prepared by a qualified and experienced civil engineer or other person approved by the General Manager in accordance with Council's *Guidelines for As Constructed Data*.

Maintenance and Defects Liability Period

49. The subdivision must be placed onto a twelve (12) month maintenance and defects liability period in accordance with Council Policy following the completion of the works in accordance with the approved engineering plans and permit conditions.

50. Water Sensitive Urban Design elements provided as part of the subdivision are to be placed and an extended maintenance and defects liability period to be determined at the detailed design stage, but not less than twenty four (24) months.

51. Prior to placing the subdivision onto the maintenance and defects liability period the Supervising Engineer must provide certification that the works comply with the Council's Standard Drawings, specification and the approved plans.

52. Prior to placing the subdivision onto the maintenance and defects liability period the developer must provide Council with a financial security (in the form of a cash or unconditional bank guarantee) of 5% of the Council's estimated value of the works. The developer is to enter into a formal Maintenance Bond Deed of Agreement with Council.

THE FOLLOWING ADVICE APPLIES TO THIS PERMIT: -

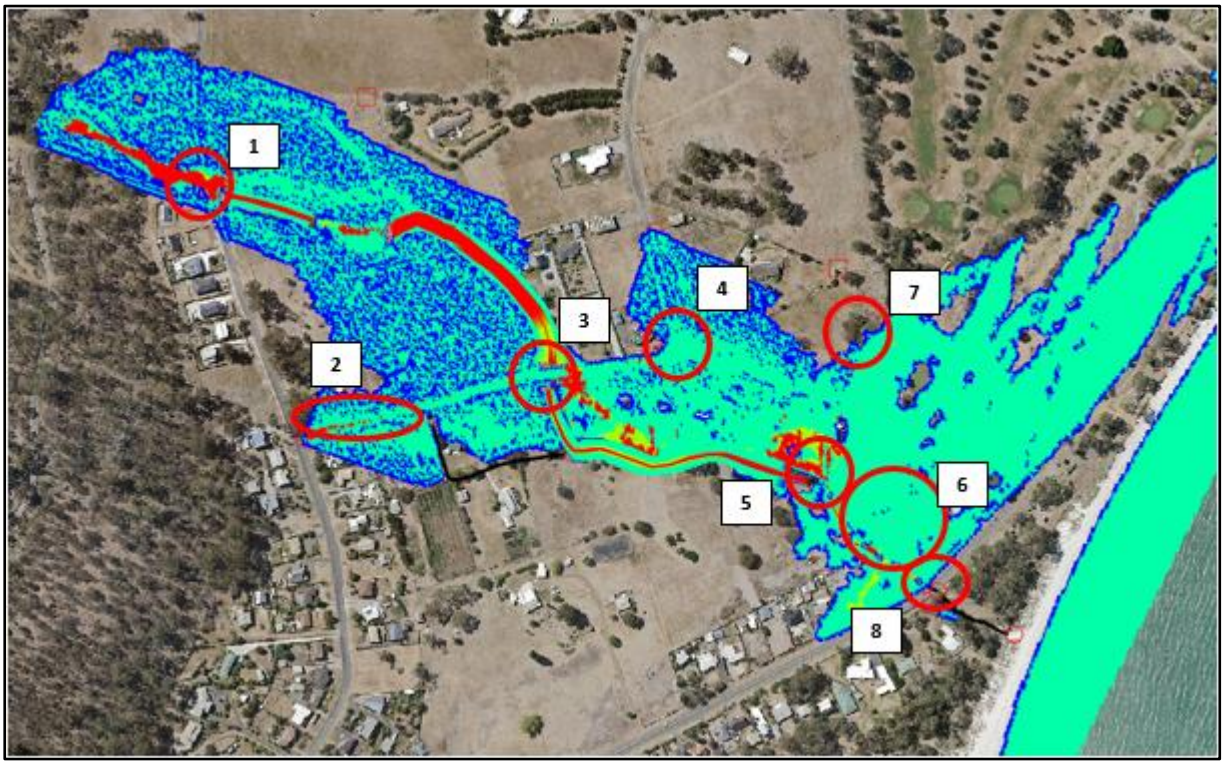
A. The owner is advised that an engineering plan assessment and inspection fee must be paid to Council in accordance with Council's fee schedule.

B. All approved engineering design drawings will form part of this permit on and from the date of approval.

Holkham Court Stormwater Assessment

GLAMORGAN SPRING BAY COUNCIL 2019

Brighton Council Anna Wilson



Prepared for for Glamorgan Spring Bay Council

Date 10/9/2019

Revision 3 *Final.*

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1. Summary

The Holkham Court area is contained within a small valley with a minor watercourse running through the centre of the area. The area is zoned predominantly as low density residential which allows for increased development of the lower half of the catchment. The area has received significant rainfall events causing flooding issues including inundation of the lower areas and some impacts on properties and roads. Management of the flow path is critical for continued development of the area.

This report and associated modelling, considers the existing condition of the catchment, examines the catchment as if it is fully developed within the existing planning scheme limitations and considers possible solutions to the stormwater and drainage issues that arise. The modelling considers a 5% and 1% AEP (20yr and 100yr ARI) with a climate change increase factor of 30%.

Important considerations that have arisen from both observation and the modelling results include: that although the drainage line is predominantly dry, it does have the characteristics of a small watercourse rather than an urban drainage line. The practical application of this, is that in large events it will act as a small creek and the flow regime will not be dominated by rates of development in the lower catchment.

It is also important to note that the very lower portion of the catchment, including areas of the caravan park and golf course, have low elevations and it may be impossible to eliminate inundation in these areas. These areas may also be impacted by storm surge from the nearby bay however this is outside of the scope of this report.

Climate change impacts have been considered in the modelling, and all modelling has been run assuming a 30% increase in runoff. This is considered a starting point and further investigations indicate that climate change impacts may be greater than this. To manage the uncertainty and the possible impacts, it is advised that the flow route be maintained with enough area that the major overland flow path may be increased in future if required. The importance of identified overland flow paths and their management is critical to future proofing the stormwater network.

The modelling has found that maintaining the overland flow path, combined with recommended infrastructure works will allow the area to be developed without further impacting properties.

2. Overview

The northern area of Orford is located within a small catchment of an unnamed minor watercourse that runs from Rudds hill to an outfall behind Raspins Beach. The base of the catchment consists of residential developed areas, undeveloped areas, a caravan park and a highway. Many of these areas have received some inundation in recent, large rainfall events.

Development applications have been received for significant portions of the midsection of the catchment. These will increase the number of roads, amount of drainage infrastructure and the impervious percentages of the catchment, with possible effects on the downstream properties.

Glamorgan Spring Bay Council has requested Brighton Council undertake modelling of this catchment. The catchment has been modelled to establish the existing conditions, and then model possible future conditions to establish an appropriate pattern of development as well as an infrastructure plan. Climate change adaptation information for the area indicates a 30% increase in runoff. This increase has been applied to the model.

This report examines the existing conditions, identifies issues and areas of interest, models possible future scenarios and provides some insight into possible solutions. This report does not consider the effects of tidal influences and storm surges.

3. Scope and Objectives

The scope of this report is to model stormwater flows throughout the Rudds Hill – Raspins Beach catchment.

Establish a flow level for the 5% and 1% AEP (annual Exceedance Probability) events and identify overland flow paths.

Assess overland flow and infrastructure required to meet the Councils Climate Adaptation policy of a 30% increase in runoff.

Model the Holkam and Alma Court subdivisions and assess the stormwater consequences to overland flow and infrastructure upgrades.

Model the future low density residential zoning area, to assess the stormwater consequences on overland flow and infrastructure upgrades.

Recommend possible infrastructure upgrades for the minor and major flow paths.

4. Background

4.1 Catchment

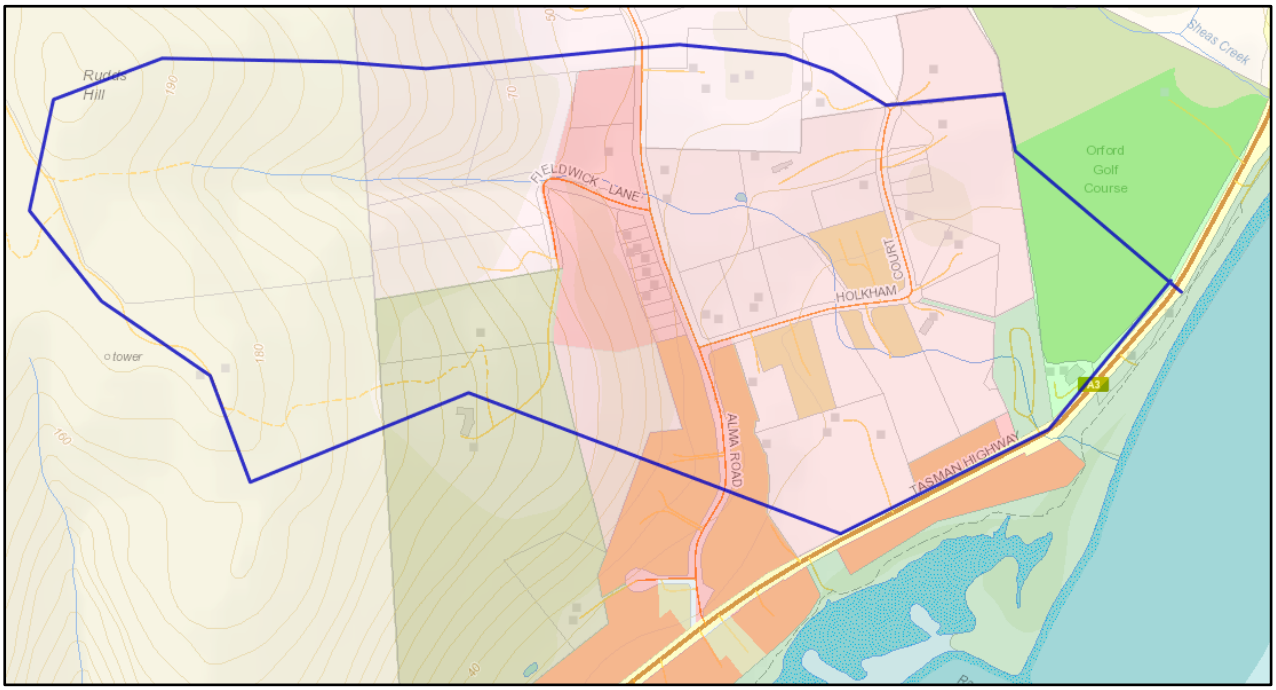


Figure 4.1 *Catchment Boundary with zoning overlay and unnamed creek drainage line shown.*

The total catchment is approximately 80 ha with a steep forested upper section transitioning into a lightly built up, medium grade residential area. The base of the catchment gradually flattens to the triple 450mm diameter outlet underneath the Tasman Highway, through the dune system to Raspins beach. The catchment includes a portion of the golf course to the north.

The catchment is dominated by the upper portion of the catchment to the west of Alma Road. This area makes up nearly half of the total catchment area and drains predominantly to the northernmost culvert under Alma Road. This section of the catchment dominates the flow regime. The catchment flow is limited at the downstream end by the Tasman Highway which severely limits outflow and provides a boundary to the lower edge of the catchment. The catchment boundary through the golf course has a very limited height change. In large events water spills northeast into the golf course catchment as the highway acts to dam the flow towards the coast.

Under the Glamorgan Spring Bay Interim Planning Scheme 2015 the upper portion of the catchment is divided between Rural Living, Environmental Living and a portion of General Residential zoning along Alma road. The lower half of the catchment is zoned Low Density Residential. The catchment is not fully developed to its capacity within the current zoning. The General Residential and Low Density Residential zonings have the capacity under the planning scheme for significant increases in dwellings and associated infrastructure.

A significant portion of the lower area is in a Coastal Inundation Hazard Area overlay. The flow path through the centre of the catchment is contained in a Water way and Coastal Protection Overlay.

The flow path through the catchment consists primarily of a managed open drain. Existing infrastructure is limited to culverts under Alma Road and Holkham court, and an open channel through the mid section of the catchment. This channel enters the caravan park lot where there are several small culverts through the channel to service small caravan park access roads.

The caravan park is in the lowest part of the catchment prior to the highway outlet and has little fall across the site.

The outfall past the highway is through the dune system to the ocean. There is very little grade through this outfall and it is affected by sand movement. Anecdotally this outfall often restricts stormwater outfall to the ocean.

The beach outfall will be affected by storm surges and high tides so has not been modelled in detail as part of this report.

4.2 History

The East Coast of Tasmania is characterised by low average annual rainfall and East Coast Low rainfall events. These events can bring extended heavy rainfall periods resulting in significant flooding and are variable in their frequency and intensity. Historically the catchment has experienced flooding effects from these events. Time between flooding event and their magnitude has been varied.

In late January 2016 there was a significant rainfall event that affected this area. The event is plotted in the graph below and clearly exceeded a 1% (ARI 100) event for all durations greater than 10 minutes. This event resulted in significant flooding in the catchment area and inundation in the caravan park and golf course.

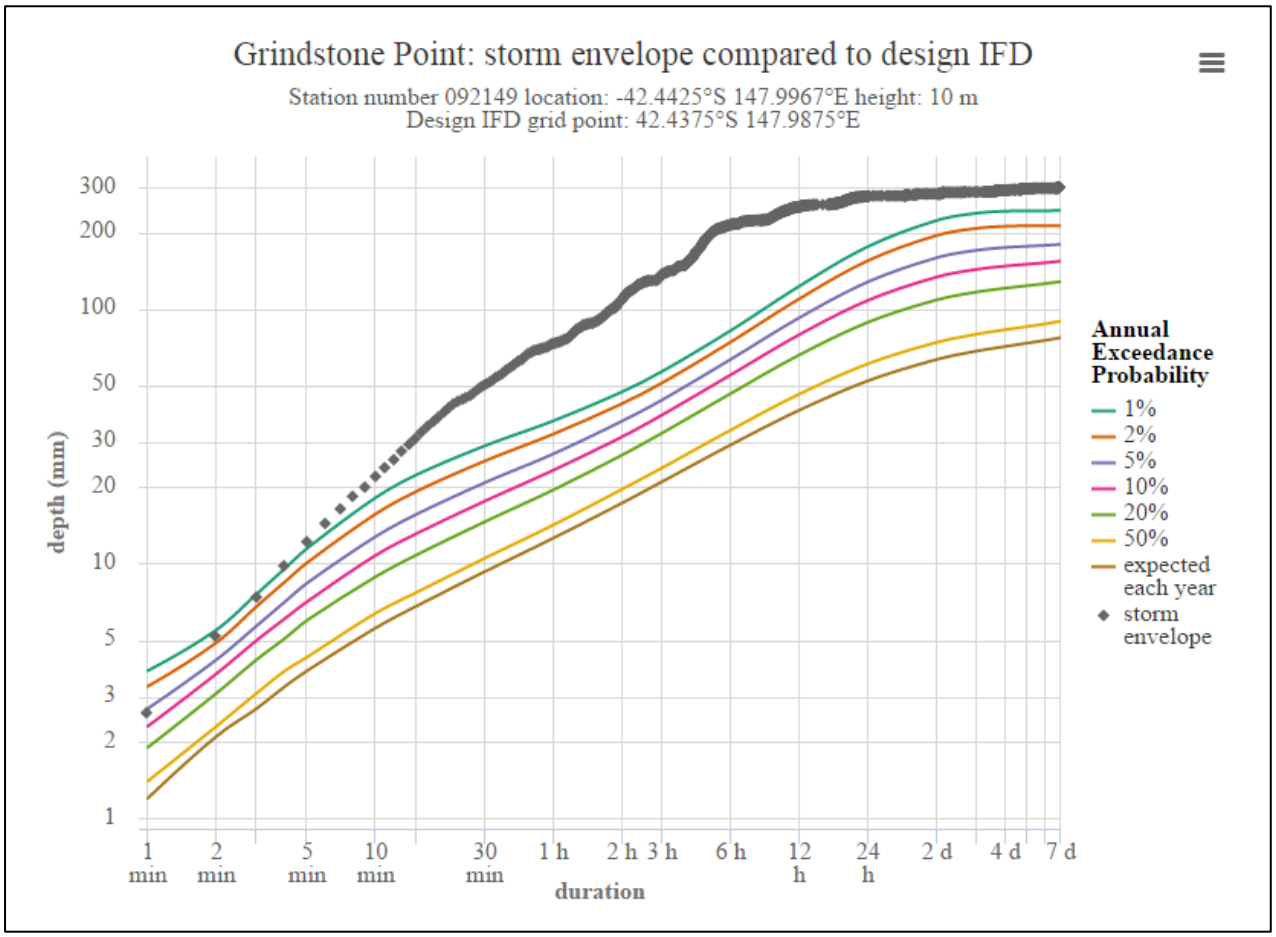


Figure.4.2 Intensity Frequency Duration (IFD) Chart with the January 2016 flood storm envelope plotted over the IFD's for Grindstone Point. Provided by the Bureau of Meteorology.

This event caused flooding in the area that has been documented in photographs. The event caused inundation of the caravan park, including flooding of the amenities block to at least 300mm depth and significant overflow over Holkham Court.

Figure 4.3 *Inundation of the Caravan park.*

4.3 Coastal Inundation

Large portions of the site have been identified under the *Glamorgan Spring Bay Interim Planning Scheme 2015* as Coastal Inundation Hazard area. Areas in this catchment that are subject to coastal inundation hazard are the same areas that will receive overland flooding during rainfall events and are likely to also be impacted by future storm surge. This includes portions of the caravan park and golf course. Recommendations to decrease flooding risk to these low-lying areas from rainfall events may increase the flooding risk from storm surge. This needs to be carefully considered in future decisions and possible mitigation strategies.

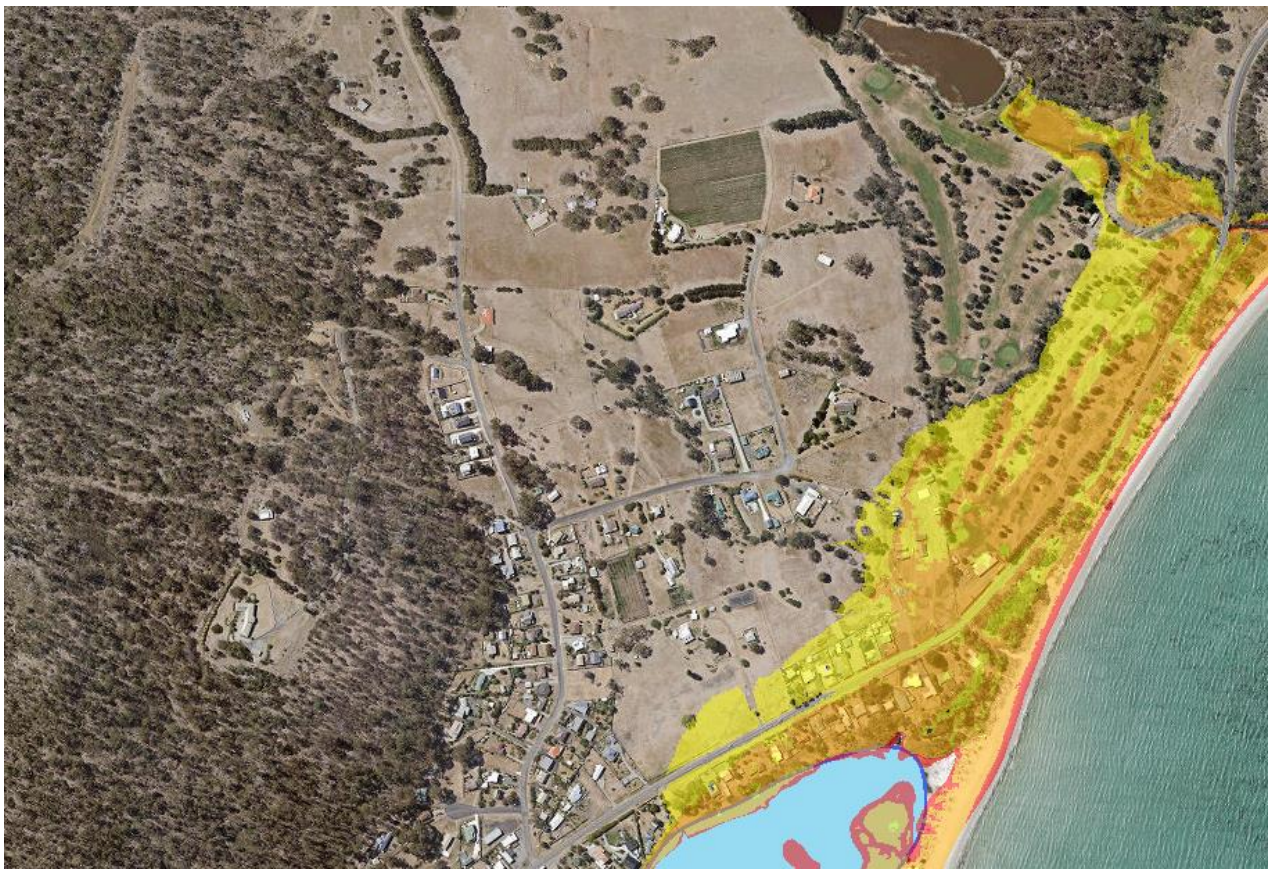


Figure 4.4 Coastal Inundation Hazard Bands LISTmap.

Coastal inundation bands; high (red), medium (orange) and low (yellow).

- High band is the area vulnerable to sea-level rise by 2050 from the mean high tide, rounded up to the nearest 100 mm.

- Medium band is the area vulnerable to a 1% AEP storm event in 2050 rounded up to the nearest 100mm plus 300 mm added for freeboard.

- Low band is the area vulnerable to a 1% AEP storm event in 2100 rounded up to the nearest 100mm, plus 300 mm added for freeboard. *M.J. Lacey, (2016) Coastal Inundation Mapping for Tasmania - Stage 4. Report to the Department of Premier and Cabinet by University of Tasmania.*

4.4 Climate Change

Climate change has been factored into the modelling by increasing the rainfall values by 30%. This value has been taken from the Glamorgan Spring Bay Council Corporate Adaptation Plan 2012 from the Runoff value (page 12). There are other considerations that are briefly discussed below.

Climate change modelling by the *Antarctic Climate and Ecosystems CRC from the Climate Futures for Tasmania project* indicates that for the east coast of Tasmania, rainfall will increase and "rainfall brought by rare extreme events will increase: a 200-year average recurrence interval (ARI) event increases by up to 110mm (90% increase). More common ARI events (ARI-10, ARI-50) increase by a similar proportion". It also indicates that "Proportional (%) increases in runoff are larger than the change in average rainfall, changes to runoff may exceed 30%". This means that by 2100 all significant events are likely to nearly double in size and what currently constitutes a significant event will occur more regularly.

Further investigations into the data showed that this increase is not linear and, as shown below, the 2069 increase may only be 11%. Discussion with current climate scientists indicate some uncertainty about the variation in increase over time. Due to this uncertainty this report does not include modelling for a 90% increase in storm values. Climate change has been incorporated into the model by increasing the rainfall values by 30% as per the recommended runoff values.

Table 7.3 Magnitudes of 24-hour duration ARI-200 (years) for 1961-1990 estimated from AWAP gridded observations (5th/95th CIs in brackets), with projected multi-GCM ensemble change for 2010-2039, 2040-2069 and 2070-2099, at eight representative locations across Tasmania. ARIs estimated using a generalized Pareto distribution. Multi-GCM ensemble ARIs estimated using the six downscaled-GCMs for the A2 emissions scenario. ARIs are expressed in mm. Delta ARI-200 values are expressed in millimetres and as a percentage change (in square brackets []), relative to the AWAP 1961-1990 baseline. Location of sites is shown in Appendix A

	ARI–200 (mm)	Delta ARI–200 (mm)		
Location	AWAP (1961–1990)	Multi–GCM ensemble (2010–2039)	Multi–GCM ensemble (2040–2069)	Multi–GCM ensemble (2070–2099)
Hobart	100 (76/128)	31 [31%]	40 [40%]	30 [30%]
Swansea	122 (91/162)	16 [13%]	14 [11%]	112 [92%]
St Helens	145 (107/210)	10 [7%]	40 [27%]	68 [47%]
Launceston	66 (51/85)	3 [4%]	34 [51%]	34 [52%]
Devonport	97 (76/131)	4 [4%]	23 [24%]	36 [37%]
Strahan	68 (65/73)	6 [9%]	8 [12%]	18 [26%]
Strathgordon	97 (93/105)	21 [21%]	30 [31%]	36 [37%]
Miena/Liawenee	98 (78/134)	50 [51%]	30 [30%]	5 [5%]

Figure 4.4 ACE CRC Climate futures for Tasmania, Technical Report 2010, Extreme Events Table 7.3.

Complicating this is the Australian Rainfall and Runoff Data Hub which holds data used for stormwater modelling in Australia has a different Climate Change factors of between 3.2% and 16.3% depending on the climate change model and year of consideration. This is based on a regional model that includes all of Tasmania so is unlikely to be as accurate as the ACE CRC modelling. These values may be used by engineers modelling stormwater within the Council area. Council must decide if this is acceptable. It is recommended that Council continue to use the 30% increase in runoff rates until data is available that is more accurate or up to date than the ACE CRC data.

In the future if it is clarified that the 90% increase occurs on a more linear trajectory than the current output suggests there are a number of options for Council to consider.

1. Council may increase its stormwater requirements for minor and major flow paths to be installed to cater for a 90% increase in flow rates.
2. Council may continue to use the current increase of 30% for its minor and major infrastructure until a set date based around the expected life of the infrastructure and cost benefit analysis.
3. Council may continue to use the current increase of 30% but accept that in the future the level of service provided to residents will be reduced i.e. the current level of service is to have a minor (mostly underground) network catering for a 5% AEP event (1 in 20 year ARI), this may, for instance, be reduced to a 10% AEP event (1 in 10 year ARI) and the major infrastructure may cater for a 2% AEP event (1 in 50 year ARI) instead of a 1% AEP.

Current recommendations are to:

1. Prioritise protecting the overland flow path. This will ensure that there is capacity to enlarge the overland drainage system as required. Having a robust major network also provides security for your minor network, it allows it to 'fail safely' and by doing so means that the impacts of increased flows on the minor network are less critical to amenity and safety.
2. Continue basing Council infrastructure on a 30% increase in runoff.
3. At minimum require developers to consider their major flow paths with a 30% increase.

5. Modelling Process.

The model has been based on a desktop analysis of the terrain, photography and on ground data provided by Glamorgan Spring Bay Council.

The area was modelled using procedures in line with Australian Rainfall and Runoff 2016 (ARR) using XP SWMM 2018.2.1 and 2018.2.2 modelling software.

A 1D/2D base model was set up using Lidar at 1m centres for the terrain model. The open channel was modelled with 1D channels and culverts linking to a 2D overland flow model. The developed catchments were modelled with 40% impervious for the low density residential and 60% impervious for the general residential areas.

Infiltration rates used for the catchment were adopted from ARR data hub recommendations. These rates are recommended for use unless they can be replaced by appropriate on-site infiltration data. Initial infiltration rates have a significant impact on initial flow rates, but much less impact on long term flow rates and areas of inundation. Antecedent rainfall places some rainfall on the catchment prior to the main rainfall event. Antecedent rainfall depths have been included in the modelling.

The base model was run as per the ARR 2016 procedures, with a suite of event times and storm ensembles to select the appropriate storms for catchment modelling. Storms selected for modelling were the 2hr storm number 7 for the 5% event and the 4.5 hr storm number 2 for the 1% event.

As per the adopted climate change scenario, there will be an increase in runoff of 30%. This is added to the model by increasing the rainfall multiplier by a factor of 1.3. The existing and climate change values for the chosen rainfall events are provided below.

The values in the below table have been used to assess the 5% and 1 % event with a 30% increase in rainfall during these events.

Name	Initial Multiplier	Climate Change 30% value
SST_5pct_2hr_7	35.1	45.63
SST_1pct_4_5hr_2	67.8	88.14

The climate change 30% multipliers were used for all standard models.

Models were run for the 1% (ARI 100) and 5% (ARI 20) scenarios as these are specified in the planning scheme for the minor and major stormwater systems.

6. Scenarios

The model was edited from the base model to test different scenarios that affect flow through the catchment. This allowed flooding impacts to be assessed and compared.

Scenario 1: **Culvert blockages** - Photographic evidence demonstrates that the HWY culverts may experience reduced flow due to sediment blockages. This was modelled with a 30% blockage to this culvert.

Scenario 2: **Outlet blockage** - Full outflow to the ocean is often impeded by dune movement. This has been modelled by raising the outfall to cause some impedance to the outflow.

Scenario 3: **Holkham subdivision** - Added Holkham subdivision area into the scenario. Added via new catchment with 40% impervious and free outfall at southern end of subdivision. Site coverage for structures in planning scheme is up to 25% plus added impervious areas for roads and driveways.

Scenario 4: **Alma subdivision** - Added Alma subdivision to the model as described above.

Scenario 5: **Full development under existing zoning** – Added 40% impervious for all catchments within the low-density residential zoning and general residential modelled at 60% impervious.

6.1 Scenario Analysis

Scenarios 1 and 2: **Highway Culvert Blockage and Outlet Blockage**

The highway culvert blockage had a significantly greater impact on the area of inundation upstream of the culvert than blocking the outlet. Culvert blockage was therefore considered highest risk and of significant likelihood and was selected for further modelling. This scenario may be impacted by tides and storm surge which is beyond the scope of this report.

Scenarios 3, 4 and 5: **Holkham Subdivision, Alma Subdivision and Full Low-Density Residential Models**

It quickly became apparent that assessing each subdivision alone was irrelevant as any future infrastructure upgrades will need to cater for full low-density residential development to future proof the upgrades. Further modelling therefore focussed on managing issues and sizing infrastructure for full low-density residential development. Interestingly, all the issues raised by increased development are already occurring due to inappropriate infrastructure and the nature of the catchment.

The other notable result was that due to the nature of the catchment, increases in impervious areas do not make a significant difference to the higher flow rates. This is due to two things, firstly the soil becomes saturated causing flow on pervious areas to act in the same manner as flow on impervious areas and secondly, the large upper portion of the catchment flow, which dominates the later stages of runoff events.

Points of interest:

The waterway running through the catchment is disrupted in several areas causing flow to be dispersed into properties unnecessarily. Maintaining the major flow path will be a priority for this area.

The lower portion of the catchment is in a depression that will become inundated under all flooding scenarios. If flow paths are increased to improve outfall into the ocean this may improve flood situations some of the time however, flood risk from storm surge and coincident flooding must be considered.

7. Results Assessment and Analysis

7.1 Summary of issues:

1. **Alma Road Culvert**. Flow from the creek line overflows Alma Road at this location.
2. **Holkham road entrance and first culvert**. The road geometry allows flow to cross the road and flow overland through private property into the secondary drain.
3. **Holkham Culvert**. Undersized for this location. Forces water onto the road. This then flows along the road east to the turning circle and flows over the road into private properties 24 and 30 and possibly 34 Holkham Court.
4. **Holkham Turning Circle**. Flows occur overland from the south side of this area. Low flow depths only however the water path has to flow overland for some distance through private property prior to re-entering the main channel. It then re-enters at the top of the caravan park where infrastructure is insufficient to manage this flow.
5. **Top Caravan Culvert** causes flows to back up and extend outwards. Addressing this issue will change the area of inundation.
6. **Caravan Park and Golf Club building area**. This area receives significant inundation affecting the caravan park and the golf club building.
7. **Holkham Court Subdivision**. This subdivision will create flow that does not flow into any currently defined flow paths.
8. **Highway Culvert.** The highway under the culvert is undersized and throttles flow. This is exacerbated by the culvert being periodically affected by sediment blockage.

Note issues 1 to 4 are independent of impacts from tidal variations and storm surge. Storm surge and tidal impacts do not form part of this model.

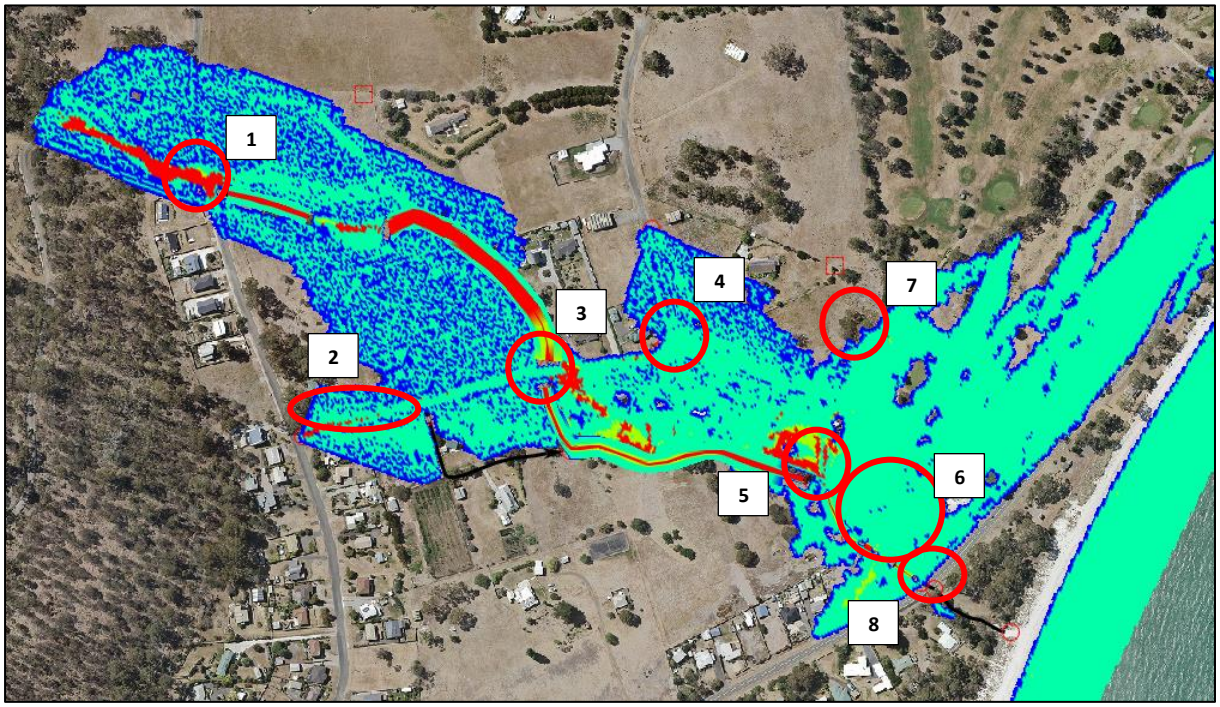


Figure 7.1 Low Density Residential model results. Showing areas of inundation and areas of particular concern. 1pct 4.5hr climate change model.

7.2 Results

Total Overland Flow Area

The previous map shows the entire area of inundation. Further maps will show areas with inundation deeper than 0.1m as a 10 cm water depth is of minimal concern to people or property.

5% AEP Results

Overland Flow of Depths Greater than 0.1m. 5% Result.

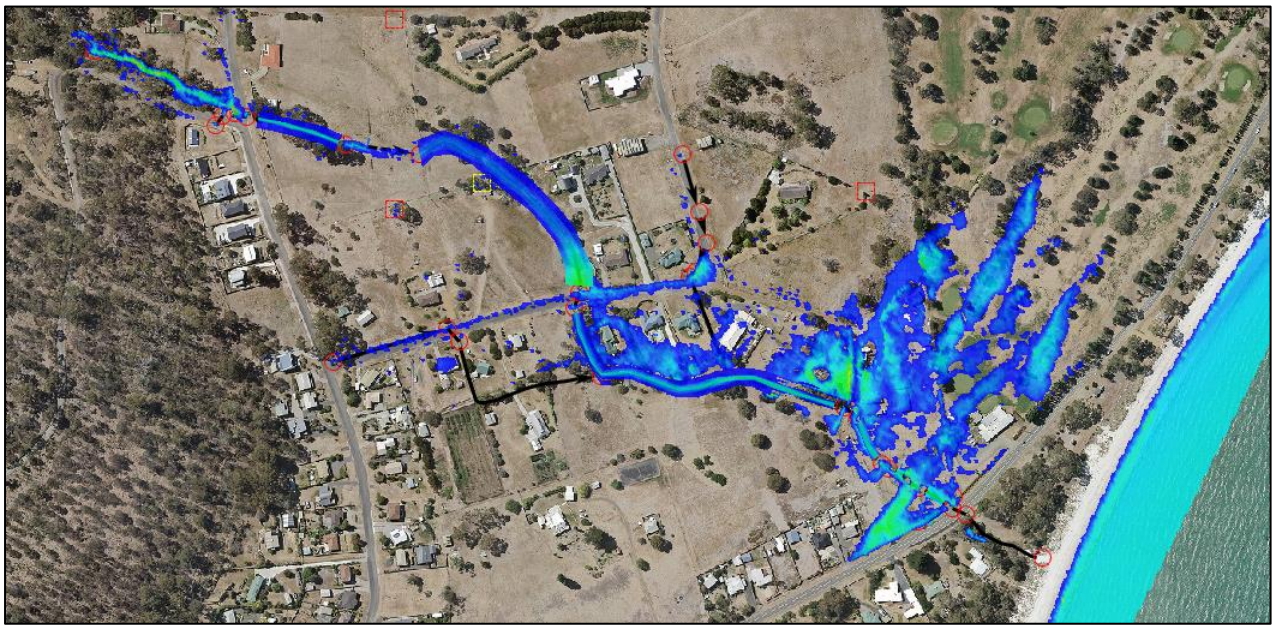


Figure 7.2 5% 2hr Climate Change Base model results. Max Water Depth. Map showing depths greater than 0.1m. 5pct_2hr climate change model.

Figure 7.3 2hr Climate Change Low Density Residential model results. Max Water Depth. Map showing depths greater than 0.1m. 5pct_2hr climate change model. This is the assumed future scenario to develop infrastructure for.

Overland Flow of Depths Greater than 0.1m. 5% Low Density Residential Result.

Comparing the above two images, it is clear the increase in residential area does not result in significant increases in the flooded zone for the 5% event given that what is shown is depths greater than 10cm of pooled water. Increasing the impervious area results in very slight increased peak flow rates in these events as shown by the graph below. The graph below is from the model that assumes some antecedent rainfall. This means it assumes there has been some rain preceding the main burst of the event. This is likely to be the case in real life and the antecedent volume from the Bureau of Meteorology has been used.

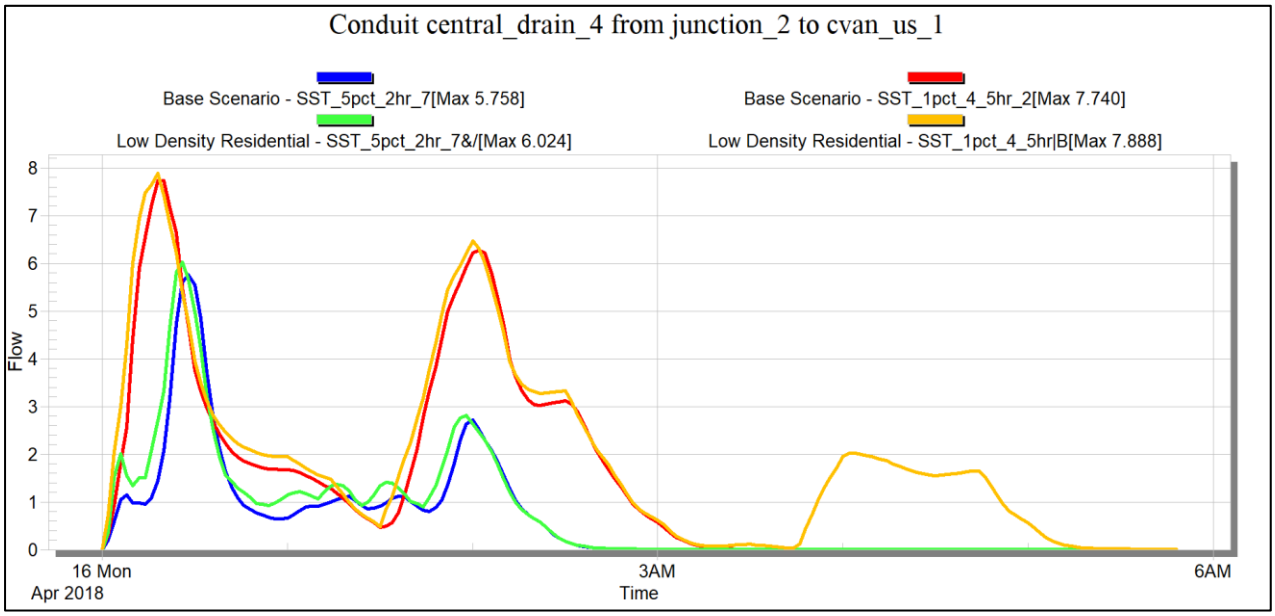


Figure 7.4 Graph of flow rates for Base model and Low Density Residential model for Central drain 4 section as shown above

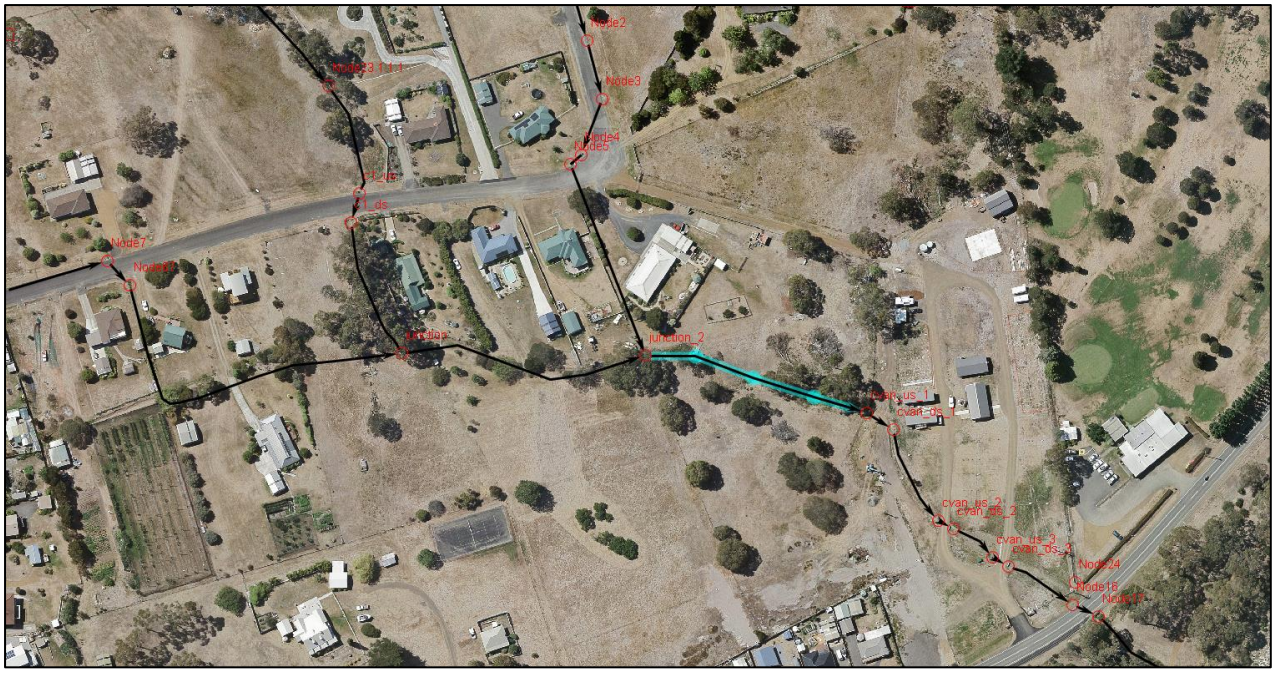


Figure 7.5 Central drain 4 section for above graph.

1% AEP Results

Overland Flow of Depths Greater than 0.1m. 1% Low Density Residential Result

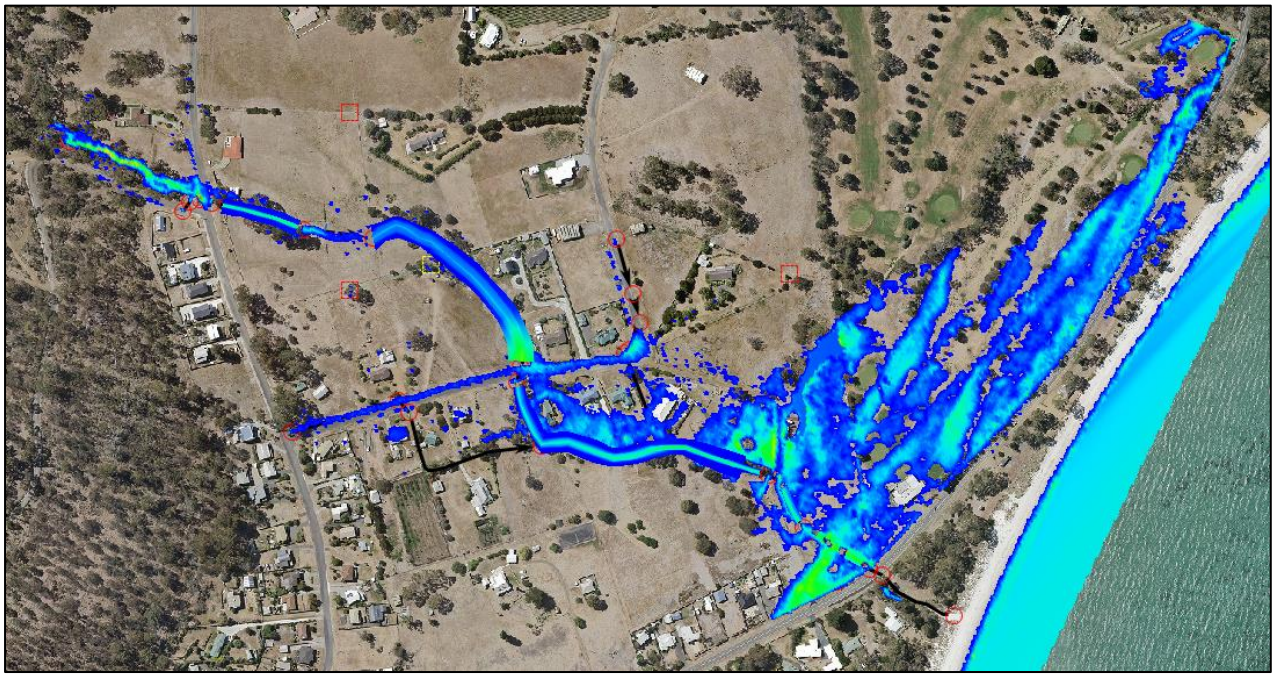


Figure 7.6 1pct 4.5hr Climate Change 30% Low Density Residential model results. Max Water Depth. Map showing depths greater than 0.1m.

Total Overland Flow Area. 1% Low Density Residential Result

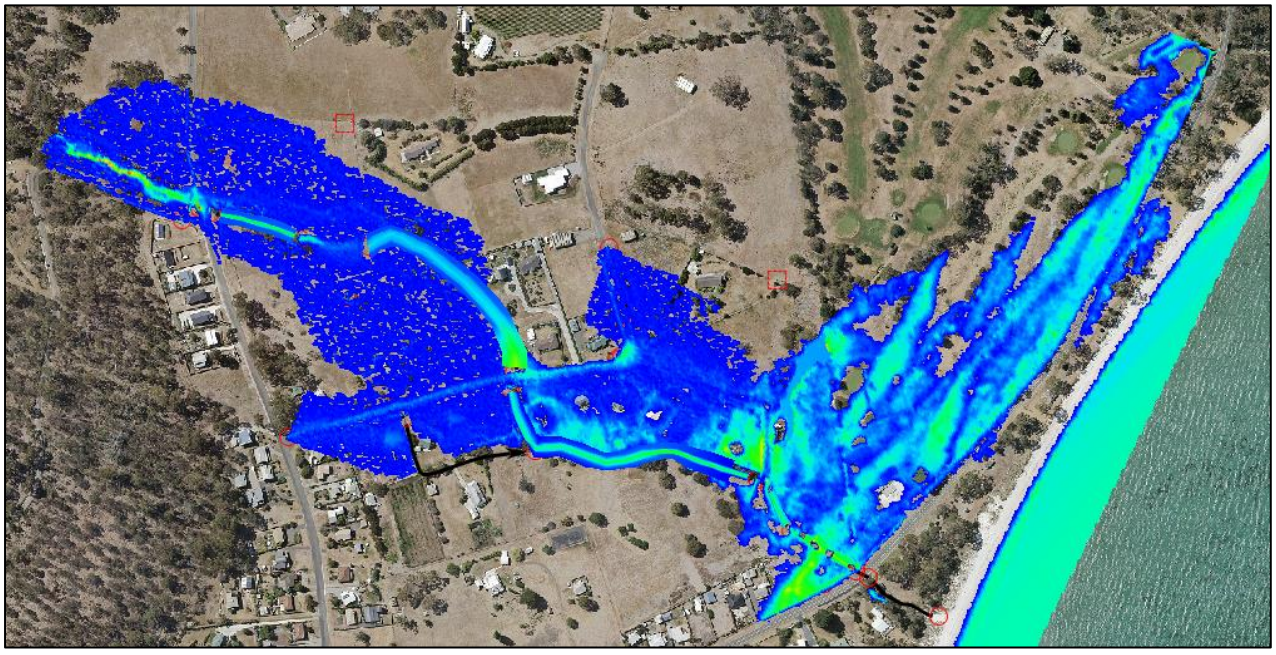


Figure 7.7 1pct 4.5hr Climate Change Low Density Residential model results. Max Water Depth. ***Map showing all depths for comparison.***

Note in the 1pct event the flood area extends throughout the golf course and overtops the highway.

7.3 Areas of Interest Results.

1. **Alma Road Culvert**

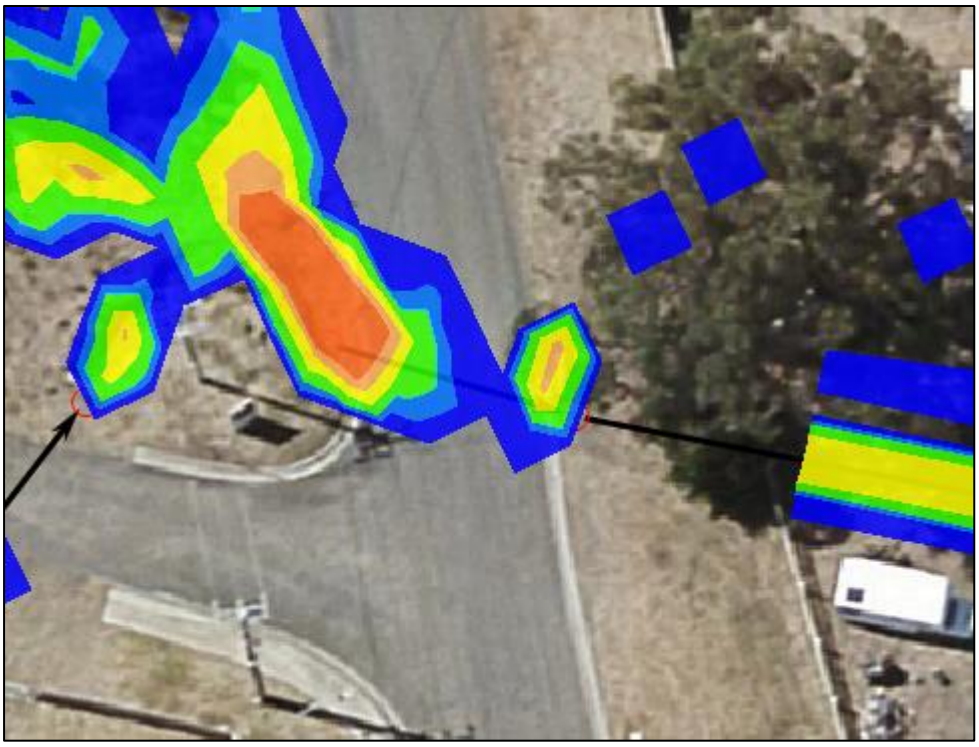


Figure 7.8 5% 2hr Climate Change Base model results. Flow greater than 0.1m overtopping Alma Road.

This demonstrates that some flows overtop Alma road in a 5% event.

2. **Holkham road entrance and first culvert**

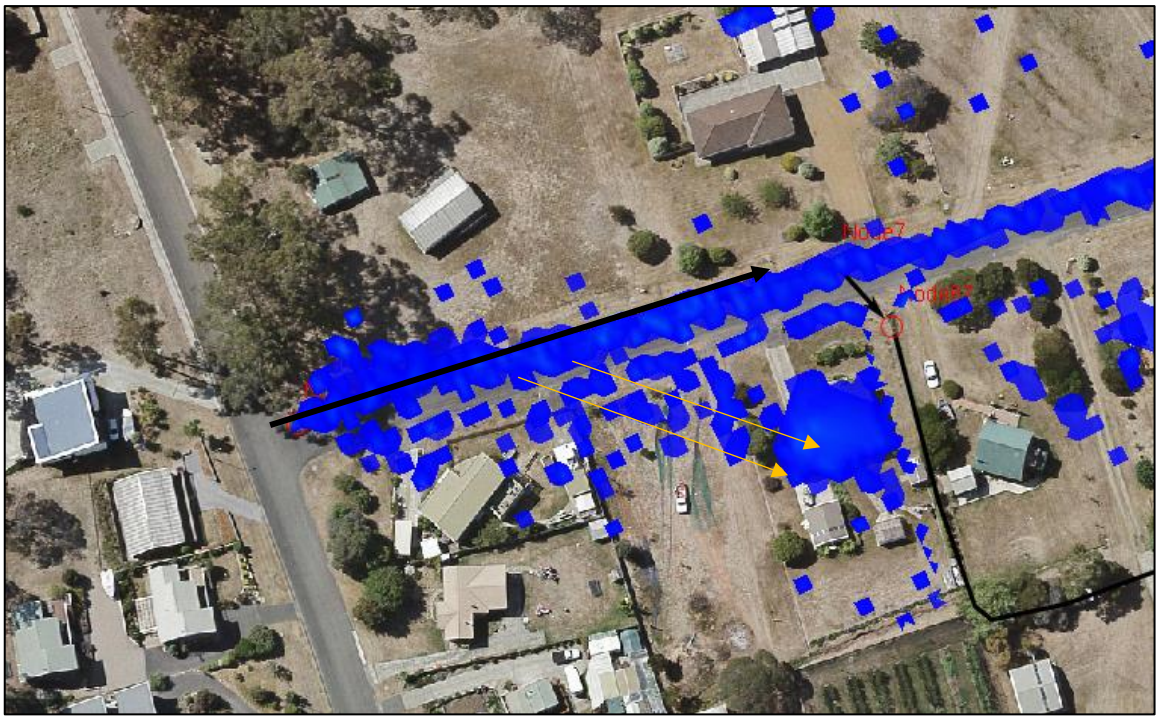


Figure 7.9 5% 2hr Climate Change Base model showing 5cm of water flow. This shows that water comes across Holkham Court and crosses private property to enter the small open drain.

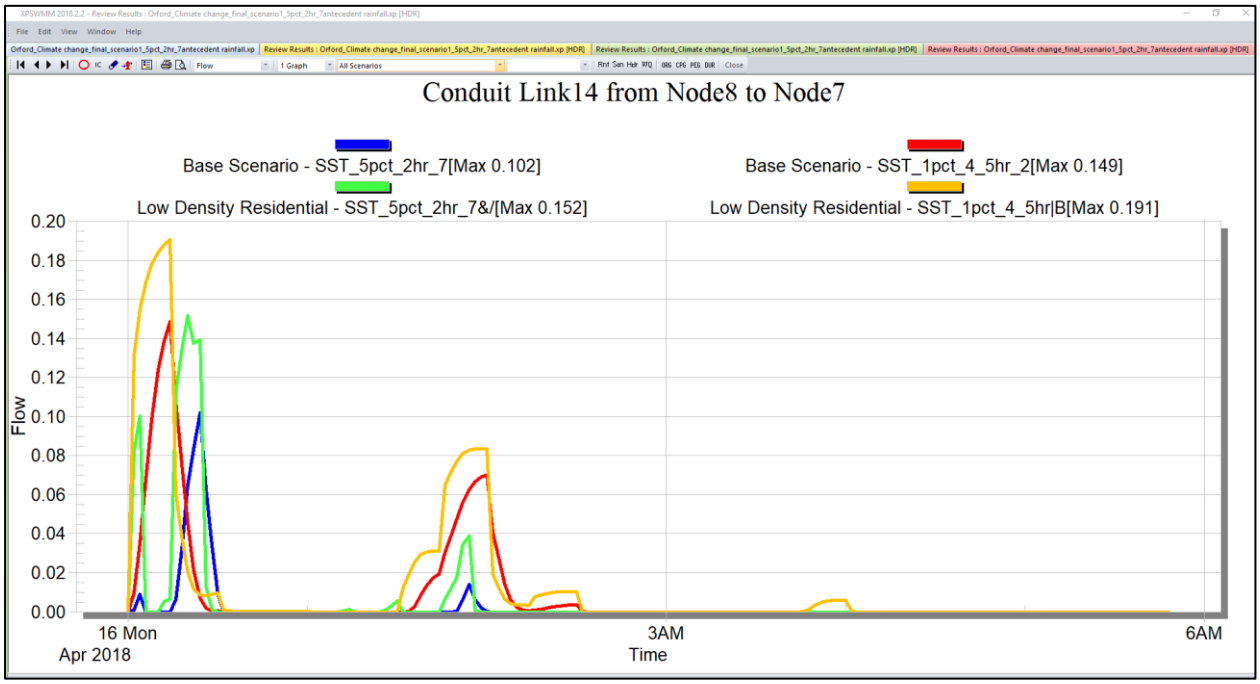
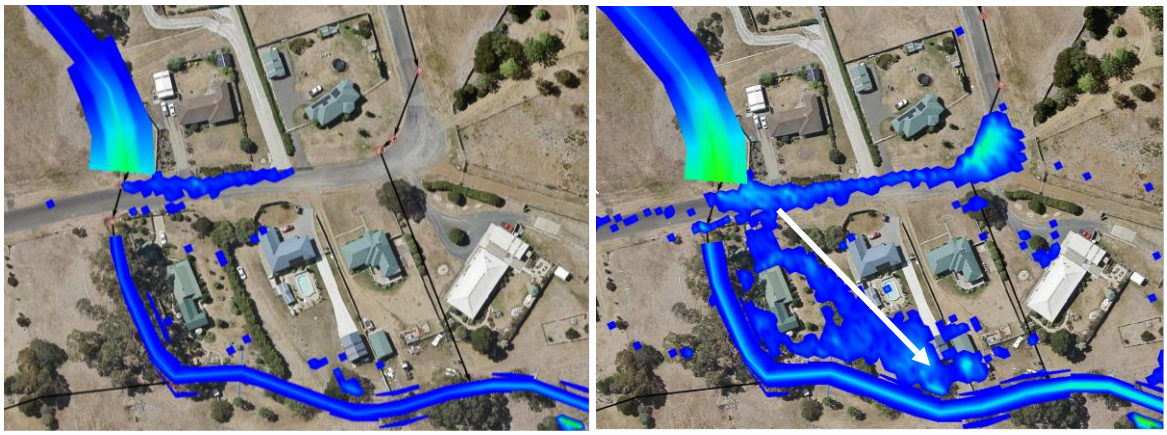


Figure 7.10 Flow rate in Link 14 for the 1% and 5% events. – Roadside drain in Fig 14 above.

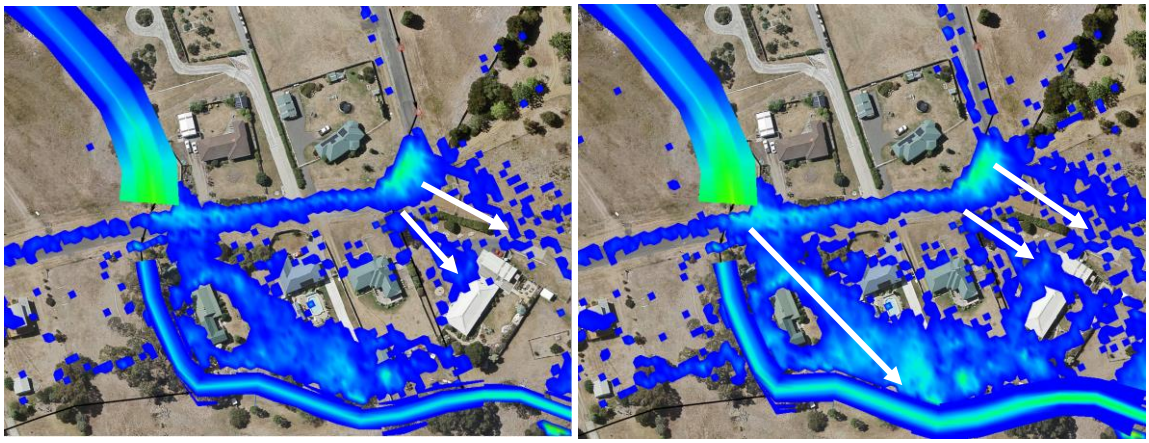
These results indicate that flow escapes the drainage network at the entrance to Holkham Court and passes overland through private properties. Although flow depths are not large, these impacts are increased by increases in development as shown in Figure 0.15 which shows the increases in flow rates in the 5% and 1% events under the low-density residential scenario. The low-density results from both

events show that the increase in development results in higher peak flows, peaking slightly earlier than in the base scenario.

3 & 4. Holkham Culvert and Holkham Turning Circle.



1. 8 minutes **2. 20 minutes**



2. 22 minutes **4. 28 minutes**

Figure 7.11 2hr Climate Change Low Density Residential model showing all water flow.

This series of images shows that the water that backs up at the Holkham Road culvert overtops onto the road and diverts east along Holkham Court where it flows out over a low point at the turning circle. The flow also overtops straight over Holkham Court and through private properties prior to re-entering the open drain.

5 & 6. Top Caravan Culvert

The culverts in the caravan park cause constrictions in the flow path. This causes the water to spread further into areas that may otherwise be unaffected.

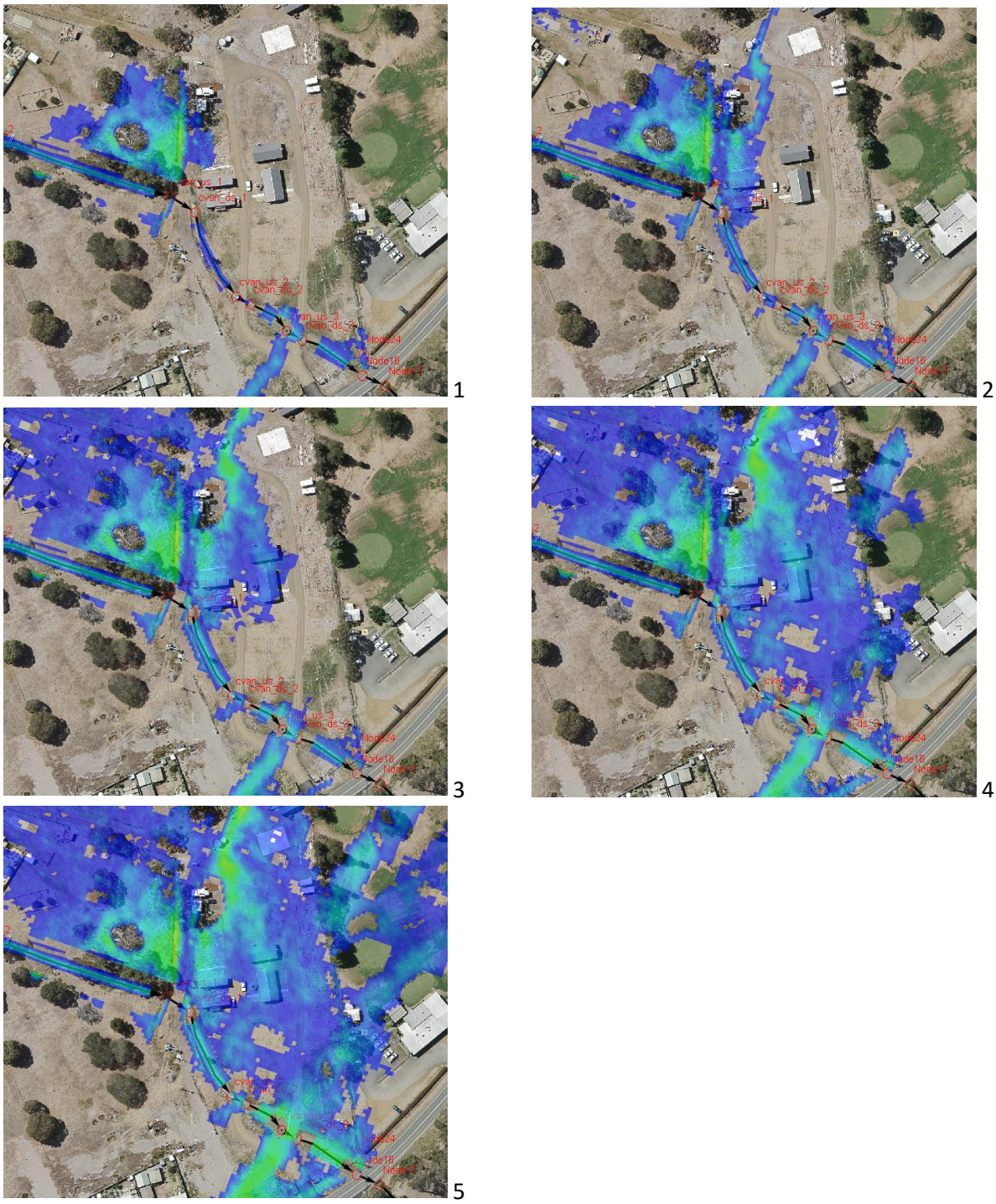


Figure 7.12 Series showing effects of restrictions caused by road and culverts in the caravan park.

7. Holkham Court Subdivision

This subdivision will divert water into the highlighted node.

Figure 7.13 Holkham Court Subdivision downstream node (node 75).

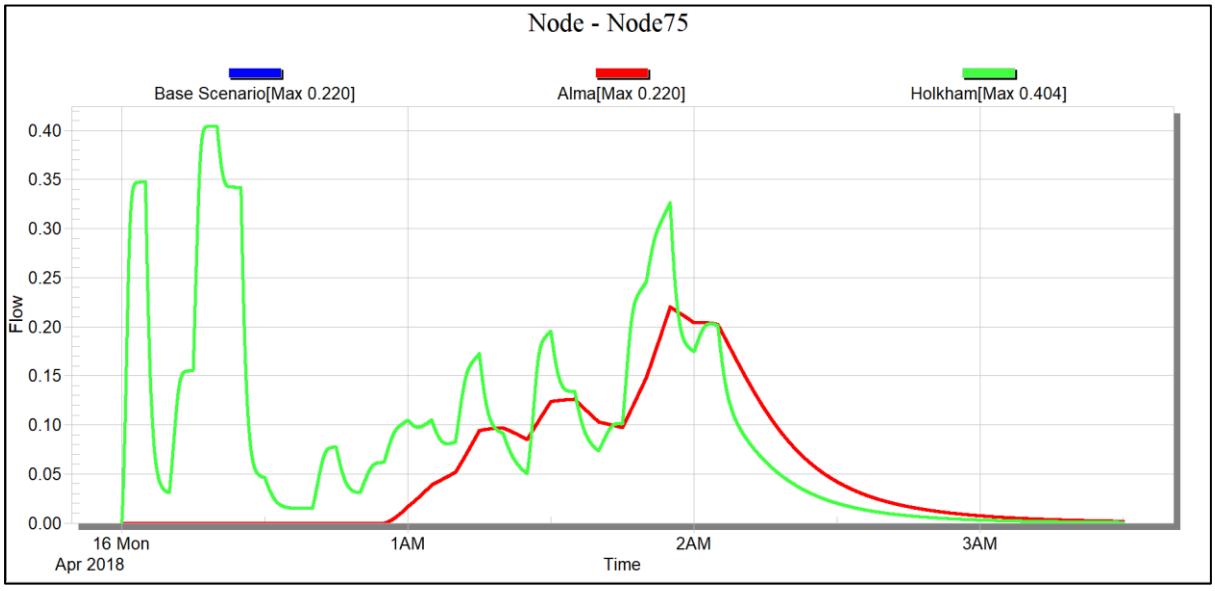


Figure 7.14 Runoff results from Holkham Court Subdivision catchment undeveloped vs developed.

This graph shows the extra outflow created from the south-east corner of the proposed Holkham subdivision. This results in a large amount of extra flow along this eastern boundary area but the overall impact on the peak flow rate within the caravan park area is unaffected as shown by the graph of the node highlighted in the caravan park below.

Figure 7.15 Holkham Court Subdivision downstream node (node cvan_us_1).

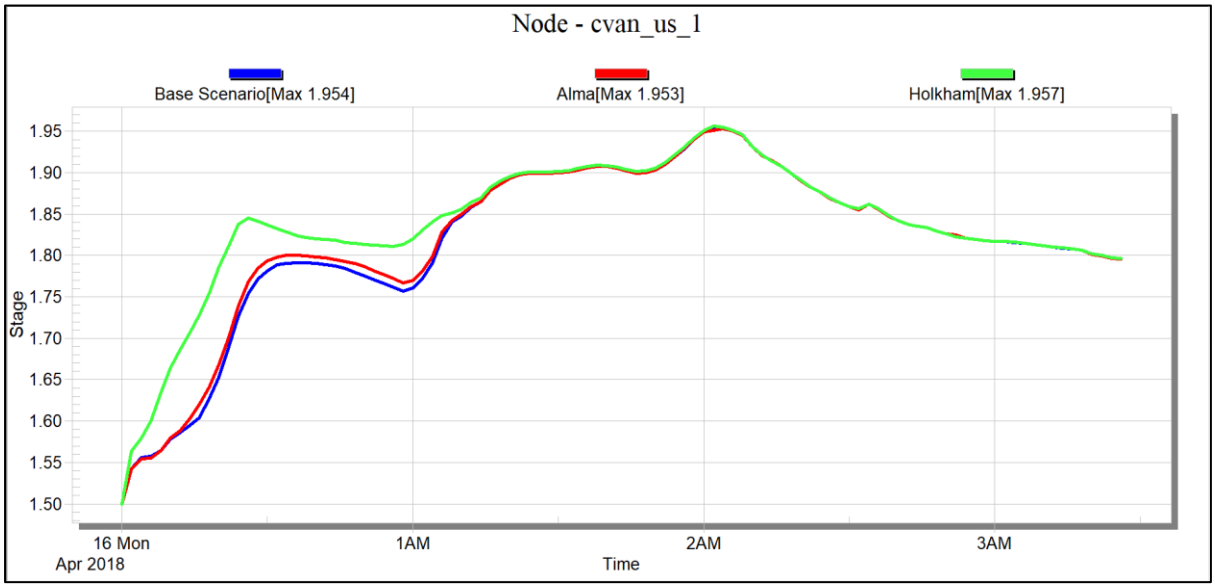


Figure 7.16 Hydraulic Results from the upstream culvert in the caravan park (node cvan_us_1).

The graph above shows the results from the top culvert in the caravan park. As shown, the Holkham development has some impact in the early stages of the event but the peak is unaffected by the extra impervious area.

8. Highway Culvert

The culvert under the highway causes large flow restrictions which impacts up into the catchment. These are exacerbated when the highway culvert is blocked by silt or other debris.
The below image shows the extent of overland flow greater than 10cm depth during the low density residential 5% event with the existing culvert. The final image shows the reduction in inundation area when the recommended mitigation measures have been installed.

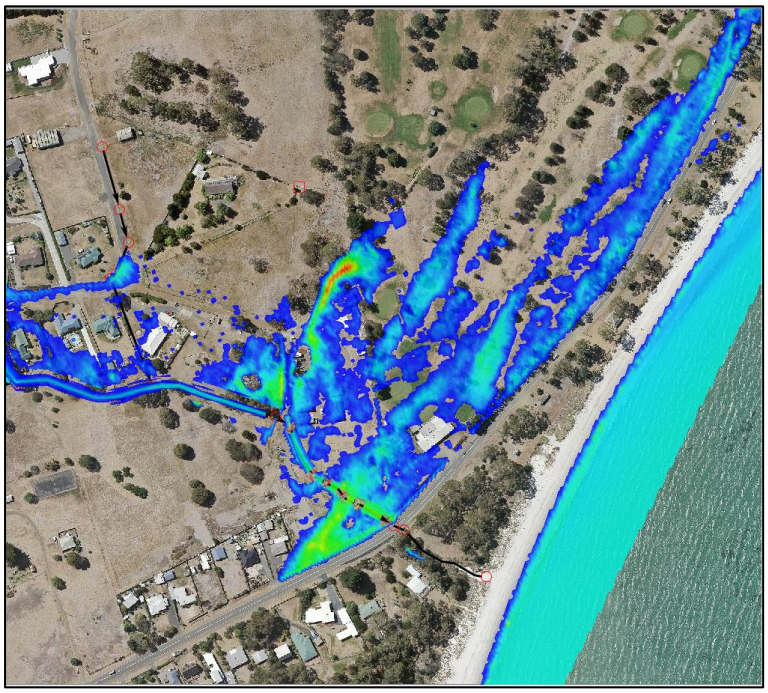


Figure 7.17 5% Low Density Residential inundation areas with existing HWY culvert

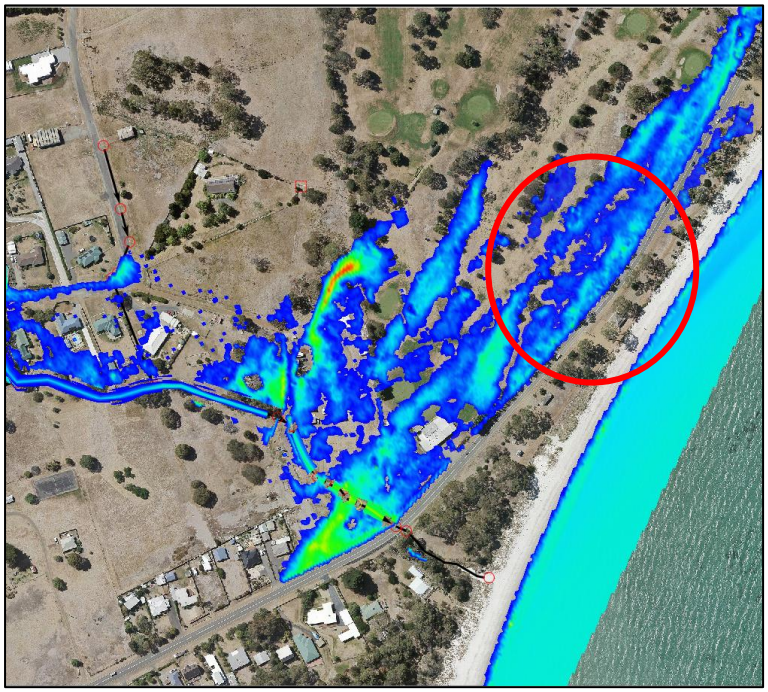


Figure 7.18 5% Low Density Residential inundation area with existing HWY culvert with 30% blockage.

Figure 7.19 5% Low Density Residential inundation area with enlarged HWY and Holkham culverts and a bypass channel around the western boundary of the caravan park.

8. Recommendations.

Figure 8.1 2hr Climate Change Low Density Residential model results. Max Water Depth. Map showing depths greater than 0.1m. 5pct_2hr climate change model.

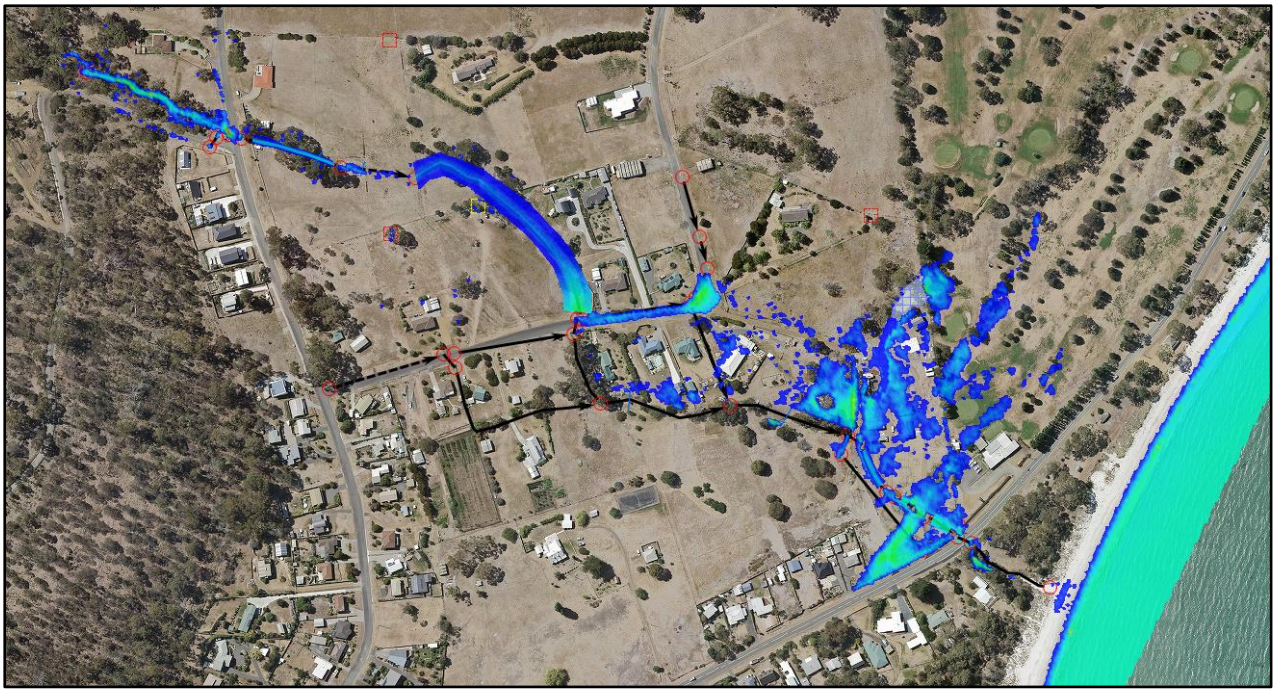


Figure 8.2 2hr Climate Change Low Density Residential model results. Max Water Depth. Map showing depths greater than 0.1m. 5pct_2hr climate change model. Model including recommended upgrades and showing area of greatest reduction in overland flow.

There are a variety of short and long term works required in this catchment to reduce impacts of water flow on private property. These recommendations are general and specific design advice will be required for each job.

The following recommendations revolve around the key principles of increasing the highway culvert size, appropriately managing the central drainage line and installing kerb and channel along Holkham Court.

Minor works have been modelled to the 5pct 2hr low density residential climate change model and major works to the 1pct 4.5hr low density residential climate change model. On ground works should be designed to include climate change. The minor and major systems should be designed for the 30% increase in runoff from climate change however it will be prudent to protect the major drainage paths with appropriate public space or easements to allow for potential increases in climate change effects. This should also be considered when the major drainage path is incorporated into infrastructure such as roads.

Minor system works should aim to accommodate the 5% event and the major drainage system should, at this stage, be designed for a 1% event with a 30% increase for climate change.

Works that are interdependent and works that are achievable should be identified prior to undertaking any individual section of work in the lower catchment. If it is not possible to increase the highway culvert size this will impact upstream works. If this can be done expediently and combined with a diversion channel around the caravan park it will have a large effect on the amount of water that can be drained from the area.

The recommendations provided are based on modelling and lidar of the area. It is advisable to undertake specific surveys and design to ensure sizing and fall to accurately size infrastructure.

The above diagrams show that it is possible to minimise inundation on private property however there will be some areas, notably in the Southern end of the caravan park where some inundation shall still be expected.

9. Recommended Actions.

Recommended actions have been divided into specific actions that may be implemented as required and long-term general actions which will require further or ongoing planning.

Location	Recommendation	Possible Solution
1. Alma Road Culvert (Link 7)	**This culvert straddles the major drainage path. Consider whether a culvert is installed for the 1% event or if it is acceptable to allow flow over the road in events exceeding the 5% event.** **Increase the size of the Alma Road Culvert** to **5.1 cubic meters per second (cm/s)** capacity (Link 7) This will allow the low density residential 5% event to pass under Alma Road. Alma road should also have a slight redesign to allow the 1 % event to pass over Alma road and into the natural channel in a controlled manner. Alternately consider enlarging this culvert to cater for the 100 year event.	***A 1050mm dia pipe at 3.5% grade or similar for the 5% event.*** *The 1% event requires approximately 10 cm/s capacity so would require a twin 1050mm setup at this grade.*
2. Holkham Road Central Culvert	**This culvert straddles the major drainage path. Consider whether a culvert is installed for the 1% event or if it is acceptable to allow flow over the road in events exceeding the 5% event.** **Increase the size of the Central Holkham Road Culvert** to **5 cms** capacity. This will allow the low density residential 5% event to pass under Holkham Court. Holkham Court should also have a slight redesign to allow the 1 % event to pass over Alma road and into the natural channel in a controlled manner. This may be managed by appropriate design of kerb and channel.	***A 1050mm dia pipe at 3.5% grade or similar for the 5% event.*** *The 1% event requires approximately 10 cm/s capacity so would require a twin 1050mm setup at this grade.* **Modelling this area demonstrated that the design of the inlet area to the culvert is critical to preventing flow over the road. The existing ground levels and inlet arrangement is a factor in flow overtopping Holkham Court.**
3. Holkham Court	**Kerb and channel along Holkham Court**. Install kerb and channel along the length of Holkham court –	**Kerb and channel Holkham Court**

	particularly the east west section and the right angled bend. Ensure that the driveways are not low points. This will minimise water flows off Holkham Court and into private properties. Increasing the culvert as described above will also assist this situation as currently water that gets onto the road from the drain does not return directly to the main drain due to the easterly fall of the road. The existing 450 dia pipe from the right angled bend back to the main drainage line may require upgrading however this may not be required if the main drain is upgraded effectively.	**Modelled with 150mm kerb from the entrance to the culvert and 300mm kerb from the culvert around the northerly bend.**
4. Caravan Park	**The major flow path should be identified and adequately protected through this area with adequate space for a significant drainage path.** **Create an open channel bypass around the caravan park**. Capacity should be ideally **4.5cms** for a 5% event or **7.4 cms** for a 1% event. This will not prevent all the flows going through the park but will utilise the drain more efficiently causing less water to back up around the Caravan Park and Golf Course area. This should be done in conjunction with increasing the culvert size under the highway. **There is not grade available for a deep channel in this area so a wide and shallow channel is the likely outcome.** **This will allow flows to reach the highway culvert more efficiently without being throttled by the caravan park culverts. Otherwise maintain the existing flow path through the caravan park on the understanding that inundation is**	

	inevitable but does not cause great impact to property.	
5. Highway Culvert	**Increase the size of the Highway Culvert. This will have a significant effect on the volume of inundation in the lower catchment. The area most affected by this will be the caravan park and golf course, it will have minimal effects on other properties.** The design capacity of this culvert will be dependent on the design of the channel into the culvert. For a 1% event it will range between approximately 5 to 6 cms for a 1% event. Increasing the size of this culvert will allow flows to escape the caravan park area more efficiently. It will also provide some protection for blockages. This will also open the area up for increases in storm surge flows into the area which have not been considered as part of this report. A non-return valve may be considered at this location.	This has been modelled as a 1.75m wide and 0.85m high rectangular box culvert. **Increasing this culvert size is recommended in this report and will assist with solving inundation issues from rainfall events. However it is possible that it may have an effect on inundation of the area from storm surge events under sea level rise scenarios.**
6. Central Open Drain	**Increase the size of the open drain.** Increase the area of the open drain in locations where it is insufficient. Local knowledge will assist in providing this information. The model indicates that the area directly south of Holkham Court to is likely to require size increases. The open drains should be sized for a 1% event with capacity for **6.7 cms** capacity.	**Trapezoidal drain** **Approx Dimensions for** **0.5% fall** **5m base** **1m depth** **1 in 2 sides**

10. Ongoing and Long-Term Actions

Long term actions will be considered as the area is further developed.

1. **Keep the Major flow path**
   A major flow route should be kept and protected through planning processes. The area designated for the overland flow path should include sufficient space to not limit future expansion of the flow path due to predicted climate change impacts. This can either be as part of a defined channel or may be contained in constructed roads if designed appropriately. Either way the Major flow route should always be designed for and protected as development increases. Development design in this area should also ensure that if the minor or major flow routes are exceeded water is not directed into private dwellings. Ensure that driveways or roads do not become low points for water entry. Due to the nature of the major flow path through this catchment it may help to consider it as a small creek rather than an urban overland flow path.

2. **Construct infrastructure with a 30% increase to account for climate change.**
   Council infrastructure should be designed and constructed to cater for an increase of 30% in runoff. Major infrastructure that will become Council assets should meet this requirement. Council should determine if a 30% increase will be required for minor infrastructure constructed by developers or if the ARR Data hub factors are sufficient.

3. **Design for inundation in low areas**
   The lowest areas in the catchment are geographically very low. This increases the chances of inundation from overland runoff and possibly storm surge events, particularly under the probable climate change scenario. Portions of the catchment on the inland side of the highway are between 1 and 1.5m above sea level. The Glamorgan Spring Bay Local Climate Profile states that "Accounting for all effects, the current 100-year event in Hobart is projected to be a 1.58 m in Spring Bay by 2090 under the high emissions scenario." This includes a 0.82m sea level rise and increases in the size of 100-year storm surge event on top of the base increase. Design and development in this area should be mindful of this and be designed to consider some inundation. The caravan park should be aware of this and manage the area accordingly and if any future development occurs here it should be designed accordingly with minimum floor heights and clear communication of the issues. The caravan park should also be prevented from placing blockages in the main flow path. The golf club may also find it advisable to do some small earth works to prevent water ingress into their building. Earthworks may reduce the inundation effects in other areas, if considered these must be designed with consideration for the effects on the flow regime through the area.

4. **Consider Detention or Retention options**
   Detention or retention options either above ground or underground may be considered to minimise the volume of flow reaching the lower catchment. Retention would be a better option lower in the catchment, particularly if the golf course can get involved with utilising any saved water. Any of these options need to be individually assessed and designed and should consider the effect on the whole catchment small and larger events.

11. Conclusion

Modelling has been undertaken to assess the Holkham Court catchment. The catchment is defined by an undeveloped, steep upper sub catchment and a lower sub catchment with increasing developmental pressures. It has an open drain through the centre of the catchment, large low-lying areas in the lower catchment and infrastructure of varying scope that crosses the drainage path.

There are a number of issues caused by flow paths through public property and inundation of the low lying areas. The catchment and these issues have been examined by the stormwater modelling and recommendations made in this report. Some of the issues can be managed by relatively small infrastructure projects and some may be moderated by larger projects as recommended in the report. Works are unlikely to completely prevent some inundation of very low-lying areas within the caravan park.

A discussion with State Growth should be initiated about the possibility of increasing the size of the highway culvert. The investigations into this option should consider storm surge effects. If this culvert is not increased in size the other recommended works will result in greater increases in inundation in the lower catchment in the caravan park area.

12. References

Heyward O, Graham K, Green G (2012) '*Glamorgan Spring Bay Council Corporate Adaptation Plan'* Southern Tasmanian Councils Authority, Tasmania

ACE CRC (2010*), Climate Futures for Tasmania local climate profile Glamorgan Spring Bay municipality,* Antarctic Climate and Ecosystems Cooperative Research Centre, Hobart, Tasmania

White CJ, Grose MR, Corney SP, Bennet JC, Holz GK, Sanabria LA, McInnes KL, Cechet RP, Gaynor SM & Bindoff NL (2010) *Climate Futures for Tasmania: extreme events technical report,* Antarctic Climate and Ecosystems Cooperative Research Centre, Hobart, Tasmania

Comparison of Draft and Final Holkham Stormwater Court Assessments.

This document briefly summarises the differences between the draft and final Holkham Stormwater Court Assessments.

The draft Stormwater assessment was intended to be reviewed internally by GSB Council staff to ensure that the direction of the document was meeting the requirements of the Council. This document was never intended for dissemination as the details of the report were still to be finalised. Feedback from the draft was included in the final report.

As the draft document was disseminated to Council and the public I am providing a short comparison on the two documents. I recommend that the best course of action would be for anyone who has received a copy of the draft document receive and read a copy of the final Holkham Court Stormwater Assessment.

Final Report	Draft Report
• Considers Climate change and ramifications at a more in depth level. • Modelled with a 30% increase in runoff for climate change • Recommends prioritising overland flow paths to cater for possible greater than 30% increases in runoff due to climate change. • Greater detail on the modelling inputs. • Does not consider storm surge. • Included a chapter on flood history of the area. • Included chapter on Coastal inundation but recommended further coastal specific modelling be undertaken • Included a chapter on climate change and how the possible variability arising from predicting climate change effects means that the prudent response to managing risk is to ensure that there is capacity to enlarge the overland drainage system if required in the future. • Model inputs adjusted for the addition of antecedent rainfall. This resulted in increases in the runoff volumes it	• Considers Climate change • Modelled with a 30% increase in runoff for climate change • Antecedent rainfall not included in draft results. • SST_5pct_4_5hr results mentioned.

reduced the rainfall volume that was taken up by infiltration. • Removed the model results from the report for the SST_5pct_4_5hr_4 (4.5hr 5pct event scenario 4). These were unnecessary given the alternate 5% results already considered. • Modelled full development with 40% impervious area for low density residential zoning and 60% impervious for general residential areas. Therefore increased runoff slightly from draft model. • Filled in the dam in the model that has been filled in above the caravan park – near location 7. Slightly changed the overland flow path. • Increases in total flow rates ie. Central drain 4 base scenario in a 5% event increase from 3.343 cumecs to 5.758 cumecs. • Areas inundated did not significantly change. • Overflow from Holkham court turning circle increased. • More background information included in recommendations. • Explicitly identified that whilst the situation can be significantly improved for many properties with the recommended works it is possible that some inundation of the low area in the caravan park can not be mitigated due to its low elevation and combined risks from stormwater flooding and likely storm surge risk. • Changed pipe sizes in recommendations to cater for increased modelled flow.	• Modelled full development at 40% impervious area for all future residential areas. • Ground model included dam that has been filled in.

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20 November 2019

Nick Griggs
Land Surveyors
295 Elizabeth St
North Hobart TAS 7055

Dear Nick

Re: Subject – 66 Alma Road, Orford – AMNS Pty Ltd

You have asked me to provide a bushfire assessment relative to the subdivision of the above property within the Orford township.

The title details are:

Property Address – 66 Alma Road, Orford TAS 7190

Property ID – 7637944

Title Reference – 35054/1

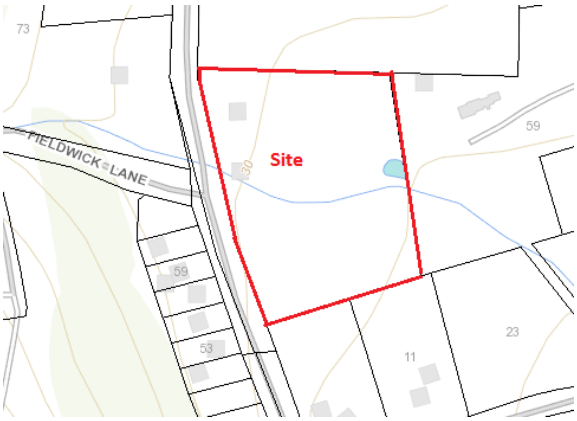


Figure 1 – general locality

Figure 2 – location plan

It is proposed to subdivide the lot into 15 lots plus a road and a POS area. The lots will have the following areas:

Lot No	Area (sqm)	Lot No	Area (sqm)	Lot No	Area (sqm)
1	1000	2	1000	3	1000
4	1635	5	1088	6	1291
7	No Lot 7	8	1375	9	1739

10	2006	11	2474	12	1383
13	1070	14	1099	15 (balance) – contains dwelling	2873
100 (road)	2014	101 (POS)	402		

Apart from a grouping of trees around a water course, the land is cleared and used for rough grazing. There is a dwelling on the northern section of the site and some shedding/shelter to the centre.

The subject site currently fronts a sealed, kerb and channelled roadway (Alma Road) which is 7.5m wide set in a 24m wide carriageway. The new subdivision road will be sealed and will become a Council maintained roadway (once it is formed) built to Council standards, which will also comply with Bushfire Standards. In terms of access, the proposal will comply with the required standards provided it is built to the standards outlined in the recommendations.

Figure 3: Alma Road outside the site.

Fire Hydrants are evident in Alma Road, with two outside the subject site, with reticulated water running past the subject site. Fire Hydrants will be required to service the proposed lots. Water for fire fighting purposes will comply with bushfire standards provided they are installed to the standards outlined in the recommendations.

Figure 4 Fire Plug/hydrant outside subject site

The site slopes NW to SE at 4.1 degrees.

Figure 5 Fall across site

The surrounding land slopes west to east at 6.5 degrees.

Figure 6 fall across neighbouring land

The site and the land to the east and south are zoned Low Density Residential use under the local planning scheme. Land to the west is zoned General Residential use and land to the north is zoned Rural Living use.

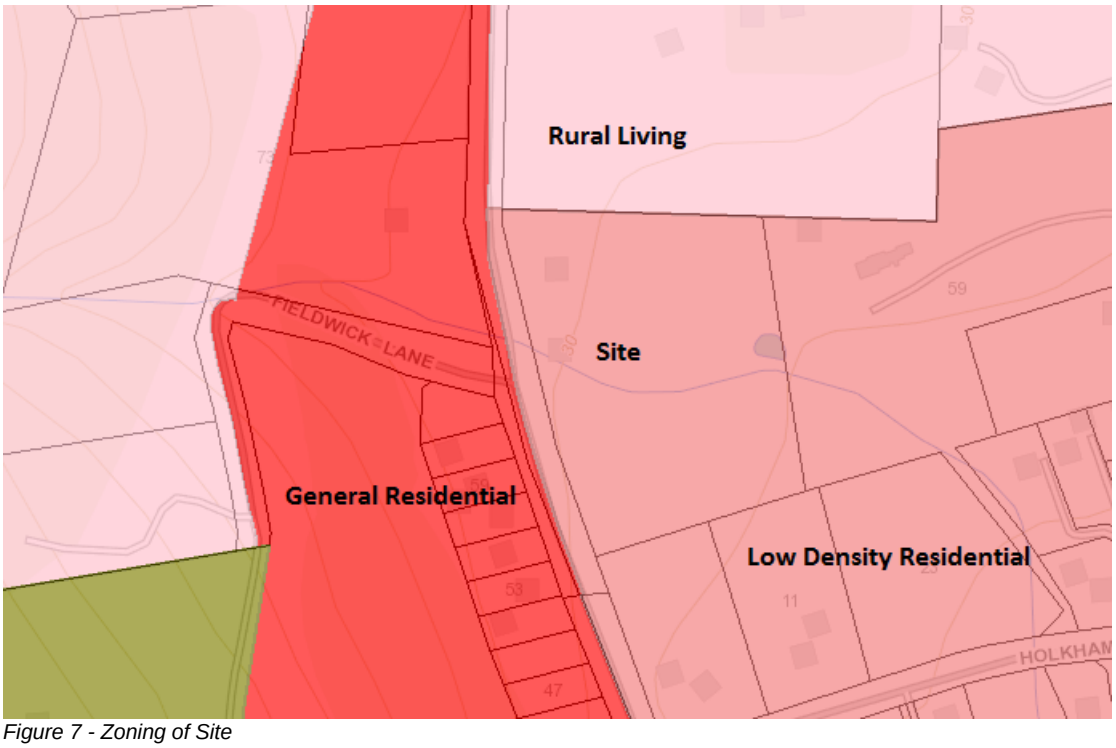


Figure 7 - Zoning of Site

The land in the General Residential zone which is fully subdivided can be dismissed from further assessment due to Bushfire Prone Areas Advisory Note V 3.0 – 2014. That eliminates all lots to the west fronting Amla Road.

There is one overlay within the Planning Scheme impacting this site – Waterway and Coastal Protection (covering the creek). This will not impact on Bushfire Assessment.

In determining whether the remainder of the study area is in a bushfire prone area reference is made to the

definition – Bushfire Prone Areas. The definition of bushfire prone areas is:

Bushfire-prone areas

1. For the purposes of the Act, land is a bushfire-prone area if –
   a) the land is within the boundary of a bushfire-prone area on a planning scheme overlay map; or
   b) where the relevant planning scheme overlay map for the land does not show any land within the relevant municipal area as being within the boundary of a bushfire-prone area, the land is within 100 metres of an area of bushfire-prone vegetation that is equal to or greater than one hectare.
2. For the purposes of sub regulation (1)(b), vegetation is bushfire-prone vegetation if the vegetation is contiguous vegetation that includes grasses and shrubs but does not include maintained lawns, parks or gardens, nature strips, plant nurseries, golf courses, vineyards, orchards or vegetation on land that is used for horticultural purposes.

Outside of the immediate lots surrounding the subject site the assessment has to consider land within 100m radius as shown in figure 5 below:

Figure 8 Bushfire Prone Areas

Assessment of Risk

In assessing the risk from bushfire a number of matters have to be considered:

1. Access – the access to the site complies with requirements. The new subdivision road will have to be built to Council Standards and will thus comply.
2. Water supply – the water supply will comply with requirements once fire hydrants are extended intothe new subdivison.
3. Zoning – lands zoned General Residential can be dismissed from further consideration having regard to Bushfire Prone Areas Advisory Note No 01 – 2014 - Having regard to the objectives of all of the applicable standards in the Bushfire-Prone Area Code, there is insufficient increase in risk to the development from bushfire to warrant any specific bushfire protection measures if: a) the risk arises from vegetation located on land zoned as inner residential, general residential or village.
4. Bushfire Prone vegetation – the area of bushfire vegetation within the 100m radius zone is forest located behind part of the subdivided and developed land. The fuel load in this area is high – but there is a 10m wide cleared area between the forest and the existing dwellings which can be access by fire fighting vehicles. There is also grassland (grazing) to the north of the site. Fuel load from this area is low due to grazing regimes which

sees the paddock basically bare during the fire season.

Figure 9 The bushfire prone vegetation behind the existing row od dwellings fronting Alma Road

	North	South	East	West
Vegetation	Grassland	Urban	Urban	Woodland/forest
Slope	Flat Contour	4.1 degrees	6.5 degrees	Upslope
Distance to Bushfire Prone Vegetation	Zero	N/a	N/a	71m

TasVeg 3.0 classifies the Bushfire Prone Vegetation as (DPU) Eucalyptus pulchella forest and woodland. The area is highlighted as a long, narrow strip of vegetation between urban areas.

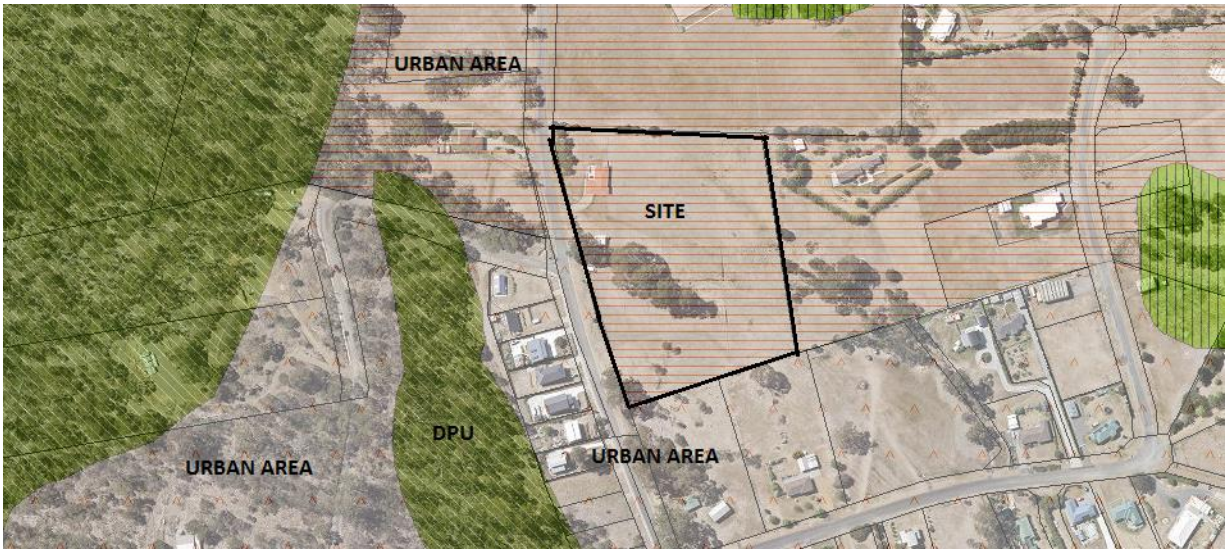


Figure 10 – TasVeg 3.0 mapping – source theLIST

The consequence of a bushfire impacting on the subject site is low given the narrow nature of the bushfire prone vegetation and the existence of urban development further to the west and the low fuel loads in the grassland to the north.

It is now proposed to stage the development and thus a Hazard Management Area will be required within the site until the second stage of the development is complete. This will take the form of a rolling HMA on the western side of the boundary to the lots in Stage 1.

The BAL ratings for each lot – together with required Hazard Management Areas are shown in the table below:

Lot No	Hazard Management Area	BAL Rating
1	The whole site is to be classed as an HMA and managed such by the owner. 25m interim hazard management area to be implemented and maintained by owner of balance land until stage 2 is completed.	BAL 19
2	The whole site is to be classed as an HMA and managed such by the owner. 25m interim hazard management area to be implemented and maintained by owner of balance land until stage 2 is completed.	BAL 19
3	The whole site is to be classed as an HMA and managed such by the owner. 25m interim hazard management area to be implemented and maintained by owner of balance land until stage 2 is completed.	BAL 19
4	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
5	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
6	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
7	NOT USED	
8	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
9	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
10	The whole site is to be classed as an HMA and managed such by the owner. 10m No Build area included to northern boundary	BAL 19
11	The whole site is to be classed as an HMA and managed such by the owner. A10m No Build area included to northern boundary	BAL 19

12	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
13	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
14	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
15	The whole site is to be classed as an HMA and managed such by the owner. – the 10m no build area has been extended along the northern boundary to allow the site to get a BAL rating	BAL 19
Lot 101 Open Space	Will be part of Councils regular Open Space maintenance programme – no specific measures required	Exempt

A hazard management area must be maintained in a low fuel condition throughout the bushfire season. This will include a number of strategies such as:

• Removing of fallen limbs, sticks, leaf and bark litter

• Maintaining grass at less than a 100mm height

• Removing pine bark and other flammable mulch (especially from against buildings)

• Thinning out understory vegetation to provide horizontal separation between fuels

• Pruning low-hanging tree branches (<2m from the ground) to provide vertical separation between fuel layers

• Pruning larger trees to maintain horizontal separation between canopies

• Minimize the storage of flammable materials such as firewood

• Maintaining vegetation clearance around vehicular access and water supply points

• Use of low-flammability species for landscaping purposes where appropriate

• Clearing out any accumulated leaf and other debris from roof gutters.

Additional site specific fuel reduction or management may be required. An effective hazard management area does not require removal of all vegetation. Rather, vegetation must be designed and maintained in a way that limits opportunity for vertical and horizontal fire spread in the vicinity of the building being protected. Retaining some established trees can even be beneficial in terms of protecting the building from wind and ember attack. Ongoing maintenance for the life of the building being protected is critically important.

A poorly maintained hazard management area will significantly increase risk to built assets and occupants in a bushfire, regardless of construction standard.

Recommendations

ROADS – Subdivision roads to be constructed to Council Standards – as a minimum:

• Two-wheel drive, all weather construction;

• Load capacity of at least 20 tonnes, including for bridges and culverts;

• A minimum carriageway width of 7 metres for a through road, or 5.5 metres for a dead end or cul-de-sac road;

• A minimum vertical clearance of 4 metres;

• A minimum horizontal clearance of 2 metres from the edge of the carriageway;

• Crossfalls of less than 3 degrees (1:20 or 5%);

• Maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads;

• Curves have a minimum inner radius of 10 metres;

• Dead-end or cul-de-sac roads are not more than 200 metres in length unless the carriageway is 7 metres in width;

• Dead-end or cul-de-sac roads have a turning circle with a minimum 12 metre outer radius; and carriageways less than 7 metres wide have 'No Parking' zones.

INTERNAL ACCESS – Lots 4, 9 – 11

All-weather construction; (note: driveway carriageways do not necessarily need to be sealed. For example, a gravel driveway with appropriate drainage may be acceptable);

• Load capacity of at least 20 tonnes, including for bridges and culverts;

• Minimum carriageway width of 4 metres;

• Minimum vertical clearance of 4 metres;

• Minimum horizontal clearance of 0.5 metres from the edge of the carriageway;

• Cross falls of less than 3 degrees (1:20 or 5%);

• Dips less than 7 degrees (1:8 or 12.5%) entry and exit angle;

• Curves with a minimum inner radius of 10 metres;

• Maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads; and

• Terminate with a turning area for fire appliances provided by one of the following: a. a turning circle with a minimum outer radius of 10 metres; or b. a property access encircling the building; or c. a hammerhead "T" or "Y" turning head 4 metres wide and 8 metres long.

WATER – Distance to property

• The building area to be protected must be located within 120 metres of a fire hydrant; and

• The distance must be measured as a hose lay, between the water connection point and the furthest part of the building area.

Design of Hydrants

• Fire hydrant system must be designed and constructed in accordance with TasWater Supplement to Water Supply Code of Australia WSA 03 – 2011-3.1 MRWA Edition 2.0; and

• Fire hydrants are not installed in parking areas.

Yours sincerely

Ian Abernethy
Principal Planner and Bushfire Assessor 124

Enc. Planning Certificate and Bushfire Management Plan

Tom O'Connor
Planning & Assessment Officer
On behalf of Chief Officer,
Tasmania Fire Service
12/12/19

Agenda Item 3.2 - Attachment F

Nick Griggs & Co.
Land Surveyors, 295 Elizabeth Street, North Hobart 7000
Phone: 6234 5022 Fax: 6231 2412

BUSHFIRE MANAGEMENT PLAN

OWNER: AMNS PTY LTD

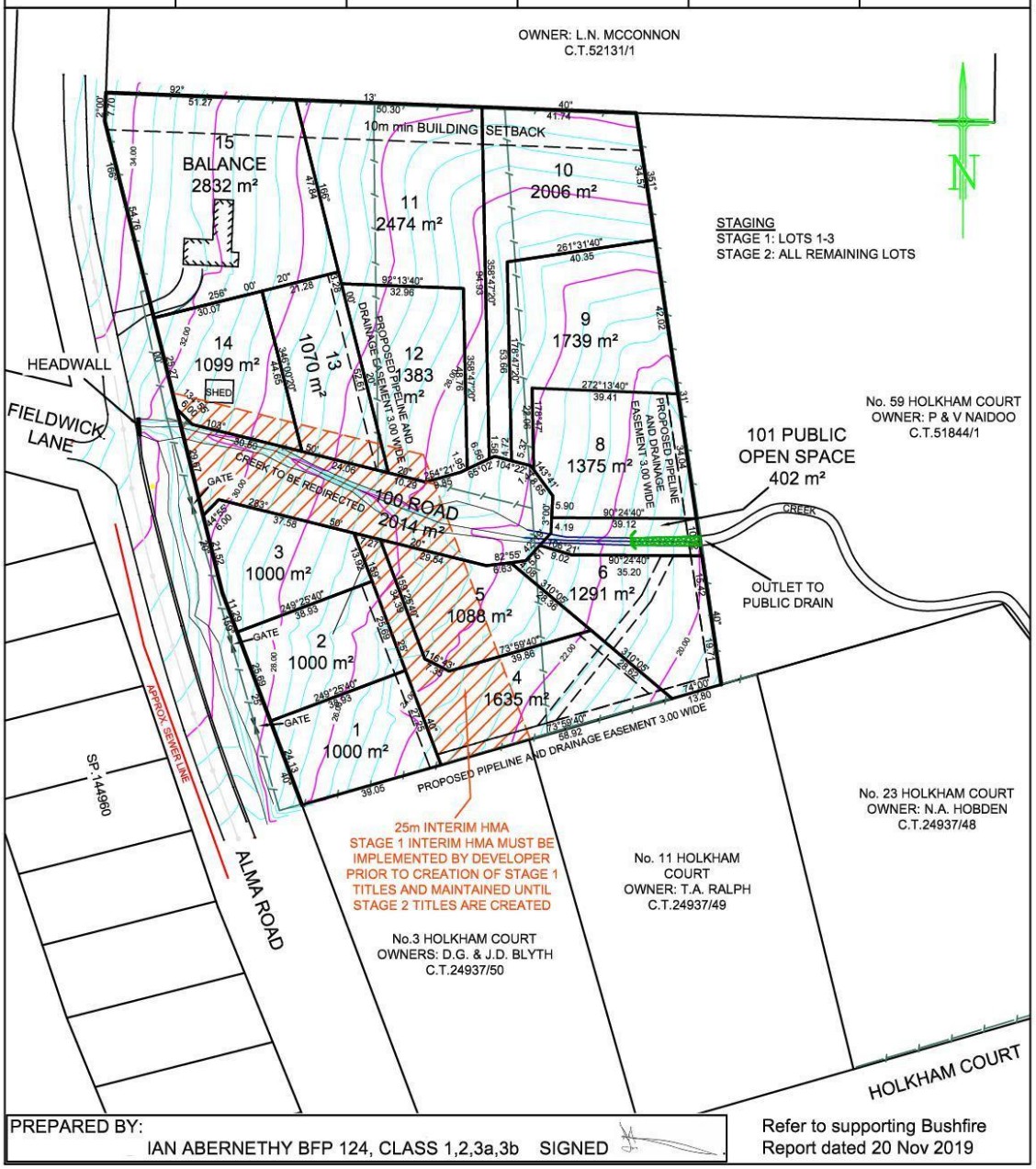
LOCATION: 66 ALMA RD ORFORD TAS 7190

MUNICIPALITY: Parish of TRIABUNNA, Land District of PEMBROKE

Important Note:
This plan was prepared as a proposed subdivision to accompany a subdivision application to Glamorgan-Spring Bay Council and should not be used for any other purpose. The dimensions, areas and total number of lots shown hereon are subject to field survey and also to the requirements of Council and any other authority which may have requirements under any relevant legislation. In particular, no reliance should be for any financial dealings involving the land. This note is an integral part of this plan.

MEASUREMENTS ARE IN METRES AND SUBJECT TO FINAL SURVEY

SCALE: 1:1000 @ A3	CONTOUR INT: 0.5m	DATE: 10/12/2019	REF. No: C.T. 35054/1	File No: 375711	PAGE 1/2



PREPARED BY:
IAN ABERNETHY BFP 124, CLASS 1,2,3a,3b SIGNED

Refer to supporting Bushfire Report dated 20 Nov 2019

Nick Griggs & Co. Land Surveyors, 295 Elizabeth Street, North Hobart 7000 Phone: 6234 5022 Fax: 6231 2412				**BUSHFIRE MANAGEMENT PLAN**	
OWNER: AMNS PTY LTD	**Important Note:** This plan was prepared as a proposed subdivision to accompany a subdivision application to Glamorgan-Spring Bay Council and should not be used for any other purpose. The dimensions, areas and total number of lots shown hereon are subject to field survey and also to the requirements of Council and any other authority which may have requirements under any relevant legislation. In particular, no reliance should be for any financial dealings involving the land. This note is an integral part of this plan.				
LOCATION: 66 ALMA RD ORFORD TAS 7190					
MUNICIPALITY: Parish of TRIABUNNA, Land District of PEMBROKE					
	MEASUREMENTS ARE IN METRES AND SUBJECT TO FINAL SURVEY				
		DATE: 10/12/2019	REF. No: C.T. 35054/1	File No: 375711	PAGE 2/2

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6	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
7	NOT USED	
8	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
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10	The whole site is to be classed as an HMA and managed such by the owner. 10m No Build area included to northern boundary	BAL 19
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13	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
14	The whole site is to be classed as an HMA and managed such by the owner.	BAL 12.5
15	The whole site is to be classed as an HMA and managed such by the owner. – the 10m no build area has been extended along the northern boundary to allow the site to get a BAL rating	BAL 19
Lot 101 Open Space	Will be part of Councils regular Open Space maintenance programme – no specific measures required	Exempt

RECOMMENDATIONS

HAZARD MANAGEMENT AREAS –

The whole site be classed as a hazard management area

Hazard Management Areas shall be maintained to a standard where by vegetation is maintained at a level of no greater than 100mm in length.

This does not rely on the removal of specimen trees within the HMA which can be managed by controlling build up of fuel load and ensuring the trucks are clear of limbs for a distance of 4m from ground level.

Build up of fuel load will be controlled by regular pick up and removal of material likely to add to fuel load in times of bushfire risk.

A no build area has been established along a 10m wide strip on the northern boundary of Lots 10 and 11

The Stage 1 interim HMA must be implemented by the developer prior to the creation of stage 1 titles and maintained until Stage 2 titles are created

Regular maintenance of the HMA is essential to ensure the long term integrity of the bushfire reduction measure.

ROADS – Subdivision roads to be constructed to Council Standards – as a minimum:

- Two-wheel drive, all weather construction;
- Load capacity of at least 20 tonnes, including for bridges and culverts;
- A minimum carriageway width of 7 metres for a through road, or 5.5 metres for a dead end or cul-de-sac road;
- A minimum vertical clearance of 4 metres;
- A minimum horizontal clearance of 2 metres from the edge of the carriageway;
- Crossfalls of less than 3 degrees (1:20 or 5%);
- Maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads;
- Curves have a minimum inner radius of 10 metres;
- Dead-end or cul-de-sac roads are not more than 200 metres in length unless the carriageway is 7 metres in width;
- Dead-end or cul-de-sac roads have a turning circle with a minimum 12 metre outer radius; and carriageways less than 7 metres wide have 'No Parking' zones.

INTERNAL ACCESS – Lots 4, 9 – 11

All-weather construction; (note: driveway carriageways do not necessarily need to be sealed. For example, a gravel driveway with appropriate drainage may be acceptable);

- Load capacity of at least 20 tonnes, including for bridges and culverts;
- Minimum carriageway width of 4 metres;
- Minimum vertical clearance of 4 metres;
- Minimum horizontal clearance of 0.5 metres from the edge of the carriageway;
- Cross falls of less than 3 degrees (1:20 or 5%);
- Dips less than 7 degrees (1:8 or 12.5%) entry and exit angle;
- Curves with a minimum inner radius of 10 metres;
- Maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads; and
- Terminate with a turning area for fire appliances provided by one of the following: a. a turning circle with a minimum outer radius of 10 metres; or b. a property access encircling the building; or c. a hammerhead "T" or "Y" turning head 4 metres wide and 8 metres long.

WATER – Distance to property

- The building area to be protected must be located within 120 metres of a fire hydrant; and
- The distance must be measured as a hose lay, between the water connection point and the furthest part of the building area.

Design of Hydrants

- Fire hydrant system must be designed and constructed in accordance with TasWater Supplement to Water Supply Code of Australia WSA 03 – 2011-3.1 MRWA Edition 2.0; and
- Fire hydrants are not installed in parking areas.

PREPARED BY:
IAN ABERNETHY BFP 124, CLASS 1,2,3a,3b SIGNED

Refer to supporting Bushfire Report dated 20 Nov 2019

BUSHFIRE-PRONE AREAS CODE

CERTIFICATE[1] UNDER S51(2)(d) *LAND USE PLANNING AND APPROVALS ACT 1993*

1. Land to which certificate applies[2]

Land that <u>is</u> the Use or Development Site that is relied upon for bushfire hazard management or protection.

Name of planning scheme or instrument:	**Glamorgan Spring Bay Interim Planning Scheme 2015**
Street address:	66 Alma St, Orford
Certificate of Title / PID:	**35054/1 – PID 7637944**

Land that <u>is not</u> the Use or Development Site that is relied upon for bushfire hazard management or protection.

Street address:	**Nil**
Certificate of Title / PID:	

2. Proposed Use or Development

Description of Use or Development:

Subdivide into 14 lots plus road and POS

Code Clauses:

- ❑ **E1.4 Exempt Development**
- ❑ **E1.5.1 Vulnerable Use**
- ❑ **E1.5.2 Hazardous Use**
- X **E1.6.1 Subdivision**

[1] This document is the approved form of certification for this purpose, and must not be altered from its original form.

[2] If the certificate relates to bushfire management or protection measures that rely on land that is not in the same lot as the site for the use or development described, the details of all of the applicable land must be provided.

3. Documents relied upon

Documents, Plans and/or Specifications

Title:	Plan of Subdivision, 66 Alma Road, Orford		
Author:	Nick Griggs, Land Surveyors, Elizabeth St North Hobart		
Date:	04/10/2019	**Version:**	n/a

Bushfire Hazard Report

Title:	Bushfire Assessment, 66 Alma Road, Orford		
Author:	Ian Abernethy		
Date:	05/12/2019	**Version:**	1

Bushfire Hazard Management Plan

Title:	Bushfire Hazard Management Plan, 66 Alma Road, Orford		
Author:	Nick Griggs		
Date:	10/12/2019	**Version:**	1

Other Documents

Title:			
Author:			
Date:		**Version:**	

4. Nature of Certificate

❑	**E1.4 – Use or development exempt from this code**		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.4 (a)	Insufficient increase in risk	

❑	**E1.5.1 – Vulnerable Uses**		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.5.1 P1	Residual risk is tolerable	
❑	E1.5.1 A2	Emergency management strategy	
❑	E1.5.1 A3	Bushfire hazard management plan	

❑	**E1.5.2 – Hazardous Uses**		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.5.2 P1	Residual risk is tolerable	
❑	E1.5.2 A2	Emergency management strategy	
❑	E1.5.2 A3	Bushfire hazard management plan	

X	**E1.6 – Development standards for subdivision**		
	E1.6.1 Subdivision: Provision of hazard management areas		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.6.1 P1	Hazard Management Areas are sufficient to achieve tolerable risk	
❑	E1.6.1 A1 (a)	Insufficient increase in risk	
X	E1.6.1 A1 (b)	Provides BAL 19 for all lots	Report and Plans
❑	E1.6.1 A1 (c)	Consent for Part 5 Agreement	

	E1.6.2 Subdivision: Public and fire fighting access		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.6.2 P1	Access is sufficient to mitigate risk	
❑	E1.6.2 A1 (a)	Insufficient increase in risk	
X	E1.6.2 A1 (b)	Access complies with Tables E1, E2 & E3	**Plans and Report**

	E1.6.3 Subdivision: Provision of water supply for fire fighting purposes		
	Assessment Criteria	**Compliance Requirement**	**Reference to Applicable Document(s)**
❑	E1.6.3 A1 (a)	Insufficient increase in risk	
X	E1.6.3 A1 (b)	Reticulated water supply complies with Table E4	**Report and Plans**
❑	E1.6.3 A1 (c)	Water supply consistent with the objective	
❑	E1.6.3 A2 (a)	Insufficient increase in risk	
❑	E1.6.3 A2 (b)	Static water supply complies with Table E5	
❑	E1.6.3 A2 (c)	Static water supply is consistent with the objective	

5. Bushfire Hazard Practitioner[3]

Name:	Ian Abernethy	**Phone No:**	0417233732
Address:	Cimitiere St	**Fax No:**	
	Launceston	**Email Address:**	iabernethy@pittsh.com.au
Accreditation No:	BFP – 124	**Scope:**	1, 2, 3a, 3b

6. Certification

I, certify that in accordance with the authority given under Part 4A of the Fire Service Act 1979 –

The use or development described in this certificate is exempt from application of Code E1 – Bushfire-Prone Areas in accordance with Clause E1.4 (a) because there is an insufficient increase in risk to the use or development from bushfire to warrant any specific bushfire protection measure in order to be consistent with the objectives for all the applicable standards identified in Section 4 of this Certificate.	❑

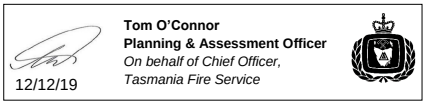
or

There is an insufficient increase in risk from bushfire to warrant the provision of specific measures for bushfire hazard management and/or bushfire protection in order for the use or development described to be consistent with the objective for each of the applicable standards identified in Section 4 of this Certificate.	❑

and/or

The Bushfire Hazard Management Plan/s identified in Section 3 of this certificate is/are in accordance with the Chief Officer's requirements and can deliver an outcome for the use or development described that is consistent with the objective and the relevant compliance test for each of the applicable standards identified in Section 4 of this Certificate.	X

Signed: *certifier*



Date: 10/12/2019 **Certificate No:** LN19173

[3] A Bushfire Hazard Practitioner is a person accredited by the Chief Officer of the Tasmania Fire Service under Part IVA of *Fire Service Act 1979.* The list of practitioners and scope of work is found at www.fire.tas.gov.au.

31st October 2019

Glamorgan Spring Bay Council,

9 Melbourne Street,

TRIABUNNA. 7190

Attention: General Manager

Dear Sir,

RE: PROPOSED DEVELOPMENT APPLICATION - 66 Alma Road. Orford.

We strongly object against this development going ahead until the existing storm water system below this subdivision is upgraded as per the council's own report (The Brighton Report). The Councils own report shows modelling that the properties downstream will be impacted by flooding unless urgent upgrades are made to the existing storm water. The development application shows pipes of 750/900mm diameter needed for the Stormwater system within this development, is this filling in the creek or creating a storm water drain? With our development we were told we were unable to pipe the stormwater we had to leave it as an open drain what has changed? The proposed pipework in the development will speed up the water flow into the pipes downstream under Holkham Court which are only 450mm diameter. How do you get 900mm flow of water into a 450mm diameter pipe, any engineer or planner with any common sense would know that will definitely not work and will over flow and impact properties below the proposed development.

The inability of council employees to do their job to minimise the impact of flooding, to surrounding properties from a Storm water system that is already to maximum capacity is obvious and they need to be held accountable for their decisions.

The Storm water act clearly states that you cannot direct Storm Water onto someone else's property. Clearly this development is catching water into the pipes and directing water onto the neighbours property which will impact all properties downstream.

Urban drainage act 2013 clearly states, Part 2 obligations of Storm Water Service providers, 5. Council to provide adequate Storm Water Systems

(1) A Council must in accordance with this act, provide for such public Storm Water systems as may be necessary to effectively drain the Urban area of the council municipal area.

If the Council recommends this Development for approval, we will be in contact with the Minister for Local Councils as the Council are not fulfilling their obligations for Public Storm Water.

The Developers own Hydrologist report states that there will be an impact on an already over capacity Storm Water system, the Hydrologist has said it will increase impact 2% on the Storm Water System, this may not sound like much but if this Development is approved. It is setting a standard for other Developments in the catchment area. Has the council engineer come up with the same figures or employed a consultant to do so? In our opinion the impact will be greater than 2%.

The Developer has included water tanks in this application, and calculated a roof area of 300sqm this is only a small house, no consideration has been given for sheds or carports also no calculations have included drive ways and hard stand areas all these factors increase the collection and speed of water flow.

We have sought Legal Advice and if the council approve this Subdivision knowing full well that the current Storm Water system downstream is inadequate and desperately needs upgrading, any future flooding after this Subdivision is approved. Legal action will be taken against the Council for negligence.

If the council are recommending this for approval they should, have the conditions that no work is to be done until all the upgrades to the Storm Water System downstream from this development including under Tasman Highway are completed, the Council would be negligent to do otherwise.

The inability of the Planning Department and Engineering Department, of Glamorgan Spring Bay Council to do their jobs properly has resulted in costing residents thousands of dollars doing the work that these departments should have done properly in the first place. We do not want to see this happening again.

Kind Regards

[redacted]

Refer to : Brighton Report

General Manager & Councillors

Glamorgan Spring Bay Council

Triabunna TASMANIA 7190

Subdivision of 66 Alma Road into 14 lots

Representation to Glamorgan Spring Bay Council from [redacted]

Dear Sir/Madam

We refer to the application above as advertised in the Mercury newspaper on 20 November 2019, and make this representation opposing the development as presented in the available documentation on the basis that it would put further unacceptable pressure on the already overloaded Holkham Court storm water system. The recent approval of the 54 Holkham Court subdivision will no doubt be similarly contribute to these issues. Further volumes could have serious consequences

The proposed subdivision is also out of character from that which exists on the northern side of Alma Road.

Our property, and that of several of our neighbours, has recently been subjected to flooding causing many thousands of dollars damage. This has been due to the inadequate infrastructure in Holkham Court. As a result we are anxious try to ensure additional developments do not add to the existing problems.

The GSB Council commissioned a study to model existing and future conditions of storm water flows to establish an appropriate pattern of development and an infrastructure plan. This resulted in the "***Holkham Court Storm Water Assessment***" *(Anna Wilson – October 2018).* This report highlighted the serious flooding issues especially in the lower areas of the catchment. We make the following observations relative to the published documents:

1. The proposal contains no mention of the "***Holkham Court Storm Water Assessment***" and the issues highlighted by the report or the effect this proposal would have on the already overloaded storm water system in the area. The exhibited documents totally disregard the observations in this report and the effect on the downstream residents in Holkham Court.

2. The additional run-off created by this proposal would be expected to be in the region of an additional 40% from the road, footpaths, roofs and other impervious surfaces in the subdivision **not** including any allowance of a **30% increase for the mandated GSBC Climate Change Adaption Policy which, once again, has been totally disregarded**. (Reference is made to the **"*GSBC Corporate Adaption Plan of April 2012*"**.)

3. Whilst it is not within the remit of the developer to consider downstream effects of the proposal and its increased flows on the infrastructure, **it is the Council's responsibility to do so**. This deliberation should include reference to all available information - not just that included by the proposer. The opinions and issues raised by local residents are also of paramount importance.

4. Council should also be mindful of the scientifically accepted concept of sea level rise and its consequences. (Reference is made once again to the "*GSBC Corporate Adaption Plan of April 2012")* Storm surge and tidal level dramatically influence the ability of storm water to escape to the sea at Raspin's Beach regardless of the size of the culvert under the Tasman Highway. This problem cannot be solved by larger pipes and drainage ditches.

5. The photograph below is of Holkham Court during a flood in January 2016, which graphically depicts the inadequacy of the Alma Road and Holkham Court storm water infrastructure. **The flows over the paddocks in the middle distance have inundated the area of the proposed subdivision, exactly as predicted in *Figure 1 on page 6 of the "Holkham Court Stormwater Assessment"*. These conditions are not 5% or 1% storm events being much more regular in spite of our long dry spells.**

It is recommended that Councillors come to the area, view for themselves, and discuss the issues with affected ratepayers (voters) rather than make cursory desk top decisions purely based on information provided by the developer.

We believe that Council should try to maintain our pleasant environment and not accede to greedy developers who don't have to live with the consequences of their actions.

Yours sincerely

[redacted]

21st November 2019

31 October 2019

Planning Department

Glamorgan Spring Bay Council

To whom it may concern: PROPOSED DEVELOPMENT APPLICATION SA 2019/024

We, the current property owners of [redacted] formally lodge our objection to the proposed sub-division for the following matters

1. The Owner AMNS Pty ltd does not have permission to include our allotment to be included with this sub-division as previously advised and as shown on consultants' drawings
2. The consultants for the sub-division are showing a stormwater easement through our property which we have not agreed to
3. The Stormwater design does not reflect how the sub-division will remove stormwater from the lower 2 allotments (lot 4 and lot6) adjoining my property at [redacted] The ground level will show the lower half of the lots won't be able to gravity feed back to the existing creek line and they will need to be coventated to achieve this
4. The proposed allotments 4 and 6 will have an unreasonable impact on our amenity as the allotments are so small and the longest boundary adjoins ours, structures will have to be built within 4.0 metres of our boundary which will be discretionary under the planning scheme
5. We object to the lot size of 1000.00 sqm to these allotments 4 and 6 and require these to be a minimum of 1500 sqm suitable for the low-density residential zone
6. The consultants for the subdivision are showing a sewer easement through our property which we have not agreed to
7. The current developer has no access to our property, they have no easement and we will not grant approval for them to place an easement over our property. The sewer line from last inspection is a dn 100 and we will not give approval to excavate and replace with a dn 150 needed to service the sub-division

Kind regards

[redacted]

[redacted]

[redacted]

31 October 2019

The General Manager
Glamorgan/Spring Bay Council
PO Box 6
TRIABUNNA TAS 7190

Dear Sir

REPRESENTATION

PROPOSED DEVELOPMENT APPLICATION – SUBDIVISION 15 Lots
Nick Griggs & Co, 66 Alma Road, Orford.

We make the following representation with regard to the proposed application for a subdivision development at RA66 Alma Road Orford SA 2019/024.

We believe that approval of the above subdivision application should be deferred until the existing stormwater infrastructure is upgraded to accommodate current flows and any increases that may result if the subdivision proceeds.

We base this belief on the following:

1. Flooding in Holkham Court

[redacted]

During this time we have experienced many flooding events in and around the creek and culvert that passes under Holkham Court. These events have caused water to flow onto the road and overflow into [redacted]t and other properties in the street and the catchment area.

We experienced flooding and or the results of the flooding on the following dates:

December 27 to 29, 1993 - Total rainfall 115.2mm
Road flooded and driveway washed away [redacted]

January 29 to 30, 1995 – Total rainfall 106.0mm
Road flooded and driveway washed away [redacted]

December 18 to 20, 1995 – Total rainfall 134.4mm
Road flooded and driveway washed away [redacted]

January 25 and 26, 1996 – Total rainfall 99.6mm
Road flooded and driveway washed away [redacted]

November 23 to 29, 2001 – Total rainfall 101.6mm
Road flooded and driveway washed away [redacted]

August 22 to 25, 2003 – Total rainfall 79.4mm
Road flooded and driveway washed away [redacted]

January 27 to 31, 2016 – Total rainfall 217.9mm
Road flooded and driveway washed away [redacted]

June 5 to 8, 2016 – Total rainfall 154.2mm
Road flooded. No photo available because it was 3 am in the morning.

These rainfall figures were accessed from BOM and our own readings.

These figures show that:

- Rainfall figures differ significantly on these dates which indicate that heavy rainfall over relatively short periods is a major contributor to the flooding. These heavy rainfalls are often a series of thunderstorms.

- It is obvious from the dates and rainfall data detailed above that flooding in the area is not a 1 in 20 year occurrence but more like a 1 in 4 year event.

- That the stormwater infrastructure in the area is inadequate and has been so for at least 26 years.

- The main cause of flooding is the size of the 2 pipes in the central culvert under the road which together measure 900mm. These pipes are incapable of handling the stormwater flow during sustained heavy rainfall.

- Any increase in the runoff from the subdivision will increase the intensity of any flooding. If the climate change estimate of a 30% increase in stormwater runoff eventuates there will be major flooding in Holkham Court.

- Damage caused and the extent of the flooding is illustrated in the attached photos (12).

- On several occasions floodwater has overflowed from the end of the driveway threatening to enter our house.

2. Holkham Court Stormwater Assessment

The Brighton Council prepared this assessment following a request by the Glamorgan/Spring Bay Council. The assessment report identifies, among other things, the following:

- That all issues raised by increased development are already occurring due to inappropriate infrastructure.

- The Holkham Court Central Culvert is undersized for the location. Forces water onto the road. This then flows along the road east to the turning circle and flows over the road into private property [redacted]

- Recommends an increase in the size of the Central Holkham Court Culvert.

This assessment alone indicates that the existing stormwater infrastructure in Holkham Court is inadequate and should in itself be evidence that the subdivision should be deferred until the problems identified are fixed.

3. Subdivision Application

Proposed Stormwater Layout

Stormwater Layout notes prepared by Ross Cumming Engineering in support of subdivision Development Application.

Note 4 (from the Stormwater Layout notes) indicates that the creek will be piped under the new road with a DN750 system which will discharge into DN900 pipe before it is in turn discharged back into the existing creek. It is presumed that this proposed system will accommodate AEP 5% and 1% storms. The design is based on the probability of flows which are not specific to the area.

Information provided in **Item 1** (Flooding in Holkham Court) above indicates that flooding occurs on average every 4 years. When flooding occurs the 900mm capacity culvert under Holkham Court is unable to handle the flow and it follows that the proposed pipe system of DN750 and DN900 through the subdivision will also be incapable of handling the flow.

The volume of water in times of flooding will cause water to overflow at the entrance to the proposed subdivision and run into lots 1 to 6. If the flow is restricted to 750mm at the headwall in Alma Road it may cause flooding in Alma Road and flow into Holkham Court.

The Glamorgan/Spring Bay Council Corporate Adaption Plan April 2012 projects an increase in stormwater runoff of 30% in the 21st century due to climate change, any increase of this magnitude will have a major effect on the frequency and intensity of flooding in this area.

General

The proposal as advertised is for a Subdivision of 15 lots but the Plan of the Subdivision dated 4 October 2019 shows only 14 lots. Throughout the application there is reference to 15 lots, just how many lots are there? This fundamental error begs the question of how many other inaccuracies lie within the technical detail of the submission.

Summary

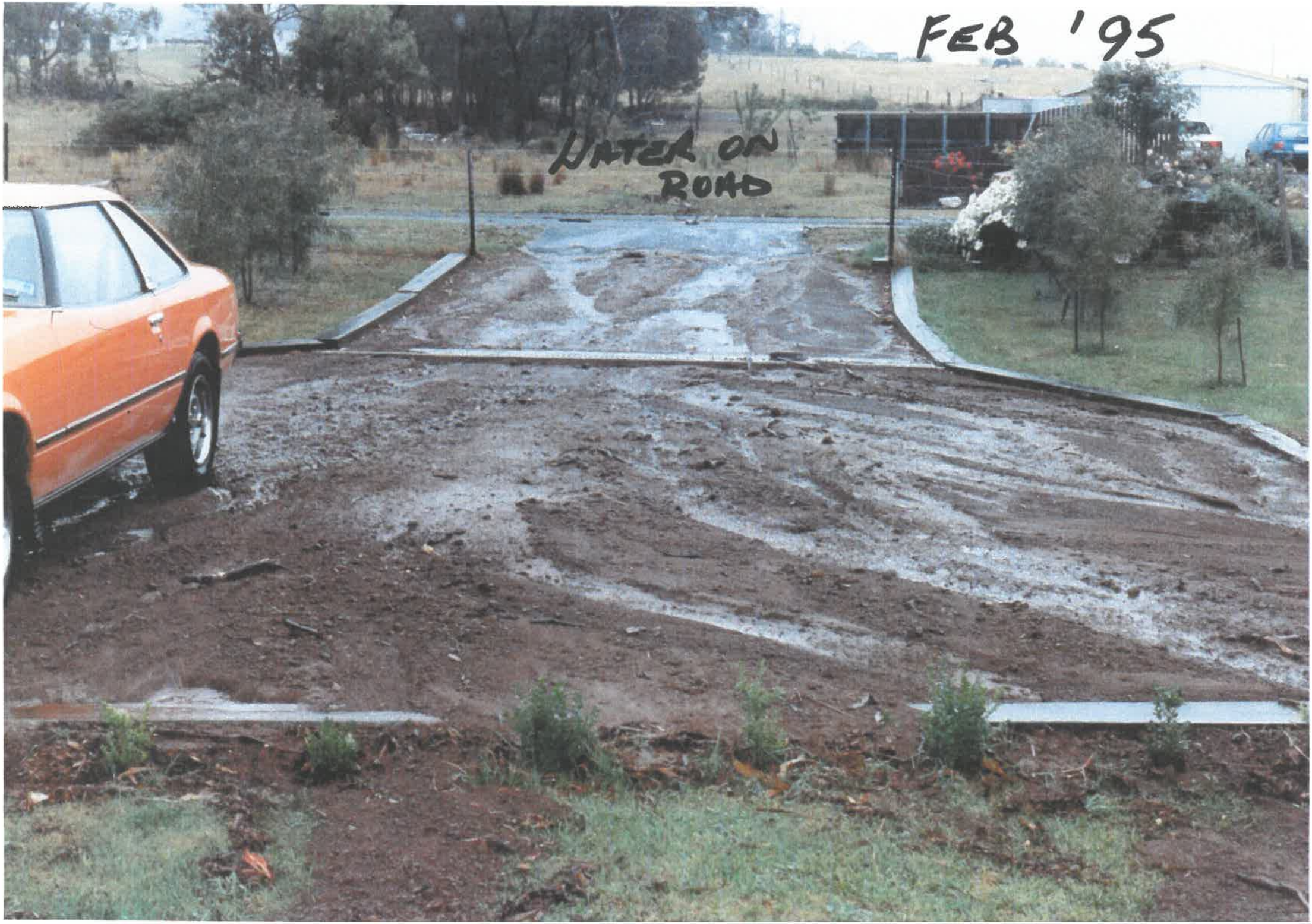
- **That the existing culvert be upgraded to a table drain of suitable dimensions to handle existing and projected stormwater flows.**
- **That the creek be modified to carry current and future stormwater flows and be maintained on a regular basis.**
- **That the Holkham Court Stormwater Assessment Plan be implemented by the Council as a matter of urgency.**
- **That approval of the above subdivision application should be deferred until the existing stormwater infrastructure is upgraded to accommodate current flows and any increases that may result if the subdivision proceeds.**
- **Approval of this subdivision without regard to the safety of properties and wellbeing of residents in the area would be both irresponsible and insensitive.**

Yours sincerely

[redacted]

[redacted]

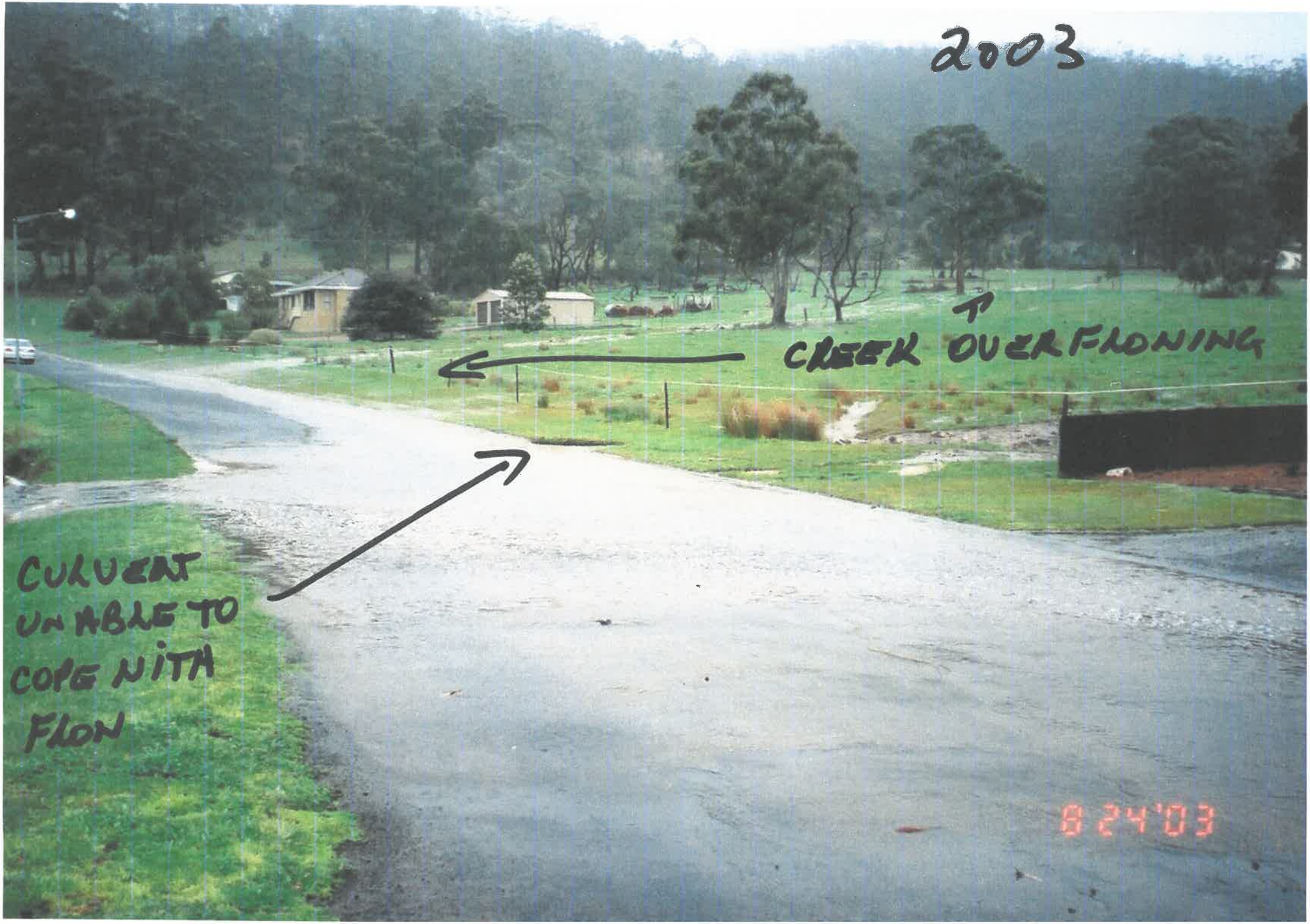

1993
ROAD FLOODED
CULVERT
OVER FLOWING


FEB '95
WATER ON ROAD


DEC '95
DRIVEWAY WASHED OUT


1996
WASHED OUT AGAIN
GRAVEL ON VERANDAH
CO 3802


WASHED OUT
WATER & GRAVEL
ON VERANDAH
2001
11 25 '01


2003
CREEK OVERFLOWING
CULVERT UNABLE TO COPE WITH FLOW
8 24 '03


2003
HOLKHAM COURT
IN FLOOD
6 24 03


2016
CREEK OVERFLOWING


2016
CULVERT (900MM) OBVIOUSLY
CANT HANDLE FLOW


2016
DRIVE & FRONT
YARD IN FLOOD


WATER OFF ROAD
FLOODING DRIVEWAY


5 M³ WASHED ANAY
2016
FB 6733

RECEIVED
03 DEC 2019
BY: .....

[redacted]

3/12/19

THE GENERAL MANAGER
G.S.B.C

RE: SA 2019/00024 66 ALMA RD

WE WISH TO LODGE A REPRESENTATION OF OBJECTION TO THE ABOVE DEVELOPMENT APPLICATION.

1. THE NUMBER OF LOTS IS ACTUALLY 14 PLUS BALANCE NOT 13 PLUS BALANCE AS ADVERTISED. UNDER THE PLANNING SCHEME THE LOT SHOWN AS PUBLIC OPEN SPACE SHOULD HAVE BEEN INCLUDED, THUS REQUIRING ALTERATION AND RE-ADVERTISING.
2. DRAINAGE FROM LOTS 1-5 ARE EXPECTED TO DEFY GRAVITY, THEN PASSING THROUGH CENTRE OF LOT 6 AND TOWARDS THE OPEN DRAIN AGAIN DEFYING GRAVITY. WATER WON'T FLOW UPHILL.
3. ITEM 4.3 ROOF DRAINAGE AND STORAGE TANK — COUNCIL PREVIOUSLY REQUIRED INSTALLATION OF 10,000 LITRE TANKS WITH ALL NEW BUILDS BUT RESCINDED THIS IN RECENT YEARS. THE PROPONENT SUGGEST A 5000L TANK FOR COLLECTION OF RAIN WATER AND QUOTES FIGURES FOR A 6 MINUTE FLASH STORM. LOCAL KNOWLEDGE AND PAST EXPERIENCE SUGGEST THIS TO BE GROSSLY UNDERESTIMATED. WE HAVE NOTED ONE OF OUR 10,000L TANKS FILL FROM EMPTY IN LESS THAN ONE HOUR DURING HEAVY RAINFALL — WITH A ROOF CATCHMENT OF 162 m^2.
4. HOLKHAM CT. STORMWATER ASSESSMENT PLAN RECOMMENDS THE CULVERT PIPE UNDER ALMA RD BE INCREASED FROM 750MM TO 1050 MM. THE D/A DRAINAGE PLAN HAS NOT CONSIDERED THIS AND PROPOSES A 750MM PIPE UNDER THE CUL-DE-SAC (PROPOSED) WHICH IS AT ODDS WITH THE ASSESSMENT. ANY STORMWATER EXITING THE SUB-DIVISION IN LARGE PIPES WILL CREATE A QUICKER FLOW ON ENTERING THE POORLY DEFINED SHALLOW CREEK ON DRINKDOG'S PROPERTY.

THIS WILL SUBSEQUENTLY DISPERSE ONTO NEIGHBOURING PROPERTIES.

5. UPGRADES TO STORMWATER ISSUES OUTLINED IN THE HOLKHAM CT STORMWATER ASSESSMENT ARE CURRENTLY NOT BUDGETED AND WONT BE FULLY ADDRESSED FOR 2-5 YEARS AS NOTED IN COUNCIL'S AGENDA OF 27/8/19.

6. PROJECTIONS OF A 30% INCREASE IN RAIN EVENTS MAY LEAD TO A 90% INCREASE IN SURFACE RUN-OFF DUE TO LONGER PERIODS OF SOIL SATURATION, WHICH IS HIGHER THAN THE RUN OFF ESTIMATED IN THE STORMWATER ASSESSMENT MODEL. THIS PLACES EVEN GREATER IMPORTENCE ON OVERLAND FLOWS AND SIZING OF KEY INFRASTRUCTURE.
(THIS IS A QUOTE FROM COUNCIL'S REPORT ON THE HOLKHAM CT STORMWATER ASSESSMENT.)

7. THE TIME FRAME FOR STAGES 1 AND 2 IS NOT DEFINED.

8. THE HYDROLOGY AND STORMWATER DRAINAGE DESIGN SHOULD BE INDEPENTLY ASSESSED AS IT DOES NOT ADDRESS LOCAL AND HISTORICAL ISSUES.

9. COUNCIL HAS AN OBLIGATION TO PROVIDE SUITABLE INFRASTRUCTURE TO ENABLE ITS RATEPAYERS TO ENJOY THE AMENITY OF THEIR PROPERTIES WITHOUT FEAR OF BEING IMPACTED BY STORMWATER FROM INAPPROPRIATE OPEN DRAINS AND CULVERTS.

10. GIVEN THE NUMBER OF ISSUES WITH THIS SUB DIVISION APPLICATION WE ENCOURAGE BOTH COUNCIL AND THE PROPONENT TO ADDRESS THESE BEFORE ANOTHER APPLICATION IS SUBMITTED.

[redacted]