APPENDIX B

Auckland Council Model Review Form

Auckland Council Model Review
USER GUIDE

Please READ prior to carrying out the review

About the Review Form

The Auckland Council Model Review form is created to support the Quality Assurance procedures for Council owned stormwater models. The Model Review form is required as part of the model deliverables for Council approvals and model registration.
On model delivery from The Modeller, Auckland Council will assign The Reviewer to go through necessary checks and perform the Council Review using this Model Review form. The Council Review is carried out as Auckland Council's due diligence before accepting the model for subsequent floodplain publication and/or catchment planning activities.
The Council Review is NOT a replacement for any internal reviews required from The Modeller. Model deliverables are expected to have been internally reviewed within the Modeller's company and relevant sections of the Model Review form completed, prior to the model delivery. The quality and reliability of all modelling work undertaken as part of the project is the responsibility of The Modeller. As such, Auckland Council reserves the right to bring to the attention of The Modeller for necessary corrective action on any issues found at any time during the project.

Review Holding Point

A review holding point has been introduced to the review. The model review should be put on-hold until all issues raised in *A - General Information Review* have been addressed by The Modeller, and accepted by Auckland Council.

The Tabs

The Model Review form is made up of three main tabs or sections:
Tab 1 - Model Metadata , provides a quick summary of key model characteristics, files and documentation and model metadata. This tab is for The Modeller to complete and is highlighted in yellow.
Tab 2 - Review Summary , provides a quick summary of the review findings, document controls and review scoring. This tab is for The Reviewer to complete.
Tab 3 - Detailed Review Check List , provides an extensive list of all the check and review questions that both The Modeller and The Reviewer should go through. On delivery of the DRAFT model, the Modeller should have completed the "Modeller's Initial Notes" column under Tab 3 in addition to Tab 1. There are three detailed review tabs, each corresponding with one type of model (FHM, FWM or RFHM, as defined below). Only one of these tabs needs to be filled, based on the model type.

Types of Model

The type of model is categorised by the levels of detail as well as modelling methodology, rather than the project objectives and purpose. For example, a model used for testing options could be either an detailed FHM model, an FWM model or an RFHM model. Therefore the review check list for an options model review is dependant on which category the options model falls under.
Flood Hazard Models (FHM) - Flood Hazard Models are detailed models that are either 1D only or 1D/2D coupled. The subcatchment sizes of these models are generally less than 3ha and the primary drainage systems are modelled extensively. These models are generally suitable for floodplain publication purposes for the whole model extent.
Framework Models (FWM) - Framework models generally focus on representing trunk primary drainage system of a catchment. These may include large diameter pipes, main streams and river systems, etc. The average subcatchment size for framework models are typically larger compared to FHM models. Framework models could be 1D only or 1D/2D coupled.
Rapid Flood Hazard Models (RFHM) - Rapid Flood Hazard Models are generally 2D rain-on-grid models that utilises direct/effective rainfall and terrain to route flow. RFHM models are predominately 2D and may include structures along main streams and limited 1D pipe networks, etc. Small depressions may be filled prior to final flood simulation in RFHM models for conservativeness.
All Other Models - There may be models with mixed levels of detail and/or mixed methodology for different areas of the model. In that case the review should be carried out using the most extensive check list covering all features of the model.

Types of Review

Standard Review - Full review which includes both 1) review on whether the model meets the project purpose and objectives (fit for purpose); whether the model is schematised appropriately; whether the model is consistent with report; 2) go through the corresponding check list, and check/spot check model features against the modelling spec requirements.
Partial Review - A review which only focuses on one or more aspects of the modelling work. For example, a review on hydrological model only, or review of the options modelled only, or a review on the model build only (not on the results), etc.

Glossary

The Modeller - The company engaged by Auckland Council to carry out modelling work.
The Reviewer - A model reviewer appointed by Auckland Council to carry out the Council Review. The reviewer could be an in-house modeller or from a consultant company.
Council Review - the due diligence review based on this model review template, on behalf of Auckland Council, before the model is accepted for floodplain publication or other catchment planning activities.

Auckland Council Model Review

Section 1 - Model Metadata

General Model Info	
Main Consolidated SW Catchment:	**Wellsford**
Council Project Manager	
Other SW Catchment within Model Extent:	None
Other relevant SW Catchment for model inputs:	N/A
Model Name:	Wellsford
Model Horizon ID:	
Model Software, AND Version:	Infoworks ICM 2021.6
Type of Model:	Flood Hazard Model (FHM)
Model Created By (Person/Organisation):	Miguel Hernandez, Woods
Is this model an update based on a previous model?	NO
Is the model built as per the SW Modelling Specs?	YES
Model Description:	1D/2D model of Wellsford catchment. The 2D model extent covers the northeast part of this catchment. The model includes a 1D representation of the Oruawharo river. Main culverts along SH1 and the railway were included to represent the connection between the floodplain areas. Model extent is shown in Figure 1.
Model Purpose / Objectives:	Make a flood assessment for the proposed development located in the northeast part of the Wellsford urban area. The model is focused on the flood impact near the open channels and creeks. The development considers a future urban plan change. The model is the primary tool to compare the effects of the new urban implementation in the area.
Limitations specific to this model:	- Survey was carried out as a part of this study only for the main structures on the open channels inside the interest area. -No urban stormwater network at the eastern side of the SH1. - The LiDAR data has an absolute vertical accuracy of +/- 0.10m. Deviations in vertical accuracy can occur in areas of dense vegetation. Below water ground levels are not reliably represented in the LiDAR data - There is no new measured flow data in the catchment; therefore, it was only possible to check the model against measured peak water levels, anecdotal evidence and previous modelling - Updates were completed to some of the culverts through the SH1. -The model simplifies the subcatchments to represent post-development considerations. - Subcatchments are loading directly to the open channels.
Is this model fit for producing floodplain for publication?	NO
If answered "NO" for the above question, why not?	Model created for purpose - based on SWCoP v3 rainfall depths

Model Files and Documentation	
File directory for model deliverables (MUST COMPLETE): (All model deliverables are to be stored at respective catchment folder(s) under "U:\COO\IES \StormWaterModels\00 Model DELIVERABLES\...")	
Is model report supplied (must have, but can be draft):	YES
Is model extent polygon supplied (must have):	NO
Is model schematisation map supplied (must have):	NO
Is model data flag file supplied:	NO
Are model results supplied:	YES
List out all scenarios modelled (design storm events, validation events, sensitivity analysis runs, etc.)	A total of 15 scenarios were modelled. Climate change (CC) includes a temperature increase of 3.8°. -ED with CC for 2yr, 10yr and 100yr ARI -ED no CC for 10yr and 100yr ARI -Plan Change with CC for 2yr, 10yr and 100yr ARI (PC) -Plan Change no CC fo 10yr and 100yr ARI (PC) -Plan Change and MPD with CC for 2yr, 10yr and 100yr ARI (PC FUZ) -Plan Change and MPD no CC for 10yr and 100yr ARI (PC FUZ)

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Section 1 - Model Metadata

List relevant input/calculation files supplied:	-LiDAR 2016 -Survey points
Is WaterRIDE file supplied (only at FINAL delivery):	NO
Model Metadata	
Hydrology Method	TP108
LiDAR Source (2016, 2013, 2006-2010, etc.)	2016
Any DEM modifications? If yes, describe in more detail.	No
Mesh Type	Flexible Triangular Mesh
Mesh Size	2 m^2 to 5 m^2
Soakage representation	No infiltration is represented in the model.
Pipe network modelled (e.g. all pipes >=300mm, etc.)	59 pipes in total. 43 2D conneciton dummy pipes.
Key structures modelled? Describe type and number	14 1D culverts
Open channel / stream representation description	2D mesh
MPD representation (Unitary Plan, District Plan, etc.)	Proposed plan changes were modelled together with the AC Unitary Plan Operative in part
Climate change allowances	RCP8.5 (2101-2120)
Tide Boundary Level (current and future)	3.3m RL (future)
Simulation Duration (24hrs, etc.)	24 hrs
Simulation Timesteps	1440min
Model Run Time (How long did it take to run)	0.4-0.8 hrs

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Section 2 Review Summary

Review Summary	
Reviewed By (Person/Organisation):	
Type of Review (Standard Review or Partial Review)	
Review Scope Description:	
Summarise Key Findings of the Review:	

Document Control

Model Revision	Delivery Date	Review Version	Review Date	Review Completed By, Company
1	20/04/2022	v1		

Overview of Review Findings

Traffic Light Rating Scores (0 - no issue, 3 - major issue)

0 - No issue found

1 - Minor issue or non-standard approach, but unlikely to significantly impact on objectives of the study

2 - Some concerns, likely to have an impact on model results

3 - Concerns that may have a significant impact on model results and not meeting the study objectives

Review Section	Traffic Light	Comments
A - Overview		
A:1 Deliverables	0	
A:2 Previous Review Comments	0	
A:3 Model Speed and Stability	0	
B - Detailed Model Review		
B:1 Model Boundary Conditions	0	
B:2 Model Catchments	0	
B:3 Pipe Networks	0	
B:4 Channel / Stream Networks	0	
B:5 Hydraulic Structures and Control Elements	0	
B:6 Other Asset Features	0	
B:7 1D Overland Flow Paths	0	
B:8 2D Model Components	0	
C - Model Results Review		
C:1 Model Results Check	0	
C:2 Model Validation	0	
D - Additional Checks		
D:1 Additional Check Items	0	

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Section 3 Review Details

Instruction Notes:

1. About FIGURES *-- Please note figures should be clearly* ***labelled*** *and included the FIGURES tab and* ***referenced*** *in the review comments.*

2. Traffic Light Rating Scores *(0 - no issue, 3 - major issue)*

0 - No issue found

1 - Minor issue or non-standard approach, but unlikely to significantly impact on objectives of the study

2 - Some concerns, likely to have an impact on model results

3 - Concerns that may have a significant impact on model results and not meeting the study objectives

A - General Information Review

A:1 - Deliverables

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
A:1.1	Is tab "Section 1 - Model Metadata" filled in and does it provide an accurate summary of the supplied model data.	0	Checked		
A:1.2	Have all agreed deliverables been provided – Reporting, Model Database, Survey etc.	0	All model networks and result scenarios were provided inside the model database. Total 15 scenarios according to Figure A:1.2. Model build memo report is provided (DRAFT).		
A:1.3	Is the model delivered in the required software version?	0	YES. Model has been build in version 2021.6.1		
A:1.4	Are all associated model input files supplied in specified format, i.e. as part of the icmt file or in folders with appropriate naming conversion if using other software.	0	Associated model input files are detailed in the model build report.		
A:1.5	Are all required modelled scenarios included in the deliverable? Does the model database include result files for all the scenarios?	0	All model scenario results are included in the database.		

A:2 - Previous Review Comments

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
A:2.1	Confirm that all previous review comments have been incorporated or resolved, if any (such as MEDAR recommendations, etc.). List any that have not, and comment on impact to model usability.	N/A	N/A		
A:2.2	Assess model against any other review recommendations produced during the model development. If there was no formal process for resolving the reviewers comments, then each item should be listed below and a comment made as to whether or not the issue has been resolved, and if it has significant impacts.	N/A	N/A		
A:2.3	Identify and document any agreed divergence from spec and adopted model build process	0	With the AC it has been agreed to use an increment in temperature of 3.8°C in the scenarios with climate change. This value comes from the SW Code of Practice version 3 (SWCoPv3), September 2021.		

A:3 - Model Speed and Stability

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
A:3.1	Check model simulation period and time steps, including result time steps.	0	Checked. Timestep 1 second. Results timestep multiplier 300.		
A:3.2	Comment on run time expected in terms of the catchment size and complexity.	0	Model run time around 0.5 hrs per scenario. Time is acceptable based on model extent and solution used.		
A:3.3	Check model validation errors and warning messages.	0	Checked, no errors. Some warnings about system type and inconsistency on the levels are derived from mesh interpolation. Acceptable total mass error (<0.5m³).		
A:3.4	Assess model stability i.e. identify time step critical locations. Any apparent issues in model results caused by model instabilities? Is peak impacted by instabilities?	0	During debugging issues were identified instabilities along river reach, these were fixed to allow realistic flow. Some high velocities were fixed in the following culverts: 2258569_US and 2258572_US.		
A:3.5	Review mass balance (<1%, if more than 1%, find out why & whether improvements should be made, discuss with AC if mass balance error cannot be reduced)	0	Volume balance less than 1%		

Review Hold Point – if there is any corrective action required as a result of the above – the review is to be halted until the issue is resolved to the satisfaction of the appointed reviewer and Auckland Council

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Section 3 Review Details

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response

B - Detailed Model Review

B:1 - Model Boundary Conditions

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:1.1	Confirm rainfall values and profiles used are appropriate, and that modelled values are equivalent to what is included in the associated reporting.	0	Due to the size of the catchment, there were considered two rain profiles along the Oruawharu river as seen in Figure B:1.1. Rainfall depth values are summarized in Table B:1.1.		
B:1.2	Assess downstream water levels with reference to coastal marine boundary or other software	0	A coastal tailwater boundary condition was applied for all modelled scenarios where the Oruawharo River discharges to the Kaipara Harbour at a constant water level of 3.3 m based on the Mean High-Water Springs (MHWS) 10%ile with 1 m sea level rise consideration for climate change. See Figure B:1.4 for location		
B:1.3	Describe and review any inflow boundary conditions	N/A	N/A. No inflow boundary conditions, all contributing areas modelled.		
B:1.4	Check how model initial conditions are applied for both 1D and 2D. The use of model features such as initial condition zone for tidal areas and ponds, etc.	0	Checked. The tidal boundary (3.3mRL) at the end of the Oriawharo river reaches is the only boundary level condition. The minimum base flow depth for river reach is 0.02m. It was assumed dry conditions on the 2D surface at initialisation.		
B:1.5	Check time varying inputs and make sure their start and finish time aligns with simulation setting.	0	Checked and no issues found.		
B:1.6	How is climate change applied? Check rainfall and tide boundary	0	Rainfall depths are updated with the latest AC specifications which consider a temperature increment of 3.8°C.		

B:2 - Model Catchments

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:2.1	Review modelled catchment extent. Confirm that it follows contours, and incorporates or excludes any additional primary network which is not consistent with the contours. Any flow transfers across catchment boundaries?	0	The model extent covers the Wellsford AC catchment for subcatchments that drains to the Oriawharo River, see Figure 0:1. No flow transfer between AC catchments.		
B:2.2	Subcatchment extents and sizes. Comment on methodology used for subcatchments delineation – is it appropriate, are there any limitations? Any impact on model usefulness.	0	The delineation of the subcatchments within the model extent is based on the latest 2016 LiDAR data and the Auckland Council Geomaps overland flow path layer. Few changes were made to represent the pre and post-development scenarios. The modelled subcatchments areas range between 1 ha and 384 ha. Total subcatchments 68. For the large subcatchments (near the coast) were calculated a time of concentration based on TP108 guidelines. Based on aerials, these catchments were loaded to the stream junctions on the Oruawharu river.		
B:2.3	Spot check subcatchment loading nodes are assigned properly.	0	Checked. Subcatchments are updated and loaded based on overland flow paths and the reticulation system		
B:2.4	Check hydrological method used	0	Checked. TP108 methodology applied.		
B:2.5	Identify the curve numbers used in the model. Compare to Auckland Council Soil Maps to confirm appropriate use of curve number for pervious land use.	0	Checked. CN from the SCS method.		
B:2.6	Check impervious coverage and compare numbers extracted from model with reported figures. Spot check ED imperviousness using existing impervious layers and aerial photographs – include a screen dump of any issues identified. Review approach for defining MPD.	**0**	Checked. ED and future scenario imperviousness where based on the following sources: * AC geomaps, 'Impervious Surface 2008' * LINZ latest 'Building outlines ' * Private Plan Change zones. *AUP operative in parts zones. Impervious values are summarized in Figure B:2.6		
B:2.7	Spot check and document time of concentration for catchments, comparing to TP108 graphical calculations.	**0**	Checked. Time of concentration analysis made for significant catchments. Time varies between 10 and 260 minutes. From the 68 subcatchments, 10 have a Tc >= 15min as seen in Figure B:2.7.		
B:2.8	Check initial abstraction (Ia) ranges in existing / future scenarios.	**0**	Checked. An initial abstraction of 5mm and 0mm has been used for pervious and impervious areas respectively for all subcatchments		
B:2.9	Check catchment length, slope and Tc are correctly assigned.	**0**	Checked and no issues found.		

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Section 3 Review Details

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:3 - Pipe Networks					
Item	**Description**	**Rating Score**	**Modeller's Initial Notes**	**Reviewer's Comments**	**Modellers Response**
B:3.1	Confirm all critical network and structures are included in model (trunk network, known flooding points, key structures, etc.)	0	Checked. Structures relevant/hydraulically connected to plan change area were modelled.		
B:3.2	Check if the model extent is suitable for generating floodplains, i.e. does it extend far enough upstream and include all flood prone areas.	0	Checked and no issues found.		
B:3.3	Check asset naming convention. Can model ID be linked to assets in the GIS	0	Checked and no issues found.		
B:3.4	Confirm node/manhole data source flagging and if it is documented for attributes such as lid level, invert level, shaft area, flood type, etc.	0	Confirmed. Most of the invert and lid levels for the structures were surveyed. A table with the surveyed elements are shown in Table B:3.3.		
B:3.5	Confirm pipe asset data source flagging and if it is documented for attributes like shape, diameter / width/ height, material, upstream and downstream inverts, etc.	0	Checked. Survey made to the main structures.		
B:3.6	Spot check data entry of asset inspection/survey records for 5 locations	0	Checked and no issues found.		
B:3.7	Spot check node attributes (diameter, shaft area, invert level and lid level) match asset data or are interpolated appropriately.	0	Checked and no issues found.		
B:3.8	Compare node lid levels to LiDAR	0	Checked and no issues found.		
B:3.9	Check cover types are appropriate i.e. sealed, stored, 2D, etc.	0	Checked and no issues found.		
B:3.10	Check pipe attributes (diameter, shape, length, material, invert levels) match asset data or are interpolated sensibly	0	Checked. Data from survey.		
B:3.11	Check pipe long section and gradient for steep, zero and negative grades.	0	Checked. Data from survey.		
B:3.12	Check if continuation pipe is matched using soffit levels	0	Checked. Data from survey.		
B:3.13	Ground cover. Identify pipes that have insufficient cover – less than 300mm.	0	Checked. Data from survey.		
B:3.14	Identify any network which has decreasing diameters in a down-stream direction.	0	Checked and no issues found.		
B:3.15	Check pipe lengths less than 10m, and if any actions required.	0	Checked and no issues found.		
B:3.16	Check pipe roughness assumptions appropriate for material and condition	0	Updated accordance with Modelling Spec (November 2011)		
B:3.17	Check manhole headlosses in the model.	0	Headlosses checked and found appropiate, pipe headlosses applied using Inference tool in ICM.		
B:3.18	Check entry and exit losses of pipes and any minor losses caused by bends, side connections or joint defects, etc.	0	Checked and no issues found.		
B:3.19	Check natural depression areas or dry pond are modelled with proper outlet configuration i.e. it drains properly after flooding.	0	Checked and no issues found.		
B:3.20	How is storage compensation applied to any trimmed network.	0	Checked and no issues found.		

B:4 - Channel/Stream Networks

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:4.1	Are channels modelled appropriately? (in 2D or as 1D river reaches)	0	1D Channel- Oruawharo River: Downstream SH1, 5100 meters. Upstream SH1, 850 meters. Checked		
B:4.2	In case of burning surveyed cross-sections in 2D, spot check cross-sections from 2D bathymetry compared to the surveyed cross-sections.	0	Checked. Cross sections have been taken from LiDAR2016 and survey. Five burnt areas have been implemented as mesh level zone in ICM. See survey area on Figure B:4.2		
B:4.3	Spot check modelled cross-sections and banklines with LiDAR	N/A	Checked and no issues were found. Cross-sections have been taken from LiDAR2016. Few spot heights around the main culvert (2000811317) were taken to confirm levels (no cross section survey)		

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Section 3 Review Details

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:4.4	Is location and spacing between cross sections appropriate? (e.g. maximum dx in MIKE11)	N/A	Checked. Between 20 and 50 meters between CSs		
B:4.5	Spot check of modelled cross-sections whether it includes low flow channel.	N/A	Checked. The low flow channel for all river reaches is based on a minimum base flow of 0.02m.		
B:4.6	Spot check data entry of survey records for 5 locations	N/A	No cross sections surveyed		
B:4.7	Identify any topography which may cause instabilities – such as flat sections.	0	No cross sections surveyed		
B:4.8	Review the use of “channel markers” or “new panels”.	N/A	No cross sections surveyed		
B:4.9	Identify if cross sections are drawn properly: - check length and extents sufficient to cover flood flows - any sections which are not perpendicular to the direction of flow. - are sections straight lines? Comment on the impact to the conveyance, and to the model results.	N/A	Checked. No issues found		
B:4.10	Check locations where flooding extends from the channel to the 2D mesh – comment on merging of 1D/2D representation.	N/A	Few cases with this issue. 1D and 2D model results has been analysed		
B:4.11	Comment on application of roughness values.	N/A	Roughness values in river reach were taken from Table 5-1. AC Stormwater Flood Modelling specification (2011). Roughness values (n of Manning) of 0.03 and 0.04. These were validated with the photos taken in the survey campaign.		
B:4.12	Identify any double counting of volumes, in overland flow paths basins other cross sections	N/A	None		
B:4.13	Check gradient for steep, zero and negative grades.	N/A	None		
B:4.14	Confirm no double counting of flood storage volumes, at locations such as basins or connection nodes at the ends of channels, , etc.	N/A	None		

B:5 - Hydraulic Structures and Control Elements

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:5.1	Are inlets represented correctly? Do they align with surrounding terrain and have correct inlet control/headloss parameters?	0	Yes they are. Culvert inlets and outlets were checked and found appropriate.		
B:5.2	Check outlet and/or outfall representations. Do they align with surrounding terrain or connect appropriately with downstream features?	0	Checked and no issues found.		
B:5.3	Check representation of culverts. Shape, number of barrels, inlet/outlet losses, roughness, gradient, etc.	0	Checked and no issues found.		
B:5.4	Review bridges representation: - cross sections - contraction and expansion losses - bridge deck, profile and coefficients - bridge skew - bridge opening, gradient, inlet and outlet losses - bridge piers or other obstructions	N/A	N/A		
B:5.5	Check representation of storages, depressions, dams or constructed ponds: - stage storage relationship - any controls - inlets and outlets - initial or permanent water levels - overtopping arrangements (single level or irregular shape; weir coefficients; 2D mesh / breaklines);	N/A	N/A		
B:5.6	Check pump configurations. On/off levels, pump type, pump curve, pump controls, etc.	N/A	N/A		

B:6 - Other Asset Features

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response

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Section 3 Review Details

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:6.1	Soakage modelling methods and representation in the model.	0	No soakage represented in the model		
B:6.2	How is the soakage outlet capacity modelled. The assumptions, e.g. ARIs, etc.	N/A	N/A		
B:6.3	Review the use of weir units in the model. Comment on the weir representation and coefficients used	N/A	N/A. No weir elements		
B:6.4	Review the use of orifice units in the model, comment on the associated coefficients applied.	N/A	N/A. No oriffice elements		
B:6.5	Check representation of tunnels/underpasses	N/A	N/A		

B:7 - 1D Overland Flow Paths

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:7.1	Modelled overland flow paths locations and downstream connectivity.	N/A	N/A		
B:7.2	Comment on application of roughness values applied to 1D overland flow paths.	N/A	N/A		
B:7.3	Review section shape for 1D overland flow paths	N/A	N/A		
B:7.4	Check OLFP gradient and levels	N/A	N/A		

B:8 - 2D Model Components

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
B:8.1	Review 2D extent and mesh sizes (any terrain sensitive meshing, and no extremely large or small meshes) Are mesh sizes appropriate at inlets and outlets.	0	2D extent is focused on where the proposed development plan change is located.		
B:8.2	How have building footprints been represented	0	No building footprints are represented on the mesh. They were used as an impervious area in the runoff calculation.		
B:8.3	Review DEM and identify if any errors in DEM, e.g. around buildings	0	Used Lidar 2016 (latest data captured by AC)		
B:8.4	Check representation of any key obstructions	0	n/a		
B:8.5	Check roughness zones and values	0	Roughness values are shown in Figure B:5.5. Values were taken as per the Table 5.4 Stormwater Flood Modelling specification (2011). Figure B:5.5 shows the roughness. As the catchments are loading directly to open channels, no overland flow is modelled near existing buildings; therefore, no building roughness was considered on the 2D surface.		
B:8.6	Review and check double countings between 1D and 2D model components. For example 2D cells not blocked out where flow is represented in 1D.	0	Checked and no issues found.		
B:8.7	Check 1D/2D interface and coupling method is appropriate. Check appropriate 1D/2D connections are applied at 2D nodes, inline banks, river reach banks, etc. E.g. appropriate Qmax at 2D manhole, RESERVOIRHEIGHT= 100m, M21_AS_GROUNDLEVEL=0 in dhiapp.in file	0	Checked and no issues found.		

C - Model Results Review

C:1 - Model Results Check

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
C:1.1	Have all events been simulated and results provided?	0	Scenarios modelled with results. Results included inside the model database.		
C:1.2	All correct input data assigned to the run file for each simulation? and check simulation start and stop times.	0	Yes all files are included		
C:1.3	Check if flow, level and velocity are within reasonable range for pipes. - Identify Pipes with velocities >6m/s; - Check if inlet control should be included.	0	After the debugging of some instabilities, the following culverts have velocities between 6m/s and 7.8 m/s just for the critical scenario (PCFUZ100yrCC): 2000811317, 2258564_US and 2258567_US. Inlet control has been used in the culvert configuration.		

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Section 3 Review Details

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
C:1.4	Check if flow, level and velocities are within reasonable range for overland flow paths, open channels and floodplain	0	Checked, no issues found. Levels and velocities are consitant with the flow magnitude.		
C:1.5	Is there any depression area or ponding not drained at the end of simulation? Check outlet configuration for depression.	0	Model results at the project location were checked and no issues were founded.		
C:1.6	Are predicted losses at manhole and pipe connections within reasonable range and as expected?	0	Checked and no issues found.		
C:1.7	Are predicted losses at inlet and outlet within reasonable range and as expected?	0	Checked and no issues found.		
C:1.8	Culvert Performance: - Is culvert operating as expected? Headlosses within reasonable range. - Is flow limiting observed for 1D/2D connection at inlet/outlet? - Spot Check with HY8 and manuals calcs at least 2 locations,	0	Checked and no issues found.		
C:1.9	Bridge Performance: - Is bridge operating as expected? - Are contraction and expansion losses within reasonable range.	N/A	N/A		
C:1.10	Check if 1D / 2D flow transfers as expected. Any location with significant instabilities, unexpected headloss or flow limiting.	0	Checked and no issues found.		
C:1.11	Check if pump operation as expected	N/A	N/A		

C:2 - Model Validation

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
C:2.1	Compare TP108 graphical and modelled peak flows at a range of key locations, comment on any significant differences, and the impact on model predicted flows.	0	Checked and no issues found.		
C:2.2	Check if overall flood extent sensible. Compare new flood extent with any previous floodplains.	0	Checked and no issues found. Flood plain results were compared with published AC flood plains and no big differences found.		
C:2.3	Validation against RFS records, anecdotal evidence?	N/A	N/A		
C:2.4	Validation against gauged data or flood surveys?	N/A	N/A		

D - Additional Checks

D:1 - Additional Check Items

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
D:1.1	Does the model report provides adequate documentation on: - project objectives and purpose; - data analysis and model schematisation; - modelling methodology for key model components - assumptions and limitations.	N/A	Model suitable for understanding flood risk and complete effects assessment for the proposed project. The model aligns with AC specifications but may vary with proposed future plan changes.		
D:1.2	If applicable, are options represented adequately with appropriate levels of details? Comment on confidence level based on both model setup and model results.	0	Post-development results are consistent and reflect the requirements of the project scope		
D:1.3	Should any aspects of the model be refined or redone in order to further investigate flooding effects?	0	The models should be refined to reflect existing conditions for a complete catchment analysis. Confirm survey data and update with as-built information. Include existing urban networks.		

Auckland Council Model Review

Section 3 Review Details

Item	Description	Rating Score	Modeller's Initial Notes	Reviewer's Comments	Modellers Response
D:1.4	Which scenarios are modelled? Comment on the adequacy of scenarios modelled for achieving the project objectives	0	A total of 15 scenarios were modelled. Climate change (CC) includes a temperature increase of 3.8°. -ED with CC for 2yr, 10yr and 100yr ARI -ED no CC for 10yr and 100yr ARI -Plan Change with CC for 2yr, 10yr and 100yr ARI (PC) -Plan Change no CC fo 10yr and 100yr ARI (PC) -Plan Change and MPD with CC for 2yr, 10yr and 100yr ARI (PC FUZ) -Plan Change and MPD no CC for 10yr and 100yr ARI (PC FUZ) All model results achieve the project objectives.		
D:1.5	Any other assumptions used in the model that may have an impact on the overall model performance and meeting project objectives?	0	The rainfall-runoff model assumes the loading catchment to dummy nodes on the surface. The flow represents different land uses according to the scenario. It is assumed that the future network will drain directly to the modelled open channel in the future system.		
D:1.6	Describe any additional checks or issues to raise	N/A	N/A		

Figure 0:1 **Model extent**

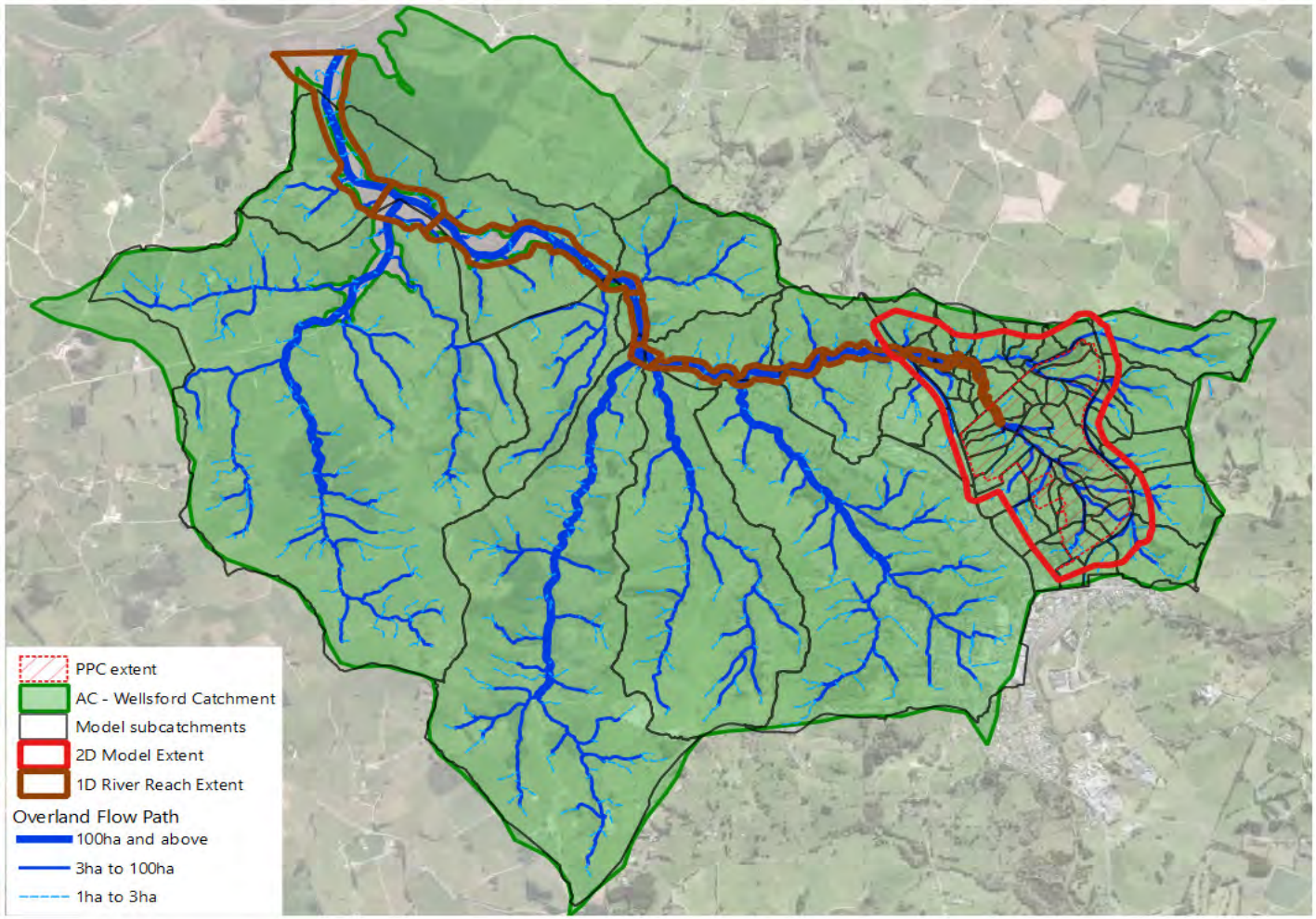
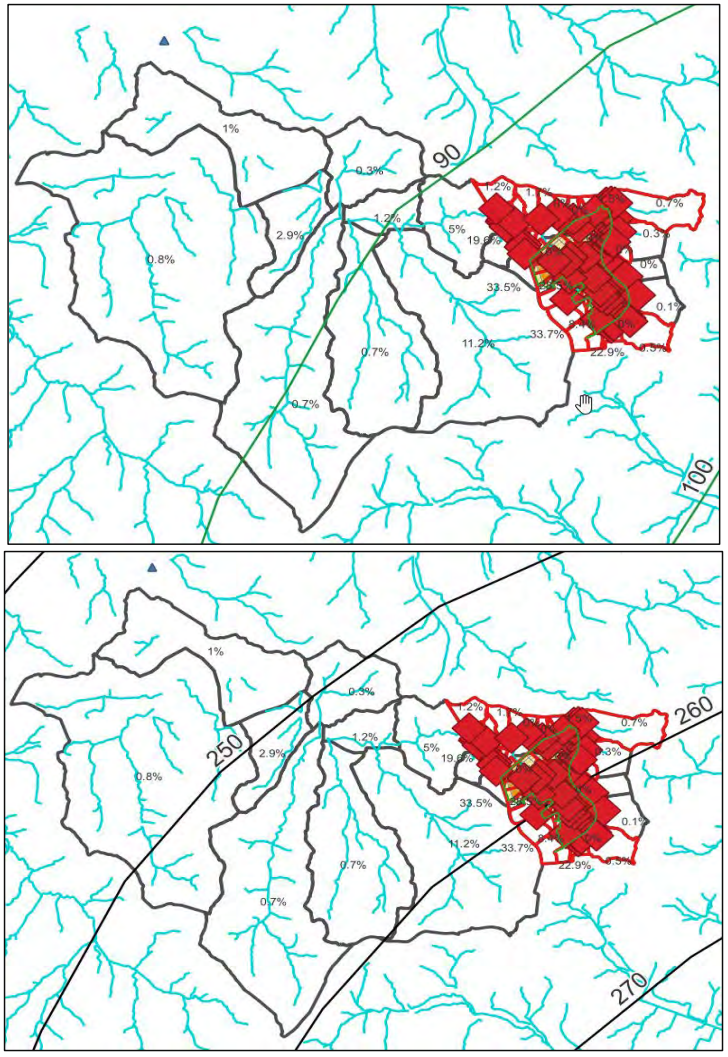
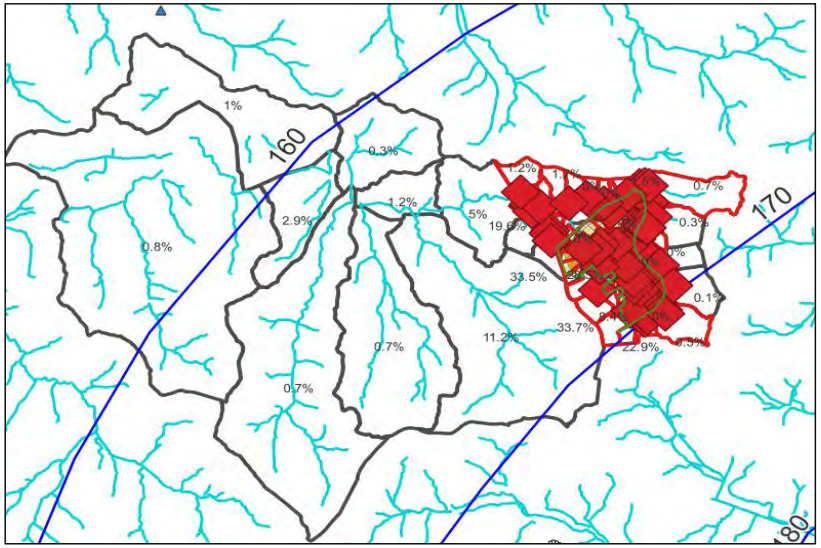


Figure B:1.1 **Modelled scenarios**

2 YR



10 YR



100 YR

Table B:1.1 **Modelled scenarios**

	SWCoPv3 -3.8°			
	DEPTH	% increment	Depth (mm)	Profile
2 Year	95	27.4%	121	1
	85		108	2
10 Year	120	30.8%	157	1
	160		209	2
100 Year	260	32.7%	345	1
	250		332	2

Table A:1.2 **Modelled scenarios**

No	Network	Land use	Storm Event (ARI)	Climate Change	Rainfall depth (mm)	Tide level
1	Existing	Existing Development (ED)	10yr	NO	120/160	2.3 + 1 mRL (MHWS 10%il)
2			100yr		260/250	
3			2yr	Yes 3.8°C	121/108	
4			10yr		157/209	
5			100yr		345/332	
6		Existing Development and proposed Plan Change (PC)	10yr	NO	120/160	
7			100yr		260/250	
8			2yr	Yes 3.8°C	121/108	
9			10yr		157/209	
10			100yr		345/332	
11		Proposed Plan Change and Future Urban Zone (PC FUZ)	10yr	NO	120/160	
12			100yr		260/250	
13			2yr	Yes 3.8°C	121/108	
14			10yr		157/209	
15			100yr		345/332	

Figure B:1.4 Boundary conditions

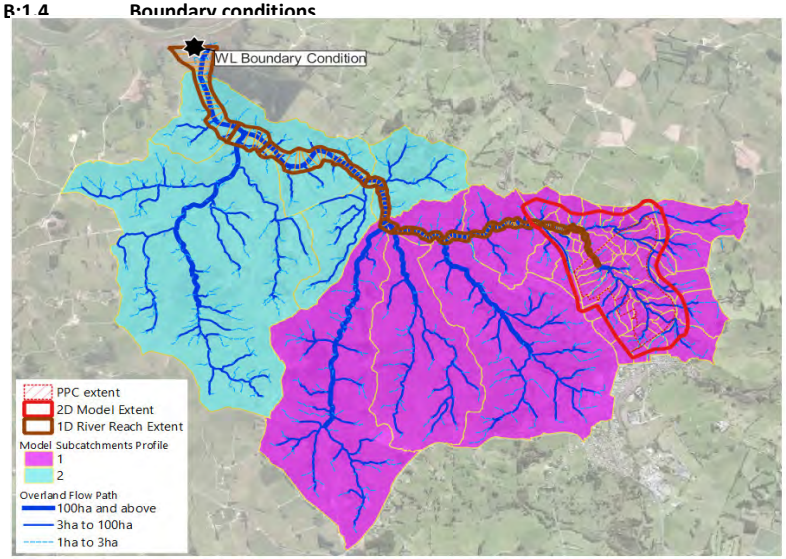


Figure B:2.6 Imperviousness values

Source		Impervious %
ED	Impervious ED	100
PC	Mixed Housing Suburban Zone	60
	Mixed Housing Urban Zone	60
	Neighbourhood Centre Zone	100
	Residential-Large Lot Zone	35
	Pervious [Open Space Conservation Zone]	10
	Roads	90
AUP	Residential-Large Lot Zone	35
	Open Space - Conservation Zone	10
	Residential - Single House Zone	60
	Road [i]	90
	Strategic Transport Corridor	100
	Rural - Countryside Living Zone2	25
	Future Urban Zone5	70
	Open Space - Informal Recreation Zone	10
	Rural - Rural Production Zone2	5
	Open Space - Sport and Active Recreation Zone	33

Table B:3.2

Appendix A. Existing Culvert information

No	us_node_id	Asset Owner	Survey Levels	ds_node_id	Photo Inlet	Photo Outlet	Diam (mm)	Shape and material	INLET COEFF. CONTROL*					INLET / OUTLET LOSS COEFF			
									Nr *	K	M	C	Y	Type Inlet	Ki	Type Outlet	Kf
2	2000063746	AC - Transport	YES	2000819719	NO	YES	450	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
3	2000805184	NZTA	YES	2000213627	YES	NO	450	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
1	2000811317N	AC - Stormwater	YES	2000293597N	YES	YES	2000	Circular Concrete	2	0.0018	2.0000	0.0292	0.7400	Circular/Headwalland wingwalls	0.5	Straight line (wingwall)	0.5
1	2000811317S	AC - Stormwater	YES	2000293597S	YES	YES	2000	Circular Concrete	2	0.0018	2.0000	0.0292	0.7400	Circular/Headwalland wingwalls	0.5	Straight line (wingwall)	0.5
19	2258561_US	Kiwi Rail	NO	2258561_DS	NO	YES	600	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
18	2258562_US	Kiwi Rail	NO	2258562_DS	NO	NO	300	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
17	2258563_US	Kiwi Rail	NO	2258563_DS	NO	NO	920	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
16	2258564_US	Kiwi Rail	NO	2258564_DS	NO	NO	450	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
15	2258565_US	Kiwi Rail	YES	2258565_DS	NO	YES	600	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
13	2258567_US	Kiwi Rail	YES	2258567_DS	YES	NO	300	Circular Concrete	-	-	-	-	-	Square manhole (no culvert). Modelled has manhole 2D. 1by1 manhole_1m²		-	-
12	2258568_US	Kiwi Rail	NO	2258568_DS	NO	NO	250	Circular Concrete	3	0.0045	2.0000	0.0317	0.6900	Projecting / Square Edge	0.5	-	-
11	2258569_US	Kiwi Rail	YES	2258569_DS	YES	YES	500	Circular Concrete	1	0.0098	2.0000	0.0398	0.6700	Headwall / square edge	0.5	-	-
10	2258570_US	Kiwi Rail	NO	2258570_DS	NO	NO	375	Circular Concrete	1	0.0098	2.0000	0.0398	0.6700	Headwall / square edge	0.5	-	-
9	2258571_US	Kiwi Rail	YES	2258571_DS	NO	YES	460	Circular Concrete	1	0.0098	2.0000	0.0398	0.6700	Headwall / square edge	0.5	-	-
8	2258572_US	Kiwi Rail	YES	2258572_DS	NO	YES	250	Circular Concrete	1	0.0098	2.0000	0.0398	0.6700	Headwall / square edge	0.5	-	-
7	2258573_US	Kiwi Rail	YES	2258573_DS			1120x1120	Rectangular/Headwall	20	0.4950	0.6670	0.0314	0.8200	Any/ Square End (Nowingwalls)	0.3		

*Coefficients based on 'Culvert, Screen and Outfall Manual. Ciria 2019'. Table A7.5 and A7.8

Figure B:4.2

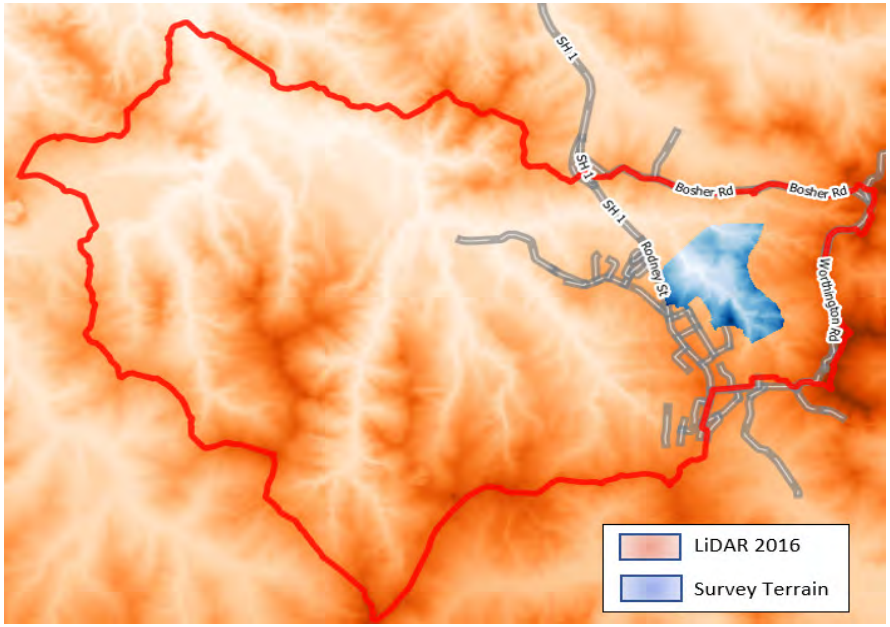

SH 1
SH 1
SH 1
Bosher Rd
Bosher Rd
Rodney St
Worthington Rd
LiDAR 2016
Survey Terrain

Figure B:8.5

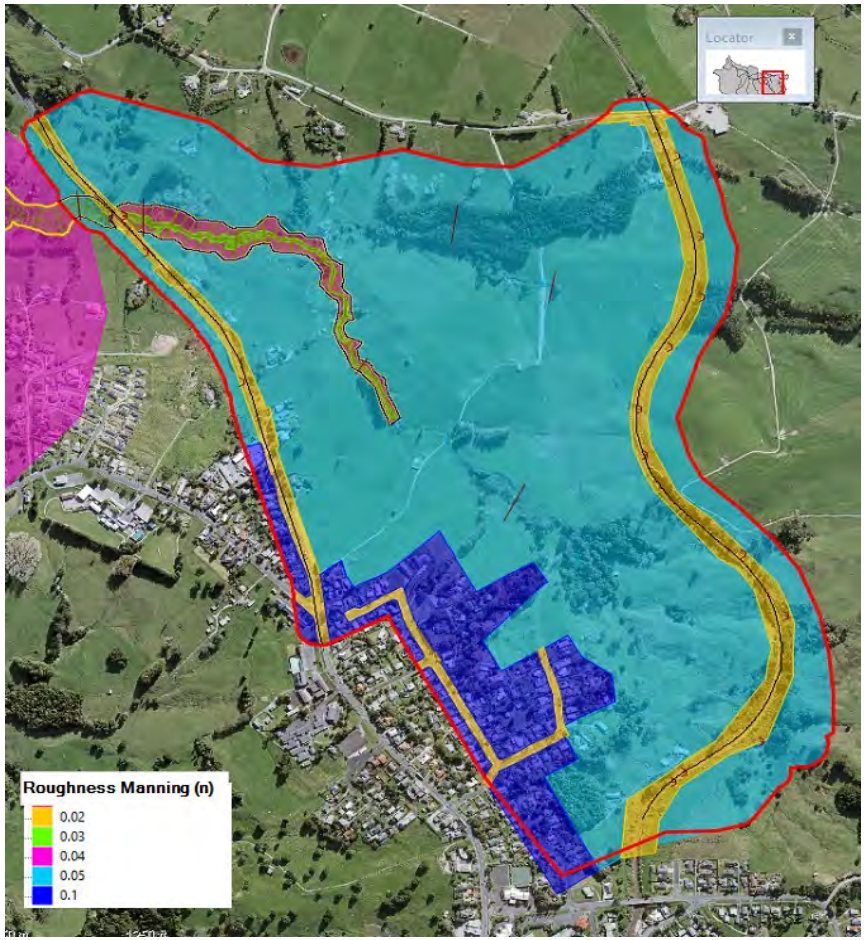
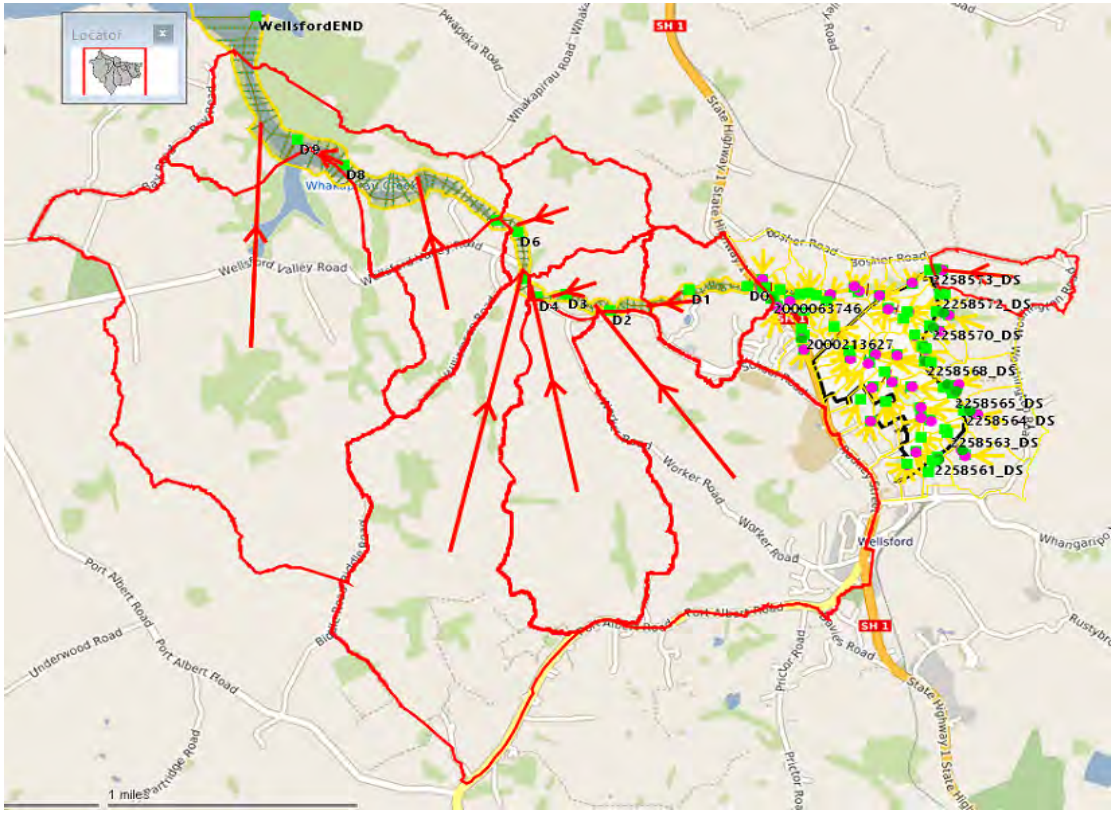


Table B:8.5

Land Use	Manning's n
Roads	0.02
Residentials	0.1
Open Space	0.05
Stream banks	0.04
Stream wet base	0.03

Figure B:2.7



Subcatchment ID	AREA (ha)	Tc (min)
Wellsford-1D-PRE-16	132.503	260.04
Wellsford-1D-PRE-17	433.247	68.19
Wellsford-1D-PRE-14	266.599	63.08
Wellsford-1D-PRE-10	245.942	50.36
Wellsford-1D-PRE-13	165.018	48.36
Wellsford-1D-PRE-15	51.546	31.66
Wellsford-1D-PRE-11	29.05	26.9
Wellsford-1D-PRE-09	57.45	26.41
Wellsford-1D-PRE-12	64.822	23.21
Wellsford-151	28.489	14.8

APPENDIX C

Healthy Waters recommended imperviousness table

ZONE ID	Zone Description	Recommended MPD % impervious coverage based on AUP OiP for hydraulic modelling[1]	Upper % impervious coverage allowed by AUP OiP for hydraulc modelling[1]	Notes extracted from AUP Document	Data Source & Rationale
1	Business - Business Park Zone	80	-	80% max imperviousness	Max imperviousness as per H15.6.4. The Business – Business Park Zone enables moderate to intensive office activity and some ancillary services such as gymnasiums, child care and food and beverage outlets.
3	Rural - Countryside Living Zone[2]	25	50	Min net site area mostly in the range of 1-2 ha, most at 2ha, except Swanson & Okura West at 4ha, and point wells at 5,000m2, without transferable rural site subdivision. If transferable rural site subdivision is considered, the minimum net site area would be reduced to 8,000m2 and average minimum to 1ha for most specified locations.	Minimum net site area as per Table E39.6.5.2.1. % imperviousness worked out based on minimum lot size and rule E8 (A7) "Diversion and discharge of stormwater runoff from impervious areas up to 5,000m2 outside an urban area that complies with Standard E8.6.1 and Standard E8.6.2.4" is a permitted activity.
4	Future Urban Zone[5]	70	-	NA	Minimum 70% impervious assumed in all future urban areas. The make of the future urban zone is assumed to be mostly residential with some business zones, approx 25% road corridors and 10% open spaces, etc.
5	Business - Heavy Industry Zone[3]	90	100	NA	Assumed to have small pockets of green areas. 'Imperviousness assumed between Business Park Zone and City, Metropolitan, Town Centre Zones. Based on advises from planning.
7	Business - Local Centre Zone	100	-	NA	Assumption that green areas are not significant in all business centre zones. Provides for the local convenience needs of surrounding residential areas, including local retail, commercial services, offices, food and beverage, and appropriately scaled supermarkets.
8	Residential - Terrace Housing and Apartment Buildings Zone[6]	70	-	max 70% impervious	Max imperviousness as per H6.6.10
10	Business - Metropolitan Centre Zone	100	-	NA	Assumption that green areas are not significant in all business centre zones. Applies to centres located in different subregional catchments of Auckland.
11	Rural - Mixed Rural Zone[2]	10	-	min site size 40-50ha	Minimum site sizes as per Table E39.6.5.1.1. % imperviousness worked out based on minimum lot size and rule E8 (A7) "Diversion and discharge of stormwater runoff from impervious areas up to 5,000m2 outside an urban area that complies with Standard E8.6.1 and Standard E8.6.2.4" is a permitted activity.
12	Business - Mixed Use Zone[3]	80	100	NA	Assumed to be the same as H15 Business Park Zone. Typical transition zone between residential zone and city, metropolitan, town centre zones. Supposingly larger green areas compared to other business zones, based on zone definition. However from spot checks on GeoMap the % imperviousness could be up to 100% depending on locations.
15	Rural - Rural Conservation Zone[2]	10	-	min site size 10-20ha	Minimum site sizes as per Table E39.6.5.1.1. % imperviousness worked out based on minimum lot size and rule E8 (A7) "Diversion and discharge of stormwater runoff from impervious areas up to 5,000m2 outside an urban area that complies with Standard E8.6.1 and Standard E8.6.2.4" is a permitted activity.
16	Rural - Rural Production Zone[2]	5	-	min site size 80-100ha	Minimum site sizes as per Table E39.6.5.1.1. % imperviousness worked out based on minimum lot size and rule E8 (A7) "Diversion and discharge of stormwater runoff from impervious areas up to 5,000m2 outside an urban area that complies with Standard E8.6.1 and Standard E8.6.2.4" is a permitted activity.
17	Business - Light Industry Zone[3]	90	100	NA	Assumed to have small pockets of green areas. 'Imperviousness assumed between Business Park Zone and City, Metropolitan, Town Centre Zones
18	Residential - Mixed Housing Suburban Zone[6]	60	-	max 60% impervious	Max imperviousness as per H4.6.8
19	Residential - Single House Zone	60	-	max 60% impervious	Max imperviousness as per H3.6.9
20	Residential - Rural and Coastal Settlement Zone	35	-	35% or 1400m2, whichever is lesser	Max imperviousness as per H2.6.8
22	Business - Town Centre Zone	100	-	NA	Assumption that green areas are not significant in all business centre zones. Applies to suburban centres throughout Auckland, the satellite centres of Warkworth and Pukekohe, and the rural towns of Helensville and Wellsford.
23	Residential - Large Lot Zone	35	-	35% or 1400m2, whichever is lesser	Max imperviousness as per H1.6.6.
25	Water [i]	100	-	NA	Water is effectively impervious
26	Strategic Transport Corridor	100	-	NA	Assumed to be completely impervious. These areas will be the minority in any catchment and variations in assumptions are not likely to significantly affect modelling outcomes.
27	Road [i]	90	-	NA	Assumption. Road corridor instead of just areas between kerblines. Includes berm, footpath, etc.
30	Coastal - General Coastal Marine Zone [rcp]	100	-	NA	Coastal areas mostly covered by water and esturay
31	Open Space - Conservation Zone	10	-	lesser of 10% or 5000m2	Maximum Impervious Areas as per H7.11.7
32	Open Space - Informal Recreation Zone	10	-	lesser of 10% or 5000m2	Maximum Impervious Areas as per H7.11.7
33	Open Space - Sport and Active Recreation Zone	40	-	40% max imperviousness	Maximum Impervious Areas as per H7.11.7
34	Open Space - Community Zone	70	100	70% or no limit depending on adjacent zone	Maximum Impervious Areas as per H7.11.7, 70 per cent where the adjacent zone is a residential zone, Business – Business Park Zone or Business – General Business Zone. No limit in the Business – Mixed Use Zone or the business centre zones.
35	Business - City Centre Zone	100	-	NA	Assumption that green areas are not significant in all business centre zones. Applies to centres located in different subregional catchments of Auckland.
37	Coastal - Minor Port Zone [rcp/dp]	100	-	NA	Water, and heavily paved land areas.
39	Coastal - Defence Zone [rcp/dp]	100	-	NA	Water, and heavily paved land areas.
40	Coastal - Marina Zone [rcp/dp]	100	-	NA	Water, and heavily paved land areas.
41	Coastal - Mooring Zone [rcp]	100	-	NA	Water.
43	Hauraki Gulf Islands	*Per project basis*	-	NA	Special consideration required
44	Business - Neighbourhood Centre Zone	100	-	NA	Assumption that green areas are not significant in all business centre zones. Single corner stores or small shopping strips located in residential neighbourhoods.
45	Coastal - Ferry Terminal Zone [rcp/dp]	100	-	NA	Very few green areas in such areas
46	Rural - Rural Coastal Zone[2]	10	-	min site size 40-50ha	Minimum site sizes as per Table E39.6.5.1.1. % imperviousness worked out based on minimum lot size and rule E8 (A7) "Diversion and discharge of stormwater runoff from impervious areas up to 5,000m2 outside an urban area that complies with Standard E8.6.1 and Standard E8.6.2.4" is a permitted activity.
49	Business - General Business Zone[3]	80	100	NA	Assumed to be the same as H15 Business Park Zone. Based on zone definition, supposingly larger green areas compared to other business zones. This zone provides for business activities from light industrial to limited office, large format retail and trade suppliers.
51	Special Purpose - Quarry Zone	80	-	NA	Assuming quarry surfaces are mostly impervious, with some green areas remained in the fringe of the zone.

ZONE ID	Zone Description	Recommended MPD % impervious coverage based on AUP OiP for hydraulic modelling[1]	Upper % impervious coverage allowed by AUP OiP for hydraulc modelling[1]	Notes extracted from AUP Document	Data Source & Rationale
52	Special Purpose - Maori Purpose Zone	60	-	60% max imperviousness	Max imperviousness as per H27.6.6
53	Special Purpose - Cemetery Zone	60	-	60% max imperviousness	Max imperviousness as per H24.6.7
54	Special Purpose - Major Recreation Facility Zone	80	-	NA	Assuming sports field with underdrains as impervious. Assuming a higher % imperviousness based on analysis from aerial phots. This zone applies to major recreation facilities include sports arenas, showgrounds, events centres, racecourses, motor-racing tracks, the Auckland Zoo, and Museum of Transport and Technology (MOTAT).
55	Special Purpose - Healthcare Facility and Hospital Zone	80	-	80% max imperviousness	Max imperviousness as per H25.6.4
56	Special Purpose - Airports and Airfields Zone[4]	80	-	NA	Based on numbers given by Planner (Email dated 24/09/2014), 80%. Precinct rules apply for specific airport zones. Site specific analysis may be required to determine % imperviousness on a case by case basis.
59	Coastal - Coastal Transition Zone	10	-	NA	Coastal fringe areas unlikely to be developed, mostly green spaces
60	Residential - Mixed Housing Urban Zone[6]	60	-	max 60% impervious	Max imperviousness as per H5.6.9.
61	Green Infrastructure Corridor (Operative in somne Special Housing Areas)	10	-	NA	Based on numbers given by planner (Email dated 24/09/2014), lesser of 10% or 5000m2. Assumed to be mostly green with minimal imperviousness
62	Open Space - Civic Spaces Zone	100	-	no limit	Max impervious Areas as per H7.11.7
63	Special Purpose - School Zone	70	-	70% max imperviousness	Max imperviousness as per H29.6.5
64	Special Purpose - Tertiary Education Zone	70	-	NA	No max imperviousness defined in H30 but assumed to the same as school zone, as building coverage requirement is the same as 50%
68	Rural - Waitakere Foothills Zone[2]	12.5	-	min site size 4ha	Minimum lot sizes as per Table E39.4.5, (A31) Table H20.4.1, >25% non compliant. % imperviousness worked out based on minimum lot size and rule E8 (A7) "Diversion and discharge of stormwater runoff from impervious areas up to 5,000m2 outside an urban area that complies with Standard E8.6.1 and Standard E8.6.2.4" is a permitted activity.
69	Rural - Waitakere Ranges Zone[2]	25	-	min net site area 2ha	Minimum net site area as per E39.6.5.3 (3), H21 (>15% non compliant). % imperviousness worked out based on minimum lot size and rule E8 (A7) "Diversion and discharge of stormwater runoff from impervious areas up to 5,000m2 outside an urban area that complies with Standard E8.6.1 and Standard E8.6.2.4" is a permitted activity.

1 The % imperviousness numbers given in the above table are provided for consistency purposes for hydraulic modelling. The table should be used as a reference or "starting point" when determining what MPD % imperviousness is to be used for a specific study. The information given above is not a replacement for project specific analysis. Variations/deviations from the % imperviousness numbers given in the above table should be noted, rationale provided, with approval sought from Auckland Council.

2 Rural Zones: As max % imperviousness is not specified in AUP for rural zones, the above % imperviousness was worked out based on the minimum lot size requirement (E39) and the stormwater discharge and diversion rule E8 (A7). However, for some rural zones, the existing lots may be a smaller size than the current AUP subdivision requirements. It is therefore important to carry out project specific analysis and verify the above % imperviousness for rural zones before applying the number in subsequent hydraulic modelling activities.

3 Business Zones: Only Business Park Zone has a max % imperviousness specified in AUP. According to advises from planning, theoretically all other business zones could develop up to 100% impervious. However, practically with the riparian rules and existing green features, a likely % imperviousness is provided based on definitions and objectives for each individual zone.

4 Special Purpose - Airports and Airfields Zone: the specified 80% imperviousness is based on a Planner's recommendation. It could be conservative for most of the airport/airfields zones, and site specific imperviousness analysis is recommended on a case by case basis. Precinct rules would apply for specific airport zones.

5 More detailed zoning is to be used for Future Urban Zones, when and if it becomes available through structure planning activities.

6 Sensitivity analysis is recommended to test impact of % imperviousness greater than allowed by AUP for Residential - Terrace Housing and Apartment Buildings Zone, Residential - Mixed Housing Urban Zone and Residential - Mixed Housing Suburban Zone.

Appendix D

Model Results

WL:12.52 mRL
Depth:1.55 m
Flow:19.76 m³/s
Vel:0.88 m/s

WL:15.03 mRL
Depth:2.09 m
Flow:18.68 m³/s
Vel:0.87 m/s

WL:21.33 mRL
Depth:0.93 m
Flow:7.24 m³/s
Vel:0.82 m/s

WL:26.94 mRL
Depth:0.47 m
Flow:2.32 m³/s
Vel:1.24 m/s

WL:19.53 mRL
Depth:1.17 m
Flow:11.24 m³/s
Vel:1.88 m/s

WL:26.85 mRL
Depth:0.65 m
Flow:8.63 m³/s
Vel:1.03 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section ED 10yr
- Flood Extent ED 10yr

Max Depth ED 10yr [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. ED 10yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-1001	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:12.56 mRL
Depth:1.59 m
Flow:21.27 m³/s
Vel:0.9 m/s

WL:15.19 mRL
Depth:2.25 m
Flow:20.14 m³/s
Vel:0.87 m/s

WL:21.35 mRL
Depth:0.95 m
Flow:7.67 m³/s
Vel:0.84 m/s

WL:26.97 mRL
Depth:0.5 m
Flow:2.76 m³/s
Vel:1.32 m/s

WL:19.59 mRL
Depth:1.22 m
Flow:12.71 m³/s
Vel:1.96 m/s

WL:26.87 mRL
Depth:0.67 m
Flow:9.48 m³/s
Vel:1.08 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

- Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section PC 10yr
- Flood Extent PC 10yr

Max Depth PC 10yr [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC 10yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-1002	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:15.36 mRL
Depth:2.42 m
Flow:21.9 m³/s
Vel:0.88 m/s

WL:12.62 mRL
Depth:1.65 m
Flow:23.23 m³/s
Vel:0.91 m/s

WL:21.38 mRL
Depth:0.97 m
Flow:8.22 m³/s
Vel:0.86 m/s

WL:26.98 mRL
Depth:0.51 m
Flow:2.9 m³/s
Vel:1.34 m/s

WL:19.64 mRL
Depth:1.27 m
Flow:14.18 m³/s
Vel:2.03 m/s

WL:26.89 mRL
Depth:0.69 m
Flow:10.61 m³/s
Vel:1.14 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Ahuru Street
Astrid Lane
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Batten Street
Monowai Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone

River Cross Section PC FUZ 10yr

Flood Extent PC FUZ 10yr

Max Depth PC FUZ 10yr [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC FUZ 10yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-1003	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:12.95 mRL
Depth:1.98 m
Flow:38.82 m³/s
Vel:1.05 m/s

WL:17.25 mRL
Depth:4.3 m
Flow:37.53 m³/s
Vel:0.86 m/s

WL:21.66 mRL
Depth:1.23 m
Flow:15.23 m³/s
Vel:1.11 m/s

WL:27.11 mRL
Depth:0.68 m
Flow:5.94 m³/s
Vel:1.75 m/s

WL:20.03 mRL
Depth:1.66 m
Flow:30.36 m³/s
Vel:2.69 m/s

WL:27.06 mRL
Depth:0.85 m
Flow:21.57 m³/s
Vel:1.6 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links
- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan
- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone

River Cross Section ED 100yr

Flood Extent ED 100yr

Max Depth ED 100yr [m]
- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. ED 100yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-1004	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:12.97 mRL
Depth:2 m
Flow:39.73 m³/s
Vel:1.05 m/s

WL:17.38 mRL
Depth:4.43 m
Flow:40.53 m³/s
Vel:0.87 m/s

WL:21.7 mRL
Depth:1.26 m
Flow:16.24 m³/s
Vel:1.14 m/s

WL:27.13 mRL
Depth:0.71 m
Flow:6.44 m³/s
Vel:1.81 m/s

WL:20.07 mRL
Depth:1.7 m
Flow:32.17 m³/s
Vel:2.75 m/s

WL:27.08 mRL
Depth:0.86 m
Flow:22.56 m³/s
Vel:1.63 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section PC 100yr
- Flood Extent PC 100yr

Max Depth PC 100yr [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS
Est.1970

WOODS.CO.NZ

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC 100yr No CC

STATUS	ISSUED FOR INFORMATION
SCALE	1:5300 @ A3
COUNCIL	AUCKLAND COUNCIL
DWG NO.	P21-395-SKT-1005
REV	1.0

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:12.99 mRL
Depth:2.02 m
Flow:40.66 m³/s
Vel:1.06 m/s

WL:17.53 mRL
Depth:4.59 m
Flow:39.79 m³/s
Vel:0.88 m/s

WL:21.7 mRL
Depth:1.27 m
Flow:16.48 m³/s
Vel:1.15 m/s

WL:27.14 mRL
Depth:0.72 m
Flow:6.61 m³/s
Vel:1.83 m/s

WL:20.09 mRL
Depth:1.72 m
Flow:33.52 m³/s
Vel:2.79 m/s

WL:27.09 mRL
Depth:0.87 m
Flow:23.59 m³/s
Vel:1.66 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Ahuru Street
Astrid Lane
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

- Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section PC FUZ 100yr
- Flood Extent PC FUZ 100yr

Max Depth PC FUZ 100yr [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC FUZ 100yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-1006	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:15.25 mRL
Depth:2.31 m
Flow:20.75 m³/s
Vel:0.86 m/s

WL:12.59 mRL
Depth:1.62 m
Flow:22.11 m³/s
Vel:0.9 m/s

WL:21.37 mRL
Depth:0.96 m
Flow:8.16 m³/s
Vel:0.85 m/s

WL:26.96 mRL
Depth:0.49 m
Flow:2.61 m³/s
Vel:1.29 m/s

WL:19.59 mRL
Depth:1.23 m
Flow:12.9 m³/s
Vel:1.97 m/s

WL:26.87 mRL
Depth:0.68 m
Flow:9.8 m³/s
Vel:1.22 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone

River Cross Section ED 2yr CC

Flood Extent ED 2yr CC

Max Depth ED 2yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. ED 2yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION
SCALE	1:5300 @ A3
COUNCIL	AUCKLAND COUNCIL
DWG NO.	P21-395-SKT-1007
REV	1.0

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:15.42 mRL
Depth:2.48 m
Flow:22.43 m³/s
Vel:0.87 m/s

WL:12.63 mRL
Depth:1.66 m
Flow:23.8 m³/s
Vel:0.92 m/s

WL:21.4 mRL
Depth:1 m
Flow:8.85 m³/s
Vel:0.89 m/s

WL:26.99 mRL
Depth:0.52 m
Flow:3.12 m³/s
Vel:1.37 m/s

WL:19.65 mRL
Depth:1.28 m
Flow:14.67 m³/s
Vel:2.06 m/s

WL:26.89 mRL
Depth:0.69 m
Flow:10.79 m³/s
Vel:1.15 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Ahuru Street
Astrid Lane
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section PC 2yr CC
- Flood Extent PC 2yr CC

Max Depth PC 2yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC 2yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-1008	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:15.62 mRL
Depth:2.67 m
Flow:24.15 m³/s
Vel:0.88 m/s

WL:12.68 mRL
Depth:1.71 m
Flow:25.74 m³/s
Vel:0.94 m/s

WL:21.42 mRL
Depth:1.02 m
Flow:9.31 m³/s
Vel:0.9 m/s

WL:26.99 mRL
Depth:0.53 m
Flow:3.28 m³/s
Vel:1.4 m/s

WL:19.7 mRL
Depth:1.33 m
Flow:16.34 m³/s
Vel:2.14 m/s

WL:26.92 mRL
Depth:0.71 m
Flow:12.07 m³/s
Vel:1.21 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Ahuru Street
Astrid Lane
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone

River Cross Section PC FUZ 2yr CC

Flood Extent PC FUZ 2yr CC

Max Depth PC FUZ 2yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC FUZ 2yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION
SCALE	1:5300 @ A3
COUNCIL	AUCKLAND COUNCIL
DWG NO.	P21-395-SKT-1009
REV	1.0

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:12.74 mRL
Depth:1.77 m
Flow:28.48 m³/s
Vel:0.96 m/s

WL:15.91 mRL
Depth:2.97 m
Flow:26.65 m³/s
Vel:0.87 m/s

WL:21.47 mRL
Depth:1.07 m
Flow:10.45 m³/s
Vel:0.94 m/s

WL:27.01 mRL
Depth:0.56 m
Flow:3.64 m³/s
Vel:1.45 m/s

WL:19.76 mRL
Depth:1.39 m
Flow:18.38 m³/s
Vel:2.24 m/s

WL:26.94 mRL
Depth:0.74 m
Flow:13.58 m³/s
Vel:1.29 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Ahuru Street
Astrid Lane
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone

River Cross Section ED 10yr CC

Flood Extent ED 10yr CC

Max Depth ED 10yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. ED 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-10010	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:12.78 mRL
Depth:1.8 m
Flow:29.88 m³/s
Vel:0.97 m/s

WL:16.09 mRL
Depth:3.15 m
Flow:28.25 m³/s
Vel:0.87 m/s

WL:21.51 mRL
Depth:1.1 m
Flow:11.45 m³/s
Vel:0.97 m/s

WL:27.03 mRL
Depth:0.59 m
Flow:4.18 m³/s
Vel:1.52 m/s

WL:19.81 mRL
Depth:1.44 m
Flow:20.37 m³/s
Vel:2.33 m/s

WL:26.96 mRL
Depth:0.75 m
Flow:14.66 m³/s
Vel:1.34 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section PC 10yr CC
- Flood Extent PC 10yr CC

Max Depth PC 10yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE		
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION
SCALE	1:5300 @ A3
COUNCIL	AUCKLAND COUNCIL
DWG NO.	P21-395-SKT-10011
REV	1.0

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:12.81 mRL
Depth:1.84 m
Flow:31.63 m³/s
Vel:0.99 m/s

WL:16.28 mRL
Depth:3.34 m
Flow:29.86 m³/s
Vel:0.88 m/s

WL:21.52 mRL
Depth:1.11 m
Flow:11.73 m³/s
Vel:0.98 m/s

WL:27.04 mRL
Depth:0.6 m
Flow:4.34 m³/s
Vel:1.54 m/s

WL:19.85 mRL
Depth:1.48 m
Flow:22.03 m³/s
Vel:2.4 m/s

WL:26.98 mRL
Depth:0.77 m
Flow:15.94 m³/s
Vel:1.39 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone

River Cross Section PC FUZ 10yr CC

Flood Extent PC FUZ 10yr CC

Max Depth PC FUZ 10yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE		
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

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Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC FUZ 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION
SCALE	1:5300 @ A3
COUNCIL	AUCKLAND COUNCIL
DWG NO.	P21-395-SKT-10012
REV	1.0

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:13.21 mRL
Depth:2.24 m
Flow:54.76 m³/s
Vel:1.17 m/s

WL:18.58 mRL
Depth:5.63 m
Flow:58.42 m³/s
Vel:0.87 m/s

WL:21.85 mRL
Depth:1.42 m
Flow:21.83 m³/s
Vel:1.3 m/s

WL:27.26 mRL
Depth:0.83 m
Flow:9.27 m³/s
Vel:2.16 m/s

WL:20.33 mRL
Depth:1.96 m
Flow:47.45 m³/s
Vel:3.15 m/s

WL:27.2 mRL
Depth:0.61 m
Flow:32.67 m³/s
Vel:1.9 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section ED 100yr CC
- Flood Extent ED 100yr CC

Max Depth ED 100yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
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Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. ED 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-10013	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:13.25 mRL
Depth:2.28 m
Flow:57.8 m³/s
Vel:1.21 m/s

WL:18.65 mRL
Depth:5.71 m
Flow:61.29 m³/s
Vel:0.87 m/s

WL:21.88 mRL
Depth:1.46 m
Flow:23.2 m³/s
Vel:1.34 m/s

WL:27.27 mRL
Depth:0.86 m
Flow:9.81 m³/s
Vel:2.24 m/s

WL:20.36 mRL
Depth:1.99 m
Flow:49.53 m³/s
Vel:3.2 m/s

WL:27.21 mRL
Depth:0.99 m
Flow:33.84 m³/s
Vel:1.93 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section PC 100yr CC
- Flood Extent PC 100yr CC

Max Depth PC 100yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS
Est.1970

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Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-10014	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

WL:13.31 mRL
Depth:2.34 m
Flow:61.39 m³/s
Vel:1.23 m/s

WL:18.73 mRL
Depth:5.79 m
Flow:63.68 m³/s
Vel:0.87 m/s

WL:21.89 mRL
Depth:1.46 m
Flow:23.43 m³/s
Vel:1.34 m/s

WL:27.28 mRL
Depth:0.86 m
Flow:9.95 m³/s
Vel:2.26 m/s

WL:20.38 mRL
Depth:2.01 m
Flow:50.95 m³/s
Vel:3.24 m/s

WL:27.22 mRL
Depth:1 m
Flow:34.92 m³/s
Vel:1.95 m/s

Reid Underpass
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Ahuru Street
Astrid Lane
Tuaraki Drive
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street
Wi Apo Place

Legend

Private Plan Change Extent

NETWORK

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- River Cross Section PC FUZ 100yr CC
- Flood Extent PC FUZ 100yr CC

Max Depth PC FUZ 100yr CC [m]

- 0m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.4m
- 0.4m - 0.5m
- 0.5m - 0.7m
- 0.7m - 1.0m
- 1.0m - 2.0m
- >2.0m

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
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Wellsford North Plan Change
Stormwater Model Results
Max. Water Depth [m]. PC FUZ 100yr CC
(SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-10015	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

State Highway 1

Bailey Road

Lovers Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 10yr
- Flood Extent PC 10yr

Afflux PC Minus ED 10yr [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 10yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0001	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

Bailey Road

Lovers Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 10yr
- Flood Extent PC FUZ 10yr

Afflux PC FUZ Minus ED 10yr [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 10yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0002	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

State Highway 1

Bailey Road

Lowes Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 100yr
- Flood Extent PC 100yr

Afflux PC Minus ED 100yr [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS
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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 100yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0003	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

State Highway 1

Bailey Road

Lovers Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 100yr
- Flood Extent PC FUZ 100yr

Afflux PC FUZ Minus ED 100yr [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 100yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0004	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

Bailey Road

Lovers Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 2yr CC
- Flood Extent PC 2yr CC

Afflux PC Minus ED 2yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 2yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0005	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

State Highway 1

Bailey Road

Lovers Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent PC FUZ 2yr CC
- Flood Extent ED 2yr CC

Afflux PC FUZ Minus ED 2yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
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WOODS.CO.NZ

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 2yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0006	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

State Highway 1

Bailey Road

Lowes Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 10yr CC
- Flood Extent PC 10yr CC

Afflux PC Minus ED 10yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS
EST.1970

WOODS.CO.NZ

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0007	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

State Highway 1

Bailey Road

Lovers Lane

Reid Underpass

Wellsford Valley Road

Bosher Road

State Highway 1

Rodney Street

Raki Lane

Astrid Lane

Ahuru Street

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 10yr CC
- Flood Extent PC FUZ 10yr CC

Afflux PC FUZ Minus ED 10yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0008	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road
Awapeka Road
Whakapirau Road
State Highway 1
State Highway 1
Bailey Road
Lovers Lane
Reid Underpass
Wellsford Valley Road
Bosher Road
State Highway 1
Rodney Street
Raki Lane
Astrid Lane
Ahuru Street
Tuaraki Drive
State Highway 1
School Road
Kelgary Place
Tobruk Road
Armitage Road
Monowai Street
Batten Street
Tomas Street

Legend

Links
- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan
- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 100yr CC
- Flood Extent PC 100yr CC

Afflux PC Minus ED 100yrCC [m]
- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-0009	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

PLAN VIEW DOWNSTREAM SH1 CULVERT

SCALE: 1:2100 @ A3

0 500 1,000 m

PLAN VIEW UPSTREAM SH1 CULVERT

Oruwharu River

Bay Road

Awapeka Road

Whakapirau Road

State Highway 1

State Highway 1

Bailey Road

Lovers Lane

Reid Underpass

Bosher Road

Wellsford Valley Road

State Highway 1

Rodney Street

Raki Lane

Ahuru Street

Astrid Lane

Tuaraki Drive

State Highway 1

School Road

Kelgary Place

Tobruk Road

Armitage Road

Monowai Street

Batten Street

Tomas Street

Legend

Links

- <450mm
- 450-600mm
- 600-1000mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Neighbourhood Centre
- Pervious
- Roads
- Residential-Large Lot Zone
- Flood Extent ED 100yr CC
- Flood Extent PC FUZ 100yr CC

Afflux PC FUZ Minus ED 100yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS
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Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-00010	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

Appendix E

State Highway 1 - Hazard Plots

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Astrid Lane

Tuaraki Drive

School Road

Legend

Private Plan Change Extent

NETWORK

Links

<450mm

450-600mm

1-2m

ARR Hazard Classification

H1

H2

H3

H4

H5

H6

Notes:

PC: Private Plan Change

PC FUZ: Private Plan Change and Future Urban Zone

ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

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Wellsford North Plan Change
Stormwater Model Results
ARR Hazard - ED 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-2001	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

Private Plan Change Extent

NETWORK

Links

<450mm

450-600mm

1-2m

ARR Hazard Classification

H1

H2

H3

H4

H5

H6

Notes:

PC: Private Plan Change

PC FUZ: Private Plan Change and Future Urban Zone

ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
ARR Hazard - PC 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-2002	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

Private Plan Change Extent

NETWORK

Links

<450mm

450-600mm

1-2m

ARR Hazard Classification

H1

H2

H3

H4

H5

H6

Notes:

PC: Private Plan Change

PC FUZ: Private Plan Change and Future Urban Zone

ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
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WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
ARR Hazard - PC FUZ 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-2003	

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State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

Private Plan Change Extent

NETWORK

Links

<450mm

450-600mm

1-2m

ARR Hazard Classification

H1

H2

H3

H4

H5

H6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE		
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
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WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
ARR Hazard - ED 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-2004	

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State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

Private Plan Change Extent

NETWORK

Links

<450mm

450-600mm

1-2m

ARR Hazard Classification

H1

H2

H3

H4

H5

H6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE		
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
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WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
ARR Hazard - PC 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-2005	

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State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

Private Plan Change Extent

NETWORK

Links

<450mm

450-600mm

1-2m

ARR Hazard Classification

H1

H2

H3

H4

H5

H6

Notes:

PC: Private Plan Change

PC FUZ: Private Plan Change and Future Urban Zone

ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
ARR Hazard - PC FUZ 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-2006	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

Appendix F

State Highway 1 – Afflux plots

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 10yr
- Flood Extent PC 10yr

Afflux PC Minus ED 10yr [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 10yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3001	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 10yr
- Flood Extent PC FUZ 10yr

Afflux PC FUZ Minus ED 10yr [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 10yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3002	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 100yr
- Flood Extent PC 100yr

Afflux PC Minus ED 100yr [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 100yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3003	

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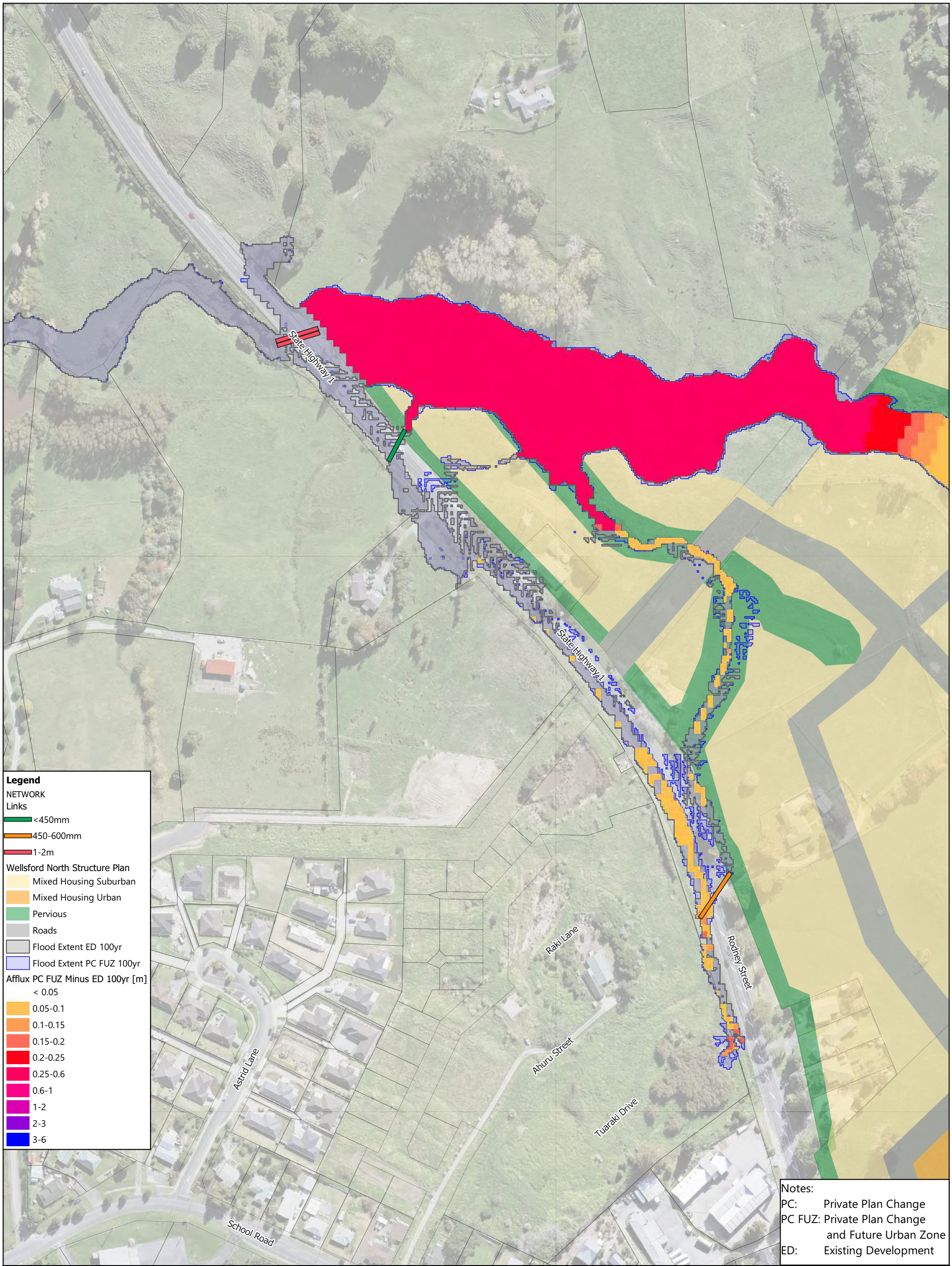

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
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EST.1970
WOODS.CO.NZ

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 100yr No CC

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3004	

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State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 2yr CC
- Flood Extent PC 2yr CC

Afflux PC Minus ED 2yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 2yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3005	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Astrid Lane

Tuaraki Drive

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 2yr CC
- Flood Extent PC FUZ 2yr CC

Afflux PC FUZ Minus ED 2yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 2yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3006	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 10yr CC
- Flood Extent PC 10yr CC

Afflux PC Minus ED 10yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3007	

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State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 10yr CC
- Flood Extent PC FUZ 10yr CC

Afflux PC FUZ Minus ED 10yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
- 2-3
- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 10yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3008	

This drawing was generated from QGISX:\Stormwater\ICM Models SW\Wellsford\Wellsford_MapResults.qgz

State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Astrid Lane

Tuaraki Drive

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 100yr CC
- Flood Extent PC 100yr CC

Afflux PC Minus ED 100yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
- 0.6-1
- 1-2
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- 3-6

Notes:
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ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS
Est.1970

WOODS.CO.NZ

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-3009	

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State Highway 1

State Highway 1

Raki Lane

Rodney Street

Ahuru Street

Tuaraki Drive

Astrid Lane

School Road

Legend

NETWORK

Links

- <450mm
- 450-600mm
- 1-2m

Wellsford North Structure Plan

- Mixed Housing Suburban
- Mixed Housing Urban
- Pervious
- Roads
- Flood Extent ED 100yr CC
- Flood Extent PC FUZ 100yr CC

Afflux PC FUZ Minus ED 100yrCC [m]

- < 0.05
- 0.05-0.1
- 0.1-0.15
- 0.15-0.2
- 0.2-0.25
- 0.25-0.6
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- 3-6

Notes:
PC: Private Plan Change
PC FUZ: Private Plan Change and Future Urban Zone
ED: Existing Development

REVISION DETAILS		INT	DATE	SURVEYED	-
1.0	FOR INFORMATION	PW	28/04/2022	DESIGNED	MH
-	-	-	-	DRAWN	SB
-	-	-	-	CHECKED	AD
-	-	-	-	APPROVED	-

Level 8/139
Quay Street
Auckland CBD

WOODS.CO.NZ

WOODS Est.1970

Wellsford North Plan Change
Stormwater Model Results
Afflux Plot - ED Vs PC FUZ 100yr CC (SWCoPv3-3.8°c)

STATUS	ISSUED FOR INFORMATION	REV
SCALE	1:5300 @ A3	1.0
COUNCIL	AUCKLAND COUNCIL	
DWG NO.	P21-395-SKT-30010	

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Appendix G

SMAF calculations

PROJECT NUMBER: P21-460
ADDRESS: Wellsford
BY: TW
DATE: 3/12/2021

SMAF 1

SMAF TYPE	1	
RAINFALL EVENT:	95th Percentile	
RAINFALL DEPTH:	41.5	mm

	CN	S (mm)	Ia (mm)	Q (mm)
Permeable	74	89.24	5	10.60
Impermeable	98	5.18	0	36.89

Total Depth	26.3	mm
Retention Depth	5.0	mm
Detention Depth	21.3	mm

Figure 6: Map of 95th percentile 24-hour rainfall event
Source: Auckland Council TR 2013/035[15]

Figure 6: Map of 95th percentile 24-hour rainfall event
Source: Auckland Council TR 2013/035[15]