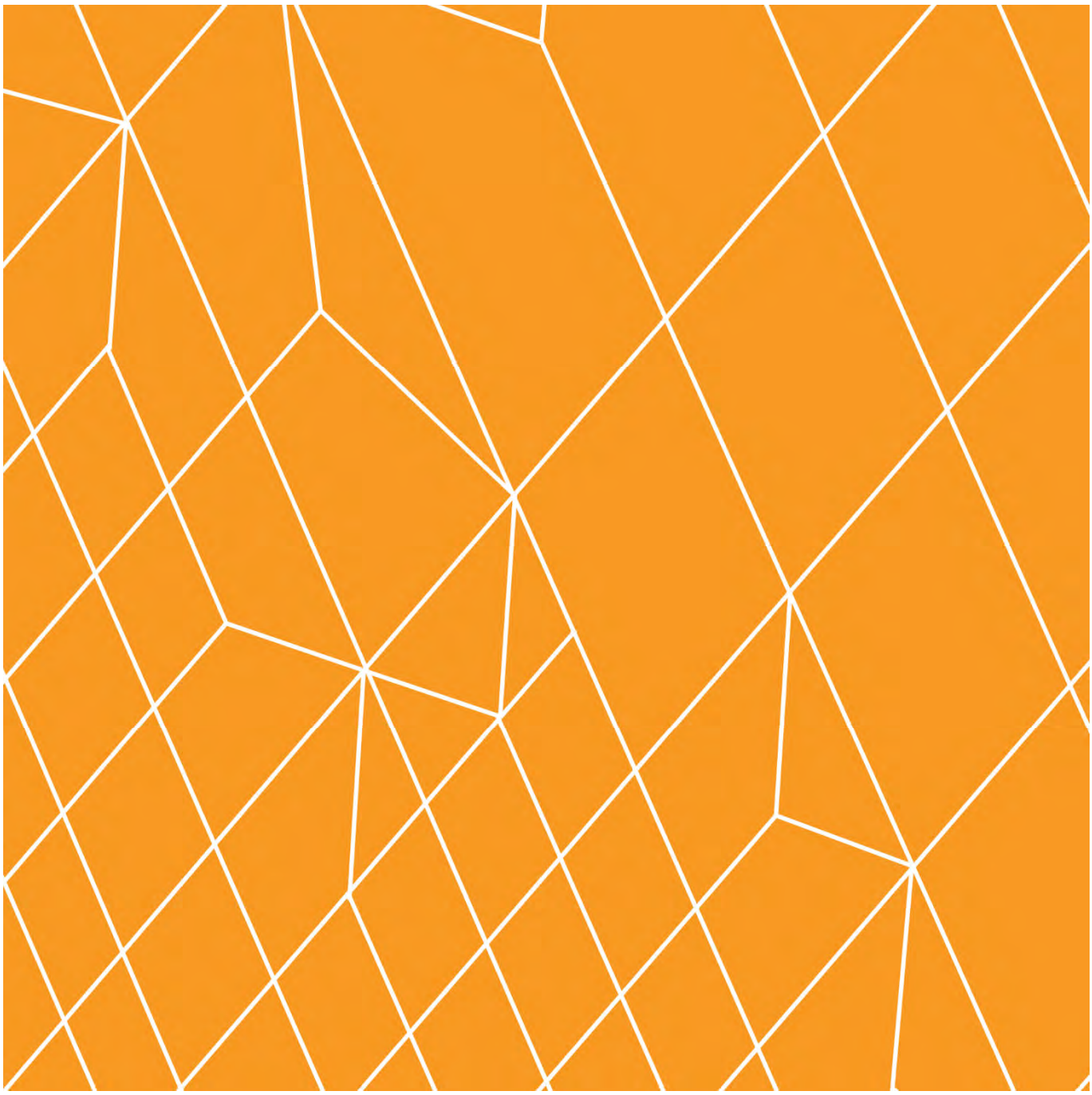
Attachment 6

Civils Assessment

B&A

Urban & Environmental



Flooding and Infrastructure Assessment to support a referral

Fast Track Application at 14 Edmonton Road, Henderson

14 Edmonton Road

Henderson

Auckland

Flooding and Infrastructure Assessment - Civil

Version 1.4
07 March 2025
149014.33

Flooding and Infrastructure Assessment to support a referral Fast Track Application at 14 Edmonton Road, Henderson.

Waitākere Courthouse

Prepared for

The Ministry of Justice

Date:	07 March 2025
Project No:	149014.33
Version No:	1.4

Report Prepared by:

s 9(2)(a)

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Reviewed By:

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Limitations

The information provided herein is for the sole use of Waitakere Design Team and Ministry of Justice and Auckland Council and is provided for the purpose of providing information on the existing overland flow path and existing public infrastructure to enable the development of Bulk & Location considerations for the proposed new development at 14 Edmonton Road, Henderson, Auckland. The findings are not intended for use by other parties and may not contain sufficient information for the purposes of other parties or other uses.

Our observations have been restricted to site information provided by our client and publicly available information from the Auckland GeoMaps GIS, Health Waters Developments, BeforeUDig utility information and topographical and utility location survey information.

Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practicing in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

Report Issue Register

DATE	VER. NO.	REASON FOR ISSUE
13/11/2024	1.0	For Information
19/11/2024	1.1	Report updated
06/12/2024	1.2	Overland flow path and wastewater sections updated
20/12/2024	1.3	Concept design
07/03/2025	1.4	Concept design update

Holmes

CONTENTS

1 GENERAL

The Ministry of Justice (MoJ) proposes to lodge a Notice of Requirements application for a referral project under the Fast Track Approvals Act 2024 for a new Justice Facility at 14 Edmonton Road in Henderson, Auckland. Given the application is for a Notice of Requirement (NOR), a specific development proposal is not known at this stage, however, the assessment is based on project assumptions outlined in the report and the concept scheme for an indicative future building footprint on the site.

Holmes NZ LP has been engaged by the Project Management Team (The Building Intelligence Group), acting on behalf of the Ministry of Justice (Client) to provide an assessment of the existing overland flow paths, public stormwater and wastewater drainage and stormwater mitigation to aid in the Bulk & Location design for the proposed new Courthouse located at 14 Edmonton Road, Henderson, Auckland.

The information provided in this report is based on a desktop study using Auckland Council GeoMaps records, LiDAR, and Flood Hazard Mapping Reports in addition to updated flood information by Healthy Waters. Topographical survey provided by Survey Worx covering existing site levels, boundary location and existing public and private services and utilities used as bases for concept drainage design levels.

1.1 Objective

This Infrastructure Report is a preliminary assessment report that summarises the results of the assessment and calculations undertaken to determine the extent of the existing major overland flow path that traverses through the middle of the subject site.

1.2 Site Description

The subject site which is located at the intersection of Edmonton Road and Alderman Drive, is legally described as Lot 1 DP 24633, largely rectangular in shape and covers an area of 4,435m². As indicated in Figure 1 below, the existing site comprises of carparking with minor vegetation (several trees within and along the boundary) and grassed berms. Notable and protected trees are located around the road frontage boundary and the northwest corner of the site and are to remain on the site.

Figure 1: *Site location (Auckland GeoMaps - December 2024)*

Two vehicle crossings provide access into the subject site off Edmonton Road and Alderman Drive, respectively. A vehicle entrance entering the car park from the northeast is noted to be from the accessway of the church.

1.3 Assumptions

Our preliminary overland flow path assessment is based on the following Information and condition assumptions:

- Site levels are based on a combination of public GIS LiDAR and topographical survey information,
- Peak flow rates are based on information provided by Auckland Council GeoMaps with verification of catchments used to generate overland flow data,
- For HydroExpress Calculations it is assumed that the existing stormwater network, including the 1500mmØ concrete line, and all permeable surfaces are fully submerged,

2 PROJECT INFORMATION

2.1 Site Investigation

Site investigation has been undertaken on the site; the latest relevant information is shown in the Table 2.1.1 below:

Table 2.1.1 Summary of relevant site investigation

Type	Provided by	Latest date / version	Notes
Topographic survey	Survey Worx	9722-705-01 / 22/10/24	Survey of existing levels and structures
Services Survey	Locator Worx	9722-1025-R / 14/10/24	Identified existing services and utilities
CCTV survey	Hydro Specialists	14/10/24	CCTV of all existing SW and WW drainage on subject site

3 EARTHWORKS & EROSION SEDIMENT CONTROLS

3.1 Earthworks

Bulk earthworks will be required to support a future development and building on site. This will include the scraping and removal of the existing asphalt layer to an approximate depth of 200mm to enable to re-profiling of the entranceways and the surface contours underneath the extent of the indicative building footprint.

Standard earthworks do not necessarily apply as much of the works will relate to the boring for piles (0.750mØ x 11.000m) in set locations along the extent of the indicative building footprint to enable to suspension of the ground floor slab over the 100-year overland flow path.

The initial material that will be removed from site due to the scrapping process will be approximately 615m³. This will consist of asphalt and the basecourse layer of the existing carpark that is situated under the future building. Each pile will require approximate 8.25m³ (0.75m x 11.0m) of material removed to allow it to be installed.

Once the piling work has been completed it is expected that scraped surface will be restored to existing levels with minor reshaping under the future building to provide a larger 'dish' that will allow the flood waters to spread over a wider area, thus decreasing depths and providing more clearance underneath the foundation beams. The grading extent of this wider dish will be confirmed in the next phase of the project design stage.

3.2 Erosion & Sediment Controls

To mitigate the effects of future earthworks at the subject site, erosion & sediment controls are to be installed in general accordance with Auckland Council: *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region* - Guidance Document 2016/05.

As the site is less than 10,000m², and the average slope is less than 5%, standard sediment control on the site will be achieved be the following methods:

- Installation, monitoring and maintenance of erosion & sediment controls like silt fences, clean water diversion bunds to ensure adequate control of any sediment transportation following removal of vegetation on site to protect the
- Installation of stabilised construction entrance to restrict the transportation of soils onto main arterials and roadways from site vehicles.

- All affected road catchpits are to be protected by filter socks and geo-cloth as needed.

We recommend that the condition requiring an Erosion & Sediment Control Plan (ESCP) to be submitted to support future development/site works is captured as a condition in the NOR Application.

4 SITE SERVICING

Auckland GeoMaps, and Figure 2, shows the subject site to be within proximity to all public services and utilities. Suitability and connection to the public drainage and water supply services will be discussed in the sections below.

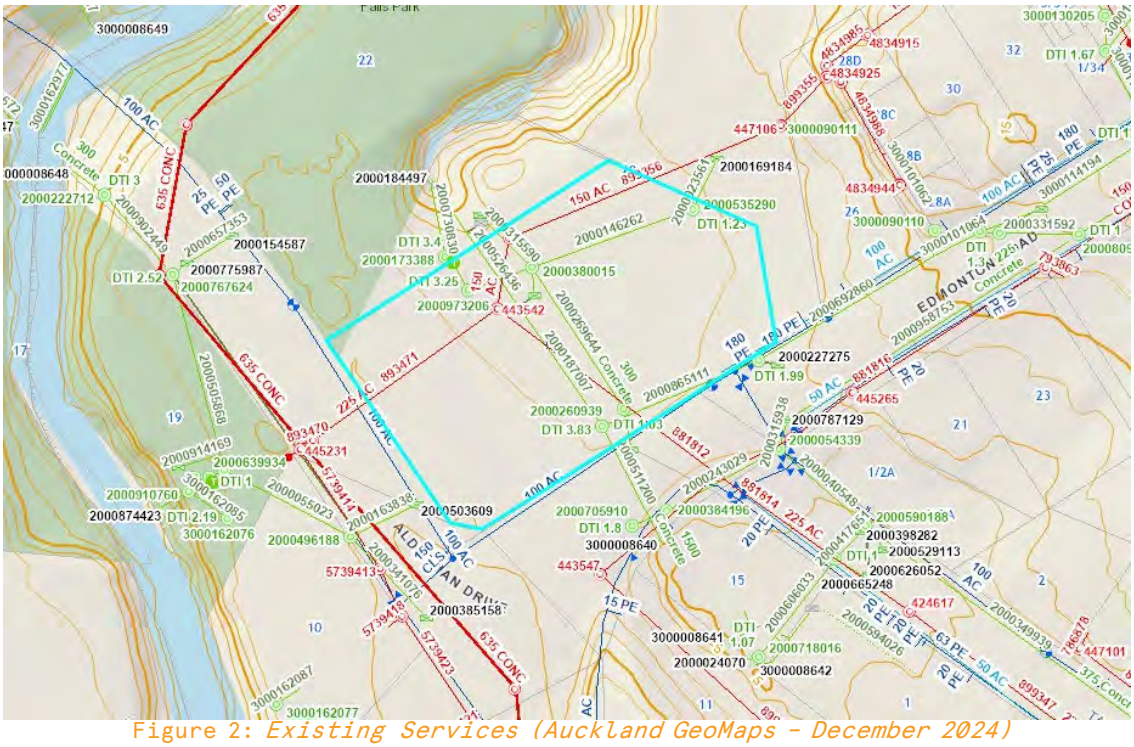


Figure 2: *Existing Services (Auckland GeoMaps - December 2024)*

4.1 Stormwater - Existing

Auckland GeoMaps records show several existing public stormwater lines traversing through the site. Most notably is the existing 1500mmØ (GIS ID: 2000187007) concrete line, servicing the upstream catchment and network within the Oratia Catchment. This runs from south to north through the centre of the site and discharges into the Waikumete Stream via a concrete outfall.

A 300mmØ concrete line (GIS ID: 2000865111) which collects run-off from Edmonton Road and the residential development upstream from the site, discharges its collected run-off directly into the 1500mmØ line via the existing Stormwater manhole (GIS ID: 2000260939).

A 225mmØ PE line (GIS ID: 2000146262), which services the car parking area for the local church to the west, is shown to discharge into a 3000mmØ chamber (GIS ID: 2000973206). CCTV has shown that this chamber I filled with a volume of water and discharges the collected run-off into a smaller diameter pipe. It is assumed that this chamber is used as detention structure to capture and slow flows prior to being treated and discharging into the Waikumete Stream via a 200mmØ concrete outfall.

A single catchpit (GIS ID: 200058545) connects to the existing manhole (GIS ID: 200085748) which discharges into the 300mmØ concrete line (GIS ID: 2000269644) and into the 3000mmØ chamber, having its run-off treated before being discharged into the Waikumete Stream via the same 200mmØ outfall. Surface run-off within the carpark is collected via several catchpits and is directed to the piped stormwater network as described above.

Due to the 100% impervious nature of the site, capacity calculations for the existing network have not been undertaken as the resultant impervious nature of the site associated with the future construction of a building on the site will not change post development. Auckland GeoMaps has indicated that the site is situated within Stormwater Management Area Flow 2 (SMAF 2) area. The provisions and mitigation requirements outlined in Chapter E10 of the AUP(OP) applying to SMAF areas, will be used to guide and inform the proposed mitigation strategy for a future development proposal/building on the site.

4.1.1 Stormwater – Proposed

The Architectural Bulk & Location Drawings by Architectus (Dated: February 2025) and indicated on the Civil Design Drawings (Appendix A), shows that the indicative building footprint covers the majority of the site. Due to the extent the existing public stormwater infrastructure within the site will be required to be relocated, realigned or removed in their entirety.

As the 1500mmØ line services the Oratia Catchment upstream of the subject site, it is proposed that this line should remain. A future building will be required to provide a 20.m wide opening providing adequate clearance between the structure's foundation piles and the existing 1500mmØ stormwater line. It is also the intention to utilise the foundation piles of the future building rather than having to design and install specific pipe bridging piles.

Due to the extent of the indicative building footprint, it is highly likely that stormwater lines will be required to be realigned outside of the footprint. This includes the existing 300mmØ line, which runs along the same alignment as the 1500mmØ line, that will need to be removed as part of the building works. The existing 225mmØ ID PE line and its associated manholes will also be removed, and a new outfall be installed to service the neighbouring property.

Details of private drainage and above ground detention tank requirements will be captured at a later stage.

Due to the reduction in surface run-off being discharged into the outfalls (resulting from redirecting the neighbouring stormwater flows) and proposed mitigation, it is considered that the capacity of the existing outfalls will be improved, and the effects of stormwater runoff can be appropriately managed on the site, such that the effects can be considered to be less than minor.

Please refer to drawing C40-02 for proposed drainage plan and design levels and CSK-001 for proposed demolition of services in Appendix A.

4.1.2 Stormwater Mitigation

As per Auckland GeoMaps, refer Figure 3, the subject site is shown to located in a Stormwater Management Area Flow 2 (SMAF 2) zone. The stormwater mitigation approach for a future building on the site will be guided by the provisions and assessment criteria outlined in Chapter E10 of the AUP(OP) applying to SMAF areas.

The architectural bulk & location drawings provided by Architectus (Dated: February 2025) and, indicated on the Civil Design Drawing C40-02 (Appendix A), shows that the indicative building footprint is approximately 3,148m², which is approximately 70.9% of the subject site.

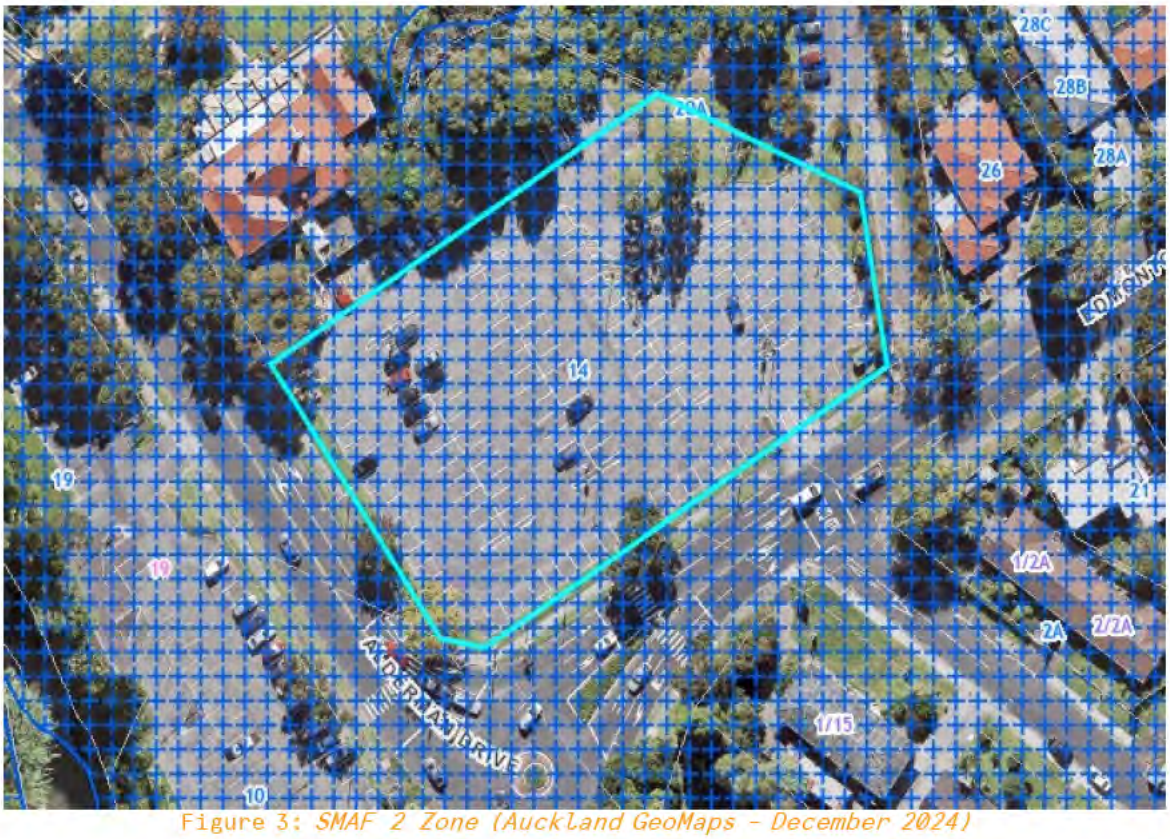


Figure 3: *SMAF 2 Zone (Auckland GeoMaps - December 2024)*

Using the E10 mitigation requirements as a design guide and applying to this site, considering the redeveloped area is greater than 50%, the calculated mitigation volume required for this site is approximately 69.22m³.

A summary of the calculation results is summarised in Table 4.2.2 below.

Table 4.1.2.1 Summary of SMAF 2 mitigation calculations

SMAF ZONE	Total Mitigation Volume (m³)	Detention (m³)	Retention (m³)	Orifice Ø (mm)
2	69.22	51.86	17.36	20

Due to the extent of the indicative building footprint required to meet the operational and functional requirements of a Justice Facility on the site, underground tanks are not a viable option due to the space requirements and location of all other required services.

Based on the indicative volumes calculated above, approximately 3x 25,000L above ground tanks would be an appropriate solution to capture roof runoff and mitigate the effects of stormwater on the site. This set up will allow for the capture of up to 75,000L of roof run-off and ultimately discharge into the Waikumete Stream via the existing 200mmØ outfall via controlled release.

As noted in section 4.1.1, details of the above ground tanks shall be captured at a later stage. Concept mitigation calculations have been included in Appendix B of this report.

4.2 Wastewater - existing

Auckland GeoMaps records, refer Figure 2, shows two 225mmØ, two 150mmØ AC public wastewater lines and two public 1050mmØ wastewater manholes located within the subject site. These existing lines collect wastewater run-off from the residential areas to the east and south of the subject site and discharge directly into the 635mmØ concrete main trunk line located within Alderman Drive.

Review of CCTV has confirmed that the existing network is constructed at shallow grades, a result of the large stormwater line that traverses through the middle of the site. As such it is noted that a majority of the network is submerged, which does affect its operational capacity.

Preliminary calculations, summarized in Table 4.2.1 below, have been conducted and determined that the existing flows generated for the upstream catchment situated to the south of the subject site have been calculated to be 19.21 l/s (PWWF). Flows generated from the eastern residential catchment were calculated to 1.39 l/s. This gives a combined flow rate of 20.61 l/s.

As the existing site is a car park, with no toilet facilities available, the site currently does not generate any wastewater flows.

Table 4.2.1 Summary of existing wastewater capacity calculations

Pipe Description	Catchment Flows (Q.m³/s)	Pipe Capacity (Q.m³/s)	Capacity Check
Ex. 225 AC Pipe (GIS ID: 893471) (Total Catchment)	20.61	19.48	NOT OK
Ex. 150 AC Pipe (GIS ID: 899356) (eastern catchment)	1.39	14.26	OK
Ex. 150 AC Pipe (GIS ID: 877837) (eastern catchment)	1.39	19.52	OK
Ex. 225 AC Pipe (GIS ID: 881812) (southern catchment)	19.21	31.18	OK

As indicated in the table above, the existing wastewater line (GIS ID: 893471) which services the total catchment, has been found to be under capacity by 1.13 l/s which is due to its shallow (0.16%) grade.

4.2.1 Wastewater – proposed

The Architectural Bulk & Location Drawings by Architectus (Dated: February 2025) and indicated on the Civil Design Drawing C40-02 (Appendix A), shows that the existing public wastewater network be re-routed around the indicative building footprint.

Based on the scheme provided, a future courthouse building can be appropriately serviced by wastewater, including the installation of new public 225mmØ uPVC lines and four new public 1050mmØ manholes around the indicative building footprint. As per drawing C40-02, the redirection of services for the southern catchment will require that drainage works be done within the Edmonton Steet Carriageway.

Consultation with the relevant stakeholders, including Auckland Transport, Auckland Council and Watercare Services will be undertaken to support a future development proposal.

Redirection of services for the eastern catchment will remain within the subject site and thus will only require approval from Auckland Council and Watercare Services. It is proposed to maintain the existing connection to the 635mmØ trunk main and have the new lines discharge into the existing 225mmØ via a new 1050mmØ manhole. It is recommended that all works within the berm and road reserve of Edmonton Road must only be undertaken once all services within the berm have been located and marked out.

A capacity assessment on the proposed public wastewater drainage layout was completed to ensure that serviceability to the existing residence is maintained. The results of the capacity assessment are summarised in Table 4.2.1.1 below.

Table 4.2.1.1 Summary of proposed wastewater capacity calculations

Pipe Description	Pipe flow (Q.m³/s)	Velocity (m/s)	Pipe Design Grade (%)	Pipe Length (m)
Proposed 225 uPVC. WWP-1 (east)	42.24	1.062	0.65	41.57
Proposed 225 uPVC. WWP-2 (east)	49.36	1.241	0.89	13.30
Proposed 225 uPVC. WWP-3 (south)	27.79	0.699	0.28	37.70
Proposed 225 uPVC. WWP-4 (south)	28.74	0.723	0.30	44.57

To determine an increase in site flows, and as no definition within the Watercare Code of Practice relates to Courthouses, it was concluded that the activity should be classed as commercial in line with Table 5.1.3. to determine a design population and average daily flows per person. Based on the total floor area, it was calculated that the proposed development shall have a design population of 389 people. At 65 l/day, the Peak Wet Weather Flow rate has been calculated to be 1.46 l/s.

This increase in flows increases the total catchment flow rate discharging into the existing 225mmØ AC line to 22.07 l/s and thus increases the shortfall in capacity for this line to 2.59 l/s Discussions with Watercare Servies Limited will also be required to determine if the proposed gradients and capacity constraints are acceptable.

In terms of civil engineering is it concluded that the future courthouse building on the site can be appropriately serviced with respect to wastewater.

For capacity calculations, please refer to Appendix B and refer to drawing C40-02 for proposed drainage plan and design levels and CSK-001 for proposed demolition of services in Appendix A.

4.3 Water Supply - existing

Auckland GeoMaps records have shown that the subject site is within proximity of existing public water reticulation and able to be serviced by the local network. The site is also located within 135m of 4 fire hydrants and thus it is considered that the site can be serviced for a sprinkler system under FW2 flows. Council may require hydrant testing to be carried out as part of the overall assessment on the network to confirm residual pressure within the network.

A new water meter and connection for domestic use is proposed to be installed on the existing public water main in Alderman Drive. It is proposed that a new 100mmØ line be installed on Edmonton Road to service any future sprinkler system for the future courthouse. Location of these services are to be finalised and coordinated in conjunction with Building Services during the Preliminary Design phase.

In terms of civil engineering is it concluded that the future courthouse building on the site can be appropriately serviced with respect to water supply.

4.4 Utilities

Auckland GeoMaps records and survey information have shown that the subject site is within proximity of existing power and telecommunication utility services and will be able to be serviced by the existing network. It is noted that there are several telecommunication and power cables located within the subject site.

These services are to be removed and capped at the boundary where not required. It is proposed that a new Telecommunication toby box be installed near the new water meter within Alderman Drive to provide telecommunication services to the future courthouse building. All electrical cables servicing the existing streetlights within the car park are to be removed and redirected as required.

In terms of civil engineering is it concluded that the future courthouse building on the site can be appropriately serviced with respect to existing utility services. All works are to be completed in accordance with the NZBC and the utility providers specifications.

5 FLOODING AND OVERLAND FLOW PATH ASSESSMENT

5.1 General

A review of Auckland GeoMaps, refer Figure 4, shows the presence of a major overland flow path which traverses through the subject site, following a similar path to the existing public 1500mmØ concrete line, and discharges into the Waikumete Stream at the northern boundary. A minor overland flow path, which has a catchment of less than 4,000m² and originates on the site, is shown to discharge into the major overland flow path.

A review of the current available flood information on Auckland GeoMaps and subsequent report is based on 2016 LiDAR information and provide peak flow rates for both the existing (current) and predicted (future) floodplains and associated overland flow paths for the 10-year and 100-year storm event. Updated information received from Healthy Waters showed that a new flood model was constructed in 2022. This new information indicated that the predicted a greater flood extent due to the additional flood waters coming from Alderman Drive.

Healthy Waters confirmed that the 2022 flow data are to be used to determine minimum FFL requirements. It is understood that a separate flood model will be provided (done by others) to confirm and validate 2022 flood data.

Our preliminary review of the 2022 flow rate across Edmonton Road showed that it corresponded with the 2016 1:100-year peak flow (climate adjusted) of 10.00m³/s. A summary of the current and predicted peak flow rates for 2016 and 2022 are outlined in Table 4.1 below

s 9(2)(ba)(i)

It must be noted that that for the current flow rates there has been no adjustment for climate change made. For both the 2016 & 2022 predicted peak flow rates a climate change of 3.8° has been applied.

As indicated in Figure 4 the assessment will be based on taking several sections along and across the length of the overland flow path to determine its width, depth and velocity using the provided 2016 peak flow rates (as per Auckland GeoMaps) for the predicted (3.8° climate change) 100-year storm event.

Figure 4: *Overland Flow and Flooding (Auckland GeoMaps - December 2024)*

The results of the assessment will be discussed in the following sections below.

5.2 Overland Flow Assessment (2016)

5.2.1 Assessment criteria

The assessment of the existing 100-year major overland flow path was completed using the outlined storm event peak flow rates (adjusted for 3.8° climate change), being taken directly from Auckland GeoMaps and assigned to three cross- section as indicted in Figure 4. These peak flow rates are outlined in the table below.

Table 5.2.1.1 - Predicted 100-year Peak Flow rates (2016)

s 9(2)(ba)(i)

In determining the extent of the major overland flow path, it is assumed that the existing public network is fully submerged, and any permeable surfaces (grassed and vegetated areas) are fully saturated.

5.2.2 Assessment results

Using Hydro Express, Civil 3D assessment tool, sections were cut along and across the length of the major overland flow path located within the subject site. These sections are based on the existing topographical data, which was then imported into Hydro Express.

Using the peak flow rates provided in Table 4.2.1.1 the width, depth and velocity of the 100-year overland flow path was determined. The results from that assessment have been summarised in Table 5.2.1.1 below.

s 9(2)(ba)(i)

Based on the assessment it has been determined that the 100-year overland flow path has an average width of s 9(2)(ba)(i) an average depth of s 9(2)(ba)(i), an average velocity of s 9(2)(ba)(i) and covers an approximate area of 1,489m² of the subject site. The calculations have also confirmed the ponding of flood waters (due to the topographical nature of the car park) along the northern boundary to a depth of s 9(2)(ba)(i) before spilling over the embankment and discharging in the Waikumete Stream.

Please refer to Appendix C for HydroExpress sections.

5.3 Overland Flow Assessment (2022)

5.3.1 Assessment results

Using Hydro Express, Civil 3D assessment tool, the same sections that were used in the 2016 data assessment were used to determine that extent and depth of the 100-year flows coming from Edmonton Road, which is 10.00m³ (Section 3 – marked) as per Figure 5 below.

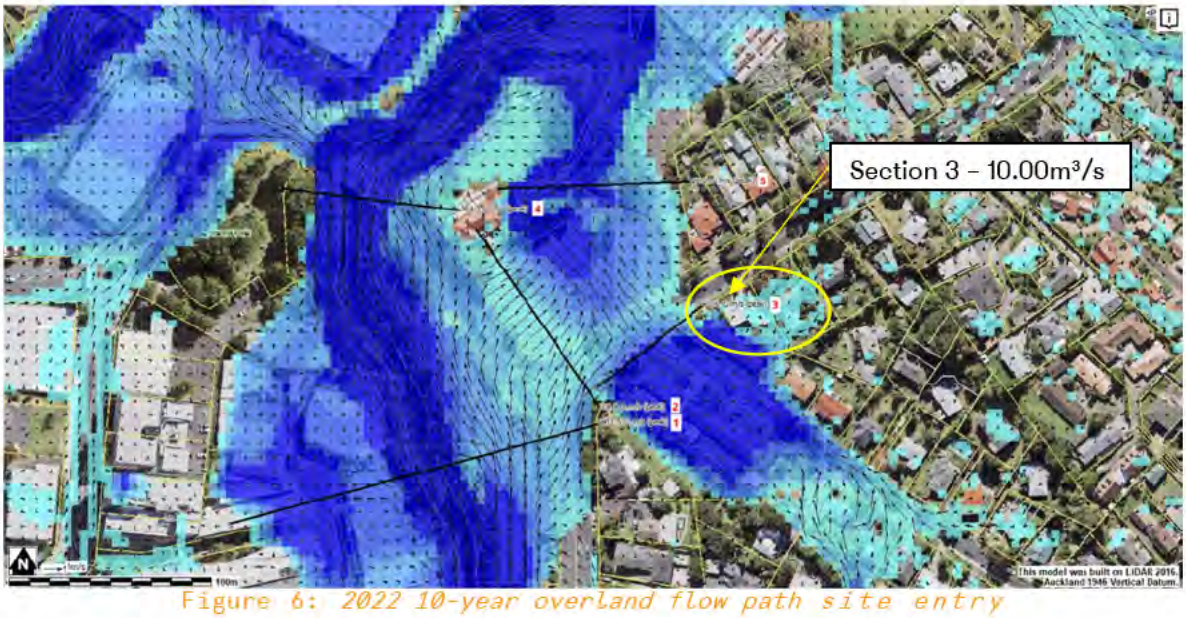


Figure 6: *2022 10-year overland flow path site entry*

It was noted that the result from the assessment provided an error and that investigation into its cause showed that the minimum peak flow rate required to overtop the kerb was more than 10.00m³/s. It was therefore determined that the 2016 Peak Flow rates would be applicable to be used to simulate 2022 overland flow path extend and flows.

To determine the extent of the overland flow path under the extent of the indicative building footprint, a plan and section drawing was created. The resultant plan shows then the area most affected by the overland flow path is mostly restricted to the centre of the site. The sections allowed for the proposed FFL to be calculated, providing 500mm freeboard as well providing additional clearances under the foundation beams. Drawing C90-01 and Section Drawing C40-03 is included in Appendix A for reference.

The 2022 100-year flood data provided by Healthy Waters is included in Appendix D of this report for reference on the discussed predicted peak flow rates.

5.3.2 Overland flow considerations

To manage the impact of the future courthouse on the existing overland flow path it has been proposed that the entire foundation slab be elevated to be situated above the calculated water level of the 2016/2022 100-year overland flow path. This suspended foundation will have minimal obstructions within the flow path extent and will provide a clear path for the water to enter and exit the site and therefore maintain the current flood situation.

Based on preliminary structural design, the western end of the future building slab will tie into the existing ground levels achieving a minimum 150mm clearance as required by the NZBC. The slab will then extend towards the eastern part of the subject site with 750mmØ concrete piles suspending the foundation a minimum off s 9(2)(ba)(i) above the overland flow path (across its entire extent).

The clearance between the bottom of the concrete beam and the top of the overland flow path will vary from the front of the future building to the rear. A clearance of s 9(2)(ba)(i) will be achieved at the front of the building and increasing to s 9(2)(ba)(i) at the rear of the future building.

As discussed in the above section, a minimum Finished Floor Level (FFL) of FFL of s 9(2)(ba)(i) has been proposed for the ground floor of a future courthouse building, which is situated well above top of the water level. This FFL will ensure that the occupants will be kept well above the flood waters in the event of a heavy rain event. Safe egress of the occupants of the building will be able to be done via the west of the future courthouse building as this area is not impacted by the overland flow path or localised ponding.

To ensure these areas stay outside of the flooding, it is proposed that existing ground levels (as best as practicable) be maintained. Little to no change to the entry or exit point levels are to occur. It is recommended that signals and telemetry alarms system be incorporated into the future courthouse building construction to provide an early warning system for the building occupants. This system will enable the occupants and detainees to be safely escorted out and away from the future building prior to being inundated by flood waters.

It is our understanding that a Flood model shall be provided to Auckland Council which will shows that impact of the 2022 data on the subject site. The proposed FFL shall then be reviewed and revised as required. Subject to the outcome of the flood model, there are several possible design considerations that can be explored to further improve and provide additional protection to the occupants and the future building.

This can include the possibility of increasing the berm height at the intersection and along Alderman Drive frontage to manage and divert any flood waters around the site and into the Waikumete Stream. The possibility of providing a second stream culvert (installation of another 1500mmØ concrete line) along the same alignment to increase capacity of the culvert may also be a viable option.

5.3.3 Flood risk and climate change adaptability

To further enhance climate change adaptation and resilience, the future courthouse building has been designed to mitigate and reduce flood and natural hazard risks within its own site but also ensure that downstream properties are not adversely affected.

The proposed elevated foundation slab, positioned above the 2016/2022 100-year overland flow path water level, plays a critical role in adapting to increasing rainfall intensities and potential climate change-driven flood events. The provision of a suspended foundation is that any obstructions within an overland flow path is kept to an absolute minimum, and in doing so ensures unimpeded water flow, preserving the natural hydrological function of the site and reducing the likelihood of localised ponding or flood displacement to neighbouring properties.

Additionally, the use of 750mmØ concrete piles to elevate the foundation slab will not only provide structural integrity but also create a clearance buffer between foundation beams of the future courthouse building and potential floodwaters. The elevation strategy discussed within this report accommodates the projected 3.8° climate change impacts by allowing for increased flood capacity while maintaining accessibility and overall structural safety.

The design's resilience is further reinforced through the proposed Finished Floor Level (FFL) of 8.10mRL, which is situated well above the preliminary modelled flood levels. This measure ensures the safety of occupants, providing adequate freeboard to account for extreme weather events while aligning with best practices for flood resilience in building design.

To further mitigate flood risk, the proposal considers maintaining existing ground levels wherever feasible to avoid altering natural drainage patterns. The incorporation of signals and telemetry alarm systems will provide an early warning mechanism, enhancing response measures for building occupants in case of severe flood events.

Additionally, subject to further flood modelling, supplementary design enhancements could be explored to further mitigate potential flood risks. These could include increasing the berm height at the intersection and along the Alderman Drive frontage to help manage and divert excess floodwaters towards the Waikumete Stream. Another possible mitigation strategy is the installation of a secondary 1500mmØ culvert along the same alignment to enhance the floodwater conveyance capacity of the stream, thereby reducing the potential for backflow or overflow impacts on the site.

Through these measures, the courthouse development is proactively addressing climate change adaptation while ensuring flood resilience, hazard risk reduction, and the protection of both the site and surrounding properties from future extreme weather events.

6 SUMMARY

The Ministry of Justice (MoJ) proposes to lodge a Notice of Requirements application for a referral project under the Fast Track Approvals Act 2024 for a new Justice Facility at 14 Edmonton Road in Henderson, Auckland. Given the application is for a Notice of Requirement (NOR), a specific development proposal is not known at this stage, however, the assessment is based on project assumptions outlined in the report and the concept scheme for an indicative future building footprint on the site.

Holmes NZ LP have been engaged to assess the existing overland flow paths, stormwater and wastewater realignment and mitigation requirements for the site located at 14 Edmonton Road, Henderson, Auckland, to support the design of a proposed courthouse.

The subject site covers an area 4,435m² and includes car parking, minor vegetation, and grassed berms, with vehicle access from Edmonton Road and Alderman Drive. A major overland flow path traverses through the middle of the subject site, with ponding observed at the northern boundary before discharging into the Waikumete Stream. A minor flow path along the northern boundary does not affect the indicative location of future building platforms. The assessment was conducted using a combination of LiDAR data, Hydro Express modelling, and topographical surveys.

Earthworks will largely consist of scraping and removing of existing asphalt and the basecourse layer of the existing carpark and the drilling for the piles to allow for the suspended ground floor. Minor reshaping of the carpark to allow for a wider dish once the piles have been completed will allow for flood waters to spread across a wider area. This will reduce the overall depth of the flood waters as well as improve the clearance between the flood waters and the underside of the foundation beams.

Standard erosion and sediment controls (ESC) in accordance with the Auckland Council: *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region* - Guidance Document 2016/05. A ESCP will need to be provided to Auckland Council prior t the start of construction.

Site servicing for the indicative building footprint for a future Justice Facility has been reviewed and assessed with respect to existing stormwater., with existing stormwater, wastewater, and water supply infrastructure evaluated for capacity and alignment. Stormwater mitigation measures include installing 70m³ of Stormwater Mitigation in the form of Detention and Retention Tanks in general accordance with the SMAF 2 requirements set out in Section E10 of the Unitary Plan. Most of the existing public stormwater drainage pipes within the site are to be removed and/or realigned due to the extent and positioning of the proposed Courthouse.

Wastewater pipes constructed of asbestos cement require realignment to avoid structural risks. The position and extent of the indicative building footprint for a future courthouse has meant that the existing public wastewater lines within the site be removed, and new public lines installed around the indicative building footprint. The site is within proximity to power and telecommunications services, and fire safety requirements are supported by nearby hydrants. The suspended foundation design minimises disruptions and ensures the site remains functional while accommodating the courthouse.

In terms of civil engineering is it concluded that the future courthouse building on the site can be appropriately serviced with respect to wastewater. Stormwater and existing public utility services.

Based on the overland flow path assessment a suspended slab is proposed to allow for flood waters to freely move underneath the proposed Courthouse. The proposed minimum FFL of s 9(2)(ba)(i) has been proposed by to the Architect. Safe egress will be able to be done via the west of the future building as this area is not impacted by the overland flow path or localised ponding.

The 2022 100-year peak flow rate is in-line with the 2016 100-year peak flow rates. Overland flow path considerations have only used the data flows coming from Edmonton Road as it has been noted that the flows from Alderman Drive can be excluded. It is our understanding that a flood model will be provided to Auckland Council which shows impact of 2022 flood data on the subject site. The proposed FFL with the be reviewed and revised as required.

The future courthouse has been designed to enhance climate change adaptation and resilience by mitigating flood and natural hazard risks while ensuring downstream properties remain unaffected.

The elevated foundation slab, positioned above the 100-year overland flow path, minimises obstructions within the 100-year flow path to maintain unimpeded water movement. This approach preserves the site's natural hydrology, reducing localized ponding and flood displacement risks. The foundation is supported by 750mmØ concrete piles, providing both structural integrity and a clearance buffer to accommodate increased flood capacity due to projected climate change impacts.

The proposed Finished Floor Level (FFL) of s 9(2)(ba)(i) is set well above modelled flood levels, ensuring occupant safety by maintaining adequate freeboard for extreme weather events. To further mitigate flood risks, the design maintains existing ground levels where possible, preventing disruptions to natural drainage. A telemetry alarm system is proposed to provide early warnings and enhance emergency response.

Additional flood mitigation strategies, subject to further modelling, include raising the berm height along Alderman Drive to redirect excess floodwaters into the Waikumete Stream. Installing a secondary 1500mmØ culvert may also be considered to improve stream floodwater conveyance and reduce potential backflow impacts.

These measures ensure the courthouse is resilient to climate change while safeguarding both the site and surrounding properties from future extreme weather events

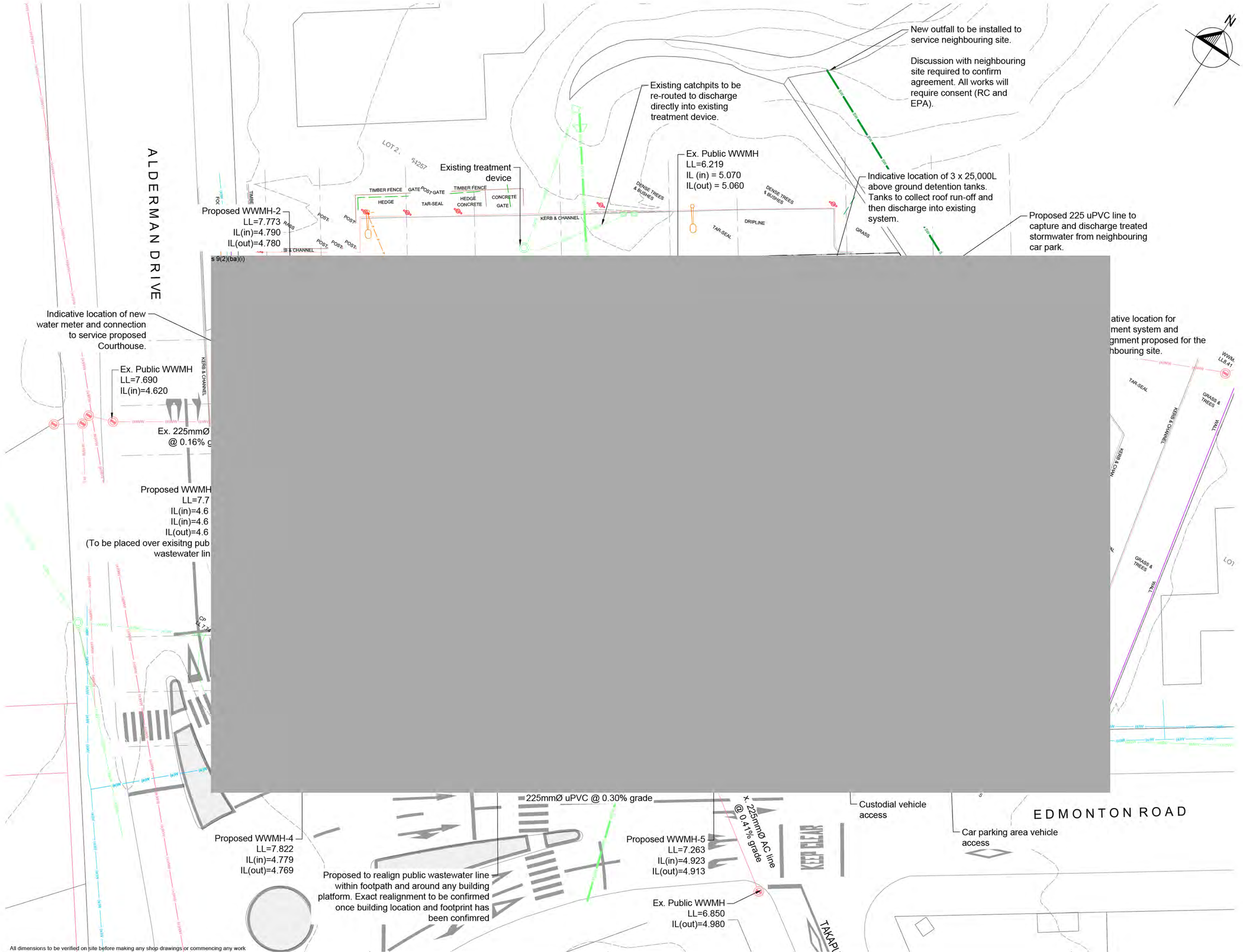
Based on the assessment undertaken it is concluded that any potential adverse effects with respect to flooding will be appropriately managed through design parameters (i.e. minimum finished floor level), such that effects are considered to be less than minor.

Appendix A: Civil Design Drawings

WAITAKERE COURTHOUSE
14 EDMONTON ROAD
HENDERSON, AUCKLAND

Holmes

Project 149014.33



notes:

1. Refer to drawing C00-01 for project notes.
2. This drawing set contains colour. All reproduction to be in colour.
3. Above ground detention tanks location indicatively shown.
4. Downpipe locations to be confirmed by Architect.
5. Wastewater and stormwater demolition plans as per CSK-001.
6. All re-routing of drainage is for concept design only.

legend:

- Site boundary (existing)
- Adjacent site boundary (existing)
- Wastewater MH (existing)
- Wastewater MH (proposed)
- Stormwater MH (existing)
- Stormwater sump (existing)
- Stormwater MH (proposed)
- SW Standard sump (proposed)
- Water valve (existing)
- Fire hydrant (existing)
- Water meter (existing)
- Water valve (proposed)
- Fire hydrant (proposed)
- Water meter (proposed)
- Fibre Box (existing)
- Telecommunications box (existing)
- Street light (existing)
- Electrical power box (existing)
- Stormwater pipe (existing)
- Wastewater pipe (existing)
- Water pipe (existing)
- Duct (existing)
- Fibre optic (existing)
- Gas (existing)
- Power (existing)
- Telecommunications (existing)
- Stormwater pipe (proposed)
- Wastewater pipe (proposed)
- Water pipe (proposed)
- Duct (proposed)
- Fibre optic (proposed)
- Gas (proposed by others)
- Power (proposed)
- Building footprint (proposed)
- Access door

All dimensions to be verified on site before making any shop drawings or commencing any work

Rev	Date	Appd	Reason
B	28/02/2025	CG	Concept Design

Consultants

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Christchurch 8442
New Zealand
holmesanz.com
T: +64 3 366 3366

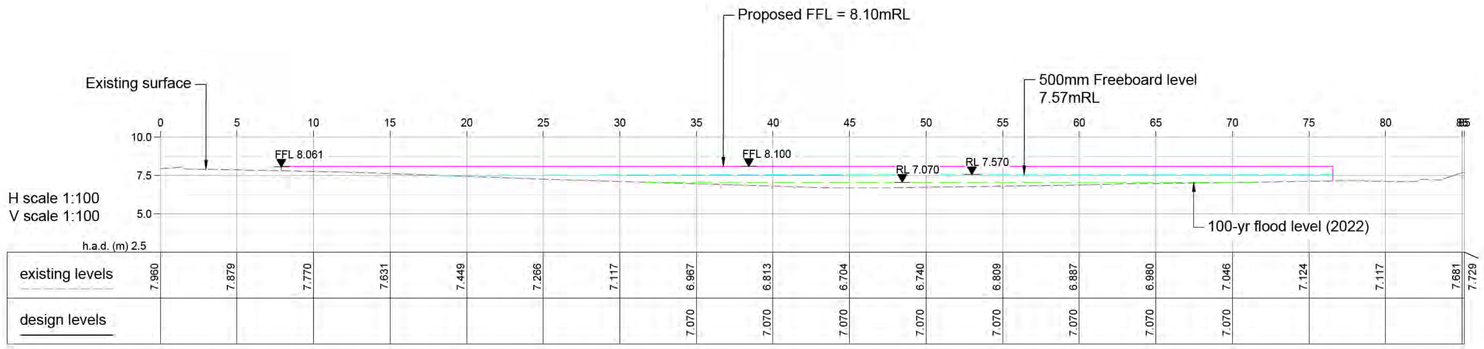
WAITAKERE COURTHOUSE
14 EDMONTON ROAD
HENDERSON, AUCKLAND

Sheet Title: proposed drainage and utility services layout plan

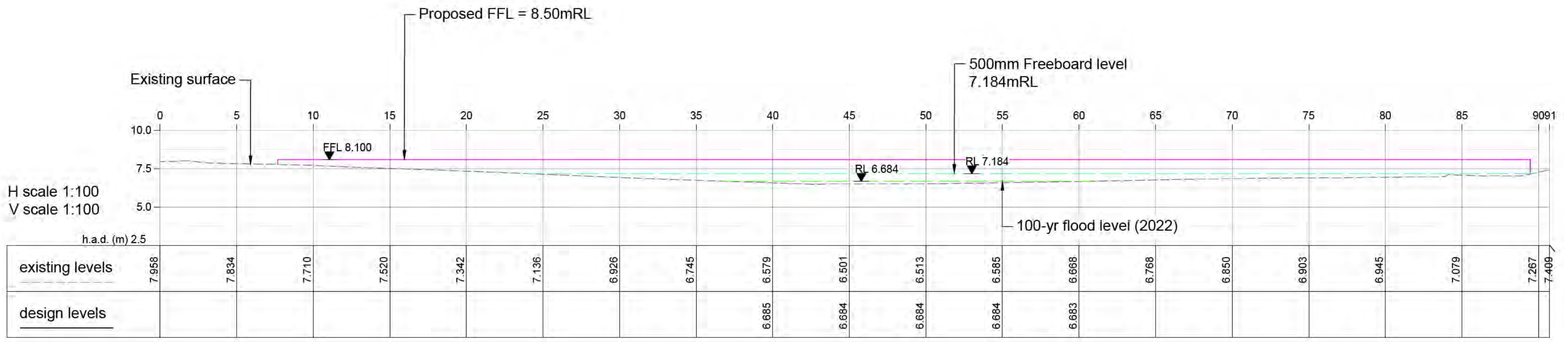
Drawn: JP | Scale: 1:200 (at A1)

Filename: HC_149014.33 - M-P - Concept Design.dwg

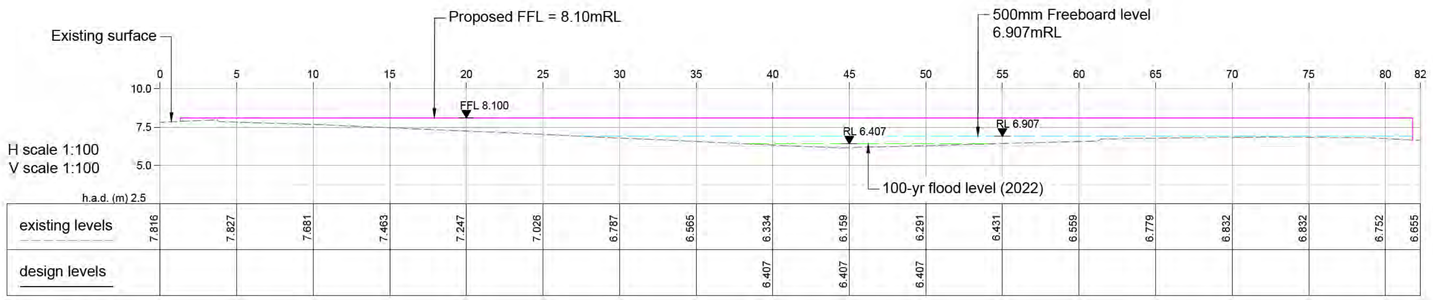
Job No: 149014.33 | Sheet No: C40-02 | Rev: B



A C90-01 Building Frontage Section - Edmonton Road
1: 200



B C90-01 Central Building Extent Section
1: 200



C C90-01 Back of Building - Stream Side
1: 200

notes:

1. Refer to drawing C00-01 for project notes.
2. This drawing set contains colour. All reproduction to be in colour.
3. This drawing is provided for information purposes only to enable Bulk & Location.
4. Topographical information provided b Survey Worx..
5. Overland flow path locations as per Auckland GeoMaps (November 2024).
6. Peak flow rate as per Auckland Council GeoMaps records 1:100 year event with 3.8° climate change.
7. Flood information base don 2022 region wide flood model provided by Healthy Waters

legend:

- Building FFL
- 500mm freeboard
- 50 yr top of flood level (2022)

All dimensions to be verified on site before making any shop drawings or commencing any work

Consultants

Rev	Date	Appd	Reason
A	28/01/2025	JP	Concept Design

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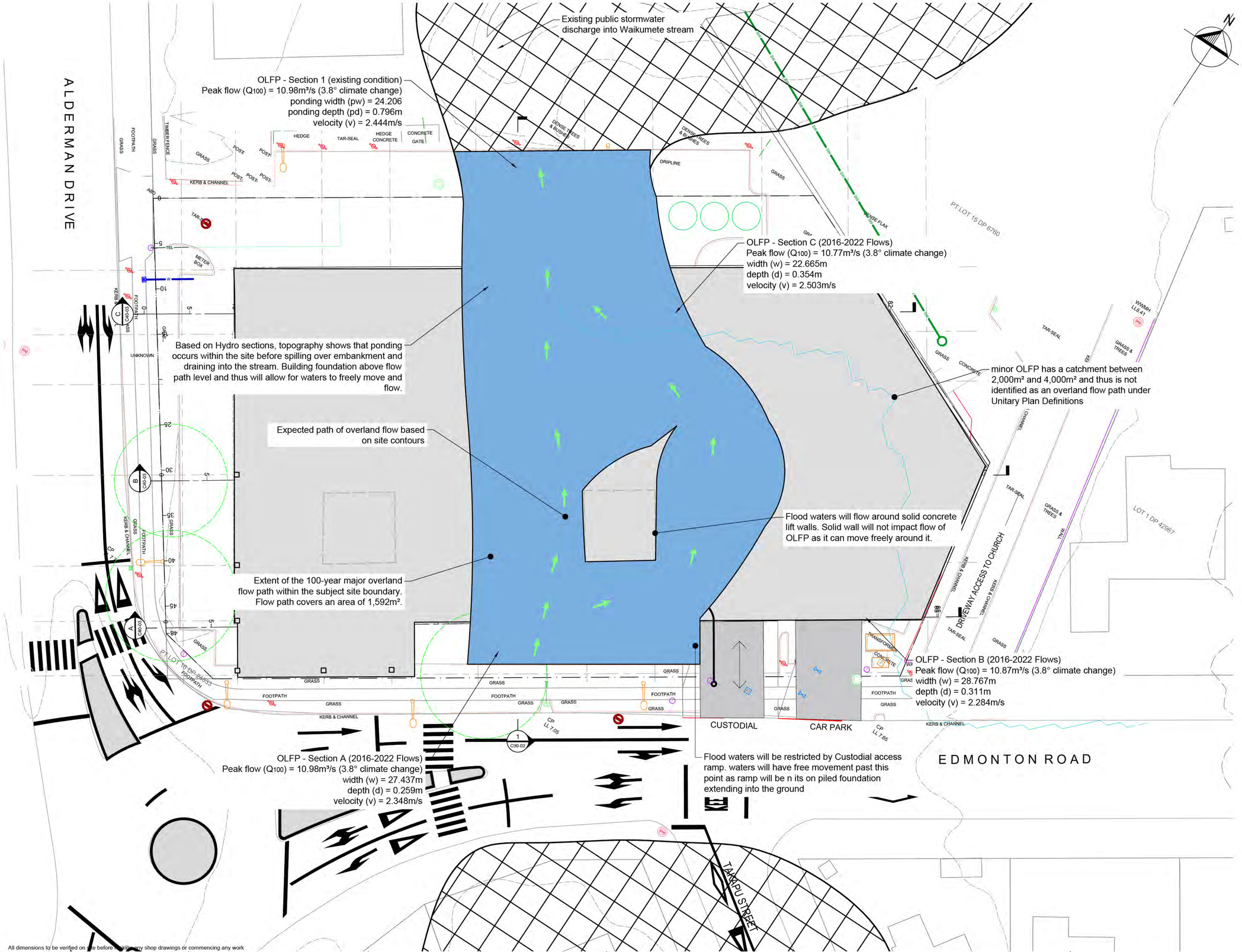
WAITAKERE COURTHOUSE
14 EDMONTON ROAD
HENDERSON, AUCKLAND

Sheet Title
50 yr Flood depth - FFL check Sections
2022 AC Information

Drawn JP Scale 1:200 (A1) (at A1)
Filename HC_149014.33 - M-P - Concept Design.dwg
Job No 149014.33 Sheet No C40-03 Rev A



notes:

1. Refer to drawing C00-01 for project notes.
2. This drawing set contains colour. All reproduction to be in colour.
3. This drawing is provided for information purposes only to enable Bulk & Location.
4. Topographical information provided b Survey Worx.
5. Overland flow path locations as per Auckland GeoMaps (December 2024).
6. Peak flow rate as per Auckland Council GeoMaps records 1:100 year event with 3.8° climate change.
7. Refer to HydroExpress Sections for OLFP sections attached to the Infrastructure Report.

legend:

- Contours major (existing)
- Contours minor (existing)
- Site boundary (existing)
- Major overland flow path
- Minor overland flow path
- Direction of flow
- Overland flow path extent (existing)
- Flood plain (as per GeoMaps)
- Solid concrete walls (extend to existing ground)

All dimensions to be verified on site before fabrication, any shop drawings or commencing any work

Rev	Date	Appd	Reason
B	28/02/2025	CG	Concept Design

Consultants

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WAITAKERE COURTHOUSE
14 EDMONTON ROAD
HENDERSON, AUCKLAND

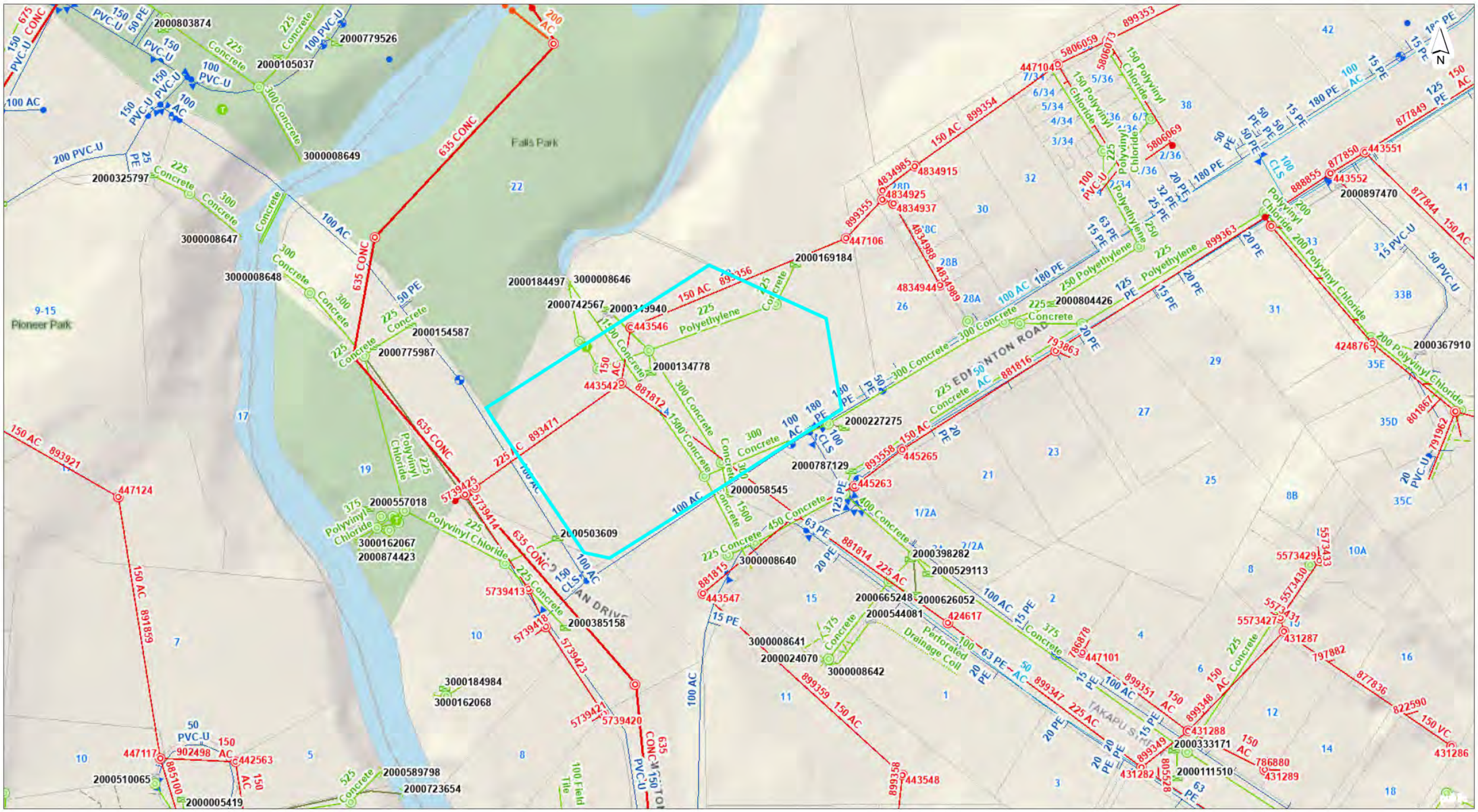
Sheet Title: flooding and overland flow path extent plan

Drawn: JP | Scale: 1:200 (A1) (at A1)

Filename: HC_149014.33 - M-P - Concept Design.dwg

Job No	Sheet No	Rev
149014.33	C90-01	B

File: \\all.offices.holmesgroup.com\data\HC\CAD\149014.33\149014.33_Waitakere Courthouse\HC_149014.33 - M-P - Concept Design.dwg Date Plotted: 28/02/2025 11:25:39 am by Jean Pelserbrige



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Height datum: Auckland 1946.

Edmonton Road - Demolition Plan

0 10 20 30
Meters

Scale @ A3
= 1:1,000

Date Printed:
20/12/2024

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Appendix B: SMAF & Capacity Calculations

Holmes CALCULATION SHEET	JOB NAME:	Waitakere Courthouse	PAGE No:
	SECTION:	SMAF DETENTION CALCULATIONS	1
	JOB NO:	149014.33	DESIGNED: JP
	DATE:	19/12/2024	

GD01 STORMWATER DETENTION CALCULATION - SMAF 2

INITIAL DATA

Total Site Area	4435	m²

Pre Development	Area	C	Description
Pre Development Impermeable Area	3835	0.9	Existing impervious
Pre Development Permeable Area	600	0.3	Landscaped Areas
Total Site Area	4435	m²	
Impervious Area %	86.5%		

C=	Run-off Coefficient	0.9
A=	Site Area	0.3

Post Development	Area	C	Description
New/ redevelopment Impermeable Area	3471	0.9	Proposed Roof
Existing untouched impervious area	590	0.9	Hardstand areas not into tank
Post-development permeable area	374	0.3	Landscaped Areas
Total Site Area	4435	m²	
New/Redeveloped Impervious Area %	78.3%		

Total area redeveloped impervious > 50% Yes

Area for Hydrology mitigation **Entire Site**

CONTROL DATA

Rainfall Depth	=	25	mm	*(As per 90th Percentile Map)*
Hydrological Soil Group	=	C		*(Table 1: Pervious Area Curve Numbers)*
Pre-Development Curve Number	=	74		*(Table 1: Pervious Area Curve Numbers)*
Post Development Curve Number	=	98		*(Constant Value)*

Initial Abstraction	
Pre	*Post*
5	0

Item	Pre Development	Post Development (Imperv)	Post Development (perv)
CN	74	98	74
Soil Storage (mm)	89.24	5.18	89.24
Initial Abstraction	5	0	5
Run-off Depth (mm)	3.66	20.71	3.66

VOLUME CALCULATIONS

Pre-development Runoff Volume	=	16.24	m³
Post Development Runoff Volume	=	85.46	m³
Total Mitigation Volume	=	69.22	m³
RETENTION VOLUME	=	**17.36**	m³
DETENTION VOLUME	=	**51.86**	m³
Limit Flows from Tank	=	0.92	l/s
Minimum Catchment area	=	2768.79	m²

PRELIMINARY TANK SIZING CALCULATIONS

Maximum Tank Height	=	1.2	m	
Velocity (V1) at orifice O_1	=	4.85	m/s	
Orifice Diameter (Ø)	=	**20**	mm	**Size Check - OK**
Preliminary Tank Details	=	**1.2**	mØ	*Tank Diameter*
	=	**61.20**	m	*Length of Tank*

$$O_1 = \sqrt{2gH}$$

$$Orifice\ \emptyset = \sqrt{\frac{4Q_1}{0.62V_1\pi}}$$

Holmes	JOB NAME:	**14 Edmonton Road, Henderson**		PAGE No:
	SECTION:	**WASTEWATER CAPACITY CHECK**		**1.0**
	JOB NO:	**149014.33**	DESIGNED:	**JP**
	DATE:	**19/12/2024**		

CATCHMENT FLOW ANALYSIS CALCULATIONS - EXISTING

EXISTING SUBJECT SITE FLOWS - Carpark

ITEM	DATA	NOTES/COMMENTS
Site area	0	Car park - no wastewater facilities
Persons/15m^2	0	As per Table 5.1.3 Commercial - Office
ADWF per person, Litres/day	65	As per Table 5.1.3 Commercial - Office
PDWF peaking factor	2	As per Table 5.1.3 Commercial - Office
PWWF peaking factor	5	As per Table 5.1.3 Commercial - Office
Existing Residential ADWF, litres/sec	0.00	
Existing Residential PDWF, litres/sec	0.00	ADWF x PDWF peaking factor
Existing Residential PWWF, litres/sec	**0.00**	ADWF x PWWF peaking factor

EXISTING UPSTREAM CATCHMENT FLOWS - East of Subject Site

ITEM	DATA	NOTES/COMMENTS
Catchment Area, m^2	21651	Upstream catchment
Number of Dwellings	33	Based on 650m^2 Lots
People per dwelling/area	3	As per Table 5.1.1 Residential
ADWF per person, Litres/day	180	As per Table 5.1.1 Residential
PDWF peaking factor	3	As per Table 5.1.1 Residential
PWWF peaking factor	6.7	As per Table 5.1.1 Residential
Existing Residential ADWF, litres/sec	0.21	
Existing Residential PDWF, litres/sec	0.62	ADWF x PDWF peaking factor
Existing Residential PWWF, litres/sec	**1.39**	ADWF x PWWF peaking factor

EXISTING UPSTREAM CATCHMENT FLOWS - South of Subject Site

ITEM	DATA	NOTES/COMMENTS
Catchment Area, m^2	367090	Upstream catchment
Number of Dwellings	459	Based on 800m^2 Lots
People per dwelling/area	3	As per Table 5.1.1 Residential
ADWF per person, Litres/day	180	As per Table 5.1.1 Residential
PDWF peaking factor	3	As per Table 5.1.1 Residential
PWWF peaking factor	6.7	As per Table 5.1.1 Residential
Existing Residential ADWF, litres/sec	2.87	
Existing Residential PDWF, litres/sec	8.60	ADWF x PDWF peaking factor
Existing Residential PWWF, litres/sec	**19.21**	ADWF x PWWF peaking factor

	JOB NAME:	**14 Edmonton Road, Henderson**		PAGE No:
	SECTION:	**WASTEWATER CAPACITY CHECK**		**1.1**
	JOB NO:	**149014.33**	DESIGNED:	**JP**
	DATE:	**19/12/2024**		

CATCHMENT FLOW ANALYSIS CALCULATIONS - PROPOSED

PROPOSED COURTHOUSE DEVELOPMENT FLOWS

29-BEDROOM APARTMENT DEVELOPMENT		
ITEM	**DATA**	**NOTES/COMMENTS**
Floor Areas (excl.service areas and public corridors)	5834.8	Total Floor Area of Courthouse
Persons/15m^2	389	As per Table 5.1.3 Commercial - Office
ADWF per person, Litres/day	65	As per Table 5.1.3 Commercial - Office
PDWF peaking factor	2	As per Table 5.1.3 Commercial - Office
PWWF peaking factor	5	As per Table 5.1.3 Commercial - Office
Proposed Residential ADWF, litres/sec	0.29	
Proposed Residential PDWF, litres/sec	0.59	ADWF x PDWF peaking factor
Proposed Residential PWWF, litres/sec	**1.46**	ADWF x PWWF peaking factor

WASTEWATER FLOW CALCULATION SUMMARY

Existing Flows, Litres/second	**20.61**	Exisitng site + Existing Catchment Flows
Proposed Flows, Litres/second	**1.46**	Proposed Development Flows
Total Generated PWW Flows (Existing)	**20.61**	Total Existing Catchment Flows
Total Generated PWW Flows (Proposed)	**22.07**	Existing Flows + Proposed Flows

JOB NAME:	**14 Edmonton Road, Henderson**		PAGE No:
SECTION:	**WASTEWATER CAPACITY CHECK**		**1.2**
JOB NO:	**149014.33**	DESIGNED:	**JP**
DATE:	**19/12/2024**		

PIPE CAPACITY CALCULATIONS - Existing

Existing Line (893471) - Receiving/Critical Line - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Ex. 225mmØ AC (893471)	50.09	0.225	4.70	4.62	1.0

Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
0.16%	0.490	19.48	**20.61**	Change Design

Existing Line (881812) - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Ex. 225mmØ AC (881812)	56.25	0.225	4.98	4.75	1.0

Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
0.41%	0.784	31.18	19.21	OK

Existing Line (899356) - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Ex. 150mmØ AC (899356)	61.10	0.150	5.52	5.07	1.0

Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
0.74%	0.807	14.26	1.39	OK

Existing Line (877837) - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Ex. 150mmØ AC (877837)	19.57	0.150	5.04	4.77	1.0

Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
1.38%	1.105	19.52	1.39	OK

JOB NAME:	**14 Edmonton Road, Henderson**		PAGE No:
SECTION:	**WASTEWATER CAPACITY CHECK**		**1.3**
JOB NO:	**149014.33**	DESIGNED:	**JP**
DATE:	**19/12/2024**		

PIPE CAPACITY CALCULATIONS - Proposed

Proposed line - East Catchment - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Prop. 225mmØ uPVC WWP-01	41.57	0.225	5.06	4.79	0.6

Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
0.65%	1.062	42.24	1.39	OK

Proposed line - East Catchment - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Prop. 225mmØ uPVC WWP-02	13.30	0.225	4.78	4.66	0.6

Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
0.89%	1.241	49.36	1.39	OK

Proposed line - South Catchment - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Prop. 225mmØ uPVC WWP-03	37.70	0.225	4.77	4.66	0.6

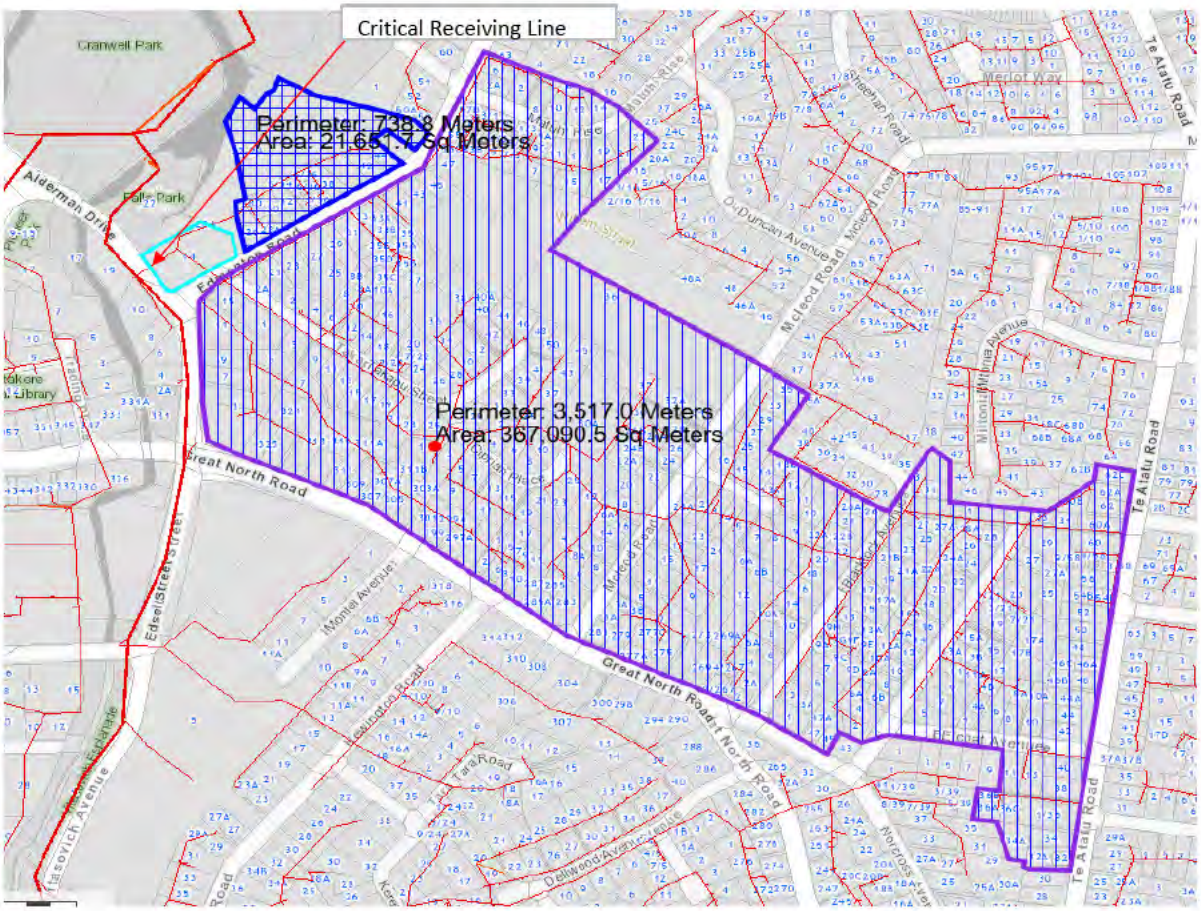
Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
0.28%	0.699	27.79	19.21	OK

Proposed line - South Catchment - Colebrook White					
Pipe TYPE & ID	Pipe Length (m)	Pipe Diameter (Ø)	Upstream RL (m)	Downstream RL (m)	k, mm
Prop. 225mmØ uPVC WWP-04	44.57	0.225	4.91	4.78	0.6

Slope (%)	Pipe Velocity (m/s)	Q, Pipe (l/s)	Q, Catchment (l/s)	Capacity Check (3% margin of error)
0.30%	0.723	28.74	19.21	OK

Holmes	JOB NAME:	14 Edmonton Road, Henderson		PAGE No:
	SECTION:	WASTEWATER CAPACITY CHECK		1.4
	JOB NO:	149014.33	DESIGNED:	JP
	DATE:	19/12/2024		

Wastewatert Catchment upstream from Subject Site - Auckland GeoMaps (December 2024)



Appendix C: HydroExpress Sections

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 13 2024

Section 1 - Long section OLFP Alignment

User-defined

Invert Elev (m)	= 5.5680
Slope (%)	= 1.5000
N-Value	= 0.016

Calculations

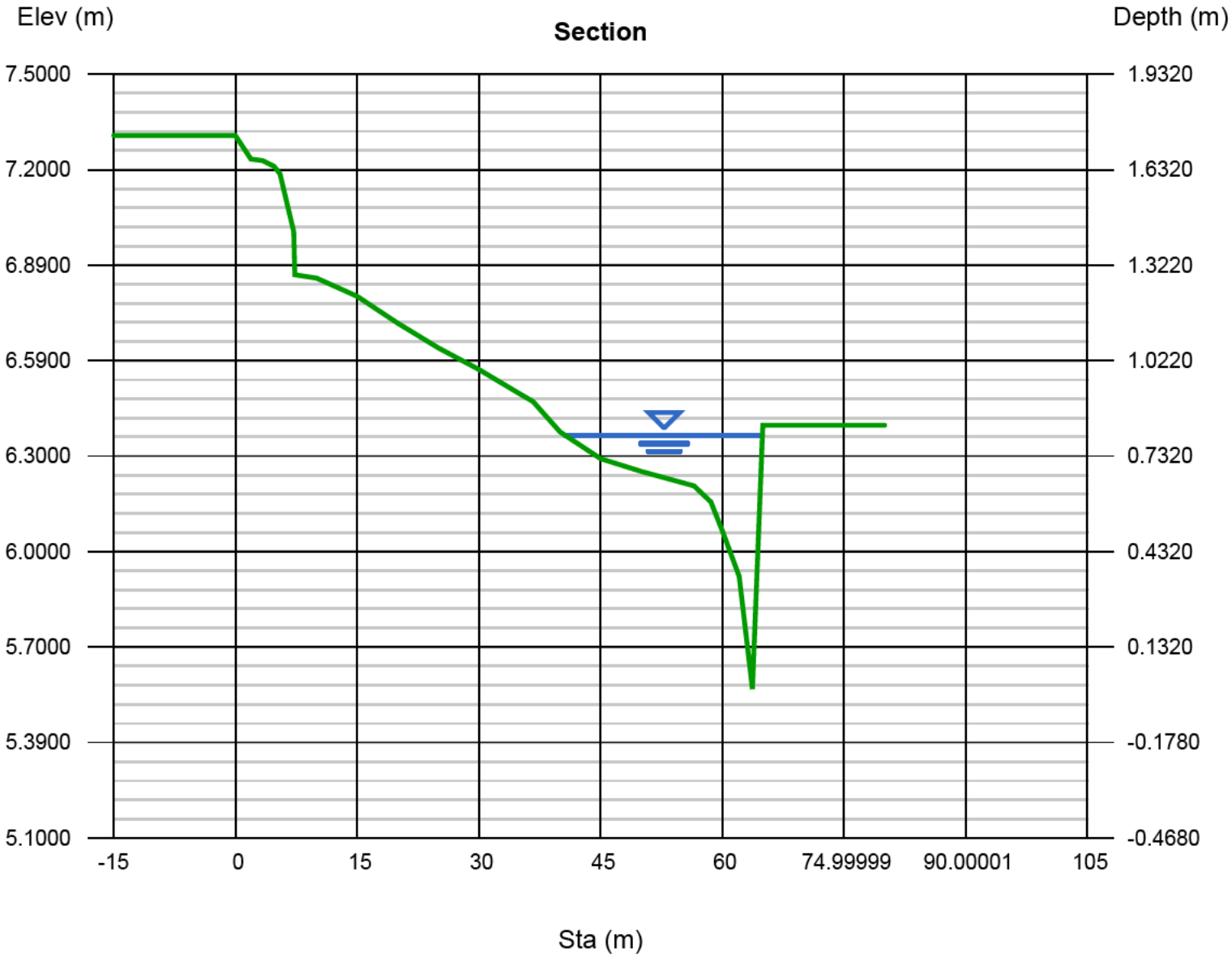
Compute by:	Known Q
Known Q (cms)	= 10.9800

Highlighted

Depth (m)	= 0.7955
Q (cms)	= 10.9800
Area (sqm)	= 4.4929
Velocity (m/s)	= 2.4439
Wetted Perim (m)	= 24.4891
Crit Depth, Yc (m)	= 0.8931
Top Width (m)	= 24.2061
EGL (m)	= 1.1002

(Sta, El, n)-(Sta, El, n)...

(0.0000, 7.3070)-(1.8960, 7.2330, 0.016)-(3.3300, 7.2280, 0.016)-(4.7660, 7.2100, 0.016)-(5.5050, 7.1870, 0.016)-(7.1940, 7.0050, 0.016)-(7.3260, 6.8700, 0.0
-(10.0000, 6.8590, 0.016)-(15.0000, 6.8020, 0.016)-(20.0000, 6.7170, 0.016)-(25.0000, 6.6400, 0.016)-(30.0000, 6.5720, 0.016)-(32.4490, 6.5350, 0.016)-(35.00
-(36.6830, 6.4710, 0.016)-(40.0000, 6.3760, 0.016)-(45.0000, 6.2920, 0.016)-(50.0000, 6.2520, 0.016)-(55.0000, 6.2170, 0.016)-(56.5320, 6.2060, 0.016)-(58.58
-(60.0000, 6.0650, 0.016)-(62.0860, 5.9220, 0.016)-(63.7250, 5.5680, 0.016)-(65.0000, 6.3970, 0.016)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 12 2024

OLFP Cross-section A

User-defined

Invert Elev (m)	= 6.8110
Slope (%)	= 1.5000
N-Value	= 0.016

Calculations

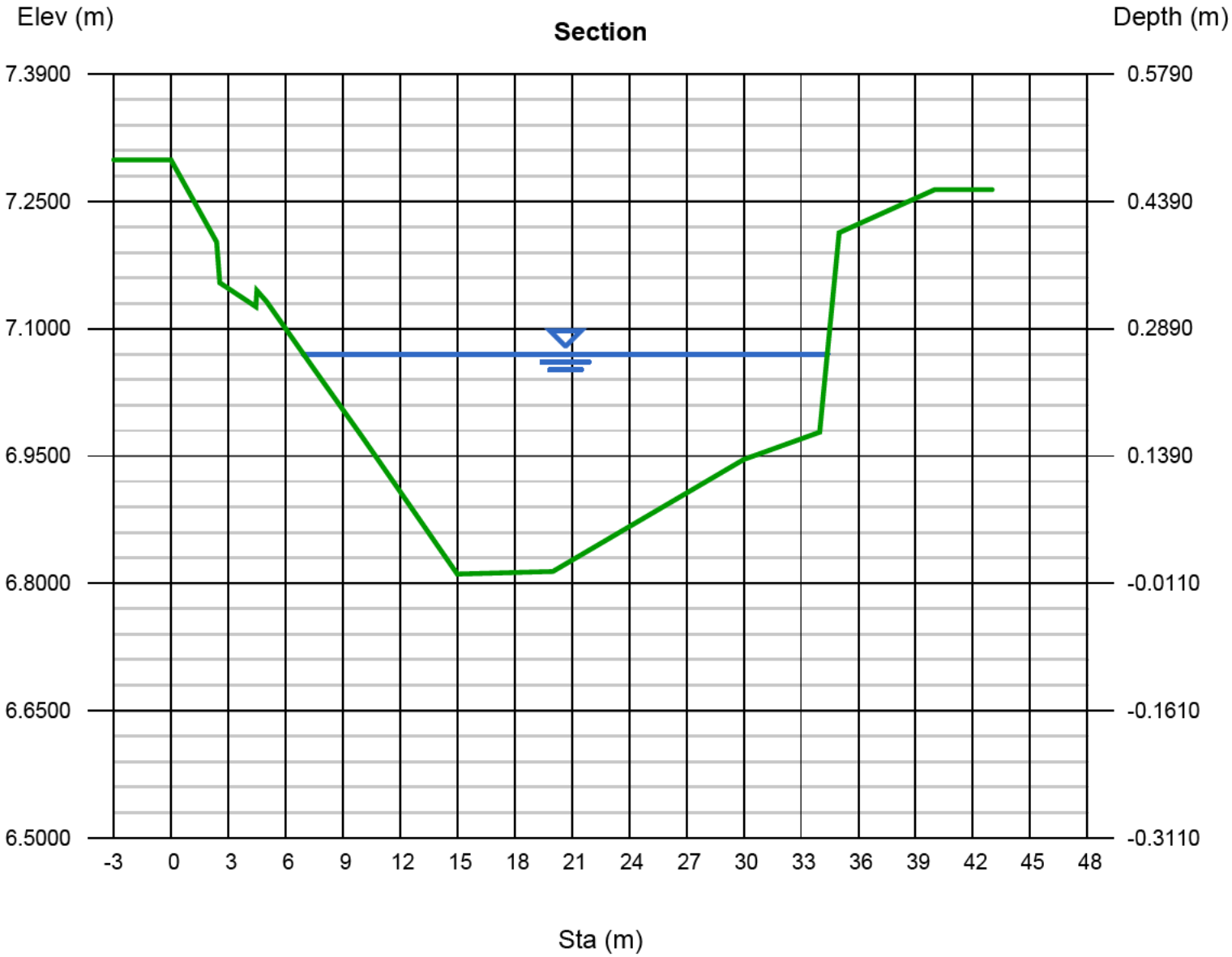
Compute by:	Known Q
Known Q (cms)	= 10.9800

Highlighted

Depth (m)	= 0.2591
Q (cms)	= 10.9800
Area (sqm)	= 4.6761
Velocity (m/s)	= 2.3481
Wetted Perim (m)	= 27.4529
Crit Depth, Yc (m)	= 0.3505
Top Width (m)	= 27.4373
EGL (m)	= 0.5403

(Sta, El, n)-(Sta, El, n)...

(0.0000, 7.2990)-(2.3880, 7.2020, 0.016)-(2.5490, 7.1540, 0.016)-(4.4370, 7.1260, 0.016)-(4.5040, 7.1450, 0.016)-(5.0000, 7.1320, 0.016)-(7.4460, 7.0540, 0.0
-(10.0000, 6.9730, 0.016)-(15.0000, 6.8110, 0.016)-(20.0000, 6.8140, 0.016)-(25.0000, 6.8800, 0.016)-(30.0000, 6.9460, 0.016)-(33.9790, 6.9780, 0.016)-(35.00
-(40.0000, 7.2640, 0.016)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 12 2024

OLFP Cross-section B

User-defined

Invert Elev (m)	= 6.3740
Slope (%)	= 1.5000
N-Value	= 0.016

Calculations

Compute by:	Known Q
Known Q (cms)	= 10.8700

Highlighted

Depth (m)	= 0.3109
Q (cms)	= 10.8700
Area (sqm)	= 4.7595
Velocity (m/s)	= 2.2838
Wetted Perim (m)	= 28.7750
Crit Depth, Yc (m)	= 0.3993
Top Width (m)	= 28.7670
EGL (m)	= 0.5769

(Sta, El, n)-(Sta, El, n)...

(0.0000, 6.9730)-(5.0000, 6.7560, 0.016)-(10.0000, 6.5810, 0.016)-(15.0000, 6.4040, 0.016)-(15.8230, 6.3740, 0.016)-(20.0000, 6.4220, 0.016)-(25.0000, 6.490
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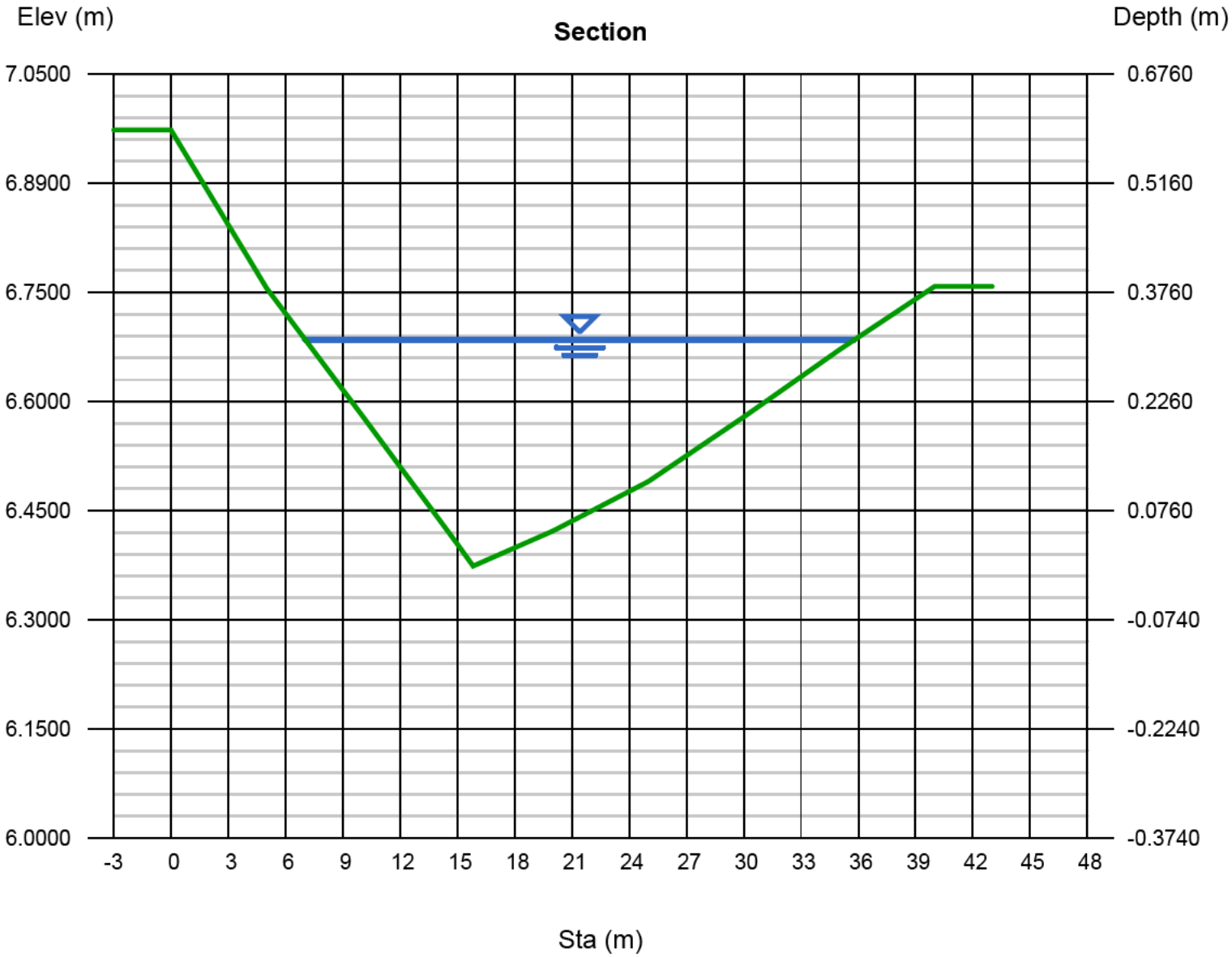

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 12 2024

OLFP Cross-section C

User-defined

Invert Elev (m)	= 6.0530
Slope (%)	= 1.5000
N-Value	= 0.016

Calculations

Compute by:	Known Q
Known Q (cms)	= 10.7700

Highlighted

Depth (m)	= 0.3536
Q (cms)	= 10.7700
Area (sqm)	= 4.3037
Velocity (m/s)	= 2.5025
Wetted Perim (m)	= 22.6766
Crit Depth, Yc (m)	= 0.4602
Top Width (m)	= 22.6648
EGL (m)	= 0.6730

(Sta, El, n)-(Sta, El, n)...

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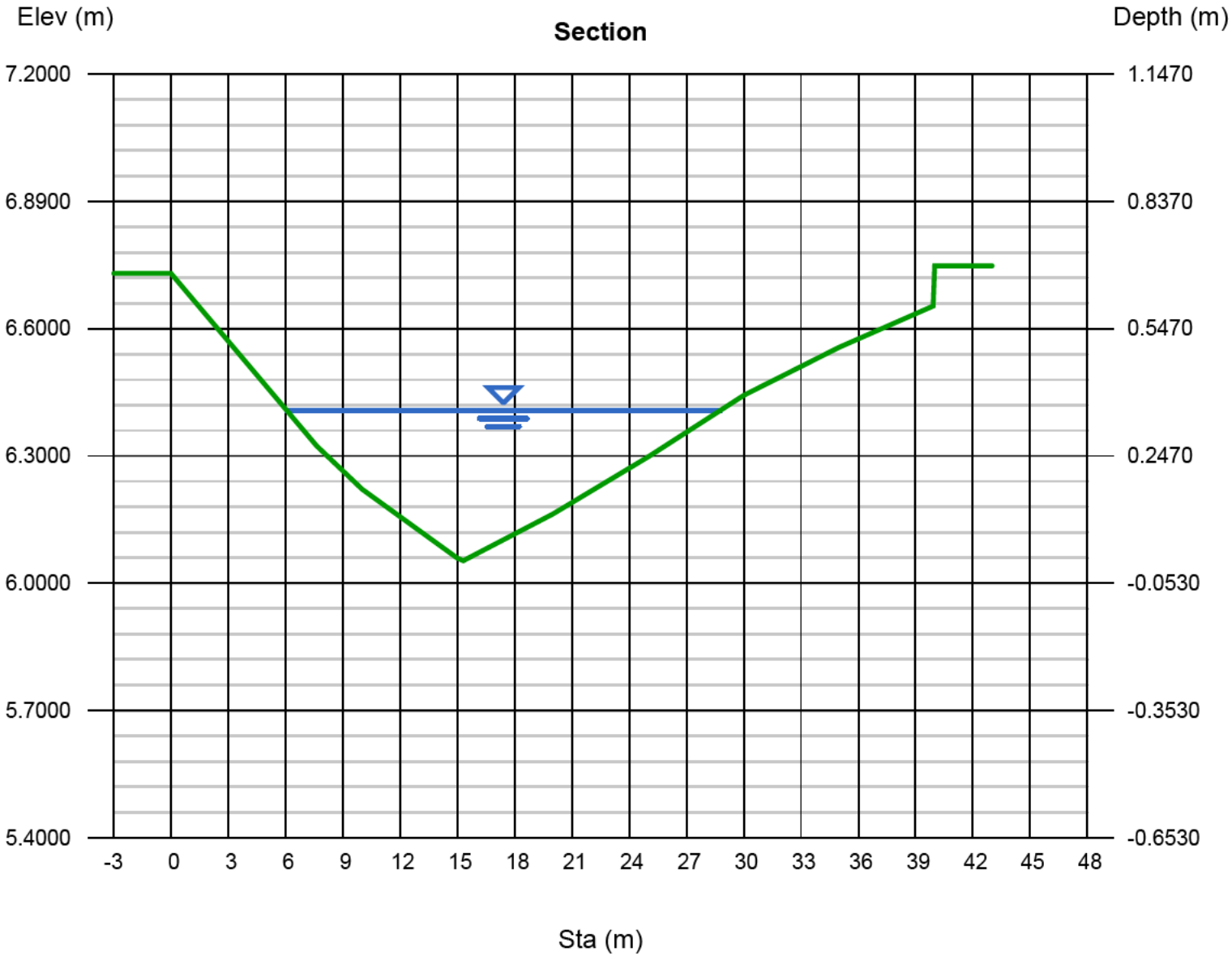


Appendix D: 2022 Flood Data by Healthy Waters

AUCKLAND COUNCIL HEALTHY WATERS

RESPONSE TO REQUEST FOR FLOODING INFORMATION

Ref:	8704080434

Requestor details	Name	Business Name	Email
	Jéan Petherbridge	Holmes	jean.petherbridge@holmesgroup.com

Site Address	Catchment / Model
14 Edmonton Road, Henderson	Regionwide Rural Rapid Flood Model 2022 Unit D

INFORMATION TO APPLICANT

This Document provides current information held by Auckland Council relating to predicted flooding levels and extent within the catchment that includes the property noted above.

The information is extracted from a catchment wide modelling study. The study does not consider effects of built structures or potential blockage of piped infrastructure and should not be assumed to be a detailed representation of potential flooding impact that will occur within a particular site.

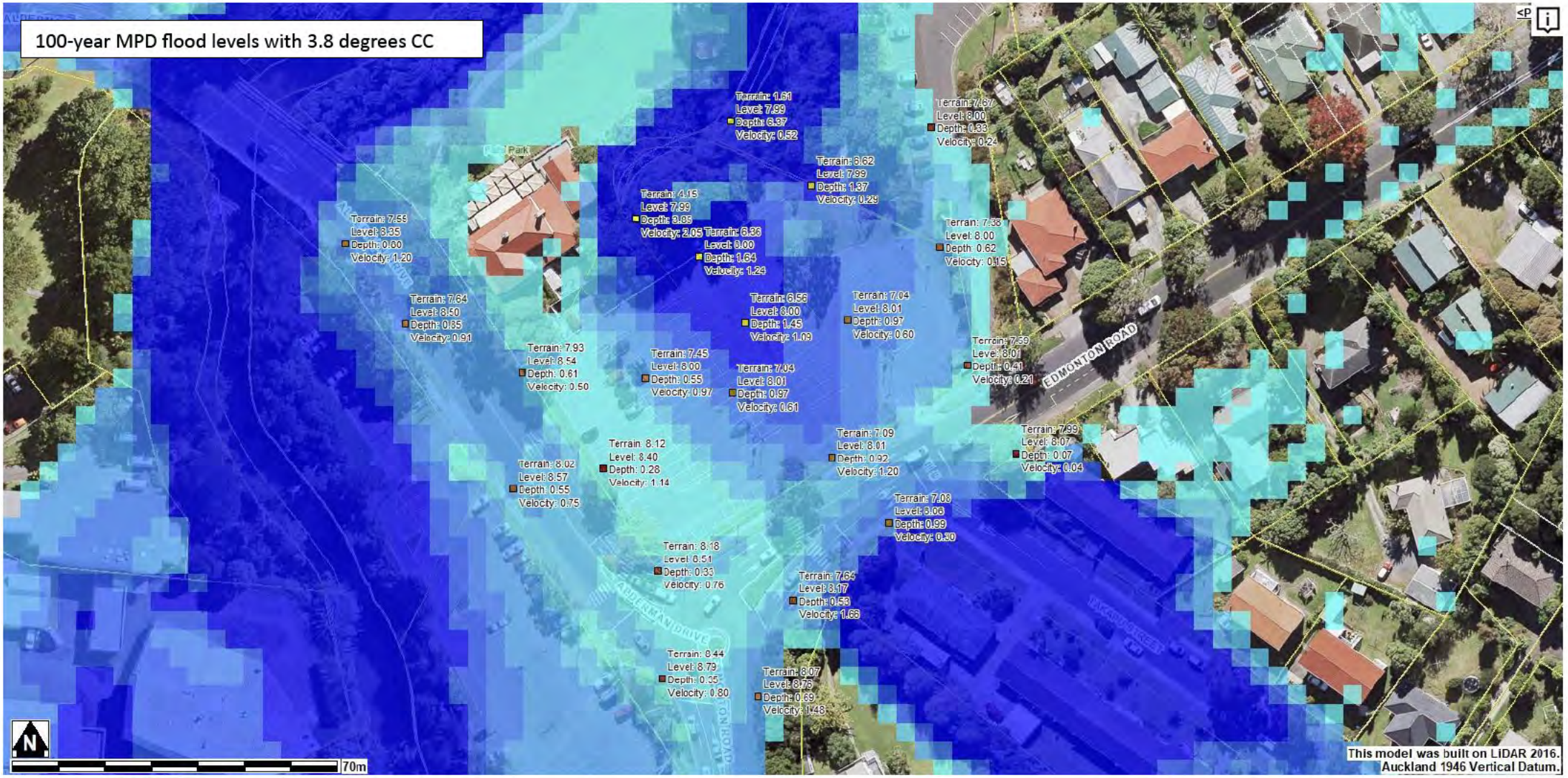
Disclaimer

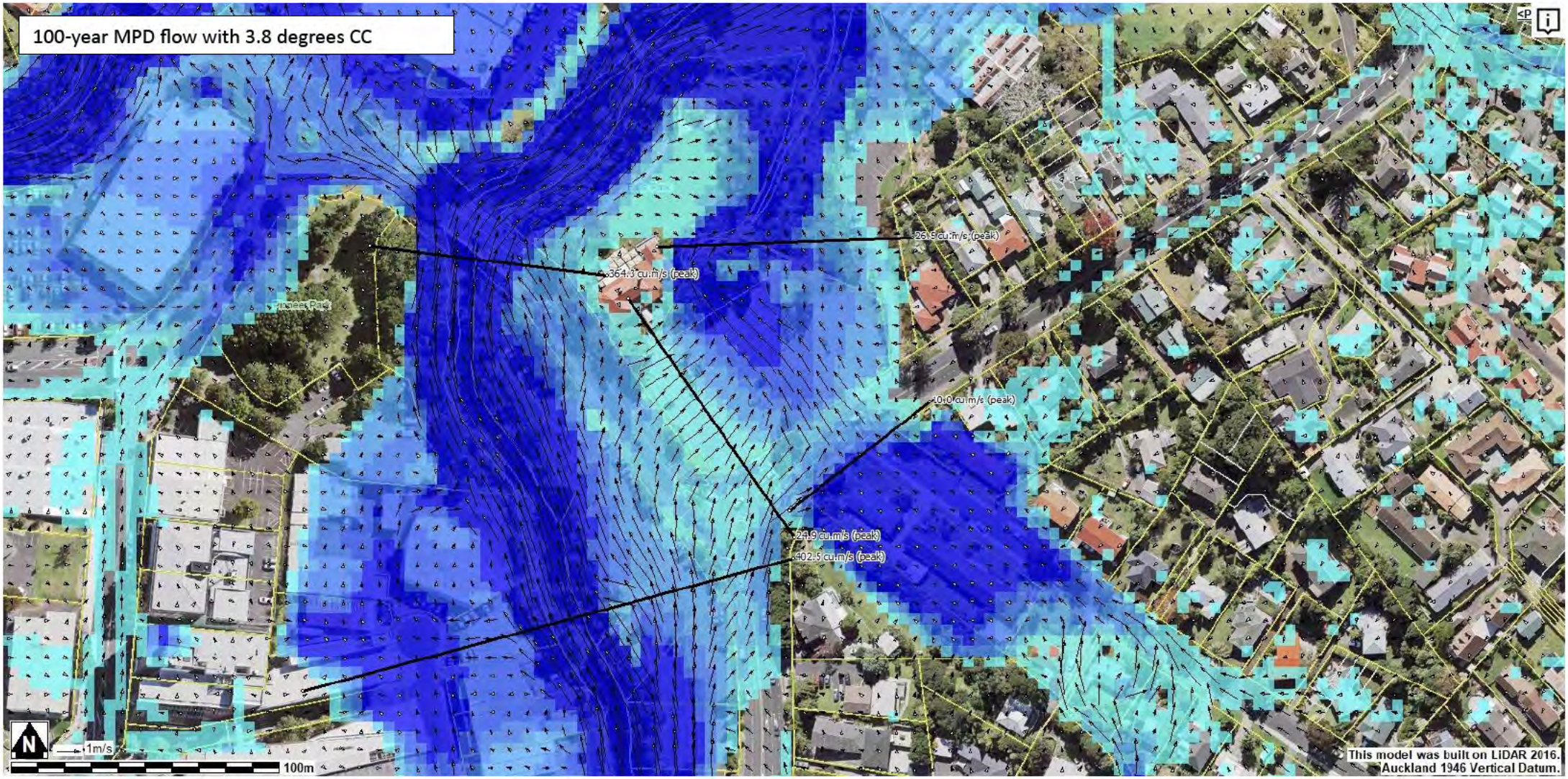
Auckland Council gives no warranty as to the accuracy and completeness of any information given and accepts no liability for any error, omission or use of the information. The information provided does not preclude the need for an appropriate site-specific assessment and cannot be construed as endorsement, or approval, by Auckland Council. of any development

Special information requirements Auckland Unitary Plan Chapter E36 Section E36.9.2
A hazard risk assessment must be undertaken when subdivision, use or development requiring resource consent is proposed to be undertaken on land which may be subject to the 1 per cent annual exceedance probability (AEP) floodplain or overland flow paths. A hazard risk assessment report must accompany a resource consent application for the subdivision, use or development referenced above. The flooding hazard risk should be assessed for all rainfall event frequencies where flooding of the site occurs.

FLOODING INFORMATION

1% AEP Flooding Information		
Overland Flow: Q_{max}	402.5 m^3/sec	Please refer to the attached figures for flow rates and velocities for the 1% AEP event.
Maximum Flooding Level	RL 8.54 (AUK1946)	Refer to the attached figure for a variety of flood levels and depths for the 1% AEP event across the wider site area. Note that the site is near a flood prone area.


100-year MPD flood levels with 3.8 degrees CC
Terrain: 1.61
Level: 7.99
Depth: 6.37
Velocity: 0.52
Terrain: 7.67
Level: 8.00
Depth: 0.33
Velocity: 0.24
Terrain: 8.62
Level: 7.99
Depth: 1.37
Velocity: 0.29
Terrain: 4.15
Level: 7.99
Depth: 3.85
Velocity: 2.03
Terrain: 6.36
Level: 8.00
Depth: 1.64
Velocity: 1.24
Terrain: 7.55
Level: 8.35
Depth: 0.80
Velocity: 1.20
Terran: 7.38
Level: 8.00
Depth: 0.62
Velocity: 0.15
Terrain: 7.64
Level: 8.50
Depth: 0.85
Velocity: 0.91
Terrain: 6.56
Level: 8.00
Depth: 1.45
Velocity: 1.09
Terrain: 7.04
Level: 8.01
Depth: 0.97
Velocity: 0.60
Terrain: 7.93
Level: 8.54
Depth: 0.61
Velocity: 0.50
Terrain: 7.45
Level: 8.00
Depth: 0.55
Velocity: 0.97
Terrain: 7.04
Level: 8.01
Depth: 0.97
Velocity: 0.61
Terrain: 7.39
Level: 8.01
Depth: 0.41
Velocity: 0.21
EDMONTON ROAD
Terrain: 8.12
Level: 8.40
Depth: 0.28
Velocity: 1.14
Terrain: 7.09
Level: 8.01
Depth: 0.92
Velocity: 1.20
Terrain: 7.99
Level: 8.07
Depth: 0.07
Velocity: 0.04
Terrain: 8.02
Level: 8.57
Depth: 0.55
Velocity: 0.75
Terrain: 7.08
Level: 8.06
Depth: 0.99
Velocity: 0.30
Terrain: 8.18
Level: 8.51
Depth: 0.33
Velocity: 0.76
Terrain: 7.64
Level: 8.17
Depth: 0.53
Velocity: 1.66
ABERDEEN DRIVE
Terrain: 8.44
Level: 8.79
Depth: 0.35
Velocity: 0.80
Terrain: 8.07
Level: 8.76
Depth: 0.69
Velocity: 1.48
N
70m
This model was built on LiDAR 2016.
Auckland 1946 Vertical Datum.
Depth [m]
0.05 to 0.3
0.3 to 0.5
0.5 to 0.8
0.8 to 1
1 to 1.2
> 1.2 (Ctrl Alt: N W U D R)


100-year MPD flow with 3.8 degrees CC
364.3 cu.m/s (peak)
26.5 cu.m/s (peak)
40.0 cu.m/s (peak)
24.9 cu.m/s (peak)
402.5 cu.m/s (peak)
N
1m/s
100m
This model was built on LiDAR 2016.
Auckland 1946 Vertical Datum.

Flood prone area information for 100-year MPD with 2.1 degrees CC

Info | Legend | Results

Flood Prone Area

Attribute	Value
Flood prone area ID	30502357
Can fill in a 100yr ARI rainfall event	Yes
Catchment Area (m2)	264572
Minimum elevation (m RL AUK1946)	3.88
Minimum elevation (m RL NZVD2016)	3.6
Spill elevation (m RL AUK1946)	7.58
Spill elevation (m RL NZVD2016)	7.3
Spill ponding depth (m)	3.7
Volume to spill elevation (m3)	6543
Rainfall required to fill flood prone area (mm)	49
Rainfall depth 100yr ARI future scenario (mm)	234
Flood prone elevation in 100yr ARI event (m RL)	Spills – specific calculation is required
Flood prone elevation in 100yr ARI event (m RL NZVD_2016)	Spills – specific calculation is required
Flood prone depth in 100yr ARI event (m)	Spills – specific calculation is required
Flood prone volume stored in 100yr ARI event (m3)	Spills – specific calculation is required

Appendix E: Qualifications/CV of Jéan Petherbridge

Jéan Petherbridge

Senior Project Engineer

T: +64 3 366 3366
PO Box 6718
Christchurch 8442
jean.petherbridge@holmesgroup.com

Jéan has been working in the civil and land development engineering space for almost 10 years. He has worked on a range of projects which range for small to medium residential developments, three waters design in the educational sector for both public and private entities, and civil engineering design for light industrial and mixed commercial developments.

Jéan joined Holmes in April of 2024 as a Senior Project Engineer to aid in the delivery and management of projects within the wider Infrastructure and Three Waters Team. Jéan's role within the team is the provide input and advice at various levels, covering a wide range of residential, commercial, and educational projects. His responsibilities cover, lead design engineer, internal and external project coordination, project design reviews, report writing, site observation and reporting and management of contractor queries.

EDUCATION

Bachelor of Engineering Technology (Civil)
ME (Project Management) - In progress

AREAS OF SPECIALTY

Three waters infrastructure design
Engineering feasibility assessments
Pavement and private road design
Construction monitoring and reporting
AutoCAD Civil 3D proficient
Stormwater attenuation design
Project Management

PROFESSIONAL AFFILIATIONS

Member of Engineering New Zealand
Engineers Without Borders

REPRESENTATIVE PROJECTS

Symphony Centre—Auckland

Jéan has been a key member of the Holmes Civil team working on the Symphony Centre, a new 21 storey building which is partially supported on the Te Waihorotiu CRL station building in Auckland. They modelled and designed stormwater hydraulics and contaminant loading, working with the client towards a Green Star Low Damage Design. During the design process, Jéan has worked hard within the Holmes team to ensure the lines of communication are clear, and that the project is tracking well.

Residential Apartment Development—Auckland

The project involved the demolition of existing commercial buildings across two Lots and allow for the construction of a new 15-storey , 174 unit Apartment Building. The development also included the three retail units at street level. Jéan was the Lead Civil Design Engineer responsible for the assessment and design of new public infrastructure and water supply reticulation to service to new development, including the assessment of overland flows and flooding, vehicular access to the lower basement parking levels. He was also responsible for the preparation of reporting documentation to support the Resource and Engineering Planning Approval consents. Jéan's role also required liaison with the Architect, Planner, Client and the wider design team, including Auckland Council, throughout the design and consenting process.

Residential Apartment Development—Auckland

The project involved the demolition of existing commercial buildings to allow for the construction of a new 9-storey , 70 unit Apartment Building, and includes to basement level carparks. Jéan was the Lead Civil Design Engineer responsible for the assessment and design of new public infrastructure and water supply reticulation to service to new development, including the assessment of overland flows and flooding, vehicular access to the lower basement parking levels. He was also responsible for the preparation of reporting documentation to support the Resource and Engineering Planning Approval consents. Jéan's role also required liaison with the Architect, Planner, Client and the wider design team, including Auckland Council, throughout the design and consenting process.

Proposed Hotel Development—Auckland

The proposed development consisted of the construction of a 4-storey, 120-room Hotel, extension of both public stormwater and wastewater infrastructure as well as the extension of public water supply to service the new Hotel. Jéan was the Lead Civil Design Engineer and was responsible for the assessment and design of new public infrastructure and water supply reticulation to service to new development, as well as, the assessment of overland flows and flooding, and extension of a private access road to allow for vehicular access to the new Hotel. Including in his responsibilities was to prepare the Reporting documentation in support of the consents. Jéan's role also required liaison with the Architect, Planner, Client and the wider design team, including Auckland Council, throughout the design and consenting process.

Jéan Petherbridge

Senior Project Engineer

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PO Box 6718
Christchurch 8442
jean.petherbridge@holmesgroup.com

Westgate Bus Depot—Auckland
The construction of a new Bus Depot located across three large industrial Lots within the Westgate area. Jéan was the Lead Civil Design Engineer responsible for the civil design, reporting and delivery of consent documentation for the Bus Depot. The project included coordination and liaison with large multi disciple design team. The overall civil design included design of employee and bus carparking, designing of site access to accommodate a large selection of bus types, site access retaining, pedestrian access, public and private wastewater drainage design, public and private stormwater design, design of treatment trains to treat surface run-off prior to discharging into a detention/ treatment pond, public water supply as well flooding and secondary overland flow path considerations.

Saint Kentigern Boys Preschool—Auckland
Construction of a new 120-child preschool center for Saint Kentigern Boys School – Remuera Campus. Jéan was the Lead Civil Design Engineer responsible for the design, reporting and delivery of consent documentation for the new childcare facility. The project included coordination and liaison with large multi disciple design team. Overall Civil Design included design of a new carpark, pedestrian access, public and private wastewater drainage design, private stormwater discharge and treatment design, public water supply including flooding and primary and secondary overland flow path considerations.

Waiheke High School Wastewater Upgrade—Waiheke
The upgrade of the existing private wastewater drainage system and the installation of a new pressure wastewater network and associated new onsite treatment systems. These works were required to improve the collection of wastewater, eliminate blockage and leakage issues and allow for future development of the school. Jéan was the Lead Civil Design Engineer responsible for completion of the Civil Design and Construction packages for the project, attending PCG meetings and coordination with school administration, project manager and wider design team. Jéan was also responsible for civil construction observation and reporting, liaison with Civil contractor and coordinating construction program.

ADDITIONAL PROJECT EXPERIENCE

- Kristen School water supply and irrigation concept design—Albany, Auckland
- Teruja School Temporary Erosion & Sediment Controls—Vanuatu
- Fulton Hogan Stormwater Sand Filter Treatment Design—Silverdale, Auckland
- Pillans Point School Carpark and Drainage Design—Hamilton
- Early Learning Centre three water and access design—Otahuhu, Auckland
- Kāinga Ora Residential Projects (Various)—Nelson, Timaru, Christchurch