Tonkin+Taylor

Job No: 1016772.0000
27 April 2021

Ministry of Education
48 Hereford Street,
Christchurch

Attention: Deb Taylor

Dear Deb

Horouta School Development - Civil Infrastructure Preliminary Feasibility Report

1 Introduction

Tonkin & Taylor Limited (T+T) was engaged by the Ministry of Education (MoE) to undertake a preliminary assessment of civil infrastructure associated with the proposed primary school in the Kaiti area of Gisborne.

The information provided by the MoE indicates that the site currently covers an area of approximately 1.3 Ha in size, with Barton Street bisecting the eastern part of the site in a north-south direction. We understand that negotiations are currently underway with the neighbouring property owners to acquire more land to expand this development.

The proposed primary school may host up to 400 pupils and staff, but we understand that the form and the layout of the proposed school is yet to be finalised.

This report has been prepared to assist the MoE with its pre-development assessment by identifying:

- Typical civil service capacity requirements for the proposed primary school.
- Assessing the available civil services and adequacy of the existing infrastructure to accommodate the development and whether the current services provision favours development in any particular part of the site.
- Potential flood hazards and minimum floor level requirements, as set out by the local authority.
- Aspects of the proposed development that could result in 'abnormal' development costs such as managing overland flow paths or other implications associated with civil infrastructure.

This assessment has been undertaken in accordance with our proposal dated 25 February 2021.

1.1 Scope of works

The scope of work carried out for the purposes of this report comprised:

- Desktop assessment of water supply demands and wastewater peak flows.
- Desktop assessment of stormwater peak run-off rates and overland flow paths.
- Review of flood hazard mapping on the Gisborne District Council (GDC) website and advice on the vulnerability of the site to flooding.

Tonkin & Taylor Ltd | Level 3, PwC Centre, 60 Cashel Street, West End, Christchurch, 8013, New Zealand | PO Box 13-055, Christchurch 8141
P +64-3-363 2440 F +64-9-307 0265 E chc@tonkintaylor.co.nz

- Liaising with GDC Three Waters Engineer regarding availability of services connections and proposed upgrades to the local infrastructure[1].
- Preparation of this report summarising the findings of the desk study, including the likely options for water, stormwater and wastewater and the associated risks and opportunities.

1.2 Site description

The site comprises one industrial land parcel, 17 Ranfurly Street, with the remainder being residential land parcels. The topography of the land is generally flat with some minor localised depressions towards the western boundary with Barton Street.

The industrial land parcel was previously a petrochemical storage facility and has been the subject of previous geotechnical and ground contamination investigations by T+T[2][3][4].

Barton Street divides the site into two portions but can also provide secondary access to both portions of the site, if deemed useful.

The residential land parcels contain dwellings with paved access ways. These will be demolished prior to the school development commencing.

The approximate location of the site is shown on Figure 1.1 below.

Figure 1.1: Site location and approximate extent. Image source Bay of Plenty TAs.

1.3 Proposed development

Plans showing the potential layout of the proposed school development are currently not available. However, for the purpose of quantifying expected discharges and demand on the civil services, we

[1] GDC Three Waters Engineer – Neville West.
[2] 17 Ranfurly Street, Gisborne. Review of Previous investigation data. Tonkin & Taylor Ltd. 1007466. 11 July 2018.
[3] TKKM o Horouta Wananga – 17 Ranfurly Street, Gisborne. Geotechnical investigation and assessment report. Tonkin & Taylor Ltd. 1007466. 21 September 2018.
[4] TKKM o Horouta Wananga – 17 Ranfurly Street, Gisborne. Ground contamination investigation and assessment report. Tonkin & Taylor Ltd. 1007466. 16 January 2019.

have assumed the site coverage for the proposed development to be a comparable to other recent school developments with a similar student role.

Our assumptions are as follows:

- For stormwater run-off estimation, hardstand areas to be approximately 4,000 m^2 and roof areas to be approximately 3,500 m^2. The remainder of the site is assumed to be landscaped with grass or garden areas.
- The peak wastewater discharge from the school development is not expected to coincide with the peak domestic wastewater disposal (typically around 6.30am - 8.30am and 4.30pm – 8.00pm) from the surrounding residential area.
- The topographical information available through Tairawhiti Maps is an accurate representation of the current site topography.
- No sprinkler system or similar fire suppressant system is proposed for the school.

2 Civil services assessment

Our civil infrastructure assessment is based on the available information through GDC. We have had verbal discussions with GDC and have requested, via email, current flood maps, topographical maps and as-built infrastructure plans[5]. No information relating to the existing civil services connection points at the site boundary has been received. However, the residential lots that have been recently purchased by MoE are currently serviced by the council, the connections remain live and therefore a precedent for continued discharge exists.

2.1 Stormwater

2.1.1 Existing infrastructure

Currently there are two existing stormwater mains available, a 375 mm diameter pipe in Barton Street and a 900 mm diameter pipe running across the site, connecting the Ranfurly Street pipe network to the Crawford Road network (refer Appendix A). We have not been able to verify the invert levels of these pipes. On Ranfurly Street and Crawford Road stormwater from individual properties is discharged directly to the network via lateral connections.

Network capacity analysis undertaken by GDC indicates that under 1 in 10 year 24 hour storm event the downstream end of the 375 mm diameter pipe on Barton Street is at more than 100% capacity. This may be due to backwater effect from the stream culvert. The 900 mm diameter pipe running from Ranfurly Street to Crawford Road is shown as having less than 50% available flow capacity.

Following discussions with the GDC Three Waters Engineer, Neville West, we have been advised that there is no objection to connecting into the existing pipe network, providing that the runoff from the site does not exceed pre-development run-off rate. This would need to be confirmed and approved by GDC during building consent.

2.1.2 Proposed stormwater

It is expected that the post-development run off from the site will be higher than the pre-development run off owing to the increased proportion of impermeable surfaces.

We have estimated the predicted run off for a 1 in 10 year 24 hour event and the difference between of the pre-development flow rate and post-development rate is approximately 5.0 l/s. It is likely that 60 – 100 m^3 of storage will be needed to provide on-site attenuation to balance the runoff. GDC has not specifically requested a specific storm event to be attenuated, and we consider

[5] Email from GDC Asset Manager - Mike Greef to Chamath Nanayakkara on 23/02/21 time stamped 2:45pm.

that using a 24hr event is conservative as a shorter duration (which would yield a smaller required attenuation volume) is likely to be more realistic.

Potential attenuation options include ponds, underground storage tanks, permeable subbase and swales. A single option or a combination of these options could be adopted to integrate the stormwater infrastructure.

The preferred stormwater discharge point from the site will be to connect on to the 900 mm diameter pipe located to the west of the site as this is currently shown as having some capacity. Although it is not crucial, locating any proposed attenuation ponds or tanks closer to the western side of the site will be beneficial for conveyance. This will be subject to confirmation of the topography of the site and invert levels of the existing infrastructure. However, the likelihood of proposed and existing stormwater infrastructure influencing (or significantly limiting) the building locations is minor.

2.2 Wastewater

2.2.1 Existing infrastructure

There are three 150 mm diameter mains available on Ranfurly Street, Barton Street and Crawford Road which have sufficient capacity for future connections from the school. There is also an additional 150 mm diameter pipe laid across the site connecting the Ranfurly Street pipe network to the Crawford Road network. The site location is at the upstream end of the sewer network and given the number of mains available in the vicinity, we consider that there is capacity for future connections from the school.

The existing gravity mains network flow towards the Port Pump Station. This pump station has been recently upgraded to have a 150 mm diameter rising main[6].

2.2.2 Proposed sewer

The expected discharge from the proposed school development is expected to be in the range of 0.4-0.45 l/s. This is projected over an operational period of 8 hours per day. We expect the peak flows from the school to be offset from domestic peak flow, therefore the capacity of the network is not affected by additional flow from the school.

Verbal discussion with the GDC Three Waters Engineer indicated that there is sufficient capacity in the network for future connections from the site, given the school peak flow is offset from the residential peak flow. GDC will assess the connection feasibility during building consent. It is possible that the site may need to be equipped with sufficient storage to accommodate, for example ‘a day’s discharge volume’ to discharge over a period of time at an agreed rate with GDC.

2.3 Water supply

There are two 100 mm diameter water mains located near the site on Ranfurly Street and Crawford Road. The water supply demand for the site will primarily be for potable water and firefighting.

As there is no current plan of the proposed school layout, there is no information available to determine specific firefighting requirements. Generally, a fire hydrant should be made available within 135 m of the site and a secondary fire hydrant available within no more than 270 m from the site. Currently there are four fire hydrants available on Ranfurly Street on the boundary of the site, therefore there is no requirement to install additional hydrants.

[6] Telephone discussion with Neville West and Chamath Nanayakkara on 4/03/21.

GDC has confirmed there is sufficient capacity available for a future school connection for potable supply.

GDC has indicated that pressure and flow testing of the hydrants can be undertaken upon request. Hydrant flow data will be beneficial during the design phase of the proposed school.

2.4 Three waters summary

In general, the existing civil infrastructure is adequate for the servicing of the proposed school site, however there are a few constraints that should be taken into consideration:

- Stormwater attenuation is likely to be required due to a post-development increase in impervious areas over current. Current infrastructure favours the proposed development to discharge to the 900 mm pipe on the west of the site. It may be beneficial to locate any stormwater attenuation features closer to this 900 mm pipe.
- Sufficient capacity is likely to be available for wastewater discharge in the GDC network. However, GDC may require sufficient storage for the anticipated daily discharge volume is provided with a lower discharge rate. Give the existing infrastructure is easily accessed around the site boundary, location of infrastructure does not favour development in any particular area.
- Water supply is sufficient for both potable water and firefighting requirements and there are no issues anticipated.
- Whilst costs associated with providing stormwater attenuation and wastewater storage is likley, these are not considered abnormal development costs. Flood hazard and finished floor levels

3 Fooding

3.1 Flood maps

GDC has undertaken flood modelling for the 2%, 10% and 50% Annual Exceedance Probability (AEP) events (this can be interpreted as having 50 Year, 10 Year and 2 year Annual Recurrence Interval (ARI) respectively). The maps produced by GDC are based on ‘Rain on Grid’ analysis which only take into account the topography of the site. No drainage conveyance is accounted for and so the ponding that is evident on the flood maps gives a misleading view of the actual situation. The flood maps provided from GDC are attached in Appendix B.

The maps provided by GDC indicate a ponding depth of approximately 300 mm close to the western boundary with Barton Street, for all the modelled AEP events. The significance of this is that, based solely on the existing analysis any buildings proposed in this area will need to have finished floor levels raised by either enhancing foundations or building up the surrounding ground levels. However, as mentioned above, the flooding depths shown on the GDC maps are primarily due to local topographic depressions within the site and may not represent a true flood effect.

In the interests of providing a conservative assessment, any new buildings near the western boundary of Barton Street should only be considered once the minimum floor level requirements and accessibility into the raised building platforms are understood.

Flood modelling incorporating drainage and current infrastructure capacity should be undertaken to further understand the extent and level of flooding on site and identify any implications on neighbouring properties.

3.2 Overland flow paths

Based on the GDC modelling, GDC maps indicate there is an overland flow path through the site for all events modelled. However, through discussions with the GDC Three Waters Engineer, he confirmed that Barton Street currently serves as the secondary flow path. Close examination of the topographical information, available through Tairawhiti Maps and Google Maps, indicates that there is a localised high point towards the northern end of Barton Street, which may be acting as a barrier to the secondary the flow path and account for the discrepancy between the flood maps and GDC's belief that Barton Street acts as the secondary flow path.

If this discrepancy does exist (i.e. the secondary flow path does in fact cut through the site and not through Barton Street) this could potentially be resolved if the elevated portion of Barton Street is either re-profiled to enable passage of secondary flow from Ranfurly Street to Crawford Road or provide an open channel conveyance through Barton Street. This would ultimately result in a clear flow path and alleviated risk of flooding for the proposed development and the neighbouring properties.

Until this discrepancy of overland flow path is resolved with GDC, proposing to construct buildings in the north eastern part of the site (to the west of Barton Street) will require substantially higher finished floor levels relative to existing ground levels. However, as mentioned above, GDC may be open to the idea of providing an open channel conveyance through Barton Street for secondary flow which may alleviate the flow path through the proposed school site as shown on GDC plans.

In order to assess if diverting the secondary flow path is required (and at what potential cost), the following steps should be considered:

1 A more accurate model of the stormwater discharge system needs to be developed to understand the likely extent of flooding incorporating the existing drainage network and its residual capacity. For further clarity, undertaking a topographical survey to assess the difference in existing levels is recommended.

2 The effects of raising site levels on the west side of Barton Street and potential implications of flooding neighbouring properties needs to be understood.

3 An engineering solution needs to be developed to either provide a conveyance channel on the side or re-profiling of Barton Street for providing secondary flow passage.

The anticipated cost for undertaking the first step could be in the rage of $15,000 - $25,000. Upon completion of the first step, if deemed necessary, cost for completion of second step could be approximately $10,000 – $20,000. The cost for the third step could be in the vicinity of $150,000 - $250,000. These costs are indicative only and we may not require all three steps to be undertaken if following the first step, analysis of the effects of flooding is assessed to be minor.

The flood maps do not indicate the portion of the site to the east of Barton Street is at significant risk, and the use of this portion of the site is not constrained by flooding risk. However, we recommend that the Barton Street portion of the site is maintained at a low elevation to allow for a secondary flow path and any development of this area should be compatible with maintaining a clear flow passage. Development features in this area could be car parking, hard stand play areas or outdoor education areas.

3.3 Accessibility for emergency vehicles

The GDC maps indicate that there is flooding to a depth of 400 mm for all events considered (50 year, 10 year and 2 year) on Ranfurly Street towards the east of the site and this may impede emergency services access. However, as noted above, the current flood maps may not accurately represent flood depths. Furthermore, as there is no flooding indicated on Ranfurly Road to the western side of the site, an alternative access route is readily available for emergency vehicles.

3.4 Finished floor levels

GDC has provided flood hazard maps for the area (Appendix C). The proposed site has some areas, especially towards the Crawford Road frontage, that have been identified as falling under the F7 flood hazard classification. There are minimum floor level requirements specifically for these areas set out by GDC. Any new builds in these areas would be required to have a minimum floor level of 300 mm above the existing ground level[7]. GDC has indicated that in some areas of the F7 region, the ponding depth can be up to 400 mm, in such cases the gully traps should be placed 150 mm above ponding depth and finished floor level set 100mm above gully trap level reaching a finished floor level 650 mm above existing ground levels[7].

As shown on the plan in Appendix C, the area of the proposed site that falls under this flood hazard area is minimal and is unlikely to significantly impact the development. For any new builds outside of the F7 flood hazard area the minimum floor level is required to be 250 mm above existing ground levels. This applies to most of the site.

3.5 Flooding summary

In summary, based on the information provided by GDC, there are some uncertainties and potential development constraints associated with potential flooding on site to the western boundary to Barton Street. These uncertainties and potential constraints include:

- Alleviating flood risk from the proposed development will require further engineering input to understand the extent of flooding and implications on neighbouring properties.
- Minimum floor level requirements for the identified flooding area of the site could be significant if any buildings are proposed in this area.
- Costs associated with managing the secondary flow path away from the site could be expected to be borne by MOE as the developer and GDC may not be open to share costs.
- Undertaking the modelling and analysis of the flooding will clarify the potential for flooding at the site and further support the consenting process to assess effects on third party.

4 Conclusion

This site is generally well located for civil services, especially being positioned at the upstream of the stormwater and sewer catchments. There are multiple connection points available on the GDC network for three waters connections in the near vicinity of the site. There are no major concerns with regards to three waters connections and available capacity of the existing GDC network.

There is however a requirement to provide onsite stormwater attenuation for the increase in post-development run off. Provision of onsite attenuation is typical for this type of development and associated cost are not regarded abnormal. Some onsite storage for the sewer may also be required if deemed necessary by GDC to offset any discharge peaks with domestic flow. In the overall cost analysis for the proposed school development, provision of onsite sewer storage should be considered as a contingent sum. There are no significant issues identified with respect to water supply, there are sufficient fire hydrants and connection points available for the proposed development.

There is a discrepancy with GDC 'Rain on grid' flood maps and Floor Levels Flood Hazard map which identify two different flood routes, through the proposed site and through Barton Street respectively. This discrepancy needs to be assessed further and cleared with GDC as it could significantly influence the development of the site. Based on currently available data, it is beneficial for the development to establish a secondary flow path through Barton Street which would optimise

[7] Email correspondence from Mike Greef dated 24/02/201 time stamped 8.45am.

the available space for the school development. The need for and costs associated with establishing flow path on Barton Street will depend on the results of further flood analysis and assessment of flooding effects on adjacent properties. As a reasonable worst-case estimate, engineering costs for providing a flow path through Barton Street would be anticipated in the order of $150,000 - $250,000 and a contingent sum should be allowed for this in the overall cost analysis.

The current secondary flow path through the site as shown on the GDC flood maps influences floor levels for future buildings close to the western side of Barton Street. If the current flood maps are correct the finished floor levels of any building proposed in this area, though it is outside of F7 flood hazard area, could be up to 650 mm above existing ground level. However, if the secondary flow path is established on Barton Street, and there is no residual flooding risk to the neighbouring properties, the site levels in this area could be raised to accommodate buildings with relatively low finished floor levels. Verbal discussions with GDC Three Waters Engineer, service capacity and connection availability for the three waters has been established. We have followed up with the three waters engineer in writing to confirm these for future reference.

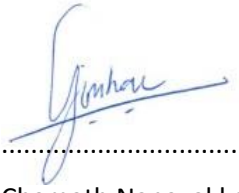
5 Applicability

This report has been prepared for the exclusive use of our client Ministry of Education, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:



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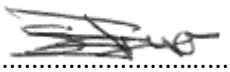
Chamath Nanayakkara
Civil Engineer

Reviewed by:



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Simon Fryer
Senior Civil Engineer

Authorised for Tonkin & Taylor Ltd by:

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Paul Walker

Project Director

CHNA
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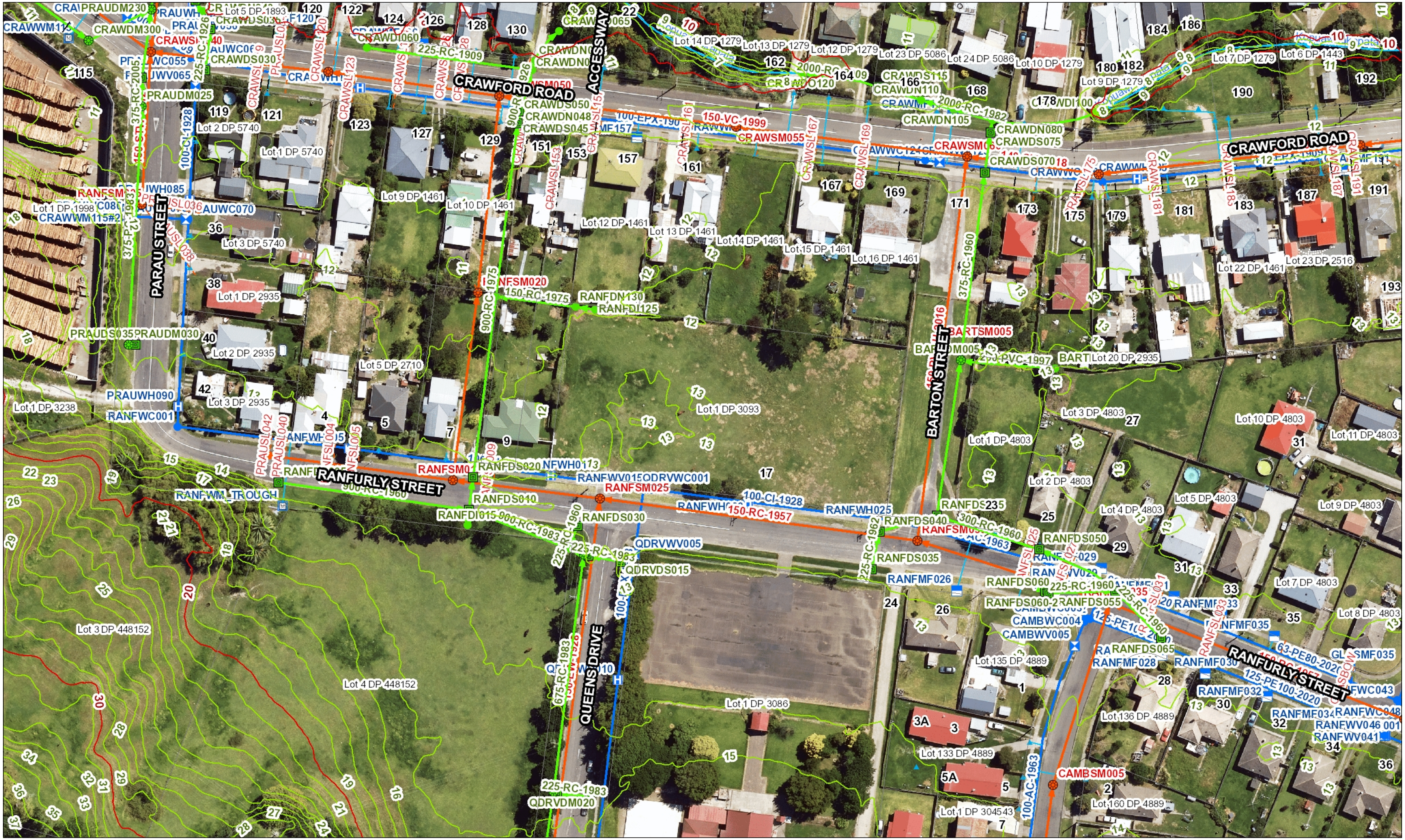
Appendix A: GDC existing civil services



GISBORNE DISTRICT COUNCIL

Existing Services

Information shown on this plan is indicative only and not mapped to a survey accurate scale. Gisborne District Council accepts no liability for its accuracy and it is your responsibility to ensure that the data contained herein is appropriate and applicable to the end use intended. Contains Crown Copyright Data -Sourced from Land Information NZ. Orthophotography -NZAM, Terralink and Aerial Surveys

Additional Notes:

For information only

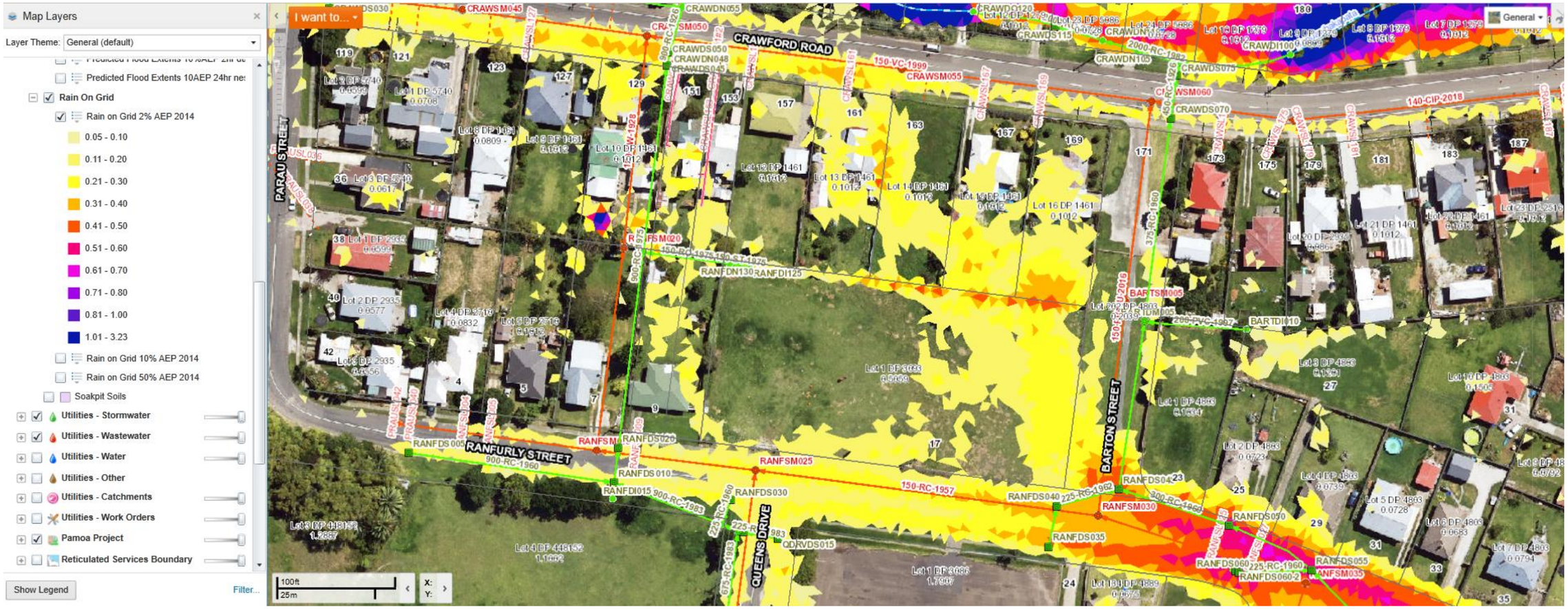
Indicative Map Scale: 1: 1,000 @ A3

Created by: Tonkin + Taylor Ltd

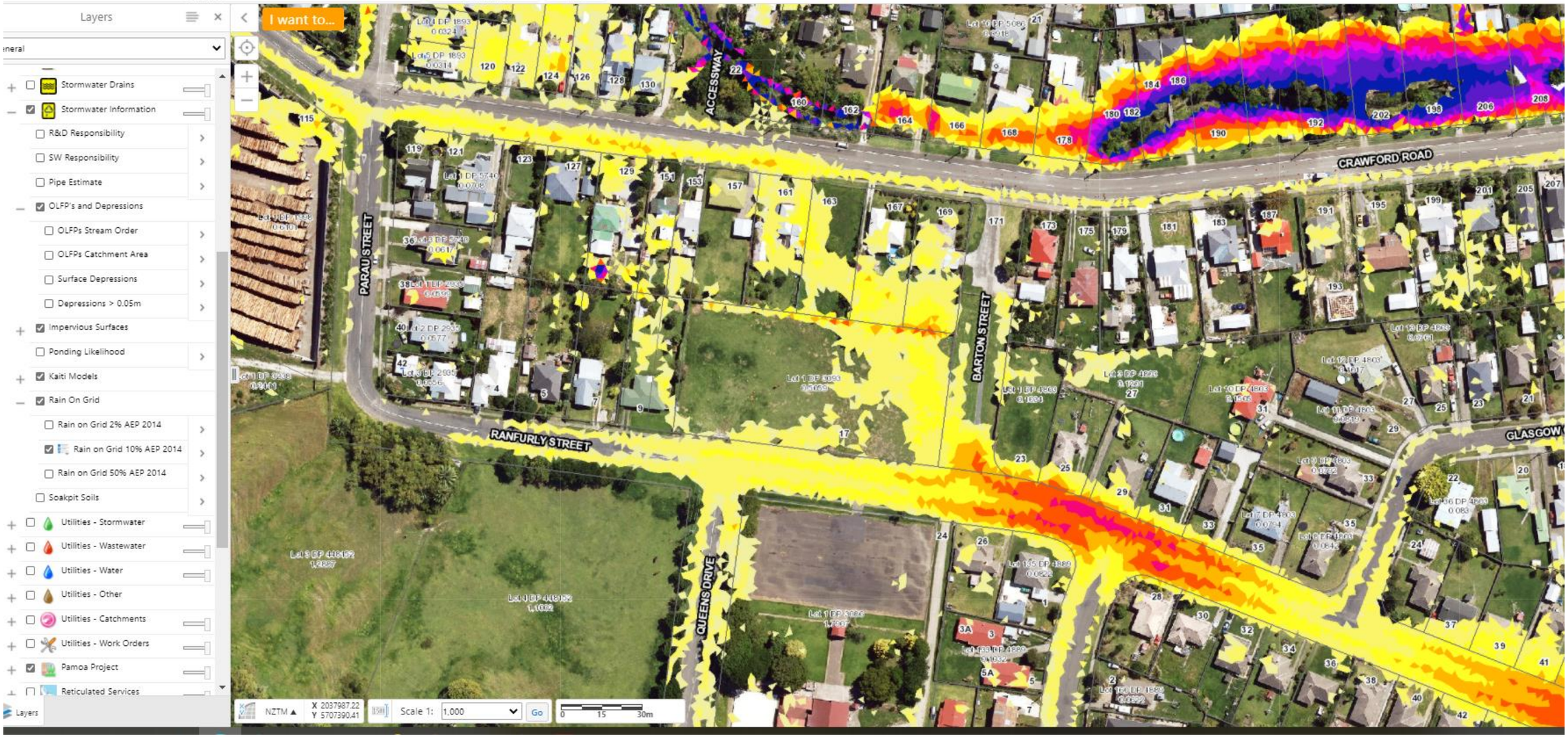
Date: 11/03/2021 10:39:51 AM

Projection: NZGD2000 New Zealand Transverse Mercator

Appendix B: GDC flood maps



Flood Map - Rain on Grid – 2% AEP based on Lidar Survey in 2014

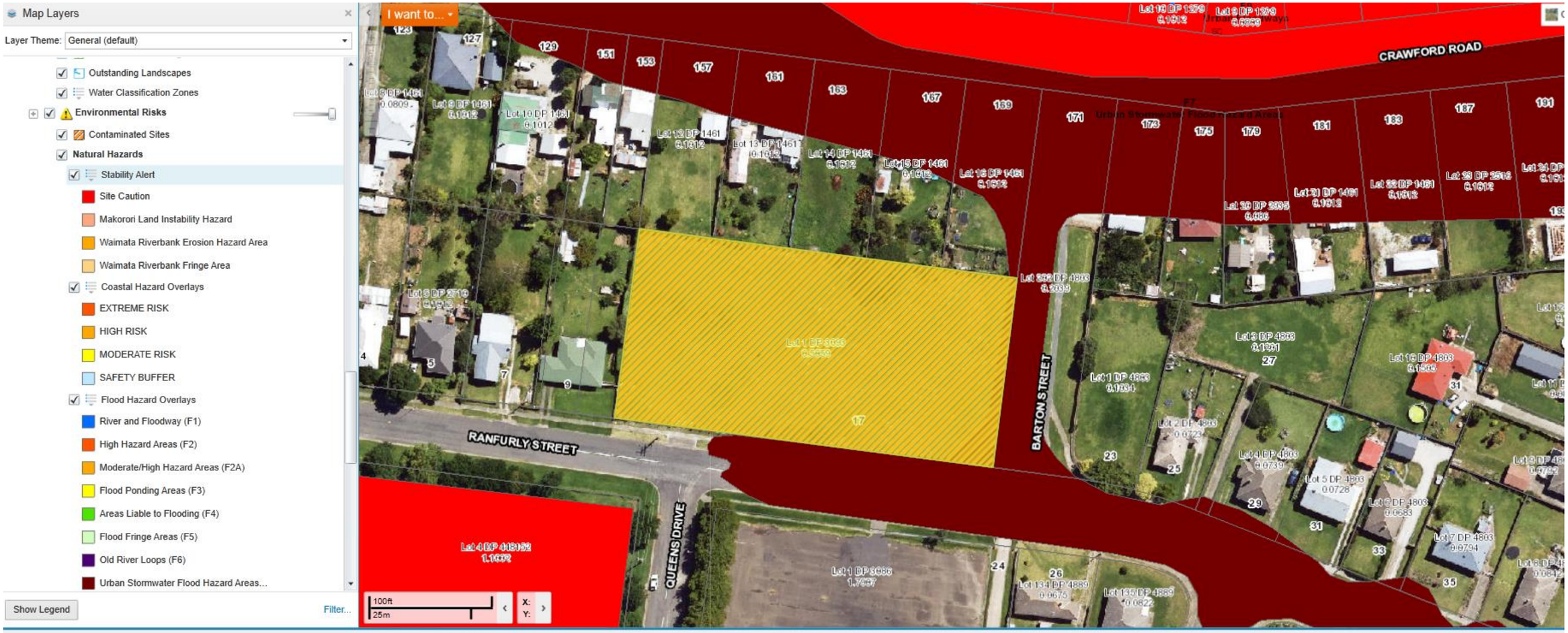


Flood Map - Rain on Grid – 10% AEP based on Lidar Survey in 2014

Flood Map - Rain on Grid – 50% AEP based on Lidar Survey in 2014

Overland flow paths and depressions based on Lidar Survey in 2014

Appendix C: Flood hazard areas for minimum floor levels



Minimum floor level requirements – Flood Hazard Map

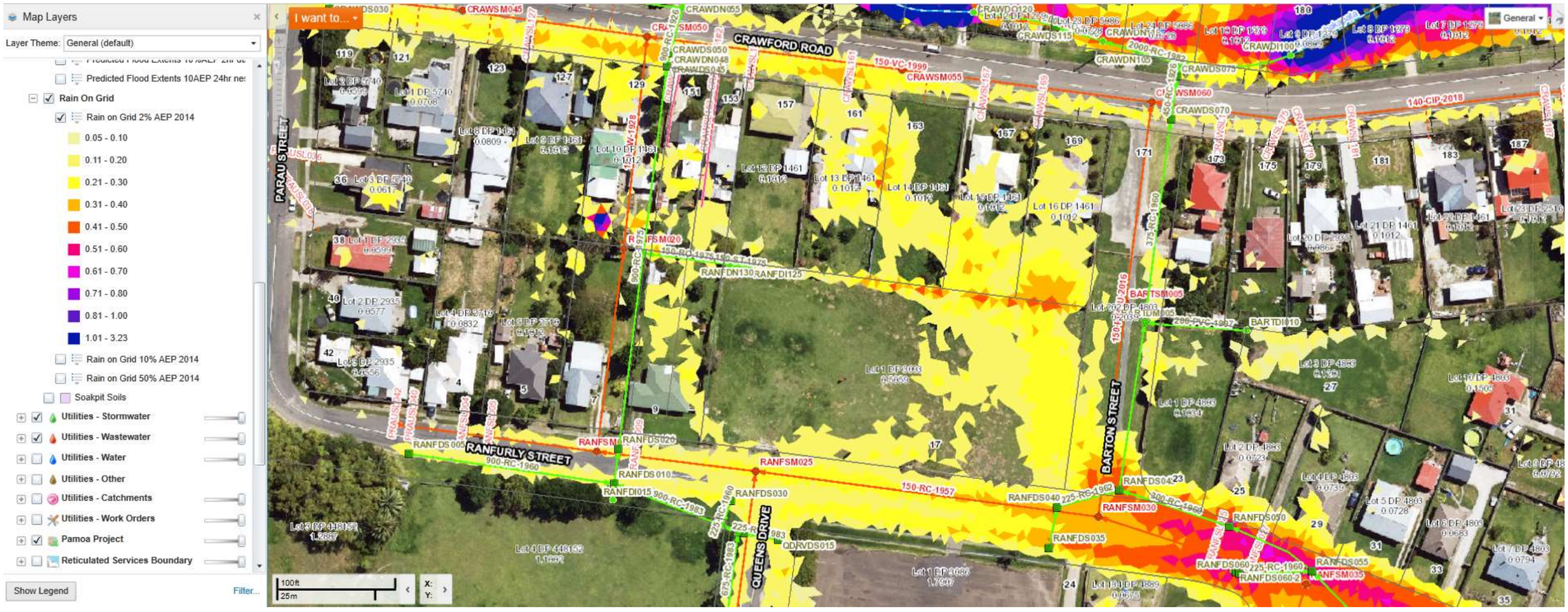
Appendix D: Correspondence

Chamath Nanayakkara
From: Mike Greeff <Mike.Greeff@gdc.govt.nz>
Sent: Wednesday, 24 February 2021 8:45 AM
To: Chamath Nanayakkara
Cc: Chris Hopman
Subject: RE: Ministry of Education Potential School Development

Morning Chamath

See Below:

1. Rain on Grid – 2% AEP based on Lidar Survey in 2014 – This is the only modeling data available. We do not have modeling available for 1% or 0.5% events available. I have attached additional modeling information for your information.
   Please contact me if you want to discuss this.



2. Network Capacities for 10% AEP 2hr duration storm

3. Overland Flowpaths and depressions

4. In terms of floor levels consider the following:
   Some of the properties are in the F7 flood hazard zone – this requires floor levels to be at least 300mm above ground level. See image below.
   However the likelihood of ponding in certain areas of the sites seem to be in the order of 400mm deep. Gully traps should be 150mm above this level – if they are located in these areas. The floor level then needs to be 100mm above the gully trap.
   So this is something that needs consideration of where buildings will be placed.
   If they are outside the flood areas – the gully trap needs to be at least 150mm above ground level and your building 100mm above the gully trap – giving floor levels of 250mm above natural ground level.

   Please also note that 17 Ranfurly street is classified as a contaminated site.

From: Chris Hopman <Chris.Hopman@gdc.govt.nz>

Sent: Wednesday, 24 February 2021 7:58 am
To: Mike Greeff <Mike.Greeff@gdc.govt.nz>
Cc: Chamath Nanayakkara <CNanayakkara@tonkintaylor.co.nz>
Subject: FW: Ministry of Education Potential School Development

Mike

Can you provide 3 and 4 to Chamath by 10.30am this morning. He has 1 & 2

Cheers
Chris

From: Chamath Nanayakkara <CNanayakkara@tonkintaylor.co.nz>
Sent: Tuesday, 23 February 2021 9:53 AM
To: Chris Hopman <Chris.Hopman@gdc.govt.nz>
Subject: Ministry of Education Potential School Development

Hi Chris,

It was good to speak to you earlier. As mentioned, we are currently undertaking a feasibility assessment for a school development in Kaiti area for Ministry of Education. As part of our assessment we are looking at the existing infrastructure in the area to understand capacity and identify areas that needs upgrading. To undertake out assessment we would like to request information on following items:

- LiDAR information or area topography/contour maps for the area shown on the attached plan
- As-built plans of existing three-waters infrastructure in the area
- Existing flood hazard modelling maps for the region for 1 in 200 yr, 1 in 100 yr and 1 in 50 yr flood events
- Finished floor levels set by the council for the properties outlined on the attached plan

If you could please provide the information requested above that would be very helpful.

If you have any queries please feel free to contact me.

Kind regards

Chamath Nanayakkara | Civil Engineer
BE(Hons)
Tonkin + Taylor - ***Exceptional thinking together***
Level 3, PwC Centre, 60 Cashel Street, West End, Christchurch | PO Box 13055 Christchurch, New Zealand
T +6433610319 **www.tonkintaylor.co.nz** T+T profile
Tonkin+Taylor
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