

# **The Proprietors of Hauhungaroa No. 6 Trust**

Whareroa North

Preliminary Stormwater Assessment

*IBA 1070 Rev.4*

*26 September 2019*

## The Proprietors of Hauhungaroa No. 6 Trust

Whareroa North

Preliminary Stormwater Assessment

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## Attachments –

1. Cheal Geotechnical Report IBA 1070L150, dated 18 October 2018
2. Cheal Drawing IBA1070-656 Rev.B - Conceptual Design Stormwater Catchment Analysis Pre & Post Development
3. Cheal Drawing 1070-SK650 – Conceptual Design Stormwater Catchment Analysis Pre-Development
4. Preliminary Calculations Rev.1
5. Stormwater Device Concepts 1070-SK660 Rev.1

## 1. INTRODUCTION AND OBJECTIVE

This preliminary stormwater assessment has been prepared for The Proprietors of Hauhungaroa No. 6 Trust in response to a Taupo District Council (TDC) request for further information to accompany a proposed plan change, to allow development of a staged residential development in Whareroa, on the western side of Lake Taupo.

The objective of this assessment is to broadly outline the proposed approach for dealing with stormwater flows and quality on the subject site. A low impact design is proposed which will utilise the site's natural soakage capabilities, whilst substantially reducing existing erosion patterns above the Whareroa Stream and preventing water quality degradation in the stream itself.

In preparing this assessment, several discussions were undertaken with TDC engineering staff and these have been considered. In addition, the Waikato Regional Council (WRC) Stormwater Management Guidelines have also been used in terms of addressing water quality issues for development runoff.

The geotechnical report prepared for the development and included as Attachment 1 (Cheal ref IBA 1070L150, dated 18 October 2018) has also been considered.

It should be noted that this assessment is not a detailed design, and it is not intended to be submitted to TDC or WRC for the purposes of obtaining a resource consent.



## 2. SITE DESCRIPTION

The proposed development site is located on the western shore of Lake Taupo, on the northern side of the Whareroa settlement. The site is accessed off Whareroa Road and lies in a west-east alignment on an elevated ridge north of the Whareroa Stream.



Figure 1: Location Plan (indicative only)

The site is mainly bare pasture, with regenerated scrub and native bush at its eastern extent where access is proposed down to and over the Whareroa Stream. The site drains generally towards the south and east via shallow ephemeral watercourses. There is a large "bowl-shaped" depression on the southern side of the site, with an erosion feature at its low point.

## 3. PROPOSED DEVELOPMENT

It is proposed to subdivide the subject site over several stages. The indicative site layout is shown on Cheal drawing 1070-SK656 included as Attachment 2. This is subject to final design and approval.

The works will involve earthworks to provide graded surfaces suitable for the construction of roads and lots, with reshaping being carried out to direct stormwater flows to proposed stormwater ponds.

As part of the earthworks, reshaping will be carried out above the existing erosion feature adjacent to the bowl-shaped drainage depression in the southern area of the site, as recommended in the

appended geotechnical report. This will direct stormwater surface flows away from the erosion feature.

## 4. EXISTING STORMWATER SITUATION

Cheal drawing 1070-SK650 included as Attachment 3 is based on LIDAR contour information and shows the existing stormwater catchments. Pre-development Catchments A to D, are on the subject site, with the largest pre-development Catchment B flowing to the existing erosion feature adjacent to the bowl-shaped depression on the southern side of the site.

Pre-development Catchments E to G are on the adjacent land to the north of the subject site.

## 5. PROPOSED STORMWATER DESIGN

The focus is on low impact stormwater design with roadside bioretention swales (i.e. vegetated roadside channels with engineered filter and drainage media placed in the base, as shown on Cheal sketch 1070-SK660 included as Attachment 5), and disposal to soak holes being utilised. These measures will assist in reducing contaminants by treating and disposing of the stormwater close to the source, resulting in a much higher quality of stormwater discharging to the environment than would be achieved otherwise with a traditional, non-low impact approach.

“First flush” stormwater from roads resulting from the 10% AEP rainfall event will be treated by the bioretention swales before being disposed of to soak holes. The swales will be designed in accordance with WRC guidelines to ensure a minimum 9-minute residence time for stormwater. With this residence time, simple grassed swales alone will remove at least 80% of total suspended solids; the additional bioretention component of the swales will provide treatment over and above this, as will the filter strip effect from the vegetated space between the road and the swale. Use of planting species other than grass within the swales will provide even further treatment, although the exact species used would need to be amenable to TDC because the vegetation will be located within public road reserve.

To further promote stormwater quality, all lots will be restricted from using exposed zinc-coated (galvanized) roofing materials and will be required to install and maintain erosion and sediment controls during the actual building phase, by way of Consent Notes on the lot titles.

Discussions with the Geotechnical Engineer who prepared the appended geotechnical report has led to the approach being taken as shown on drawing 1070-SK656, discussed in detail below. The aim is to reduce the amount of runoff and soakage into pre-development Catchment B as shown on drawing 1070-SK650, which as mentioned currently drains to the existing erosion feature adjacent to the bowl-shaped drainage depression.

To achieve this reduction, the roads within post-development Catchment A (annotated as “Soakage Area 1”), the upper portion of road within post-development Catchment B (annotated as “Soakage Area 2”), and future roofs on the upper lots (annotated as “Soakage Area 3”), will discharge to ground in a 10% AEP event. Roof runoff from a 10% AEP event from post-development

Catchments A and D will also go to ground soakage, but via attenuation tanks fitted with slow-release outlets on each site.

As shown in the preliminary calculations included as Attachment 4, and summarised below, this reduces the 10% AEP runoff/infiltration into pre-development Catchment B:

<b>Catchment/soakage area</b>	<b>10% AEP runoff</b>
Pre-dev Catchment	326 litres/sec
Post-dev Catchment A (Soakage Area 1)	156 litres/sec
Post-dev Soakage Area 2	46 litres/sec
Post-dev Soakage Area 3	100 litres/sec
Post-dev total	302 litres/sec

This represents a pre-development to post-development reduction of 7% for the 10% AEP event. The actual reduction will be higher because during events larger than the 10% AEP, stormwater will be directed to the proposed attenuation ponds instead of running overland or soaking away as it currently does.

The reduction will be further enhanced by recontouring the land, to eliminate almost all overland flow to the erosion feature itself. Planting will also be carried out above the erosion feature.

## 5.1 Post-development Catchment A

Post-development Catchment A consists of 5,140m<sup>2</sup> of road reserve and 27,000m<sup>2</sup> of lot/reserve areas. It is proposed that for post-development Catchment A:

- Vegetated bioretention swales will be provided to treat road runoff as per WRC guidelines;
- Drilled soak holes will be provided for the roads to dispose of stormwater resulting from up to a 10% AEP event;
- Stormwater resulting from up to a 1% AEP event will be conveyed via the road reserve to an attenuation pond (Pond 1) on the southern side of the site;
- Each lot will have an above-ground stormwater tank for stormwater collection and attenuation, to be installed at the time of building by way of Consent Notes on the lot titles. The tanks will be sized to deal with the 10% AEP 1 hour rainfall event, and be fitted with orifice outlets to restrict outflows to pre-development flow rates; and
- Restricted outflows from the attenuation tanks on the lots will be discharged via soak pits or infiltration trenches on each lot, to be installed by way of Consent Notes on the lot titles. A target design will be provided for the pits / trenches based on soakage rates and tank outfall rates.

The primary purpose of Pond 1 is to minimise discharge flow rates from the site and to divert flows away from the existing scour area downstream. Consequently, Pond 1 will have an impermeable liner and will be sized to hold the 1% AEP rainfall event. Events larger than this will overtop the pond via a traditional stabilised spillway. The pond and its surrounds will be planted with selected species and to the extent as agreed with TDC.

To minimise impact on the steep bank and to avoid vegetation removal and construction activities in the stream bed and on the banks, discharge from Pond 1 is proposed to outlet via sheet flow onto

the existing ground surface, utilising the existing vegetation and the approximately 50m of relatively flat ground between the pond outlet and the bank to further treat and disperse flows.

The sheet flow discharge will be limited to the pre-development 10% AEP flow rate and can be accomplished via a bubble-up level spreader swale system designed to disperse outlet flows and minimise flow depths and velocities, as shown on Cheal sketch 1070-SK660 included as Attachment 5.

The pond structure will be located on proposed local purpose drainage reserve within the development site, to allow for ownership and continued access and maintenance by TDC.

Although calculations are not included in this report, conservative preliminary volume calculations for Pond 1 indicate an approximate pond volume of 120m<sup>3</sup> for the attenuation of the 1% AEP event. However, this will be refined during detailed design. A pond forebay is not considered necessary because the first flush from any rainfall event will be dealt with by the roadside swales.

## 5.2 Post-development Catchment B

Post-development Catchment B consists of 12,490m<sup>2</sup> of road reserve. It is proposed that for post-development Catchment B:

- Vegetated bioretention swales will be provided to treat road runoff as per WRC guidelines;
- Drilled soak holes will be provided for the roads to dispose of stormwater resulting from up to a 10% AEP event; and
- Stormwater resulting from up to a 1% AEP event will be conveyed via the road reserve to an attenuation pond (Pond 2) on the southwestern side of the site.

As with Pond 1, the primary purpose of Pond 2 is to minimise discharge flow rates from the site and to divert flows away from the existing scour area downstream. However, Pond 2 can utilise soakage as it is well away from the scour area. As with Pond 1, Pond 2 will be sized to deal with the 1% AEP rainfall event, with events larger than this overtopping the pond via a traditional stabilised spillway. The pond and its surrounds will be planted with selected species and to the extent as agreed with TDC.

For the same reasons as for Pond 1, discharge from Pond 2 is proposed to be limited to the pre-development 10% AEP flow rate and will outlet by way of sheet flow onto the existing vegetated ground surface via a bubble-up level spreader swale system designed to minimise flow depth and velocities.

The pond structure will be located on proposed local purpose drainage reserve within the development site, to allow for ownership and continued access and maintenance by TDC.

Although calculations are not included in this report, conservative preliminary volume calculations for Pond 2 indicate an approximate pond volume of 240m<sup>3</sup> for the attenuation of the 1% AEP event. However, this will be refined during detailed design. A pond forebay is not considered necessary because the first flush from any rainfall event will be dealt with by the roadside swales.

Though not accounted for within the preliminary calculations forming this report, there is some potential for reuse of stormwater for irrigating the private land to the west of post-development Catchment B. Based on the current development layout, Pond 2 would likely be the best source for this, however the details of how such a reuse system might work would need to be discussed and agreed with TDC (including how TDC could be protected in the event that such a system was installed and then at some point in the future was no longer required).

### 5.3 Post-development Catchment C

Post-development Catchment C consists of 8,480m<sup>2</sup> of road reserve. It is proposed that for post-development Catchment C:

- Vegetated bioretention swales will be provided to treat road runoff as per WRC guidelines;
- Drilled soak holes will be provided for the roads to dispose of stormwater resulting from up to a 10% AEP event; and
- Stormwater resulting from up to a 1% AEP event will be conveyed via the road reserve to an attenuation pond (Pond 3) on the eastern side of the site.

As with Ponds 1 and 2, the primary purpose of Pond 3 is to minimise discharge flow rates from the site and to divert flows away from the existing scour area downstream. As with Pond 2, Pond 3 can also utilise soakage as it is well away from the scour area. Pond 3 will be sized to deal with the 2% AEP rainfall event, with events larger than this overtopping the pond via a traditional stabilised spillway. The pond and its surrounds will be planted with selected species and to the extent as agreed with TDC.

Discharge from Pond 3 is proposed to be limited to the pre-development 10% AEP flow rate and will outlet by way of sheet flow onto the existing ground surface via a bubble-up level spreader swale system designed to minimise flow depth and velocities. Again, the pond structure will be located on proposed local purpose drainage reserve within the development site, to allow for ownership and continued access and maintenance by TDC.

Although calculations are not included in this report, conservative preliminary volume calculations for Pond 3 indicate an approximate pond volume of 120m<sup>3</sup> for the attenuation of the 2% AEP event. However, this will be refined during detailed design. A pond forebay is not considered necessary because the first flush from any rainfall event will be dealt with by the roadside swales.

### 5.4 Post-development Catchment D

Post-development Catchment D consists of 1,645m<sup>2</sup> of road reserve and 5,066m<sup>2</sup> of lot area. It is proposed that for post-development Catchment D:

- Vegetated bioretention swales will be provided to treat road runoff as per WRC guidelines;
- Drilled soak holes will be provided for the road to dispose of stormwater resulting from up to a 10% AEP event;
- Stormwater resulting from up to a 1% AEP event will be conveyed via the road reserve and an overland flow path to discharge onto undeveloped land on the south-eastern side of the site, where there is plenty of space to allow overland dispersal;

- Each lot will have an above-ground stormwater tank for roof water collection and attenuation, to be installed at the time of building by way of Consent Notes on the lot titles. The tanks will be sized to deal with the 10% AEP 1 hour rainfall event, and be fitted with orifice outlets to restrict outflows to pre-development flow rates; and
- As with discharge from the tanks in post-development Catchment A, the restricted outflows from the attenuation tanks will be discharged via soak pits or infiltration trenches on each lot, to be installed by way of Consent Notes on the lot titles. A target design will be provided for the pits / trenches based on soakage rates and tank outfall rates.

## 5.5 Access Road

Stormwater from the proposed access road into the subject site from Whareroa Road will be collected and disposed of using low impact principles, with a combination of sheet flow off the road and use of bioretention swales and soak holes as required. Care will be taken to ensure runoff is not concentrated in such a way to cause scour or erosion once it leaves the road.

## 5.6 Stormwater device access and maintenance

The roadside swales will need mowing if they are vegetated in grass, and this will likely be mostly carried out by the adjacent property owners. If an alternative plant species is used in the swales, the plants will likely need periodic maintenance by TDC, although this could be minimised by selecting hardy evergreen species from the extensive list of recommended species provided in Table 8-6 of the WRC stormwater management guideline.

The roadside soak holes are not expected to need maintenance provided that the swales are maintained as required and pre-entry catchpits are installed and maintained.

The ponds and their proposed outlet swales will need periodic maintenance depending on how they are constructed and vegetated. The ponds will be located within local purpose drainage reserve to allow TDC to own, access and maintain them.

# 6. CONCLUSION

This report outlines a catchment-based approach to managing stormwater quality and runoff volumes from the proposed development. The potential impact of stormwater runoff on the adjacent Whareroa Stream environs has been identified as a key issue, particularly the issues of pre- and post-development flows and the need to prevent contaminants entering the stream environment. The potential impact of runoff on the existing erosion feature at the low point of the bowl-shaped depression on the southern side of the site, and on the steep bank on the northern side of the Whareroa Stream, has also been considered.

The preliminary design approach taken in order to achieve these outcomes has been to minimise the impact of post-development stormwater runoff on these areas. This will be achieved by:

- Reducing runoff and soakage into pre-development Catchment B from pre-development volumes;

- Reducing post-development soakage into the area above the bowl-shaped depression and erosion feature;
- Almost completely eliminating overland flow to the erosion feature itself; and
- Providing attenuation ponds with level spreader outlets onto stable ground well away from the steep bank on the northern side of the Whareroa Stream, to eliminate the need for piping or drilling down the bank to the stream.

The desired stormwater quality outcomes are proposed to be achieved with a low impact design approach which will provide treatment at or close to source, and will include:

- Providing vegetated bioretention swales to convey and treat road runoff as per WRC guidelines;
- Restricting all proposed dwellings from using zinc-coated (galvanised) roof materials;
- Requiring all private building work to be carried out with erosion and sediment controls; and
- Providing the proposed stormwater ponds with level spreader outlets onto vegetated ground, to evenly disperse outflows and provide further quality treatment.

With these approaches, it is considered that subject to final detailed design, the proposed development will result in good stormwater outcomes both in terms of stormwater quality (ie with treatment at or close to source in order to avoid adverse off-site/stream effects) and stormwater runoff quantity (and therefore dramatically reduced actual and potential erosion effects).

## 7. DISCLAIMER

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**CHEAL CONSULTANTS LIMITED**  
**26 September 2019**

# **Attachment 1**

Cheal Geotechnical Report  
IBA 1070L150  
18 October 2018



OUR REF: IBA 1070L150  
TDC Ref: RM170357

18 October 2018

The Proprietors of Hauhungaroa No.6 Trust  
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ATTENTION: MERILYN CONNOLLY

Email: [Merilyn@whenuakete.co.nz](mailto:Merilyn@whenuakete.co.nz)

Dear Merilyn

WHAREROA NORTH SUBDIVISION : VERIFICATION OF GEOTECHNICAL CONSTRAINTS FOR RESIDENTIAL DEVELOPMENT

Upon a request for further information (RFI) issued by Taupo District Council (TDC) on 15 February 2018, in relation to an application for a Taupo District Plan change, Andres Martinez (Geotechnical Engineer) from Cheal Consultants Ltd, carried out an assessment for geotechnical constraints potentially affecting the land comprising future residential development over what is known as Whareroa North Block.

This letter aims to cover concerns identified by Council under Infrastructure/Engineering Assessment - Stormwater Management items 3 and 4 of the referred RFI.

The geotechnical assessment comprised a:

- Desktop analysis using provided and publicly available information, and a
- Specific site assessment.

Desktop analysis includes the revision of a geotechnical report appended to the infrastructure report prepared by Key Solutions in 2017, a review of historic aerial photographs and TDC online hazard database (Mapi).

A geotechnical report produced by Mark T. Mitchell Ltd (MTM) in 2006, focused on identifying if the low-lying area of the subdivision, **which forms a "bowl" shaped feature**, was the remnants of a shallow landslide. MTM mentioned sand/gravels deposited as delta or alluvial deposits when the lake was at a higher level. Based on a geomorphological/geological description of the site and trenching, MTM concluded that the site is covered by silt (ashes) that move downslope shortly after its deposition and that the bowl is a natural bench feature.

From an analysis of historic photographs of the site (Figure 1), sourced from Retrolens, the instability process present at the lowest part of the bowl was tracked back to 1969 when the scar of the process is noticed uphill from the former location of the Whareroa Stream. The process is erosive and retrogressive in nature and its potential failure sequence is summarised below:

1. An ephemeral drainage path diverting water from the bowl-shaped area run downslope and saturated loosely packed materials;
2. Saturated materials at the base of the slope were undermined, by the action of the former course of the Whareroa Stream that hit the slope on a degradation zone;
3. Retrogressive slope erosion created a deep incised gully shape geoform (i.e. no lateral expansion);
4. Underground seepage enhanced erosion of loosely packed materials of the upper scarp.

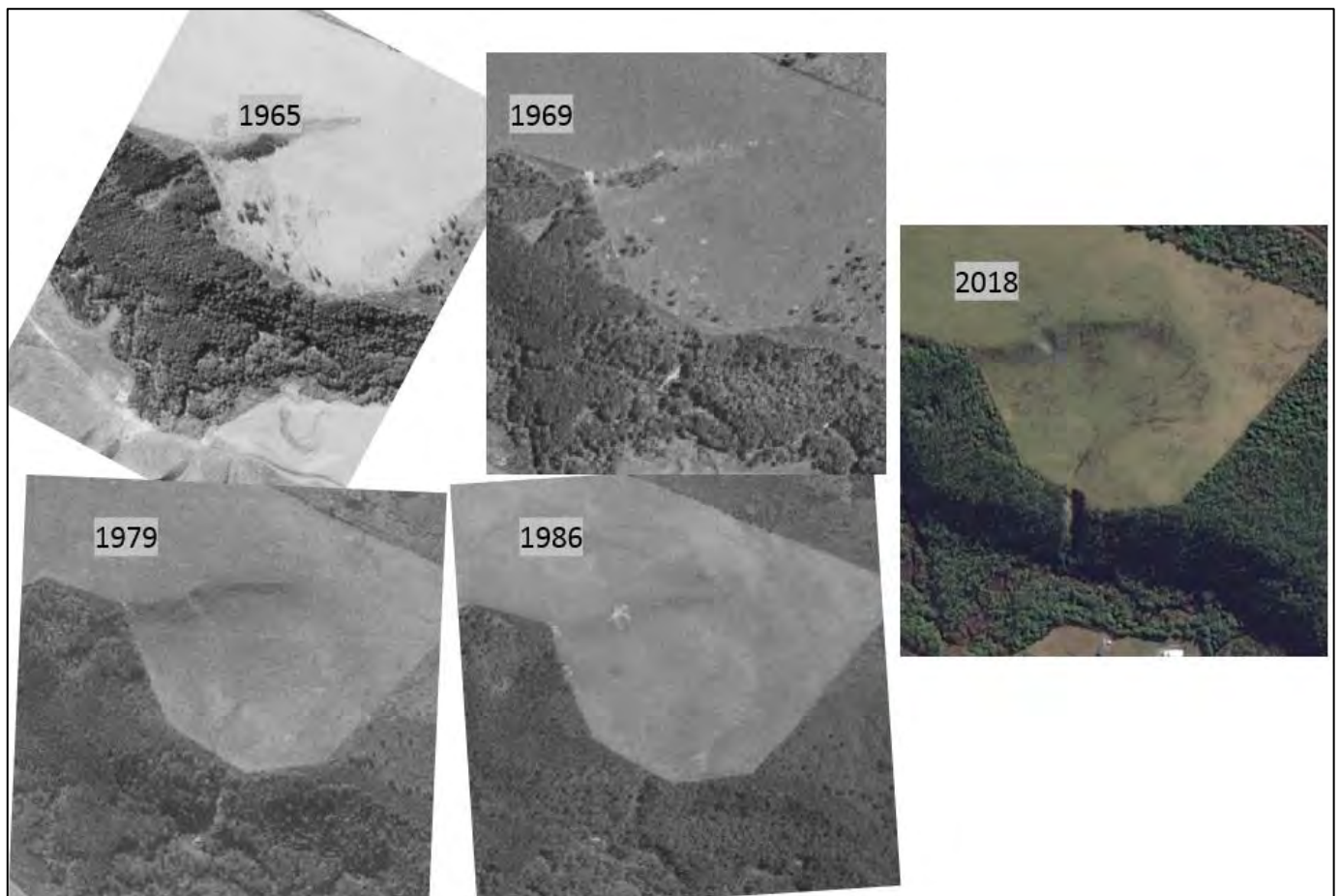


Figure 1 – Photo-interpretation (API) for qualitative analysis of the failure process

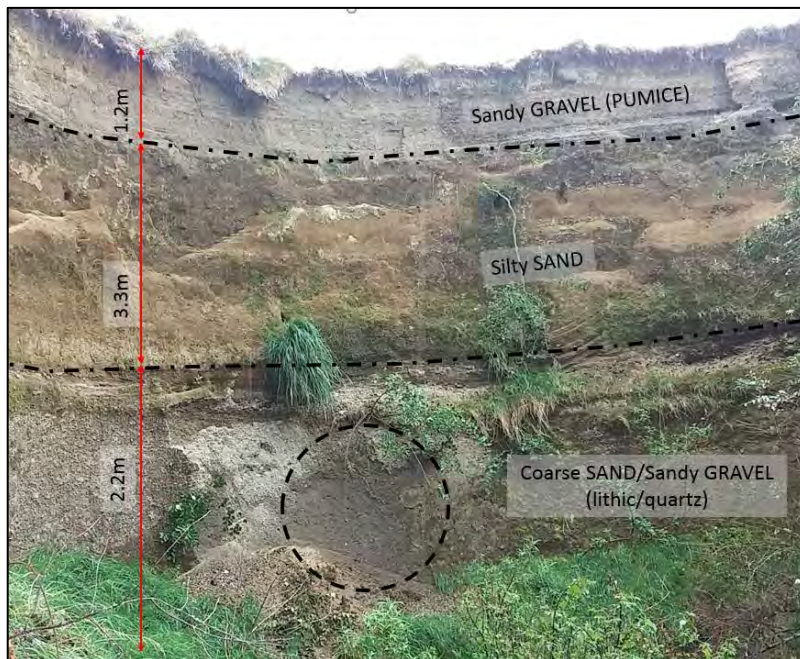
Specific geotechnical assessment included a walkover around the bowl-shaped area and as far/deep as possible on the failed area. The following was noticed:

- Whilst clearly marked shallow ephemeral water courses paths were noticed on the land shaping the bowl and pointed out towards the instability process, there was no evidence of either wet land areas (i.e. reed plants) or ponded water close to the crown of the erosion process (Photo 1).
- At least 20m of loosely packed granular materials, with thicknesses in the order of 3m, were noticed on the exposed face and sides of the upper scarp of the failure process (Photo 2 and 3).
- A circular/tunnel shaped wet area was noticed on the coarse SAND/sandy GRAVEL layer (4.5-6.7m deep). We consider that as an indication of concentrated underground water flow, seeping through granular materials following infiltration from the bowl area. This emphasizes the comments from the first bullet point.
- The process creates a deep incised geoform, common in granular pumiceous materials around the Taupo area (Photo 4).

- Natural slope gradients on the sides of the Whareroa Stream are in an equilibrium condition, being that equivalent to the angle of friction of the materials shaping them  $\pm 35^\circ$  (granular). However, the slope created by the erosion process is in average  $16^\circ$ , indicating that water flow keeps eroding the base of the process and deepening it (Sketch attached in Enclosure 2).
- The trend of movement indicates that the erosion process will extend backwards at least 15m before reaching its equilibrium condition (Sketch attached in Enclosure 2).



Photo 1 – Drainage pattern above failure process



Photos 2 and 3 – Exposed soil materials



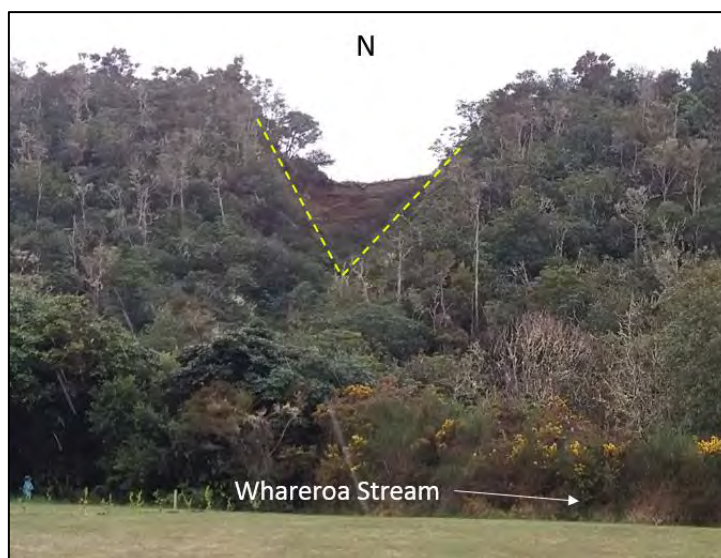


Photo 4 – V shape of erosion processes

## Discussion

The investigation carried out by MTM is considered a basic level investigation/analysis that did not allow them to directly discard that a landslide had occurred on the bowl-shaped area nor to verify the source of the sandy/gravelly materials deposited underneath the ash material noticed via trenching. The report does not investigate the reason of the failure noticed at the lowest part of the bowl or the genesis of the bowl-shaped feature.

Based on Cheal specific assessment, the bowl-shaped area noticed on the proposed development area and at two areas further to the west, could indicate ancient meanders of the Whareroa Stream created when the level of Lake Taupo was at a higher level than present. This could also be used to clarify the source of the sandy/gravelly materials noticed on the lower part of the bowl, which potentially were mobilised and deposited by the power of the stream flow.

The potential failure sequence, as described in a previous section, is the result of the knowledge of failure processes in similar materials around the Taupo area and a meticulous analysis of the shape of the process in top view (Enclosure 2). The longitudinal section has a bending point approximately halfway down, defining the limit of the initial process. Further down from that point, geoforms suggest the failure of a block of materials which deposited at stream level and changed its course. From the same point up, further water dynamics slowly eroded the slope to its current location.

The process affecting the slope is considered erosive in nature and conditioned to the loosely packed condition of the underground materials easily eroded by surface/underground water flow.

From the analysed photographic records, the failure process could be categorised as a very slow process (+49 years). The process could be even slower if consequences of both subsurface water flow eroding material on the face of the upper scarp and the erosion itself are minimised.

The site walkover confirmed that significant overflow of stormwater runoff, accumulated in the bowl-shaped area, and causing erosion of the scarp has a very low potential to occur and therefore it is not considered the main triggering element causing failure, contrary to the effect of infiltrated runoff creating underground flow paths which certainly contribute to the failure.

In terms of extension, the process is close to reaching its final equilibrium shape. Special consideration must be given to the potential final extension of the process to incorporate its location within the design of the stormwater pond around that area and the development layout itself.

#### TDC Request for Further Information

Answers and comments to stormwater management section points 3 and 4, which directly involves geotechnical issues, are presented below.

Point 3 relates to both a) the stormwater pond proposed directly up from the upper limit of the instability process and b) the direct disposal of stormwater down the escarpment face.

- a) Based on our geotechnical assessment, if remedial/control measures are not proposed and put in place the failure could slowly extend backwards up to 15m before reaching its equilibrium condition. As the proposed pond will be within the potential 15m affected length, as a cautionary measure it is recommended to provide a 15m setback from the slope crest for the location the pond (including the maximum extension of the batters, if any).

The provision of remedial measures to remediate/control the progress of the failure process will help to reduce the speed of the erosion process while still allowing for the final equilibrium condition (15m setback) with no adverse effects to the pond or development. Definition of remediation/control measures could be defined during the design stage of the project.

- b) Direct disposal of stormwater on the escarpment face is not recommended, however properly designed disposal systems to collect, convey and dispose stormwater further down to the Whareroa Stream are considered an option. Design of any stormwater disposal systems could happen during the design stage of the project.

The author wants to emphasise that the process is erosive in nature and consequently the speed and magnitude of its extension is longitudinal, rather than lateral. This is important for the definition of both the land that could potentially be affected in the future by the process and of the remedial/control measures to be implemented.

Point 4 relates to the catchment plan. Particularly related with geotechnical issues is **bullet point No 3** "identify means to address potential adverse environmental effects including addressing disposal down the current escarpment.

Section b) above states that disposal of stormwater on the escarpment is not recommended, but rather specifically designed systems disposing directly to the stream could be an option, therefore environmental effects, related with geotechnical matters, due to direct disposal on the escarpment/stream are not expected.

As an additional geotechnical comment, the author could want to propose reshaping/recontouring of the land around the lower part of the bowl-shaped area, with the aim of deliberately modifying the stormwater runoff pattern and related infiltration and underground water flow which could minimise concentration of infiltrated water towards the lower part of the drainage "bowl", helping to minimise/control the failure process affecting the lower part of the proposed development area. However, in any case, the 15m setback allows for regression of the escarpment to its final equilibrium condition with no adverse effects on the development.

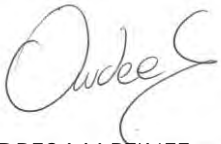
Disclaimer

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No liability is accepted in respect of its use for any other purpose or by any other person or entity.

The opinions, recommendations and comments given in this report are the result from the application of accepted industry guidelines / standards. As information over much of the site and surrounding land has been obtained solely from publicly available and provided information, and visual assessment of the land features there may be special conditions pertaining to this site which have not been identified by the undertaken analysis and which have not been taken into account in the report.

Yours sincerely



ANDRES MARTINEZ  
GEOTECHNICAL ENGINEER  
Email: andresm@cheal.co.nz

Enclosures:

1. Taupo District Council Request for Further Information
2. Cheal Sketch IBA1070 – SK15: Erosion Process Details

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15 February 2018

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Dear Joanne

**FURTHER INFORMATION REQUIRED**

**THE PROPRIETORS OF HAUHUNGAROA NO.6 - 480 WHAREROA ROAD, TONGARIRO WARD**

**Further Information**

Pursuant to clause 23(1) of the first schedule of the Resource Management Act 1991, the Council requests the following information. This information is necessary to enable the Taupō District Council to better understand—

- (a) the nature of the request in respect of the effect it will have on the environment, including taking into account the provisions of Schedule 4; or
- (b) the ways in which any adverse effects may be mitigated; or
- (c) the benefits and costs, the efficiency and effectiveness, and any possible alternatives to the request; or
- (d) the nature of any consultation undertaken or required to be undertaken—

Information Required	Reason
<b>Landscape Assessment</b>	
<p><b>1</b> Provide a landscape and visual assessment identifying the effects of the proposed access road on landscape values. The assessment should contain:</p> <ul style="list-style-type: none"> <li>• A detailed assessment of the physical changes to the landscape that will result from the proposal;</li> <li>• A description and analysis of the impact that physical changes will have on identified landscape values, visual impacts from key locations and cumulative effect of the proposed activity;</li> <li>• A detailed assessment of the extent to which the changes will affect the existing landscape character and the way in which affected parties' perception and experience of the landscape including visual amenity values is likely to be affected;</li> <li>• An evaluation of the significance of natural character, landscape, visual and amenity</li> </ul>	<p>The Infrastructure Report by Key Solutions identifies that bridging the Whareroa Stream and access to the development area have been considered in depth and that there is only one practical access to the plateau area to contain the Whareroa North zoning being a 'sidling construction'.</p> <p>Given the access corridor is generally known, as identified in Appendix 1 to Appendix D of the Infrastructure Assessment, a more detailed assessment, includes an assessment of the cumulative effects of the development enabled by the PC combined with existing developments, to inform Council in the decision-making process.</p> <p>The provision of a landscape assessment will also provide certainty that the zoning can be realised if it the plan change is accepted or adopted.</p>

	<p>effects in relation to statutory requirements; and</p> <ul style="list-style-type: none"> <li>• Identification of landscape mitigation measures, including enhancement or rehabilitation and assessment of the effectiveness of such measures.</li> </ul>	
<b>Infrastructure / Engineering Assessment</b>		
<b>Servicing Capabilities</b>		
2	<p>Provide a revised assessment for demand on Council's infrastructure assets for water and wastewater based on the permitted dwelling density proposed under a Taupo "residential environment"</p>	<p>For the purpose of infrastructure design, the assessment has relied on a figure of 160 additional dwelling equivalents on the north side has been as a maximum. This is anticipated to be made up of section size between 500 m<sup>2</sup> and 1,100 m<sup>2</sup> (and the majority between 600 m<sup>2</sup> and 750 m<sup>2</sup>);</p> <p>The request seeks to adopt the current residential environment provisions of the District Plan, which, as of right (permitted activity) allows for up to 3 residential dwellings to be established on one allotment.</p> <p>Such an increase in density may have significant impacts on Council's ability to serve Whareroa under current consent limits for water and wastewater from the Waikato Regional Council and require additional infrastructure to be considered (e.g. reservoir(s), pipelines (for water) and additional storage and oxidation pond area (for wastewater)).</p>
<b>Stormwater Management</b>		
3	<p>Provide a geotechnical assessment/investigation on the stormwater detention pond area (proposed Local Purpose Reserve) and any potential instability on this area as a result of escarpment face positioned directly below (south) stormwater detention pond area. The investigation shall identify any risk to Council of inheriting this site for stormwater purposes.</p> <p>The investigation shall also provide an assessment of the ability to discharge stormwater down the escarpment face following development of Whareroa North.</p>	<p>This area has been subject to extensive scouring and erosion. The Geotechnical Assessment appended to the Infrastructure Report highlights that this feature "will require remedial action to be taken as soon as possible as it appears that this erosion failure-feature is increasing in size". Given the assessment/statement was made over 11 years ago, and that it appears that no remedial works have been undertaken, a revised assessment on this part of the site is required.</p> <p>The proposal This area is proposed to retain a stormwater retention pond given with the structural formation of the land, which is to be inherited by Council, potentially comprised.</p>
4	<p>Provide a stormwater catchment plan for the development area</p>	<p>Notwithstanding the acceptability of the land for stormwater retention purposes (point 3 above), which may require an alternative solution to stormwater detention and or disposal, an assessment on how stormwater will be managed</p>



		<p>having regard to a total catchment management and any low impact design methods is required.</p> <p>Stormwater catchment plans (SCP) for greenfield urban development are required by the Regional Council and TDC is required to provide these as part of its 'blanket' or comprehensive stormwater discharge consent.</p> <p>The purpose of the SCP is to assess the potential adverse effects of the development on surface water resources downstream of the Whareroa North. The SCP will:</p> <ul style="list-style-type: none"> <li>• Provide baseline information within SCP</li> <li>• Identify potential environmental effects on riparian and aquatic ecology from urban development within the Whareroa North development.</li> <li>• Identify means to address potential adverse environmental effects including addressing disposal down the current escarpment.</li> </ul> <p>It is highlighted that the Cultural Impact Assessment (CIA) also recommends providing a <i>"baseline data be recorded on key fisheries indicators on the Whareroa Stream and then monitored over the consent period, with particular emphasis during the period of construction of the Whareroa Stream Bridge to manage any potential risks to fish habitat"</i>.</p>
<b>Land Improvement Area</b>		
5	Provide title plan showing the extent of Land Improvement Agreement (with the Waikato Regional Council) as contained within Interest H282790	To establish the extend of this area and any bearing it may have on the request sought.
<b>Legal Position on Bridge Crossing</b>		
6	Provide additional assessment on the legal requirements for the bridge to access Whareroa North to cross Whareroa Stream	<p>It is identified in the Plan Change that physical and legal access to Whareroa North will be via a proposed bridge across the Whareroa Stream.</p> <p>Generally, once land has been developed which connects to existing Council services (i.e. water, wastewater and roading) those assets are vested in the Council at the time of subdivision. This is supported in Key Solutions assessment which identifies that "it is logical for all the new roading to ultimately transfer to public ownership and be operated and maintained along with the rest of the District roading network by the Taupō District Council".</p>

		<p>As identified at Section 7.5.2 of the Plan Change, the bed of Whareroa Stream, over which the proposed bridge must cross, is held in ownership by the Tuwharetoa Maori Trust Board.</p> <p>The Council has concerns about securing the 'right' legal tenure for the bridge. The Council is opposed gaining a right to occupy that has an ongoing cost attached to it. Given the bridge appears to be the only feasible option into Whareroa North, the tenure options for the bridge need to be investigated further so sufficient provision has been made for long-term legal and physical access to the allotments to be created by the rezoning.</p>
<b>National Policy Statements</b>		
7	<p>Provide an assessment of the proposal against the provisions of:</p> <ul style="list-style-type: none"> <li>a. National Policy Statement for Freshwater Management 2014 (NPS-FW); and</li> <li>b. National Policy Statement on Urban Development Capacity 2016 (NPD-UDC).</li> </ul>	<p>The request is silent on the applicability of the provisions of the NPS-FW and NPS-UDC on the plan change sought.</p> <p>NPS-FW sets out the objectives and policies for freshwater management under the Resource Management Act 1991. It came into effect on 1 August 2014 and amendments made in August 2017 took effect on 7 September 2017. Although the NPS-FM does not directly require territorial authorities to include specific provisions in the district plans which relate to fresh water, territorial authorities are required to 'have regard' to the NPS-FM. It is also identified that the proposal, which will require drinking water, wastewater, and stormwater services, relates to the wider management of fresh water.</p> <p>The NPS-UDC sets out the objectives and policies for providing development capacity under the Resource Management Act 1991. The NPS-UDC came into effect on 1 December 2016.</p> <p>Council is to 'have regard' to these policy documents in determining the request. Accordingly, an assessment on the applicability of these policy statements and their relevancy to the request is required.</p>

## Council to Commission Reports

### 1. Urban Capacity

Taupō District Council believes that considerations around the timing and costs will be central to consideration of the plan change application and intends to commission a report that:

- a. Clarifies the anticipated demand for future residential households and sections over 10 and 20 year timeframes in terms of Whareroa and the wider district holiday home market.
- b. Identifies the current supply of residential sections in terms of vacant sections, consented sections and zoned sections for both Whareroa and the wider district holiday home market.
- c. Identifies the likely costs to the community associated with taking over and maintaining new infrastructure assets as a result of the development of the plan change area.
- d. Identifies any potential opportunity costs and cumulative effects to the community from the uptake of land in the plan change area impacting on the uptake of sections in areas that are already zoned.

This report is considered necessary because Council's wishes to understand whether there is a need for more residential land to be rezoned and when, furthermore, Council needs to understand the implications of zoning land for residential purposes ahead of any anticipated demand and the cost implications this may have on the ratepayer.

Council has used population projections from Statistics New Zealand to estimate future demand for residential housing and is of the view that future demand is likely to be more subdued compared to previous indications. The projections in Taupō District 2050 were based on the 2001 Census and the Southern Settlements Structure Plan reflected the 2006. This is summarised in Council's draft Demographic Snapshot 2016/17 (DS) for the Taupō District (**attached**). The DS indicates that we are exceeding the supply for this type of urban development for the foreseeable future. A review of the growth management strategy – Taupō District 2050 shows that for the population for the district has seen steady growth in recent times but projected growth into the future remains modest before peaking in late 2030s. For the Kuratau/Omori 'area unit', within which the Whareroa North site is located, the review identifies "the area has several adjacent areas of freehold land around Omori and Kuratau that are zoned for residential development". With a potential smaller and or/declining population, the ongoing 'cost' of serving Whareroa North becomes more difficult.

Section 3e of the Taupō District Plan sets out the process that should be followed to make land available for future residential development. The Plan anticipates an orderly release of land linked to appropriate infrastructure provision with structure planning and an associated plan change the preferred vehicle for undertaking that planning. In section 3e.7 there is a description of what that planning needs to address including "*consideration of the efficient use and development of natural and physical resources across the District and within the Urban Growth Area itself. Regard should be given to the capacity of zoned areas and notified Taupo District Structure Plans to accommodate the growth of the District in a 20 year period*".

The requirement to consider existing capacity to meet future demands is also reinforced in the Southern Settlements Structure Plan where it notes that "*possible staging within Urban Growth Areas is an option to ensure the efficient use and development of natural and physical resources across the District and within the Urban Growth Area itself. Regard should be given to the capacity of currently zoned areas and new growth areas to accommodate the growth of the District in a 20 year period and possibly beyond. Consideration also needs to be given to the cost of infrastructure and the utilisation of existing capacity and services, prior to new areas being developed and new service extensions being required. Overall, investments made by Council on behalf of the community should be recouped prior to new investments being made*" (page 17).

The Structure Plan goes further (page 38) to explain some of the effects that Council is concerned about managing "*there are significant financial risks associated with rezoning too much land ahead of reasonable demand, particularly if that land is not currently serviced. If Council invests in main infrastructure services the*

costs can be considerable (particularly interest costs on borrowings) and the return period on investment long". The Structure Plan indicates that at the time there was sufficient capacity in existing Whareroa to cater for more than 20 years of residential household growth.

There is therefore clear direction in both the Southern Settlements Structure Plan and the District Plan that Council expects applications for rezoning urban growth areas to address issues of supply, demand and the timing of rezoning to ensure that adverse effects are managed

## 2. Infrastructure Capacity - Wastewater

Council has concerns that the existing treatment facilities are not sufficient to accommodate the additional loading required to treat effluent for an additional 160 allotments (or up to 480 dwellings).

Council intends on commissioning an engineering report by a suitability qualified expert to determine the treatment capabilities of the existing treatment plant as a result of the 160 allotments (up to 480 dwellings). If it is determined that there isn't sufficient treatment capacity (being treatment, storage and disposal), the report will provide treatment options to address additional loading.

Another factor which may influence Council's ability to receive the full development capacity of Whareroa North is its resource consent to discharge treated effluent from Whareroa Wastewater Treatment Plant (WWTP). Council has recently submitted a resource consent to renew its discharge from the WWTP however as this is yet to be determined, there is a risk that any changes required (or imposed) by the Regional Council to the discharge regime or limits e.g. nitrogen may influence the ability of the WWTP to receive the full development capacity of Whareroa North.

Clause 23(5) of the first schedule of the RMA provides that you may:

- (a) decline, in writing, to provide the further or additional information or to agree to the commissioning of a report; and
- (b) may require the local authority to proceed with considering the request.

If you decide to decline to provide the further or additional information under subclause (5), the Council may at any time reject the request or decide not to approve the plan change requested, if it considers that it has insufficient information to enable it to consider or approve the request.

### **Meeting**

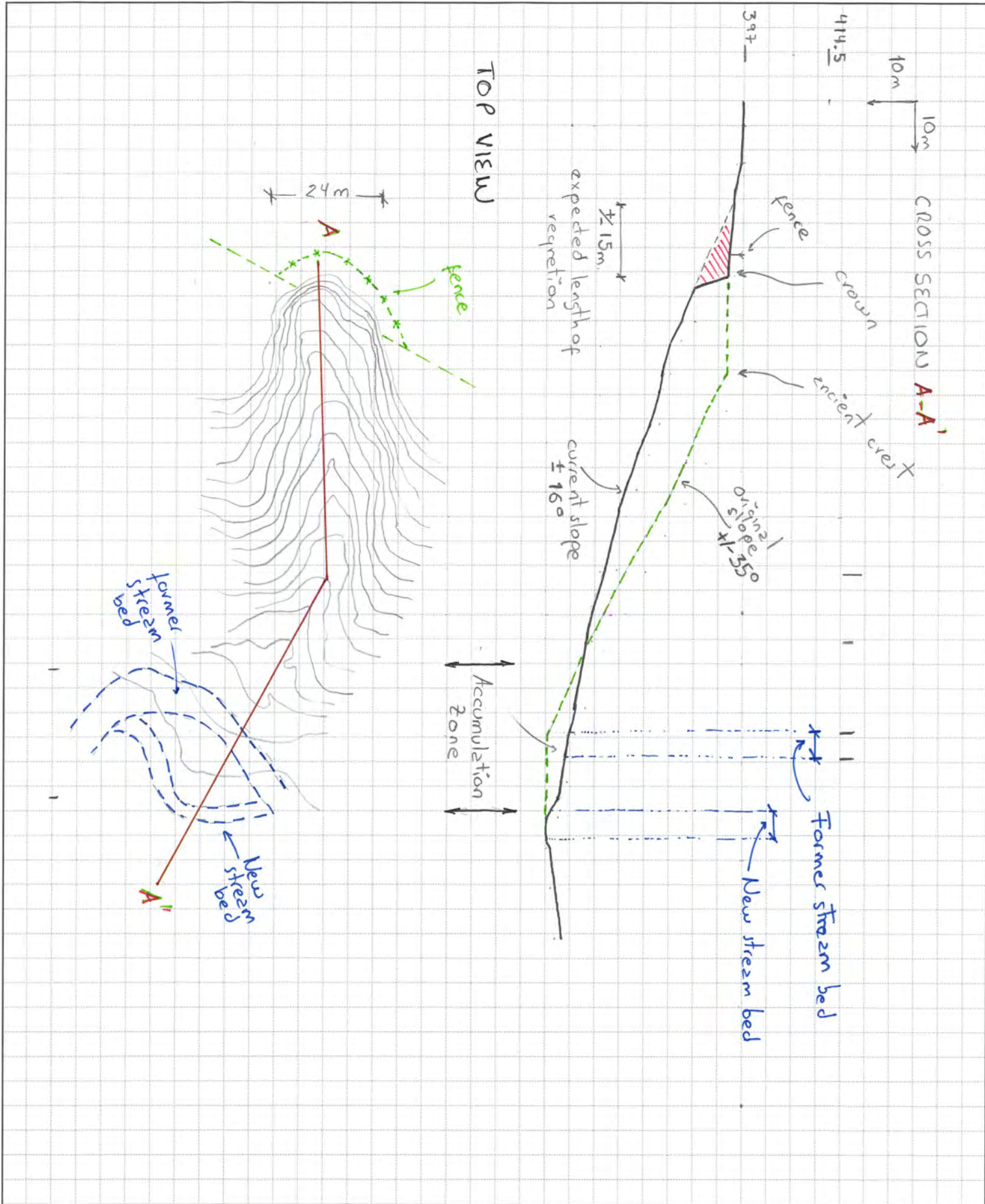
We would welcome the chance to meet to discuss and clarify the information requirements identified above and will be in touch shortly via email to make arrangements for this. If you have any questions please call me on 021 1468556 or email me at [jeremyianwilliams@gmail.com](mailto:jeremyianwilliams@gmail.com).

Yours sincerely

Jeremy Williams  
Consultant Planner  
(on behalf of)  
TAUPŌ DISTRICT COUNCIL

Taupō District Demographic Snapshot 2016/17 (Draft)





Notes

Whenua Kate Ltd  
Whaveron Subdivision

Designed	Checked	Approved	Date	Scale
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Drawing Title

Erosion Process Details

Drawing Number

1BA1070 - SK15

## **Attachment 2**

Cheal Drawing IBA1070-656 -  
Conceptual Design  
Stormwater Catchment  
Analysis Pre & Post  
Development





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**Disclaimer:**

This sketch drawing shall be used for the purpose of discussion and shall not form any part of a tender or construction process. The information hereon shall not be passed on to any third party without the express written permission of Cheal Consultants Ltd. In the event of this information being passed on to a third party, even with written permission, or the information being used for any other purpose than discussion, Cheal Consultants Ltd take no responsibility for its correctness and subsequent use.

Existing contours obtained from Lidar in NZTM coordinate system.  
Road layout indicative only.  
Contour Interval = 1.0m

**Catchment Description:**

Post-develop Catchment	Total Catchment Area (m <sup>2</sup> ):	Road Area (m <sup>2</sup> )	Color
A	32,140	5,140	Red Hatched
B	12,490	12,490	Blue Hatched
C	8,480	8,480	Cyan Hatched
D	5,066	1,645	Orange Hatched

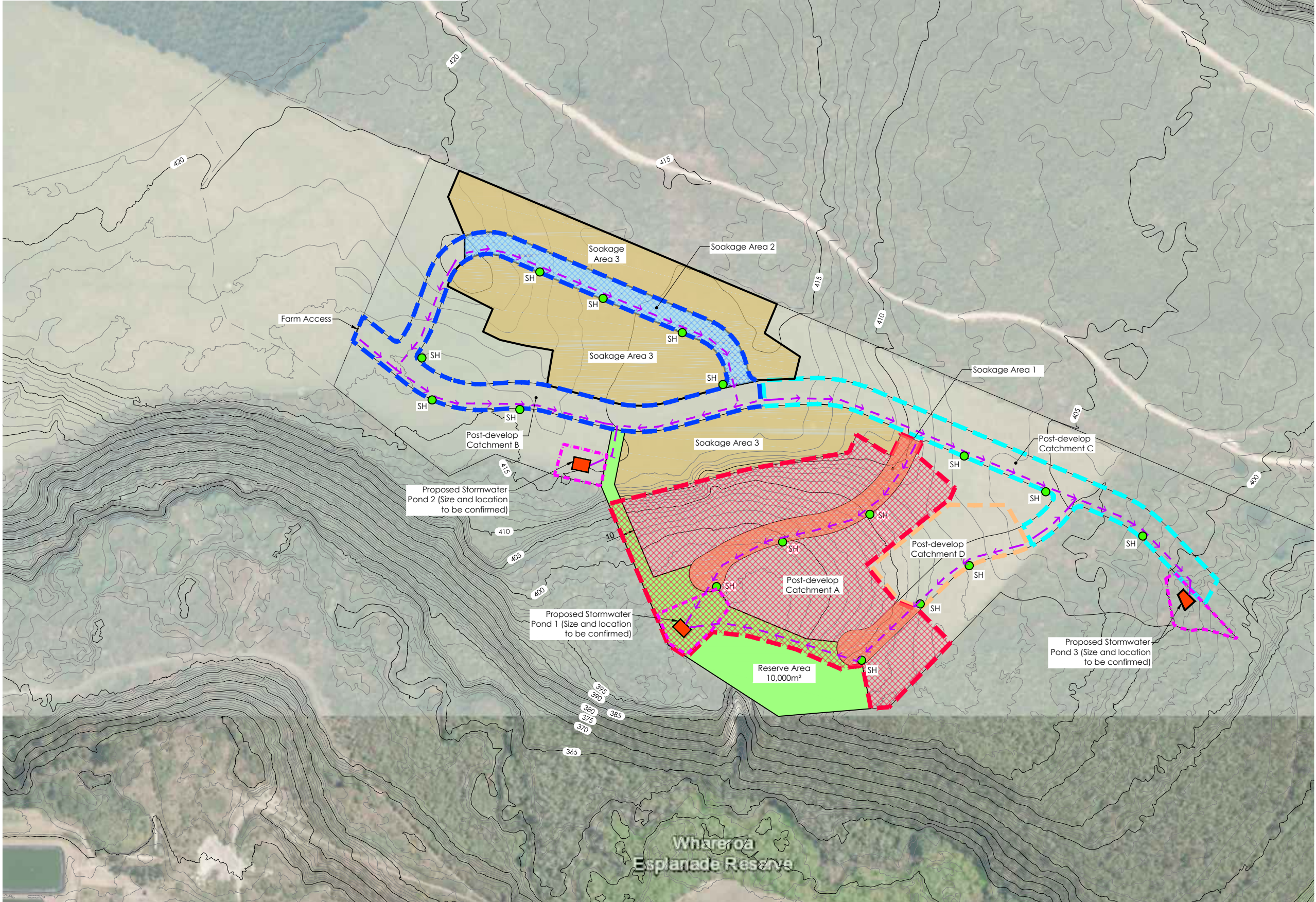
**Soakage Area Description:**

Soakage Area:	Total Soakage Area (m <sup>2</sup> ):	Road Area (m <sup>2</sup> )	Color
1	32,140	Road & Lots	Red Hatched
2	4,300	Road	Blue Hatched
3	22,260	Lots	Yellow

**Legend:**

- Reserve
- SH Proposed Road Soak Hole
- Flowpaths
- Indicative Local Purpose Drainage Reserve

Pond	Deals with:	Volume (approx.)	Outflow limited to:
1	10% > 1% AEP runoff post-development A	120m <sup>3</sup>	Pre-development 10% AEP (approx. 90L/s)
2	10% > 1% AEP runoff post-development B	240m <sup>3</sup>	Pre-development 10% AEP (approx. 130L/s)
3	10% > 2% AEP runoff post-development C	60m <sup>3</sup>	Pre-development 10% AEP (approx. 70L/s)



Rev	Date	Amendment	By	Chk	App
B	11/09/19	Lot Boundaries Removed	RS	TK	DGF
A	06/06/19	For Review & Discussion	RS	TK	TWB

Project Title  
**The Proprietors of Hauhungaroa No. 6 Trust Whareroa North**

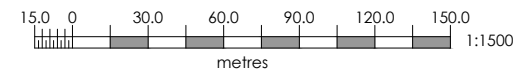
Drawing Title  
**Conceptual Design Stormwater Catchment Analysis Pre & Post Development**

Surveyed	-	-	-
Designed	T. Kelly	15/03/19	TK
Drawn	R. Singh	16/03/19	RS
Checked	T. Kelly	05/06/19	TK
Approved	T. Brand	05/06/19	TWB

Status **INFORMATION**

Scale A1	1:1500	A1
A3	1:3000	

Drawing Number **IBA1070-656** | Rev **B**





## **Attachment 3**

Sketch Drawing  
1070-SK650



**Disclaimer:**

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Existing contours obtained from Lidar in NZTM coordinate system.

Contour Interval = 1.0m

**Catchment Description:**

Pre-developed Catchment	Catchment Area (m <sup>2</sup> ):	Flow Length (m):
A	55,189.40	560.0
B	86,931.90	611.0
C	24,090.20	335.0
D	72,305.60	445.0
E	67,526.30	410.0
F	131,963.00	1185.0
G	60,670.00	794.0
H	17,171.20	794.0

**Legends:**

- Main Catchment Areas
- Adjacent Catchment Areas
- - - - - Stormwater Flow Path

Rev	Date	Amendment	By	Chk	App
A	26/04/19	For Review & Discussion	RS	-	-

Project Title  
**The Proprietors of Hauhungaroa No. 6 Trust  
 Whareroa North**

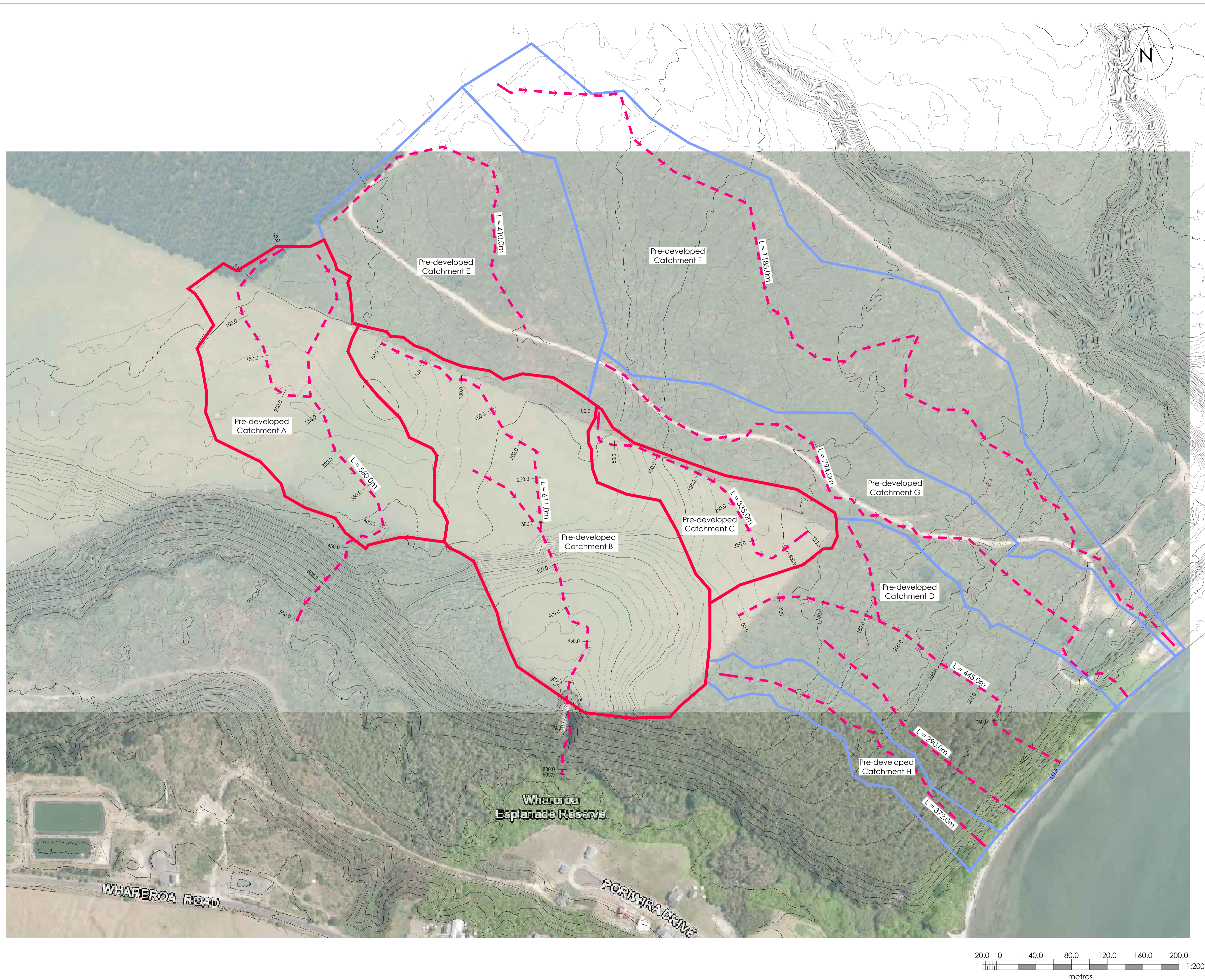
Drawing Title  
**Conceptual Design  
 Stormwater Catchment Analysis  
 Pre-Development**

Surveyed	-	-	-
Designed	-	-	-
Drawn	-	-	-
Checked	-	-	-
Approved	-	-	-

Status **INFORMATION**

Scale A1	1:2000	A1
A3	1:400	

Drawing Number **1070-SK650** Rev **A**





# **Attachment 4**

Preliminary Calculations  
Rev.1

### Pre-dev Catchment B to "bowl" & sewer

pre-dev 10yr 1hr  $C = 0.3$   $i = 45 \text{ mm/hr}$

$$Q = CIA / 360 = 0.3 \times 45 \times 8.69 / 360 = \underline{326 \text{ l/s}}$$

### Post-dev "soakage area 1"

road soakpits  $C = 0.85$

lots (attenuated to pre-dev)  $C = 0.3$

$$Q = 0.85 \times 45 \times 0.514 / 360 + 0.3 \times 45 \times 2.700 / 360 = 156 \text{ l/s}$$

### Post-dev "soakage area 2"

road soakpits

$$Q = 0.85 \times 45 \times 0.43 / 360 = 46 \text{ l/s}$$

### Post-dev "soakage area 3"

lots 2.23 ha, 40% coverage = 0.89 ha,  $C = 0.9$

$$Q = 0.9 \times 45 \times 0.89 / 360 = 100 \text{ l/s}$$

↳ post-dev total =  $156 + 46 + 100 = \underline{302 \text{ l/s}}$

$302 / 326 = 93\%$  of pre-dev, i.e. a reduction.

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Notes

Pre/post-dev runoff into "bowl" shaped depression

Designed

TK

Checked

TK

Approved

TK

Date

4/6

Scale

—

Drawing Title

IBA 1070

Drawing Number

whareroa SW

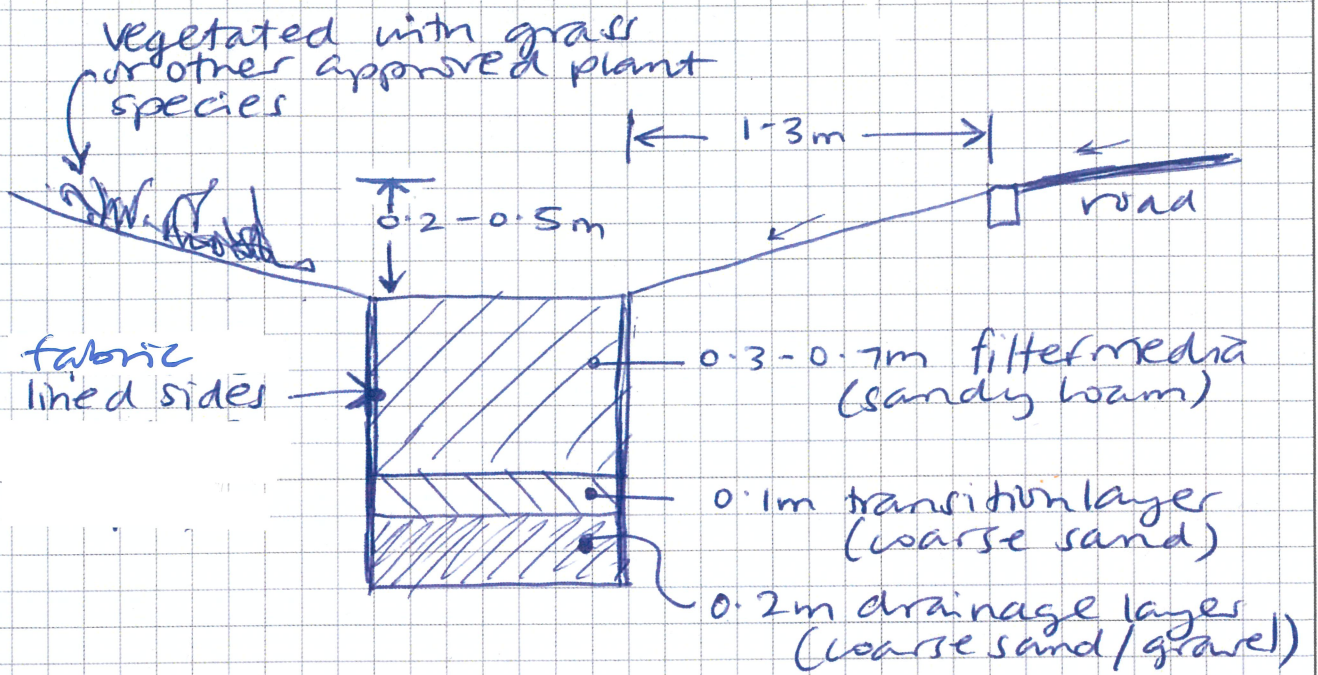
Rev 1

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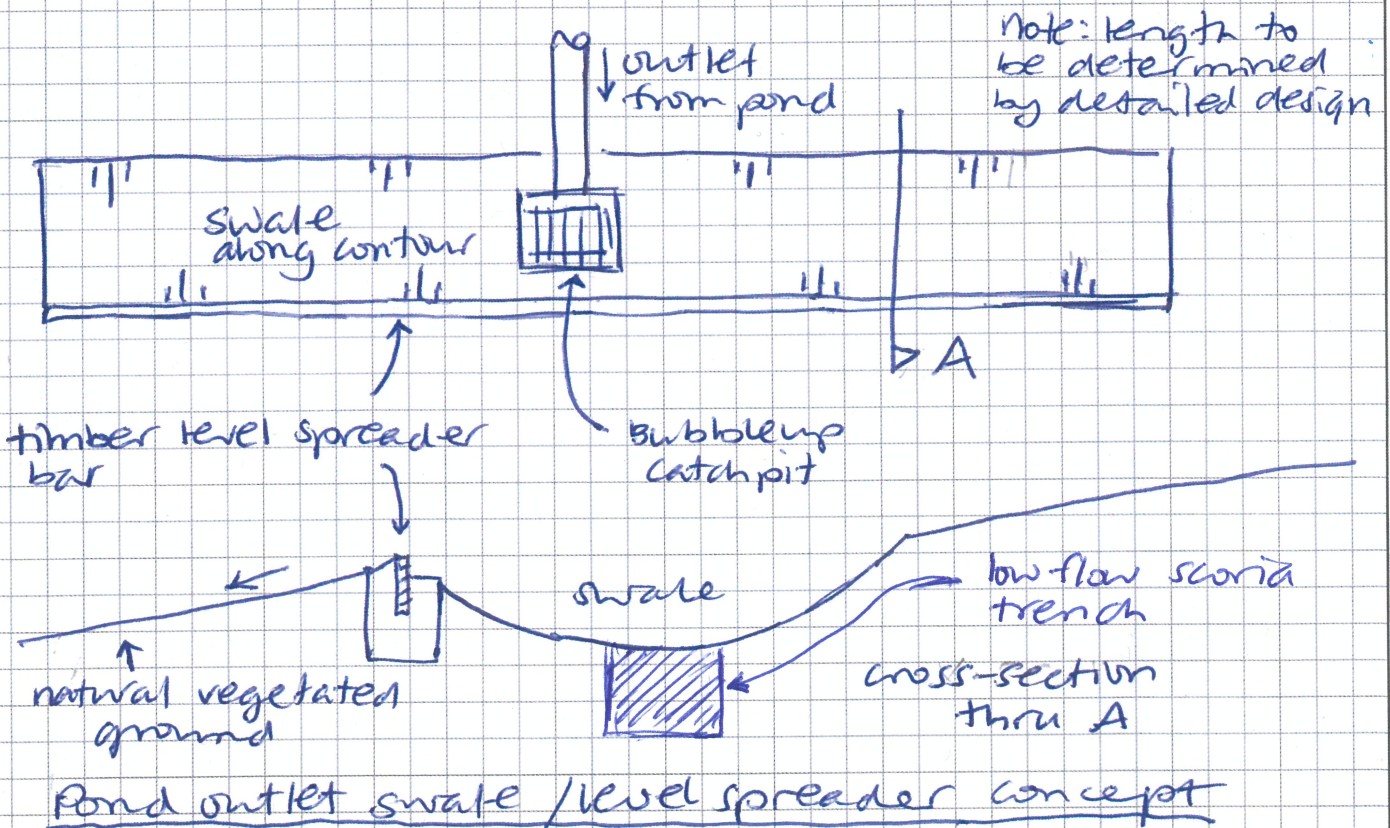
## **Attachment 5**

Stormwater Device  
Concepts 1070-SK660 Rev.1





Bioretention swale (as per WRC SW guidelines Fig 8-13)



cheal

Notes

preliminary info only.

Drawing Title

sw device concepts  
Whareroa

Drawing Number

1070-SK 660 Rev 1.

Designed

TK

Checked

Tuz

Approved

Tuz

Date

2/5

Scale

NTS