

# Te Awa Lakes – Private Plan Change

Update to Stormwater  
Infrastructure Assessment

**Perry Group Limited**

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# 1 Introduction

Perry Group Limited lodged an application for a Private Plan Change to convert existing Industrial/Deferred Industrial Zoned Land at Horotiu to mixed residential, commercial and tourism uses.

This process was on hold while Perry Group developed an application for the residential portion of this development under the Housing Accord and Special Housing Areas (HASHA) Act as a Qualifying Development and commenced work to support the associated consent applications as would be required under that legislation. That route is now not available to progress the consent for the proposed activities and the Private Plan Change process has been reactivated.

Hamilton City Council (HCC) have requested that the supporting application documents are to be updated to include additional information where this is available or where the situation has changed.

This report provides an update to the Stormwater Infrastructure Assessment provided for the Plan Change application.

## 2 Supporting Documents

The documents to be read in conjunction with this Stormwater Infrastructure update are:

- *Subcatchment Integrated Catchment Management Plan* by BBO dated 27 October 2017 – prepared to support the Plan Change Application;
- *Stormwater Management Strategy* by CKL Report dated 5 December 2018 - prepared to support the Plan Change Application;
- *Te Awa Lakes Lake Water Quality Assessment and Design Approach* River Lake draft report dated 22 July 2019 – prepared for the updated application to provide more information on the requirements and management to create and maintain a water body of suitable quality for recreational use as this is an important feature for the Te Awa Lakes development.

## 3 Additional Design Work

As part of the HASHA applications further detailed analysis and assessment was undertaken by Aurecon in conjunction with the other specialist consultants working with Perry Group on this development design and planning.

These activities included more detailed assessments for site stormwater management including:

- Trunk stormwater main routes;
- The initial location, size and hydraulic function of the stormwater treatment facilities (on-lot storage, raingardens, swales, and wetlands) to provide the quality of discharge into the proposed lakes to maintain contact recreation water quality;
- A water balance assessment to determine the net surplus or deficit of water within the proposed lakes.

The assessment was undertaken based on a layout and landform prepared for the HASHA applications, however, are also applicable to the plan change as there were only minor changes in layout and landform.

## 4 Stormwater Infrastructure Assessment

The proposed development for which a Private Plan Change is sought includes for a range of activities on the 62ha area including:

- Residential;
- Commercial;
- Tourism including adventure park and associated accommodation.

The development includes approximately 6.5ha of permanent water bodies for the purposes of swimming and contact recreation and amenity within the residential area of development, generally reshaped from the existing open water bodies on the current site that have been formed by the previous sand quarry activities.

The existing topography of the site and surrounding infrastructure dictates the final landform shape of the development. The higher ground is located at the access to the site from Hutchinson Road, and the lowest areas at the proposed lake within the central to eastern portion of the site.

The eastern boundary is the Waikato River which controls the minimum finished elevation of the development.

There is also groundwater inflow to the block from the western surrounding land.

## 4.1 Stormwater Management Strategy

A Sub-Catchment Integrated Catchment Management Plan prepared by BBO, which included as an Appendix the Stormwater Management Strategy prepared by CKL, was a supporting document to the Plan Change application and provided a framework for the existing site features and constraints and recommendations on the stormwater management system required and proposed to manage and mitigate the potential effects of the stormwater runoff from the proposed developed to the Waikato River.

The key elements of that document that relate to the proposed stormwater management are;

- Building material controls to reduce risk of contaminants from roof runoff;
- Runoff reduction by rainwater tanks for reuse (where feasible) and pervious pavements;
- Water Quality treatment by a combination of rainwater tanks (for roofs), raingardens, swales, and wetlands;
- Extended detention by the use of all of the above and the lakes;
- Stormwater conveyance by a combination of reticulation and swales;
- Storm management by overland flowpaths to protect building platforms;
- Consistency with the existing Waikato Regional Council Discharge Consents including the additional unbuilt discharge structure at the north of the site;
- Water volume balance for the ongoing maintenance of water levels within the lakes.

As the design process develops the location and areas associated with the sub-catchments will also vary, however the overall management of the sub-catchments will remain consistent with the Stormwater Management Strategy.

These stormwater management recommendations are still valid and have been developed further in concept and detail by the Aurecon work as described below.

## 4.2 Water Quality Treatment Train

The water quality of the discharge to the Waikato River requires on site treatment to ensure contaminants within the discharge are below the required levels of concentration.

In addition to that the Te Awa Lakes development proposes recreational water bodies within the development and this requires a higher level of treatment and management than would be required to achieve the discharge consent requirements. These have been assessed collaboratively with River Lake to ensure the overall requirements for the lakes is achieved.

To achieve this additional water quality treatment features would be required including:

- **On site storage tanks** for residential roof runoff to provide peak flow attenuation off roofs. This will also provide some treatment by interception of leaves and vegetation detritus off roofs and also coarser sediments being trapped in the base of the storage tanks;
- **Raingardens.** A preliminary assessment of the size required as part of the treatment train for the contact recreation water quality has confirmed that sizing based on 5% of impervious areas in the road corridors should be sufficient. This is consistent with the HCC practice note guidelines. As part of the detailed design this will be quantified through MUSIC modelling.

The size and configuration of raingardens has been assessed for the indicative road cross sections developed and they can fit within the road zone at one raingarden of approximately 40m<sup>2</sup> for every 50 lineal metres of road on average, however this varies based on the proposed developments various roading cross sections.

The use of higher permeability media such as that promoted by Stormwater 360's Filterra® would reduce the raingarden footprint further but haven't been included in our assessment to date.

- **Wetland** locations have been determined and sized for three locations around the main linear lake, consistent with the locations shown within the CKL Stormwater Management Strategy report.

These wetlands are typically 30% greater in area than the wetlands required by the ARC TP10 design guideline to provide the greater phosphorus removal required for the higher water quality sought.

Consistent with good design practice the wetlands would incorporate a bypass for large storm flows to avoid the re-mobilising of the trapped contaminants within the wetland.

## 4.3 Lake Management

The ongoing management of the recreational lake has been assessed in collaboration with River Lake to provide ongoing water quality suitable for swimming and contact recreation.

The River Lake report *Te Awa Lakes: Lake Water Quality Assessment and Design Approach* dated 29 July 2019 assesses the issues associated with ensuring that the water quality of the new Te Awa lakes and Adventure Park lakes are suitable for contact recreation and to provide design principles for constructing and maintaining the lakes to optimise water quality in the long term.

The Key Design Recommendations included the following summary of recommendations (section 8.1):

- Design lake depth of about 6m, maximum depth and >3m average depth;
- Ensure aquatic macrophytes cover >30% of the lake area (some of the in-lake wetlands may be included);
- Catfish threaten native aquatic life and reduce water clarity. If possible, eradicate catfish from the existing wetland ponds to avoid them invading the Te Awa Lakes. The practicality of eradicating the catfish population may need to be reconsidered if they are found to also be present in the larger lakes. It is important to not connect the existing wetland with other ponds (e.g. North Pond, South Pond and Central Ski Pond) until catfish are eradicated or if it is found that catfish have already invaded the other ponds;
- Install pumps to circulate lake water through treatment devices to reduce effective residence time for phytoplankton growth and attenuate nutrients;
- Adopt the lake edge treatments generally as in Figure 3.1;
- Prepare an aquatic plant planting and management plan for all of the lake edge and wetland areas;
- Implement a high degree of education and engagement with residents over management of nutrients, pest plants and animal control.

The recommendations that are specific to the landform design and water quality features have been checked against the preliminary design and can be accommodated within the current concept layout. Lake maintenance features such as the recirculating pump is achievable through normal design processes. The control of the rate of recirculation, and the location of the pumped discharge, will protect against possible damage to the wetland from localized scour or concentrated velocities that can remove the contaminants connected to the wetland plants themselves. The concentration of nutrients in the recirculated water will need to be managed

to not exceed the band of concentration for the wetland plants chosen. These elements are manageable through the planning and design process.

The sizing of the water treatment features has been undertaken in conjunction with River Lake and checked within the overall layout of the development as detailed above.

## 4.4 Water Volume Balance

To more accurately determine the water volume balance expected within the recreational lakes a Goldsim model was developed that incorporated inflow volumes from all surfaces via all the proposed reuse, attenuation and treatment features.

The variables included:

- The constant inflow from groundwater flow expected to be intercepted from the western portion of the development (set at nil for the initial assessment);
- Evapotranspiration from raingardens;
- Evaporation from the surface water body surfaces;
- Overflow volumes in larger rainstorm events;
- Leakage rates out of the lakes (seepage into the groundwater).

The historical rainfall data was used from 1909 to 2005 and run through the model as a continuous simulation.

The work was not completed however initial indications confirm the CKL assessment that the overall inflow exceeds the volume requirements to maintain a permanent waterbody, but the result is sensitive to the net volume of seepage into the ground from the lake. This is an element that can be engineered to provide the reduction of seepage necessary.

Conversely the volume of inflow from groundwater collected in the western portion of the catchment will also contribute to the inflow which will provide additional input volume than that modelled to maintain a healthy water volume within the lakes continuously.

This work will be completed in the detailed design once more definitive information is known on groundwater inflows and seepage rates however it provides confidence that maintaining a healthy body of water in the lakes is likely to be achieved from natural sources.

## 5 Conclusion

In summary the more detailed stormwater and lake quality assessments undertaken as part of the HASHA Qualifying Development application has:

- confirmed the appropriateness of the CKL Stormwater Management Strategy for the proposed development;
- provided more detail in terms of sizing and location of specific stormwater management features proposed within the Stormwater Management Strategy; and
- confirmed the ability to accommodate the design and maintenance elements recommended by River Lake to achieve swimmable and contact recreation appropriate water quality within the lakes.

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