

## MEMO

**To:** North Shore Golf Club – Dan Molloy  
**From:** Scott McIntyre  
**Cc:**  
**Date:** 18/11/2022  
**Re:** **Civil Engineering Assessment**

McKenzie and Co Consultants have undertaken a Civil Engineering due diligence assessment of three portions of the North Shore Golf Club with the view to these areas being redeveloped for residential purposes. Our assessment considers the follow aspects;

- Stormwater
- Overland Flow/flooding
- Wastewater
- Water Supply
- Transportation Access
- Utilities

The purpose of this assessment is to identify civil engineering issues that may impact on the ability to develop the sites or need to be considered to enable the site to be developed. This assessment does not address specific details of the development themselves.

All advice provided here is based on good engineering judgement, a single site walkover and from use of freely available information such as Council GIS information system. No detail investigations, survey validation or specific consultation has been undertaken with Council or Watercare. It has been prepared on the basis to provide general advice to North Shore Golf Club on the potential civil engineering factors that should be considered for the future development of these sites.

## Site 1

Site 1 is situated adjacent to the existing clubrooms with a moderate contour from its highest point in the south-west corner of approximately RL 47m falling north and east with a ground level of approximately RL 30-31m at its western edge and RL 29-30m at its northern edge adjacent to the existing clubrooms access drive.



Figure 1 - Site 1

### *Stormwater*

The site is not reticulated for public stormwater and does not have any current formal controls with rainwater generally sheet flowing off the site to the north, west and south-west.

Council's Auckland Unitary Plan has a control overlay, Stormwater Management Area Control – Albany West, Flow 2 applying to the site which will require management of surface water runoff. The site will also likely require a Stormwater Management Plan for future development as it is currently not zoned for urban development.

While not known until such time as a Stormwater Management Plan is developed it is expected that future surface water runoff from impervious areas would be limited to predevelopment levels and this will require some form of detention being provided on site to meet this requirement.

The proposed future development is expected to result in more than 30 parking spaces being provided so would be considered a high contaminant generating car park and treatment of carriageway areas would be required prior to discharge from the site.

From a review of Council GIS data (refer Figure 1) and a visit to the site there are two minor overland flow paths (light blue lines in figure 1) which discharge towards natural gullies and streams. These represent the likely discharge route for stormwater flows generated from any future development.

### *Overland Flow/Flooding*

Site 1 is located at the top of the local catchment and is not subject to any flooding (light blue shading), refer to figure 2 below. The access to this site is however subject to flooding and that is addressed in the Transport and Access comments .

There are minor overland flow paths identified on Council GIS, these originate within the site and do not appear to cater for any noticeable flow from beyond the site bounds. These are expected to be catered for in the eventual design of the site and should pose no particular limitations to the development potential of the site.



*Figure 2 - Overland Flow/Flooding*

### *Wastewater*

The site is partially served by a local 150 mm diameter sewer which traverses the eastern half of the site (refer to the red line in figure 1). This existing main discharges to a local trunk sewer of 300mm diameter just beyond the extents of the site within No 48 English Oak Drive.

Currently the existing 150mm diameter main serves a catchment containing in excess of 200 houses and is expected to be at or near its capacity as it has an estimated minimal grade. The proposed development of the site could generate circa 200+ units and townhouses based on the concept yield proposals prepared by Barker and Associates. The additional

flows generated by the development will likely result in the existing 150mm diameter main being under capacity and require upgrading.

As the main directly connects to a local trunk sewer consultation will be required with Watercare to determine if there is adequate capacity in the wider network to cater for the expected additional flows.

In addition to the existing 150mm diameter main being expected to be under capacity for future development it is also located at a depth that precludes it from being able to service the entire site at the present ground levels. The downstream end of the existing 150mm diameter wastewater line (where it connects to the local trunk sewer) has been estimated based on Council GIS information to be approximately RL 32.5m. The western portion of the site has an existing ground level of RL 32.0m and would require in the order of 250 –300m of reticulation to connect to the downstream end. At minimum grades and depths to meet Watercare code requirements this would result in a wastewater invert level at the western portion of the site in the order of 35.5m which is 3.5 m higher than the existing ground level at the western edge of the site.

To enable the western portion of the site can be serviced there are several options available as follows.

1. Raise the ground levels at the western end of the site to circa RL 36.5m with a minimum floor level of RL 38.0m to ensure that a gravity based system can service the full extents of the site.
2. Maintain existing ground levels and provide a wastewater pump station to collect flows from the western end and then pump them until a gravity based connection is available. This pump station could be either private or public. A private pump station may be possible given the proposed development yields indicate a unit title type development which would have the necessary management structure through a body corporate in place to operate a private pump station. It is noted that Watercare are unlikely to support a public wastewater pump station for a small receiving catchment such as this.
3. Develop a low pressure wastewater network for the western portion of the site (or more) to collect wastewater and then discharge to a suitable gravity connection location.

### ***Water Supply***

As shown in figure 1 there is an existing public main extending along the northern side of the golf course clubroom access road. This main is 150mm diameter and is a single feed supply, eg it has only a single connection point to the wider water network. There are no other public watermains that readily abut the site or would be considered practically available to connect to without needing to traverse private third party land owners.



The proposed concept yield of circa 200 + units and townhouses will likely require a two ended supply to meet Watercare requirements and surety of supply and meet firefighting requirements. To achieve a two ended supply it would likely require an extension of the existing public network from 18 Appleby Road which is the nearest principal main, a distance of approximately 500m.

Subject to testing multilevel buildings may require pressure boosting and or supplemental storage for firefighting purposes.

### *Transport Access*

Flow Transportation Specialists (Flow) have identified the potential roading requirements for access for this site in their report. They have identified a 5.5m wide carriageway with a 12m or 16m wide corridor depending on if private or public. In either case the existing Appleby Road (within the golf course) will require upgrading from its intersection with St Andrews Way through to the development.

From a visual observation of the existing formation it is expected that the entire section of existing carriageway up to the clubrooms will require reconstruction whether private or public and not just widening. This will be combined with the expected extension of services such as water, power and communications as well as the formation of footpaths.

In conjunction with the upgrading works the installation of a stormwater runoff management network will also be required for the entire length.

Consideration will also be needed to given to the existing trees on the golf course side of Appleby Road if a public road option is pursued as they are potentially within the 16m wide corridor in places. Also services installation will need to consider the trees.

The current low point (refer figure 4 below) in the existing road will require significant reconstruction as the current formation here is approximately 5.0m wide and to accommodate the increased carriageway width and, footpath(s) and services will almost certainly impact on the golf course to some extent. Furthermore the approach grades as noted by Flow may require a change in levels here to accommodate appropriate grades.

In addition the existing culvert beneath the road may need to be upgraded as the flooding extents as shown in Figure 2 indicate that it may not be able to pass the 100 1% AEP (100 year) storm event. For the access road to be upgraded to comply with Council standards whether private or public is likely to have a significant impact in this area. It is also complicated by the presence of the pond upstream and the ecological considerations relating to this area that may further dictate limitations or parameters that may influence how this is addressed.

Flow have also identified the potential requirement to undertake an intersection upgrade at Appleby Road and Albany Highway, this is addressed in more detail in their report.



*Figure 2 – Road Low Point*

Also continued access to the golf club will need to be maintained during any upgrading works and this may also impact on golf course operations, notably hole 10 of the blue course.

#### ***Utilities***

Extensions to utility services (Power and Telecommunications) will be required. It is expected that these can be made and will only be a matter of cost and distance to provide servicing. It is likely that extensions to both networks will be from Appleby Road or more than likely from infrastructure in Albany Highway.

## Site 2

Site 2 is situated adjacent to Oak Manor Drive and the 10<sup>th</sup> green of the blue course and has a gentle contour from its highest point in the south of RL 35m falling north with a ground level of approximately RL 32m at its frontage with Oak Manor Drive. The frontage with Oak Manor Drive is also the access to the maintenance facilities for the golf course, refer to figure 4 below.

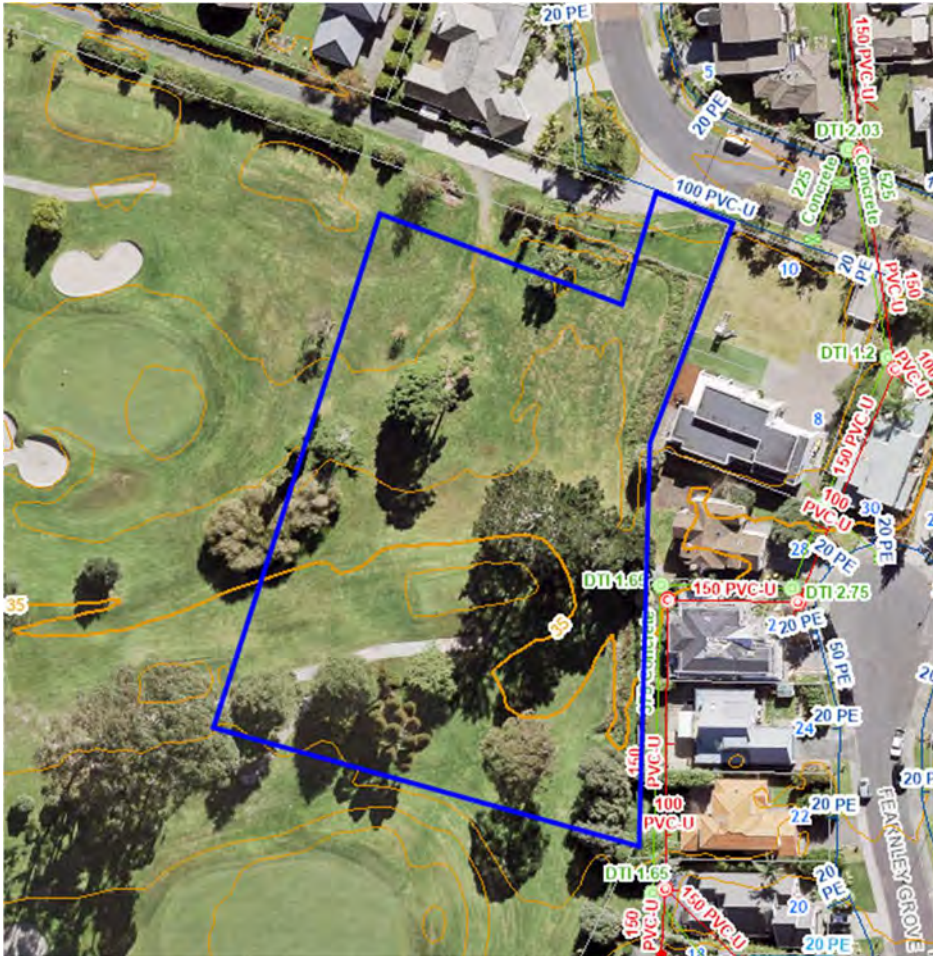


Figure 3 - Site 2

### Stormwater

The site is not serviced for stormwater with runoff generally uncontrolled and sheet flowing off to the north and west. The existing maintenance facilities access drive contains an open channel which collects runoff from the drive and this area. This open channel ultimately discharges to the golf course, likely the pond adjacent to the 13<sup>th</sup> Hole.

The site has the same zoning overlay control as Site 1 and would likely require a Stormwater Management Plan and similar limits to post development runoff. In addition the proposed future development is expected to result in more than 30 parking spaces being provided so



would be considered a high contaminant generating car park and treatment of carriageway areas would be required prior to discharge from the site.

Ultimately the stormwater will be collected and needs to discharge somewhere. As there is no reticulation in or immediately adjacent to the site there are two more practical options available. These are either an extension from public reticulation network in Oak Manor Drive and a manhole with an invert level of RL 30.3m located in No 5 Oak Manor Drive or to the open channel adjacent to the maintenance facilities access and ultimately the on-course pond adjacent to hole 13.

The reticulation within Oak Manor Drive is unlikely to have factored in the development of this site and as such it is unlikely there is capacity to cater for its runoff and there may be significant detention requirements required along with the potential need to access private property to connect to existing infrastructure.

Discharge to the golf course via the open channel beside the access drive may require improvements to this channel and downstream pipework to convey flows to the pond. In addition there may be requirements for detention as well subject to the golf course requirement for greater runoff or reduced runoff in this area.

### *Overland Flow/Flooding*

Site 2 is located in a small local catchment and is not subject to any flooding (light blue shading), refer to Figure 3 below.

There are minor overland flow paths identified on Council GIS, these originate within the site or within the adjacent golf club land and do not appear to cater for any significant flow from beyond the site bounds. These are expected to be catered for in the eventual design of the site and should pose no particular limitations to the development potential of the site.





Figure 3 - Overland Flow / Flooding

### Wastewater

No public wastewater reticulation is available within the bounds of the site or immediately adjacent to the site. There is reticulation within Oak Manor Drive which could be extended to serve site 2. This infrastructure is relatively shallow at approximately 2.0m and has an invert level of RL 30.3m (source Council GIS). If extended to the site a distance of approximately 50m (refer figure 4 below) it would result in an invert level of approximately RL 31.0m and set a minimum floor level of approximately RL 32.5m at the northern boundary of the site which is achievable with the existing ground levels.

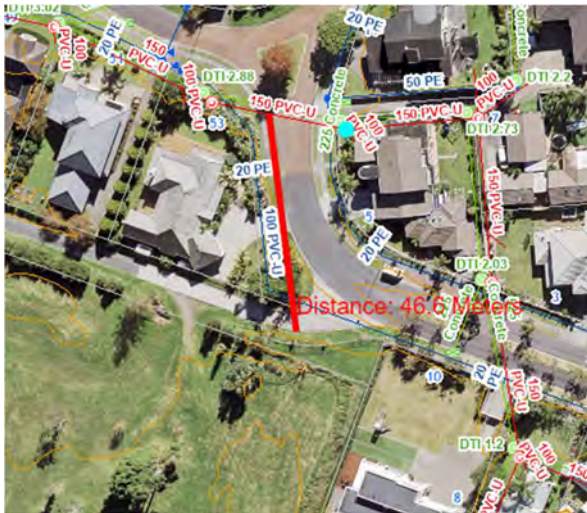


Figure 4 – Council GIS Wastewater access

The existing infrastructure connects to a local trunk sewer downstream at 37 Oak Manor Drive and serves a current catchment of approximately 50 houses. Subject to detailed analysis the existing infrastructure should have capacity for the proposed development yield of circa 60 units.

Consultation will be required with Watercare to determine if there is adequate capacity in the wider network to cater for the expected additional flows.

### ***Water Supply***

There is an existing 100 dia water supply main in Oak Manor Drive which fronts site 2. This main is a two ended supply and currently serves the 31 Houses of Oak Manor Drive. It is expected that this main could be extended to serve the additional 60 units subject to testing and Watercare approval.

### ***Transport Access***

Flow have identified the potential options for roading access for Site 2 in their report. They have identified 2 options subject to Site 3 being also developed or only site 2 being developed. In either scenario to subject to detailed design no significant works are required and are generally confined to a standard private access onto an existing public road.

Flow have identified the likely need for a footpath on the southern side of Oak Manor Drive to meet pedestrian requirements. They have assessed the existing intersection of Oak manor drive and Albany highway and consider the risk of needing to improve the intersection for capacity or safety reasons is low.

### ***Utilities***

Extensions to utility services (Power and Telecommunications) will be required. It is expected that these can be made and will only be a matter of cost and distance to provide servicing. It is likely that extensions to both networks will be from Oak Manor Drive or more than likely

from infrastructure within Albany Highway. Note if site 3 is also developed the extensions to infrastructure could be made jointly to minimise impacts and costs.

DRAFT



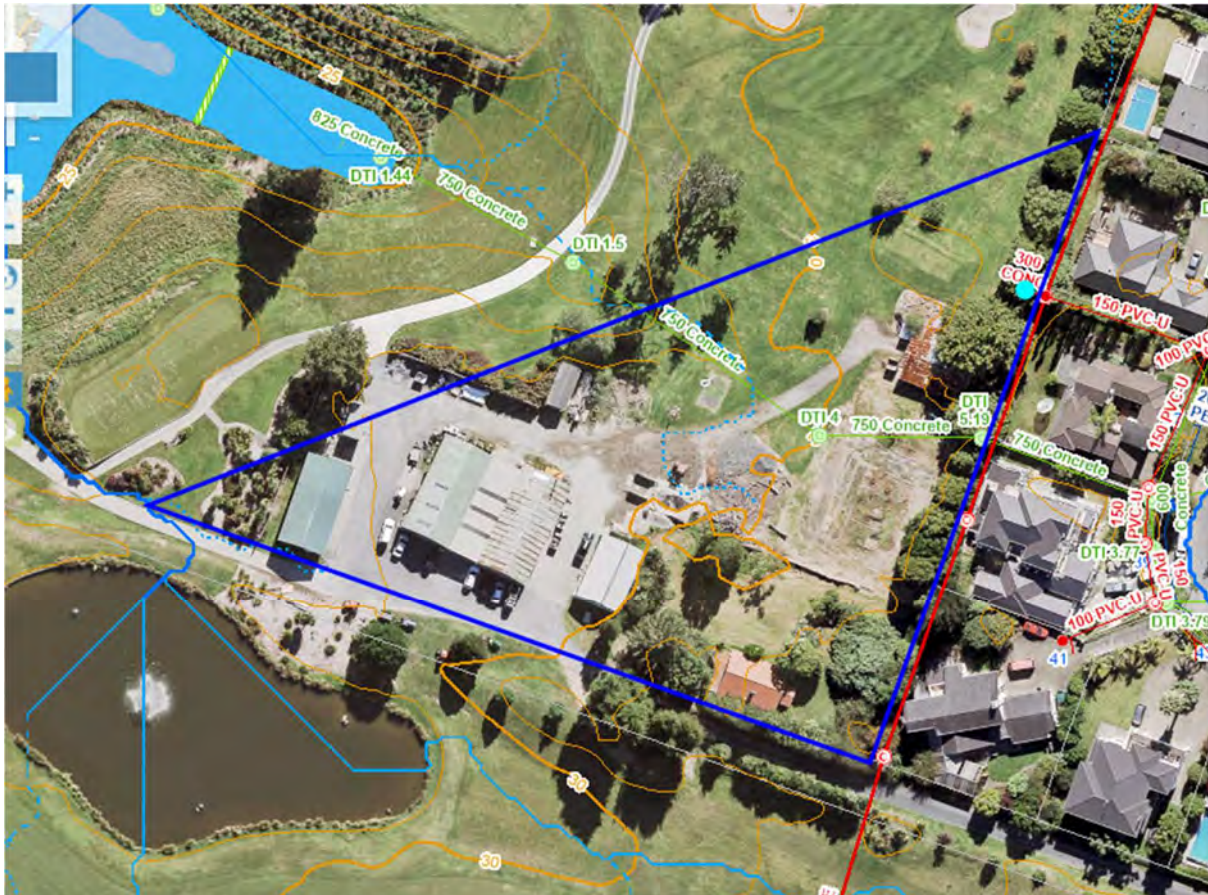




*Overland Flow/Flooding*

Site 2 is located in a small local catchment and is not subject to any flooding (light blue shading), refer to Figure 3 below.

There are minor overland flow paths identified on Council GIS, these originate within the site and do not appear to cater for any significant flow from beyond the site bounds. These are expected to be catered for in the eventual design of the site and should pose no particular limitations to the development potential of the site.



*Wastewater*

The site is serviced for wastewater via a satellite manhole located on the eastern boundary that connects directly to the local trunk sewer.

From Council GIS records the manhole has an invert level of RL 27.3m. An extension from this manhole to service site 3 could be made without in significant limitations on floor levels if the existing lower contour of RL 30.0 is maintained.

*Water Supply*

There is an existing 100 dia water supply main in Oak Manor Drive which fronts site 2. This main is a two ended supply and currently serves the 31 Houses of Oak Manor Drive. It is

expected that this main could be extended to serve the additional 60 units subject to testing and Watercare approval.

### *Transport Access*

Flow have identified the potential options for roading access for Site 3 in their report. They have identified 2 options subject to Site 2 being also developed or only site 3 being developed. In either scenario to subject to detailed design no significant works are required and are generally confined to a standard private access onto an existing public road.

Site 3 would require the formation of private accessway along the same alignment as the existing maintenance shed access. This access will need a corridor 10-12m wide corridor based on Flow Transportation's recommendations. The present access drive would require replacement and widening to serve the development but it is expected it would be constructed on a similar line and grade.

### *Utilities*

Extensions to utility services (Power and Telecommunications) will be required. It is expected that these can be made and will only be a matter of cost and distance to provide servicing. It is likely that extensions to both networks will be from Oak Manor Drive or more than likely from infrastructure within Albany Highway. Note if site 2 is also developed the extensions to infrastructure could be made jointly to minimise impacts and costs.