Bioresearches
A Babbage Company

To:	**Neil Construction Limited**	**Date:**	9 November 2020
Attention:	David Page	**Job No:**	63907
Subject:	98 & 100-102 Totara Road, Whenuapai – Watercourse Classification		

Bioresearches was engaged by Neil Construction Limited to undertake a watercourse classification within the properties of 98-100 and 102 Totara Road, Whenuapai, Auckland. Multiple overland flow paths were predicted to flow through the site (Figure 1).

Prior to the field survey, a map of the site was created from the Auckland Council GeoMaps GIS viewer to identify any potential overland flow paths, ecological overlays, stormwater services and contours of the site. A site assessment was undertaken by an experienced ecologist on the 21st October, 2020. During the site assessment, the presence and extent of water within the properties was noted and the quality of instream habitat was assessed, taking note of riparian vegetation and aquatic habitat features. Overland flow paths were ground-truthed and classified under the Auckland Unitary Plan – Operative in Part (AUP OP) as to their permanent, intermittent or ephemeral status.

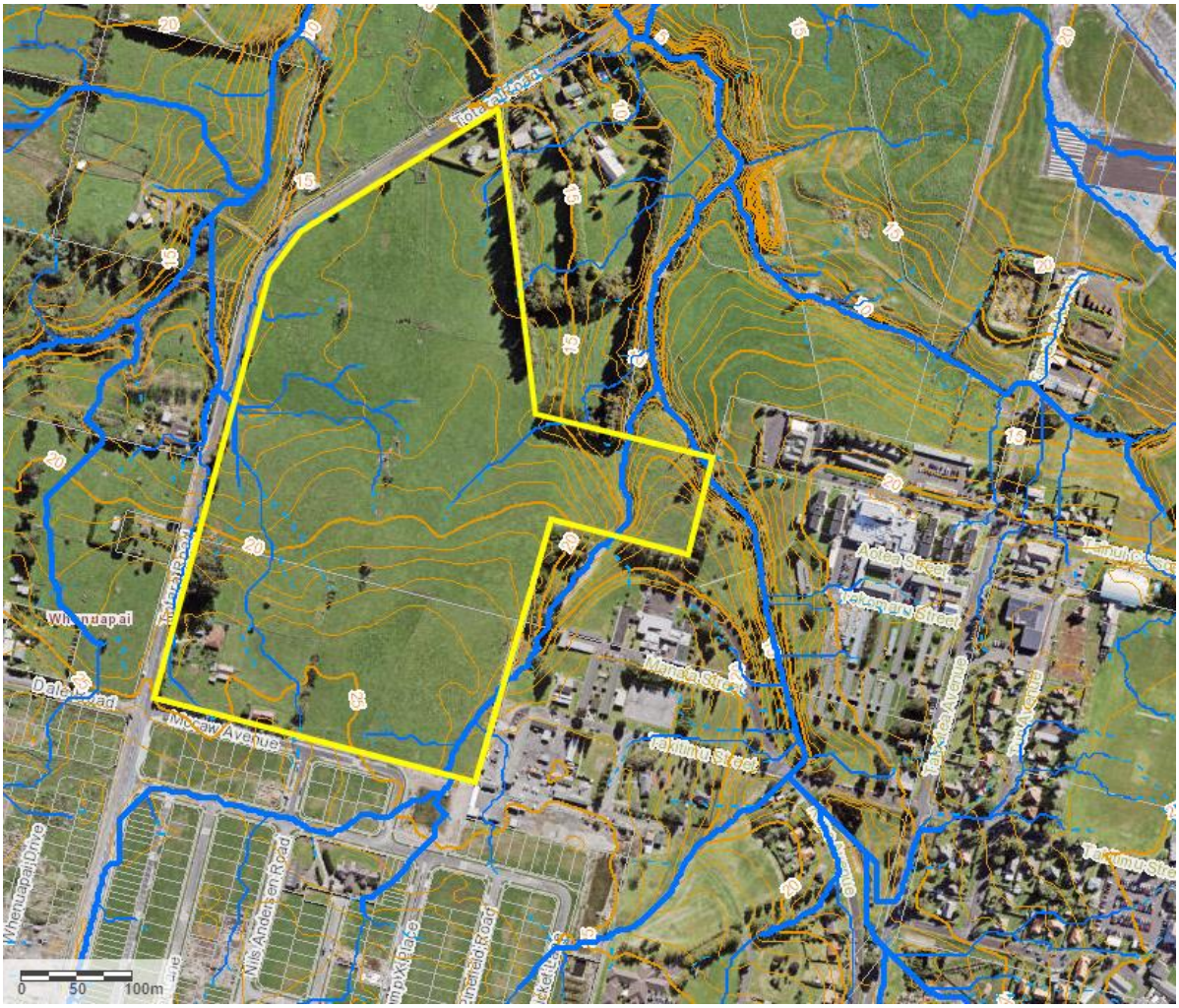

Figure 1. A map of the site showing indicated watercourses from Auckland Council's GIS viewer (dark blue lines) and land contours (orange lines). The yellow polygon shows the property boundary of 98 and 100-102 Totara Road, Whenuapai.

Under the AUP OP, an intermittent stream is defined as:

'Stream reaches that cease to flow for periods of the year because the bed is periodically above the water table. This category is defined by those stream reaches that do not meet the definition of permanent river or stream and meet at least three of the following criteria:

- *a) it has natural pools;*
- *b) it has a well-defined channel, such that the bed and banks can be distinguished;*
- *c) it contains surface water more than 48 hours after a rain event which results in stream flow;*
- *d) rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel;*
- *e) organic debris resulting from flood can be seen on the floodplain; or*
- *f) there is evidence of substrate sorting process, including scour and deposition.'*

Within 98 and 100-102 Totara Road, the GIS viewer indicated multiple, small tributaries transecting the site, with the majority running in a general south to north or east to west direction. Following the site assessment, the overland flow paths were identified to be tributaries of two different stream networks. Watercourses A and B (Figure 3) are unnamed tributaries of the Rarawaru Creek, which flowed for approximately 500 meters downstream of the site before entering the marine environment. Watercourses C , D and E (Figure 3) are unnamed tributaries of the Ratara Stream which flows approximately 700 meters downstream before entering the marine environment. Both the Ratara Stream and Rarawaru Creek drain into a north-western arm of the Waitematā Harbour.

No significant rainfall events (>25mm) occurred in the month prior to the site assessment. Rainfall in the week immediately preceding the site assessment was low to moderate with 0mm to 17.5mm falling on each day, indicating the catchment was at least partially saturated (Figure 2). There was a very low rainfall event (<1mm) 48 hours prior to site assessment (Auckland Council Environmental Monitoring Site: Whenuapai @ Airbase).

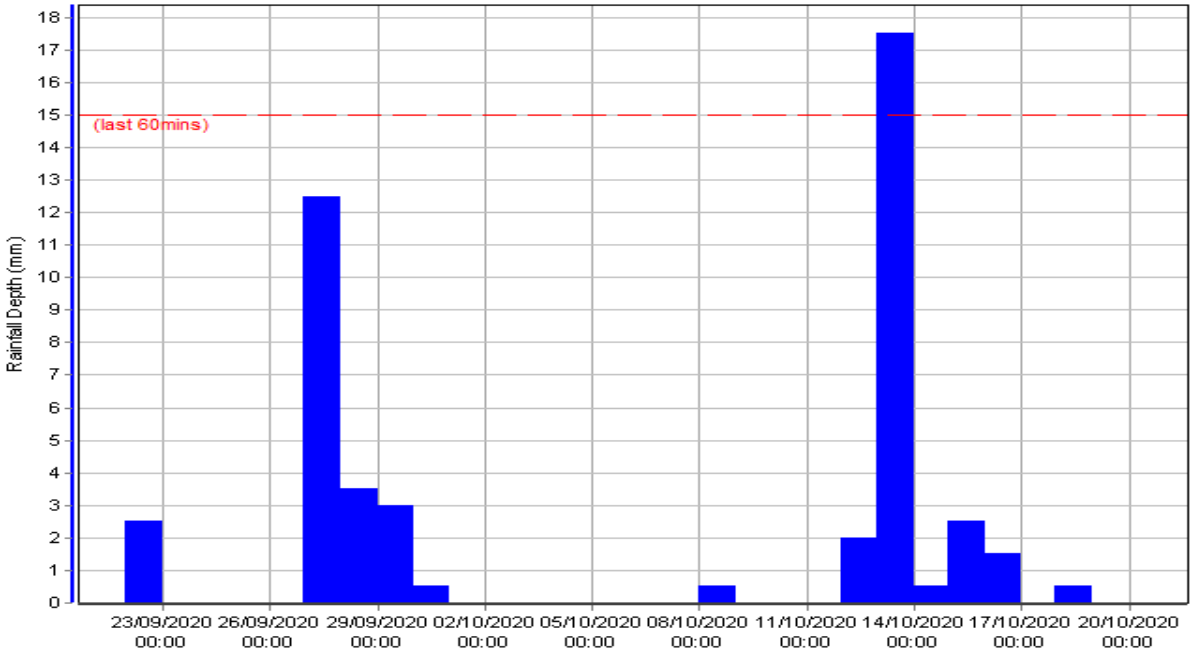

Figure 2. Total rainfall depth (mm) between 21/09/2020 - 21/10/2020. Data sourced from Auckland Council rainfall monitoring site Whenuapai @ Airbase

Figure 3. Classified and ground-truthed watercourses at 98 and 100-102 Totara Road.

1.1 Watercourse A

Watercourse A was entered the site at the south-western boundary of the property (Figure 3), through two culverts (Photo 1). The watercourse had a somewhat defined channel that had been degraded by stock access. It ran through the site for approximately 90m before flowing into the neighbouring property, then re-entering the site approximately 160m downstream (forming Watercourse B). The wetted width and depth of the channel was variable (between 0.1m to >1m wide and 0.05m to 0.20m deep) (Photo 2), mainly due to highly degraded banks caused by livestock pugging (Photo 3).

The watercourse was slow flowing, three deep pools, relative to mean depth, were observed and water clarity was generally clear. Approximately 50m downstream, a farm track crossed the watercourse with two pipes allowing water to flow through. Wooden planks had been laid over the watercourse channel and a further 30m downstream a stormwater pipe discharged to the watercourse from the neighbouring property (Photo 4). Substrate consisted predominantly of silt and a few large cobbles were present in the watercourse, likely from the rip-rap within the culverts. Macrophytes were common within the watercourse and dominant species included buttercup (*Ranunculus* spp.), soft rush (*Juncus effusus*), watercress (*Nasturtium officinale*) and water celery (*Apium nodiflorum*). The riparian yard and channel banks were dominated[1] by terrestrial exotic pasture grass.

Watercourse A contained continuous, flowing water more than 48 hours after a rain event that would be expected to result in the flow of intermittent streams, had natural deep pools relative to stream depth and no rooted terrestrial vegetation within the channel. A stream channel can be distinguished (Photo 3. Channel banks are distinguishable however, degraded due to livestock), however livestock access has resulted in degradation to the channel form. Under the AUP OP, this stream meets four of the criteria of intermittent streams and has been classified as an intermittent stream modified through farming practices.

Photo 1. The two culverts which Watercourse A enters the property through

Photo 2. A natural flow path with highly variable wetted width and pools can be observed in watercourse A

[1] Dominance means greater than 51% area coverage.

Photo 3. Channel banks are distinguishable however, degraded due to livestock

Photo 4. Upstream view of Watercourse A with a stormwater pipe present

1.2 Watercourse B

Watercourse B entered the site through a pipe and is a downstream reach of Watercourse A (Figure 3). Watercourse B flowed through the site for approximately 100m through highly variable hydrological conditions, with the wetted width of the channel ranging from 0.15m to >1.5m (Photo 6; Photo 10). Upstream, the low flow path was wide and the channel was not well-defined however a clear flow path could be observed with two large, deep pools. Whilst the channel was not well-defined in the upstream portion of the reach, this is likely due to channel damage through livestock access (Photo 8). One pool was located less than 1m downstream of the pipe (Photo 5) and the other approximately 64m downstream. The largest of these pools was the downstream pool and was approximately 2.5m wide and 0.20m deep (Photo 6). The dominant aquatic vegetation present included buttercup (*Ranunculus* spp.), water celery (*Apium nodiflora*), starwort (*Callitiche stagnalis*) and heavily grazed soft-rush (*Juncus effusus*), no riparian planting was established along Watercourse B. The riparian yard and channel banks were dominated[1] by terrestrial exotic pasture grass.

Approximately 70m downstream, the watercourse flowed through a culvert under a farm crossing (Photo 9) and the channel became well-defined and incised, with banks 0.5m high and 0.67m wide (Photo 10). The substrate within the channel of Watercourse B consisted of silt and a few large cobbles, and the banks were heavily pugged by livestock and damaged, particularly in the upstream portion of the reach. Watercourse B exited the site at the northern site boundary, into neighbouring property where relatively extensive riparian plantings are established and stock are excluded. Downstream in the neighbouring property, the stream channel was clearly defined. Watercourse B contained surface water 48 hours after a rain event, had natural deep pools, a well-defined channel throughout much of its length and no rooted

terrestrial vegetation present within the channel. Under to AUP OP, Watercourse B meets the criteria of an intermittent stream.

Photo 5. Pool located <1m downstream of pipe.

Photo 6. The upstream portion of Watercourse B had highly degraded banks due to pugging. The second largest pool shown on the lower left-hand side.

Photo 7. A narrow flow path could be discerned, flowing through the roots of aquatic vegetation.

Photo 8. The upstream portion of Watercourse B had degraded banks and a degraded channel.

Photo 9. Downstream channel after the culverted farm crossing with pugged ground.

Photo 10. Downstream portion of Watercourse B had banks which became more defined and incised.

1.3 Watercourse C

Watercourse C consisted of two reaches of the Ratara Stream (C.1 and C.2) with a confluence present on the western boundary of the site (Figure 3). Watercourse C.1 began within the property and continued north for approximately 30m before the confluence with Watercourse C.2. Watercourse C.2 began north-east of C.1, continued west for approximately 35m before the confluence.

No discernible channel could be seen in the Watercourse C.1 and C.2 areas (Photo 11). Historic clay drainage pipes were observed in both channels which had been broken up as a result of stock. Where the clay drainage pipes were found, standing water accumulated in shallow puddles formed by livestock pugging. Some vegetation that can tolerate wet conditions was present along the narrow flow paths including buttercup (*Rancunculus* sp.), broad-leaved dock (*Rumex obtusifolius*), and small patches of starwort (*Callitiche stagnalis*). Kikuyu and other exotic pasture grasses were also rooted throughout and consisted of more than 50% of the vegetation cover throughout the area.

Within Watercourse C.1, approximately 19m downstream of the beginning of the pugging that contained standing water, a stagnant puddle could be seen with starwort growing throughout (Photo 13). This puddle has been induced from pugging and the formation of small earthbound along the fence line. The area became completely dry for approximately 10m below this puddle, until the confluence with Watercourse C.2.

Watercourse C.2 had a stagnant shallow puddle present in the upper section that contained filamentous green algae (Photo 14). Broken clay drainage pipes were present at the upper end of the pool however, the inflow side could not be located. No water flowed from the pipe or the puddle and water was only retained in pugging caused by livestock for 35m before exiting the property (Photo 15). There were small

patches of starwort within the puddle, and water pepper (*Persecaria hydropiper*) and buttercup grew through approximately 30% of the flow path below. Terrestrial exotic pasture grasses and kikuyu were rooted throughout the remaining 70%.

Standing water was present in patches 48 hours after a rain event and the C.1 and C.2 areas often contained some vegetation that can tolerate wet conditions, however the dominant species was still terrestrial exotic pasture grasses. There was no defined channel or even evidence of a channel that appeared to have been modified by stock access, although a depression area where water likely flows for short periods (<48hrs) after high rainfall could be distinguished. If pugging from stock was not present a well-defined channel would still not be present. As the Watercourse C areas only met two[2] of the intermittent stream criteria and did not meet the definition of a natural wetland, the areas were classified as ephemeral overland flow paths.

Photo 11. Watercourse C.1 had no distinguishable channel.

Photo 12. Water was largely retained in pugged holes from live stock. Vegetation was predominantly pasture grass.

Photo 13. Stagnant puddle present in Watercourse C.1 before becoming dry

[2] It contains surface water more than 48 hours after a rain event which results in stream flow and rooted terrestrial vegetation is not established across the entire cross-sectional width of the channel.

Photo 14. Stormwater pipe and stangnant puddle at the top of Watercourse C.2

Photo 15. Ground impression indicating where the ephemeral overland flow path for Watercouse C.2 runs.

1.4 Watercourse D

Auckland Council GIS Viewer indicated an overland flow path to be present in the lower south-western side of the property (Figure 3). During the site visit, this was deemed to be an artificially created depression, that was likely originally a farm drainage channel. The shallow depression was completely straight and the depth of the depression was consistent for the whole length (Photo 16). No water was present in the channel and rooted terrestrial vegetation could be seen throughout. The edges of the banks have been damaged through pugging by livestock (Photo 17). Furthermore, land contours do not indicate any naturally occurring flow paths and no head waters were historically present.

Under the AUP OP, artificial water courses are defined as:

Constructed watercourses that contain no natural portions from their confluence with a river or stream to their headwaters.
Includes:

a) *canals that supply water to electricity power generation plants;*
b) *farm drainage canals;*
c) *irrigation canals; and*
d) *water supply races.*

Excludes: naturally occurring watercourses

As such, Watercourse D was classified as an ephemeral drainage channel under the AUP OP.

Photo 16. View of Watercourse D looking towards Totara Road

Photo 17. Channel damage caused through pugging by livestock access

1.5 Watercourse E

Watercourse E, a reach of the Rarawaru Creek, flowed for approximately 17m within the north-east corner of the site. This reach was not ground-truthed however the very large catchment size (83ha), contours and aerial images indicate that this is very likely a permanent stream reach of the Rarawaru Creek.

2 SUMMARY

Watercourses A and B were classified as modified intermittent streams under the AUP OP as they contained standing water 48 hours after a rain event, natural pools and no rooted terrestrial vegetation within the watercourse channel. Some portions of the three watercourses had well-defined channels, however due to bank damage from livestock had flattened these channels in places. Watercourse C was classified as ephemeral overland flow paths due to meeting only two intermittent stream criteria and was not classified as a wetland as it contained a dominance of terrestrial pasture species. Watercourse D was classified as an ephemeral artificial watercourse for the purpose of farm drainage as it contained no characteristics of a natural watercourse. Watercourse E was classified as a permanent stream. All other overland flow paths, as indicated by Auckland Council's GIS viewer (Figure 1) were ephemeral or absent. In regards to freshwater ecology, the following rules in the AUP OP apply to potential activities within the site:

- E3.4.1(A19) – Diversion of a river or stream to a new course is a discretionary activity.
- E3.4.1(A22) Minor upgraded to existing infrastructure related structure complying with the standards in E3.6.1.12 is a permitted activity.
- E3.4.1(A29) – New bridges, complying with the standards in E3.6.1.16 are a permitted activity.
- E3.4.1 (A30) – New cables, ducts, lines or pipelines on structures complying with E3.6.1.14
- E3.4.1(A32) – New culverts less than 30m in length and complying with the standards in E3.6.1.18 are a permitted activity.
- E3.5.1(A49) – New reclamation or drainage, including filling over a piped stream, is a non-compliant activity.
- E3.4.1(A53) – Any activity that is undertaken in, on, over or within the bed of an ephemeral river and streams complying with the standards in E3.6.1.1 is a permitted activity.
- H3.6.8.1 – A building or parts of a building must be set back from the relevant boundary by a minimum depth of 10m from the edge of all permanent and intermittent streams.
- H18.6.3.1 (Future Urban Zone) – A building or parts of a building must be set back from the relevant boundary by a minimum depth of 20m from the edge of all permanent and intermittent streams.

Regards,

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