



Akaroa Wastewater Project Land Disposal Alternatives Update on Land Investigations

Presentation to the community

Gaiety Hall

Wednesday 9 November 2016

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Background

- Council has committed to moving the treatment plant from Takapuneke to Old Coach Road
- Consents granted for new treatment plant and network upgrades
- Consents declined for harbour outfall because:
 - Adverse effects on Ngāi Tahu cultural values
 - Found that Resource Management Act (RMA) tests were not satisfied, which require avoiding discharge to water unless alternatives have been reasonably discounted
- Council appealed the decline of consents
- Ngāi Tahu parties joined as parties to the appeal. Council is engaging with the parties to the appeal in considering options

Background

- Council will be making a Local Government Act (LGA) decision on the wastewater discharge option to pursue
- Council must take into account social, cultural and economic interests; the option must be efficient, effective and appropriate; and the option must be consentable as sustainable management under the RMA
- Discharge to water is not sustainable management under the RMA unless options that avoid discharge to water have been adequately investigated and reasonably discounted
- Council has not yet selected a preferred option but considers that there are some discharge to land options that are more efficient, effective, feasible and appropriate than originally thought
- Harbour outfall may not be sustainable management under the RMA, or sustainable development under the LGA, if land disposal is efficient, effective, feasible and appropriate
- Strong preference to acquire any land needed from willing property owners

Criteria for short-listing

- Cost
- Technical feasibility
- Timeliness
- Environmental effects
- Cultural acceptance
- Social acceptance

Options Assessment – Long List

- Long list options not selected:
 - Pumping or tankering wastewater to the Christchurch treatment plant
 - Overland flow treatment
 - Surface flow wetland
 - Rakahore chamber
 - Non-potable reuse (e.g. toilet flushing, garden watering) could be considered in future

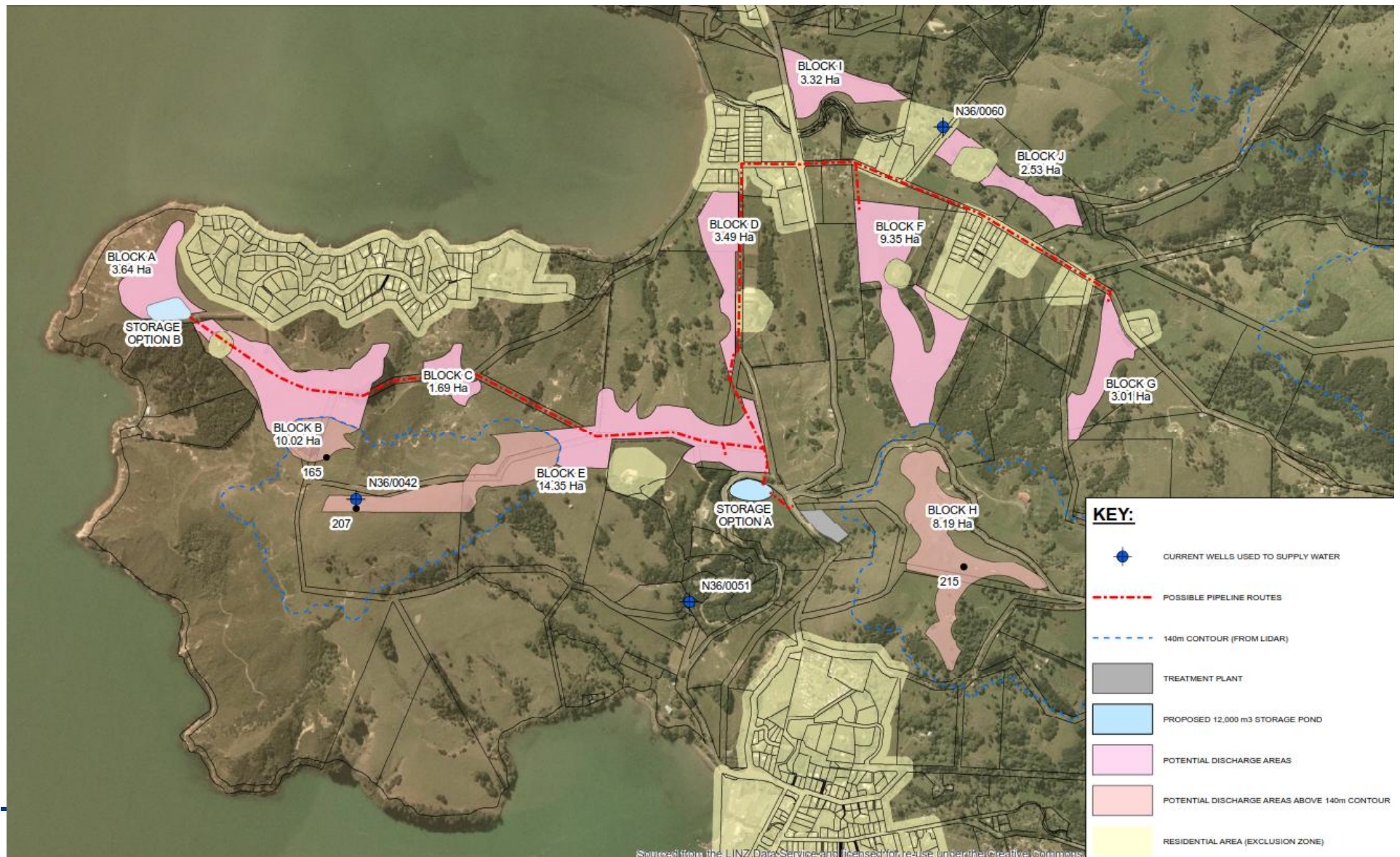
Options Assessment – Short List – May 2016

- Short listed options were further investigated:
 1. Year-round irrigation to trees
 2. Year-round irrigation to pasture
 3. Summer only irrigation, with a subsurface flow wetland or infiltration basin and discharge via a coastal infiltration gallery at other times
 4. Subsurface flow wetland and discharge via a coastal infiltration gallery
 5. Infiltration basin and discharge via a coastal infiltration gallery
 6. Outfall pipeline to mid-harbour

Criteria for identifying possibly suitable land

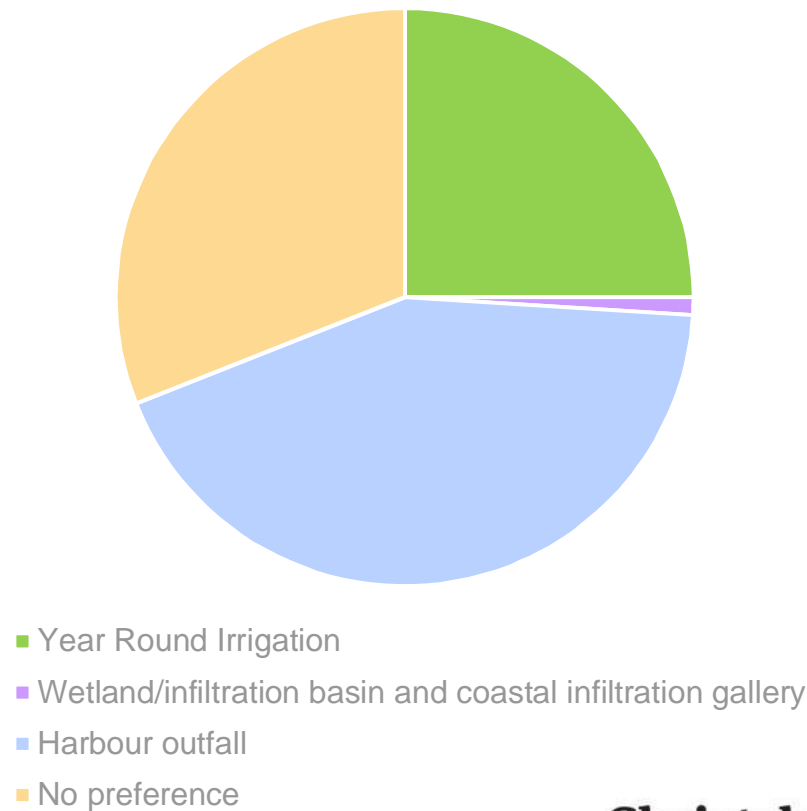
- Not too far from the proposed treatment plant - within 2 km
- Relatively flat - slopes less than 15 degrees
- At least 25 metres from residential area or waterway
- Property size at least 1 hectare
- Not known to have land instability issues

Possible Irrigation Areas



Consultation Results on Short Listed Options

- § Consultation from 26 April to 12 June 2016
- § Concerns raised about irrigation causing land instability



Land Investigations

- § Uncertainty about land instability risks meant staff did not have enough information to recommend a preferred option to Councillors
- § Therefore geotechnical investigations and infiltration testing undertaken in May 2016

Land Investigations of Alternative Sites

§ Infiltration tests

- to determine the infiltration rate which impacts on the type of irrigation and when irrigation can be applied
- to determine capacity of the soil to hold moisture in the root zone (the Plant Available Water) which impacts on the depth and return period of irrigation

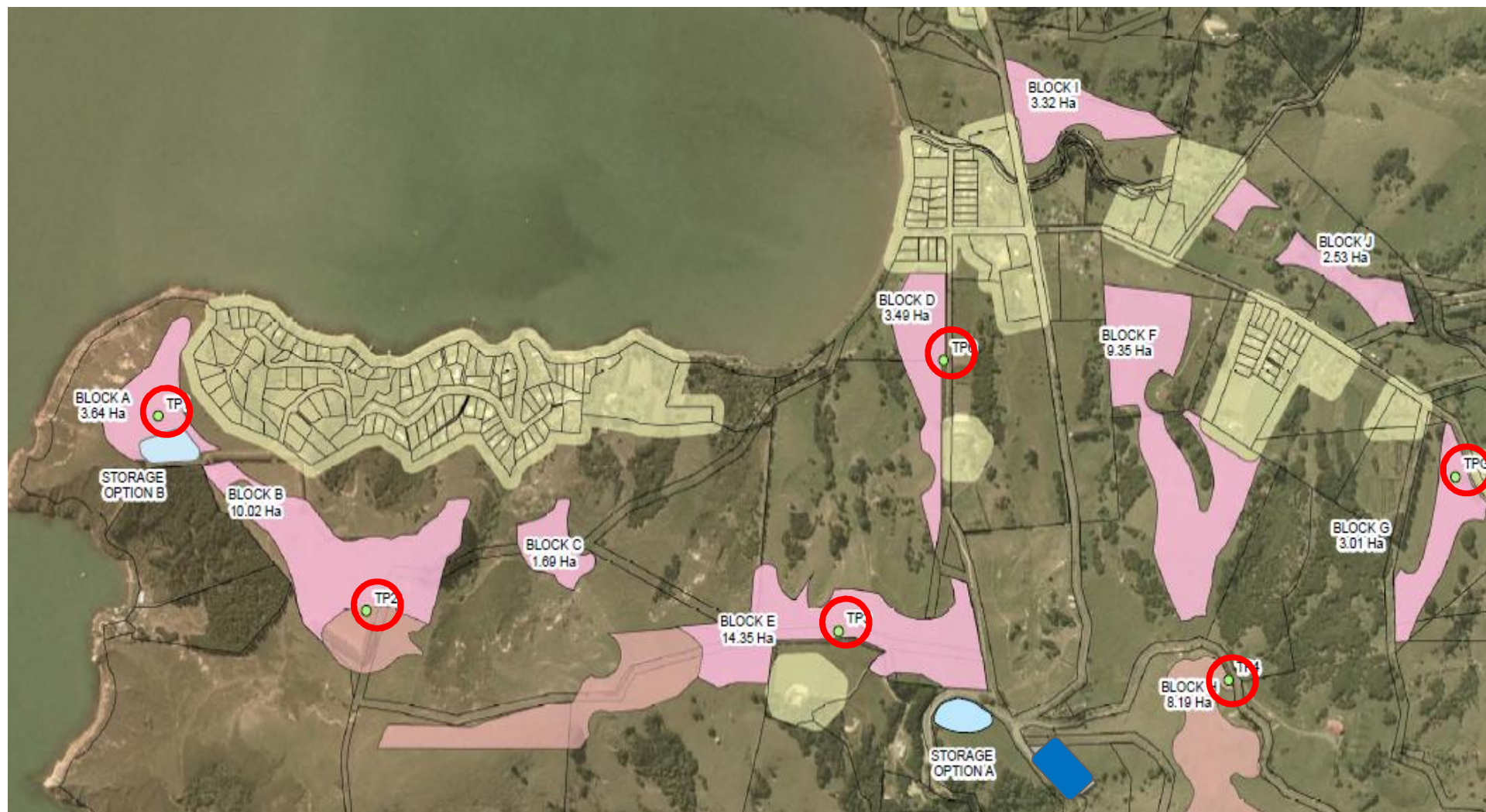
§ Geotechnical test pits

- to investigate the thickness and strength of shallow soils and depth to groundwater to determine suitability

§ Groundwater monitoring bores

- to record information on groundwater levels over time

Test Pit Locations – May 2016

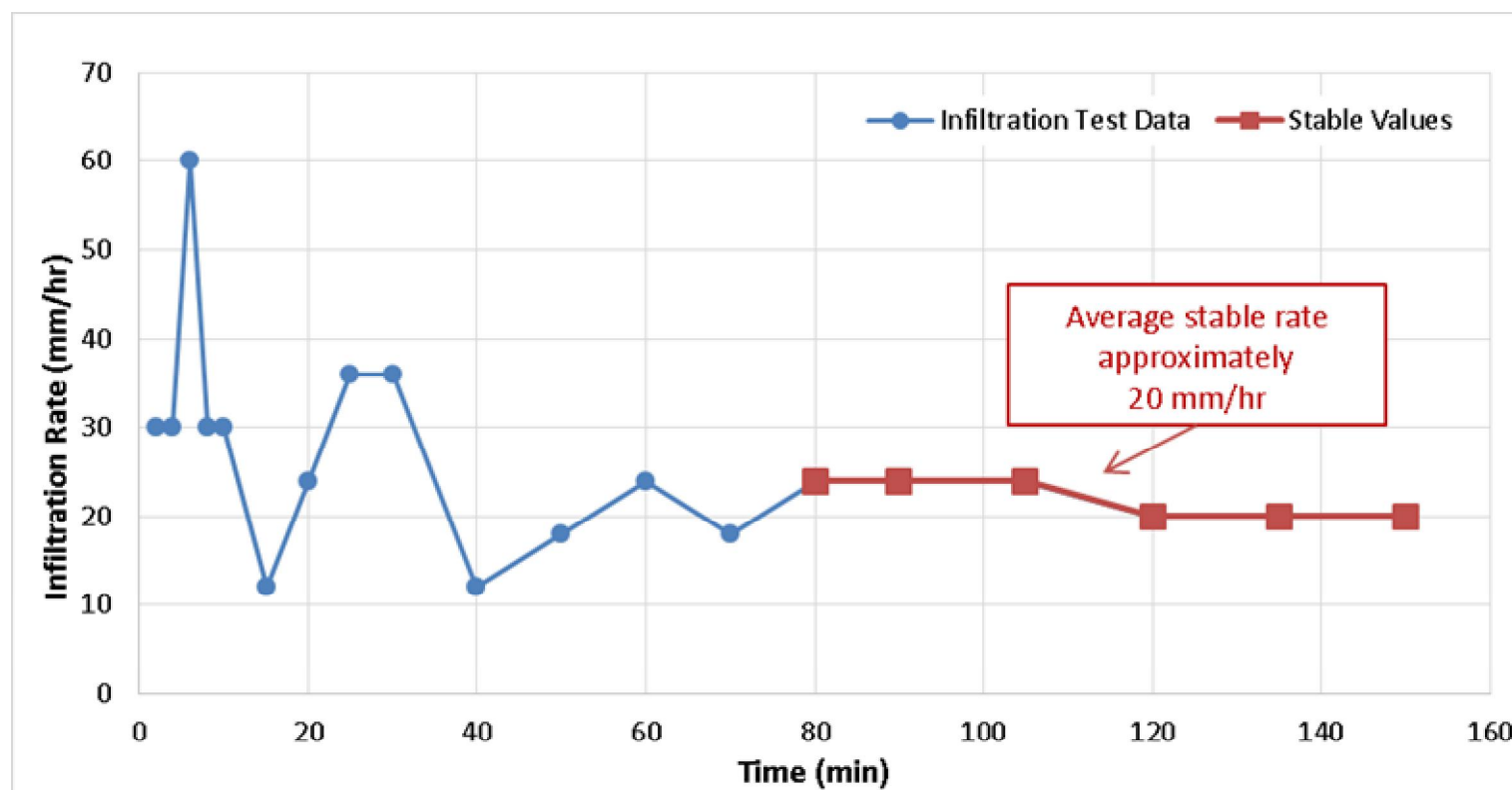


Infiltration Testing

- § Double ring infiltrometer measures the rate water enters the soil



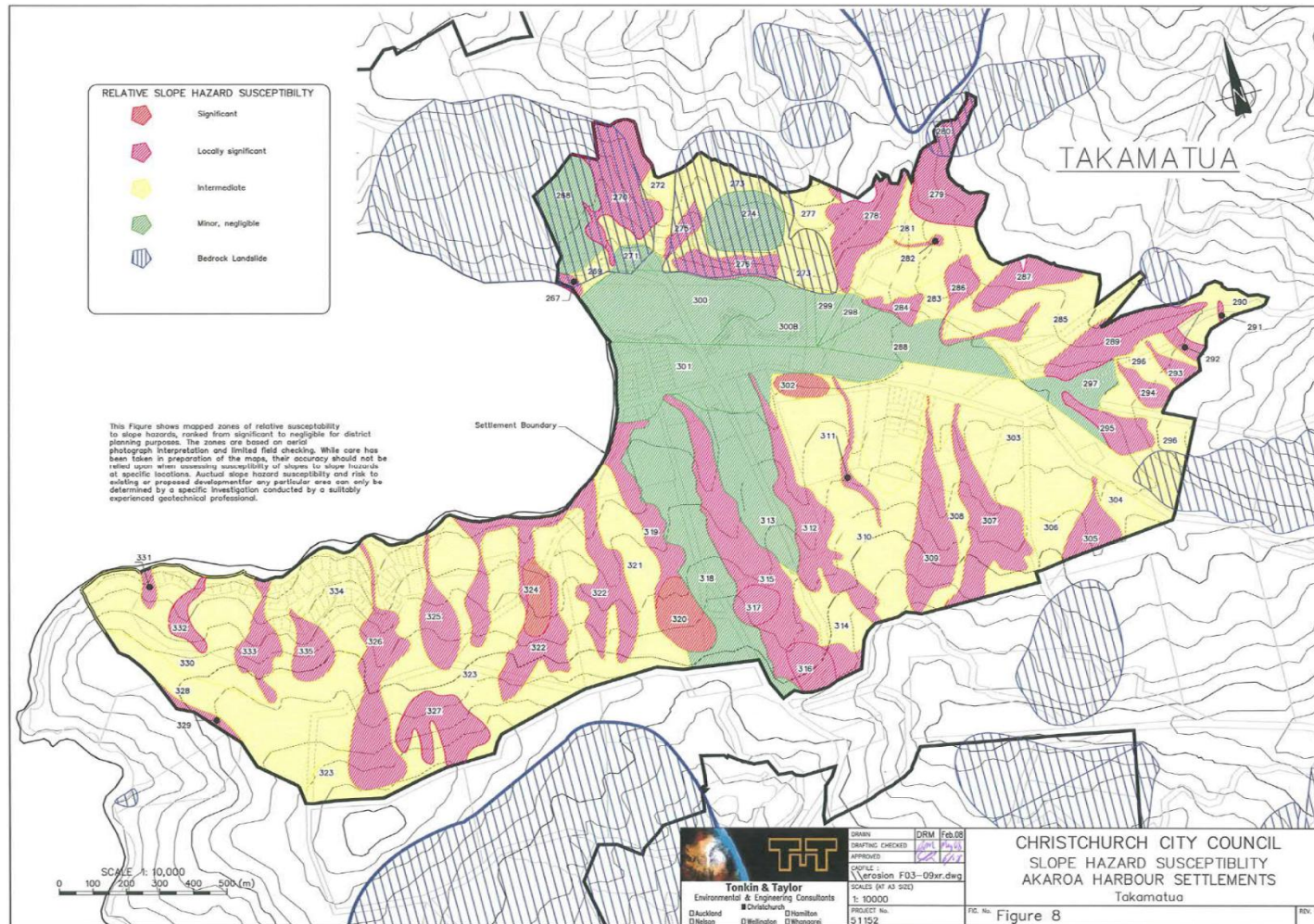
Typical Infiltration Test Result



Findings of Infiltration Testing Fieldwork

- § Surface infiltration rates (6 to 21 mm/hr) are suitable for both spray and drip irrigation options
- § Sub-soil infiltration rates (0 to 17 mm/hr)
- § Zero infiltration would limit irrigation to summer only unless sub-soil can be broken up to allow drainage
- § Reduction of Plant Available Water from 72mm to 48mm results in
 - Increased drainage to underlying strata (impacting on stability of loess)
 - Additional storage required compared with earlier assessments
 - To keep storage the same would require approximately another 10 ha of irrigated land

Geotechnical Background



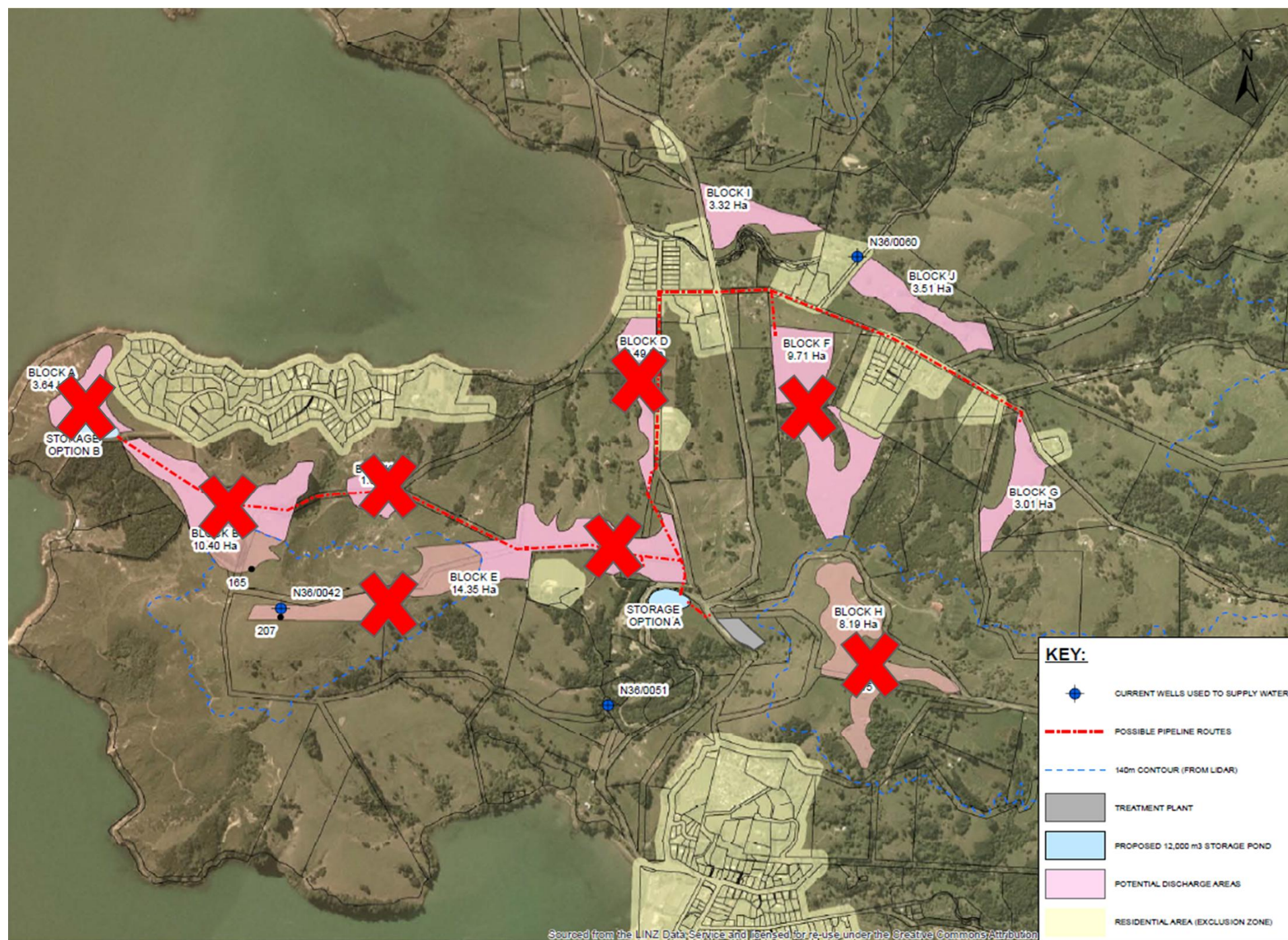
Geotechnical Testing

- § 0.15m – 0.25 metres topsoil
- § 4 metres loess
- § Groundwater not encountered
- § In situ (undrained) shear strength
- § Moisture content



Geotechnical Conclusions

- § The steeper areas of Takamatua Peninsula are currently marginally stable
- § Irrigating these areas, or the flatter areas above these slopes, increases the frequency of instability
- § Recommended to Council that there should be no irrigation of slopes where downhill slopes are steeper than 15 degrees

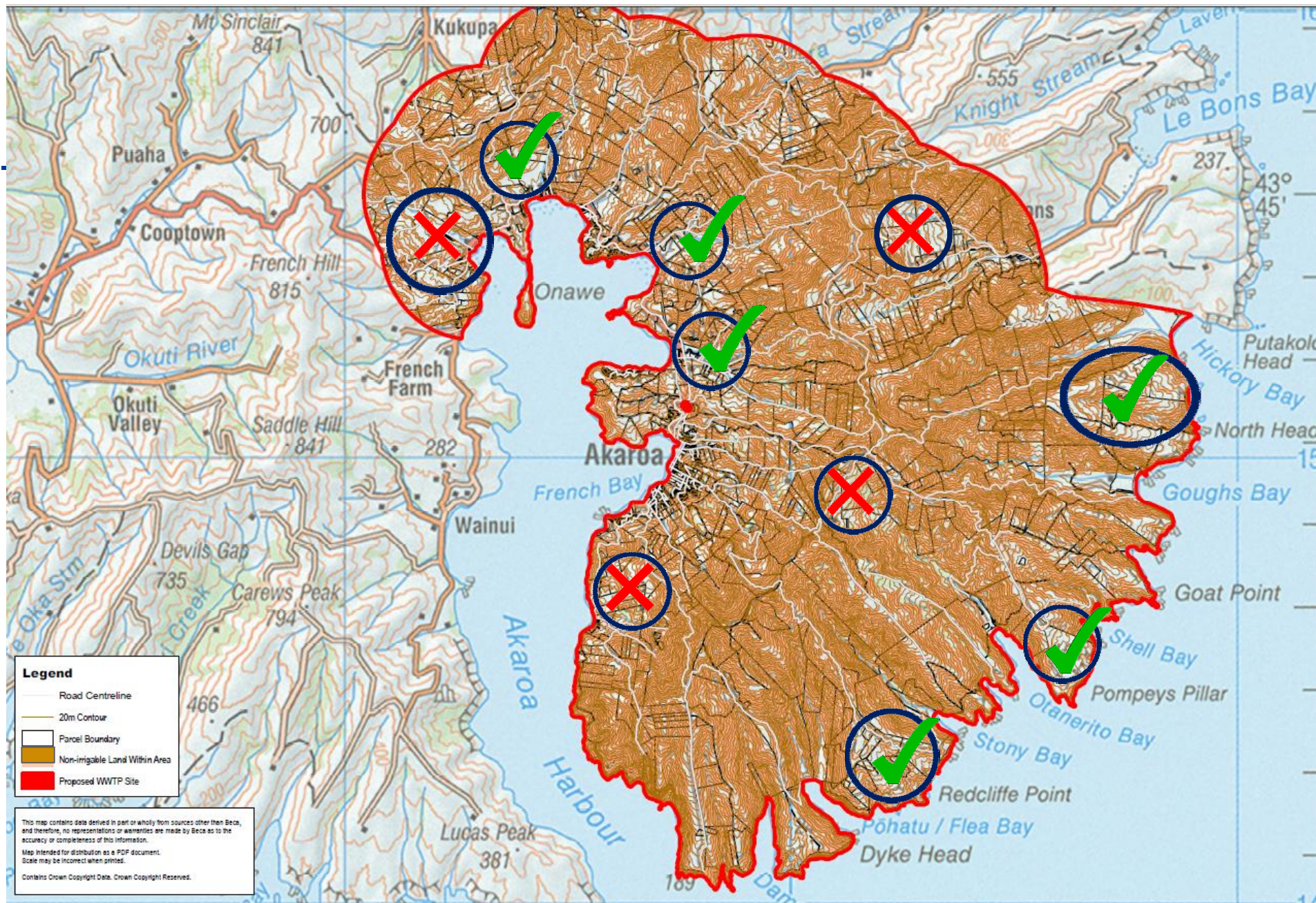


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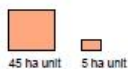
- CURRENT WELLS USED TO SUPPLY WATER
- POSSIBLE PIPELINE ROUTES
- 140m CONTOUR (FROM LIDAR)
- TREATMENT PLANT
- PROPOSED 12,000 m³ STORAGE POND
- POTENTIAL DISCHARGE AREAS
- RESIDENTIAL AREA (EXCLUSION ZONE)

Wider Review of Possible Irrigation Areas

- § Land identified at concept report on Takamatua Peninsula and Blocks F and H in Takamatua Valley no longer considered suitable for irrigation
- § Need to consider wider area:
 - Sufficient land less than 15 degrees slope (including downhill of area)
 - Within 10 km of proposed treatment plant by road
 - Within 5 km of Wainui (would require pipeline across harbour)
 - Some areas excluded for geotechnical reasons such as downhill slope too steep



Map Scale @ A3: 1:80,000

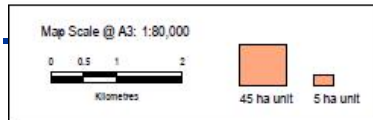
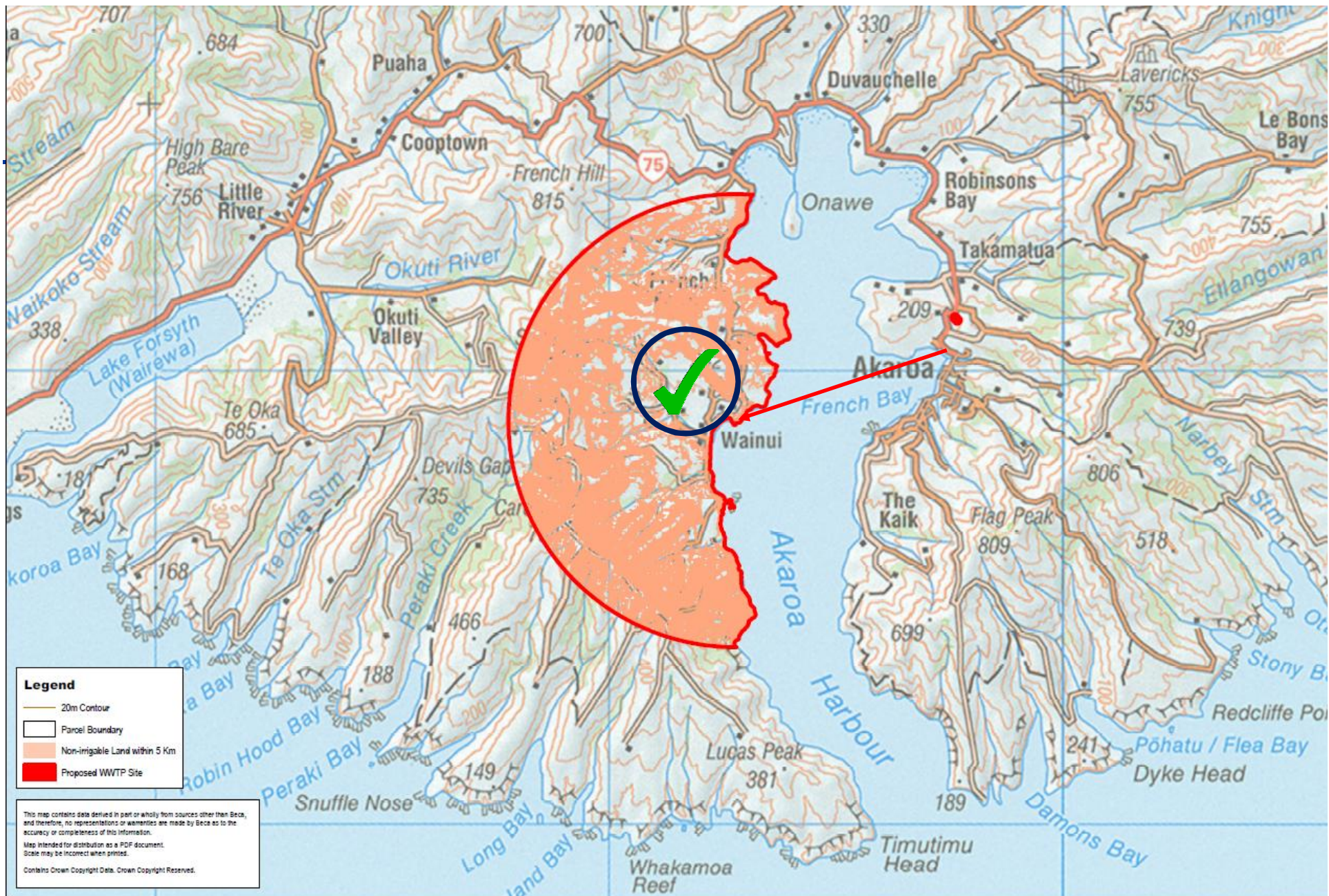


Revision	Author	Verified	Approved	Date
0.20	SOP	DRAFT	DRAFT	11.07.2016
0.10	SOP	DRAFT	DRAFT	08.07.2016

Title: Akaroa Wastewater Upgrade
Non-irrigable Land (land greater than 15° slope)
Analysis within 10Km driving distance of
New WWTP Site (plus 2km buffer)

Client: Christchurch City Council
Project: Akaroa Wastewater Upgrade





Revision	Author	Verified	Approved	Date
0.01	SCP	DRAFT	DRAFT	13.07.2016
0.10	SCP	DRAFT	DRAFT	06.07.2016

Title: **Akaroa Wastewater Upgrade**
Non-irrigable Land (land greater than 15° slope)
Analysis within 5Km of Otuturinga

Client: Christchurch City Council

Project: Akaroa Wastewater Upgrade



Selection of Alternative Areas

§ Selection of alternative areas for further investigation was based on:

- Meeting the selection criteria
- Proximity to proposed wastewater treatment plant site
- Sufficient land (minimum 25 ha or 27 ha plus storage plus buffer zones) area potentially available to irrigate wastewater

§ Three sites selected:

- Robinsons Bay
- Pompeys Pillar
- Takamatua Valley

§ Undertook geotechnical testing (test pits, bore logs), infiltration testing and installed monitoring bores

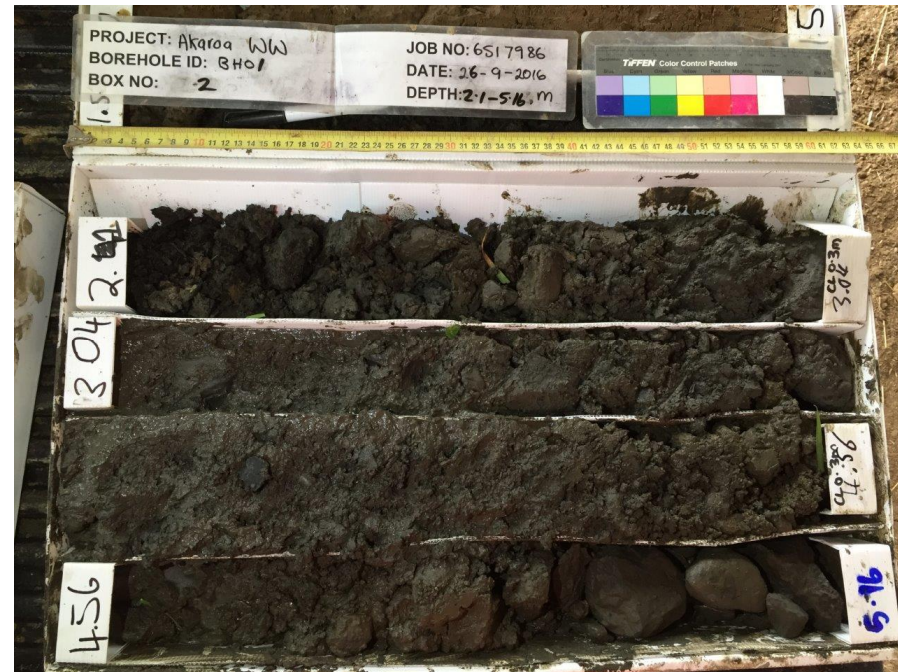
Land Requirements

Option	Storage (m ³)	Area for treatment (ha)	Area for buffer (ha)	Area for storage (ha)	Total area required (ha)
Irrigation to trees (drip)	12,000	25	2.5	0.7	28
Irrigation to pasture (spray)	35,000	27	8.1	2.5	38



Monitoring Bores & Bore Logs

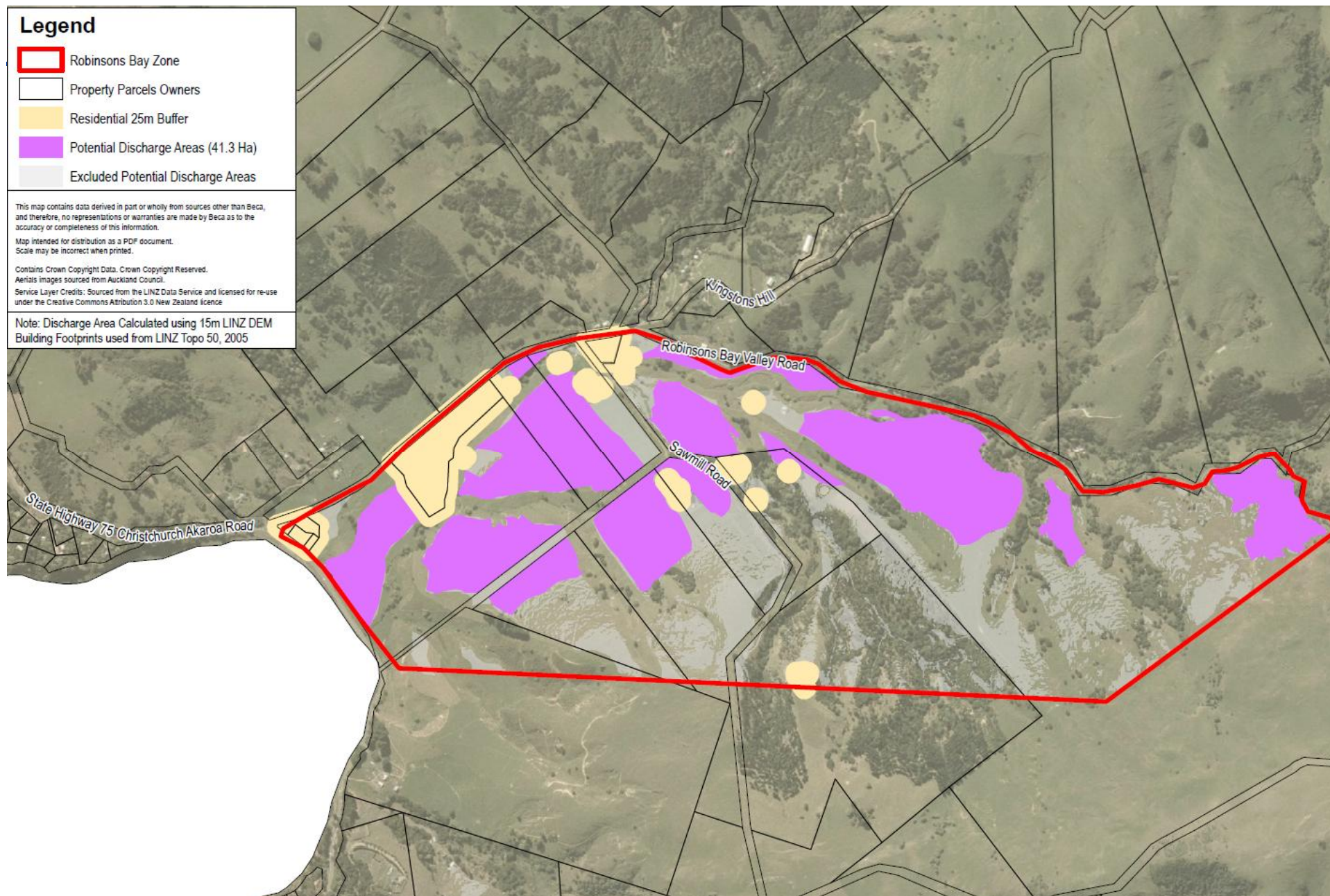
- § Drilling rig used to install monitoring bores, also enables soil borelog



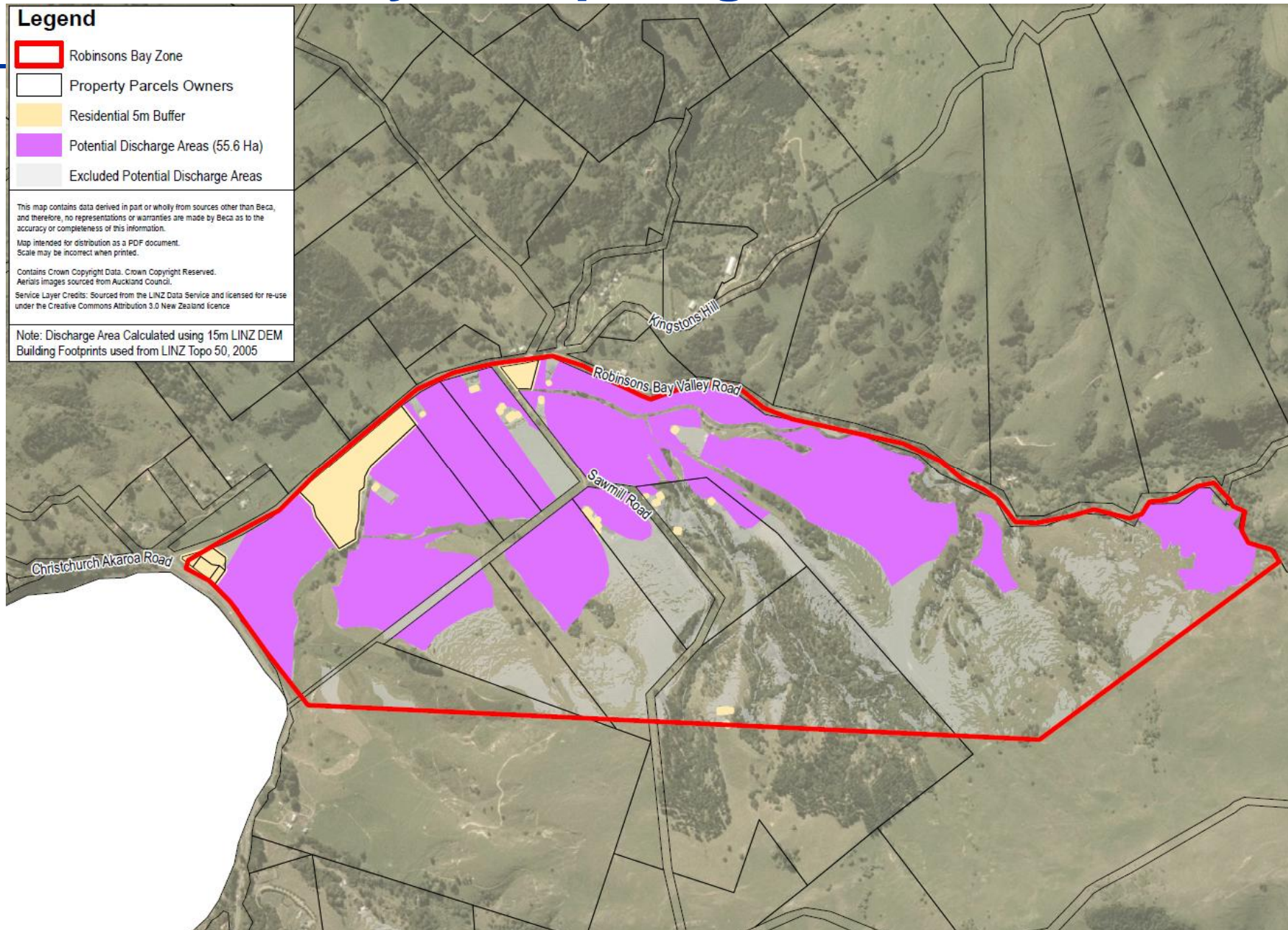
Refined Mapping of Possibly Suitable Irrigation Areas

- § Buffer distance to buildings and streams for spray irrigation
25 metres
- § Buffer distance to buildings and streams for drip irrigation
5 metres
- § Mapped possibly suitable land in Takamatua Valley,
Robinsons Bay and Pompeys Pillar

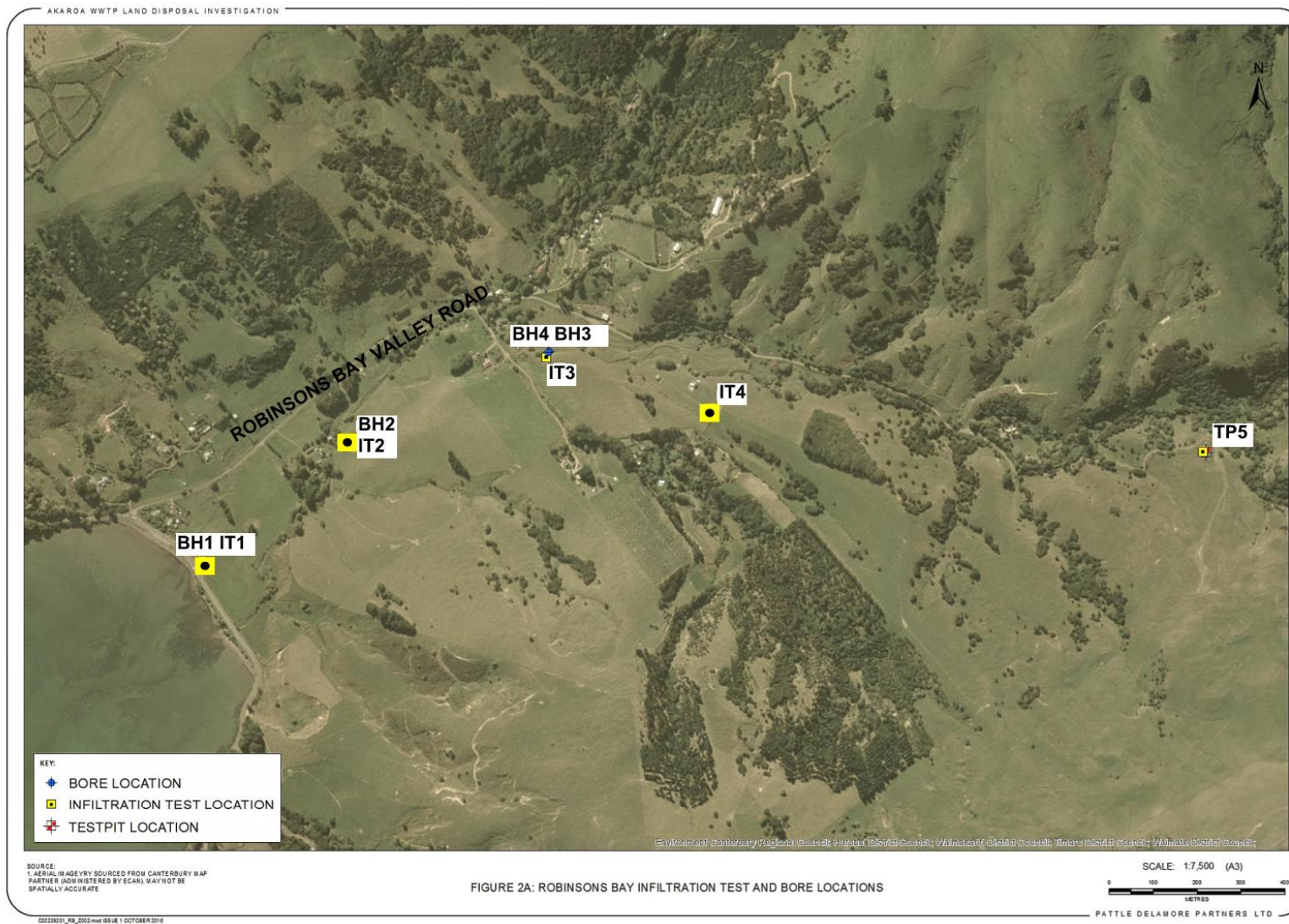
Robinsons Bay – Spray Irrigation



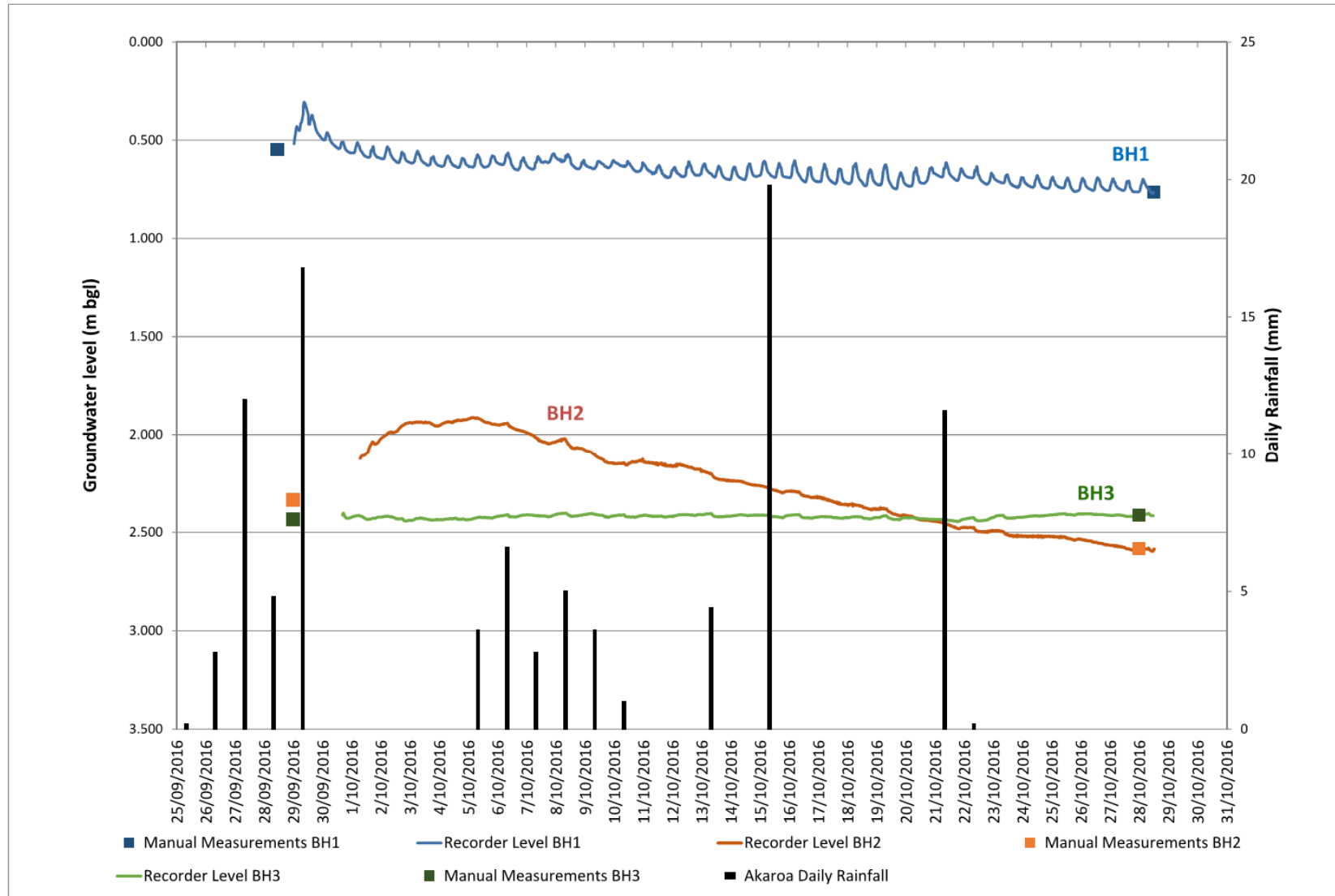
Robinsons Bay – Drip Irrigation



Robinsons Bay Valley Test Locations



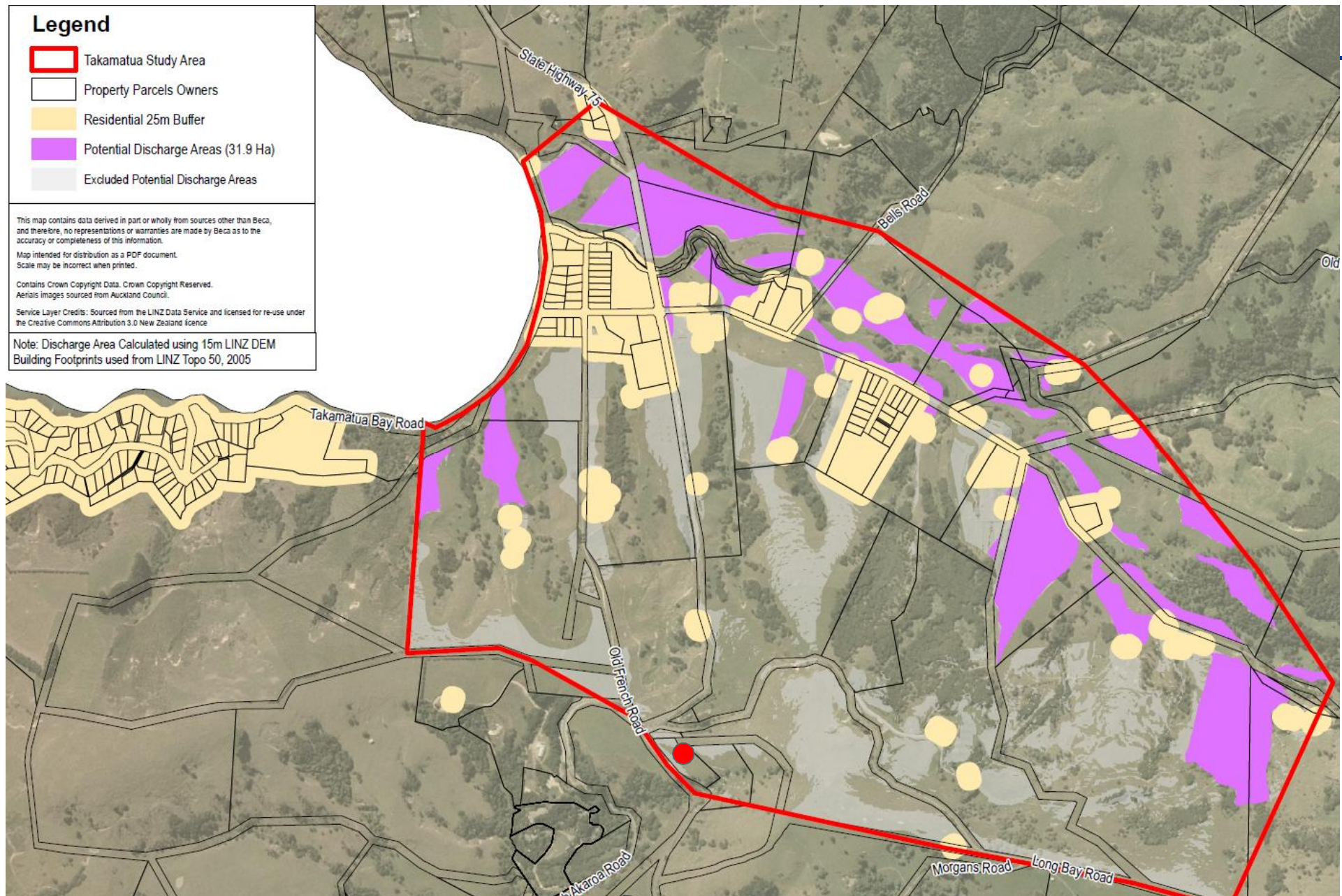
Robinsons Bay Valley Groundwater



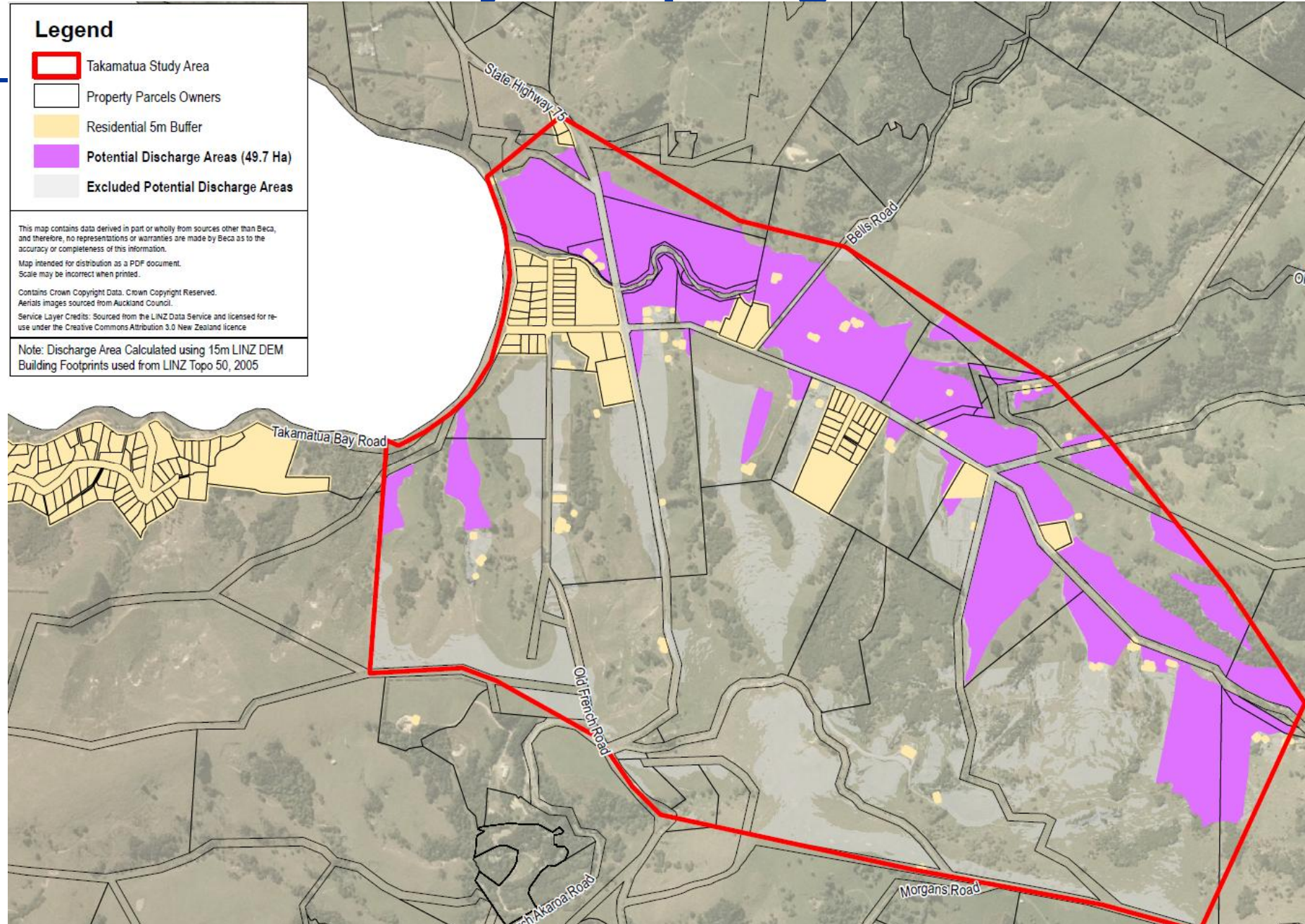
Robinsons Bay Test Findings

- § The whole area is suitable for irrigation
- § Combination of soil types provides for more flexible operation than other areas
- § May be limitations to irrigation in winter on the hill soils
- § Shallow groundwater close to coast may restrict irrigation (ponding problems) in late winter/early spring
- § Depth to groundwater elsewhere unlikely to restrict irrigation
- § Observed flooding in lower valley will be short term in nature and can be managed with correct maintenance of culverts

Takamatua Valley – Spray Irrigation



Takamatua Valley – Drip Irrigation



Takamatua Valley Test Locations



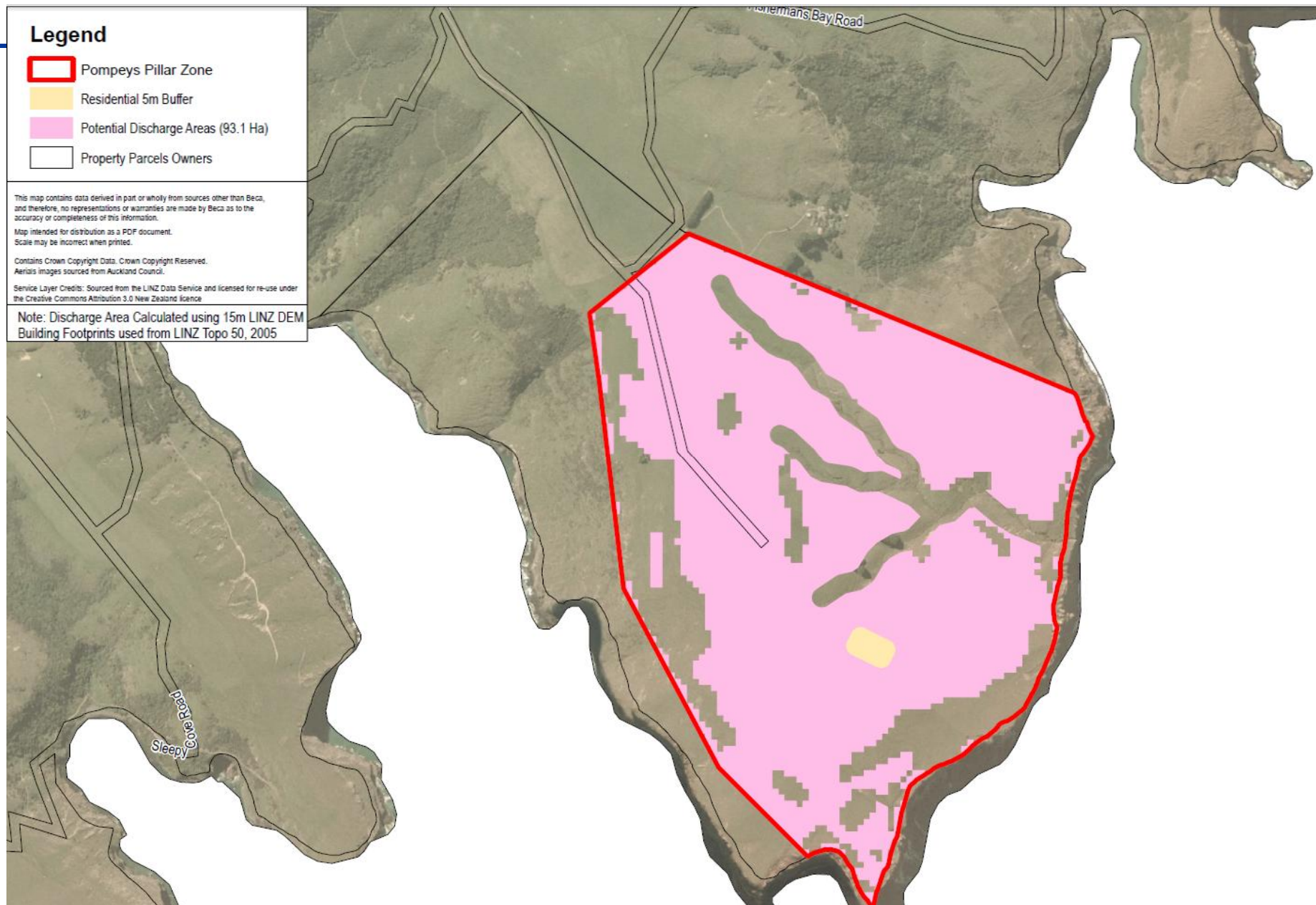
Takamatua Valley Groundwater



Takamatua Test Findings

- § No testing - boreholes for groundwater monitoring only
- § Initial results indicate groundwater close to ground level in lower valley (i.e. very shallow)
- § Bore shows rapid response to rainfall which indicates strong connection of groundwater to rainfall/surface water
- § Could restrict irrigation and pose higher risks (such as ground water mounding and nutrient leaching) in Takamatua Valley compared to other sites

Pompeys Pillar – Spray Irrigation



Pompeys Pillar Test Locations



Pompeys Pillar Test Findings

- § Ground conditions observed at Pompeys Pillar are considered suitable for wastewater irrigation
- § Soils exhibit lower permeability than other sites. This may limit the application rate.
- § Available area is very extensive; application area can be increased to meet the loading requirements to counter lower permeability.

Geotechnical Findings

§ All three sites considered geotechnically suitable

§ Takamatua and Robinsons Bay

- Soils in these valleys are more free draining being composed of silts and sandy silts overlying gravel, with the depth to groundwater falling from 0.5m to 3.0m inland
- Central lower-gradient areas have comparatively low risk of ground movement
- Potential for localised erosion and instability at points where groundwater exits the ground

§ Pompeys Pillar

- Soils at Pompeys Pillar are less free draining being composed of loess with groundwater at depth (likely within the bedrock)
- Irrigation may cause localised instability around cliff tops and steeper zones around incised gullies

Update on Land Area Required (three sites)

- § In addition to the irrigable land the following factors will impact on the total area of land needed:
 - Shape of blocks
 - Buffer zones required to neighbouring properties and streams
 - Allowance for non irrigable areas such as springs, boggy areas, localised areas that are too steep.
- § Land area assessment based on the test pits being representative of a wider area. Still some uncertainty and more testing should be undertaken.

Conclusions of Land Investigations

- § Insufficient suitable land on Takamatua Peninsula as downslope areas too steep
- § Spray irrigation in Takamatua Valley impractical as many scattered areas would be required and not enough room for storage pond
- § Drip irrigation to trees in Takamatua Valley may be possible but there may be insufficient area for this and storage
- § More land appears suitable for irrigation in Robinsons Bay - spray and drip irrigation both possible
- § Plenty of land at Pompeys Pillar, but 10 km away and high pressure (stainless steel) pipe would be required to pipe over the hill

Capital Cost Estimates

Option	Cost \$ million (Trees)	Cost \$ million (Pasture)
Harbour Outfall	6.7	N/A
Takamatua Valley irrigation	5.9	9.4
Robinsons Bay irrigation	5.7	7.3
Pompeys Pillar irrigation	11.2	14.9
Wainui irrigation	16.4	20.3

Next steps

- § Public consultation mid-December to mid-February on options:
 - Takamatua Valley – drip irrigation to trees
 - Robinsons Bay – irrigation to trees or pasture
 - Pompeys Pillar – irrigation to trees or pasture
 - Harbour outfall
- § Staff recommend an option to relevant Council committee
- § Councillors make a decision on which option to proceed with
- § Consenting
 - New resource consents if irrigation
 - Environment Court appeal if harbour outfall