Appendix C

MWH Proposed CBD Reservoir, Options Assessment - 2011

MWH

BUILDING A BETTER WORLD

[REF 5]

REPORT

Wellington City Council
Proposed CBD Reservoir Options Assessment

Prepared for Capacity Infrastructure Services Ltd

24 MARCH 2011

QUALITY STATEMENT

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Executive Summary

This report has considered potential sites for the construction of a 35ML reservoir to supply Wellington CBD and provide emergency storage for the Wellington Regional Hospital. The new reservoir is required to have a top water level of 92 metres above sea level. This altitude constraint means that the available sites are all located in or around the Town Belt. All of the sites would require some temporary realignment of walking tracks and temporary construction works, and access to all the sites would require significant construction traffic movement through residential areas.

A long list of 10 sites that had been identified and investigated in previous studies was inspected and a short list of four sites is considered in further detail in this report. These sites are:

- Site A – Prince of Wales. This site is located on a ridge coming down from Dorking Road towards the Upper Prince of Wales playing field located at the end of Rolleston Street.
- Site B – Torquay. This site is located in the Macalister Park area on the east side of a ridge between Finnimore Terrace and Torquay Terrace, to the north-east of the existing Macalister Park reservoir.
- Site C – Carmichael. This site is located on the ridge running south from the existing Carmichael reservoir, between Crawford Road and Owen Street.
- Site D – Government House. This site is located to the east of a saddle between Wellington College and Ewart Hospital in Newtown, on the east side of the Government House boundary.

A preliminary assessment has been made of planning and engineering issues related to construction and siting of a reservoir at the four short listed sites. Excavation volumes have been calculated and preliminary site plans have been prepared. Planning, environmental and cultural issues have also been considered. Capacity has prepared concept plans and cost estimates for inlet and outlet pipework and provisions for secure emergency supply to the hospital and back-up connection to the Karori bulk main. The capacity or condition of scour / overflow pipes has not been investigated at this stage. Further studies would be required on all these issues and in particular detailed landscaping requirements, which have not been defined at this stage other than a requirement that the reservoir be fully buried.

A multi-criteria assessment has been undertaken by MWH to rank the respective site options. The preferred site was the Prince of Wales Park site, the second favourable site was Torquay, the third Government House and the fourth Carmichael.

The preferred Prince of Wales site is located off Rolleston Street. The site has reasonable construction access, working area and is not immediately adjacent to residential properties. It is located centrally with regard to the CBD and hospital, is close to the bulk supply mains and is the preferred site from a network flexibility and hydraulic point of view. The construction area would be clearly visible from the CBD however the finished reservoir would be buried, with only access hatches and vent covers visible. The location is zoned Open Space C and no significant planning, environmental or cultural issues have been identified at this stage. There is opportunity at this site to reduce spoil disposal volumes by raising the playing fields. This site has the lowest excavation volume requirements of 50,000 m^3. The construction cost estimate for the reservoir is $13.4M and pipe work costs to enable connection of the reservoir to the CBD network and a secure supply to the hospital are $4.8M giving a total capital cost of $18.2M.

The second ranked site, Torquay, is located in the Macalister Park area of the town belt, in line with Torquay Terrace. Access could be from Adelaide Road or alternatively either Finnimore Terrace or from Hanson Street / Stoke Street. An area of regenerating vegetation would need to be cleared for the reservoir. The site is more difficult to work on than the Prince of Wales site. The location is Open Space C and no significant planning, environmental or cultural issues have been identified at this stage. The calculated excavation volume of 60,000m^3 is about 20% higher than the Prince of Wales site but more backfill could be used to even the contours of the land and again there may be opportunity to reduce spoil disposal volumes by raising the playing fields. This site is very close to the existing Macalister Park reservoir, so would only require short connections to the inlet and outlet pipe work from that reservoir butIt would require a longer upgrade to reticulation on Tasman Street to function effectively. The cost estimate

for this site is marginally higher than the Prince of Wales site, with a reservoir cost of $14.3M and associated pipe work costs of $4.0M giving a total capital cost of $18.3M.

The third ranked site, Government House, is located on the ridge west of Alexandra Park. Access would be via a track from Mein Street by the hospital or alternatively from Coromandel Road. The site requires an excavation of about 84,000m^3 to cut a suitable platform into the ridgeline which increases the capital cost substantially. The site is also located further from existing bulk mains so has much more expensive pipe work requirements to integrate effectively with the reticulation. The location is Open Space B and is identified as a prominent ridgeline so would require special landscaping consideration. There are no significant environmental issues identified specific to this site however the site is in the Te Ranga a Hiwi Precinct so additional consultation would be required with iwi. This site is relatively expensive to develop, with a reservoir cost of $16.1M and associated pipe work costs of $11.8M giving a total capital cost of $27.9M.

The fourth ranked site is located south of the existing Carmichael reservoir. Access is from an existing winding track from the south end of Owen Street. The site is close to residential properties and requires a similar volume excavation to the Government House site, as the existing ground level is quite high relative to the required top water level. There is very limited construction working area at present. The location is Open Space C and is identified as a prominent ridgeline so would require special landscaping consideration and may require full burying rather than the 0.5m cover assumed in the preliminary engineering profile. No significant environmental or cultural issues have been identified at this stage. Although this site is very close to the existing Carmichael reservoir major new inlet and outlet pipelines would be required. It is the most expensive of the sites, with a reservoir cost of $16.4M and associated pipe work costs of $15.1M giving a total capital cost of $31.3M.

It is recommended that WCC adopt the Prince of Wales Park site as the preferred site for the proposed CBD reservoir. Planning approvals will need to be obtained, including approval by WCC Parks and Gardens for access requirements and any spoil disposal on site and separate approvals will be required from the Town Belt Trustees. Resource consents will need to be obtained. Further studies will be required for the Assessment of Effects on the Environment as part of the planning phase, particularly around traffic impact and landscaping. Geotechnical studies to confirm the foundation conditions will need to be undertaken prior to detailed design. Network pipeline connections, including inlet and outlet pipes and other network upgrades including provision of a secure connection to the hospital, will also need to be designed and constructed prior to reservoir commissioning.

Capacity Infrastructure Services Ltd

Wellington City Council
Proposed CBD Reservoir Options Assessment

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1 Introduction

MWH New Zealand Ltd (MWH) has been commissioned by Capacity Infrastructure Services Ltd (Capacity) to prepare an Options Assessment report for the proposed CBD reservoir for Wellington City Council (WCC).

This report has been prepared for the purpose of recommending a preferred site. Council approvals, preliminary design, consultation, resource consent and detailed design are to follow once the preferred site has been confirmed.

2 Background

2.1 Need for the Reservoir

The proposed reservoir is required for two reasons. Firstly, Wellington City Council has experienced significant growth and there is a need to provide for recent and future growth. The reservoir sizing is based around growth projections through to the 2060 planning horizon. Secondly, there is a need to provide 30 days emergency storage for the Wellington Regional Hospital site. The need for 30 days emergency storage was identified in 2002 following detailed consideration of the seismic resilience of the Wellington regional bulk water supply. Restoration of the Te Marua to Karori bulk main following a major seismic event along the Wellington Fault is expected to take between 40 and 55 days and would only provide a partial supply. Restoration of the Petone to Thorndon main may take significantly longer, depending on the earthquake characteristics.

2.2 Reservoir Concept Design

The size of the proposed reservoir has been advised by Capacity as 35ML (mega-litres, equivalent to 35,000 m^3). No consideration of alternative sizes or schemes has been made in this report. Capacity has noted that any future storage would be better constructed elsewhere, for geographic distribution of stored water for emergency use. Constructing a larger reservoir would provide some economy of scale however a second future reservoir would allow for spreading of capital expenditure.

Capacity has advised that the top water level (TWL) of the proposed new reservoir is to be 92 metres above sea level. This elevation would enable the proposed new reservoir to balance with the existing reservoirs in the low level zone.

A 35ML reservoir would generally be constructed as a single structure. A 67 metre diameter post tensioned reinforced concrete structure has been assumed, with side wall depth of 11 metres (allowing for 10 metre storage and 1 metre of freeboard). These preliminary dimensions are expected to be varied during detailed design to allow optimisation of earthworks with structural considerations.

Given the altitude constraint all the sites are located in or around the Town Belt, so will be subject to the Town Belt planning approval process. It has been assumed that the reservoir would be covered with a nominal 0.5 metre of fill, and that the top of the reservoir would be flat. Again, this is expected to be varied during detailed design as landscaping would be a significant consideration for this project.

The reservoir would require air vents, access points, valve chambers and inlet and outlet pipe work. An access tunnel may be required to the valve chamber. An overflow and scour pipe for emptying of the reservoir during maintenance work would also need to be provided. No investigations have yet been made into the capacity or condition of existing stormwater or scour lines for this purpose.

2.3 Integration of Reservoir to Existing Network

The existing bulk water network has two main supply routes into Wellington.

The first is the bulk main from Waterloo and Wainuiomata, that comes from Petone to Thorndon, and then through Wellington City to Macalister Park reservoir. A branch from this main would be the primary inlet to the proposed new reservoir.

The second feed is the Te Marua to Karori main. This line runs from Kaitoke through Upper Hutt, crossing the Hutt River at Silverstream and over State Highway 58 and through to Karori. This is a newer pipeline and because of its construction material and location is expected to be the first supply to be restored following a major earthquake. There is a branch from this main from Karori to Bell Road reservoir that is planned to be connected as an alternative emergency supply to the proposed new CBD reservoir.

The outlet from the new reservoir would need to integrate with the existing reticulation. A location closer to the CBD would be preferred to provide for higher pressures in the CBD as there would be lower head losses.

Close proximity of the new reservoir to the existing reticulation would obviously minimise the cost of new pipe work. Concepts for the connection of existing mains to each new site have been prepared by Capacity[1] and the plans for this new pipework are attached in Appendix A.

2.4 Previous Reports

Previous relevant reports that have been reviewed as part of this Options Assessment are summarised below.

2.4.1 WRC / WCC / Brickell Moss 1974-1988

Investigations for a new CBD reservoir extend back to 1974. These were documented in a report on Low Level Zone Water Storage for Wellington City dated 23 October 1987. That report identified six sites, of which three were considered unsuitable. The recommended approach was to provide 30ML water storage by either one 20ML or two 10ML reservoirs for the central low zone and a separate 7ML Miramar Peninsula reservoir and a separate 3.5ML reservoir in southern Island Bay.

A more detailed investigation of 10 sites was undertaken by Brickell Moss in 1988 in a comprehensive scheme option assessment report[2] of 21 combinations to provide one or more reservoirs of 20ML capacity.

Further to these investigations WCC constructed a 20ML reservoir at Macalister Park in 1992. Since that time 6.5ML and 3.5ML reservoirs have been constructed, at Aramoana and at Mt Albert, respectively.

2.4.2 WCC 2002-2003

The previous investigations remain relevant as a combination of issues required consideration of additional reservoir storage by 2002. These issues included population increases, and identification of the need for emergency storage for the Wellington Regional Hospital in Newtown and Greater Wellington Regional Council (GWRC) bulk water supply operational requirement for additional buffer storage. GWRC have since confirmed that they no longer require additional storage for operational reasons.

[1] Capacity memo 16 March 2011, "Supporting Information for MWH report"

[2] Brickell Moss Ltd, August 1988, Wellington Regional Council, "Scheme Option Assessment for Water Storage Reservoirs in the Wellington City Low-Level Zone

Technical investigations in 2002 were initially focused on three sites in the Mt Victoria Town Belt including Government House, Fever Hospital and Alexandra Park, with the Bell Road reservoir site later included. A WCC report[3] concluded that the Bell Road reservoir site would be preferable from an operational point of view.

2.4.3 SKM 2004

A technical investigation in 2004 by consultants Sinclair Knight Merz Ltd (SKM) on the Bell Road site[4] also considered an alternative location on the Prince of Wales Park, adjacent to the initial site option. This alternative location, which had also been considered as one of the ten sites in the Brickell-Moss 1988 investigation, had several advantages including lower capital cost due to lower excavation volumes and the avoidance of major underground electricity cables. The SKM report recommended the Prince of Wales site as the preferred location. One additional technical study has subsequently been undertaken on the use of Prince of Wales sports field for spoil disposal and preliminary discussions have been held with WCC Parks and Gardens on this and related issues.

[3] WCC file ref D3452/RJ 3 February 2003, "Emergency Potable Water Supply Storage for Wellington Hospital: Reservoir Location Assessment"
[4] SKM, June 2004, Greater Wellington Water and Wellington City Council, "Proposed Central Business District Reservoir"

3 Long- List Sites

A "long list" of potential sites was identified from the eleven sites considered in the previous reports noted in Section 2. Macalister Park was not included as a 20ML reservoir was constructed at that site in 1992. Other potential sites at a suitable elevation in Aro Valley have been reviewed however these are not considered to offer any benefits over sites previously investigated due to the steep terrain, distance from the hospital and distance from existing mains. The long list sites are shown in Figure 3-1 below and have been summarised in Table 3-1 overleaf. Four of the sites were selected for more detailed evaluation as a "short list".

Figure 3-1: Site Locations

Table 3-1: Long List of potential CBD reservoir sites

Site Name	Location	Advantages	Disadvantages	Short-Listed?
1. Alexandra Park	Wellington College upper playing field	Relatively concealed site Close proximity to hospital and CBD	Land gazetted for education purposes Large excavation volumes required	No
2. Fever Hospital	Former Chest Hospital on Alexandra Road	Close proximity to hospital and CBD	Planning restrictions for heritage site preclude this site	No
3. Government House	Mt Victoria town belt land adjacent to Government House	Close proximity to hospital and CBD	Poor construction access High visibility site Large excavation required	Yes
4. Carmichael reservoir	Immediately south of existing reservoir	Close proximity to hospital Close proximity to bulk main	Large excavation volumes required Limited construction area Long distance to CBD	Yes
5. Charles Plimmer Park	Mt Victoria town belt land above Oriental Bay	Close proximity to CBD	High value recreation area Very long distance to hospital	No
6. Torquay Terrace	150m north-east of Macalister reservoir	Close proximity to bulk main Close proximity to hospital	Limited construction area Removal of regenerating vegetation required	Yes
7. Scottish Harriers	South end of Prince of Wales Park)	Close proximity to hospital and CBD	Limited construction room Close to a cultural heritage site	No
8. Prince of Wales Park	Ridge south of Upper Playing Field	Close proximity to Karori bulk main Relatively good construction work area and access	Moderate distance to hospital High visibility site	Yes
9. Bell Road	North of existing reservoir	Close proximity to Karori bulk main	Major underground electrical services present Large excavation volumes required	No
10. Salamanca Road	Botanical Gardens land north of the MetService building	Close proximity to CBD	High value recreation area Very long distance to hospital	No

4 Resource Consent / Planning Issues

This section describes the statutory context, the consents needed, and the main objectives and policies of the relevant statutory documents.

4.1 Resource Management Act

The Resource Management Act sets out the circumstances in which resource consent for activities are required. The following section is important for the applications.

Section 9 sets out restrictions on the use of land as follows:

(2) No person may use land in a manner that contravenes a regional rule unless the use—
(a) is expressly allowed by a resource consent; or
(b) is an activity allowed by section 20A.

(3) No person may use land in a manner that contravenes a district rule unless the use—
(a) is expressly allowed by a resource consent; or
(b) is allowed by section 10; or
(c) is an activity allowed by section 10A.

Therefore, land use consent would be needed for the development as it does not meet the permitted activity standards of the District Plan and Regional Plans.

4.2 Wellington City District Plan

The proposed activity must be assessed in accordance with the Wellington City Council District Plan. The relevant rules relating to the proposed activity are set out in the following assessment and the activity status determined.

4.2.1 Zoning

All four of the short list sites are located within the Wellington Town Belt which is zoned Open Space on Map 6 of the Wellington City Council District Plan maps. The specific zoning and any particular features or overlays associated with each of the four short list sites are outlined below:

Site A: Prince of Wales
- Open Space C Zone (Inner Town Belt)
- No notable features or overlays

Site B: Torquay
- Open Space C Zone
- No notable features or overlays

Site C: Carmichael
- Open Space C Zone
- Within the Ridgeline and Hilltops Overlay

Site D: Government House
- Open Space B Zone (Natural Environment)
- Within the Ridgeline and Hilltops Overlay
- Within the Te Ranga a Hiwi Precinct

4.2.2 Objectives and Policies

The following objectives and policies are of particular relevance to the proposed activity:

Open Space

Objective 16.5.1	*To maintain, protect and enhance the open spaces of Wellington City.*
Policy 16.5.1.3	*Manage the impacts of activities in the Inner Town Belt in order to protect and preserve its special qualities for the benefit of future generations.*
Objective 16.5.2	*To maintain and enhance natural features (including landscapes and ecosystems) that contribute to Wellingtons natural environment.*
Policy 16.5.2.2	*Restrict the construction of buildings, structures and earthworks on identified ridgelines and hilltops.*
Policy 16.5.2.3	*Encourage retention of existing native vegetation and where appropriate re-introduce native cover.*

Heritage

Objective 20.2.2	*To facilitate and enable the exercise of tino rangatiratanga and kaitiakitanga by Wellington's tangata whenua and other Maori.*
Policy 20.2.2.1	*Identify, define and protect sites and precincts of significance to tangata whenua and other Maori using methods acceptable to tangata whenua and other Maori.*
Policy 20.2.2.2	*Require that the tangata whenua be consulted where a resource consent is required for an activity within a Maori precinct.*

Activity Status

Chapter 17 (Open Space) states that Chapter 23 should be referred to for utility activities in the Open Space Zones. The Prince of Wales, Torquay and Carmichael sites are all within the Open Space C Zone and are all assessed under the same rule below. A separate assessment of the Government House site which is located within the Open Space B Zone is provided.

Sites A, B and C – Prince of Wales, Torquay and Carmichael
Rule 23.4.1

Antennas, masts (with or without associated antennas, aerials and utility network apparatus) and utility structures including water reservoirs, not specifically provided for as Permitted, Controlled or Discretionary Activities(Restricted) or that do not meet the conditions or standards and terms for Permitted, Controlled or Discretionary Activities (Restricted) are ***Discretionary Activities*** *(Unrestricted) in all areas.*

Site D – Government House
Rule 23.2.2

The construction, alteration of and addition to water reservoirs is a ***Controlled Activity*** *in the Central Area, Suburban Centres, Institutional Precincts, Residential, Open Space A and B, and Rural Areas in respect of:*

- *siting and screening.*

Standards and Terms

- *Under this rule water reservoirs must not exceed 100m^2 in plan area or 8m in height.*

As the proposed reservoir would be greater than 100m^2 and 8m in height it fails to comply with rule 23.2.2. As such, the reservoir at Site D would also be considered a **Discretionary Activity** under Rule 23.4.1 above.

Assessment Criteria

In determining whether to grant consent and what conditions, if any, to impose, Council would have regard to the following criteria:

23.4.1.1 *Whether the size and scale of the proposal is generally compatible with other development in the area. More substantial structures may be acceptable in circumstances where:*
• the size or location of sites permits a greater separation from existing development
• the local topography, existing vegetation or surrounding building forms and development would diminish the impact of the new structure
• development on adjacent sites is similar in size and scale.
Council seeks to ensure that structures located in or visible from Residential Areas are not obtrusively visible.

23.4.1.2 *The degree to which the utility structure, mast or antenna is appropriately located. Wellington's hilly terrain imposes constraints on the siting of some utilities but structures are generally discouraged on prominent ridgelines and hilltops. Where [located on identified ridgelines or hilltops,]* [PC33]*, Council encourages [the avoidance, remediation or mitigation of visual effects by:*
• the co-siting of utilities to avoid, remedy or mitigate their visual impact
• the siting of utilities away from Residential or Open Space Areas would also be generally supported to protect the amenities of these areas.
• minimising the visibility of the site and/or structures in relation to district wide, local and neighbouring views
• ensuring visual continuity of relatively undeveloped land is maintained on the upper slopes and summit of the ridgeline or hilltop
• ensuring the antenna, mast or utility structure is seen against a landform backdrop and not the sky
• mitigating against potential adverse visual effects of development by sensitive siting and design and appropriate planting and/or screening
• the use of external colour and materials to minimise the visual contrast with the surrounding environment] [PC33]

23.4.1.3 *With regard to water reservoirs, the extent to which they can be sited to harmonise with the natural or built features of the area in which they are situated, by one or more of the following means:*
• burying the reservoir
• partial or complete backfilling of reservoir walls
• screening using mounding
• locating the reservoir so that it is not visible from a Residential Area.

23.4.1.4 *Where the above treatments are not possible for hydraulic, topographical or other reasons, the extent to which impacts would be avoided, remedied or mitigated through:*
• appropriate screening and/or planting
• colour treatment to reduce visual dominance; and/or design modifications such as domed roofs where reservoirs are situated on hills.

23.4.1.5 *The extent to which the utility can be designed to reflect the form of development in the immediate locality. Where practicable, Council expects the design of structures to reflect elements such as roof pitch and materials of buildings in the vicinity. Special consideration should be given to design near heritage sites or character areas. Where structures are proposed to be sited on the top of a building, they should be designed or screened so that they form an integral part of the total building design.*

23.4.1.6 *The extent to which any utility would be hazardous or otherwise affect people's health or safety. Appropriate separation distances would be considered for the siting of such*

utilities. Where relevant, Council seeks compliance with Codes of Practice or New Zealand Standards.

23.4.1.7 *In respect of noise, dust, lighting and electromagnetic radiation, the extent to which noise emissions, dust nuisance, lighting glare and electromagnetic effects would be intrusive. Council would seek to ensure the best practicable option is used to mitigate such effects and that any adverse effects are minor.*

23.4.1.8 *Where a utility structure is located within a Hazard Area the extent that measures are taken to mitigate the effects of any hazard event.*

23.4.1.9 *In respect of heritage items whether the heritage significance of the area or site is affected by the construction or placement of the utility structure, mast or antennas.*

23.4.1.10 *The extent to which any of the above criteria are constrained by operational or technical issues.*

Summary
Resource Consent would be required for the proposed activity as a **Discretionary Activity** irrespective of which site is chosen pursuant to Rule 23.4.1 of the Wellington City District Plan. It is noted that some of the sites would have an increased planning risk because of their location within the ridgeline and hilltops overlay and the Te Tanga a Hiwi Precinct.

4.3 Town Belt Management Plan

The Town Belt Management Plan is a working document which sets out the objectives and policies of management and how these should be achieved. The plan provides the framework within which all future management of the property would be carried out. The aims of the plan are:

1. *A town belt which is managed in accordance with the principal intention of the original Deed of 1873, which is to keep the Town Belt land forever "as a public recreation ground for the inhabitants of the City of Wellington."*
2. *A sustainably managed Town Belt in which the natural, landscape, cultural and historic values are protected and enhanced.*

The management plan document outlines the relationship between the management plan and the District Plan. The Town Belt is identified as open space are in the District Plan and the District Plan's policies, objectives and rules relate to the Management Plan. Any proposal to locate a new activity on the Town Belt would be assessed against the provisions of both the Town Belt Management Plan and the District Plan. It would only be permitted if it complies with the provisions of both plans. The objectives and policies outlined in the management plan which are applicable to this project are outlined below.

Objective 6 - Conservation and Land Management

- *To only permit such development on the Town Belt as is required to achieve the objectives above or the purposes of public utility and to specify the conditions under which this might take place.*

Utilities Policies

- *1. Easements or leases over Town Belt land may be granted for the purpose of allowing public and private utilities, provided that the utility is an essential service to the public, that it cannot reasonably be located elsewhere and provided that the impact on the recreational nature of the Town Belt is minimised by compliance with conditions 6 (i) -(v) below.*
- *3. Leases shall be granted for utilities that are located on or above the ground and shall be for less than 20 years. This period shall include both the term of the current lease and the term of any right of renewal.*
- *5. Market rentals shall be charged for utility leases and easements in conformity with the intentions of the original Deed which were to achieve the "best or most improved*

rent" and shall be reviewed every 5 years.

- *6. All new utilities and replacement or upgrading of existing utilities shall comply with the following conditions to the reasonable satisfaction of the Council.*
  (i)The impact of all utilities on Town Belt land shall be minimised.
  (ii)All utility services shall be placed underground, except where it is not practicable to do so.
  (iii)Where practicable, underground services shall be sited to minimise interference with existing features, facilities and plants.
  (iv)Utility services shall be located so as not to restrict areas useable for outdoor activities or required for future facilities or tree planting.
  (v)Any disturbance of the existing site during installation of a utility shall be made good immediately after completion.
- *7. All costs arising from the application for a new utility or upgrading or replacement of an existing one shall be met by the applicant.*
- *8. All public and private utilities crossing the Town Belt (above and below ground) shall be accurately mapped and documented with plans to be lodged with Council.*
- *9. Where the Council has the legal prerogative to do so upon cessation of a utility to function, related services and structures shall be removed where it would improve the recreational value of the land and the site made good at the utility operator's expense. Where there is legislation which over-rides Council control of this (eg the Electricity Act 1992) Council shall apply to the appropriate authority for the related services and structures to be removed.*
- *10. The Chief Executive, Wellington City Council, or delegated authority may grant written permission to adjoining property owners to lay private discharge utilities (such as stormwater and sewer pipes) through the Town Belt to connect into existing main piping networks subject to the following conditions:*
  (i)no practicable alternative route is available;
  (ii)a fee for use of the route and a refundable site restoration bond, as determined by Council, shall be paid;
  (iii)the adjoining property owner shall be responsible for the accurate mapping of the connection(s) and shall provide documentation of this to Council;
  (iv)the property owner shall be responsible for any future maintenance and repairs of the private connection and shall be required to make good any site disturbance on the Town Belt to the Council's satisfaction. This includes any emergency works being undertaken without prior consent.

Relationship to the District Plan

- *All decisions relating to the negotiation of fresh, renewed and new leases, licences, easements and long term concessions, which grant special rights over the use of Town Belt land, shall be publicly notified. Written submissions shall be invited but provision for public hearings shall be at the discretion of the Chief Executive, Wellington City Council, or delegated authority. Each case shall be decided on its merits according to the objectives and policies of the management plan, and taking account of the public submissions.*
- *Applications for activities on the Town Belt which require resource consents shall be publicly notified where required by the Resource Management Act.*
- *All matters to do with changes on the Town Belt requiring public notification (as above) shall be dealt with according to the provisions of Sections 119 and 120 of the Reserves Act, 1977 except that the notifications shall be published twice (instead of once) with a two week interval between. Council shall also consult with interested parties on matters which relate to the Town Belt.*
- *A Town Belt Management Report shall be published annually to facilitate public accountability in decision making and implementation of the management plan.*
- *Council shall assist with the establishment of a 'Friends of the Town Belt',*
- *The active participation by the community and the Friends of the Town Belt, in the ongoing management, maintenance, development and monitoring of the Town Belt shall be encouraged.*

4.4 Greater Wellington Regional Council Requirements

The proposal must be assessed against the Regional Soil Plan for the Greater Wellington Region with regard to soil excavation and vegetation clearance.

4.4.1 Regional Soil Plan Objectives and Policies

Vegetation Cover

Objective 4.1.9 — *On erosion prone areas vegetative cover is maintained (including maintained through revegetation), enhanced or established; or where the retention of vegetation is not practical, other methods are used so that the adverse effects of erosion are avoided, remedied or mitigated.*

Policy 4.2.14 — *To avoid, remedy or mitigate the adverse effects of vegetation disturbance by promoting:*
- *the maintenance and enhancement of vegetation in erosion prone areas;*
- *the conversion of erosion prone areas to forestry or soil conservation woodlots, or regeneration or active restoration to native bush;*
- *riparian management, including where this would help safeguard the life supporting capacity of aquatic ecosystems;*
- *compliance with industry recognised standards and procedures such as the Logging Industry Research Organisation's (LIRO) "Forestry Code of Practice" (Second Edition, 1993); and/or*
- *the maintenance and retention of erosion control plantings.*

Soil Erosion

Objective 4.1.11 — *Land management practices are adopted for the effective control of sediment runoff to water bodies.*

Policy 4.2.15 — *To regulate soil disturbance activities to ensure that they are unlikely to have significant adverse effects on:*
- *erosion rates;*
- *soil fertility;*
- *soil structure;*
- *flood mitigation structures and works;*
- *water quality;*
- *downstream locations;*
- *bridges, culverts and other water crossing structures;*
- *aquatic ecosystems; and*
- *historic sites with tangata whenua values.*

Policy 4.2.16 — *To ensure that recognised erosion control and land rehabilitation techniques are adopted to avoid, remedy or mitigate any adverse effects resulting from soil disturbance activities.*

4.4.2 Regional Soil Plan Rules

The Regional Soil Plan splits the Wellington region into two areas; Area 1 and Area 2. All of the 4 short list sites are located within Area 2 being *'that area of land within the Wellington Regional Council's jurisdiction where the eastern boundary is the Ruamahanga River; and the western boundary is the west coast south of Pukerua Bay and State Highway 1, north of Pukerua Bay'.*

The definition of erosion prone land depend on the area which the site is located within. Erosion prone land in Area 2 is defined as:

'Any land within Area 2 (see definition) with a slope greater than 28 degrees.'

(Slope is the angle from horizontal and is measured in degrees to an accuracy no less than that achieved by a hand-held inclinometer or abney level.)

Soil Disturbance

Rule 2 Soil disturbance on erosion prone land

Any soil disturbance on erosion prone land that:
(1) involves the disturbance of greater than or equal to 1,000 m^3 of soil, within any 10,000 m^2 area (calculated using a minimum width of 10 m) and within any continuous 12 month period; or
(2) involves root raking over an area greater than 10,000 m^2 in any continuous 12 month period;
excluding any soil disturbance;
(a) associated with roading and tracking activities, or
(b) undertaken in accordance with conditions on a subdivision consent;
*is a **Restricted Discretionary Activity.***

The matters over which the Wellington Regional Council has restricted the exercise of discretion are:
(1) the duration of the consent;
(2) the carrying out of measurements, samples, analyses, surveys, investigations, or inspection;
(3) the provision of information to the consent authority at specified times;
(4) compliance with monitoring, sampling and analysis conditions at the consent holder's expense;
(5) the payment of administration charges;
(6) the methods of sediment retention and sediment runoff control to be adopted;
(7) any measures necessary to rehabilitate the land following the completion of the activity;
(8) the effects of the activity on soil conservation and water quality, including any measures necessary to avoid, remedy or mitigate those adverse effects;
(9) any steps to be taken to ensure the minimisation of vegetation, soil, slash or any other debris entering any water body;
(10) any steps to be taken to avoid, remedy or mitigate the effects of the activity on slope stability; and
(11) the effects of the activity on tangata whenua values.

Vegetation Removal

Rule 3 Vegetation disturbance on erosion prone land

*Vegetation disturbance, excluding vegetation disturbance undertaken in accordance with conditions on a subdivision consent, of a continuous area of more than one hectare on erosion prone land is a **Permitted Activity** provided the following conditions are met:*
Conditions
(1) The Wellington Regional Council's Regional Soil Conservator is notified in writing at least 21 days prior to the vegetation disturbance being undertaken. Notification is to include details of the site location and timing of the vegetation disturbance operation.
(2) The area of vegetation disturbance would be re-established in woody vegetation within 18 months from the start of the vegetation disturbance operation.
(3) Where ground-based methods are used, best management practices as described in the New Zealand Forest Code of Practice (LIRO 1990, revised 1993) are adopted.
(4) No vegetation or slash with a diameter of greater than 100 mm shall be allowed to remain in any watercourse and when removed, shall be placed in a position where that material cannot enter any watercourse.

Given that the entire area subject vegetation disturbance would not be re-established within 18 months (i.e. most of that area would become the reservoir), if the site is greater than 28 degrees (i.e. erosion prone), vegetation removal of more than one hectare on any of the four sites is unlikely to be a permitted activity. As such, Rule 4 below would apply and resource consent would be required.

Rule 4 Vegetation disturbance on erosion prone land

Any vegetation disturbance activity which is provided for by Rule 3 but does not comply with any of the conditions in Rule 3 is a ***Restricted Discretionary Activity****.*

The matters over which the Wellington Regional Council has restricted the exercise of its discretion are:
(1) the duration of the consent;
(2) the carrying out of measurements, samples, analyses, surveys, investigations, or inspection;
(3) the provision of information to the consent authority at specified times;
(4) compliance with monitoring, sampling and analysis conditions at the consent holder's expense;
(5) the payment of administration charges;
(6) the methods of sediment retention and sediment run-off control to be adopted;
(7) any measures necessary to rehabilitate the land following the completion of the activity;
(8) the effects of the activity on soil conservation and water quality including any measures necessary to avoid, remedy or mitigate those adverse effects;
(9) any steps to be taken to ensure the minimisation of vegetation, soil, slash or any other debris entering any water body;
(10) the deposition of soil on, or immediately adjacent to, the area of land being disturbed;
(11) any steps to be taken to avoid, remedy or mitigate the effects of the activity on slope stability; and
(12) the effects of the activity on tangata whenua values.

4.4.3 Regional Council consents required

As the slope of the short list sites is unknown at this stage, it cannot be determined whether resource consent would be required under the Regional Soil Plan. If any of the sites are determined to be on erosion prone land, i.e. if the slope of the land is greater than 28 degrees, resource consent would be required for soil disturbance under Rule 2 and for vegetation removal under Rule 4 of the Regional Soil Plan. If required, both activities, soil disturbance and vegetation removal, can be applied for under one consent application to the Greater Wellington Regional Council.

5 Description of Short-List Sites

5.1 Site A: Prince of Wales

5.1.1 Location

5.1.1.1 Description

This site is immediately south of the upper field of Prince of Wales Park at the end of Rolleston Street. The construction platform is on a ridge that climbs south from the upper field towards Dorking Road. The ridge slopes down to a gully on the western side and to the lower field on the eastern side. The City to Sea track runs through the site. The site is approximately 1,000m from the hospital.

Figure 5-1: View of Prince of Wales site from the east

5.1.1.2 Excavation, Fill, Stockpile and Disposal

Approximately 50,000m^3 (solid measure) of material would be excavated for the construction platform. Volumes are detailed on the layout plans attached in Appendix B and are summarised in section 5.5 as both solid measures and bulked measures.

Approximately 13,000m^3 of material would be required to back-fill following construction (allowing a bulking factor of 1.1). This would be stockpiled from the excavated material. Either the upper playing field and/or the lower playing fields could be used for this purpose, but this is subject to approval from WCC Parks and Gardens.

About 50,000m^3 of material would need to be disposed (allowing a bulking factor of 1.3). This location is 8km from the Southern landfill via Brooklyn. The possibility of using about one third of the excavated material to increase the level of the playing fields to improve their drainage and reduce disposal volumes

has been investigated[5]. This would significantly reduce truck movements. However, any raising of the parks will be subject to further detailed feasibility studies and economic considerations at design phase as well as agreement with WCC Parks and Gardens.

5.1.1.3 Construction Working Area

Part of the upper playing field could potentially be used for a temporary construction yard, subject to approval from WCC Parks and Gardens. The playing field is about 10 metres below the reservoir site but would be suitable for construction accommodation and plant.

A temporary access road about 100m long would need to be constructed from the end of Rolleston Street to the site. The last part of the track would be steep (4:1 existing), but this could be reduced to 5:1. Bulk concrete and precast panels should be able to be delivered directly to site provided some temporary traffic management measures are made on Rolleston Street.

5.1.1.4 Geotechnical

A previous preliminary geological investigation (WRC, 1988), found the site comprised undifferentiated insitu rock overlain by Makara and Korokoro Hill soils.

The cut slope that forms the boundary of the upper playing field was inspected (SKM, 2004) and found to comprise mainly of highly weathered greywacke sandstone and argillite. The inactive Lambton Fault may cross the site. The site is expected to have a sound foundation and the excavation is expected to consist of mostly rippable rock.

Existing cut batters in close proximity have slopes of about 2V:1H and appear stable. There is a gully to the southeast and running parallel with the site to the west which may contain unsuitable material. The proposed site should generally avoid these areas.

5.1.2 Economic

5.1.2.1 Inlet / Outlet Pipes

Capacity has undertaken a preliminary investigation of the pipe work requirements for this site and the layout plan is attached in Appendix A. A 340m long 800mm diameter pipeline would be required to connect to the 800mm diameter bulk main. A secondary connection to the Bell Road reservoir inlet could also readily be constructed which would provide additional security of supply for the CBD low level zone.

The 900mm diameter outlet pipe would be 500m long connecting to an upgraded main in Tasman Street.

A total length 450m of new dedicated pipe work could be laid from the bulk supply main to provide a secure connection.

5.1.2.2 Capital cost

A cost estimate was prepared by SKM in 2007 and updated by Capacity in late 2010. The reservoir construction cost estimate including a 30% contingency allowance is $13.4 million. Capacity has estimated that pipe work connection works would cost $4.8 million. The operational cost saving has been excluded for this capital cost comparison.

5.1.2.3 Network / operational flexibility

Capacity has noted that the main advantage of this option is the spare capacity provided from the reticulation upgrades. This spare capacity provides operational flexibility both presently and in the future for both Wellington City and Greater Wellington by reducing the reliance on the Thorndon PRV.

This site would also provide some associated operational savings due to lower pumping energy requirements from the bulk supply as there are lower head losses. Capacity has quantified this saving as about 27,000 kWhr/yr.

[5] Use of Prince of Wales Park sports fields for facilitation of construction of proposed central business district reservoir, September 2004, Recreational Services Ltd

This location would also reduce reliance on the Hall Street junction which is currently an operational risk to the low level zone (LLZ) by establishing a new, independent junction at the intersection of Tasman and Howard Streets. The Hall Street junction is currently the main confluence for the 800 mm primary main, Macalister Park inlet and outlet mains, Carmichael inlet supply, and the Tasman St 450 mm. This pipeline junction is arguably the most critical within the Council's water supply network

5.1.3 Social

5.1.3.1 Proximity to residential areas

The closest neighbours are about 60m from the excavation and appropriate management of dust and noise would need to be considered.

5.1.3.2 Construction Traffic Movements

The main site access would be off Rolleston Street. Some temporary measures may need to be made to restrict parking on the corner midway up Rolleston Street and at the end of Rolleston Street to allow sufficient room for construction traffic.

With up to 52,000 m^3 of excavation material to be disposed (depending on whether some can be used to raise the playing fields) there could be around 5,200 return large truck movements through the residential area in addition to the baseline construction traffic. The construction traffic has not been considered in detail at this stage.

5.1.3.3 Visual Impact

The site would have a 17m cut batter during construction, and a permanent (i.e. height above the reservoir roof) 6m batter. This could be planted. The site is highly visible from the east.

Most of the site is on a grassed area, so there would not be a large loss of existing vegetation. Some pine trees and eucalypts would need to be removed, as well as some scrub and regenerating native vegetation.

5.1.3.4 Other Issues

The "City to Sea" walking track passes through the proposed site. This track would need to be diverted during construction.

A sewer pipe runs close to the west of the proposed reservoir and would need to be protected during construction.

5.1.4 Environmental

5.1.4.1 Changes to local environment

The site is currently covered with scrub and regenerating native vegetation, with some macarocarpa and eucalyptus trees. There is a regenerating bush gully to the west of the site. Appropriate landscaping is expected to result in a long term improvement to the site.

No detailed assessment of the site has been prepared to date however there are no obvious environmental issues with this site. A more detailed assessment should be undertaken prior to construction.

5.1.4.2 Consenting issues

The site is located in the town belt and Zoned Open Space C and it is likely a fully notified resource consent would be required from the Wellington City Council as a Discretionary Activity pursuant to Rule 23.4.1 of the Wellington City District Plan.

Resource consent is also likely to be required from the Greater Wellington Regional Council for earthworks and vegetation clearance as a Restricted Discretionary Activity pursuant to Rules 2 and 3 of the Regional Soil Plan. However, details of the slope of the site are needed to confirm this requirement.

5.1.5 Cultural

There are no known sites of special value to tangata whenua identified on the WCC Planning Maps in the vicinity of Site A. Detailed consideration of cultural issues should be undertaken as part of an Assessment of Effects on the Environment for consent purposes. This may require consultation with the Wellington Tenths Trust and/or local iwi.

The Omaroro cultivation area is located on the southern end of the Prince of Wales Park about 500m to the south. This area, identified as M74 on District Plan maps, is noted a site of potentially high significance requiring further investigation. The location of that site should be further investigated prior to construction.

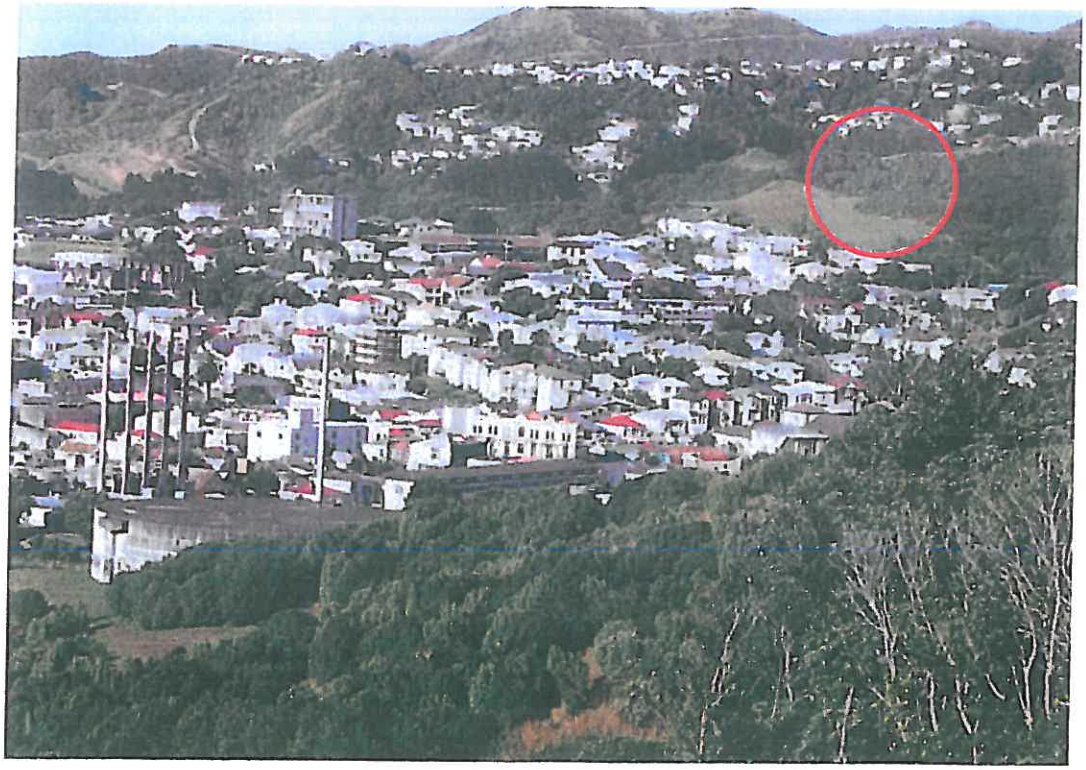
5.2 Site B: Torquay

5.2.1 Location

5.2.1.1 Description

This site lies between the northern end of Macalister Park and Torquay Terrace (off Adelaide Road). It lies on a ridge spur running up to the northwest. The water mains to and from the existing Macalister Park reservoir has been cut through this ridge to the east of the proposed site. The site is about 140m northeast of the existing Macalister Park reservoir and approximately 1,000m from the hospital.

Figure 5-2: View of Torquay site location from north-east



5.2.1.2 Excavation, Fill, Stockpile and Disposal

Approximately 60,000 m^3 of material (solid measure) would be excavated to create a platform for construction of the reservoir. Volumes are detailed on the layout plans attached in Appendix B and are summarised in section 5.5 as both solid measures and bulked measures.

The concept design calculated that approximately 15,000 m^3 of back-fill. This assumes the north-east batter would be filled at a 1:1 slope to minimise clearance of existing vegetation in a gully. The Macalister Park playing field could also potentially be used, although this is some distance away down a steep slope, and approval would need to be sought from WCC Parks and Gardens.

Up to 62,000 m^3 of material would need to be disposed. This site is 8.4km from the Southern landfill via Island Bay. Some material could potentially be used to raise the level of Macalister Park however this has not been investigated further at this stage.

5.2.1.3 Construction Working Area

There is limited flat area available for construction site establishment. A former building platform accessed from the end of Stoke Street / Hanson Street could possibly be used, subject to agreement with WCC Parks and Gardens. Alternatively, the Macalister Park reservoir is less than 150 metres from the site and provides a flat area that could be used subject to structural limitations.

There are several options for construction access. The most likely is to construct a temporary access from Adelaide Road across the south facing slope to the south of the site. Alternatively, the existing access track to Macalister Park reservoir from Finnimore Terrace could have an extension constructed. Alternatively, an access road from the end of Stoke Street goes up part way towards the site however this may need structural retaining improvements for heavy loads and is immediately adjacent to resident properties. A route of almost 4:1 should be possible from any of these options. Bulk concrete and precast panels should be able to be delivered directly to site.

5.2.1.4 Geotechnical

A previous preliminary geological investigation (Brickell Moss, 1988), found the site comprised undifferentiated greywacke overlain by Paremata silt loam and Korokoro Hill soils over the lower eastern side and Makara soils over the steeper western side.

There is a gully to the northeast and south of the site. These areas may contain unsuitable material that would require excavation and placement of compacted fill. The site should have a sound foundation as long as it is completely sited on insitu rock.

5.2.2 Economic

5.2.2.1 Inlet / Outlet Pipes

Capacity has undertaken a preliminary investigation of the pipe work requirements for this site and layout plans are attached in Appendix A. The principal main to the Macalister Park reservoir runs less than 50m to the east of proposed site. Therefore a short connection could be constructed to connect to this main. A 500m long 300mm diameter secondary connection could be made to connect the Te Marua supply bulk main to the existing 800mm diameter bulk main.

The 900mm diameter outlet pipe would also connect 50m to the existing Macalister Park reservoir outlet pipe work. 965m of the Tasman Street pipe work would require an upgrade.

A total length of 650m of new connection pipe work could be laid from the bulk supply main to provide a secure connection to the hospital.

5.2.2.2 Capital cost

The capital cost for this site has been estimated relative to the Capacity cost estimate for the Prince of Wales site. The additional excavation, fill and disposal volumes would increase the reservoir construction cost estimate by about $900,000 to $14.3 million. Capacity has estimated that pipe work connection works would cost $4.0 million.

5.2.2.3 Network / operational flexibility

Capacity has noted that the main advantage of this option is the short lengths of inlet and outlet pipe required. As the site is adjacent to the Macalister Park inlet and outlet mains, the reservoir can be

connected directly to these pipes minimising the overall pipe work required. This location would essentially result in a dual tank site.

5.2.3 Social

5.2.3.1 Proximity to residential areas

The closest neighbours are about 70m from the excavation and appropriate management of dust and noise would need to be considered.

5.2.3.2 Construction traffic movements

As noted above, construction access could be via several routes and would be subject to agreement with WCC Parks & Gardens. No discussions have been entered into at this stage.

With up to 47,000 m^3 of excavation material to be disposed (depending on whether some can be used to raise the playing fields) there could be around 4,700 return truck movements through the residential area in addition to the baseline construction traffic. The construction traffic has not been considered in detail at this stage.

5.2.3.3 Visual impact

The site would have a 24m cut batter during construction, and a permanent (i.e. height above the reservoir roof) 13m batter. This could be planted to minimize the impact. The site is highly visible from the south and east.

5.2.3.4 Other Issues

The "City to Sea" walking track passes through the proposed site. This track would need to be diverted during construction.

The water mains to the east of the site would need to be protected during construction.

5.2.4 Environmental

5.2.4.1 Changes to local environment

The site is currently covered by regenerating native vegetation accessed from a large grassed area between Hanson Street and Macalister Park. There is regenerating bush gully to the south of the site. Appropriate landscaping is expected to result in minimal long term impact to the site.

No detailed assessment of the site has been prepared to date however there are no obvious environmental issues with this site. A more detailed assessment should be undertaken prior to construction.

5.2.4.2 Consenting issues

The site is located in the town belt and Zoned Open Space C and it is likely a fully notified resource consent would be required from the Wellington City Council as a Discretionary Activity pursuant to Rule 23.4.1 of the Wellington City District Plan.

Resource consent is also likely to be required from the Greater Wellington Regional Council for earthworks and vegetation clearance as a Restricted Discretionary Activity pursuant to Rules 2 and 3 of the Regional Soil Plan. However, details of the slope of the site are needed to confirm this requirement.

5.2.5 Cultural

There are no known sites of special value to tangata whenua identified on the WCC Planning Maps in the immediate vicinity of the site. Detailed consideration of cultural issues should be undertaken as part of an Assessment of Effects on the Environment for consent purposes. This may require consultation with the Wellington Tenths Trust and/or local iwi.

The Omaroro cultivation area is located on the southern end of the Prince of Wales Park about 500m to the north. This area, identified as M74 on District Plan maps, is noted a site of potentially high significance requiring further investigation. The location of that site should be further investigated prior to construction.

5.3 Site C: Carmichael

5.3.1 Location

5.3.1.1 Description

The site is located south of Coromandel Street on a prominent ridge that climbs to the south. Local residents currently use the area beside the existing reservoir as a parking area. The site is immediately south of the existing Carmichael reservoir.

5.3.1.2 Excavation, Fill, Stockpile and Disposal

Approximately 84,000m^3 of material would be excavated (solid measure). Volumes are detailed on the layout plans attached in Appendix B and are summarised in section 5.5 as both solid measures and bulked measures.

Approximately 14,000m^3 of fill would be required. There is no space to stockpile excavated material close to the site. About 94,000m^3 of material would need to be disposed. This location is 9.7km from the Southern landfill.

5.3.1.3 Construction Working Area

There is very limited space in the immediate area for construction site area. Some working area would need to be excavated to the north of the proposed site, possibly on the paper road however this has not been considered in detail at this stage.

The main site access would be from the existing unsealed access track that comes off Owen Street by the Wellington Working Men's bowling club. This track may need some strengthening and one corner may require widening to get long pre-cast concrete to site. The reservoir construction would intrude on part of this track and a new track would need to be cut on the hill side and up the ridge. Bulk concrete and precast panels should be able to be delivered directly to site.

5.3.1.4 Geotechnical

A previous preliminary geological investigation (Brickell Moss, 1988), found the site comprised undifferentiated insitu rock overlain by Paremata silt loam and Korokoro Hill soils. Some concerns were noted about the stability of the steeper eastern slope and this should be investigated if this site is preferred.

Existing cut batters in close proximity to the north of the site have near vertical slopes and appear stable. The site should have a sound foundation as long as it is completely situated on insitu rock.

Figure 5-3: View of Carmichael site location from the west

5.3.2 Economic

5.3.2.1 Inlet / Outlet Pipes

Capacity has undertaken a preliminary investigation of the pipe work requirements for this site and layout plans are attached in Appendix A. The existing inlet to the Carmichael reservoir is too small and a new 1600m inlet main would be required. A 500m 300mm diameter secondary connection could be made to connect the Te Marua supply bulk main to the existing 800mm diameter bulk main.

A new 950mm diameter 1600m long outlet pipe would be required. In addition, 500m of the Adelaide Street pipe work would require an upgrade.

The hospital is 1,000m from the site but a secure connection could be laid from the new outlet main that would run immediately next to the hospital.

5.3.2.2 Capital cost

The capital cost for this site has been estimated relative to the Capacity cost estimate for the Prince of Wales site. The additional excavation, fill and disposal volumes and the need for a remote stock-pile for back-fill would increase reservoir construction cost estimate by about $3.0M to $16.4 million. Capacity has estimated that pipe work connection works outlined above would cost $15.1 million.

Depending on landscaping requirements the roof may need to be strengthened to take the additional soil loading however this cost has not been estimated at this stage.

5.3.2.3 Network / operational flexibility

Capacity has noted that this location, even with the proposed upgrades, provides no spare capacity in the inlet pipeline for beyond 2081 which reduces the networks operational flexibility. A longer length of pipe work, at a larger diameter, is required to effectively link this reservoir main to the CBD demand centroid.

5.3.3 Social

5.3.3.1 Proximity to residential areas

The closest neighbours are about 45m from the excavation and appropriate management of dust and noise would need to be considered.

5.3.3.2 Construction Traffic Movements

The main site access would be off Owen Street.

With up to 94,000 m^3 of excavation material to be disposed (depending on whether the roof is strengthened to maintain the existing ridge profile) there could be around 9,400 return truck movements through the residential area in addition to the baseline construction traffic. The construction traffic has not been considered in detail at this stage.

5.3.3.3 Visual Impact

The site would have an 18m cut batter during construction. The final batter height above the reservoir roof is shown as 7m on the initial plan however this would be subject to landscaping requirements as the site is immediately on the ridgeline.

The site is currently covered by mature pine trees. These would need to be removed, and no future trees could be planted directly on the reservoir roof. The ridge that the site is on is visible from most of Newtown, Mt Cook to the west and much of Kilbirnie to the east. The reservoir cut would change the shape of the ridge and a detailed landscaping plan would be required to mitigate this impact.

5.3.3.4 Other Issues

The "Southern Walkway" walking track passes through the proposed site. This track would need to be diverted during construction.

5.3.4 Environmental

5.3.4.1 Changes to local environment

The site is currently covered by mature pine trees. The slope to the west has recently had the pine trees removed and native species planted.

No detailed assessment of the site has been prepared to date however there are no obvious environmental issues with this site. A more detailed assessment should be undertaken prior to construction.

5.3.4.2 Consenting issues

The site is located in the town belt and within the Open Space C Zone. The site is also located within the ridgeline and hilltops overlay on the Wellington District Planning Maps. It is likely that a fully notified resource consent would be required as a Discretionary Activity pursuant to Rule 23.4.1 of the Wellington City District Plan. The consenting risks of Site C are higher due to its location within the ridgeline and hilltops overlay. The Wellington City Council would consider the open space objectives and policies which aim to restrict the construction of structures on identified ridgelines and hilltops in their assessment of the resource consent application. A visual/landscape assessment would be required as part of the consent application.

Resource consent is also likely to be required from the Greater Wellington Regional Council for earthworks and vegetation clearance as a Restricted Discretionary Activity pursuant to Rules 2 and 3 of the Regional Soil Plan. However, details of the slope of the site are needed to confirm this requirement.

5.3.5 Cultural

There are no known sites of special value to tangata whenua identified on the Wellington City Council Planning Maps in the vicinity of Site C. Detailed consideration of cultural issues should be undertaken as part of an Assessment of Effects on the Environment for consent purposes. This may require consultation with the Wellington Tenths Trust and/or local Iwi.

5.4 Site D: Government House

5.4.1 Location

5.4.1.1 Description

This site is located adjacent to a saddle to the east of Government House. Wellington College lies to the north, and Wellington Hospital and Ewart hospitals lie to the south.

Figure 5-4: View of Government House site location from the south

5.4.1.2 Excavation, Fill, Stockpile and Disposal

Approximately 84,000m^3 of material would be excavated (solid measure). Volumes are detailed on the layout plans attached in Appendix B and are summarised in section 5.5 as both solid measures and bulked measures.

Approximately 26,000m^3 of fill would be required for the assumed profile. This would need to be stockpiled from the excavated material. There is very limited space (500m^2) in the immediate area for stock-piling so a remote stock-pile would need to be established. The balance between back-fill and disposal would depend on the final profile of the site. Note that additional depth of soil cover would require increased structural support for the reservoir, with an associated cost that has not been estimated at this stage.

About 81,000m^3 of material may need to be disposed. This site is 10km from the Southern landfill.

5.4.1.3 Construction Working Area

There is very limited space for use as construction accommodation. Some area is available on the sloping ground down the slope to the south of the site however this is subject to WCC Parks & Gardens approval.

The preferred access would probably be from the hospital off Mein Street. The most direct route is via Coromandel Road through the Ewart Hospital entrance. The route would probably involve constructing an access through the existing Vice Regal playground which would need to be relocated and then following the rough track 300m up to the site. An improved access road would need to be constructed, at least temporarily.

The last part of the track would have a grade of about 3.5:1. This may require pumping concrete to site and the use of cranes for precast panel movement.

5.4.1.4 Geotechnical

A previous preliminary geological investigation (Brickell Moss, 1988), found the site comprised undifferentiated insitu rock overlain by Makara and Korokoro Hill soils. The valley to the south contained Paremata silt loam. An inactive fault may exist within the proposed site.

There is a gully to the north and south of the site. These areas could contain unsuitable material although the reservoir should be sited far enough away from these areas. The site should have a sound foundation as long as it is completely sited on insitu rock.

5.4.2 Economic

5.4.2.1 Inlet / Outlet Pipes

Capacity has undertaken a preliminary investigation of the pipe work requirements for this site and layout plans are attached in Appendix A. A 1250m long 800mm diameter inlet would be required. A 500m long 300mm diameter secondary connection could be made to connect the Te Marua supply bulk main to the existing 800mm diameter bulk main.

A 1250m long 900mm diameter outlet pipe would be required. In addition, 1300m of the Adelaide Street pipe work would require upgrade.

The hospital is 250m from the site but a secure connection could be laid from the new outlet main that would run immediately next to the hospital.

5.4.2.2 Capital cost

The capital cost for this site has been estimated relative to the Capacity cost estimate for the Prince of Wales site. The additional excavation and fill volumes and the need for a remote stock-pile for back-fill would increase reservoir construction cost estimate by about $2.7M to $16.1 million. Capacity has estimated that pipe work connection works would cost $11.8 million.

5.4.2.3 Network / operational flexibility

Capacity has noted that similar to Carmichael, this location, even with the proposed upgrades, provides no spare capacity in the inlet pipeline for beyond 2081 which reduces the networks operational flexibility. A longer length of pipe work, at a larger diameter, is required to effectively link this reservoir main to the CBD demand centroid.

5.4.3 Social

5.4.3.1 Proximity to residential areas

The closest neighbours are about 150m from the excavation and appropriate management of dust and noise would need to be considered.

5.4.3.2 Construction Traffic Movements

The main site access would be off Coromandel Road.

With up to 81,000 m^3 of excavation material to be disposed there could be around 8,100 return truck movements through the residential area in addition to the baseline construction traffic. The construction traffic has not been considered in detail at this stage.

5.4.3.3 Visual Impact

The site would have a 23m cut batter during construction, and a permanent (i.e. height above the reservoir roof) 12m batter. The reservoir cut would change the shape of the ridge and a detailed landscaping plan would be required to mitigate this impact.

Most of the site is currently covered in scrub. The site is visible from part of Newtown, and from the CBD.

5.4.3.4 Other Issues

The Mt Victoria-Newtown walking track passes through the site. This would need to be diverted during construction.

5.4.4 Environmental

5.4.4.1 Changes to local environment

The site is currently covered by grass on the west and scrub on the east.

No detailed assessment of the site has been prepared to date however there are no obvious environmental issues with this site. A more detailed assessment should be undertaken prior to construction.

5.4.4.2 Consenting issues

The site is located in the town belt and is zoned Open Space B. The site is also located within the Ridgeline and Hilltops Overlay and the Te Ranga a Hiwi Precinct. Resource consent would be required as a Discretionary Activity pursuant to Rule 23.4.1 of the Wellington City District Plan and is likely to be fully notified. While water reservoirs are provided for as a controlled activity in the Open Space B Zone, the maximum plan area and height standards cannot be met.

The consenting risks of Site D are higher due to its location within the ridgeline and hilltops overlay and within the Te Ranga a Hiwi Precinct. The Wellington City Council would consider the open space objectives and policies which aim to restrict the construction of structures on identified ridgelines and hilltops in their assessment of the resource consent application. A visual/landscape assessment would be required as part of the consent application. The Council would also consider the objectives and policies which aim to protect the sites and precincts of significance to Maori when assessing the consent application. The Wellington City District Plan also requires that tangata whenua be consulted with for any activity within a Maori precinct. This would involve consultation with the Wellington Tenths Trust and/or local iwi. A cultural impact assessment may be required to be undertaken.

Resource consent is also likely to be required from the Greater Wellington Regional Council for earthworks and vegetation clearance as a Restricted Discretionary Activity pursuant to Rules 2 and 3 of the Regional Soil Plan. However, details of the slope of the site are needed to confirm this requirement.

5.4.5 Cultural

As stated above, Site D is located within the Te Ranga a Hiwi Precinct. The District Plan identifies two outstanding sites within the precinct, however, the location of Site D does not appear to affect either of these sites. Consultation would be required to be undertaken with tangata whenua if this site is chosen. This may add increased time and cost to the consent process and a cultural impact assessment may be required.

5.5 Summary

Engineering issues have been summarised in Appendix C. Earthworks volumes are shown below for clarity on solid and bulked measures.

Table 5-1 : Summary of Excavation, Fill and Disposal

Site	Excavation Volume (solid)	Excavation Volume bulk factor 1.3	Fill Volume (solid)	Fill Volume bulk factor 1.1	Disposal Volume bulk factor 1.3
Prince of Wales	49,600 cu m	64,500 cu m	13,000 cu m	14,300 cu m	50,200 cu m
Torquay Terrace	60,300 cu m	78,400 cu m	15,000 cu m	16,500 cu m	61,900 cu m
Carmichael	83,800 cu m	108,900 cu m	14,000 cu m	15,400 cu m	93,500 cu m
Government House	84,100 cu m	109,300 cu m	26,000 cu m	28,600 cu m	80,700 cu m

Reservoir construction costs have been estimated based on the current cost estimate for consstruction at the Prince of Wales site and scaled for earthwork volumes. The reservoir and pipeline capital cost estimates are summarised below, rounded to the nearest $100,000.

Table 5-2 : Summary of Capital Costs

Item	Prince of Wales	Torquay	Carmichael	Government House
CBD Reservoir construction	$ 13,400,000	$ 14,300,000	$ 16,400,000	$ 16,100,000
Pipeline connection costs	$ 4,800,000	$ 4,000,000	$ 15,100,000	$ 11,800,000
TOTAL	**$ 18,200,000**	**$ 18,300,000**	**$ 31,500,000**	**$ 27,900,000**

With regard to integration with the existing network, Capacity has advised that while all options are viable, some require more works than others to achieve this. The preferred option from a network and operational flexibility point of view is Prince of Wales Park. The additional benefits of this site over the others are:

- greater operational and future planning flexibility due to the spare flow capacity through to the CBD;
- a reduction of risk exposure from the Hall Street mains junction, arguably the most critical pipe confluence in the city;
- greater energy efficiency due to reduced GW pumping requirements; and
- reduction of reliance on the Thorndon PRV, further improving turnover in the CBD and Macalister Park reservoirs. This also provides maintenance flexibility to GW, allowing them a greater window of opportunity to shutdown and maintain the bulk supply between Ngauranga and Thorndon.

The Torquay Terrace site is the least expensive site, but this option simply expands the storage at the existing Macalister Park site and does not provide redundancy options or reduce network risks. To achieve the same redundancy benefits as the Prince of Wales Park option would require increasing the outlet and Tasman Street pipe sizes to 950 mm, which then increase pipe costs to the same as the Prince of Wales Park option ($4.7m), but without the reduced network risks or energy efficiencies.

Both the Government House and Carmichael options are prohibitively expensive and with lesser hydraulic benefits than the previously mentioned options, effectively eliminating these from consideration with respects to the objectives of this report.

6 Multi-Criteria Comparison of Sites

Evaluation criteria for the site selection were developed in discussions between MWH and Capacity staff. The criteria were developed to ensure that the four well beings of Economic, Environmental, Social and Cultural were considered when selecting the proposed sites. The location of the reservoir was also included as a separate category as the strategic network considerations were considered to be significant.

Figure 6-1 shows the evaluation criteria and the scores from the MWH evaluation. The results of the MWH evaluation scoring are shown in Figure 6-2.

Key Issues	Attributes	Weighting	POW	TORQ	CARM	GOVT
Location	• Proximity to hospital	5%	3	3	3	4
	• Proximity to CBD	5%	4	3	2	3
	• Proximity to Thorndon-Macalister main	5%	4	5	2	2
	• Network / operational flexibity	5%	5	3	2	2
Economic	• Geotechnical suitability of site;	5%	3	3	3	3
	• Cost of Inlet & Outlet mains;	10%	4	5	2	1
	• Capital Cost of reservoir construction.	10%	4	3	2	2
Social	• Proximity to residential areas;	10%	3	3	3	4
	• Landscaping and visual impacts.	10%	3	3	2	2
Environmental Issues	• Changes due to modified habitat.	20%	3	2	3	4
	• Other consenting difficulties	5%	4	4	3	2
Cultural	• Cultural impacts	10%	3	3	3	2

Figure 6-1 : Summary of site scoring

MWH

Wellington City Council
Proposed CBD Reservoir
Site Option Assessment
Project: Z1306852

		Evaluation Criteria						
		Location	Economic	Social	Environmental Issues	Cultural Issues		
	Site	20%	25%	20%	25%	10%	Score	Rank
Short list sites	Prince of Wales park	4.00	3.80	3.00	3.20	3.00	3.45	1
	Torquay	3.50	3.80	3.00	2.40	3.00	3.15	2
	Carmichael	2.25	2.20	2.50	3.00	3.00	2.55	4
	Government House	2.75	1.80	3.00	3.60	2.00	2.70	3

Figure 6-2 : Results of evaluation scoring

7 Discussion

This report has considered four potential sites. A preliminary assessment has been made of planning and engineering issues related to construction and construction of a reservoir at these sites. Environmental and cultural issues have also been considered, however not to the same level of detail. Further studies would be required on all these issues

A multi-criteria assessment has been undertaken by the MWH team to rank the respective site options. The preferred site was the Prince of Wales Park site, the second favourable site was Torquay, the third Government House and the fourth Carmichael.

The preferred Prince of Wales site is located off Rolleston Street. The site has reasonable construction access, working area and is not immediately adjacent to residential properties. It is located centrally with regard to the CBD and hospital and is the preferred site from a network flexibility and hydraulic point of view. The construction area would be clearly visible from the CBD however the finished reservoir would be buried, with only access hatches and vent covers visible. The location is zoned Open Space C and no significant planning, environmental or cultural issues have been identified at this stage. There is opportunity at this site to reduce spoil disposal volumes by raising the playing fields. This site has the lowest excavation volume requirements of 50,000 m^3. The construction cost estimate for the reservoir is $13.4M and pipe work costs to enable connection of the reservoir to the CBD network and a secure supply to the hospital are $4.8M giving a total capital cost of $18.2M.

The second ranked site, Torquay, is located in the Macalister Park area of the town belt, in line with Torquay Terrace. Access could be from Adelaide Road or alternatively either Finnimore Terrace or from Hanson Street / Stoke Street. An area of regenerating vegetation would need to be cleared for the reservoir. The site is more difficult to work on than the Prince of Wales site. The location is Open Space C and no significant planning, environmental or cultural issues have been identified at this stage. The calculated excavation volume of 60,000m^3 is about 20% higher than the Prince of Wales site but more backfill could be used to even the contours of the land and again there may be opportunity to reduce spoil disposal volumes by raising the playing fields. This site is very close to the existing Macalister Park reservoir, so would only require short connections to the inlet and outlet pipe work from that reservoir butIt would require a longer upgrade to reticulation on Tasman Street to function effectively. The cost estimate for this site is marginally higher than the Prince of Wales site, with a reservoir cost of $14.3M and associated pipe work costs of $4.0M giving a total capital cost of $18.3M.

The third ranked site, Government House, is located on the ridge west of Alexandra Park. Access would be via a track from Mein Street by the hospital or alternatively from Coromandel Road. The site requires an excavation of about 84,000m^3 to cut a suitable platform into the ridgeline which increases the capital cost substantially. The site is also located further from existing bulk mains so has much more expensive pipe work requirements to integrate effectively with the reticulation. The location is Open Space B and is identified as a prominent ridgeline so would require special landscaping consideration. There are no significant environmental issues identified specific to this site however the site is in the Te Ranga a Hiwi Precinct so additional consultation would be required with iwi. This site is relatively expensive to develop, with a reservoir cost of $16.1M and associated pipe work costs of $11.8M giving a total capital cost of $27.9M.

The fourth ranked site is located south of the existing Carmichael reservoir. Access is from an existing winding track from the south end of Owen Street. The site is close to residential properties and requires a similar volume excavation to the Government House site, as the existing ground level is quite high relative to the required top water level. There is very limited construction working area at present. The location is Open Space C and is identified as a prominent ridgeline so would require special landscaping consideration and may require full burying rather than the 0.5m cover assumed in the preliminary engineering profile. No significant environmental or cultural issues have been identified at this stage. Although this site is very close to the existing Carmichael reservoir major new inlet and outlet pipelines would be required. It is the most expensive of the sites, with a reservoir cost of $16.4M and associated pipe work costs of $15.1M giving a total capital cost of $31.3M.

8 Recommendation

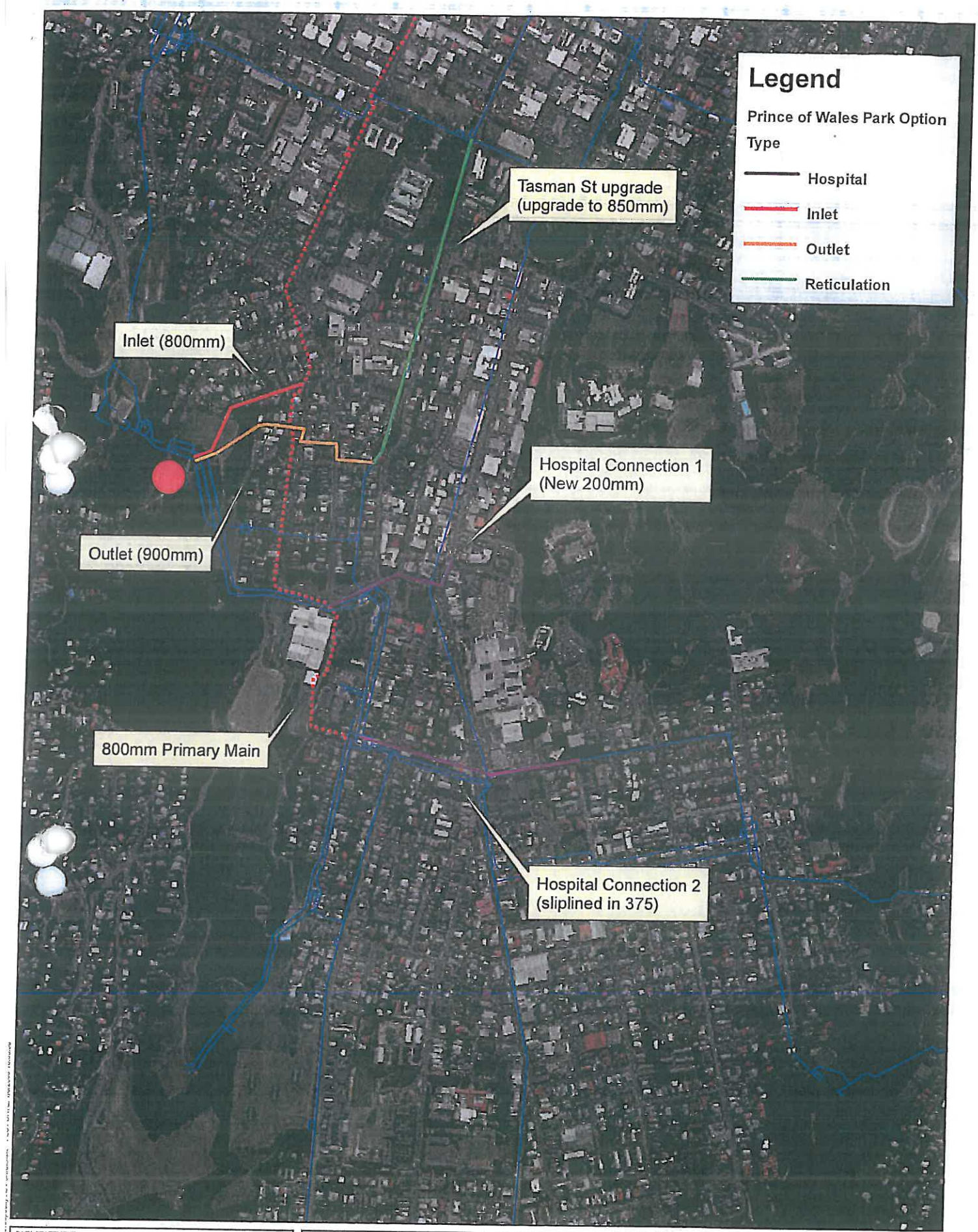
It is recommended that WCC adopt the Prince of Wales Park site as the preferred site for the proposed CBD reservoir.

Planning approvals will need to be obtained, including approval by WCC Parks and Gardens for access requirements and any spoil disposal on site and separate approvals will be required from the Town Belt Trustees. Resource consents will need to be obtained.

Further studies will be required for the Assessment of Effects on the Environment as part of the planning phase, particularly around traffic impact and landscaping.

Geotechnical studies to confirm the foundation conditions will need to be undertaken prior to detailed design. Network pipeline connections, including inlet and outlet pipes and other network upgrades including provision of a secure connection to the hospital, will also need to be designed and constructed prior to reservoir commissioning.

Appendix A Site Location and Connection Plans



DATA STATEMENT

Property boundaries ; Land Information NZ
Licence WN0853547/2
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Accuracy in urban areas: +/-1m
Accuracy in rural areas: +/-30m

Topographic data: Wellington City Council
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Accuracy: +/- 50cm

Other data has been compiled from a variety of sources and its accuracy may vary

Colour Orthophotography 1:500 flown Feb 2002 owned by Terralink International Ltd and used under licence by WCC

Any contours displayed are only approximate and must not be used for detailed engineering design

TITLE

CBD Reservoir Mains

Prince of Wales Park

N

1:10,000

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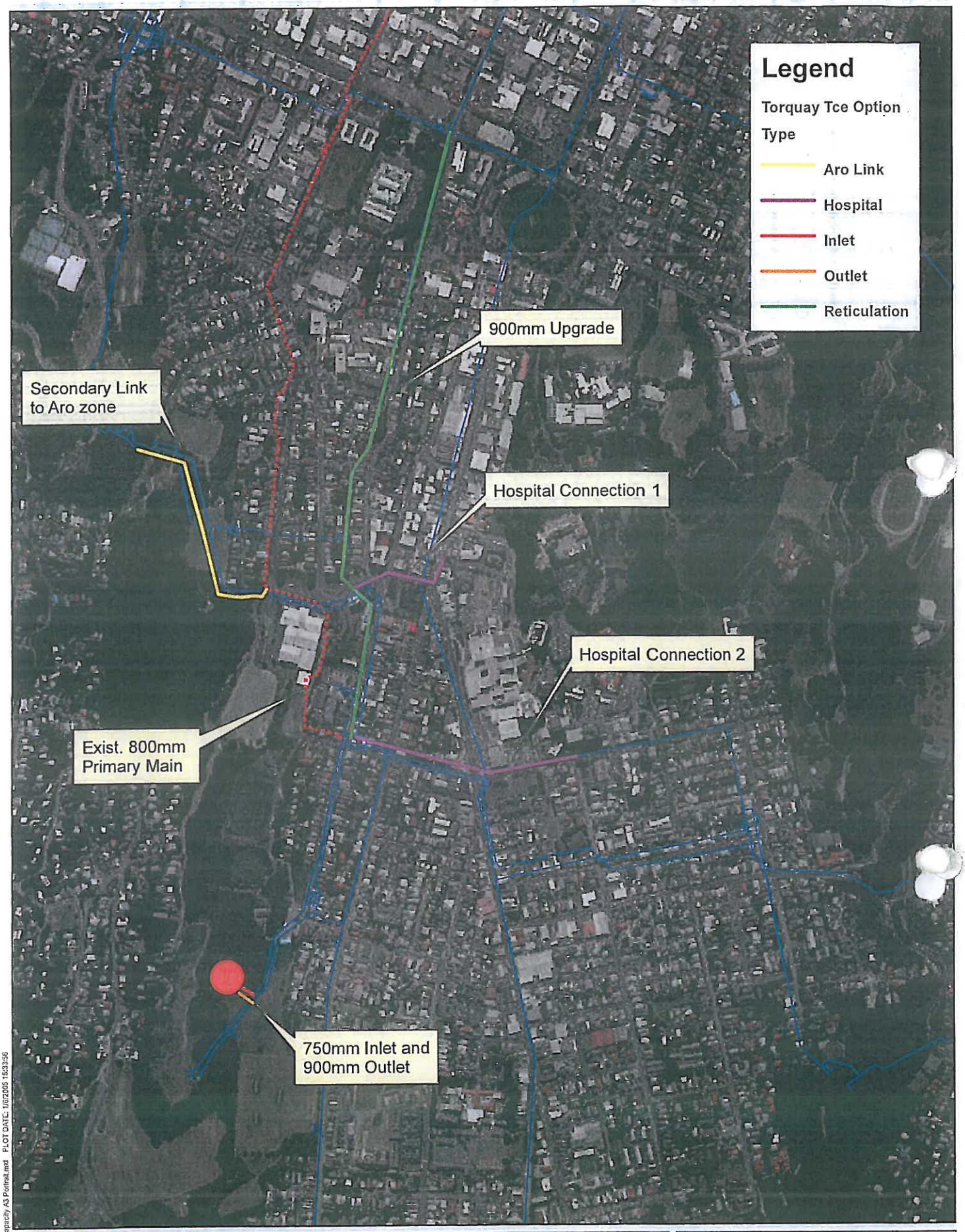
capacity infrastructure services



DATA STATEMENT

Property boundaries ; Land Information NZ Licence WN0853547/2
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Accuracy in urban areas: +/-1m
Accuracy in rural areas: +/-30m

Topographic data: Wellington City Council
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Colour Orthophotography 1:500 flown Feb 2002 owned by Terralink International Ltd and used under licence by WCC

Any contours displayed are only approximate and must not be used for detailed engineering design

TITLE

CBD Reservoir Mains

Torquay Terrace

N

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capacity infrastructure services

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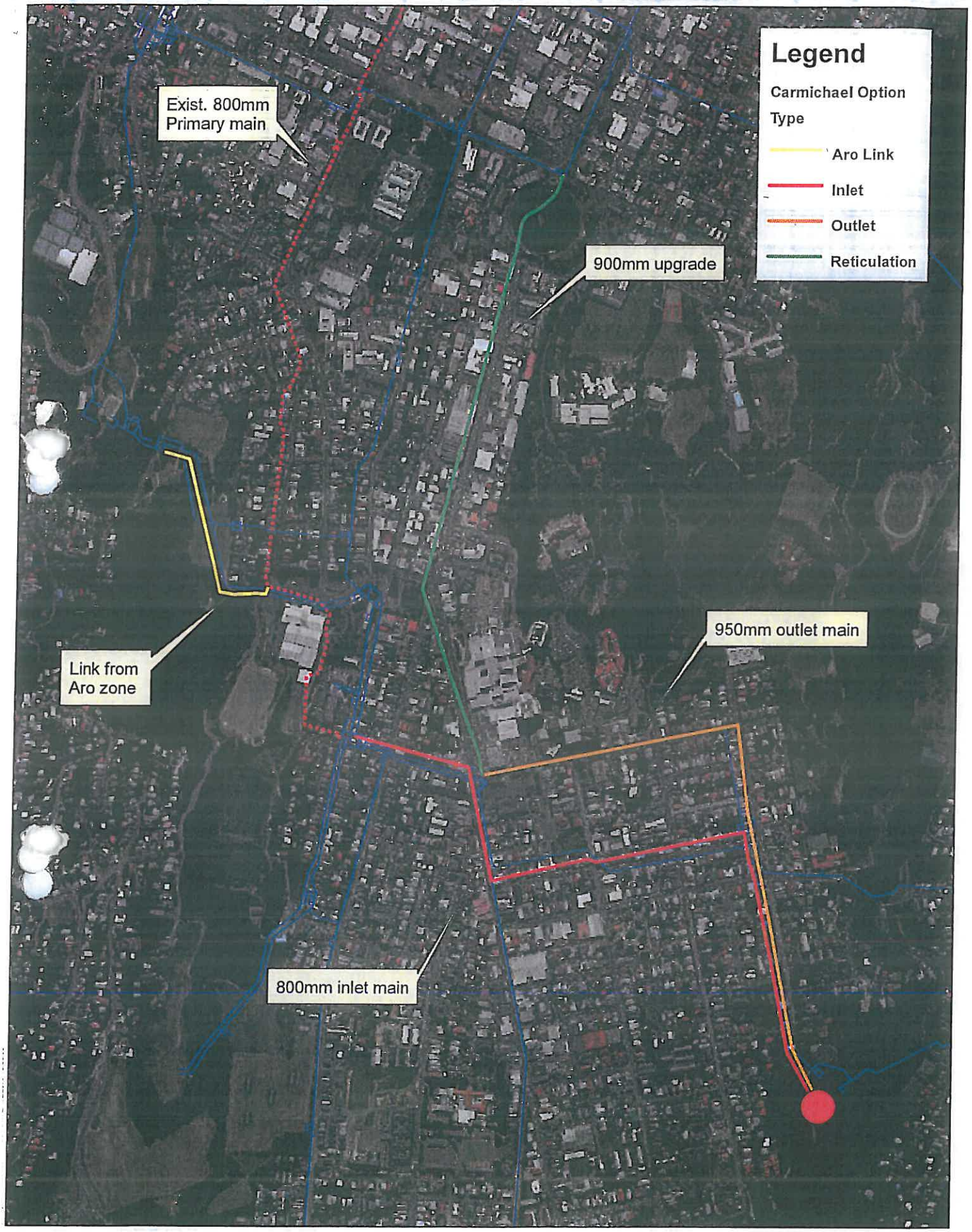

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Other data has been compiled from a variety of sources and its accuracy may vary

TITLE

CBD Reservoir Mains

Carmichael

N

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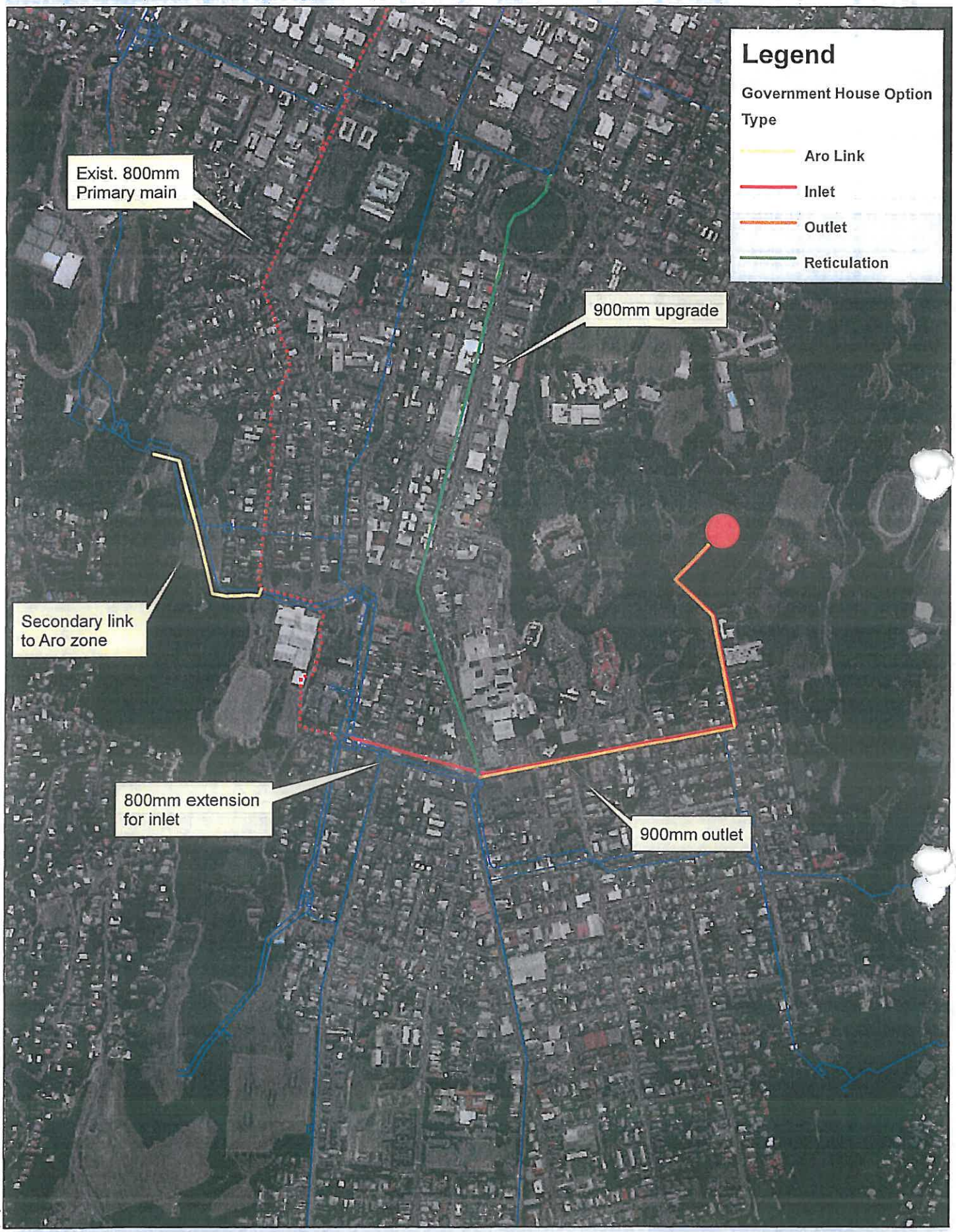
capacity infrastructure services



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Topographic data: Wellington City Council
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Accuracy: +/- 30cm

Any contours displayed are only approximate and must not be used for detailed engineering design

Other data has been compiled from a variety of sources and its accuracy may vary

TITLE

CBD Reservoir Mains

Government House

N

1:9,912

0 90 180 270 360 450 m

capacity infrastructure services

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Appendix B Site Excavation profiles

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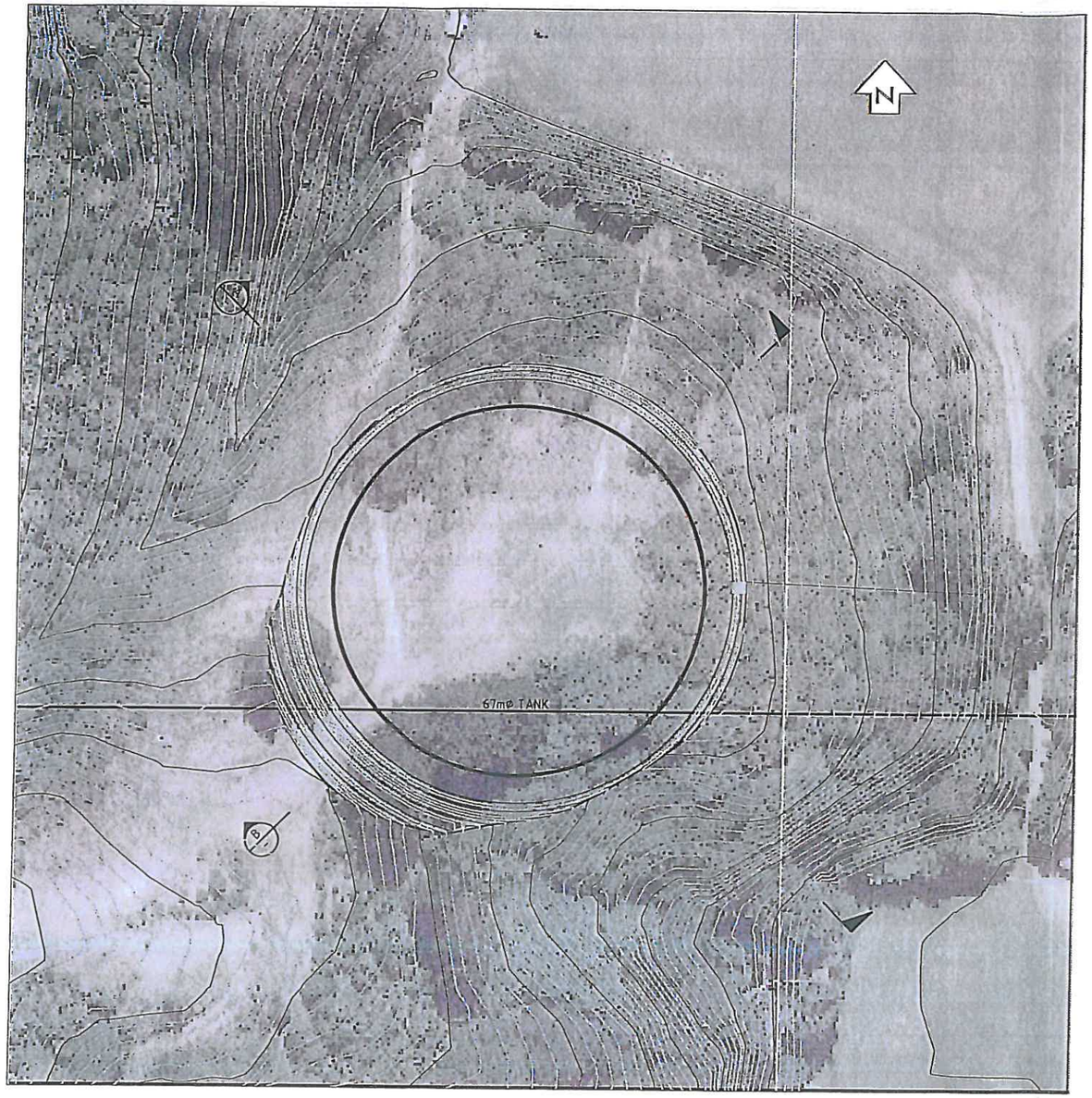

SITE PLAN
SCALE 1:500

VOLUME CALCULATIONS		
BASE SURFACE	COMPARISON SURFACE	
EXISTING GROUND	TANK CUT	
CUT	FILL	NET
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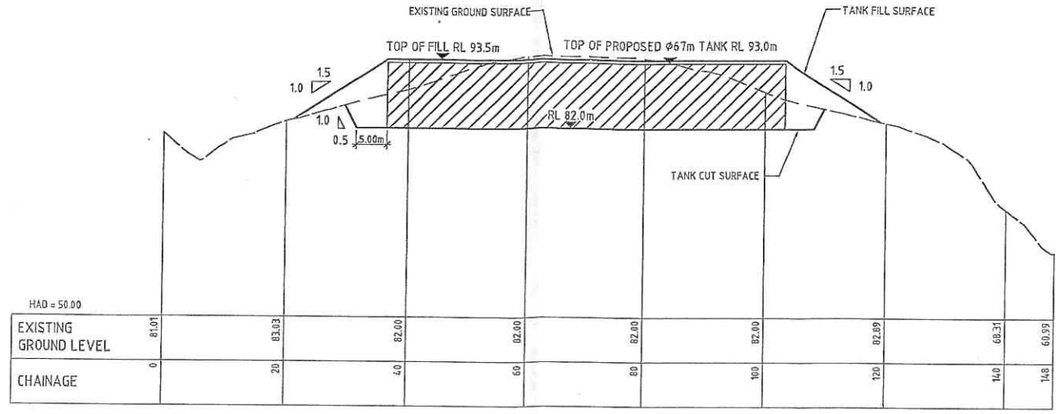
TANK VOLUME = 38782 m³ (35 Ml RESERVOIR)		
BASE SURFACE	COMPARISON SURFACE	
EG-CUT COMBINED	TANK FILL – TANK VOLUME	
CUT	FILL	NET GRAPH
0 m³	APPROX 13000 m³	13000 m³ <FILL>



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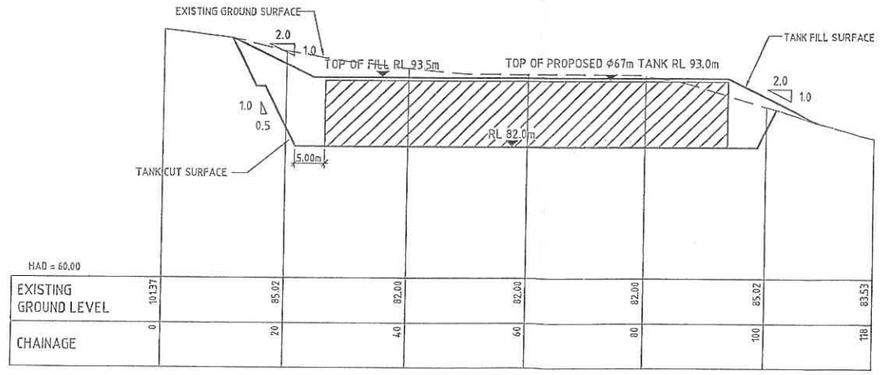

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V 1:500

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	CHECKED	APPROVED	DATE

	Name	Date
SURVEYED		
DESIGNED		
DESIGN CHECK		
DRAWN	JM HUNT	03/11
DRAWING CHECK		
APPROVED		

MWH

capacity infrastructure services

PROPOSED CBD RESERVOIR OPTIONS

PRINCE OF WALES PARK SITE
PLAN AND SECTIONS

Status Stamp: WORKING PLOT
Date Stamp: 24/03/2011
SCALES (A1) AS SHOWN
Drawing No.: Z1306852 | Sheet No.: SK004 | Rev.: A

XREFS: X_Z1306852 – POW GIS

\\hnzwgn1gen1\projects\Z13000up\Z13068 – Capacity Renewals\Z1306852 – Proposed CBD Reservoir Options\CAD\Z1306852_SK04.dwg

MS
12/11

SITE PLAN
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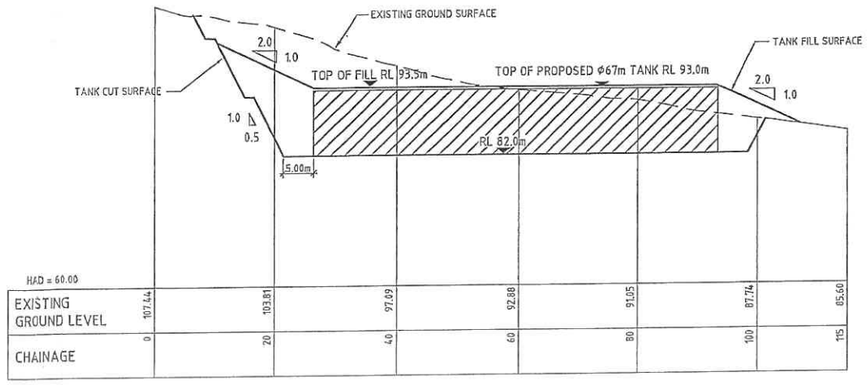

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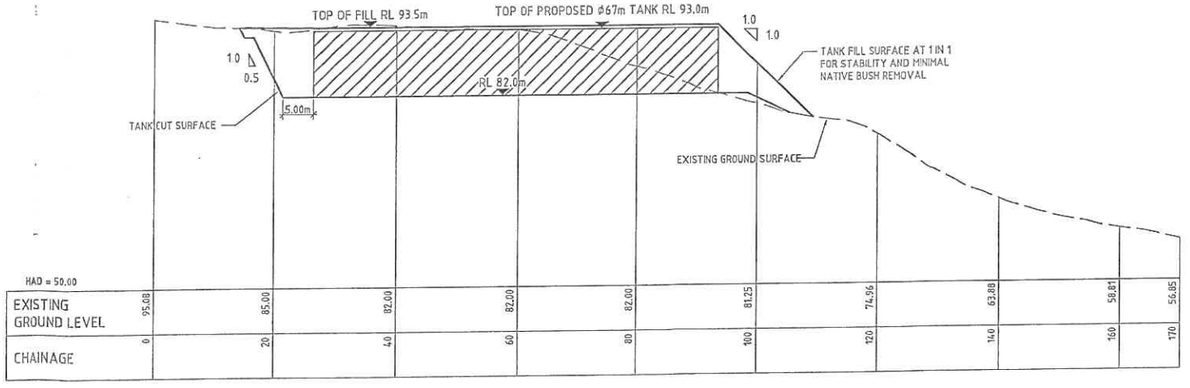

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EXISTING GROUND	TANK CUT	
CUT	FILL	NET
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TANK VOLUME = 38782 m^3 (35 Ml RESERVOIR)		
BASE SURFACE	COMPARISON SURFACE	
EG-CUT COMBINED	TANK FILL – TANK VOLUME	
CUT	FILL	NET GRAPH
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NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	CHECKED	APPROVED	DATE

	Name	Date
SURVEYED		
DESIGNED		
DESIGN CHECK		
DRAWN	JM HUNT	02/11
DRAWING CHECK		
APPROVED		

MWH

capacity infrastructure services

PROPOSED CBD RESERVOIR OPTIONS

TORQUAY SITE
PLAN AND SECTIONS

Status Stamp: WORKING PLOT
Date Stamp: 24/03/2011
SCALES (A1) AS SHOWN
Drawing No.: Z1306852
Sheet No.: SK002
Rev.: A

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DO NOT SCALE – IF IN DOUBT, ASK

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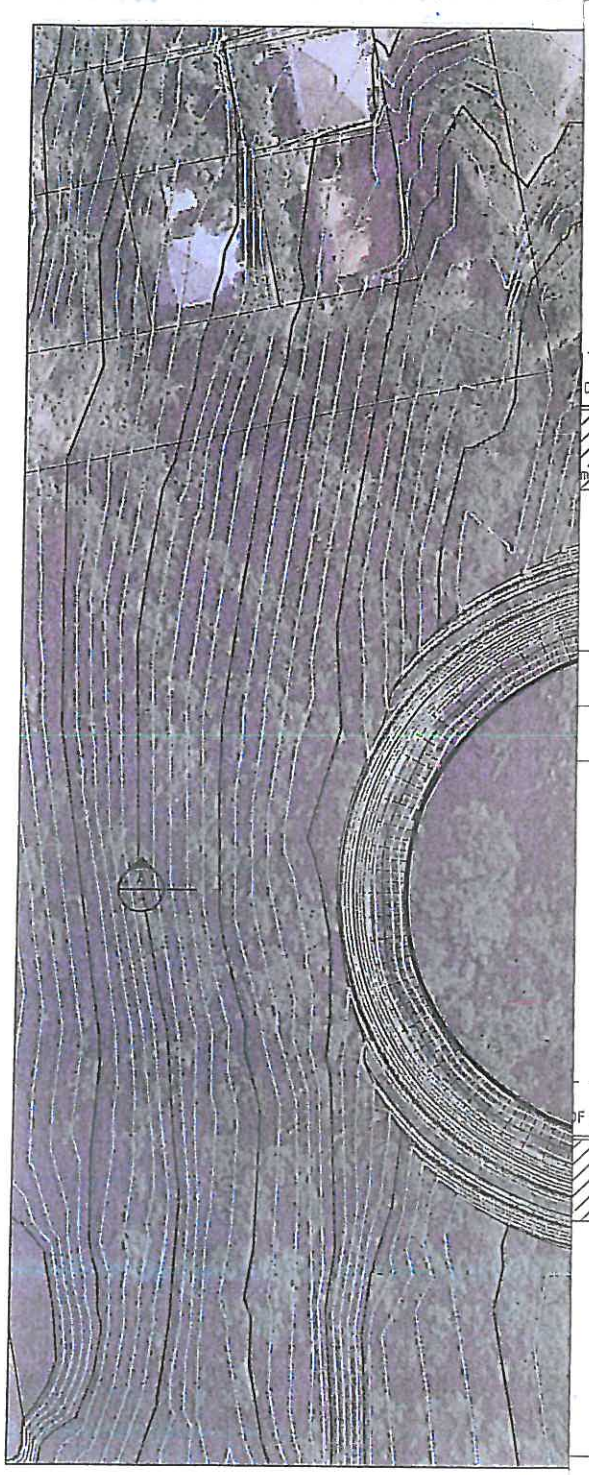

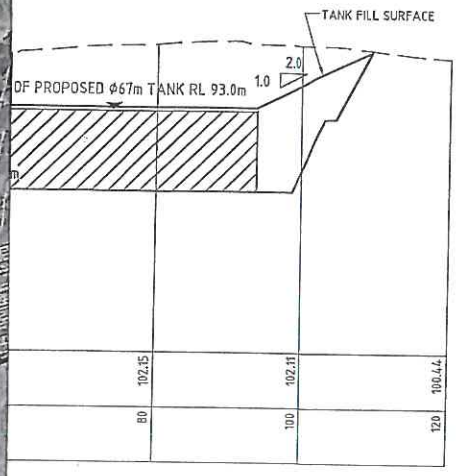

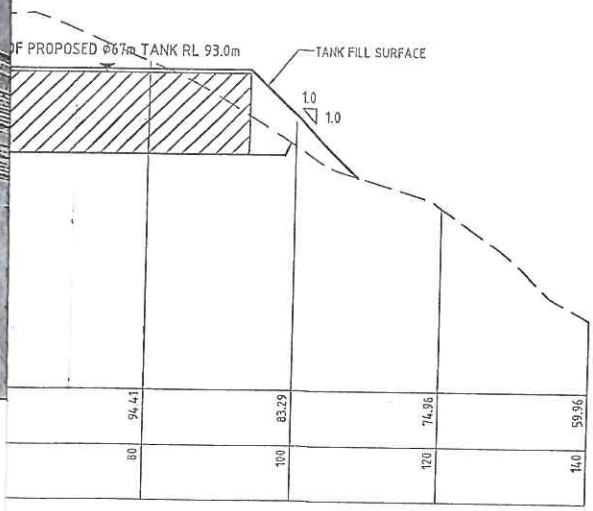

VOLUME CALCULATIONS		
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EXISTING GROUND	TANK CUT	
CUT	FILL	NET
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TANK VOLUME = 36782 m^3 (35 Ml RESERVOIR)		
BASE SURFACE	COMPARISON SURFACE	
EG-CUT COMBINED	TANK FILL - TANK VOLUME	
CUT	FILL	NET GRAPH
0 m^3	APPROX 14000 m^3	14000 m^3 <FILL>

DO NOT SCALE - IF IN DOUBT, ASK

200 mm

ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS

Status Stamp	WORKING PLOT
Date Stamp	24/03/2011
SCALES (A1)	AS SHOWN

Drawing No.	Sheet No.	Rev.
Z1306852	SK003	A

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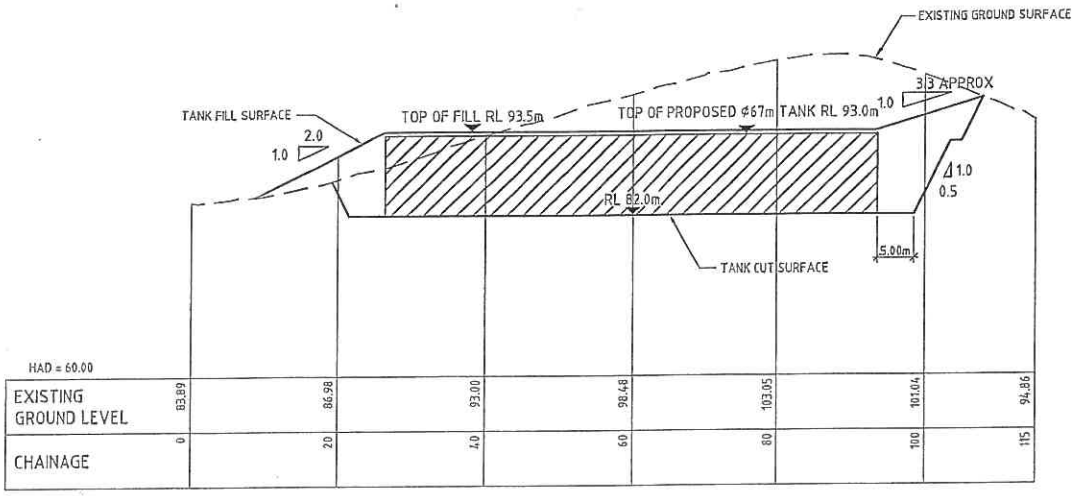

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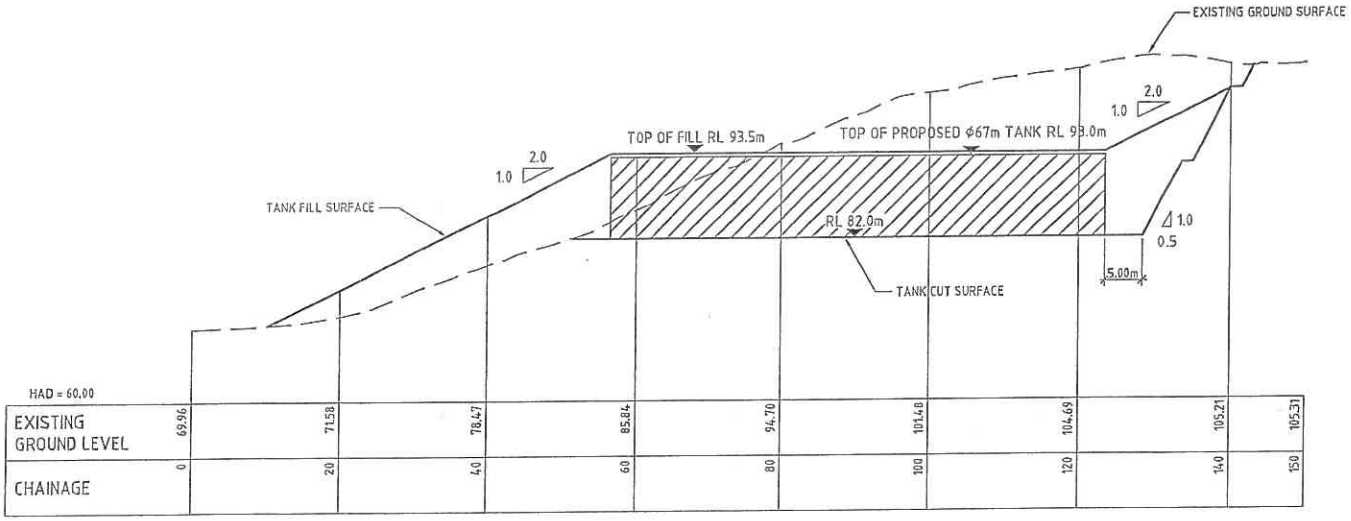

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CHAINAGE	0	20	40	60	80	100	120	140	150

SECTION A CH: 0.00 – 150.00
SCALES: H 1:500
V 1:500

NOT FOR CONSTRUCTION

capacity infrastructure services	PROPOSED CBD RESERVOIR OPTIONS	Status Stamp	WORKING PLOT
		Date Stamp	24/03/2011
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		Drawing No. Z1306852	Sheet No. SK001 / Rev. A

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Appendix C Engineering Comparison of Sites

MS IW

	Site A: Prince of Wales	Site B: Torquay	Site C: Carmichael	Site D: Government House
CONSTRUCTABLILTY				
Batter height	17m Cut batter (6m finished)	24m Cut batter (13m finished)	18m Cut batter (7m finished)	23m Cut batter (12m finished)
Excavation Volume	49587 cu m	60278 cu m	83794 cu m	84068 cu m
Bulk Excavation Volume	64463 cu m	78361 cu m	108932 cu m	109288 cu m
Fill Volume	13000 cu m	15000 cu m	14000 cu m	26000 cu m
Bulk Fill Volume	14300 cu m	16500 cu m	15400 cu m	28600 cu m
Disposal Volume	50163 cu m	61861 cu m	93532 cu m	80688 cu m
Excavation cost @18.25/m3	$ 904,963	$ 1,100,074	$ 1,529,241	$ 1,534,241
Backfill with excavated material cost @22.5/m3	$ 292,500	$ 337,500	$ 315,000	$ 585,000
Disposal Cost @35.50/m3	$ 1,780,790	$ 2,196,080	$ 3,320,393	$ 2,864,438
TOTAL EARTHWORKS	$ 2,978,253	$ 3,633,653	$ 5,164,634	$ 4,983,679
Stockpile/ Lay down area	Can potentially use one playing field during construction.	Some space (approx 4,000m2) to the northeast and south of the site.	No space for stockpiling.	No space adjacent to site. Very limited space (500m2) down slope to south of site.
Distance from Landfill	8.0km via Taranaki St, Brooklyn Hill.	8.4km via Adelaide Road and Island Bay. 9.2km via Adelaide Road, Brooklyn Hill.	9.7km via Adelaide Road and Island Bay.	10km via Adelaide Road and Island Bay. 9.8km via Brooklyn Hill.
Vegetation to be Cleared	Some trees. Pine, eucalyptus plus others. Possibly Pohutakawa	Scrub down gully	Pines trees on ridge	Regenerating bush down gullies
Existing Services	A sewer runs close to the west of the proposed reservoir, but should be out of the excavation area.	Inlet and outlet water mains to Macalister Park reservoir to the south of the site. Out of the excavation area but may need protection from temporary construction road.	None identified at this stage	None identified at this stage
Neighbours	60m from excavation.	About 70m from excavation.	About 45m from excavation.	About 150m from excavation.
Public	Walking track would need to be rerouted during construction	Walking track would need to be rerouted during construction	Walking track would need to be rerouted during construction	Walking track would need to be rerouted during construction
ACCESS				
Construction Access	Main access would be off Rolleston Street. A road about 100m long would need to be constructed from the end of Rolleston Street to the site. Temporary traffic management would be required on the corners of Rolleston Street.	Several options. Access could be constructed from Adelaide Road with temporary road up south facing slope to reservoir. Alternatively, an extension to the access track that runs to Macalister Reservoir from Finnimore Terrace could be extended by a new 50m access road to site. Alternatively, access is possible via Hanson / Stoke Street, with an existing sealed track part way to site however this is closer to residential properties.	Access from the existing unsealed access track that comes off Owen Street. The reservoir would require a new alignment for the top part of this track, which could be cut on the hill side lower on the ridge.	Access via Mein Street hospital reservoir, upgrade reservoir access and extend to the new site. Alternatively from Coromandel Road, a combined access with Ewart Hospital an upgrade the existing rough track 300m up to the site however this route would require temporarily moving the existing Vice Regal play area.
Ease of Construction	Last part of track will be steep (4:1 existing, could reduce to 5:1), but concrete mixers and precast panels should be able to deliver directly to site.	Last part of track will be steep (4:1 existing, could reduce to 5:1), but concrete mixers and precast panels should be able to deliver directly to site.	Last part of track will be steep (4:1 existing, could reduce to 5:1), but concrete mixers and precast panels should be able to deliver directly to site.	Last part of track grade will be about 3.5:1. This may require concrete pumping and cranes to get panels to site.
Permanent Maintenance Access	Same as Construction Access. Alternatively, it may also be possible to come down from Dorking Road.	Via Finnimore Terrace access to the existing Macalister Park reservoir or alternatively from Hanson / Stoke Street.	Same as Construction Access	Same as Construction Access