

Water Servicing

W-2 Alternative Servicing Strategies Development Report

Project # TPB168050; Client Name: City of Guelph

Prepared for:

City of Guelph

1 Carden Street, Guelph, ON N1H 3A1

2/1/2019

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2/1/2019

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Appendix A - Alternative Cost Breakdown

ISSUE	DATE	ORIG	REVIEW	DESCRIPTION
Initial Draft	January 2019	EA Poirier/ Ali Aamir	R. Sawhney	Initial Draft for Client Review



1.0 Introduction

The scope of this report involves the following:

- Preparation of Water Servicing Concepts to develop the ultimate scenario demand for proposed CMSP (Clair Maltby Servicing Plan);
- Identify system needs for servicing the ultimate scenario based on proposed demands for storage, pumping, transmission, and distribution into the CMSP lands;
- Identify alternative strategies for servicing the CMSP lands by accounting for alternative approaches and system configurations, and;
- Provide an evaluation of the alternatives in terms of Cost Benefit.

The options to be evaluated for the Clair Maltby Secondary Plan include systems that are connected to the City's distribution system resulting in the need for storage as described in Technical Memorandum W-1.

The plan of services is based on the preferred land use plan provided in June 2018 and estimated population as shown in Technical Memorandum W-1.

2.0 Water Servicing Alternatives

2.1 Development of Water Distribution System Alternatives

Servicing of the lands is described in terms of alternative approaches applied to alternate system configurations. The delineation of the alternative approaches to servicing is first established with two options.

These options are then applied in alternate system configurations for the CMSP area. These alternatives and respective system configurations are assessed based on the potential upgrades to storage capacity via either an elevated tank or underground storage as identified in Technical Memorandum W-1. The approximate footprint for facility requirements is given in each option.

Based on the planning information described in Technical Memorandum W-1 the Clair Maltby Secondary Plan lands demand is determined based on servicing a population of 25,059 people on a net developable land of 238.86 ha. It is expected that the land use plan will be refined, and population distribution will change accordingly.

For evaluating the water alternatives, this study assigns the water demand based on the population & net developable land being evenly distributed throughout the Clair Maltby Secondary Lands. This can be refined in the next stage (Technical Memorandum W-3 Staging and Implementation Plan).

Probable cost estimates are provided based on 2018 dollars for similar work in Southern Ontario. Consistent unit costs were applied to all alternatives and the estimates provided allow for a comparison of the relative cost of one alternative solution to the next. Note that the cost of implementation is volatile and can vary considerably from the estimates provided.

2.2 Alternative Servicing Solutions

2.2.1 Alternative #1 - Do Nothing

This alternative would not implement any infrastructure to service the CMSP lands. As such there would be no municipal water services for the planned growth.

2.2.2 Alternative #2 Provide Zone 3 Service for Full Growth Requirements in Zone 3 including Clair Maltby Lands

This alternative addresses the storage and transmission requirements for the projected growth in land use as described in Technical Memorandum W-1. The planned population for the CMSP lands is 25,059 people, but the future population is unknown at this time¹.

The primary system components required are:

1. **Zone 3 Functional Storage:** Storage volume requirements are a function of the overall needs in Zone 3, i.e. not simply the CMSP lands. Functional Storage will support a normal operating HGL of 382-394 masl.
2. **Transmission Main to Storage:** A 600 mm transmission main from the Clair Gordon Booster Pumping Station to the new storage facility will be required at the same time as the storage is implemented.
3. **Internal Distribution System:** A 300 mm looped distribution system will be implemented.

This alternative is subdivided into two series of sub alternatives based on the approach to functional storage.

Alternative 2 (a) Full Zone 3 Storage and Transmission using Underground Storage

"Floating"² underground storage is commonly used in Ontario Systems in areas where topography is suitable. Integrated Urban Systems with multiple zones, progressing in elevation, lend themselves to the use of underground floating storage. In such situations, underground floating storage reservoirs are located in ground that is higher than the pressure zone they service, connected via transmission mains, and often used as the launch point for pumping into the next zone.

The CMSP lands are located at a topographic high point, as such, there is no nearby ground that is at a suitable elevation for providing floating underground storage. Underground storage will need to be combined with a pumping system located at the storage reservoir to simulate what a floating storage reservoir would do. This pumping system will need to be equipped with back-up power generation – typically natural gas or diesel generator – to ensure the ability to use the storage in the event of an emergency.

The storage is configured with a pumping station that pressurizes water to Zone 3 operating levels. The pumping station will meet max day demands and max day plus fire flow demands in combination with other booster pumping stations (i.e Clair Road BPS). The pumping station will have a firm capacity of 140 L/s, as well as backup power.

This alternative has three sub-options (i – iii) based on three possible locations for the underground storage. Underground storage volume requirement – as per Technical Memorandum W-1 – is 9.4 ML³. The total storage area required is approximately 2249 m² for this amount of storage. The area is divided into 3 cells, and assuming a 1:1 grading slope of 5 m, as well as space for the pumping facility, parking, and roadways, a conservative footing of 100 m x 60 m (6000 m²) is used for facility sizing.

¹ Subject to confirmation with City of Guelph. Initial population was estimated to be 30,000 persons, but was subsequently reduced to 25,059 persons as per City request per email dated 29-01-2019

² Floating Storage refers to water that is stored at an elevation range that coincides with the pressure requirements of a distribution zone and does not require pumping to be distributed to the zone

³ The storage requirement is subject to refinement – based on planning estimates for all of Zone 3

Alternative 2 (a) (i) Full Service Underground Storage – Location 1

Alternative 2 (a) (i) (**Figure 2.1**) shows the location of the underground storage reservoir within the northwest portion of the CMSP lands. The approximate mean elevation the underground storage reservoir at this location is 355.5 masl (meters above sea level).

In this configuration, approximately 11,100 m of new 300 mm WM (watermains), and 608 m of new 600 mm transmission main will be required. The existing 300 mm WM and 600 mm transmission mains will have lengths of 5750 m and 620 m, respectively.

The approximate capital cost for an underground storage reservoir in this location is **\$21.7 million**, with the cost breakdown shown in **Table 2.1**.

Table 2.1. Estimated Cost – Alternative 2 (a) (i) – Full Service Underground Storage – Location 1

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$10.3 M
Underground Storage (9.4 ML) including Pumping Systems (140 L/s)	\$9.2 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$2.2 M
Total Cost Option 2 (a) (i)	\$21.7 M

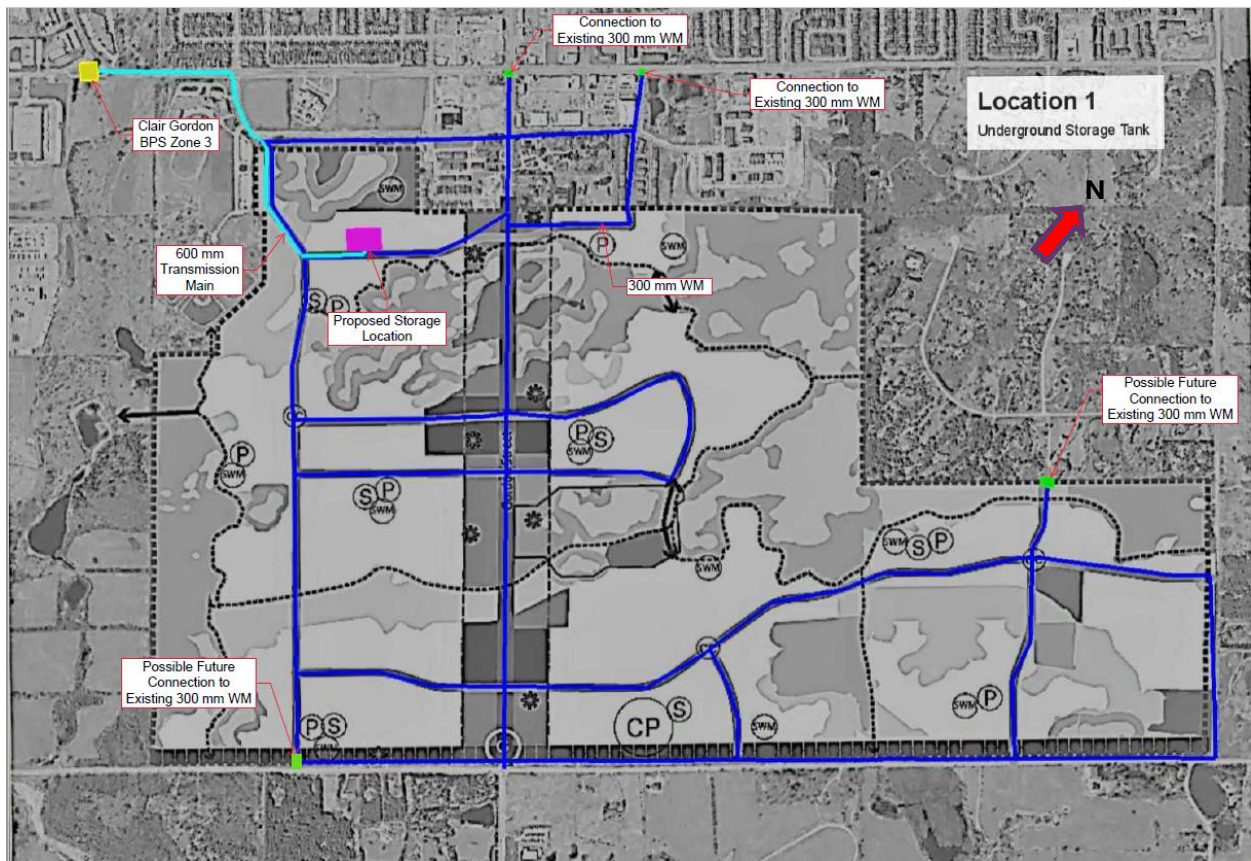


Figure 2.1. Full Service Underground Storage – Location 1

Alternative 2 (a) (ii) Full Service Underground Storage – Location 2

Alternative 2 (a) (ii) (**Figure 2.2**) shows the location of the underground storage reservoir within the southern portion of the CMSP lands. The approximate mean elevation the underground storage reservoir at this location is 359.5 masl.

In this configuration, approximately 11,100 m of new 300 mm WM (watermains), and 1530 m of new 600 mm transmission main will be required. The existing 300 mm WM and 600 mm transmission mains will have lengths of 5750 m and 1620 m, respectively.

The approximate capital cost for an underground storage reservoir in this location is **\$24.8 million**, with the cost breakdown shown in **Table 2.2**. The key difference in cost for this alternative is primarily due to a longer 600 mm transmission main connecting the Clair Gordon BPS Zone 3 and the proposed below ground storage reservoir.

Table 2.2. Estimated Cost – Alternative 2 (a) (ii) – Full Service Underground Storage – Location 2

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Underground Storage (9.4 ML) including Pumping Systems (140 L/s)	\$ 9.2 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 5.3 M
Total Cost Option 2 (a) (ii)	\$ 24.8 M

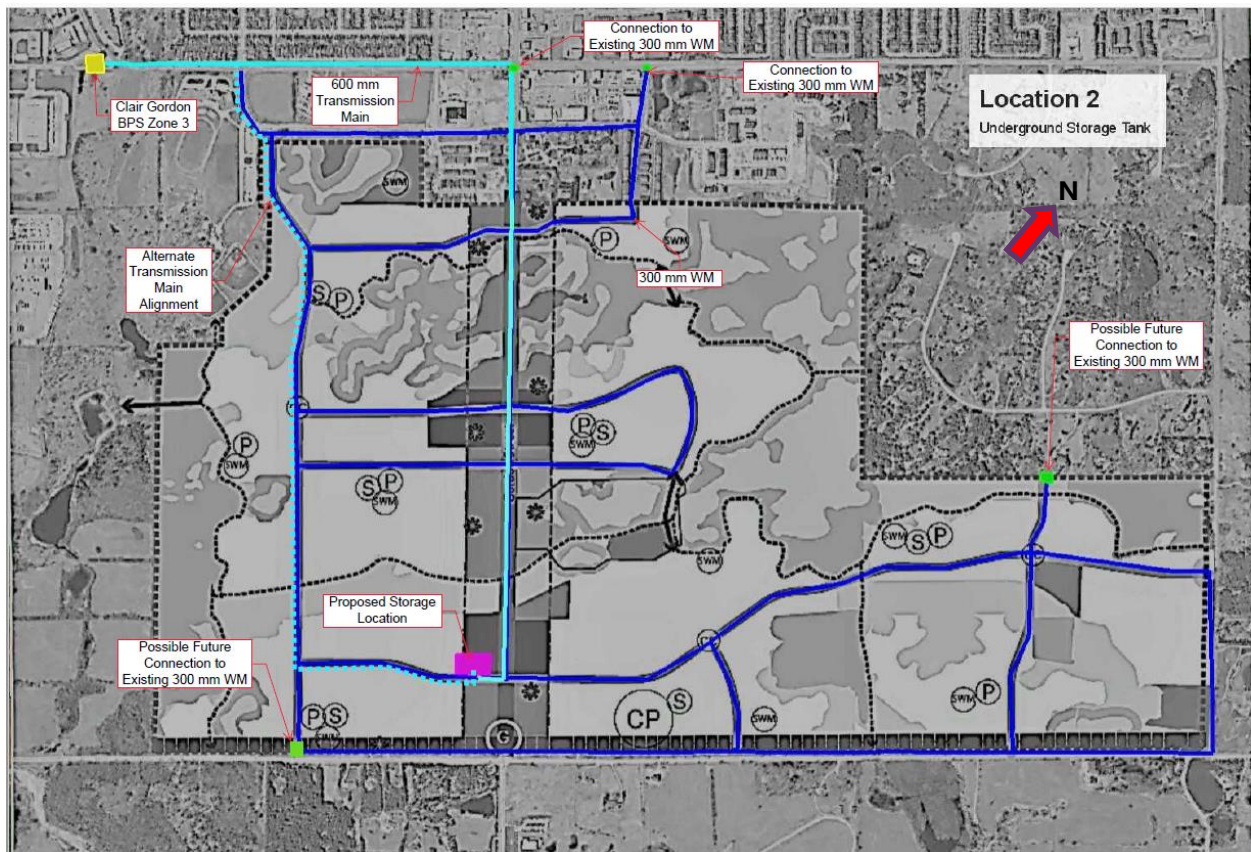


Figure 2.2. Full Service Underground Storage – Location 2

Alternative 2 (a) (iii) Full Service Underground Storage – Location 3

Alternative 2 (a) (iii) (**Figure 2.3**) shows the location of the underground storage reservoir within the northeastern portion of the CMSP lands. The approximate mean elevation the underground storage reservoir at this location is 352 masl.

In this configuration, approximately 11,100 m of new 300 mm WM (watermains), 3400 m of new 600 mm transmission main will be required. The existing 300 mm WM and 600 mm transmission mains will have lengths of 5750 m and 1750 m, respectively.

The approximate capital cost for an underground storage reservoir in this location is **\$27.7 million**, with the cost breakdown shown in **Table 2.3**.

Table 2.3. Estimated Cost – Alternative 2 (a) (iii) – Full Service Underground Storage – Location 3

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Underground Storage (9.4 ML) including Pumping Systems (140 L/s)	\$ 9.2 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 8.2 M
Total Cost Option 2 (a) (iii)	\$ 27.7 M

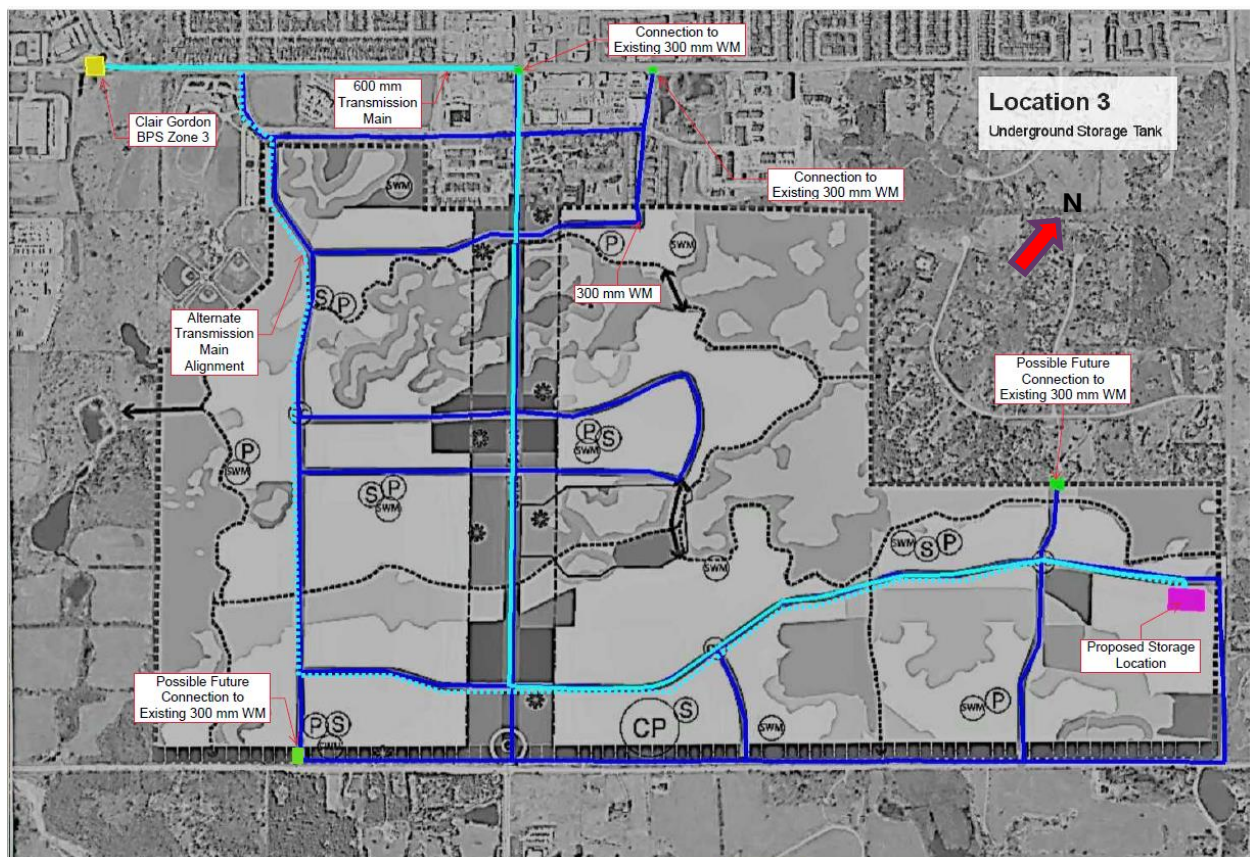


Figure 2.3. Full Service Underground Storage – Location 3

Alternative 2 (b) Full Zone 3 Storage and Transmission using Elevated Storage

The Elevated Storage option for Zone 3 has the specific advantage of being configured as floating storage. Floating storage from an operational, economics, and practicality perspective, a much simpler option to implement than a system which must require pumping, to utilize the storage to its full potential. Elevated Storage eliminates the need for electrical systems and backup power, and makes the entire storage potential available to the pressure zone in an emergency situation.

This alternative has three sub-options (i – iii) based on three possible locations for the elevated storage. Elevated storage volume requirement – as per Technical Memorandum W-1 – is 6.3 ML⁴. The storage elevation is assumed to be 12 m, resulting in a total required storage area of approximately 627 m². The tank diameter is estimated to be 28 m. The facility footprint, including the elevated tank, parking, and roadways resulted in a conservative value of 50 m x 50 m for the total facility area.

Alternative 2 (b) (i) Full Service Elevated Storage – Location 1

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 2 (b) (i) is identical to the values provided in Alternative 2 (a) (i). (**Figure 2.4**) shows the location of the Elevated Storage within the northwest portion of the CMSP lands.

The approximate capital cost for Elevated Storage in this location is **\$22.3 million**, with the cost breakdown shown in **Table 2.4**.

Table 2.4. Estimated Cost – Alternative 2 (b) (i) – Full Service Elevated Storage – Location 1

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Elevated Storage (6.3 ML)	\$ 9.8 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 2.2 M
Total Cost Option 2 (b) (i)	\$ 22.3 M

⁴ The storage requirement is subject to refinement – based on planning estimates for all of Zone 3

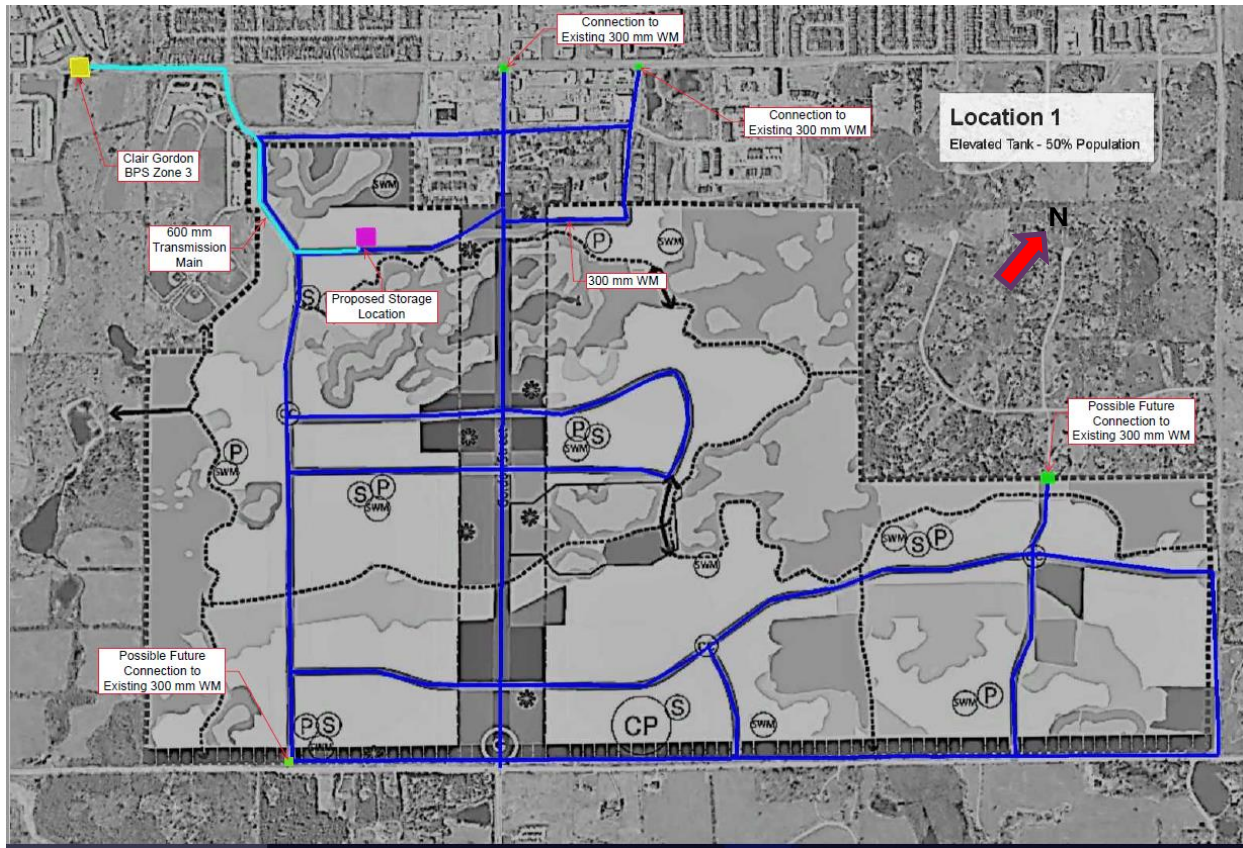


Figure 2.4. Full Service Elevated Storage – Location 1

Alternative 2 (b) (ii) Full Service Elevated Storage – Location 2

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 2 (b) (ii) is identical to the values provided in Alternative 2 (a) (ii). (Figure 2.5) shows the location of the Elevated Storage within the southern portion of the CMSP lands.

The approximate capital cost for Elevated Storage in this location is **\$25.4 million**, with the cost breakdown shown in Table 2.5.

Table 2.5. Estimated Cost – Alternative 2 (b) (ii) – Full Service Elevated Storage – Location 2

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Elevated Storage (6.3 ML)	\$ 9.8 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 5.3 M
Total Cost Option 2 (b) (ii)	\$ 25.4 M

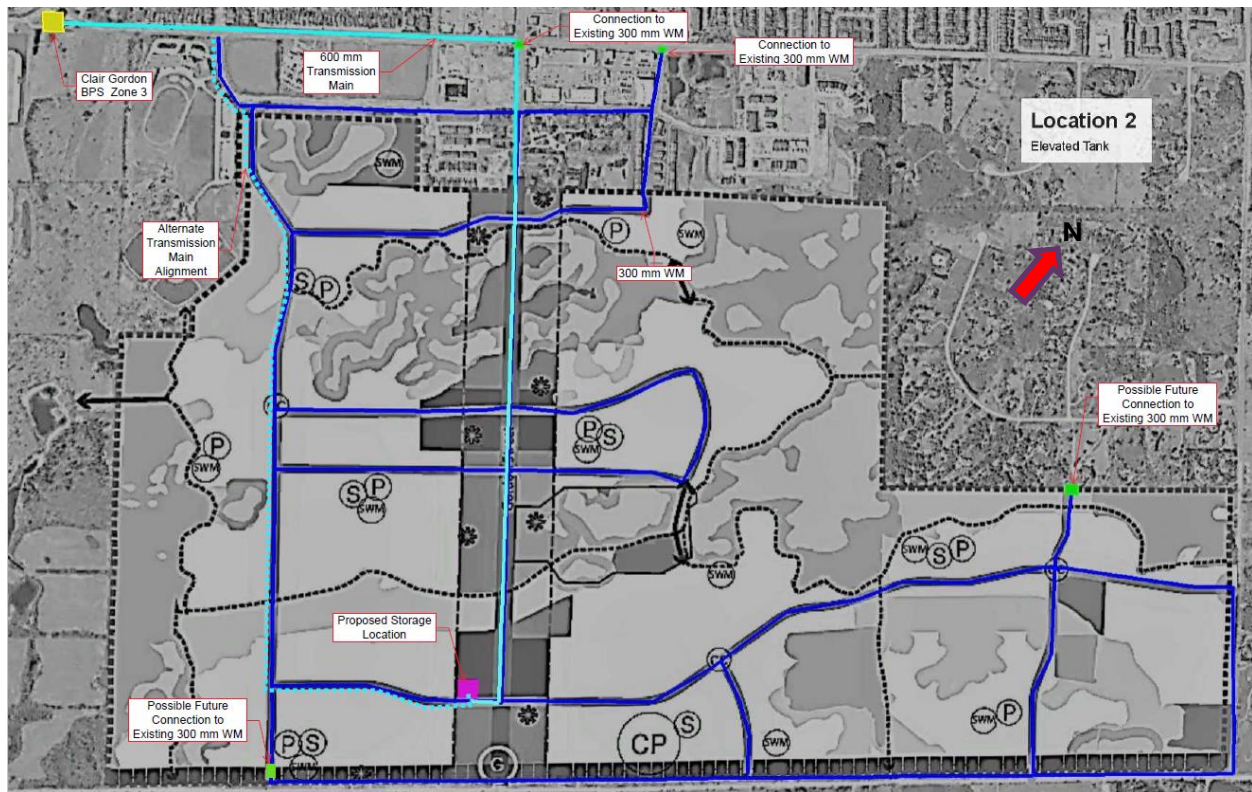


Figure 2.5. Full Service Elevated Storage – Location 2

Alternative 2 (b) (iii) Full Service Elevated Storage – Location 3

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 2 (b) (iii) is identical to the values provided in Alternative 2 (a) (iii). **(Figure 2.6)** shows the location of the Elevated Storage within the northeastern portion of the CMSP lands.

The approximate capital cost for Elevated Storage in this location is **\$28.3 million**, with the cost breakdown shown in **Table 2.6**.

Table 2.6. Estimated Cost – Alternative 2 (b) (iii) – Full Service Elevated Storage – Location 3

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Elevated Storage (6.3 ML)	\$ 9.8 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 8.2 M
Total Cost Option 2 (b) (iii)	\$ 28.3 M

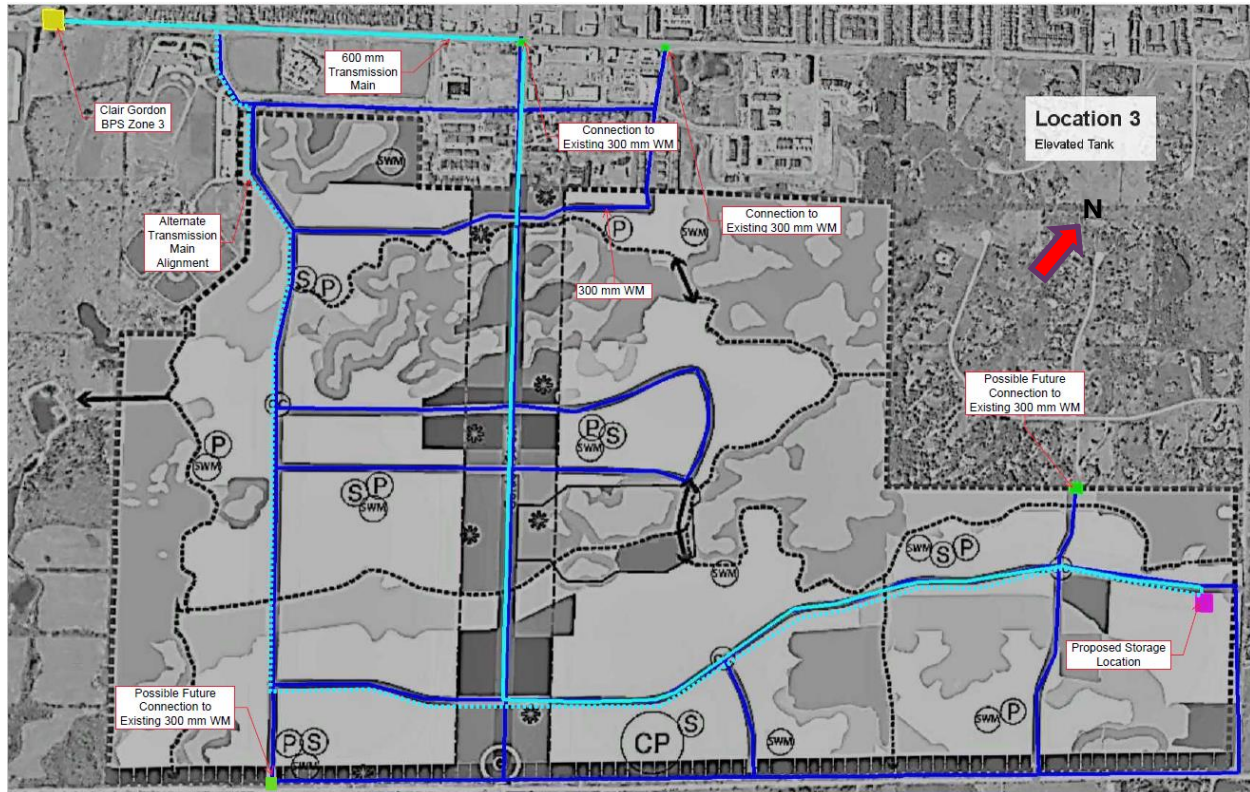


Figure 2.6. Full Service Elevated Storage – Location 3

2.2.3 Alternative #3 Provide Zone 3 Service for Limited Growth - 50% of projected Growth

The limit growth alternative would implement the reduction of future water servicing requirements by limiting the extent, density, type and/or location of future residential, industrial, commercial, and institutional growth in the CMSP area.

A limited growth in population would be represented by a smaller storage volume for either the elevated tank or underground storage options for the CMSP area compared to the estimate provided in Technical Memorandum W-1.

To estimate the sizing of the storage area for this scenario, a smaller population size would have to be projected for the lower expected growth in Zone 3 lands and the new storage values would have to be assessed on these terms. A population reduction of 50% from the service population of 25,059 (from Technical Memorandum W-1) to a service population of 12,500 people is assumed for this scenario.

As in Alternative 2, the primary system components required are:

1. **Zone 3 Functional Storage:** Storage volume requirements are a function of the overall needs in Zone 3, i.e. not simply the CMSP lands. Functional Storage will support a normal operating HGL of 395-400 masl.
2. **Transmission Main to Storage:** A 600 mm transmission main from the Clair Gordon Booster Pumping Station to the new storage facility will be required at the same time as the storage is implemented.
3. **Internal Distribution System:** A 300 mm looped distribution system will be implemented.

This alternative is subdivided into two series of sub alternatives based on the approach to functional storage.

Alternative 3 (a) 50% Zone 3 Storage and Transmission using Underground Storage

As in Alternative 2 a), "Floating"⁵ underground storage is implemented for Alternative 3 a) for a population at 50% of projected growth. Underground storage reservoirs are located in ground that is higher than the pressure zone they service, via connected transmission mains, and are often used as a launch point for pumping into the next zone.

The CMSP lands are located at a topographic high point, as such, there is no nearby ground that is at a suitable elevation for providing floating underground storage. Underground storage will need to be combined with a pumping system located at the storage reservoir to simulate what a floating storage reservoir would do. This pumping system will need to be equipped with back-up power generation – typically natural gas or diesel generator – to ensure the ability to use the storage in the event of an emergency.

This alternative has three sub-options (i – iii) based on three possible locations for the underground storage. Underground storage volume requirement – as per Technical Memorandum W-1 – is 4.7 ML⁶. The total storage area required is approximately 1135 m² for this amount of storage. The area is divided into 3 cells, and assuming a 1:1 grading slope of 5 m, as well as space for the pumping facility, parking, and roadways, a conservative footing of 70 m x 40 m (2800 m²) was used for facility sizing.

Alternative 3 (a) (i) 50% Service Underground Storage – Location 1

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 3 (a) (i) is identical to the values provided in Alternative 2 (a) (i). (**Figure 3.1**) shows the location of the underground storage reservoir within the northwest portion of the CMSP lands.

The approximate capital cost for an underground storage reservoir in this location is **\$17.8 million**, with the cost breakdown shown in **Table 3.1**.

Table 3.1. Estimated Cost – Alternative 3 (a) (i) – 50% Service Underground Storage – Location 1

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Underground Storage (4.7 ML) including Pumping Systems (140 L/s)	\$ 5.3 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 2.2 M
Total Cost Option 3 (a) (i)	\$ 17.8 M

⁵ Floating Storage refers to water that is stored at an elevation range that coincides with the pressure requirements of a distribution zone and does not require pumping to be distributed to the zone.

⁶ The storage requirement is subject to refinement – based on planning estimates for all of Zone 3

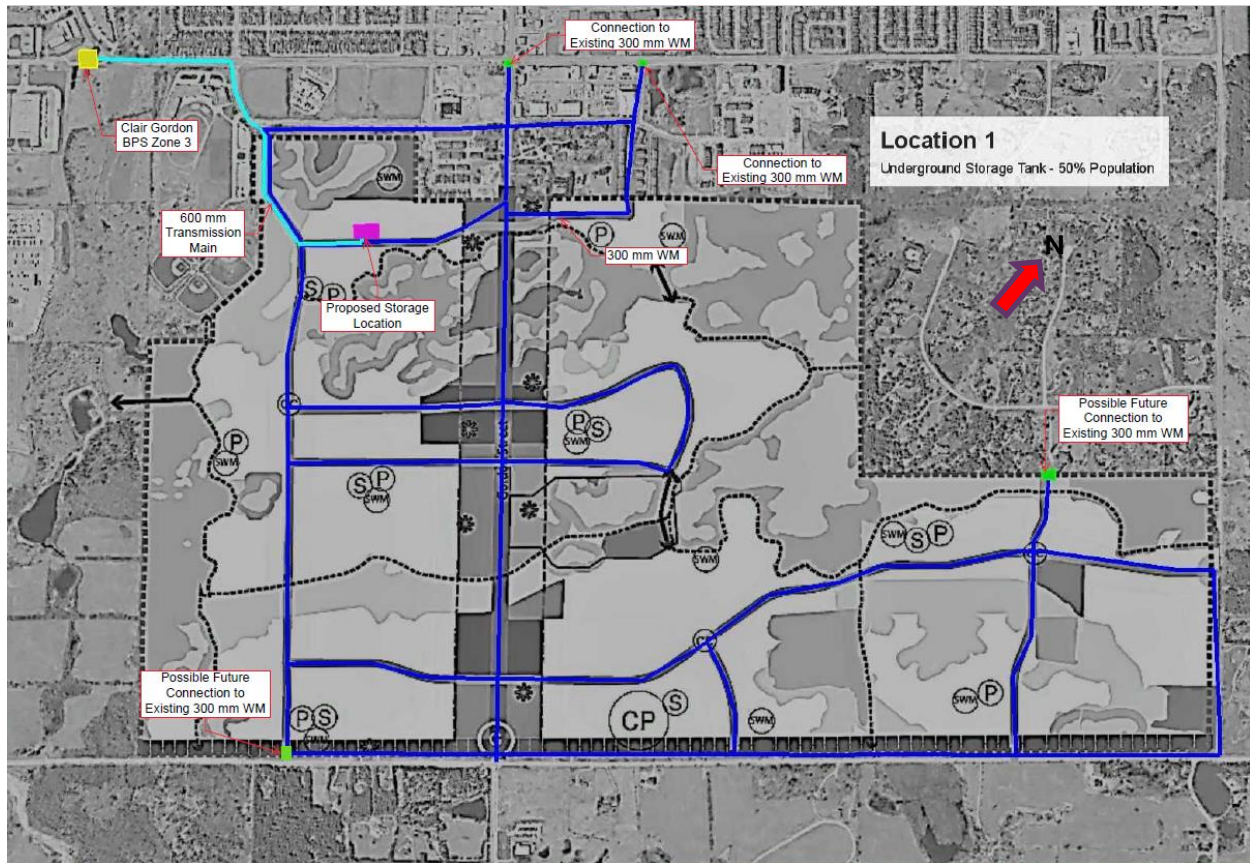


Figure 3.1. 50% Service Underground Storage – Location 1

Alternative 3 (a) (ii) 50% Service Underground Storage – Location 2

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 3 (a) (ii) is identical to the values provided in Alternative 2 (a) (ii). (**Figure 3.2**) shows the location of the underground storage reservoir within the southern portion of the CMSP lands.

The approximate capital cost for an underground storage reservoir in this location is **\$20.9 million**, with the cost breakdown shown in **Table 3.2**.

Table 3.2. Estimated Cost – Alternative 3 (a) (ii) – 50% Service Underground Storage – Location 2

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Underground Storage (4.7 ML) including Pumping Systems (140 L/s)	\$ 5.3 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 5.3 M
Total Cost Option 3 (a) (ii)	\$ 20.9 M

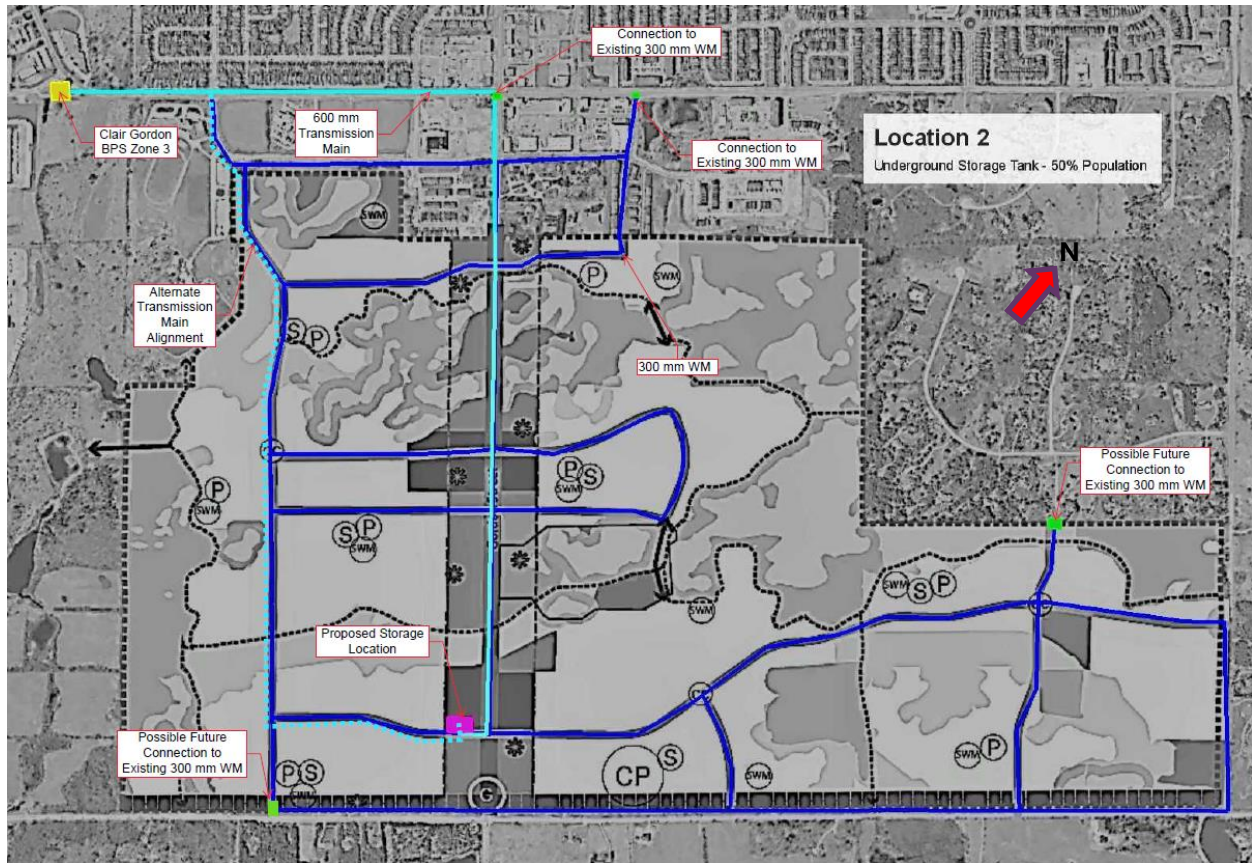


Figure 3.2. 50% Service Underground Storage – Location 2

Alternative 3 (a) (iii) 50% Service Underground Storage – Location 3

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 3 (a) (iii) is identical to the values provided in Alternative 2 (a) (iii). (Figure 3.3) shows the location of the underground storage reservoir within the northeastern portion of the CMSP lands.

The approximate capital cost for an underground storage reservoir in this location is **\$23.8 million**, with the cost breakdown shown in **Table 3.3**.

Table 3.3. Estimated Cost – Alternative 3 (a) (iii) – 50% Service Underground Storage – Location 3

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$ 10.3 M
Underground Storage (4.7 ML) including Pumping Systems (140 L/s)	\$ 5.3 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 8.2 M
Total Cost Option 3 (a) (iii)	\$ 23.8 M

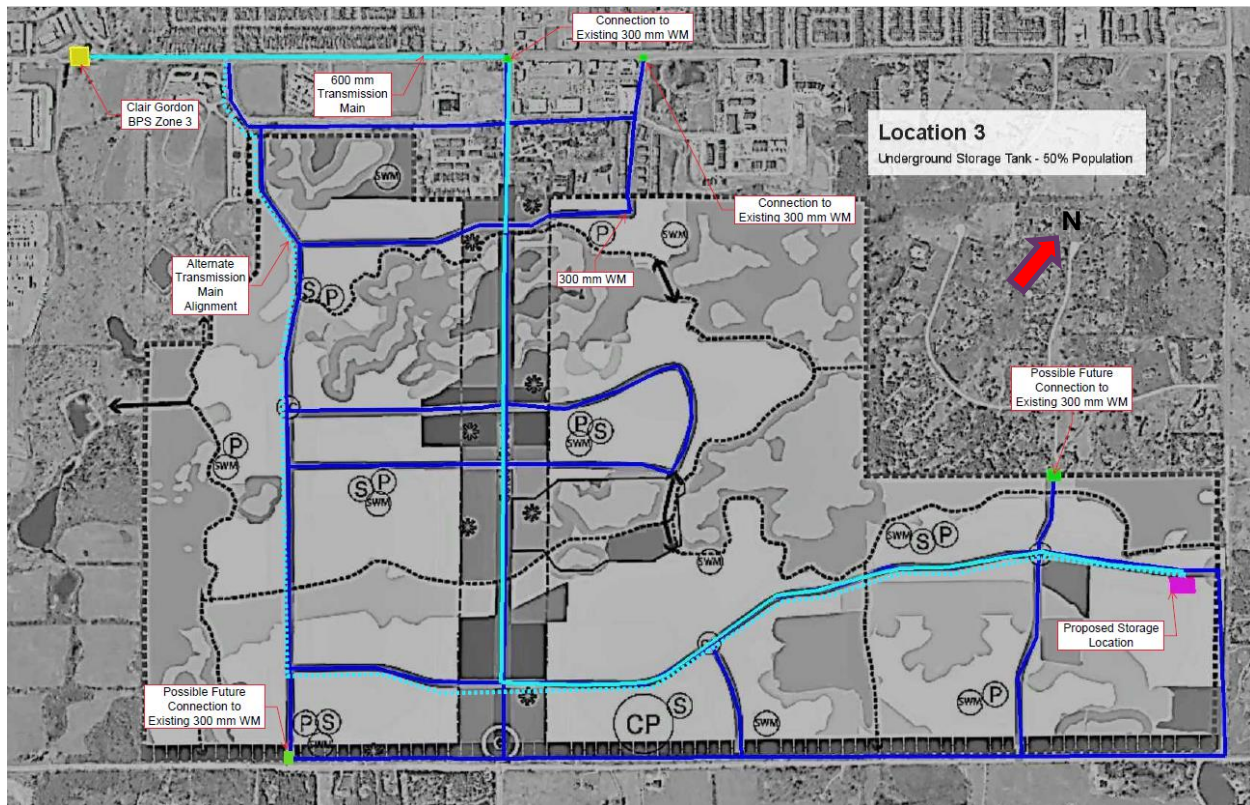


Figure 3.3. 50% Service Underground Storage – Location 3

Alternative 3 (b) 50% Service Elevated Storage

The Elevated Storage option for Zone 3 has the specific advantage of being configured as floating storage. Floating storage from an operational, economics, and practicality perspective, a much simpler option to implement than a system which must require pumping, to utilize the storage to its full potential. Elevated Storage eliminates the need for electrical systems and backup power and makes the entire storage potential available to the pressure zone in an emergency situation.

This alternative has three sub-options (i – iii) based on three possible locations for the elevated storage. Elevated storage volume requirement – as per as estimated 12,500-person population – is 3.2 ML⁷. The storage elevation is assumed to be 12 m, resulting in a total required storage area of approximately 316 m². The tank diameter is estimated to be 20 m. The facility footprint, including the elevated tank, parking, and roadways resulted in a conservative value of 40 m x 40 m for the total facility area.

Alternative 3 (b) (i) 50% Service Elevated Storage – Location 1

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 3 (b) (i) is identical to the values provided in Alternative 3 (a) (i). (**Figure 3.4**) shows the location of the Elevated Storage within the northwest portion of the CMSP lands.

⁷ The storage requirement is subject to refinement – based on planning estimates for all of Zone 3

The approximate capital cost for Elevated Storage in this location is **\$17.5 million**, with the cost breakdown shown in **Table 3.4**.

Table 3.4. Estimated Cost – Alternative 3 (b) (i) – 50% Service Elevated Storage – Location 1

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$10.3 M
Elevated Storage (3.2 ML)	\$ 5 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 2.2 M
Total Cost Option 3 (b) (i)	\$ 17.5 M

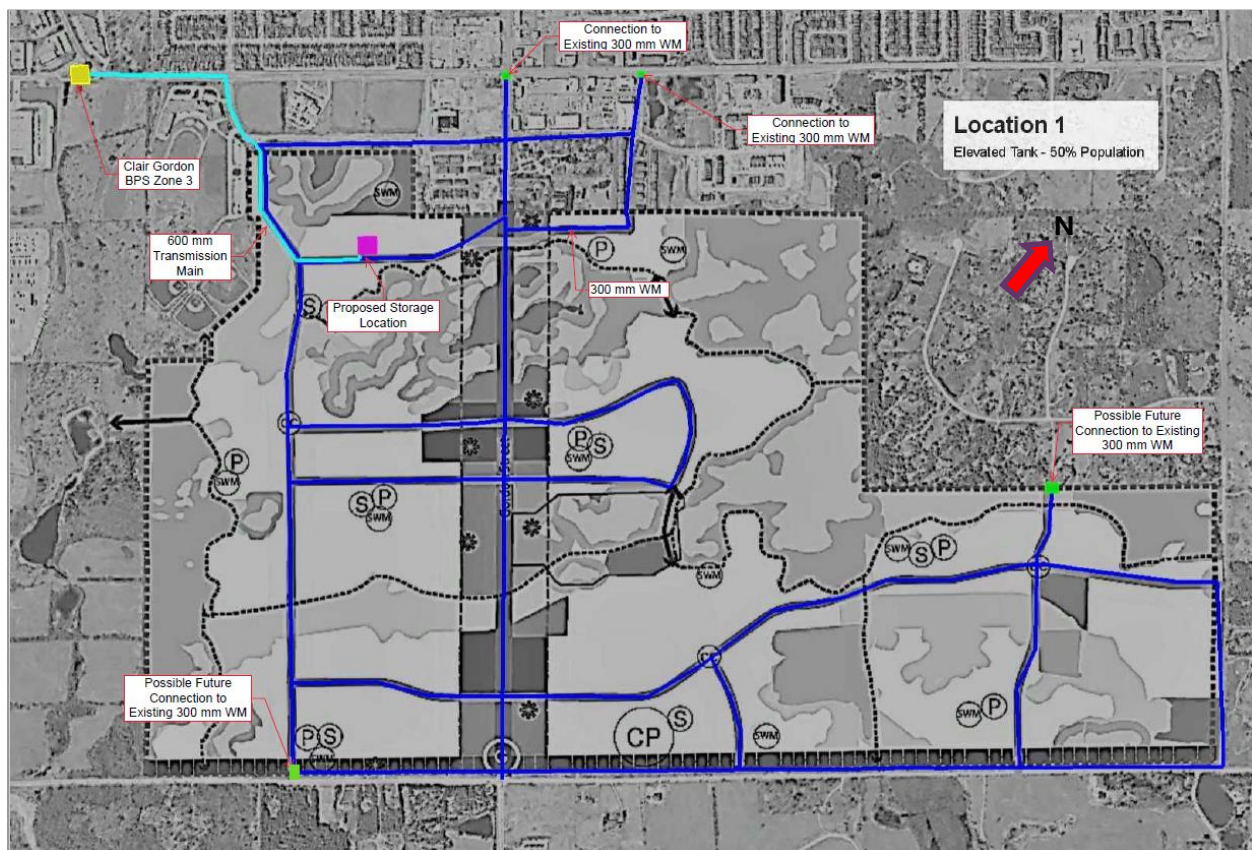


Figure 3.4. 50% Service Elevated Storage – Location 1

Alternative 3 (b) (ii) 50% Service Elevated Storage – Location 2

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 3 (b) (ii) is identical to the values provided in Alternative 3 (a) (ii). (**Figure 3.5**) shows the location of the Elevated Storage within the southern portion of the CMSP lands.

The approximate capital cost for Elevated Storage in this location is **\$20.6 million**, with the cost breakdown shown in **Table 3.5**.

Table 3.5. Estimated Cost – Alternative 3 (b) (ii) – 50% Service Elevated Storage – Location 2

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$10.3 M
Elevated Storage (3.2 ML)	\$ 5 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 5.3 M
Total Cost Option 3 (b) (ii)	\$ 20.6 M

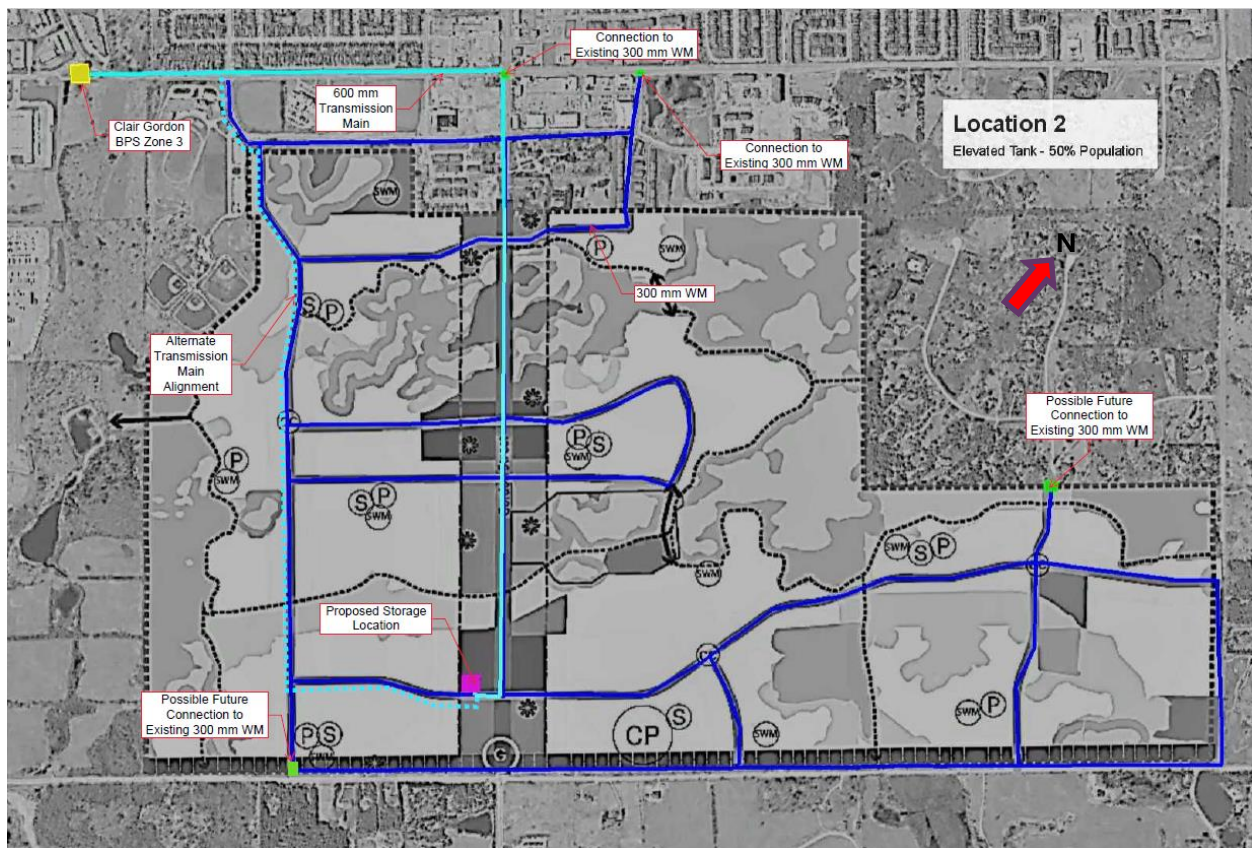


Figure 3.5. 50% Service Elevated Storage – Location 2

Alternative 3 (b) (iii) 50% Service Elevated Storage – Location 3

The elevation, and lengths of new and existing watermains and transmission mains in Alternative 3 (b) (iii) is identical to the values provided in Alternative 3 (a) (iii). (Figure 3.6) shows the location of the Elevated Storage within the northeastern portion of the CMSP lands.

The approximate capital cost for Elevated Storage in this location is **\$23.5 million**, with the cost breakdown shown in **Table 3.6**.



Table 3.6. Estimated Cost – Alternative 3 (b) (iii) – 50% Service Elevated Storage – Location 3

Local Distribution Systems (300 mm WMs, Valves, Hydrants)	\$10.3 M
Elevated Storage (3.2 ML)	\$ 5 M
600 mm Transmission Main from Clair Gordon BPS (with Valve Chamber Connections)	\$ 8.2 M
Total Cost Option 3 (b) (iii)	\$ 23.5 M

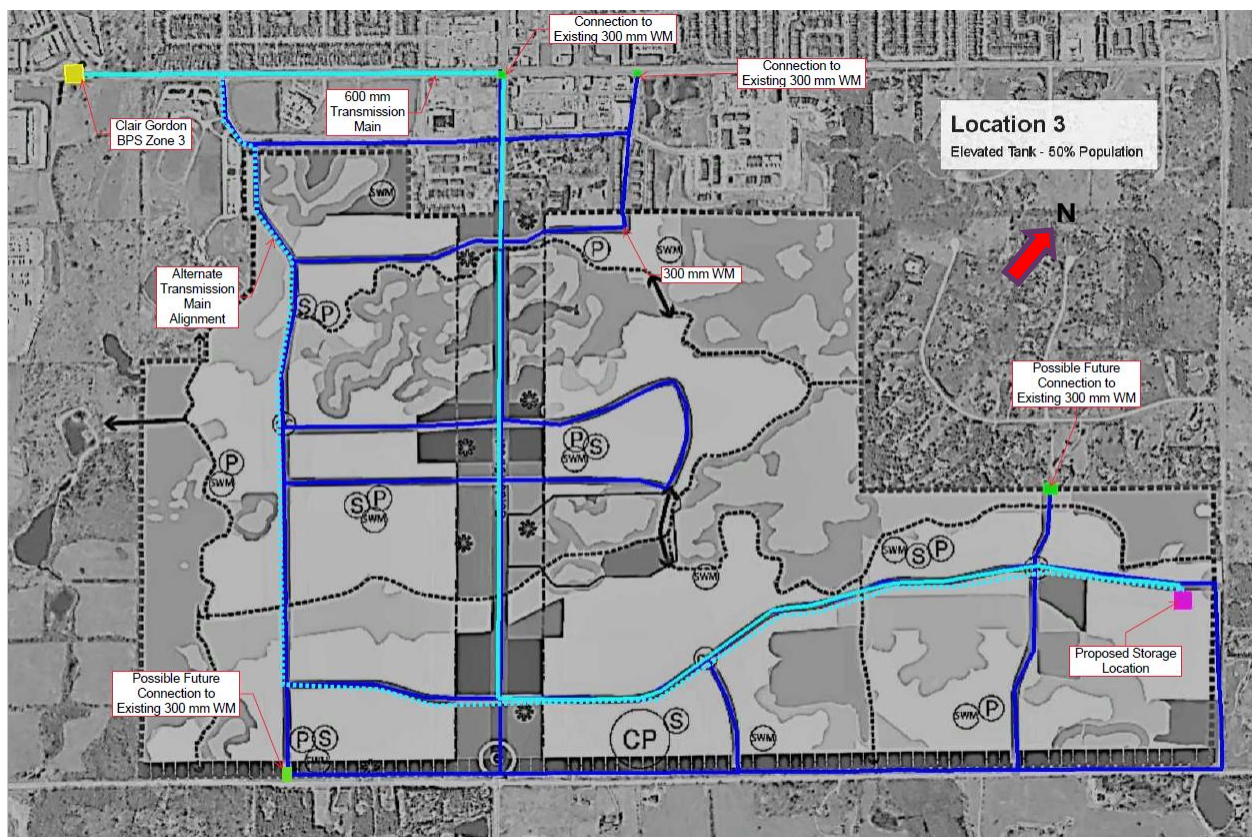


Figure 3.6. 50% Service Elevated Storage – Location 3

3.0 Conclusions and Next Steps

Three alternative solutions have been prepared and can be refined with the development of the Clair Maltby Secondary Plan Lands.

The alternative solutions as described in this report will be evaluated in consultation with the City of Guelph and Stakeholders as part of the Master Servicing Plan.

A preferred strategy will be developed, and a staging and implementation plan will be developed and described in the final **Technical Memorandum # W-3 Evaluation & Selection of Preferred Strategy**.

APPENDIX A

ALTERNATIVE COST BREAKDOWN



Estimated Cost of Water Servicing Alternative 2 (a) (i - iii)						
Clair Maltby Underground Storage - 25,059 People						
Item	Description	Unit	Quantity	Unit Cost	Extended Cost	Amount
1.0	Location 1					
1.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
1.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
1.03	600 mm Transmission Main in New Road	meter	608	\$1050/m	\$ 638,400	
1.04	600 mm Transmission Main in Existing Road	meter	619	\$1350/m	\$ 835,650	
1.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,000	
1.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
1.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
1.08	Underground Storage Reservoir (9.4 ML)	Unit	1	\$5600000/unit	\$ 5,600,000	
1.09	Storage Pumping System	LS	1	\$1200000/unit	\$ 1,200,000	
1.10	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate					\$	16,016,550
Contingency & Engineering Allowance 35%					\$	5,605,793
Total Cost Estimate (rounded)					\$	21,622,343
2.0	Location 2					
2.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
2.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
2.03	600 mm Transmission Main in New Road	meter	1528	\$1050/m	\$ 1,604,400	
2.04	600 mm Transmission Main in Existing Road	meter	1618	\$1350/m	\$ 2,184,300	
2.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,000	
2.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
2.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
2.08	Underground Storage Reservoir (9.4 ML)	Unit	1	\$5600000/m	\$ 5,600,000	
2.09	Storage Pumping System	LS	1	\$1200000/m	\$ 1,200,000	
2.10	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate					\$	18,331,200
Contingency & Engineering Allowance 35%					\$	6,415,920
Total Cost Estimate (rounded)					\$	24,747,120
3.0	Location 3					
3.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
3.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
3.03	600 mm Transmission Main in New Road	meter	3382	\$1050/m	\$ 3,551,100	
3.04	600 mm Transmission Main in Existing Road	meter	1739	\$1350/m	\$ 2,347,650	
3.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
3.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
3.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
3.08	Underground Storage Reservoir (9.4 ML)	Unit	1	\$5600000/m	\$ 5,600,000	
3.09	Storage Pumping System	LS	1	\$1200000/m	\$ 1,200,000	
3.10	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate					\$	20,441,725
Contingency & Engineering Allowance 35%					\$	7,154,604
Total Cost Estimate (rounded)					\$	27,596,329

Note that the cost of implementation is volatile and can vary considerably from the estimates provided.

Estimated Cost of Water Servicing Alternative 2 (b) (i - iii)

Clair Maltby Elevated Tank - 25,059 People

Item	Description	Unit	Quantity	Unit Cost	Extended Cost	Amount
1.0	<u>Location 1</u>					
1.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
1.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
1.03	600 mm Transmission Main in New Road	meter	608	\$1050/m	\$ 638,400	
1.04	600 mm Transmission Main in Existing Road	meter	619	\$1350/m	\$ 835,650	
1.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
1.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
1.06	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
1.07	Elevated Tank (6.3 ML)	Unit	1	\$7200000/unit	\$ 7,200,000	
1.08	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 16,417,025
Contingency & Engineering Allowance 35%						\$ 5,745,959
Total Cost Estimate (rounded)						\$ 22,162,984
2.0	<u>Location 2</u>					
2.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
2.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
2.03	600 mm Transmission Main in New Road	meter	1528	\$1050/m	\$ 1,604,400	
2.04	600 mm Transmission Main in Existing Road	meter	1618	\$1350/m	\$ 2,184,300	
2.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
2.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
2.06	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
2.07	Elevated Tank (6.3 ML)	Unit	1	\$7200000/unit	\$ 7,200,000	
2.08	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 18,731,675
Contingency & Engineering Allowance 35%						\$ 6,556,086
Total Cost Estimate (rounded)						\$ 25,287,761
3.0	<u>Location 3</u>					
3.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
3.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
3.03	600 mm Transmission Main in New Road	meter	3382	\$1050/m	\$ 3,551,100	
3.04	600 mm Transmission Main in Existing Road	meter	1739	\$1350/m	\$ 2,347,650	
3.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
3.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
3.06	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
3.07	Elevated Tank (6.3 ML)	Unit	1	\$7200000/unit	\$ 7,200,000	
3.08	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 20,841,725
Contingency & Engineering Allowance 35%						\$ 7,294,604
Total Cost Estimate (rounded)						\$ 28,136,329

Note that the cost of implementation is volatile and can vary considerably from the estimates provided.

Estimated Cost of Water Servicing Alternative 3 (a) (i - iii)

Clair Maltby Underground Storage - 12,500 People

Item	Description	Unit	Quantity	Unit Cost	Extended Cost	Amount
1.0	Location 1					
1.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
1.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
1.03	600 mm Transmission Main in New Road	meter	608	\$1050/m	\$ 638,400	
1.04	600 mm Transmission Main in Existing Road	meter	619	\$1350/m	\$ 835,650	
1.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
1.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
1.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
1.08	Underground Storage Reservoir (4.7 ML)	Unit	1	\$2850000/unit	\$ 2,850,000	
1.09	Storage Pumping System	LS	1	\$1100000/unit	\$ 1,100,000	
1.10	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 13,167,025
Contingency & Engineering Allowance 35%						\$ 4,608,459
Total Cost Estimate (rounded)						\$ 17,775,484
2.0	Location 2					
2.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
2.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
2.03	600 mm Transmission Main in New Road	meter	1528	\$1050/m	\$ 1,604,400	
2.04	600 mm Transmission Main in Existing Road	meter	1618	\$1350/m	\$ 2,184,300	
2.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
2.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
2.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
2.08	Underground Storage Reservoir (4.7 ML)	Unit	1	\$2850000/unit	\$ 2,850,000	
2.09	Storage Pumping System	LS	1	\$1100000/unit	\$ 1,100,000	
2.10	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 15,481,675
Contingency & Engineering Allowance 35%						\$ 5,418,586
Total Cost Estimate (rounded)						\$ 20,900,261
3.0	Location 3					
3.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
3.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
3.03	600 mm Transmission Main in New Road	meter	3382	\$1050/m	\$ 3,551,100	
3.04	600 mm Transmission Main in Existing Road	meter	1739	\$1350/m	\$ 2,347,650	
3.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
3.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
3.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
3.08	Underground Storage Reservoir (4.7 ML)	Unit	1	\$2850000/unit	\$ 2,850,000	
3.09	Storage Pumping System	LS	1	\$1100000/unit	\$ 1,100,000	
3.10	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 17,591,725
Contingency & Engineering Allowance 35%						\$ 6,157,104
Total Cost Estimate (rounded)						\$ 23,748,829

Note that the cost of implementation is volatile and can vary considerably from the estimates provided.

Estimated Cost of Water Servicing Alternative 3 (b) (i - iii)

Clair Maltby Elevated Tank - 12,500 People

Item	Description	Unit	Quantity	Unit Cost	Extended Cost	Amount
1.0	Location 1					
1.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
1.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
1.03	600 mm Transmission Main in New Road	meter	608	\$1050/m	\$ 638,400	
1.04	600 mm Transmission Main in Existing Road	meter	619	\$1350/m	\$ 835,650	
1.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
1.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
1.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
1.08	Elevated Tank (3.2 ML)	Unit	1	\$3657500/unit	\$ 3,657,500	
1.09	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 12,874,525
Contingency & Engineering Allowance 35%						\$ 4,506,084
Total Cost Estimate (rounded)						\$ 17,380,609
2.0	Location 2					
2.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
2.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
2.03	600 mm Transmission Main in New Road	meter	1528	\$1050/m	\$ 1,604,400	
2.04	600 mm Transmission Main in Existing Road	meter	1618	\$1350/m	\$ 2,184,300	
2.05	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
2.06	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
2.07	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
2.08	Elevated Tank (3.2 ML)	Unit	1	\$3657500/m	\$ 3,657,500	
2.09	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 15,189,175
Contingency & Engineering Allowance 35%						\$ 5,316,211
Total Cost Estimate (rounded)						\$ 20,505,386
3.0	Location 3					
3.01	300 mm Watermain in New Road	meter	11096	\$350/m	\$ 3,883,600	
3.02	300 mm Watermain in Existing Road	meter	5742	\$450/m	\$ 2,583,900	
3.03	600 mm Transmission Main in New Road	meter	3382	\$1050/m	\$ 3,551,100	
3.04	600 mm Transmission Main in Existing Road	meter	1739	\$1350/m	\$ 2,347,650	
4.01	Gate Valve	Unit	60	\$3500/unit	\$ 210,475	
4.02	Hydrant	Unit	140	\$6000/unit	\$ 840,000	
4.03	Standard RH 402.020 (2.4m x 2.4m Valve Chamber)	Unit	3	\$25000/unit	\$ 75,000	
4.04	Elevated Tank (3.2 ML)	Unit	1	\$3657500/m	\$ 3,657,500	
5.01	Valve Chambers	Unit	4	\$37500/unit	\$ 150,000	
Sub-Total Cost Estimate						\$ 17,299,225
Contingency & Engineering Allowance 35%						\$ 6,054,729
Total Cost Estimate (rounded)						\$ 23,353,954

Note that the cost of implementation is volatile and can vary considerably from the estimates provided.