

TECHNICAL MEMORANDUM TM2/3

DATE	March 1, 2018
TO	Shivan Narine, York Region
SUBJECT	Stouffville Water Storage Class EA Identification of Alternative Solutions and Selection of Class EA Schedule
FROM	Kevin Brown, P.Eng
PROJECT NUMBER	17100

1 Background

As part of the Stouffville Water System Upgrades Class Environmental Assessment (Class EA), TMIG has undertaken a review of the background information relating to the community's water supply. The purpose of this technical memorandum is to identify alternative solutions to meet the long-term service demands for the storage and water supply systems in Stouffville.

As part of the EA process, a comprehensive list of potential alternative solutions has been identified, with brief descriptions of these alternatives provided in the following section. This list will be reduced to three to four of the most reasonable/feasible alternatives, with these being carried forward for a more thorough review through subsequent phases of the Class EA process.

This memo also documents the preliminary review of the Municipal Class EA requirements and presents the rationale for the selection of the Schedule for the Stouffville Water Storage Class EA. The solutions will be classified in four categories that are described as Schedules A, A+, B and C in the Municipal Class Environmental Assessment (MCEA), Municipal Engineers Association October 2000, as amended in 2007 and 2011 & 2015. Table 1 provides details of the different project schedules under the MCEA.

TABLE 1 - DESCRIPTION OF PROJECT SCHEDULES UNDER THE MCEA

Schedule	Description
Schedule A	Schedule A projects are pre-approved and the public does not need to be informed and advance directly to Phase 5 (i.e. Complete contract documents, and proceed to construction and operation). Projects are limited in scale, have minimal adverse environmental effects and include a number of municipal maintenance and operational activities.
Schedule A+	Schedule A+ projects are pre-approved; however the public is to be informed prior to project implementation. There, would be no ability for the public to request a Part II Order. If the public has comments, they should be directed to the municipal council where they would be more appropriately addressed.
Schedule B	Projects have the potential for some adverse environmental effects. The proponent is required to undertake a screening process, involving mandatory contact with directly affected public and relevant review agencies, to ensure that they are aware of the project and that their concerns are addressed
Schedule C	Projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class EA document. Schedule C projects require that an Environmental Study Report be prepared and filed for review by the public and review agencies.

The Stouffville Water System consists of the following:

- Five supply Wells (Well 1, Well 2, Well 3, Well 5, and Well 6);

- Three storage facilities (Stouffville Zone 1 Elevated Tank, Stouffville Elevated Tank, Stouffville Reservoir);
- Three booster pumping stations (Highway 48 Booster Pumping Station, Stouffville Zone 1 Booster Pumping Station, and Stouffville Zone 2 Booster Pumping Station); and,
- Three Pressure Reducing Valves (PRV 1A, PRV 2A, and PRV 2B).

A lake-based supply is also provided through the Stouffville Zone 2 Pumping Station at the McCowan Reservoir.

2 Description of Alternative Solutions

In this Class EA, two classes of solutions are being considered:

- Supply Solutions; and,
- Storage Solutions.

This memo will describe the individual options for each of the Supply and Storage facilities, and present a matrix of which combinations of Supply/Storage options should be considered through the EA process.

2.1 Water Supply Options

This section will discuss the options related to supplying water to the Stouffville system for the year 2043 (just beyond the planning horizon of 2041). This horizon is being considered as it is known that Well 3 will require reinvestment at that time.

Wells 1, 2, and the Zone 2 Pumping Station (Lake Based Water Supply) have operational lives that extend past the planning horizon, and as such will be considered as an active water supply for the duration of the planning horizon. Figure 1 below, shows the Stouffville Water Supply with End of Service (EOS) for the various water supply facilities. These projected EOS dates represent decision points, where the Region can choose to re-invest in prolonging the service life of these facilities, or retire these facilities in favour of newer (and perhaps larger) modern facilities.

FIGURE 1 STOUFFVILLE WATER SUPPLY WITH PROJECTED END OF SERVICE LIFE

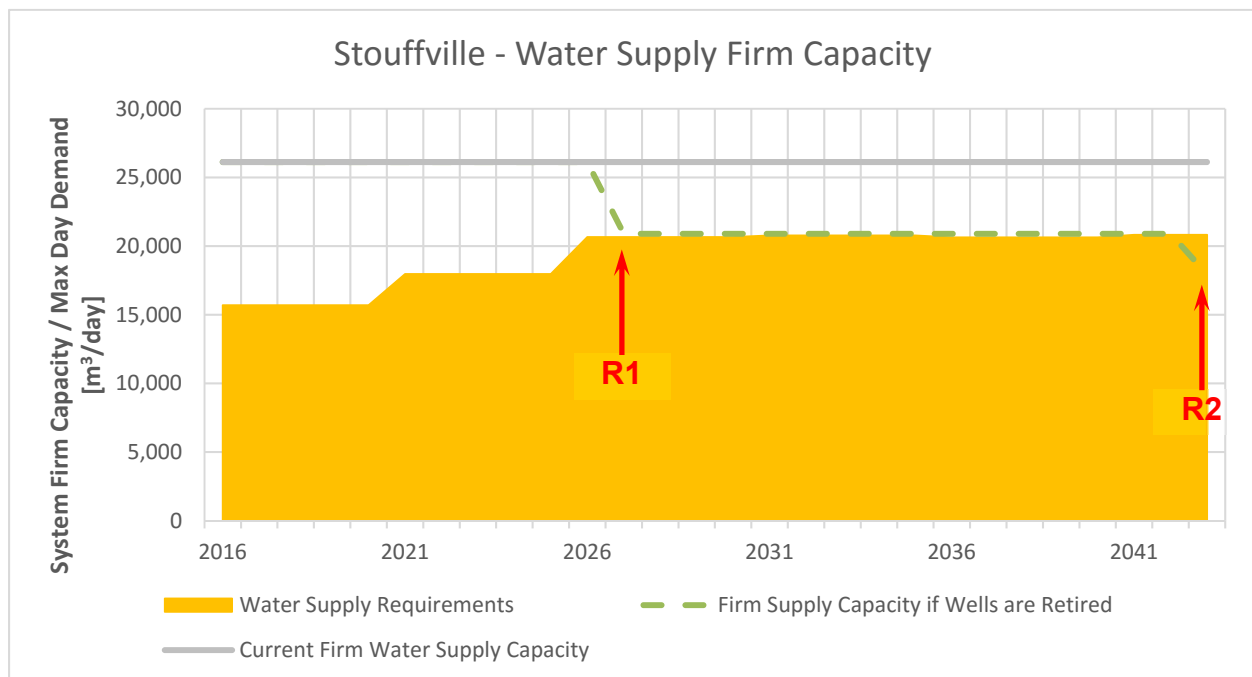


TABLE 2 - WELL 5, 6, AND 3 REHABILITATION COSTS

Rehabilitation Project	Well Number	Cost
R1	Well 5 and 6	\$1,756,258
R2	Well 3	\$578,265

2.1.1 Do Nothing

The “Do Nothing” alternative must be considered in all Class EAs. While it may not satisfy the objectives, it will serve as a baseline by which all other alternative solutions can be compared.

The “Do Nothing” alternative proposes no changes to the existing water supply system be considered for Stouffville. In this case, the facilities will continue to be maintained indefinitely, but without any expansion. Based on the information presented above, there will be no potential supply shortages until 2043, assuming that the existing facilities can continue to operate beyond their assumed end-of-service life. If Wells 5 and 6 are not maintained beyond 2026, the Stouffville water supply system will have to operate at near 100% of its remaining capacity.

This alternative will require reinvestment in the existing facilities, in particular Wells 3, 5, and 6. These three wells have recently had condition assessments completed which indicate that they will reach the end of their current service lives by 2026 (Wells 5 and 6) and 2043 (Well 3). This option involves extending the service life of wells 5&6 as well as Well 3 to beyond the planning horizon (2041). If all wells have their service life extended, Firm Water Supply Capacity (26,120 m³/day) will meet Water Supply Requirements through 2043.

This “Do Nothing” alternative will require in excess of \$2.3M in capital expenditures to rehabilitate the existing facilities.

This Supply Alternative will be carried forward to the detailed evaluation of alternatives, as a benchmark by which other alternatives are compared.

2.1.2 Limit Community Growth

As of 2015, the community plan was approximately 37,866 persons (as per the documented historical water production data). The projected population through to 2041 is approximately 64,671 persons (as per the population projections in the masterplan).

The existing water supply system (well plus the Lake-based supply) can accommodate a population of approximately 80,000. The population of Stouffville is not expected to exceed this value until well beyond the current planning horizon.

This Supply Alternative will NOT be carried forward to the detailed evaluation of alternatives.

This alternative does not fall under any Schedule in the MCEA since there is no infrastructure project associated with it.

2.1.3 Water Conservation

This option involves a conscious reduction in water consumption on a daily basis. The Region may impose regulatory measures (such as lawn watering restrictions) or provide incentives (such as rebates on retrofitting existing plumbing fixtures to low-water versions) in order to achieve the conservation requirement. Alternatively, the residents may voluntarily reduce their daily consumption to meet the requirements of a larger population.

This option does not involve building additional infrastructure, but the success of the program is difficult to guarantee.

A successful water conservation program could eliminate the re-investment required to maintain the capacity of some or all of the existing facilities as they reach the end of their service lives. In order to offset the potential loss of water production associated with the potential retirement of Wells 5 and 6, the projected 2041 water demands would need to be reduced by approximately 25%. To offset Well 3, a separate water demand reduction of approximately 14% would be needed.

Water conservation is actively being promoted by the Region, and the past successes of the program is reflected in the Region's declining water design criteria moving forward.

As such, Water Conservation (as a Class EA water supply alternative) **will not be carried forward to the detailed evaluation as a stand-alone alternative.** A continued commitment to water conservation is assumed to be a proactive step which will be implemented as a part of all of the Class EA supply alternatives.

2.1.4 Change the Percentage of Water Supplied from Lake-Based System

This option would involve retiring some or all of the existing well facilities when they reach the end of their service lives, replacing this production capacity with an increased supply from the Lake-based system. Overall, the firm capacity of the system would be maintained, and no increases to the total existing water supply system capacity (26,120 m³/day) would be required until beyond the current planning horizon.

This Supply Alternative will be carried forward to the detailed evaluation of alternatives.

This alternative would consist of increasing pumping capacity and also the retirement of existing well facilities. As such, two clauses within the MCEA process need to be considered:

From the Municipal Class Environmental Assessment (Appendix 1, Schedule A, Water Projects):

"2. Increase pumping station capacity by adding or replacing equipment where new equipment is located within an existing building or structure."

From the Municipal Class Environmental Assessment (Appendix 1, Schedule A+, Water Projects):

"5. Retire a water facility which would have been planned under Schedule B or C of the Municipal Class EA for its establishment."

In this instance, retiring the existing well facilities results in this needing to be undertaken as a Schedule A+ Class EA.

- One challenge with this is the risk associated with the single watermain from the District 2 BPS.
- Stouffville could be supplied by Zone 2 alone (average day), but Region needs to maintain at least winter average day supply capacity from the wells.

2.1.5 Expand Existing Wells

There are two potential mechanisms by which this alternative could be implemented:

- Option 1: Increase the supply capacity of remaining wells to replace production capacity of any wells that are retired at the end of their design life.
- Option 2: Install additional wells at existing well fields.

Option 1 would likely not require any additional land. Option 2 could require additional land if there is not adequate site capacity at the other remaining well sites. Both options could require expansion of the mechanical systems (pumps, chlorination, emergency power, SCADA upgrades), and possibly also expansion to the well houses and chlorine contact tanks. Expanding the mechanical systems may lead to potential issues with pipe capacity constraints in which case the piping system will need to be replaced with a new larger capacity system. Overall, this alternative may require extensive upgrades to the existing water system which may push its classification from B to C.

This Supply Alternative will be carried forward to the detailed evaluation of alternatives.

This alternative falls under Schedule B of the MCEA, with a potential of becoming Schedule C.

Appendix 1, Schedule B, Water Projects:

8. ***“Establish a well at a new municipal well site, or install new wells or deepen existing wells or increase pump capacity of existing wells at an existing municipal site where the existing rated yield will be exceeded. If a new water system is also required, this will become a Schedule C project.”***

2.1.6 Develop New Well Sites

This alternative involves installing a new well system at a different location from the existing wells. This alternative would involve a new water source complete with pumps, chemical systems (including sequestration and chlorination), and backup power. Depending on where a suitable site is identified, this alternative might also require an extension of the water distribution network. The Region might also have to purchase land in order to accommodate the new well in this alternative.

This Supply Alternative will be carried forward to the detailed evaluation of alternatives.

This Alternative falls under Schedule B of the MCEA, with a potential of becoming Schedule C.

Appendix 1, Schedule B, Water Projects:

8. ***Establish a well at a new municipal well site, or install new wells or deepen existing wells or increase pump capacity of existing wells at an existing municipal site where the existing rated yield will be exceeded. If a new water system is also required, this will become a Schedule C project.***

2.2 Water Storage Options

This section presents the options related to water storage in the Stouffville system for the year 2041 (the current planning horizon).

The Stouffville (Zone 1) Elevated Tank has an operational life that extend past the planning horizon, and as such will be considered as an active storage facility for the duration of the planning horizon. Figure 2 below shows the water storage capacities for the facilities in Zone 2 assuming dedicated fire storage in Zone 2 with End of Service (EOS) for the various storage facilities. The projected EOS dates represent decision points, where the Region can choose to re-invest in prolonging the service life of these facilities, or retire these facilities in favour of newer (and perhaps larger) modern facilities.

FIGURE 2 ZONE 2 STORAGE WITH DEDICATED FIRE AND END OF SERVICE SHOWN

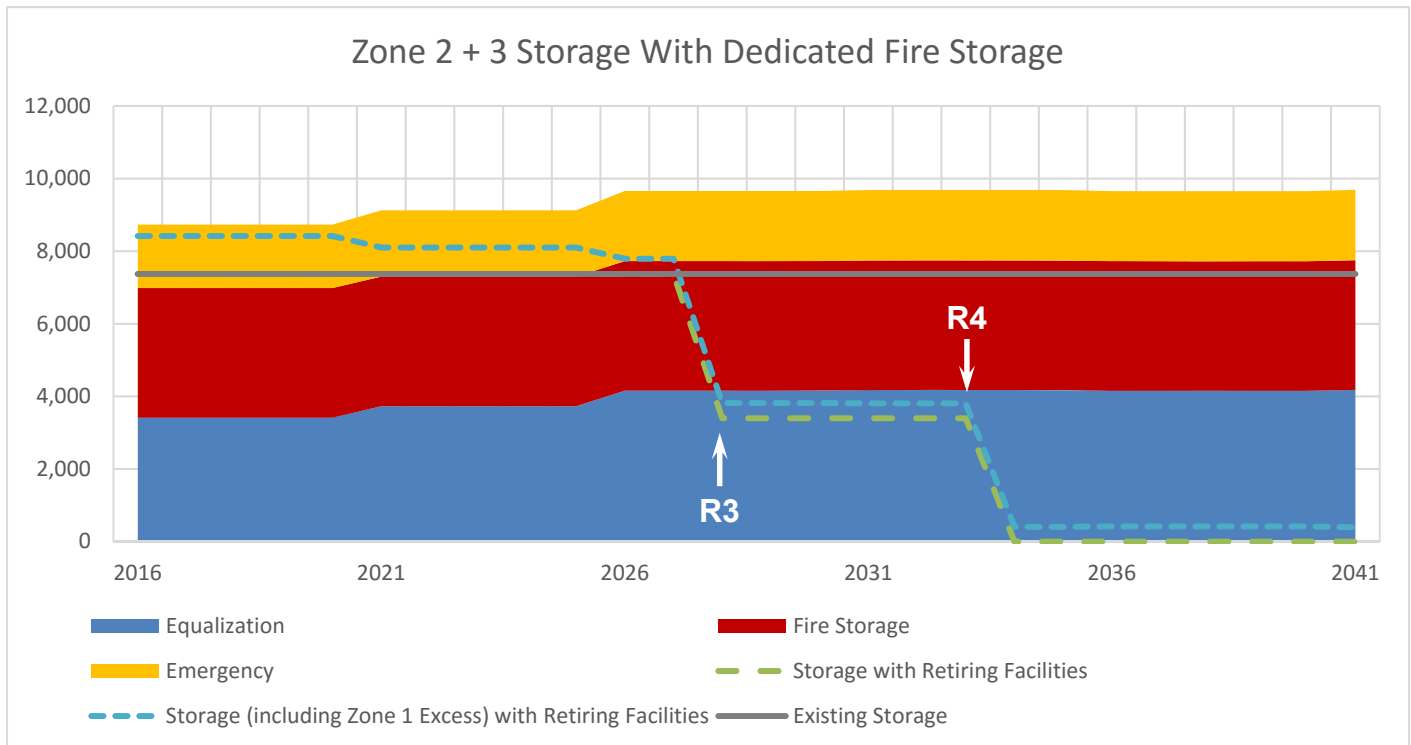


TABLE 3 - STOUFFVILLE RESERVOIR AND STOUFFVILLE ZONE 2 ELEVATED TANK REHABILITATION COSTS

Rehab Number	Water Storage Facility	Cost
R3	Stouffville Reservoir (East and West Cells)	\$796,000
R4	Stouffville (Zone 2) Elevated Tank	\$1,961,100

2.2.1 Do Nothing

The “Do Nothing” alternative proposes no changes to the existing water storage infrastructure servicing the Stouffville system. In this case, the facilities will be maintained indefinitely. There is currently a marginal storage deficit in Zone 2, which is presently being mitigated by excess storage capacity in Zone 1.

This alternative will require maintenance reinvestment in the existing facilities, consisting of an at-grade reservoir at the Well 5/6 site, and the Zone 2 Elevated Tank at the Well 3 site.

The “Do Nothing” alternative will result in deficient Zone 2 water storage volumes by approximately 2021. The Region’s desired level-of-service would not be met under this alternative.

This “Do Nothing” alternative will require approximately \$2.8M in capital expenditures to rehabilitate the existing facilities.

This Alternative will be carried forward to the detailed evaluation of alternatives, as a benchmark by which other alternatives are compared.

2.2.2 Limit Community Growth

As 2015, the current community plan is approximately 37,866 persons (as per the documented historical water production data). The projected population through to 2041 is approximately 64,671 persons (as per the population projections in the masterplan).

This alternative would limit community growth, such to reduce the impacts to storage and supply requirements. Based on Figure 2, the population would need to be limited to the present 2017 levels, and not permitted to grow.

This alternative would not satisfy the growth projections of the masterplan.

This Alternative will be carried forward to the detailed evaluation of alternatives.

This alternative does not fall under any Schedule in the MCEA since there is no infrastructure project associated with it.

2.2.3 Water Conservation

This option involves a conscious reduction in water consumption on a daily basis. The Region may impose regulatory measures (such as lawn watering restrictions) or provide incentives (such as rebates on retrofitting existing plumbing fixtures to low-water versions) in order to achieve the conservation requirement. Alternatively, the residents may voluntarily reduce their daily consumption to meet the requirements of a larger population.

This option does not involve building additional infrastructure, but the success of the program is difficult to guarantee. If successful, it is possible that the existing water storage would be able to support the desired growth, while maintaining the Region's level of service.

Water conservation is actively being promoted by the Region, and the past successes of the program is reflected in the Region's declining water design criteria moving forward.

As such, Water Conservation (as a Class EA water storage alternative) ***will not be carried forward to the detailed evaluation as a stand-alone alternative.*** A continued commitment to water conservation is assumed to be a proactive step which will be implemented as a part of all of the Class EA storage alternatives.

2.2.4 Build Additional Zone 2 Storage

Currently Zone 2 storage is accomplished through 2 facilities, Stouffville (Zone 2) Elevated Tank, and the Stouffville Reservoir (East and West Cells). Stouffville (Zone 2) elevated tank is rated for a volume of 3,400 m³, while the Stouffville Reservoir is rated for 5,132 m³ (2,136 m³ in the East cell, and 2,996 m³ in the West cell).

Stouffville Reservoir constructed in 1967 will reach the end of its service life in 2028, this applies for both the East and West cells (refer to Figure 2). Stouffville (Zone 2) Elevated Tank constructed in 1983, will reach the end of its service life in 2034 (refer to Figure 2).

Storage requirements for Zone 2 as of 2016 are 8,676 m³, this is greater than the existing storage capacity of 8,532 m³. Storage requirements up to 2043 for Zone 2 are 10,518 m³.

Additional storage of 1,986 m³ is required assuming current facilities have serviceable lives extended to the storage capabilities to 2043. As a sub-alternative, any new storage facility could be sized to allow for the retirement of an existing Zone 2 storage facility.

This Alternative will be carried forward to the detailed evaluation of alternatives.

This alternative falls under Schedule B of the MCEA:

From the Municipal Class Environmental Assessment (Appendix 1, Schedule B, Water Projects):

"6. Establish new or expand/replace existing water storage facilities."

2.2.5 Facilitate Shared Fire Storage Between Zone 1 and Zone 2 and Maintain Current Storage Facilities

In Figure 3, similarly water storage capabilities are shown with EOS but this time assuming shared fire storage with Zone 1.

This option involves facilitating shared fire storage between Zone 1 and Zone 2. Here fire storage would be provided by Zone 1 (which has an excess of available storage through the Zone 1 Elevated Tank) to Zone 2. For this to occur, the transmission capacity from Zone 1 to Zone 2 would need to accommodate a flow rate of 283.33 L/s (Fire Storage amount for a small population as per York Region Design Guidelines).

With shared fire storage, the supply requirements in the year 2043 are 6,056 m³ (refer to Figure 3). This requires both the Stouffville Reservoir and the Stouffville Zone 2 would to have their service lives extended to 2043.

There is currently a single pressure-reducing valve located along the boundary between Zone 1 and Zone 2, on the site of the Zone 2 Elevated Tank and Zone 1 Booster Station. The Region is presently designing a replacement to this PRV, to be installed within the Zone 1 Booster Station. In order to ensure the ability of Zone 1 to provide fire storage to Zone 2, a second PRV could be considered in order to maintain the system should one of the PRVs need to be taken off-line.

This Alternative will be carried forward to the detailed evaluation of alternatives.

This alternative falls under Schedule A of the MCEA:

From the Municipal Class Environmental Assessment (Appendix 1, Schedule A, Water Projects):

“1. Normal or emergency operational activities. Such activities may include but are not limited to the following:

- ...
- ***Install new service connections, hydrants and appurtenances from existing water mains.”***

FIGURE 3 ZONE 2 STORAGE WITH SHARED FIRE AND END OF SERVICE SHOWN

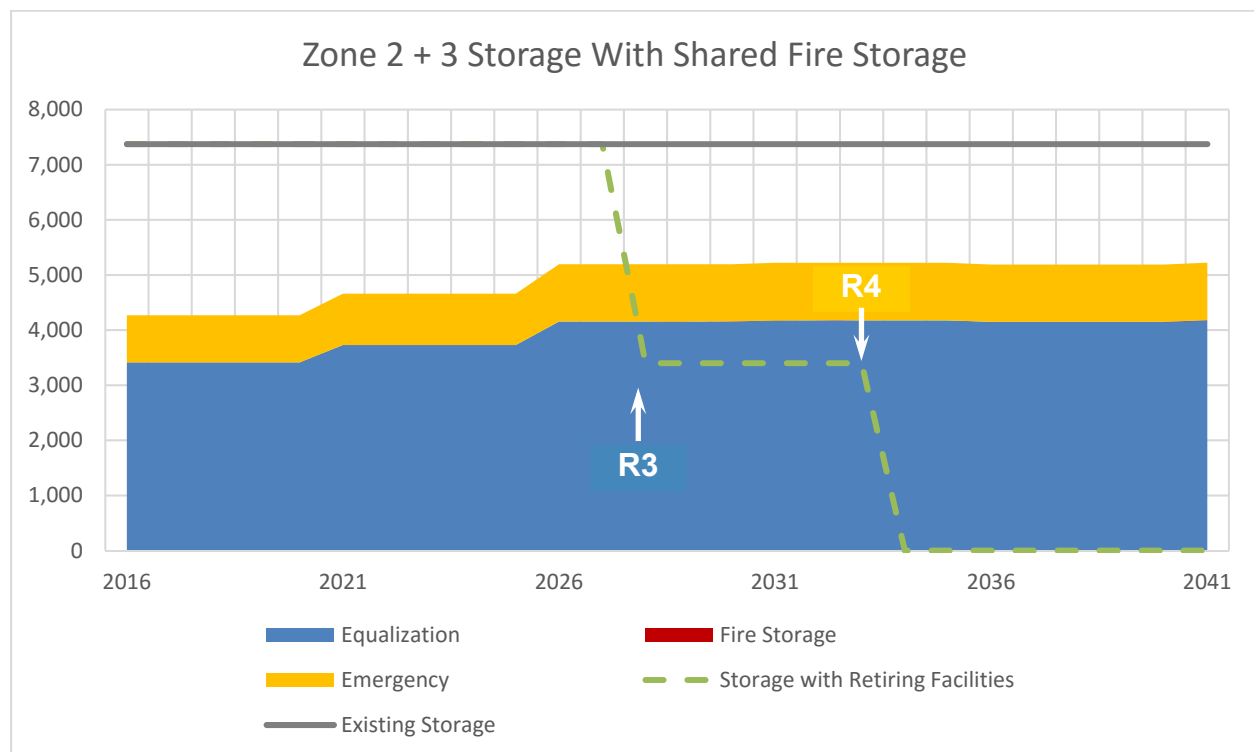


TABLE 4 - STOUFFVILLE RESERVOIR AND STOUFFVILLE ZONE 2 ELEVATED TANK SHARED FIRE STORAGE REHABILITATION COSTS

Rehab Number	Water Storage Facility	Cost
Rehab 3 (R3)	Stouffville Reservoir (East and West Cells)	\$796,000
Rehab 4 (R4)	Stouffville (Zone 2) Elevated Tank	\$1,961,100

3 Summary of Alternatives to be Considered

The summary of the Alternatives to be considered are presented in Table 5. Since this Class EA is considering both Supply and Storage Alternatives, these are presented in a matrix format.

Where individual alternatives are not being carried forward to the detailed evaluation, any of those “intersections” in the matrix are identified as Not Applicable (N/A) to this process. There are therefore 16 Alternative Combinations which will be considered through the process. As the Study progresses, some of these may be deemed redundant, and no longer considered.

TABLE 5 DESCRIPTION OF PROJECT SCHEDULES UNDER THE MCEA

			Supply Alternatives					
			Do Nothing	Limit Community Growth	Water Conservation	Change Percentage of Water Supply from Lake Based System	Expand Existing Wells	Develop New Well Sites
			No Class EA Schedule	Not carried forward	Not carried forward	Schedule 'A+'	Schedule 'B' (or 'C')	Schedule 'B' (or 'C')
Storage Alternatives	Do Nothing	No Class EA Schedule	No Class EA Schedule	N/A	N/A	Schedule 'A+'	Schedule 'B'	Schedule 'B'
	Limit Community Growth	No Class EA Schedule	No Class EA Schedule	N/A	N/A	Schedule 'A+'	Schedule 'B'	Schedule 'B'
	Water Conservation	Not carried forward	N/A	N/A	N/A	N/A	N/A	N/A
	Build Additional Zone 2 Storage	Schedule 'B'	Schedule 'B'	N/A	N/A	Schedule 'B'	Schedule 'B'	Schedule 'B'
	Supply Fire Storage from Zone 1	Schedule 'A'	Schedule 'A'	N/A	N/A	Schedule 'A+'	Schedule 'B'	Schedule 'B'

4 Selection of Class EA Schedule

The appropriate Class EA Schedule is identified for each combination of alternatives in Table 5. Combinations of Supply and Storage Alternatives (where appropriate) will consider the more stringent Class EA Schedule.

It is therefore appropriate to undertake this Class EA as a "Schedule B" undertaking. The Supply Alternatives which would expand existing wells or develop new well sites could become Schedule 'C' undertakings if new water systems are required. The selection of Schedule will be reconsidered as the alternatives are fully-developed.