The Regional Municipality of Durham

Works Department

Memorandum

Date: June 21, 2024

To: Regional Chair Henry and Members of Regional Council

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Subject: Regional Works Depot Rationalization and Asset Renewal Implementation Strategy

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Purpose

This memo provides information on the rationalization study completed by Stirling Rothesay Consulting for the Regional Works Department's five operations and maintenance Depots and outlines the proposed path forward to implement the report's recommendations.

Executive Summary

The Regional Municipality of Durham (Region) retained Stirling Rothesay Consulting to complete a rationalization study of the Regional Works Department Depots. The study, completed in December 2021, offered various recommendations to meet, improve, and forecast the future needs of the Works Depots in service to the public.

The primary objective of the rationalization study was to assess the current depot network and recommend the most effective and efficient means of operation and site utilization strategies to respond to the immediate, medium, and long-term needs of the Work's Depots as the Region experiences significant population growth. The study also considered opportunities to co-locate field functions across other groups within the Works Department and consolidate existing operational facilities and groups to improve efficiencies and leverage synergies for service delivery.

The Region currently has a network of five (5) Works Depots spread geographically throughout the Region. These are the Ajax/Pickering Depot, Oshawa/Whitby Depot, Orono Depot, Scugog Depot, and the Sunderland Depot. Staff at these depots carry out critical functions, maintaining the Regional road network and the sewer and water infrastructure. The five depots have vehicle service bays for the maintenance and repairs of Regional fleet vehicles, including ambulances, heavy equipment, trucks, and passenger-type vehicles.

The results of the rationalization study revealed that the age and condition of the existing depot assets require significant investment to bring them to current industry standards, improve staff productivity and improve service levels. Several depot facility structures pre-date the formation of the Region of Durham and are approaching the end of their expected asset life. In some instances, the structures have exceeded the asset life expectancy:

- The fleet service building at the Sunderland Depot was constructed in 1942 and was originally a horse barn before being converted to a fleet repair bay. Certain aspects of the horse stalls have been preserved and now serve as office spaces.
- The administration building at the Sunderland Depot was added in 1955.
- The Ajax Depot was constructed in 1973, and the Oshawa Depot was built in 1974.

The size of the facilities at most depots is inadequate to meet the Region's current needs and future growth. Continued population growth and the evolution of new technologies, vehicles, and equipment have expanded the requirements placed on the depots since they were initially constructed. The design of the existing facilities and use of the space are not optimal and do not follow industry best practices and design trends.

The rationalization study has identified key strategies that, when implemented, will not only enhance the Regional assets but also significantly improve employee safety and service delivery through greater operational efficiencies. These key recommendations are summarized below.

1. The Region's depot network design should continue to consist of five (5) decentralized Depots.

2. The Ajax/Pickering depot should be re-developed on the existing site.
3. The Oshawa/Whitby depot should be relocated, requiring land acquisition to establish a new site.
4. Other regional operations groups, such as Traffic Field Operations and Facilities Maintenance and Operations, should be consolidated at the new Oshawa/Whitby depot campus.
5. The Sunderland Depot should be relocated, requiring land acquisition to establish a new site.
6. Explore co-location opportunities with other Regional operational business units, external agencies, and municipal groups for partnerships at the new Oshawa/ Whitby depot and Sunderland depot campuses.
7. Additional vehicle maintenance bays, indoor vehicle storage, and wash bays should be included to satisfy growth requirements scheduled on a priority basis at each of the five depots.
8. A new Works depot is not required to be built in Seaton as this area can be suitably serviced from the expanded Ajax/Pickering depot.
9. Seek modifications to the service territory boundaries of each depot as the new Oshawa/Whitby and Sunderland depots are relocated.

Background

A network of five (5) existing Works Department depots are located throughout the Region. These five (5) depots are the Ajax/Pickering depot, Oshawa/Whitby depot, Orono depot, Scugog depot and the Sunderland depot. The service boundaries of each depot follow the municipal boundaries. Many of the existing depot building assets are approaching the end of useful life and need renewal.

Some Regional depots pre-date the Region's establishment, having been former County properties that were absorbed when the Region was formed.

The typical Works depot consists of a main administration building and ancillary buildings for vehicle storage, maintenance, material and equipment storage. Open areas of the compound provide safe vehicular circulation and outdoor storage of various materials and equipment used to maintain services across the Region. This includes road salt and brine-making equipment used in winter maintenance activities, granular and asphalt materials, snow-clearing equipment, piping, and valves for repairs and maintenance of the potable water distribution network and the sewage collection piping network.

Durham Region is the largest municipal Region in Ontario, and the population is expected to grow to more than one million by 2041. The Region recognized the need for a rationalization study of the Regional Works Depots and retained Stirling Rothesay Consulting to undertake the study, which was completed in December 2021. The report offers various recommendations to meet, improve and forecast the future needs of the Works depots in service to the public.

The rationalization study provided recommendations to improve service delivery and asset improvements across all Regional depots to support the long-term growth of the Region. The results of the study recommended that the Region maintain the current network of five (5) depots spread geographically throughout the Region with some consideration for modification to the existing service boundaries, that the Ajax depot be expanded at its current location, that the Oshawa/Whitby depot be relocated and expanded, and that the Sunderland depot be relocated and expanded. Functional changes were recommended for the Orono depot and Scugog depots.

Based on the above recommendations, a comprehensive facility master plan was developed for each depot site. These facility master plans detailed the preferred location and layout of the future site and included the programming and functional areas to be accommodated.

Optimization and Modernization

Some improvements were implemented at the existing depots, which required minimal investment but provided improvements to optimize the use of space within the existing buildings. This strategy would align with ongoing space optimization and modernization initiatives at other Regional facilities, such as the Headquarters building at 605 Rossland Road East and 101 Consumers Drive in the Town of Whitby. However, these modest improvements to the existing layout will not provide sufficient space to meet projected needs for future programming at the depots.

The furniture from Regional headquarters was repurposed and utilized at the Oshawa/Whitby depot administration area to optimize the existing layout. This provides a more modular layout, improves space utilization, and maximizes occupancy. It also promotes the ongoing vision of creating a hybrid workspace and supporting a mobile workforce by creating touchdown spaces for staff.

The same modernization principles will be adopted in the design of the new depots, which will create functional spaces that are welcoming and allow staff to work efficiently and collaboratively.

Environmental Sustainability and Climate Change Initiatives

The age of the current depot assets makes it difficult and cost-prohibitive to invest in upgrading the facilities and associated infrastructure to reduce greenhouse gas emissions and leverage greener energy alternatives. However, through the design and construction of the proposed expansion of the Ajax depot, relocation of the Oshawa/ Whitby depot and the Sunderland depots, opportunities to leverage the adoption of green technologies, thus reducing the Region's carbon footprint by implementing clean energy solutions will be available.

The buildings will be designed to function with reduced carbon output, improved energy efficiency and potentially net zero greenhouse gas emissions. Should the Region wish to pursue aggressive greening strategies and alignment with the Durham Standard in developing the new depot assets, these can be further developed, and detailed budget estimates can be presented at a future date. The budgets in Table 1 below do not include specific targets for GHG reductions or aggressive greening strategies.

Regional Fleet Greening Strategy

The existing infrastructure and building assets of the depots are restricted because of infrastructure limitations and the prohibitive cost of expanding and upgrading these services. With the renewal of the depot assets, the Region can also leverage the opportunity to enhance and support carbon reduction by implementing the infrastructure to advance the greening of the Regional fleet vehicles. Also, opportunities to explore alternative fuel for the vehicles and facilities to support the maintenance of these vehicles can be better supported in a new location.

If electrification of Regional fleet vehicles is adopted on a broader basis, the electric vehicle (EV) charging infrastructure for the expanded fleet can be installed as part of the base design of the new depots. Should the Region adopt other alternative fuels (for example, compressed natural gas (CNG) or hydrogen), the Region can quickly pivot to include the service bay infrastructure in the new facility designs, allowing for greater flexibility in the service of these different types of vehicles.

Co-location Opportunities

The design and construction of new locations for the Oshawa/Whitby and the Sunderland depots will provide co-location opportunities with internal and external groups.

The new Oshawa/Whitby depot could serve as a central “super depot” to consolidate many field-based functions of the Region in one facility. The campus for this new depot will house the depot maintenance operations and potentially the traffic operations and the facilities maintenance and operations business units. Although in the early planning stages, the sewer pumping station maintenance unit, which operates out of less-than-ideal facilities at the Corbett Creek WPCP, could relocate to the new Oshawa Depot location. If space allows, the water plant maintenance unit could also be consolidated at the newly renovated Ajax Depot location. These business units share similar work functions, and consolidation can result in operational synergies, lower facility operating costs (no duplicated buildings, staff common areas) and improved service levels.

The current fleet operations at the existing Oshawa/Whitby depot will be relocated to this new depot, which will allow for the much-needed expansion of service bays required to support the Regional fleet. The expansion will also enable the necessary infrastructure to service these vehicles with a focus on the greening of the fleet.

As further planning for this campus is developed, the Region will consider possible co-location opportunities with municipal partners and other external agencies. This objective aligns with the Region’s strategic goal of service excellence by optimizing resources and fostering partnerships to deliver exceptional quality services and value. This collaboration could also provide a seamless service experience for the public with the adoption of myDurham311 vision. The study has recommended the placement of this new depot further east. Therefore, leveraging the site planned for the new Durham Transit maintenance facility in north Oshawa is not in ideal alignment with the service delivery planned or sizing required for the new Works Depot.

Facility Master Plans

Since its construction, the services provided and requirements placed on the depots have evolved and expanded. The facility design and use of space are not optimal by today's standards. Stirling Rothesay Consulting developed Facility Master Plans for the Ajax/ Pickering, Oshawa/ Whitby, and Sunderland depots, with the recommendations that the Ajax/ Pickering depot be expanded on the current site and the Oshawa/Whitby and the Sunderland depots be relocated to new sites to allow for the expansion of services as the current sites are too small.

The Ajax depot should remain in its current location but expand its facilities and ancillary buildings to serve the growing community and demand for services. The current facilities at the Oshawa/ Whitby depot and the Sunderland depot are at the end of their useful life, and the recommendations are to replace these depots and spend minimal investment on the current infrastructure until the new depots can be built.

The master plans provided the preferred geographic location and service territory for the depots and will provide the foundation for future planning and design of the facilities. The programming and functional areas of each depot were also developed and summarized. The layout of the yard, showing the location of buildings and ancillary services to meet operational growth requirements, was presented. These master plans were used to develop the Class "D" cost estimates as shown in Table 1.

The following sections provide detailed information on the rationalization study and proposed projects, which are attached for reference. The 10-year forecast for the depot expansion is captured in **Table #1** below (based on Class 'D' estimates in 2022 dollars).

Table #1 – Depot Expansion 10-Year Forecast

Depot	Description	2023 ($M)	2024 ($M)	2025 ($M)	2026 ($M)	2027 ($M)	2028 ($M)	2029 ($M)	Total ($M)
Ajax/Pickering	Expansion Design	5.00	-	-	-	-	-	-	5.00
Ajax/Pickering	Expansion Construction	-	35.00	-	-	-	-		35.00
Oshawa/Whitby	Land Acquisition	38.00	-	-	-	-	-	-	38.00
Oshawa/Whitby	New Depot Design	-	5.00	-	-	-	-	-	5.00
Oshawa/Whitby	New Depot Construction	-	-	165.00	-	-	-	-	165.00
Sunderland	Land Acquisition	4.00	-	-	-	-	-	-	4.00

Depot	Description	2023 ($M)	2024 ($M)	2025 ($M)	2026 ($M)	2027 ($M)	2028 ($M)	2029 ($M)	Total ($M)
Sunderland	New Depot Design	-	4.00	-	-	-	-	-	4.00
Sunderland	New Depot Construction	-	-	42.00	-	-	-	-	42.00
Scugog	Additional Office Space – Design	-	-	-	0.28	-	-	-	0.28
Scugog	Additional Office Space – Construction	-	-	-	-	1.22	-	-	1.22
Scugog	New Salt/ Brine Storage Facility – Design	-	-	-	0.30	-	-	-	0.30
Scugog	New Salt/ Brine Storage Facility – Construction	-	-	-	-	3.20	-	-	3.20
Scugog	New 16 Bay Cold Vehicle Storage Bldg. - Design	-	-	-	0.22	-	-	-	0.22
Scugog	New 16 Bay Cold Vehicle Storage Bldg. - Construction	-	-	-	-	2.98	-	-	2.98
Orono	New Salt/ Brine Storage Facility – Design	-	-	-	-	-	0.35	-	0.35
Orono	New Salt/ Brine Storage Facility – Construction	-	-	-	-	-	-	3.15	3.15

Depot	Description	2023 ($M)	2024 ($M)	2025 ($M)	2026 ($M)	2027 ($M)	2028 ($M)	2029 ($M)	Total ($M)
Orono	New 20 Bay Cold Vehicle Storage Bldg. - Design	-	-	-	-	-	0.22	-	0.22
Orono	New 20 Bay Cold Vehicle Storage Bldg. - Construction	-	-	-	-	-	-	3.58	3.58
Grand Total	**-**	**47.00**	**44.00**	**207.00**	**0.80**	**7.40**	**0.57**	**6.73**	**313.5**

Financial Implications

The proposed depot renewal is a long-term investment that will be prioritized and implemented over 20 years. However, short-term funding is crucial to initiate the property search and acquisition process for the proposed relocation of the Oshawa/Whitby and Sunderland depots. The amounts shown in Table #1 for the Oshawa/Whitby depot and Sunderland depot include an estimate for the cost of acquiring property. However, due to the current market volatility, the final cost will depend on the location selected. The budget was developed based on 2022 dollars and includes a modest escalation for inflation and a five (5) per cent contingency for other unknown variability (e.g., COVID-19 cost pressures).

The initial funding for property acquisition and preliminary pre-design services for the priority one project tasks (a, b, & c) was approved in the 2023 budget, with funding in the forecast for detailed design and construction. After the priority one projects, financing for priorities two and three will be requested in subsequent years. Current investments on assets that will be replaced, such as the Oshawa/Whitby depot and the Sunderland depot, will be kept to a minimum to maintain service levels and conserve overall spending.

The table below reflects the estimated financing required to implement the recommendations of the report and support the renewal of the Works depots to meet the service level demands of the future.

Table – Estimated Cost of Implementing Depot Asset Improvements

Depot	Estimated cost ($)*	Priority for Implementation	Comments
Ajax/Pickering	40,000,000	1a	Expansion depot on existing site
Oshawa/Whitby	208,000,000	1b	Construct new depot on a new site
Sunderland	50,000,000	1c	Construct new depot on a new site
Scugog	8,200,000	2	Functional changes on the existing site
Orono	7,300,000	3	Functional changes on the existing site
Total	**313,500,000**	-	-

***Class 'D' Estimate in 2022 Dollars**

Conclusion

The depot rationalization study completed in 2021 identified the long-term depot facility needs for Regional services related to roads, water and sewer maintenance to continue in an effective manner.

Financing for the proposed redevelopment work has been included since the 2023 Business Plans and Budget for the Works Department and in the 10-Year Capital Forecasts.

A summary of the detailed project information is attached to this memorandum for your reference, with the depot rationalization study report (Attachment #1) and the individual master plans for the Oshawa/Whitby depot (Attachment #2), Ajax/Pickering depot (Attachment #3) and Sunderland depot (Attachment #4).

Attachments

Attachment #1 – Works Depot Rationalization Study Report

Attachment #2 – Oshawa/Whitby Depot Master Plan Report

Attachment #3 – Ajax/Pickering Depot Master Plan Report

Attachment #4 – Sunderland Depot Master Plan Report

For additional information please contact Christine Dunkley, Director, Corporate Infrastructure and Strategic Business Services, at 905-668-7711 extension 3475.

End of Memo

Attachment #1 - Works Depot Rationalization Study Report

Consulting Services for the Completion of a Rationalization Study for the Region of Durham's Works Department

Presented by: Stirling Rothesay **Consulting Inc.**

Date: December 8, 2021.

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1.0 EXECUTIVE SUMMARY

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots. This Report will focus on the completion of the Rationalization Study. A follow-up report will focus on the Facility Master Plans.

The Works Department's Operations and Maintenance Depots are referred to as:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

The objective of the **Rationalization Study** was to assess the Depots (as well as the subject operational groups and the potential Seaton Depot), and recommend the most efficient accommodation and site utilization strategy to respond to the immediate, medium (10 years) and long-term (20 years) needs of the Region's Works Department. The Study was to also assess opportunities to (1) consolidate existing operational facilities and operational groups to increase efficiencies and leverage synergies for service delivery, and (2) co-locate field functions with other groups within the Region.

The Study, therefore, needed to consider the following:

- How the forecasted growth in population (and other factors), within each of the service territories, would affect the infrastructure to be maintained, and the building space and equipment requirements to 2040;

- Whether the current alignment of service territories, for each of the Depots, should be shifted to improve the efficiency and effectiveness of service delivery;

- Which functions, and activities should be conducted at each of the Depots, to improve productivity and leverage synergies for service delivery;

- The efficacy of consolidating services/activities at certain Depots;

- Whether the locations of the Depots, within the current and preferred service territories, should be expanded or relocated, if feasible, over the next 20 years;

- The potential for consolidating and sharing existing or future Depot facilities with other operational groups within the Region (e.g., The Traffic Operations Group, The Facilities Maintenance and Operations Group, Durham Region Transit, etc.);

- The infrastructure to be maintained, and the building space and equipment requirements at each of the current and proposed Depots, to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department.

To achieve the Study's objectives, a Facility Needs Assessment was completed for the five Depots (as well as the subject operational groups and the potential Seaton Depot) looking at the immediate, medium (10 years) and long-term (20 years) requirements. The Assessment required the completion of the following tasks which are documented within this report:

- Identified general opportunities for the Works Department to streamline their business processes, incorporate new technology and operational best practices, and consolidate space so as to reduce operating costs while maintaining or improving service delivery;

- Identified general opportunities to improve the design of the Depots and the efficiency of space usage so as to reduce the need for space;

- Identified operational synergies between the different Departmental groups so as to reduce space requirements and operating costs;

- Estimated the impact (over the next 20 years) of changes in technology, legislation, built infrastructure, environmental requirements, population, traffic volumes, community expectations, and minimum service level standards on the growth in resource requirements (number of employees, and work vehicles) for the Works Department;

- Identified the optimal Depot network design as a blueprint for the number of Depots required, where they should be located, and what service functions they should provide in order to minimize operating costs and meet service level requirements;

- Developed a high-level space program for the indoor and outdoor storage requirements at each Depot (over the next 20 years) for employee, contractor and Region vehicles;

- Developed a high-level, conceptual block site plan (for the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots) to reflect the most efficient yard utilization strategy to respond to the immediate, medium and long-term needs of these locations;

- Estimated the construction costs to satisfy the needs of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

Like most Public Works facilities, the requirements placed on the five Depots and Traffic Operations Centre have expanded and evolved since they were originally built. As a result, (1) the size of the facilities at most Depots is insufficient to meet current needs and future growth requirements, (2) the design of the facilities and use of space are not optimal or compliant with industry best practices and design trends, (3) the age of some of the facilities is approaching the end of its expected asset life, (4) the flow of employees and vehicles within most of the Depots is not efficient, and (5) most of the Depots are not in the best location to efficiently satisfy the needs of the community. These issues have had a negative impact on employee productivity and the cost effectiveness of maintaining service levels.

Specific issues causing concern include:

- There is or will be a shortage of mechanics and vehicle maintenance bays at all of the Depots – especially at the Oshawa-Whitby Depot. These shortages have a direct impact on vehicle availability, crew productivity, and the ability of crews to meet service level requirements;

- At all of the Depots, there is insufficient indoor space for storing vehicles and equipment. As a result, vehicles and equipment that should be protected from the elements to maintain their safe functionality, increase their asset life, and reduce the need for repairs are, instead, stored outdoors year-round;

- All of the buildings are aging and some are either close to or beyond their expected asset life. As a result, the costs to maintain and repair these facilities will continue to increase in the coming years;

- At some of the Depots ((Oshawa-Whitby and Sunderland), growth requirements will result in insufficient space to store and manoeuvre the vehicles, equipment and materials safely and efficiently around the yard. This shortage of space will increase the time required to park the vehicles, and the risk of vehicle and pedestrian collisions.

To address the concerns documented in this report we have created a number of recommendations to help the Works Department improve employee safety, achieve operational synergies, increase space utilization, and satisfy space requirements for their employees, vehicles, equipment, and materials. The recommendations also describe the preferred Depot network design to minimize operating costs and meet service level requirements.
The main recommendations are as follows:

1. The Region’s Depot network design should continue to consist of five decentralized Depots and the Traffic Operations Centre (until it can be consolidated into a new Oshawa-Whitby Depot). Doing so will be the best approach to optimize the balance between reducing crew travel times, response times, fuel costs, and wear on the vehicles versus reducing facility capital and operating costs. Reducing travel times will have a significant impact on increasing employee productivity and the ability of the work crews to meet their service level requirements. These benefits, in our opinion, outweigh the

disadvantage associated with operating multiple facilities (i.e., duplication of certain functional areas resulting in less efficient overall use of space).

Below, in Table 1.1, we summarize the proposed locations for each of the Works Department's functional groups.

Table 1.1 – Proposed Locations for Each of the Works Department Functional Groups

Location	Departments/Groups								
	Roads	Water & Sewer	Fleet Services	Water Meter	MTLS	Traffic Operations	FMO	SWAT	Training
A-P Depot	Yes	Yes	Yes						
O-W Depot	Yes	Yes	Yes	Yes	Yes			Yes	Yes
Orono Depot	Yes	Yes	Yes						
Scugog Depot	Yes	Yes	Yes						
Sunderland Depot	Yes	Yes	Yes						
Traffic Operations Centre						Yes	Yes		
Proposed New O-W Depot (in 2040)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

2. The Region should redevelop the Ajax-Pickering Depot as soon as funding will permit (preferably within 10 years) due to the advanced age of the main building, the operational need for more indoor space, and the limitations of the yard's layout. Detailed recommendations on how best to proceed will be discussed in the Master Plan Report.

3. The Region should develop a plan to acquire a new site for the relocation of the Oshawa-Whitby Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to operational needs and the limitations of the current site). When the Greenbelt and local zoning restrictions are taken into consideration the best location would be between Ritson Rd. North and Highway 407 (north of Conlin Rd. E.).

   There could be some synergies achieved by building the Depot at the location planned for the new Durham Region Transit bus storage and maintenance facility (if the office functions shared the same building). However, the savings in construction costs for the combined facility (by reducing space requirements) would be far less than the cost of the added crew travel times over the lifespan of the facility.

We also believe that the Traffic Operations Group and the Facilities Maintenance and Operations Group should be consolidated into the new Depot site. Doing this would achieve numerous synergies between the three operations and would eliminate the duplication of common spaces: employee amenities, training rooms, shops, and parts storage. It would also provide the operations with the opportunity to better collaborate, and to work within new facilities that achieve best practices in design and promote operational productivity;

4. A new Depot should not be built in Seaton for the Works Department. The Seaton area is within an acceptable driving distance for work crews from the Ajax-Pickering Depot. That said, we would support storing some indoor/outdoor materials at a Seaton Depot so that work crews (working in the area) could replenish without having to drive back to the Ajax-Pickering or Scugog Depots. But this would be dependant on Transit and Waste deciding to build facilities there;

5. The size of the site for the Sunderland Depot is too small to satisfy future growth requirements. Furthermore, the buildings are old and inefficient in terms of layout and energy conservation. Therefore, the Region should develop a plan to acquire a new site for the relocation of the Sunderland Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to the age of the buildings, operational needs, and limitations of the current site). Detailed recommendations on how best to proceed will be discussed in the Master Plan Report.

6. Recommendations for additional maintenance bays, indoor vehicle storage and wash bays were provided for each of the five Depots and the Traffic Operations Centre to satisfy growth requirements to a horizon of 2040. More details will be provided for the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots in their Master Plan Reports.

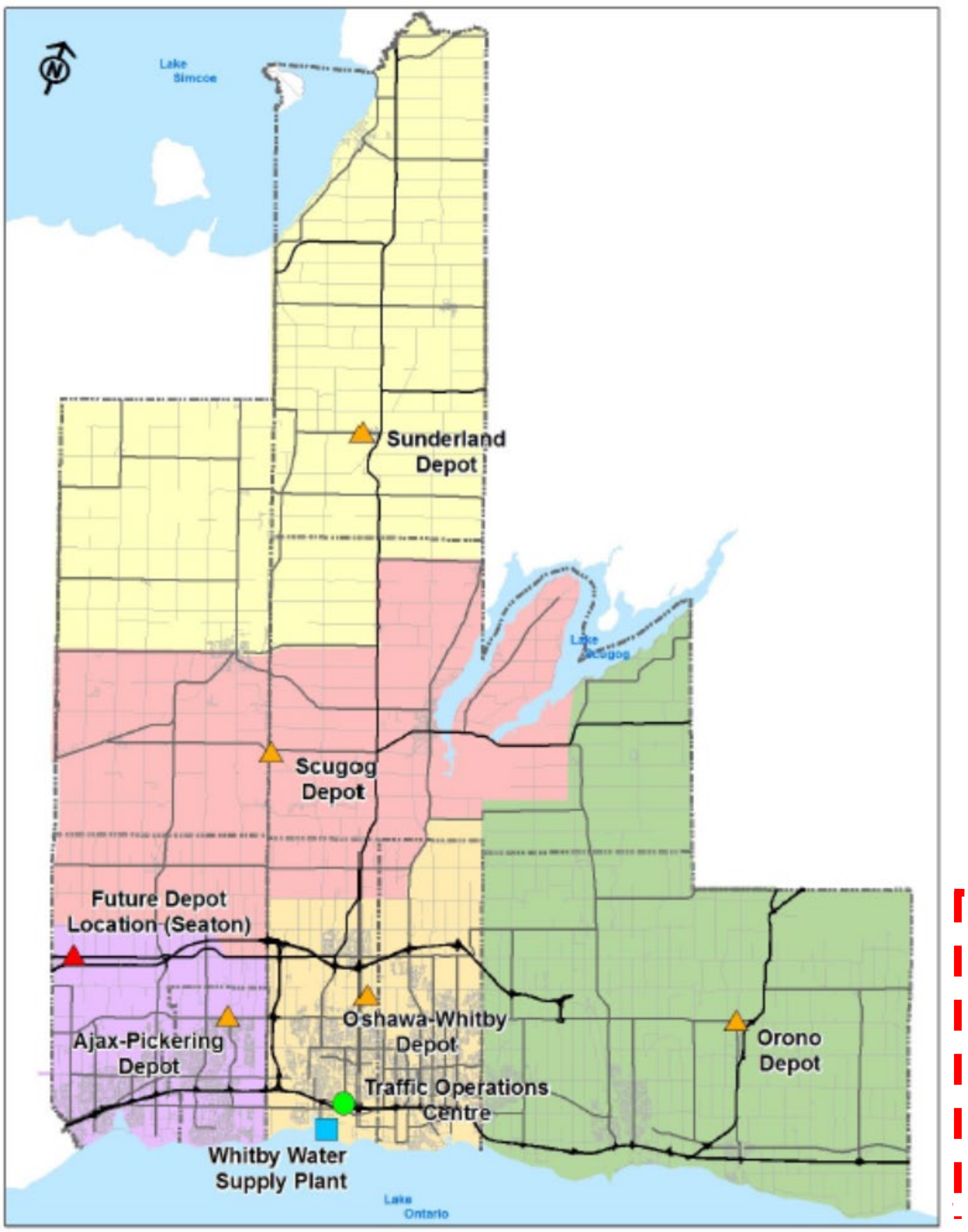
7. Medium and slow-moving parts stock, and critical spares, should be consolidated into the central parts warehouse at the Oshawa-Whitby Depot. Dead stock (i.e., has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. This would help to justify the use of high-density storage systems and automation, reduce labour and space requirements, and reduce warehouse costs.

8. The Region should further analyse the potential benefits of using Vendors or 3PL’s (Third Party Logistics provider’s) to manage the fast movers (e.g., parts stock with ten or more turns per year) off-site and replenish the parts warehouse, as required. This would reduce on-site storage space requirements within the stockroom at the Oshawa-Whitby Depot.

9. The line marking crew(s) for the Traffic Operations Group should be relocated to the Oshawa-Whitby Depot which is more centrally located and offers Fleet maintenance on-site.

10. The current service territory boundaries for each of the Depots appear to be based on the municipal boundaries. They should, instead, be based on reducing overall travel times by the work crews. Therefore, the five current service territories should be redrawn as shown by the red dashed lines on Map 1.1, below. Redrawing the service boundaries would help to minimize crew travel times, deadhead times, response times, fuel costs, and wear on the vehicles.

Map 1.1 – Proposed Service Territory Boundaries



2.0 INTRODUCTION

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

The Region's operations and maintenance activities are currently delivered from five Works Department Depots:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

Like most Public Works facilities, the requirements placed on these five Depots have expanded and evolved since they were originally built. As a result, the size of the facilities and outdoor yard storage areas may be insufficient to meet current or future growth requirements. In addition, the current use of space and flow of employees and vehicles may not be optimal or compliant with industry best practices and design trends. Furthermore, the Depots may no longer be in the optimal location to efficiently satisfy the service needs of the community.

In fact, since 2009, requests for additional facility space and modifications have been brought forward by staff (of the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) to accommodate expanding population growth and community needs, equipment and technological changes, environmental, and legislative needs. However, these requests have been put on hold pending the outcome of the Rationalization Study and Master Plans.

Therefore, the Region requires a **Rationalization Study** that will assess the five Depots (as well as the subject operational groups and potential Seaton Depot), and recommend the most efficient accommodation and site utilization strategy to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department. The Study should also assess (1) opportunities to consolidate existing operational facilities and operational groups to increase efficiencies and leverage synergies for service delivery, and (2) opportunities to co-locate field functions with other groups within the Region including, but not limited to, Durham Region Transit maintenance and operations facilities.

The Study will consider the following:

- How the forecasted growth rates of population, employment, and traffic volumes, within each of the service territories, will affect the infrastructure to be maintained, and the building space and equipment requirements to 2040;
- How these forecasts will affect the data and recommendations within the 2009 Report completed by AECOM;
- Whether the current alignment of boundaries, for the service territories for each of the Depots (including the proposed new Seaton Depot), should be shifted to provide the most efficient and effective service for the territories;
- The current and future functions, use, and activities that should be conducted at each of the Depots (including the proposed new Seaton Depot), to improve productivity and leverage synergies for service delivery;
- The efficacy of consolidating services/activities at certain Depots. For example:
    - providing all water and sewer infrastructure services from a single Depot for all service territories;
    - providing emergency repair operations from two Depots – one in the south and one in the north;
- How best to deliver services to the northern communities of the Region in conjunction with the Sunderland Depot;
- Whether the locations of the Depots, within the current and preferred service territory boundaries, should be expanded or relocated, if feasible, over the next 20 years. For example, should the entire Ajax-Pickering service territory be consolidated to a single location – either at the proposed Seaton Depot or a different location;
- For those Depots that should be relocated, where would be the preferred geographic location, and what would be the relocation cost;
- The potential for consolidating and sharing existing or future Depot facilities with other operational groups within the Region (e.g., The Traffic Operations Group, The Facilities Maintenance and Operations Group, Durham Region Transit, etc.). This could be through the expansion of existing facilities or new facilities. Also, what the full impact of these consolidations would be;
- The infrastructure to be maintained, and the building space and equipment requirements at each of the current and proposed Depots (including the proposed new Seaton Depot), to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department.

In addition, the Region requires a **Facility Master Plan** for each of three Depots (the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) including the accommodation of relocated operational service groups, if recommended. The Facility Master Plans will consolidate, for each of the Depots, the analysis and recommendations from the Rationalization Study for the immediate, short term (5 year), medium term (10 year) and long term (20 year). This will include the following:

- The preferred geographic location and service territory for each Depot;
- The current and future functions, use, and activities that should be conducted at each of the Depots;
- The infrastructure to be maintained, and the building/yard space and equipment required to 2040 (for employees, vehicles, equipment, parts, and materials). This will include the following functional areas:
    - Site access points;
    - Administrative areas;
    - Employee lunch room, locker rooms, and washrooms;
    - Training facilities;
    - Vehicle fueling stations;
    - Fleet washing;
    - Fleet maintenance and parts storage (including receiving/shipping);
    - Equipment and Material storage;
    - Indoor versus outdoor vehicle parking;
    - Vehicle staging areas;
    - Staff parking;
    - Vehicle traffic patterns (fleet, employee) and pedestrian circulation;
- Any facility/yard design issues or deficiencies negatively affecting operational flow, productivity, working conditions, environmental stewardship, and/or service delivery;
- Site safety and security issues;
- The need for facility upgrade requirements or new/expanded facilities;
- The potential impact of proposed developments on the area adjacent to the Depots

The Facility Master Plans will also provide (1) an optimized site and facility conceptual plan, (2) detailed Class "D" cost estimates for building and yard upgrades/expansions/new facilities, and (3) a sequence of events implementation schedule required to achieve the upgrades/expansions/new facilities.

The objectives of the Facility Master Plans include making recommendations that will (1) provide safe and efficient work conditions, (2) make best use of the existing site and facilities, (3) provide efficient flow of employees and vehicles through the yards, (4) meet industry best practices in facility and yard layout design, and (5) meet the operational growth requirements over the next 20 plus years.

This report will focus on the Rationalization Study. The Facility Master Plans will be completed separately in a companion Report.

3.0 FACILITY NEEDS ASSESSMENT

This section describes the current and future state facility needs (to the year 2040) for the Region of Durham's Works Department's (1) five Operations and Maintenance Depots, and (2) the Traffic Operations Group, and the Facilities Maintenance and Operations Group.

The Region's five Depots are referred to as:

- Ajax-Pickering Depot;
- Oshawa-Whitby Depot;
- Orono Depot;
- Scugog Depot;
- Sunderland Depot.

In addition, there are two Operations Groups: the Traffic Operations Group, and the Facilities Maintenance and Operations Group. The Traffic Operations Group is located at the Regions Traffic Operations Centre. The Facilities Maintenance and Operations Group is scheduled to be relocated to the Traffic Operations Centre (from the Region's Whitby Water Supply Plant) in 2023.

3.1 Current State

This section describes the current state location, size, service boundaries, service functions and locations, and resources for each of the Works Department's five Depots and two Operations facilities. It also describes (1) the characteristics of the key functional work areas, (2) the limitations that the current buildings and yards place on the ability of the employees to operate efficiently and effectively, and (3) the opportunities to eliminate business process inefficiencies.

3.1.1 Location, Size and Service Boundaries (For Each Depot)

The Region of Durham was established in 1974 and is the largest geographical jurisdiction in the Greater Toronto Area encompassing approximately 2,532 km^2 of land and almost 800,000 residents. The vast majority of the residents live in the five southern municipalities of Pickering, Ajax, Whitby, Oshawa, and Clarington.

To service this vast area, the Region of Durham's Works Department operates five Depots which are distributed, strategically, across the Region. In addition, the Works Department operates the Traffic Operations Group, and the Facilities Maintenance and Operations Group from two Operations facilities.

On the following page, in Table 3.1, we describe the current location, size and service boundaries for each of the Depots and Operations facilities:

Table 3.1 - Current Location, Size and Service Boundaries

Depot/Facility	Location	Size of Site (acres)	Total Indoor Space (ft^2)	Service Boundaries
Ajax-Pickering Depot	202 Salem Rd., Ajax	14.75	17,425 (excluding separate buildings)	The entire City of Pickering and the Town of Ajax
Oshawa-Whitby Depot	825 Conlin Rd., Whitby	14.9	51,500	The entire City of Oshawa and the Town of Whitby
Orono Depot	3480 Taunton Rd., Orono (Clarington)	10	20,478 (4,806 for material storage bldg.)	East part of Durham Region - Clarington
Scugog Depot	10 Regional Rd.21, Port Perry	80	11,301 (2,348 for steel storage bldg.)	Central part of Durham Region - Scugog
Sunderland Depot	S995 Regional Rd. 10, Sunderland	4.02	8,201 (main building and service garage)	North part of Durham Region – Uxbridge and Brock
The Region's Traffic Operations Center	101 Consumers Drive, Whitby	3.5	44,518	Region of Durham
The Region's Whitby Water Supply Plant	301 Water Street West, Whitby			Region of Durham

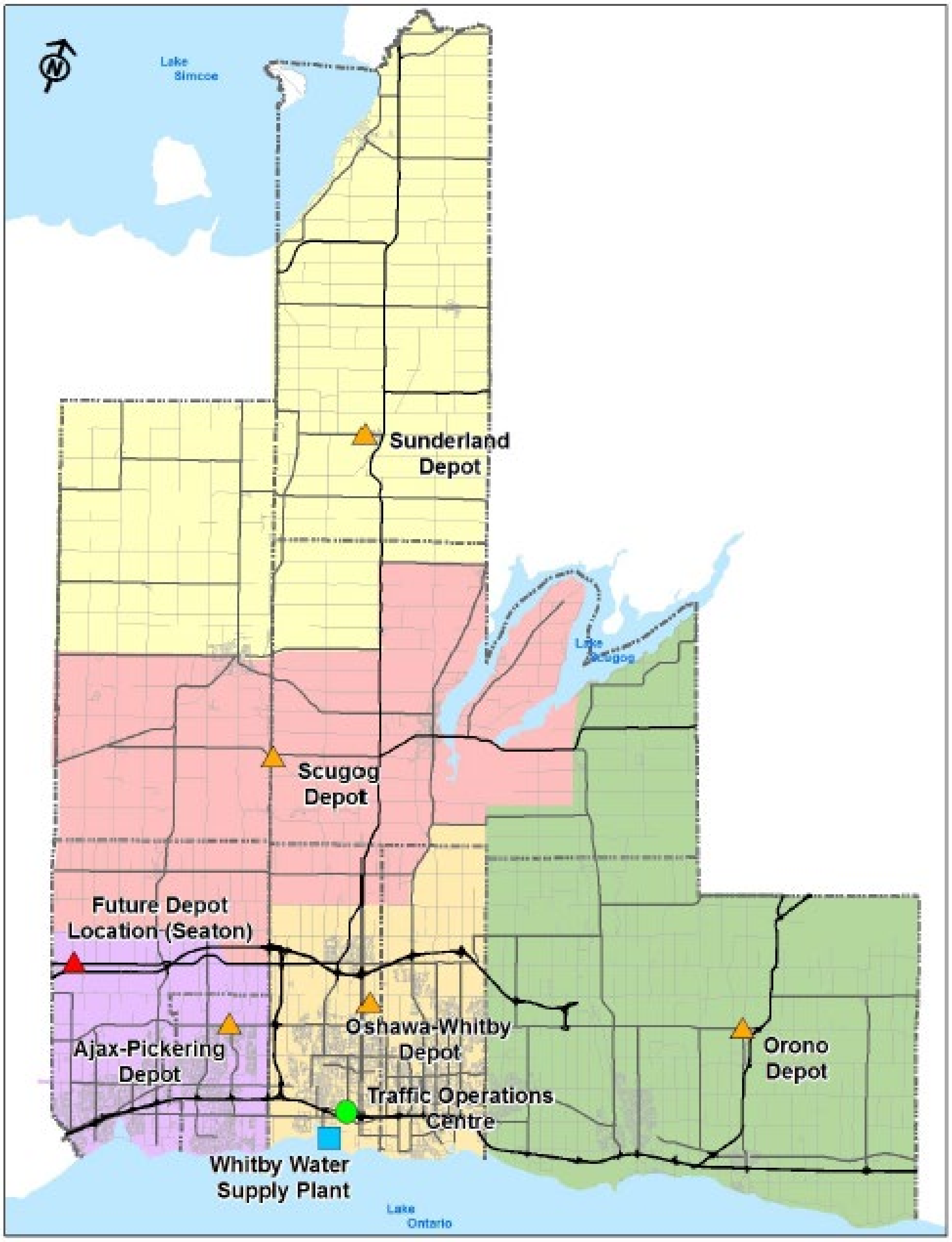
It should be noted that the Region is considering building a new Depot in Seaton which would service the community of Seaton as well as the northern areas of Pickering and Ajax. The property is located on the north side of Highway 7, west of Sideline 32.

On the following page, we show Map 3.0 which identifies the location of the five Depots, the two Operations facilities, and their respective service boundaries. It also identifies the location of the potential Depot in Seaton.

3.1.2 Service Functions and Service Locations

The Region's Works Department is responsible for a number of service functions including operating and maintaining the Region's (1) network of roads and bridges, (2) networks of water, storm water, and sanitary sewage piping, (3) traffic signals, warning devices, roadside protection and line markings, and (4) buildings. In this section, we describe the service functions performed from each of the Department's five Depots and two Operations facilities.

Map 3.0 – Current Location of the Works Department Depots and Operations Centres



Ajax-Pickering Depot

Roads Department
The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads, bridges and culverts. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store a large quantity of road salt (for winter road maintenance) and smaller quantities of other materials (such as gravel, cold-patch,

etc.). The employees are provided with parking and indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water and Sewer Departments
The Water and Sewer Departments also operate a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations.

Fleet Services Department
The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Ajax-Pickering Depot they provide two licensed mechanics who service the fleet of Roads and Water Department vehicles. They operate on the day shift using two maintenance bays, and provide Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

Oshawa-Whitby Depot

Roads Department
The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads and bridges. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store a large quantity of road salt (for winter road maintenance) and smaller quantities of other materials (such as gravel, cold-patch, etc.). The employees are provided with parking and indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water and Sewer Departments
The Water and Sewer Departments also operate a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations. Approximately 45% of the service activities for the Region are conducted by the staff located at the Oshawa-Whitby Depot.

Fleet Services Department
The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Oshawa-Whitby Depot they provide eight licensed mechanics who service the fleet of Roads, Water, and Water Meter Department vehicles. They operate on the day shift using eight maintenance

bays, and report to a Supervisor and the Depot Superintendent located on-site. The bays provide space for Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

Water Meter Division
The Water Meter Division operates as a centralized group (at the Oshawa-Whitby Depot) to provide water meter maintenance and replacement across the Region. The Division has three clerks and eight meter mechanics and maintains a fleet of eight Service Repair Vans which need to be stored indoors. The mechanics have use of a lab to calibrate meters and check for faults.

Materials Testing and Laboratory Services (MTLS)
The MTLS operates as a centralised group (at the Oshawa-Whitby Depot) to complete concrete, asphalt and soil testing for construction contractors. They have six full-time employees and two temporary employees all of whom are located at the Oshawa-Whitby Depot because of its south-central location (to minimize driving distances). They operate within the Depot and also provide four vehicles for the inspectors.

Sewer and Water Appurtenance Testing (SWAT)
The Region's SWAT team has six full-time employees and two temporary employees. The Manager and Supervisor need to be located at the Region's Headquarters, but the other six employees are consolidated at the Oshawa-Whitby Depot because of its south-central location (to minimize driving distances). They operate three service vehicles.

Training
The Training group has three full-time employees who provide training to Durham Region staff and employees on topics such as Maximo, WHMIS, Confined Space, and First Aid. All of the employees are located at the Oshawa-Whitby Depot because of its south-central location (to minimize driving distances).

Orono Depot

Roads Department
The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads and bridges. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store a large quantity of road salt (for winter road maintenance) and smaller quantities of other materials (such as gravel, cold-patch, etc.). The employees are provided with parking and indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water and Sewer Departments
The Water and Sewer Departments also operate a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require

indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations.

Fleet Services Department
The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Orono Depot they provide two licensed mechanics who service the fleet of Roads and Water Department vehicles. They operate on the day shift using two and a half maintenance bays, and provide Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

Scugog Depot

Roads Department
The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads and bridges. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store a large quantity of road salt (for winter road maintenance) and smaller quantities of other materials (such as gravel, cold-patch, etc.). The employees are provided with parking and indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water Department
The Water Department also operates a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations.

Fleet Services Department
The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Scugog Depot they provide one licensed mechanic who services the fleet of Roads and Water Department vehicles. He operates on the day shift using two maintenance bays, and reports to a Supervisor and the Depot Superintendent. The bays provide space for Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

Sunderland Depot

This is the smallest Depot though it still provides full services to its territory.

Roads Department
The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads and bridges. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store a large quantity of road salt (for winter road maintenance) and smaller quantities of other materials (such as gravel, cold-patch, etc.). The employees are provided with parking and indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water Department
The Water Department also operates a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations.

Fleet Services Department
The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Sunderland Depot they provide one licensed mechanic who services the fleet of Roads and Water Department vehicles. He operates on the day shift using two and a half maintenance bays, and reports to a Supervisor and the Depot Superintendent located on-site. The bays provide space for Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

In addition, the Works Department operates the Traffic Operations Group, and the Facilities Maintenance and Operations Group from two facilities – The Region’s Traffic Operations Centre, and The Region’s Whitby Water Supply Plant. Below we describe the service functions performed by each of these Groups:

Traffic Operations Centre

The Traffic Operations Group’s service functions include the construction and maintenance of traffic signals and warning devices, roadside protection (guardrails), pavement line markings, and sign manufacturing and installation. Their facility contains an electronic lab and sign shop, the traffic engineering and signal control group, and related administrative staff. Maintenance of the fleet of vehicles is provided at the Oshawa-Whitby Depot.

Housed in the same building are staff from the Health Department. Also, planning to move into the building, in 2023, is the Facilities Maintenance and Operations Group (see below).

Whitby Water Supply Plant (FMO Group)

The Facilities Maintenance and Operations Group provides the facility maintenance for the Region of Durham's buildings (including the coordination of outside contractors for specialty functions). Their current main facility contains equipment storage, shop space, and administrations office space. Many of the employees are stationed at their work site which is the Durham Region Headquarters Building. Maintenance of the fleet of vehicles is provided at the Oshawa-Whitby Depot. They are scheduled to be relocated to 101 Consumers Drive, in 2023, to share the facility with the Traffic Operations Group, and the Health Group (due to expansion of the water treatment plant operations).

3.1.3 Resources – Employees, Vehicles and Materials

In Appendix A, we list the current number of resources (employees, vehicles, equipment and materials) utilized by the Works Department at each of its five Depots and two Operations facilities. These numbers will be used, in section 3.2.4, to estimate the future resource requirements in 2030 and 2040.

3.1.4 Functional Work Areas

In this section, we describe the characteristics of the key functional work areas that are located at each of the five Depots and two Operations facilities. In section 4.2, we will discuss some of these areas in more detail from the context of industry best practices in layout design.

Administrative Office
The office staff require administrative space for offices, meeting rooms, printers, and various types of storage. A small reception area is also required for visitors to the site. The outdoor staff require a training room and a place to discuss daily work assignments at the beginning of the shift. Some of the outdoor workers (typically Lead Hands) require access to a touch-down station (with computer terminal) to input data at the end of the shift.

Employee Amenities
The outside workers require changing rooms, lockers, washrooms and showers for male and female outside employees. Lunchrooms are also required, however, most of the outside workers do not return to the Depots/facilities for lunch so the lunchrooms are primarily used by the office staff. There also needs to be consideration for gender-neutral and multi-faith facilities.

Materials Testing Lab
The Materials Testing Lab provides space for various machines and rooms used to test concrete, asphalt and soil samples for contractors. Space is currently required for six full-time employees and two temporary employees.

Water Meter Shop
The Water Meter Shop provides space for water meter maintenance and replacement. The shop is used to store new/replaced meters, and to calibrate meters and check for faults. Office space is also required for a part time Supervisor and three clerks.

Fleet Maintenance Garage
Fleet Maintenance bays are required for providing on-site maintenance to the Fleet of work vehicles. The bays provide space for changing fluids, as well as for completing major repairs (including welding). Painting and body work are contracted out.

Parts/Tools Storage
Storage space is required for the storage of Fleet maintenance parts. Automotive parts are, typically, stored on shelves in a room adjacent to the maintenance bays. Small tools and equipment (for the outdoor crews) are, typically, stored in locked rooms adjacent to the employee amenities and parking area for the work vehicles.

Vehicle/Equipment Storage
At each of the Depots, indoor storage space for specialized work vehicles and equipment is provided. This includes bucket trucks and tandem axle plows. All other vehicles are stored outdoors.

Wash Bay
Three of the Depots (Ajax-Pickering, Oshawa-Whitby, and Scugog) provide an indoor wash bay for their fleet of vehicles. The other Depots rely on washing their vehicles in the yard.

Salt Storage
At each of the Depots there is at least one building for the indoor storage of salt for winter maintenance operations. Salt is stored indoors to protect it from rain.

Fueling
At each of the Depots there are fueling pumps that provide fuel (gas, diesel and coloured diesel) to work vehicles stored within the yard.

On the following page, in Table 3.2, we provide the current space available for each of these areas at each Depot and Operations Facility.

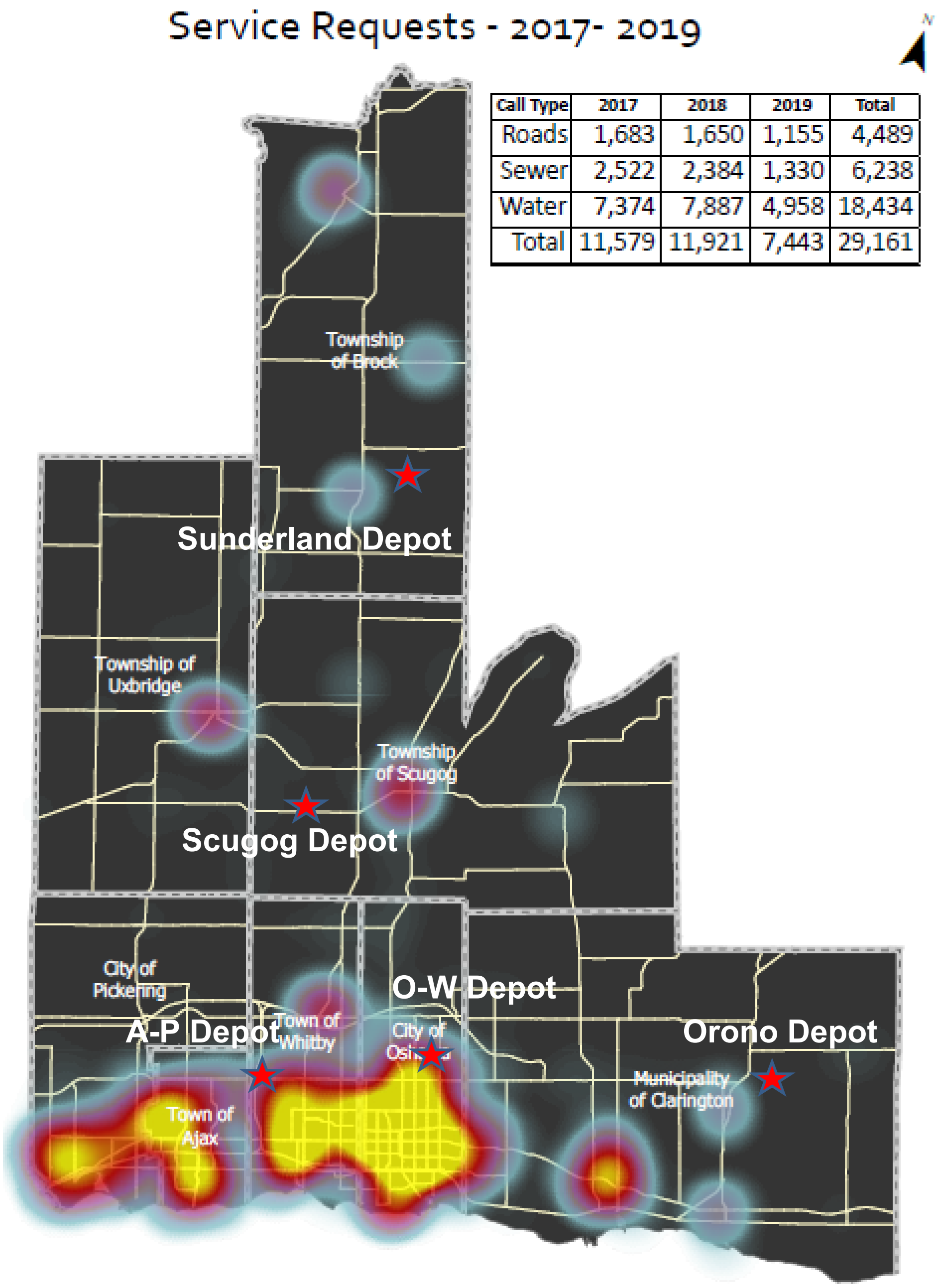
3.1.5 Facility Limitations – Location, Size, Design, Layout and Condition

In this section, we discuss the limitations imposed on each Depot and Operations Facility due to its location, size, design, layout and condition. Map 3.1, on page 22, is a Heat map and will be used to evaluate the location of each Depot relative to where the service calls are. The Heat map uses colour to reflect the frequency of service calls throughout the Region. Light blue represents a low frequency of calls whereas yellow represents a high frequency.

Table 3.2 – Current State Areas for Each Depot and Operations Facility – 2020

Functional Work Area	Ajax-Pickering (ft^2)	Oshawa-Whitby (ft^2)	Orono (ft^2)	Scugog (ft^2)	Sunderland (ft^2)	Consumers Drive (ft^2)	Water Street (ft^2)
Administrative Office	37,714	64,991		20,804	23,574		
Employee Amenities							
Materials Testing Lab	0	2,000	0	0	0	0	0
Water Meter Shop	0	1,250	0	0	0	0	0
Fleet Maintenance Garage	4,391 1 Drive-through; 1 one-way	7,938 9 one-way	1 one-way And 2 two-way	3,300 4 one-way	2,521 3 one-way	0	0
Parts Storage	2,118	15,485		638	560		
Vehicle/Equipment Storage	14,826 2 Drive-through; 8 one-way	18,408 8 one-way	7 one-way and 4 material storage bays	5,595 3 one-way	10,323 5 one-way	1 one-way	0
Wash Bay	Yes	Yes	Yes	Yes	0	0	0
Salt Storage	4,909	12,345	8,000	4,188	1,302	0	0
Fueling	Yes	Yes	Yes	Yes	Yes	0	0

Map 3.1 – Frequency of Service Requests for Roads, Sewer and Water by Location



Call Type	2017	2018	2019	Total
Roads	1,683	1,650	1,155	4,489
Sewer	2,522	2,384	1,330	6,238
Water	7,374	7,887	4,958	18,434
Total	11,579	11,921	7,443	29,161

Ajax-Pickering Depot

Location
The Depot is located slightly north and, approximately, 5 km to the east of the geographical centre point of its service territory – the City of Pickering and the Town of Ajax. It is located on the north-west corner of the intersection of Salem Road and Taunton Road East. To the east is a golf course; To the north is a hydro corridor; To the west is low density residential, and to the south is commercial development and a sprawling residential community.

In general, the Depot is considered, by staff, to be in a good location relative to the area that it serves. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is located close to the where the majority of the service requests originate from. That said, it would be preferable for the Roads group, currently, if the Depot was located closer to the geographical center point of the service territory. For the Water and Sewer Services groups it would be preferable, currently, if the Depot was located further south-west towards where most of the pipe networks are located.

2) **Traffic Congestion Faced by Work Crews:** The populations of Pickering and Ajax have increased significantly during the last twenty years which has increased traffic congestion and adversely affected the travel time required by work crews during the rush hour periods. This has decreased their productivity. However, they have benefited from the fact that the Depot is located on a major road network with good access to all parts of the service territory. That said, it would be preferable for the work crews, currently, if the Depot was located closer to Brock Road for its north-south access, and connection to Highway 401.

3) **Location of the Depot Versus Future Population and Employment Growth:** The construction of Highway 407 has encouraged the growth in population and housing to move northwards. This will have a greater impact on the Water Services group as new water, storm and sewer systems are built in the north half of the service territory. Therefore, to minimize travel distances, in the future, it would be preferable if the Depot was located closer to the geographical center point of the service territory.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wetlands. Given these requirements, the Ajax-Pickering Depot is in a relatively good location.

Size, Design and Layout
The productivity of the employees currently working at the Ajax-Pickering Depot is directly affected by the size, design and layout of the buildings and the yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The size of the site, at 15.2 acres, provides sufficient space for the expansion of buildings and yard activities over the next 20 years. The main building was built in 1973 and has been modified, internally, over the decades to suit changing needs. The layout of the buildings and yard reveal that they do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The office area, shops, and employee amenities are too small (in most cases) for current needs, and present numerous limitations to the efficient flow of employees. Hence, the level of efficiency and effectiveness at which the employees work is compromised. For example, the lunchroom is also used for storing technical drawings, and there are no washrooms/changing rooms for female outside workers;

- The individual offices are, typically, larger than they need to be. Furthermore, there are too many private offices and cubicles which reduce employee collaboration, and consume excess floor space;

- The meeting rooms and training rooms should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy;

- Touch-down stations should be made available for those outside workers requiring a computer for less than 4 hours per day (to reduce space requirements);

- The design of the facility should be “barrier free” and comply with provincial requirements for accessibility. The meeting room and changing area on the second floor within the maintenance garage are not accessible;

- Many workspaces receive little or no natural light and ventilation (which can be as simple as access to an operable window). This has often been identified as a cause of lower productivity levels and morale within offices;

- The storage rooms do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements;

- There is no system for managing the Fleet maintenance parts, and the storage system is inefficient;

- The indoor vehicle wash bay is too small for the larger trucks;
- There is a shortage of space for both interior and yard materials storage;
- This salt storage building should provide both indoor storage and loading. This will minimize spillage of salt into the environment and help contain the noise from the loading operation;
- The two yard entrances should have one-way flow to reduce the risk of vehicle collisions;
- The flow of heavy vehicles should be counter-clockwise through the yard to improve driver sightlines and minimize the risk of collisions;
- Employee and work vehicles share the same two yard entrances but are kept separate once in the yard. Ideally, they would use separate entrances to minimize the risk of collisions;
- All plastic and rubber items, including piping and fittings, must be stored in shelters that protect these items from deterioration by the sun;
- The desiccant drying area should be paved;
- The general arrangement of the buildings within the yard is adequate. However, the material and tool storage buildings (adjacent to the salt storage building) should be located closer to the main building for quicker access by employees. Typically, these storage areas are located adjacent to the indoor vehicle storage area and employee amenities.

Building Condition
The main building was built in 1973 and is, therefore, approximately 3/4 through its expected asset life. In general, the building appears to be well maintained and in reasonable condition given its age. The following items have been identified as issues requiring repair or upgrade to the building’s substructure, shell, interior or services:

- The roof requires replacement (estimated at $480,000);
- An epoxy coating should be applied to the vehicle storage area (estimated at $155,000);
- There are no sprinklers within the building ($100,000);
- An emergency back-up electrical generator should be installed ($295,000);
- A hydro service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot;

- A gas service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot.

Our understanding is that a Building Condition Assessment will be completed within the next two years to better identify any underlying issues requiring current or future repair to the buildings on-site.

Oshawa-Whitby Depot;

Location
The Depot is located, approximately, 2 km to the north of the geographical centre point of its service territory – the Town of Whitby and City of Oshawa. It is located on the south side of Conlin Road between Thickson Road and Garrard Road. To the north and east is farmland; To the west is an environmentally protected wetland and industrial lands, and to the south is the Region's underground Municipal Water Reservoir, a Recycling Center, and a waste Material Recovery Facility. Beyond that is the urban residential area of Whitby.

In general, the Depot is considered, by staff, to be in a good location relative to the area that it serves. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is located close to where the majority of the service requests originate from. That said, it would be preferable for the Roads group, currently, if the Depot was located slightly further south – perhaps on Taunton Road East. For the Water Services group, it would be preferable, currently, if the Depot was located further south towards where most of the pipe networks are located – perhaps on Rossland Road East.

2) **Traffic Congestion Faced by Work Crews:** The populations of Oshawa and Whitby have increased significantly during the last twenty years which has increased traffic congestion and adversely affected the travel time required by work crews during the rush hour periods. This has decreased their productivity. However, they have benefited from the fact that the Depot is located close to a major road network with good access to all parts of the service territory. That said, it would be preferable for the work crews, currently, if the Depot was located further south along Thickson Road North, between Taunton Road East and Rossland Road East.

3) **Location of the Depot Versus Future Population and Employment Growth:** The construction of Highway 407 has encouraged the growth in population and housing to move northwards. This will have a greater impact on the Water Services group as new water, storm and sewer systems are built in the north half of the service territory. Therefore, to minimize travel distances, in the future, it would be preferable if the Depot was located closer to the

geographical center point of the service territory: further south along Thickson Road North and near to Taunton Road East.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wetlands. Given these requirements, the Oshawa-Whitby Depot is in a relatively good location except for the environmentally protected wetland along the western property boundary.

Size, Design and Layout
The productivity of the employees currently working at the Oshawa - Whitby Depot is directly affected by the size, design and layout of the buildings and yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The size of the site, at 14.9 acres, provides sufficient space for the expansion of buildings over the next 20 years. However, yard storage will be limited. The layout of the buildings and yard reveal that they do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The individual offices are larger than they need to be. Furthermore, there are too many private offices and cubicles which reduce employee collaboration, and consume excess floor space;
- The office space should be reconfigured to improve space utilization. This would eliminate the need for two employees to have their work desks located in the lunchroom;
- The lunchroom should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy;
- Touch-down stations should be made available for those outside workers requiring a computer for less than 4 hours per day (to reduce space requirements);
- The size of the locker rooms and washrooms is too small to meet the current demand;
- The design of the facility should be "barrier free" and comply with provincial requirements for accessibility;

- Many workspaces receive little or no natural light and ventilation (which can be as simple as access to an operable window). This is often identified as a cause of lower productivity levels and morale within offices;
- The storage rooms for Fleet parts do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements. The current storage systems should be re-evaluated to determine how best to maximize storage densities. Also, a warehouse management system is required;
- The Water Meter Shop is too small to meet current space requirements;
- The layout of the Material Testing Lab should be reconfigured into a U-shaped cell to improve productivity;
- There are too few vehicle maintenance bays. There should be at least 1.5 bays per mechanic;
- The indoor vehicle storage area is too small. As a result, vehicles are squeezed in which slows down their ability to drive out in the morning. It is estimated that this process could take up to 30 minutes and delay the crews from leaving the Depot;
- There should be a 2nd wash bay primarily for use by the Fleet Services maintenance garage;
- This salt storage building should provide both indoor storage and loading. This will minimize spillage of salt into the environment and help contain the noise from the loading operation;
- The two yard entrances should have one-way flow to reduce the risk of collisions;
- The flow of heavy vehicles should be counter-clockwise through the yard to improve driver sightlines and minimize the risk of collisions;
- The vehicle refueling station is above ground but located in-line with the flow of work vehicle traffic. This creates a potential bottleneck;
- The yard is currently at full capacity for the storage of vehicles and materials. A new layout is required to improve the utilization of space;
- Plastic and rubber items, including piping, fittings and the brine storage tanks, are stored outdoors fully exposed to the sun. This will lead to material deterioration by the sun. Indoor storage space is required;
- The decanting area for the Vactor and sweepers is outside the yards boundaries;

- The east side of the yard should be fenced and gates should be installed at the two entrances;

- Additional security cameras should be installed, and the exterior lighting should be upgraded.

- The general arrangement of the buildings within the yard is adequate. However, the material and tool storage buildings (adjacent to the salt storage building) should be located closer to the main building for quicker access by employees. Typically, these storage areas are located adjacent to the indoor vehicle storage area and employee amenities.

Building Condition
The main building was built in 1978 and is, therefore, at least 2/3 through its expected asset life. That said, the building appears to be in reasonable condition given its age. The following items have been identified as requiring repair or upgrade to the building's substructure, shell, interior or services:

- Repairs are required to address concrete pitting in the vehicle storage area (north and south sides) ($185,000);

- A 4,500L underground storage oil tank should be removed ($65,000);

- Various floor grates and drains should be repaired ($180,000);

- Certain office windows should be replaced ($200,000);

- Portions of the exterior brick veneer on the building are flaking and falling off. Some of the mortar should be repointed (where required) and all damaged bricks should be replaced ($150,000);

- Many of the exterior walls are not insulated resulting in higher energy costs. No changes are recommended;

- An Emergency Standby Generator is required ($456,000);

- The UPS battery should be replaced ($17,000);

- The furnace should be replaced ($150,000);

- The ventilation for the Material Testing Lab should be isolated from the ventilation for the rest of the building in order to eliminate odours ($20,000);

- The hydro service is being used to its full capacity. A hydro service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot;

- The pressure for the supply of natural gas is too low. A gas service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot;
- There are no sprinklers within the building ($150,000).
- The steel septic sewage tank is believed to be corroded and should be replaced ($65,000).

Orono Depot

Location
The Depot is located 6-8 km further east within its service territory than would be optimal to minimize travel times. However, the growth in population is expanding east towards the location of the Depot. It is located on the north-west corner of the intersection between Taunton Road and Best Road. To the north, east and west is farmland; To the south is a mixture of farmland and residential.

In general, the Depot is considered, by staff, to be in a relatively good location to address future service requirements as new residential developments expand in Bowmanville and Newcastle. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is not located close to the where the majority of the service requests originate from (which is in Bowmanville). It would be preferable for the Roads group, currently, if the Depot was located further west, closer to the geographical center point of the service territory. For the Water Services group it would be preferable, currently, if the Depot was located further south-west towards where most of the pipe networks are located (Bowmanville).

2) **Traffic Congestion Faced by Work Crews:** The population of the east end of Durham Region has not grown to the same extent as the west end of the Region during the Last 20 years. So, traffic congestion has not yet affected the travel time required by work crews during the day. The work crews have also benefited from the fact that the Depot is located on Taunton Road with good east-west access. That said, it would be preferable for the work crews, currently, if the Depot was located further west closer to Regional Road 57 for its north-south access, and connection to Highway 401.

3) **Location of the Depot Versus Future Population and Employment Growth:** The construction of Highway 407 has not yet extended to the east boundary of Durham Region. Nor has the boom in residential growth that has characterised the west end during the last 20 years. That said, both are expected to continue to push east in future years. This will have a greater impact on the Sewer Water Services group as new water, storm and sewer

systems are built in the east half of the service territory. Therefore, to minimize travel distances, in the future, it would be preferable if the Depot was located only slightly further west - closer to the geographical center point of the service territory.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wetlands. Given these requirements, the Orono Depot is in a good location.

Size, Design and Layout

The productivity of the employees currently working at the Orono Depot is directly affected by the size, design and layout of the buildings and yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the utilization of space.

The size of the site, at 10 acres, provides sufficient space for the expansion of buildings, and yard storage over the next 20 years. The main building was built in 2016 and is, therefore, at the beginning of its expected asset life (which should be approximately 60 years). The layout of the buildings and yard reveal opportunities for improvement. A list of some of these opportunities is shown below:

- The Administrative Office area is new (2016) and, therefore, has been designed to meet future space requirements. However, more indoor vehicle and equipment storage is required. Two new maintenance bays were built in 2016;
- The Fleet Maintenace parts storage shelving/racking needs to be upgraded to meet current inventory needs. Currently there is no base line inventory system set up with min-max quantities and parts rotation;
- There is a shortage of indoor space for storing vehicles;
- There is only one yard entrance/exit, and there is no clear separation between the flow of work vehicles and employees walking into the facility from their cars;
- The flow of heavy vehicles should be counter-clockwise through the yard to improve driver sightlines and minimize the risk of collisions;
- The yard should have one-way flow to reduce the risk of vehicle collisions;
- This salt storage buildings should provide both indoor storage and loading. This will minimize spillage of salt into the environment and help contain the noise from the loading operation;

- The vehicle refueling station is above ground but located in-line with the flow of work vehicle traffic. This creates a potential bottleneck;
- Plastic and rubber items, including piping, and fittings, are stored outdoors fully exposed to the sun. This will lead to material deterioration by the sun;
- The decanting area for the Vactor truck is too small and should be paved;
- The general arrangement of the buildings within the yard is adequate.

Building Condition
The garage structure, adjacent to the new administrations area, was built in 1964. The main administrations area was built in 2017. In general, the garage structure appears to be well maintained and in reasonable condition given its age. The following items have been identified as issues requiring repair or upgrade to the building's substructure, shell, interior or services:

- Should replace the vehicle storage bay roof ($200,000);
- Should install thermal glass panels for the rollup doors in the garage ($125,000);
- Should replace the Ford Smith 32,000 lb hoist in the maintenance area ($520,000);
- Should replace the Veeder root and Computrol hardware and software for existing fuel system ($125,000);
- Should install a new access gate ($100,000).

Scugog Depot

Location
The Depot is located, approximately, 4 km to the west of the geographical centre point of its service territory. It is located on the southeast corner of the intersection of Regional Road 21 and Regional Road 23. To the north is an industrial pit; In all other directions the Depot is surrounded by rural farmland. The closest major residential areas are Uxbridge to the north and Port Perry to the east.

In general, the Depot is considered, by staff, to be in a good location relative to the area that it serves – the central area of Durham Region. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is not located close to the where the majority of the service requests originate from (which are in Port Perry and Uxbridge). It would be preferable for the Roads group, currently, if the Depot was located slightly further east - closer to the

geographical center point of the service territory. For the Water Services group it would be preferable, currently, if the Depot was located further east towards Port Perry where most of the pipe networks are located.

2) **Traffic Congestion Faced by Work Crews:** The population of the central part of Durham Region has not increased significantly during the last twenty years. Therefore, traffic congestion has not adversely affected the travel time required by work crews during the day. Furthermore, they have benefited from the fact that the Depot is located on Regional Road 21 with good access to all parts of the service territory. That said, it would be preferable for the work crews, currently, if the Depot was located slightly further east - closer to the geographical center point of the service territory.

3) **Location of the Depot Versus Future Population and Employment Growth:** The growth in local population is not expected to increase significantly during the next 20 years. Therefore, to minimize travel distances, in the future, it would be preferable if the Depot was located slightly further east - closer to the geographical center point of the service territory.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wetlands. Given these requirements, the Scugog Depot is in a good location.

Size, Design and Layout

The productivity of the employees currently working at the Scugog Depot is directly affected by the size, design and layout of the buildings, and yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The size of the site, at 80 acres, provides more than sufficient space for the expansion of the buildings and yard storage requirements over the next 20 years. The layout of the buildings and yard reveal that they do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The size of the office area is too small for the number of employees working there. The office footprint should be expanded, and the layout reconfigured to maximize space utilization and to optimize employee collaboration;

- There are no sprinklers within the building;

- There are no female changerooms and no gender-neutral or multi-faith facilities.

- Touch-down stations should be provided to those outside workers requiring a computer for less than 4 hours per day (to reduce space requirements);
- The design of the facility should be “barrier free” and comply with provincial requirements for accessibility. For example, the meeting room and lunch room on the second floor are not accessible;
- Storage rooms do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements. Also, an inventory management system is required;
- The number of indoor vehicle storage bays is insufficient for the number of vehicles/equipment that should be protected from the elements;
- This salt storage building should provide both indoor storage and loading. This will minimize spillage of salt into the environment and help contain the noise from the loading operation;
- There is only one yard entrance/exit;
- The flow of heavy vehicles should be counter-clockwise through the yard to improve driver sightlines;
- There is no separate employee parking area free from the flow of work vehicles. This puts employees at risk walking between their vehicles and the main building;
- There is no outdoor parking pad with designated stalls for storing work vehicles;

Building Condition
The date the Depot was built is unknown. However, the building appears to be well maintained and in reasonable condition given its age. The following items have been identified as repair or upgrade to the building’s substructure, shell, interior or services:

- Repairs are required to the concrete floors and floor drains in the fleet bays ($85,000);
- Structural Repairs are required to the Mezzanine ($80,000);
- Repairs are required to the metal frames and man doors ($11,500);
- The automatic garage door openers require retrofitting ($55,000).

Sunderland Depot

Location
The Depot is located very close to the geographical centre point of its service territory. It is located on the north side of Regional Road 10, at the west limit of the Village of Sunderland. The Depot is largely surrounded by rural farmland with residential homes nearby in the Village. Immediately adjacent to the Depot, on its east boundary, is the Township of Brock's Maintenance and Operations Depot. There is a new residential development almost immediately east and north of that Depot (behind the Township's Depot).

In general, the Depot is considered, by staff, to be in a good location relative to the area that it serves – the north end of the Region. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is not located close to where the majority of the service requests originate from (which is in Beaverton). That said, it would be preferable for the Roads group to stay in Sunderland whereas for the Water Services group it would be preferable to be near Cannington.

2) **Traffic Congestion Faced by Work Crews:** The population of the northern part of York Region has not increased significantly during the last twenty years. Therefore, traffic congestion has not increased or adversely affected the travel time required by work crews. The crews have also benefited from the fact that the Depot is located close to Highway 12 with good north-south access to all parts of the service territory.

3) **Location of the Depot Versus Future Population and Employment Growth:** The growth in local population is not expected to increase significantly during the next 20 years. Therefore, to minimize travel distances, in the future, it would be preferable for the Depot to stay where it is which is – very close to the geographical center point of the service territory.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wetlands. Given these requirements, the Sunderland Depot is in a relatively good location.

Size, Design and Layout
The productivity of the employees currently working at the Sunderland Depot is directly affected by the size, design and layout of the buildings, and the layout of the yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The size of the site, at 4 acres, is currently at full capacity with no room for the expansion of buildings or yard storage over the next 20 years. The layout of the buildings and yard reveal that they do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The office area, shops, and employee amenities are poorly laid out, too small for current needs, and present numerous limitations to the efficient flow of employees. Hence, the level of efficiency and effectiveness at which the employees work is compromised.
- The Boardroom and lunchroom should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy;
- Touch-down stations should be made available for those outside workers requiring a computer for less than 4 hours per day (to reduce space requirements);
- There are no female changerooms and no gender-neutral or multi-faith facilities;
- The design of the facility should be “barrier free” and comply with provincial requirements for accessibility. For example, the lunchroom on the second floor is not accessible;
- Storage rooms do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements. Also, an inventory management system is required;
- There is no indoor vehicle wash bay;
- There is a shortage of indoor vehicle and equipment storage space;
- There is a shortage of space for yard materials storage. The site does not provide sufficient space for future growth;
- Require a separate employee parking area with direct access into the main building without having to cross the path of work vehicle traffic;
- Require an outdoor parking pad for storing vehicles within the yard;
- Require counter-clockwise flow through the yard, for work vehicles, to improve driver sightlines;
- The vehicle refueling station is located in-line with the flow of work vehicle traffic, potentially, creating a bottleneck;

- Plastic and rubber items, including piping, fittings and the brine storage tanks, are stored outdoors fully exposed to the sun. This will lead to material deterioration by the sun;

Building Condition
The date of construction of the main building (with offices) and Fleet shop is unknown but believed to be prior to 1965 which is when the four bays and lunchroom were built. The building is, therefore, past its expected asset life. However, the building appears to be well maintained and in good condition given its age. The following items have been identified as issues requiring repair or upgrade to the building's substructure, shell, interior or services:

- Epoxy coating for the floors ($85,000);
- Require an Emergency Standby Generator ($295,000);
- The Hoist in the garage requires reconditioning ($45,000);
- There are no sprinklers within the building;
- Many of the exterior walls are not insulated resulting in higher energy costs.

The Region's Traffic Operations Centre

Location
The Traffic Operations Centre is located in the extreme south end of the Region, along Highway 401, approximately, 7 km west of the North-South centre line for the Region. It is located on the south side of Consumers Drive, in the Town of Whitby. The Operations Centre is surrounded by a high-density mixture of commercial and light industrial buildings.

In general, the Operations Centre is considered, by staff, to be in a good location relative to the area that it serves – the Region of Durham. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** 80% of the traffic signals are within the south area of the Region quickly accessible using Highway 401. Therefore, it is preferable to keep the group consolidated in one location (to achieve synergies) in the south-central part of the Region with easy access onto Highway 401.

2) **Traffic Congestion Faced by Work Crews:** The population in the south-west area of Durham Region has increased significantly during the last twenty years which has increased traffic congestion, and adversely affected the travel time required by work crews. This has decreased their productivity. However, they have benefited from the fact that the Operations Centre is located along

Highway 401 with quick east-west access across the most densely populated part of the Region.

3) **Location of the Operations Centre Versus Future Population and Employment Growth:** The construction of Highway 407 has encouraged residential and commercial growth to expand northwards. However, the vast majority of the Region's population still lives between Lake Ontario and Highway 407 in the south-west area of the Region. Future growth will continue northward as well as eastward towards Clarington and Orono. Therefore, the current location of the Operations Centre is well positioned to meet the future needs of the Region's new population and employment areas.

4) **Impact of the surrounding Neighbours on Yard Operations:** The ideal site should be in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, or traffic resulting from the Operations Centre. Given these requirements, the Operations Centre is in a good location.

Size, Design and Layout
The productivity of the employees currently working at The Region's Traffic Operations Centre is directly affected by the size, design and layout of the buildings and yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The site is at full capacity with no room for expansion of the building or yard storage (unless additional floors can be built on the existing facility). The building was not originally designed to meet the needs of the Traffic Operations Department, so some compromises have been made. Furthermore, the layout of the building and yard do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The office area is not laid out efficiently using the new office standards. There are too many private offices and cubicles which reduce employee collaboration, and consume excess floor space. If improved, the utilization of space would increase creating space for future growth;

- The shop space was designed for a different purpose (and tenant) and is too small for current needs;

- There is a shortage of space for both interior and yard materials storage;

- There is no indoor parking for some of the work vehicles. This creates a long list of concerns which are described in more detail in section 3.1.6.

- The design of the facility should be "barrier free" and comply with provincial requirements for accessibility. For example, there should be an elevator to the second floor;

- Storage rooms do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements;

- The flow of heavy vehicles should be counter-clockwise through the yard to improve driver sightlines.

- There is no vehicle wash bay or vehicle refueling station.

It should be noted that there are plans to reconfigure the office layout to consolidate FMO into this building.

The Region's Whitby Water Supply Plant

The Region's Facilities Maintenance and Operations Group (FMO) is scheduled to be relocated to The Region's Traffic Operations Centre (101 Consumers Drive), in 2023, to share the facility with the Traffic Operations Group. For this reason, we will critique the Traffic Operations Centre rather than the current location at the Water Supply Plant.

Location
As discussed above, the Traffic Operations Centre is located in the extreme south end of the Region, along Highway 401, approximately, 7 km west of the North-South centre line for the Region. It is located on the south side of Consumers Drive, in the Town of Whitby. The Operations Centre is surrounded by a high-density mixture of commercial and light industrial buildings.

In general, the Traffic Operations Centre is considered, by the FMO Group, to be a good location for their operation. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** The majority of the facilities that need to be maintained by the FMO Group are south of Highway 7. Therefore, it is preferable to keep the group consolidated in one location (to achieve synergies) and in the south-central part of the Region with easy access onto Highway 401.

2) **Traffic Congestion Faced by Work Crews:** The population in the south-west area of Durham Region has increased significantly during the last twenty years which has increased traffic congestion, and adversely affected the travel time required by work crews in this area. This has decreased their productivity. However, the Traffic Operations Centre is located along Highway 401 with quick east-west access across the most densely populated part of the Region. This will assist the work crews to minimize their travel times.

3) **Location of the Depot Versus Future Population and Employment Growth:** The construction of Highway 407 has encouraged residential and commercial growth to expand northwards. However, the vast majority of the

Region's population still lives between Lake Ontario and Highway 407 in the south-west area of the Region. Future growth will continue northward as well as eastward towards Clarington and Orono. Therefore, the location of the Traffic Operations Centre is well positioned to meet the future needs of the FMO Group.

4) **Impact of the surrounding Neighbours on Yard Operations:** The ideal site would be in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, or traffic resulting from the Operations Centre. Given these requirements, the Traffic Operations Centre would be a good location for the FMO Group.

Size, Design and Layout
The productivity of the Facilities Maintenance and Operations Group employees will be directly affected by the size, design and layout of the Traffic Operations Centre. Below, we discuss these issues and whether they will adversely affect employee productivity, and the efficient utilization of space.

The size of the site, at 3.5 acres, is currently at full capacity with no room for expansion of the buildings or yard storage (unless additional floors can be built on the existing facility). The main building was built in the 1970's and is, therefore, close to its expected asset life. The layout of the building and yard reveal opportunities for improvement. To provide sufficient space for the Facilities Maintenance and Operations Group, the layout of the Traffic Operations Building will need to be modernized to achieve synergies, and to increase the efficiency of space usage.

3.1.6 Opportunities to Reduce Space Requirements

In this section, we will discuss a number of Best Practices for reducing space requirements within an Operations Depot. Reducing space requirements would, potentially, reduce the need for building additions and/or yard expansions at the five Depots and Operations Facilities. **Some of these approaches may have already been initiated by the Works Department.**

Incorporate LEAN to Reduce Waste Within the Business Processes
LEAN is an operational philosophy that improves business processes by focusing on the delivery of *value* to the customer. Employees, at all levels of the operation, participate in the identification and elimination of non-value-added activities (waste) throughout the operation. The result is shorter cycle times, lower operating costs, and higher customer service levels. Other benefits often include a reduction in the number of employees, equipment, inventory and space required.

LEAN was originated by Toyota to dramatically reduce cycle times and costs, and to increase product quality and service delivery. The seven types of waste that LEAN seeks to eliminate are present in every operation. They include (with examples):

- Transportation (transporting work vehicles to a different yard to be maintained);

- Defects (time spent fixing work done incorrectly the first time);
- Inventory (storing more materials or maintenance parts on-site than are necessary);
- Motion (crews driving to a work site);
- Wait time (crews stuck in traffic or waiting for their vehicle to be repaired);
- Overproduction (making more signs than are needed or before there is demand for them);
- Over-processing (performing steps in a process that are unnecessary).

LEAN uses various standard techniques and tools which fall into the broad categories of visual communication of information, process mapping, process control, and identification and elimination of defects. Some of the best-known lean tools and techniques include value-stream mapping (a diagram of the employee/material and information flows required to complete a job); just-in-time production (delivering the exact amount needed, when and where it's needed); the "5 S's" (five principles of an organized workplace); work leveling (ensuring consistent type and quantity of work over a period of time to avoid batching and backlogs); and kaizen (continuous improvement).

Therefore, all business processes should be streamlined to reduce waste before determining if a building needs to be expanded. Doing this would ensure that the size of the expansion is minimized to reduce land requirements, and capital construction and operating costs.

Our understanding is that the Region has begun training employees in LEAN Manufacturing and will be using it to improve their business processes.

Incorporate a Performance Management System to Achieve Continuous Improvement

A Performance Management System is an ongoing process for reducing operating costs and improving customer service. A common Performance Management System uses a five-step approach (define, measure, analyze, improve, and control) to help ensure that management decision-making and employee activities are focused on identifying and eliminating non-productive activities so as to continuously improve operational performance and achieve objectives for service delivery.

More specifically, the process should:

- Define key success factors and key performance indicators;
- Measure and report actual performance (i.e., service levels and operating costs) and compare it to the target standards;
- Analyse the results and identify opportunities to improve, and actions required;
- Improve performance through informed decision making, and a focus on accountability for performance.

- Control/Sustainable improvements over time.

A Performance Management System transforms the organization, its management, and the policy-making process. It becomes integrated into all aspects of the organization's management and policy-making processes, so that it is focused on achieving improved performance for the public.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the business process are adhered to. They must be chosen with care because changes in one area of the business process can have unintended impacts in other areas.

All key performance indicators should be measured through an IT management system and reported on a weekly basis. Weekly meetings should take place both at a senior management level as well as in the shops to analyze this information and to determine what action should be taken to improve the results. Any recommended changes to the business process should be documented and controlled as a Standard Operating Procedure (SOP). Semi-annual audits are required to ensure compliance of the SOP's by the workforce.

The Works Department is currently in the process of implementing a Performance Management System (to be referred to as EMMS).

Consolidate Administrative Staff, where possible, into a Single Location (to improve collaboration and share common spaces)

Administrative staff, across all departments, who do not have responsibilities at specific yards, should be consolidated into one location. This would improve collaboration between
the different staff and permit them to share common spaces (e.g., employee amenities, training rooms and meeting rooms) which would reduce the need for space.

Our understanding is that the Works Department had previously consolidated specialized staff such as the SWAT, Training, and Water Meter staff into the Oshawa-Whitby Depot.

Outsource Scheduled Maintenance for Light Duty Vehicles (Class 1 & 2) (to reduce maintenance costs and maintenance bays)

Outsourcing scheduled maintenance for light duty vehicles (Class 1 & 2) to a Third-Party Provider, often, reduces maintenance costs and permits Fleet Services to focus on unscheduled maintenance and heavy vehicles. This also reduces the number of maintenance bays, parts storage, employee amenities, and employee parking. However, Class 1 & 2 vehicles located at Depots with Fleet Services are often fully maintained there (i.e., scheduled and unscheduled maintenance) to eliminate the downtime from shuttling vehicles to off-site Third-Party Providers.

Consolidate Parts Storage into One Area and Review the Management Approach

The parts/supplies storage for all five Depots and the Operations Centre should be consolidated into one Stores Department. This would eliminate duplication in space requirements and would achieve economies of scale.

In terms of the management approach, Vendors or 3PL's (Third Party Logistics provider's) are, typically, very cost effective at managing those parts which move off the shelf quickly - referred to as fast movers (e.g., ten or more turns per year). Therefore, these parts should, probably, be managed off-site by the vendors or a 3PL and supplied to the Stores Department, as required, to replenish their point-of-use storage levels. This would reduce on-site storage space, stock-outs, logistics costs and improve customer service.

Vendors and 3PL's (Third Party Logistics provider's) tend to be much less cost effective at managing slow movers, critical spares and dead stock. Dead stock (i.e., has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. The slow movers and critical spares should be managed in-house to reduce logistics costs.

Consolidation of medium and slow movers, and critical spares, into one Stores Department, would help to justify high density storage systems and automation, reduce labour and space requirements, and reduce warehouse costs.

The objective of the Stores Department would be to order, receive and store inventory, and to replenish parts, tools and miscellaneous supplies to the point of use storage areas within the maintenance garages and Departmental tool/supplies storage areas at each Depot and the Operations Centre.

Our understanding is that the Works Department maintains a central Parts Store at the Oshawa-Whitby Depot. From here they supply the Fleet garages located at the other four Depots. However, they should also supply the Traffic Operations and FMO Group at the Traffic Operations Centre.

Optimize the Inventory Levels within the Stores Department and at the Point-of-Use Storage (to reduce costs versus using a Vendor or 3PL, and to minimize space)

Stores Department and point-of-use inventory levels should be analysed and optimized to minimize space requirements, inventory costs and stockouts. There are two primary ways to minimize space requirements for the storage of parts:

1. Reduce inventory levels
2. Increase the density of storage

This section will discuss ways to reduce inventory levels. Later we will discuss ways to increase the density of storage.

Reduce Inventory Levels

The two primary ways to reduce inventory levels are:

- Reduce the number of SKU's;
- Reduce the average inventory level for each SKU.

Industry Best Practice is for 3 turns/year or greater within the storage area. If the inventory is, typically, turning over less than 3 turns/year there is likely an opportunity to reduce warehouse inventory levels which would reduce inventory carrying costs and the need for warehouse storage space (and associated operating costs).

We recommend that inventory levels be measured and recorded, at least monthly, so that the number of turns of individual SKU's can be measured. Once this information is available, it is recommended that those SKU's with a turnover of 1 or less be analysed to determine why their turnover was so low and whether the turnover could be increased while still satisfying service requirements.

Some of the typical reasons for low turnover may include:

- Some of the SKU's are dead stock that should be written-off and removed from inventory;
- For some SKU's, the reorder levels are too high which should be reviewed and corrected;
- For some SKU's, the reorder quantities are too high which should be reviewed and corrected;
- Actual inventory levels were higher than thought when new orders were requested;
- When some of the SKU's were brought into stock for the first time, the requestor overstated their needs resulting in excess, unused inventory;
- Seasonal items will likely have excess levels that are held over until the next year;
- Critical Spares stock may require excess inventory levels to avoid the possibility of stock-outs;
- End users may request that certain SKU's be held in stock (rather than removed) for multiple years because they are no longer commercially available;
- The rate of demand for some SKU's is unpredictable, thereby, requiring higher than optimal inventory levels.

Additional opportunities for reducing either the number of SKU's in inventory or the average level of inventory for each SKU may include:

- Reduce the number of vendors providing the same equipment. For example, purchase all crew cabs from the same manufacturer. This will reduce the number of maintenance SKU's required;

- Determine which SKU's (other than the Critical Spares) could be eliminated from inventory because they could be supplied, by the vendor, within two hours of request;
- Determine which SKU's (other than the Critical Spares) could have their inventory significantly reduced because a vendor would be willing to manage the inventory to optimal levels. This is referred to as Vendor Managed Inventory (VMI);
- Reduce excess inventory levels by analysing those items purchased in bulk to determine whether there are false economies with purchasing in bulk;
- Reduce excess inventory levels by using bar code scanners (integrated with a Warehouse Management System) to improve inventory accuracy, visibility and control.

In summary, there is likely an opportunity to reduce warehouse space and operating costs by determining which of the SKU's may be eliminated from inventory, and which SKU's may have their average inventory level reduced.

Measure Performance and Hold Accountable the Vendors or 3PL to Reduce Stock-Outs and Lead Times (to reduce vehicle downtime and spare vehicles)

Above, we discussed the importance of using a Performance Management System to measure and improve performance. If the Region decides, in the future, to use a Vendor or 3PL to manage the parts inventory, their performance must be measured to ensure that the objectives for customer service are being met. Failure to meet objectives will lead to greater vehicle downtime and a larger number of spare vehicles required to compensate for the downtime.

Below, we list a number of key performance indicators that could be used to measure the performance of a Vendor or 3PL.

On-Time Delivery:

- **Inventory Count Accuracy by Dollars/Units** measures the accuracy of the physical inventory compared to the reported inventory;
- **Line Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of lines filled to the customer's request;
- **Order Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of orders filled to the customer's request;
- **Backorders as a% of Total Lines** measures the percentage of orders that are shipped late due to a lack of stock;
- **Order Picking Accuracy** measures the picking accuracy. It is the percentage of orders picked correctly;

- **On Time Ready to Ship** measures the success rate of the warehouse to prepare items on-time for shipment. It is the percentage of orders ready at the planned time to meet customer requirements;
- **On Time Shipments** measures the success rate of the warehouse to actually ship items on-time. It is the percentage of orders shipped at the planned time;
- **On Time Delivery** measures the success rate of the trucks to deliver on-time. It is the percentage of orders delivered to the customer at the requested time.

Warehouse Costs:

- **Lines Received and Put Away per Person Hour** measures the productivity of receiving operations;
- **Lines Picked and Shipped per Person Hour** measures the productivity of picking operations;
- **Cases Picked and Shipped per Person Hour** measures the productivity of picking operations;
- **Internal Order Cycle Time** measures the average time from when the order was received from the customer to when the order was shipped;
- **Productive Employee Utilization** measures labour activity levels;
- **Material Handling Rate** measures the total cost to operate the distribution network relative to the total cost of Inventory Sales.

Inventory Costs:

- **Turnover Rate** measures the level of excess inventory within the warehouse.

Transportation Costs:

- **Courier Cost per Line Shipped** measures courier efficiency.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the supply chain process are adhered to. They must be chosen with care because changes in one area of the supply chain can have unintended impacts in other areas.

Maximize Cubic Density - Incorporate Automation and High-Density Storage Systems for Indoor and Outdoor Storage Areas (to reduce space)

Innovations in technology and the use of automation offer the potential to dramatically improve the material handling, storage, and order fulfillment operations within the Stores Department. This may lead to significant gains in productivity, space and cost reduction, and service delivery when employed appropriately.

Below, we discuss ways to use technology to increase the density of storage as a means of minimizing space requirements for the storage of parts, tools and other supplies.

INCREASE THE DENSITY OF STORAGE

The cubic fill (or density) of storage locations within the warehouse should be optimized. This involves balancing the need for selectivity versus storage density. In general, if there are only one to three pallets of each SKU, single selective racking is preferred (as a racking option) in order to achieve access and prevent individual pallets from becoming buried. For individual cases or pieces, 6 ft. high shelving is typically recommended. However, we will consider other options for smaller pieces – namely, Automated Storage and Retrieval Systems (AS/RS).

An automated storage and retrieval system (AS/RS) consists of a variety of computer-controlled systems for automatically storing and retrieving items from defined storage locations (bins). Storage of items within the AS/RS is accomplished by a computer which

directs the automated storage and retrieval machine (SRM) to rapidly transfer the load, vertically and/or horizontally, to the bin where the load is to be stored. The process for retrieving items is conducted in reverse. As items are stored into or retrieved from the racks, the computer updates its inventory levels accordingly.

These systems are typically used in applications where (a) there are very high levels of loads being moved into and out of storage, (b) storage density is important because of space constraints, or (c) accuracy of load movement is critical because product damage is very costly.

The benefits of an AS/RS system include:

- Reduced labor requirements and costs;
- Increased worker safety;
- Improved accuracy in tracking of inventory;
- Reduced product damage;
- Reduced space requirements as items are stored in high-density storage with narrower aisles.

AS/RS's are divided into three primary types - Fixed Aisle, Carousels, and Vertical Lift Modules. Of these three types, we recommend that the Region consider the use of a Vertical Lift Module in the Parts Store at the Oshawa-Whitby Depot.

Vertical Lift Modules

Inventory within Vertical Lift Modules (VLM's) is stored on front and rear tray locations or rails. When a tray is requested, by entering a part through software, an extractor travels vertically between the two columns of trays and pulls the requested tray from its location and brings it to an access point. The operator then picks or replenishes stock and the tray is returned to its home upon confirmation.

VLM's can be built quite high to match the available overhead space in a warehouse. Multiple units can be placed in 'pods' whereby an operator can retrieve items from one unit while the other units are moving.

The rapid movement of the extractor as well as inventory management software can dramatically increase the efficiency of the picking process. This occurs by simultaneously retrieving and storing trays in multiple units.

VLM's provide floor space savings, increased labor productivity, improved worker ergonomics, and controlled process.

In conclusion, VLM's would certainly provide numerous benefits ranging from improved inventory accuracy and picking productivity to improved storage density and security. Their cost may be justified - especially for higher priced items which require added security, and for critical spares which require added inventory accuracy.

Outdoor Yard Storage

Where appropriate, the outdoor storage of equipment and parts should be stored on pallets within single deep, metal storage racking. The racking would need to be placed on concrete foundations for stability.

Improve Vehicle Availability (to reduce spare vehicles)

It is common for municipal operations to have vehicle availability problems which severely constrain their ability to meet service requirements. Typical factors which may create a problem include:

- Difficulty in obtaining parts to carry out repairs which, in turn, may have been caused by:
    - Inadequate inventory;
    - Having too many types of equipment requiring too many types of spare parts;
    - Damage caused by operations resulting from inadequate training of operators or other factors resulting in unnecessary breakdowns;
    - Outdoor storage of vehicles, particularly sidewalk plows and blower attachments for loaders;
    - Failure to complete annual preventive maintenance and inspections;
    - Poor communications with Fleet Services.

Steps that can be taken to improve vehicle availability include:

- Improve operator training on vehicle damage issues;
- Improve communications with Fleet Services;
- Provide indoor parking for vehicles to reduce failure rates;

- Contract out seasonal inspections/refurbs if Fleet Services is unable to ensure completion;
- Improve standardization of vehicles/equipment – buy fewer specialized units;
- Accept mechanics with heavy equipment ticket;
- Have operators report equipment problems directly to Fleet Services (while also advising their Supervisor);
- Provide faster feedback to operators on preventable damage occurrences;
- Establish a process to have Fleet Services and Operators formally review failures and repair delays every two weeks to identify issues. The result could be changes in operating practices and/or inventory levels required and/or notice/directive/training for vehicle users;
- Improve training, of operators aimed at reducing equipment damage, improving operator familiarity and skill with equipment for snow operations.

Incorporate Technology to Optimize Vehicle Service Routes (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should use computer programs to plan, balance, develop and optimize vehicle service routes for winter maintenance (i.e., plowing and salting). The objectives of the programs are to, in part, reduce deadhead time, and maximize the overall efficiency of the routes and required fleet of vehicles. This helps to reduce operating costs and improve service delivery. By optimizing the service routes, the Department will minimize the size of its Fleet. This reduces vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Incorporate Technology (AVL/GPS Tracking) to Measure Performance of Field Crews (both Contractors and City Employees) (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should continue using AVL technology to monitor and record the routes taken by their vehicles. This is most often done for winter maintenance vehicles to mitigate the risk of lawsuits. However, it can be done for all vehicles as a way of monitoring their daily routes and ensuring that they are being used productively. This well help management to identify and eliminate non-productive work activities so as to continuously improve operational performance and minimize the size of the fleet required. Reducing the size of the fleet will reduce vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Eliminate Contractor Parking at the Depots

For Winter Maintenance contracts (i.e., plows and salters), there are benefits to having the contract vehicles located at the Depots (close to the salt/sand storage and the start of the routes).

Municipalities now have to operate in compliance with the Minimum Maintenance Standards for Municipal Highways (MMSMH) if they wish to limit their liability and exposure to claims for negligence. The MMSMH were originally developed in the late

1990's as a mechanism to help municipalities deal with the increasing costs of negligence liability insurance as a result of increases in claim settlements.

This Provincial regulation, under the new Municipal Act, specifies minimum maintenance standards for roads, bridges, shoulders and signs. Although such "standards" have only "guideline" status, failure to achieve such 'standards of care' could have liability implications in civil suits. As such, municipalities have, typically, taken the approach of aligning their standards to the minimum standards set out in the regulation. In theory, in any potential lawsuit, if the municipality can show that it meets the Minimum Maintenance Standards for Municipal Highways, then it has presented the legal argument against the lawsuit. There is an increased liability risk associated with not meeting the minimum standards under Ontario Regulation 239/02.

Municipalities have complete administrative control over highways/roads under the jurisdiction of the new Municipal Act but do not have to adopt the Standards. However, in cases where the Standards are not adopted by a municipality, judgements against such municipalities for poor maintenance will be made by the courts after comparison with the Standards. Such being the case, the Standards will be the defacto standard for all municipalities as far as road maintenance is concerned.

That said, given the close proximity of all five Depots to rural areas, it may not be necessary for the Works Department to provide space at the Depots for the contractors to park their vehicles. The contractors may be able to find alternative, affordable space near by. This would reduce the space requirements at each Depot.

Optimize the Average Age of the Fleet (to reduce fleet maintenance, and the number of spare vehicles)

There are many issues that will affect the determination of the optimal number of vehicles in the Fleet - shift work structure, location of yards, design of service routes, age of the Fleet and requirement for spares, use of contractors, and mix of vehicles. Some of these (location of Depots and the design of service routes) were discussed above. In this and the following two sections, we discuss the importance of fleet age and utilization, and the mix of vehicles within the Fleet.

The optimal service life of a work vehicle varies based on class, duty and utilization. Vehicles which are kept longer than their optimal service life require increasing amounts of maintenance – both scheduled and unscheduled. Older vehicles, therefore, consume more maintenance time and are out of use longer. This puts a heavier burden on Fleet Services and lowers the productivity of the work crews. To compensate, Public Works Departments, typically, carry a number of spare vehicles which require space to park when not in use. Therefore, the Works Department is recommended to replace vehicles once they are beyond their optimal service life.

Our understanding is that the Region does carefully manage the average age of their Fleet of vehicles.

Increase Fleet Utilization (to reduce fleet size)

The Works Department should maximize the utilization of its work vehicles so as to reduce the size of the fleet and the need for parking space.

Often, the utilization of vehicles reaches its peak in certain months, each year, then drops off significantly for the balance of the year. For example, tandem axle trucks usually reach their peak utilization in January and February because of plowing but then are largely inactive during the summer. This seasonal variation provides an opportunity to rely more heavily on contractors during the winter months. This would permit a reduction in the number of in-house winter maintenance trucks saving approximately $30,000 per truck per year in maintenance and depreciated costs. It would also reduce parking space requirements.

Optimize the Mix of Vehicles (to reduce fleet size)

There is a need to rationalize the Fleet, for the services provided, to ensure that there is the optimal mix of vehicles and equipment based on best practices. For example, when possible, vehicles should be deployed for multiple uses (e.g., plow, wing, spread, haul – with full capacity).

Permit Select Drivers to Take Cars, Vans and Pick-up Trucks Home (to reduce employee parking)

There are potential complications related to permitting employees to drive work vehicles home. However, there is also the potential to save a significant amount of yard space due to a reduction in employee vehicles.

Provide Incentives for Employees to Car Pool, Cycle or Use Transit

Encouraging employees to car pool, cycle or use public transit will reduce the need for yard space for employee parking. Buildings should be equipped with lockable storage for bicycles, and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

Refuel Work Vehicles during the Night (to reduce the number of dispensing pumps and lanes)

It is best practice, within the Transit industry, to clean and refuel buses (using specialized work crews) during the night when they are not in use. This, potentially, reduces the number of refueling pumps required because the process is spread out over four to eight hours. It also reduces vehicle downtime (during the day) and ensures that the buses are ready to operate at the start of their shift. This approach to refueling may be applicable to the Fleet for the Works Department.

Permit Class 1 & 2 Vehicles (i.e., Cars, Vans and Pick-Up Trucks) To Use Public Gas Stations (to reduce dispensing pumps and lanes)

Refueling off-site, potentially, reduces the number of refueling pumps required and the space required.

Reduce the Use of Salt for Winter Maintenance (to minimize the size of salt storage buildings)

The Roads group needs to store salt indoors for winter roads/sidewalk maintenance. The best practice approach for salt storage is the combined storage and loading into one facility. The alternative approach is to store the materials inside but to conduct the loading outside.

To minimize the size and capital cost of any new salt storage facilities, the Roads group should look for additional ways to reduce its annual consumption of salt. Industry Best Practices for reducing the consumption of salt are shown in Table 3.3, on the following page.

The Roads group should also consider the following ways to minimize their use of salt:

- Weigh scales should be considered to help measure the amount of salt being loaded into trucks;
- Should adjust the quantity of salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems;
- Should optimize salt application rates. For example, restrict application rates on arterial collector roads to 135kg/lane km, and for local roads to 70 kg/lane km;
- Should undertake pre-wetting in all spreading activity. Pre-wetting is a very effective practice and should be included in all spreading activity. The entire spreading fleet should be outfitted with pre-wetting capability. The purpose of pre-wetting is to wet the salt for several reasons:
    - In the case of cold pavements, it enables the grain to freeze to the pavement
    - In the case of snow packed surfaces, it enables the grain to “melt” into the snow pack rather than “blowing” off
    - In the case of de-icing, it begins the brine making process by reacting with the crystalline salt to produce a brine concentrate which then lowers the freezing point of contact resulting in melting
    - In the case of traffic, it mitigates bounce off (up to 30% has been measured) by making the grains “stickier,” similarly with windy conditions.

  In general, the benefits include granules that adhere to the surface better, have a faster and longer-lasting effect, and can be spread more quickly.

  The practical result of pre-wetting should be a reduction in the resources necessary. The investment in brine making equipment would reduce the cost of supplying the brine. There is no advantage to using chemicals such as calcium chloride. Water could be used to similar benefit if it could be prevented from freezing in the tanks. With improved calibration and controls in spreader vehicles, it is reasonable to establish a range of spread rates to be applied under certain conditions.

- Should undertake a demonstration program to assess the merit of achieving centre bare pavement service, post storm, by using a sand product mixed with 25% salt;
- Should make use of calibrated spread vehicles to compare actual material spread rates across routes, across vehicle units, and across staff operators within a given winter season;
- Should compare actual material spread rates for each route and vehicle unit across winter seasons (time series analysis);
- Should implement disciplined spread management practices supported and refined by spread rate benchmarking and measurement. The benchmarking approach is practical because it is internal in focus (avoiding complex apple to apple issues across other municipalities), and it is firmly linked to the enforcement of service levels, individual operator behavior, and cost savings targets.

Table 3.3 - Industry Practices for Reducing Salt Consumption

Industry Practice
Removing as much snow from the roads as possible to minimize the amount of snow and ice that that needs to be melted (and the quantity of sand/salt required)
Using Material Loading Sheets that describe and limit the amount of sand/salt loaded into the sander/salter. This will prevent the driver from using excessive quantities of sand/salt.
Adjusting the quantity of sand/salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems
Optimize sand/salt application rates. For example, restrict application rates on arterial collector roads to 130 kg/lane km, and for local roads to 65 kg/lane km.
Pre-wetting of salt using brine to improve the utilization rate
Pre-wetting of sand using hot water to reduce bouncing and improve the utilization rate
Using computerized controls on spreader equipment that can accurately control the rate of sand/salt application so that the quantity applied to the roadway is minimized
Blend brine with other chemicals to produce “Hot Brine” that will be effective below -12°C
Direct Liquid Application to replace the use of brine with a chemical that works as low as -30°C
Using GPS systems on the trucks to (1) monitor the speed and location of the trucks through Automated Vehicle Location (AVL), and (2) provide route guidance and spreader control for the driver
Training staff so that they understand how to use the equipment and take other steps to minimize the application of sand/salt
Use loader scales to measure and record the quantity of sand/salt used by each truck and then use this information to identify opportunities to reduce consumption rates. If you don’t measure it, you can’t reduce it.
Store sand indoors as this will reduce the need for pickling with salt from 5% down to 3%.

Request that Field Crews Eat at their Work Site (to reduce the size of lunchrooms - only for inside workers)
Field crews should continue, when possible, to eat lunch at their work site (or closest restaurant/Depot) rather than returning to their home yard to eat in the lunchroom. Doing this will permit the lunchroom to be sized only for those employees working full-time at the yard. This, in turn, will reduce space requirements.

Replace Touch-Down Desks with Dash Mounted Devices (to reduce space)
Some field employees/foremen require limited access, each day, to a computer to receive work orders and to input information/data. Typically, workstations or "touch-down desks" are provided for these employees. The new trend is to provide these employees with access to mobile tablets or dash mounted devices to input the information/data. The benefit is increased employee productivity and a reduction in office space for the workstations or "touch-down desks".

3.1.7 Opportunities to Improve the Depot Design

In section 3.1.5 we listed a number of design issues, at each Depot, that are adversely affecting employee productivity, and the efficient utilization of space. Below, we list a number of ways to improve the design of an existing Depot.

Incorporate Transit Bus Style of Parking for Vehicles (to reduce space)
Within the Transit industry, it is best practice to store buses indoors in long lanes (typically, 6-8 buses deep). This approach should be considered for other municipal fleets that require indoor storage and can operate with a first in, first out philosophy. This would include those winter maintenance vehicles that leave the yard at the same time.

Therefore, the approach to designing the layout for the indoor storage of work vehicles should (1) identify those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identify the optimal width and length of each lane to minimize the total area requirement.

Standardize - Utilize Corporate Space Standards for Offices, Employee Amenities and Shops (to reduce variation and space, and increase collaboration and productivity)
The Region of Durham is currently going through a process to standardize and document their space requirements for offices so as to reduce variation amongst locations, and space requirements. These standards should help promote employee collaboration, productivity and the desired corporate culture. For example, most municipalities are eliminating walls and modular office partitions in favour of an open concept office environment. Offices are becoming smaller or eliminated all together in favour of more meeting rooms.

- Office staff should, where appropriate, be consolidated into one open concept administration office area. This will improve communication and collaboration between employees, and will optimize space utilization;

- Meeting rooms and training rooms (adjacent to the administration office area) should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy. Their use should be shared amongst the Works Department to reduce the total number required due to variations in demand;
- Touch-down stations should be consolidated (if not replaced with mobile devices or vehicles dash board units) between the different groups to reduce the number required and to reduce space requirements;
- Employee amenities (lunch room, change rooms and washrooms) should be consolidated and shared by all employees (including both office and unionized staff) to eliminate duplication and to efficiently utilize space. The lunch room should also be designed for flexible use (with mobile partitions and furniture). The employee amenities should be located on the ground floor level close to the work vehicle storage areas;
- Parts/materials stores, from different groups, should be consolidated to eliminate duplication, and to implement technology and storage systems which will maximize the cube and more efficiently utilize space;

Design for Flexibility - Design Lunchrooms to be Multi-purpose (e.g., crew meetings and training) (to reduce space)
When possible, facility areas should be designed to be flexible in their use. For example, lunch rooms should be designed for multiple purposes as a way of consolidating areas and reducing the total space requirements. Lunchrooms are often also used for start-of-shift crew meeting areas, and training rooms.

Design a Healthy Work Environment (to improve productivity)

A variety of research has shown that employees are both happier and more productive in office environments with natural light and views, as well as natural ventilation (which can be as simple as access to an operable window). Natural light has been shown to reduce seasonal affective disorder, increase visual clarity, help regulate sleep, reduce drowsiness, improve immune function, reduce sick days and increase productivity. Access to natural light, views and ventilation is the basis for three LEED points and is written into many other green standards. Many government organizations have codified the ‘Right to Light’ for their office design standards -- for example, Alberta Infrastructure’s *Technical Design Requirements*.

Contemporary office design best practice places open workspaces toward the exterior of the floor plate, with private offices and meeting rooms closer to the center. In this way daylight reaches the greatest number of staff. Natural ventilation, including operable windows, should be incorporated wherever possible. Workshops should be treated similarly, maximizing use of natural light and air, with control of glare being critical. We have found that small areas of transparent glazing combined with larger zones of light-diffusing translucent panels provide ideal lighting conditions for fleet garages, wood and metal shops, and other similar environments.

Design for Safety

The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the building. Once in the building, the public should be greeted at a reception counter.

The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles.

3.2 Future State

This section will begin by discussing the various growth factors that will be affecting the Works Department over the next twenty years. It will then recommend the future state (2030 and 2040) Depot network design that will optimize the Department's ability to adjust to the growth factors while continuing to work efficiently and effectively towards meeting its service delivery requirements. This optimal Depot network design will include identifying (1) where the Depots and service functions should be located, (2) whether their current service territory boundaries should be adjusted, and (3) the number of resources required at each Depot.

3.2.1 Growth and the Changing Needs of Durham Region

The Region of Durham is considered to be one of the fastest growing Regions in the world. Between 2011 and 2016, the population grew by 6% to 673,000 people. It is now expected to grow by another 78% to 1.2 million people by 2041 (according to the "Durham Region Planning for Growth" report issued under "Envision Durham" in 2017). To sustain this growth, new roads, sewers, and water supply infrastructure will be expanded, and additional traffic signals and facilities will be required. Furthermore, changes in climate, technology, government legislation, communications and the condition of infrastructure, will further increase the demand for Regional resources.

Below, is a description of some of the main factors that will affect the need for resources (employees, work vehicles, and materials), by the Works Department, over the next 20 years, to best meet the service and maintenance requirements for the Region.

Population and Infrastructure Growth

The Region of Durham covers an area of 2,500 square kilometres, which is four times the size of Metropolitan Toronto. With an expected population growth of almost 80%, over the next 20 years, there will be a direct impact on the Region's Works Department. Expected changes will include the need to maintain new and expanded infrastructure (such as roads, water, sewers, traffic operations), as well as existing, aging infrastructure that suffer greater wear and tear with higher population levels.

In some areas (the East and North end of Durham, and in the Seaton area) there are still considerable areas for urban expansion growth, with new housing subdivisions being planned. These changes will likely result in an increase in lane kilometres of roads and pipe networks that will need to be maintained. In the South and West end of Durham, population densification is both expected and desirable as new families choose lifestyles that include apartment and condominium living, and homes with reduced property area. This densification will likely result in a number of changes that will affect the resource requirements for the Department. Examples include:

- Increased and extended traffic congestion, affecting both work site interference and staff travel time. This will increase the need for more employees in order to maintain the same service levels;
- Reduced speed for snow plowing resulting in the possible splitting of routes;
- Increased use of smaller equipment that is more suited to sidewalks and partially restricted narrower streets;
- Increased control of Traffic Operations to measure, meter, control and coordinate traffic flow;
- Expansion of Water, Storm, Sewer, Electrical and Communications services and related capacities to meet the increased service density;
- Changes to Regional roadways to accommodate transit, pedestrians, cycling and alternate forms of transportation.

To reduce the effect of population growth and densification, it will become increasingly important to have the correct number of employees, vehicles, equipment, and materials strategically located and supported from efficient Works Depots that can expand and change to meet new requirements.

Lane Km's of New Roads

There is estimated to be an increase of 341 lane km's of new Regional roads over the next 20 years. This represents a **14.2%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Km's of new Pipe Systems

There is estimated to be an increase of 1,945 km's of new Regional pipe systems over the next 20 years. This represents a **41.8%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Changing Technology and Expectations

Durham Region has, over the years, adapted to numerous changes in technology and methods that will continue to affect the way operations are carried out. These changes save money, labour, time, and the environment. Community expectations are also changing. As densification increases, greater emphasis must also be placed on alternate transportation methods, more efficient land use, transit infrastructure and support for pedestrians. This will make roadways and their associated service infrastructure much more complex, with increased activities required to maintain the related assets.

In addition, population demographics will continue to change towards residents with higher service expectations which will also increase the demand for services. Citizens are expecting greater communication, involvement, and transparency in the planning and spending of their tax dollars. This means that the Department will need to continue to implement new technologies and require more formal procedures to monitor and improve performance.

Increasing Legislative Regulations, Standards and Associated Costs

A trend towards increasing government regulations, policies, standards, and their associated higher costs will continue to impact the ability of the Department to deliver core services and meet expectations. This is already being experienced in winter roads maintenance, where feedback from insurance company data and judicial claims is, in many cases, dictating the service response time for winter roads maintenance. Managing to reduce potential liability claims, is now affecting the ability to manage within the existing budgets and resources.

Environmental Considerations and Related Costs

Durham Region is already experiencing increasing costs related to rapidly changing climatic factors. In the last decade, storm frequency and severity has increased, resulting in substantially increased operations costs. As this new situation becomes the norm, considerable work will be required to render the infrastructure more robust to withstand high winds, increased volumes of storm water, and sudden floods with high lake and ground water levels. Also, as the Region works to mitigate these factors, the Works Depots and Operations Centre will be expected to remain fully operational during emergencies with emergency power, communications systems and service equipment that fully support emergency repair services.

In addition, Durham Region has made a commitment to continue to be environmentally responsible and meet recognized environmental targets. These targets include initiatives to improve energy efficiency and reduce greenhouse gas emissions and other environmental contaminants. Improvements will be identified at all Depots that will need infrastructure upgrades to meet generally accepted best practices.

Infrastructure Deficit

Across many Canadian regions, aging and deteriorating infrastructure has resulted in a large and growing infrastructure deficit. Within many municipalities, aging roads, water, storm and sewer systems are deteriorating and in need of repair beyond the level of normal annual maintenance.

As the infrastructure continues to age within Durham Region (especially in the oldest developed areas), more of the Region's efforts and annual costs will be focused on upgrading and replacing these infrastructure elements. This will add to the daily requirements of the workforce.

Durham Region is also very aware that the Works Depots that support daily maintenance work are needing upgrades to meet accepted best practices and new legislation changes. These changes will involve capital costs but will improve operations efficiency and employee relations for higher performance and competitive operations that provide good value for money spent.

Demand for Accountability and Value for Money

The Region, like all municipalities, is under increasing pressure to reduce operational costs and deliver greater value. Continuous improvement programs will be underway to eliminate waste and to develop improved methods for delivering services at reduced cost to the taxpayer. This means improved technology, increased training and monitoring of work crews, and overall increased transparency of operations that will demonstrate to the public that they are receiving good value for money spent.

Therefore, the number of services, employees and work vehicles that will be required in the coming years will be influenced by the above factors - changes in population, technology, legislation, aging infrastructure, and community expectations for service level requirements. While there is no way to know precisely how all of these issues will unfold, interact and affect the Works Department over the next 20 plus years, there is no doubt that they will lead to an increase in the number of employees, work vehicles, equipment and storage space required. This report will address the factors outlined above to develop a plan for growth that will be consistent with lean, efficient and competitive operations that the Public will be proud to support.

3.2.2 Preferred Location of Depots and Their Service Functions

The future state Depot network design is a blueprint for the number of Depots required, where they should be located, and what capacity (i.e., service functions) they should have. The network design, therefore, has a major impact on the Work Department's service levels and operational costs. It is the most important factor affecting their ability to achieve their required operational performance levels.

The potential benefits of optimizing the Depot network design include the following:

- The workforce would be more effectively managed as it becomes consolidated into the optimal number of depots. This would lead to improved workforce productivity and flexibility – reducing travel times, operating costs and/or improving service levels;
- The total cost of operating and maintaining the remaining Depots would decrease;

- New Depots (if required) would be designed according to Best Practices to enable lean, efficient flow of employees, vehicles, materials and equipment.

To design the optimal Depot network, the Region needs to first specify the optimal performance levels for customer service and cost for the department. This requires a detailed understanding of the trade-offs between customer service and cost – no municipal department can simultaneously maximize customer service and minimize cost. For example, the Region can select a high customer service position (with high service levels) but this requires a high number of employees and vehicles, and multiple depots, all of which raise operational costs. As an alternative, the Region can select a low-cost position (requiring fewer employees and vehicles, a single yard and lower service levels) but at the expense of customer service. A successful strategy will, therefore, balance these trade-offs and select the optimal service-cost performance levels.

Our understanding is that the Region places high weighting on achieving their customer service levels while minimizing costs. That said, the current Depot network consists of five Depots and two Operations Centres that are located across the Region and are a result of the amalgamation of various geographical areas that took place in 1974.

To design the optimal Depot network, we will need to consider numerous issues that will affect the ability of the design to meet the Region's operational objectives, and demand for services over the next twenty years. These issues include:

- The Region covers a vast area (2,532 km^2 of land) which is mostly rural with two lane roads;
- The majority of the Region's population (totalling almost 800,000 residents) currently lives in the south-west and south-central area of the Region in one of five municipalities – Ajax, Pickering, Oshawa, Whitby and Clarington;
- As discussed in section 3.2.1, the Region's population is expected to grow by another 78 % to 1.2 million people by 2041 (according to the "Durham Region Planning For Growth" report issued under "Envision Durham" in 2017);
- The south-west corner of the Region will continue to experience the most residential/commercial growth and demand for services, in the coming decades;
- During the next Regional budget forecast window (2019 – 2028), 153 lane km's of new roads are proposed for construction (this does not include turning lanes). This is broken down by current Depot area as follows:

Ajax-Pickering Depot	61.1 km
Oshawa-Whitby Depot	69.9 km
Orono Depot	14.9 km
Scugog Depot	7.4 km
Sunderland Depot	0 km

- There is estimated to be an increase of 1,945 km's of new Regional pipe systems over the next 20 years. This represents a **41.8%** increase. This increase is expected to result in the need for additional resources and storage space at each of the existing Depots.

- The north end of the Region is mostly rural with a scattering of small townships – Scugog, Uxbridge and Brock;

- The network of Regional roads, bridges and culverts is spread across the Region though it is more densely situated within the major municipalities located in the south-west area. This supports decentralizing the Roads Department's crews throughout the Region (in multiple Depots) so as to minimize their travel times, deadhead times, response times, fuel costs, and wear on their vehicles. Reducing travel times would have the largest impact on increasing employee productivity, and the ability of the Roads crews to meet their service level requirements. However, decentralization would also increase the risk of lower crew utilization rates (increasing the risk of higher labour costs and/or lower service levels), and increase total Depot operating costs;

- The networks of water, storm and sanitary pipe systems are largely consolidated in the south-west end of the Region where the majority of the population lives. This supports consolidating most of the Water and Sewer Department's crews into the south-west area of the Region (in three or less Depots) so as to minimize their travel times, response times, fuel costs, and wear on their vehicles. Reducing travel times would have the largest impact on increasing employee productivity and the ability of the crews to meet their service level requirements. Consolidating the crews should also increase the ability of staff to increase crew utilization rates (resulting in lower labour costs and/or improved service levels) and decrease total facility operating costs. However, some crews should be located in the central and north areas of the Region to meet local requirements;

- The condition and location of the current Depots and Operations Centres will play a decisive role in whether they should be relocated. More specifically, the high capital cost required to build a new Depot often prohibits relocating an existing Depot just to reduce travel times. However, if the existing Depot was at the end of its asset life or lacked sufficient yard space, justification to build elsewhere might be achievable;

- Another issue that will affect whether a Depot should be relocated is the availability of suitable land in a better location;

- Opportunities to co-locate a Depot or Operations Centre with another Regional operation could lead to synergies which would reduce overall space requirements and capital construction costs.

Below, for each of the five sub-departments in this study, we will discuss the number of Depots recommended, and where they should be located.

Roads Department

As mentioned above, the current network of Regional roads, bridges and culverts spread across the Region supports continuing to decentralize the Roads Department's crews into multiple Depots. Doing so will reduce their travel times, response times, fuel costs, and wear on their vehicles. Reducing travel times will have a significant impact on increasing employee productivity and the ability of the Roads crews to meet their service level requirements. These benefits, in our opinion, outweigh the disadvantage associated with operating multiple facilities (i.e., duplication of certain functional areas resulting in less efficient overall use of space).

On Map 3.2, on page 66, we have drawn five circles evenly spread across the Region (each with a 10 km radius) to help identify where each Depot should be located so as to minimize total travel times amongst the network of Depots. We propose that 10 km is within an acceptable distance for Roads crews to travel from their Depot (in the densely populated southern area where traffic congestion and traffic lights can delay movement and dramatically increase crew travel times). In the rural, northern area of the Region this number could increase without adversely affecting travel time.

Map 3.3, on page 67, is a Heat map which uses colour to reflect the frequency of service calls throughout the Region. Blue represents a low frequency of calls whereas yellow represents a high frequency. On the map we have also drawn the five circles evenly spaced across the Region. Comparing the circles to the location of the service calls helps to determine the optimal location for each Depot so as to minimize overall travel times.

Our conclusions from Maps 3.2 and 3.3 are as follows:

1. If they could be placed in the ideal locations, five Depots would provide the Roads Department with the optimal number of Depots to achieve a good balance between the productivity benefits of reducing travel times versus the financial benefits of consolidating resources into fewer locations;

   Although there are currently five Depots, only the Ajax-Pickering Depot is well located to cover its assigned territory. The optimal location for each Depot is shown in Map 3.4 on page 68. The optimal locations are as follows:

   - The Ajax-Pickering Depot is well located given the location of the Regional roads, the circles, and the areas with the highest frequency of service calls. The Depot covers the south-west area of the Region well although the optimal location for the Depot would be approximately 1.5 km to the west of its current location. This location would minimize total travel times by the crews;

- The optimal location for the Oshawa-Whitby Depot would be approximately 8 km to the south-east along Regional Road 4 in an area zoned for light industrial. From this location the crews would best be able to cover the south-central area of the Region while minimizing their total travel times. However, when the Greenbelt and local zoning restrictions are taken into consideration the best location would be between Ritson Rd. North and Highway 407 (north of Conlin Rd. E.).

- The Orono Depot is reasonably well located to cover the south-east area of the Region. However, the optimal location would be approximately 3 km to the south-west in an area zoned for light industrial;

- The optimal location for the Scugog Depot would be approximately 6.5 km north of its current location. From this new location it would be best able to cover the central area of the Region so as to minimize travel times;

- The optimal location for the Sunderland Depot would be approximately 8 km north of its current location. From this location it would be best able to cover the central area of the Region so as to minimize travel times;

2. Above, we have stated that four of the five current Depots are not well located to minimize the average travel times of their work crews. However, when we consider their physical condition, the size of the yards, the capital cost of new construction, and the availability of suitable land in the ideal locations, we recommend that only two of the Depots relocate to a new site – the Oshawa-Whitby and Sunderland Depots. Given that the Scugog Depot will not be relocating, the new location for the Sunderland Depot should remain close to its current site.

3. As stated above, the relocation of the Oshawa-Whitby Depot to a new location, further east, would help to reduce travel times. However, it should be noted that the current site is too small to fully expand the Fleet Services garage to satisfy current operational needs, and the space used for the storage of waste soil will need to be vacated within five years. These issues, until addressed, will lead to increased operational costs (to out-source Fleet maintenance activities, and to manage the waste soil off-site). We, therefore, recommend that the Region develop a plan to acquire a new site for the relocation of the Oshawa-Whitby Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to operational needs and the limitations of the current site). As stated earlier, when the Greenbelt and local zoning restrictions are taken into consideration the best location would be between Ritson Rd. North and Highway 407 (north of Conlin Rd. E.).

4. The Region should develop a plan to acquire a new site for the relocation of the Sunderland Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to the age of the buildings, operational needs, and limitations of the current site).

5. We do not recommend building a new Depot in Seaton. The Seaton area is within an acceptable driving distance for work crews from the Ajax-Pickering Depot. The money would, therefore, be much better spent on expanding the Ajax-Pickering Depot which is undersized yet well positioned (in terms of minimizing travel times) to service the south-west area of the Region. That said, we would support storing some indoor/outdoor materials at a Seaton Depot so that work crews (working in the area) could replenish without having to drive back to the Ajax-Pickering or Scugog Depots. But this would be dependant on Transit and Waste deciding to build facilities there.

6. We spoke to representatives from Durham Region Transit (DRT) about the potential opportunity to co-locate a new Depot with the new Durham Region Transit bus storage and maintenance facility to be located in the south-central area of Durham Region (west of Thornton Rd. North and north of Conlin Rd.). The new Depot would replace the Oshawa-Whitby Depot. We believe that such a venture would have the potential to achieve some synergies that would reduce overall space requirements and, therefore, total capital construction costs. For example, the employee amenities for the two operations (such as change rooms, washrooms and lunchroom) could be shared, and the maintenance activities could share the same parts storage warehouse. However, the location for the new DRT facility is further away from the optimal location for the Oshawa-Whitby Depot. As a result, the savings in construction costs for the combined facility (by reducing space requirements) would be far less than the cost of the added travel times over the lifespan of the facility. Therefore, we do not recommend co-locating a new Depot with the new Durham Region Transit bus storage and maintenance facility.

   We also considered whether the required new Fleet Services maintenance bays should be built at the new DRT facility instead of the existing Oshawa-Whitby Depot. Our concerns include the following:

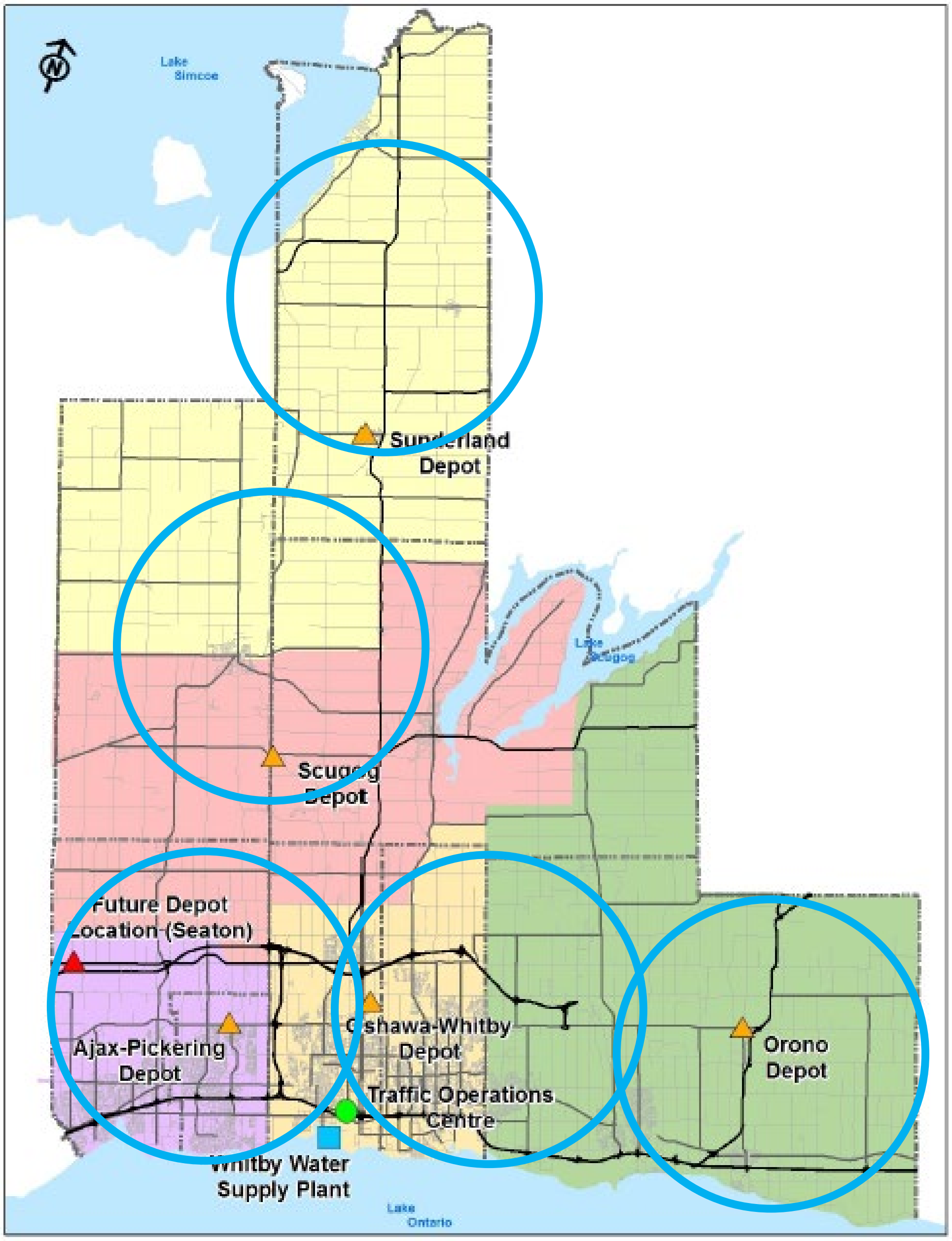
   - The size of the required Fleet Services bays would be different from those required for the buses, so they could not be shared;
   - Splitting the Fleet Services mechanics across two sites would, likely, require added supervisory costs;
   - Duplicate Fleet Services vehicle maintenance parts would need to be stored at the DRT facility increasing the warehouse space requirements and inventory carrying costs for Fleet Services;
   - Fleet vehicles at the Oshawa-Whitby Depot would need to be shuttled to the DRT facility in order to use the maintenance facilities which would add to the maintenance costs;
   - The synergies that would be achieved by building the Fleet Services maintenance bays at the new DRT facility would be too small to justify the added costs described above.

Therefore, we do not recommend building the new Fleet Services maintenance bays at the new DRT facility.

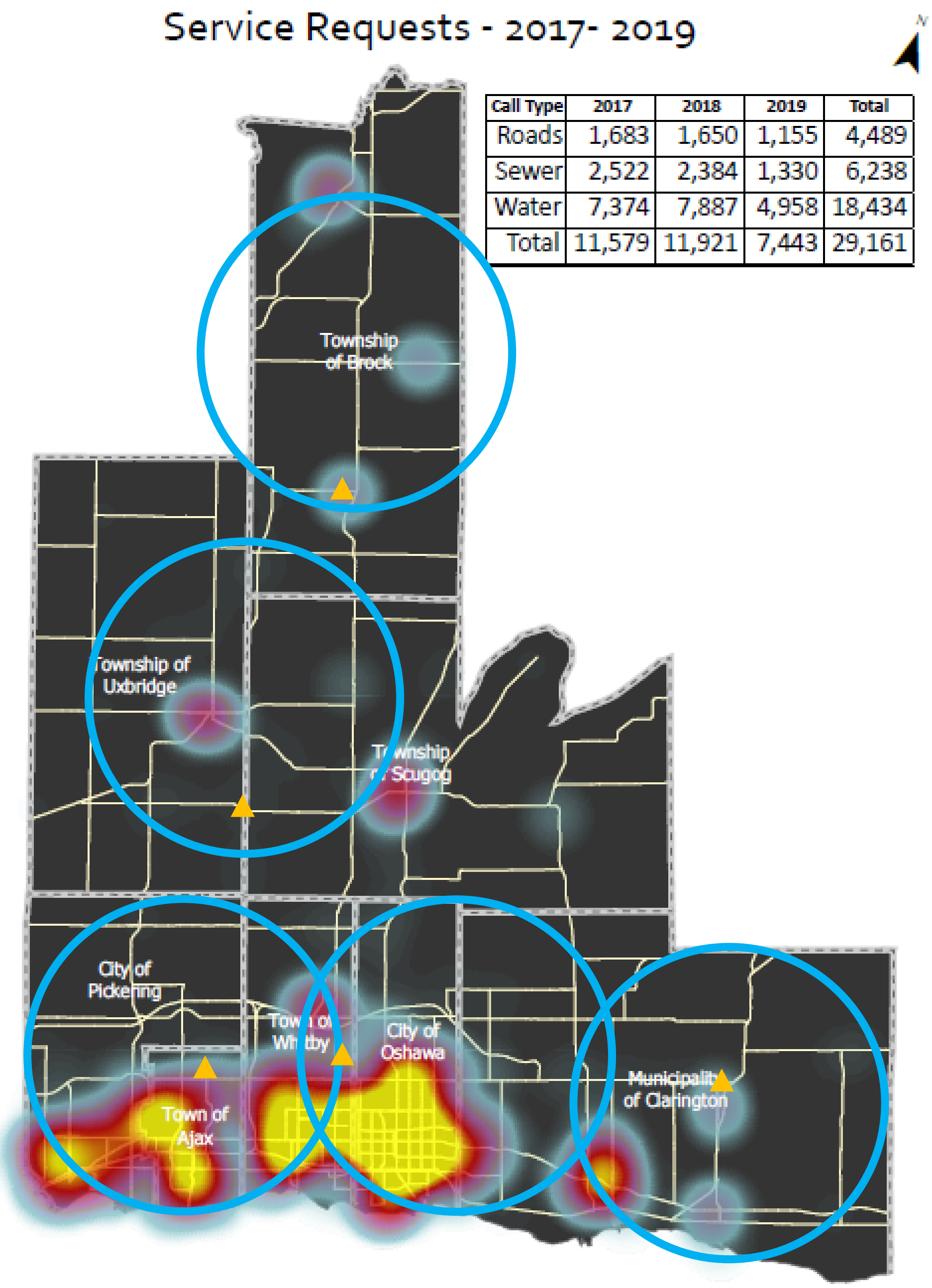
Lastly, we considered relocating the entire Fleet Services operation from the Oshawa-Whitby Depot to the new DRT facility. However, the cost of shuttling the vehicles from the Oshawa-Whitby Depot (year after year) would be greater than any potential synergies that could be achieved.

7. The number of Roads crews at each Depot should then be recalculated based on the amount of work in each new territory (expected to be proportional to the number of lane km's od Regional roads). This will be discussed further in the Master Plan Reports.

Map 3.2 – 10 Km Travel Circles

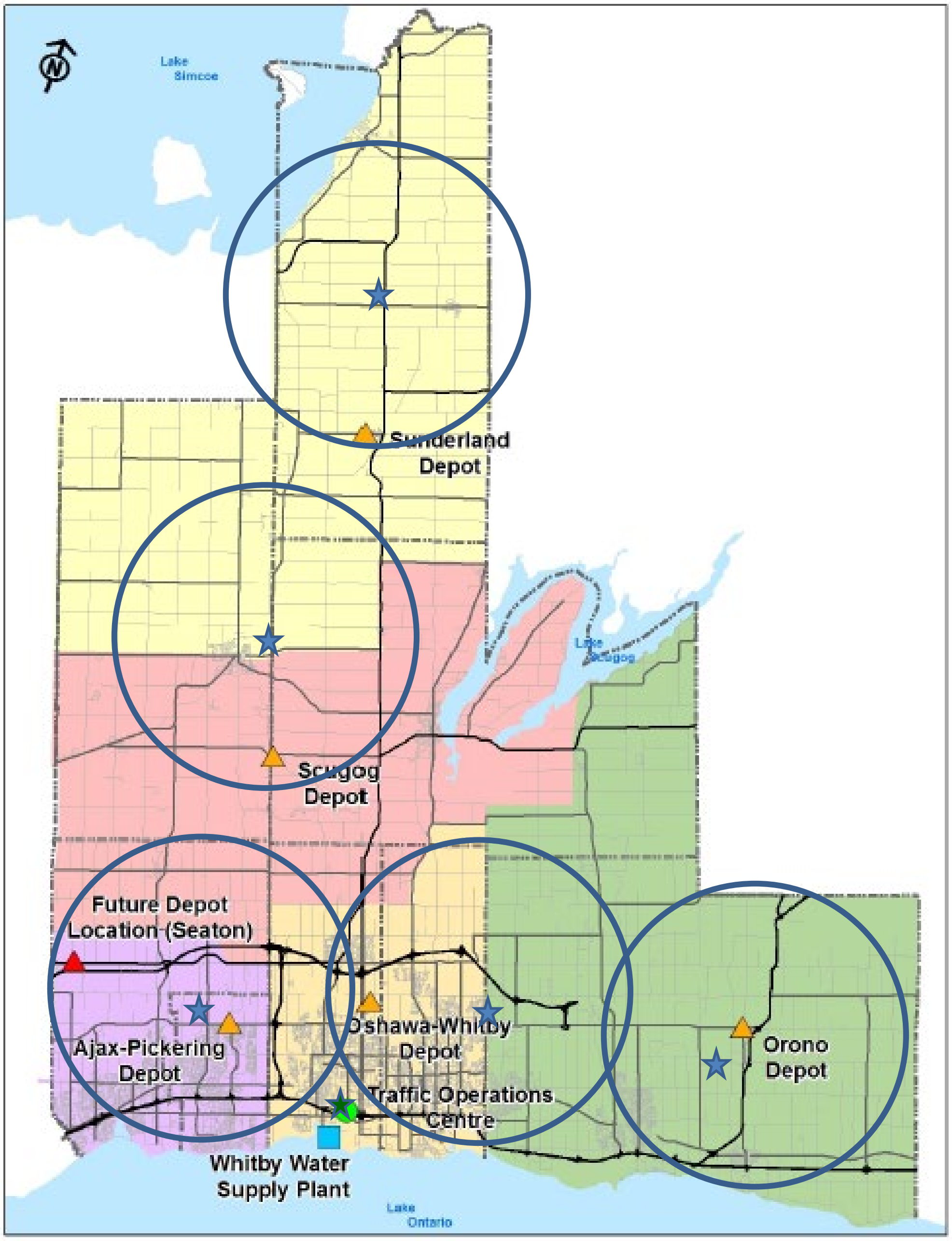


Map 3.3 – Service Call Heat Map



Call Type	2017	2018	2019	Total
Roads	1,683	1,650	1,155	4,489
Sewer	2,522	2,384	1,330	6,238
Water	7,374	7,887	4,958	18,434
Total	11,579	11,921	7,443	29,161

Map 3.4 – Optimal Depot Locations



Water and Sewer Departments

As mentioned above, the current networks of water, storm and sanitary pipe systems are largely consolidated in the south-west end of the Region where the majority of the population lives. This supports continuing to consolidate most of the Water and Sewer Department's crews in the south-west area of the Region (in three or less Depots) so as to minimize their travel times, response times, fuel costs, and wear on the vehicles.

Our conclusions from Map 3.2 and Map 3.3 are as follows:

1. If they could be placed in the ideal locations, five Depots would provide the Water and Sewer Departments with the optimal number of Depots to achieve a good balance between the productivity benefits of reducing travel times versus the financial benefits of consolidating resources into fewer locations. Although most of the crews should be located in the south-west area of the Region, some need to be located further north to respond to service calls in the small towns such as Uxbridge, Cannington and Beaverton;

2. As discussed for the Roads Department, only the Ajax-Pickering Depot is well located to cover its assigned territory. The optimal location for the other Depots would be at least 3 km from their current location so as to reduce the average travel times of the work crews (assuming their territories changed as well). See Map 3.4 for the optimal location for each Depot (the blue stars);

3. Above, we have stated that four of the five current Depots are not well located to minimize the average travel times of their work crews. However, when we consider their physical condition, the size of the yards, the capital cost of new construction, and the availability of suitable land in the ideal locations, we recommend that only two of the Depots relocate to a new site – the Oshawa-Whitby and Sunderland Depots. Given that the Scugog Depot will not be relocating, the new location for the Sunderland Depot should remain close to its current site;

4. As discussed for the Roads Department, we recommend that the Region develop a plan to acquire a new site for the relocation of the Oshawa-Whitby Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to operational needs and the limitations of the current site). As stated earlier, when the Greenbelt and local zoning restrictions are taken into consideration the best location would be between Ritson Rd. North and Highway 407 (north of Conlin Rd. E.).

5. As discussed for the Roads Department, we recommend that the Region develop a plan to acquire a new site for the relocation of the Sunderland Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to the age of the buildings, operational needs, and limitations of the current site).

6. As discussed for the Roads Department, we do not recommend building a new Depot in Seaton for the Water and Sewer Department. The Seaton area is within an acceptable driving distance for work crews from the Ajax-Pickering Depot;

7. As discussed for the Roads Department, we spoke to representatives from Durham Transit about the potential opportunity to co-locate a new Depot with the new Durham Transit bus storage and maintenance facility. The new Depot would replace the Oshawa-Whitby Depot. However, the location that was being considered by Durham Transit was too far north to be acceptable for the Oshawa-Whitby service territory;

8. The number of Water and Sewer crews, at each Depot, should then be recalculated based on the amount of work in each new territory (expected to be proportional to the number of km's of pipe systems). This will be discussed in more detail in the Master Plan Reports;

Fleet Services Department

Theoretically, to minimize maintenance costs and space requirements, only one Fleet Services garage should be built to service the entire fleet of vehicles across the Region. However, this would significantly lower Fleet Service's customer service levels and the Works Department would spend more time shuttling vehicles to and from the single maintenance garage. This would also lower crew productivity and, therefore, encourage the Works Department to increase its fleet of spare vehicles (and vehicle storage requirements) to compensate for the lower customer service levels.

By contrast, to maximize customer service levels, a Fleet Services garage should be built at each Depot. However, maintenance costs and space requirements would also be maximized. This is the current model being used with a Fleet Services garage at each of the five Depots.

Given the size of the Region, and the location of the existing Depots and garages, we believe that the current model should be continued. That is, we recommend that (1) the primary Fleet Services garage and Parts Store should continue to be located at the Oshawa-Whitby Depot, and (2) 1-3 mechanics be provided at each of the other Depots (as justified by the size of the local Fleet) for completing unscheduled maintenance.

The number of mechanics (and maintenance bays) at each Depot should be optimized to ensure that Fleet Services can meet its service level objectives for scheduled and unscheduled maintenance. To help maximize mechanic utilization, there are, typically, 1.5 to 2 maintenance bays provided for each mechanic. As mechanic utilization increases, customer service levels increase and space requirements for everyone decreases – fewer mechanics, work crews and vehicles are required. The need for spare vehicles also decreases.

A two-shift operation within the Fleet Services garages (especially at the Oshawa-Whitby Depot) would offer numerous advantages including:

- Reducing the number of maintenance bays required by doubling the utilization of each bay;
- Reducing the turn around time for each vehicle and, thereby, increase crew productivity and the number of spare vehicles required;
- The salters and plows would have greater maintenance coverage throughout their operating period. This would improve customer service levels.

The main parts/supplies storage for all of the Depots should be consolidated into one Stores Department at the Oshawa-Whitby Depot. This would eliminate duplication in space requirements and would achieve economies of scale. Smaller, point of use storage would still exist at each Depot for daily consumables.

The objective of the Stores Department would be to order, receive and store inventory, and to replenish parts, tools and miscellaneous supplies to the point of use storage areas within the maintenance garages, and Departmental tool/supplies storage areas.

In terms of the management approach, Vendors or 3PL's (Third Party Logistics provider's) are, typically, very cost effective at managing those parts which move off the shelf quickly - referred to as fast movers (e.g., ten or more turns per year). Therefore, these parts should be managed off-site by the vendors or a 3PL and supplied to the Stores Department, as required, so it can replenish the point-of-use storage levels. This would reduce on-site storage space, stock-outs, logistics costs and improve customer service.

Vendors and 3PL's (Third Party Logistics provider's) tend to be much less cost effective at managing medium and slow movers, critical spares and dead stock. Dead stock (i.e., has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. The medium and slow movers, and critical spares should be managed in-house to reduce logistics costs.

Consolidation of medium and slow movers, and critical spares, into one Stores Department, would help to justify high density storage systems and automation (e.g., vertical lift modules), reduce labour and space requirements, and reduce warehouse costs.

Water Meter Division

The Water Meter Division currently operates as a consolidated group (at the Oshawa-Whitby Depot) to provide water meter maintenance and replacement services across the Region. However, their services are mostly located in the highly populated south-west area of the Region. There are three clerks and eight-meter mechanics who operate a fleet of eight Service Repair Vans. This supports continuing to consolidate the staff and crews into one facility in the south-central area of the Region so as to minimize total travel times (and to achieve operational synergies and collaboration).

Consolidating the work crews into one facility should also improve the ability of staff to increase crew utilization resulting in lower operating costs and/or improved service levels. However, crew travel times and vehicle costs would be higher than if there were multiple facilities.

Our conclusions are as follows:

1. The Water Meter Division should continue to remain consolidated in one facility to achieve operational synergies and employee collaboration;

2. The Water Meter Division should remain at the Oshawa-Whitby Depot because it is somewhat centred across the south-west end of the Region (which will help to reduce travel times), and because there is a large Fleet Services Department able to maintain the fleet of vans.

Materials Testing and Laboratory Services (MTLS)

The MTLS currently operates as a consolidated group (at the Oshawa-Whitby Depot) to complete concrete, asphalt and soil testing for construction contractors across the Region. However, the construction sites are mostly located in the south-west area of the Region. They have six full-time employees and two temporary employees. This supports continuing to consolidate the employees into one lab facility in the south-central area of the Region so as to minimize total travel times (and to achieve operational synergies and collaboration).

Our conclusions are as follows:

1. The MTLS should continue to remain consolidated in one lab facility to achieve operational synergies and employee collaboration;

2. The MTLS should remain at the Oshawa-Whitby Depot because it is somewhat centred across the south-west end of the Region (which will help to reduce travel times), and because there is a large Fleet Services Department able to maintain the fleet of vehicles.

Sewer and Water Appurtenance Testing Team (SWAT)

The Region's SWAT team has six full-time employees and two temporary employees. The Manager and Supervisor need to be located at the Region's Headquarters but the other six employees are consolidated at the Oshawa-Whitby Depot because of its south-central location (to minimize driving distances). They operate three service vehicles.

Traffic Operations Group

The Traffic Operations Group's service functions are mostly consolidated in the south-west area of the Region and include the construction and maintenance of traffic signals and warning devices, roadside protection (guardrails), pavement line markings, and sign manufacturing and installation. Their facility contains an electronic lab and sign shop, the traffic engineering and signal control group, and related administrative staff. This supports consolidating most of the Department's crews in one facility in the south-central area of the Region so as to minimize their total travel times (80% of the traffic signals are within the south area of the Region quickly accessible using Highway 401). The exception is the crew(s) responsible for pavement line markings which perform their work throughout the Region. A case could be made to relocate them to a central Depot further north (i.e., the Oshawa-Whitby Depot)

Consolidating the work crews into one facility (i.e., Operations Centre) should improve the ability of staff to increase crew utilization resulting in lower operating costs and/or improved service levels. Having only one facility would also minimize facility operating costs (because there are no duplicated areas). However, crew travel times and vehicle costs would be higher than if there were multiple facilities.

In Map 3.5, on page 78, we have drawn an ellipse around the most densely populated area of Durham Region where most of the crew activities are performed. Our conclusions are as follows:

1. The Traffic Operations Group should remain consolidated in one facility to achieve operational synergies and employee collaboration;

2. The current Traffic Operations Centre is well positioned to cover the most densely populated area of the Region. Quick access to Highway 401 reduces travel time for the crews. Furthermore, the construction cost to build a new facility during the next 10 plus years would be prohibitive. However, when both the Traffic Operations Centre and the Oshawa-Whitby Depot are at the end of their asset lives, there would be a benefit to consolidating both operations into one new facility. Consolidating several departments into one new Depot would create operational synergies that would reduce total space requirements and decrease operating costs;

3. The line marking crew(s) should be relocated to the Oshawa-Whitby Depot which is more centrally located and offers Fleet maintenance on-site;

4. Employees at the Scugog and Sunderland Depots should be cross-trained to complete locates, guiderail and sign work. Doing this would prevent the need for crews to travel from 101 Consumers Drive to complete the work.

Facilities Maintenance and Operations Group (FMO)

The majority of the facilities that the FMO Group needs to maintain are located south of Highway 7. Therefore, this supports consolidating most of their crews in one facility in the south-central area of the Region with easy access onto Highway 401 so as to minimize their total travel times (and to achieve operational synergies).

Consolidating the work crews into one facility (i.e., Operations Centre) should improve the ability of staff to increase crew utilization resulting in lower operating costs and/or improved service levels. Having only one facility would also minimize facility operating costs (because there are no duplicated areas). However, crew travel times and vehicle costs would be higher than if there were multiple facilities.

Referring again to Map 3.5, our conclusions are as follows:

1. The FMO Group should remain consolidated in one facility to achieve operational synergies and employee collaboration;

2. The FMO Group is scheduled to be relocated to The Region's Traffic Operations Centre (101 Consumers Drive), in 2023, to share the facility with the Traffic Operations Group. This is a good idea as the Operations Centre is well positioned for the requirements of the FMO Group - quick access to Highway 401 will reduce travel time for the crews. However, to provide sufficient space for the FMO Group, the layout of the Operations Building will need to be modernized to achieve synergies, and to increase the efficiency of space usage;

3. Although the Operations Centre can be retrofitted to meet the needs of the FMO Group, we recommend that, eventually, the Group relocate along with the Traffic Operations Group and Oshawa-Whitby Depot to a new facility. Doing this would achieve numerous synergies between the three operations and would eliminate the duplication of common spaces: employee amenities, training rooms, shops, and parts storage. It would also provide the operations with the opportunity to improve their collaboration, and to work within new facilities that achieve best practices in design and promote operational productivity.

Map 3.5 – Most Densely Populated Part of Durham Region

In summary, our conclusions are as follows:

1. The Region should develop a plan to acquire a new site for the relocation of the Oshawa-Whitby Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to operational needs and the limitations of the current site). When the Greenbelt and local zoning restrictions are taken into consideration the best location would be between Ritson Rd. North and Highway 407 (north of Conlin Rd. E.).

2. The Region should develop a plan to acquire a new site for the relocation of the Sunderland Depot as soon as possible. Design and construction of the Depot should begin as soon as funding can be acquired (preferably within 5 years due to the age of the buildings, operational needs, and limitations of the current site).

3. A new Depot should not be built in Seaton for the Works Department. The Seaton area is within an acceptable driving distance for work crews from the Ajax-Pickering Depot. That said, we would support storing some indoor/outdoor materials at a Seaton Depot so that work crews (working in the area) could replenish without having to drive back to the Ajax-Pickering or Scugog Depots. But this would be dependant on Transit and Waste deciding to build facilities there;

4. The planned location for a new Durham Transit bus storage and maintenance facility is too far north to be acceptable for a new Oshawa-Whitby Depot;

5. Given the size of the Region, and the location of the existing Depots and garages, we believe that the current model for Fleet Services should be continued. That is, we recommend that the primary Fleet Services garage should continue to be located at the Oshawa-Whitby Depot with satellite locations at each of the other four Depots;

6. The number of mechanics (and maintenance bays) at each Depot should be optimized to ensure that Fleet Services can meet its service level objectives for scheduled and unscheduled maintenance. We will discuss more about the required number of mechanics in section 3.25 and 3.2.6;

7. The main parts/supplies storage for all of the Depots should be consolidated into one central Stores Department at the Oshawa-Whitby Depot. This would eliminate duplication in space requirements and would achieve economies of scale. Smaller, point of use storage would still exist at each Depot for daily consumables.

8. The Region should further analyse the potential benefits of using Vendors or 3PL's (Third Party Logistics provider's) to manage the fast movers (e.g., SKU's with ten or more turns per year) off-site and replenish the Stores Department, as required. This would reduce on-site storage space requirements, stock-outs, logistics costs, and improve customer service.

9. Vendors and 3PL's tend to be much less cost effective at managing medium and slow movers, critical spares and dead stock. Dead stock (i.e. has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. Therefore, the medium and slow movers, and critical spares should be consolidated into the central Stores Department. This would help to justify the use of high-density storage systems and automation, reduce labour and space requirements, and reduce warehouse costs.

10. The Water Meter Division, MTLS, SAT and Training team should all continue to be consolidated at the Oshawa-Whitby Depot.

11. The current Traffic Operations Centre is well positioned to meet the needs of the Traffic Operations Group and the FMO Group over the next 10-20 years. However, when the Traffic Operations Centre is at the end of its asset life, there would be a benefit to consolidating the operations into the new Oshawa-Whitby Depot. Doing this would achieve numerous synergies between the three operations and would eliminate the duplication of common spaces: employee amenities, training rooms, shops, and parts storage. It would also provide the operations with the opportunity to improve their collaboration, and to work within new facilities that achieve best practices in design and promote operational productivity.

12. The line marking crew(s) for the Traffic Operations Group should be relocated to the Oshawa-Whitby Depot which is more centrally located and offers Fleet maintenance on-site.

In Table 3.4, on the following page, we summarize the proposed locations for each of the Works Departments functions:

Table 3.4 – Proposed Locations for Each of the Works Department Functional Groups

Location	Departments/Groups								
	Roads	Water & Sewer	Fleet Services	Water Meter	MTLS	Traffic Operations	FMO	SWAT	Training
A-P Depot	Yes	Yes	Yes						
O-W Depot	Yes	Yes	Yes	Yes	Yes			Yes	Yes
Orono Depot	Yes	Yes	Yes						
Scugog Depot	Yes	Yes	Yes						
Sunderland Depot	Yes	Yes	Yes						
Traffic Operations Centre						Yes	Yes		
New Durham Transit Facility									
Proposed Seaton Depot									
Proposed New O-W Depot	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

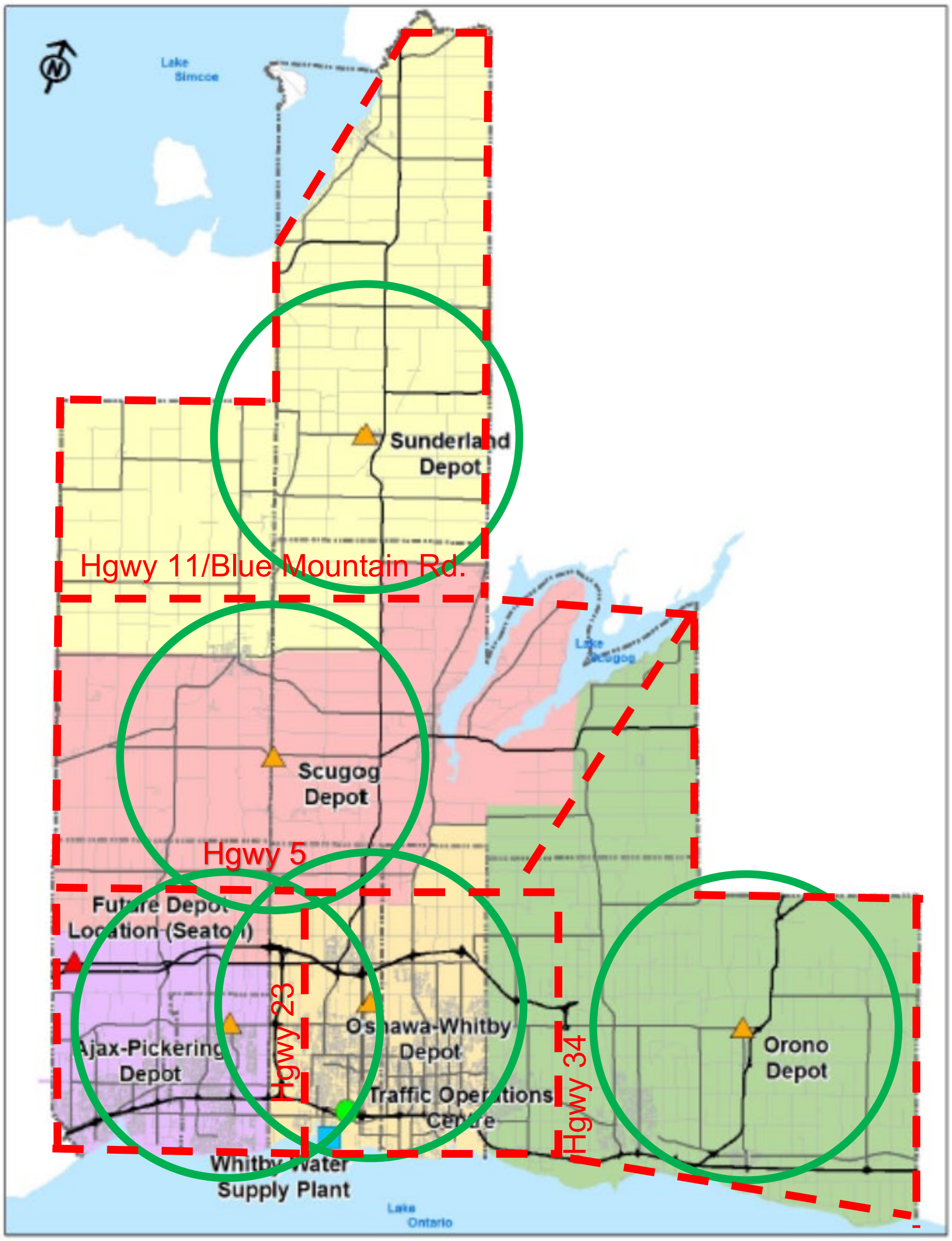
3.2.3 Preferred Location of the Service Territory Boundaries

The current service territory boundaries for each of the Depots appear to be based on the municipal boundaries. We propose that they, instead, be based on reducing overall travel times by the work crews. Therefore, the five current service territories should be redrawn as described below:

- The territory for the Ajax-Pickering Depot should be extended to the north and the east (to the mid-point with the Oshawa-Whitby Depot);
- The territory for the Oshawa-Whitby Depot should be extended to the east;
- The territory for the Orono Depot should be reduced on its western side;
- The territory for the Scugog Depot should be extended to the north (to the mid-point with the Sunderland Depot) and reduced in the south;
- The territory for the Sunderland Depot should be reduced in the south;

Redrawing the service boundaries will help to minimize crew travel times, deadhead times, response times, fuel costs, and wear on the vehicles (as shown by the dashed red lines on Map 3.6):

Map 3.6 – Proposed Service Territory Boundaries



3.2.4 Site Selection

We have proposed that the Region, eventually, relocate the Oshawa-Whitby Depot and the Traffic Operations Centre to a new, joint site. Below, we list the criteria that we recommend be used for the site analysis:

Land Use Zoning

An optimal site would be in an industrial park with compatible surrounding operations that would not be affected by the potential noise, traffic or air-born emissions generated by the activities within the Yard.

Total Acreage Available

The optimal site would have sufficient useable land to accommodate growth in operations for at least the next five to six decades. The number will be determined in the Master Plan Report.

Shape and Topography of the Land

The optimal site would be relatively flat and rectangular with an aspect ratio of 2:1. A flat site would avoid major cut and fill costs and minimize the cost of grading. A rectangular site would best facilitate the flow of vehicles and employees.

Ease of Access onto the Site

The site would permit at least two exits/entrances without interference from traffic flows/congestion (e.g., from cars waiting at an intersection or traffic lights).

Impact of the Location on Crew Travel Time

The optimal site (in terms of minimizing crew travel times) would be located along Thickson Road North, between Taunton Road East and Rossland Road East.

Environmental Considerations

The site would not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wet lands. This is because of the large volume of salt that will be stored on site and the potential for it to contaminate the ground water and enter the watercourse/wet lands. That said, an indoor salt storage and loading facility would likely contain the salt and minimize any risk to the environment.

Potential Cost of Providing Services (power, water, sanitary, storm)

Ideally, the site would be located within a developed industrial park with ready access to services (power, water, sanitary, storm) so as to minimize construction costs.

3.2.5 Resources (Employees/Vehicles/Equipment/Materials) for Each Yard and Satellite Location

Section 3.2.1 discussed the predominant factors that will affect the resource requirements (employees, vehicles, equipment and materials) for the Works Department over the next 20 years. In this section, we will forecast the number of resources to be utilized at each of the Depots and the Traffic Operations Centre over the next 10 to 20 years.

We will make the following assumptions:

- The current number of employees is sufficient to efficiently meet the service level requirements;
- The levels of service will not change over the next 20 years;
- There will be no new outsourcing or privatization of existing services;
- The utilization and mix of vehicles and equipment will not change;
- The need to increase resources (i.e., employees, vehicles and equipment) for the Roads Departments and will be proportional to the increase in lane km's of Regional roads. The need to increase resources for the Water and Sewer Departments will be proportional to the increase in km's of pipe networks;

In Table 3.5, below, we list the increase in lane km's of Regional roads for each of the Depot service territories.

Table 3.5 – Lane Km's of Regional Roads

Department	Depot	Current Lane Km's of Roads	Increase in Lane km's by 2030	% Increase by 2030	Increase in Lane km's by 2040	% Increase by 2040
Roads	A-P Depot	525.3	68	**12.9**	136	**25.9**
	O-W Depot	691.3	78	**11.3**	155	**22.4**
	Orono Depot	408.4	17	**4.2**	34	**8.3**
	Scugog Depot	393.6	8	**2.0**	16	**4.1**
	Sunderland Depot	376.1	0	**0**	0	**0**
	TOTAL	**2,394.7**	**171**	**7.1**	**341**	**14.2**

Note: The above numbers are based on Regional forecasts for 2019-2028 for each of the Depot service territories (Ajax/Pickering = 61.1, Oshawa/Whitby = 69.9, Orono = 14.9, Scugog = 7.4 km)

In Table 3.6, below, we list the increase in km’s of water and sewer pipe systems for each of the Depot service territories.

Table 3.6 – Km’s of Water and Sewer Pipe Systems

Department	Depot	Current Km’s of Pipe Systems	Increase in km’s by 2030	% Increase by 2030	Increase in km’s by 2040	% Increase by 2040
Water and Sewer	A-P Depot	755.6 Water 657.26 Sewer	149.25 Water 134.74 Sewer	19.75 Water 20.5 Sewer	298.49 Water 269.48 Sewer	39.50 Water 41.00 Sewer
	O-W Depot	1,211.89 Water 1,045.88 Sewer	207.97 Water 187.76 Sewer	17.16 Water 17.95 Sewer	415.94 Water 375.52 Sewer	34.32 Water 35.90 Sewer
	Orono Depot	385.93 Water 281.0 Sewer	112.23 Water 100.00 Sewer	29.08 Water 35.59 Sewer	224.46 Water 199.99 Sewer	58.16 Water 71.17 Sewer
	Scugog Depot	135.04 Water 91.05 Sewer	21.93 Water 19.80 Sewer	16.24 Water 21.74 Sewer	43.85 Water 39.59 Sewer	32.47 Water 43.48 Sewer
	Sunderland Depot	50.74 Water 42.99 Sewer	20.38 Water 18.40 Sewer	40.16 Water 42.79 Sewer	40.75 Water 36.79 Sewer	80.31 Water 85.57 Sewer
	TOTAL	**4,657.4**	**972.46**	**20.88**	**1,944.86**	**41.76**

Note: The above numbers are based on Regional forecasts for each of the Depot service territories.

Using the numbers from these two tables (the % increase in 2030 and 2040), we will forecast the number of Roads, Water and Sewer employees and work vehicles that will be required at each Depot in 2030 and 2040. These forecasts are shown in Appendix B.

The number of Fleet Services employees forecast for 2030 and 2040 relied on the **“current number of mechanics needed”** (which was calculated by the Fleet Services Department) for the 2020 base number of mechanics. The Department determined that for the mix of vehicles in the fleet and the number of hours of maintenance required per vehicle, six additional mechanics are currently required. The details are shown in Table 3.7 below.

Table 3.7 – Fleet Services Mechanics Required in 2020

	A-P Depot	O-W Depot	Orono Depot	Scugog Depot	Sunderland Depot
Current Actual No. of Mechanics	2	8	2	1	1
Current No. of Mechanics Needed	**2**	**12**	**2**	**2**	**2**

The future number of Traffic Operations and FMO employees and work vehicles were estimated by these departments and are shown in Appendix B. The growth requirements for the FMO Department will be largely impacted by the addition of the following locations over the next ten years:

Table 3.8 – New FMO Location Responsibilities

101 Consumers	4 Bay garage expansion - Construct
	4 Bay garage expansion - Design
Ajax Depot - Expansion	Construct - 20 Bay Cold Vehicle Storage
	Construct - Additional Office Space and Heated Vehicle Storage Space
	Construct - Mechanic Garage Bay
	Design - 20 Bay Cold Vehicle Storage
	Design - Additional Office Space and Heated Vehicle Storage Space
	Design - Mechanic Garage Bay
	Material Storage Facility Expansion
Children's Services - Whitby ELCC	Playground Renovations - Construction
	Playground Replacement - Design
Clarington RDPS	Clarington RDPS New Build - Construction
	Clarington RDPS New Build - Consulting
Health	Seaton Planned Community – Design
	Seaton Planned Community - Construction
Orono Depot - Expansion	Design & Construct - 20 Bay Cold Vehicle Storage
	Design & Construct - Salt Storage Building
Oshawa/Whitby Depot	Design & Construct - 20 Bay Cold Vehicle Storage
	Mechanic’s Bay Expansion (6 Bay) including new roof specifications for existing fleet bay and vehicle storage area
Plants Central – Sunvalley Well	Replacement of Well Building

Table 3.8 – New FMO Location Responsibilities – Continued

Scugog Depot	Construction of Mezzanine in Fleet Area
Scugog Depot - Expansion	Design & Construct - 16 Bay Cold Vehicle Storage
	Design & Construct - Additional Office Space
	Design & Construct - Salt and brine storage facility
Seaton Depot	Proposed Seaton Depot
Social Services	Seaton Social Services – Design
	Seaton Social Services – Construct
Sunderland Depot - Expansion	Design & Construct - Salt and brine storage facility
Transit	Indoor Bus Storage/Servicing Facility Expansion
	New Indoor Bus Storage/Servicing Facility - Construction
	New Indoor Bus Storage/Servicing Facility - Design
Transit - Raleigh	Office Area Demolition/Rebuild
Transit - Seaton	Seaton Transit New Build
Uxbridge RDPS	Uxbridge RDPS New Build

In Appendix B, we also list the number of Fleet Services mechanics that will be required to maintain the number of vehicles estimated to be required by the Works Department in 2030 and 2040.

The Region has established the following criteria for the storage of work vehicles:

Heated Storage:

- Diesel vehicles
- Vehicles with hydraulic systems
- Tandem / single axle plow trucks
- Water meter vans

Cold Vehicle Storage:

- As many vehicles as possible preferably with electric plug ins.

3.2.6 Future Functional Needs

In this section, we will document the future functional needs for each of the Depots and Operations Centre for a time horizon of current, 10 and 20 years.

Ajax-Pickering Depot

Table 3.9 – Ajax-Pickering Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay (1,800 ft^2)	**Recommend building a larger wash bay (30x60 ft)**
Fleet Maintenance Garage	4,391 ft^2 1 Drive-through; 1 One-way	3 bays (1 new bay at 1,375 ft^2)	3 bays	5 bays (3 new bays at 3,630 ft^2	**Require 3 more maint. bays for 2040. 3 mechanics require 5 bays (25x55 ft each).**
Indoor Vehicle/Equipment Storage	14,826 2 Drive-through; 8 one-way	25 storage bays (15 new bays)	29 storage bays (29 new bays)	33 storage bays (23 new bays at 12,480 ft^2)	**Require 23 more medium size storage bays for 2040 (16x32.5 ft each)**
Indoor Salt Storage	4,909 ft^2	1 salt building	1 salt building	1 salt building	Recommend replacing the existing building with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is new
Employee Parking	60	57 plus 5 visitor stalls	65 (require 10 more stalls)	74 (require 20 more stalls)	**Require 20 more parking stalls by 2040**
Outdoor Vehicle Parking	36	35	42	48	There is ample open space in the yard to create the additional 12 parking stalls for 2040
Secure Yard Fencing	The Depot is fenced with gates at the entrances	None	None	None	The existing fence and gates surround the Depot and satisfy security requirements
Site Entrance/Exit	Two points of access	Three points of access	Three points of access	Three points of access	Should create a new yard entrance for work vehicles to permit the employee parking to expand north
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	The flow through the yard should be one-way in a counter-clockwise direction.
Arrangement of Buildings on the Site	irregular				The material and tool storage buildings are too far from the main building. No changes recommended

Note: we have assumed that each mechanic requires at least 1.5 bays (each bay is 25x55 ft)

In summary, we recommend the following changes to the yard (listed in order of priority):

- The flow through the yard should be one-way in a counter-clockwise direction;
- Build a new yard entrance for work vehicles closer to the north end of the yard. This would permit the outdoor employee parking lot to expand by the required 20 stalls;
- Convert the existing wash bay into a parts storage room/supervisor office/mechanic lunch room;
- Build three more maintenance bays beside the existing maintenance bays. They should each be approximately 25x55 ft. in size for a total of 3,630 ft^2;
- Build a new stand-alone vehicle wash bay (to replace the existing one) close to the salt storage building. The wash bay should be approximately 30x60 ft. (1,800 ft^2) in size and the wash water should be filtered for reuse in the wash area or to make brine;
- Build 23 more medium size indoor storage bays. They should be approximately 16x32.5 ft each in size for a total of 12,480 ft^2. If room permits the building should be drive-through and 2 vehicles deep;
- When the existing salt storage building has reached the end of its asset life, it should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

Oshawa-Whitby Depot

Table 3.10 - Oshawa-Whitby Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Materials Testing Lab	2,000 ft^2	2,000 ft^2	2,000 ft^2	2,000 ft^2	The lab is sufficient in size for the current activities.
Water Meter Shop	1,250 ft^2	1,250 ft^2	1,250 ft^2	1,250 ft^2	The shop is sufficient in size for the current activities.
Wash Bay	1 Wash Bay	1 Wash Bay	2 Wash Bay	2 Wash Bay (1,800 ft^2)	**Recommend building a 2nd wash bay (30x60 ft)**
Fleet Maintenance Garage	7,938 ft^2 9 one-way	18 bays (9 new bays at 12,375 ft^2)	21 bays (12 new bays at 16,500 ft^2)	24 bays (15 new bays at 18,150 ft^2)	**Require 15 more maint. bays for 2040. 16 mechanics require 24 bays (22x55 ft each).**
Indoor Vehicle/Equipment Storage	18,408 ft^2 8 one-way (fit approx. 30 vehicles)	42 storage bays (12 new bays)	49 storage bays (19 new bays)	57 storage bays (27 new bays at 12,960 ft^2)	**Require 27 more medium size storage bays for 2040 (16x30 ft each)**

Table 3.10 - Continued

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Indoor Salt Storage	12,345 ft^2	1 salt building	1 salt building	1 salt building	Recommend replacing the existing building with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is new
Employee Parking	115	133 plus visitor stalls (require 28 more stalls)	149 (require 44 more stalls)	163 (require 58 more stalls)	**Require 58 more parking stalls by 2040**
Outdoor Vehicle Parking	65	56	66	115	**50 additional parking stalls for 2040**
Desiccant Drying	None on the actual property				Require a decanting system
Secure Yard Fencing	The Depot is fenced except on the east side. No gates at the entrances	The east side should be fenced	The east side should be fenced	The east side should be fenced	The east side of the yard should be fenced and gates should be installed at the two entrances
Site Entrance/Exit	Two points of access	Two points of access	Two points of access	Two points of access	
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	The flow through the yard should be one-way in a counter-clockwise direction.
Arrangement of Buildings on the Site	Traditional				No changes recommended

As stated in section 3.2.2, the O-W Depot is not in the optimal location to minimize crew travel times. It is also too close to the A-P Depot which negatively affects the location of the service boundaries and the optimal use of both Depots. We have recommended that the Region come to an agreement now on the optimal Depot Network design and then develop a long-term plan to achieve it. This would lead to acquiring a new, much larger site in a better location and then relocating the Depot when it has reached the end of its asset life (or has outgrown the site). Though it could be rebuilt on the existing site crew travel times would suffer and the cost to build a multi-storey parking garage (to increase the sites storage capacity) would be expensive - currently $70,000 for each medium size work vehicle. Making this decision now would improve the chances of being able to purchase the preferred site (before the best sites have been developed).

Assuming that the Depot will remain at its existing site for the next 20 years, we recommend the following changes to the yard (listed in order of priority):

- The flow through the yard should be one-way in a counter-clockwise direction;
- The east side of the yard should be fenced and gates should be installed at the two entrances;
- The administrative office and employee amenities area need to be expanded by approx. 2,300 ft^2;
- Require 15 more maintenance bays by 2040. There will be 16 mechanics requiring a total of 24 bays. Eight of the new maintenance bays can be built beside the existing maintenance bays. They should each be approximately 22x55 ft. in size for a total of 9,680 ft^2. The other bays would not fit on the site;
- Build a 2nd stand-alone vehicle wash bay (to replace the existing one). The wash bay should be approximately 30x60 ft. (1,800 ft^2) in size and the wash water should be filtered for reuse in the wash area or to make brine;
- Build 27 more medium size indoor vehicle storage bays. They should be approximately 16x30 ft each in size for a total of 12,960 ft^2;
- Build 110 additional outdoor employee parking stalls by 2040;
- Build 50 additional outdoor parking stalls for work vehicles;
- When the existing salt storage building has reached the end of its asset life, it should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

Please note that the high capital cost of most of these recommendations may help to justify relocating the Depot to a new site much sooner than 20 years. This will be further analyzed in the Master Plan Report for the Oshawa-Whitby Depot.

Orono Depot

Table 3.11 - Orono Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay (1,650 ft^2)	
Fleet Maintenance Garage	1 one-way And 2 two-way	3 bays (0 new bays)	3 bays (0 new bays)	5 bays (2 new bays at 2,750 ft^2)	**Require 2 more maint. bays for 2040. 3 mechanics require 5 bays (25x55 ft each).**
Indoor Vehicle/Equipment Storage	7 one-way and 4 material storage bays	23 storage bays (12 new bays)	28 storage bays (17new bays)	33 storage bays (22 new bays at 15,400 ft^2)	**Require 22 more medium size storage bays for 2040 (20x35 ft each)**

Table 3.11 - Continued

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Indoor Salt Storage	8,000 ft^2	2 salt building	2 salt building	2 salt building	Recommend replacing the 2 existing buildings with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is new
Employee Parking	57	46 plus 5 visitor stalls	53 plus 5 visitor stalls (require 1 more stalls)	59 plus 5 visitor stalls (require 7 more stalls)	**Require 7 more parking stalls by 2040**
Outdoor Vehicle Parking	17	16	19 (require 2 more stalls)	20 (require 3 more stalls)	There is ample open space in the yard to create the additional 3 parking stalls for 2040
Secure Yard Fencing	The Depot is fenced with a gate at the entrance				
Site Entrance/Exit	One point of access	Two points of access	Two points of access	Two points of access	Because of the limited road frontage it would be difficult to build a second access point
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	The flow through the yard should be one-way in a counter-clockwise direction.
Arrangement of Buildings on the Site	Traditional				No changes recommended

In summary, we recommend the following changes to the yard (listed in order of priority):

- The flow through the yard should be one-way in a counter-clockwise direction;
- Expand the outdoor employee parking lot by 7 stalls;
- Build two more maintenance bays. They will need to be built as a stand-alone building in the yard because the existing two bays are surrounded by other building areas. Each bay should be approximately 25x55 ft. in size for a total of 2,750 ft^2;
- Build 22 more medium size indoor storage bays. They should be approximately 20x35 ft each in size for a total of 15,400 ft^2. If room permits the building should be drive-through and 2-4 vehicles deep;
- When the two existing salt storage buildings have reached the end of their asset life, they should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

Scugog Depot

Table 3.12 - Scugog Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Wash Bay	1 Wash Bay	1 Wash Bay			
Fleet Maintenance Garage	4,950 ft^2 4 one-way	4 bays (0 new bays)	4 bays (0 new bays)	5 bays (1 new bay at 1,375 ft^2)	**Require 1 more maint. bays for 2040. 3 mechanics require 5 bays (25x55 ft each).**
Indoor Vehicle/Equipment Storage	5,595 ft^2 3 one-way	19 storage bays (16 new bays)	20 storage bays (17 new bays)	21 storage bays (18 new bays at 14,400 ft^2)	**Require 18 more large size storage bays for 2040 (20x40 ft each)**
Indoor Salt Storage	4,188 ft^2	1 salt building	1 salt building	1 salt building	Recommend replacing the existing building with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is relatively new
Employee Parking	No defined parking stalls on the existing unpaved yard area	26 plus 5 visitor stalls (require 31 more stalls)	29 plus 5 visitor stalls (require 34 more stalls)	32 plus 5 visitor stalls (require 37 more stalls)	**Require a separate employee parking area with direct access into the main building without having to cross the path of work vehicle traffic. Require 37 stalls to satisfy 2040 requirements**
Outdoor Vehicle Parking	No defined parking stalls on the existing paved yard area	13	15	16	**There is ample space at the site to build a proper outdoor parking pad for 16 work vehicles to satisfy 2040 requirements**
Secure Yard Fencing	The Depot is fenced with a gate at the entrance				
Site Entrance/Exit	One point of access	Two points of access	Two points of access	Two points of access	**Should build a second access point to the yard from Lake Ridge Road**

Table 3.12 - Continued

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	The flow through the yard should be one-way in a counter-clockwise direction.
Arrangement of Buildings on the Site	Traditional				No changes recommended

In summary, we recommend the following changes to the yard (listed in order of priority):

- Should build a second access point to the yard from Lake Ridge Road;
- The flow through the yard should be one-way in a counter-clockwise direction;
- Require a separate employee parking area with direct access into the main building without having to cross the path of work vehicle traffic. Require 37 stalls to satisfy 2040 requirements;
- There is ample space at the site to build a proper outdoor parking pad for 16 work vehicles to satisfy 2040 requirements;
- Build one more maintenance bay beside the existing maintenance bays. Each bay should be approximately 25x55 ft. in size for a total of 1,375 ft^2;
- Build 18 more medium size indoor storage bays for vehicle storage. They should be approximately 20x40 ft each in size for a total of 14,400 ft^2. If room permits the building should be drive-through and 2-4 vehicles deep. If the tandem trucks will have their attachments on the bays may need to be up to 22x45 ft;
- When the two existing salt storage buildings have reached the end of their asset life, they should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

Sunderland Depot

Table 3.13 - Sunderland Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Wash Bay	No Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay (1,800 ft²)	**Recommend building a new wash bay (30x60 ft)**
Fleet Maintenance Garage	2,521 ft² 3 one-way	3 bays (0 new bay)	3 bays (0 new bay)	5 bays (2 new bays at 2,420 ft²)	**Require 2 more maint. bays for 2040. 3 mechanics require 5 bays (22x55 ft each).**
Indoor Vehicle/Equipment Storage	10,323 ft² 4 one-way	19 storage bays (15 new bays)	23 storage bays (19 new bays)	25 storage bays (21 new bays at 16,800 ft²)	**Require 21 more large size storage bays for 2040 (20x40 ft each)**
Indoor Salt Storage	1,302 ft²	1 salt building	1 salt building	1 salt building	Recommend replacing the existing building with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is relatively new
Employee Parking	No defined parking stalls on the existing paved yard area	35 plus 5 visitor stalls	38 plus 5 visitor stalls	40 plus 5 visitor stalls (require 45 stalls designated on the pavement in front of the main buildings)	**Require a separate employee parking area with direct access into the main building without having to cross the path of work vehicle traffic. Require 45 stalls to satisfy 2040 requirements**
Outdoor Vehicle Parking	No defined parking stalls on the existing unpaved yard area	11	13	15	**There is very little space at the site to build a proper outdoor parking pad for 15 work vehicles to satisfy 2040 requirements**
Secure Yard Fencing	The Depot is fenced with a gate at the entrance				
Site Entrance/Exit	One point of access	Two points of access	Two points of access	Two points of access	**Should build a second access point into the yard**

Table 3.13 - Continued

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	**The flow through the yard should be one-way in a counter-clockwise direction.**
Arrangement of Buildings on the Site	Tightly packed close to the main building				No changes recommended given the limited size of the yard

The ability of the current site to address the 20- year needs of the Sunderland Depot will be analyzed in the Master Plan Report. For now, we recommend the following changes to the yard (listed in order of priority):

- Should build a second access point into the yard;
- The flow through the yard should be one-way in a counter-clockwise direction;
- Require a separate employee parking area with direct access into the main building without having to cross the path of work vehicle traffic. Require 45 stalls to satisfy 2040 requirements;
- Build two more maintenance bays beside the existing maintenance bays. Each bay should be approximately 22x55 ft. in size for a total of 2,420 ft^2;
- Build a new stand-alone vehicle wash bay. The wash bay should be approximately 30x60 ft. (1,800 ft^2) in size and the wash water should be filtered for reuse in the wash area or to make brine;
- Build 21 more large size indoor storage bays for vehicle storage. They should be approximately 20x40 ft each in size for a total of 16,800 ft^2. If room permits the building should be drive-through and 2-4 vehicles deep. If the tandem trucks will have their attachments on the bays may need to be up to 22x45 ft;
- There is very little space at the site to build a proper outdoor parking pad for 15 work vehicles to satisfy 2040 requirements;
- When the existing salt storage building has reached the end of its asset life, they should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

Traffic Operations Centre

Table 3.14 –Traffic Operations Centre Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Wash Bay	No Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay (1,650 ft^2)	**Recommend building a new wash bay (30x55 ft)**
Fleet Maintenance Garage	None				**Don't recommend building a maintenance garage on site**
Indoor Vehicle/Equipment Storage	2 one-way	13 storage bays (11 new bays)	16 storage bays (14 new bays)	18 storage bays (16 new bays at 10,080 ft^2)	**Require 16 more storage bays for 2040 (18x35 ft each)**
Above Ground Fuel Tanks	None				**Don't recommend building a refueling operation**
Employee Parking	187	70 plus 10 visitor stalls	78 plus 10 visitor stalls	88 plus 10 visitor stalls	No changes required
Outdoor Vehicle Parking	30	14	21	29	No additional stalls required
Secure Yard Fencing	The storage yard is fenced with a gate at the entrance				No changes required
Site Entrance/Exit	Three points of access				**Should limit one of the entrances to employee vehicles only**
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is two-directional	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	**The flow through the yard should be one-way in a counter-clockwise direction.**
Arrangement of Buildings on the Site	A single main building				No changes recommended

In summary, we recommend the following changes to the yard (listed in order of priority):

- The employee parking area should have its own entrance from the street so as to avoid the work vehicles. The parking area should also have direct access into the main building without having to cross the path of work vehicle traffic;
- The flow through the yard should be one-way in a counter-clockwise direction;
- Build 16 indoor storage bays for vehicle storage. They should be approximately 18x35 ft each in size for a total of 10,080 ft^2. If room permits the building should be drive-through and 2 vehicles deep;
- Build a new stand-alone vehicle wash bay. The wash bay should be approximately 30x55 ft. (1,650 ft^2) in size and the wash water should be filtered for reuse in the wash area or to make brine;
- To be consistent with the five Depots, it would be preferable to have two mechanics and three maintenance bays on site. However, space limitations prevent this. Each bay would be approximately 25x55 ft. in size for a total of 4,125 ft^2. Additional space would be required for parts storage.

4.0 BEST PRACTICES IN FUNCTIONAL AREA DESIGN

4.1 Justification for Indoor Vehicle Storage

In section 3.1.5 we listed a number of design issues, at each Depot, that are adversely affecting employee productivity, and the efficient utilization of space. In section 3.1.7 we listed a number of ways to improve the design of an existing Depot. Below, we discuss the reasons for storing Winter Maintenance vehicles indoors during the winter months.

Park Winter Maintenance Vehicles Indoors

When possible, vehicles and equipment should be stored indoors during the winter. The primary benefits of storing vehicles indoors are listed below:

- Public Safety;
- Employee Safety;
- Improved Productivity and Response Time;
- Improved Asset Management;
- Impact on the Adjacent Neighbourhood;
- Impact on the Environment;
- Cost Savings.

Public Safety
Vehicles such as plows are used to keep the roads safe, and to respond to emergencies. They are also sensitive to cold temperature and, therefore, may experience starting problems if parked outdoors during the winter. Diesel engines can suffer from jelling; hydraulic oil may have difficulty flowing; and air lines can freeze. In addition to starting problems, the driver/crew might be required to waste valuable time by having to warm-up and clean snow off their vehicle prior to responding to an emergency. This could result in unsafe conditions for the public

Employee Safety
Storage of larger vehicles outdoors during inclement weather may require an employee to climb on the vehicle to clean it off and prepare it for use. This could expose the employee to unnecessary risks such as slipping and falling. In addition, employees must often access and connect smaller equipment to their vehicles (such as plow attachments and towed compressors). This could also pose unnecessary risks when conducted in inclement weather or in parts of the yard with inadequate lighting.

Improved Productivity and Response Time
Storing vehicles and equipment indoors will enhance the performance of the vehicles, thereby, eliminating potential delays associated with cold engines and frozen equipment. This will increase employee productivity and reduce response time. Furthermore, vehicles that are stored indoors can have their tools and related equipment left in the vehicle overnight. This reduces the need to unload and reload tools between shifts, thereby, increasing employee productive time.

Improved Asset Management
Storing vehicles and equipment indoors will reduce unscheduled maintenance costs and vehicle downtime, protect the vehicles from environmental conditions which could increase maintenance costs and reduce vehicle life span, and protect the vehicles from potential vandalism or theft.

Impact on the Adjacent Neighbourhood
The outdoor storage of vehicles will increase the noise output and exhaust emissions from the site. The outdoor storage of vehicles will require extended periods of idling during the winter months, thereby, increasing the inconveniences already imposed on the neighbors.

Impact on the Environment
Storing vehicles and equipment outdoors will negatively impact the environment because of oil, grease, and engine fluid entering the groundwater or stormwater system. By comparison, any leaks that occur within a vehicle storage garage will be captured in a closed floor drain system, thereby, preventing the fluids from reaching the environment.

Cost Savings
The additional costs associated with storing the vehicles outdoors, as discussed above, include:

- Loss of productive labour due to delays in starting the vehicles and preparing them for the road;
- Increased unscheduled maintenance costs;
- Increased vehicle downtime and resulting loss in productivity;
- Reduced vehicle life expectancy and accelerated vehicle replacement costs.

Therefore, for the reasons discussed above, we recommend that winter maintenance vehicles be parked indoors.

4.2 Opportunities to Improve the Depot Design

Below, we discuss the best practices and design features that will be incorporated into the proposed site plans for the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots in section 5.0 and in the Master Plan Reports.

Work Vehicle Storage Buildings

To reduce space requirements, the layout of the storage areas should incorporate the following best practices and design features:

- The Vehicle Storage Building should be designed so that it can be expanded as the size of the fleet grows;

- The internal storage area should be heated in the winter months to a temperature of 10 °C to ensure that the vehicles are ready for service in the morning. The installation of insulated rapid motion doors will prevent the need for air curtains over the external doors (to maintain the internal room temperature). All walls and ceilings should be painted white (to present a clean appearance and to reflect light). The paint should be an industrial epoxy brand to withstand cleaning by high pressure water. Provision for the proper drainage of ice and snow from the floor area will be a critical safety design feature;

- The current fleet of vehicles are all operated with gas or diesel fuel. However, it is expected that, in the future, some or all of the vehicles will be electrically powered. Therefore, allowances should be provided for future electric recharging equipment;

- Our methodology for designing the layout for the Vehicle Storage Building aims to minimize the total area required by (1) identifying those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identifying the optimal width and length of each lane to minimize the total area requirement. Those vehicles and equipment that require independent use and, therefore, cannot be blocked within a long lane should be stored in a building that has drive-through lanes that are only 2 vehicles long.

- Where vehicles are parked indoors, adequate ventilation measures must be taken to prevent the accumulation of fumes, and to prevent fumes from entering office areas.

Salt Storage Buildings

To reduce the total space requirements, all of the salt, at each yard, should be stored in one building. This building should provide indoor storage and loading to contain the salt (to comply with the Salt Management Plan), and the noise from the loading operation. The facility should have the following characteristics:

- Salt delivery and loading, and brine makeup and loading are all located under one roof;

- Salt should be dumped inside the building by the supplier and then conveyed to the top of the pile using a stacking conveyor. This will maximize the height of the pile and storage capacity of the building;

- Brine makeup utilizes the salt pile as a feedstock along with the weak salt solution coming from the truck wash combined with rainwater collected from the storage building roof and neighbouring driveways;

- The brine making area should be adjacent to the main structure (so that it does not block the flow of the loader during the loading process). Drywall should not be used within the brine pump room because of the moisture). The brine area should also include a washroom;

- The concrete wall surrounding the sand/salt storage area should be at least 25’ high to maximize the height of the pile within the cubic space of the building;

- The two drive-through doors for the salters should be 20’ wide and 20’ tall. The two doors for the delivery truck should be 20’ wide and at least 40’ high (to avoid being hit by a tilted truck bed). Use of metal for the door sliding system should be avoided due to potential corrosion and premature failure;

- Salt and brine loading should all take place on one side of the storage area in a covered drive through lane;
- The loading lane for the salters should be at least 144' long to allow space for three trucks to be loaded with sand/salt or brine simultaneously;
- The roof decking, structural steel and walls of the storage facility should be painted white to present a bright clean appearance and to better reflect light;
- Where possible, windows should be incorporated into the design of the facility to reduce the need for light fixtures and to provide a better working environment.

Yard Entrances

Where possible, the entrances to the yard should incorporate the following best practices and design features:

- Vehicle entrances should be located at signal lights, especially on busy road ways;
- Vehicle entrances and exits should be separated and closed off with an automated gate to exclude people and vehicles that are not part of the operations. The entrance should be set back from the roadway, such that vehicles entering the yard are off from the main roadway, while waiting for the entrance gate to open;
- Entrances for employee and public vehicles should be kept separate from the flow of operational vehicles.

Yard Configuration

The yard is used by all five Divisions for various purposes. To reduce space requirements and to promote the safety and security of employees and visitors, the layout of the Yard should incorporate the following best practices and design features:

- The site should be configured to provide for the safe and efficient flow of employees, the public, and vehicles (work vehicles and personal vehicles). The building(s) will be situated on the site so as to provide room to expand as operational growth demands greater capacity;
- The movement of work vehicles should be kept separate from the flow of pedestrians and employee vehicles (for safety reasons). Their movement should be configured for one-way traffic flow utilizing primarily left-hand turns to improve visibility for the driver;

- The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles;

- If an area does not need to be paved it should be landscaped so as to permit storm water to percolate naturally into the ground;

- For trucks backing up to a truck dock (to deliver parts), they should be permitted to turn left so that the driver can readily see the back of the truck from his driver's position;

- Any refuelling stations located in the yard, should be situated out of the main flow of traffic, and designed to be able to accommodate vehicle line-ups without blocking the general flow of traffic in the yard;

- The yard should be configured such that items that are most frequently used are closest to the main yard flow. Items less frequently used are placed near the back of the yard;

- The yard should be equipped with well-marked signage that clearly marks direction of travel, storage locations, and special movement and safety instructions;

- Full security fencing should be constructed around the yard, and external lighting, security cameras and motion alarms should be installed. Electronic pass-keys should be used within the building.

Yard Parking

To reduce space requirements and to promote the safety and security of employees and visitors, Yard Parking should incorporate the following best practices and design features:

- The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the front of the building;

- Employee parking should be consolidated at the front of the building (close to the employee entrance and away from the flow of work vehicles) to minimize the honeycomb affect (empty stalls due to variations in demand) and, therefore, the total number of stalls required;

- To minimize the footprint required, a multi-storey parking structure should be constructed for employee/visitor;

- Where it is not practical to park winter response vehicles indoors, they should be located in open shelters faced to the east or south, with receptacles to allow block heaters and hydraulic heaters to be plugged in overnight;

- Work vehicles parked outdoors should be located close to the building so as to minimize employee walking distances;

- Where possible, surfaces should be unpaved to allow storm water to percolate naturally through the parking surface. When paving is required, materials that are permeable to water are recommended (e.g., permeable concrete);

- Environmentally friendly modes of transportation should be promoted. Buildings should be equipped with lockable storage for bicycles and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

- Light pollution control can be achieved by installing fixtures that are down-lit. Full-cut off, ground covers and positioning of the fixtures on site would stop the light from over spilling to other adjacent sites.

Yard Storage

To reduce space requirements and to promote the safety of employees, Yard Storage (for vehicles, equipment and materials) should incorporate the following best practices and design features:

- Work vehicles should be parked as close to the indoor employee amenities as possible to minimize walking distances by the work crews. This does not apply to contractor vehicles as the crews do not utilize the buildings;

- For storing certain types of equipment and materials (those that can be placed on pallets) metal racking (single deep) should be installed in the yard to reduce space requirements;

- The yard space that is used by Transportation Services as a Winter Maintenance Yard should, during the summer, be shared with other departments to increase yard utilization and reduce overall space requirements. For example, this space could be used to park contractor vehicles (for Forestry operations), and stage materials such as wood and compost;

- The bulk storage of materials within the concrete block storage bunkers should be shared by all the Divisions to eliminate duplication in other parts of the yard;

- All plastic and rubber items, including piping and fittings, must be stored in shelters that protect these items from deterioration by the sun.

- Items that must be kept clean, such as fittings for water services, should be stored such that they will not become contaminated with yard dust and debris.

- All items stored in the yard should be organized in well-marked storage locations.

- Outdoor storage areas should not be paved, unless needed, to allow storm water to percolate naturally into the ground.

- The view of the yard from all public roadways must be attractive, well landscaped, and well maintained without appearing extravagant. Landscaping buffers should be built.

Vehicle Fueling

To reduce space requirements, and to promote the safety and productivity of employees, the location of the Vehicle Fueling operation should incorporate the following best practices and design features:

- The vehicle fuelling location should be set up such that vehicles returning to the yard can travel (without backtracking) from the yard entrance to the fuelling location and then to the parking area, in the most efficient way possible. Since there may be a line-up for fuelling it should be located such that vehicle line-ups do not block the main access route around the yard;

- The fuelling location should be situated well away from buildings and the property line to meet safety requirements;

- The fuelling traffic lanes should be set up such that vehicles waiting for fuel do not block yard circulation;

- The fuel tanks should be located above ground with each storage tank inside a separate outer containment tank that acts as a protective barrier;

- The entire tank area, along with the pumps, should be mounted on an elevated concrete pad;

- The entire tank area should also be protected by heavy steel bollards and a crash resistant railing;

- The fuel islands and pumps should be set up such that they can be approached from either side, and are far enough apart that two full sized trucks (equipped with ploughs) can pass, side by side, between the islands and pumps;

- Newer installations are often equipped with canopies and lighting such that vehicles can be fuelled in the dark and in inclement weather without delaying operations;

- The fuelling area should not have a drain so that spilled fuel will not enter local water courses;

- The current fleet of work vehicles are all operated with gas or diesel fuel. However, it is expected that, in the future, some or all of the vehicles will be electrically powered. Therefore, allowances should be provided for future electric recharging equipment.

Vehicle Washing

To reduce space requirements, and to promote the productivity of employees, the location of the Vehicle Wash Bay should incorporate the following best practices and design features:

- The Wash Bay facility should be located near the brine makeup area (which should be adjacent to the salt storage building);
- The facility should have 2 drive-through wash bays that can be accessed by vehicles without blocking traffic flowing through the yard;
- The vertical clearance within the Wash Bay should be sufficient to allow dump trucks to raise their box for rinsing;
- The interior of the Wash Bay should be equipped with sufficient heating to prevent freezing inside during the winter;
- The Wash Bay should be equipped with an access platform so that operators can access the top of their vehicle safely without climbing onto the vehicle itself;
- The concrete pad immediately outside the entrance/exit doors should have radiant heating to prevent the formation of ice during the winter;
- The installation of insulated rapid motion doors will prevent the need for air curtains over the exterior doors (to maintain the internal room temperature);
- The door should be 18 ft. wide and 15 ft. high. The room for a single wash bay should be 50 ft. long and 31 ft. wide (to handle tandem trucks);
- The Wash Bay should be equipped with a steam cleaning system to remove grease from vehicles and engine parts. It should be located in an adjacent room to avoid corrosion. Operators will utilize a high-pressure, hand held, spray wand to clean the vehicles. There will also be a fire hose and a built-in underbody spray;
- A drainage system and sump will be required to collect approximately 70% of the grey water for reuse;

5.0 CONCEPTUAL SITE PLANS

Aerial photos for each of the Depots and the Traffic Operations Centre are shown in Appendix C. For the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots we have added (in block format) the functional changes recommended in section 3.2.6. These recommendations will address the needs for additional indoor vehicle storage space, and vehicle maintenance repair space through to 2040. Additional space requirements will be addressed in the Master Plan Reports for these three Depots.

6.0 CONSTRUCTION COST ESTIMATES

In this section, we list the estimated construction costs for the functional changes recommended, in section 3.2.6, for the five Depots. The Master Plan Reports created for the Ajax-Pickering Depot, Oshawa-Whitby Depot, and Sunderland Depot will provide more detailed Class D cost estimates.

Table 5.1 – Estimated Construction Costs

Depot	Functional Change	Area (ft^2)	Unit Cost ($\$/ft^2$)	Estimated Cost
Ajax-Pickering	Build 1 vehicle wash bay	1,800	330	594,000
	Build 3 maintenance bays	3,630	380	1,379,400
	Build a heated indoor vehicle storage building (24 vehicle bays)	12,480	300	3,744,000
	TOTAL			**5,717,400**
Oshawa-Whitby	Build 1 vehicle wash bay	1,800	330	594,000
	Build 15 maintenance bays	18,150	380	6,897,000
	Build a heated indoor vehicle storage building (27 vehicle bays)	12,960	300	3,888,000
	Build 57 additional outdoor employee parking stalls	18,000	8	144,000
	TOTAL			**11,523,000**
Sunderland	Build 1 vehicle wash bay	1,800	330	594,000
	Build 2 maintenance bays	2,420	380	919,600
	Build a heated indoor vehicle storage building (21 vehicle bays)	16,800	300	5,040,000
	Build 45 outdoor employee parking stalls	13,500	8	108,000
	TOTAL			**6,661,600**
Orono	Build 3 maintenance bays	4,125	380	1,567,500
	Build 22 heated vehicle storage bays	15,400	300	4,620,000
	TOTAL			**6,187,500**
Scugog	Build 2 maintenance bays	2,750	380	1,045,000
	Build a heated indoor vehicle storage building (17 vehicle bays)	13,600	300	4,080,000
	Build 37 additional outdoor employee parking stalls	11,800	8	94,400
	Build 16 additional outdoor work vehicle parking stalls	9,000	10	90,000
	TOTAL			**5,309,400**

These construction costs provide a preliminary estimate of the fair market value for the hard construction costs associated with these Depots. More detailed order of magnitude cost estimates will be provided in the upcoming Master Plan Reports for the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots.

An order of magnitude estimate is intended to represent the median bid amount in a competitive bidding process. The accuracy of the estimate is expected to have a variance of +/- 20%. Contingencies are included in the estimate to offset the accuracy risk.

To create the current cost estimates we have used typical unit rates (in 2020 dollars) that are based on the project specifications and historical cost data for this type of project. The unit rates are based on typical mid-range costs for the type of design and construction proposed.

Although every attempt has been made to reflect market conditions in the estimates, the actual marketplace prices will not be known until the results of tenders have been received.

The following soft costs have been specifically excluded from the cost estimate:

- Harmonized Sales Tax (HST);
- Escalation allowance for unit prices beyond 2020;
- Design / project management fees;
- Legal fees;
- Land acquisition;
- Development fees and permits;
- Environmental / hazardous material abatement (including asbestos and contaminated soils);
- Furniture, furnishings and equipment;
- Telephone / communication systems;
- Security systems;
- Relocation and reconnection of Owner's existing equipment;
- Temporary office facilities and/or moving costs;
- Building commissioning / start up by third party commissioning agency / consultant.

APPENDIX A – Current Resources

In this Appendix we list the current number of resources (employees, vehicles, equipment, and materials) utilized by the Works Department at each of its five Depots and two Operations facilities.

Ajax-Pickering Depot

Employees

The total number of employees currently working from the Ajax-Pickering Depot (during the summer and winter seasons) is shown in the table below.

Table A.1 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Ajax-Pickering	Admin	7	0	0	**7**
	Fleet Services		2	2	**2**
	Roads	2	14	13	**16**
	Water/Sewer	3	29	27	**32**
	Total	**12**	**45**		**57**

Work Vehicles

The total number of work vehicles currently assigned to the Ajax-Pickering Depot is shown in the table below.

Table A.2 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Roads/Water/Sewer	½ Ton	7	Outdoor
Roads	1 Ton Pick Up	1	Outdoor
Roads	Grader	1	Outdoor
Roads/Sewer	3 Ton Crew Cab	4	Outdoor
Water	Backhoe	1	Outdoor
Sewer	Heavy Excavator	1	Outdoor
Water	Steam generator	1	Outdoor
Roads/Water/Sewer	8 Trailers / 2 DLA Tanks /1 Spray Patch	11	Outdoor
Roads - **Contractor**	Tandem Snow Plows	8	Outdoor
	Total	**35**	

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Water/Roads	¾ Ton	4	Indoor
Roads	6 Ton Tandem	8	Indoor
Roads	Loader	1	Indoor
Roads	Roller	1	Indoor
Water	½ Ton Van	2	Indoor
Water	¾ Ton Van	2	Indoor
Water/Sewer	1 Ton Van	3	Indoor
Sewer	Sewer Jet	1	Indoor
Water	3 Ton Service	2	Indoor
Water	Compressor	1	Indoor
Water	Steam generator	1	Indoor
	Total	**26**	
Water/Roads/Sewer	Misc. small tools i.e.: cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, DEF Tank, jackhammers, sewer camera, chainsaws, portable generators, etc.	**40**	Indoor

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Ajax-Pickering Depot there is one large building capable of storing up to 7,000 tonnes of salt.

Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and top soil).

Oshawa-Whitby Depot

Employees

The total number of employees currently working from the Oshawa-Whitby Depot (during the summer and winter seasons) is shown in the table below.

Table A.3 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Oshawa/Whitby	Admin	12	0	0	**12**
	Water Meter	4	10	10	**14**
	Materials Testing	2	4	4	**6**
	SWAT		6	6	**6**
	Fleet Services	6	12	12	**18**
	Training	2	2	2	**4**
	Roads	2	25	18	**27**
	Water/Sewer	5	41	41	**46**
	Total	**33**	**100**		**133**
Note: 1. Training will be hiring 1 additional staff after July 2020. That person has been included in these numbers. 2. Materials Testing is looking to expand the staff complement by adding 2 more field staff in the next few years.					

Work Vehicles

The total number of work vehicles currently assigned to the Oshawa-Whitby Depot is shown in the table below.

Table A.4 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
3 Roads, 2 Water, 4 Sewer, 1 Meter	½ Ton Pickup	10	Outdoor
1 Water, 3 Roads, 2 Sewer	Tilted Bed Trailers	6	Outdoor
2 Water, 1 Roads, 1 Sewer	Tandem Trailers	4	Outdoor
1 Water, 1 Roads	Misc. Trailer	2	Outdoor
1 Roads, 1 Fleet	Asphalt Hot Box Trailer	2	Outdoor
Roads	1 Ton Pickup	2	Outdoor
Roads	5 Ton Dump/Plow/Sand	1	Outdoor
Roads	Tractor	1	Outdoor
Roads	Signal Boards	6	Outdoor
Roads	Utility Trailers	2	Outdoor
Sewer	¾ Ton Pickup	2	Outdoor
1 Water, 2 Meters	SUV	3	Outdoor

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Water Meter	Service Vans	8	Outdoor
Materials Testing	Service Vans	4	Outdoor
SWAT	Service Vans	3	Outdoor
	Total	**56**	
Roads	Medium Articulated	1	Indoor
Roads	Steam Generator	1	Indoor
Roads	Pavement Roller	1	Indoor
1 Sewer, 5 Roads	6 Ton Tandem Truck	6	Indoor
6 Water, 2 Roads, 2 Sewer	3Ton Crew Cab	10	Indoor
1 Water, 1 Roads	3/4 Ton Van	2	Indoor
1 Water, 1 Roads	HD Backhoe	2	Indoor
1 Water, 1 Roads, 1 Sewer	Air Compressor	3	Indoor
1 Water, 6 Meters	Econo Van	7	Indoor
Water	1Ton Crew Cab	1	Indoor
1 Water, 1 Sewer	3 Ton Service	2	Indoor
5 Water, 2 Meters, 1 Sewer	1 Ton Van	8	Indoor
Sewer	Excavator	1	Indoor
	Total	**45**	

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Oshawa-Whitby Depot there is one large building capable of storing up to 6,000 tonnes of salt.

Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and top soil).

Orono Depot

Employees

The total number of employees currently working from the Orono Depot (during the summer and winter seasons) is shown in the table below.

Table A.5 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Orono	Admin	10	0	0	**10**
	Fleet Services		2	2	**2**
	Roads	2	13	13	**15**
	Water/Sewer	2	17	17	**19**
	Total	**14**	**32**		**46**

Work Vehicles

The total number of work vehicles currently assigned to the Orono Depot is shown in the table below.

Table A.6 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
3 Roads, 2 Water, 1 Sewer	½ Ton Pick-up	6	Outdoor
Roads	1 Ton Pick-up	2	Outdoor
Roads	¾ Ton Pick-up	2	Outdoor
Roads	Backhoe	1	Outdoor
Roads	Grader	1	Outdoor
Roads	Tractor	1	Outdoor
Roads	Loader	1	Outdoor
Roads	Asphalt Spray Patcher	1	Outdoor
Roads	Wood Chipper	1	Outdoor
	Total	**16**	
Roads	Pavement Roller	1	Indoor
Roads	6 Ton Tandem	7	Indoor
Roads	Gradall	1	Indoor
1 Roads, 1 Water	Steam Generator	2	Indoor
3 Sewer, 2 Water, 2 Roads	3 Ton Crew Cab	7	Indoor
Fleet	Econo Van Mechanic	1	Indoor
Water	Econo Van Flushing	1	Indoor
Water	3 Ton Service Truck	1	Indoor
Water	1 Ton Van - Locate	1	Indoor
Water	1 Ton Van - Hydrant	2	Indoor

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Sewers	Sewer Jet	1	Indoor
Water / Sewer	Air Compressor	1	Indoor
	Total	**26**	

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Orono Depot there is one large building capable of storing up to 7,000 tonnes of salt.

Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and top soil).

Scugog Depot

Employees

The total number of employees currently working from the Scugog Depot (during the summer and winter seasons) is shown in the table below.

Table A.7 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Scugog	Admin.	4			**4**
	Fleet Services		1	1	**1**
	Roads	1	7	7	**8**
	Water/Sewer	2	11	11	**13**
	Total	**7**	**19**		**26**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Work Vehicles

The total number of work vehicles currently assigned to the Scugog Depot is shown in the table below.

Table A.8 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Roads/Water/Sewer	76/78/79 series trailers	6	Outdoor
Roads	61 series water tank	1	Outdoor
Roads	35 /36 series tractor attachments	4	Outdoor
Roads	73 series	2	Outdoor plug-in requirement
	Total	**13**	
Roads	17/51 series tractors skid steer	3	Cold Covered
Roads	91 series woodchipper	1	Cold covered
Roads	99 series large snow blower	1	Cold covered
Roads	Contracted plows	3	Cold covered storage with electrical plug-in requirement
	Total	**8**	
Roads	09 series tandems with plow and wing	6	Indoor
Roads	05 series patrol trucks with hopper/sander	3	Indoor
Roads	34 series tractor	1	Indoor
Roads	25 series grader	1	Indoor
Roads	80 series asphalt hot box	1	Indoor
Roads	50 series loader	1	Indoor
2 Roads, 1 water, 1 sewer	46 series service trucks	4	Indoor
2 roads, 1 water, 1 sewer	13 series pickups	5	Indoor
1 roads/ 2 water	02/15/28 series vans	3	Indoor
Roads/Water/Sewer	misc. small tools	16	Indoor
Water	59 series steam generator	1	Indoor
Sewer	16 series sewer jet	1	Indoor
Sewer	66 series air compressor	1	Indoor
	Total	**44**	

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Scugog Depot there is one large building capable of storing up to 2,500 tonnes of salt.

Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and top soil).

Sunderland Depot

Employees

The total number of employees currently working from the Sunderland Depot (during the summer and winter seasons) is shown in the table below.

Table A.9 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Sunderland	Admin	6			**6**
	Fleet Services		1	1	**1**
	Roads	3	16	18	**21**
	Water/Sewer	3	4	4	**7**
	Total	**12**	**21**		**35**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Work Vehicles

The total number of work vehicles currently assigned to the Sunderland Depot is shown in the table below.

Table A.10 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
1 Roads, 1 Water	Trailers (76 series shoring and enclosed cargo trailer)	2	Outdoor
Roads	75 series HD Float trailer	1	Outdoor
Roads	61 series water tank	1	Outdoor

Department	Vehicle Type	No. Vehicles	Type of Storage Required
1 Roads, 1 water	13 series Supervisor pickups	2	Outdoor
Roads	04 series crew cab	1	Outdoor
Roads	50 series loaders	2	Outdoor
Contractor	Personal vehicles	2	Outdoor
	Total	**11**	
Roads	35 series broom attachment	1	Cold, covered storage
Roads	36 series tractor mower attachments	2	Cold, covered storage
Roads	91 series wood chipper	1	Cold, covered storage
Roads	73 series sign board trailers	3	Cold, covered storage with plug in provision for battery maintaining
Roads	Contracted Plows	2	Cold, covered storage with electrical plug in provisions
	Total	**9**	
Roads	09 series Tandems with plows and wing	7	Indoor
Roads	05 series patrol trucks with 24 series hopper / sander	2	Indoor
3 Roads, 2 Water	46 series service trucks	5	Indoor
Roads	34 series tractor	1	Indoor
Roads and Water	52 series Gradall	1	Indoor
Roads	25 series grader	1	Indoor
Roads	80 series diesel fired asphalt hot box	1	Indoor
Roads and Water	59 series steam generator	2	Indoor
Roads, Water/Sewer	66 series air compressor	1	Indoor

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Roads and Water/Sewer	Misc. small tools i.e.: Cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, jackhammers, sewer camera, thawing machine, chainsaws, portable generators, etc.	15 +/-	Indoor
	Total	**36+/-**	

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Sunderland Depot there is one large building capable of storing up to 4,500 tonnes of salt.

Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and top soil).

Traffic Operations Centre

Employees

The total number of employees currently working from the Traffic Operations Centre (during the summer and winter seasons) is shown in the table below.

Table A.11 - Current State Employees – 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Traffic Eng./Operations	Works	12	23	23	35
	Total	**12**	**23**		**35**

Work Vehicles

The total number of work vehicles currently assigned to the Traffic Operations Centre is shown in the table below.

Table A.12 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Signs& Markings	5 Ton Dump Truck	1	Outdoor
	Ford Loop Truck/Cube Van	1	Outdoor
	Crash Trailer	1	Outdoor
	Total	**3**	
	Ford 3 Ton Crane Truck	4	Indoor
	Small Paint Truck	1	Indoor
	Large Paint Truck	1	Indoor
	New Paint Truck	1	Indoor
	Total	**7**	
Signal Maintenance	162 Middlebury Trailer	1	Outdoor
	Box Trailer	1	Outdoor
	Wire Trailer	1	Outdoor
	Pole Trailer	2	Outdoor
	¾ Ton Dodge Sprinter Van	2	Outdoor
	3 Ton Crew Cab	1	Outdoor
	Total	**8**	
	3 Ton Service Truck	2	Indoor
	1 Ton Van (Small Bucket)	2	Indoor
	Total	**4**	
Signal & Sign	½ Ton Pick-up	3	Outdoor
	Materials/Equipment		Outdoor
	Total	**3+**	
	Variable Message Signs	2	Indoor
	Total	**2**	
Signal, Sign & Road Safety	Variable Message Signs	8	Indoor
	Radar Speed Signs	4	
	Total	**12**	

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Signal. Design, Contract Administration	½ Ton Pick-up	1	Outdoor
	Total	**1**	

Whitby Water Supply Plant

Employees

The total number of employees currently working from the Whitby Water Supply Plant (during the summer and winter seasons) is shown in the table below.

Table A.13 - Current State Employees – 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Whitby Water Supply Plant	Help Desk	6	14	14	**20**
	Contract Services	8			**8**
	Custodian Services		3	3	**3**
	Security	1	3	3	**4**
	Total	**15**	**20**		**35**

Note: The Help Desk requires 4 Touch Down Stations

Work Vehicles

The total number of work vehicles currently assigned to the Whitby Water Supply Plant is shown in the table below.

Table A.14 - Current State Work Vehicles – 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Help Desk	Service Vans	13	Outdoors
	Total	**13**	
Contract Services	None	0	Outdoors
Custodian Services	Service Vans	2	Outdoors
	Total	**2**	
Security	Service Trucks	3	Outdoors
	Total	**3**	

APPENDIX B – Future Resources

Ajax-Pickering Depot

Employees

The total number of employees forecast to be working from the Ajax-Pickering Depot in 2030 and 2040 (during the summer and winter seasons) is shown in the tables below:

Table B.1 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Ajax-Pickering	Admin	7	0	0	**7**
	Fleet Services		2	2	**2**
	Roads	2	16	15	**18**
	Water/Sewer	3	35	33	**38**
	Total	**12**	**53**		**65**

Table B.2 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Ajax-Pickering	Admin	7	0	0	**7**
	Fleet Services		3	3	**3**
	Roads	2	18	17	**20**
	Water/Sewer	3	41	38	**44**
	Total	**12**	**62**		**74**

Work Vehicles

The total number of work vehicles currently assigned to the Ajax-Pickering Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.3 below.

Table B.3 – Future Number of Work Vehicles

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Roads/Water/Sewer	½ Ton	7	8.41	9.81	Outdoor
Roads	1 Ton Pick Up	1	1.13	1.26	Outdoor
Roads	Grader	1	1.13	1.26	Outdoor
Roads/Sewer	3 Ton Crew Cab	4	4.80	5.61	Outdoor
Water	Backhoe	1	1.20	1.40	Outdoor
Sewer	Heavy Excavator	1	1.20	1.40	Outdoor
Water	Steam generator	1	1.20	1.40	Outdoor

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Roads/Water/Sewer	8 Trailers / 2 DLA Tanks /1 Spray Patch	11	13.21	15.42	Outdoor
Roads - **Contractor**	Tandem Snow Plows	8	9.03	10.07	Outdoor
	Total	**35**	**41.31**	**47.63**	
Water/Roads	¾ Ton	4	3.60	5.6	Indoor
Roads	6 Ton Tandem	8	9.03	10.07	Indoor
Roads	Loader	1	1.13	1.26	Indoor
Roads	Roller	1	1.13	1.26	Indoor
Water	½ Ton Van	2	2.40	2.80	Indoor
Water	¾ Ton Van	2	2.40	2.80	Indoor
Water/Sewer	1 Ton Van	3	3.6	4.2	Indoor
Sewer	Sewer Jet	1	1.20	1.40	Indoor
Water	3 Ton Service	2	2.40	2.80	Indoor
Water	Compressor	1	1.20	1.40	Indoor
Water	Steam generator	1	1.20	1.40	Indoor
	Total	**26**	**29.29**	**34.99**	Indoor
					Indoor
Water/Roads/Sewer	Misc. small tools i.e.: cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, DEF Tank, jackhammers, sewer camera, chainsaws, portable generators, etc.	**40**	**41**	**56**	Indoor

Oshawa-Whitby Depot

Employees

The total number of employees forecast to be working from the Oshawa-Whitby Depot in 2030 and 2040 (during the summer and winter seasons) is shown in the tables below:

Table B.4 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Oshawa/Whitby	Admin	12	0	0	**12**
	Water Meter	4	12	12	**16**
	Materials Testing	2	6	6	**8**
	SWAT		6	6	**6**
	Fleet Services	6	14	14	**20**
	Training	2	2	2	**4**
	Roads	2	28	20	**30**
	Water/Sewer	5	48	48	**53**
	Total	**33**	**116**		**149**
Note: 1. Training will be hiring 1 additional staff after July 2020. That person has been included in these numbers.					

Table B.5 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Oshawa/Whitby	Admin	12	0	0	**12**
	Water Meter	4	14	14	**18**
	Materials Testing	2	6	6	**8**
	SWAT		6	6	**6**
	Fleet Services	6	16	16	**22**
	Training	2	2	2	**4**
	Roads	2	31	22	**33**
	Water/Sewer	5	55	55	**60**
	Total	**33**	**130**		**163**
Note: 1. Training will be hiring 1 additional staff after July 2020. That person has been included in these numbers.					

Work Vehicles

The total number of work vehicles currently assigned to the Oshawa-Whitby Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.6 below.

Table B.6 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
3 Roads, 2 Water, 4 Sewer, 1 Meter	½ Ton Pickup	10	11.75	13.51	Outdoor
1 Water, 3 Roads, 2 Sewer	Tilted Bed Trailers	6	7.05	8.11	Outdoor
2 Water, 1 Roads, 1 Sewer	Tandem Trailers	4	4.7	5.4	Outdoor
1 Water, 1 Roads	Misc. Trailer	2	2.35	2.7	Outdoor
1 Roads, 1 Fleet	Asphalt Hot Box Trailer	2	2.23	2.45	Outdoor
Roads	1 Ton Pickup	2	2.23	2.45	Outdoor
Roads	5 Ton Dump/Plow/Sand	1	1.11	1.22	Outdoor
Roads	Tractor	1	1.11	1.22	Outdoor
Roads	Signal Boards	6	6.68	7.34	Outdoor
Roads	Utility Trailers	2	2.23	2.45	Outdoor
Sewer	¾ Ton Pickup	2	2.35	2.7	Outdoor
1 Water, 2 Meters	SUV	3	3.53	4.05	Outdoor
Water Meter	Service Vans	8	9.4	10.81	Outdoor
Materials Testing	Service Vans	4	6	6	Outdoor
SWAT	Service Vans	3	3	3	Outdoor
	Total	**56**	**65.72**	**73.41**	
Roads	Medium Articulated	1	1.11	1.22	Indoor
Roads	Steam Generator	1	1.11	1.22	Indoor
Roads	Pavement Roller	1	1.11	1.22	Indoor
1 Sewer, 5 Roads	6 Ton Tandem Truck	6	7.05	8.11	Indoor
6 Water, 2 Roads, 2 Sewer	3Ton Crew Cab	10	11.75	13.51	Indoor
1 Water, 1 Roads	3/4 Ton Van	2	2.35	2.7	Indoor
1 Water, 1 Roads	HD Backhoe	2	2.35	2.7	Indoor
1 Water, 1 Roads, 1 Sewer	Air Compressor	3	3.53	4.05	Indoor
1 Water, 6 Meters	Econo Van	7	8.23	9.45	Indoor
Water	1Ton Crew Cab	1	1.18	1.35	Indoor

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
1 Water, 1 Sewer	3 Ton Service	2	2.35	2.7	Indoor
5 Water, 2 Meters, 1 Sewer	1 Ton Van	8	9.4	10.81	Indoor
Sewer	Excavator	1	1.18	1.35	Indoor
	Total	**45**	**52.7**	**60.39**	

Orono Depot

Employees

The total number of employees forecast to be required for the Orono Depot, in 2030 and 2040, (during the summer and winter seasons) is shown in the table below:

Table B.7 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Orono	Admin	10	0	0	**10**
	Fleet Services		2	2	**2**
	Roads	2	14	14	**16**
	Water/Sewer	2	23	23	**25**
	Total	**14**	**39**		**53**

Table B.8 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Orono	Admin	10	0	0	**10**
	Fleet Services		3	3	**3**
	Roads	2	14	14	**16**
	Water/Sewer	2	28	28	**30**
	Total	**14**	**45**		**59**

Work Vehicles

The total number of work vehicles currently assigned to the Orono Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.9 below.

Table B.9 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
3 Roads, 2 Water, 1 Sewer	½ Ton Pick-up	6	7.94	9.88	Outdoor
Roads	1 Ton Pick-up	2	2.08	2.17	Outdoor
Roads	¾ Ton Pick-up	2	2.08	2.17	Outdoor
Roads	Backhoe	1	1.04	1.08	Outdoor
Roads	Grader	1	1.04	1.08	Outdoor
Roads	Tractor	1	1.04	1.08	Outdoor
Roads	Loader	1	1.04	1.08	Outdoor
Roads	Asphalt Spray Patcher	1	1.04	1.08	Outdoor
Roads	Wood Chipper	1	1.04	1.08	Outdoor
	Total	**16**	**18.34**	**19.62**	
Roads	Pavement Roller	1	1.04	1.08	Indoor
Roads	6 Ton Tandem	7	7.29	7.58	Indoor
Roads	Gradall	1	1.04	1.08	Indoor
1 Roads, 1 Water	Steam Generator	2	2.65	3.29	Indoor
3 Sewer, 2 Water, 2 Roads	3 Ton Crew Cab	7	9.26	11.52	Indoor
Fleet	Econo Van Mechanic	1	1.32	1.646	Indoor
Water	Econo Van Flushing	1	1.32	1.646	Indoor
Water	3 Ton Service Truck	1	1.32	1.646	Indoor
Water	1 Ton Van - Locate	1	1.32	1.646	Indoor
Water	1 Ton Van - Hydrant	2	2.65	3.29	Indoor
Sewers	Sewer Jet	1	1.32	1.646	Indoor
Water / Sewer	Air Compressor	1	1.32	1.646	Indoor
	Total	**26**	31.85	**37.72**	

Scugog Depot

Employees

The total number of employees forecast to be required for the Scugog Depot, in 2030 and 2040, (during the summer and winter seasons) is shown in the table below:

Table B.10 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Scugog	Admin.	4			4
	Fleet Services		2	2	2
	Roads	1	7	7	8
	Water/Sewer	2	13	13	15
	Total	**7**	**22**		**29**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Table B.11 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Scugog	Admin.	4			4
	Fleet Services		3	3	3
	Roads	1	7	7	8
	Water/Sewer	2	15	15	17
	Total	**7**	**25**		**32**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Work Vehicles

The total number of work vehicles currently assigned to the Scugog Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.12 below.

Table B.12 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Roads/Water/Sewer	76/78/79 series trailers	6	7.14	8.28	Outdoor
Roads	61 series water tank	1	1.02	1.04	Outdoor
Roads	35 /36 series tractor attachments	4	4.08	4.16	Outdoor
Roads	73 series	2	2.04	2.08	Outdoor plug-in requirement
2 roads, 1 water, 1 sewer	13 series pickups	5	5.95	6.9	Outdoor
1 roads/ 2 water	02/15/28 series vans	3	3.57	4.14	Outdoor
Roads/Water/Sewer	misc. small tools	16	19.04	22.08	Outdoor
	Total	**37**	**42.84**	**48.68**	
Roads	17/51 series tractors skid steer	3	3.06	3.12	Cold Covered
Roads	91 series woodchipper	1	1.02	1.04	Cold covered
Roads	99 series large snow blower	1	1.02	1.04	Cold covered
Roads	Contracted plows	3	3.06	3.12	Cold covered storage with electrical plug-in requirement
	Total	**8**	**8.16**	**8.32**	
Roads	09 series tandems with plow and wing	6	6.12	6.25	Indoor
Roads	05 series patrol trucks with hopper/sander	3	3.06	3.12	Indoor
Roads	34 series tractor	1	1.02	1.04	Indoor
Roads	25 series grader	1	1.02	1.04	Indoor
Roads	80 series asphalt hot box	1	1.02	1.04	Indoor
Roads	50 series loader	1	1.02	1.04	Indoor
2 Roads, 1 water, 1 sewer	46 series service trucks	4	4.76	5.52	Indoor

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Water	59 series steam generator	1	1.19	1.38	Indoor
Sewer	16 series sewer jet	1	1.19	1.38	Indoor
Sewer	66 series air compressor	1	1.19	1.38	Indoor
	Total	**20**	**21.59**	**23.19**	

Sunderland Depot

Employees

The total number of employees forecast to be required for the Sunderland Depot, in 2030 and 2040, (during the summer and winter seasons) is shown in the table below:

Table B.13 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Sunderland	Admin	6			**6**
	Fleet Services		2	2	**2**
	Roads	3	16	18	**21**
	Water/Sewer	3	6	6	**9**
	Total	**12**		**26**	**38**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Table B.14 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Sunderland	Admin	6			**6**
	Fleet Services		3	3	**3**
	Roads	3	16	18	**21**
	Water/Sewer	3	7	7	**10**
	Total	**12**		**28**	**40**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Work Vehicles

The total number of work vehicles currently assigned to the Sunderland Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.15.

Table B.15 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
1 Roads, 1 Water	Trailers (76 series shoring and enclosed cargo trailer)	2	2.83	3.66	Outdoor
Roads	75 series HD Float trailer	1	1	1	Outdoor
Roads	61 series water tank	1	1	1	Outdoor
1 Roads, 1 water	13 series Supervisor pickups	2	2.83	3.66	Outdoor
Roads	04 series crew cab	1	1	1	Outdoor
Roads	50 series loaders	2	2	2	Outdoor
Contractor	Personal vehicles	2	2	2	Outdoor
Roads	Contracted Plows	2	2	2	Cold, covered storage with electrical plug-in provisions
	Total	**13**	**14.66**	**16.32**	
Roads	35 series broom attachment	1	1	1	Cold, covered storage
Roads	36 series tractor mower attachments	2	2	2	Cold, covered storage
Roads	91 series wood chipper	1	1	1	Cold, covered storage
Roads	73 series sign board trailers	3	3	3	Cold, covered storage with plug in provision for battery maintaining
	Total	**7**	**7**	**7**	
Roads	09 series Tandems with plows and wing	7	7	7	Indoor
Roads	05 series patrol trucks with 24	2	2	2	Indoor

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
	series hopper / sander				
3 Roads, 2 Water	46 series service trucks	5	7.08	9.15	Indoor
Roads	34 series tractor	1	1	1	Indoor
Roads and Water	52 series Gradall	1	1.42	1.83	Indoor
Roads	25 series grader	1	1	1	Indoor
Roads	80 series diesel fired asphalt hot box	1	1	1	Indoor
Roads and Water	59 series steam generator	2	2.84	3.66	Indoor
Roads, Water/Sewer	66 series air compressor	1	1.42	1.83	Indoor
Roads and Water/Sewer	Misc. small tools i.e.: Cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, jackhammers, sewer camera, thawing machine, chainsaws, portable generators, etc.	15 +/-	21 +/-	28 +/-	Indoor
	Total	**36+/-**	45.76	56.47	

Traffic Operations Centre

Employees

The total number of employees forecast to be required for the Traffic Operations Centre, in 2030 and 2040, (during the summer and winter seasons) is shown in the table below:

Table B.16 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Traffic Eng./Operations	Works	15	23	23	38
	Total				**38**

Table B.17 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Traffic Eng./Operations	Works	18	30	30	48
	Total				**48**

Work Vehicles

The total number of work vehicles currently assigned to the Traffic Operations Centre, and forecast to be required in 2030 and 2040, is shown in the Table B.18 below.

Table B.18 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Signs& Markings	5 Ton Dump Truck	1	1	1	Indoor
	Ford Loop Truck/Cube Van	1	1	1	Outdoor
	Crash Trailer	1	1	1	Outdoor
	Total	**3**	**3**	**3**	
	Ford 3 Ton Crane Truck	4	4	4	Indoor
	Small Paint Truck	1	1	1	Indoor
	Large Paint Truck	1	1	1	Indoor
	New Paint Truck	1	1	1	Indoor
	Total	**7**	**7**	**7**	
Signal Maintenance	162 Middlebury Trailer	1	1	1	Outdoor

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
	Box Trailer	1	1	1	Outdoor
	Wire Trailer	1	1	1	Outdoor
	Pole Trailer	2	2	2	Outdoor
	¾ Ton Dodge Sprinter Van	2	2	2	Outdoor
	3 Ton Crew Cab	1	1	1	Outdoor
	Ground Service Truck		1	2	Outdoor
	3 Ton Crew Overhead Service		1	2	Outdoor
	Total	**8**	**10**	**12**	
	3 Ton Service Truck	2	2	3	Indoor
	1 Ton Van (Small Bucket)	2	2	2	Indoor
	1 Ton Service Vehicles		1	2	Indoor
	Pole Trailer		1	1	Indoor
	Total	**4**	**6**	**8**	
Signal & Sign	½ Ton Pick-up	3	4	5	Outdoor
	Total	**3**	**4**	**5**	
	Variable Message Signs	2	2	2	Indoor
	Total	**2**	**2**	**2**	
Signal, Sign & Road Safety	Variable Message Signs	8	10	12	Indoor
	Radar Speed Signs	4	10	10	Indoor
	Total	**12**	**20**	**22**	
Signal. Design, Contract Administration	½ Ton Pick-up	1	5	10	Outdoor
	Total	**1**	**5**	**10**	

Facilities Maintenance and Operations

Employees

The total number of employees forecast to be working for the Facilities Maintenance and Operations Group (during the summer and winter seasons) is shown in the table below.

Table B.19 - Future State - 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
	Help Desk	6	15	15	21
	Contract Services	9			9
	Custodian Services		4	4	4
	Security	1	5	5	6
	Total				40

Note: The Help Desk will require 5 Touch Down Stations

Table B.20 - Future State - 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
	Help Desk	6	15	15	21
	Contract Services	9			9
	Custodian Services		4	4	4
	Security	1	5	5	6
	Total				**40**

Note: The Help Desk will require 5 Touch Down Stations

Work Vehicles

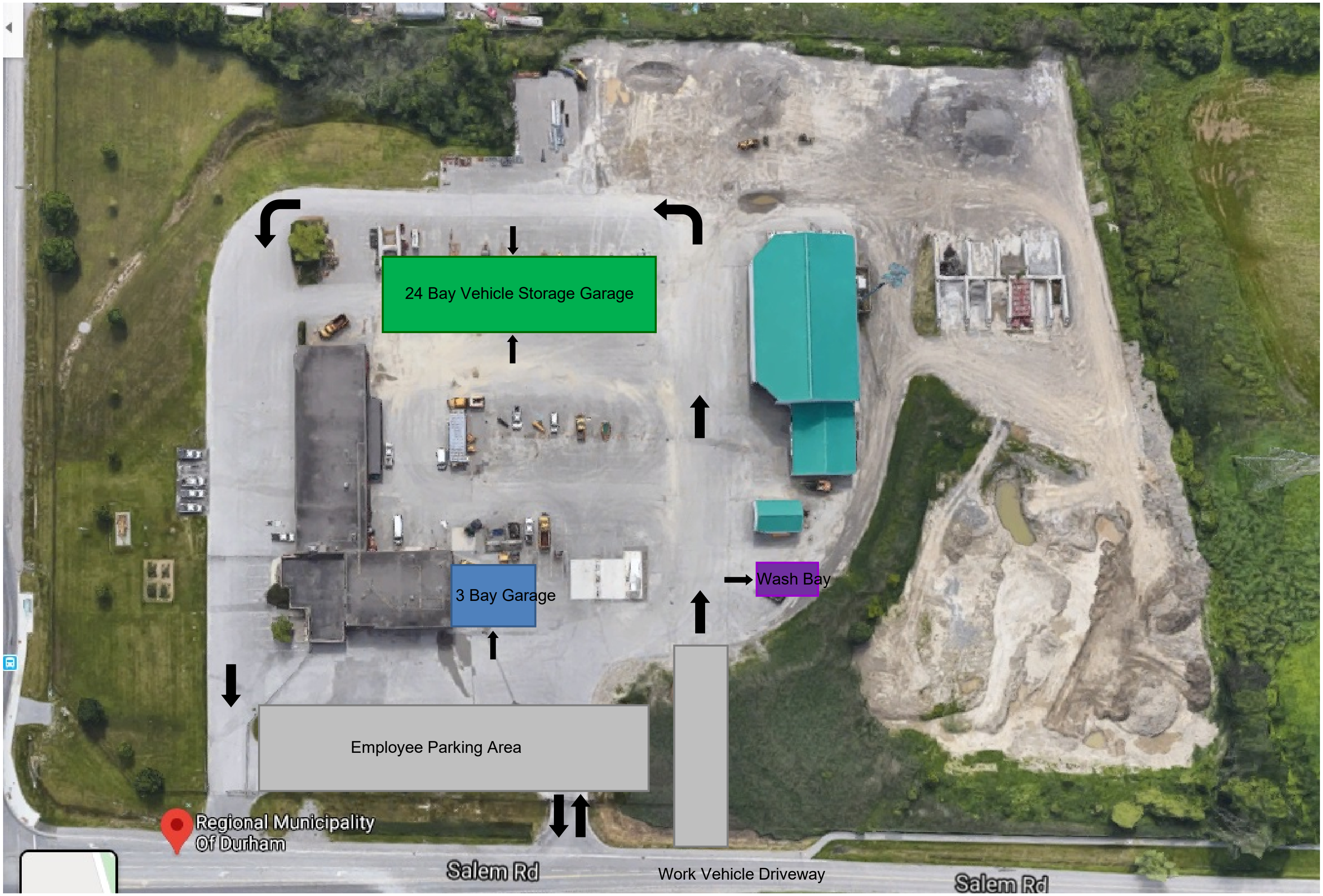
The total number of work vehicles currently assigned to the FMO, and forecast to be required in 2030 and 2040, is shown in the Table B.21 below.

Table B.21 - Future State

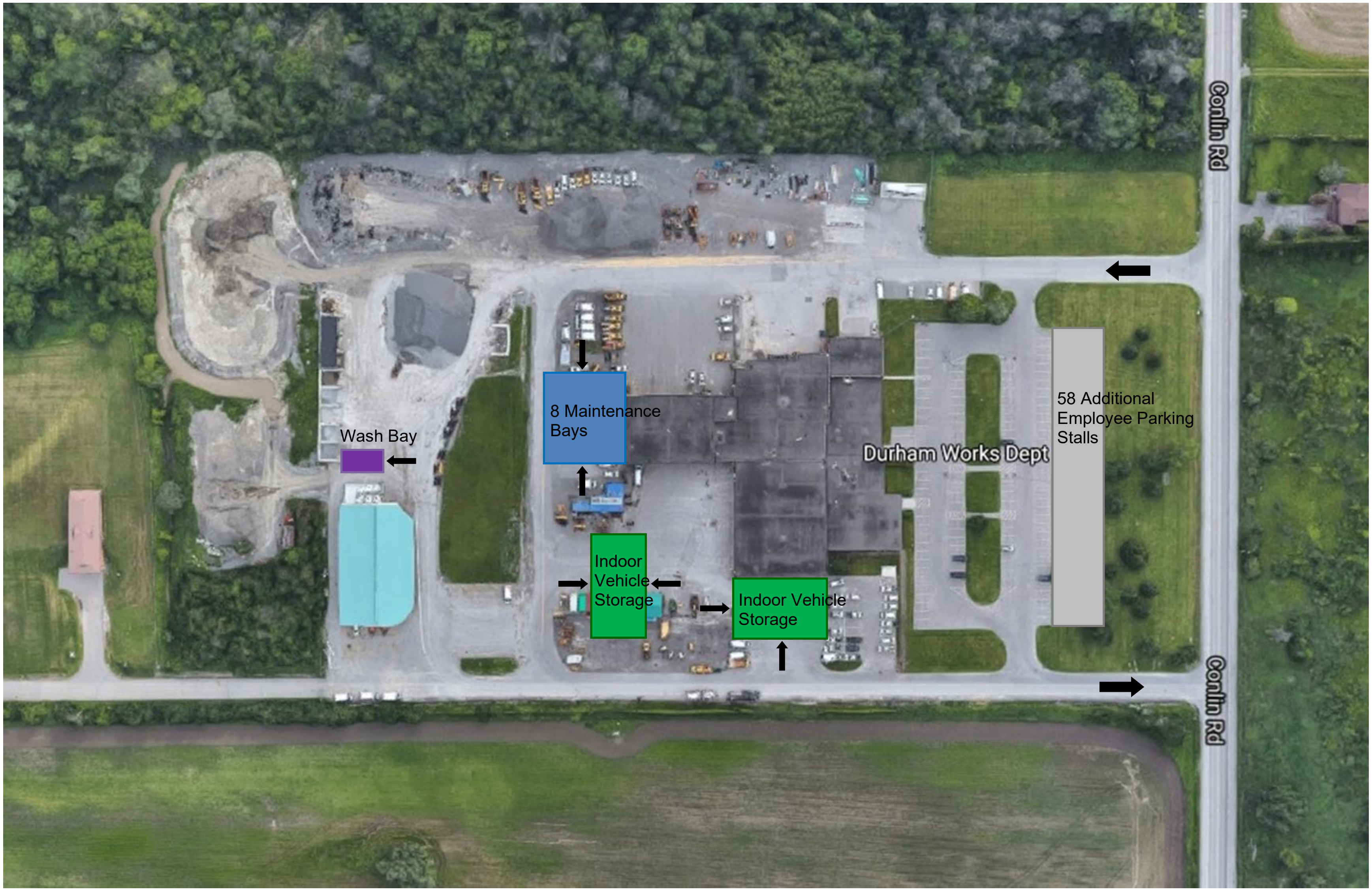
Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2019	2030	2040	
Help Desk	Service Vans	13	14	14	Outdoor
	Total	**13**	**14**	**14**	
Contract Services	None	0	0	0	
Custodian Services	Service Vans	2	3	3	Outdoor
	Total	**2**	**3**	**3**	
Security	Service Trucks	3	5	5	Outdoor
	Total	**3**	**5**	**5**	

APPENDIX C – Conceptual Site Plans

Ajax Pickering Depot



Oshawa-Whitby Depot



Orono Depot


4
17
Orono Depot -
Region of Durham
Best Rd
Taunton Rd
Best Rd
Best Rd

Scugog Depot

Sunderland Depot

Traffic Operations Centre

Attachment #2 - Oshawa/Whitby Depot Master Plan Report

Stirling Rothesay
CONSULTING, INC.

Consulting Services for
Completion of a Master
the Region of Durham's
Oshawa-Whitby Depot

Presented by: Stirling Rothesay **Consulting Inc.**

Date: November 24, 2021.

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1.0 EXECUTIVE SUMMARY

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

This Report will focus on the completion of the Master Plan for the Oshawa-Whitby Depot. Three other companion Reports will document the Rationalization Study and the Master Plans for the Ajax-Pickering and Sunderland Depots.

The Works Department's Operations and Maintenance Depots are referred to as:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

The Facility Master Plan for the Sunderland Depot will consolidate the analysis and recommendations for the Depot from the Rationalization Study for the immediate, short term (5 year), medium term (10 year) and long term (20 year). This will include the following:

- The preferred geographic location and service territory for the Depot;
- The current and future functions, use, and activities that should be conducted at the Depot;
- The infrastructure to be maintained, and the building/yard space and equipment required to 2040 (for employees, vehicles, equipment, parts, and materials). This will include the following functional areas:
  - Site access points;
  - Administrative areas;
  - Employee lunch room, locker rooms, and washrooms;

  - Training facilities;
  - Vehicle fueling stations;
  - Fleet washing;
  - Fleet maintenance and parts storage (including receiving/shipping);
  - Equipment and Material storage;
  - Indoor versus outdoor vehicle parking;
  - Vehicle staging areas;
  - Staff parking;
  - Vehicle traffic patterns (fleet, employee) and pedestrian circulation;
- Any facility/yard design issues or deficiencies negatively affecting operational flow, productivity, working conditions, environmental stewardship, and/or service delivery;
- Site safety and security issues;
- The need for facility upgrade requirements or new/expanded facilities;
- The potential impact of proposed developments on the area adjacent to the Depot.

The Facility Master Plan will also provide (1) an optimized site conceptual plan, (2) detailed Class "D" cost estimates for building and yard upgrades/expansions/new facilities, and (3) a sequence of events implementation schedule required to achieve the upgrades/expansions/new facilities.

The objectives of the Facility Master Plan include making recommendations that will (1) provide safe and efficient work conditions, (2) make best use of the existing site and facilities, (3) provide efficient flow of employees and vehicles through the yard, (4) meet industry best practices in facility and yard layout design, and (5) meet the operational growth requirements over the next 20 plus years.

Like most Public Works facilities, the requirements placed on the Oshawa-Whitby Depot have expanded and evolved since it was originally built. As a result, (1) the size of the facility is insufficient to meet current needs and future growth requirements, (2) the design of the facility and use of space are not optimal or compliant with industry best practices and design trends, (3) the age of the facility is rapidly approaching the end of its expected asset life, (4) the flow of employees and vehicles within the Depot is not efficient, and (5) the Depot is not in the best location to efficiently satisfy the needs of the community. These issues have had a negative impact on employee productivity and the cost effectiveness of maintaining service levels.

Specific issues causing concern include:

- There is a shortage of mechanics and vehicle maintenance bays at the Depot. These shortages have a direct impact on vehicle availability, crew productivity, and the ability of crews to meet service level requirements;
- There is insufficient indoor space for storing vehicles and equipment. As a result, vehicles and equipment that should be protected from the elements to maintain their safe functionality, increase their asset life, and reduce the need for repairs are, instead, stored outdoors year-round;
- All of the buildings are aging and close to their expected asset life. As a result, the cost to maintain and repair these facilities will continue to increase in the coming years;
- Growth requirements will result in insufficient space to store and manoeuvre the vehicles, equipment and materials safely and efficiently around the yard. This shortage of space will increase the time required to park the vehicles, and the risk of vehicle and pedestrian collisions.

To address the concerns documented in this report we have created a number of recommendations to help the Works Department improve employee safety, achieve operational synergies, increase space utilization, and satisfy space requirements for their employees, vehicles, equipment, and materials. The recommendations also describe the preferred Depot network design to minimize operating costs and meet service level requirements.

The main recommendations are as follows:

1. A high-level, Functional Space Program (for 2040), and a preferred Conceptual Site Plan were developed for the existing Oshawa-Whitby Depot. The Space Program and the Site Plan are shown in Appendices C and D, respectively. Unfortunately, the layout of the existing buildings, and the limited size of the site prevented the full incorporation of the Functional Space Program into the Site Plan. The deficiencies within the Site Plan were as follows:
    - Short 5 Fleet Services maintenance bays;
    - No mud room within the employee changing rooms;
    - No parking stalls for the contractor's employee vehicles (this is common at other urban municipalities but does create an operational problem);
    - Short 7 parking stalls for the contractor's work vehicles;
    - Short 30 parking stalls for work vehicles in/out for Fleet Services maintenance;
    - Short 49 parking stalls for work vehicles for Roads/Water/Sewer;
    - Short 25 parking stalls for work vehicles managed by Fleet Services (e.g., ambulances)

- Short 195 m^2 for storing the shipping containers and misc. equipment;
- No space for storing the waste soil (8,600 m^2);
- No space for storing the unprocessed or processed asphalt (3,700 m^2).

Therefore, we concluded that the Region should limit spending at the existing Depot (to just necessary repairs) and focus, instead, on planning for the construction of a new Oshawa-Whitby Depot (that would include the Traffic Operations Group and the Facilities Maintenance and Operations Group) at a new, much larger site.

2. The Region should develop a plan to acquire a new site for the construction of a new Oshawa-Whitby Depot, as soon as possible. Design and construction of the new Depot should begin as soon as funding can be acquired (preferably within 5 years due to operational needs and the limitations of the current site). When the Greenbelt and local zoning restrictions are taken into consideration the best location would be between Ritson Rd. North and Highway 407 (north of Conlin Rd. E.).

There could be some synergies achieved by building the Depot at the location planned for the new Durham Region Transit bus storage and maintenance facility (if the office functions shared the same building). However, the savings in construction costs for the combined

facility (by reducing space requirements) would be far less than the cost of the added crew travel times over the lifespan of the facility.

We also believe that the Traffic Operations Group and the Facilities Maintenance and Operations Group should be consolidated into the new Depot site. Doing this would achieve numerous synergies between the three operations and would eliminate the duplication of common spaces: employee amenities, training rooms, shops, and parts storage. It would also provide the operations with the opportunity to better collaborate, and to work within new facilities that achieve best practices in design, and promote operational productivity;

Below, in Table 1.1, we list the functional groups that should be located at the new Oshawa-Whitby Depot.

Table 1.1 – Proposed Locations for Each of the Works Department Functional Groups

Location	Departments/Groups								
	Roads	Water & Sewer	Fleet Services	Water Meter	MTLS	Traffic Operations	FM&O	SWAT	Training
Proposed New O-W Depot (in 2040)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3. The total hard construction cost to build the new Depot on a new, larger site is estimated to be **$106,932,959** (see Table 1.2, on the following page). The estimated construction costs provide a high-level "ball-park" estimate and should not be used for budget purposes due to their low level of accuracy (with a variance of perhaps +- 40%).

Table 1.2 – Estimated Hard Construction Costs

Depot	Functional Area	Area (m^2)	Unit Cost ($\$/m^2$)	Estimated Cost ($)
New Oshawa-Whitby Depot	Admin. Office & Employee Amenities	11,102.93	5,504	61,110,529
	Fleet Services Garage/Wash Bay/Parts	4,126.94	3,200	13,206,199
	Indoor Vehicle Storage Building	2,983.77	2,000	5,967,531
	Indoor Salt Storage & Loading Building	1,926	1,800	3,466,800
	Site Work (including M&E Site Services)	157,700	147	23,181,900
	TOTAL (rounded)			**106,932,959**

To create the estimates, typical unit rates (in 2021 dollars) were used that are based on the project specifications for the proposed new Sunderland Depot. The unit rates are based on typical mid-range costs for the type of design and construction proposed. Contingencies are included in the estimate to offset the accuracy risk.

The total project soft cost to build the new Depot is estimated to be **$25,396,578** (see Table 1.3, below).

The total project budget cost, therefore, is estimated to be **$132,330,000** (this assumes a construction start date of April 1, 2024).

Table 1.3 – Estimated Project Soft Costs

<table>
<tr><th>Depot</th><th>Project Soft Costs</th><th>Estimated Cost ($)</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td rowspan="11">New Oshawa-Whitby Depot</td><td>Land Acquisition Costs</td><td>Unknown</td></tr>
<tr><td>Municipal Charges</td><td>0</td></tr>
<tr><td>Project Management Fees</td><td>0</td></tr>
<tr><td>Consulting Fees and Expenses</td><td rowspan="7">25,396,578</td></tr>
<tr><td>Specialty Consultants</td></tr>
<tr><td>Owner Supplied Furnishings, Fixtures and Equipment</td></tr>
<tr><td>Financing and Loan Fees</td></tr>
<tr><td>Operational Expenses</td></tr>
<tr><td>Taxes</td></tr>
<tr><td>Project Soft Cost Contingency</td></tr>
<tr><td>TOTAL (rounded)</td><td>25,396,578</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

Exclusions & Qualifications

The following items are excluded from the estimates in Tables 1.2 and 1.3:

- Land acquisition
- Premium time for afterhours and weekend work
- Phasing premium (assumed to be executed in a single phase)
- Municipal off-site service connections (outside the property line)
- Abatement and handling of asbestos contaminated materials
- Handling and removal of contaminated soils
- Special foundations such as caissons or pile foundations
- Development charges and building permit fees
- Sole sourcing of materials, services, or equipment
- Premiums for LEED certification
- Independent 3rd Party Commissioning
- Onsite or offsite temporary storage facilities
- Mock ups

4. The proposed Implementation schedule (for the construction of a new Depot) is shown in Appendix E. We expect the pre-construction phase to last 26 months and would include such tasks as Site Plan Approval, preliminary and detailed design, and tendering for construction. The construction phase is expected to last 30 months.

We have assumed that the current operations would continue from the existing site until the new Depot is ready to be occupied.

5. Given the size of the Region, and the location of the existing Depots and garages, we believe that the current model for Fleet Services should be continued. That is, we recommend that the primary Fleet Services garage should continue to be located at the Oshawa-Whitby Depot with satellite locations at each of the other four Depots;

6. The number of mechanics (and maintenance bays) at each Depot should be optimized to ensure that Fleet Services can meet its service level objectives for scheduled and unscheduled maintenance. We will discuss more about the required number of mechanics in section 3.2.3;

7. The main parts/supplies storage for all of the Depots should be consolidated into one central Stores Department at the Oshawa-Whitby Depot. This would eliminate duplication in space requirements and would achieve economies of scale. Smaller, point of use storage would still exist at each Depot for daily consumables.

8. The Region should further analyse the potential benefits of using Vendors or 3PL's (Third Party Logistics provider's) to manage the fast movers (e.g., SKU's with ten or more turns per year) off-site and replenish the Stores Department, as required. This would reduce on-site storage space requirements, stock-outs, logistics costs, and improve customer service.

9. Vendors and 3PL's tend to be much less cost effective at managing medium and slow movers, critical spares and dead stock. Dead stock (i.e. has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. Therefore, the medium and slow movers, and critical spares should be consolidated into the central Stores Department. This would help to justify the use of high-density storage systems and automation, reduce labour and space requirements, and reduce warehouse costs.

2.0 INTRODUCTION

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

The Region's operations and maintenance activities are currently delivered from five Works Department Depots:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

Like most Public Works facilities, the requirements placed on these five Depots have expanded and evolved since they were originally built. As a result, the size of the facilities and outdoor yard storage areas may be insufficient to meet current or future growth requirements. In addition, the current use of space and flow of employees and vehicles may not be optimal or compliant with industry best practices and design trends. Furthermore, the Depots may no longer be in the optimal location to efficiently satisfy the service needs of the community.

In fact, since 2009, requests for additional facility space and modifications have been brought forward by staff (of the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) to accommodate expanding population growth and community needs, equipment and technological changes, environmental, and legislative needs. However, these requests have been put on hold pending the outcome of the Rationalization Study and Master Plans.

Therefore, the Region requires a **Rationalization Study** that will assess the five Depots (as well as the subject operational groups and potential Seaton Depot), and recommend the most efficient accommodation and site utilization strategy to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department. The Study should

also assess (1) opportunities to consolidate existing operational facilities and operational groups to increase efficiencies and leverage synergies for service delivery, and (2) opportunities to co-locate field functions with other groups within the Region including, but not limited to, Durham Region Transit maintenance and operations facilities.

The Study will consider the following:

- How the forecasted growth rates of population, employment, and traffic volumes, within each of the service territories, will affect the infrastructure to be maintained, and the building space and equipment requirements to 2040;
- How these forecasts will affect the data and recommendations within the 2009 Report completed by AECOM;
- Whether the current alignment of boundaries, for the service territories for each of the Depots (including the proposed new Seaton Depot), should be shifted to provide the most efficient and effective service for the territories;
- The current and future functions, use, and activities that should be conducted at each of the Depots (including the proposed new Seaton Depot), to improve productivity and leverage synergies for service delivery;
- The efficacy of consolidating services/activities at certain Depots. For example:
  - providing all water and sewer infrastructure services from a single Depot for all service territories;
  - providing emergency repair operations from two Depots – one in the south and one in the north;
- How best to deliver services to the northern communities of the Region in conjunction with the Sunderland Depot;
- Whether the locations of the Depots, within the current and preferred service territory boundaries, should be expanded or relocated, if feasible, over the next 20 years. For example, should the entire Ajax-Pickering service territory be consolidated to a single location – either at the proposed Seaton Depot or a different location;
- For those Depots that should be relocated, where would be the preferred geographic location, and what would be the relocation cost;
- The potential for consolidating and sharing existing or future Depot facilities with other operational groups within the Region (e.g., The Traffic Operations Group, The Facilities Maintenance and Operations Group, Durham Region Transit, etc.). This could be through the expansion of existing facilities or new facilities. Also, what the full impact of these consolidations would be;
- The infrastructure to be maintained, and the building space and equipment requirements at each of the current and proposed Depots (including the proposed new Seaton Depot), to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department.

In addition, the Region requires a **Facility Master Plan** for each of three Depots (the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) including the accommodation of relocated operational service groups, if recommended. The Facility Master Plans will consolidate, for each of the Depots, the analysis and recommendations from the Rationalization Study for the immediate, short term (5 year), medium term (10 year) and long term (20 year). This will include the following:

- The preferred geographic location and service territory for each Depot;
- The current and future functions, use, and activities that should be conducted at each of the Depots;
- The infrastructure to be maintained, and the building/yard space and equipment required to 2040 (for employees, vehicles, equipment, parts, and materials). This will include the following functional areas:
    - Site access points;
    - Administrative areas;
    - Employee lunch room, locker rooms, and washrooms;
    - Training facilities;
    - Vehicle fueling stations;
    - Fleet washing;
    - Fleet maintenance and parts storage (including receiving/shipping);
    - Equipment and Material storage;
    - Indoor versus outdoor vehicle parking;
    - Vehicle staging areas;
    - Staff parking;
    - Vehicle traffic patterns (fleet, employee) and pedestrian circulation;
- Any facility/yard design issues or deficiencies negatively affecting operational flow, productivity, working conditions, environmental stewardship, and/or service delivery;
- Site safety and security issues;
- The need for facility upgrade requirements or new/expanded facilities;
- The potential impact of proposed developments on the area adjacent to the Depots

The Facility Master Plans will also provide (1) an optimized site and facility conceptual plan, (2) detailed Class “D” cost estimates for building and yard upgrades/expansions/new facilities, and (3) a sequence of events implementation schedule required to achieve the upgrades/expansions/new facilities.

The objectives of the Facility Master Plans include making recommendations that will (1) provide safe and efficient work conditions, (2) make best use of the existing site and facilities, (3) provide efficient flow of employees and vehicles through the yards, (4) meet industry best practices in facility and yard layout design, and (5) meet the operational growth requirements over the next 20 plus years.

This Report will focus on the Master Plan for the Oshawa-Whitby Depot. The Rationalization Study, and the Facility Master Plans for the Ajax-Pickering and Sunderland Depots will be completed in separate companion Reports.

3.0 FACILITY NEEDS ASSESSMENT

The Region of Durham's Works Department is comprised of (1) five Operations and Maintenance Depots, and (2) the Traffic Operations Group, and the Facilities Maintenance and Operations Group.

The Region's five Depots are referred to as:

- Ajax-Pickering Depot;
- Oshawa-Whitby Depot;
- Orono Depot;
- Scugog Depot;
- Sunderland Depot.

In addition, there are two Operations Groups: the Traffic Operations Group, and the Facilities Maintenance and Operations Group. The Traffic Operations Group is located at the Regions Traffic Operations Centre. The Facilities Maintenance and Operations Group will be relocated to the Traffic Operations Centre (from the Region's Whitby Water Supply Plant) in 2023.

The Needs Assessment will describe the current and future state facility needs (to the year 2040) for the Region's Oshawa-Whitby Depot.

3.1 Current State

This section begins with a high-level description of the current size, location and service boundaries for the Region of Durham's Works Department's five Depots and two Operations facilities. It then proceeds to focus on the Region's Oshawa-Whitby Depot – describing its current state service functions, and resources. It also describes (1) the characteristics of its key functional work areas, (2) the limitations that the current buildings and yard place on the ability of the employees to operate efficiently and effectively, and (3) the opportunities to eliminate business process inefficiencies.

3.1.1 Location, Size and Service Boundaries (For Each Depot and Operations Facility)

The Region of Durham was established in 1974 and is the largest geographical jurisdiction in the Greater Toronto Area encompassing approximately 2,532 km^2 of land and almost 800,000 residents. The vast majority of the residents live in the five southern municipalities of Pickering, Ajax, Whitby, Oshawa, and Clarington.

To service this vast area, the Region of Durham's Works Department operates five Depots which are distributed, strategically, across the Region. In addition, the Works

Department operates the Traffic Operations Group, and the Facilities Maintenance and Operations Group from two Operations facilities.

Below, in Table 3.1, we describe the current location, size and service boundaries for each of the Depots and Operations facilities.

Table 3.1 - Current Location, Size and Service Boundaries

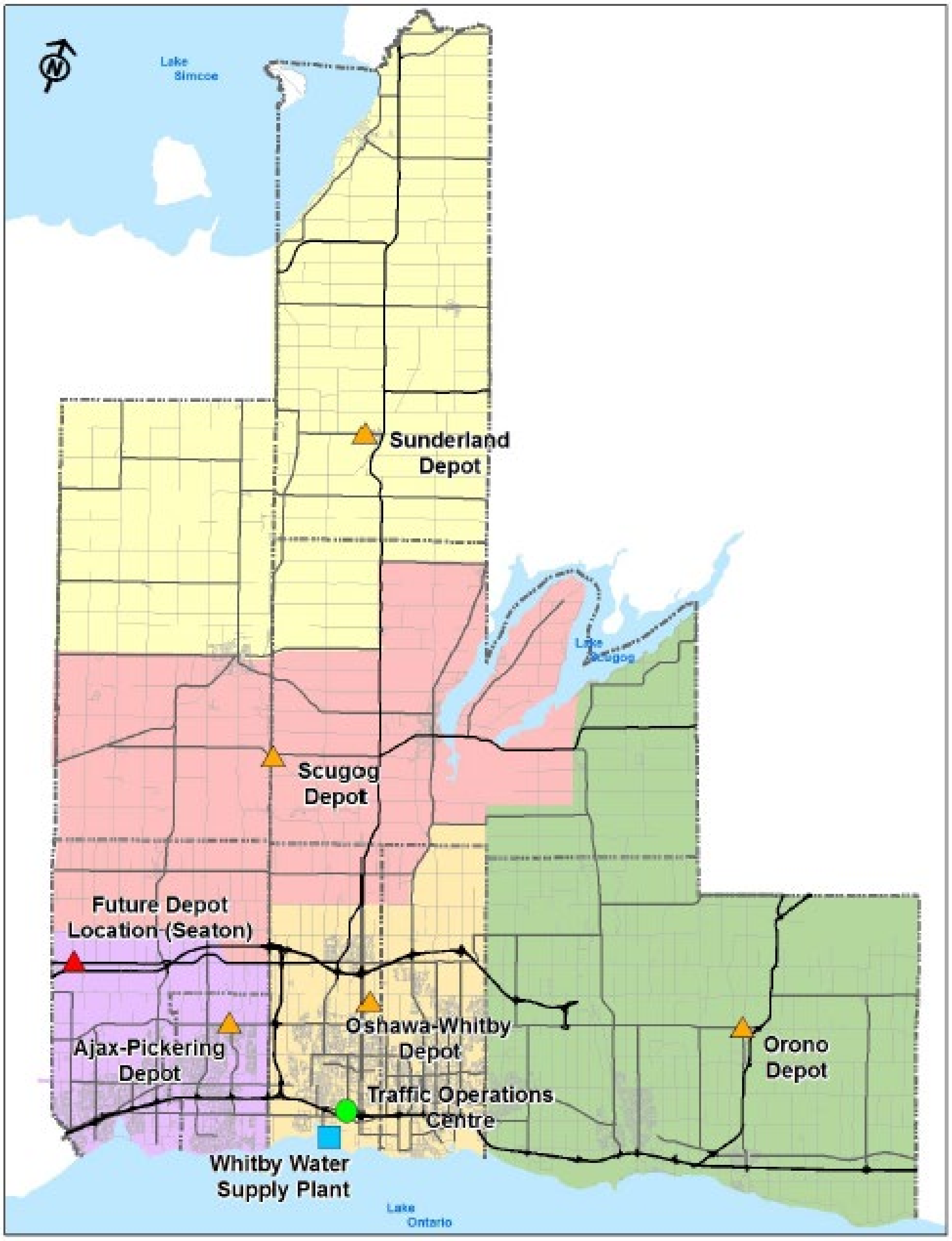
Depot/Facility	Location	Size of Site (acres)	Total Indoor Space (ft^2)	Service Boundaries
Ajax-Pickering Depot	202 Salem Rd., Ajax	14.75	17,425 (excluding separate buildings)	The entire City of Pickering and the Town of Ajax
Oshawa-Whitby Depot	825 Conlin Rd., Whitby	14.9	51,500	The entire City of Oshawa and the Town of Whitby
Orono Depot	3480 Taunton Rd., Orono (Clarington)	10	20,478 (4,806 for material storage bldg.)	East part of Durham Region - Clarington
Scugog Depot	10 Regional Rd.21, Port Perry	80	11,301 (2,348 for steel storage bldg.)	Central part of Durham Region - Scugog
Sunderland Depot	S995 Regional Rd. 10, Sunderland	4.02	8,201 (main building and service garage)	North part of Durham Region – Uxbridge and Brock
The Region's Traffic Operations Center	101 Consumers Drive, Whitby	3.5	44,518	Region of Durham
The Region's Whitby Water Supply Plant	301 Water Street West, Whitby			Region of Durham

On the following page, we show Map 3.0 which identifies the location of the five Depots, the two Operations facilities, and their respective service boundaries.

3.1.2 Service Functions and Service Locations (Oshawa-Whitby Depot)

The Region's Works Department is responsible for a number of service functions including operating and maintaining the Region's (1) network of roads and bridges, (2) networks of water, storm water, and sanitary sewage piping, (3) traffic signals, warning devices, roadside protection and line markings, and (4) buildings. In this section, we describe the service functions performed from the Oshawa-Whitby Depot.

Map 3.0 – Current Location of the Works Department Depots and Operations Centres



Oshawa-Whitby Depot

Roads Department

The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads and bridges. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store a large quantity of road salt (for winter road maintenance) and smaller quantities of other materials (such as gravel, cold-patch, etc.). The employees are provided with parking and indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water and Sewer Departments
The Water and Sewer Departments also operate a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations. Approximately 45% of the service activities for the Region are conducted by the staff located at the Oshawa-Whitby Yard.

Fleet Services Department
The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Oshawa-Whitby Depot
they provide eight licensed mechanics who service the fleet of Roads, Water, and Water Meter Department vehicles. They operate on the day shift using eight maintenance bays, and report to a Supervisor and the Depot Superintendent located on-site. The bays provide space for Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

Water Meter Division
The Water Meter Division operates as a centralized group (at the Oshawa-Whitby Depot) to provide water meter maintenance and replacement across the Region. The Division has three clerks and eight meter mechanics, and maintains a fleet of eight Service Repair Vans which need to be stored indoors. The mechanics have use of a lab to calibrate meters and check for faults.

Materials Testing and Laboratory Services (MTLS)
The MTLS operates as a centralised group (at the Oshawa-Whitby Depot) to complete concrete, asphalt and soil testing for construction contractors. They have six full-time employees and two temporary employees all of whom are located at the Oshawa-Whitby Depot because of its south-central location (to minimize driving distances). They operate within the Depot and also provide four vehicles for the inspectors.

Sewer and Water Appurtenance Testing (SWAT)
The Region's SWAT team has six full-time employees and two temporary employees. The Manager and Supervisor need to be located at the Regions Headquarters but the other six employees are consolidated at the Oshawa-Whitby Depot because of its south-central location (to minimize driving distances). They operate three service vehicles.

Training
The Training group has three full-time employees who provide training to Durham Region staff and employees on topics such as Maximo, WHMIS, Confined Space, and First Aid.
All of the employees are located at the Oshawa-Whitby Depot because of its south-central location (to minimize driving distances).

3.1.3 Resources – Employees, Vehicles and Materials (Oshawa-Whitby Depot)

In Appendix A, we list the current number of resources (employees, vehicles, equipment and materials) utilized by the Works Department at the Oshawa-Whitby Depot. These numbers will be used, in section 3.2.4, to estimate the future resource requirements in 2030 and 2040.

3.1.4 Functional work Areas (Oshawa-Whitby Depot)

In this section, we describe the characteristics of the key functional work areas that are located at the Oshawa-Whitby Depot. In section 4.2, we will discuss some of these areas in more detail from the context of industry best practices in layout design.

Administrative Office
The office staff require administrative space for offices, meeting rooms, printers, and various types of storage. A small reception area is also required for visitors to the site. The outdoor staff require a training room and a place to discuss daily work assignments at the beginning of the shift. Some of the outdoor workers (typically Lead Hands) require access to a touch-down station (with computer terminal) to input data at the end of the shift.

Employee Amenities
The outside workers require changing rooms, lockers, washrooms and showers for male and female outside employees. A lunchroom is also required, however, most of the outside workers do not return to the Depot for lunch so the lunch room is primarily used by the office staff. There also needs to be consideration for gender-neutral and multi-faith facilities.

Materials Testing Lab
The Materials Testing Lab provides space for various machines and rooms used to test concrete, asphalt and soil samples for contractors. Space is currently required for six full-time employees and two temporary employees.

Water Meter Shop
The Water Meter Shop provides space for water meter maintenance and replacement. The shop is used to store new/replaced meters, and to calibrate meters

and check for faults. Office space is also required for a part time Supervisor and three clerks.

Fleet Maintenance Garage
Fleet Maintenance bays are required for providing on-site maintenance to the Fleet of work vehicles. The bays provide space for changing fluids, as well as for completing major repairs (including welding). Painting and body work are contracted out.

Parts/Tools Storage
Storage space is required for the storage of Fleet maintenance parts. Automotive parts are, typically, stored on shelves in a room adjacent to the maintenance bays. Small tools and equipment (for the outdoor crews) are, typically, stored in locked rooms adjacent to the employee amenities and parking area for the work vehicles.

Vehicle/Equipment Storage
Indoor storage space for specialized work vehicles and equipment is provided. This includes bucket trucks and tandem axle plows. All other vehicles are stored outdoors.

Wash Bay
There is an indoor wash bay for their fleet of vehicles. The other Depots rely on washing their vehicles in the yard.

Salt Storage
There is one building for the indoor storage of salt for winter maintenance operations. Salt is stored indoors to protect it from rain.

Fueling
There are fueling pumps that provide fuel (gas, diesel and coloured diesel) to work vehicles stored within the yard.

On the following page, in Table 3.2, we provide the current space available for each of these areas.

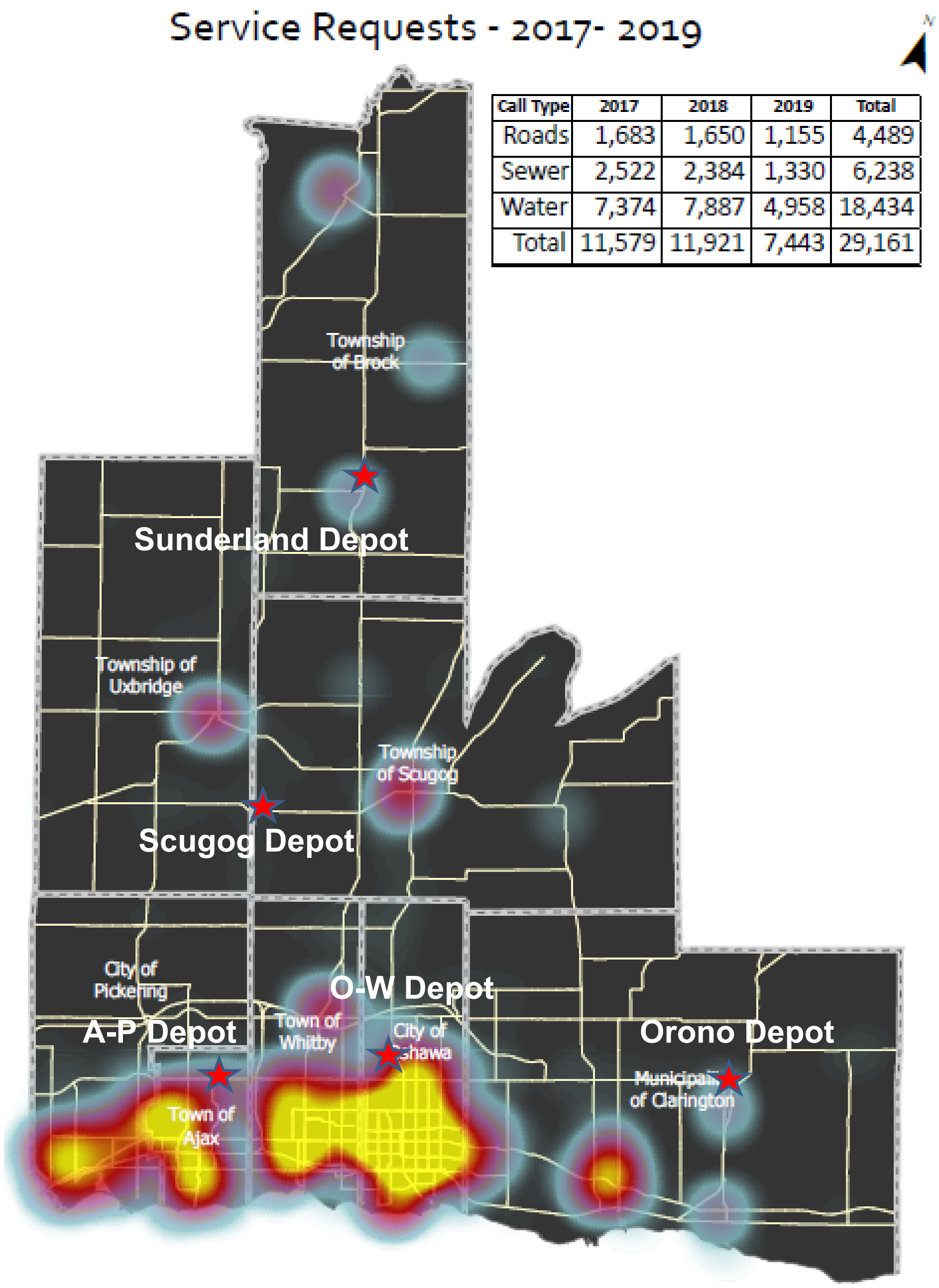
3.1.5 Facility Limitations – Location, Size, Design, Layout and Condition (Oshawa-Whitby Depot)

In this section, we discuss the limitations imposed on the Oshawa-Whitby Depot due to its location, size, design, layout and condition. Map 3.1, on page 20, is a Heat map and will be used to evaluate the location of the Oshawa-Whitby Depot relative to where the service calls are. The Heat map uses colour to reflect the frequency of service calls throughout the Region. Light blue represents a low frequency of calls whereas yellow represents a high frequency.

Table 3.2 – Current State Areas at the Oshawa-Whitby Depot – 2020

Functional Work Area	Space (ft^2)
Administrative Office	23,574
Employee Amenities	
Materials Testing Lab	0
Water Meter Shop	0
Fleet Maintenance Garage	2,521 3 one-way
Parts Storage	560
Vehicle/Equipment Storage	10,323 5 one-way
Wash Bay	0
Salt Storage	1,302
Fueling	Yes

Map 3.1 – Frequency of Service Requests for Roads, Sewer and Water by Location



Call Type	2017	2018	2019	Total
Roads	1,683	1,650	1,155	4,489
Sewer	2,522	2,384	1,330	6,238
Water	7,374	7,887	4,958	18,434
Total	11,579	11,921	7,443	29,161

Oshawa-Whitby Depot;

Location

The Depot is located, approximately, 2 km to the north of the geographical centre point of its service territory – the Town of Whitby and City of Oshawa. It is located on the south side of Conlin Road between Thickson Road and Garrard Road. To the north and east is farmland; To the west is an environmentally protected wetland and industrial lands, and to the south is the Region's underground Municipal Water Reservoir, a Recycling Center, and a waste Material Recovery Facility. Beyond that is the urban residential area of Whitby.

In general, the Depot is considered, by staff, to be in a good location relative to the area that it serves. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is located close to where the majority of the service requests originate from. That said, it would be preferable for the Roads group, currently, if the Depot was located slightly further south – perhaps on Taunton Road East. For the Water Services group, it would be preferable, currently, if the Depot was located further south towards where most of the pipe networks are located – perhaps on Rossland Road East.

2) **Traffic Congestion Faced by Work Crews:** The populations of Oshawa and Whitby have increased significantly during the last twenty years which has increased traffic congestion and adversely affected the travel time required by work crews during the rush hour periods. This has decreased their productivity. However, they have benefited from the fact that the Depot is located close to a major road network with good access to all parts of the service territory. That said, it would be preferable for the work crews, currently, if the Depot was located further south along Thickson Road North, between Taunton Road East and Rossland Road East.

3) **Location of the Depot Versus Future Population and Employment Growth:** The construction of Highway 407 has encouraged the growth in population and housing to move northwards. This will have a greater impact on the Water Services group as new water, storm and sewer systems are built in the north half of the service territory. Therefore, to minimize travel distances, in the future, it would be preferable if the Depot was located closer to the geographical center point of the service territory: further south along Thickson Road North and near to Taunton Road East.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wetlands. Given these requirements, the Oshawa-Whitby Depot is in a relatively good location except for the environmentally protected wetland along the western property boundary.

Size, Design and Layout
The productivity of the employees currently working at the Oshawa - Whitby Depot is directly affected by the size, design and layout of the buildings and yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The size of the site, at 14.9 acres, provides very limited space for the expansion of buildings and yard storage over the next 20 years. The layout of the buildings and yard reveal that they do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The individual offices are larger than they need to be. Furthermore, there are too many private offices and cubicles which reduce employee collaboration, and consume excess floor space;

- The office space should be reconfigured to improve space utilization. This would eliminate the need for two employees to have their work desks located in the lunchroom;

- The lunchroom should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy;

- Touch-down stations should be made available for those outside workers requiring a computer for less than 4 hours per day (to reduce space requirements);

- The size of the locker rooms and washrooms is too small to meet the current demand;

- The design of the facility should be “barrier free” and comply with provincial requirements for accessibility;

- Many workspaces receive little or no natural light and ventilation (which can be as simple as access to an operable window). This is often identified as a cause of lower productivity levels and morale within offices;

- The storage rooms for Fleet parts do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements. The current storage systems should be re-evaluated to determine how best to maximize storage densities. Also, a warehouse management system is required;

- The Water Meter Shop is too small to meet current space requirements;

- The layout of the Material Test Lab should be reconfigured into a U-shaped cell to improve productivity;

- There are too few vehicle maintenance bays. There should be at least 1.5 bays per mechanic;

- The indoor vehicle storage area is too small. As a result, vehicles are squeezed in which slows down their ability to drive out in the morning. It is estimated that this process could take up to 30 minutes and delay the crews from leaving the Depot;

- There should be a 2nd wash bay primarily for use by the Fleet Services maintenance garage;

- This salt storage building should provide both indoor storage and loading. This will minimize spillage of salt into the environment and help contain the noise from the loading operation;

- The two yard entrances should have one-way flow to reduce the risk of collisions;

- The flow of heavy vehicles should be counter-clockwise through the yard to improve driver sightlines and minimize the risk of collisions;

- The vehicle refueling station is above ground but located in-line with the flow of work vehicle traffic. This creates a potential bottleneck;

- The yard is currently at full capacity for the storage of vehicles and materials. A new layout is required to improve the utilization of space;

- Plastic and rubber items, including piping, fittings and the brine storage tanks, are stored outdoors fully exposed to the sun. This will lead to material deterioration by the sun. Indoor storage space is required;

- The decanting area for the Vactor and sweepers is outside the yards boundaries;

- The east side of the yard should be fenced, and gates should be installed at the two entrances;

- Additional security cameras should be installed, and the exterior lighting should be upgraded.

- The general arrangement of the buildings within the yard is adequate. However, the material and tool storage buildings (adjacent to the salt storage building) should be located closer to the main building for quicker access by employees. Typically, these storage areas are located adjacent to the indoor vehicle storage area and employee amenities.

Building Condition
The main building was built in 1978 and is, therefore, at least 2/3 through its expected asset life. That said, the building appears to be in reasonable condition given its age. The following items have been identified as requiring repair or upgrade to the building's substructure, shell, interior or services:

- Repairs are required to address concrete pitting in the vehicle storage area (north and south sides) ($185,000);
- A 4,500 L underground storage oil tank should be removed ($65,000);
- Various floor grates and drains should be repaired ($180,000);
- Certain office windows should be replaced ($200,000);
- Portions of the exterior brick veneer on the building are flaking and falling off. Some of the mortar should be repointed (where required) and all damaged bricks should be replaced ($150,000);
- Many of the exterior walls are not insulated resulting in higher energy costs. No changes are recommended;
- An Emergency Standby Generator is required ($456,000);
- The UPS battery should be replaced ($17,000);
- The furnace should be replaced ($150,000);
- The ventilation for the Material Testing Lab should be isolated from the ventilation for the rest of the building in order to eliminate odours ($20,000);
- The hydro service is being used to its full capacity. A hydro service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot;
- The pressure for the supply of natural gas is too low. A gas service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot;
- There are no sprinklers within the building ($150,000).
- The steel septic sewage tank is believed to be corroded and should be replaced ($65,000).

3.1.6 Opportunities to Reduce Space Requirements

In this section, we will discuss a number of Best Practices for reducing space requirements within an Operations Depot. Reducing space requirements would, potentially, reduce the size of building additions. **Some of these approaches may have already been initiated by the Works Department.**

Incorporate LEAN to Reduce Waste Within the Business Processes

LEAN is an operational philosophy that improves business processes by focusing on the delivery of *value* to the customer. Employees, at all levels of the operation, participate in the identification and elimination of non-value-added activities (waste) throughout the operation. The result is shorter cycle times, lower operating costs, and higher customer service levels. Other benefits often include a reduction in the number of employees, equipment, inventory and space required.

LEAN was originated by Toyota to dramatically reduce cycle times and costs, and to increase product quality and service delivery. The seven types of waste that LEAN seeks to eliminate are present in every operation. They include (with examples):

- Transportation (transporting work vehicles to a different yard to be maintained);
- Defects (time spent fixing work done incorrectly the first time);
- Inventory (storing more materials or maintenance parts on-site than are necessary);
- Motion (crews driving to a work site);
- Wait time (crews stuck in traffic or waiting for their vehicle to be repaired);
- Overproduction (making more signs than are needed or before there is demand for them);
- Over-processing (performing steps in a process that are unnecessary).

LEAN uses various standard techniques and tools which fall into the broad categories of visual communication of information, process mapping, process control, and identification and elimination of defects. Some of the best-known lean tools and techniques include value-stream mapping (a diagram of the employee/material and information flows required to complete a job); just-in-time production (delivering the exact amount needed, when and where it's needed); the "5 S’s" (five principles of an organized workplace); work leveling (ensuring consistent type and quantity of work over a period of time to avoid batching and backlogs); and kaizen (continuous improvement).

Therefore, all business processes should be streamlined to reduce waste before determining if a building needs to be expanded. Doing this would ensure that the size of the expansion is minimized to reduce land requirements, and capital construction and operating costs.

Our understanding is that the Region has begun training employees in LEAN Manufacturing and will be using it to improve their business processes.

Incorporate a Performance Management System to Achieve Continuous Improvement

A Performance Management System is an ongoing process for reducing operating costs and improving customer service. A common Performance Management System uses a five step approach (define, measure, analyze, improve, and control) to help ensure that management decision-making and employee activities are focused on identifying and eliminating non-productive activities so as to continuously improve operational performance and achieve objectives for service delivery.

More specifically, the process should:

- Define key success factors and key performance indicators;
- Measure and report actual performance (i.e., service levels and operating costs) and compare it to the target standards;
- Analyse the results and identify opportunities to improve, and actions required;
- Improve performance through informed decision making, and a focus on accountability for performance;
- Control/Sustainable improvements over time.

A Performance Management System transforms the organization, its management, and the policy-making process. It becomes integrated into all aspects of the organization's management and policy-making processes, so that it is focused on achieving improved performance for the public.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the business process are adhered to. They must be chosen with care because changes in one area of the business process can have unintended impacts in other areas.

All key performance indicators should be measured through an IT management system and reported on a weekly basis. Weekly meetings should take place both at a senior management level as well as in the shops to analyze this information and to determine what action should be taken to improve the results. Any recommended changes to the business process should be documented and controlled as a

Standard Operating Procedure (SOP). Semi-annual audits are required to ensure compliance of the SOP's by the workforce.

The Works Department is currently in the process of implementing a Performance Management System (to be referred to as EMMS).

Outsource Scheduled Maintenance for Light Duty Vehicles (Class 1 & 2) (to reduce maintenance costs and maintenance bays)

Outsourcing scheduled maintenance for light duty vehicles (Class 1 & 2) to a Third-Party Provider, often, reduces maintenance costs and permits Fleet Services to focus on unscheduled maintenance and heavy vehicles. This also reduces the number of maintenance bays, parts storage, employee amenities, and employee parking. However, Class 1 & 2 vehicles located at Depots with Fleet Services are often fully maintained there (i.e., scheduled and unscheduled maintenance) to eliminate the downtime from shuttling vehicles to off-site Third-Party Providers.

Consolidate Parts Storage into One Area and Review the Management Approach

The parts/supplies storage for all five Depots and the Operations Centre should be consolidated into one Stores Department. This would eliminate duplication in space requirements and would achieve economies of scale.

In terms of the management approach, Vendors or 3PL's (Third Party Logistics provider's) are, typically, very cost effective at managing those parts which move off the shelf quickly - referred to as fast movers (e.g., ten or more turns per year). Therefore, these parts should, probably, be managed off-site by the vendors or a 3PL and supplied to the Stores Department, as required, to replenish their point-of-use storage levels. This would reduce on-site storage space, stock-outs, logistics costs and improve customer service.

Vendors and 3PL's (Third Party Logistics provider's) tend to be much less cost effective at managing slow movers, critical spares and dead stock. Dead stock (i.e. has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. The slow movers and critical spares should be managed in-house to reduce logistics costs.

Consolidation of medium and slow movers, and critical spares, into one Stores Department, would help to justify high density storage systems and automation, reduce labour and space requirements, and reduce warehouse costs.

The objective of the Stores Department would be to order, receive and store inventory, and to replenish parts, tools and miscellaneous supplies to the point of use storage areas within the maintenance garages and Departmental tool/supplies storage areas at each Depot and the Operations Centre.

Our understanding is that the Works Department maintains a central Parts Store at the Oshawa-Whitby Depot. From here they supply the Fleet garages located at the other four Depots. However, they should also supply the Traffic Operations and FM&O Group at the Traffic Operations Centre.

Optimize the Inventory Levels within the Stores Department and at the Point-of-Use Storage (to reduce costs versus using a Vendor or 3PL, and to minimize space)

Stores Department and point-of-use inventory levels should be analysed and optimized to minimize space requirements, inventory costs and stockouts.

There are two primary ways to minimize space requirements for the storage of parts:

1. Reduce inventory levels
2. Increase the density of storage

This section will discuss ways to reduce inventory levels. Later we will discuss ways to increase the density of storage.

Reduce Inventory Levels

The two primary ways to reduce inventory levels are:

- Reduce the number of SKU's;
- Reduce the average inventory level for each SKU.

Industry Best Practice is for 3 turns/year or greater within the storage area. If the inventory is, typically, turning over less than 3 turns/year there is likely an opportunity to reduce warehouse inventory levels which would reduce inventory carrying costs and the need for warehouse storage space (and associated operating costs).

We recommend that inventory levels be measured and recorded, at least monthly, so that the number of turns of individual SKU's can be measured. Once this information is available, it is recommended that those SKU's with a turnover of 1 or less be analysed to
determine why their turnover was so low and whether the turnover could be increased while still satisfying service requirements.

Some of the typical reasons for low turnover may include:

- Some of the SKU's are dead stock that should be written-off and removed from inventory;
- For some SKU's, the reorder levels are too high which should be reviewed and corrected;

- For some SKU's, the reorder quantities are too high which should be reviewed and corrected;
- Actual inventory levels were higher than thought when new orders were requested;
- When some of the SKU's were brought into stock for the first time, the requestor overstated their needs resulting in excess, unused inventory;
- Seasonal items will likely have excess levels that are held over until the next year;
- Critical Spares stock may require excess inventory levels to avoid the possibility of stock-outs;
- End users may request that certain SKU's be held in stock (rather than removed) for multiple years because they are no longer commercially available;
- The rate of demand for some SKU's is unpredictable, thereby, requiring higher than optimal inventory levels.

Additional opportunities for reducing either the number of SKU's in inventory or the average level of inventory for each SKU may include:

- Reduce the number of vendors providing the same equipment. For example, purchase all crew cabs from the same manufacturer. This will reduce the number of maintenance SKU's required;
- Determine which SKU's (other than the Critical Spares) could be eliminated from inventory because they could be supplied, by the vendor, within two hours of request;
- Determine which SKU's (other than the Critical Spares) could have their inventory significantly reduced because a vendor would be willing to manage the inventory to optimal levels. This is referred to as Vendor Managed Inventory (VMI);
- Reduce excess inventory levels by analysing those items purchased in bulk to determine whether there are false economies with purchasing in bulk;
- Reduce excess inventory levels by using bar code scanners (integrated with a Warehouse Management System) to improve inventory accuracy, visibility and control.

In summary, there is likely an opportunity to reduce warehouse space and operating costs by determining which of the SKU's may be eliminated from inventory, and which SKU's may have their average inventory level reduced.

Measure Performance and Hold Accountable the Vendors or 3PL to Reduce Stock-Outs and Lead Times (to reduce vehicle downtime and spare vehicles)

Above, we discussed the importance of using a Performance Management System to measure and improve performance. If the Region decides, in the future, to use a Vendor or 3PL to manage the parts inventory, their performance must be measured to ensure that the objectives for customer service are being met. Failure to meet objectives will lead to greater vehicle downtime and a larger number of spare vehicles required to compensate for the downtime.

Below, we list a number of key performance indicators that could be used to measure the performance of a Vendor or 3PL.

On-Time Delivery:

- **Inventory Count Accuracy by Dollars/Units** measures the accuracy of the physical inventory compared to the reported inventory;
- **Line Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of lines filled to the customer's request;
- **Order Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of orders filled to the customer's request;
- **Backorders as a% of Total Lines** measures the percentage of orders that are shipped late due to a lack of stock;
- **Order Picking Accuracy** measures the picking accuracy. It is the percentage of orders picked correctly;
- **On Time Ready to Ship** measures the success rate of the warehouse to prepare items on-time for shipment. It is the percentage of orders ready at the planned time to meet customer requirements;
- **On Time Shipments** measures the success rate of the warehouse to actually ship items on-time. It is the percentage of orders shipped at the planned time;
- **On Time Delivery** measures the success rate of the trucks to deliver on-time. It is the percentage of orders delivered to the customer at the requested time.

Warehouse Costs:

- **Lines Received and Put Away per Person Hour** measures the productivity of receiving operations;
- **Lines Picked and Shipped per Person Hour** measures the productivity of picking operations;
- **Cases Picked and Shipped per Person Hour** measures the productivity of picking operations;

- **Internal Order Cycle Time** measures the average time from when the order was received from the customer to when the order was shipped;
- **Productive Employee Utilization** measures labour activity levels;
- **Material Handling Rate** measures the total cost to operate the distribution network relative to the total cost of Inventory Sales.

Inventory Costs:

- **Turnover Rate** measures the level of excess inventory within the warehouse.

Transportation Costs:

- **Courier Cost per Line Shipped** measures courier efficiency.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the supply chain process are adhered to. They must be chosen with care because changes in one area of the supply chain can have unintended impacts in other areas.

Maximize Cubic Density – Incorporate Automation and High-Density Storage Systems for Indoor and Outdoor Storage Areas (to reduce space)

Innovations in technology and the use of automation offer the potential to dramatically improve the material handling, storage, and order fulfillment operations within the Stores Department. This may lead to significant gains in productivity, space and cost reduction, and service delivery when employed appropriately.

Below, we discuss ways to use technology to increase the density of storage as a means of minimizing space requirements for the storage of parts, tools and other supplies.

Increase the Density of Storage

The cubic fill (or density) of storage locations within the warehouse should be optimized. This involves balancing the need for selectivity versus storage density. In general, if there are only one to three pallets of each SKU, single selective racking is preferred (as a racking option) in order to achieve access and prevent individual pallets from becoming buried. For individual cases or pieces, 6 ft. high shelving is typically recommended. However, we will consider other options for smaller pieces – namely, Automated Storage and Retrieval Systems (AS/RS).

An automated storage and retrieval system (AS/RS) consists of a variety of computer-controlled systems for automatically storing and retrieving items from defined storage locations (bins). Storage of items within the AS/RS is accomplished by a computer which directs the automated storage and retrieval machine (SRM) to rapidly transfer the load, vertically and/or horizontally, to the bin where the load is to be stored. The process for retrieving items is conducted in reverse. As items are stored into or retrieved from the racks, the computer updates its inventory levels accordingly.

These systems are typically used in applications where (a) there are very high levels of loads being moved into and out of storage, (b) storage density is important because of space constraints, or (c) accuracy of load movement is critical because product damage is very costly.

The benefits of an AS/RS system include:

- Reduced labor requirements and costs;
- Increased worker safety;
- Improved accuracy in tracking of inventory;
- Reduced product damage;
- Reduced space requirements as items are stored in high-density storage with narrower aisles.

AS/RS's are divided into three primary types - Fixed Aisle, Carousels, and Vertical Lift Modules. Of these three types, we recommend that the Region consider the use of a Vertical Lift Module in the Parts Store at the Oshawa-Whitby Depot.

Vertical Lift Modules

Inventory within Vertical Lift Modules (VLM's) is stored on front and rear tray locations or rails. When a tray is requested, by entering a part through software, an extractor travels vertically between the two columns of trays and pulls the requested tray from its location
and brings it to an access point. The operator then picks or replenishes stock and the tray is returned to its home upon confirmation.

VLM's can be built quite high to match the available overhead space in a warehouse. Multiple units can be placed in 'pods' whereby an operator can retrieve items from one unit while the other units are moving.

The rapid movement of the extractor as well as inventory management software can dramatically increase the efficiency of the picking process. This occurs by simultaneously retrieving and storing trays in multiple units.

VLM's provide floor space savings, increased labor productivity, improved worker ergonomics, and controlled process.

In conclusion, VLM's would certainly provide numerous benefits ranging from improved inventory accuracy and picking productivity to improved storage density and security. Their cost may be justified - especially for higher priced items which require added security, and for critical spares which require added inventory accuracy.

Outdoor Yard Storage

Where appropriate, the outdoor storage of equipment and parts should be stored on pallets within single deep, metal storage racking. The racking would need to be placed on concrete foundations for stability.

Improve Vehicle Availability (to reduce spare vehicles)

It is common for municipal operations to have vehicle availability problems which severely constrain their ability to meet service requirements. Typical factors which may create a problem include:

- Difficulty in obtaining parts to carry out repairs which, in turn, may have been caused by:
  - Inadequate inventory;
  - Having too many types of equipment requiring too many types of spare parts;
  - Damage caused by operations resulting from inadequate training of operators or other factors resulting in unnecessary breakdowns;
  - Outdoor storage of vehicles, particularly sidewalk plows and blower attachments for loaders;
  - Failure to complete annual preventive maintenance and inspections;
  - Poor communications with Fleet Services.

Steps that can be taken to improve vehicle availability include:

- Improve operator training on vehicle damage issues;
- Improve communications with Fleet Services;
- Provide indoor parking for vehicles to reduce failure rates;
- Contract out seasonal inspections/refurbs if Fleet Services is unable to ensure completion;
- Improve standardization of vehicles/equipment – buy fewer specialized units;
- Accept mechanics with heavy equipment ticket;
- Have operators report equipment problems directly to Fleet Services (while also advising their Supervisor);

- Provide faster feedback to operators on preventable damage occurrences;
- Establish a process to have Fleet Services and Operators formally review failures and repair delays every two weeks to identify issues. The result could be changes in operating practices and/or inventory levels required and/or notice/directive/training for vehicle users;
- Improve training, of operators aimed at reducing equipment damage, improving operator familiarity and skill with equipment for snow operations.

Incorporate Technology to Optimize Vehicle Service Routes (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should use computer programs to plan, balance, develop and optimize vehicle service routes for winter maintenance (i.e., plowing and salting). The objectives of the programs are to, in part, reduce deadhead time, and maximize the overall efficiency of the routes and required fleet of vehicles. This helps to reduce operating costs and improve service delivery. By optimizing the service routes, the Department will minimize the size of its Fleet. This reduces vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Incorporate Technology (AVL/GPS Tracking) to Measure Performance of Field Crews (both Contractors and City Employees) (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should continue using AVL technology to monitor and record the routes taken by their vehicles. This is most often done for winter maintenance vehicles to mitigate the risk of lawsuits. However, it can be done for all vehicles as a way of monitoring their daily routes and ensuring that they are being used productively. This well help management to identify and eliminate non-productive work activities so as to continuously improve operational performance and minimize the size of the fleet required. Reducing the size of the fleet will reduce vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Eliminate Contractor Parking at the Depots

For Winter Maintenance contracts (i.e., plows and salters), there are benefits to having the contract vehicles located at the Depots (close to the salt/sand storage and the start of the routes).

Municipalities now have to operate in compliance with the Minimum Maintenance Standards for Municipal Highways (MMSMH) if they wish to limit their liability and exposure to claims for negligence. The MMSMH were originally developed in the late 1990’s as a mechanism to help municipalities deal with the increasing costs of negligence liability insurance as a result of increases in claim settlements.

This Provincial regulation, under the new Municipal Act, specifies minimum maintenance standards for roads, bridges, shoulders and signs. Although such "standards" have only "guideline" status, failure to achieve such 'standards of care' could have liability implications in civil suits. As such, municipalities have, typically, taken the approach of aligning their standards to the minimum standards set out in the regulation. In theory, in any potential lawsuit, if the municipality can show that it meets the Minimum Maintenance Standards for Municipal Highways, then it has presented the legal argument against the lawsuit. There is an increased liability risk associated with not meeting the minimum standards under Ontario Regulation 239/02.

Municipalities have complete administrative control over highways/roads under the jurisdiction of the new Municipal Act but do not have to adopt the Standards. However, in cases where the Standards are not adopted by a municipality, judgements against such municipalities for poor maintenance will be made by the courts after comparison with the Standards. Such being the case, the Standards will be the defacto standard for all municipalities as far as road maintenance is concerned.

That said, given the close proximity of all five Depots to rural areas, it may not be necessary for the Works Department to provide space at the Depots for the contractors to park their vehicles. The contractors may be able to find alternative, affordable space near by. This would reduce the space requirements at each Depot.

Optimize the Average Age of the Fleet (to reduce fleet maintenance, and the number of spare vehicles)

There are many issues that will affect the determination of the optimal number of vehicles in the Fleet - shift work structure, location of yards, design of service routes, age of the Fleet and requirement for spares, use of contractors, and mix of vehicles. Some of these (location of Depots and the design of service routes) were discussed above. In this and the following two sections, we discuss the importance of fleet age and utilization, and the mix of vehicles within the Fleet.

The optimal service life of a work vehicle varies based on class, duty and utilization. Vehicles which are kept longer than their optimal service life require increasing amounts of maintenance – both scheduled and unscheduled. Older vehicles, therefore, consume more maintenance time and are out of use longer. This puts a heavier burden on Fleet Services and lowers the productivity of the work crews. To compensate, Public Works Departments, typically, carry a number of spare vehicles which require space to park when not in use. Therefore, the Works Department is recommended to replace vehicles once they are beyond their optimal service life.

Our understanding is that the Region does carefully manage the average age of their Fleet of vehicles.

Increase Fleet Utilization (to reduce fleet size)

The Works Department should maximize the utilization of its work vehicles so as to reduce the size of the fleet and the need for parking space.

Often, the utilization of vehicles reaches its peak in certain months, each year, then drops off significantly for the balance of the year. For example, tandem axle trucks usually reach their peak utilization in January and February because of plowing but then are largely inactive during the summer. This seasonal variation provides an opportunity to rely more heavily on contractors during the winter months. This would permit a reduction in the number of in-house winter maintenance trucks saving approximately $30,000 per truck per year in maintenance and depreciated costs. It would also reduce parking space requirements.

Optimize the Mix of Vehicles (to reduce fleet size)

There is a need to rationalize the Fleet, for the services provided, to ensure that there is the optimal mix of vehicles and equipment based on best practices. For example, when possible, vehicles should be deployed for multiple uses (e.g., plow, wing, spread, haul –with full capacity).

Permit Select Drivers to Take Cars, Vans and Pick-up Trucks Home (to reduce employee parking)

There are potential complications related to permitting employees to drive work vehicles home. However, there is also the potential to save a significant amount of yard space due to a reduction in employee vehicles.

Provide Incentives for Employees to Car Pool, Cycle or Use Transit

Encouraging employees to car pool, cycle or use public transit will reduce the need for yard space for employee parking. Buildings should be equipped with lockable storage for bicycles, and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

Refuel Work Vehicles during the Night (to reduce the number of dispensing pumps and lanes)

It is best practice, within the Transit industry, to clean and refuel buses (using specialized work crews) during the night when they are not in use. This, potentially, reduces the number of refueling pumps required because the process is spread out over four to eight hours. It also reduces vehicle downtime (during the day) and ensures that the buses are ready to operate at the start of their shift. This approach to refueling may be applicable to the Fleet for the Works Department.

Permit Class 1 & 2 Vehicles (i.e., Cars, Vans and Pick-Up Trucks) To Use Public Gas Stations (to reduce dispensing pumps and lanes)

Refueling off-site, potentially, reduces the number of refueling pumps required and the space required.

Replace Touch-Down Desks with Dash Mounted Devices (to reduce space)

Some field employees/foremen require limited access, each day, to a computer to receive work orders and to input information/data. Typically, workstations or "touch-down desks" are provided for these employees. The new trend is to provide these employees with access to mobile tablets or dash mounted devices to input the information/data. The benefit is increased employee productivity and a reduction in office space for the workstations or "touch-down desks".

Request that Field Crews Eat at their Work Site (to reduce the size of lunch rooms - only for inside workers)

Field crews should continue, when possible, to eat lunch at their work site (or closest restaurant/Depot) rather than returning to their home yard to eat in the lunchroom. Doing this will permit the lunchroom to be sized only for those employees working full-time at the yard. This, in turn, will reduce space requirements.

Reduce the Use of Salt for Winter Maintenance (to minimize the size of salt storage buildings)

The Roads group needs to store salt indoors for winter roads/sidewalk maintenance. The best practice approach for salt storage is the combined storage and loading into one facility. The alternative approach is to store the materials inside but to conduct the loading outside.

To minimize the size and capital cost of any new salt storage facilities, the Roads group should look for additional ways to reduce its annual consumption of salt. Industry Best Practices for reducing the consumption of salt are shown in Table 3.3.

The Roads group should also consider the following ways to minimize their use of salt:

- Weigh scales should be considered to help measure the amount of salt being loaded into trucks;
- Should adjust the quantity of salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems;

- Should optimize salt application rates. For example, restrict application rates on arterial collector roads to 135kg/lane km, and for local roads to 70 kg/lane km;
- Should undertake pre -wetting in all spreading activity. Pre-wetting is a very effective practice and should be included in all spreading activity. The entire spreading fleet should be outfitted with pre-wetting capability. The purpose of pre-wetting is to wet the salt for several reasons:
    - In the case of cold pavements, it enables the grain to freeze to the pavement;
    - In the case of snow packed surfaces, it enables the grain to “melt” into the snow pack rather than “blowing” off;
    - In the case of de-icing, it begins the brine making process by reacting with the crystalline salt to produce a brine concentrate which then lowers the freezing point of contact resulting in melting;
    - In the case of traffic, it mitigates bounce off (up to 30% has been measured) by making the grains “stickier,” similarly with windy conditions.

  In general, the benefits include granules that adhere to the surface better, have a faster and longer-lasting effect, and can be spread more quickly.

  The practical result of pre-wetting should be a reduction in the resources necessary. The investment in brine making equipment would reduce the cost of supplying the brine. There is no advantage to using chemicals such as calcium chloride. Water could be used to similar benefit if it could be prevented from freezing in the tanks. With improved calibration and controls in spreader vehicles, it is reasonable to establish a range of spread rates to be applied under certain conditions;

- Should undertake a demonstration program to assess the merit of achieving centre bare pavement service, post storm, by using a sand product mixed with 25% salt;

- Should make use of calibrated spread vehicles to compare actual material spread rates across routes, across vehicle units, and across staff operators within a given winter season;

- Should compare actual material spread rates for each route and vehicle unit across winter seasons (time series analysis);

- Should implement disciplined spread management practices supported and refined by spread rate benchmarking and measurement. The benchmarking approach is practical because it is internal in focus (avoiding complex apple to apple issues across other municipalities), and it is firmly linked to the enforcement of service levels, individual operator behavior, and cost savings targets.

Table 3.3 - Industry Practices for Reducing Salt Consumption

Industry Practice
Removing as much snow from the roads as possible to minimize the amount of snow and ice that that needs to be melted (and the quantity of sand/salt required)
Using Material Loading Sheets that describe and limit the amount of sand/salt loaded into the sander/salter. This will prevent the driver from using excessive quantities of sand/salt.
Adjusting the quantity of sand/salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems
Optimize sand/salt application rates. For example, restrict application rates on arterial collector roads to 130 kg/lane km, and for local roads to 65 kg/lane km.
Pre-wetting of salt using brine to improve the utilization rate
Pre-wetting of sand using hot water to reduce bouncing and improve the utilization rate
Using computerized controls on spreader equipment that can accurately control the rate of sand/salt application so that the quantity applied to the roadway is minimized
Blend brine with other chemicals to produce "Hot Brine" that will be effective below – 12^{o}C
Direct Liquid Application to replace the use of brine with a chemical that works as low as -30^{0}C
Using GPS systems on the trucks to (1) monitor the speed and location of the trucks through Automated Vehicle Location (AVL), and (2) provide route guidance and spreader control for the driver
Training staff so that they understand how to use the equipment and take other steps to minimize the application of sand/salt
Use loader scales to measure and record the quantity of sand/salt used by each truck and then use this information to identify opportunities to reduce consumption rates. If you don't measure it, you can't reduce it.
Store sand indoors as this will reduce the need for pickling with salt from 5% down to 3%.

3.1.7 Opportunities to Improve the Depot Design

In section 3.1.5 we listed a number of design issues that are adversely affecting employee productivity, and the efficient utilization of space at the Oshawa-Whitby Depot. Below, we list a number of ways to improve the design of a new Depot.

Incorporate Transit Bus Style of Parking for Vehicles (to reduce space)

Within the Transit industry, it is best practice to store buses indoors in long lanes (typically, 6-8 buses deep). This approach should be considered for other municipal fleets that require indoor storage and can operate with a first in, first out philosophy. This would include those winter maintenance vehicles that leave the yard at the same time.

Therefore, the approach to designing the layout for the indoor storage of work vehicles should (1) identify those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identify the optimal width and length of each lane to minimize the total area requirement.

Standardize - Utilize Corporate Space Standards for Offices, Employee Amenities and Shops (to reduce variation and space, and increase collaboration and productivity)

The Region of Durham is currently going through a process to standardize and document their space requirements for offices so as to reduce variation amongst locations, and space requirements. These standards should help promote employee collaboration, productivity and the desired corporate culture. For example, most municipalities are eliminating walls and modular office partitions in favour of an open concept office environment. Offices are becoming smaller or eliminated all together in favour of more meeting rooms.

- Office staff should, where appropriate, be consolidated into one open concept administration office area. This will improve communication and collaboration between employees, and will optimize space utilization;

- Meeting rooms and training rooms (adjacent to the administration office area) should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy. Their use should be shared amongst the Works Department to reduce the total number required due to variations in demand;

- Touch-down stations should be consolidated (if not replaced with mobile devices or vehicles dashboard units) between the different groups to reduce the number required and to reduce space requirements;

- Employee amenities (lunchroom, change rooms and washrooms) should be consolidated and shared by all employees (including both office and unionized staff) to eliminate duplication and to efficiently utilize space. The lunchroom should also be designed for flexible use (with mobile partitions and furniture). The employee amenities should be located on the ground floor level close to the work vehicle storage areas;

- Parts/materials stores, from different groups, should be consolidated to eliminate duplication, and to implement technology and storage systems which will maximize the cube and more efficiently utilize space;

Design for Flexibility - Design Lunchrooms to be Multi-Purpose (e.g., crew meetings and training) (to reduce space)

When possible, facility areas should be designed to be flexible in their use. For example, lunchrooms should be designed for multiple purposes as a way of consolidating areas and reducing the total space requirements. Lunchrooms are often also used for start-of-shift crew meeting areas, and training rooms.

Design a Healthy Work Environment (to improve productivity)

A variety of research has shown that employees are both happier and more productive in office environments with natural light, as well as natural ventilation (which can be as simple as access to an operable window). Natural light has been shown to reduce seasonal affective disorder, increase visual clarity, help regulate sleep, reduce drowsiness, improve immune function, reduce sick days and increase productivity. Access to natural light, views and ventilation is the basis for three LEED points and is written into many other green standards. Many government organizations have codified the 'Right to Light' for their office design standards -- for example, Alberta Infrastructure's *Technical Design Requirements*.

Contemporary office design best practice places open workspaces toward the exterior of the floor plate, with private offices and meeting rooms closer to the center. In this way daylight reaches the greatest number of staff. Natural ventilation, including operable windows, should be incorporated wherever possible. Workshops should be treated similarly, maximizing use of natural light and air, with control of glare being critical. We have found that small areas of transparent glazing combined with larger zones of light-diffusing translucent panels provide ideal lighting conditions for fleet garages, wood and metal shops, and other similar environments.

Design for Safety

The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the building. Once in the building, the public should be greeted at a reception counter.

The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles.

3.2 Future State

This section will begin by discussing the various growth factors that will be affecting the Works Department over the next twenty years. It will then recommend the future number of resources required at the Oshawa-Whitby Depot so that it may continue to work efficiently and effectively towards meeting its service delivery requirements.

3.2.1 Growth and the Changing Needs of Durham Region

The Region of Durham is considered to be one of the fastest growing Regions in the world. Between 2011 and 2016, the population grew by 6% to 673,000 people. It is now expected to grow by another 78% to 1.2 million people by 2041 (according to the “Durham Region Planning for Growth” report issued under “Envision Durham” in 2017). To sustain this growth, new roads, sewers, and water supply infrastructure will be expanded, and additional traffic signals and facilities will be required. Furthermore, changes in climate, technology, government legislation, communications and the condition of infrastructure, will further increase the demand for Regional resources.

Below, is a description of some of the main factors that will affect the need for resources (employees, work vehicles, and materials), by the Works Department, over the next 20 years, to best meet the service and maintenance requirements for the Region.

Population and Infrastructure Growth

The Region of Durham covers an area of 2,500 square kilometres, which is four times the size of Metropolitan Toronto. With an expected population growth of almost 80%, over the next 20 years, there will be a direct impact on the Region's Works Department – especially along the Lake Ontario shore communities where the majority of growth is expected. Expected changes will include the need to maintain new and expanded infrastructure (such as roads, water, sewers, traffic operations), as well as existing, aging infrastructure that suffer greater wear and tear with higher population levels.

In some areas (the East and North end of Durham, and in the Seaton area) there are still considerable areas for urban expansion growth, with new housing subdivisions being planned. These changes will likely result in an increase in lane kilometres of roads and pipe networks that will need to be maintained. In the South and West end of Durham, population densification is both expected and desirable as new families choose lifestyles that include apartment and condominium living, and homes with reduced property area. This densification will likely result in a number of changes that will affect the resource requirements for the Department. Examples include:

- Increased and extended traffic congestion, affecting both work site interference and staff travel time. This will increase the need for more employees in order to maintain the same service levels;
- Reduced speed for snow plowing resulting in the possible splitting of routes;
- Increased use of smaller equipment that is more suited to sidewalks and partially restricted narrower streets;
- Increased control of Traffic Operations to measure, meter, control and coordinate traffic flow;
- Expansion of Water, Storm, Sewer, Electrical and Communications services and related capacities to meet the increased service density;
- Changes to Regional roadways to accommodate transit, pedestrians, cycling and alternate forms of transportation.

To reduce the effect of population growth and densification, it will become increasingly important to have the correct number of employees, vehicles, equipment, and materials strategically located and supported from efficient Works Depots that can expand and change to meet new requirements.

Lane Km's of New Roads

There is estimated to be an increase of 341 lane km's of new Regional roads over the next 20 years. This represents a **14.2%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Km's of new Pipe Systems

There is estimated to be an increase of 1,945 km's of new Regional pipe systems over the next 20 years. This represents a **41.8%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Changing Technology and Expectations

Durham Region has, over the years, adapted to numerous changes in technology and methods that will continue to affect the way operations are carried out. These changes save money, labour, time, and the environment. Community expectations are also changing. As densification increases, greater emphasis must also be placed on alternate transportation methods, more efficient land use, transit infrastructure and support for pedestrians. This will make roadways and their associated service infrastructure much more complex, with increased activities required to maintain the related assets.

In addition, population demographics will continue to change towards residents with higher service expectations which will also increase the demand for services. Citizens are expecting greater communication, involvement, and transparency in the planning and spending of their tax dollars. This means that the Department will need to continue to implement new technologies, and require more formal procedures to monitor and improve performance.

Increasing Legislative Regulations, Standards and Associated Costs

A trend towards increasing government regulations, policies, standards, and their associated higher costs will continue to impact the ability of the Department to deliver core services, and meet expectations. This is already being experienced in winter roads maintenance, where feedback from insurance company data and judicial claims is, in many cases, dictating the service response time for winter roads maintenance. Managing to reduce potential liability claims, is now affecting the ability to manage within the existing budgets and resources.

Environmental Considerations and Related Costs

Durham Region is already experiencing increasing costs related to rapidly changing climatic factors. In the last decade, storm frequency and severity has increased, resulting in substantially increased operations costs. As this new situation becomes the norm, considerable work will be required to render the infrastructure more robust to withstand high winds, increased volumes of storm water, and sudden floods with high lake and ground water levels. Also, as the Region works to mitigate these factors, the Works Depots and Operations Centre will be expected to remain fully operational during emergencies with emergency power, communications systems and service equipment that fully support emergency repair services.

In addition, Durham Region has made a commitment to continue to be environmentally responsible and meet recognized environmental targets. These targets include initiatives

to improve energy efficiency and reduce greenhouse gas emissions and other environmental contaminants. Improvements will be identified at all Depots that will need infrastructure upgrades to meet generally accepted best practices.

Infrastructure Deficit

Across many Canadian regions, aging and deteriorating infrastructure has resulted in a large and growing infrastructure deficit. Within many municipalities, aging roads, water, storm and sewer systems are deteriorating and in need of repair beyond the level of normal annual maintenance.

As the infrastructure continues to age within Durham Region (especially in the oldest developed areas), more of the Region's efforts and annual costs will be focused on upgrading and replacing these infrastructure elements. This will add to the daily requirements of the workforce.

Durham Region is also very aware that the Works Depots that support daily maintenance work are needing upgrades to meet accepted best practices and new legislation changes. These changes will involve capital costs, but will improve operations efficiency and employee relations for higher performance and competitive operations that provide good value for money spent.

Demand for Accountability and Value for Money

The Region, like all municipalities, is under increasing pressure to reduce operational costs
and deliver greater value. Continuous improvement programs will be underway to eliminate waste and to develop improved methods for delivering services at reduced cost to the taxpayer. This means improved technology, increased training and monitoring of work crews, and overall increased transparency of operations that will demonstrate to the public that they are receiving good value for money spent.

Therefore, the number of services, employees and work vehicles that will be required in the coming years will be influenced by the above factors - changes in population, technology, legislation, aging infrastructure, and community expectations for service level requirements. While there is no way to know precisely how all of these issues will unfold, interact and affect the Works Department over the next 20 plus years, there is no doubt that they will lead to an increase in the number of employees, work vehicles, equipment and storage space required. This report will address the factors outlined above to develop a plan for growth that will be consistent with lean, efficient and competitive operations that the Public will be proud to support.

3.2.2 Site Selection

We have proposed that the Region build a new Oshawa-Whitby Depot on a new site. Below, we list the criteria that we recommend be used for the site analysis:

Land Use Zoning

An optimal site would be in an industrial park with compatible surrounding operations that would not be affected by the potential noise, traffic or air-born emissions generated by the activities within the Yard.

Total Acreage Available

The optimal site would have sufficient useable land to accommodate growth in operations for at least the next five to six decades.

Shape and Topography of the Land

The optimal site would be relatively flat and rectangular with an aspect ratio of 2:1. A flat site would avoid major cut and fill costs and minimize the cost of grading. A rectangular site would best facilitate the flow of vehicles and employees.

Ease of Access onto the Site

The site would permit at least two exits/entrances without interference from traffic flows/congestion (e.g., from cars waiting at an intersection or traffic lights).

Impact of the Location on Crew Travel Time

The optimal site (in terms of minimizing crew travel times) would be located along Thickson Road North, between Taunton Road East and Rossland Road East.

Environmental Considerations

The site would not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wetlands. This is because of the large volume of salt that will be stored on site and the potential for it to contaminate the ground water and enter the watercourse/wetlands. That said, an indoor salt storage and loading facility would likely contain the salt and minimize any risk to the environment.

Potential Cost of Providing Services (power, water, sanitary, storm)

Ideally, the site would be located within a developed industrial park with ready access to services (power, water, sanitary, storm) so as to minimize construction costs.

3.2.3 Resources (Employees/Vehicles/Equipment/Materials) for the Oshawa-Whitby Depot

Section 3.2.1 discussed the predominant factors that will affect the resource requirements (employees, vehicles, equipment and materials) for the Works Department over the next 20 years. In this section, we will forecast the number of resources to be utilized at the Oshawa-Whitby Depot over the next 10 to 20 years.

We will make the following assumptions:

- The current number of employees is sufficient to efficiently meet the service level requirements;
- The levels of service will not change over the next 20 years;
- There will be no new outsourcing or privatization of existing services;
- The utilization and mix of vehicles and equipment will not change;

- The need to increase resources (i.e., employees, vehicles and equipment) for the Roads Departments and will be proportional to the increase in lane km's of Regional roads. The need to increase resources for the Water and Sewer Departments will be proportional to the increase in km's of pipe networks;

In Table 3.4, below, we list the increase in lane km's of Regional roads for the service territory covered by the Oshawa-Whitby Depot.

Table 3.4 – Lane Km's of Regional Roads

Department	Depot	Current Lane Km's of Roads	Increase in Lane km's by 2030	% Increase by 2030	Increase in Lane km's by 2040	% Increase by 2040
	O-W Depot	691.3	78	**11.3**	155	**22.4**

Note: The above numbers are based on Regional forecasts for 2019-2028 for each of the Depot service territories (Ajax/Pickering = 61.1, Oshawa/Whitby = 69.9, Orono = 14.9, Scugog = 7.4 km)

In Table 3.5, below, we list the increase in km's of water and sewer pipe systems for the service territory covered by the Oshawa-Whitby Depot.

Table 3.5 – Km's of Water and Sewer Pipe Systems

Department	Depot	Current Km's of Pipe Systems	Increase in km's by 2030	% Increase by 2030	Increase in km's by 2040	% Increase by 2040
Water and Sewer	**O-W Depot**	1,211.89 Water 1,045.88 Sewer	207.97 Water 187.76 Sewer	17.16 Water 17.95 Sewer	415.94 Water 375.52 Sewer	**34.32 Water** **35.90 Sewer**

Note: The above numbers are based on Regional forecasts for each of the Depot service territories.

Using the numbers from these two tables (the % increase in 2030 and 2040), we will forecast the number of Roads, Water and Sewer employees and work vehicles that will be required at the Oshawa-Whitby Depot in 2030 and 2040. These forecasts are shown in Appendix B.

The number of Fleet Services employees forecast for 2030 and 2040 relied on the **"current number of mechanics needed"** (which was calculated by the Fleet Services Department) for the 2020 base number of mechanics. The Department determined that for the mix of vehicles in the fleet and the number of hours of maintenance required per vehicle, six additional mechanics are currently required. The details are shown in Table 3.6, below.

Table 3.6 – Fleet Services Mechanics Required in 2020

	A-P Depot	O-W Depot	Orono Depot	Scugog Depot	Sunderland Depot
Current Actual No. of Mechanics	2	8	2	1	1
Current No. of Mechanics Needed	**2**	**12**	**2**	**2**	**2**

In Appendix B, we also list the number of Fleet Services mechanics that will be required to maintain the number of vehicles estimated to be required by the Works Department in 2030 and 2040.

The Region has established the following criteria for the storage of work vehicles:

Heated Storage:

- Diesel vehicles
- Vehicles with hydraulic systems
- Tandem / single axle plow trucks
- Water meter vans

Cold Vehicle Storage:

- As many vehicles as possible preferably with electric plug ins.

3.2.4 Future Functional Needs for the Oshawa-Whitby Depot

In this section, we will document the future functional needs for the Oshawa-Whitby Depot for a time horizon of current, 10 and 20 years.

Oshawa-Whitby Depot

Table 3.7 - Oshawa-Whitby Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Materials Testing Lab	2,000 ft^2	2,000 ft^2	2,000 ft^2	2,000 ft^2	The lab is sufficient in size for the current activities.
Water Meter Shop	1,250 ft^2	1,250 ft^2	1,250 ft^2	1,250 ft^2	The shop is sufficient in size for the current activities.
Wash Bay	1 Wash Bay	1 Wash Bay	2 Wash Bay	2 Wash Bay (1,800 ft^2)	**Recommend building a 2nd wash bay (30x60 ft)**
Fleet Maintenance Garage	7,938 ft^2 9 one-way	18 bays (9 new bays at 12,375 ft^2)	21 bays (12 new bays at 16,500 ft^2)	24 bays (15 new bays at 18,150 ft^2)	**Require 15 more maint. bays for 2040. 16 mechanics require 24 bays (22x55 ft each).**
Indoor Vehicle/Equipment Storage	18,408 ft^2 8 one-way (fit approx. 30 vehicles)	42 storage bays (12 new bays)	49 storage bays (19 new bays)	57 storage bays (27 new bays at 12,960 ft^2)	**Require 27 more medium size storage bays for 2040 (16x30 ft each)**
Indoor Salt Storage	12,345 ft^2	1 salt building	1 salt building	1 salt building	Recommend replacing the existing building with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is new
Employee Parking	115	133 plus visitor stalls (require 28 more stalls)	149 (require 44 more stalls)	225 (require 110 more stalls)	**Require 110 more parking stalls by 2040**
Outdoor Vehicle Parking	65	56	66	115	**50 additional parking stalls for 2040**
Desiccant Drying	None on the actual property				Require a decanting system
Secure Yard Fencing	The Depot is fenced except on the east side. No gates at the entrances	The east side should be fenced	The east side should be fenced	The east side should be fenced	The east side of the yard should be fenced and gates should be installed at the two entrances
Site Entrance/Exit	Two points of access	Two points of access	Two points of access	Two points of access	

Table 3.7 – Continued

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	The flow through the yard should be one-way in a counter-clockwise direction.
Arrangement of Buildings on the Site	Traditional				No changes recommended

As stated in section 3.2.2, the O-W Depot is not in the optimal location to minimize crew travel times. It is also too close to the A-P Depot which negatively affects the location of the service boundaries and the optimal use of both Depots. We have recommended that the Region come to an agreement now on the optimal Depot Network design and then develop a long-term plan to achieve it. This would lead to acquiring a new, much larger site in a better location and then relocating the Depot when it has reached the end of its asset life (or has outgrown the site). Though it could be rebuilt on the existing site crew travel times would suffer and the cost to build a multi-storey parking garage (to increase the sites storage capacity) would be expensive - currently $70,000 for each medium size work vehicle. Making this decision now would improve the chances of being able to purchase the preferred site (before the best sites have been developed).

Assuming that the Depot will remain at its existing site for the next 20 years, we recommend the following changes to the yard (listed in order of priority):

- The flow through the yard should be one-way in a counter-clockwise direction;
- The east side of the yard should be fenced and gates should be installed at the two entrances;
- The administrative office and employee amenities area need to be expanded by approximately 2,300 ft^2;
- Require 15 more maintenance bays by 2040. There will be 16 mechanics requiring a total of 24 bays. Eight of the new maintenance bays can be built beside the existing maintenance bays. They should each be approximately 22x55 ft. in size for a total of 9,680 ft^2. The other bays would not fit on the site;
- Build a 2nd stand-alone vehicle wash bay (to replace the existing one). The wash bay should be approximately 30x60 ft. (1,800 ft^2) in size and the wash water should be filtered for reuse in the wash area or to make brine;
- Build 27 more medium size indoor vehicle storage bays. They should be approximately 16x30 ft each in size for a total of 12,960 ft^2;

- Build 110 additional outdoor employee parking stalls by 2040;
- Build 50 additional outdoor parking stalls for work vehicles;
- When the existing salt storage building has reached the end of its asset life, it should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

A high-level, Conceptual Site Plan will be developed (in section 6.0) to reflect as many of these required changes as will fit on the existing site. However, as stated in section 3.2.2, we recommend that the Region develop a plan to acquire a new, larger site for the construction of a new Oshawa-Whitby Depot, as soon as possible.

4.0 BEST PRACTICES IN FUNCTIONAL AREA DESIGN

4.1 Justification for Indoor Vehicle Storage

In section 3.1.5 we listed a number of design issues, at the Oshawa-Whitby Depot, that are adversely affecting employee productivity, and the efficient utilization of space. In section 3.1.7 we listed a number of ways to improve the design of an existing Depot. Below, we discuss the reasons for storing Winter Maintenance vehicles indoors during the winter months.

Park Winter Maintenance Vehicles Indoors

When possible, vehicles and equipment should be stored indoors during the winter. The primary benefits of storing vehicles indoors are listed below:

- Public Safety;
- Employee Safety;
- Improved Productivity and Response Time;
- Improved Asset Management;
- Impact on the Adjacent Neighbourhood;
- Impact on the Environment;
- Cost Savings.

Public Safety
Vehicles such as plows are used to keep the roads safe, and to respond to emergencies. They are also sensitive to cold temperature and, therefore, may experience starting problems if parked outdoors during the winter. Diesel engines can suffer from jelling; hydraulic oil may have difficulty flowing; and air lines can freeze. In addition to starting problems, the driver/crew might be required to waste valuable time by having to warm-up and clean snow off their vehicle prior to responding to an emergency. This could result in unsafe conditions for the public.

Employee Safety
Storage of larger vehicles outdoors during inclement weather may require an employee to climb on the vehicle to clean it off and prepare it for use. This could expose the employee to unnecessary risks such as slipping and falling. In addition, employees must often access and connect smaller equipment to their vehicles (such as plow attachments and towed compressors). This could also pose unnecessary risks when conducted in inclement weather or in parts of the yard with inadequate lighting.

Improved Productivity and Response Time
Storing vehicles and equipment indoors will enhance the performance of the vehicles, thereby, eliminating potential delays associated with cold engines and frozen equipment. This

will increase employee productivity and reduce response time. Furthermore, vehicles that are stored indoors can have their tools and related equipment left in the vehicle overnight. This reduces the need to unload and reload tools between shifts, thereby, increasing employee productive time.

Improved Asset Management
Storing vehicles and equipment indoors will reduce unscheduled maintenance costs and vehicle downtime, protect the vehicles from environmental conditions which could increase maintenance costs and reduce vehicle life span, and protect the vehicles from potential vandalism or theft.

Impact on the Adjacent Neighbourhood
The outdoor storage of vehicles will increase the noise output and exhaust emissions from the site. The outdoor storage of vehicles will require extended periods of idling during the winter months, thereby, increasing the inconveniences already imposed on the neighbors.

Impact on the Environment
Storing vehicles and equipment outdoors will negatively impact the environment because of oil, grease, and engine fluid entering the groundwater or stormwater system. By comparison, any leaks that occur within a vehicle storage garage will be captured in a closed floor drain system, thereby, preventing the fluids from reaching the environment.

Cost Savings
The additional costs associated with storing the vehicles outdoors, as discussed above, include:

- Loss of productive labour due to delays in starting the vehicles and preparing them for the road;
- Increased unscheduled maintenance costs;
- Increased vehicle downtime and resulting loss in productivity;
- Reduced vehicle life expectancy and accelerated vehicle replacement costs.

Therefore, for the reasons discussed above, we recommend that winter maintenance vehicles be parked indoors.

4.2 Opportunities to Improve the Depot Design

Below, we discuss the best practices and design features that (if appropriate) will be incorporated into the proposed site plans for the Oshawa-Whitby Depot in section 5.0.

Work Vehicle Storage Buildings

To reduce space requirements, the layout of the storage areas should incorporate the following best practices and design features:

- The Vehicle Storage Building should be designed so that it can be expanded as the size of the fleet grows;

- The internal storage area should be heated in the winter months to a temperature of 10ºC to ensure that the vehicles are ready for service in the morning. The installation of insulated rapid motion doors will prevent the need for air curtains over the external doors (to maintain the internal room temperature). All walls and ceilings should be painted white (to present a clean appearance and to reflect light). The paint should be an industrial epoxy brand to withstand cleaning by high pressure water. Provision for the proper drainage of ice and snow from the floor area will be a critical safety design feature;

- The current fleet of vehicles are all operated with gas or diesel fuel. However, it is expected that, in the future, some or all of the vehicles will be electrically powered. Therefore, allowances should be provided for future electric recharging equipment;

- Our methodology for designing the layout for the Vehicle Storage Building aims to minimize the total area required by (1) identifying those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identifying the optimal width and length of each lane to minimize the total area requirement. Those vehicles and equipment that require independent use and, therefore, cannot be blocked within a long lane should be stored in a building that has drive-through lanes that are only 2 vehicles long.

- Where vehicles are parked indoors, adequate ventilation measures must be taken to prevent the accumulation of fumes, and to prevent fumes from entering office areas.

Salt Storage Buildings

To reduce the total space requirements, all of the salt, at each yard, should be stored in one building. This building should provide indoor storage and loading to contain the salt (to comply with the Salt Management Plan), and the noise from the loading operation. The facility should have the following characteristics:

- Salt delivery and loading, and brine makeup and loading are all located under one roof;

- Salt should be dumped inside the building by the supplier and then conveyed to the top of the pile using a stacking conveyor. This will maximize the height of the pile and storage capacity of the building;

- Brine makeup utilizes the salt pile as a feedstock along with the weak salt solution coming from the truck wash combined with rainwater collected from the storage building roof and neighbouring driveways;

- The brine making area should be adjacent to the main structure (so that it does not block the flow of the loader during the loading process). Drywall should not be used within the brine pump room because of the moisture). The brine area should also include a washroom;

- The concrete wall surrounding the sand/salt storage area should be at least 25' high to maximize the height of the pile within the cubic space of the building;

- The two drive-through doors for the salters should be 20' wide and 20' tall. The two doors for the delivery truck should be 20' wide and at least 40' high (to avoid being hit by a tilted truck bed). Use of metal for the door sliding system should be avoided due to potential corrosion and premature failure;

- Salt and brine loading should all take place on one side of the storage area in a covered drive through lane;

- The loading lane for the salters should be at least 144' long to allow space for three trucks to be loaded with sand/salt or brine simultaneously;
- The roof decking, structural steel and walls of the storage facility should be painted white to present a bright clean appearance and to better reflect light;
- Where possible, windows should be incorporated into the design of the facility to reduce the need for light fixtures and to provide a better working environment.

Yard Entrances

Where possible, the entrances to the yard should incorporate the following best practices and design features:

- Vehicle entrances should be located at signal lights, especially on busy road ways;

- Vehicle entrances and exits should be separated and closed off with an automated gate to exclude people and vehicles that are not part of the operations. The entrance should be set back from the roadway, such that vehicles entering the yard are off from the main roadway, while waiting for the entrance gate to open;

- Entrances for employee and public vehicles should be kept separate from the flow of operational vehicles.

Yard Configuration

To reduce space requirements and to promote the safety and security of employees and visitors, the layout of the Yard should incorporate the following best practices and design features:

- The site should be configured to provide for the safe and efficient flow of employees, the public, and vehicles (work vehicles and personal vehicles). The building(s) will be situated on the site so as to provide room to expand as operational growth demands greater capacity;

- The movement of work vehicles should be kept separate from the flow of pedestrians and employee vehicles (for safety reasons). Their movement should be configured for one-way traffic flow utilizing primarily left-hand turns to improve visibility for the driver;

- The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles;

- If an area does not need to be paved it should be landscaped so as to permit storm water to percolate naturally into the ground;

- For trucks backing up to a truck dock (to deliver parts), they should be permitted to turn left so that the driver can readily see the back of the truck from his driver's position;

- Any refuelling stations located in the yard, should be situated out of the main flow of traffic, and designed to be able to accommodate vehicle line-ups without blocking the general flow of traffic in the yard;

- The yard should be configured such that items that are most frequently used are closest to the main yard flow. Items less frequently used are placed near the back of the yard;

- The yard should be equipped with well-marked signage that clearly marks direction of travel, storage locations, and special movement and safety instructions;

- Full security fencing should be constructed around the yard, and external lighting, security cameras and motion alarms should be installed. Electronic pass-keys should be used within the building.

Yard Parking

To reduce space requirements and to promote the safety and security of employees and visitors, Yard Parking should incorporate the following best practices and design features:

- The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the front of the building;

- Employee parking should be consolidated at the front of the building (close to the employee entrance and away from the flow of work vehicles) to minimize the honeycomb affect (empty stalls due to variations in demand) and, therefore, the total number of stalls required;

- To minimize the footprint required, a multi-storey parking structure should be constructed for employee/visitor;

- Where it is not practical to park winter response vehicles indoors, they should be located in open shelters faced to the east or south, with receptacles to allow block heaters and hydraulic heaters to be plugged in overnight;

- Work vehicles parked outdoors should be located close to the building so as to minimize employee walking distances;

- Where possible, surfaces should be unpaved to allow storm water to percolate naturally through the parking surface. When paving is required, materials that are permeable to water are recommended (e.g., permeable concrete);

- Environmentally friendly modes of transportation should be promoted. Buildings should be equipped with lockable storage for bicycles and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

- Light pollution control can be achieved by installing fixtures that are down-lit. Full-cut off, ground covers and positioning of the fixtures on site would stop the light from over spilling to other adjacent sites.

Yard Storage

To reduce space requirements and to promote the safety of employees, Yard Storage (for vehicles, equipment and materials) should incorporate the following best practices and design features:

- Work vehicles should be parked as close to the indoor employee amenities as possible to minimize walking distances by the work crews. This does not apply to contractor vehicles as the crews do not utilize the buildings;

- For storing certain types of equipment and materials (those that can be placed on pallets) metal racking (single deep) should be installed in the yard to reduce space requirements;

- The yard space that is used by Roads as a Winter Maintenance Yard should, during the summer, be shared with other departments to increase yard utilization and reduce overall space requirements. For example, this space could be used to park contractor vehicles (for Forestry operations), and stage materials such as wood and compost;

- The bulk storage of materials within the concrete block storage bunkers should be shared by all the Divisions to eliminate duplication in other parts of the yard;

- All plastic and rubber items, including piping and fittings, must be stored in shelters that protect these items from deterioration by the sun.

- Items that must be kept clean, such as fittings for water services, should be stored such that they will not become contaminated with yard dust and debris.
- All items stored in the yard should be organized in well-marked storage locations.
- Outdoor storage areas should not be paved, unless needed, to allow storm water to percolate naturally into the ground.
- The view of the yard from all public roadways must be attractive, well landscaped, and well maintained without appearing extravagant. Landscaping buffers should be built.

Vehicle Fueling

To reduce space requirements, and to promote the safety and productivity of employees, the location of the Vehicle Fueling operation should incorporate the following best practices and design features:

- The vehicle fuelling location should be set up such that vehicles returning to the yard can travel (without backtracking) from the yard entrance to the fuelling location and then to the parking area, in the most efficient way possible. Since there may be a line-up for fuelling it should be located such that vehicle line-ups do not block the main access route around the yard;
- The fuelling location should be situated well away from buildings and the property line to meet safety requirements;
- The fuelling traffic lanes should be set up such that vehicles waiting for fuel do not block yard circulation;
- The fuel tanks should be located above ground with each storage tank inside a separate outer containment tank that acts as a protective barrier;
- The entire tank area, along with the pumps, should be mounted on an elevated concrete pad;
- The entire tank area should also be protected by heavy steel bollards and a crash resistant railing;
- The fuel islands and pumps should be set up such that they can be approached from either side, and are far enough apart that two full sized trucks (equipped with ploughs) can pass, side by side, between the islands and pumps;
- Newer installations are often equipped with canopies and lighting such that vehicles can be fuelled in the dark and in inclement weather without delaying operations;
- The fuelling area should not have a drain so that spilled fuel will not enter local water courses;

- The current fleet of work vehicles are all operated with gas or diesel fuel. However, it is expected that, in the future, some or all of the vehicles will be electrically powered. Therefore, allowances should be provided for future electric recharging equipment.

Vehicle Washing

To reduce space requirements, and to promote the productivity of employees, the location of the Vehicle Wash Bay should incorporate the following best practices and design features:

- The vertical clearance within the Wash Bay should be sufficient to allow dump trucks to raise their box for rinsing;

- The interior of the Wash Bay should be equipped with sufficient heating to prevent freezing inside during the winter;

- The Wash Bay should be equipped with an access platform so that operators can access the top of their vehicle safely without climbing onto the vehicle itself;

- The concrete pad immediately outside the entrance/exit doors should have radiant heating to prevent the formation of ice during the winter;

- The installation of insulated rapid motion doors will prevent the need for air curtains over the exterior doors (to maintain the internal room temperature);

- The door should be 18 ft. wide and 15 ft. high. The room for a single wash bay should be a minimum of 50 ft. long and 31 ft. wide (to handle tandem trucks);

- The Wash Bay should be equipped with a steam cleaning system to remove grease from vehicles and engine parts. It should be located in an adjacent room to avoid corrosion. Operators will utilize a high-pressure, handheld, spray wand to clean the vehicles. There will also be a fire hose and a built-in underbody spray;

- A drainage system and sump will be required to collect approximately 70% of the grey water for reuse;

5.0 FUNCTIONAL SPACE PROGRAM

In this section, we will document the Functional Space Program required to satisfy the future (20-year time horizon) additional space requirements (for each of the main functional areas) for the employees and contractors working at the existing Oshawa-Whitby Depot location. The Program will consider the growth requirements, and operational needs discussed, previously, in sections 3.2 and 4.0 of this report.

Within the Program, we will look for ways to minimize space requirements so as to reduce travel distances and construction costs while still achieving space adjacency preferences. space adjacency preferences are important to minimize travel distances by vehicles and employees within the buildings. Excessive travel distances add to operational costs. Of critical importance is the relationship between the employee amenities and the storage location for the vehicles. Whenever possible, the walking distances for the employees should be minimized.

The Space Program will assume that all of the existing Depot buildings will remain and be utilized within the expanded operation.

The main functional areas are summarized in Table 5.1, below. The Space Program is shown in Appendix C.

Table 5.1 - Space Requirements for an Expanded Oshawa-Whitby Depot

Functional Area	Area Required in 2040 (ft^2)	Area Required in 2040 (m^2)
Administration Office	1,300	121
Employee Amenities	1,000	93
Fleet Services Shop	18,513	1,720
Total Main Building	**20,813**	**1,934**
Two-Level Parking Garage	88,278	8,201
Indoor Work Vehicle/Equipment Storage	13,709	1,274
Vehicle Wash Bay	2,486	231

The Administration Office will also require 4,400 ft^2 of existing space to be completely renovated to accommodate an open concept office layout so as to increase the space utilization.

The Employee Amenities area will also require 2,660 ft^2 of existing space to be completely renovated to increase the size of the employee changing rooms.

The existing Fleet Service Shop will also require 1,600 ft^2 of existing space to be renovated to accommodate the required office space and employee amenities for the mechanics.

6.0 CONCEPTUAL SITE PLAN

A high-level, Conceptual Site Plan was developed for the existing Oshawa-Whitby Depot to try to reflect the Functional Space Program (for 2040) recommended in section 5.0. This Site Plan is shown in Appendix D. The Site Plan also reflects (1) Industry Best Practices and design trends for new Operations Depots, and (2) functional space adjacency preferences to minimize travel distances. Particular emphasis was placed on assessing the impact of vehicle traffic within the yard and how to optimize its flow and egress.

Unfortunately, the layout of the existing buildings, and the limited size of the site prevented us from incorporating the full Functional Space Program within the Site Plan. The deficiencies within the Site Plan are as follows:

- Short 5 Fleet Services maintenance bays;
- No mud room within the employee changing rooms;
- No parking stalls for the contractor's employee vehicles (this is common at other urban municipalities but does create an operational problem);
- Short 7 parking stalls for the contractor's work vehicles;
- Short 30 parking stalls for work vehicles in/out for Fleet Services maintenance;
- Short 49 parking stalls for work vehicles for Roads/Water/Sewer;
- Short 25 parking stalls for work vehicles managed by Fleet Services (e.g., ambulances)
- Short 195 m^2 for storing the shipping containers and misc. equipment;
- No space for storing the waste soil (8,600 m^2);
- No space for storing the unprocessed or processed asphalt (3,700 m^2).

To maximize the utilization of space at the site, we have included the construction of a two-level parking structure for employee and visitor vehicles.

In Appendix D, we have included a second Conceptual Site Plan that shows the number of additional acres (8.2) required to achieve the required Functional Space Program (for 2040) recommended in section 5.0. This Site Plan, however, is still missing five of the recommended new maintenance bays because the existing septic field is in the way.

Please note that we would recommend more than 8.2 additional acres if the Depot was to remain operational for more than 20 additional years (to accommodate additional growth and changing operational needs).

The objective of this second Site Plan is to help convey just how undersized the existing site is in terms of a 20-year time horizon. We, therefore, recommend that the Region limit spending at the existing Depot (to just necessary repairs) and focus, instead, on acquiring a new, much larger site and building a new Oshawa-Whitby Depot (that would include Traffic Operations and FM&O).

7.0 CONSTRUCTION COST ESTIMATES

As discussed in section 6.0, we recommend that the Region limit spending, at the existing Depot, (until it is decommissioned) to just those repairs necessary to maintain a safe, operable facility. Capital spending should be focused, instead, on the construction of a new Depot. Therefore, we have not created an estimated construction cost for the expansion/modernization of the existing Depot.

The hard construction cost to build a new Depot on a new, larger site is estimated in Table 7.1, below. The areas stated for each functional area are high-level estimations done without the benefit of a Functional Space Program or a Conceptual Site Plan for the new Depot. These construction costs, therefore, provide a high-level "ball-park" estimate. They should not be used for budget purposes due to their low level of accuracy (with a variance of perhaps +- 40%).

Table 7.1 – Estimated Hard Construction Costs

Depot	Functional Area	Area (m^2)	Unit Cost ($/$m^2$)	Estimated Cost ($)
New Oshawa-Whitby Depot	Admin. Office & Employee Amenities	11,102.93	5,504	61,110,529
	Fleet Services Garage/Wash Bay/Parts	4,126.94	3,200	13,206,199
	Indoor Vehicle Storage Building	2,983.77	2,000	5,967,531
	Indoor Salt Storage & Loading Building	1,926	1,800	3,466,800
	Site Work (including M&E Site Services)	157,700	147	23,181,900
	TOTAL (rounded)			**106,932,959**

In Table 7.2, below, we list the estimated project soft costs for building the new Depot.

Table 7.2 – Estimated Project Soft Costs

<table>
<tr><th>Depot</th><th>Project Soft Costs</th><th>Estimated Cost ($)</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td rowspan="9">New Oshawa-Whitby Depot</td><td>Land Acquisition Costs</td><td>Unknown</td></tr>
<tr><td>Municipal Charges</td><td>0</td></tr>
<tr><td>Project Management Fees</td><td>0</td></tr>
<tr><td>Consulting Fees and Expenses</td><td rowspan="6">25,396,578</td></tr>
<tr><td>Specialty Consultants</td></tr>
<tr><td>Owner Supplied Furnishings, Fixtures and Equipment</td></tr>
<tr><td>Financing and Loan Fees</td></tr>
<tr><td>Operational Expenses</td></tr>
<tr><td>Taxes</td></tr>
</table>

	Project Soft Cost Contingency	
	TOTAL (rounded)	**25,396,578**

To create the estimates, typical unit rates (in 2021 dollars) were used that are based on the project specifications for the proposed new Sunderland Depot. The unit rates are based on typical mid-range costs for the type of design and construction proposed. Contingencies are included in the estimate to offset the accuracy risk.

The total project budget cost is **$132,330,000**

Exclusions & Qualifications

The following items are excluded from the estimates in Tables 7.1 and 7.2:

- **Land acquisition**
- Premium time for afterhours and weekend work
- Phasing premium (assumed to be executed in a single phase)
- Municipal off-site service connections (outside the property line)
- Abatement and handling of asbestos contaminated materials
- Handling and removal of contaminated soils
- Special foundations such as caissons or pile foundations
- Development charges and building permit fees
- Sole sourcing of materials, services, or equipment
- Premiums for LEED certification
- Independent 3rd Party Commissioning
- Onsite or offsite temporary storage facilities
- Mock ups

8.0 IMPLEMENTATION SCHEDULE

As discussed above, in sections 3.2.2 and 6.0, we recommend that the Region limit spending, at the existing Depot, (until it is decommissioned) to just those repairs necessary to maintain a safe, operable facility. Capital spending should be focused, instead, on the construction of a new Depot.

In this section, we have created an Implementation Schedule for the construction of the new Depot. We have assumed that this new Depot would be constructed on a new site which would permit the current operations to continue from the existing site until the new Depot is ready to be occupied.

We expect the pre-construction phase to last 26 months. This would include the completion of such tasks as Site Plan Approval, preliminary and detailed design, and tendering for construction. The construction phase is expected to last 30 months.

The Implementation Schedule is shown in Appendix F.

APPENDIX A – Current Resources

In this Appendix we list the current number of resources (employees, vehicles, equipment, and materials) utilized by the Works Department at its Oshawa-Whitby Depot.

Oshawa-Whitby Depot

Employees

The total number of employees currently working from the Oshawa-Whitby Depot (during the summer and winter seasons) is shown in the table below.

Table A.3 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Oshawa/Whitby	Admin	12	0	0	**12**
	Water Meter	4	10	10	**14**
	Materials Testing	2	4	4	**6**
	SWAT		6	6	**6**
	Fleet Services	6	12	12	**18**
	Training	2	2	2	**4**
	Roads	2	25	18	**27**
	Water/Sewer	5	41	41	**46**
	Total	**33**	**100**		**133**
Note: 1. Training will be hiring 1 additional staff after July 2020. That person has been included in these numbers. 2. Materials Testing is looking to expand the staff complement by adding 2 more field staff in the next few years.					

Work Vehicles

The total number of work vehicles currently assigned to the Oshawa-Whitby Depot is shown in the table below.

Table A.4 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
3 Roads, 2 Water, 4 Sewer, 1 Meter	½ Ton Pickup	10	Outdoor
1 Water, 3 Roads, 2 Sewer	Tilted Bed Trailers	6	Outdoor
2 Water, 1 Roads, 1 Sewer	Tandem Trailers	4	Outdoor

Department	Vehicle Type	No. Vehicles	Type of Storage Required
1 Water, 1 Roads	Misc. Trailer	2	Outdoor
1 Roads, 1 Fleet	Asphalt Hot Box Trailer	2	Outdoor
Roads	1 Ton Pickup	2	Outdoor
Roads	5 Ton Dump/Plow/Sand	1	Outdoor
Roads	Tractor	1	Outdoor
Roads	Signal Boards	6	Outdoor
Roads	Utility Trailers	2	Outdoor
Sewer	¾ Ton Pickup	2	Outdoor
1 Water, 2 Meters	SUV	3	Outdoor
Water Meter	Service Vans	8	Outdoor
Materials Testing	Service Vans	4	Outdoor
SWAT	Service Vans	3	Outdoor
	Total	**56**	
Roads	Medium Articulated	1	Indoor
Roads	Steam Generator	1	Indoor
Roads	Pavement Roller	1	Indoor
1 Sewer, 5 Roads	6 Ton Tandem Truck	6	Indoor
6 Water, 2 Roads, 2 Sewer	3Ton Crew Cab	10	Indoor
1 Water, 1 Roads	3/4 Ton Van	2	Indoor
1 Water, 1 Roads	HD Backhoe	2	Indoor
1 Water, 1 Roads, 1 Sewer	Air Compressor	3	Indoor
1 Water, 6 Meters	Econo Van	7	Indoor
Water	1Ton Crew Cab	1	Indoor
1 Water, 1 Sewer	3 Ton Service	2	Indoor
5 Water, 2 Meters, 1 Sewer	1 Ton Van	8	Indoor
Sewer	Excavator	1	Indoor
	Total	**45**	

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Oshawa-Whitby Depot there is one large building capable of storing up to 6,000 tonnes of salt. Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and topsoil).

APPENDIX B – Future Resources

Oshawa-Whitby Depot

Employees

The total number of employees forecast to be working from the Oshawa-Whitby Depot in 2030 and 2040 (during the summer and winter seasons) is shown in the tables below:

Table B.4 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Oshawa/Whitby	Admin	12	0	0	**12**
	Water Meter	4	12	12	**16**
	Materials Testing	2	6	6	**8**
	SWAT		6	6	**6**
	Fleet Services	6	14	14	**20**
	Training	2	2	2	**4**
	Roads	2	28	20	**30**
	Water/Sewer	5	48	48	**53**
	Total	**33**	**116**		**149**
Note: 1. Training will be hiring 1 additional staff after July 2020. That person has been included in these numbers.					

Table B.5 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Oshawa/Whitby	Admin	12	0	0	**12**
	Water Meter	4	14	14	**18**
	Materials Testing	2	6	6	**8**
	SWAT		6	6	**6**
	Fleet Services	6	16	16	**22**
	Training	2	2	2	**4**
	Roads	2	31	22	**33**
	Water/Sewer	5	55	55	**60**
	Total	**33**	**130**		**163**
Note: 1. Training will be hiring 1 additional staff after July 2020. That person has been included in these numbers.					

Work Vehicles

The total number of work vehicles currently assigned to the Oshawa-Whitby Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.6 below.

Table B.6 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
3 Roads, 2 Water, 4 Sewer, 1 Meter	½ Ton Pickup	10	11.75	13.51	Outdoor
1 Water, 3 Roads, 2 Sewer	Tilted Bed Trailers	6	7.05	8.11	Outdoor
2 Water, 1 Roads, 1 Sewer	Tandem Trailers	4	4.7	5.4	Outdoor
1 Water, 1 Roads	Misc. Trailer	2	2.35	2.7	Outdoor
1 Roads, 1 Fleet	Asphalt Hot Box Trailer	2	2.23	2.45	Outdoor
Roads	1 Ton Pickup	2	2.23	2.45	Outdoor
Roads	5 Ton Dump/Plow/Sand	1	1.11	1.22	Outdoor
Roads	Tractor	1	1.11	1.22	Outdoor
Roads	Signal Boards	6	6.68	7.34	Outdoor
Roads	Utility Trailers	2	2.23	2.45	Outdoor
Sewer	¾ Ton Pickup	2	2.35	2.7	Outdoor
1 Water, 2 Meters	SUV	3	3.53	4.05	Outdoor
Water Meter	Service Vans	8	9.4	10.81	Outdoor
Materials Testing	Service Vans	4	6	6	Outdoor
SWAT	Service Vans	3	3	3	Outdoor
	Total	**56**	**65.72**	**73.41**	
Roads	Medium Articulated	1	1.11	1.22	Indoor
Roads	Steam Generator	1	1.11	1.22	Indoor
Roads	Pavement Roller	1	1.11	1.22	Indoor
1 Sewer, 5 Roads	6 Ton Tandem Truck	6	7.05	8.11	Indoor
6 Water, 2 Roads, 2 Sewer	3Ton Crew Cab	10	11.75	13.51	Indoor
1 Water, 1 Roads	3/4 Ton Van	2	2.35	2.7	Indoor
1 Water, 1 Roads	HD Backhoe	2	2.35	2.7	Indoor
1 Water, 1 Roads, 1 Sewer	Air Compressor	3	3.53	4.05	Indoor
1 Water, 6 Meters	Econo Van	7	8.23	9.45	Indoor
Water	1Ton Crew Cab	1	1.18	1.35	Indoor
1 Water, 1 Sewer	3 Ton Service	2	2.35	2.7	Indoor
5 Water, 2 Meters, 1 Sewer	1 Ton Van	8	9.4	10.81	Indoor

Sewer	Excavator	1	1.18	1.35	Indoor
	Total	**45**	**52.7**	**60.39**	

Traffic Operations Centre

Employees

The total number of employees forecast to be required for the Traffic Operations Centre, in 2030 and 2040, (during the summer and winter seasons) is shown in the table below:

Table B.16 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Traffic Eng./Operations	Works	15	23	23	38
	Total				**38**

Table B.17 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Traffic Eng./Operations	Works	18	30	30	48
	Total				**48**

Work Vehicles

The total number of work vehicles currently assigned to the Traffic Operations Centre, and forecast to be required in 2030 and 2040, is shown in the Table B.18 below.

Table B.18 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Signs& Markings	5 Ton Dump Truck	1	1	1	Indoor
	Ford Loop Truck/Cube Van	1	1	1	Outdoor

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
	Crash Trailer	1	1	1	Outdoor
	Total	**3**	**3**	**3**	
	Ford 3 Ton Crane Truck	4	4	4	Indoor
	Small Paint Truck	1	1	1	Indoor
	Large Paint Truck	1	1	1	Indoor
	New Paint Truck	1	1	1	Indoor
	Total	**7**	**7**	**7**	
Signal Maintenance	162 Middlebury Trailer	1	1	1	Outdoor
	Box Trailer	1	1	1	Outdoor
	Wire Trailer	1	1	1	Outdoor
	Pole Trailer	2	2	2	Outdoor
	¾ Ton Dodge Sprinter Van	2	2	2	Outdoor
	3 Ton Crew Cab	1	1	1	Outdoor
	Ground Service Truck		1	2	Outdoor
	3 Ton Crew Overhead Service		1	2	Outdoor
	Total	**8**	**10**	**12**	
	3 Ton Service Truck	2	2	3	Indoor
	1 Ton Van (Small Bucket)	2	2	2	Indoor
	1 Ton Service Vehicles		1	2	Indoor
	Pole Trailer		1	1	Indoor
	Total	**4**	**6**	**8**	
Signal & Sign	½ Ton Pick-up	3	4	5	Outdoor
	Total	**3**	**4**	**5**	
	Variable Message Signs	2	2	2	Indoor
	Total	**2**	**2**	**2**	
Signal, Sign & Road Safety	Variable Message Signs	8	10	12	Indoor
	Radar Speed Signs	4	10	10	Indoor
	Total	**12**	**20**	**22**	

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Signal. Design, Contract Administration	½ Ton Pick-up	1	5	10	Outdoor
	Total	**1**	**5**	**10**	

Facilities Maintenance Operation

Employees

The total number of employees forecast to be working for the Facilities Maintenance Operation (during the summer and winter seasons) is shown in the table below.

Table B.19 - Future State - 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
	Help Desk	6	15	15	21
	Contract Services	9			9
	Custodian Services		4	4	4
	Security	1	5	5	6
	Total				40

Note: The Help Desk will require 5 Touch Down Stations

Table B.20 - Future State - 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
	Help Desk	6	15	15	21
	Contract Services	9			9
	Custodian Services		4	4	4
	Security	1	5	5	6
	Total				**40**

Note: The Help Desk will require 5 Touch Down Stations

Work Vehicles

The total number of work vehicles currently assigned to the FMO, and forecast to be required in 2030 and 2040, is shown in the Table B.21 below.

Table B.21 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2019	2030	2040	
Help Desk	Service Vans	13	14	14	Outdoor
	Total	**13**	**14**	**14**	
Contract Services	None	0	0	0	
Custodian Services	Service Vans	2	3	3	Outdoor
	Total	**2**	**3**	**3**	
Security	Service Trucks	3	5	5	Outdoor
	Total	**3**	**5**	**5**	

APPENDIX C – Space Program

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
1.0 Administration Office								
Roads Department								
Supervisor	OO		2	90	1.4	126	12	Open concept work stations
Water/Sewer Department								
Supervisor	OO		5	225	1.4	315	29	Open concept work stations
Touchdown stations	OO		4	144	1.4	202	19	For Locators
Administrative Staff								
Staff	OO		11	396	1.4	554	52	Open concept work stations
Superintendent	**PO**		1	110	1.4	154	14	
Training								
Staff	OO		4	180	1.4	252	23	Open concept work stations
Common Areas								
High Density File Storage System (1)	**PO**			200	1.4	280	26	
Quick-Access File Storage	OO			105	1.4	147	14	
Office Storage Room (1)	**PO**			150	1.4	210	20	For Miscellaneous Items
Vault	**PO**			150	1.4	210	20	Require 1 room
Printer/fax/stationary (1)	**PO**			150	1.4	210	20	Require 1 room
Winter Coat Storage	**PO**			63	1.4	88	8	for 21 employees
Coffee Stations (1)	**PO**			45	1.4	63	6	1 Station
Office Washrooms (2) for 21 staff	**PO**			300	1.4	420	39	2 Accessable washrooms (M/F)

The functional areas in purple font will be reconfigured within the current main office area of the facility

	Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	Common Areas - Continued									
	Large Meeting Room (1) (16 people)	**PO**				400	1.4	560	52	Require 1 room for 16 people
	Medium Meeting Room (1) (8 people)	**PO**				200	1.4	280	26	Require 1 room for 8 people
	Phone Rooms (1) (1 person)	**PO**				40	1.4	56	5	Require 1 room
	Training Room 1 (24 people)					600	1.4	840	78	For 24 people (for traning group)
	Public Lobby	OO				400	1.4	560	52	
	Public Washrooms (male/female)	**PO**				75	1.4	105	10	One barrier free washroom
	Reception Desk/Counter	OO				50	1.4	70	7	
	Janitors Rooms (1)	**PO**					1.4	-	-	One room
	Communications/IT Room	**PO**					1.4	-	-	
	Electrical Room	**PO**					1.4	-	-	
	Mechanical Room	**PO**					1.4	-	-	
	TOTAL					**4,073**		**5,702**	**530**	

The functional areas in purple font will be reconfigured within the current main office area of the facility

	Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	2.0 Employee Amenities									
	Common Areas for Both Departments									
	Male Washroom/locker room/showers	**PO**			**117**	1,377	1.25	1,721	160	Sized for 117 males (90% of 130)
	Female Washrm/locker rm/showers	**PO**			**33**	519	1.25	648	60	Sized for 33 females (25% of 130)
	First Aid/Quiet Room (1)	**PO**				120	1.4	168	16	Require 1 Room
	Lunch Room/Training Room	**PO**			**40**	900	1.25	1,125	105	Sized for 40 employees
										use an accordian wall to
										separate the lunch room from
										the training room
	TOTAL					**2,916**		**3,662**	**340**	

The functional areas in purple font will be reconfigured within the current main office area of the facility

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
3.0 Fleet Services Shop									
Fleet Mechanics Area									
Mechanic Lunch Room	**PO**			16	338	1.4	473	44	Sized for 16 mechanics
M/F Washrooms (2)	**PO**				150	1.4	210	20	two M/F washrooms
Maintenance Offices									
Vestibule (single door from outdoors)	OO				35	1.4	49	5	
Reception desk (key drop-off)	OO				100	1.4	140	13	
Superv., Fleet Maint.	OO	1		3	108	1.4	151	14	
Team Leader Stores & Equip.	OO	1		1	36	1.4	50	5	
File Storage (1)	OO				30	1.4	42	4	
Printer/fax/stationary (1)	OO				96	1.4	134	12	
	PO								
Winter Coat Storage	**PO**				6	1.4	8	1	for 2 employees
First Aid Room	**PO**				120	1.4	168	16	
Maintenance Library	**PO**				135	1.4	189	18	6 touch down stations & shelving

The functional areas in purple font will be reconfigured within the current main office area of the facility

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
Maintenance Bays & Shops									
Maintenance Bays (Heavy Duty)	OO			14	16,940	1.02	17,279	1,605	14 new bays (22x55 ft)
Quick Lube Bay	OO			1	1,210	1.02	1,234	115	1 new bay (22x55 ft)
TOTAL					**19,304**		**20,129**	**1,870**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
4.0 Parts Stores (Fleet Services)									
Service Counter & Offices									
Service Counter	OO				100	1.4	140	13	
Touchdown Station	OO	1		1	10	1.4	14	1	1
Supervisor	OO	1		1	36	1.4	50	5	
Common Area									
Receiving Dock	**PO**				340	1.25	425	39	1 man door
									and 1 drive-in door
TOTAL					**486**		**629**	**58**	

The functional areas in purple font will be reconfigured within the current main office area of the facility

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
5.0 Indoor Work Vehicle/Equipment Storage - Heated									
Roads and Water/Sewer Depts.									
Indoor Work Vehicle Parking	**PO**			28	13,440	1.02	13,709	1,274	
TOTAL					**13,440**		**13,709**	**1,274**	
TOTAL INDOOR SPACE					**40,219**		**43,831**	**4,072**	Excludes the salt storage bldg.
									and Pole Barn

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Vehicles 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
6.0 Wash Bay									
Wash Bay	**PO**			1	1,800	1.02	1,836	171	1 bay (30x60)
Wash Water Filtration Room	**PO**				500	1.3	650	60	
TOTAL					**2,300**		**2,486**	**231**	

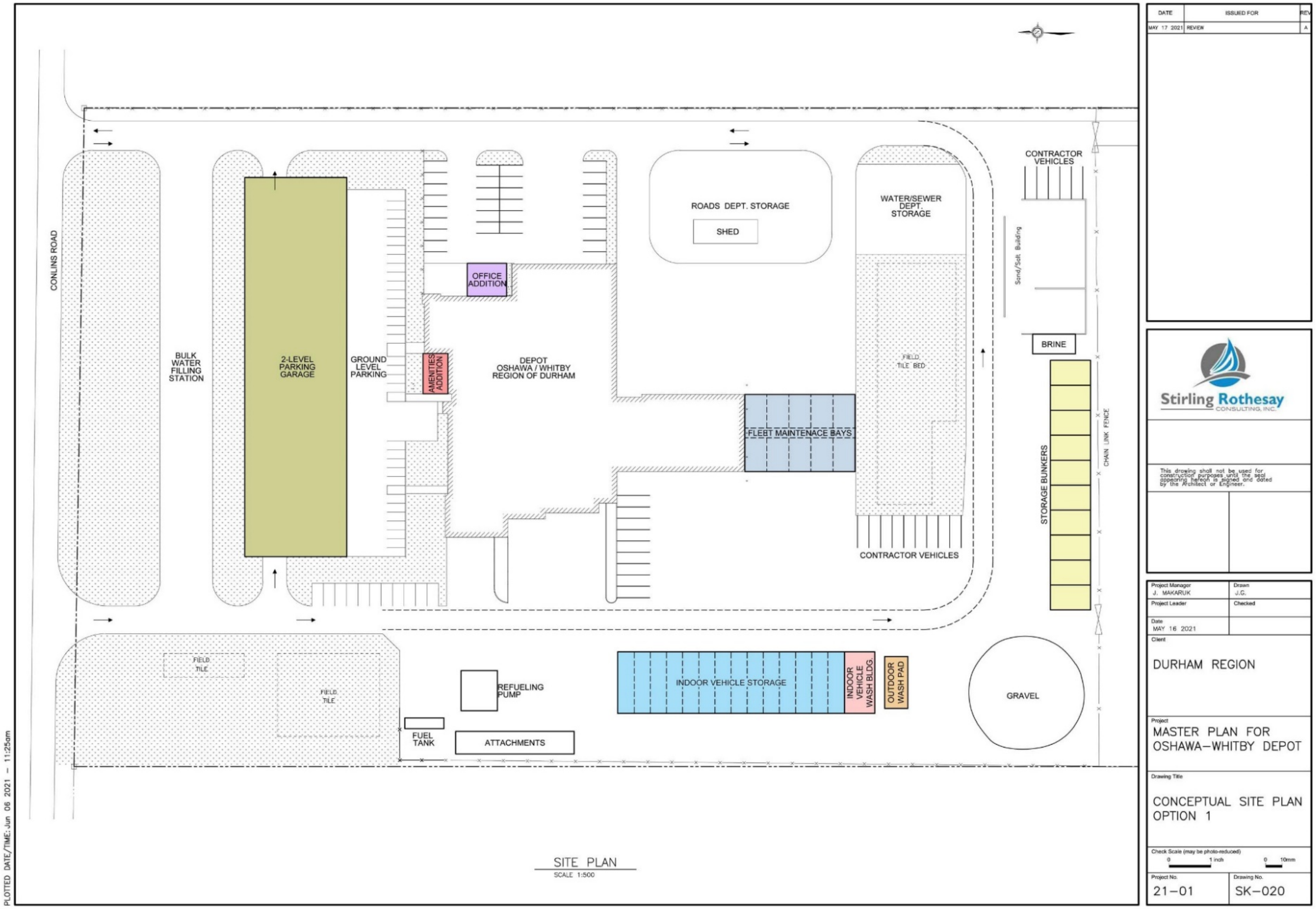
Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
7.0 Region & Contractor Employee Vehicle Parking - Outdoor									
Region Employee Vehicles (all Depts.)				**163**	47,372	1.35	63,952	5,941	forcasted 163 employees
Visitor Parking & handicapped				17	4,941	1.35	6,670	620	
Roads Contractor Employee Vehicles				**0**	-	1.35	-	-	Assumed no contractor parking
Visitors for Training courses				45	13,078	1.35	17,656	1,640	Board room training sessions
TOTAL					**65,391**		**88,278**	**8,201**	

	Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	8.0 Outdoor Yard Space									
	Roads Dept.									
	Open space for gravel					11,000	1	11,000	1,022	
	Open space for unprocessed asphalt					27,000	1	27,000	2,508	
	Open space for processed asphalt					13,000	1	13,000	1,208	
	Open space for waste soil					92,000	1	92,000	8,547	
	Water/Sewer Dept.									
	Miscellaneous equipment/piping					11,000	1	11,000	1,022	
	Water Meter Dept.									
	Fleet Maintenance									
	Waste Metal Bins (2)					500	1.3	650	60	2 bins
	Waste Fluids					300	1.3	390	36	Bulk storage tanks - above ground
	Vehicles waiting/finshed being serviced				48	26,221	1.3	34,087	3,167	24 vehicles in and 24 vehicles out

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
Common Areas									
Region Work Vehicles (all Depts.)				78	29,141	1.3	37,883	3,519	78 stalls -- single deep
Attachments				30	2,100	1.3	2,730	254	open area
Contractor Work Vehicles				12	6,555	1.3	8,522	792	vehicles single deep
Fleet Vehicles (e.g. ambulances)				25	13,657	1.3	17,754	1,649	vehicles single deep
Outdoor Wash Pad					1,375	1.3	1,788	166	Require catwalk beside wash pad
Bunker Material Storage (10)					10,000	1.3	13,000	1,208	10 bunkers for bulk materials
Tool/equipment storage shed					2,000	1.0	2,000	186	
Shipping Containers (storage)					2,100	1.0	2,100	195	
Open Space for Miscellaneous					5,000	1.3	6,500	604	
Waste Containers					500	1.3	650	60	2 large metal bins
Refueling Station					5,000	1.3	6,500	604	
TOTAL OUTDOOR SPACE					**258,448**		**288,553**	**26,807**	Excludes roads, landscaping and set

APPENDIX D – Conceptual Site Plan

Current Site Layout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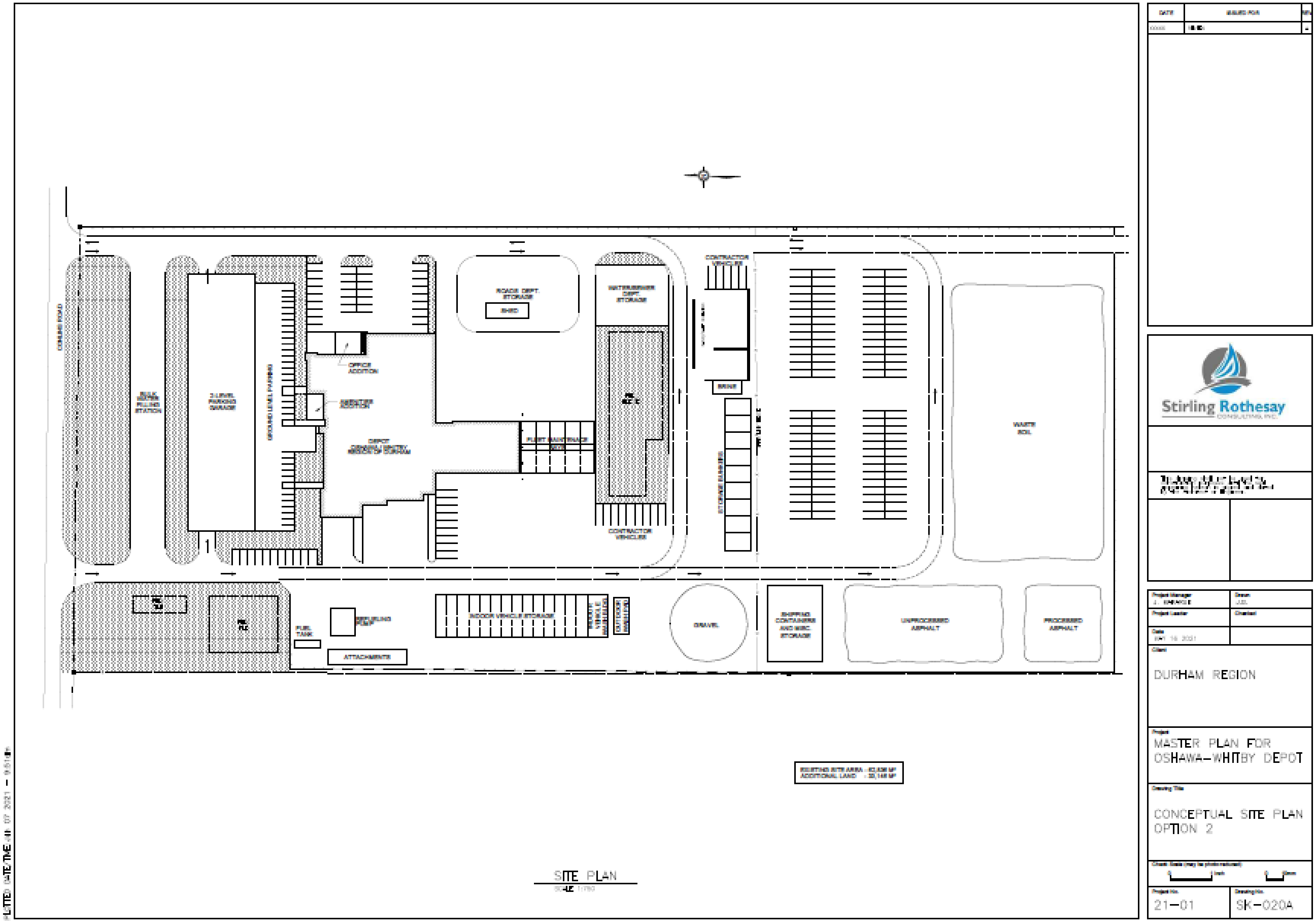
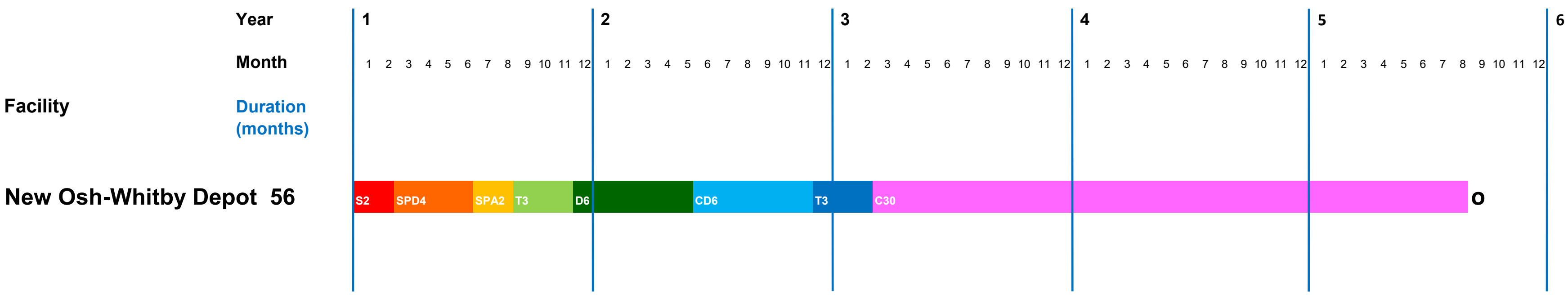
BULK WATER FILLING STATION
2-LEVEL PARKING GARAGE
GROUND LEVEL PARKING
AMENITIES ADDITION
OFFICE ADDITION
DEPOT OSHAWA / WHITBY REGION OF DURHAM
ROADS DEPT. STORAGE
SHED
WATER/SEWER DEPT. STORAGE
FIELD TILE BED
FLEET MAINTENACE BAYS
CONTRACTOR VEHICLES
CONTRACTOR VEHICLES
Sand/Salt Building
BRINE
STORAGE BUNKERS
CHAIN LINK FENCE
FIELD TILE
FIELD TILE
REFUELING PUMP
FUEL TANK
ATTACHMENTS
INDOOR VEHICLE STORAGE
INDOOR VEHICLE WASH BLDG
OUTDOOR WASH PAD
GRAVEL
SITE PLAN
SCALE 1:500
PLOTTED DATE/TIME: Jun 06 2021 - 11:25am
DATE | ISSUED FOR | REV
MAY 17 2021 | REVIEW | A
Stirling Rothesay CONSULTING, INC.
This drawing shall not be used for construction purposes until the seal appearing hereon is signed and dated by the Architect or Engineer.
Project Manager J. MAKARUK
Drawn J.G.
Project Leader
Checked
Date MAY 16 2021
Client DURHAM REGION
Project MASTER PLAN FOR OSHAWA-WHITBY DEPOT
Drawing Title CONCEPTUAL SITE PLAN OPTION 1
Check Scale (may be photo-reduced)
Project No. 21-01
Drawing No. SK-020


SITE PLAN
BULK WATER FILLING STATION
2-LEVEL PARKING GARAGE
OFFICE ADDITION
DEPOT
ROADS DEPT. STORAGE
SHED
WATER/SEWER DEPT. STORAGE
FLEET MAINTENANCE BAYS
CONTRACTOR VEHICLES
WASTE SOIL
FUEL TANK
REFUELING PUMP
ATTACHMENTS
INDOOR VEHICLE STORAGE
GRAVEL
SHIPPING CONTAINERS AND MISC. STORAGE
UNPROCESSED ASPHALT
PROCESSED ASPHALT
Project Manager
Drawn
Project Leader
Checked
Date
Client
DURHAM REGION
Project
MASTER PLAN FOR OSHAWA-WHITBY DEPOT
Drawing Title
CONCEPTUAL SITE PLAN OPTION 2
Project No.
21-01
Drawing No.
SK-020A

APPENDIX E – Implementation Schedule

Region of Durham Yard Master Plan - Implementation Schedule for a New Oshawa-Whitby Depot



Legend

- **S2**, Studies for site development with duration noted in months (site surveys, geotechnical, noise, traffic, storm water management and emissions)
- **SPD4**, Site Plan Development detailed design with duration noted in months (detailed civil site plan design, grading, drainage, storm water management, site servicing, utilities, and civil design drawings and specifications for full build out)
- **SPA2**, Site Plan Approval process with duration noted in months (obtain site plan approval and a zoning amendment if required)
- **T3**, Tender Phase for preliminary and detailed design with duration noted in months
- **D6**, Design Phase with duration noted in months (preliminary and detailed design for structural, architectural, civil, mech. & elec., IT)
- **CD6**, Contract Documents Phase with duration noted in months
- **T3**, Tender Phase for construction with duration noted in months
- **C30**, Construction Phase with duration noted in months
- **O** **Occupancy**

Attachment #3 - Ajax/Pickering Depot Master Plan Report

Presented by: Stirling Rothesay Consulting Inc.

Date: November 24, 2021.

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1.0 EXECUTIVE SUMMARY

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

This Report will focus on the completion of the Master Plan for the Ajax-Pickering Depot. Three other companion Reports will document the Rationalization Study, and the Master Plans for the Oshawa-Whitby and Sunderland Depots.

The Works Department's Operations and Maintenance Depots are referred to as:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

The Facility Master Plan for the Ajax-Pickering Depot will consolidate the analysis and recommendations for the Depot from the Rationalization Study for the immediate, short term (5 year), medium term (10 year) and long term (20 year). This will include the following:

- The preferred geographic location and service territory for the Depot;
- The current and future functions, use, and activities that should be conducted at the Depot;
- The infrastructure to be maintained, and the building/yard space and equipment required to 2040 (for employees, vehicles, equipment, parts, and materials). This will include the following functional areas:
    - Site access points;
    - Administrative areas;

  - Employee lunch room, locker rooms, and washrooms;
  - Training facilities;
  - Vehicle fueling stations;
  - Fleet washing;
  - Fleet maintenance and parts storage (including receiving/shipping);
  - Equipment and Material storage;
  - Indoor versus outdoor vehicle parking;
  - Vehicle staging areas;
  - Staff parking;
  - Vehicle traffic patterns (fleet, employee) and pedestrian circulation;

- Any facility/yard design issues or deficiencies negatively affecting operational flow, productivity, working conditions, environmental stewardship, and/or service delivery;

- Site safety and security issues;

- The need for facility upgrade requirements or new/expanded facilities;

- The potential impact of proposed developments on the area adjacent to the Depot.

The Facility Master Plan will also provide (1) an optimized site conceptual plan, (2) detailed Class “D” cost estimates for building and yard upgrades/expansions/new facilities, and (3) a sequence of events implementation schedule required to achieve the upgrades/expansions/new facilities.

The objectives of the Facility Master Plan include making recommendations that will (1) provide safe and efficient work conditions, (2) make best use of the existing site and facilities, (3) provide
efficient flow of employees and vehicles through the yard, (4) meet industry best practices in facility and yard layout design, and (5) meet the operational growth requirements over the next 20 plus years.

Like most Public Works facilities, the requirements placed on the Ajax-Pickering Depot have expanded and evolved since it was originally built. As a result, (1) the size of the main building is insufficient to meet current needs and future growth requirements, (2) the design of the facility and use of space are not optimal or compliant with industry best practices and design trends, (3) the age of the main building (48 years) is approaching the end of its expected asset life, and (4) the flow of employees and vehicles within the yard is not efficient. These issues have had a negative impact on employee productivity and the cost effectiveness of maintaining service levels.

Specific issues causing concern include:

- The office area, and employee amenities are too small for current needs, and present numerous limitations for achieving efficient employee operations;
- There is a shortage of mechanics and vehicle maintenance bays. These shortages have a direct impact on vehicle availability, crew productivity, and the ability of crews to meet service level requirements;
- There is insufficient indoor space for storing vehicles and equipment. As a result, vehicles and equipment that should be protected from the elements (to maintain their safe functionality, increase their asset life, and reduce the need for repairs) are, instead, stored outdoors year-round;
- The main building is approaching the end of its expected asset life. As a result, the cost to maintain and repair the building will continue to increase in the coming years;

To address the concerns documented in this report we have created a number of recommendations to help the Works Department improve employee safety, achieve operational synergies, increase space utilization, and satisfy space requirements for their employees, vehicles, equipment, and materials. The recommendations also describe the preferred Depot network design to minimize operating costs and meet service level requirements.

The main recommendations are as follows:

1. The Region should redevelop and expand the Ajax-Pickering Depot (as described within this report) as soon as funding will permit (preferably within 10 years) due to (1) the advanced age of the main building, (2) the operational need for more indoor space for employees, vehicles and parts, and (3) the limitations of the yard's layout for employee and vehicle flow.

2. The recommended Conceptual Site Plan for the redeveloped, larger Depot required the use of the entire site comprising 59,643 m^2 (14.75 acres). Given that future operations, beyond 2040, will likely require additional indoor/outdoor space we, therefore, recommend that the Region purchase some of the adjacent land when that opportunity arises (the cost and details of this recommendation are not included in this report).

3. The redeveloped, larger Depot would consist of (1) 1,700 m^2 of new space for the main building, (2) two unheated buildings for the storage of salt and work vehicles, and (3) a new vehicle wash building. The estimated hard construction cost is $21,209,000. The estimated project soft cost is $5,038,000. The total project budget cost is, therefore, $26,247,000 (this assumes a construction start date of April 1, 2024).

4. The proposed Implementation schedule (for the expansion of existing buildings and the construction of new buildings) will assume that the construction will be carefully phased to permit most of the Depot to remain in operation, at any one time, during the construction. We expect the pre-construction phase to last 26 months and would include such tasks as Site Plan Approval, preliminary and detailed design, and tendering for construction. The construction phase is expected to last 24 months.

2.0 INTRODUCTION

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

The Region's operations and maintenance activities are currently delivered from five Works Department Depots:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

Like most Public Works facilities, the requirements placed on these five Depots have expanded and evolved since they were originally built. As a result, the size of the facilities and outdoor yard storage areas may be insufficient to meet current or future growth requirements. In addition, the current use of space and flow of employees and vehicles may not be optimal or compliant with industry best practices and design trends. Furthermore, the Depots may no longer be in the optimal location to efficiently satisfy the service needs of the community.

In fact, since 2009, requests for additional facility space and modifications have been brought forward by staff (of the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) to accommodate expanding population growth and community needs, equipment and technological changes, environmental, and legislative needs. However, these requests have been put on hold pending the outcome of the Rationalization Study and Master Plans.

Therefore, the Region requires a **Rationalization Study** that will assess the five Depots (as well as the subject operational groups and potential Seaton Depot), and recommend the most efficient accommodation and site utilization strategy to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department. The Study should

also assess (1) opportunities to consolidate existing operational facilities and operational groups to increase efficiencies and leverage synergies for service delivery, and (2) opportunities to co-locate field functions with other groups within the Region including, but not limited to, Durham Region Transit maintenance and operations facilities.

The Study will consider the following:

- How the forecasted growth rates of population, employment, and traffic volumes, within each of the service territories, will affect the infrastructure to be maintained, and the building space and equipment requirements to 2040;

- How these forecasts will affect the data and recommendations within the 2009 Report completed by AECOM;

- Whether the current alignment of boundaries, for the service territories for each of the Depots (including the proposed new Seaton Depot), should be shifted to provide the most efficient and effective service for the territories;

- The current and future functions, use, and activities that should be conducted at each of the Depots (including the proposed new Seaton Depot), to improve productivity and leverage synergies for service delivery;

- The efficacy of consolidating services/activities at certain Depots. For example:

    - providing all water and sewer infrastructure services from a single Depot for all service territories;

    - providing emergency repair operations from two Depots – one in the south and one in the north;

- How best to deliver services to the northern communities of the Region in conjunction with the Sunderland Depot;

- Whether the locations of the Depots, within the current and preferred service territory boundaries, should be expanded or relocated, if feasible, over the next 20 years. For example, should the entire Ajax-Pickering service territory be consolidated to a single location – either at the proposed Seaton Depot or a different location;

- For those Depots that should be relocated, where would be the preferred geographic location, and what would be the relocation cost;

- The potential for consolidating and sharing existing or future Depot facilities with other operational groups within the Region (e.g., The Traffic Operations Group, The Facilities Maintenance and Operations Group, Durham Region Transit, etc.).

This could be through the expansion of existing facilities or new facilities. Also, what the full impact of these consolidations would be;

- The infrastructure to be maintained, and the building space and equipment requirements at each of the current and proposed Depots (including the proposed new Seaton Depot), to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department.

In addition, the Region requires a **Facility Master Plan** for each of three Depots (the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) including the accommodation of relocated operational service groups, if recommended. The Facility Master Plans will consolidate, for each of the Depots, the analysis and recommendations from the Rationalization Study for the immediate, short term (5 year), medium term (10 year) and long term (20 year). This will include the following:

- The preferred geographic location and service territory for each Depot;
- The current and future functions, use, and activities that should be conducted at each of the Depots;
- The infrastructure to be maintained, and the building/yard space and equipment required to 2040 (for employees, vehicles, equipment, parts, and materials). This will include the following functional areas:
    - Site access points;
    - Administrative areas;
    - Employee lunch room, locker rooms, and washrooms;
    - Training facilities;
    - Vehicle fueling stations;
    - Fleet washing;
    - Fleet maintenance and parts storage (including receiving/shipping);
    - Equipment and Material storage;
    - Indoor versus outdoor vehicle parking;
    - Vehicle staging areas;
    - Staff parking;
    - Vehicle traffic patterns (fleet, employee) and pedestrian circulation;
- Any facility/yard design issues or deficiencies negatively affecting operational flow, productivity, working conditions, environmental stewardship, and/or service delivery;
- Site safety and security issues;

- The need for facility upgrade requirements or new/expanded facilities;
- The potential impact of proposed developments on the area adjacent to the Depots

The Facility Master Plans will also provide (1) an optimized site and facility conceptual plan, (2) detailed Class "D" cost estimates for building and yard upgrades/expansions/new facilities, and (3) a sequence of events implementation schedule required to achieve the upgrades/expansions/new facilities.

The objectives of the Facility Master Plans include making recommendations that will (1) provide safe and efficient work conditions, (2) make best use of the existing site and facilities, (3) provide efficient flow of employees and vehicles through the yards, (4) meet industry best practices in facility and yard layout design, and (5) meet the operational growth requirements over the next 20 plus years.

This Report will focus on the Master Plan for the Ajax-Pickering Depot. The Rationalization Study, and the Facility Master Plans for the Oshawa-Whitby and Sunderland Depots have been completed in separate companion Reports.

3.0 FACILITY NEEDS ASSESSMENT

The Region of Durham's Works Department is comprised of (1) five Operations and Maintenance Depots, and (2) the Traffic Operations Group, and the Facilities Maintenance and Operations Group.

The Region's five Depots are referred to as:

- Ajax-Pickering Depot;
- Oshawa-Whitby Depot;
- Orono Depot;
- Scugog Depot;
- Sunderland Depot.

In addition, there are two Operations Groups: the Traffic Operations Group, and the Facilities Maintenance and Operations Group. The Traffic Operations Group is located at the Region s Traffic Operations Centre. The Facilities Maintenance and Operations Group will be relocated to the Traffic Operations Centre (from the Region's Whitby Water Supply Plant) in 2023.

This section of the Report describes the current and future state facility needs (to the year 2040) for the Region's Ajax-Pickering Depot.

3.1 Current State

This section begins with a high-level description of the current size, location and service boundaries for the Region of Durham's Works Department's five Depots and two Operations facilities. It then proceeds to focus on the Region's Ajax-Pickering Depot – describing its current state service functions, and resources. It also describes (1) the characteristics of its key functional work areas, (2) the limitations that the current buildings and yard place on the ability of the employees to operate efficiently and effectively, and (3) the opportunities to eliminate business process inefficiencies.

3.1.1 Location, Size and Service Boundaries (For Each Depot and Operations Facility)

The Region of Durham was established in 1974 and is the largest geographical jurisdiction in the Greater Toronto Area encompassing approximately 2,532 km^2 of land and almost 800,000 residents. The vast majority of the residents live in the five southern municipalities of Pickering, Ajax, Whitby, Oshawa, and Clarington.

To service this vast area, the Region of Durham's Works Department operates five Depots which are distributed, strategically, across the Region. In addition, the Works

Department operates the Traffic Operations Group, and the Facilities Maintenance and Operations Group from two Operations facilities.

Below, in Table 3.1, we describe the current location, size and service boundaries for each of the Depots and Operations facilities:

Table 3.1 - Current Location, Size and Service Boundaries

Depot/Facility	Location	Size of Site (acres)	Total Indoor Space (ft^2)	Service Boundaries
Ajax-Pickering Depot	202 Salem Rd., Ajax	14.75	17,425 (excluding separate buildings)	The entire City of Pickering and the Town of Ajax
Oshawa-Whitby Depot	825 Conlin Rd., Whitby	14.9	51,500	The entire City of Oshawa and the Town of Whitby
Orono Depot	3480 Taunton Rd., Orono (Clarington)	10	20,478 (4,806 for material storage bldg.)	East part of Durham Region - Clarington
Scugog Depot	10 Regional Rd.21, Port Perry	80	11,301 (2,348 for steel storage bldg.)	Central part of Durham Region - Scugog
Sunderland Depot	S995 Regional Rd. 10, Sunderland	4.02	8,201 (main building and service garage)	North part of Durham Region – Uxbridge and Brock
The Region's Traffic Operations Center	101 Consumers Drive, Whitby	3.5	44,518	Region of Durham
The Region's Whitby Water Supply Plant	301 Water Street West, Whitby			Region of Durham

On the following page, we show Map 3.0 which identifies the location of the five Depots, the two Operations facilities, and their respective service boundaries.

3.1.2 Service Functions and Service Locations (Ajax-Pickering Depot)

The Region's Works Department is responsible for a number of service functions including operating and maintaining the Region's (1) network of roads and bridges, (2) networks of water, storm water, and sanitary sewage piping, (3) traffic signals, warning devices, roadside protection and line markings, and (4) buildings. In this section, we describe the service functions performed from the Ajax-Pickering Depot.

Map 3.0 – Current Location of the Works Department Depots and Operations Centres

Ajax-Pickering Depot

Roads Department
The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads, bridges and culverts. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store a large quantity of road salt (for winter road maintenance) and smaller quantities of other materials (such as gravel, cold-patch, etc.). The employees are provided with parking and indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water and Sewer Departments
The Water and Sewer Departments also operate a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations.

Fleet Services Department
The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Ajax-Pickering Depot they provide two licensed mechanics who service the fleet of Roads and Water Department vehicles. They operate on the day shift using two maintenance bays, and provide Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

3.1.3 Resources – Employees, Vehicles and Materials (Ajax-Pickering Depot)

In Appendix A, we list the current number of resources (employees, vehicles, equipment and materials) utilized by the Works Department at the Ajax-Pickering Depot. These numbers will be used, in section 3.2.4, to estimate the future resource requirements in 2030 and 2040.

3.1.4 Functional Work Areas (Ajax-Pickering Depot)

In this section, we describe the characteristics of the key functional work areas that are located at the Ajax-Pickering Depot. In section 4.2, we will discuss some of these areas in more detail from the context of industry best practices in layout design.

Administrative Office
The office staff require administrative space for offices, meeting rooms, printers, and various types of storage. A small reception area is also required for visitors to the site. The outdoor staff require a training room and a place to discuss daily work assignments at the beginning of the shift. Some of the outdoor workers (typically Lead Hands) require access to a touch-down station (with computer terminal) to input data at the end of the shift.

Employee Amenities
The outside workers require changing rooms, lockers, washrooms and showers for male and female outside employees. A lunchroom is also required, however, most of the outside workers do not return to the Depot for lunch so the lunch room is primarily used by the office staff. There also needs to be consideration for gender-neutral and multi-faith facilities.

Fleet Maintenance Garage
Fleet Maintenance bays are required for providing on-site maintenance to the Fleet of work vehicles. The bays provide space for changing fluids, as well as for completing major repairs (including welding). Painting and body work are contracted out.

Parts/Tools Storage
Storage space is required for the storage of Fleet maintenance parts. Automotive parts
are, typically, stored on shelves in a room adjacent to the maintenance bays. Small tools and equipment (for the outdoor crews) are, typically, stored in locked rooms adjacent to the employee amenities and parking area for the work vehicles.

Vehicle/Equipment Storage
Indoor storage space for specialized work vehicles and equipment is provided. This includes bucket trucks and tandem axle plows. All other vehicles are stored outdoors.

Wash Bay
An indoor wash bay is provided for the fleet of vehicles.

Salt Storage
There is one building for the indoor storage of salt for winter maintenance operations. Salt is stored indoors to protect it from rain.

Fueling
There are fueling pumps that provide fuel (gas, diesel and coloured diesel) to work vehicles stored within the yard.

On the following page, in Table 3.2, we provide the current space available for each of these areas.

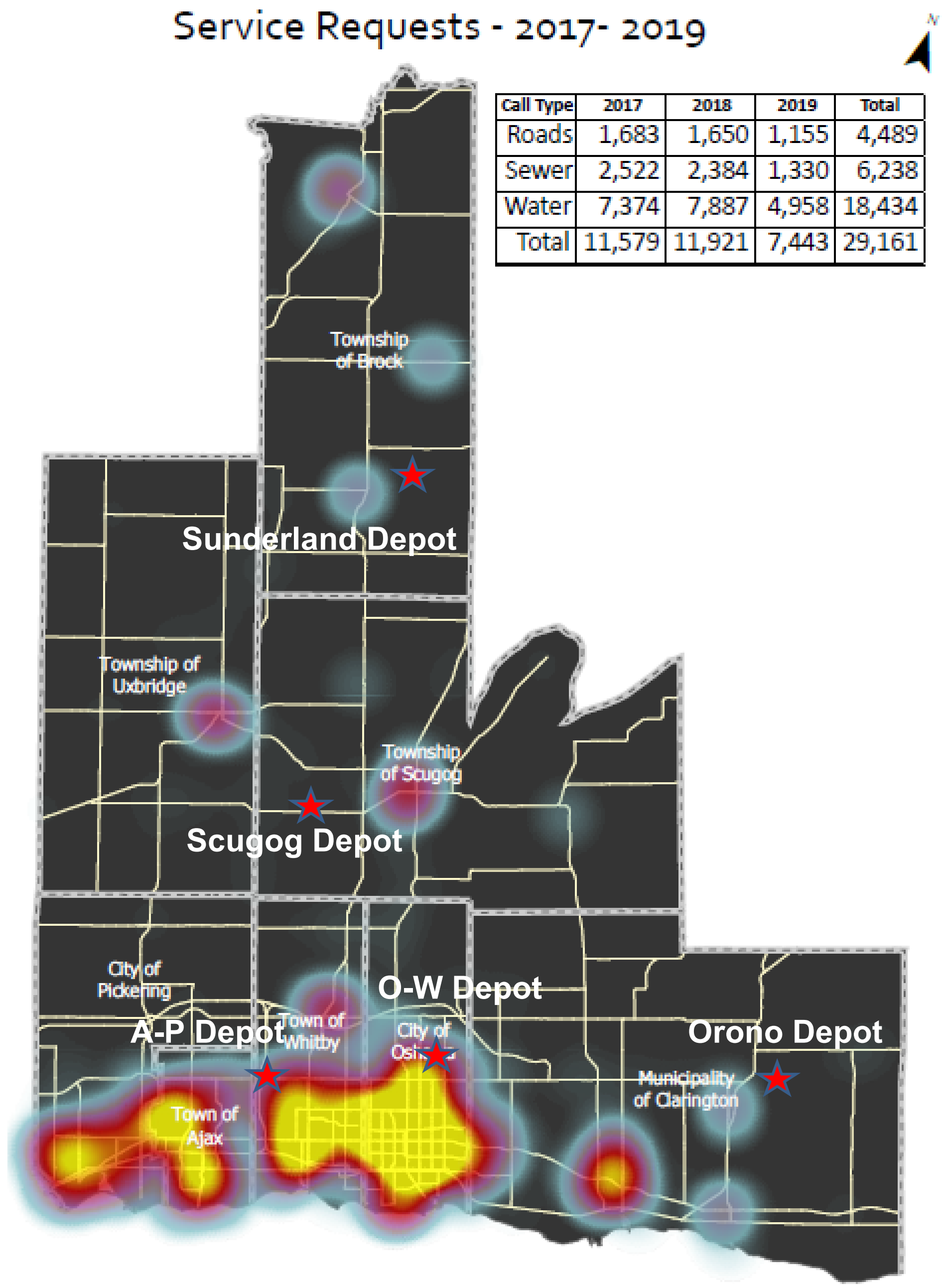
3.1.5 Facility Limitations – Location, Size, Design, Layout and Condition (Ajax-Pickering Depot)

In this section, we discuss the limitations imposed on the Ajax-Pickering Depot due to its location, size, design, layout and condition. Map 3.1, on page 15, is a Heat map and will be used to evaluate the location of the Ajax-Pickering Depot relative to where the service calls are. The Heat map uses colour to reflect the frequency of service calls throughout the Region. Light blue represents a low frequency of calls whereas yellow represents a high frequency.

Table 3.2 – Current State Areas at the Ajax-Pickering Depot – 2020

Functional Work Area	Ajax-Pickering (ft^2)
Administrative Office	37,714
Employee Amenities	
Materials Testing Lab	0
Water Meter Shop	0
Fleet Maintenance Garage	4,391 1 Drive-through; 1 one-way
Parts Storage	2,118
Vehicle/Equipment Storage	14,826 2 Drive-through; 8 one-way
Wash Bay	Yes
Salt Storage	4,909
Fueling	Yes

Map 3.1 – Frequency of Service Requests for Roads, Sewer and Water by Location



Call Type	2017	2018	2019	Total
Roads	1,683	1,650	1,155	4,489
Sewer	2,522	2,384	1,330	6,238
Water	7,374	7,887	4,958	18,434
Total	11,579	11,921	7,443	29,161

Ajax-Pickering Depot

Location

The Depot is located slightly north and, approximately, 5 km to the east of the geographical centre point of its service territory – the City of Pickering and the Town of Ajax. It is located on the north-west corner of the intersection of Salem Road and

Taunton Road East. To the east is a golf course; To the north is a hydro corridor; To the west is low density residential, and to the south is commercial development and a sprawling residential community.

In general, the Depot is considered, by staff, to be in a good location relative to the area that it serves. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is located close to the where the majority of the service requests originate from. That said, it would be preferable for the Roads group, currently, if the Depot was located closer to the geographical center point of the service territory. For the Water and Sewer Services groups it would be preferable, currently, if the Depot was located further south-west towards where most of the pipe networks are located.

2) **Traffic Congestion Faced by Work Crews:** The populations of Pickering and Ajax have increased significantly during the last twenty years which has increased traffic congestion and adversely affected the travel time required by work crews during the rush hour periods. This has decreased their productivity. However, they have benefited from the fact that the Depot is located on a major road network with good access to all parts of the service territory. That said, it would be preferable for the work crews, currently, if the Depot was located closer to Brock Road for its north-south access, and connection to Highway 401.

3) **Location of the Depot Versus Future Population and Employment Growth:** The construction of Highway 407 has encouraged the growth in population and housing to move northwards. This will have a greater impact on the Water Services group as new water, storm and sewer systems are built in the north half of the service territory. Therefore, to minimize travel distances, in the future, it would be preferable if the Depot was located closer to the geographical center point of the service territory.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wet lands. Given these requirements, the Ajax-Pickering Depot is in a relatively good location.

Size, Design and Layout
The productivity of the employees currently working at the Ajax-Pickering Depot is directly affected by the size, design and layout of the buildings and the yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The size of the site, at 15.2 acres, provides sufficient space for the expansion of buildings and yard activities over the next 20 years. The main building was built in 1973 and has been modified, internally, over the decades to suit changing needs. The layout of the buildings and yard reveal that they do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The office area, shops, and employee amenities are too small (in most cases) for current needs, and present numerous limitations to the efficient flow of employees. Hence, the level of efficiency and effectiveness at which the employees work is compromised. For example, the lunchroom is also used for storing technical drawings, and there are no washrooms/changing rooms for female outside workers;

- The individual offices are, typically, larger than they need to be. Furthermore, there are too many private offices and cubicles which reduce employee collaboration, and consume excess floor space;

- The meeting rooms and training rooms should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy;

- Touch-down stations should be made available for those outside workers requiring a computer for less than 4 hours per day (to reduce space requirements);

- The design of the facility should be “barrier free” and comply with provincial requirements for accessibility. The meeting room and changing area on the second floor within the maintenance garage are not accessible;

- Many work-spaces receive little or no natural light and ventilation (which can be as simple as access to an operable window). This has often been identified as a cause of lower productivity levels and morale within offices;

- The storage rooms do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements;

- There is no system for managing the Fleet maintenance parts, and the storage system is inefficient;

- The indoor vehicle wash bay is too small for the larger trucks;
- There is a shortage of space for both interior and yard materials storage;
- This salt storage building should provide both indoor storage and loading. This will minimize spillage of salt into the environment and help contain the noise from the loading operation;
- The two yard entrances should have one-way flow to reduce the risk of vehicle collisions;
- The flow of heavy vehicles should be counter-clockwise through the yard to improve driver sightlines and minimize the risk of collisions;
- Employee and work vehicles share the same two yard entrances but are kept separate once in the yard. Ideally, they would use separate entrances to minimize the risk of collisions;
- All plastic and rubber items, including piping and fittings, must be stored in shelters that protect these items from deterioration by the sun;
- The desiccant drying area should be paved;
- The general arrangement of the buildings within the yard is adequate. However, the material and tool storage buildings (adjacent to the salt storage building) should be located closer to the main building for quicker access by employees. Typically, these storage areas are located adjacent to the indoor vehicle storage area and employee amenities.

Building Condition
The main building was built in 1973 and is, therefore, approximately 3/4 through its expected asset life. In general, the building appears to be well maintained and in reasonable condition given its age. The following items have been identified as issues requiring repair or upgrade to the building's substructure, shell, interior or services:

- The roof requires replacement (estimated at $480,000);
- An epoxy coating should be applied to the vehicle storage area (estimated at $155,000);
- There are no sprinklers within the building ($100,000);
- An emergency back-up electrical generator should be installed ($295,000);

- A hydro service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot;

- A gas service audit is required to determine if the existing service will meet the demands of a future expansion to the Depot.

Our understanding is that a Building Condition Assessment will be completed within the next two years to better identify any underlying issues requiring current or future repair to the buildings on-site.

3.1.6 Opportunities to Reduce Space Requirements

In this section, we will discuss a number of Best Practices for reducing space requirements within an Operations Depot. Reducing space requirements would, potentially, reduce the size of needed building additions. **Some of these approaches may have already been initiated by the Works Department.**

Incorporate LEAN to Reduce Waste Within the Business Processes

LEAN is an operational philosophy that improves business processes by focusing on the delivery of *value* to the customer. Employees, at all levels of the operation, participate in the identification and elimination of non-value-added activities (waste) throughout the operation. The result is shorter cycle times, lower operating costs, and higher customer service levels. Other benefits often include a reduction in the number of employees, equipment, inventory and space required.

LEAN was originated by Toyota to dramatically reduce cycle times and costs, and to increase product quality and service delivery. The seven types of waste that LEAN seeks to eliminate are present in every operation. They include (with examples):

- Transportation (transporting work vehicles to a different yard to be maintained);
- Defects (time spent fixing work done incorrectly the first time);
- Inventory (storing more materials or maintenance parts on-site than are necessary);
- Motion (crews driving to a work site);
- Wait time (crews stuck in traffic or waiting for their vehicle to be repaired);
- Overproduction (making more signs than are needed or before there is demand for them);
- Over-processing (performing steps in a process that are unnecessary).

LEAN uses various standard techniques and tools which fall into the broad categories of visual communication of information, process mapping, process control, and identification and elimination of defects. Some of the best-known lean tools and techniques include value-stream mapping (a diagram of the employee/material and information flows required to complete a job); just-in-time production (delivering the exact amount needed, when and where it's needed); the "5 S's" (five principles of an organized workplace); work leveling (ensuring consistent type and quantity of work over a period of time to avoid batching and backlogs); and kaizen (continuous improvement).

Therefore, all business processes should be streamlined to reduce waste before determining if a building needs to be expanded. Doing this would ensure that the size of the expansion is minimized to reduce land requirements, and capital construction and operating costs.

Our understanding is that the Region has begun training employees in LEAN Manufacturing and will be using it to improve their business processes.

Incorporate a Performance Management System to Achieve Continuous Improvement

A Performance Management System is an ongoing process for reducing operating costs and improving customer service. A common Performance Management System uses a five-step approach (define, measure, analyze, improve, and control) to help ensure that management decision-making and employee activities are focused on identifying and eliminating non-productive activities so as to continuously improve operational performance and achieve objectives for service delivery.

More specifically, the process should:

- Define key success factors and key performance indicators;
- Measure and report actual performance (i.e.; service levels and operating costs) and compare it to the target standards;
- Analyse the results and identify opportunities to improve, and actions required;
- Improve performance through informed decision making, and a focus on accountability for performance;
- Control/Sustainable improvements over time.

A Performance Management System transforms the organization, its management, and the policy-making process. It becomes integrated into all aspects of the organization's management and policy-making processes, so that it is focused on achieving improved performance for the public.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the business process are adhered to. They must be chosen with care because changes in one area of the business process can have unintended impacts in other areas.

All key performance indicators should be measured through an IT management system and reported on a weekly basis. Weekly meetings should take place both at a senior management level as well as in the shops to analyze this information and to determine what action should be taken to improve the results. Any recommended changes to the business process should be documented and controlled as a Standard Operating Procedure (SOP). Semi-annual audits are required to ensure compliance of the SOP's by the workforce.

The Works Department is currently in the process of implementing a Performance Management System (to be referred to as EMMS).

Outsource Scheduled Maintenance for Light Duty Vehicles (Class 1 & 2) (to reduce maintenance costs and maintenance bays)

Outsourcing scheduled maintenance for light duty vehicles (Class 1 & 2) to a Third-Party Provider, often, reduces maintenance costs and permits Fleet Services to focus on unscheduled maintenance and heavy vehicles. This also reduces the number of maintenance bays, parts storage, employee amenities, and employee parking. However, Class 1 & 2 vehicles located at Depots with Fleet Services are often fully maintained there (i.e., scheduled and unscheduled maintenance) to eliminate the downtime from shuttling vehicles to off-site Third-Party Providers.

Consolidate Parts Storage into One Area and Review the Management Approach

The parts/supplies storage for all five Depots and the Operations Centre should be consolidated into one Stores Department. This would eliminate duplication in space requirements and would achieve economies of scale.

In terms of the management approach, Vendors or 3PL's (Third Party Logistics provider's) are, typically, very cost effective at managing those parts which move off the shelf quickly - referred to as fast movers (e.g., ten or more turns per year). Therefore, these parts should, probably, be managed off-site by the vendors or a 3PL and supplied to the Stores Department, as required, to replenish their point-of-use storage levels. This would reduce on-site storage space, stock-outs, logistics costs and improve customer service.

Vendors and 3PL's (Third Party Logistics provider's) tend to be much less cost effective at managing slow movers, critical spares and dead stock. Dead stock (i.e., has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. The slow movers and critical spares should be managed in-house to reduce logistics costs.

Consolidation of medium and slow movers, and critical spares, into one Stores Department, would help to justify high density storage systems and automation, reduce labour and space requirements, and reduce warehouse costs.

The objective of the Stores Department would be to order, receive and store inventory, and to replenish parts, tools and miscellaneous supplies to the point of use storage areas within the maintenance garages and Departmental tool/supplies storage areas at each Depot and the Operations Centre.

Our understanding is that the Works Department maintains a central Parts Store at the Oshawa-Whitby Depot. From here they supply the Fleet garages located at the other four Depots. However, they should also supply the Traffic Operations and FM&O Group at the Traffic Operations Centre.

Optimize the Inventory Levels within the Stores Department and at the Point-of-Use Storage (to reduce costs versus using a Vendor or 3PL, and to minimize space)

Stores Department and point-of-use inventory levels should be analysed and optimized to minimize space requirements, inventory costs and stockouts.

There are two primary ways to minimize space requirements for the storage of parts:

1. Reduce inventory levels
2. Increase the density of storage

This section will discuss ways to reduce inventory levels. Later we will discuss ways to increase the density of storage.

Reduce Inventory Levels

The two primary ways to reduce inventory levels are:

- Reduce the number of SKU's;
- Reduce the average inventory level for each SKU.

Industry Best Practice is for 3 turns/year or greater within the storage area. If the inventory is, typically, turning over less than 3 turns/year there is likely an opportunity to reduce warehouse inventory levels which would reduce inventory carrying costs and the need for warehouse storage space (and associated operating costs).

We recommend that inventory levels be measured and recorded, at least monthly, so that the number of turns of individual SKU's can be measured. Once this information is available, it is recommended that those SKU's with a turnover of 1 or less be analysed to determine why their turnover was so low and whether the turnover could be increased while still satisfying service requirements.

Some of the typical reasons for low turnover may include:

- Some of the SKU's are dead stock that should be written-off and removed from inventory;
- For some SKU's, the reorder levels are too high which should be reviewed and corrected;
- For some SKU's, the reorder quantities are too high which should be reviewed and corrected;
- Actual inventory levels were higher than thought when new orders were requested;
- When some of the SKU's were brought into stock for the first time, the requestor overstated their needs resulting in excess, unused inventory;
- Seasonal items will likely have excess levels that are held over until the next year;
- Critical Spares stock may require excess inventory levels to avoid the possibility of stock-outs;
- End users may request that certain SKU's be held in stock (rather than removed) for multiple years because they are no longer commercially available;
- The rate of demand for some SKU's is unpredictable, thereby, requiring higher than optimal inventory levels.

Additional opportunities for reducing either the number of SKU's in inventory or the average level of inventory for each SKU may include:

- Reduce the number of vendors providing the same equipment. For example, purchase all crew cabs from the same manufacturer. This will reduce the number of maintenance SKU's required;
- Determine which SKU's (other than the Critical Spares) could be eliminated from inventory because they could be supplied, by the vendor, within two hours of request;
- Determine which SKU's (other than the Critical Spares) could have their inventory significantly reduced because a vendor would be willing to manage the inventory to optimal levels. This is referred to as Vendor Managed Inventory (VMI);
- Reduce excess inventory levels by analysing those items purchased in bulk to determine whether there are false economies with purchasing in bulk;

- Reduce excess inventory levels by using bar code scanners (integrated with a Warehouse Management System) to improve inventory accuracy, visibility and control.

In summary, there is likely an opportunity to reduce warehouse space and operating costs by determining which of the SKU's may be eliminated from inventory, and which SKU's may have their average inventory level reduced.

Measure Performance and Hold Accountable the Vendors or 3PL to Reduce Stock-Outs and Lead Times (to reduce vehicle downtime and spare vehicles)

Above, we discussed the importance of using a Performance Management System to measure and improve performance. If the Region decides, in the future, to use a Vendor or 3PL to manage the parts inventory, their performance must be measured to ensure that the objectives for customer service are being met. Failure to meet objectives will lead to greater vehicle downtime and a larger number of spare vehicles required to compensate for the downtime.

On the following page, we list a number of key performance indicators that could be used to measure the performance of a Vendor or 3PL.

On-Time Delivery:

- **Inventory Count Accuracy by Dollars/Units** measures the accuracy of the physical inventory compared to the reported inventory;
- **Line Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of lines filled to the customer's request;
- **Order Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of orders filled to the customer's request;
- **Backorders as a% of Total Lines** measures the percentage of orders that are shipped late due to a lack of stock;
- **Order Picking Accuracy** measures the picking accuracy. It is the percentage of orders picked correctly;
- **On Time Ready to Ship** measures the success rate of the warehouse to prepare items on-time for shipment. It is the percentage of orders ready at the planned time to meet customer requirements;
- **On Time Shipments** measures the success rate of the warehouse to actually ship items on-time. It is the percentage of orders shipped at the planned time;
- **On Time Delivery** measures the success rate of the trucks to deliver on-time. It is the percentage of orders delivered to the customer at the requested time.

Warehouse Costs:

- **Lines Received and Put Away per Person Hour** measures the productivity of receiving operations;
- **Lines Picked and Shipped per Person Hour** measures the productivity of picking operations;
- **Cases Picked and Shipped per Person Hour** measures the productivity of picking operations;
- **Internal Order Cycle Time** measures the average time from when the order was received from the customer to when the order was shipped;
- **Productive Employee Utilization** measures labour activity levels;
- **Material Handling Rate** measures the total cost to operate the distribution network relative to the total cost of Inventory Sales.

Inventory Costs:

- **Turnover Rate** measures the level of excess inventory within the warehouse.

Transportation Costs:

- **Courier Cost per Line Shipped** measures courier efficiency.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the supply chain process are adhered to. They must be chosen with care because changes in one area of the supply chain can have unintended impacts in other areas.

Improve Vehicle Availability (to reduce spare vehicles)

It is common for municipal operations to have vehicle availability problems which severely constrain their ability to meet service requirements. Typical factors which may create a problem include:

- Difficulty in obtaining parts to carry out repairs which, in turn, may have been caused by:
  - Inadequate inventory;
  - Having too many types of equipment requiring too many types of spare parts;
  - Damage caused by operations resulting from inadequate training of operators or other factors resulting in unnecessary breakdowns;
  - Outdoor storage of vehicles, particularly sidewalk plows and blower attachments for loaders;

  - Failure to complete annual preventive maintenance and inspections;
  - Poor communications with Fleet Services.

Steps that can be taken to improve vehicle availability include:

- Improve operator training on vehicle damage issues;
- Improve communications with Fleet Services;
- Provide indoor parking for vehicles to reduce failure rates;
- Contract out seasonal inspections/refurbs if Fleet Services is unable to ensure completion;
- Improve standardization of vehicles/equipment – buy fewer specialized units;
- Accept mechanics with heavy equipment ticket;
- Have operators report equipment problems directly to Fleet Services (while also advising their Supervisor);
- Provide faster feedback to operators on preventable damage occurrences;
- Establish a process to have Fleet Services and Operators formally review failures and repair delays every two weeks to identify issues. The result could be changes in operating practices and/or inventory levels required and/or notice/directive/training for vehicle users;
- Improve training, of operators aimed at reducing equipment damage, improving operator familiarity and skill with equipment for snow operations.

Incorporate Technology to Optimize Vehicle Service Routes (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should use computer programs to plan, balance, develop and optimize vehicle service routes for winter maintenance (i.e., plowing and salting). The objectives of the programs are to, in part, reduce deadhead time, and maximize the overall efficiency of the routes and required fleet of vehicles. This helps to reduce operating costs and improve service delivery. By optimizing the service routes, the Department will minimize the size of its Fleet. This reduces vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Incorporate Technology (AVL/GPS Tracking) to Measure Performance of Field Crews (both Contractors and City Employees) (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should continue using AVL technology to monitor and record the routes taken by their vehicles. This is most often done for winter maintenance vehicles to mitigate the risk of lawsuits. However, it can be done for all vehicles as a way of monitoring their daily routes and ensuring that they are being used productively. This well help management to identify and eliminate non-productive work activities so as to continuously improve operational performance and minimize the size of the fleet required. Reducing the size of the fleet will reduce vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Eliminate Contractor Parking at the Depots

For Winter Maintenance contracts (i.e., plows and salters), there are benefits to having the contract vehicles located at the Depots (close to the salt/sand storage and the start of the routes).

Municipalities now have to operate in compliance with the Minimum Maintenance Standards for Municipal Highways (MMSMH) if they wish to limit their liability and exposure to claims for negligence. The MMSMH were originally developed in the late 1990's as a mechanism to help municipalities deal with the increasing costs of negligence liability insurance as a result of increases in claim settlements.

This Provincial regulation, under the new Municipal Act, specifies minimum maintenance standards for roads, bridges, shoulders and signs. Although such "standards" have only "guideline" status, failure to achieve such 'standards of care' could have liability implications in civil suits. As such, municipalities have, typically, taken the approach of aligning their standards to the minimum standards set out in the regulation. In theory, in any potential lawsuit, if the municipality can show that it meets the Minimum Maintenance Standards for Municipal Highways, then it has presented the legal argument against the lawsuit. There is an increased liability risk associated with not meeting the minimum standards under Ontario Regulation 239/02.

Municipalities have complete administrative control over highways/roads under the jurisdiction of the new Municipal Act but do not have to adopt the Standards. However, in cases where the Standards are not adopted by a municipality, judgements against such municipalities for poor maintenance will be made by the courts after comparison with the Standards. Such being the case, the Standards will be the defacto standard for all municipalities as far as road maintenance is concerned.

That said, given the close proximity of all five Depots to rural areas, it may not be necessary for the Works Department to provide space at the Depots for the contractors to park their vehicles. The contractors may be able to find alternative, affordable space near by. This would reduce the space requirements at each Depot.

Optimize the Average Age of the Fleet (to reduce fleet maintenance, and the number of spare vehicles)

There are many issues that will affect the determination of the optimal number of vehicles in the Fleet - shift work structure, location of yards, design of service routes, age of the Fleet and requirement for spares, use of contractors, and mix of vehicles. Some of these (location of Depots and the design of service routes) were discussed above. In this and the following two sections, we discuss the importance of fleet age and utilization, and the mix of vehicles within the Fleet.

The optimal service life of a work vehicle varies based on class, duty and utilization. Vehicles which are kept longer than their optimal service life require increasing amounts of maintenance – both scheduled and unscheduled. Older vehicles, therefore, consume more maintenance time and are out of use longer. This puts a heavier burden on Fleet Services and lowers the productivity of the work crews. To compensate, Public Works Departments, typically, carry a number of spare vehicles which require space to park when not in use. Therefore, the Works Department is recommended to replace vehicles once they are beyond their optimal service life.

Our understanding is that the Region does carefully manage the average age of their Fleet of vehicles.

Increase Fleet Utilization (to reduce fleet size)

The Works Department should maximize the utilization of its work vehicles so as to reduce the size of the fleet and the need for parking space.

Often, the utilization of vehicles reaches its peak in certain months, each year, then drops off significantly for the balance of the year. For example, tandem axle trucks usually reach their peak utilization in January and February because of plowing but then are largely inactive during the summer. This seasonal variation provides an opportunity to rely more heavily on contractors during the winter months. This would permit a reduction in the number of in-house winter maintenance trucks saving approximately $30,000 per truck per year in maintenance and depreciated costs. It would also reduce parking space requirements.

Optimize the Mix of Vehicles (to reduce fleet size)

There is a need to rationalize the Fleet, for the services provided, to ensure that there is the optimal mix of vehicles and equipment based on best practices. For example, when possible, vehicles should be deployed for multiple uses (e.g., plow, wing, spread, haul –with full capacity).

Permit Select Drivers to Take Cars, Vans and Pick-up Trucks Home (to reduce employee parking)

There are potential complications related to permitting employees to drive work vehicles home. However, there is also the potential to save a significant amount of yard space due to a reduction in employee vehicles.

Provide Incentives for Employees to Car Pool, Cycle or Use Transit

Encouraging employees to car pool, cycle or use public transit will reduce the need for yard space for employee parking. Buildings should be equipped with lockable storage for bicycles, and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

Refuel Work Vehicles during the Night (to reduce the number of dispensing pumps and lanes)

It is best practice, within the Transit industry, to clean and refuel buses (using specialized work crews) during the night when they are not in use. This, potentially, reduces the number of refueling pumps required because the process is spread out over four to eight hours. It also reduces vehicle downtime (during the day) and ensures that the buses are ready to operate at the start of their shift. This approach to refueling may be applicable to the Fleet for the Works Department.

Permit Class 1 & 2 Vehicles (i.e., Cars, Vans and Pick-Up Trucks) To Use Public Gas Stations (to reduce dispensing pumps and lanes)

Refueling off-site, potentially, reduces the number of refueling pumps required and the space required.

Reduce the Use of Salt for Winter Maintenance (to minimize the size of salt storage buildings)

The Roads group needs to store salt indoors for winter roads/sidewalk maintenance. The best practice approach for salt storage is the combined storage and loading into one facility. The alternative approach is to store the materials inside but to conduct the loading outside.

To minimize the size and capital cost of any new salt storage facilities, the Roads group should look for additional ways to reduce its annual consumption of salt. Industry Best Practices for reducing the consumption of salt are shown in Table 3.3.

The Roads group should also consider the following ways to minimize their use of salt:

- Weigh scales should be considered to help measure the amount of salt being loaded into trucks;

- Should adjust the quantity of salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems;

- Should optimize salt application rates. For example, restrict application rates on arterial collector roads to 135 kg/lane km, and for local roads to 70 kg/lane km;

- Should undertake pre -wetting in all spreading activity. Pre-wetting is a very effective practice and should be included in all spreading activity. The entire spreading fleet should be outfitted with pre-wetting capability. The purpose of pre-wetting is to wet the salt for several reasons:

    - In the case of cold pavements, it enables the grain to freeze to the pavement
    - In the case of snow packed surfaces, it enables the grain to “melt” into the snow pack rather than “blowing” off
    - In the case of de-icing, it begins the brine making process by reacting with the crystalline salt to produce a brine concentrate which then lowers the freezing point of contact resulting in melting
    - In the case of traffic, it mitigates bounce off (up to 30% has been measured) by making the grains “stickier,” similarly with windy conditions.

  In general, the benefits include granules that adhere to the surface better, have a faster and longer-lasting effect, and can be spread more quickly.

  The practical result of pre-wetting should be a reduction in the resources necessary. The investment in brine making equipment would reduce the cost of supplying the brine. There is no advantage to using chemicals such as calcium chloride. Water could be used to similar benefit if it could be prevented from freezing in the tanks. With improved calibration and controls in spreader vehicles, it is reasonable to establish a range of spread rates to be applied under certain conditions;

- Should undertake a demonstration program to assess the merit of achieving centre bare pavement service, post storm, by using a sand product mixed with 25% salt;

- Should make use of calibrated spread vehicles to compare actual material spread rates across routes, across vehicle units, and across staff operators within a given winter season;

- Should compare actual material spread rates for each route and vehicle unit across winter seasons (time series analysis);

- Should implement disciplined spread management practices supported and refined by spread rate benchmarking and measurement. The benchmarking approach is practical because it is internal in focus (avoiding complex apple to apple issues across other municipalities), and it is firmly linked to the enforcement of service levels, individual operator behavior, and cost savings targets.

Table 3.3 - Industry Practices for Reducing Salt Consumption

Industry Practice
Removing as much snow from the roads as possible to minimize the amount of snow and ice that that needs to be melted (and the quantity of sand/salt required)
Using Material Loading Sheets that describe and limit the amount of sand/salt loaded into the sander/salter. This will prevent the driver from using excessive quantities of sand/salt.
Adjusting the quantity of sand/salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems
Optimize sand/salt application rates. For example, restrict application rates on arterial collector roads to 130 kg/lane km, and for local roads to 65 kg/lane km.
Pre-wetting of salt using brine to improve the utilization rate
Pre-wetting of sand using hot water to reduce bouncing and improve the utilization rate
Using computerized controls on spreader equipment that can accurately control the rate of sand/salt application so that the quantity applied to the roadway is minimized
Blend brine with other chemicals to produce “Hot Brine” that will be effective below – 12°C
Direct Liquid Application to replace the use of brine with a chemical that works as low as -30°C

Industry Practice
Using GPS systems on the trucks to (1) monitor the speed and location of the trucks through Automated Vehicle Location (AVL), and (2) provide route guidance and spreader control for the driver
Training staff so that they understand how to use the equipment and take other steps to minimize the application of sand/salt
Use loader scales to measure and record the quantity of sand/salt used by each truck and then use this information to identify opportunities to reduce consumption rates. If you don't measure it, you can't reduce it.
Store sand indoors as this will reduce the need for pickling with salt from 5% down to 3%.

Request that Field Crews Eat at their Work Site (to reduce the size of lunchrooms - only for inside workers)

Field crews should continue, when possible, to eat lunch at their work site (or closest restaurant/Depot) rather than returning to their home yard to eat in the lunchroom. Doing this will permit the lunchroom to be sized only for those employees working full-time at the yard. This, in turn, will reduce space requirements.

Replace Touch-Down Desks with Dash Mounted Devices (to reduce space)

Some field employees/foremen require limited access, each day, to a computer to receive work orders and to input information/data. Typically, workstations or "touch-down desks" are provided for these employees. The new trend is to provide these employees with access to mobile tablets or dash mounted devices to input the information/data. The benefit is increased employee productivity and a reduction in office space for the workstations or "touch-down desks".

3.1.7 Opportunities to Improve the Depot Design

In section 3.1.5 we listed a number of design issues that are adversely affecting employee productivity, and the efficient utilization of space at the Ajax-Pickering Depot. Below, we list a number of ways to improve the design of a Depot.

Incorporate Transit Bus Style of Parking for Vehicles (to reduce space)

Within the Transit industry, it is best practice to store buses indoors in long lanes (typically, 6-8 buses deep). This approach should be considered for other municipal fleets that require indoor storage and can operate with a first in, first out philosophy. This would include those winter maintenance vehicles that leave the yard at the same time.

Therefore, the approach to designing the layout for the indoor storage of work vehicles should (1) identify those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identify the optimal width and length of each lane to minimize the total area requirement.

Standardize - Utilize Corporate Space Standards for Offices, Employee Amenities and Shops (to reduce variation and space, and increase collaboration and productivity)

The Region of Durham is currently going through a process to standardize and document their space requirements for offices so as to reduce variation amongst locations, and space requirements. These standards should help promote employee collaboration, productivity and the desired corporate culture. For example, most municipalities are eliminating walls and modular office partitions in favour of an open concept office environment. Offices are becoming smaller or eliminated all together in favour of more meeting rooms.

- Office staff should, where appropriate, be consolidated into one open concept administration office area. This will improve communication and collaboration between employees, and will optimize space utilization;

- Meeting rooms and training rooms (adjacent to the administration office area) should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy. Their use should be shared amongst the Works Department to reduce the total number required due to variations in demand;

- Touch-down stations should be consolidated (if not replaced with mobile devices or vehicles dashboard units) between the different groups to reduce the number required and to reduce space requirements;

- Employee amenities (lunchroom, change rooms and washrooms) should be consolidated and shared by all employees (including both office and unionized staff) to eliminate duplication and to efficiently utilize space. The lunchroom should also be designed for flexible use (with mobile partitions and furniture). The employee amenities should be located on the ground floor level close to the work vehicle storage areas;

- Parts/materials stores, from different groups, should be consolidated to eliminate duplication, and to implement technology and storage systems which will maximize the cube and more efficiently utilize space;

Design for Flexibility - Design Lunchrooms to be Multi-purpose (e.g., crew meetings and training) (to reduce space)

When possible, facility areas should be designed to be flexible in their use. For example, lunchrooms should be designed for multiple purposes as a way of consolidating areas and reducing the total space requirements. Lunchrooms are often also used for start-of-shift crew meeting areas, and training rooms.

Design a Healthy Work Environment (to improve productivity)

A variety of research has shown that employees are both happier and more productive in office environments with natural light, views, and ventilation (which can be as simple as access to an operable window). Natural light has been shown to reduce seasonal affective disorder, increase visual clarity, help regulate sleep, reduce drowsiness, improve immune function, reduce sick days and increase productivity. Access to natural light, views and ventilation is the basis for three LEED points and is written into many other green standards. Many government organizations have codified the 'Right to Light' for their office design standards -- for example, Alberta Infrastructure's *Technical Design Requirements*.

Contemporary office design best practice places open workspaces toward the exterior of the floor plate, with private offices and meeting rooms closer to the center. In this way daylight reaches the greatest number of staff. Natural ventilation, including operable windows, should be incorporated wherever possible. Workshops should be treated similarly, maximizing use of natural light and air, with control of glare being critical. We have found that small areas of transparent glazing combined with larger zones of light-diffusing translucent panels provide ideal lighting conditions for fleet garages, wood and metal shops, and other similar environments.

Design for Safety

The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the building. Once in the building, the public should be greeted at a reception counter.

The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles.

3.2 Future State

This section will begin by discussing the various growth factors that will be affecting the Works Department over the next twenty years. It will then recommend the future number of resources required at the Ajax-Pickering Depot so that it may continue to work efficiently and effectively towards meeting its service delivery requirements.

3.2.1 Growth and the Changing Needs of Durham Region

The Region of Durham is considered to be one of the fastest growing Regions in the world. Between 2011 and 2016, the population grew by 6% to 673,000 people. It is now expected to grow by another 78% to 1.2 million people by 2041 (according to the "Durham Region Planning for Growth" report issued under "Envision Durham" in 2017). To sustain this growth, new roads, sewers, and water supply infrastructure will be expanded, and additional traffic signals and facilities will be required. Furthermore, changes in climate, technology, government legislation, communications and the condition of infrastructure, will further increase the demand for Regional resources.

Below, is a description of some of the main factors that will affect the need for resources (employees, work vehicles, and materials), by the Works Department, over the next 20 years, to best meet the service and maintenance requirements for the Region.

Population and Infrastructure Growth

The Region of Durham covers an area of 2,500 square kilometres, which is four times the size of Metropolitan Toronto. With an expected population growth of almost 80%, over the next 20 years, there will be a direct impact on the Region's Works Department – especially along the Lake Ontario shore communities where the majority of growth is expected. Expected changes will include the need to maintain new and expanded infrastructure (such as roads, water, sewers, traffic operations), as well as existing, aging infrastructure that suffer greater wear and tear with higher population levels.

In some areas (the East and North end of Durham, and in the Seaton area) there are still considerable areas for urban expansion growth, with new housing subdivisions being planned. These changes will likely result in an increase in lane kilometres of roads and pipe networks that will need to be maintained. In the South and West end of Durham, population densification is both expected and desirable as new families choose lifestyles that include apartment and condominium living, and homes with reduced property area. This densification will likely result in a number of changes that will affect the resource requirements for the Department. Examples include:

- Increased and extended traffic congestion, affecting both work site interference and staff travel time. This will increase the need for more employees in order to maintain the same service levels;
- Reduced speed for snow plowing resulting in the possible splitting of routes;

- Increased use of smaller equipment that is more suited to sidewalks and partially restricted narrower streets;
- Increased control of Traffic Operations to measure, meter, control and coordinate traffic flow;
- Expansion of Water, Storm, Sewer, Electrical and Communications services and related capacities to meet the increased service density;
- Changes to Regional roadways to accommodate transit, pedestrians, cycling and alternate forms of transportation.

To reduce the effect of population growth and densification, it will become increasingly important to have the correct number of employees, vehicles, equipment, and materials strategically located and supported from efficient Works Depots that can expand and change to meet new requirements.

Lane Km's of New Roads

There is estimated to be an increase of 341 lane km's of new Regional roads over the next 20 years. This represents a **14.2%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Km's of new Pipe Systems

There is estimated to be an increase of 1,945 km of new Regional pipe systems over the next 20 years. This represents a **41.8%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Changing Technology and Expectations

Durham Region has, over the years, adapted to numerous changes in technology and methods that will continue to affect the way operations are carried out. These changes save money, labour, time, and the environment. Community expectations are also changing. As densification increases, greater emphasis must also be placed on alternate transportation methods, more efficient land use, transit infrastructure and support for pedestrians. This will make roadways and their associated service infrastructure much more complex, with increased activities required to maintain the related assets.

In addition, population demographics will continue to change towards residents with higher service expectations. Citizens are expecting greater communication, involvement, and transparency in the planning and spending of their tax dollars. This means that the Department will need to continue to implement new technologies and require more formal procedures to monitor and improve performance.

Increasing Legislative Regulations, Standards and Associated Costs

A trend towards increasing government regulations, policies, standards, and their associated higher costs will continue to impact the ability of the Department to deliver core services, and meet expectations. This is already being experienced in winter roads maintenance, where feedback from insurance company data and judicial claims is, in many cases, dictating the service response time for winter roads maintenance. Managing to reduce potential liability claims, is now affecting the ability to manage within the existing budgets and resources.

Environmental Considerations and Related Costs

Durham Region is already experiencing increasing costs related to rapidly changing climatic factors. In the last decade, storm frequency and severity has increased, resulting in substantially increased operations costs. As this new situation becomes the norm, considerable work will be required to render the infrastructure more robust to withstand high winds, increased volumes of storm water, and sudden floods with high lake and ground water levels. Also, as the Region works to mitigate these factors, the Works Depots and Operations Centre will be expected to remain fully operational during emergencies with emergency power, communications systems and service equipment that fully support emergency repair services.

In addition, Durham Region has made a commitment to continue to be environmentally responsible and meet recognized environmental targets. These targets include initiatives to improve energy efficiency and reduce greenhouse gas emissions and other environmental contaminants. Improvements will be identified at all Depots that will need infrastructure upgrades to meet generally accepted best practices.

Infrastructure Deficit

Across many Canadian regions, aging and deteriorating infrastructure has resulted in a large and growing infrastructure deficit. Within many municipalities, aging roads, water, storm and sewer systems are deteriorating and in need of repair beyond the level of normal annual maintenance.

As the infrastructure continues to age within Durham Region (especially in the oldest developed areas), more of the Region's efforts and annual costs will be focused on upgrading and replacing these infrastructure elements. This will add to the daily requirements of the workforce.

Durham Region is also very aware that the Works Depots that support daily maintenance work are needing upgrades to meet accepted best practices and new legislation changes. These changes will involve capital costs but will improve operations efficiency and employee relations for higher performance and competitive operations that provide good value for money spent.

Demand for Accountability and Value for Money

The Region, like all municipalities, is under increasing pressure to reduce operational costs and deliver greater value. Continuous improvement programs will be underway to eliminate waste and to develop improved methods for delivering services at reduced cost to the taxpayer. This means improved technology, increased training and monitoring of work crews, and overall increased transparency of operations that will demonstrate to the public that they are receiving good value for money spent.

Therefore, the number of services, employees and work vehicles that will be required in the coming years will be influenced by the above factors - changes in population, technology, legislation, aging infrastructure, and community expectations for service level requirements. While there is no way to know precisely how all of these issues will unfold, interact and affect the Works Department over the next 20 plus years, there is no doubt that they will lead to an increase in the number of employees, work vehicles, equipment and storage space required. This report will address the factors outlined above to develop a plan for growth that will be consistent with lean, efficient and competitive operations that the Public will be proud to support.

3.2.2 Resources (Employees/Vehicles/Equipment/Materials) for the Ajax-Pickering Depot

Section 3.2.1 discussed the predominant factors that will affect the resource requirements (employees, vehicles, equipment and materials) for the Works Department over the next 20 years. In this section, we will forecast the number of resources to be utilized at the Ajax-Pickering Depot over the next 10 to 20 years.

We will make the following assumptions:

- The current number of employees is sufficient to efficiently meet the service level requirements;
- The levels of service will not change over the next 20 years;
- There will be no new outsourcing or privatization of existing services;
- The utilization and mix of vehicles and equipment will not change;
- The need to increase resources (i.e., employees, vehicles and equipment) for the Roads Departments and will be proportional to the increase in lane km's of Regional roads. The need to increase resources for the Water and Sewer Departments will be proportional to the increase in km's of pipe networks;

In Table 3.4, below, we list the increase in lane km's of Regional roads for the service territory covered by the Ajax-Pickering Depot.

Table 3.4 – Lane Km's of Regional Roads

Department	Depot	Current Lane Km's of Roads	Increase in Lane km's by 2030	% Increase by 2030	Increase in Lane km's by 2040	% Increase by 2040
Roads	**A-P Depot**	525.3	68	**12.9**	136	**25.9**

Note: The above numbers are based on Regional forecasts for 2019-2028 for each of the Depot service territories (Ajax/Pickering = 61.1, Oshawa/Whitby = 69.9, Orono = 14.9, Scugog = 7.4 km)

In Table 3.5, below, we list the increase in km's of water and sewer pipe systems for the service territory covered by the Ajax-Pickering Depot.

Table 3.5 – Km's of Water and Sewer Pipe Systems

Department	Depot	Current Km's of Pipe Systems	Increase in km's by 2030	% Increase by 2030	Increase in km's by 2040	% Increase by 2040
Water and Sewer	**A-P Depot**	755.6 Water 657.26 Sewer	149.25 Water 134.74 Sewer	19.75 Water 20.5 Sewer	298.49 Water 269.48 Sewer	39.50 Water 41.00 Sewer

Note: The above numbers are based on Regional forecasts for each of the Depot service territories.

Using the numbers from these two tables (the % increase in 2030 and 2040), we will forecast the number of Roads, Water and Sewer employees and work vehicles that will be required at the Ajax-Pickering Depot in 2030 and 2040. These forecasts are shown in Appendix B.

The number of Fleet Services employees forecast for 2030 and 2040 relied on the **"current number of mechanics needed"** (which was calculated by the Fleet Services Department) for the 2020 base number of mechanics. The Department determined that for the mix of vehicles in the fleet and the number of hours of maintenance required per vehicle, six additional mechanics are currently required. The details are shown in Table 3.6, below.

Table 3.6 – Fleet Services Mechanics Required in 2020

	A-P Depot	O-W Depot	Orono Depot	Scugog Depot	Sunderland Depot
Current Actual No. of Mechanics	2	8	2	1	1
Current No. of Mechanics Needed	**2**	**12**	**2**	**2**	**2**

In Appendix B, we also list the number of Fleet Services mechanics that will be required to maintain the number of vehicles estimated to be required by the Works Department in 2030 and 2040.

The Region has established the following criteria for the storage of work vehicles:

Heated Storage:

Diesel vehicles

- Vehicles with hydraulic systems
- Tandem / single axle plow trucks
- Water meter vans

Cold Vehicle Storage:

- As many vehicles as possible preferably with electric plug ins.

3.2.3 Future Functional Needs for the Ajax-Pickering Depot

In this section, we will document the future functional needs for the Ajax-Pickering Depot for a time horizon of current, 10 and 20 years.

Ajax-Pickering Depot

Table 3.7 – Ajax-Pickering Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay (1,800 ft^2)	**Recommend building a larger wash bay (30x60 ft)**
Fleet Maintenance Garage	4,391 ft^2 1 Drive-through; 1 One-way	3 bays (1 new bay at 1,375 ft^2)	3 bays	5 bays (3 new bays at 3,630 ft^2)	**Require 3 more maint. bays for 2040. 3 mechanics require 5 bays (22x55 ft each).**
Indoor Vehicle/Equipment Storage	14,826 2 Drive-through; 8 one-way	25 storage bays (15 new bays)	29 storage bays (29 new bays)	33 storage bays (23 new bays at 12,480 ft^2)	**Require 23 more medium size storage bays for 2040 (16x32.5 ft each)**
Indoor Salt Storage	4,909 ft^2	1 salt building	1 salt building	1 salt building	Recommend replacing the existing building with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is new
Employee Parking	60	57 plus 5 visitor stalls	65 (require 10 more stalls)	74 (require 20 more stalls)	**Require 20 more parking stalls by 2040**
Outdoor Vehicle Parking	36	35	42	48	There is ample open space in the yard to create the additional 12 parking stalls for 2040
Secure Yard Fencing	The Depo is fenced with gates at the entrances	None	None	None	The existing fence and gates surround the Depot and satisfy security requirements
Site Entrance/Exit	Two points of access	Three points of access	Three points of access	Three points of access	Should create a new yard entrance for work vehicles to permit the employee parking to expand north
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	The flow through the yard should be one-way in a counter-clockwise direction.

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Arrangement of Buildings on the Site	irregular				The material and tool storage buildings are too far from the main building. No changes recommended

Note: we have assumed that each mechanic requires at least 1.5 bays (each bay is 22x55 ft)

In summary, we recommend the following changes to the yard (listed in order of priority):

- The flow through the yard should be one-way in a counter-clockwise direction;
- Build a new yard entrance for work vehicles closer to the north end of the yard. This would permit the outdoor employee parking lot to expand by the required 20 stalls. Also, build a new yard exit for work vehicles on the south side of the site;
- Convert the existing wash bay into a parts storage room/supervisor office/mechanic lunchroom;
- Build three more maintenance bays beside the existing maintenance bays. They should each be approximately 22x55 ft. in size for a total of 3,630 ft^2;
- Build a new stand-alone vehicle wash bay (to replace the existing one). The wash bay should be approximately 30x60 ft. (1,800 ft^2) in size and the wash water should be filtered for reuse in the wash area or to make brine;
- Build 23 more medium size indoor storage bays. They should be approximately 16x32.5 ft each in size for a total of 12,480 ft^2. If room permits the building should be drive-through and 2 vehicles deep;
- When the existing salt storage building has reached the end of its asset life, it should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

4.0 BEST PRACTICES IN FUNCTIONAL AREA DESIGN

4.1 Justification for Indoor Vehicle Storage

In section 3.1.5 we listed a number of design issues, at the Ajax-Pickering Depot, that are adversely affecting employee productivity, and the efficient utilization of space. In section 3.1.7 we listed a number of ways to improve the design of an existing Depot. Below, we discuss the reasons for storing Winter Maintenance vehicles indoors during the winter months.

Park Winter Maintenance Vehicles Indoors

When possible, vehicles and equipment should be stored indoors during the winter. The primary benefits of storing vehicles indoors are listed below:

- Public Safety;
- Employee Safety;
- Improved Productivity and Response Time;
- Improved Asset Management;
- Impact on the Adjacent Neighbourhood;
- Impact on the Environment;
- Cost Savings.

Public Safety
Vehicles such as plows are used to keep the roads safe, and to respond to emergencies. They are also sensitive to cold temperature and, therefore, may experience starting problems if parked outdoors during the winter. Diesel engines can suffer from jelling; hydraulic oil may have difficulty flowing; and air lines can freeze. In addition to starting problems, the driver/crew might be required to waste valuable time by having to warm-up and clean snow off their vehicle prior to responding to an emergency. This could result in unsafe conditions for the public

Employee Safety
Storage of larger vehicles outdoors during inclement weather may require an employee to climb on the vehicle to clean it off and prepare it for use. This could expose the employee to unnecessary risks such as slipping and falling. In addition, employees must often access and connect smaller equipment to their vehicles (such as plow attachments and towed compressors). This could also pose unnecessary risks when conducted in inclement weather or in parts of the yard with inadequate lighting.

Improved Productivity and Response Time
Storing vehicles and equipment indoors will enhance the performance of the vehicles, thereby, eliminating potential delays associated with cold engines and frozen equipment. This will increase employee productivity and reduce response time. Furthermore, vehicles that are

stored indoors can have their tools and related equipment left in the vehicle overnight. This reduces the need to unload and reload tools between shifts, thereby, increasing employee productive time.

Improved Asset Management
Storing vehicles and equipment indoors will reduce unscheduled maintenance costs and vehicle downtime, protect the vehicles from environmental conditions which could increase maintenance costs and reduce vehicle life span, and protect the vehicles from potential vandalism or theft.

Impact on the Adjacent Neighbourhood
The outdoor storage of vehicles will increase the noise output and exhaust emissions from the site. The outdoor storage of vehicles will require extended periods of idling during the winter months, thereby, increasing the inconveniences already imposed on the neighbors.

Impact on the Environment
Storing vehicles and equipment outdoors will negatively impact the environment because of oil, grease, and engine fluid entering the groundwater or stormwater system. By comparison, any leaks that occur within a vehicle storage garage will be captured in a closed floor drain system, thereby, preventing the fluids from reaching the environment.

Cost Savings
The additional costs associated with storing the vehicles outdoors, as discussed above, include:

- Loss of productive labour due to delays in starting the vehicles and preparing them for the road;
- Increased unscheduled maintenance costs;
- Increased vehicle downtime and resulting loss in productivity;
- Reduced vehicle life expectancy and accelerated vehicle replacement costs.

Therefore, for the reasons discussed above, we recommend that winter maintenance vehicles be parked indoors.

4.2 Opportunities to Improve the Depot Design

Below, we discuss the best practices and design features that (if appropriate) will be incorporated into the proposed site plan for the Ajax-Pickering Depot in section 5.0.

Work Vehicle Storage Buildings

To reduce space requirements, the layout of the storage areas should incorporate the following best practices and design features:

The Vehicle Storage Building should be designed so that it can be expanded as the size of the fleet grows;

- The internal storage area should be heated in the winter months to a temperature of 10°C to ensure that the vehicles are ready for service in the morning. The installation of insulated rapid motion doors will prevent the need for air curtains over the external doors (to maintain the internal room temperature). All walls and ceilings should be painted white (to present a clean appearance and to reflect light). The paint should be an industrial epoxy brand to withstand cleaning by high pressure water. Provision for the proper drainage of ice and snow from the floor area will be a critical safety design feature;

- The current fleet of vehicles are all operated with gas or diesel fuel. However, it is expected that, in the future, some or all of the vehicles will be electrically powered. Therefore, allowances should be provided for future electric recharging equipment;

- Our methodology for designing the layout for the Vehicle Storage Building aims to minimize the total area required by (1) identifying those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identifying the optimal width and length of each lane to minimize the total area requirement. Those vehicles and equipment that require independent use and, therefore, cannot be blocked within a long lane should be stored in a building that has drive-through lanes that are only 2 vehicles long.

- Where vehicles are parked indoors, adequate ventilation measures must be taken to prevent the accumulation of fumes, and to prevent fumes from entering office areas.

Salt Storage Buildings

To reduce the total space requirements, all of the salt, at each yard, should be stored in one building. This building should provide indoor storage and loading to contain the salt (to comply with the Salt Management Plan), and the noise from the loading operation. The facility should have the following characteristics:

- Salt delivery and loading, and brine makeup and loading are all located under one roof;

- Salt should be dumped inside the building by the supplier and then conveyed to the top of the pile using a stacking conveyor. This will maximize the height of the pile and storage capacity of the building;

- Brine makeup utilizes the salt pile as a feedstock along with the weak salt solution coming from the truck wash combined with rainwater collected from the storage building roof and neighbouring driveways;

- The brine making area should be adjacent to the main structure (so that it does not block the flow of the loader during the loading process). Drywall should not be used within the brine pump room because of the moisture). The brine area should also include a washroom;
- The concrete wall surrounding the sand/salt storage area should be at least 25’ high to maximize the height of the pile within the cubic space of the building;
- The two drive-through doors for the salters should be 20’ wide and 20’ tall. The two doors for the delivery truck should be 20’ wide and at least 40’ high (to avoid being hit by a tilted truck bed). Use of metal for the door sliding system should be avoided due to potential corrosion and premature failure;
- Salt and brine loading should all take place on one side of the storage area in a covered drive through lane;
- The loading lane for the salters should be at least 144’ long to allow space for three trucks to be loaded with sand/salt or brine simultaneously;
- The roof decking, structural steel and walls of the storage facility should be painted white to present a bright clean appearance and to better reflect light;
- Where possible, windows should be incorporated into the design of the facility to reduce the need for light fixtures and to provide a better working environment.

Yard Entrances

Where possible, the entrances to the yard should incorporate the following best practices and design features:

- Vehicle entrances should be located at signal lights, especially on busy road ways;
- Vehicle entrances and exits should be separated and closed off with an automated gate to exclude people and vehicles that are not part of the operations. The entrance should be set back from the roadway, such that vehicles entering the yard are off from the main roadway, while waiting for the entrance gate to open;
- Entrances for employee and public vehicles should be kept separate from the flow of operational vehicles.

Yard Configuration

To reduce space requirements and to promote the safety and security of employees and visitors, the layout of the Yard should incorporate the following best practices and design features:

- The site should be configured to provide for the safe and efficient flow of employees, the public, and vehicles (work vehicles and personal vehicles). The building(s) will be situated on the site so as to provide room to expand as operational growth demands greater capacity;

- The movement of work vehicles should be kept separate from the flow of pedestrians and employee vehicles (for safety reasons). Their movement should be configured for one-way traffic flow utilizing primarily left-hand turns to improve visibility for the driver;

- The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles;

- If an area does not need to be paved it should be landscaped so as to permit storm water to percolate naturally into the ground;

- For trucks backing up to a truck dock (to deliver parts), they should be permitted to turn left so that the driver can readily see the back of the truck from his driver's position;

- Any refuelling stations located in the yard, should be situated out of the main flow of traffic, and designed to be able to accommodate vehicle line-ups without blocking the general flow of traffic in the yard;

- The yard should be configured such that items that are most frequently used are closest to the main yard flow. Items less frequently used are placed near the back of the yard;

- The yard should be equipped with well-marked signage that clearly marks direction of travel, storage locations, and special movement and safety instructions;

- Full security fencing should be constructed around the yard, and external lighting, security cameras and motion alarms should be installed. Electronic pass-keys should be used within the building.

Yard Parking

To reduce space requirements and to promote the safety and security of employees and visitors, Yard Parking should incorporate the following best practices and design features:

- The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the front of the building;

- Employee parking should be consolidated at the front of the building (close to the employee entrance and away from the flow of work vehicles) to minimize the honeycomb affect (empty stalls due to variations in demand) and, therefore, the total number of stalls required;

- Where it is not practical to park winter response vehicles indoors, they should be located in open shelters faced to the east or south, with receptacles to allow block heaters and hydraulic heaters to be plugged in overnight;

- Work vehicles parked outdoors should be located close to the building so as to minimize employee walking distances;

- Where possible, surfaces should be unpaved to allow storm water to percolate naturally through the parking surface. When paving is required, materials that are permeable to water are recommended (e.g., permeable concrete);

- Environmentally friendly modes of transportation should be promoted. Buildings should be equipped with lockable storage for bicycles and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

- Light pollution control can be achieved by installing fixtures that are down-lit. Full-cut off, ground covers and positioning of the fixtures on site would stop the light from over spilling to other adjacent sites.

Yard Storage

To reduce space requirements and to promote the safety of employees, Yard Storage (for vehicles, equipment and materials) should incorporate the following best practices and design features:

- Work vehicles should be parked as close to the indoor employee amenities as possible to minimize walking distances by the work crews. This does not apply to contractor vehicles as the crews do not utilize the buildings;

- For storing certain types of equipment and materials (those that can be placed on pallets) metal racking (single deep) should be installed in the yard to reduce space requirements;

- The yard space that is used by Roads as a Winter Maintenance Yard should, during the summer, be shared with other departments to increase yard utilization and reduce overall space requirements. For example, this space could be used to park contractor vehicles (for Forestry operations), and stage materials such as wood and compost;

- The bulk storage of materials within the concrete block storage bunkers should be shared by all the Divisions to eliminate duplication in other parts of the yard;

- All plastic and rubber items, including piping and fittings, must be stored in shelters that protect these items from deterioration by the sun;

- Items that must be kept clean, such as fittings for water services, should be stored such that they will not become contaminated with yard dust and debris.

- All items stored in the yard should be organized in well-marked storage locations.

- Outdoor storage areas should not be paved, unless needed, to allow storm water to percolate naturally into the ground;

- The view of the yard from all public roadways must be attractive, well landscaped, and well maintained without appearing extravagant. Landscaping buffers should be built.

Vehicle Washing

To reduce space requirements, and to promote the productivity of employees, the location of the Vehicle Wash Bay should incorporate the following best practices and design features:

- The vertical clearance within the Wash Bay should be sufficient to allow dump trucks to raise their box for rinsing;

- The interior of the Wash Bay should be equipped with sufficient heating to prevent freezing inside during the winter;

- The Wash Bay should be equipped with an access platform so that operators can access the top of their vehicle safely without climbing onto the vehicle itself;

- The concrete pad immediately outside the entrance/exit doors should have radiant heating to prevent the formation of ice during the winter;

- The installation of insulated rapid motion doors will prevent the need for air curtains over the exterior doors (to maintain the internal room temperature);

- The door should be 18 ft. wide and 15 ft. high. The room for a single wash bay should be a minimum of 50 ft. long and 31 ft. wide (to handle tandem trucks);

- The Wash Bay should be equipped with a steam cleaning system to remove grease from vehicles and engine parts. It should be located in an adjacent room to avoid corrosion. Operators will utilize a high-pressure, handheld, spray wand to clean the vehicles. There will also be a fire hose and a built-in underbody spray;

- A drainage system and sump will be required to collect approximately 70% of the grey water for reuse;

5.0 FUNCTIONAL SPACE PROGRAM

In this section, we will document the Functional Space Program required to satisfy the future (20-year time horizon) additional space requirements for each of the main functional areas (both indoors and outdoors) required by the employees and contractors working within the Ajax-Pickering Depot. The Program will consider the growth requirements, and operational needs discussed, previously, in sections 3.2 and 4.0 of this report.

Within the Program, we will look for ways to minimize space requirements so as to reduce travel distances and construction costs while still achieving space adjacency preferences. space adjacency preferences are important to minimize travel distances by vehicles and employees within the buildings. Excessive travel distances add to operational costs. Of critical importance is the relationship between the employee amenities and the storage location for the vehicles. Whenever possible, the walking distances for the employees should be minimized.

The Space Program will assume that all of the Depot space requirements will be constructed within the existing Depot.

The main functional areas are summarized in Table 5.1, below. The Space Program is shown in Appendix C.

Table 5.1 - Space Requirements for the Expanded Ajax-Pickering Depot

Functional Area	Area Required in 2040 (ft^2)	Area Required in 2040 (m^2)
Administration Office	6,182	574
Employee Amenities	5,342	496
Fleet Services Shop	4,359	405
Indoor Work Vehicle/Equipment Storage	2,468	229
Total Main Building	**18,351**	**1,704**
Vehicle Wash Bay - Heated	2,486	231
Salt & Brine Storage Building - Unheated	18,442	1,713
Indoor Work Vehicle Storage - Unheated	12,730	1,183

The Administration Office and Employee Amenities areas listed in Table 5.1, above, will be required in place of the existing space within the Depot (which should be demolished).

The existing Fleet Service Shop will provide the area required for two maintenance bays, the Parts Stores (800 ft^2), the mechanics office, and the mechanics amenities. As a result, a new building addition of only 4,359 ft^2 (for three maintenance bays, a fluids room, compressor room, and janitor room) will be required to meet the full needs for the Fleet Services Shop and Parts Stores.

The existing tool/parts storage room (in the main building) will need to be expanded into the existing vehicle storage garage to accommodate the tools that are stored in other areas of the Depot. This is expected to require two of the existing vehicle storage bays (on the east end). As a result, two new bays will need to be built on the west end of the vehicle storage garage (2,468 ft^2) to compensate.

6.0 CONCEPTUAL SITE PLAN

A high-level, Conceptual Site Plan was developed to achieve the changes recommend for the existing Ajax-Pickering Depot so as to satisfy the Functional Space Program (for 2040) discussed in section 5.0. The Plan also reflects (1) Industry Best Practices and design trends for new Operations Depots, and (2) functional space adjacency preferences to minimize travel distances. Particular emphasis was placed on assessing the impact of vehicle traffic within the yard and how to optimize its flow and egress.

The Conceptual Site Plan required the use of the entire yard comprising 59,643 m^2 (14.75 acres). Given that future operations, beyond 2040, will likely require additional indoor/outdoor space we, therefore, recommend that the Region purchase some of the adjacent land when that opportunity arises.

The Conceptual Site Plan is shown in Appendix D.

7.0 CONSTRUCTION COST ESTIMATES

In Table 7.1, below, we list the estimated hard construction costs for redeveloping the Ajax-Pickering Depot. A more detailed breakdown of the costs is shown in Appendix E. These construction costs provide a Class D order of magnitude estimate of the fair market value for the hard construction costs associated with the proposed space programs and concept design drawings attached to this report (Appendix C - D).

Table 7.1 – Estimated Hard Construction Costs

Depot	Functional Change	Area (m^2)	Unit Cost ($\$/m^2$)	Estimated Cost ($)
Ajax-Pickering	Admin. Office & Employee Amenities	1,070	5,167	5,529,200
	Fleet Services Garage	405	3,500	1,417,500
	Indoor Vehicle Storage Building	229	2,000	458,000
	Indoor Salt Storage & Loading Building	1,713	1,800	3,083,400
	Indoor Vehicle Storage Building (Unheated)	1,183	1,400	1,656,200
	Vehicle Wash Building	231	2,200	508,200
	Existing Indoor Vehicle Storage Overhead Doors (10)		12,000	120,000
	Existing Fleet Services Garage Internal Renovation	126	1,000	126,000
	Decommission & Demolish Existing Salt Storage Building	1,250	150	187,500
	Decommission & Demolish Existing Administration Office	250	350	87,500
	Site Work (including M&E Site Services)	59,700	134.6	8,035,800
	TOTAL (rounded)			**21,209,300**

A Class D estimate is intended to represent the median bid amount in a competitive bidding process. The accuracy of the estimate is expected to have a variance of +/- 20%.

To create the estimates, typical unit rates (in 2021 dollars) were used that are based on the project specifications and historical cost data for this type of project. The unit rates are based on typical mid-range costs for the type of design and construction proposed. Contingencies are included in the estimate to offset the accuracy risk (described below).

Although every attempt has been made to reflect market conditions in the estimates, the actual marketplace price of the project will not be known until the results of tenders have been received.

In Table 7.2, on the following page, we list the estimated project soft costs for redeveloping the Ajax-Pickering Depot.

Table 7.2 – Estimated Project Soft Costs

Depot	Project Soft Costs	Estimated Cost ($)
Ajax-Pickering	Land Acquisition Costs	**Unknown**
	Municipal Charges	0
	Consulting Fees and Expenses	2,578,556
	Specialty Consultants	211,047
	Project Management Fees	0
	Owner Supplied Furnishings, Fixtures and Equipment	1,100,465
	Financing and Loan Fees	25,000
	Operational Expenses	186,047
	Taxes	478,367
	Project Soft Cost Contingency	457,948
	TOTAL (rounded)	**5,037,430**

The total project budget cost is **$26,247,000**

Exclusions & Qualifications

The following items are excluded from the estimates in Tables 7.1 and 7.2:

- Land acquisition (to expand the size of the existing Depot)
- Premium time for afterhours and weekend work
- Phasing premium (assumed to be executed in a single phase)
- Municipal off-site service connections (outside the property line)
- Abatement and handling of asbestos contaminated materials
- Handling and removal of contaminated soils
- Special foundations such as caissons or pile foundations
- Development charges and building permit fees

- Sole sourcing of materials, services, or equipment
- Premiums for LEED certification
- Independent 3rd Party Commissioning
- Onsite or offsite temporary storage facilities
- Mock ups

Contingencies

General Approach to Contingencies

The effective use of contingencies in construction cost planning requires a clear understanding of estimating risks in both a project specific and general construction market sense. The appropriate level of contingency is dependent on the amount of design information available, knowledge of the design teams' methods and philosophy, the timing of the estimate preparation relative to the project design and construction schedule, and the anticipated complexity of the construction work.

Design and Pricing Contingency

A design and pricing contingency of **15.0%** is included in the estimate. This allowance where included is meant to cover pricing and design unknowns during the preparation of this estimate, and not meant to cover additional scope or functional program requirements. This allowance is also meant to cover the potential changes in scope of work during the completion of the design documentation and the preparation of the tender documents.

Escalation Contingency

An escalation contingency of **5.25%** is included in the estimate. This allowance is meant to address anticipated changes in construction costs due to market fluctuations between the date of this report and the anticipated midpoint of construction.

- Anticipated start date of construction: April 1, 2024
- Estimated duration of the construction phase: 24 months
- Estimated midpoint of construction: April 1, 2025
- Start date for escalation calculations: Sept 1, 2021
- Estimated time frame for escalation (to midpoint of construction): 42 months
- Effective annual escalation factor: 4.0%
- Effective escalation calculations = 42/12 x 4.0% 14.0%

Construction Contingency (Post Contract Stage)

A post contract contingency of **5%** has been included. This contingency is meant to cover the potential changes (change orders/directives) in cost due to the discovery of unknowns during the renovation work.

Cost Considerations for the Current Health Pandemic & COVID-19

We expect the project will be tendered in the near future (within the next 6 to 12 months) and could experience the market influences of the current COVID-19 pandemic. The market influences are unquantifiable currently and are likely to change in the future. We also expect the contractors bidding the project would include in their bids, allowances for the COVID-19 risk unless that risk is mitigated in the bid documents. We forecast the inclusion of these risks in bids could impact normal competitive market conditions resulting in a bid price increase in the range of 3% to 10% or in extreme situations as much as 10% to 20%.

We encourage the owner and the consulting team to address this future risk by providing clear direction to the bidders in the bid documents on risk mitigation for COVID-19 issues.

The primary risks related to COVID-19 include impacts to the supply of materials to the site, the potential interruption of labour on the site and the productivity in executing the work.

Reduced site productivity could result from any of the following risks:

- Lack of availability of labour for due illness related to COVID-19,
- Delays related to recruiting replacement workers,
- Social/physical distancing requirements on the site,
- Site shutdowns due to the risk of workers testing positive for the COVID-19 virus,
- Health authority mandated industry or project shutdowns,
- Delays in delivery of materials and equipment to the site and the procurement supply chain,
- Unavailability of materials due to factory closure or shipping interruptions in the supply chain,
- Delays related to acquiring material and or equipment substitutions.

8.0 IMPLEMENTATION SCHEDULE

This section of the report will develop an Implementation Schedule for the expansion of existing buildings and the construction of new buildings at the existing Ajax-Pickering Depot.

The schedule will assume that the construction will be carefully phased to permit most of the Depot to remain in operation, at any one time, during the construction.

We expect the pre-construction phase to last 26 months. This would include the completion of such tasks as Site Plan Approval, preliminary and detailed design, and tendering for construction. The construction phase is expected to last 24 months.

The Schedule is shown in Appendix F.

APPENDIX A – Current Resources

In this Appendix we list the current number of resources (employees, vehicles, equipment, and materials) utilized by the Works Department at its Ajax-Pickering Depot.

Ajax-Pickering Depot

Employees

The total number of employees currently working from the Ajax-Pickering Depot (during the summer and winter seasons) is shown in the table below.

Table A.1 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Ajax-Pickering	Admin	7	0	0	**7**
	Fleet Services		2	2	**2**
	Roads	2	14	13	**16**
	Water/Sewer	3	29	27	**32**
	Total	**12**	**45**		**57**

Work Vehicles

The total number of work vehicles currently assigned to the Ajax-Pickering Depot is shown in the table below.

Table A.2 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Roads/Water/Sewer	½ Ton	7	Outdoor
Roads	1 Ton Pick Up	1	Outdoor
Roads	Grader	1	Outdoor
Roads/Sewer	3 Ton Crew Cab	4	Outdoor
Water	Backhoe	1	Outdoor
Sewer	Heavy Excavator	1	Outdoor
Water	Steam generator	1	Outdoor
Roads/Water/Sewer	8 Trailers / 2 DLA Tanks /1 Spray Patch	11	Outdoor
Roads - **Contractor**	Tandem Snow Plows	8	Outdoor
	Total	**35**	

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Water/Roads	¾ Ton	4	Indoor
Roads	6 Ton Tandem	8	Indoor
Roads	Loader	1	Indoor
Roads	Roller	1	Indoor
Water	½ Ton Van	2	Indoor
Water	¾ Ton Van	2	Indoor
Water/Sewer	1 Ton Van	3	Indoor
Sewer	Sewer Jet	1	Indoor
Water	3 Ton Service	2	Indoor
Water	Compressor	1	Indoor
Water	Steam generator	1	Indoor
	Total	**26**	Indoor
			Indoor
Water/Roads/Sewer	Misc. small tools i.e.: cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, DEF Tank, jackhammers, sewer camera, chainsaws, portable generators, etc.	**40**	Indoor

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Ajax-Pickering Depot there is one large building capable of storing up to 7,000 tonnes of salt.

Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and topsoil).

APPENDIX B – Future Resources

Ajax-Pickering Depot

Employees

The total number of employees forecast to be working from the Ajax-Pickering Depot Depot in 2030 and 2040 (during the summer and winter seasons) is shown in the tables below:

Table B.1 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Ajax-Pickering	Admin	7	0	0	**7**
	Fleet Services		2	2	**2**
	Roads	2	16	15	**18**
	Water/Sewer	3	35	33	**38**
	Total	**12**	**53**		**65**

Table B.2 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Ajax-Pickering	Admin	7	0	0	**7**
	Fleet Services		3	3	**3**
	Roads	2	18	17	**20**
	Water/Sewer	3	41	38	**44**
	Total	**12**	**62**		**74**

Work Vehicles

The total number of work vehicles currently assigned to the Ajax-Pickering Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.3 below.

Table B.3 – Future Number of Work Vehicles

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
Roads/Water/Sewer	½ Ton	7	8.41	9.81	Outdoor
Roads	1 Ton Pick Up	1	1.13	1.26	Outdoor
Roads	Grader	1	1.13	1.26	Outdoor
Roads/Sewer	3 Ton Crew Cab	4	4.80	5.61	Outdoor
Water	Backhoe	1	1.20	1.40	Outdoor
Sewer	Heavy Excavator	1	1.20	1.40	Outdoor
Water	Steam generator	1	1.20	1.40	Outdoor
Roads/Water/Sewer	8 Trailers / 2 DLA Tanks /1 Spray Patch	11	13.21	15.42	Outdoor
Roads - **Contractor**	Tandem Snow Plows	8	9.03	10.07	Outdoor
	Total	**35**	**41.31**	**47.63**	
Water/Roads	¾ Ton	4	3.60	5.6	Indoor
Roads	6 Ton Tandem	8	9.03	10.07	Indoor
Roads	Loader	1	1.13	1.26	Indoor
Roads	Roller	1	1.13	1.26	Indoor
Water	½ Ton Van	2	2.40	2.80	Indoor
Water	¾ Ton Van	2	2.40	2.80	Indoor
Water/Sewer	1 Ton Van	3	3.6	4.2	Indoor
Sewer	Sewer Jet	1	1.20	1.40	Indoor
Water	3 Ton Service	2	2.40	2.80	Indoor
Water	Compressor	1	1.20	1.40	Indoor
Water	Steam generator	1	1.20	1.40	Indoor
	Total	**26**	**29.29**	**34.99**	Indoor
					Indoor

Department	**Vehicle Type**	**No. Vehicles**			**Type of Storage Required**
		2020	2030	2040	
Water/Roads/Sewer	Misc. small tools i.e.: cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, DEF Tank, jackhammers, sewer camera, chainsaws, portable generators, etc.	**40**	**41**	**56**	Indoor

APPENDIX C – Space Program

	Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	1.0 Administration Office									
	Roads Department									
	Supervisor	OO			2	90	1.4	126	12	Open concept work stations
	Touchdown stations	OO			2	20	1.4	28	3	For outside workers
	Water/Sewer Department									
	Supervisor	OO			3	135	1.4	189	18	Open concept work stations
	Touchdown stations	OO			4	40	1.4	56	5	For outside workers
	Administrative Staff									
	Staff	OO			6	270	1.4	378	35	Open concept work stations
	Superintendent	**PO**			1	110	1.4	154	14	Private office
	Common Areas									
	High Density File Storage System	**PO**				200	1.4	280	26	
	Quick-Access File Storage (1)	OO				75	1.4	105	10	
	Office Storage Room (1)	**PO**				150	1.4	210	20	For Miscellaneous Items
	Printer/fax/stationary (1)	**PO**				200	1.4	280	26	Require 1 room
	Winter Coat Storage	**PO**				36	1.4	50	5	for 12 employees
	Office Washrooms (2) for 12 staff	**PO**				300	1.4	420	39	2 Accessable washrooms (M/F)
	Coffee Stations (1)	**PO**				45	1.4	63	6	1 Station

	Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	Common Areas - Continued									
	Medium Meeting Room (1) (8 people)	**PO**				200	1.4	280	26	Require 1 room
	Small Meeting Rooms (2) (4 people)	**PO**				200	1.4	280	26	Require 2 rooms
	Phone Rooms (1) (1 person)	**PO**				40	1.4	56	5	Require 1 room
	First Aid/Quiet Room (1)	**PO**				120	1.4	168	16	Require 1 Room
	Public Lobby	OO				400	1.4	560	52	
	Public Washrooms (male/female)	**PO**				75	1.4	105	10	One barrier free washroom
	Reception Desk/Counter	OO				50	1.4	70	7	
	Janitors Rooms (1)	**PO**				120	1.4	168	16	One room
	Communications/IT Room	**PO**				150	1.4	210	20	
	Electrical Room	**PO**				300	1.4	420	39	
	Mechanical Room	**PO**				300	1.4	420	39	
	Stairs (2 sets)					640	1.4	896	83	
	Elevator					150	1.4	210	20	
	TOTAL					**4,416**		**6,182**	**574**	

	Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	2.0 Employee Amenities									
	Common Areas									
	Male Washroom/locker room/showers	**PO**			**53**	1,142	1.25	1,427	133	Sized for 53 males (90% total)
	Female Washrm/locker rm/showers	**PO**			**15**	535	1.25	668	62	Sized for 15 females (25% total)
	Lunch Room (20 people)	**PO**			**20**	525	1.25	656	61	Sized for 20 employees
	Training Room (1) (59 people)	**PO**			**59**	1,187	1.25	1,484	138	Sized for 59 outside employees
	Stairs (2 sets)					640	1.4	896	83	
	Elevator					150	1.4	210	20	
	TOTAL					**4,179**		**5,342**	**496**	

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
3.0 Fleet Services Shop									
Fleet Mechanics Area									
Mechanic Lunch Room	**PO**		600	5	140	1.4	196	18	Sized for 3 +2 mechanics
Male Washroom & Changeroom	**PO**			5	259	1.4	363	34	Sized for 3 + 2 males
Female Washroom & Changeroom	**PO**			1	116	1.4	162	15	Sized for 1 female
Maintenance Offices									
Reception desk (key drop-off)	OO				64	1.4	90	8	
Work Stations for 5 Mechanics	OO	1		5	180	1.4	252	23	
File Storage (1)	OO				10	1.4	14	1	
Printer/fax/stationary (1)	OO				72	1.4	101	9	
	PO								
First Aid Room	**PO**				96	1.4	134	12	
Maintenance Library	**PO**				30	1.4	42	4	shelving for manuals

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
Maintenance Bays & Shops									
Maintenance Bays (Heavy Duty)	OO			3	3,630	1.02	3,703	344	3 new bays (22x55 ft)
Machine/Tool Shop	**PO**				-	1.3	-	-	Not required
Tool Crib	**PO**				200	1.3	260.00	24	place in existing mechanics office
Fluids Room	**PO**				216	1.3	281	26	
Battery Storage-Flammable	**PO**					1.3	-	-	Not required
Tire Storage	**PO**					1.3	-	-	Not required
Compressor Room	**PO**				192	1.3	250	23	
Janitors Room	**PO**				96	1.3	125	12	
Electrical Room	**PO**				-	1.3	-	-	already exists
Sprinkler Room	**PO**					1.3	-	-	already exists
TOTAL					**5,301**		**5,972**	**555**	

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
4.0 Wash Bay									
Wash Bay	**PO**			1	1,800	1.02	1,836	171	1 bay (30x60)
Wash Water Filtration Room	**PO**				500	1.3	650	60	
TOTAL					**2,300**		**2,486**	**231**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
5.0 Parts Stores (Fleet Services)									
Service Counter & Office									
Service Counter	OO					1.4	-	-	not required
Fleet Repair Parts									
Parts Warehouse	OO				800	1.00	800	74	Parts for Fleet & small engine
Explosion-Proof Room	**PO**			0		1.25	-	-	not required
Loading Dock	**PO**					1.25	-	-	not required
TOTAL					**800**		**800**	**74**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
6.0 Indoor Vehicle Storage - Heated									
Roads Department									
Miscellaneous Equip. Storage	OO				2,420	1.02	2,468	229	2 bays beside indoor vehicles
TOTAL					**2,420**		**2,468**	**229**	
TOTAL INDOOR SPACE					**19,416**		**23,250**	**2,160**	Excludes the salt storage bldg. and Pole Barn

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
7.0 Indoor Work Vehicle Storage - Unheated - Pole Barn									
City-Owned Vehicles									
Indoor Work Vehicle Parking - unheated	**PO**			24	12,480	1.02	12,730	1,183	Drive through vehicle storage
									65 ft long and 16 ft wide
									double deep bays
TOTAL					**12,480**		**12,730**	**1,183**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
8.0 Indoor Salt Storage									
Roads Department									
Indoor Salt Storage and loading	**PO**				**17,280**	1.02	17,626	1,637	5,000 Tons of salt
Indoor Brine Storage Tanks	**PO**				800	1.02	816	76	
TOTAL					**18,080**		**18,442**	**1,713**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
9.0 Region & Contractor Employee Vehicle Parking - Outdoor									
Region Employee Vehicles				**74**	21,506	1.35	29,033	2,697	74 employee parking stalls
Visitor Parking & Handicapped				13	3,778	1.35	5,100	474	3 handicapped
Contractor employee Vehicles				**15**	4,359	1.35	5,885	547	15 Contractors for winter maint.
TOTAL					**29,644**		**40,019**	**3,718**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
10.0 Outdoor Yard Space									
Roads Dept.									
Catch Basin Decant Pits (2)					3,000	1.3	3,900	362	
Weigh Scale (close to Salt Storage)					2,000	1.3	2,600	242	
Gravel Pile					23,000	1.0	23,000	2,137	
Recycled Asphalt Pile					23,000	1.0	23,000	2,137	
Open Space for Miscellaneous Materials					10,000	1.0	10,000	929	e.g. snow
Fleet Maintenance									
Waste Metal Bins (2)					500	1.3	650	60	2 bins
Welding Supplies Shed					300	1.3	390	36	
Waste Tires					450	1.3	585	54	50 tires
Waste Fluids					300	1.3	390	36	Bulk storage tanks - above ground
Vehicles waiting/finshed being serviced					8,194	1.3	10,652	990	15 vehicles in and out

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
Common Areas									
Region Work Vehicles (Roads and W/S)				38	15,161	1.3	19,709	1,831	vehicles single deep
Attachments				20	1,400	1.3	1,820	169	open area
Contractor Work Vehicles				15	8,194	1.3	10,652	990	vehicles single deep
									15 tandem plows
Outdoor Wash Pad					1,375	1.3	1,788	166	Require catwalk beside wash pad
Bunker Material Storage (10)					10,000	1.0	10,000	929	10 bunkers for bulk materials
Waste Soil Storage Pile					17,000	1.0	17,000	1,579	
Open Space for Parts Storage					10,000	1.0	10,000	929	Culverts, catchbasins, manhole fram
Waste Containers					500	1.3	650	60	2 large metal bins
TOTAL OUTDOOR SPACE					**134,374**		**146,786**	**13,637**	Excludes roads, landscaping and set

APPENDIX D – Conceptual Site Plan

Current Site Layout


SECONDARY EXIT
TRUCK WEIGH SCALE
CONTRACTOR VEHICLES
INDOOR WORK VEHICLE STORAGE
ATTACHMENTS
INDOOR LOADING SALT STORAGE BUILDING
BRINE
INDOOR VEHICLE STORAGE
OUTDOOR WASH PAD
DECANTING PIT
OUTDOOR EQUIPMENT STORAGE
STORAGE BUNKERS
EMPLOYEE ENTRANCE
INDOOR EQUIPMENT STORAGE
2 STOREY ADMIN OFFICE + AMENITIES
3 BAY GARAGE
VEHICLE WASH BUILDING
GRAVEL PILE
RECYCLED ASPHALT AND/OR WASTE SOIL
TAUNTON RD.
EXIT
SALEM ROAD
MAIN ENTRANCE
SITE PLAN
SCALE 1:500
PLOTTED DATE/TIME: May 28 2021 - 3:28pm
DATE
ISSUED FOR
REV
MAY 13 2021
REVIEW
A
Stirling Rothesay
This drawing shall not be used for construction purposes until the seal appearing hereon is signed and dated by the Architect or Engineer.
Project Manager
J. MAKARUK
Drawn
J.G.
Project Leader
Checked
Date
APR 26 2021
Client
DURHAM REGION
Project
MASTER PLAN FOR AJAX-PICKERING DEPOT
Drawing Title
CONCEPTUAL SITE PLAN OPTION 2
Project No.
21-01
Drawing No.
SK-001B

APPENDIX E – Cost Estimates

MULTIPLE ESTIMATE SUMMARY
REGION OF DURHAM - AJAX DEPOT
ORDER OF MAGNITUDE CLASS D ESTIMATE (Rev.1)
August 13, 2021

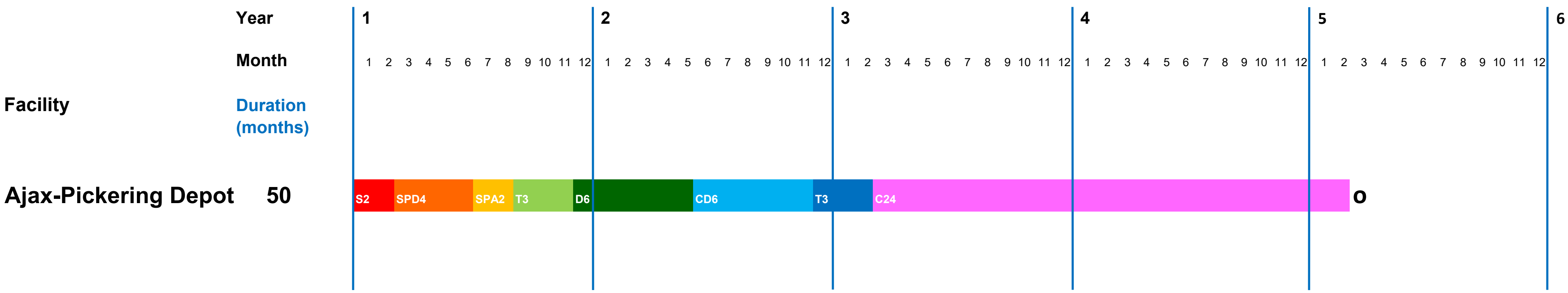
AJAX DEPOT

RLB Rider Levett Bucknall

No.	Scope Description	GFA (m2)	Unit (Cost/m2)	Estimated Total	% of Total
1.0	**Hard Construction Costs**				
1.1	Indoor Vehicle Storage Building	229	$2,000	$458,000	2.2%
1.2	Indoor Salt Storage & Loading Building (Unheated)	1,713	$1,800	$3,083,400	14.5%
1.3	Fleet Services Garage (3 Bays)	405	$3,500	$1,417,500	6.7%
1.4	Administration Office - 2 storey (detailed estimate included)	1,070	$5,167	$5,529,200	26.1%
1.5	Indoor Vehicle Storage Building (Unheated)	1,183	$1,400	$1,656,200	7.8%
1.6	Vehicle Wash Building	231	$2,200	$508,200	2.4%
1.7	Existing Indoor Vehicle Storage Overhead Doors	10	$12,000	$120,000	0.6%
1.8	Existing Fleet Services Garage Renovation	126	$1,000	$126,000	0.6%
	Subtotal - Hard Construction for Buildings	**4,967**	**$2,597**	**$12,898,500**	
2	**Decommissioning & Demolition**				
2.1	Existing Salt Storage Building Demolition	1,250	$150.00	$187,500	0.9%
2.2	Existing Administrative Ofiice Demolition	250	$350.00	$87,500	0.4%
2.3	Site Work including M&E Site Services (estimate included)	59,700	$134.60	$8,035,800	37.9%
	Total Estimated Hard Construction Cost (rounded)	**4,967**	**$4,270**	**$21,209,300**	**80.8%**
2.0	**Project Soft Costs (see separate estimate)**				
2.1	Land Acquisition Costs			$0	0.0%
2.2	Municipal Charges			$0	0.0%
2.3	Consulting Fees and Expenses			$2,578,556	51.2%
2.4	Specialty Consultants			$211,047	4.2%
2.5	Project Management Fees			$0	0.0%
2.6	Owner Supplied Furnishings, Fixtures, and Equipment (FF&E)			$1,100,465	21.8%
2.7	Financing and Loan Fees			$25,000	0.5%
2.8	Operational Expenses			$186,047	3.7%
2.9	Taxes			$478,367	9.5%
2.10	Project Soft Cost Contingency			$457,948	9.1%
	Total Project Soft Costs (rounded)	**4,967**	**$1,014**	**$5,037,000**	**19.2%**
	Total Project Budget (rounded)	**4,967**	**$5,284**	**$26,246,000**	

APPENDIX F – Implementation Schedule

Region of Durham Yard Master Plan - Implementation Schedule for Expansion of the Ajax-Pickering Depot



Legend

- **S2**, Studies for site development with duration noted in months (site surveys, geotechnical, traffic, and storm water management)
- **SPD4**, Site Plan Development detailed design with duration noted in months (detailed civil site plan design, grading, drainage, storm water management, site servicing, utilities, and civil design drawings and specifications for expansion)
- **SPA2**, Site Plan Approval process with duration noted in months (obtain site plan approval)
- **T3**, Tender Phase for preliminary and detailed design with duration noted in months
- **D6**, Design Phase with duration noted in months (preliminary and detailed design for structural, architectural, civil, mech. & elec., IT)
- **CD6**, Contract Documents Phase with duration noted in months
- **T3**, Tender Phase for construction with duration noted in months
- **C24**, Construction Phase with duration noted in months
- **O** **Occupancy**

Attachment #4 - Sunderland Depot Master Plan Report

Stirling Rothesay
CONSULTING, INC.

Presented by: Stirling Rothesay Consulting Inc.
Date: November 24, 2021.

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1.0 EXECUTIVE SUMMARY

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

This Report will focus on the completion of the Master Plan for the Sunderland Depot. Three other companion Reports will document the Rationalization Study and the Master Plans for the Ajax-Pickering and Oshawa-Whitby Depots.

The Works Department's Operations and Maintenance Depots are referred to as:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

The Facility Master Plan for the Sunderland Depot will consolidate the analysis and recommendations for the Depot from the Rationalization Study for the immediate, short term (5 year), medium term (10 year) and long term (20 year). This will include the following:

- The preferred geographic location and service territory for the Depot;
- The current and future functions, use, and activities that should be conducted at the Depot;
- The infrastructure to be maintained, and the building/yard space and equipment required to 2040 (for employees, vehicles, equipment, parts, and materials). This will include the following functional areas:
    - Site access points;
    - Administrative areas;

  - Employee lunch room, locker rooms, and washrooms;
  - Training facilities;
  - Vehicle fueling stations;
  - Fleet washing;
  - Fleet maintenance and parts storage (including receiving/shipping);
  - Equipment and Material storage;
  - Indoor versus outdoor vehicle parking;
  - Vehicle staging areas;
  - Staff parking;
  - Vehicle traffic patterns (fleet, employee) and pedestrian circulation;

- Any facility/yard design issues or deficiencies negatively affecting operational flow, productivity, working conditions, environmental stewardship, and/or service delivery;

- Site safety and security issues;

- The need for facility upgrade requirements or new/expanded facilities;

- The potential impact of proposed developments on the area adjacent to the Depot.

The Facility Master Plan will also provide (1) an optimized site conceptual plan, (2) detailed Class “D” cost estimates for building and yard upgrades/expansions/new facilities, and (3) a sequence of events implementation schedule required to achieve the grades/expansions/new facilities.

The objectives of the Facility Master Plan include making recommendations that will (1) provide safe and efficient work conditions, (2) make best use of the existing site and facilities, (3) provide efficient flow of employees and vehicles through the yard, (4) meet industry best practices in facility and yard layout design, and (5) meet the operational growth requirements over the next 20 plus years.

Like most Public Works facilities, the requirements placed on the Sunderland Depot have expanded and evolved since it was originally built more than 55 years ago. As a result, (1) the size of the site, at 4 acres, is currently at full capacity with no further room for the expansion of buildings or yard storage, (2) the size of the buildings is insufficient to meet many of the current needs yet alone medium and long-term growth requirements, (3) the design of the facility and use of space are not optimal or compliant with industry best practices and design trends, (4) the age of the facility is beyond its expected asset life, and (5) the flow of employees and vehicles within the Depot is not efficient. These issues have had a negative impact on employee productivity and the cost effectiveness of maintaining service levels.

Specific issues causing concern include:

- There is a shortage of mechanics and vehicle maintenance bays. These shortages have a direct impact on vehicle availability, crew productivity, and the ability of crews to meet service level requirements;
- There is insufficient indoor space for storing vehicles and equipment. As a result, vehicles and equipment that should be protected from the elements (to maintain their safe functionality, increase their asset life, and reduce the need for repairs) are, instead, stored outdoors year-round;
- All of the buildings are either close to or beyond their expected asset life. As a result, the cost to maintain and repair these facilities will continue to increase in the coming years;
- Growth requirements will result in insufficient space to store and manoeuvre the vehicles, equipment and materials safely and efficiently around the yard. This shortage of space will increase the time required to park the vehicles, and the risk of vehicle and pedestrian collisions.

To address these and other concerns documented in this report we have created a number of recommendations to help the Works Department improve employee safety, achieve operational synergies, increase space utilization, and satisfy space requirements for their employees, vehicles, equipment, and materials. These recommendations also describe the preferred Depot network design to minimize operating costs and meet service level requirements.

The main recommendations are as follows:

1. The Region should develop a plan to acquire a new site for the construction of a new Sunderland Depot as soon as possible. The site should be a minimum of 25 acres and close to the current Depot (given that the Scugog Depot will not be relocating). Design and construction of the new Sunderland Depot should be completed as soon as funding will permit (preferably within 10 years) due to the limitations of the current site and buildings.

2. The new Depot should consist of a 3,900 m^2 main building, and two unheated buildings for the storage of salt and work vehicles. The estimated hard construction cost is **$27,139,000**. The estimated project soft cost is **$6,290,000** (excluding the acquisition cost of land which remains unknown). The total project budget cost is, therefore, **$33,430,000** (this assumes a construction start date of April 1, 2024).

3. The proposed Implementation schedule will assume that the new Depot will be constructed on a new site which would permit the current operations to continue from the existing site until the new Depot is ready to be occupied. We expect the pre-construction phase to last 26 months and would include such tasks as Site Plan Approval, detailed design, and tendering for construction. The construction phase is expected to last 24 months.

2.0 INTRODUCTION

The Region of Durham retained Stirling Rothesay Consulting to complete (1) a **Rationalization Study** for the Works Department's five Operations and Maintenance Depots, as well as the Traffic Operations Group, and the Facilities Maintenance and Operations Group, and (2) a **Facility Master Plan** for each of the Ajax-Pickering, Oshawa-Whitby, and Sunderland Depots.

The Region's operations and maintenance activities are currently delivered from five Works Department Depots:

- Ajax-Pickering Depot, 202 Salem Rd., Ajax
- Oshawa-Whitby Depot, 825 Conlin Rd., Whitby
- Orono Depot, 3480 Taunton Rd., Orono (Clarington)
- Scugog Depot, 10 Regional Rd.21, Port Perry
- Sunderland Depot, S995 Regional Rd. 10, Sunderland

In addition, a future Depot is being considered (within the next 5 years) for the community of Seaton which will service the community of Seaton and northern areas of Pickering and Ajax.

The Traffic Operations Group, and the Facilities Maintenance and Operations Group are currently located at:

- Traffic Operations Centre, 101 Consumers Drive, Whitby
- Whitby Water Supply Plant, 301 Water Street West, Whitby

Like most Public Works facilities, the requirements placed on these five Depots have expanded and evolved since they were originally built. As a result, the size of the facilities and outdoor yard storage areas may be insufficient to meet current or future growth requirements. In addition, the current use of space and flow of employees and vehicles may not be optimal or compliant with industry best practices and design trends. Furthermore, the Depots may no longer be in the optimal location to efficiently satisfy the service needs of the community.

In fact, since 2009, requests for additional facility space and modifications have been brought forward by staff (of the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) to accommodate expanding population growth and community needs, equipment and technological changes, environmental, and legislative needs. However, these requests have been put on hold pending the outcome of the Rationalization Study and Master Plans.

Therefore, the Region requires a **Rationalization Study** that will assess the five Depots (as well as the subject operational groups and potential Seaton Depot), and recommend the most efficient accommodation and site utilization strategy to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department. The Study should

also assess (1) opportunities to consolidate existing operational facilities and operational groups to increase efficiencies and leverage synergies for service delivery, and (2) opportunities to co-locate field functions with other groups within the Region including, but not limited to, Durham Region Transit maintenance and operations facilities.

The Study will consider the following:

- How the forecasted growth rates of population, employment, and traffic volumes, within each of the service territories, will affect the infrastructure to be maintained, and the building space and equipment requirements to 2040;
- How these forecasts will affect the data and recommendations within the 2009 Report completed by AECOM;
- Whether the current alignment of boundaries, for the service territories for each of the Depots (including the proposed new Seaton Depot), should be shifted to provide the most efficient and effective service for the territories;
- The current and future functions, use, and activities that should be conducted at each of the Depots (including the proposed new Seaton Depot), to improve productivity and leverage synergies for service delivery;
- The efficacy of consolidating services/activities at certain Depots. For example:
    - providing all water and sewer infrastructure services from a single Depot for all service territories;
    - providing emergency repair operations from two Depots – one in the south and one in the north;
- How best to deliver services to the northern communities of the Region in conjunction with the Sunderland Depot;
- Whether the locations of the Depots, within the current and preferred service territory boundaries, should be expanded or relocated, if feasible, over the next 20 years. For example, should the entire Ajax-Pickering service territory be consolidated to a single location – either at the proposed Seaton Depot or a different location;
- For those Depots that should be relocated, where would be the preferred geographic location, and what would be the relocation cost;
- The potential for consolidating and sharing existing or future Depot facilities with other operational groups within the Region (e.g., The Traffic Operations Group, The Facilities Maintenance and Operations Group, Durham Region Transit, etc.).

This could be through the expansion of existing facilities or new facilities. Also, what the full impact of these consolidations would be;

- The infrastructure to be maintained, and the building space and equipment requirements at each of the current and proposed Depots (including the proposed new Seaton Depot), to respond to the immediate, medium (10 year) and long-term (20 year) needs of the Region's Works Department.

In addition, the Region requires a **Facility Master Plan** for each of three Depots (the Ajax-Pickering, Oshawa-Whitby and Sunderland Depots) including the accommodation of relocated operational service groups, if recommended. The Facility Master Plans will consolidate, for each of the Depots, the analysis and recommendations from the Rationalization Study for the immediate, short term (5 year), medium term (10 year) and long term (20 year). This will include the following:

- The preferred geographic location and service territory for each Depot;
- The current and future functions, use, and activities that should be conducted at each of the Depots;
- The infrastructure to be maintained, and the building/yard space and equipment required to 2040 (for employees, vehicles, equipment, parts, and materials). This will include the following functional areas:
    - Site access points;
    - Administrative areas;
    - Employee lunch room, locker rooms, and washrooms;
    - Training facilities;
    - Vehicle fueling stations;
    - Fleet washing;
    - Fleet maintenance and parts storage (including receiving/shipping);
    - Equipment and Material storage;
    - Indoor versus outdoor vehicle parking;
    - Vehicle staging areas;
    - Staff parking;
    - Vehicle traffic patterns (fleet, employee) and pedestrian circulation;
- Any facility/yard design issues or deficiencies negatively affecting operational flow, productivity, working conditions, environmental stewardship, and/or service delivery;
- Site safety and security issues;

- The need for facility upgrade requirements or new/expanded facilities;
- The potential impact of proposed developments on the area adjacent to the Depots

The Facility Master Plans will also provide (1) an optimized site and facility conceptual plan, (2) detailed Class "D" cost estimates for building and yard upgrades/expansions/new facilities, and (3) a sequence of events implementation schedule required to achieve the upgrades/expansions/new facilities.

The objectives of the Facility Master Plans include making recommendations that will (1) provide safe and efficient work conditions, (2) make best use of the existing site and facilities, (3) provide efficient flow of employees and vehicles through the yards, (4) meet industry best practices in facility and yard layout design, and (5) meet the operational growth requirements over the next 20 plus years.

This Report will focus on the Master Plan for the Sunderland Depot. The Rationalization Study, and the Facility Master Plans for the Ajax-Pickering and Oshawa-Whitby Depots will be completed in separate companion Reports.

3.0 FACILITY NEEDS ASSESSMENT

The Region of Durham's Works Department is comprised of (1) five Operations and Maintenance Depots, and (2) the Traffic Operations Group, and the Facilities Maintenance and Operations Group.

The Region's five Depots are referred to as:

- Ajax-Pickering Depot;
- Oshawa-Whitby Depot;
- Orono Depot;
- Scugog Depot;
- Sunderland Depot.

In addition, there are two Operations Groups: the Traffic Operations Group, and the Facilities Maintenance and Operations Group. The Traffic Operations Group is located at the Regions Traffic Operations Centre. The Facilities Maintenance and Operations Group will be relocated to the Traffic Operations Centre (from the Region's Whitby Water Supply Plant) in 2023.

This section of the Report will focus, primarily, on the current and future state facility needs (to the year 2040) for the Region's Sunderland Depot.

3.1 Current State

This section begins with a high-level description of the current size, location and service boundaries for the Region of Durham's Works Department's five Depots and two Operations facilities. It then proceeds to focus on the Sunderland Depot – describing its current state service functions, and resources. It also describes (1) the characteristics of its key functional work areas, (2) the limitations that the current buildings and yard place on the ability of the employees to operate efficiently and effectively, and (3) the opportunities to eliminate business process inefficiencies.

3.1.1 Location, Size and Service Boundaries (For Each Depot and Operations Facility)

The Region of Durham was established in 1974 and is the largest geographical jurisdiction in the Greater Toronto Area encompassing approximately 2,532 km^2 of land and almost 800,000 residents. The vast majority of the residents live in the five southern municipalities of Pickering, Ajax, Whitby, Oshawa, and Clarington.

To service this vast area, the Region of Durham's Works Department operates five Depots which are distributed, strategically, across the Region. In addition, the Works

Department operates the Traffic Operations Group, and the Facilities Maintenance and Operations Group from two Operations facilities.

Below, in Table 3.1, we describe the current location, size and service boundaries for each of the Depots and Operations facilities:

Table 3.1 - Current Location, Size and Service Boundaries

Depot/Facility	Location	Size of Site (acres)	Total Indoor Space (ft^2)	Service Boundaries
Ajax-Pickering Depot	202 Salem Rd., Ajax	14.75	17,425 (excluding separate buildings)	The entire City of Pickering and the Town of Ajax
Oshawa-Whitby Depot	825 Conlin Rd., Whitby	14.9	51,500	The entire City of Oshawa and the Town of Whitby
Orono Depot	3480 Taunton Rd., Orono (Clarington)	10	20,478 (4,806 for material storage bldg.)	East part of Durham Region - Clarington
Scugog Depot	10 Regional Rd.21, Port Perry	80	11,301 (2,348 for steel storage bldg.)	Central part of Durham Region - Scugog
Sunderland Depot	S995 Regional Rd. 10, Sunderland	4.02	8,201 (main building and service garage)	North part of Durham Region – Uxbridge and Brock
The Region's Traffic Operations Center	101 Consumers Drive, Whitby	3.5	44,518	Region of Durham
The Region's Whitby Water Supply Plant	301 Water Street West, Whitby			Region of Durham

On the following page, we show Map 3.0 which identifies the location of the five Depots, the two Operations facilities, and their respective service boundaries.

3.1.2 Service Functions and Service Locations (Sunderland Depot)

The Region's Works Department is responsible for a number of service functions including operating and maintaining the Region's (1) network of roads and bridges, (2) networks of water, storm water, and sanitary sewage piping, (3) traffic signals, warning devices, roadside protection and line markings, and (4) buildings. In this section, we describe the service functions performed from the Sunderland Depot.

Sunderland Depot

The Sunderland Depot is the smallest Depot within the Region though it still provides full services to its territory.

Map 3.0 – Current Location of the Works Department Depots and Operations Centres

Roads Department

The Roads Department operates a fleet of vehicles and equipment at the Depot to help provide summer and winter maintenance to the Regions roads and bridges.

Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to store road salt (for winter road maintenance) and other materials (such as gravel, cold-patch, etc.). The employees are provided with indoor amenities (e.g., lunchroom and changing rooms), and the administrative staff are provided with office workstations.

Water Department

The Water Department also operates a fleet of vehicles and equipment at the Depot to help provide year-round maintenance to the Regions networks of water, storm water, and sanitary sewage piping. Some of the vehicles and equipment require indoor storage while the rest are stored outdoors. The Depot is also used to provide Regional utility locates. The employees are provided with parking and shared indoor amenities (with the Roads Department employees), and the administrative staff are provided with office workstations.

Fleet Services Department

The Fleet Services Department operates as a decentralized group providing Fleet maintenance services, on site, at each of the five Depots. At the Sunderland Depot they provide one licensed mechanic who services the fleet of Roads and Water Department vehicles. He operates on the day shift using two and a half maintenance bays, and reports to a Supervisor and the Depot Superintendent located on-site. The bays provide space for Preventative Maintenance Inspections, CVOR safety inspections, and repairs for all vehicles and equipment.

3.1.3 Resources – Employees, Vehicles and Materials (Sunderland Depot)

In Appendix A, we list the current number of resources (employees, vehicles, equipment and materials) utilized by the Works Department at the Sunderland Depot. These numbers will be used, in section 3.2.4, to estimate the future resource requirements in 2030 and 2040.

3.1.4 Functional Work Areas (Sunderland Depot)

In this section, we describe the characteristics of the key functional work areas that are located at the Sunderland Depot. In section 4.2, we will discuss some of these areas in more detail from the context of industry best practices in layout design.

Administrative Office

The office staff require administrative space for offices, meeting rooms, printers, and various types of storage. A small reception area is also required for visitors to the site. The outdoor staff require a training room and a place to discuss daily work assignments at the beginning of the shift. Some of the outdoor workers (typically Lead Hands) require access to a touch-down station (with computer terminal) to input data at the end of the shift.

Employee Amenities
The outside workers require changing rooms, lockers, washrooms, and showers for male and female outside employees. A lunchroom is also required, however, most of the outside workers do not return to the Depot for lunch so the lunchroom is primarily used by the office staff. There also needs to be consideration for gender-neutral and multi-faith facilities.

Fleet Maintenance Garage
Fleet Maintenance bays are required for providing on-site maintenance to the Fleet of work vehicles. The bays provide space for changing fluids, as well as for completing major repairs (including welding). Painting and body work are contracted out.

Parts/Tools Storage
Storage space is required for the storage of Fleet maintenance parts. Automotive parts are, typically, stored on shelves in a room adjacent to the maintenance bays. Small tools and equipment (for the outdoor crews) are, typically, stored in locked rooms adjacent to the employee amenities and parking area for the work vehicles.

Vehicle/Equipment Storage
Indoor storage space for specialized work vehicles and equipment is required. This includes bucket trucks and tandem axle plows. All other vehicles are stored outdoors.

Wash Bay
The vehicles are washed outdoors in the yard.

Salt Storage
There is one building for the indoor storage of salt for winter maintenance operations. Salt is stored indoors to protect it from rain.

Fueling
There are fueling pumps that provide fuel (gas, and diesel) to work vehicles stored within the yard.

On the following page, in Table 3.2, we provide the current space available for each of these areas.

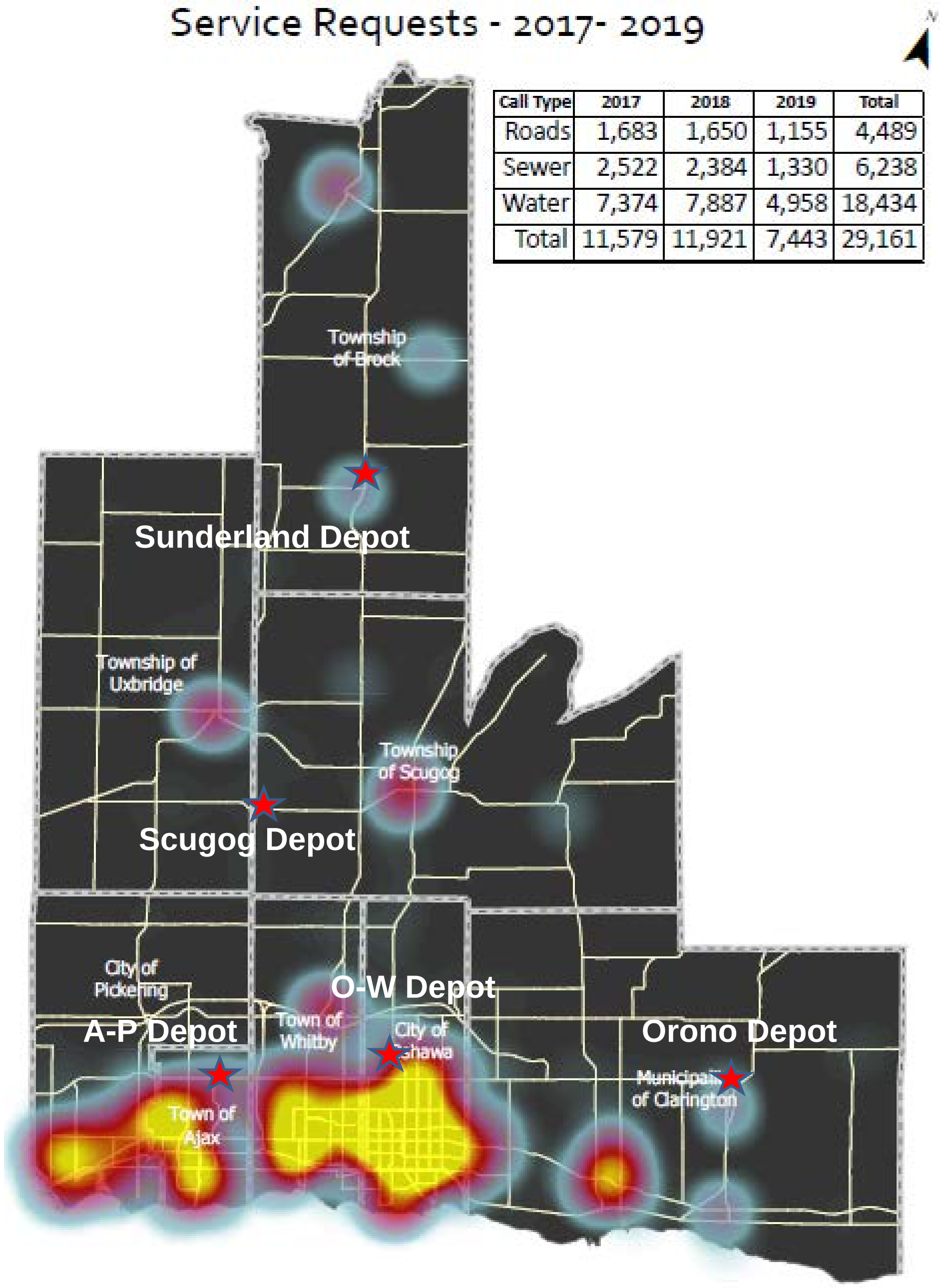
3.1.5 Facility Limitations – Location, Size, Design, Layout and Condition (Sunderland Depot)

In this section, we discuss the limitations imposed on the Sunderland Depot due to its location, size, design, layout and condition. Map 3.1, on page 15, is a Heat map and will be used to evaluate the location of the Sunderland Depot relative to where the service calls are. The Heat map uses colour to reflect the frequency of service calls throughout the Region. Light blue represents a low frequency of calls whereas yellow represents a high frequency.

Table 3.2 – Current State Areas at the Sunderland Depot – 2020

Functional Work Area	Space (ft^2)
Administrative Office	23,574
Employee Amenities	
Materials Testing Lab	0
Water Meter Shop	0
Fleet Maintenance Garage	2,521 3 one-way
Parts Storage	560
Vehicle/Equipment Storage	10,323 5 one-way
Wash Bay	0
Salt Storage	1,302
Fueling	Yes

Map 3.1 – Frequency of Service Requests for Roads, Sewer and Water by Location



Call Type	2017	2018	2019	Total
Roads	1,683	1,650	1,155	4,489
Sewer	2,522	2,384	1,330	6,238
Water	7,374	7,887	4,958	18,434
Total	11,579	11,921	7,443	29,161

Location

The Sunderland Depot is located very close to the geographical centre point of its service territory. It is located on the north side of Regional Road 10, at the west limit of the Village of Sunderland. The Depot is largely surrounded by rural farmland with residential homes nearby in the Village. Immediately adjacent to the Depot, on its east boundary, is the Township of Brock's Maintenance and Operations Depot. There is a new residential development almost immediately east and north of that Depot (behind the Township's Depot).

In general, the Depot is considered, by staff, to be in a good location relative to the area that it serves – the north end of the Region. However, below, we will analyse this location by assessing how it affects employee productivity and service delivery:

1) **Travel Distances for Work Crews:** Based on the heat map, the Depot is not located close to where the majority of the service requests originate from (which is in Beaverton). That said, it would be preferable for the Roads group to stay in Sunderland whereas for the Water Services group it would be preferable to be near Cannington.

2) **Traffic Congestion Faced by Work Crews:** The population of the northern part of Durham Region has not increased significantly during the last twenty years. Therefore, traffic congestion has not increased or adversely affected the travel time required by work crews. The crews have also benefited from the fact that the Depot is located close to Highway 12 with good north-south access to all parts of the service territory.

3) **Location of the Depot Versus Future Population and Employment Growth:** The growth in local population is not expected to increase significantly during the next 20 years. Therefore, to minimize travel distances, in the future, it would be preferable for the Depot to stay where it is which is – very close to the geographical center point of the service territory.

4) **Impact of the surrounding Neighbours on Yard Operations:** The preferred site should for any Depot is in an industrial park with compatible surrounding properties that aren't significantly affected by the noise, traffic or air-born emissions resulting from the Depot. Furthermore, a Depot should not be located immediately adjacent to environmentally sensitive areas such as a watercourse or wet lands. Given these requirements, the Sunderland Depot is in a relatively good location.

Size, Design and Layout

The productivity of the employees currently working at the Sunderland Depot is directly affected by the size, design and layout of the buildings, and the layout of the yard. Below, we discuss these issues and whether they are adversely affecting employee productivity, and the efficient utilization of space.

The size of the site, at 4 acres, is currently at full capacity with no room for the expansion of buildings or yard storage over the next 20 years. The layout of the buildings and yard reveal that they do not incorporate modern design trends and best practices for Municipal Operations. For example:

- The office area, shops, and employee amenities are poorly laid out, too small for current needs, and present numerous limitations to the efficient flow of employees. Hence, the level of efficiency and effectiveness at which the employees work is compromised.

- The Board room and lunchroom should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy;

- Touch-down stations should be made available for those outside workers requiring a computer for less than 4 hours per day (to reduce space requirements);

- There are no female changerooms and no gender-neutral or multi-faith facilities;

- The design of the facility should be “barrier free” and comply with provincial requirements for accessibility. For example, the lunchroom on the second floor is not accessible;

- Storage rooms do not have sufficient vertical clear height to take full advantage of high-density storage systems (such as vertical lift modules, and mezzanine shelving) to maximize storage densities and reduce space requirements. Also, an inventory management system is required;

- There is no indoor vehicle wash bay;

- There is a shortage of indoor vehicle and equipment storage space;

- There is a shortage of space for yard materials storage. The site does not provide sufficient space for future growth;

- Require a separate employee parking area with direct access into the main building without having to cross the path of work vehicle traffic;

- Require an outdoor parking pad for storing vehicles within the yard;

- Require counterclockwise flow through the yard, for work vehicles, to improve driver sightlines;

- The vehicle refueling station is located in-line with the flow of work vehicle traffic, potentially, creating a bottleneck;

- Plastic and rubber items, including piping, fittings and the brine storage tanks, are stored outdoors fully exposed to the sun. This will lead to material deterioration by the sun;

Building Condition
The date of construction of the main building (with offices) and Fleet shop is unknown but believed to be prior to 1965 which is when the four bays and lunchroom were built. The building is, therefore, past its expected asset life. However, the building appears to be well maintained and in good condition given its age. The following items have been identified as issues requiring repair or upgrade to the building's substructure, shell, interior or services:

- Epoxy coating for the floors ($85,000);
- Require an Emergency Standby Generator ($295,000);
- The Hoist in the garage requires reconditioning ($45,000);
- There are no sprinklers within the building;
- Many of the exterior walls are not insulated resulting in higher energy costs.

3.1.6 Opportunities to Reduce Space Requirements

In this section, we will discuss a number of Best Practices for reducing space requirements within an Operations Depot. Reducing space requirements would, potentially, reduce the size of needed building additions. **Some of these approaches may have already been initiated by the Works Department.**

Incorporate LEAN to Reduce Waste Within the Business Processes

LEAN is an operational philosophy that improves business processes by focusing on the delivery of *value* to the customer. Employees, at all levels of the operation, participate in the identification and elimination of non-value-added activities (waste) throughout the operation. The result is shorter cycle times, lower operating costs, and higher customer service levels. Other benefits often include a reduction in the number of employees, equipment, inventory and space required.

LEAN was originated by Toyota to dramatically reduce cycle times and costs, and to increase product quality and service delivery. The seven types of waste that LEAN seeks to eliminate are present in every operation. They include (with examples):

- Transportation (transporting work vehicles to a different yard to be maintained);
- Defects (time spent fixing work done incorrectly the first time);
- Inventory (storing more materials or maintenance parts on-site than are necessary);
- Motion (crews driving to a work site);

- Wait time (crews stuck in traffic or waiting for their vehicle to be repaired);
- Overproduction (making more signs than are needed or before there is demand for them);
- Over-processing (performing steps in a process that are unnecessary).

LEAN uses various standard techniques and tools which fall into the broad categories of visual communication of information, process mapping, process control, and identification and elimination of defects. Some of the best-known lean tools and techniques include value-stream mapping (a diagram of the employee/material and information flows required to complete a job); just-in-time production (delivering the exact amount needed, when and where it's needed); the "5 S's" (five principles of an organized workplace); work leveling (ensuring consistent type and quantity of work over a period of time to avoid batching and backlogs); and kaizen (continuous improvement).

Therefore, all business processes should be streamlined to reduce waste before determining if a building needs to be expanded. Doing this would ensure that the size of the expansion is minimized to reduce land requirements, and capital construction and operating costs.

Our understanding is that the Region has begun training employees in LEAN Manufacturing and will be using it to improve their business processes.

Incorporate a Performance Management System to Achieve Continuous Improvement

A Performance Management System is an ongoing process for reducing operating costs and improving customer service. A common Performance Management System uses a five-step approach (define, measure, analyze, improve, and control) to help ensure that management decision-making and employee activities are focused on identifying and eliminating non-productive activities so as to continuously improve operational performance and achieve objectives for service delivery.

More specifically, the process should:

- Define key success factors and key performance indicators;
- Measure and report actual performance (i.e., service levels and operating costs) and compare it to the target standards;
- Analyse the results and identify opportunities to improve, and actions required;
- Improve performance through informed decision making, and a focus on accountability for performance.
- Control/Sustainable improvements over time.

A Performance Management System transforms the organization, its management, and the policy-making process. It becomes integrated into all aspects of the organization's
management and policy-making processes, so that it is focused on achieving improved performance for the public.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the business process are adhered to. They must be chosen with care because changes in one area of the business process can have unintended impacts in other areas.

All key performance indicators should be measured through an IT management system and reported on a weekly basis. Weekly meetings should take place both at a senior management level as well as in the shops to analyze this information and to determine what action should be taken to improve the results. Any recommended changes to the business process should be documented and controlled as a Standard Operating Procedure (SOP). Semi-annual audits are required to ensure compliance of the SOP's by the workforce.

The Works Department is currently in the process of implementing a Performance Management System (to be referred to as EMMS).

Outsource Scheduled Maintenance for Light Duty Vehicles (Class 1 & 2) (to reduce maintenance costs and maintenance bays)

Outsourcing scheduled maintenance for light duty vehicles (Class 1 & 2) to a Third-Party Provider, often, reduces maintenance costs and permits Fleet Services to focus on unscheduled maintenance and heavy vehicles. This also reduces the number of maintenance bays, parts storage, employee amenities, and employee parking. However, Class 1 & 2 vehicles located at Depots with Fleet Services are often fully maintained there (i.e., scheduled and unscheduled maintenance) to eliminate the downtime from shuttling vehicles to off-site Third-Party Providers.

Consolidate Parts Storage into One Area and Review the Management Approach

The parts/supplies storage for all five Depots and the Operations Centre should be consolidated into one Stores Department. This would eliminate duplication in space requirements and would achieve economies of scale.

In terms of the management approach, Vendors or 3PL's (Third Party Logistics provider's) are, typically, very cost effective at managing those parts which move off the shelf quickly - referred to as fast movers (e.g., ten or more turns per year). Therefore, these parts should, probably, be managed off-site by the vendors or a 3PL and supplied to the Stores Department, as required, to replenish their point-of-use storage levels. This would reduce on-site storage space, stock-outs, logistics costs and improve customer service.

Vendors and 3PL's (Third Party Logistics provider's) tend to be much less cost effective at managing slow movers, critical spares and dead stock. Dead stock (i.e., has been sitting for multiple years and may never be used) should be written-off and removed to save warehouse space. The slow movers and critical spares should be managed in-house to reduce logistics costs.

Consolidation of medium and slow movers, and critical spares, into one Stores Department, would help to justify high density storage systems and automation, reduce labour and space requirements, and reduce warehouse costs.

The objective of the Stores Department would be to order, receive and store inventory, and to replenish parts, tools and miscellaneous supplies to the point of use storage areas within the maintenance garages and Departmental tool/supplies storage areas at each Depot and the Operations Centre.

Our understanding is that the Works Department maintains a central Parts Store at the Oshawa-Whitby Depot. From here they supply the Fleet garages located at the other four Depots. However, they should also supply the Traffic Operations and FM&O Group at the Traffic Operations Centre.

Optimize the Inventory Levels within the Stores Department and at the Point-of-Use Storage (to reduce costs versus using a Vendor or 3PL, and to minimize space)

Stores Department and point-of-use inventory levels should be analysed and optimized to minimize space requirements, inventory costs and stockouts.

There are two primary ways to minimize space requirements for the storage of parts:

1. Reduce inventory levels
2. Increase the density of storage

This section will discuss ways to reduce inventory levels. Later we will discuss ways to increase the density of storage.

Reduce Inventory Levels

The two primary ways to reduce inventory levels are:

- Reduce the number of SKU's;
- Reduce the average inventory level for each SKU.

Industry Best Practice is for 3 turns/year or greater within the storage area. If the inventory is, typically, turning over less than 3 turns/year there is likely an opportunity to reduce warehouse inventory levels which would reduce inventory carrying costs and the need for warehouse storage space (and associated operating costs).

We recommend that inventory levels be measured and recorded, at least monthly, so that the number of turns of individual SKU's can be measured. Once this information is available, it is recommended that those SKU's with a turnover of 1 or less be analysed to determine why their turnover was so low and whether the turnover could be increased while still satisfying service requirements.

Some of the typical reasons for low turnover may include:

- Some of the SKU's are dead stock that should be written-off and removed from inventory;
- For some SKU's, the reorder levels are too high which should be reviewed and corrected;
- For some SKU's, the reorder quantities are too high which should be reviewed and corrected;
- Actual inventory levels were higher than thought when new orders were requested;
- When some of the SKU's were brought into stock for the first time, the requestor overstated their needs resulting in excess, unused inventory;
- Seasonal items will likely have excess levels that are held over until the next year;
- Critical Spares stock may require excess inventory levels to avoid the possibility of stock-outs;
- End users may request that certain SKU's be held in stock (rather than removed) for multiple years because they are no longer commercially available;
- The rate of demand for some SKU's is unpredictable, thereby, requiring higher than optimal inventory levels.

Additional opportunities for reducing either the number of SKU's in inventory or the average level of inventory for each SKU may include:

- Reduce the number of vendors providing the same equipment. For example, purchase all crew cabs from the same manufacturer. This will reduce the number of maintenance SKU's required;
- Determine which SKU's (other than the Critical Spares) could be eliminated from inventory because they could be supplied, by the vendor, within two hours of request;

- Determine which SKU's (other than the Critical Spares) could have their inventory significantly reduced because a vendor would be willing to manage the inventory to optimal levels. This is referred to as Vendor Managed Inventory (VMI);
- Reduce excess inventory levels by analysing those items purchased in bulk to determine whether there are false economies with purchasing in bulk;
- Reduce excess inventory levels by using bar code scanners (integrated with a Warehouse Management System) to improve inventory accuracy, visibility and control.

In summary, there is likely an opportunity to reduce warehouse space and operating costs by determining which of the SKU's may be eliminated from inventory, and which SKU's may have their average inventory level reduced.

Measure Performance and Hold Accountable the Vendors or 3PL to Reduce Stock-Outs and Lead Times (to reduce vehicle downtime and spare vehicles)

Above, we discussed the importance of using a Performance Management System to measure and improve performance. If the Region decides, in the future, to use a Vendor or 3PL to manage the parts inventory, their performance must be measured to ensure that the objectives for customer service are being met. Failure to meet objectives will lead to greater vehicle downtime and a larger number of spare vehicles required to compensate for the downtime.

Below, we list a number of key performance indicators that could be used to measure the performance of a Vendor or 3PL.

On-Time Delivery:

- **Inventory Count Accuracy by Dollars/Units** measures the accuracy of the physical inventory compared to the reported inventory;
- **Line Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of lines filled to the customer's request;
- **Order Fill Rate** is a measure of inventory accuracy and availability. More specifically, it measures the percentage of orders filled to the customer's request;
- **Backorders as a% of Total Lines** measures the percentage of orders that are shipped late due to a lack of stock;
- **Order Picking Accuracy** measures the picking accuracy. It is the percentage of orders picked correctly;

- **On Time Ready to Ship** measures the success rate of the warehouse to prepare items on-time for shipment. It is the percentage of orders ready at the planned time to meet customer requirements;
- **On Time Shipments** measures the success rate of the warehouse to actually ship items on-time. It is the percentage of orders shipped at the planned time;
- **On Time Delivery** measures the success rate of the trucks to deliver on-time. It is the percentage of orders delivered to the customer at the requested time.

Warehouse Costs:

- **Lines Received and Put Away per Person Hour** measures the productivity of receiving operations;
- **Lines Picked and Shipped per Person Hour** measures the productivity of picking operations;
- **Cases Picked and Shipped per Person Hour** measures the productivity of picking operations;
- **Internal Order Cycle Time** measures the average time from when the order was received from the customer to when the order was shipped;
- **Productive Employee Utilization** measures labour activity levels;
- **Material Handling Rate** measures the total cost to operate the distribution network relative to the total cost of Inventory Sales.

Inventory Costs:

- **Turnover Rate** measures the level of excess inventory within the warehouse.

Transportation Costs:

- **Courier Cost per Line Shipped** measures courier efficiency.

Key performance indicators must be specific, measurable and actionable to improve performance. There must also be an operating procedure in place to ensure that any improvements made to the supply chain process are adhered to. They must be chosen with care because changes in one area of the supply chain can have unintended impacts in other areas.

Improve Vehicle Availability (to reduce spare vehicles)

It is common for municipal operations to have vehicle availability problems which severely constrain their ability to meet service requirements. Typical factors which may create a problem include:

- Difficulty in obtaining parts to carry out repairs which, in turn, may have been caused by:
    - Inadequate inventory;
    - Having too many types of equipment requiring too many types of spare parts;
    - Damage caused by operations resulting from inadequate training of operators or other factors resulting in unnecessary breakdowns;
    - Outdoor storage of vehicles, particularly sidewalk plows and blower attachments for loaders;
    - Failure to complete annual preventive maintenance and inspections;
    - Poor communications with Fleet Services.

Steps that can be taken to improve vehicle availability include:

- Improve operator training on vehicle damage issues;
- Improve communications with Fleet Services;
- Provide indoor parking for vehicles to reduce failure rates;
- Contract out seasonal inspections/refurbs if Fleet Services is unable to ensure completion;
- Improve standardization of vehicles/equipment – buy fewer specialized units;
- Accept mechanics with heavy equipment ticket;
- Have operators report equipment problems directly to Fleet Services (while also advising their Supervisor);
- Provide faster feedback to operators on preventable damage occurrences;
- Establish a process to have Fleet Services and Operators formally review failures and repair delays every two weeks to identify issues. The result could be changes in operating practices and/or inventory levels required and/or notice/directive/training for vehicle users;
- Improve training, of operators aimed at reducing equipment damage, improving operator familiarity and skill with equipment for snow operations.

Incorporate Technology to Optimize Vehicle Service Routes (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should use computer programs to plan, balance, develop and optimize vehicle service routes for winter maintenance (i.e., plowing and salting). The objectives of the programs are to, in part, reduce deadhead time, and maximize the overall efficiency of the routes and required fleet of vehicles. This helps to reduce operating costs and improve service delivery. By optimizing the service routes, the

Department will minimize the size of its Fleet. This reduces vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Incorporate Technology (AVL/GPS Tracking) to Measure Performance of Field Crews (both Contractors and City Employees) (to reduce fleet size, employee parking, and fleet maintenance)

The Works Department should continue using AVL technology to monitor and record the routes taken by their vehicles. This is most often done for winter maintenance vehicles to mitigate the risk of lawsuits. However, it can be done for all vehicles as a way of monitoring their daily routes and ensuring that they are being used productively. This well help management to identify and eliminate non-productive work activities so as to continuously improve operational performance and minimize the size of the fleet required. Reducing the size of the fleet will reduce vehicle maintenance requirements as well as the space required for work vehicle and employee parking.

Eliminate Contractor Parking at the Depots

For Winter Maintenance contracts (i.e., plows and salters), there are benefits to having the contract vehicles located at the Depots (close to the salt/sand storage and the start of the routes).

Municipalities now have to operate in compliance with the Minimum Maintenance Standards for Municipal Highways (MMSMH) if they wish to limit their liability and exposure to claims for negligence. The MMSMH were originally developed in the late 1990's as a mechanism to help municipalities deal with the increasing costs of negligence liability insurance as a result of increases in claim settlements.

This Provincial regulation, under the new Municipal Act, specifies minimum maintenance standards for roads, bridges, shoulders and signs. Although such "standards" have only "guideline" status, failure to achieve such 'standards of care' could have liability implications in civil suits. As such, municipalities have, typically, taken the approach of aligning their standards to the minimum standards set out in the regulation. In theory, in any potential lawsuit, if the municipality can show that it meets the Minimum Maintenance Standards for Municipal Highways, then it has presented the legal argument against the lawsuit. There is an increased liability risk associated with not meeting the minimum standards under Ontario Regulation 239/02.

Municipalities have complete administrative control over highways/roads under the jurisdiction of the new Municipal Act but do not have to adopt the Standards. However, in cases where the Standards are not adopted by a municipality, judgements against such municipalities for poor maintenance will be made by the courts after comparison with the Standards. Such being the case, the Standards will be the defacto standard for all municipalities as far as road maintenance is concerned.

That said, given the close proximity of all five Depots to rural areas, it may not be necessary for the Works Department to provide space at the Depots for the contractors to park their vehicles. The contractors may be able to find alternative, affordable space near by. This would reduce the space requirements at each Depot.

Optimize the Average Age of the Fleet (to reduce fleet maintenance, and the number of spare vehicles)

There are many issues that will affect the determination of the optimal number of vehicles in the Fleet - shift work structure, location of yards, design of service routes, age of the Fleet and requirement for spares, use of contractors, and mix of vehicles. Some of these (location of Depots and the design of service routes) were discussed above. In this and the following two sections, we discuss the importance of fleet age and utilization, and the mix of vehicles within the Fleet.

The optimal service life of a work vehicle varies based on class, duty and utilization. Vehicles which are kept longer than their optimal service life require increasing amounts of maintenance – both scheduled and unscheduled. Older vehicles, therefore, consume more maintenance time and are out of use longer. This puts a heavier burden on Fleet Services and lowers the productivity of the work crews. To compensate, Public Works Departments, typically, carry a number of spare vehicles which require space to park when not in use. Therefore, the Works Department is recommended to replace vehicles once they are beyond their optimal service life.

Our understanding is that the Region does carefully manage the average age of their Fleet of vehicles.

Increase Fleet Utilization (to reduce fleet size)

The Works Department should maximize the utilization of its work vehicles so as to reduce the size of the fleet and the need for parking space.

Often, the utilization of vehicles reaches its peak in certain months, each year, then drops off significantly for the balance of the year. For example, tandem axle trucks usually reach their peak utilization in January and February because of plowing but then are largely inactive during the summer. This seasonal variation provides an opportunity to rely more heavily on contractors during the winter months. This would permit a reduction in the number of in-house winter maintenance trucks saving approximately $30,000 per truck per year in maintenance and depreciated costs. It would also reduce parking space requirements.

Optimize the Mix of Vehicles (to reduce fleet size)

There is a need to rationalize the Fleet, for the services provided, to ensure that there is the optimal mix of vehicles and equipment based on best practices. For example, when possible, vehicles should be deployed for multiple uses (e.g., plow, wing, spread, haul –with full capacity).

Permit Select Drivers to Take Cars, Vans and Pick-up Trucks Home (to reduce employee parking)

There are potential complications related to permitting employees to drive work vehicles home. However, there is also the potential to save a significant amount of yard space due to a reduction in employee vehicles.

Provide Incentives for Employees to Car Pool, Cycle or Use Transit

Encouraging employees to car pool, cycle or use public transit will reduce the need for yard space for employee parking. Buildings should be equipped with lockable storage for bicycles, and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

Refuel Work Vehicles during the Night (to reduce the number of dispensing pumps and lanes)

It is best practice, within the Transit industry, to clean and refuel buses (using specialized work crews) during the night when they are not in use. This, potentially, reduces the number of refueling pumps required because the process is spread out over four to eight hours. It also reduces vehicle downtime (during the day) and ensures that the buses are ready to operate at the start of their shift. This approach to refueling may be applicable to the Fleet for the Works Department.

Permit Class 1 & 2 Vehicles (i.e., Cars, Vans and Pick-Up Trucks) To Use Public Gas Stations (to reduce dispensing pumps and lanes)

Refueling off-site, potentially, reduces the number of refueling pumps required and the space required.

Reduce the Use of Salt for Winter Maintenance (to minimize the size of salt storage buildings)

The Roads group needs to store salt indoors for winter roads/sidewalk maintenance. The best practice approach for salt storage is the combined storage and loading into one facility. The alternative approach is to store the materials inside but to conduct the loading outside.

To minimize the size and capital cost of any new salt storage facilities, the Roads group should look for additional ways to reduce its annual consumption of salt. Industry Best Practices for reducing the consumption of salt are shown in Table 3.3.

The Roads group should also consider the following ways to minimize their use of salt:

- Weigh scales should be considered to help measure the amount of salt being loaded into trucks;

- Should adjust the quantity of salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems;

- Should optimize salt application rates. For example, restrict application rates on arterial collector roads to 135kg/lane km, and for local roads to 70 kg/lane km;

- Should undertake pre -wetting in all spreading activity. Pre-wetting is a very effective practice and should be included in all spreading activity. The entire spreading fleet should be outfitted with pre-wetting capability. The purpose of pre-wetting is to wet the salt for several reasons:

    - In the case of cold pavements, it enables the grain to freeze to the pavement
    - In the case of snow packed surfaces, it enables the grain to “melt” into the snow pack rather than “blowing” off
    - In the case of de-icing, it begins the brine making process by reacting with the crystalline salt to produce a brine concentrate which then lowers the freezing point of contact resulting in melting
    - In the case of traffic, it mitigates bounce off (up to 30% has been measured) by making the grains “stickier,” similarly with windy conditions.

  In general, the benefits include granules that adhere to the surface better, have a faster and longer-lasting effect, and can be spread more quickly.

  The practical result of pre-wetting should be a reduction in the resources necessary. The investment in brine making equipment would reduce the cost of supplying the brine. There is no advantage to using chemicals such as calcium chloride. Water could be used to similar benefit if it could be prevented from freezing in the tanks. With improved calibration and controls in spreader vehicles, it is reasonable to establish a range of spread rates to be applied under certain conditions.

- Should undertake a demonstration program to assess the merit of achieving centre bare pavement service, post storm, by using a sand product mixed with 25% salt;
- Should make use of calibrated spread vehicles to compare actual material spread rates across routes, across vehicle units, and across staff operators within a given winter season;
- Should compare actual material spread rates for each route and vehicle unit across winter seasons (time series analysis);
- Should implement disciplined spread management practices supported and refined by spread rate benchmarking and measurement. The benchmarking approach is practical because it is internal in focus (avoiding complex apple to apple issues across other municipalities), and it is firmly linked to the enforcement of service levels, individual operator behavior, and cost savings targets.

Table 3.3 - Industry Practices for Reducing Salt Consumption

Industry Practice
Removing as much snow from the roads as possible to minimize the amount of snow and ice that that needs to be melted (and the quantity of sand/salt required)
Using Material Loading Sheets that describe and limit the amount of sand/salt loaded into the sander/salter. This will prevent the driver from using excessive quantities of sand/salt.
Adjusting the quantity of sand/salt applied to the roads based on road surface temperatures, weather forecasts, and road conditions to prevent excessive use. This requires the use of road sensors, and road weather information systems
Optimize sand/salt application rates. For example, restrict application rates on arterial collector roads to 130 kg/lane km, and for local roads to 65 kg/lane km.
Pre-wetting of salt using brine to improve the utilization rate
Pre-wetting of sand using hot water to reduce bouncing and improve the utilization rate
Using computerized controls on spreader equipment that can accurately control the rate of sand/salt application so that the quantity applied to the roadway is minimized
Blend brine with other chemicals to produce “Hot Brine” that will be effective below – 12^{o}C
Direct Liquid Application to replace the use of brine with a chemical that works as low as -30^{0}C
Using GPS systems on the trucks to (1) monitor the speed and location of the trucks through Automated Vehicle Location (AVL), and (2) provide route guidance and spreader control for the driver
Training staff so that they understand how to use the equipment and take other steps to minimize the application of sand/salt
Use loader scales to measure and record the quantity of sand/salt used by each truck and then use this information to identify opportunities to reduce consumption rates. If you don’t measure it, you can’t reduce it.
Store sand indoors as this will reduce the need for pickling with salt from 5% down to 3%.

Request that Field Crews Eat at their Work Site (to reduce the size of lunchrooms - only for inside workers)
Field crews should continue, when possible, to eat lunch at their work site (or closest restaurant/Depot) rather than returning to their home yard to eat in the lunchroom. Doing this will permit the lunchroom to be sized only for those employees working full-time at the yard. This, in turn, will reduce space requirements.

Replace Touch-Down Desks with Dash Mounted Devices (to reduce space)
Some field employees/foremen require limited access, each day, to a computer to receive work orders and to input information/data. Typically, workstations or "touch-down desks" are provided for these employees. The new trend is to provide these employees with access to mobile tablets or dash mounted devices to input the information/data. The benefit is increased employee productivity and a reduction in office space for the workstations or "touch-down desks".

3.1.7 Opportunities to Improve the Depot Design

In section 3.1.5 we listed a number of design issues that are adversely affecting employee productivity, and the efficient utilization of space at the Sunderland Depot. Below, we list a number of ways to improve the design of a Depot.

Incorporate Transit Bus Style of Parking for Vehicles (to reduce space)

Within the Transit industry, it is best practice to store buses indoors in long lanes (typically, 6-8 buses deep). This approach should be considered for other municipal fleets that require indoor storage and can operate with a first in, first out philosophy. This would include those winter maintenance vehicles that leave the yard at the same time.

Therefore, the approach to designing the layout for the indoor storage of work vehicles should (1) identify those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identify the optimal width and length of each lane to minimize the total area requirement.

Standardize - Utilize Corporate Space Standards for Offices, Employee Amenities and Shops (to reduce variation and space, and increase collaboration and productivity)

The Region of Durham is currently going through a process to standardize and document their space requirements for offices so as to reduce variation amongst locations, and space requirements. These standards should help promote employee collaboration, productivity and the desired corporate culture. For example, most municipalities are eliminating walls and modular office partitions in favour of an open concept office environment. Offices are becoming smaller or eliminated all together in favour of more meeting rooms.

- Office staff should, where appropriate, be consolidated into one open concept administration office area. This will improve communication and collaboration between employees, and will optimize space utilization;

- Meeting rooms and training rooms (adjacent to the administration office area) should be designed for flexible use (with mobile partitions and furniture) and made available for group activities and discussions requiring privacy. Their use should be shared amongst the Works Department to reduce the total number required due to variations in demand;

- Touch-down stations should be consolidated (if not replaced with mobile devices or vehicles dashboard units) between the different groups to reduce the number required and to reduce space requirements;

- Employee amenities (lunchroom, change rooms and washrooms) should be consolidated and shared by all employees (including both office and unionized staff) to eliminate duplication and to efficiently utilize space. The lunchroom should also be designed for flexible use (with mobile partitions and furniture). The employee amenities should be located on the ground floor level close to the work vehicle storage areas;

- Parts/materials stores, from different groups, should be consolidated to eliminate duplication, and to implement technology and storage systems which will maximize the cube and more efficiently utilize space;

Design for Flexibility - Design Lunchrooms to be Multi-Purpose (e.g., crew meetings and training) (to reduce space)

When possible, facility areas should be designed to be flexible in their use. For example, lunchrooms should be designed for multiple purposes as a way of consolidating areas and reducing the total space requirements. Lunchrooms are often also used for start-of-shift crew meeting areas, and training rooms.

Design a Healthy Work Environment (to improve productivity)

A variety of research has shown that employees are both happier and more productive in office environments with natural light and views, as well as natural ventilation (which can be as simple as access to an operable window). Natural light has been shown to reduce seasonal affective disorder, increase visual clarity, help regulate sleep, reduce drowsiness, improve immune function, reduce sick days and increase productivity. Access to natural light, views and ventilation is the basis for three LEED points and is written into many other green standards. Many government organizations have codified the ‘Right to Light’ for their office design standards -- for example, Alberta Infrastructure’s *Technical Design Requirements*.

Contemporary office design best practice places open workspaces toward the exterior of the floor plate, with private offices and meeting rooms closer to the center. In this way daylight reaches the greatest number of staff. Natural ventilation, including operable windows, should be incorporated wherever possible. Workshops should be treated similarly, maximizing use of natural light and air, with control of glare being critical. We have found that small areas of transparent glazing combined with larger zones of light-diffusing translucent panels provide ideal lighting conditions for fleet garages, wood and metal shops, and other similar environments.

Design for Safety

The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the building. Once in the building, the public should be greeted at a reception counter.

The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles.

3.2 Future State

This section will begin by discussing the various growth factors that will be affecting the Works Department over the next twenty years. It will then recommend the future number of resources required at the Sunderland Depot so that it may continue to work efficiently and effectively towards meeting its service delivery requirements.

3.2.1 Growth and the Changing Needs of Durham Region

The Region of Durham is considered to be one of the fastest growing Regions in the world. Between 2011 and 2016, the population grew by 6% to 673,000 people. It is now expected to grow by another 78% to 1.2 million people by 2041 (according to the "Durham Region Planning For Growth" report issued under "Envision Durham" in 2017). To sustain this growth, new roads, sewers, and water supply infrastructure will be expanded, and additional traffic signals and facilities will be required. Furthermore, changes in climate, technology, government legislation, communications and the condition of infrastructure, will further increase the demand for Regional resources.

Below, is a description of some of the main factors that will affect the need for resources (employees, work vehicles, and materials), by the Works Department, over the next 20 years, to best meet the service and maintenance requirements for the Region.

Population and Infrastructure Growth

The Region of Durham covers an area of 2,500 square kilometres, which is four times the size of Metropolitan Toronto. With an expected population growth of almost 80%, over the next 20 years, there will be a direct impact on the Region's Works Department – especially along the Lake Ontario shore communities where the majority of growth is expected. Expected changes will include the need to maintain new and expanded infrastructure (such as roads, water, sewers, traffic operations), as well as existing, aging infrastructure that suffer greater wear and tear with higher population levels. The north area of the Region is not expected to experience significant growth in population.

In some areas (the East and North end of Durham, and in the Seaton area) there are still considerable areas for urban expansion growth, with new housing subdivisions being planned. These changes will likely result in an increase in lane kilometres of roads and pipe networks that will need to be maintained. In the South and West end of Durham, population densification is both expected and desirable as new families choose lifestyles that include apartment and condominium living, and homes with reduced property area. This densification will likely result in a number of changes that will affect the resource requirements for the Department. Examples include:

- Increased and extended traffic congestion, affecting both work site interference and staff travel time. This will increase the need for more employees in order to maintain the same service levels;
- Reduced speed for snow plowing resulting in the possible splitting of routes;
- Increased use of smaller equipment that is more suited to sidewalks and partially restricted narrower streets;
- Increased control of Traffic Operations to measure, meter, control and coordinate traffic flow;
- Expansion of Water, Storm, Sewer, Electrical and Communications services and related capacities to meet the increased service density;
- Changes to Regional roadways to accommodate transit, pedestrians, cycling and alternate forms of transportation.

To reduce the effect of population growth and densification, it will become increasingly important to have the correct number of employees, vehicles, equipment, and materials strategically located and supported from efficient Works Depots that can expand and change to meet new requirements.

Lane Km's of New Roads

There is estimated to be an increase of 341 lane km's of new Regional roads over the next 20 years. This represents a **14.2%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Km's of new Pipe Systems

There is estimated to be an increase of 1,945 km's of new Regional pipe systems over the next 20 years. This represents a **41.8%** increase. This increase is expected to result in the need for additional Roads resources and storage space at each of the existing Depots.

Changing Technology and Expectations

Durham Region has, over the years, adapted to numerous changes in technology and methods that will continue to affect the way operations are carried out. These changes save money, labour, time, and the environment. Community expectations are also changing. As densification increases, greater emphasis must also be placed on alternate transportation methods, more efficient land use, transit infrastructure and support for pedestrians. This will make roadways and their associated service infrastructure much more complex, with increased activities required to maintain the related assets.

In addition, population demographics will continue to change towards residents with higher service expectations which will also increase the demand for services. Citizens are expecting greater communication, involvement, and transparency in the planning and spending of their tax dollars. This means that the Department will need to continue to implement new technologies and require more formal procedures to monitor and improve performance.

Increasing Legislative Regulations, Standards and Associated Costs

A trend towards increasing government regulations, policies, standards, and their associated higher costs will continue to impact the ability of the Department to deliver core services and meet expectations. This is already being experienced in winter roads maintenance, where feedback from insurance company data and judicial claims is, in many cases, dictating the service response time for winter roads maintenance. Managing to reduce potential liability claims, is now affecting the ability to manage within the existing budgets and resources.

Environmental Considerations and Related Costs

Durham Region is already experiencing increasing costs related to rapidly changing climatic factors. In the last decade, storm frequency and severity has increased, resulting in substantially increased operations costs. As this new situation becomes the norm, considerable work will be required to render the infrastructure more robust to withstand high winds, increased volumes of storm water, and sudden floods with high lake and ground water levels. Also, as the Region works to mitigate these factors, the Works Depots and Operations Centre will be expected to remain fully operational during emergencies with emergency power, communications systems and service equipment that fully support emergency repair services.

In addition, Durham Region has made a commitment to continue to be environmentally responsible and meet recognized environmental targets. These targets include initiatives to improve energy efficiency and reduce greenhouse gas emissions and other environmental contaminants. Improvements will be identified at all Depots that will need infrastructure upgrades to meet generally accepted best practices.

Infrastructure Deficit

Across many Canadian regions, aging and deteriorating infrastructure has resulted in a large and growing infrastructure deficit. Within many municipalities, aging roads, water, storm and sewer systems are deteriorating and in need of repair beyond the level of normal annual maintenance.

As the infrastructure continues to age within Durham Region (especially in the oldest developed areas), more of the Region's efforts and annual costs will be focused on upgrading and replacing these infrastructure elements. This will add to the daily requirements of the workforce.

Durham Region is also very aware that the Works Depots that support daily maintenance work are needing upgrades to meet accepted best practices and new legislation changes. These changes will involve capital costs but will improve operations efficiency and employee relations for higher performance and competitive operations that provide good value for money spent.

Demand for Accountability and Value for Money

The Region, like all municipalities, is under increasing pressure to reduce operational costs and deliver greater value. Continuous improvement programs will be underway to eliminate waste and to develop improved methods for delivering services at reduced cost to the taxpayer. This means improved technology, increased training and monitoring of work crews, and overall increased transparency of operations that will demonstrate to the public that they are receiving good value for money spent.

Therefore, the number of services, employees and work vehicles that will be required in the coming years will be influenced by the above factors - changes in population, technology, legislation, aging infrastructure, and community expectations for service level requirements. While there is no way to know precisely how all of these issues will unfold, interact and affect the Works Department over the next 20 plus years, there is no doubt that they will lead to an increase in the number of employees, work vehicles, equipment and storage space required. This report will address the factors outlined above to develop a plan for growth that will be consistent with lean, efficient and competitive operations that the Public will be proud to support.

3.2.2 Resources (Employees/Vehicles/Equipment/Materials) for the Sunderland Depot

Section 3.2.1 discussed the predominant factors that will affect the resource requirements (employees, vehicles, equipment and materials) for the Works Department over the next 20 years. In this section, we will forecast the number of resources to be utilized at the Sunderland Depot over the next 10 to 20 years.

We will make the following assumptions:

- The current number of employees is sufficient to efficiently meet the service level requirements;
- The levels of service will not change over the next 20 years;
- There will be no new outsourcing or privatization of existing services;
- The utilization and mix of vehicles and equipment will not change;
- The need to increase resources (i.e., employees, vehicles and equipment) for the Roads Departments and will be proportional to the increase in lane km's of Regional roads. The need to increase resources for the Water and Sewer Departments will be proportional to the increase in km's of pipe networks;

In Table 3.4, below, we list the increase in lane km's of Regional roads for the service territory covered by the Sunderland Depot.

Table 3.4 – Lane Km's of Regional Roads

Department	Depot	Current Lane Km's of Roads	Increase in Lane km's by 2030	% Increase by 2030	Increase in Lane km's by 2040	% Increase by 2040
Roads	Sunderland Depot	376.1	0	0	0	0

Note: The above numbers are based on Regional forecasts for 2019-2028 for each of the Depot service territories (Ajax/Pickering = 61.1, Oshawa/Whitby = 69.9, Orono = 14.9, Scugog = 7.4 km)

In Table 3.5, below, we list the increase in km's of water and sewer pipe systems for the service territory covered by the Sunderland Depot.

Table 3.5 – Km's of Water and Sewer Pipe Systems

Department	Depot	Current Km's of Pipe Systems	Increase in km's by 2030	% Increase by 2030	Increase in km's by 2040	% Increase by 2040
Water & Sewer	Sunderland Depot	50.74 Water 42.99 Sewer	20.38 Water 18.40 Sewer	40.16 Water 42.79 Sewer	40.75 Water 36.79 Sewer	80.31 Water 85.57 Sewer

Note: The above numbers are based on Regional forecasts for the Sunderland Depot service territory.

Using the numbers from these two tables (the % increase in 2030 and 2040), we will forecast the number of Roads, Water and Sewer employees and work vehicles that will be required at the Sunderland Depot in 2030 and 2040. These forecasts are shown in Appendix B.

The number of Fleet Services employees forecast for 2030 and 2040 relied on the **"current number of mechanics needed"** (which was calculated by the Fleet Services
Department) for the 2020 base number of mechanics. The Department determined that for the mix of vehicles in the fleet and the number of hours of maintenance required per vehicle, six additional mechanics are currently required. The details are shown in Table 3.6, below.

Table 3.6 – Fleet Services Mechanics Required in 2020

	A-P Depot	O-W Depot	Orono Depot	Scugog Depot	Sunderland Depot
Current Actual No. of Mechanics	2	8	2	1	1
Current No. of Mechanics Needed	**2**	**12**	**2**	**2**	**2**

In Appendix B, we also list the number of Fleet Services mechanics that will be required to maintain the number of vehicles estimated to be required by the Works Department in 2030 and 2040.

The Region has established the following criteria for the storage of work vehicles:

Heated Storage:

- Diesel vehicles
- Vehicles with hydraulic systems
- Tandem / single axle plow trucks
- Water meter vans

Cold Vehicle Storage:

- As many vehicles as possible preferably with electric plug ins

3.2.3 Future Functional Needs for the Sunderland Depot

In this section, we will document the future functional needs for the Sunderland Depot for a time horizon of current, 10 and 20 years.

Sunderland Depot

Table 3.7 - Sunderland Depot Functional Needs

Functional Work Area	Current State Design	Current Need	2030 Need	2040 Need	Recommendations
Wash Bay	No Wash Bay	1 Wash Bay	1 Wash Bay	1 Wash Bay (1,800 ft^2)	**Recommend building a new wash bay (30x60 ft)**
Fleet Maintenance Garage	2,521 ft^2 3 one-way	3 bays (0 new bay)	3 bays (0 new bay)	5 bays (2 new bays at 2,420 ft^2)	**Require 2 more maint. bays for 2040. 3 mechanics require 5 bays (22x55 ft each).**
Indoor Vehicle/Equipment Storage	10,323 ft^2 4 one-way	19 storage bays (15 new bays)	23 storage bays (19 new bays)	25 storage bays (21 new bays at 16,800 ft^2)	**Require 21 more large size storage bays for 2040 (20x40 ft each)**
Indoor Salt Storage	1,302 ft^2	1 salt building	1 salt building	1 salt building	Recommend replacing the existing building with an indoor loading facility by 2040
Above Ground Fuel Tanks	Yes	Yes	Yes	Yes	The existing above ground fuel tank is relatively new
Employee Parking	No defined parking stalls on the existing paved yard area	35 plus 5 visitor stalls	38 plus 5 visitor stalls	40 plus 5 visitor stalls	**Require a separate employee parking area with direct access into the main building. Require 45 stalls to satisfy 2040 requirements**

Outdoor Vehicle Parking	No defined parking stalls on the existing unpaved yard area	11	13	15	**There is very little space at the site to build a proper outdoor parking pad for 15 work vehicles to satisfy 2040 requirements**
Secure Yard Fencing	Fenced with a gate at the entrance				
Site Entrance/Exit	One point of access	Two points of access	Two points of access	Two points of access	**Should build a second access point into the yard**
Counter-Clockwise Traffic Flow through Yard	Flow through the yard is irregular	Require one-way counter clockwise flow	Require one-way counter clockwise flow	Require one-way counter clockwise flow	**The flow through the yard should be one-way in a counter-clockwise direction.**
Arrangement of Buildings on the Site	Tightly packed close to the main building				No changes recommended given the limited size of the yard

To accommodate the functional needs for 2040, at the current site, we recommend the following changes to the yard (listed in order of priority):

- Should build a second access point into the yard;
- The flow through the yard should be one-way in a counter-clockwise direction;
- Require a separate employee parking area with direct access into the main building without having to cross the path of work vehicle traffic. Require 45 stalls to satisfy 2040 requirements;
- Build two more maintenance bays beside the existing maintenance bays. Each bay should be approximately 22x55 ft. in size for a total of 2,420 ft^2;
- Build a new stand-alone vehicle wash bay. The wash bay should be approximately 30x60 ft. (1,800 ft^2) in size and the wash water should be filtered for reuse in the wash area or to make brine;
- Build 21 more large size indoor storage bays for vehicle storage. They should be approximately 20x40 ft each in size for a total of 16,800 ft^2. If room permits the building should be drive-through and 2-4 vehicles deep. If the tandem trucks will have their attachments on the bays may need to be up to 22x45 ft;
- There is very little space at the site to build a proper outdoor parking pad for 15 work vehicles to satisfy 2040 requirements;

- When the existing salt storage building has reached the end of its asset life, they should be replaced with an indoor storage and loading facility to better contain the salt and noise from the community.

However, as stated in the Rationalization Report, we recommend that the Region develop a plan to acquire a new, larger site for the relocation of the Sunderland Depot as soon as possible. A high-level, Conceptual Site Plan will be developed (in section 6.0) for a new Sunderland Depot on an ideal site to satisfy the Functional Space Program (for 2040) discussed in section 5.0.

4.0 BEST PRACTICES IN FUNCTIONAL AREA DESIGN

4.1 Justification for Indoor Vehicle Storage

In section 3.1.5 we listed a number of design issues, at the Sunderland Depot, that are adversely affecting employee productivity, and the efficient utilization of space. In section 3.1.7 we listed a number of ways to improve the design of an existing Depot. Below, we discuss the reasons for storing Winter Maintenance vehicles indoors during the winter months.

Park Winter Maintenance Vehicles Indoors

When possible, vehicles and equipment should be stored indoors during the winter. The primary benefits of storing vehicles indoors are listed below:

- Public Safety;
- Employee Safety;
- Improved Productivity and Response Time;
- Improved Asset Management;
- Impact on the Adjacent Neighbourhood;
- Impact on the Environment;
- Cost Savings.

Public Safety
Vehicles such as plows are used to keep the roads safe, and to respond to emergencies. They are also sensitive to cold temperature and, therefore, may experience starting problems if parked outdoors during the winter. Diesel engines can suffer from jelling; hydraulic oil may have difficulty flowing; and air lines can freeze. In addition to starting problems, the driver/crew might be required to waste valuable time by having to warm-up and clean snow off their vehicle prior to responding to an emergency. This could result in unsafe conditions for the public

Employee Safety
Storage of larger vehicles outdoors during inclement weather may require an employee to climb on the vehicle to clean it off and prepare it for use. This could expose the employee to unnecessary risks such as slipping and falling. In addition, employees must often access and connect smaller equipment to their vehicles (such as plow attachments and towed compressors). This could also pose unnecessary risks when conducted in inclement weather or in parts of the yard with inadequate lighting.

Improved Productivity and Response Time
Storing vehicles and equipment indoors will enhance the performance of the vehicles, thereby, eliminating potential delays associated with cold engines and frozen equipment. This

will increase employee productivity and reduce response time. Furthermore, vehicles that are stored indoors can have their tools and related equipment left in the vehicle overnight. This reduces the need to unload and reload tools between shifts, thereby, increasing employee productive time.

Improved Asset Management
Storing vehicles and equipment indoors will reduce unscheduled maintenance costs and vehicle downtime, protect the vehicles from environmental conditions which could increase maintenance costs and reduce vehicle life span, and protect the vehicles from potential vandalism or theft.

Impact on the Adjacent Neighbourhood
The outdoor storage of vehicles will increase the noise output and exhaust emissions from the site. The outdoor storage of vehicles will require extended periods of idling during the winter months, thereby, increasing the inconveniences already imposed on the neighbors.

Impact on the Environment
Storing vehicles and equipment outdoors will negatively impact the environment because of oil, grease, and engine fluid entering the groundwater or stormwater system. By comparison, any leaks that occur within a vehicle storage garage will be captured in a closed floor drain system, thereby, preventing the fluids from reaching the environment.

Cost Savings
The additional costs associated with storing the vehicles outdoors, as discussed above, include:

- Loss of productive labour due to delays in starting the vehicles and preparing them for the road;
- Increased unscheduled maintenance costs;
- Increased vehicle downtime and resulting loss in productivity;
- Reduced vehicle life expectancy and accelerated vehicle replacement costs.

Therefore, for the reasons discussed above, we recommend that winter maintenance vehicles be parked indoors.

4.2 Opportunities to Improve the Depot Design

Below, we discuss the best practices and design features that will (if appropriate) be incorporated into the proposed site plan for the new Sunderland Depot (in section 6.0).

Work Vehicle Storage Buildings

To reduce space requirements, the layout of the storage areas should incorporate the following best practices and design features:

- The Vehicle Storage Building should be designed so that it can be expanded as the size of the fleet grows;

- The internal storage area should be heated in the winter months to a temperature of 10°C to ensure that the vehicles are ready for service in the morning. The installation of insulated rapid motion doors will prevent the need for air curtains over the external doors (to maintain the internal room temperature). All walls and ceilings should be painted white (to present a clean appearance and to reflect light). The paint should be an industrial epoxy brand to withstand cleaning by high pressure water. Provision for the proper drainage of ice and snow from the floor area will be a critical safety design feature;

- The current fleet of vehicles are all operated with gas or diesel fuel. However, it is expected that, in the future, some or all of the vehicles will be electrically powered. Therefore, allowances should be provided for future electric recharging equipment;

- Our methodology for designing the layout for the Vehicle Storage Building aims to minimize the total area required by (1) identifying those vehicles that can be stored in long lanes (versus those that require independent use and, therefore, cannot be blocked within a long lane), and (2) identifying the optimal width and length of each lane to minimize the total area requirement. Those vehicles and equipment that require independent use and, therefore, cannot be blocked within a long lane should be stored in a building that has drive-through lanes that are only 2 vehicles long.

- Where vehicles are parked indoors, adequate ventilation measures must be taken to prevent the accumulation of fumes, and to prevent fumes from entering office areas.

Salt Storage Buildings

To reduce the total space requirements, all of the salt, at each yard, should be stored in one building. This building should provide indoor storage and loading to contain the salt (to comply with the Salt Management Plan), and the noise from the loading operation. The facility should have the following characteristics:

- Salt delivery and loading, and brine makeup and loading are all located under one roof;

- Salt should be dumped inside the building by the supplier and then conveyed to the top of the pile using a stacking conveyor. This will maximize the height of the pile and storage capacity of the building;

- Brine makeup utilizes the salt pile as a feedstock along with the weak salt solution coming from the truck wash combined with rainwater collected from the storage building roof and neighbouring driveways;

- The brine making area should be adjacent to the main structure (so that it does not block the flow of the loader during the loading process). Drywall should not be used within the brine pump room because of the moisture). The brine area should also include a washroom;

- The concrete wall surrounding the sand/salt storage area should be at least 25' high to maximize the height of the pile within the cubic space of the building;

- The two drive-through doors for the salters should be 20' wide and 20' tall. The two doors for the delivery truck should be 20' wide and at least 40' high (to avoid being hit by a tilted truck bed). Use of metal for the door sliding system should be avoided due to potential corrosion and premature failure;

- Salt and brine loading should all take place on one side of the storage area in a covered drive through lane;

- The loading lane for the salters should be at least 144' long to allow space for three trucks to be loaded with sand/salt or brine simultaneously;

- The roof decking, structural steel and walls of the storage facility should be painted white to present a bright clean appearance and to better reflect light;

- Where possible, windows should be incorporated into the design of the facility to reduce the need for light fixtures and to provide a better working environment.

Yard Entrances

Where possible, the entrances to the yard should incorporate the following best practices and design features:

- Vehicle entrances should be located at signal lights, especially on busy road ways;

- Vehicle entrances and exits should be separated and closed off with an automated gate to exclude people and vehicles that are not part of the operations. The entrance should be set back from the roadway, such that vehicles entering the yard are off from the main roadway, while waiting for the entrance gate to open;

- Entrances for employee and public vehicles should be kept separate from the flow of operational vehicles.

Yard Configuration

To reduce space requirements and to promote the safety and security of employees and visitors, the layout of the Yard should incorporate the following best practices and design features:

- The site should be configured to provide for the safe and efficient flow of employees, the public, and vehicles (work vehicles and personal vehicles). The building(s) will be situated on the site so as to provide room to expand as operational growth demands greater capacity;

- The movement of work vehicles should be kept separate from the flow of pedestrians and employee vehicles (for safety reasons). Their movement should be configured for one-way traffic flow utilizing primarily left-hand turns to improve visibility for the driver;

- The flow of work vehicles through the yard must be provided with adequate and safe turning radii to avoid collisions and damage to vehicles or buildings. This includes insuring that parking stalls are adequately sized for the vehicles;

- If an area does not need to be paved it should be landscaped so as to permit storm water to percolate naturally into the ground;

- For trucks backing up to a truck dock (to deliver parts), they should be permitted to turn left so that the driver can readily see the back of the truck from his driver's position;

- Any refuelling stations located in the yard, should be situated out of the main flow of traffic, and designed to be able to accommodate vehicle line-ups without blocking the general flow of traffic in the yard;

- The yard should be configured such that items that are most frequently used are closest to the main yard flow. Items less frequently used are placed near the back of the yard;

- The yard should be equipped with well-marked signage that clearly marks direction of travel, storage locations, and special movement and safety instructions;

- Full security fencing should be constructed around the yard, and external lighting, security cameras and motion alarms should be installed. Electronic pass-keys should be used within the building.

Yard Parking

To reduce space requirements and to promote the safety and security of employees and visitors, Yard Parking should incorporate the following best practices and design features:

- The flow of public and employee vehicles should be kept separate from that of work vehicles to avoid collisions. Furthermore, the flow of pedestrians (the public and employees) should not have to cross traffic in order to access the front of the building;

- Employee parking should be consolidated at the front of the building (close to the employee entrance and away from the flow of work vehicles) to minimize the honeycomb affect (empty stalls due to variations in demand) and, therefore, the total number of stalls required;

- Where it is not practical to park winter response vehicles indoors, they should be located in open shelters faced to the east or south, with receptacles to allow block heaters and hydraulic heaters to be plugged in overnight;

- Work vehicles parked outdoors should be located close to the building so as to minimize employee walking distances;

- Where possible, surfaces should be unpaved to allow storm water to percolate naturally through the parking surface. When paving is required, materials that are permeable to water are recommended (e.g., permeable concrete);

- Environmentally friendly modes of transportation should be promoted. Buildings should be equipped with lockable storage for bicycles and preferred parking spaces should be made available for car-pooling and energy efficient vehicles.

- Light pollution control can be achieved by installing fixtures that are down-lit. Full-cut off, ground covers and positioning of the fixtures on site would stop the light from over spilling to other adjacent sites.

Yard Storage

To reduce space requirements and to promote the safety of employees, Yard Storage (for vehicles, equipment and materials) should incorporate the following best practices and design features:

- Work vehicles should be parked as close to the indoor employee amenities as possible to minimize walking distances by the work crews. This does not apply to contractor vehicles as the crews do not utilize the buildings;

- For storing certain types of equipment and materials (those that can be placed on pallets) metal racking (single deep) should be installed in the yard to reduce space requirements;

- The yard space that is used by Roads as a Winter Maintenance Yard should, during the summer, be shared with other departments to increase yard utilization and reduce overall space requirements. For example, this space could be used to park contractor vehicles (for Forestry operations), and stage materials such as wood and compost;

- The bulk storage of materials within the concrete block storage bunkers should be shared by all the Divisions to eliminate duplication in other parts of the yard;

- All plastic and rubber items, including piping and fittings, must be stored in shelters that protect these items from deterioration by the sun.

- Items that must be kept clean, such as fittings for water services, should be stored such that they will not become contaminated with yard dust and debris.

- All items stored in the yard should be organized in well-marked storage locations.

- Outdoor storage areas should not be paved, unless needed, to allow storm water to percolate naturally into the ground.

- The view of the yard from all public roadways must be attractive, well landscaped, and well maintained without appearing extravagant. Landscaping buffers should be built.

Vehicle Fueling

To reduce space requirements, and to promote the safety and productivity of employees, the location of the Vehicle Fueling operation should incorporate the following best practices and design features:

- The vehicle fuelling location should be set up such that vehicles returning to the yard can travel (without backtracking) from the yard entrance to the fuelling location and then to the parking area, in the most efficient way possible. Since there may be a line-up for fuelling it should be located such that vehicle line-ups do not block the main access route around the yard;

- The fuelling location should be situated well away from buildings and the property line to meet safety requirements;

- The fuelling traffic lanes should be set up such that vehicles waiting for fuel do not block yard circulation;

- The fuel tanks should be located above ground with each storage tank inside a separate outer containment tank that acts as a protective barrier;

- The entire tank area, along with the pumps, should be mounted on an elevated concrete pad;

- The entire tank area should also be protected by heavy steel bollards and a crash resistant railing;

- The fuel islands and pumps should be set up such that they can be approached from either side, and are far enough apart that two full sized trucks (equipped with ploughs) can pass, side by side, between the islands and pumps;

- Newer installations are often equipped with canopies and lighting such that vehicles can be fuelled in the dark and in inclement weather without delaying operations;

- The fuelling area should not have a drain so that spilled fuel will not enter local water courses;

- The current fleet of work vehicles are all operated with gas or diesel fuel. However, it is expected that, in the future, some or all of the vehicles will be electrically powered. Therefore, allowances should be provided for future electric recharging equipment.

Vehicle Washing

To reduce space requirements, and to promote the productivity of employees, the location of the Vehicle Wash Bay should incorporate the following best practices and design features:

- The vertical clearance within the Wash Bay should be sufficient to allow dump trucks to raise their box for rinsing;

- The interior of the Wash Bay should be equipped with sufficient heating to prevent freezing inside during the winter;

- The Wash Bay should be equipped with an access platform so that operators can access the top of their vehicle safely without climbing onto the vehicle itself;

- The concrete pad immediately outside the entrance/exit doors should have radiant heating to prevent the formation of ice during the winter;

- The installation of insulated rapid motion doors will prevent the need for air curtains over the exterior doors (to maintain the internal room temperature);

- The door should be 18 ft. wide and 15 ft. high. The room for a single wash bay should be a minimum of 50 ft. long and 31 ft. wide (to handle tandem trucks);

- The Wash Bay should be equipped with a steam cleaning system to remove grease from vehicles and engine parts. It should be located in an adjacent room to avoid corrosion. Operators will utilize a high-pressure, hand held, spray wand to clean the vehicles. There will also be a fire hose and a built-in underbody spray;

- A drainage system and sump will be required to collect approximately 70% of the grey water for reuse;

5.0 FUNCTIONAL SPACE PROGRAM

In this section, we will document the Functional Space Program created to satisfy the future (20-year time horizon) space requirements for each of the main functional areas (both indoors and outdoors) required by the employees and contractors working within the Sunderland Depot. The Program will consider the growth requirements, and operational needs discussed, previously, in sections 3.2 and 4.0 of this report.

Within the Program, we will look for ways to minimize space requirements so as to reduce travel distances and construction costs while still achieving space adjacency preferences. Space adjacency preferences are important to minimize travel distances by vehicles and employees within the buildings. Excessive travel distances add to operational costs. Of critical importance is the relationship between the employee amenities and the storage location for the vehicles. Whenever possible, the walking distances for the employees should be minimized.

The Space Program will assume that all of the Depot space requirements will be newly constructed – the existing Depot buildings will not be expanded or incorporated in any way. This is due to the fact that most of the existing buildings are near the end of their expected asset life.

The main functional areas are summarized in Table 5.1, below. The Space Program is shown in Appendix C.

Table 5.1 - Space Requirements for a New Sunderland Depot

Functional Area	Area Required in 2040 (ft^2)	Area Required in 2040 (m^2)
Administration Office	**5,144**	**478**
Employee Amenities	2,788	259
Fleet Services Shop	**14,240**	**1,323**
Parts Stores (Fleet Services)	1,425	132
Indoor Tool Storage	**1,234**	**115**
Indoor Work Vehicle/Equipment Storage	17,054	1,584
Total Main Building	**41,885**	**3,891**
Salt & Brine Storage Building - Unheated	19,910	1,850
Indoor Work Vehicle Storage - Unheated	1,958	182

6.0 CONCEPTUAL SITE PLAN

A high-level, Conceptual Site Plan was developed for a new Sunderland Depot on an ideal site to satisfy the Functional Space Program (for 2040) discussed in section 5.0. An ideal site was used because the existing site is too small and a new site has not been selected. The Plan also reflects (1) Industry Best Practices and design trends for new Operations Depots, and (2) functional space adjacency preferences to minimize travel distances. Particular emphasis was placed on assessing the impact of vehicle traffic within the yard and how to optimize its flow and egress.

The Conceptual Site Plan utilizes 78,850 m^2 (19.5 acres). However, the future site selected by the Region may require additional space to allow for (1) additional growth over a 60-year period (which will be the expected asset life of the new buildings), and (2) potential unknown issues such as complications from the shape and topography of the site, and the presence of environmental setback requirements. Therefore, we recommend a site of at least 25 acres for a new Depot.

The conceptual site plan is shown in Appendix D.

7.0 CONSTRUCTION COST ESTIMATES

In Table 7.1, below, we list the estimated hard construction costs for building a new Sunderland Depot. A more detailed breakdown of the costs is shown in Appendix E. These construction costs provide a Class D order of magnitude estimate of the fair market value for the hard construction costs associated with the proposed space programs and concept design drawings attached to this report (Appendix C - D).

Table 7.1 – Estimated Hard Construction Costs

Depot	Functional Change	Area (m^2)	Unit Cost ($\$/m^2$)	Estimated Cost ($)
Sunderland	Admin. Office & Employee Amenities	737	5,504	4,056,800
	Fleet Services Garage/Wash Bay/Parts	1,455	3,200	4,656,000
	Indoor Vehicle Storage Building	1,699	2,000	3,398,000
	Indoor Salt Storage & Loading Building	1,926	1,800	3,466,800
	Site Work (including M&E Site Services)	78,850	147	11,561,600
	TOTAL (rounded)			**27,139,200**

In Table 7.2, below, we list the estimated project soft costs for building a new Sunderland Depot.

Table 7.2 – Estimated Project Soft Costs

Depot	Project Soft Costs	Estimated Cost ($)
Sunderland	Land Acquisition Costs	**Unknown**
	Municipal Charges	0
	Consulting Fees and Expenses	3,226,101
	Specialty Consultants	240,696
	Project Management Fees	0
	Owner Supplied Furnishings, Fixtures and Equipment	1,396,960
	Financing and Loan Fees	25,000
	Operational Expenses	215,696
	Taxes	613,954
	Project Soft Cost Contingency	571,841
	TOTAL (rounded)	**6,290,248**

A Class D estimate is intended to represent the median bid amount in a competitive bidding process. The accuracy of the estimate is expected to have a variance of +/- 20%.

To create the estimates, typical unit rates (in 2021 dollars) were used that are based on the project specifications and historical cost data for this type of project. The unit rates are based on typical mid-range costs for the type of design and construction proposed. Contingencies are included in the estimate to offset the accuracy risk (described below).

Although every attempt has been made to reflect market conditions in the estimates, the actual marketplace price of the project will not be known until the results of tenders have been received.

The total project budget cost is **$33,430,000**

Exclusions & Qualifications

The following items are excluded from the cost estimates in Tables 7.1 and 7.2:

- **Land acquisition**
- Premium time for afterhours and weekend work
- Phasing premium (assumed to be executed in a single phase)
- Municipal off-site service connections (outside the property line)
- Abatement and handling of asbestos contaminated materials
- Handling and removal of contaminated soils
- Special foundations such as caissons or pile foundations
- Development charges and building permit fees
- Sole sourcing of materials, services, or equipment
- Premiums for LEED certification
- Independent 3rd Party Commissioning
- Onsite or offsite temporary storage facilities
- Mock ups

Contingencies

General Approach to Contingencies

The effective use of contingencies in construction cost planning requires a clear understanding of estimating risks in both a project specific and general construction market sense. The appropriate level of contingency is dependent on the amount of design information available, knowledge of the design teams' methods and philosophy, the timing of the estimate preparation relative to the project design and construction schedule, and the anticipated complexity of the construction work.

Design and Pricing Contingency

A design and pricing contingency of **15.0%** is included in the estimate. This allowance where included is meant to cover pricing and design unknowns during the preparation of this estimate, and not meant to cover additional scope or functional program requirements. This allowance is also meant to cover the potential changes in scope of work during the completion of the design documentation and the preparation of the tender documents.

Escalation Contingency

An escalation contingency of **5.25%** is included in the estimate. This allowance is meant to address anticipated changes in construction costs due to market fluctuations between the date of this report and the anticipated midpoint of construction.

- Anticipated start date of construction: April 1, 2024
- Estimated duration of the construction phase: 24 months
- Estimated midpoint of construction: April 1, 2025
- Start date for escalation calculations: Sept 1, 2021
- Estimated time frame for escalation (to midpoint of construction): 42 months
- Effective annual escalation factor: 4.0%
- Effective escalation calculations = 42/12 x 4.0% 14.0%

Construction Contingency (Post Contract Stage)

A post contract contingency of **5%** has been included. This contingency is meant to cover the potential changes (change orders/directives) in cost due to the discovery of unknowns during the renovation work.

Cost Considerations for the Current Health Pandemic & COVID-19

We expect the project will be tendered in the near future (within the next 6 to 12 months) and could experience the market influences of the current COVID-19 pandemic. The market influences are unquantifiable currently and are likely to change in the future. We also expect the contractors bidding the project would include in their bids, allowances for the COVID-19 risk unless that risk is mitigated in the bid documents. We forecast the inclusion of these risks in bids could impact normal competitive market conditions resulting in a bid price increase in the range of 3% to 10% or in extreme situations as much as 10% to 20%.

We encourage the owner and the consulting team to address this future risk by providing clear direction to the bidders in the bid documents on risk mitigation for COVID-19 issues.

The primary risks related to COVID-19 include impacts to the supply of materials to the site, the potential interruption of labour on the site and the productivity in executing the work.

Reduced site productivity could result from any of the following risks:

- Lack of availability of labour for due illness related to COVID-19,
- Delays related to recruiting replacement workers,
- Social/physical distancing requirements on the site,
- Site shutdowns due to the risk of workers testing positive for the COVID-19 virus,
- Health authority mandated industry or project shutdowns,
- Delays in delivery of materials and equipment to the site and the procurement supply chain,
- Unavailability of materials due to factory closure or shipping interruptions in the supply chain,
- Delays related to acquiring material and or equipment substitutions.

8.0 IMPLEMENTATION SCHEDULE

This section of the report will develop an Implementation Schedule for the construction of the new Sunderland Depot. once approval and funding has been achieved.

The schedule will assume that the new Depot will be constructed on a new, ideal site which would permit the current operations to continue operating from the existing site until the new Depot has been completed and is ready to be occupied.

We expect the pre-construction phase to last 26 months. This would include the completion of such tasks as Site Plan Approval, preliminary and detailed design, and tendering for construction. The construction phase is expected to last 24 months.

The Schedule is shown in Appendix F.

APPENDIX A – Current Resources

In this Appendix we list the current number of resources (employees, vehicles, equipment, and materials) utilized by the Works Department at its Sunderland Depot.

Sunderland Depot

Employees

The total number of employees currently working from the Sunderland Depot (during the summer and winter seasons) is shown in the table below.

Table A.9 - Current State Employees - 2020

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Sunderland	Admin	6			**6**
	Fleet Services		1	1	**1**
	Roads	3	16	18	**21**
	Water/Sewer	3	4	4	**7**
	Total	**12**	**21**		**35**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Work Vehicles

The total number of work vehicles currently assigned to the Sunderland Depot is shown in the table below.

Table A.10 - Current State Work Vehicles - 2020

Department	Vehicle Type	No. Vehicles	Type of Storage Required
1 Roads, 1 Water	Trailers (76 series shoring and enclosed cargo trailer)	2	Outdoor
Roads	75 series HD Float trailer	1	Outdoor
Roads	61 series water tank	1	Outdoor
1 Roads, 1 water	13 series Supervisor pickups	2	Outdoor
Roads	04 series crew cab	1	Outdoor
Roads	50 series loaders	2	Outdoor
Contractor	Personal vehicles	2	Outdoor
	Total	**11**	

Department	Vehicle Type	No. Vehicles	Type of Storage Required
Roads	35 series broom attachment	1	Cold, covered storage
Roads	36 series tractor mower attachments	2	Cold, covered storage
Roads	91 series wood chipper	1	Cold, covered storage
Roads	73 series sign board trailers	3	Cold, covered storage with plug in provision for battery maintaining
Roads	Contracted Plows	2	Cold, covered storage with electrical plug-in provisions
	Total	**9**	
Roads	09 series Tandems with plows and wing	7	Indoor
Roads	05 series patrol trucks with 24 series hopper / sander	2	Indoor
3 Roads, 2 Water	46 series service trucks	5	Indoor
Roads	34 series tractor	1	Indoor
Roads and Water	52 series Gradall	1	Indoor
Roads	25 series grader	1	Indoor
Roads	80 series diesel fired asphalt hot box	1	Indoor
Roads and Water	59 series steam generator	2	Indoor
Roads, Water/Sewer	66 series air compressor	1	Indoor
Roads and Water/Sewer	Misc. small tools i.e.: Cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, jackhammers, sewer camera, thawing machine, chainsaws, portable generators, etc.	15 +/-	Indoor
	Total	**36+/-**	

Materials

At each of the five depots the Roads Department stores several types of materials for use throughout the Region. The material of greatest consumption is salt for winter roads and sidewalk maintenance. Salt requires indoor storage (as part of the Salt Management Plan) to protect it from the elements. At the Sunderland Depot there is one large building capable of storing up to 4,500 tonnes of salt.

Also stored within the yard (outdoors) are various materials (in small quantities) for day-to-day road repairs (e.g., cold patch, granular stone, and top soil).

APPENDIX B – Future Resources

Sunderland Depot

Employees

The total number of employees forecast to be required for the Sunderland Depot, in 2030 and 2040, (during the summer and winter seasons) is shown in the table below:

Table B.13 - Future State – 2030

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Sunderland	Admin	6			**6**
	Fleet Services		2	2	**2**
	Roads	3	16	18	**21**
	Water/Sewer	3	6	6	**9**
	Total	**12**		**26**	**38**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Table B.14 - Future State – 2040

Depot	Department	No. Office Employees	No. Outside Employees		Total (Max.)
			Summer	Winter	
Sunderland	Admin	6			**6**
	Fleet Services		3	3	**3**
	Roads	3	16	18	**21**
	Water/Sewer	3	7	7	**10**
	Total	**12**		**28**	**40**
Note: All office staff work for all departments (Roads/Water/Sewer)					

Work Vehicles

The total number of work vehicles currently assigned to the Sunderland Depot, and forecast to be required in 2030 and 2040, is shown in the Table B.15

Table B.15 - Future State

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
1 Roads, 1 Water	Trailers (76 series shoring and enclosed cargo trailer)	2	2.83	3.66	Outdoor
Roads	75 series HD Float trailer	1	1	1	Outdoor
Roads	61 series water tank	1	1	1	Outdoor
1 Roads, 1 water	13 series Supervisor pickups	2	2.83	3.66	Outdoor
Roads	04 series crew cab	1	1	1	Outdoor
Roads	50 series loaders	2	2	2	Outdoor
Contractor	Personal vehicles	2	2	2	Outdoor
Roads	Contracted Plows	2	2	2	Cold, covered storage with electrical plug-in provisions
	Total	**13**	**14.66**	**16.32**	
Roads	35 series broom attachment	1	1	1	Cold, covered storage
Roads	36 series tractor mower attachments	2	2	2	Cold, covered storage
Roads	91 series wood chipper	1	1	1	Cold, covered storage
Roads	73 series sign board trailers	3	3	3	Cold, covered storage with plug in provision for battery maintaining
	Total	**7**	**7**	**7**	
Roads	09 series Tandems with plows and wing	7	7	7	Indoor
Roads	05 series patrol trucks with 24 series hopper / sander	2	2	2	Indoor

Department	Vehicle Type	No. Vehicles			Type of Storage Required
		2020	2030	2040	
3 Roads, 2 Water	46 series service trucks	5	7.08	9.15	Indoor
Roads	34 series tractor	1	1	1	Indoor
Roads and Water	52 series Gradall	1	1.42	1.83	Indoor
Roads	25 series grader	1	1	1	Indoor
Roads	80 series diesel fired asphalt hot box	1	1	1	Indoor
Roads and Water	59 series steam generator	2	2.84	3.66	Indoor
Roads, Water/Sewer	66 series air compressor	1	1.42	1.83	Indoor
Roads and Water/Sewer	Misc. small tools i.e.: Cut-off saws, jumping jack, plate packer, weed trimmers, power brooms, jackhammers, sewer camera, thawing machine, chainsaws, portable generators, etc.	15 +/-	21 +/-	28 +/-	Indoor
	Total	**36+/-**	45.76	56.47	

APPENDIX C – Space Program

	Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	1.0 Administration Office									
	Roads Department									
	Supervisor	OO			3	135	1.4	189	18	Open concept work stations
	Touchdown stations	OO			2	72	1.4	101	9	For outside workers
	Water/Sewer Department									
	Supervisor	OO			3	135	1.4	189	18	Open concept work stations
	Touchdown stations	OO			1	36	1.4	50	5	For outside workers
	Administrative Staff									
	Staff	OO			5	225	1.4	315	29	Open concept work stations
	Superintendent	**PO**			1	110	1.4	154	14	Private Office
	Common Areas									
	High Density File Storage System	**PO**				200	1.4	280	26	
	Quick-Access File Storage (1)	OO				75	1.4	105	10	
	Office Storage Room (1)	**PO**				150	1.4	210	20	For Miscellaneous Items
	Printer/fax/stationary (1)	**PO**				200	1.4	280	26	Require 1 room
	Winter Coat Storage	**PO**				36	1.4	50	5	for 12 employees
	Office Washrooms (2) for 12 staff	**PO**				300	1.4	420	39	2 Accessable washrooms (M/F)
	Coffee Stations (1)	**PO**				45	1.4	63	6	1 Station

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
Common Areas - Continued									
Medium Meeting Room (1) (8 people)	**PO**				200	1.4	280	26	Require 2 rooms
Small Meeting Rooms (2) (4 people)	**PO**				200	1.4	280	26	Require 1 room
Phone Rooms (1) (1 person)	**PO**				40	1.4	56	5	Require 1 room
First Aid/Quiet Room (1)	**PO**				120	1.4	168	16	Require 1 room
Public Lobby	OO				400	1.4	560	52	
Public Washrooms (male/female)	**PO**				75	1.4	105	10	One barrier free washroom
Reception Desk/Counter	OO				50	1.4	70	7	
Janitors Rooms (1)	**PO**				120	1.4	168	16	One room
Communications/IT Room	**PO**				150	1.4	210	20	
Electrical Room	**PO**				300	1.4	420	39	Barrier free
Mechanical Room	**PO**				300	1.4	420	39	
TOTAL					**3,674**		**5,144**	**478**	

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
2.0 Employee Amenities									
Common Areas for Both Departments									
Male Washroom/locker room/showers	**PO**			**25**	727	1.25	909	84	Sized for 25 males (90% of 28)
Female Washrm/locker rm/showers	**PO**			**7**	365	1.25	456	42	Sized for 7 females (25% of 28)
Lunch Room	**PO**			**15**	400	1.25	500	46	Sized for 15 employees
Training Room (1) (28 people)	**PO**			28	604	1.25	755	70	Require 1 room for 28 employees
First Aid/Quiet Room (1)	**PO**				120	1.4	168	16	Require 1 Room
TOTAL					**2,216**		**2,788**	**259**	

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
3.0 Fleet Services Shop									
Fleet Mechanics Area									
Mechanic Lunch Room	**PO**		600	5	140	1.4	196	18	Sized for 3 +2 mechanics
Male Washroom & Changeroom	**PO**			5	259	1.4	363	34	Sized for 3 + 2 males
Female Washroom & Changeroom	**PO**			1	116	1.4	162	15	Sized for 1 female
Maintenance Offices									
Vestibule (single door from outdoors)	OO				35	1.4	49	5	
Reception desk (key drop-off)	OO				64	1.4	90	8	
Work Stations for 5 mechanics	OO	1		5	180	1.4	252	23	
Maintenance Library	**PO**				45	1.4	63	6	Shelving
File Storage (1)	OO				10	1.4	14	1	
Printer/fax/stationary (1)	OO				72	1.4	101	9	
	PO								
First Aid Room	**PO**				96	1.4	134	12	

Functional Area	Room Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
Maintenance Bays & Shops									
Maintenance Bays (Heavy Duty)	OO			5	6,050	1.02	6,171	573	5 bays (22x55 ft)
Quick Lube Bay	OO			1	1,210	1.02	1,234	115	1 bay (22x55 ft)
Wash Bay - Drive through	**PO**			1	1,800	1.02	1,836	171	1 bay - 60 ft in length
Wash Water Filtration Room	**PO**				500	1.3	650	60	Adjacent to wash bays
Machine/Tool Shop	**PO**				400	1.3	520	48	
Tool Crib	**PO**				240	1.3	312	29	
Fluids Room	**PO**				240	1.3	312	29	
Battery Storage-Flammable	**PO**				100	1.3	130	12	50 old and 50 new batteries
Compressor Room	**PO**				300	1.3	390	36	
Janitors Room	**PO**				120	1.3	156	14	
Electrical Room	**PO**				300	1.3	390	36	
Mechanical Room	**PO**				400	1.3	520	48	
Sprinkler Room	**PO**				150	1.3	195	18	
TOTAL					**12,827**		**14,240**	**1,323**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
4.0 Parts Stores (Fleet Services)									
Service Counter & Offices									
Service Counter	OO					1.4	-	-	not required
Fleet Repair Parts									
Parts Warehouse	OO				800	1.25	1,000	93	Parts for Fleet & small engine
Common Area									
Receiving Dock	**PO**				340	1.25	425	39	1 man door
									and 1 roll-up door
TOTAL					**1,140**		**1,425**	**132**	

	Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
	5.0 Indoor Tool Storage - Heated									
	Roads and Water/Sewer Dept.									
	Miscellaneous Tool Storage	OO				1,210	1.02	1,234	115	1 bay beside employee amenities
										28 plus for tools
	TOTAL					**1,210**		**1,234**	**115**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
6.0 Indoor Work Vehicle/Equipment Storage - Heated									
Roads and Water/Sewer Depts.									
Indoor Work Vehicle Parking	**PO**			23	16,720	1.02	17,054	1,584	Drive through vehicle storage
									9 lanes x 110 ft deep
TOTAL					**16,720**		**17,054**	**1,584**	
TOTAL INDOOR SPACE					**37,787**		**41,885**	**3,891**	Excludes the salt storage bldg.
									and Pole Barn

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Vehicles 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
7.0 Indoor Work Equipment Storage - Unheated - Pole Barn									
Roads Department									
Indoor Work Vehicle Parking	**PO**			7	1,920	1.02	1,958	182	4 bays x 16' wide x 30' deep
TOTAL					**1,920**		**1,958**	**182**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
8.0 Indoor Salt Storage									
Roads Department									
Indoor Salt Storage and loading	**PO**				18,720	1.02	19,094	1,774	5,000 Tonnes of salt plus
									1,000 Tonnes of winter mix
Indoor Brine Storage Tanks	**PO**				800	1.02	816	76	
TOTAL					**19,520**		**19,910**	**1,850**	

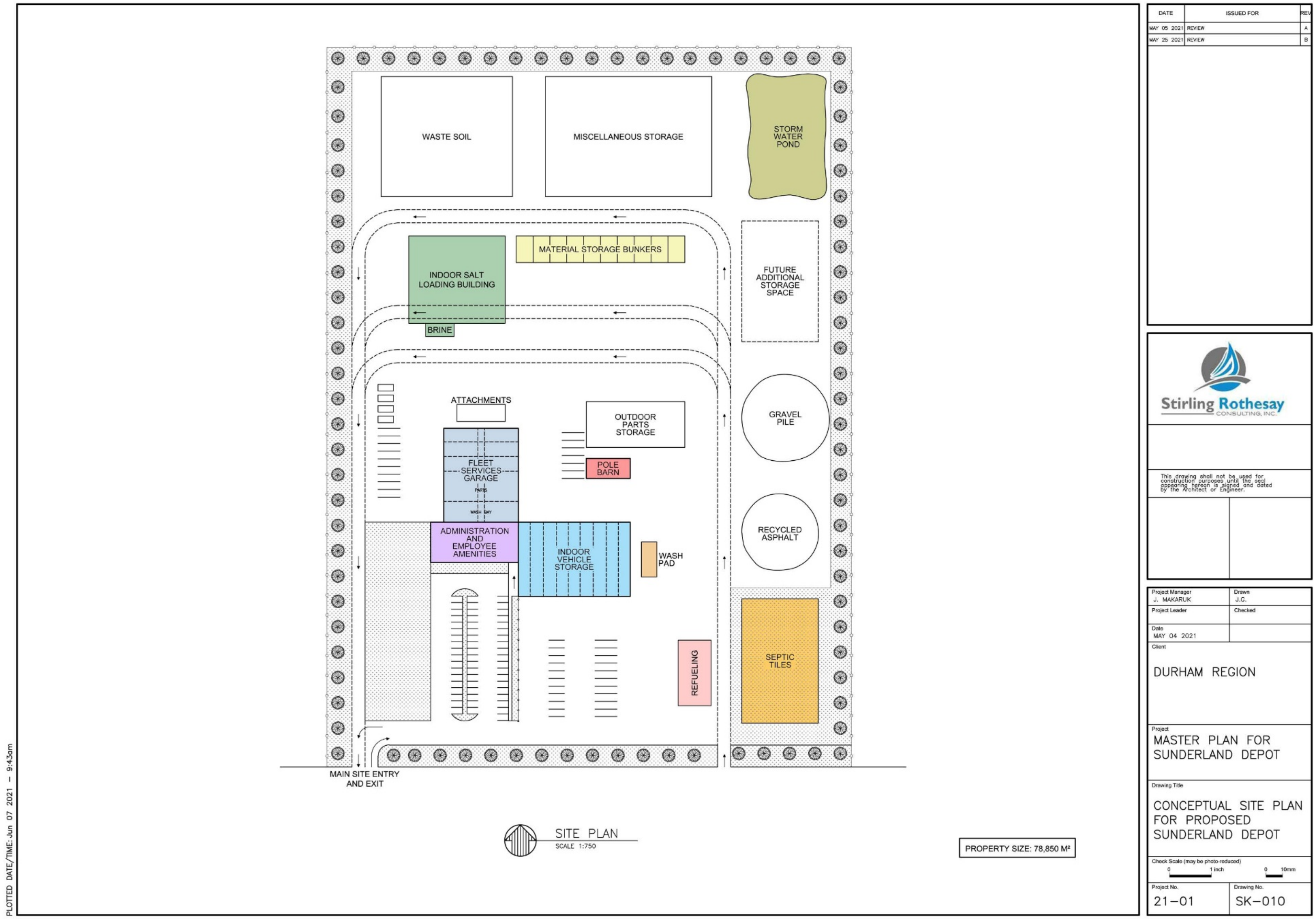
Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
9.0 Region & Contractor Employee Vehicle Parking - Outdoor									
Region Employee Vehicles (Roads and W/S)				**44**	12,788	1.35	17,263	1,604	110% of forcasted 40 employees
Visitor Parking & Handicapped				8	2,325	1.35	3,139	292	6 visitor & 2 handicapped
Roads Contractor Employee Vehicles				3	872	1.35	1,177	109	110% of 2 contractors
TOTAL					**15,984**		**21,579**	**2,005**	

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
10.0 Outdoor Yard Space									
Roads Dept.									
Catch Basin Decant Pits (2)					2,000	1.3	2,600	242	
Gravel Pile					15,000	1.0	15,000	1,394	
Recycled Asphalt Pile					10,000	1.0	10,000	929	
Open Space for Miscellaneous Materials					45,000	1	45,000	4,181	e.g. Snow, aggreagaste
Fleet Maintenance									
Waste Metal Bins (2)					500	1.3	650	60	2 bins
Welding Supplies Shed					300	1.3	390	36	
Waste Tires					450	1.3	585	54	50 tires
Waste Fluids					300	1.3	390	36	Bulk storage tanks - above ground
Vehicles waiting/finshed being serviced				15	8,194	1.3	10,652	990	15 vehicles in and out

Functional Area	Office Type PO-Private OO- Open	Number of Employees 2020	Current Area 2020 (sq.ft.)	Number of Employees 2040	Required Area in 2040 (sq.ft.)	Circulation Ratio	Total Required Area (sq.ft.)	Total Required Area (sq.m)	Comments
Common Areas									
Region Work Vehicles (Roads and W/S)				13	7,101	1.3	9,232	858	vehicles single deep
Attachments				20	1,400	1.3	1,820	169	open area
Contractor Work Vehicles				3	1,639	1.3	2,130	198	vehicles single deep
									10 tandem plows
Outdoor Wash Pad					1,375	1.3	1,788	166	Require catwalk beside wash pad
Bunker Material Storage (10)					10,000	1.0	10,000	929	10 bunkers for bulk materials
Waste Soil Storage Pile					35,000	1.0	35,000	3,252	
Open Space for Parts Storage					10,000	1.0	10,000	929	
Waste Containers					500	1.3	650	60	2 large metal bins
Refueling Station					5,000	1.3	6,500	604	
TOTAL OUTDOOR SPACE					**153,759**		**162,387**	**15,086**	Excludes roads, landscaping and set

APPENDIX D – Conceptual Site Plan

Current Site Layout


WASTE SOIL
MISCELLANEOUS STORAGE
STORM WATER POND
MATERIAL STORAGE BUNKERS
INDOOR SALT LOADING BUILDING
BRINE
FUTURE ADDITIONAL STORAGE SPACE
ATTACHMENTS
OUTDOOR PARTS STORAGE
GRAVEL PILE
FLEET SERVICES GARAGE
POLE BARN
RECYCLED ASPHALT
ADMINISTRATION AND EMPLOYEE AMENITIES
INDOOR VEHICLE STORAGE
WASH PAD
REFUELING
SEPTIC TILES
MAIN SITE ENTRY AND EXIT
SITE PLAN
SCALE 1:750
PROPERTY SIZE: 78,850 M²
PLOTTED DATE/TIME: Jun 07 2021 – 9:43am
DATE | ISSUED FOR | REV
MAY 05 2021 | REVIEW | A
MAY 25 2021 | REVIEW | B
Stirling Rothesay CONSULTING, INC.
This drawing shall not be used for construction purposes until the seal appearing hereon is signed and dated by the Architect or Engineer.
Project Manager
J. MAKARUK
Drawn
J.C.
Project Leader
Checked
Date
MAY 04 2021
Client
DURHAM REGION
Project
MASTER PLAN FOR SUNDERLAND DEPOT
Drawing Title
CONCEPTUAL SITE PLAN FOR PROPOSED SUNDERLAND DEPOT
Check Scale (may be photo-reduced)
0 1 inch
0 10mm
Project No.
21–01
Drawing No.
SK–010

APPENDIX E – Cost Estimates

Rider Levett Bucknall

EXECUTIVE ESTIMATE SUMMARY – SUNDERLAND DEPOT

MULTIPLE ESTIMATE SUMMARY
REGION OF DURHAM - SUNDERLAND DEPOT
ORDER OF MAGNITUDE CLASS D ESTIMATE (Rev.1)
August 13, 2021

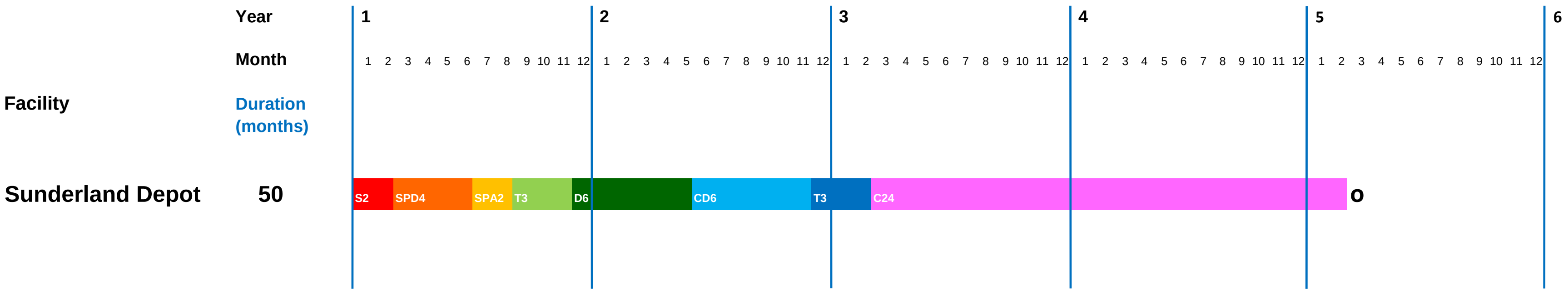
SUNDERLAND DEPOT

RLB Rider Levett Bucknall

No.	Scope Description	GFA (m2)	Unit (Cost/m2)	Estimated Total	% of Total
1.0	**Hard Construction Costs**				
1.1	Indoor Salt Storage & Loading Building (Unheated)	1,926	$1,800	$3,466,800	12.8%
1.2	Fleet Services Garage, Wash Bay and Parts Stores	1,455	$3,200	$4,656,000	17.2%
1.3	Administration Office & Employee Amenities - 1 storey	737	$5,504	$4,056,800	14.9%
1.4	Indoor Vehicle Storage Building	1,699	$2,000	$3,398,000	12.5%
	Subtotal - Hard Construction Costs - Buildings	**5,817**	**$2,678**	**$15,577,600**	
1.5	Site Work including M&E Site Services	78,850	$147	$11,561,600	42.6%
	Total Estimated Hard Construction Cost (rounded)	**5,817**	**$4,665**	**$27,139,200**	**81.2%**
2.0	**Project Soft Costs**				
2.1	Land Acquisition Costs			$0	0.0%
2.2	Municipal Charges			$0	0.0%
2.3	Consulting Fees and Expenses			$3,226,101	51.3%
2.4	Specialty Consultants			$240,696	3.8%
2.5	Project Management Fees			$0	0.0%
2.6	Owner Supplied Furnishings, Fixtures, and Equipment (FF&E)			$1,396,960	22.2%
2.7	Financing and Loan Fees			$25,000	0.4%
2.8	Operational Expenses			$215,696	3.4%
2.9	Taxes			$613,954	9.8%
2.10	Project Soft Cost Contingency			$571,841	9.1%
	Total Project Soft Costs (rounded)	**5,817**	**$1,081**	**$6,290,000**	**18.8%**
	Total Project Budget (rounded)	**5,817**	**$5,747**	**$33,429,000**	

APPENDIX F – Implementation Schedule

Region of Durham Yard Master Plan - Implementation Schedule for a New Sunderland Depot



Legend

- **S2**, Studies for site development with duration noted in months (site surveys, geotechnical, noise, traffic, storm water management and emissions)
- **SPD4**, Site Plan Development detailed design with duration noted in months (detailed civil site plan design, grading, drainage, storm water management, site servicing, utilities, septic, and civil design drawings and specifications for full build out)
- **SPA2**, Site Plan Approval process with duration noted in months (obtain site plan approval and a zoning amendment if required)
- **T3**, Tender Phase for preliminary and detailed design with duration noted in months
- **D6**, Design Phase with duration noted in months (preliminary and detailed design for structural, architectural, civil, mech. & elec., IT)
- **CD6**, Contract Documents Phase with duration noted in months
- **T3**, Tender Phase for construction with duration noted in months
- **C24**, Construction Phase with duration noted in months
- **O** **Occupancy**