
REPORT TITLE: **Paramedic Services Long Term Facilities Capital Plan, Key Supporting Analyses**

FROM: Nancy Polsinelli, Commissioner of Health Services

RECOMMENDATION

That the Paramedic Services facility plan be incorporated in the 2021-2030 Capital Plan based on the principles and methodology as outlined in the report of the Commissioner of Health Services, titled “Paramedic Services Long Term Facilities Capital Plan, Key Supporting Analyses”.

REPORT HIGHLIGHTS

- Analyses was conducted to inform the development of a long term facilities capital plan for Paramedic Services. The analyses looked at:
 - Call volume drivers
 - Predicted call volumes, 2020-2036
 - Predicted areas of increased paramedic service demand
- The infrastructure required to manage the predicted demand for Paramedic Services.
- As decisions are made regarding acquisition of additional resources (e.g., ambulances, reporting stations and satellite stations), it is recommended that all call volume projections are re-examined annually to ensure the projected trends still hold into the future.

DISCUSSION

1. Background

The last 10-Year Capital Plan (2008-2017) approved by Council included a recommendation from the Emergency and Protective Services Committee (EPSC), a Committee of Council, to adopt the Divisional Model that Peel Regional Paramedic Services (Paramedic Services) has in operation today (Resolution 2007-883). This Model was informed by a report commissioned by the Region, with oversight by EPSC, and developed by *HealthAnalytics* to recommend appropriate service delivery models to meet the increasing health care needs of the residents in Peel, respond to emergencies faster, improve efficiency, and achieve system sustainability.

Paramedic Services management committed to reporting on the progress of the Divisional Model since inception in 2007 to final implementation on January 14, 2019. In the fall of 2018, staff outside of Paramedic Services initiated a review of the Divisional Model, which was shared in a report from the Acting Commissioner of Health, titled “Review of Peel

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Regional Paramedic Services' Divisional Model" at the June 27, 2019 Regional Council meeting (Resolution 2019-644). The review found that the Divisional Model supported system optimization in four main areas, specifically contributing to service efficiencies, quality pre-hospital care, patient experience, and paramedic well-being. Areas of improvement were also identified, such as reducing response times for Canadian Triage Acuity Scale (CTAS) 1 and 2 calls, and improving measurement and data collection on paramedic well-being, client experience and the vehicle 'readying' process. The report concluded that Paramedic Services may be challenged to address areas of improvement due to continuing population growth in Peel.

Council directed that the findings from the review be used to inform the next 10-Year Capital Plan (2021-2030) as part of the 2020 Capital Budget (Resolution 2019-222). There has been continued pressure on Paramedic Services to continue providing timely high-quality pre-hospital care in the context of rising call volumes since 2005. While the review found consistent positive effects associated with implementation of the Divisional Model, it must be enhanced to meet the increasing demand over the next decade. The following will summarize key descriptive and predictive analyses that illustrate rising future demand on the system and how the Divisional Model needs to grow to successfully respond. These analyses and findings will inform the development of the Paramedic Services long term facilities capital plan and the capital requirements as outlined in the report of the Commissioner of Health Services titled "Paramedic Services Long Term Facilities Capital Plan, Planning Considerations" listed on the December 10, 2020 Regional Council agenda as Item 15.1.

2. Call Volume Drivers

As Paramedic Services' capital needs for the next 10 years are considered, it is essential to understand future demand on the system as measured by call volumes. Several descriptive and predictive analyses were conducted to support the planning. Firstly, key drivers of service demand¹²³ were studied, which are population growth and population age. Using this information, a series of predictive analyses were conducted to estimate future demand and identify areas within Peel that are predicted to experience high demand for service.

a) Population Growth, 2016 versus 2036

Population growth is a key driver of paramedic service call volume. The Region's population has grown by 19.2 per cent between 2006 to 2016 and is expected to continue to grow. Population forecasts from 2016 to 2036 were analyzed at the regional and municipal levels to determine respective areas of change, see Table 1. The Region's population is projected to experience a growth of 35.5 per cent by 2036. At the municipal level, the population of Brampton will experience the most growth in absolute size followed by Mississauga and Caledon (260,522, 158,841 and 71,538, respectively).

¹ Hamilton, B. A. (2007). Key Drivers of Demand in the Emergency Department: a hypothesis driven approach to analyse demand and supply. *Sydney: NSW Department of Health*.

² Lowthian, J. A., Cameron, P. A., Stoelwinder, J. U., Curtis, A., Currell, A., Cooke, M. W., & McNeil, J. J. (2011). Increasing utilisation of emergency ambulances. *Australian Health Review*, 35(1), 63-69.

³ Peacock, P. J., & Peacock, J. L. (2006). Emergency call work-load, deprivation and population density: an investigation into ambulance services across England. *Journal of Public Health*, 28(2), 111-115.

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Table 1. Actual and Forecasted Number of Residents per Municipality and Region for Years 2016⁴ and 2036⁵

City	Total Residential Population		
	2016	2036	Change
Mississauga	721,599	880,440	158,841
Brampton	593,638	854,160	260,522
Caledon	66,502	138,040	71,538
Peel	1,381,739	1,872,640	490,901

b) Population Demographics

i) Paramedic Services User Profile

Paramedic Services user characteristics including age and sex were studied over time to enhance the understanding of service demands. Overall, a greater proportion of users are females. For those aged 85 and over, a greater number of calls are for females than males (15.0 per cent compared to 9.9 per cent). The analysis by age groups indicates that paramedic services continues to be more heavily used by those over the age of 50 years, representing 52.8 per cent and 57.8 per cent of users in 2005 and 2019, respectively.

ii) Population Forecasts by Age and Sex, 2016 versus 2036

The population forecasts were further subdivided by age and sex, comparing 2016 with 2036. Knowledge of which population subgroups is anticipated to experience the most growth over this time period will inform future health care planning and care needs.

The comparative analyses of the population by age and sex distribution in 2016 and 2036 indicate that the proportion of seniors (age 65+), both males and females, is projected to increase by seven per cent by 2036. Conversely, the proportion of the population under 64 years of age, both males and females, is anticipated to decrease by seven per cent, with an average decline of 0.5 per cent per age group and sex. The forecasted shifts in the population will have impacts on the way health care resources are accessed and used, including paramedic services. The anticipated growth in the senior population may affect the complexity of calls and how pre-hospital care is administered by paramedics.

⁴ Statistics Canada, 2016 Census of Population

⁵ Hemson Consulting Ltd., Scenario 16: Region of Peel Population, Employment and Dwelling Forecasts by Small Geographic Units and Secondary Plan Areas, June 24, 2019.

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3. Predictions on System Demand

With the demand for paramedic services steadily increasing, as measured by call volumes, there is resulting pressure on the existing system and on resources available to meet those demands. Although these analyses are intended to support the development of a 10-year capital plan, the projections go beyond this timeframe to provide a more thorough long-term picture of the anticipated future call demand. Call volume projections will be re-examined/re-calculated annually using the most current data to update projections and monitor future trends; these analyses will inform resource needs.

a) Call Volumes, Past Trends and Future Predictions

Over the last 15 years, call volumes have been increasing and are expected to climb as the population continues to grow and age. There were 67,956 calls received in 2005 compared to 137,741 calls in 2019; this represents a 102.7 per cent increase in calls over the last 15 years.

The previous sections have illustrated several drivers of call volume, including population growth and user age. Using a modified age-period-cohort model, these drivers were applied to generate call volume predictions that show a continued increase in calls in the future. Figure 1 illustrates the actual number of calls (blue line) and predicted number of calls (orange line). Also noted is the 95 per cent prediction interval (shaded area in light orange) from 2020 to 2036. It is predicted that there will be 272,661 calls in 2036, with a 95 per cent prediction interval i.e., the predicted number of calls for 2036 could range between 208,633 and 356,603. The predictions indicate that calls will almost double in number between 2019 and 2036 (97.9 per cent increase). The resource predictions outlined later in this report are based on the predicted number of calls (orange line).

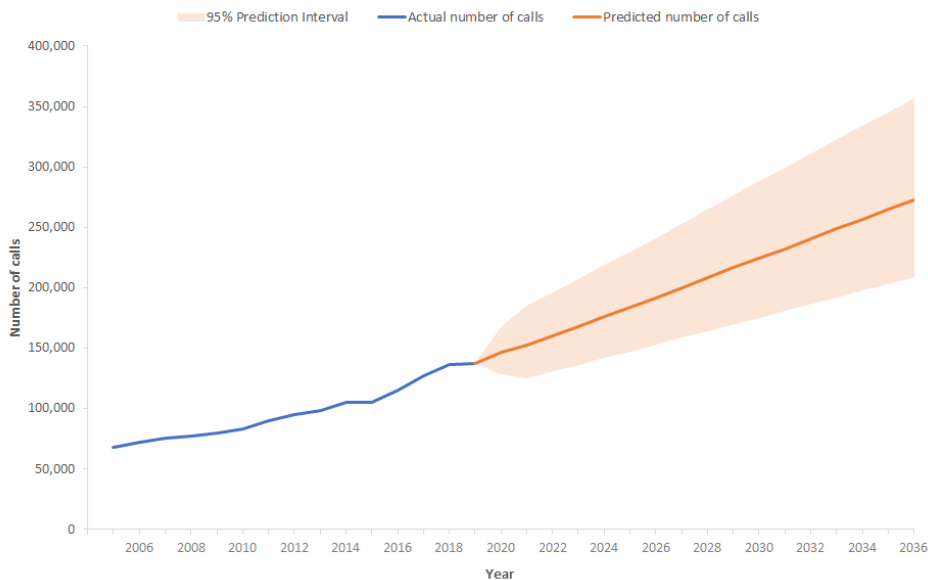


Figure 1. Yearly Paramedic Services calls and call growth projections, 2005 to 2036

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b) Forecasted Areas of High Demand

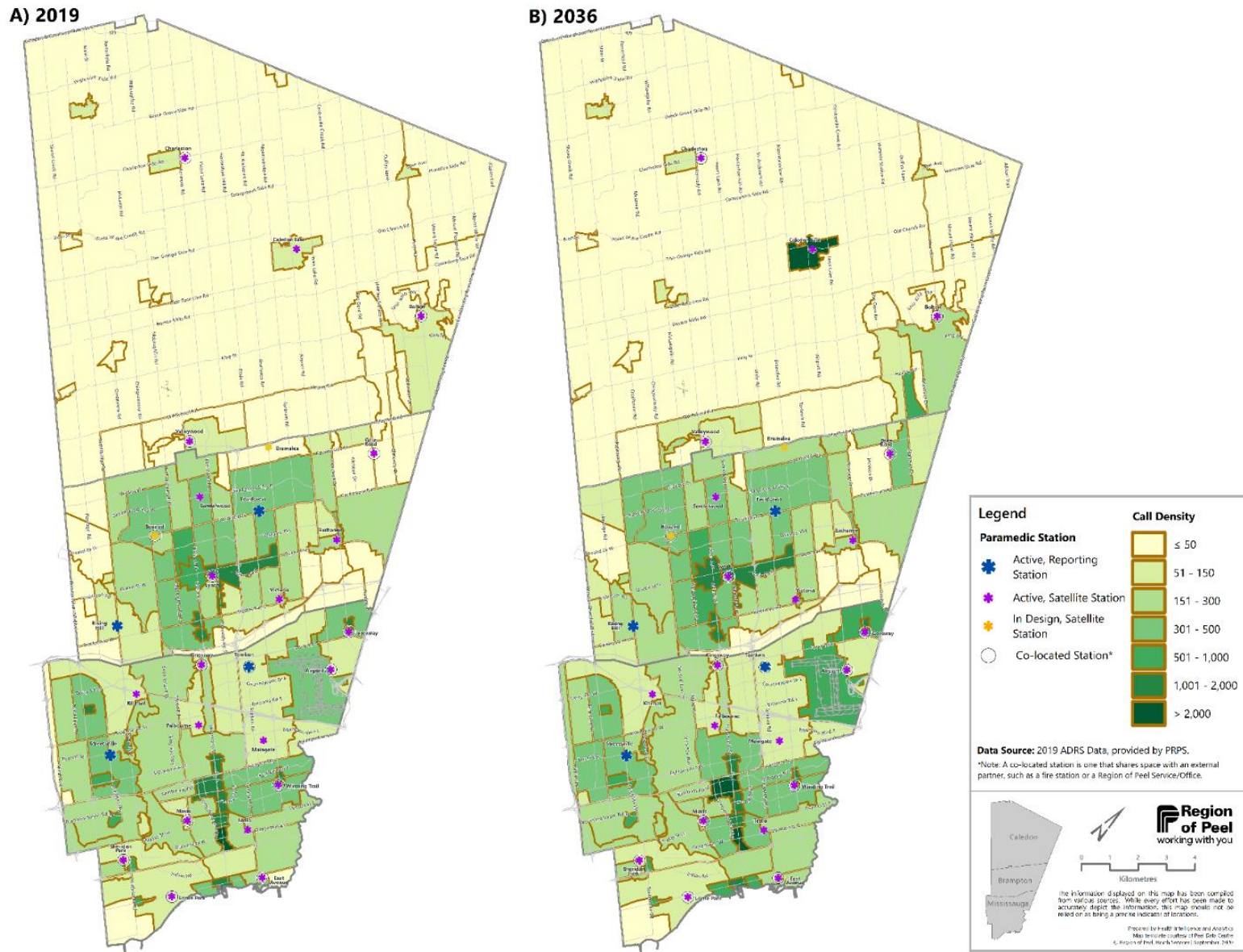
In the following section, future call volumes are spatially mapped within Peel Region to demonstrate areas calculated to experience high demand for paramedic services. Using *Geographically weighted regression*⁶, call volume growth was quantified by Secondary Plan (SP) areas within Peel over time.

The results of the spatial analyses show areas in Peel that are anticipated to grow in call volume density by 2036, see Map 1. Areas expected to further intensify include the downtown city cores of each municipality, specifically the areas surrounding Square One Shopping Centre and Hurontario Street Corridor in Mississauga, Main Street and Queen Street corridor in Brampton, and Bolton in Caledon.

Apart from the downtown city cores, the areas with the highest anticipated growth in call volume density by 2036 are found in the north west corners of Brampton and Mississauga. By contrast, Caledon is expected to experience less growth, with some villages and hamlets, particularly Caledon East and Mayfield West, anticipated to experience more moderate to high increases in call volume density by 2036.

⁶ Type of regression analysis that uses the relationship between call volumes and their origin by SP area to compute call volume densities for these areas over time.

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Map 1. Actual and Predicted Call Volume Densities by Secondary Plan Areas, Region of Peel, 2019 and 2036

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4. Future Resource Needs

The data presented have illustrated that the Region will continue to see growth in overall population, seniors (age 65+), and call volumes. In order for paramedic services system to respond to this need, additional resources are required in the form of ambulances and paramedics, as well as reporting and satellite stations. Given the timeframe for the next 10-Year Capital Plan that addresses the need for stations, the projections were extended to 2036 to provide an additional five years of resource estimates.

a) Ambulances

Currently, Paramedic Services has a total of 134 ambulances. Of these ambulances, 97 are scheduled for deployment throughout the day, either on a 12-hour day or night shift. The remainder of the fleet (37 ambulances) is set aside to ensure additional deployment levels, address vehicle breakdown, deep cleaning needs, and regular vehicle maintenance. Given the predicted growth in call volumes, the ambulance fleet size will also need to grow; yearly ambulance projections are shown below in Figure 2. Projections are based on the corresponding yearly projected call volumes and consider time spent per call, the service time provided by a 12-hour shift ambulance, and account for the fleet set aside to ensure deployment levels.

Figure 2 illustrates the number of current (orange dotted line) and predicted (blue dotted line) ambulances from 2017 to 2036. A total of 201 ambulances will be needed by 2030, which is an increase of 67 ambulances or 50.0 per cent in fleet size compared to 2020.

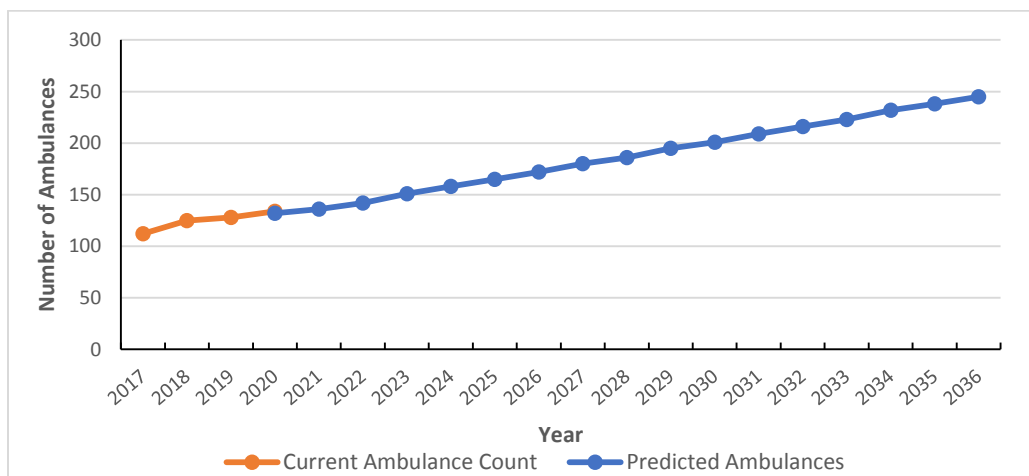


Figure 2. Number of current and predicted ambulances over time, 2017 to 2036

Note: Ambulance forecasts are based on the call volume *prediction line*.

b) Reporting and Satellite Stations

Currently, Paramedic Services has four reporting stations, three of which have an attached satellite station. In addition, there are 21 separate satellite stations and two satellite stations are in the design phase. Reporting stations are where paramedics begin and end their shift; they serve as places for crews to check in with their supervisor and other crews and receive updates on service information (called 'parade') before being deployed into the community. Reporting stations also provide spaces where ambulances are housed, cleaned and stocked throughout the day. Satellite stations

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serve as ‘posts,’ or geographic locations where an ambulance is to be located to provide the quickest response to emergencies in the community.

With the anticipated growth in call volume and the corresponding growth in ambulance fleet size, three more reporting stations will be needed to house the growing fleet over the next 15 years. Based on the predicted call volume growth and the current satellite station coverage, five new satellite stations will be needed. These new satellite stations would be strategically placed in areas with higher expected call volumes by 2036 to enhance station coverage across the Region. Table 2 provides details on the proposed number of reporting and satellite stations noting the corresponding year by which stations should be in operation to meet increasing demands.

Table 2. Proposed year and number of reporting stations and satellite stations, 2023 to 2030

Proposed Year of Full Operation	Number of New Reporting Stations	Number of New Satellite Station(s)
2023	1	3
2025	1	1
2029	1	1
Total number between 2023 - 2030	3	5

Note: Reporting station forecasts are based on the call volume *prediction line*.

CONCLUSION

These analyses demonstrate that Paramedic Services is expected to experience a substantial increase in demand for services by 2030, amounting to a 63.1 per cent increase in calls or 86,977 more calls. It is proposed that 67 ambulances, three reporting stations, and five satellite stations will be needed to manage the anticipated demand over the next 10 years.

It should be reiterated that the predictions rely on past trends, 2005 to 2019, and do not account for future changes whether they be beneficial or challenging to the system, e.g., broad health care system changes, process improvements that may affect demand and service delivery, or changes in population health. Of note, the effects of the current COVID-19 pandemic are not considered in the call volume analyses or on paramedic service implications; with comparatively little data on the call volume effects of the pandemic, the long-term impacts are difficult to reliably predict.

It is recommended that the principles and methodology contained within this report be used as input for the development of the Capital Facility Plan, 2021-2030. As decisions are made regarding acquisition of additional resources (e.g., ambulances, reporting stations and satellite stations), it is recommended that all call volume projections are re-examined annually to ensure the projected trends still hold into the future. Moreover, to manage growing demand and resource needs, Paramedic Services should continue to implement process and service delivery improvement initiatives to ensure system sustainability, mitigate system pressures and enhance service delivery.

APPENDICES

Appendix I - Analysis Report for Peel Regional Paramedic Services

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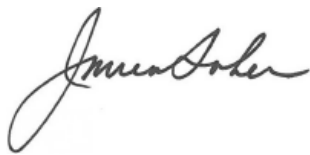
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Final approval is by the Chief Administrative Officer.



J. Baker, Chief Administrative Officer