

Background

Hamilton currently has over 4000 public parking spaces located throughout the city in 57 parking lots managed by the City of Hamilton. The current parking occupancy data is collected from parking payment transactions, recorded using technology such as parking terminals, mobile apps, and web payments. However, previous analyses indicated that payment transaction is not an accurate indicator of parking occupancy due to various problems such as insufficient payments or surpassed durations. Moreover, as the City is consistently updating its technology for the public parking practice, we may ask whether these updates improve the efficiency from the users' perspective or solely from that of the management of the City.

Objectives

- Improve efficiency of parking lot usage from the users' perspective.
- Analyze trends from existing data and identify better indicators.
- Provide predictions and recommendations.

Scope of Data

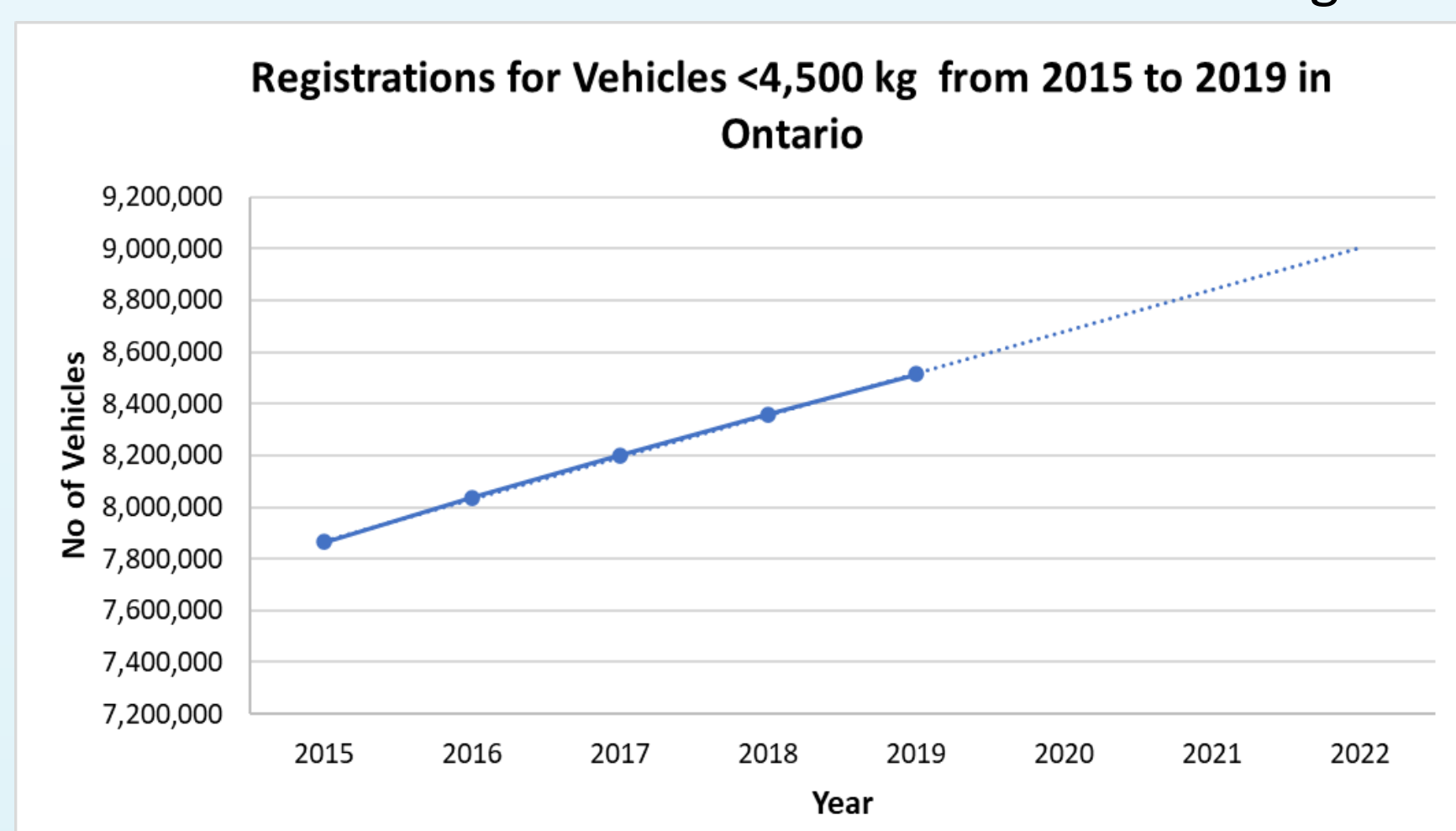
- Transaction record in the Year 2021, from users of parking terminal, mobile app, and web payment. (The data in 2020 is incomplete. Also, the year 2020 is in the midst of the pandemic, which hugely impacts the accuracy of the data.)
- Addresses of Parking Lots, with exact locations (coordinates extracted from [3]).

Figure 1

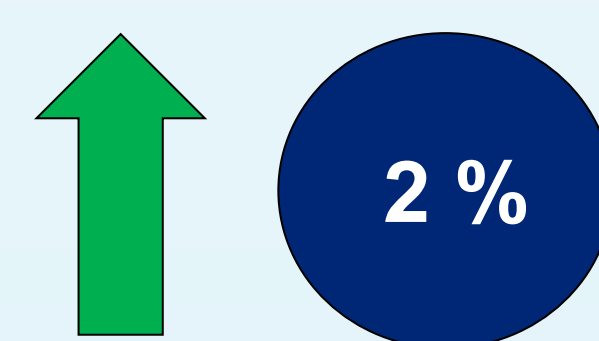


New Parking Space for Increasing Vehicles Population

Figure 2



Current Parking Spaces
4,282

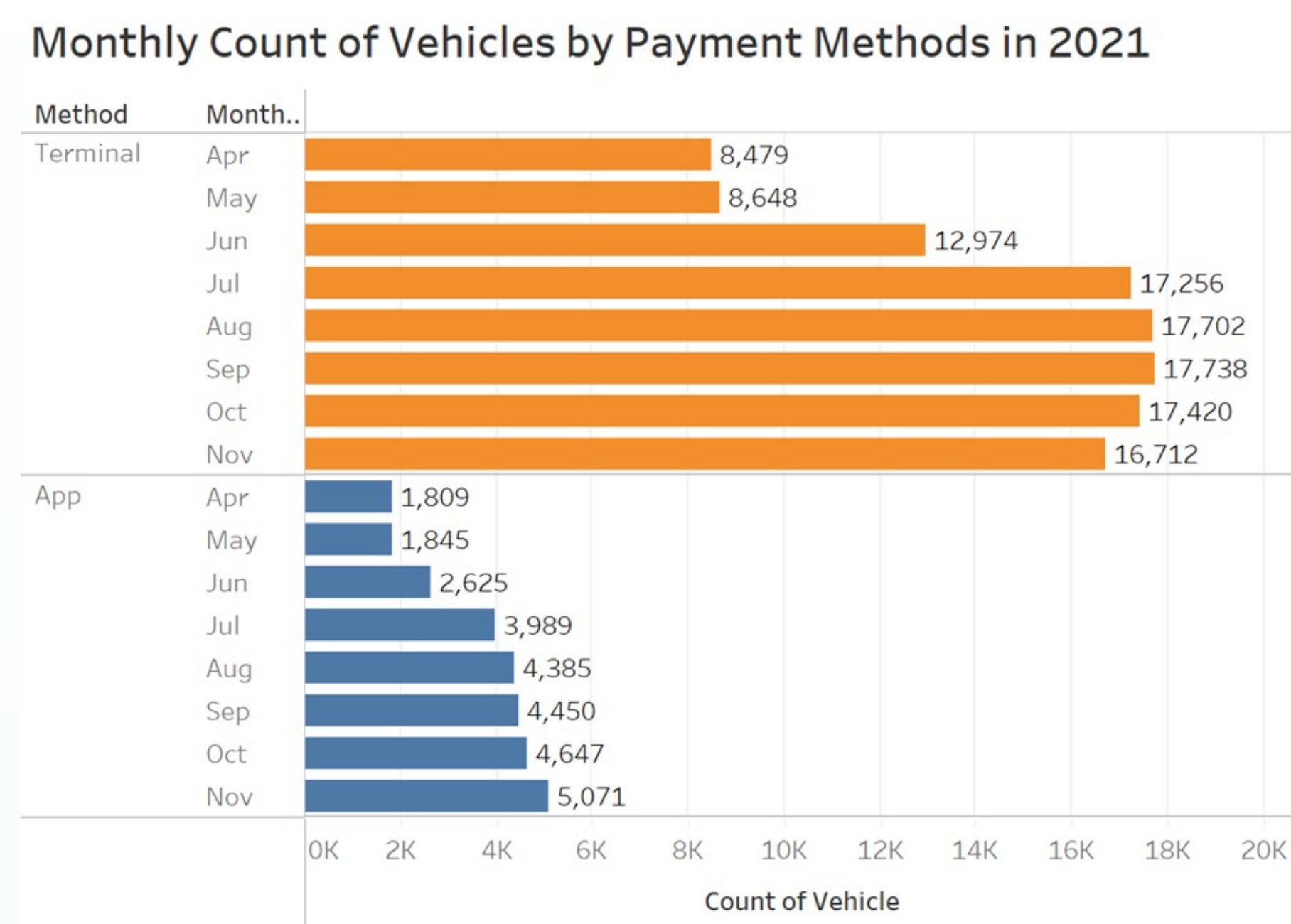


Annual New Space Requirement
86

- New vehicle registration shows 2% annual growth in Ontario (c.f. [2]).
- When vehicle population is increased, parking space requirement will grow correspondingly.

Monthly Payment Method Distribution

Figure 3



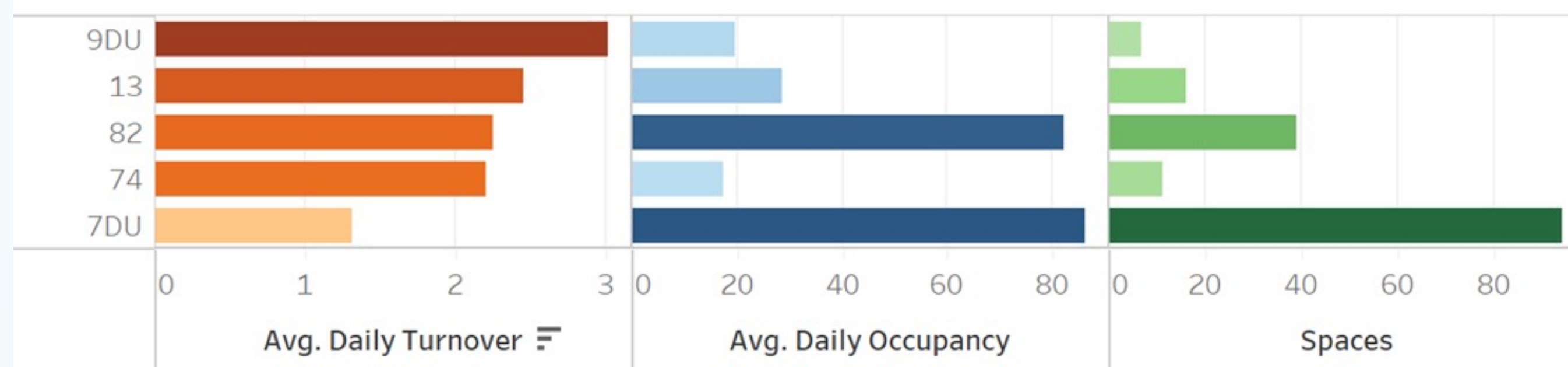
- Parking Terminal is the mostly widely used payment method, followed by mobile app.
- Usage of web payment is insignificant.
- Usage of Terminal slightly drops from October.
- Mobile app usage is getting popular as it surges from June to November.
- Records from January to March and in December are dropped from the analysis.

Analysis on New Indicators

- Two better indicators: **Turnover** and **Occupancy** (c.f. p. 6 of [1]).
- Number of spaces** also in analysis.

Figure 4

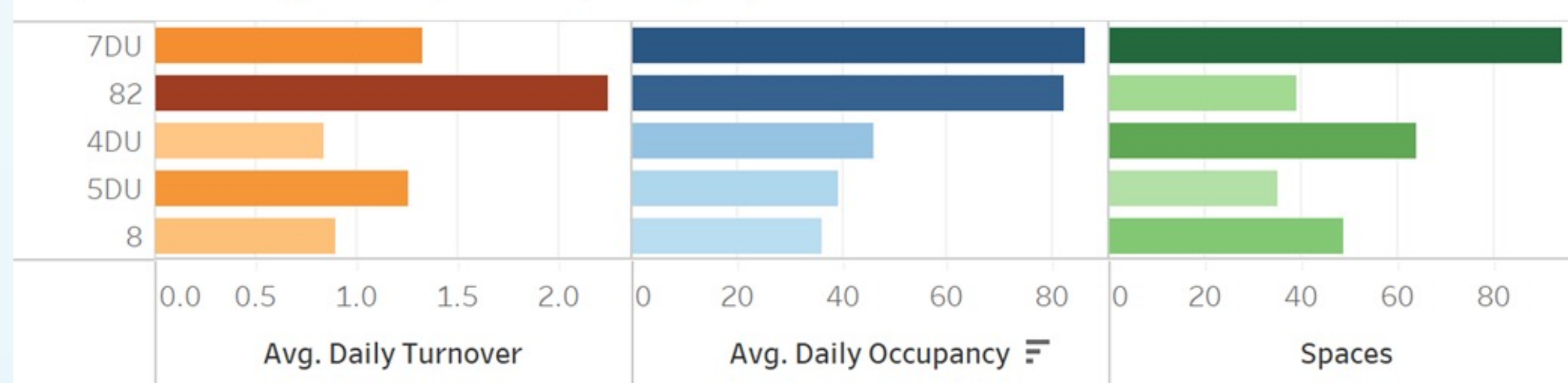
Top 5 Average Daily Turnover by Lots



- 1DU-9DU: Downtown Dundas
- 13: downtown Hamilton
- 82: General Hamilton Hospital
- 74 Hess Village

Figure 5

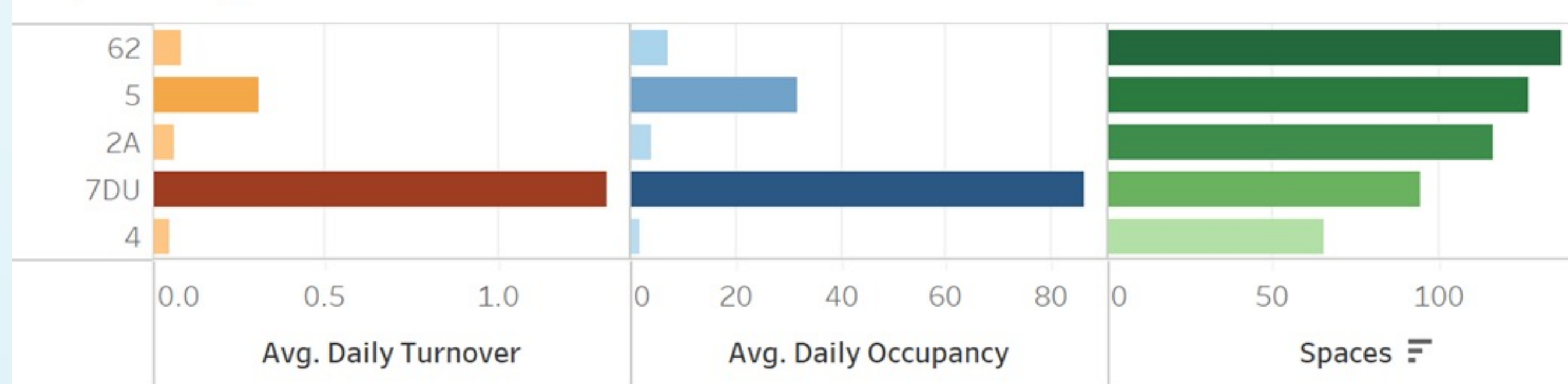
Top 5 Average Daily Occupancy by Lots



- 8: downtown Hamilton

Figure 6

Top 5 Largest Lots



- 62: Jackson Square and York Boulevard Parkette #1
- 5: Hamilton Police Service
- 4 and 2A: mostly residential and close to a large shopping mall

Analysis on Peak Hours and Rate

Figure 7



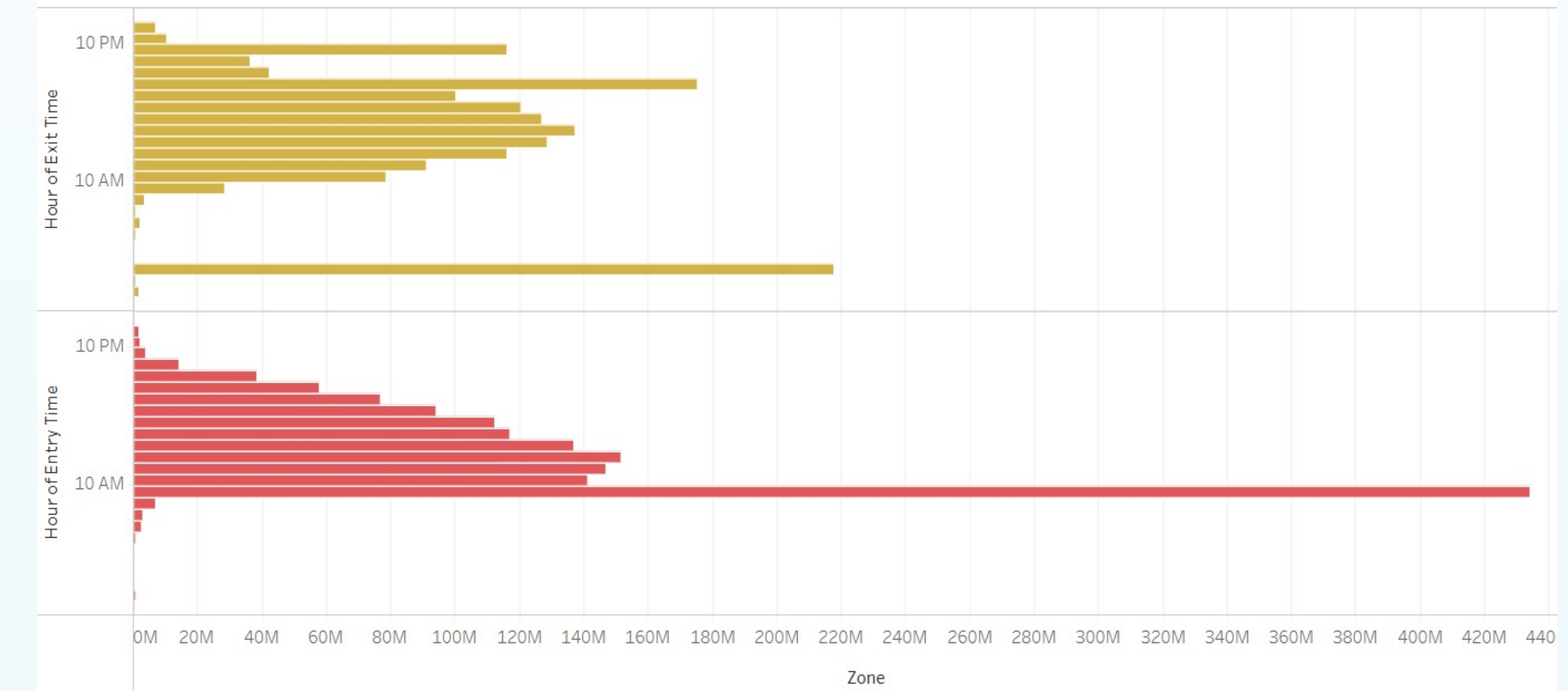
The most commonly used rates are between the hours of:
9:00A.M.-2:00A.M.
9:00A.M.-6:00P.M.
9:00A.M.-9:00P.M.

The most popular entry time for parking lots is:
9:00 A.M.

The most popular exit times for parking lots are:
2:00 A.M.
6:00 P.M.
9:00 P.M.

Figure 8

Daily Frequency of Entry and Exit times in Lots by Hour



Recommendations

- Introduce new parking zones to accommodate the upcoming growth of vehicle population.
- Improve app by providing turnover and occupancy data in nearby lots.
- Create flexible rates to distribute turnover and occupancy across parking lots.

References

- [1] 2016 PARKING STUDY & REPORTS - Town of Banff. <https://banff.ca/DocumentCenter/View/3742>
- [2] Vehicle Registration, by type and vehicle, Statistic Canada. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006701>
- [3] Map Data of Hamilton, ON Canada, 2022 Google. <https://www.google.ca/maps/@43.2604685,-80.2133343,10z>