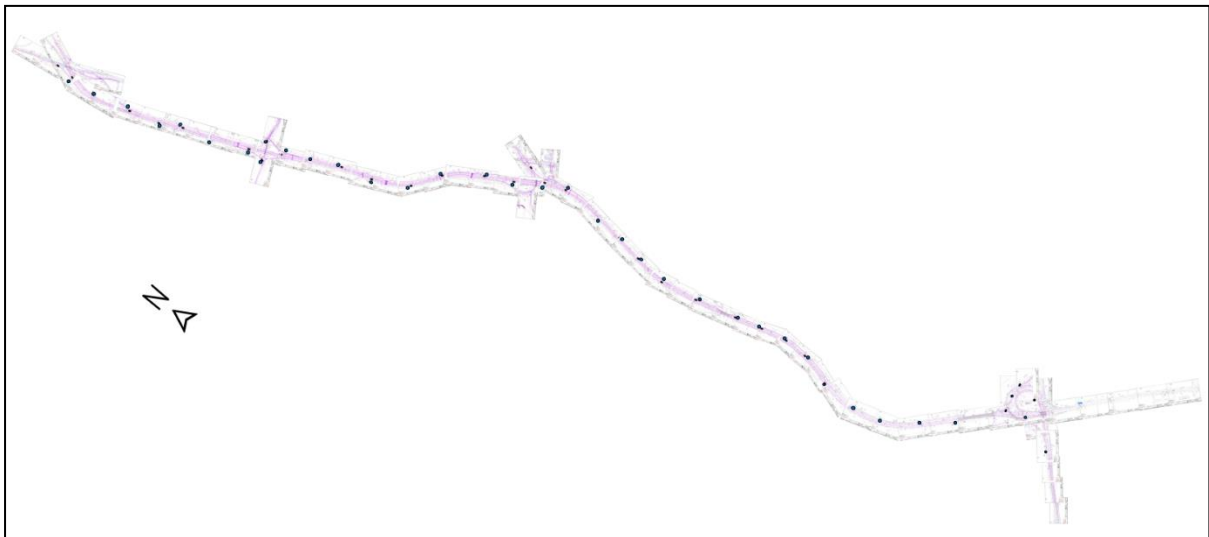


**INTRODUCTION**

The Northern Connector road was commissioned in March, with the Juvana Patriot detector installed throughout, buried at a depth of 270 mm below the road surface. This is the first time this has been done in Australia; the success of this implementation may have implications for future road construction projects. This report briefly examines the performance of these detectors in the initial period of their active use. The implications for road telemetry are the focus of this report; questions of civil engineering design are typically examined over a longer period and are not considered.

**ROAD OVERVIEW AND DETECTOR PLACEMENT**

442 such detectors were implemented in this way, across the 15km stretch of road, at intervals of approximately 500m, according to common practice for freeway telemetry. The overview below shows the placement of detector sites along the freeway. Between 12 and 18 individual loops are placed at each location indicated.



**Figure 1: Overview of Northern Connector, Small Dots Represent Detector Locations**

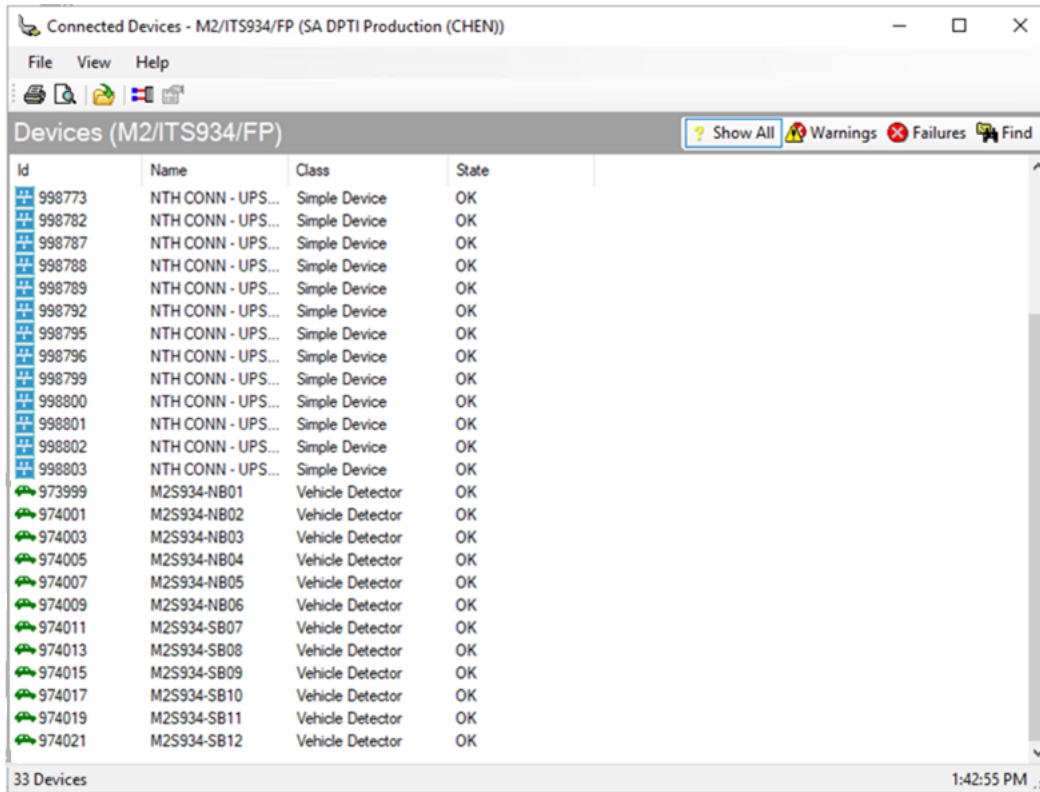
**DATA SETS**

Volume and Occupancy data for the following detectors were collected from 1<sup>st</sup> to 4<sup>th</sup> of November. These are patriot detectors from cabinet 934.

VD ID	DS ID	Direction
973999	974853	North Bound
974003	974853	North Bound
974007	974853	North Bound
974001	974854	North Bound
974005	974854	North Bound
974009	974854	North Bound
974011	974855	South Bound
974015	974855	South Bound
974019	974855	South Bound

VD ID	DS ID	Direction
974013	974856	South Bound
974017	974856	South Bound
974021	974856	South Bound

**Table 1: Patriot Detectors**



**Figure 2: Patriot Detectors from Cabinet 934**

To validate the results, additional volume and occupancy data was collected from the surrounding detector sites for comparison purposes.

DS ID	DS Name
974849	M25933NB
974850	M25933NB-S
974857	M25935NB
974852	M25933SB-S
974859	M25935SB

**Table 2: Surrounding Detector Sites**

## RESULTS

The following figures plot the average volume and occupancy for the patriot detectors of cabinet 934 including the average NB and SB directions from 1<sup>st</sup> to 4<sup>th</sup> of November. Data mostly shows a typical daily profile such as would be expected for their location. Except for Sunday 1<sup>st</sup> of November, southbound detectors show a higher morning peak for traffic inbound to the city centre, while northbound detectors showed a higher afternoon peak for traffic returning from the city.

Volume and occupancy for all days including 1<sup>st</sup> of November, are consistent with downstream and upstream readings.

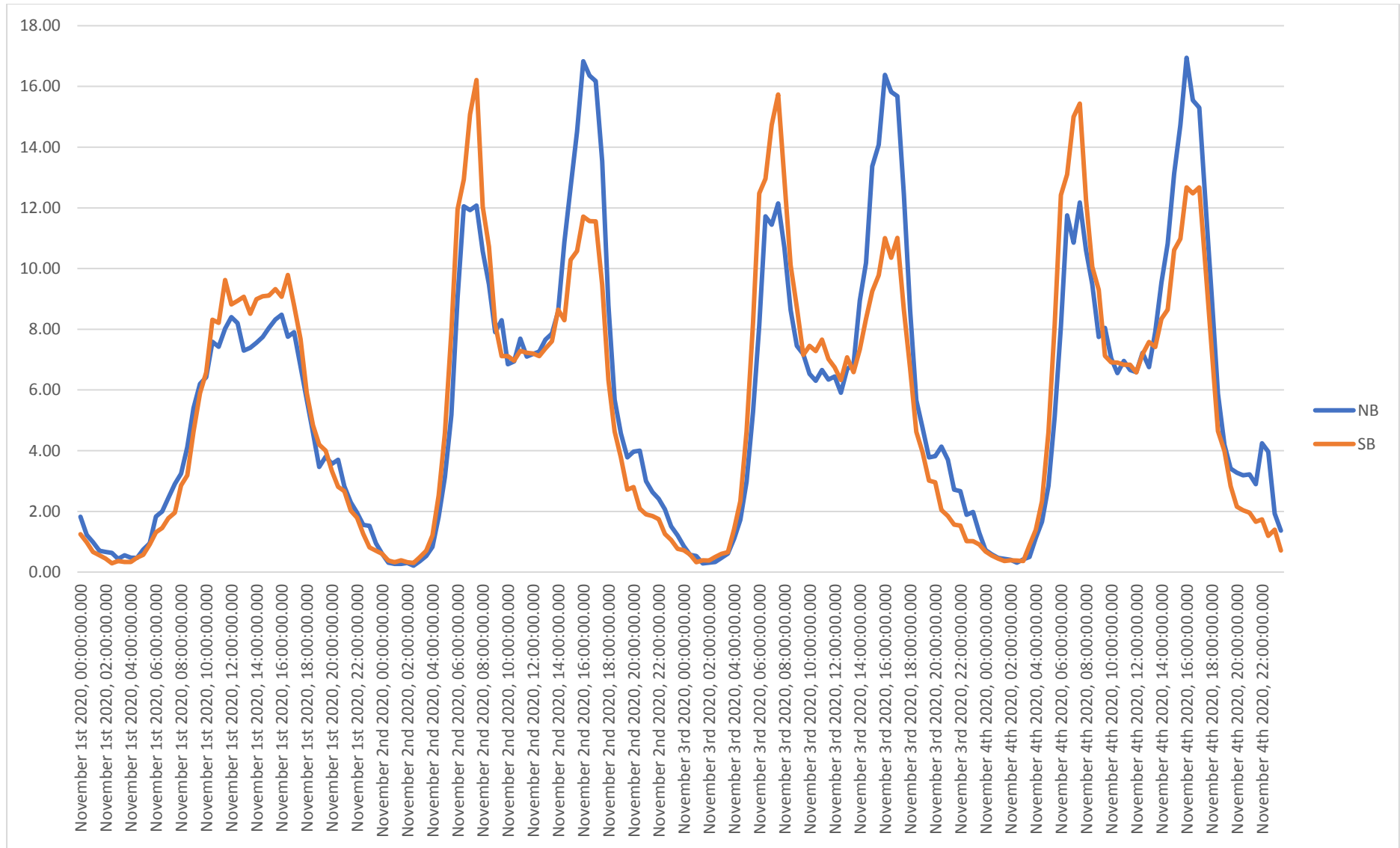


Figure 3: Directional Volume for Patriot Detectors

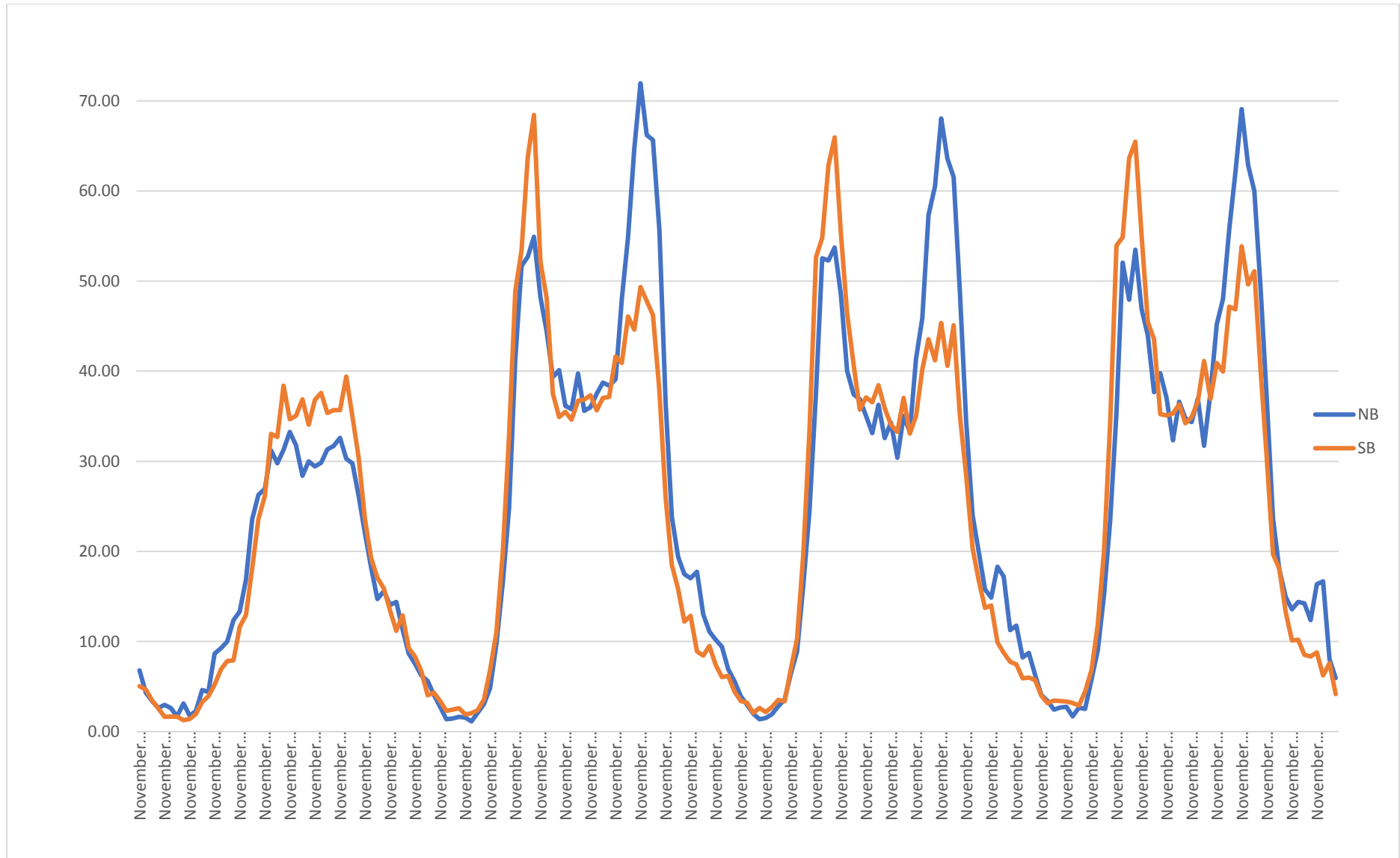


Figure 4: Directional Occupancy for Patriot Detectors

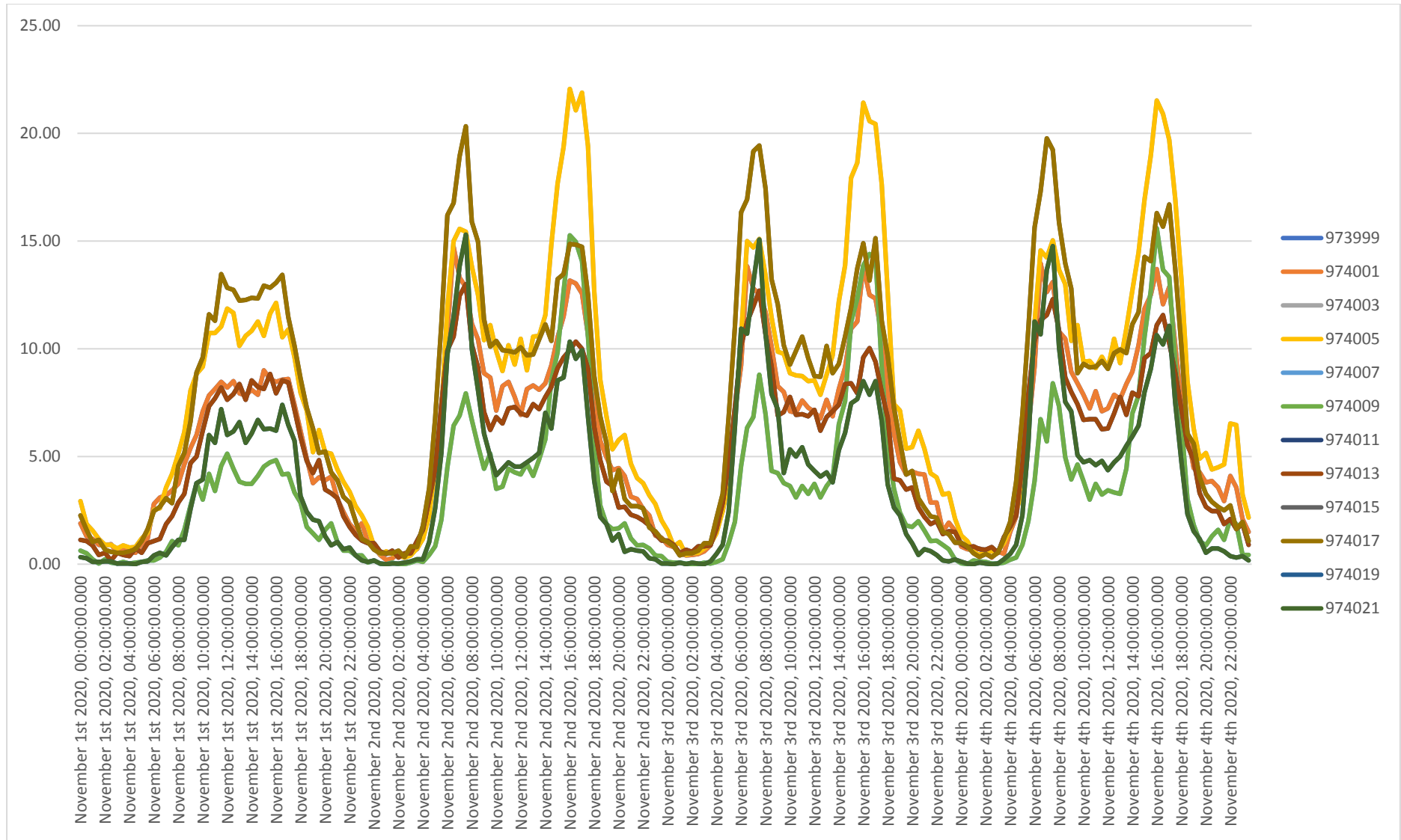


Figure 5: VD Volume for Patriot Detectors

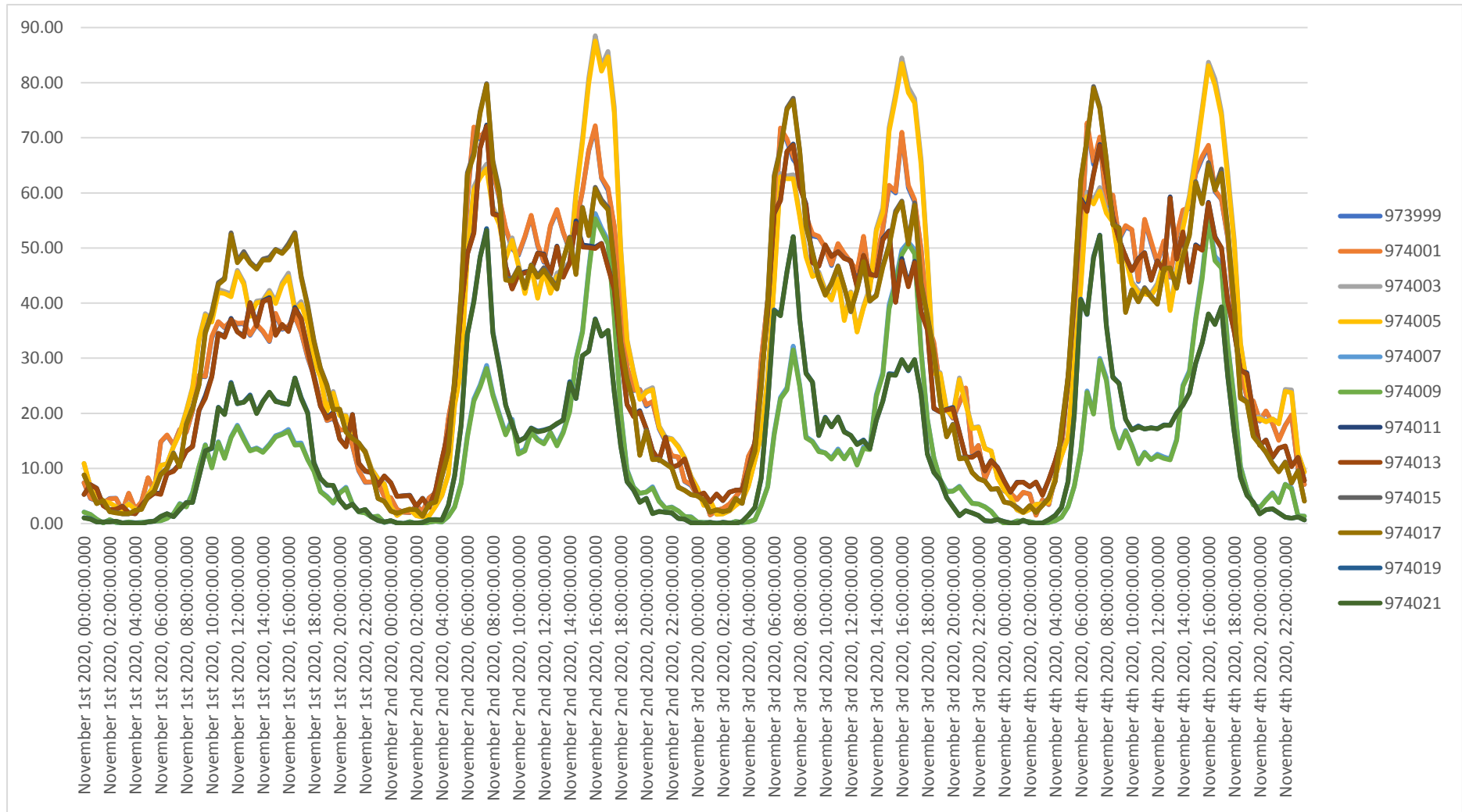


Figure 6: VD Occupancy for Patriot Detectors

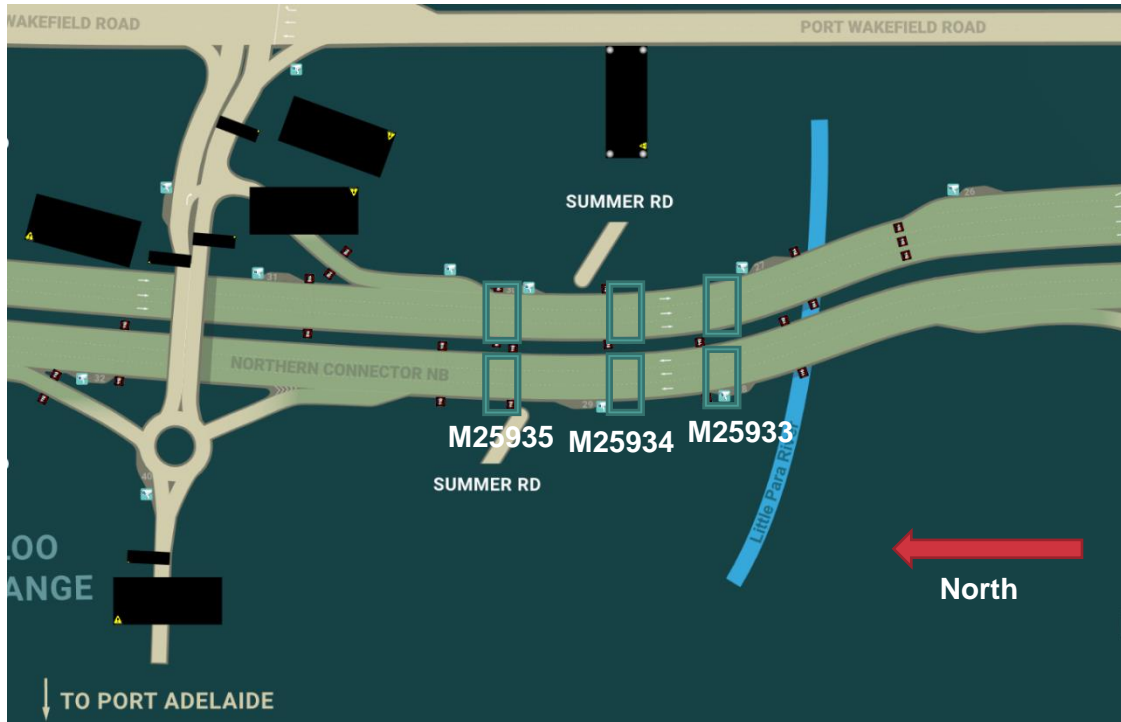
*UPSTREAM/DOWNSTREAM COMPARISON*

Based on the road geometry, the following should hold valid for volume and occupancy of Detector Sites:

M25933NB ~ M25933NB-S ~ M25934NB ~ M25934NB-S ~ M25935NB

And

M25933SB-S ~ M25934SB ~ M25935SB-S ~ M25935SB



**Figure 7: Road Geometry**

The following figures show a comparison of volume and occupancy between detector sites with patriot detectors from cabinet 934 and their surrounding detector sites on 1<sup>st</sup> of November. Refer to Table 1 for a list Detector Sites that use Patriot detectors.

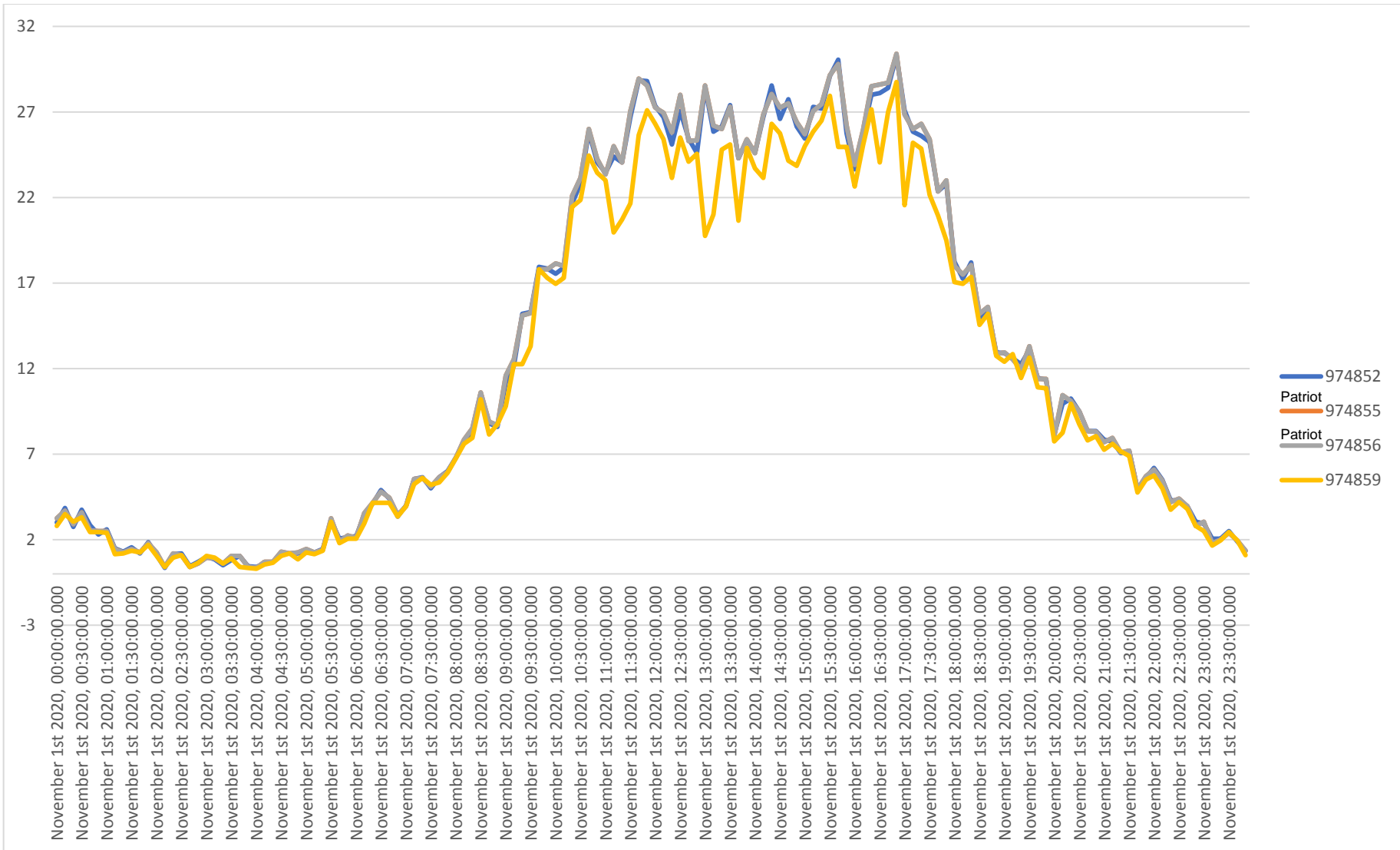


Figure 8: Volume Compression Between Detector Sites with Patriot Detectors (Cabinet 934) and Their Surrounding Detector Sites – SB



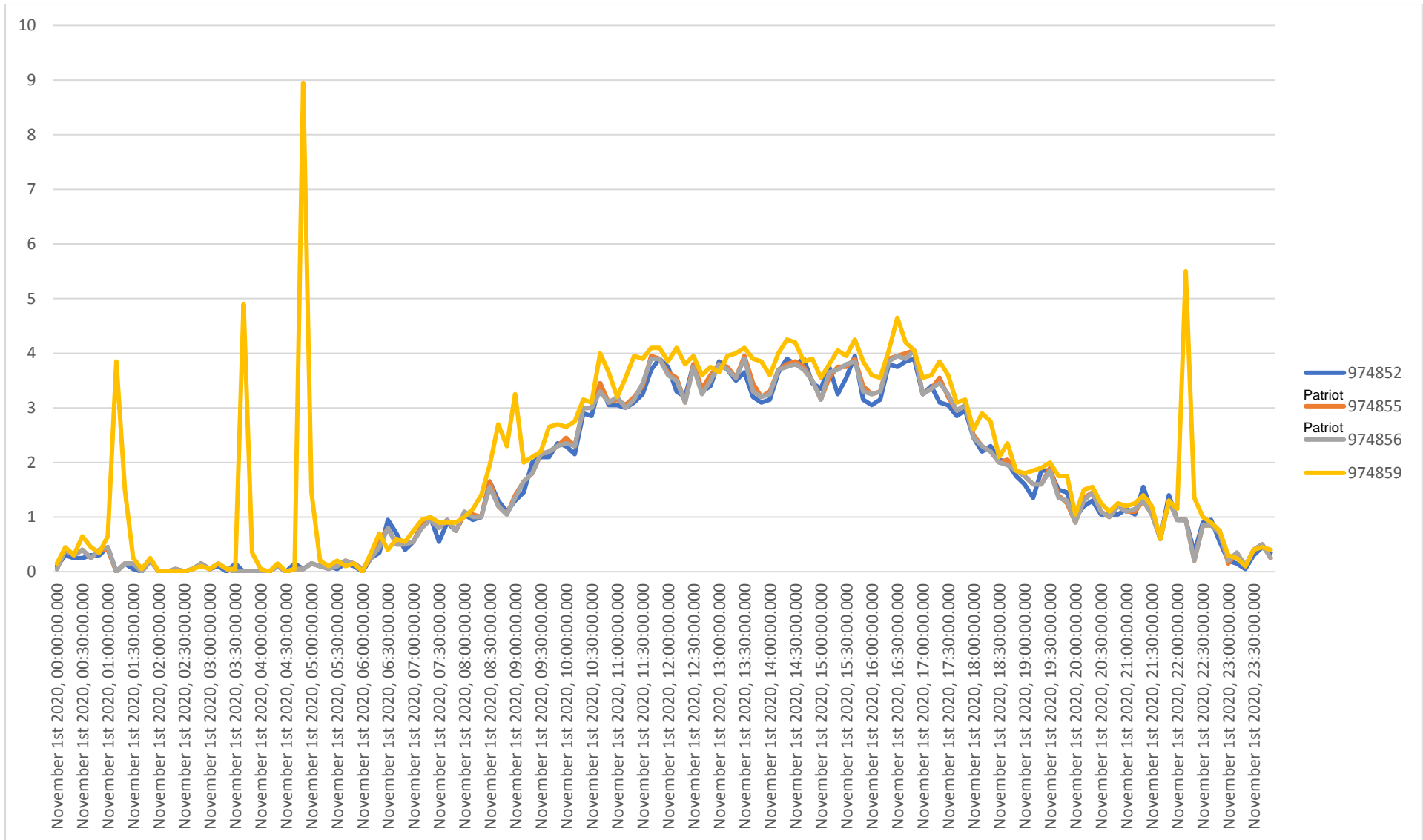


Figure 9: Occupancy Compression Between Detector Sites with Patriot Detectors (Cabinet 934) and Their Surrounding Detector Sites – SB

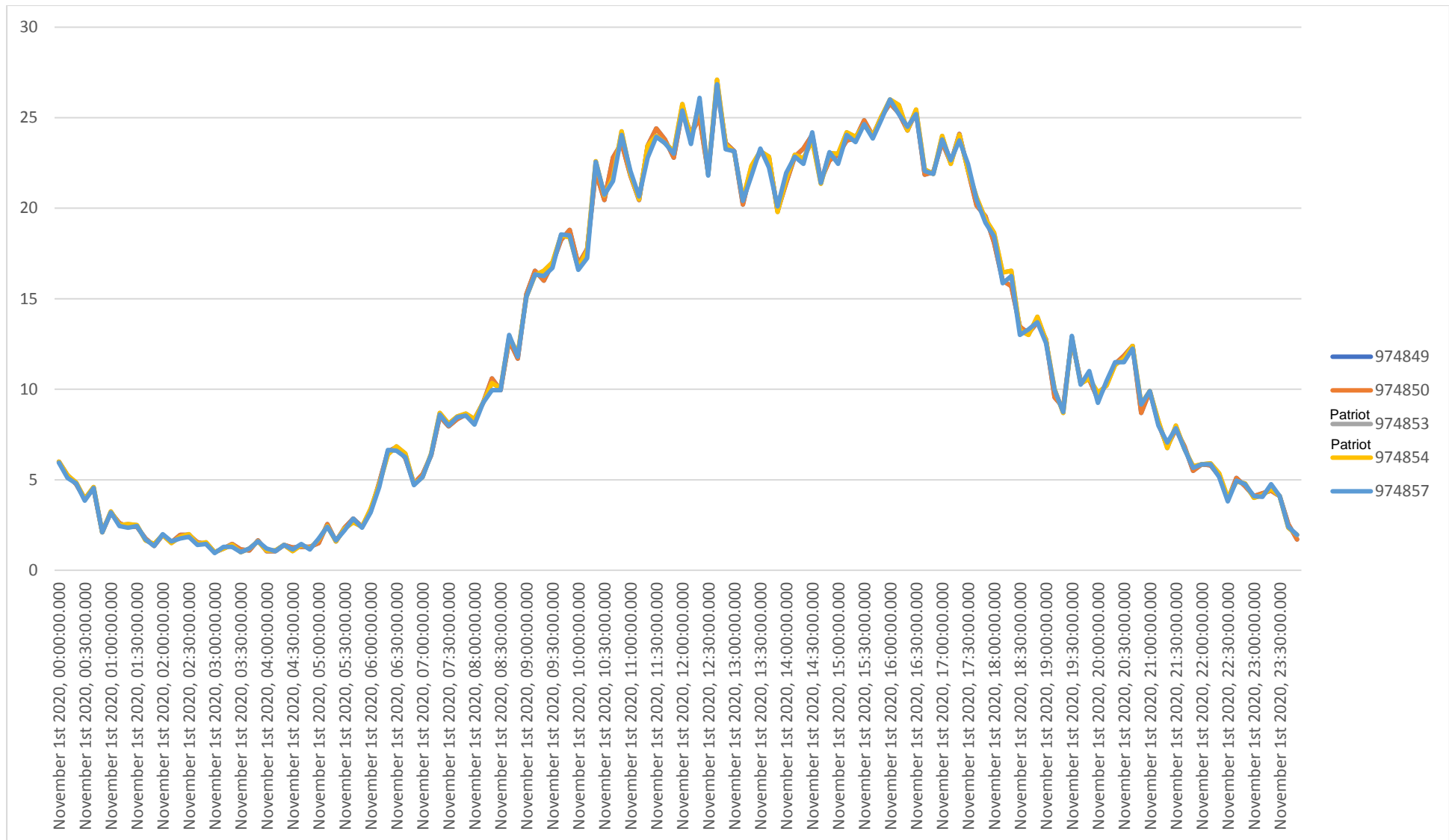


Figure 10: Volume Compression Between Detector Sites with Patriot Detectors (Cabinet 934) and their surrounding Detector Sites – NB

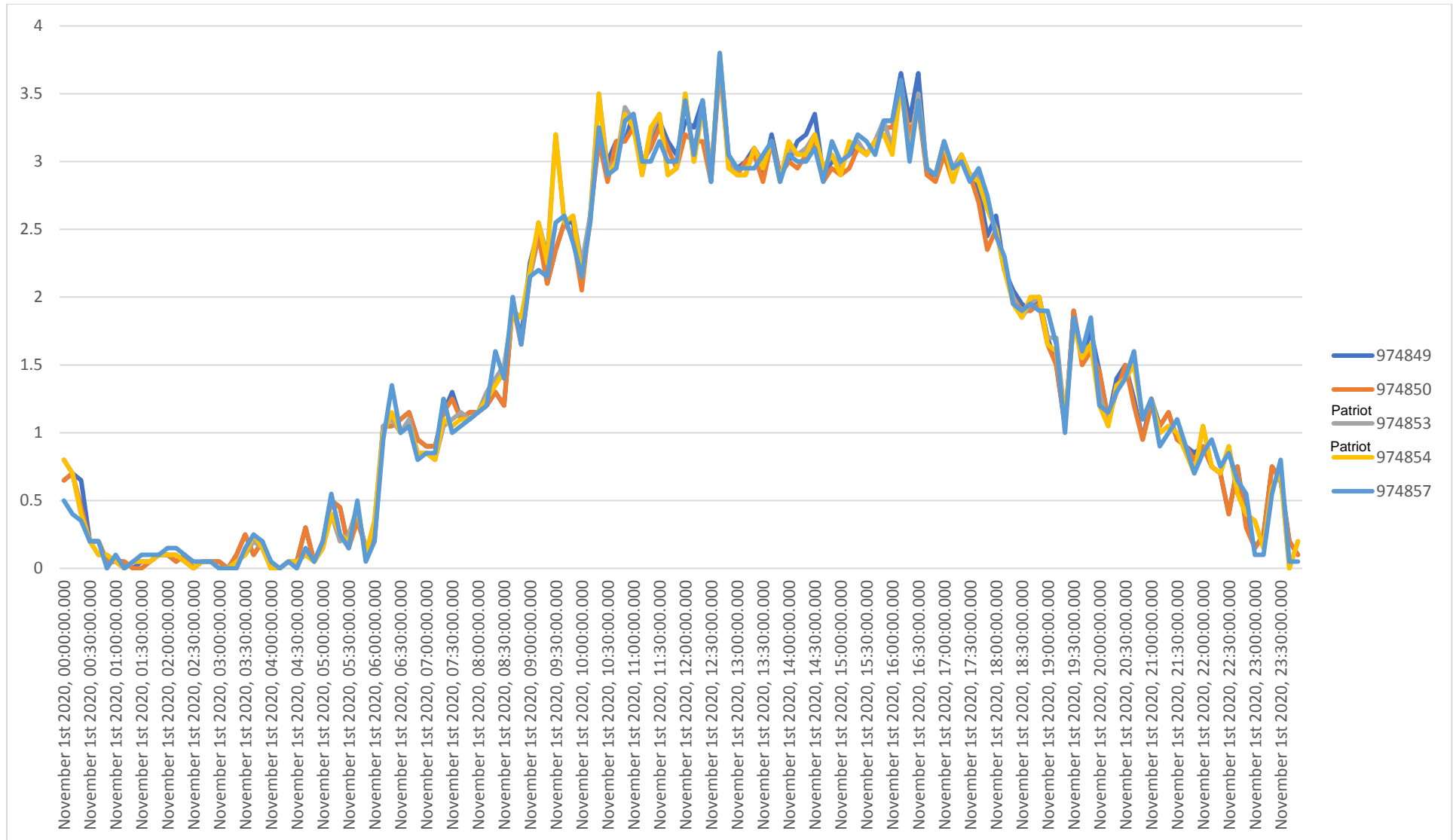
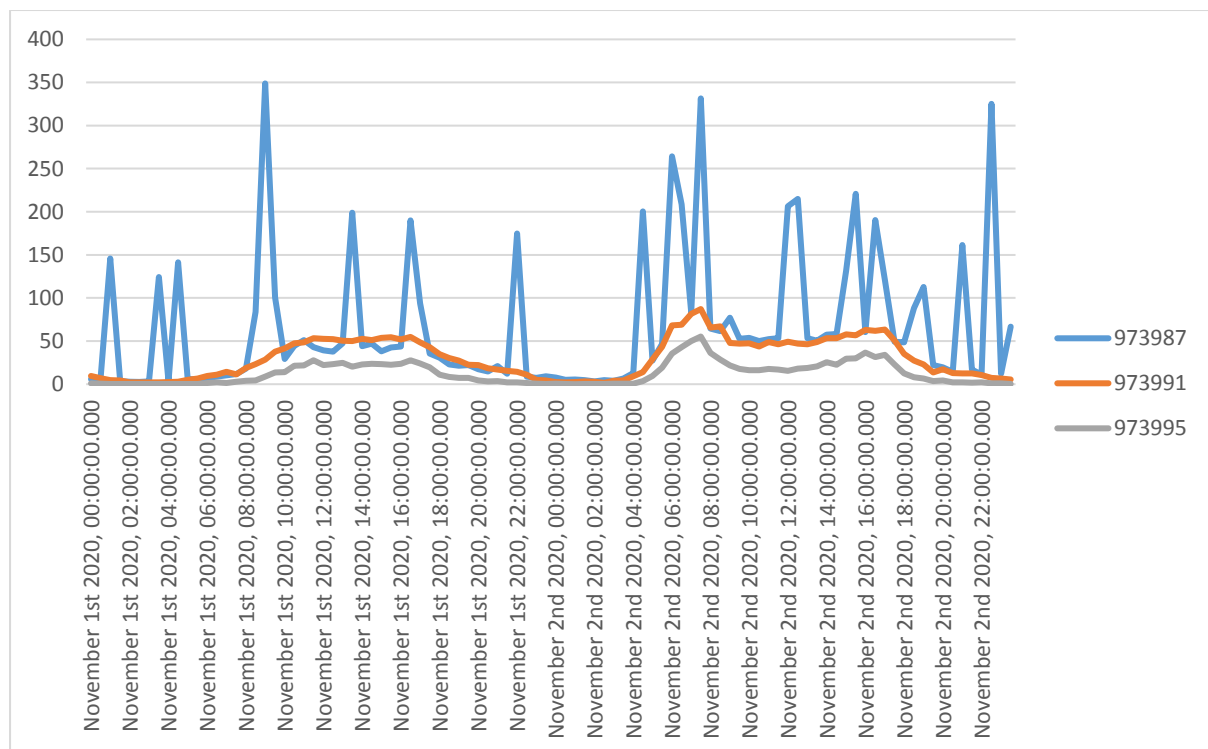


Figure 11: Occupancy Compression Between Detector Sites with Patriot Detectors (Cabinet 934) and their surrounding Detector Sites – NB

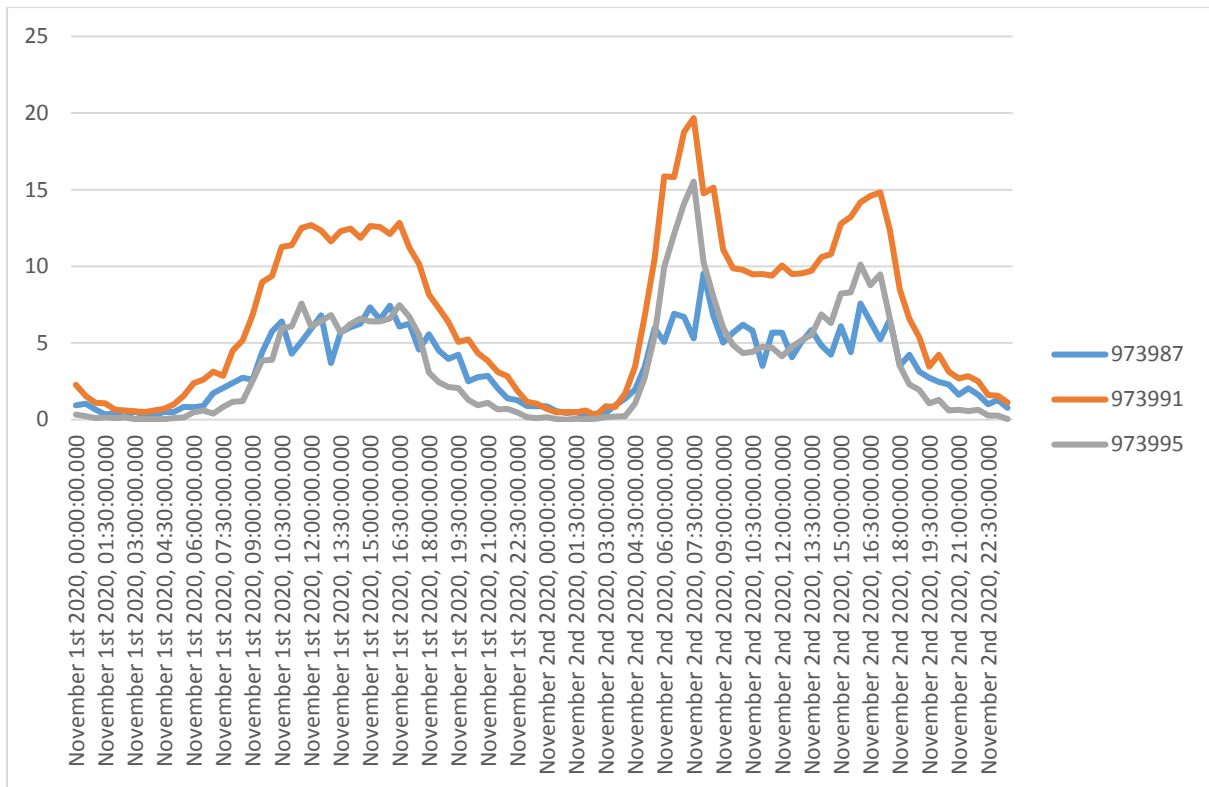
Most of the profiles are very similar, showing an almost identical shape across the 24-hour period. The only exception is detector site 974859. This detector site on average reports 16% higher occupancy and 5% lower volume. Detector site 974859 also shows four visible spikes in occupancy within the 24-hour period.

Detector site 974859 (non-patriot detectors) consists of detectors 973987, 973991 and 973995. Upon further investigation of these detectors, it was found that detector 973987 reports occupancy values with seemingly random spikes. This explains the irregularities related to DS 974859.

The following figures show the volume and occupancy for detectors 973987, 973991 and 973995 from 1<sup>st</sup> to 2<sup>nd</sup> of November. The irregular occupancy spikes on detector 973987 are clearly visible; these spikes are almost certainly spurious. The volume for detector 973987 shows no phenomena corresponding to the occupancy spikes.



**Figure 12: Average Occupancy**



**Figure 13: Average Volume**

Given the above, for the purposes of this brief report, it is satisfactory to note that the profiles are similar enough to give confidence in the reliability of the Patriot detectors.

### CONCLUSION

This report has briefly examined the installation of the Juvana Patriot detectors on the new Northern Connector roadway in Adelaide, South Australia, buried at the novel depth of 270mm beneath the road surface. It was found that the detectors are giving results comparable to those that would be expected of other kinds of detectors and other installation configurations.