Report on Patrol Staffing and Deployment

ITHACA, NEW YORK

DRAFT

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1. Introduction

(1) Project Overview

Matrix Consulting Group was retained by Center for Policing Equity to conduct analysis of field services and staffing needs for the Ithaca Police Department. Our scope of work includes:

- **Comprehensive analysis of patrol workload**, examining service needs and workload throughout Ithaca.
- **Analysis of patrol staffing needs and call diversion opportunities**, focusing on the capacity of patrol units to both handle incoming workloads and be proactive in the field.
- **Study alternative deployment configurations**, including new shift schedules and allocations of personnel, as well as redesigning the patrol beat structure.

This draft document presents the analysis of these scope areas, including findings and recommendations. Further analysis in the study will examine alternative call response and other alternative service delivery alternatives.

(2) Key Findings

The comprehensive analysis of call data presents a clear picture of workload in 2019, the year focused on to examine patrol staffing and capacity, as well as over the entire five-year period for which data was received. This enabled us to accurately measure patrol workload in terms of both the number of incidents that patrol units responded to, as well as how much time was spent handling these calls.

Similarly, department personnel data provides a measure of the capacity to handle these workloads by examining how many hours staff are on duty after accounting for factors such as time spent on leave, training, and other categories that take officers out of the field.

In measuring patrol workload and comparing that workload against staff capacity to handle it, several findings are evident:

- Patrol handled 12,217 community-generated calls for service in 2019.

- The workload that community-generated calls for service create take up 41% of officers' net available time, leaving the remaining 59% for proactive use.

- A proactive (uncommitted) time level of 59% indicates that there is not only sufficient staffing to handle workloads, but also to have exceptional proactive capabilities.

- Based on this analysis, current staffing is sufficient to handle community-generated workloads and provide a high level of service.

- Over the past five years, there has not been consistent or meaningful growth in call for service workloads.

- Self-initiated activity, however, has diminished rapidly since 2018.
  - Officers are using less of their proactive (uncommitted) time to generate activity such as traffic stops and other proactive policing efforts.
  - Given the lack of significant increase in workload during that time period, it does not explain the decline in how officers use proactive time.

- The current beat structural is effective overall; however two of four beats have moderately unequal workload levels that can create different experiences for officers day-to-day in terms of their ability to be proactive and not be overloaded by call workloads.

- The current shift schedule is problematic from perspectives of both officer quality of life and efficiency in deploying staff against when workload is greatest:
  - A variable schedule of four-on, two-off does not give officers fixed workdays.
  - This configuration also only gives officers and average of about 2.3 days off per week, in contrast with 10 and 12-hour alternatives.
  - The schedule results in only 2,008 work hours per year, as opposed to 2,080 hours in a normal 40-hour workweek pattern.
  - Equal allocations of staff by shift result in a highly inefficient distribution of personnel against workload.

(3) Recommendations

The following recommendations are made in this report to address the issues identified through the analysis:

- Maintain the current staffing level in patrol.

- As part of the collective bargaining process, implement either the 10-hour fixed workday schedule or the 12-hour Pitman schedule, allocating and deploying officers as outlined in the analysis.

- After a process of review and revision in consultation with the Ithaca Police Department and the community, adopt the alternative patrol beat structure in order to equalize workload and better facilitate community policing.

2. Patrol Workload Analysis

The following sections provide analysis of patrol workload and other issues relating to the effectiveness of field services.

(1) CAD Analysis Methodology

Our project team has calculated the community-generated workload of the department by analyzing incident records in the computer aided dispatch (CAD) database, covering the entirety of calendar years 2016 through the end of 2020. Although the entire five-year span is used to analyze trends and examine comparability, the staffing analysis focuses on workload in 2019, due to the irregularity of 2020 data stemming from the impacts of the COVID-19 pandemic.

For incidents to be identified as community-generated calls for service and included in our analysis of patrol staffing and capacity to handle workload, each of the following conditions needed to be met:

- The incident must have been unique.
- The incident must have been first created in calendar year 2019.
- The incident must have involved at least one officer assigned to patrol, whether designated as car patrol or foot patrol, as identified by the individual unit codes of each response to the call.
- The incident must have been originally initiated by the community, as identified using the following methods:
  - The source of the call must correspond to a community-generated event. Thus, if the call source value is listed as either "Radio" or "Officer Report", it is not counted as a community-generated event.
  - Additionally, the incident type of the event must have sufficiently corresponded to a community-generated event. Call types that could be identified with a high level of certainty as being self-initiated (e.g., "special detail") are not counted as community-generated calls for service.
- There must have been no major irregularities or issues with the data recorded for the incident that would prevent sufficient analysis, such as having no unit code or lack of any time stamps.

After filtering through the data using the methodology outlined above, the remaining incidents represent the community-generated calls for service handled by IPD patrol units.

(2) Calls for Service by Hour and Weekday

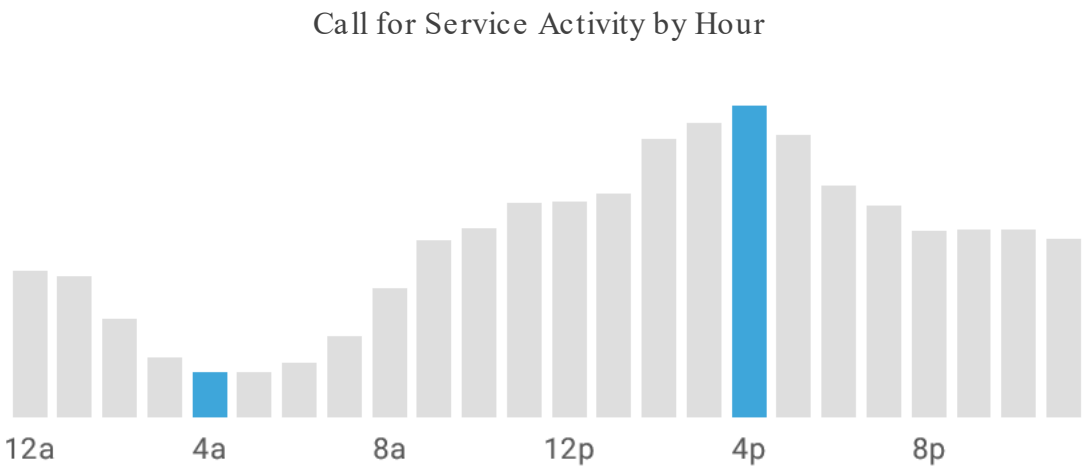
The following table displays the total number of calls for service handled by patrol units by each hour and day of the week:

Calls for Service by Hour and Weekday

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
12a	99	42	41	42	40	69	95	428
1am	91	40	42	45	40	61	93	412
2am	67	24	26	35	31	37	67	287
3am	36	17	19	23	25	29	28	177
4am	24	18	16	20	16	23	16	133
5am	20	16	17	21	19	24	18	135
6am	22	25	23	22	22	26	22	162
7am	25	30	25	43	34	44	36	237
8am	42	56	46	61	60	65	50	380
9am	69	86	70	83	64	69	79	520
10am	63	103	73	91	79	85	58	552
11am	72	98	83	97	79	95	102	626
12pm	90	97	80	76	91	108	91	633
1pm	83	91	94	101	80	110	96	655
2pm	85	115	120	119	121	148	105	813
3pm	88	122	116	127	151	126	130	860
4pm	104	143	146	133	143	130	113	912
5pm	84	125	123	156	113	130	94	825
6pm	76	109	102	98	94	109	91	679
7pm	80	99	89	78	74	107	94	621
8pm	63	84	97	76	71	78	78	547
9pm	75	68	70	74	75	87	99	548
10pm	67	80	66	67	85	92	94	551
11pm	55	55	66	56	81	101	110	524
Total	1,580	1,743	1,650	1,744	1,688	1,953	1,859	12,217

The chart demonstrates that, across all days of the week, call activity during the late night and early morning hours is minimal compared to the busier hours of the day – generally

during the afternoon and early evening. This is particularly notable given the deployment schedule of the department, which assigns equal numbers of officers to all three shifts (days, swings, and nights) despite vastly different workload levels. The following chart summarizes call for service activity on an hourly basis across all days of the week:



Call activity has a relatively even buildup and decline up to and trailing from the peak of 4:00PM. This is somewhat more pronounced than in other agencies, where there is often a longer-lasting 'plateau' of higher levels of call activity.

(3) Calls for Service by Month

The following table displays calls for service totals by month, showing seasonal variation as a percentage difference from the quarterly average:

Calls for Service by Month

Month	# of CFS	Seasonal +/ -
Jan	783	
Feb	777	- 17.8%
Mar	950	
Apr	974	
May	1,055	+0.9%
Jun	1,052	
Jul	1,076	
Aug	1,183	+14.2%
Sep	1,230	
Oct	1,143	
Nov	1,039	+2.7%
Dec	955	
Total	12,217	

Seasonal variation is significant in Ithaca, likely owing to influence of the cold winters experienced in Upstate New York. The variation in call generation due to this factor does not appear to be significantly moderated by the additional population in Ithaca during Fall through Spring as a result of Cornell University and Ithaca College being in regular session.

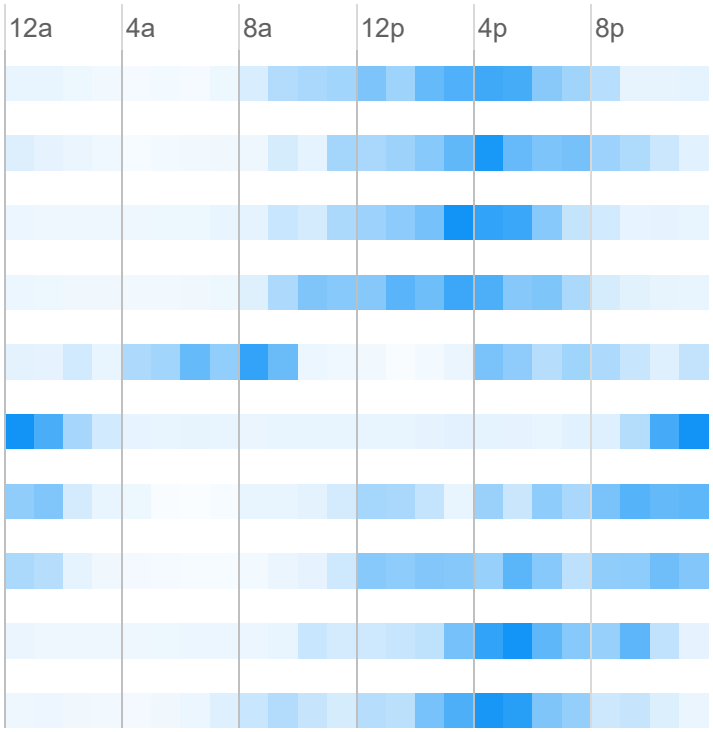
(4) Most Common Types of Calls for Service

The following table provides the ten most common incident categories of calls for service handled by patrol units over the last year, as well as the average call handling time (HT)[1] for each:

[1] Handling time is defined as the total time in which a patrol unit was assigned to an incident. It is calculated as the difference between the recorded time stamps the unit being dispatched and cleared from the incident.

Most Common Call for Service Categories

Incident Type	# CFS	HT
ASSIST	1,224	29.7
WELFARE CHECK	1,015	29.5
PD ACCIDENT	919	37.5
THEFT	760	45.6
ALARM POLICE	732	12.8
NOISE CMPLNT	665	16.6
SUSPICIOUS	637	25.8
DISPUTE	633	36.4
PARKING PROBLEM	596	19.5
TRAFFIC CMPLNT	532	18.6
All Other Types	4,504	39.6
Total	12,217	32.4



IPD uses relatively broad categories for CAD incident types, with the generic "ASSIST" category comprising 10% of all calls for service handled by the department.

It is worth noting that "PD ACCIDENT" refers to accidents that the department responds to, not accidents *involving* the police department.

Even so, there is a noticeable clustering of the top four incident categories – which together account for just under one third of all calls for service – in terms of when they are most likely to occur. Each peaks around the late afternoon and early evening hours, with their frequency rising and declining over the several hours preceding and following that period. Most of the other leading call categories, by contrast, peak in the evening and nighttime hours.

The department's demand profile of high-volume, low-priority incidences is typical, with most police forces having similar trends. The significant workload incurred from some of these incident categories, which involve lower-priority, non-violent offenses, indicates that there is opportunity to divert some of these calls for service to alternative response. The next phase of the study will examine the feasibility of such options further, such as

non-armed professionals, in addition to non-response report options (e.g., online reports and telephone reporting).

(5) Call for Service Response Time by Year

The following table displays call for service statistics priority level, showing the median (middle value) response time[2] and distribution of calls by response time for each category:

Call for Service Response Time by Priority Level

Priority Level	# CFS	% of CFS	Median RT	RT Distribution (20 40 60)
2016	12,460	21%	10.0	
2017	12,493	21%	9.8	
2018	11,717	19%	10.2	
2019	12,217	20%	10.5	
2020	11,789	19%	12.0	

In 2019, response time performance was exceptional, with 85% of all calls for service – regardless of severity – answered within 30 minutes. 97% of all calls were answered within an hour. It is important to stress that the computer-aided dispatch data received by the project team did not contain priority level information. Thus, this analysis is not able to break response times down by priority, which generally works as a proxy for call severity.

Nonetheless, a median response time of 10.5 minutes for *all* calls for service is extraordinarily low, and could indicate – but does not necessarily prove – that current staffing allows for the capacity to handle community-generated workloads.

[2] Response time is defined in this report as the duration between the call creation timestamp and the arrival time stamp for the first patrol officer on the scene.

3. Analysis of Patrol Resource Needs

Analysis of the community-generated workload handled by patrol units is at the core of analyzing field staffing needs. Developing an understanding of where, when, and what types of calls are received provides a detailed account of the service needs of the community, and by measuring the time used in responding and handling these calls, the staffing requirements for meeting the community's service needs can then be determined.

To provide a high level of service, it is not enough for patrol units to function as call responders. Instead, officers must have sufficient time outside of community-driven workload to proactively address community issues, conduct problem-oriented policing, and perform other self-directed engagement activities within the community. As a result, patrol staffing needs are calculated not only from a standpoint of the capacity of current resources to handle workloads, but also their ability to provide a certain level of service beyond responding to calls.

With this focus in mind, the following sections examine process used by the project team to determine the patrol resource needs of the Ithaca Police Department based on current workloads, staff availability, and service level objectives.

(1) Overview of the Resource Needs Analysis

An objective and accurate assessment of patrol staffing requires analysis of the following three factors:

i. The number of community-generated workload hours handled by patrol.

ii. The total number of hours that patrol is on-duty and able to handle those workloads, based on current staffing numbers and net availability factors (e.g., leave, administrative time, etc.).

iii. The remaining amount of time that patrol has to be proactive, which can also be referred to as "uncommitted" time.

This study defines the result of this process as, **patrol proactivity**, or the percentage of patrol officers' time in which they are *available and on-duty* that is *not* spent responding to community-generated calls for service. This calculation can also be expressed visually as an equation:

$$\frac{\text{Total Net Available Hours} - \text{Total CFS Workload Hours}}{\text{Total Net Available Hours}} = \%\,\text{Proactivity}$$

The result of this equation is the overall level of proactivity in patrol, which in turn provides a model for the ability of patrol units to be proactive given current resources and community-generated workloads. There are some qualifications to this, which include the following:

- Optimal proactivity levels are a generalized target, and a single percentage should be applied to every agency. The actual needs of an individual department vary based on a number of factors, including:
  - Other resources the department has to proactively engage with the community and address issues, such as a dedicated proactive unit.
  - Community expectations and ability to support a certain level of service.
  - Whether fluctuations in the workload levels throughout the day require additional or fewer resources to be staffed to provide adequate coverage.
- Sufficient proactivity at an overall level does not guarantee, based on workload patterns, and deployment schedules, that resources are sufficient throughout all times of the day and week.

Overall, to provide effective patrol services and handle community-generated workload, IPD should generally target an overall proactivity level of at least 40-45% as an effective benchmark of patrol coverage. Agencies below this number typically lack the resources to avoid issues caused by resource shortages, such as frequently experiencing queues of calls that lead to longer response times, particularly for lower-priority calls for service. An important qualifier is that even agencies above this number can have inefficient deployment schedules that do not staff high-activity periods of the day with sufficient resources, thus resulting in the same effects on response times as if staffing as a whole is adequate. Thus, the overall proactivity target of 40-45% should be thought of as a benchmark for the potential to provide effective levels of service – to avoid both longer response times to lower-priority calls for service, as well as to be able to have the time available to be proactive outside of responding to calls.

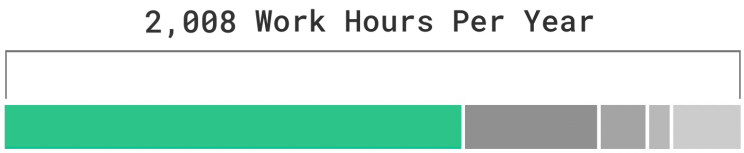
(2) Patrol Unit Staffing and Net Availability

The Ithaca Police Department follows an 8.25-hour shift configuration that assigns personnel to workday sets of 4 days on, followed by 2 days off. As a 6-day rotation, the workdays are not fixed to days of week, and are instead constantly rotating forward.

The 24[3] officers in patrol and their supervisors are assigned to one of three shifts: Day (2245–0700), Swing (1500–2315), or night (0700–1515). Officers on a platoon are assigned to a specific sergeant who is responsible for direct field supervision on shared workdays and for completing regular performance evaluations.

Given patrol staffing allocations, net availability calculations can provide a realistic picture of how staffing translates to active on-duty hours. Out of the 2,008 hours per year that officers are scheduled to work in a year (excluding overtime), a large percentage is not actually spent on-duty and available in the field.

As a result, it is critical to understand the amount of time that officers are on leave – including vacation, sick, injury, military, or any other type of leave – as well as any hours dedicated to on-duty court or training time, and all time spent on administrative tasks such as attending shift briefings. The impact of each of these factors is determined through a combination of calculations made from IPD data and estimates based on the experience of the project team, which are then subtracted from the base number of annual work hours per position. The result represents the total **net available hours** of patrol officers, or the time in which they are on-duty and available to complete workloads and other activities in the field:



The table below outlines this process in detail, outlining how each contributing factor is calculated:

Factors Used to Calculate Patrol Net Availability

Work Hours Per Year

The total number of scheduled work hours for patrol officers, without factoring in leave, training, or anything else that takes officers away from normal on-duty work. This factor forms the base number from which other availability factors are subtracted from.

Base number: **2,008 scheduled work hours per year**

[3] Filled positions only. Numbers do not include trainees, those in the academy, or officers on long-term disability leave.

Total Leave Hours (subtracted from total work hours per year)

Includes all types of leave, as well as injuries and military leave – anything that would cause officers that are normally scheduled to work on a specific day to instead not be on duty. As a result, this category excludes on-duty training, administrative time, and on-duty court time.

Calculated from IPD data: **391 hours of leave per year**

On-Duty Court Time (subtracted from total work hours per year)

The total number of hours that each officer spends per year attending court while on duty, including transit time. Court attendance while on overtime is not included in the figure.

Without any data recording on-duty court time specifically for patrol officers, the number of hours is estimated based on the experience of the project team.

Estimated: **20 hours of on-duty court time per year**

On-Duty Training Time (subtracted from total work hours per year)

The total number of hours spent per year in training that are completed while on-duty and not on overtime. This number based using watch sheet data for 2019 to estimate the training hours that would have been conducted on regular time, as opposed to overtime. If training is completed on overtime, it does not necessarily take away from the number of regular work hours an officer works in a pay period, and thus is not relevant to this analysis. However, data systems rarely designate which training is conducted on regular time versus overtime.

Estimated/calculated from IPD data: **139 hours of on-duty training time per year**

Administrative Time (subtracted from total work hours per year)

The total number of hours per year spent completing administrative tasks while on -duty, including briefing, meal breaks, and various other activities.

The number is calculated as an estimate by multiplying 60[4] minutes of time per shift times the number of shifts actually worked by officers in a year after factoring out the shifts that are not worked as a result of leave being taken.

Estimated: **196 hours of administrative time per year**

Total Net Available Hours

After subtracting the previous factors from the total work hours per year, the remaining hours comprise the total *net available hours* for officers – the time in which they are available to work after accounting for all leave, on -duty training, court, and administrative time. Net availability can also be expressed as a percentage of the base number of work hours per year.

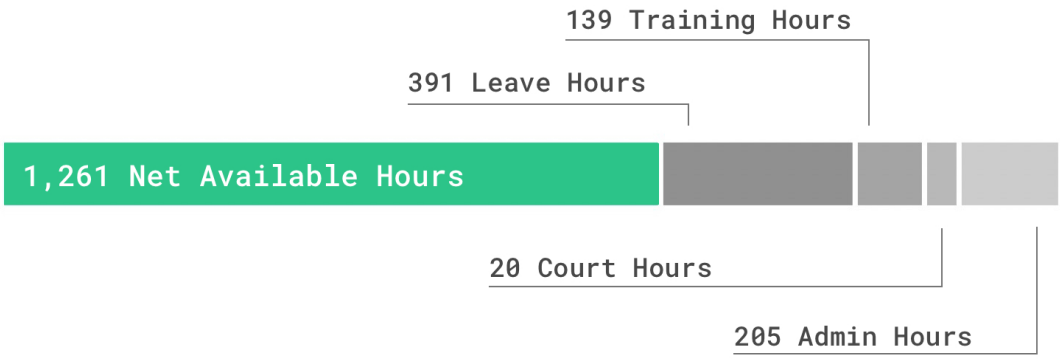
Calculated by subtracting the previously listed factors from the base number:
1,261 net available hours per officer

The following table and chart summarize this calculation process, displaying how each net availability factor contributes to the overall net availability of patrol officers:

Calculation of Patrol Unit Net Availability

Base Annual Work Hours		2,008
Total Leave Hours	–	391
On-Duty Training Hours	–	139
On-Duty Court Time Hours	–	20
Administrative Hours	–	196
Net Available Hours Per Officer	=	1,261
Number of Officer Positions	×	*24*
Total Net Available Hours	=	30,274

[4] Typically, 60 minutes are assumed for shifts from 8-9 hours in length, and 90 minutes per shift for longer patrol shifts.



Overall, the 24 filled officer positions combine for 30,274 net available hours per year, representing the total time in which they are on duty and able to respond to community-generated incidents and be proactive.

(3) Overview of Call for Service Workload Factors

The previous chapter of the report examined various trends in patrol workload, including variations by time of day and of week, common incident types, as well as a number of other methods. This section advances this analysis, detailing the full extent of the resource demands that these incidents create for responding patrol personnel.

Each call for service represents a certain amount of workload, much of which is not captured within the handling time of the primary unit. Some of these factors can be calculated directly from data provided by the department, while others must be estimated due to limitations in their measurability.

The following table outlines the factors that must be considered in order to capture the full scope of community-generated workload, and provides an explanation of the process used to calculate each factor:

Factors Used to Calculate Total Patrol Workload

Number of Community-Generated Calls for Service

Data obtained from an export of CAD data covering a period of an entire year that has been analyzed and filtered in order to determine the number and characteristics of all community-generated activity handled by patrol officers.

The calculation process used to develop this number has been summarized in previous sections.

Calculated from IPD data: **12,217 community-generated calls for service**

Primary Unit Handling Time

The time used by the primary unit to handle a community-generated call for service, including time spent traveling to the scene of the incident and the duration of on-scene time. For each incident, this number is calculated as the difference between 'call cleared' time stamp and the 'unit dispatched' time stamp.

In the experience of the project team, the average handling time is typically between 30 and 42 minutes in agencies where time spent writing reports and transporting/booking prisoners is *not* included within the recorded CAD data time stamps. At 32.3 minutes per call, IPD is somewhat on the lower end of most agencies, although not an outlier by any means.

Calculated from IPD data: **32.3 minutes of handling time per call for service**

Number of Backup Unit Responses

The total number of backup unit responses to community-generated calls for service. This number often varies based on the severity of the call, as well as the geographical density of the area being served.

This number can also be expressed as the *rate* of backup unit responses to calls for service, and is inclusive of any additional backup units beyond the first.

Calculated from IPD data: **0.55 backup units per call for service**

Backup Unit Handling Time (multiplied by the rate)

The handling time for backup units responding to calls for service is calculated using the same process that was used for primary units, representing the time from the unit being dispatched to the unit clearing the call.

Calculated from IPD data **24.7 minutes of handling time per backup unit**

Number of Reports Written

The total number of reports and other assignments relating to calls for service that have been completed by patrol units, estimated at one report written for every three calls for service. This includes any supporting work completed by backup units. *In this case, the number has been estimated based on the experience of the project team. This was done for several reasons, as explained below:*

The project team requested a dataset showing written reports and their incident numbers; however, this dataset was not available or possible to produce with IPD resources.

As a backup methodology, the CAD/RMS data provided by the department incudes a call clear field with a disposition added, which can in some cases be used to estimate report writing. There are four options, each of which repeating for all backup units on the call:

- BLANK CLEARANCE CODE (3)
- NO REPORT NEEDED (2,381)
- REPORT TO FOLLOW (9,540)
- TRANSFERRED TO OTHER AGENCY (1)

9,540 out of 12,217 community-generated calls for service had the disposition value of "REPORT TO FOLLOW" listed in that field. At 0.78 reports per call for service, this would represents an unrealistically high report writing rate. The degree to which it is an outlier is also relevant – the vast majority of agencies fall within a report writing rate of 0.25 to 0.35. At 0.78, IPD would be more than double. Consequently, it must be assumed that the disposition values for "REPORT TO FOLLOW" correspond with some type of reporting required in CAD/RMS upon clearing, given the type of incident it corresponds to. For instance, 81% of calls under the category 911 Hang Up are listed with the "REPORT TO

FOLLOW" disposition code. In reality, reporting requirements for such a call type would not likely be significant.

Given these considerations, a normative estimate was used that is at the conservative (higher) end for communities the size of Ithaca, at 1 report for every 3 community-generated calls for service.

Estimated: **0.33 reports written per call for service**

Report Writing Time (multiplied by the report writing rate)

The average amount of time it takes to complete a report or other assignment in relation to a call for service. Without any data detailing this specifically, report writing time must be estimated based on the experience of the project team. It is assumed t hat 45 minutes are spent per written report, including the time spent by backup units on supporting work assignments.

Estimated: **45 minutes per report**

Total Workload Per Call for Service

The total time involved in handling a community-generated call for service, including the factors calculated for primary and backup unit handling time, reporting writing time, and jail transport/booking time.

The product of multiplying this value by the calls for service total at each hour and day of the week is the number of hours of community-generated workload handled by patrol units – equating to approximately 12,398 total hours in 2019.

Calculated from previously listed factors: **60.9 total minutes of workload per call for service**

Each of the factors summarized in this section contribute to the overall picture of patrol workload – the total number of hours required for patrol units to handle community-generated calls for service, including primary and backup unit handling times, report writing time, and jail transport time.

These factors are summarized in the following table:

Summary of CFS Workload Factors

Total Calls for Service	12,217	
Avg. Primary Unit Handling Time	32.3 min.	53%
Backup Units Per CFS	0.55	
Avg. Backup Unit Handling Time	24.7 min.	22%
Reports Written Per CFS	0.33	
Time Per Report	45.0 min.	25%
Avg. Workload Per Call	60.9 min.	
Total Workload	**12,398 hrs.**	

Overall, each call represents an average workload of 60.9 minutes, including all time spent by the primary unit handling the call, the time spent by any backup units attached to the call, as well as any reports or other assignments completed in relation to the incident.

(4) Calculation of Overall Patrol Proactivity

Using the results of the analysis of both patrol workloads and staff availability, it is now possible to determine the remaining time in which patrol units can function proactively. The result can then function as a barometer from which to gauge the capacity of current resources to handle call workload demands, given objectives for meeting a certain service level.

The following table shows the calculation process used by the project team to determine overall proactivity levels, representing the percentage of time that patrol officers have available outside of handling community-generated workloads:

Calculation of Overall Patrol Proactivity

Total Patrol Net Available Hours		30,274
Total Patrol Workload Hours	–	12,398
Resulting # of Uncommitted Hours	=	17,876
Divided by Total Net Available Hours	÷	30,274
Overall Proactive Time Level	=	59.0%

Overall, 59.0% of on-duty time is available to be proactive – well above the targeted threshold of 40-45% as a base. This indicated that IPD has not only sufficient capacity to handle community-generated workloads, but also to provide exceptional proactive policing.

The following chart shows this analysis at a more detailed level, providing proactivity levels in four-hour blocks throughout the week:

Proactivity by Hour and Weekday

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Overall
2am–6am	76%	78%	85%	74%	79%	81%	73%	**78%**
6am–10am	81%	75%	79%	73%	70%	73%	71%	**75%**
10am–2pm	49%	50%	48%	41%	52%	39%	51%	**47%**
2pm–6pm	55%	36%	38%	34%	35%	38%	44%	**40%**
6pm–10pm	60%	48%	57%	58%	56%	46%	47%	**53%**
10pm–2am	56%	60%	68%	68%	66%	60%	56%	**62%**
Overall	63%	57%	62%	58%	60%	56%	57%	**59%**

The consistency in proactive time capabilities is highly evident. The chart's color scale ranges from white to gray to green, fully reaching the end of the scale at 40%– indicating that proactive time is not only sufficient to handle workload on a consistent basis, but to provide exceptional levels of proactive service as well. In IPD's case, virtually every four-hour block reaches this threshold, even during the daytime hours when workload is highest. A few blocks narrowly reach this level, falling just short at 38-39%, which remains a high level of proactive policing for peak activity hours.

Consequently, it can be strongly concluded from the results of this analysis that current staffing in patrol meets the demands of workload and provides for ample time to be proactive.

(5) Patrol Staffing Levels Required to Meet Service Level Objectives

Given the results of the workload and availability analysis, staffing levels can be determined based on achieving a certain target for proactive time. Prior to this, however,

there are several considerations that must be made that provide context to staffing requirements.

(5.1) Adjusting for the Impact of Turnover

For staffing targets to be grounded in the long-term reality of a workforce, is important to consider the number of vacancies that currently exist, as well as the rate of turnover. An agency will never be fully staffed, as there will always be vacancies occurring as a result of retirement, termination, and other factors. When these events occur, it takes a significant amount of time to recruit a new position, complete the hiring process, run an academy, and complete the FTO program before the individual becomes an on-duty officer. Given this consideration, agencies must always hire above the number needed to provide a targeted level of service.

The amount of 'buffer' that an agency requires should be based on the historical rate of attrition within patrol. Attrition can take many forms – if it is assumed that the majority of vacancies are carried in patrol staffing, a vacancy at the officer level in any other area of the organization would consequently remove one officer from regular patrol duties. Likewise, promotions would have the same effect, in that they create an open position slot in patrol. Not included, however, are positions that become vacant while the individual is still in the academy or FTO program, and they are not counted in our analysis as being part of 'actual' patrol staffing.

Given these considerations, **an additional 5% *authorized* (budgeted) positions should be added on top of the actual number currently filled (actual) positions in order to account for turnover** while maintaining the ability to meet the targeted proactivity level. The resulting figure can then be rounded to the nea rest whole number, assuming that positions cannot be added fractionally. It is worth noting that the number of officers needed without turnover is fractional, as it is an intermediate step in the calculation process.

(5.2) Additional Considerations

The overall patrol proactivity level should function as a barometer of potential resource capacity to handle workloads and be proactive, and different levels have varying implications for the effectiveness of an agency in being proactive at addressing public safety issues and engaging with the community. These considerations can be summarized as follows:

- In agencies that are severely understaffed in patrol functions, and consequently have very little proactive time (under 35% overall), calls will frequently be h eld in

queues as resources cannot handle the incoming workload. Proactivity also falls behind, as officers in such agencies would have little to no time to be proactive. When gaps do occur, the high rate of workload relative to available time can have a limiting factor on self-initiated generation, as officers avoid being tied up on a proactive activity such as a traffic stop in case priority calls for service occur.

- As proactivity increases (around 35-45% overall), the generation of self-initiated activity rapidly increases, as officers are able to deal with already-identified opportunities to proactively address issues in the community, some of which are prioritized and project-oriented engagements.

- Beyond those levels (at least 45-50% overall, depending on scheduling and deployment efficiency), the time available for proactive policing increases further, and opportunities to engage in self-initiated activity expand. However, the number of priority needs for self-initiated activity (e.g., addressing narcotics activity) also decrease. Despite this, no limitations exist on the time that can be spent on activities such as saturation/directed patrols and community engagement activities.

(5.3) Calculation of Staffing Needs

Staffing calculations provide the culmination of thee proactive time analysis, using the proactive time target to determine how much time must be staffed for relative to workload such that the proactive time target equals the target on an overall basis. Based on number of net available hours per officer, the number of authorized positions needed to achieve the requisite number of hours staffed can be calculated, with a buffer for turnover added thereafter.

It is important to note that the calculations do not take into account the effect of cumulative vacancies that are not able to be replaced and filled over a *multi-year* period. This is intended, as budgeting for additional staff does not fix recruiting, hiring, or training issues. Instead, the turnover factor is designed to provide a balance against the rate of attrition, assuming new recruits can complete the academy and FTO program each year.

Nonetheless, the following table presents these calculations, showing the number of officers needed to maintain the current level of proactive time, at 59% overall

Staffing Needs @ 59% Proactive Time Target

Total Workload Hours		12,398
Proactivity Target		59%
Staffed Hours Needed	=	30,239
Net Available Hours Per Officer	÷	1,261
Turnover Factor	+	5%
Patrol Officer FTEs Needed	=	26

This process can be repeated for any proactive time target, as shown in the next table:

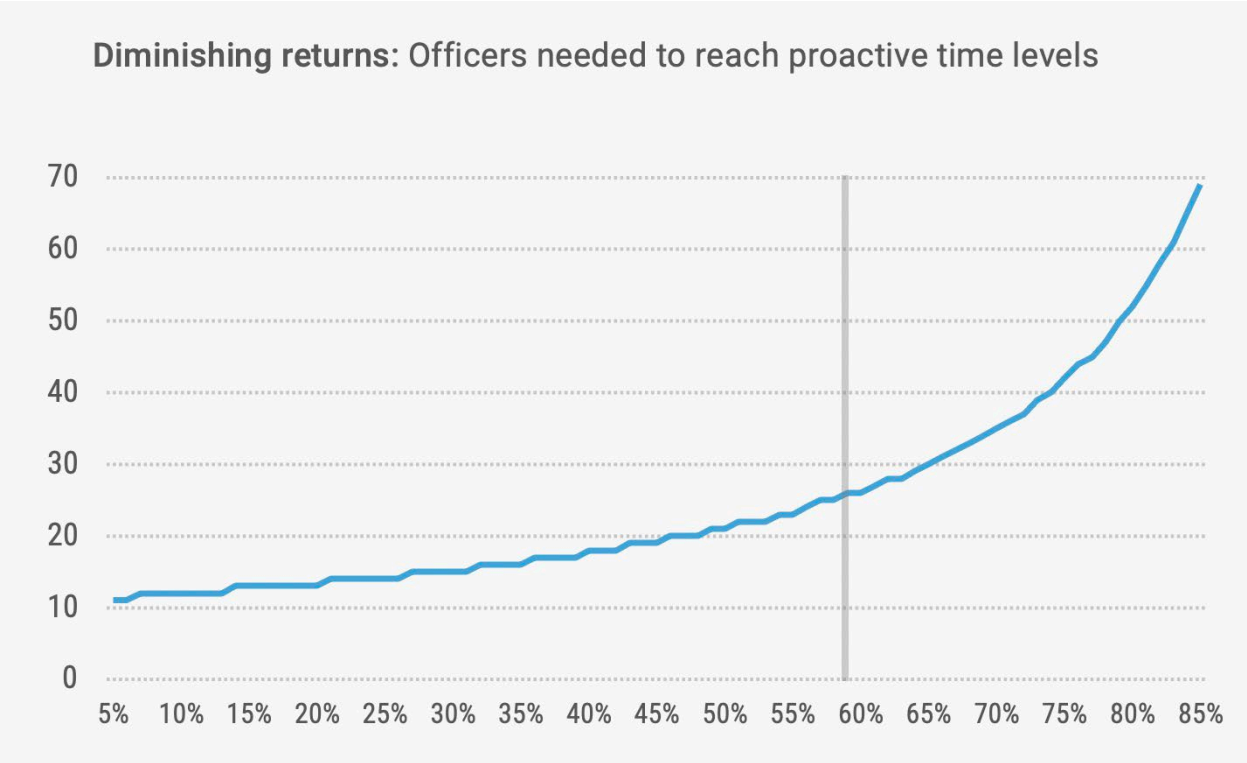
Officers Needed by Proactive Time Level

% Proac. Time	# of Ofc.	# to Raise +1%
55%	23	
56%	24	+1
57%	25	+1
58%	25	+0
59%	**26**	**+1**
60%	26	+0
61%	27	+1
62%	28	+1
63%	28	+0
64%	29	+1
65%	30	+1
66%	31	+1
67%	32	+1
68%	33	+1
69%	34	+1
70%	35	+1

The findings from this analysis are particularly notable given that as the proactivity level increases, the number of officers needed to raise it further grows exponentially. Whereas at low proactivity levels, adding several more officers would have a significant effect on

overall proactivity, doing so at high proactivity levels (>60%) would have very little effect if the proactivity level was around 60 or 60%.

The following chart provides a visualization of this issue, showing the diminishing returns of adding additional officers on patrol proactivity and service levels:



The gray vertical bar indicates the current level of patrol proactivity.

The steeper the curve, the less returns are gained from investing additional resources in patrol. This chart demonstrates that, generally, 40-50% represents the level that should be aimed for, and that improvements to service level experience diminishing returns beyond that point. Below 40%, however, adding staff to patrol achieves significant effects on proactive time with comparatively minimal financial expenditures.

Recommendation:

Maintain the current staffing level in patrol.

4. Self-Initiated Activity

The analysis to this point has focused exclusively on the reactive portion of patrol workload, consisting of community-generated calls for service and related work. In the remaining available time, which is referred to in this report as proactive time, officers are able to proactively address public safety issues through targeted enforcement, saturation patrol, community engagement, problem-oriented policing projects, and other activity. Equally critical to the question of how much proactive time is available is how and whether it is used in this manner.

There are some limitations on how the use of proactive time is measured, however. Not all proactive policing efforts are tracked in CAD data, such as some informal area checks, saturation patrol, miscellaneous field contacts, and other types of activity. However, many categories of officer-initiated activity are nonetheless recorded, such as traffic stops, predictive policing efforts, and follow-up investigations.

Nonetheless, CAD data does provide for a significant portion of officer-initiated activity to be analyzed to examined for how utilized uncommitted time is for proactive policing.

(4.1) Self-Initiated Activity by Hour and Weekday

Self-initiated activity displays different hourly trends compared to community-generated calls for service, as illustrated in the following table:

Self-Initiated Incidents by Hour and Weekday

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
12am	66	66	45	72	66	79	82	476
1am	31	37	44	48	43	42	61	306
2am	52	27	28	28	23	39	33	230
3am	21	13	23	19	17	29	18	140
4am	17	9	9	16	11	14	20	96
5am	8	9	9	7	10	15	8	66
6am	10	7	7	9	11	5	4	53
7am	6	9	3	6	3	8	9	44
8am	13	12	19	14	9	28	16	111
9am	23	25	20	28	15	20	23	154
10am	20	34	23	25	19	26	29	176
11am	32	18	24	18	18	17	30	157
12pm	25	23	23	14	16	31	12	144
1pm	15	13	18	17	19	31	26	139
2pm	31	27	23	18	14	14	19	146
3pm	11	16	19	11	13	13	25	108
4pm	31	32	29	25	29	41	26	213
5pm	36	23	18	23	25	29	28	182
6pm	35	31	27	28	24	25	29	199
7pm	28	18	15	15	19	20	23	138
8pm	14	10	27	23	20	16	24	134
9pm	12	26	14	19	24	26	29	150
10pm	13	18	13	15	15	20	12	106
11pm	45	35	28	34	33	43	38	256
Total	595	538	508	532	496	631	624	3,924

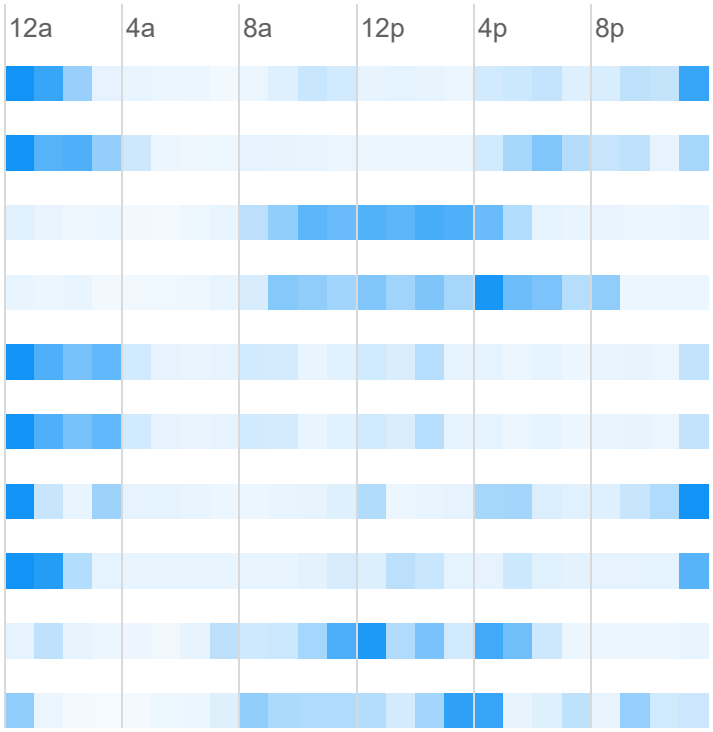
Interestingly, self-initiated activity peaks sharply from around 12:00AM to 1:00AM, with an hour or so on either side having comparable levels of activity. At these times, vastly more proactive policing is conducted than during other hours. Possible explanations could include it being immediately after shift change, as well as the high levels of proactive time that exist during those hours.

(4.2) Self-Initiated Activity by Category

Unlike community-generated calls for service, self-initiated activity is typically more concentrated over a few call types:

Most Common Categories of Self-Initiated Activity

Incident Type	# CFS	HT
TRAFFIC OFFENSE	1,512	13.3
PROPERTY CHECK	996	22.1
ASSIST	435	46.6
WARRANT	113	45.0
SUSPICIOUS	97	23.5
PARKING PROBLEM	94	18.2
LOCAL LAW	83	13.2
PROPERTY CMPLNT	76	13.7
TRAFFIC CMPLNT	59	35.9
WELFARE CHECK	54	19.8
All Other Types	405	19.6
Total	3,924	21.6



"Traffic Offense" incidents (i.e., traffic stops) account for about 39% of all self-initiated incidents, averaging just over 13 minutes per event. Beyond the top three or four categories, activity is relatively sparse. Proactive 'suspicious' events (e.g., suspicious vehicle, person, etc. – common categories of police self-initiated activity in most agencies) occur only 97 times over the course of calendar year 2019.

(4.3) Total Utilization

Overall, the rate at which self-initiated activity is conducted is not high relative to the amount of proactive time available. This can be shown by examining total utilization – the percentage of officers' net available time that is spent handling both community-generated calls for service and self-initiated activity:

Total Utilization of Patrol Officers on Calls for Service and Self-Initiated Activity

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Overall
2am–6am	30%	24%	20%	28%	24%	21%	36%	**26%**
6am–10am	23%	28%	21%	30%	31%	34%	31%	**28%**
10am–2pm	54%	52%	53%	61%	50%	64%	49%	**55%**
2pm–6pm	53%	67%	66%	69%	67%	66%	58%	**63%**
6pm–10pm	44%	53%	46%	44%	47%	57%	57%	**50%**
10pm–2am	29%	47%	41%	36%	40%	38%	40%	**45%**
Overall	42%	45%	41%	45%	43%	48%	47%	**45%**

Outside of the mid-afternoon to early evening hours, net available time is not highly utilized on either calls for service or officer-initiated activity. Of course, it could be argued that there are only so many opportunities to be proactive. Certain services, such as security checks, however, are highly repeatable in comparison to other types of activity.

Moreover, any proactive policing efforts should be balanced with their potential effects on community trust, a principle echoed in the report on the President's Task Force on 21st Century Policing. Too many vehicle stops in certain areas, for instance, can create long-lasting effects on relationships with those communities, creating perceptions that may not be aligned with the original intentions of the activity. Thus, it is not necessarily the goal for officers to be completely utilized, or for a certain threshold of self-initiated activity to be met.

(4.3) Historical Self-Initiated Activity Trends

To investigate this further, the CAD analysis can be extended for the entire five-year period for which data was received in order to gauge trends in activity levels, as was provided earlier in the analysis for community-generated calls for service.

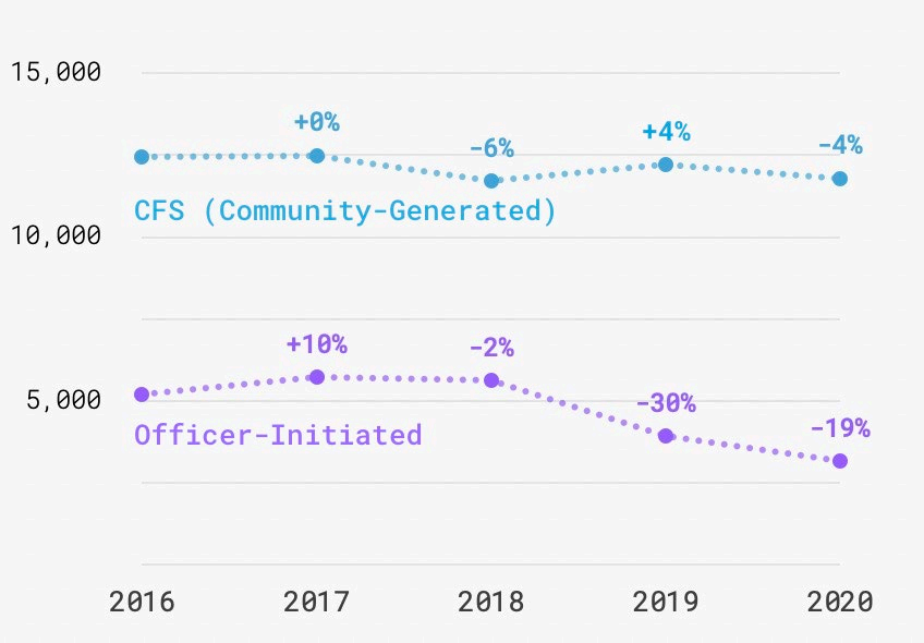
The following table presents the findings of this analysis:

Five-Year Self-Initiated Incident Trends

Year	# Self-Initiated Incidents	+/- Change
2016	5,184	N/A
2017	5,723	+10%
2018	5,610	- 2%
2019	3,924	- 30%
2020	3,163	- 19%

There is a clear drop-off in activity after 2018, with 2019 – the last pre-pandemic year – having significantly less activity than the year before. The chart below puts this into context, showing the year-by-year changes in both community-generated calls for service and officer-initiated activity:

Declining Self-Initiated Incidents Versus Community -Generated Workload



The decline in officer -initiated activity does not correlate with an increase in workload, and consequently does not appear to be indicative of a lack of staffing capacity to be proactive.

5. Shift Schedule Optimization Analysis

The following analysis examines the effectiveness of the current shift schedule and analyzes the feasibility and effects of implementing alternative schedules. This analysis is both quantitative and qualitative, balancing the objective of optimizing resource deployment with the need to have this schedule be broadly popular with officers and provide for quality of life concerns to be addressed.

The latter point is critical in part because work hours, shift length, and workday patterns are set by the collectively bargained labor agreement made with the Ithaca Police Benevolent Association (PBA), which covers all sworn personnel. Changes to work hours or any schedule characteristics must be made through the collective bargaining process, and cannot be made unilaterally by the department's management.

This analysis is intended to provide the analytical framework for any discussion on shift schedules, outlining a number of alternatives that most effectively deploy officers to achieve high levels of service, as well as to provide for officer quality of life considerations to be facilitated.

1. Current Shift Configuration: 8.25-Hour Schedule (Rotating Workdays)

(1.1) Overview

The current shift schedule, which has been in place since 2005, is an 8.25-hour shift, with officers working in a pattern of 4 days on, followed by 2 days off. Because this cycle repeats every 6 days, it is forward-rotating – officers do not have fixed workdays. If an officer worked Monday to Thursday in one calendar week, the next would be Sunday to Wednesday. Start times are schedule to provide for slight overlaps between shifts, as shown below:

Current 8.25-Hour Shift Configuration

Team	Start	End	# Officers
Night	2245	0700	8
Day	0700	1515	8
Swing	1500	2315	8

Working 8.25 hours in a 4 on, 2 off pattern equates to 38.6 work hours per calendar week, or approximately 2,008 scheduled work hours over an entire year. This is a highly unusual configuration, with the vast majority of departments following a 40-hour workweek that

equates to 2,080 hours annually. The weekly average of 38.6 hours results in fewer hours worked per officer while also likely not reducing costs overall.

An advantage of the forward-rotating workday schedule is that it gives all officers some weekend days off. This typically a leading consideration for officers, particularly among newer or younger officers that value an active social life and that lack the seniority to bid for workday sets that provide for weekend days off.

However, on balance with other concerns, the 4-on, 2 off pattern does not necessarily provide for ideal officer quality of life. Forward-rotating workday patterns such as this can often be unpopular due to their disruption on domestic and social life. It can be more difficult to schedule child care and align life outside of work with a domestic partner. Organized activities such as sports or clubs generally have fixed days when they occur, making regular attendance impossible in a rotating workday pattern. Off-duty work is also much more difficult to schedule in a rotating workday pattern – a critical issue for officers in many departments, particularly those that work 10 or 12-hour shifts and have more consecutive off days. In essence, a constantly changing set of workdays can, for some, misalign and isolate officers from life outside of work that generally follows a regular weekly pattern.

Consequently, despite this being a schedule that was and is collectively bargained for – and one that has been in place for more than 15 years – the lack of fixed workdays must be considered a key weakness of the current schedule.

(1.2) Performance and Efficiency of the Current Schedule

The following chart provides the proactive time levels, a measure of capacity and service level, achieved by the current shift sc hedule in four-hour blocks. As values drop below 40%, the color of the cell shifts closer to gray:

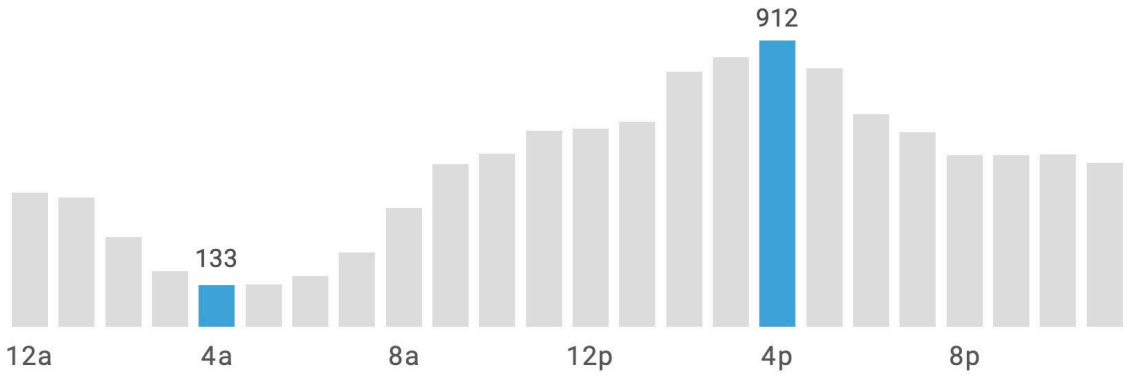
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Overall
2am–6am	76%	78%	85%	74%	79%	81%	73%	**78%**
6am–10am	81%	75%	79%	73%	70%	73%	71%	**75%**
10am–2pm	49%	50%	48%	41%	52%	39%	51%	**47%**
2pm–6pm	55%	36%	38%	34%	35%	38%	44%	**40%**
6pm–10pm	60%	48%	57%	58%	56%	46%	47%	**53%**
10pm–2am	56%	60%	68%	68%	66%	60%	56%	**62%**
Overall	63%	57%	62%	58%	60%	56%	57%	**59%**

Overall, the schedule clearly is able to accomplish high levels of proactive time throughout the day, dropping below 40% only during the afternoon and early evening, without decreasing below 34%.

The high proactive time levels do necessarily mean, however, that the schedule is achieving the results efficiently. At 59% proactive time on an overall basis, staffing is at such a high level relative to workload that even moderately inefficient schedules still accomplish deployment objectives.

While not the only aim of developing an optimized shift schedule, schedules should efficiently match staff deployments against periods when workload is greatest. In Ithaca, as explored in the patrol staffing analysis, the difference in workload levels between day and nighttime hours is exceptional. To this point, 7 times more calls for service are generated during the busiest daytime hour and the least busy nighttime hour:

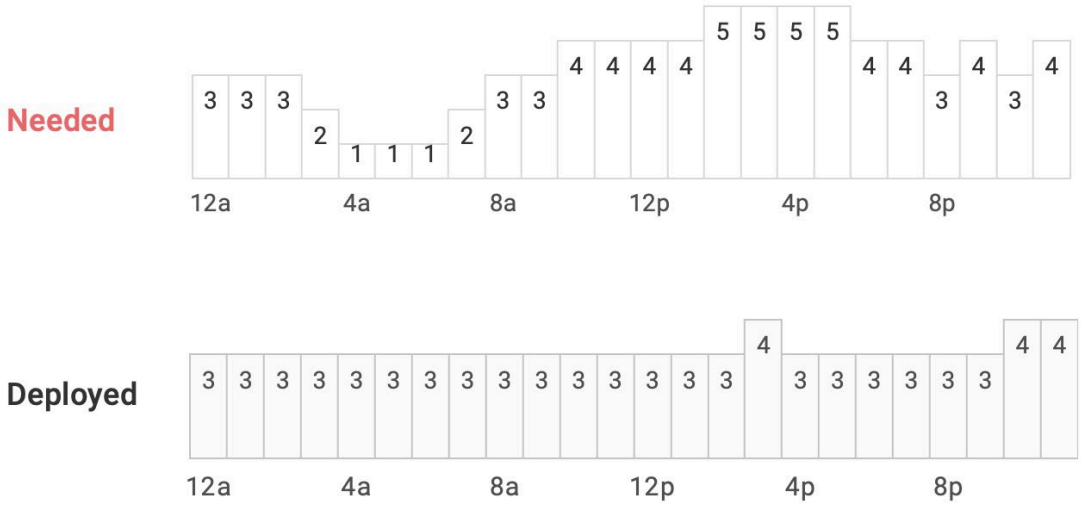
Calls for Service Activity by Hour



Granted, it should not be inferred that 1/7th of the staff are needed at night – during those hours, staffing for officer safety and emergency response capability are paramount. The objective of filling beats in itself is important only so far as it allows for response time to be minimized. In a community the size of Ithaca, this is less likely to be an issue.

Using workload and net availability data, the project team calculated the number of staff that would need to be deployed in order to achieve a proactive time level of 50% – which would represent an extraordinarily high level of service during the daytime hours. While not the only consideration in scheduling, it provides a benchmark against which to gauge how the current schedule used by the Ithaca Police Department allocates personnel against workload demands.

Deployed Staff Required for 50% Hourly Proactive Time vs Expected Number Deployed[5]



With IPD using an equal deployment of 8 officers to each shift, the 4 officers expected at certain times (as opposed to 3) is the result of slight overlaps increasing the average slightly enough to be rounded up.

Nonetheless, the results show that, if 50% proactive time is targeted for at any given hour – an exceptional level of service – too few officers are deployed during the afternoon and

[5] The expected number deployed takes into consideration the number scheduled on any particular day and factors in net availability factors such as leave, training, etc. to develop the 'typical' scenario. This does not factor in the usage of overtime to fill positions or controls against officers taking time off, nor does it include sergeants in the counts.

early evening hours, with more officers deployed than needed during the nighttime and early morning hours.

2. Priorities for Alternative Schedule Creation

To be able to offer concrete advantages over the current schedule and ensure that they could realistically be adopted through the collective bargaining process, the following aims are central to the development of alternative schedules:

- Deploy officers efficiently based on workload patterns by hour and day in order to provide for consistently high levels of service.
- Provide for officer safety and emergency response capabilities to be maintained at all hours of the day.
- Prioritize and provide for officer quality of life by:
  - Using workday patterns that are fixed over a weekly or biweekly cycle.
  - Maximizing the number of officers that receive weekend days off.
  - Scheduling reasonable shift start and end times, particularly for night shift personnel.
- Ensure that alternative schedules are Implementable and have the potential to be popular among officers, by using configurations that are analogous to schedules that are popular in other departments.

Effective schedules are able to balance these concerns, which are both qualitative and quantitative and qualitative in nature.

3. Alternative A: 10-Hour Schedule (Fixed Workdays, Adjusted Start Times)

The first alternative is a 10-hour shift in which officers work the same days each week in a four-on, three-off pattern. Such a configuration is extremely common throughout the country, given its ability to provide for overlap between shifts during high-activity periods, while also giving officers the same three days off each week. This results in a 40-hour workweek, totaling 2,080 hours per year.

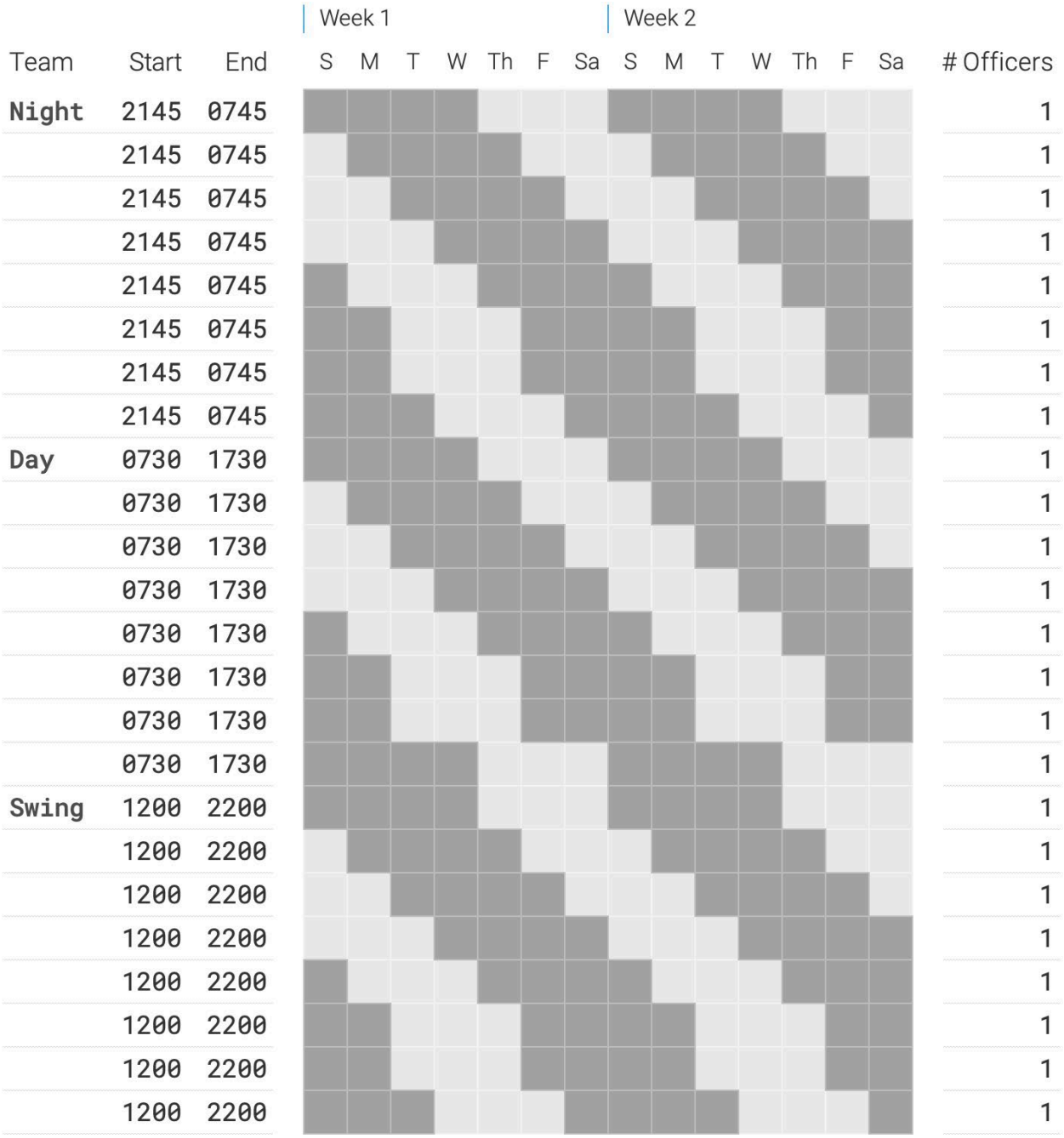
In this configuration, officers are staggered across workday sets, spreading staff out as evenly as possible across the week. This avoids a critical issue in many departments' 10-hour schedules that assigns a shared overlap day where every officer is on duty. This is inherently inefficient, as any time in which an above average officers are deployed results in other times having a *below* average number of officers deployed. By doubling the

officers on one specific day, this occurs in an extreme magnitude, having a noticeable effect on service levels on other days of the week.

Staggering officer workday sets to address this problem also achieves the benefit of giving officers more options and more ways to have at least one weekend day off, whereas most two-team approaches give half of officers the entire weekend and others no weekend days. However, a key weakness of the schedule that this creates is that officers are not working with the same sergeant each day they are on duty.

The following chart illustrates this schedule and the allocation of officers to each shift, with darker-shaded cells indicating a workday:

10-Hour Fixed Workday Schedule Configuration



In total, 8 officers are assigned to the night shift, 8 officers on the day shift, and 8 officers on the swing shift – the same allocation that exists currently.

The following chart shows the proactive time levels achieved by this currently by hour and weekday:

10-Hour Shift Configuration Proactive Time Performance

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Overall
2am–6am	75%	78%	84%	66%	74%	75%	72%	**75%**
6am–10am	81%	75%	75%	72%	64%	72%	66%	**73%**
10am–2pm	63%	62%	52%	51%	55%	55%	57%	**61%**
2pm–6pm	74%	62%	55%	57%	53%	64%	64%	**62%**
6pm–10pm	61%	50%	47%	49%	46%	47%	49%	**50%**
10pm–2am	52%	53%	57%	54%	51%	49%	50%	**52%**
Overall	69%	64%	62%	59%	57%	61%	61%	**62%**

Clearly, the schedule outperforms the current schedule significantly, consistently providing for extraordinarily high levels of proactive time while still deploying sufficient officers during the night shift to maintain officer safety and emergency response capabilities:

Potential modifications to this schedule include shifting the start times of the night shift back to 2100 in order to end at 0700, allowing for the shift to facilitate a better circadian rhythm. In this scenario, the day shift would also begin at 0700. An overlap of 15 minutes on either side could also be planned for. No adjustments would be needed to the swing shift, which already has a sufficient overlap with the night shift.

4. Alternative B: 12-Hour Schedule (Pitman Configuration)

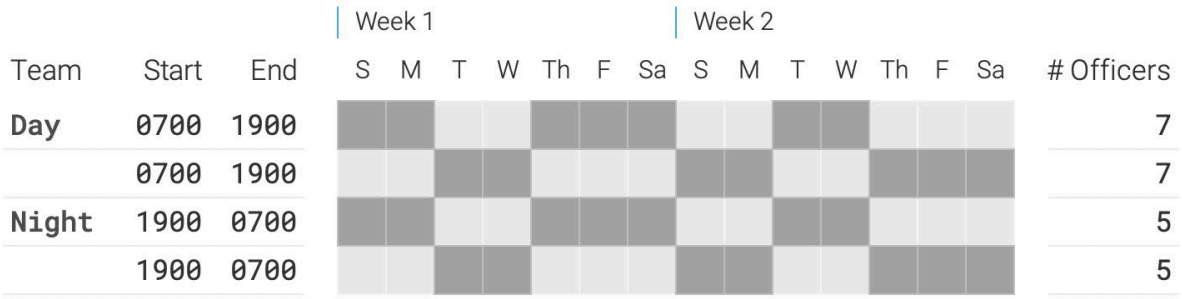
Taking a different approach, the second alternative schedule features a 12-hour shift using the popular 'Pitman' configuration, which uses a regularly repeating set of fixed workdays over a 2-week cycle. In this schedule, officers work a 2-on, 2-off, 3-on, 2-off, 2-on, and 3-off pattern.

The workday cycle equates to 84 hours biweekly, or 2,184 hours per year. Some departments pay all hours as regular time and specify the 84-hour biweekly work periods in the labor agreement, thus bypassing the FLSA requirements for overtime. Others pay the time in excess of 80 biweekly hours as built-in overtime, resulting in 2,080 hours of regular time and 104 hours of scheduled overtime per year as part of the schedule.

With officers completing 7 shifts over a two-week period, the configuration allows for a high degree of simplicity to be achieved. There are just four shift teams and sets of workdays – one each for day and night shifts, working opposite sides of the week.

The following chart illustrates this, with workdays represented by darker-shaded cells:

12-Hour Pitman Schedule Configuration



In the Pitman configuration, all officers get one weekend day off every week. If the workdays are often backwards by one day in the biweekly cycle shown in the chart, then all officers get both Saturday and Sunday off every other week. Virtually no other leading schedule configuration guarantees weekend days off to all officers regardless of seniority.

Another key benefit of 12-hour shift schedules is that they allow for officers for greater opportunity to work off-duty employment should they chose to. This can sometimes make transitioning away from 12-hour systems unpopular among a subset of officers once they are implemented.

The effects of the 12-hour Pitman schedule on proactive time are apparent, as shown in the following chart:

12-Hour Shift Configuration Proactive Time Performance

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Overall
2am–6am	76%	78%	85%	74%	80%	81%	73%	**78%**
6am–10am	86%	81%	84%	80%	78%	80%	78%	**81%**
10am–2pm	64%	64%	63%	59%	66%	57%	66%	**63%**
2pm–6pm	67%	52%	54%	51%	51%	54%	59%	**55%**
6pm–10pm	63%	53%	61%	62%	60%	50%	51%	**58%**
10pm–2am	54%	54%	64%	64%	62%	56%	51%	**58%**
Overall	69%	64%	68%	64%	66%	63%	63%	**65%**

No four-hour block falls below 50%, which places the 12-hour schedule slightly ahead of the 10-hour system in terms of efficiency and effectiveness. This is aided by the 84-hour biweekly period, which raises proactive time to 65% on an overall basis.

In spite of the positive characteristics of this schedule, the primary weakness of the schedule, is readily apparent – 12 hours is a relatively long shift in law enforcement work. Issues of fatigue and sleepiness have been attributed to 12-hour shifts by various studies, although it should also be noted that studies have found these effects for 8-hour shifts as well in comparison to 10-hour configurations.

In general, 12-hour shift configurations can be more popular and potentially cause less fatigue issues when staffing levels are adequate, or particularly, above that level. This is intuitive – if officers are going call to call for 12 hours, fatigue issues mount and be exacerbated as officers are held over at the end of a shift to handle a call or write a report. However, if officers are handling on average fewer calls per shift and have more time in between handling calls for service, then 12-hour shift configurations can be more palatable.

In Ithaca, officers have a high proactive time level of 59% of available time on an overall. This indicates that staffing levels are relatively high in comparison to workload, and consequently mean that officers often have ample time in between shifts to ward off some of the negative effects of a 12-hour shift system.

Potential modifications to the shift schedule include shifting the workday cycles back a day to guarantee a full weekend every other week for all officers, as well as adjustment of start times. It is critical, however, to have the night shift return as early as possible in order to maintain adequate circadian rhythm.

5. Conclusions

The current shift schedule is highly unusual, resulting in a forward-rotating work schedule without fixed workdays, while also guaranteeing fewer hours on duty per officer than virtually any other shift configuration. The 8.25-hour shift length, in itself becoming less common as agencies shift to 10 and 12-hour systems, is particularly misaligned given the department's high proactive time levels and consequently longer time for officers on average in between handling calls for service. In a scenario where the norm is for officers to be going from stacked call to stacked call for an entire shift without break, trading a shorter shift length for fewer days off per week or non-fixed workdays might be a reasonable trade. However, with an 8.25-hour shift worked in a 4-on, 2-off rotating pattern, given the staffing levels and service needs of Ithaca, the current schedule neither maximizes efficiency nor officer quality of life.

The 10 and 12-hour alternatives developed for this analysis provide for a balance of both qualitative and quantitative factors, offering improvements. Both have fixed sets of workdays, meaning that officers will work the same days every weekly or biweekly period.

Despite the advantages, both schedules represent a monumental change for officers, many of whom have worked this schedule for their entire careers. Furthermore, neither schedule is without its drawbacks and weaknesses. These must be considered within the context of the issues with the current schedule, as well as the relative advantages of each options. As any change to the shift schedule must be collectively bargained, officers will decide whether it makes sense for them – both professionally, as well as in their personal lives.

Recommendation:

As part of the collective bargaining process, implement either the 10 -hour fixed workday schedule or the 12 -hour Pitman schedule, allocating and deploying officers as outlined in the analysis.

6. Redesign of the Patrol Beat Structure

1. Objectives in Patrol Beat Redesign

The following subsections outline the priorities used in both assessing the current beat structure, as well as creating new beat areas.

(1.1) Patrol Workload Equalization:

Workload should be equalized across all beats in order to maintain proactive capabilities and meet service level mandates.

All beats should be created to have call for service totals that are within ±20% of the overall average. Exceptions can be made in areas that are geographically isolated and/or have significant response time issues, such as hilly terrain or significant distances that must be covered, which require fewer calls. In these cases, a lower call for service target should be used. However, no beat should exceed ±40% of the average – indicating extraordinarily uneven workload – even with these exceptions in mind.

Workload equalization ensure that patrol units in each area are able to respond to calls for service in a timely manner, and that these capabilities are distributed equitably across the city.

IPD staffing provides for the potential to consistently deploy 4 officers during daytime hours, and 3 officers at night, without using high levels of overtime. Given this, a maximum of four beats can be established – the same number that exist now.

Over a five-year period from 2016-2020, the patrol staffing analysis identified 56,949 calls for service that occurred within Ithaca's city boundaries[6]. Among the four beats, this averages out to 2,847 calls per year, or 14,237 calls per beat over the entire five-year period.

To stay within the benchmark range for workload equalization of ±20% the average call for service total, each beat must have between 11,390 and 17,085 calls for service over five years.

The project team geolocated the calls for service that occurred within this period and counted the number that occurred within each beat in order to measure whether workload was adequately equalized among the patrol areas.

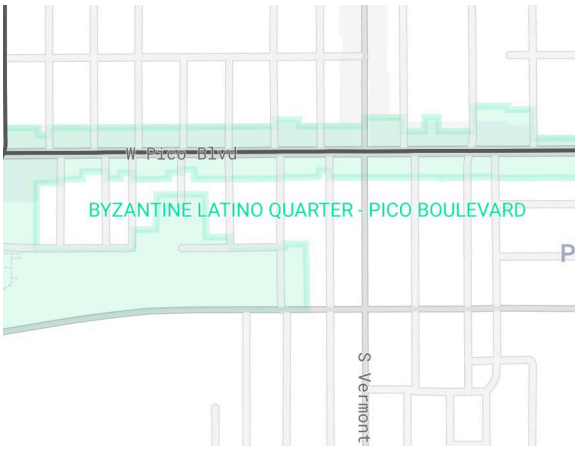
[6] This excludes any responses to incidents outside of Ithaca, as well as calls for service that could not be geolocated, though these occurred at a relatively negligible rate.

(1.2) Neighborhood Integrity

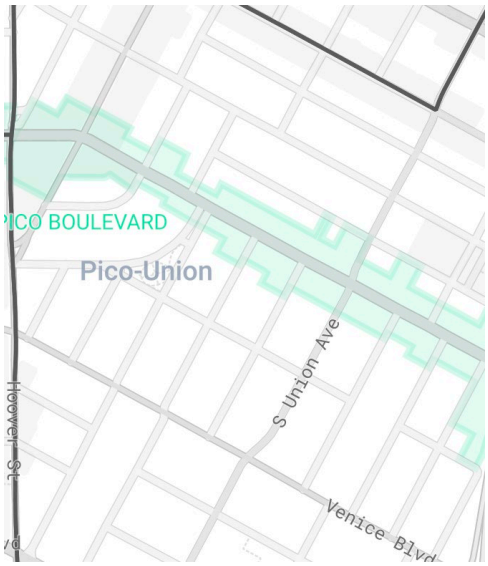
Neighborhoods and business districts should be kept together as much as possible in order to facilitate community policing.

By designing beats around entire areas and neighborhoods– rather than through them – the patrol officers assigned to that area are better able to become familiar with the community and its issues and concerns. From the perspective of the public, this can provide for the development of trust and one point of contact for specific neighborhoods. Some departments even publicize the patrol officer assigned to the area on their website, which can further this sense of geographic responsibility and accountability for community policing.

Consider an example in another municipality where a business district, highlighted in teal could either be split between a beat or kept within one:



Less Effective: *The split down the middle of an arterial road that functions as a focal point for the business district.*



More Effective: *The beat extends to both sides of the street, keeping the business district together.*

Differences in how these boundaries are drawn have real-world impacts in how community policing is coordinated, particularly when distinct areas have assigned points of contact within the police department.

These considerations must also be balanced with call equalization and geographic barriers, although the latter is almost always congruent with neighborhood integrity. Geographic barriers– even manmade barriers such as freeways– are prominent markers

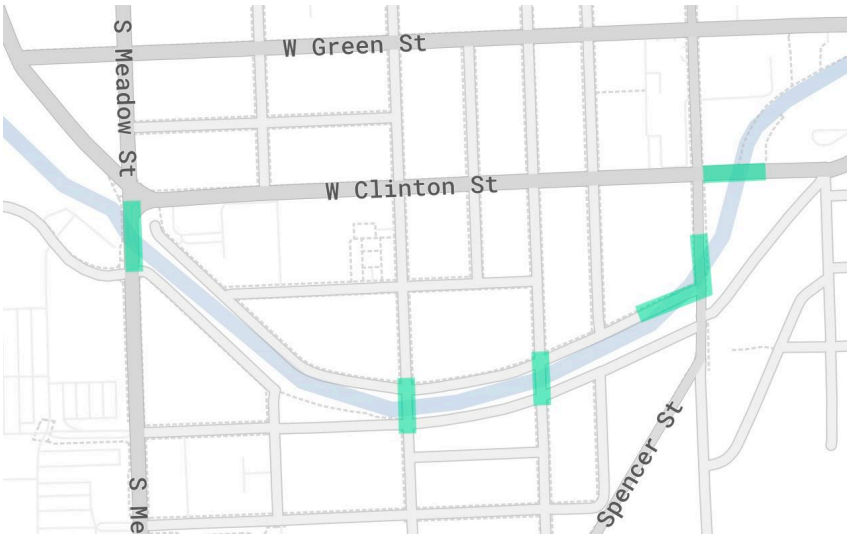
that divide and form our understanding of where one community ends and another begins.

(1.3) Logical Barriers and Transportation Routes

The road and transportation network within a beat structure should facilitate timely response times.

Beats should be designed with the local road network in mind, taking in to account how features such as creeks or rivers, hills, and highways with limited access impact the ability of officers to travel from one side of the beat to the other in order to respond to a call for service.

Despite its small size of around six square miles, the geography of Ithaca is shaped by its numerous features such as waterways that provide for transportation barriers. Among them, the Cayuga Inlet and several creeks run through the heart of the city, with varying degrees of access across them. Wh ere numerous connection points exist across these features, areas can be joined together in the same beat. Where this is not possible, the transportation barrier it creates could lead to higher response times.



In Ithaca, for example, the many crossings (highlighted in green) across this part of Six Mile Creek prevent any impacts to transportation. Further upstream to the east, by contrast, there are only afew crossings across the creek.

To the contrary, the hillside on the west side of the Cornell campus has only two access points – one at the southern terminus of University Ave, and the other at the northern

terminus of Lake St. Traversing west to east can take an extra minute or two as a result of this impediment.

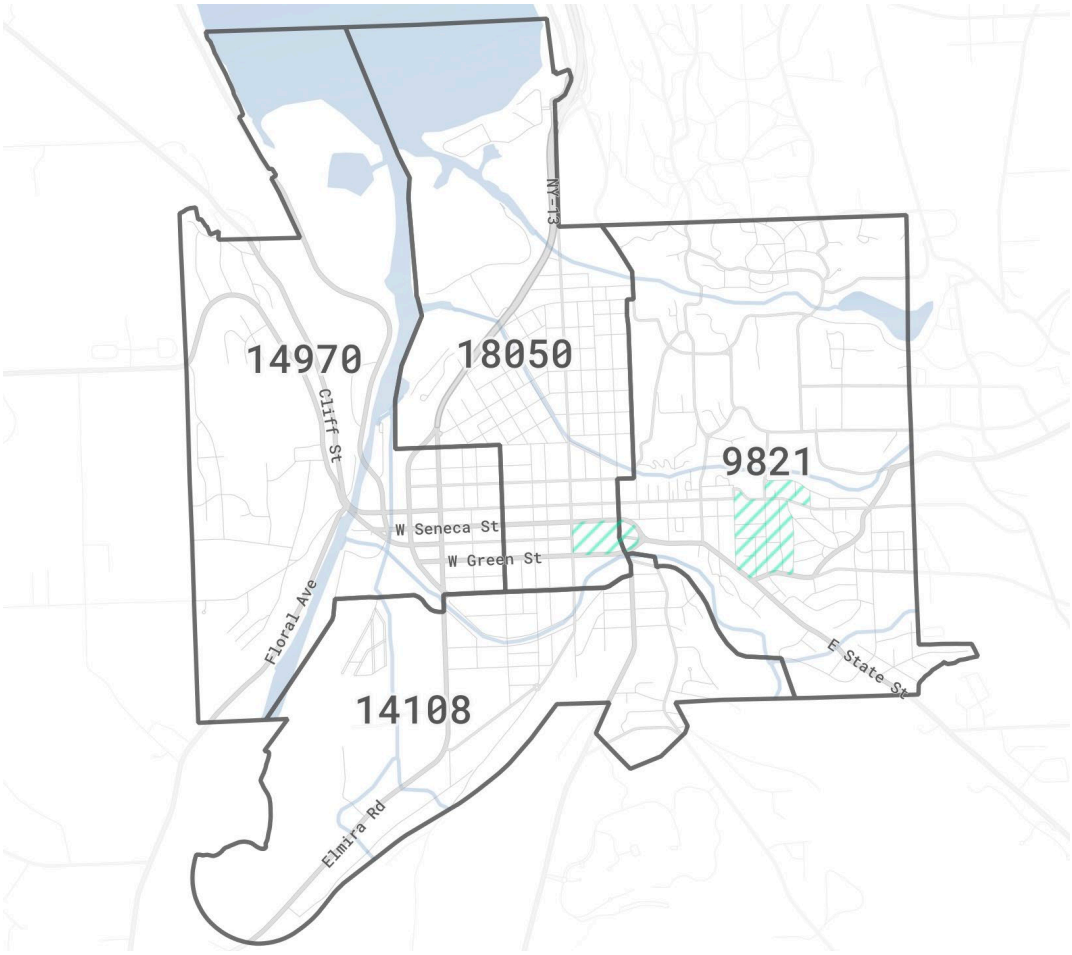
However, these considerations must also be balanced with competing priorities, such as neighborhood integrity and balance of workload. As a result, the degree to which transportation is affected must be weighed as well.

2. Assessment of the Current Beat Structure

Workload equalization the most quantifiable metric by which to evaluate how well a beat structure is able to provide the framework for community policing, by ensuring that no beats are too busy relative to others to be able to have sufficient – or at least equitable – levels of proactive time available. Calls for service over a five-year period (2016–2021) are used for the assessment, with the totals for each beat then compared against the average for all four beats.

The following map provides the five-year call for service totals by beat:

5YR Call for Service Totals by Beat (Current Beat Structure)



The hashed green areas represent officer foot beats, which overlap the car beat structure.

The four beats range from 9,821 calls (-31% below the average) to 18,050 ca lls (+27% above the average), with the other two remaining within around ±5% of the average. Compared to the benchmark established for patrol workload variation of ±20% from the average, beats 203 (northern) and 204 (eastern) exceed this threshold. Howeve, no beats are more than ±40% of the average, which would indicate severely unequal workloads.

In other words, workload is somewhat even under the current beat structure. Officers assigned to 204 (eastern) would have a largely different day-to-day experience compared to officers assigned to 203 (northern), assuming officers have primary responsibility for responding to calls that occur in their beat.

In terms of neighborhood integrity, a few of the principally identifiable neighborhoods include Downtown Ith aca – particularly its core, but also extending along State Street –

the Cornell University campus, Collegetown, and the box store commercial district surrounding Elmira Rd that includes a Walmart Supercenter. Other neighborhoods include the industrial area along the Cayuga Inlet, the upsloping residential neighborhoods west of the inlet, and the single-family home neighborhoods north of Downtown.

For the most part, the current beat structure is able to keep each of these neighborhoods together. There are some exceptions, however.

In the greater Downtown area, a few blocks of what would generally be considered to be part of the same district are split from 203 (the downtown/northern beat) into 202 (western beat) and 204 (eastern beat), as shown in the following map:

1) *On the western border, the area along State Street continues into another beat, separating those blocks from the main beat covering the State Street corridor.*

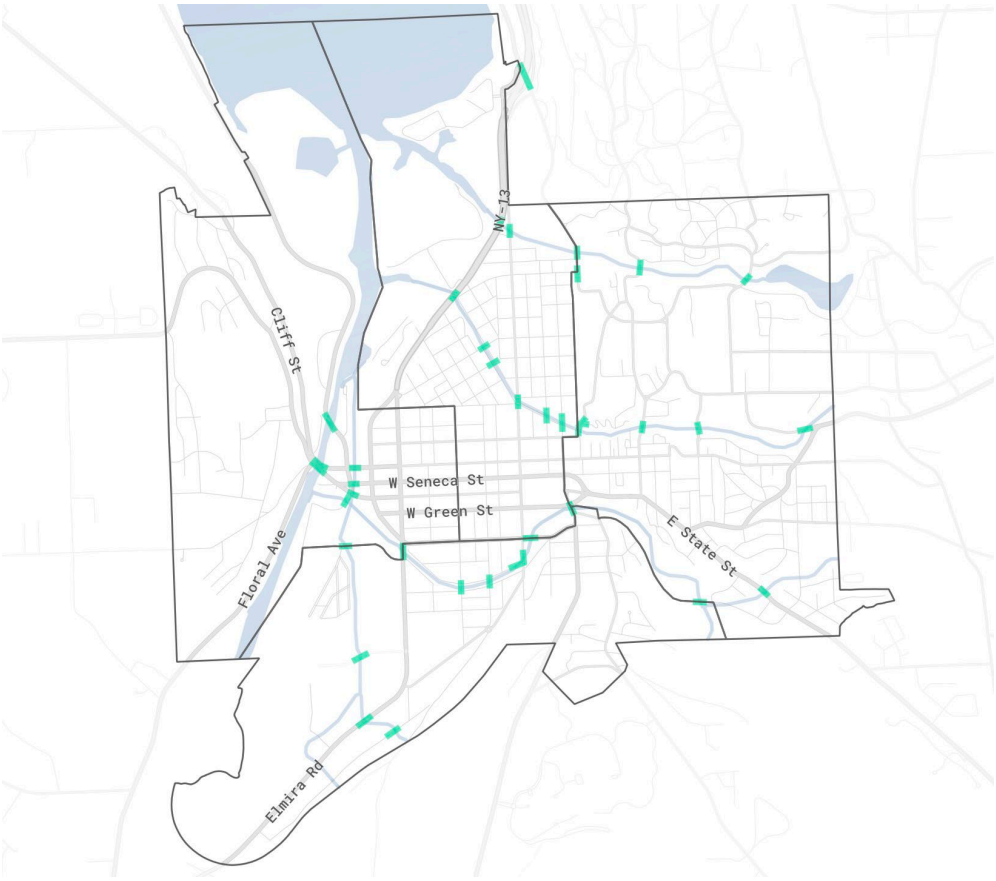
2) *The block between N Aurora St and E State St immediately east of the boundary contains several restaurants and bars that would be considered part of the Downtown area from the public's perspective.*

For the most part, however, the current beat structure does an effective job of aligning communities and business districts to beat boundaries.

As discussed earlier, the issue of transportation routes and logical barriers is complex in that it depends greatly on the context of the surrounding transportation network. A river or creek can be a significant impediment if there are no routes across it for an extended area of its course, but these issues are mitigated and even eliminated if numerous bridges exist crossing it.

The following map provides the road network and waterways of Ithaca with beat boundaries overlayed on top, and bridge crossings highlighted in green:

Transportation Barriers and Waterway Crossings (Current Beat Structure)



It is evident that barriers are well accounted for in the current beat boundaries. One example is the stretch of the creek in the SW quadrant of Ithaca, just SW of E State St label on the map, which has no crossings for almost a mile. The boundary between the two beats is approximately along the river, ensuring that cross-waterway travel is not needed to respond to calls within the same beat.

The following table summarizes the findings made in this assessment of the current beat structure against the criteria established previously:

Current Beat Structure Findings

Category	Rating	Description
Workload Equalization	B-	Moderate workload inequality is an issue in 2 of 4 beats, creating differences in the ability to conduct community policing.
Neighborhood Integrity	A-	Major neighborhoods kept together with only minor exclusions.
Logical Barriers and Transportation	A	

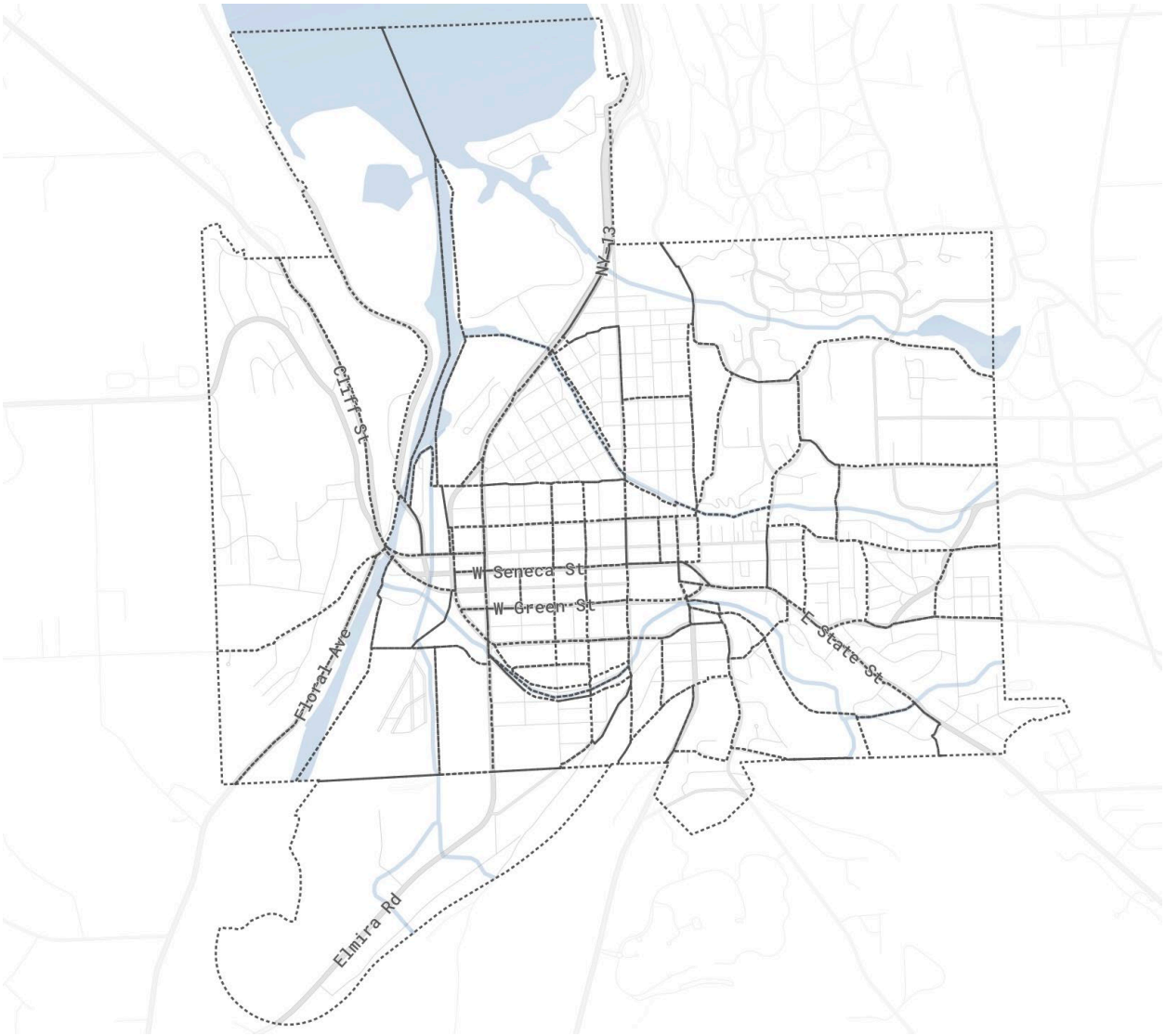
In short, there are no major issues with the current beat structure. The issue of call inequality between beats 203 (Downtown/northern) and 204 (eastern) is tempered by being somewhat moderate in severity, as well as the context of the geographic and transportation barriers that run through and around the area. However, improvements can be made to the beat structure to address call workload inequalities.

3. Redevelopment of the Beat Structure

To accomplish the objective of addressing the current call inequalities within the current structure, the project team undertook a restructuring of its beat boundaries. To accomplish this in a manner that keeps communities together and is cognizant of where concentrations of calls exist, this process must begin with an entirely clean slate.

The project team started with a shapefile layer of U.S. Census blocks– the smallest level of geography available – and combined these to form cluster areas. The resulting cluster areas, which number around 90, each represent a portion of either a neighborhood, line at a geographic barrier such as a waterway, or a notable concentration of calls for service. Within each of these areas, calls for service were totaled over the entire five-year period used in the data analysis.

Initial Cluster Areas Used to Redraw Beat Boundaries



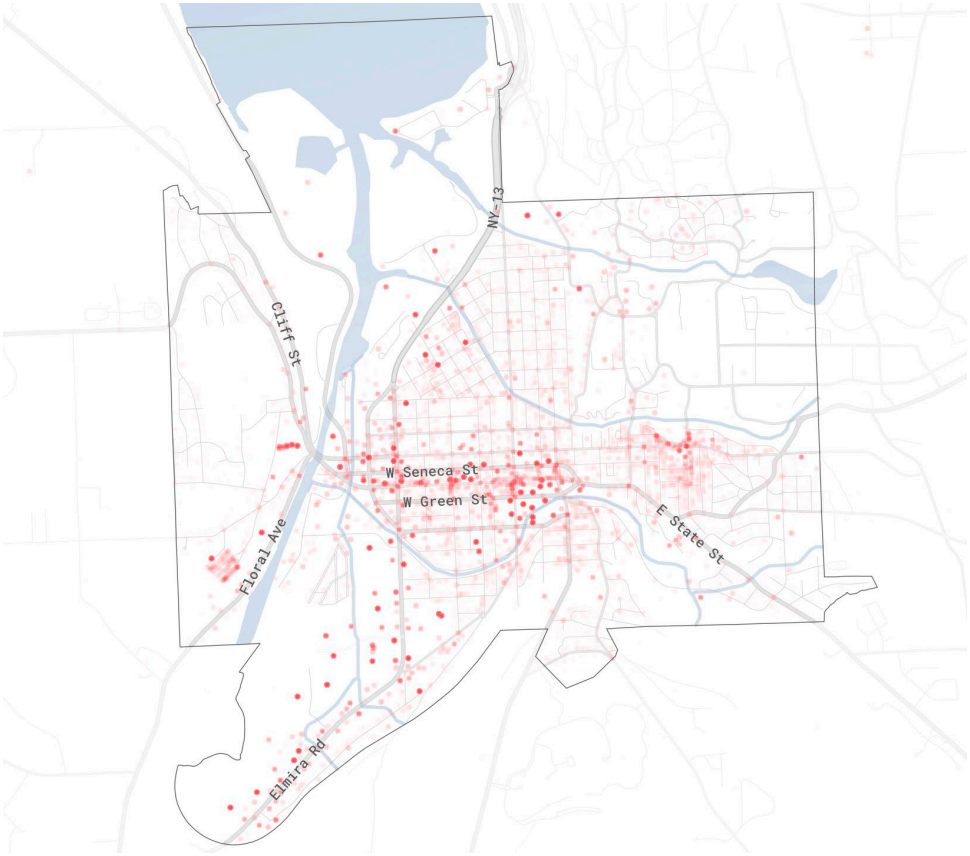
The approximately 90 clusters represent a portion of a larger area, a section of a neighborhood, a cluster of calls, or a geographical barrier (e.g., the Cayuga Lake).

The clusters are not weighted equally in terms of calls, given the different purposes that the different types of clusters service.

To better illustrate this in the beat redesign process, these numbers are shown visually. For mapping purposes, however, a better illustration can be shown by a point overlay map, which shows each call for service as semi-transparent dots. As more calls occur at the same location or area, the overlapping points become more opaque and visible. Given that redrawing boundaries requires notice of specific hotspots rather than more

generalized areas, this approach avoids some limitations of heat maps. The following map presents this analysis:

5YR Call for Service Concentrations



Clearly, the State Street corridor is a significant area of calls based on this map. And additionally, while the commercial district along Elmira Road may not seem like a concentration, because the addresses are mostly large stores such as a Walmart Supercenter, each of those points can represent hundreds to well over one thousand calls for service.

The clusters are merged together in a continuous process until several areas of focus emerge, which later form the redesigned beats.

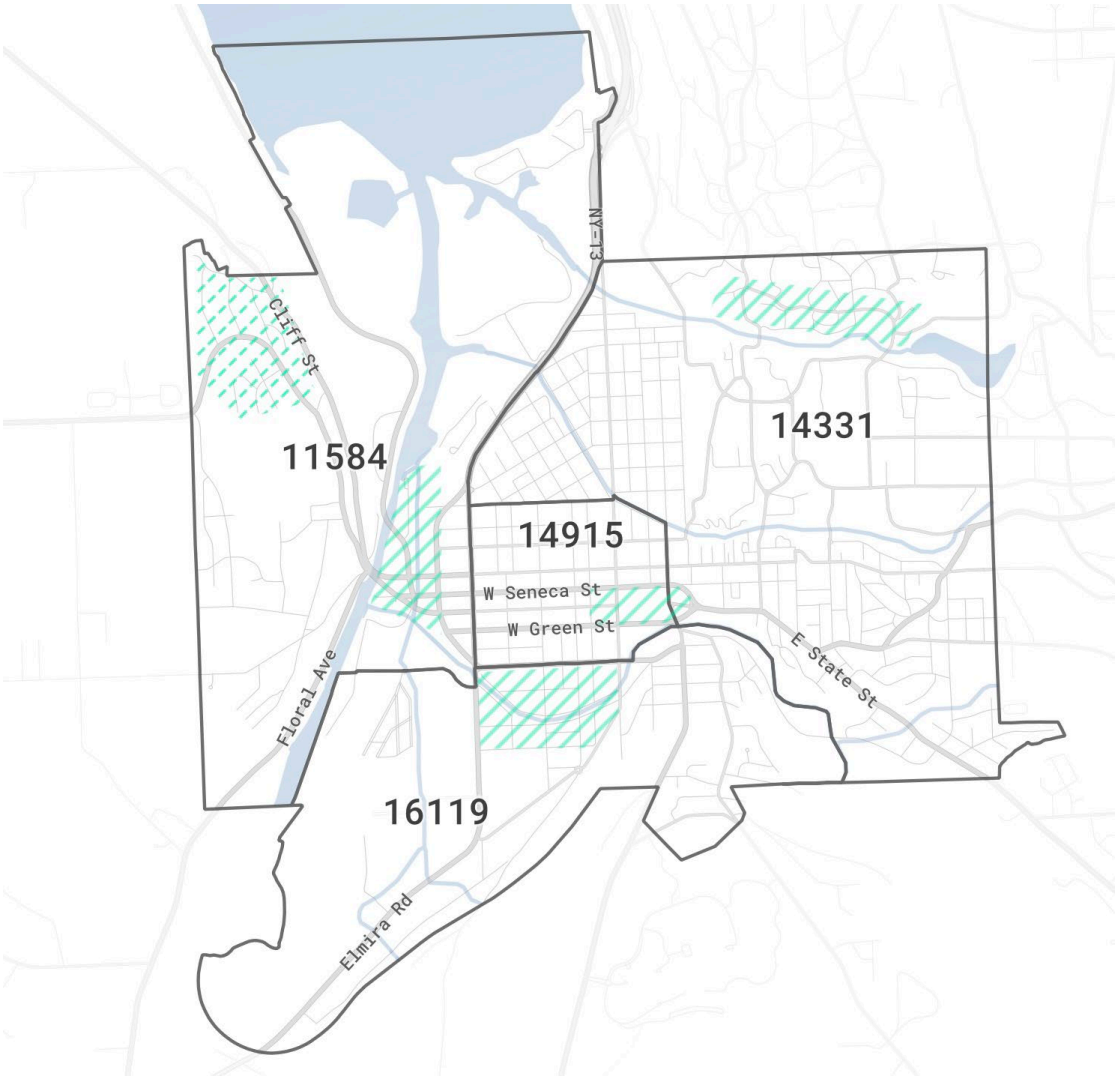
The 'mega-clusters' that are formed from combining the smaller clusters represent the major areas and concentrations of calls – the Downtown core, Cornell and Collegetown, the commercial district around Elmira Rd, everything west of the Cayuga Inlet, and so forth. Each of these are guaranteed to be joined within the same beat later in the analysis, and their call totals are recalculated.

Between each of the areas are buffers comprised of unmerged cluster areas, which are then gradually joined to the larger areas to reach equalized workload and to finetune the boundaries. Edits are made in order to ensure that neighborhoods are kept together and geographic barriers are consistent. If needed, travel time estimates from point to point are developed based on the road networks in order to ensure that in-beat travel is kept generally under 8-10 minutes without requiring lights and sirens under normal traffic circumstances.

Input was sought from the community on where walking beats would be desired. These have been incorporated into the alternative beat structure, which include additional walking beats compared to the current configuration.

The following map provides the results of this analysis, displaying the total calls for service over the past five years in the redesigned beat structure:

Redesigned Beat Structure: Boundaries and 5YR Call for Service Totals



The hashed green areas represent the community-defined officer walking beats, which overlap the car beat structure. One of these, represented with dotted lines, is a secondary/optional walking beat area.

All four beats have call for service totals that are within 20% of the average, accomplishing the goal of equalizing workload while keeping neighborhoods together. Geographic barriers are also accounted for, within the contest of available road networks. Nonetheless, trade-offs are inherently part of this process. For instance, a compromise may need to be made in equalization of calls in order to keep travel times to a minimum, as well as vice versa. In these circumstances however, the magnitude of any issues caused by these decisions are kept within tolerable limits.

The alternative beat structure should be reviewed and revised in consultation with the community and the police department, including line-level patrol officers who ultimately have the greatest day-to-day stake in the new geographic deployment structure.

The draft patrol beat structure can be downloaded electronically as a shapefile (.shp) for use in GIS applications such as ArcGIS or QGIS using the following Drive link:

https://drive.google.com/file/d/1fEs_-JiAYS1GOsxmiQR8nkXIp2aZnrhn/view?usp=sharing

The beat structure can also be viewed as an interactive map at the following Google Maps link:

https://www.google.com/maps/d/u/1/edit?mid=1iDD_-a-INVbdCYgJUvwSOsFnDA9W9k_l0&usp=sharing

Recommendation:

After a process of review and revision in consultation with the Ithaca Police Department and the community, adopt the alternative patrol beat structure in order to equalize workload and better facilitatecommunity policing.