SEBAGO TECHNICS

FEBRUARY 2024

BACTS TRAFFIC SIGNAL CENTRAL MANAGEMENT SYSTEM MASTER PLAN

PREPARED FOR:

BANGOR AREA COMPREHENSIVE BACTS TRANSPORTATION SYSTEM

Document Control

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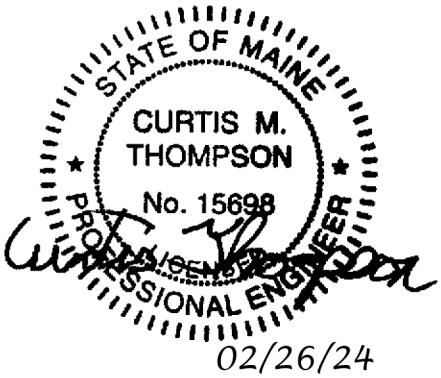

Definitions

- TSCMS – Traffic Signal Central Management System
- BACTS – Bangor Area Comprehensive Transportation System
- RTMS – Regional Traffic Management System
- ATMS – Automated Traffic Management System
- ATC – Advanced Transportation Controller

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1 – Master Plan Overview

1.1 Overview

The following sections provide an executive summary of the content included within the detailed sections of this Master Plan document.

1.1.1 Existing Signal Equipment and Communications Network Infrastructure

The traffic signals within the BACTS region have predominately been Econolite, with 95 of the total 104 intersection currently running Econolite branded controllers. The majority of these controllers are older ASC/2 and ASC/3 model controllers but 34 of the intersections are now running the latest Cobalt ATC controller.

In the past the City of Bangor had a copper based Telmetry network to manage the 5 coordinated signal corridors within the City but has recently implemented a ethernet based network as part of recent projects on Main St and around the Penobscot Bridge. The City of Brewer also has a wireless-based network along the Wilson St corridor. The City of Old Town and the Town of Orono don't currently have any intersections connected to a central system, but there is fiber available at most of the intersections that can be utilized to establish a new network. This fiber is either owned by OTT/UMS or Maine Fiber Company (MFC) / First Light Fiber Networks. The signals for the remaining municipalities are relatively rural and spread across the region with no communication infrastructure.

As part of newer signal improvement projects, 10 of the intersections in the region have been connected to MaineDOT's cloud server, which hosts a management software developed by Applied Information (AI) called Glance. The connection to this system is made through a field monitoring unit installed in the ATC cabinet. Glance allows for remote monitoring of the cabinet's environment and basic functions, such as flash status, the door alarm, and cabinet temperature. Glance also can be used to remotely access the web-based user interface of devices networked in the cabinet, such as the traffic signal controller and video detection.

1.1.2 TSCMS Systems Engineering

Sebago completed a simplified Systems Engineering process to determine the use cases and requirements for a region-wide TSCMS. The member municipalities were provided with a brief questionnaire to determine high-level use cases and potential requirements for the TSCMS. The results from the questionnaire, in addition to follow-up discussions with municipal staff, were then used to outline the proposed use cases for the TSCMS. These include traffic signal operations, responding to issues identified in traffic signal operations or citizen complaints, and assisting with

emergency maintenance or new construction. These use cases were then used to outline the minimum requirements for the TSCMS.

1.1.3 Recommendations

Three alternatives for the architecture of the TSCMS were evaluated:

1. Upgrading and expanding the Bangor Econolite Centracs ATMS that was recently procured under the Penobscot Bridge Corridor Signal Improvement project to the entire BACTS region.
2. Utilizing the existing MaineDOT Cloud Based Econolite Centracs ATMS to manage all the signals within the entire BACTS region.
3. Using a hybrid approach of utilizing the Bangor Centracs ATMS to manage the signals within Bangor and other high-priority corridors in the municipality and then utilizing the MaineDOT Centracs to manage the other signals within the region.

It is recommended that the hybrid approach should be considered for the BACTS region as there are notable benefits to each system and the negatives can be minimized by utilizing the two systems in parallel. A phased approach was proposed to implement the new system:

- **Phase 1**: Expanding the Bangor Centracs ATMS to the high-priority corridors throughout the region, including the 5 corridors in Bangor, the Stillwater Corridor in Orono and Old Town, and the Wilson St. Corridor in Brewer.
- **Phase 2**: Connect the Bangor Centracs ATMS to the MaineDOT Centracs ATMS using the server-to-server module and then integrate the remaining intersections into the MaineDOT traffic network.

Using the compiled signal information, cost estimates were prepared for each of the proposed Phases of deployment for the recommended TSCMS.

- Phase 1 includes network and server upgrades along with connecting 49 signals to the BACTS Centracs RTMS for a total estimated cost of $823,900 in 2024 dollars.
- Phase 2 provides new remote connection and/or hardwired interconnect to 55 signals for a total estimated cost of $1,290,500 in 2024 dollars.

In total the estimated cost to connect all the signals within the BACTS region to the proposed TSCMS is $2,114,400 in 2024 dollars.

2 – Existing Signal Equipment and Communications Network Infrastructure

2.1 Existing Traffic Signal Equipment

In May of 2022 Sebago produced a memorandum detailing a Traffic Signal Asset Assessment and Management Plan for the BACTS region based on signal inventories and discussions with municipal representatives completed over the Fall and early winter of 2021. The following sections summarize the relative results from the signal inventory along with aerial-based maps at the end of this Report detailing the signal locations and communications infrastructure. Additionally, the signal inventory was incorporated into a Microsoft Power Bi GIS report which provides a visual database of the signal equipment inventoried and an interactive GIS map detailing intersection information. The Power BI GIS report can be accessed through the following link:

https://app.powerbi.com/view?r=eyJrIjoiMjU5MjA5MzktOWZkMi00MTA2LThiMWEtM2NmMDY0OTAyOTNlIiwidCI6IjUyM2M5MWRjLTI3OGEtNDQyMS1iNDIzLWQ0ZTk5NmJlYmExNyIsImMiOjN9

2.1.1 Bangor

The City of Bangor has a total of 68 signals with most of the signals present on major arterials throughout the City:

- Stillwater Ave Corridor (7)
- Hogan Rd Corridor (7)
- Broadway Corridor (7)
- Union St Corridor (8)
- Main St Corridor (7)

The remaining 32 signals are spread throughout the City at major intersections. Most of the traffic signal controllers are a combination of older Econolite ASC/2 and ASC/3. Twenty-four of the signals have modern Econolite Cobalt controllers. The remaining intersection is a Naztec 900 at Griffin Rd and Kenduskeag Ave. The primary form of vehicle detection is video based at 56 intersections in total with the remaining intersections consisting of a single intersection with in-pavement loops, 6 intersections having microwave based detection, and 5 intersection running pretimed signal programming.

2.1.2 Brewer

The City of Brewer has 19 signals with a single signal corridor on Wilson St consisting of 7 signals. The intersections have mostly Econolite ASC/2 and ASC/3 controllers. Three of the intersections have newer Econolite Cobalt controllers and two of the intersections have Eagle EPAC 300 controllers. All but three of the intersections utilize Econolite video vehicle detection, with the remaining intersections having in pavement loops.

2.1.3 Old Town

The City of Old Town has 5 signals with 4 on Stillwater Ave and 1 in the city center at Main St and Center St. All but one of the traffic signal controllers are Econolite Cobalt controllers and the remaining intersection has a Naztec 980 controller. All 5 intersections utilize video-based detection.

2.1.4 Orono

The Town of Orono has 5 signals with two on Stillwater Ave near Interstate 95 and the remaining 3 intersections are on Main St at the intersections of Kelley Rd, Bennoch Rd, and College Ave. The two intersections on Stillwater Ave have Naztec 980 controllers and the remaining have older Econolite ASC/3 controllers. Four intersections utilize video-based detection, with one intersection using pavement loops.

2.1.5 Hampden

The Town of Hampden has 3 signals with two on Western Ave at the intersections of Main Rd and US 202 and the third at US 202 and Coldbrook Rd. The intersections have an Econolite ASC/2, Naztec 980, and McCain ATCeX controllers. Two of the intersections use video-based detection, and the last uses pavement loops.

2.1.6 Hermon

The Town of Hermon has two signals, Emerson Mill Rd at Coldbrook Rd and US Route 2 at Billings Rd. The Emerson Mill Rd at Coldbrook Rd has an Econolite Cobalt controller and video-based vehicle detection. The Route 2 at Billings Rd has a Naztec 980 controller with in pavement loops.

2.1.7 Milford

The Town of Milford has a single signal at Main Rd and Bradley Rd that has a McCain ATC eX2 controller with video based vehicle detection.

2.1.8 Veazie

The Town of Veazie has a single signal at State St at Chase Rd and has an older Eagle EPAC controller with video-based vehicle detection based on our inventory in 2021. It should be noted that this signalized intersection was replaced in the Summer of 2023 based on information provided by the Town.

2.2 Existing Communications Network Infrastructure

The following sections describe the existing network infrastructure used to connect the traffic signals within each community. Within the appendix are maps detailing the available interconnect for the relevant municipalities.

2.2.1 Bangor:

Historically, the City of Bangor had an extensive copper telemetry-based traffic network to manage the older Econolite controllers along the signal corridors. The Stillwater Ave, Hogan Rd, Broadway, and Union St corridors still have the copper interconnect but the Main St corridor was updated with fiberoptic and wireless interconnect as part of a signal improvement project. As part of the Penobscot Corridor Improvements project the intersections of Oak St at State St, Oak St at Hancock St, Oak St at Washington St, and Washington St at Exchange St were interconnected using wireless radios.

2.2.2 Brewer:

The City of Brewer has a wireless interconnect system connecting the 7 signals on the Wilson St corridor and the intersection of Dirigo Dr and Parkway South. Additionally, the intersections of State St at Penobscot St and State St at North Main St were also included in the Penobscot Corridor Improvements project and now also have wireless radio interconnect.

2.2.3 Orono and Old Town:

The City of Old Town and the Town of Orono do not currently have any interconnected intersections, however, as part of a Traffic Signal Coordination Study and Evacuation Plan that was completed in 2021, it was identified that all but three of the intersections, two in Orono on Stillwater Ave and Main St at Center St in Old Town, have an existing fiber optic network available being either owned by OTT/UMS or Maine Fiber Company (MFC) / First Light Fiber Networks.

2.3 Existing TSCMS Systems

2.3.1 Bangor Econolite Centracs ATMS:

As part of the Penobscot Bridge Corridor Signal Improvements Project, the Cities of Bangor and Brewer purchased and installed an Econolite Centracs ATMS server to manage the signals that were improved as part of the project. The server was installed locally on the City of Bangor's traffic signal network.

2.3.2 MaineDOT AI Glance Cloud Server and Cloud Based Econolite Centracs ATMS:

The MaineDOT recently implemented a cloud server to host AI's Glance software and Econlite's Centracs ATMS to manage the improved traffic signals as part of the Statewide Build Grant Project, which is still in progress. In particular, the AI Glance software has been expanded beyond the Statewide Build Grant Project and is being utilized by multiple municipalities to connect to and manage intersections with newer ATC cabinets with AI field monitoring units. Currently, the BACTS region communities have the following intersections connected to the MaineDOT Glance cloud server:

- Bangor, Broadway at Oak St and State St
- Bangor, Oak St at Hancock St
- Bangor, Oak St at Washington St
- Bangor, Washington St at Exchange St
- Brewer, State St at N. Main St
- Brewer, State St at Penobscot St
- Brewer, Wilson St at Dirigo Dr
- Hermon, Coldbrook Rd at Odlin Rd
- Holden, Route 1A at Lower Dedham Rd
- Old Town, Main St at Center St

3 – TSCMS Systems Engineering

3.1 Systems Engineering Purpose and Scope

The following sections overview a shortened Systems Engineering process that was completed in order to better define the requirements of the proposed TSCMS and to outline the proposed use cases and operational scenarios in how the proposed TSCMS would be used.

3.2 Existing TSCMS Operational Description

3.2.1 Existing Use Cases:

The Bangor Centracs server will be primarily utilized to retrieve and store signal controller programming and controller logs, to keep signal controller clocks synchronized, to occasionally make changes to controller programming, and to diagnose malfunctioning equipment.

The MaineDOT Glance software can be used to monitor cabinet environmental statistics, cabinet status, and events from the cabinet monitor unit. Glance can also be used to access the web UI of IP accessible devices such as vehicle detection, controllers, and cabinet monitor units.

3.2.2 Limitations of the Existing Systems:

The most significant limitation of the existing TSCMS is that they are specific to a single brand of traffic signal controller or field monitor unit, in this case Econolite and AI respectively.

3.3 Vision for the Proposed System

A questionnaire was distributed to the representatives from each municipality and the MaineDOT. Each municipal representative was asked to respond to 10 questions/statements on a 5-step range between “Strongly Agree” to “Strongly Disagree”, a summary of the results are detailed in the following sections. Furthermore, we also asked that each question be ranked from highest to lowest priority, 1 to 10, respectively. A copy of the Systems Engineering Questionnaire is included within the Appendix.

3.3.1 Is it important that there is a single system / software that manages all the signals within the BACTS RTMS?

Strongly Agree: 33.3%

Agree: 66.7%

Neutral: 0%

Disagree: 0%

Strongly Disagree: 0%

Priority: 3.33

This question was to determine the general scope and scale of the proposed TSCMS. Overall, the responses agreed with the statement and as such the proposed TSCMS should support all the signals in the region rather than having separate TSCMS for each major municipality.

3.3.2 It is important that the TSMS is a single piece of software that is able to meet all the desired use cases of the system rather than a collection of separate software for each device type.

Strongly Agree: 33.3%

Agree: 66.6%

Neutral: 0%

Disagree: 0%

Strongly Disagree: 0%

Priority: 4.17

The intent of this statement was to determine if the system requirements should be met by a single piece of software of it a collection of various software. As the responses all agreed with the statement then the proposed TSCMS should be able to meet the majority of the system requirements with a single software platform.

3.3.3 It is important that all traffic signals are connected to the TSMS.

Strongly Agree: 16.7%

Agree: 0%

Neutral: 33.3%

Disagree: 50.0%

Strongly Disagree: 0%

Priority: 9.67

3.3.4 It is important that priority traffic signals, such as coordinated or high volume intersections, are actively managed through signal performance data collected by the TSMS and it is less imperative that all traffic signals are actively managed.

Strongly Agree: 50%

Agree: 50%

Neutral: 0%

Disagree: 0%

Strongly Disagree: 0%

Priority: 5.00

This statement and the previous statement (Section 3.3.3) were a linked pair to better define a typical use case of the proposed TSCMS and to evaluate potential priorities when deploying the TSCMS. Based on the responses and the higher priority of the latter statement, it seems that deployment of the proposed TSCMS should focus first on the high volume or high priority signals and focus less on connecting all signals.

3.3.5 The TSMS should be capable of storing backups of the controller programing.

Strongly Agree: 50.0%

Agree: 50.0%

Neutral: 0%

Disagree: 0%

Strongly Disagree: 0%

Priority: 4.5

This statement was to determine a specific system requirement typically related to NTCIP compliant TSMS systems such as Econolite Centracs ATMS. As most open

source or vender-neutral TSMS systems aren't capable of storing backup databases, the proposed TSMS is more likely to be a vendor-specific software.

3.3.6 The TSMS should be capable of changing the signal timings through the web-ui of the controller rather than through a NTCIP Upload/Download compliant database.

Strongly Agree: 16.7%

Agree: 50.0%

Neutral: 0%

Disagree: 33.3%

Strongly Disagree: 0%

Priority: 6.83

This statement outlines one of the potential use cases and a system requirement for the proposed TSMS. Based on the mixed response, the proposed TSMS should have the ability to use a NTCIP Upload/Download process and the proposed TSMS should have use cases for utilizing both the web-ui and the NTCIP Upload/Download process.

3.3.7 The TSMS should be capable of monitoring the traffic signal controllers and cabinets and producing alerts when critical events are detected such as when the door switch is activated, flashing operation, or loss of power/communications.

Setrongly Agree: 66.7%

Agree: 33.3%

Neutral: 0%

Disagree: 0%

Strongly Disagree: 0%

Priority: 2.67

This was the highest priority statement and the responses were all in agreement. This statement outlines common use cases of TSMS, in particular the need for regular monitoring of the TSMS and some of the system requirements.

3.3.8 It is important that all data is stored on isolated municipal/BACTS controlled networks rather than utilizing cloud based infrastructure.

Strongly Agree: 16.7%

Agree: 0%

Neutral: 50.0%

Disagree: 33.3%

Strongly Disagree: 0%

Priority: 9.00

This statement outlines the network requirements of the proposed TSMS by determining if the network needs to be designed for either a local network or a cloud based network. The mixed response and low priority suggests that there isn't a preference for the network type.

3.3.9 The TSMS only needs to be accessible by users responsible for the operation of the traffic signals rather than easily accessible for all users.

Strongly Agree: 33.3%

Agree: 50.0%

Neutral: 16.7%

Disagree: 0%

Strongly Disagree: 0%

Priority: 6.17

This statement determines the system requirements related to user access and complexity when accessing the system. Based on the response it seems that the proposed TSMS can use more secure, but limited access, methods to access the system such as virtual private network tunnels and software installed on individual workstations rather than network accessible or cloud software.

3.3.10 The TSMS needs to have the capability for advanced functions such as adaptive signal control, high resolution data, and emergency signal operation/management.

Strongly Agree: 50.0%

Agree: 50.0%

Neutral: 0%

Disagree: 0%

Strongly Disagree: 0%

Priority: 3.67

This statement outlines potential use cases and system requirements for the proposed TSMS.

3.4 Proposed Use Cases and Operational Scenarios

3.4.1 Traffic Signal Operations

- *Daily:* The operator(s) will review the alarms generated by the TSCMS and will determine if any further response is necessary.
- *Weekly:* The operator(s) will review the coordination logs to determine if any further review or response is necessary.
- *Monthly:* The operator(s) will upload the controller programming to be archived.
- *Monthly:* The operator(s) will review the split and detector logs to determine if any further review or response is necessary.
- *Monthly:* The operator(s) will review available signal performance data to determine if any further review or response is necessary.
- *Monthly:* The operator(s) will review the available signal performance data to determine if the operational goals for each system are being met and if any further review or response is necessary.
- *Yearly:* The operator(s) will review the available signal performance data to evaluate seasonal and yearly variations and will determine if any further review or response is necessary.

3.4.2 Responding to Issues Identified in Traffic Signal Operations or Citizen Complaints

- *Detector Failure*: The operator(s) will review the relevant signal performance data, such as split history and detector activations, and the current status of the detector calls to determine which detector is failing (if any) and when the detector started to fail. The operator(s) will then notify municipal staff so that the detector can be repaired.

- *Split Failure or Lack of Green Time*: The operator(s) will review the relevant signal performance data, such as the split history, and the current status of the phase state to determine which phases are experiencing abnormal utilization. The operator(s) will recommend to municipal staff how to correct the issue, such as modifying controller programming, or how the issue can be mitigated.
- *Poor Coordinated Progression*: The operator(s) will review the relevant signal performance data, such as the split history and coordination logs, and the current coordination status to identify the issue. The operator(s) will recommend to municipal staff how to correct the issue, such as modifying controller programming, or how the issue can be mitigated.
- *Lack of Phase Service*: The operator(s) will review the relevant signal performance data, such as the split history and detector activations, and the current status of the phase state and detector calls to determine which phases are experiencing abnormal service. The operator(s) will recommend to municipal staff how to correct the issue, such as modifying controller programming, identifying malfunctioning equipment, or how the issue can be mitigated.
- *Continuous Pedestrian Service*: The operator(s) will review the relevant signal performance data, such as the split history and pedestrian detector activations, and the current status of the phase state and pedestrian detector calls to determine which phases are experiencing abnormal service. The operator(s) will recommend to municipal staff how to correct the issue, such as modifying controller programming, identifying malfunctioning equipment, or how the issue can be mitigated.
- *Loss of Communications or Server Fault*: The operator(s) will review the communication logs to determine when and how often the signal equipment is losing communications. The operator(s) will then identify which equipment is likely malfunctioning based on the information available. The operator(s) will recommend to municipal staff how to correct the issue, such as modifying equipment programming, identifying malfunctioning equipment, or how the issue can be mitigated.

3.4.3 Assisting With Emergency Maintenance or New Construction

- The operator(s) will assist municipal employees or contractors with diagnosing issues with the signal equipment such as flash events, equipment failure, and communication issues.
- The operator(s) will assist municipal employees or contractors by providing or uploading archived controller programing if a malfunctioning controller needs to be replaced or a new controller is being installed.
- For new construction, the operator(s) will assist municipal employees or contractors with connecting the signal equipment to the proposed TSCMS.

3.5 System Requirements

The following are the minimum system requirements for the proposed TSCMS system to meet the vision and identified use cases.

3.5.1 The TSCMS shall be able to communicate with traffic signal controllers connected to traffic signal networks managed by municipalities.

The TSCMS will need to be able to fully function without being on the same local area network of the traffic signals, such as a connection through VPN tunnels. Furthermore, the TSCMS will need to be able to accommodate varying IP schemes and security configurations as each municipal managed network is unique to that municipality.

3.5.2 The TSCMS shall allow users to connect to the system through the existing municipally managed traffic signal networks, through a dedicated VPN tunnel opened by the user, or a secure web interface.

3.5.3 The TSCMS shall allow for multiple users to access the system with varying levels of permissions (Admin, Full User, Read Only, etc.)

3.5.4 The TSCMS shall allow for multiple users to access the system at the same time with accommodations to prevent duplicate or conflicting modifications to the system.

3.5.5 The TSCMS shall allow for each user to only have access to specific signalized intersections and access can be modified at any time by a user with Administrator permissions.

3.5.6 The TSCMS shall be capable of expanding to cover signals existing on or added to the municipal managed traffic signal networks at any point after the system has been initially deployed.

3.5.7 The TSCMS shall be able to view the current status of connected traffic signal controllers.

The viewable traffic signal controller status shall include but is not limited to:

- Real time indication status for each phase
- Real time detector activation status
- Real time pedestrian detector activation status
- Real time coordination status, such as coordination state, active pattern, active schedule, active day plan, and transition status
- Real time cycle clock status, such as cycle position, active phase max times or remaining times, and real time extension timer(s).

3.5.8 The TSCMS shall be able to upload, modify, and download traffic signal controller programing utilizing a NTCIP compliant Upload/Download process.

3.5.9 The TSCMS shall collect and store log information from connected traffic signal controllers.

The traffic signal log shall include but is not limited to:

- Phase/Split Duration
- Detector Activations
- Pedestrian Detector Activations
- Coordination Summary (typically combined with Phase/Split Duration)
- Communications Status
- Alarm Status

3.5.10 The TSCMS shall have the ability to support adaptive signal control.

The functions of the adaptive signal control shall include but is not limited to:

- Cycle by cycle adjustment of cycle length
- Cycle by cycle adjustment of split times
- Ability for a user to set minimum and maximum limits to the cycle length and split times.
- Ability to enable or disable adaptive signal control based on a time of day schedule or by manual control.

3.5.11 The TSCMS shall have the ability to support the retrieval, storage, and reporting for high resolution data produced by traffic signal controllers.

The requirements for the high resolution data system shall meet the following:

- The system shall collect data consistent with the Indiana Traffic Signal High Resolution Data Logger Enumerations.
- The system shall store uploaded high-resolution data for a user defined period of at least 24 months.
- The system shall produce performance measurement reports consistent with descriptions in ATSPM Version 4.0 (or later) documentation.
- The system shall be able to produce at a minimum the following signal performance measure reports:
  - Arrivals on Green
  - Purdue Coordination Diagram
  - Split Monitor
- The system shall allow users to view and download the high resolution event data stored by the system.

3.5.12 The TSCMS shall be able to send notifications to particular users depending on configurable trigger events, such as Alarm Status Changes.

The notifications should be sent by email with additional communication methods being desirable.

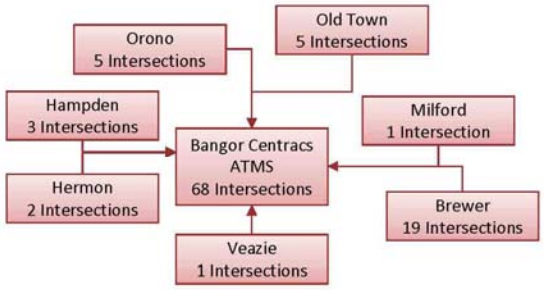
4 – Recommendations

4.1 Alternatives Analysis

Three TSCMS alternatives were scoped and presented for consideration. Based on the systems engineering process, it is recommended that the proposed TSCMS should be an Econolite Centracs ATMS given the following:

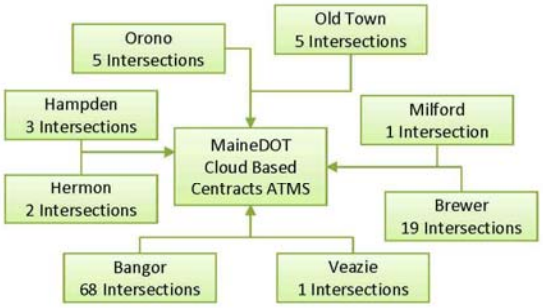
- The City of Bangor has already made an investment in purchasing and implementing an Econolite Centracs ATMS local server.
- Roughly 40% of the traffic signals currently in the field are compatible with an Econolite Centracs ATMS.
- The Econolite Centracs ATMS meets and exceeds the proposed system requirements outlined in the systems engineering process.

4.1.1 Alternative 1: Expand Bangor's Econolite Centracs ATMS



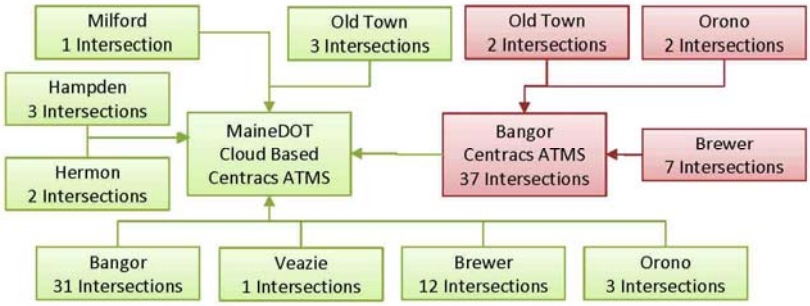
The first alternative considers utilizing the existing Bangor Econolite Centracs ATMS as the regionwide TSCMS. This would be the simplest solution as Bangor's Centracs ATMS is already set up and operational and the majority of high volume and/or high priority intersections are located within Bangor. In particular having the Centracs ATMS on the same network as corridors utilizing adaptive signal control has a large benefit to network performance and stability. Bangor's traffic network would need to be opened and expanded to cover the major corridors within the region and there could be some complications with the more remote and isolated intersections.

4.1.2 Alternative 2: Utilize MaineDOT's Cloud-Based Econolite Centracs ATMS



The second alternative takes advantage of the existing MaineDOT's Cloud-Based Econolite Centracs ATMS as the regionwide TSCMS. The major advantages of the Cloud Based Centracs ATMS is that the actual system is municipal neutral which simplifies setting up connections to all the municipal networks, allows for easier access for all users, reduces downtime from maintenance, and doesn't put additional pressure on a single municipality to manage or maintain the System. The downsides are the increased ongoing costs to cover renting the Cloud Services, slower performance as data is transferred to and from the cloud, and the increased reliance on existing communications networks; for example, if cellular or internet service is lost, a server-based installation like the Bangor Centracs ATMS will still be able to function with the controllers located on the same network, whereas a cloud-based system will lose connection to everything.

4.1.3 Alternative 3: Utilize a Hybrid of MaineDOT's Cloud-Based Econolite Centracs ATMS and Bangor's Econolite Centracs ATMS



The last Alternative explores the option of utilizing both the MaineDOT's Cloud-Based Econolite Centracs ATMS and the Bangor's Econolite Centracs ATMS to cover the intersections in the region. MaineDOT's Cloud-Based Centracs ATMS has the advantage of already being configured and designed to handle a broad network consisting of many VPN connections, whereas Bangor's local system has the advantage of being on the local network where the majority of the signals are connected. Bangor's local system can be upgraded with Econolite's Server to Server (S2S) module to allow it to share its data with MaineDOT's Cloud Based system; in short, users connected to the MaineDOT Centracs web interface will be able to monitor the controllers and perform the use cases defined in section 3.4.

4.2 Recommended TSCMS

Based on the TSCMS Systems Engineering process and the comparison between the three alternatives, it is recommended that BACTS consider Alternative 3: Utilize a Hybrid of MaineDOT's Cloud-Based Econolite Centracs ATMS and Bangor's Econolite Centracs ATMS utilizing a phased approach. The deployment of the proposed system should be split into 2 phases. The BACTS GIS Power Bi database was updated with an RTMS Phase filter and a condensed version of the signal inventory with the proposed phase information is included in the Appendix.

4.2.1 Phase 1: Expand Bangor's Centracs ATMS to High Volume and High Priority Corridors

The priority of the first phase is to connect the high volume and priority intersections to Bangor's Centracs ATMS including the following corridors:

- Bangor, Broadway Corridor (7 intersections)
- Bangor, Hogan Rd Corridor (7 Intersections)
- Bangor, Main St Corridor (7 intersections already connected)
- Bangor, Stillwater Ave Corridor (8 intersections)
- Bangor, Union St Corridor (8 intersections)
- Brewer, Wilson St Corridor (7 intersections)
- Orono/Old Town, Stillwater Ave Corridor (4 intersections)
  48 Intersection in total

The Bangor Broadway, Hogan Rd, Stillwater Ave, and Union St corridors will need to have their copper interconnect telemetry-based network upgraded to an ethernet-based system using ethernet boosters, which will have a notable boost in data throughput compared to the serial-based connection of the telemetry based network. Based on experience with other ethernet-boosted copper networks, there should be enough data throughput to allow for the managing of the traffic signal controllers and collection of high-resolution data, but it may have issues streaming the video from video-based detection or being managed by adaptive signal control. Over time, the copper interconnect can be replaced with either a fiber optic-based interconnect or a wireless radio-based interconnect to improve data throughput.

All the corridors, besides the Bangor Main St Corridor, will need to be connected back to Bangor's traffic network. The copper interconnect telemetry-based network utilized dial-up modem drops at key locations to communicate back to the traffic network. More modern options include either upgrading to cable internet drops or utilizing a cellular-based network. In recent years, cellular-based networks have become a relatively cost effective way of connecting signalized intersections, particularly as intersections that have been updated with an ATC cabinet can have a field monitor unit that has a built in cellular modem and VPN router (there are also field monitor unit options for TS1 and TS2 cabinets).

4.2.2 Phase 2: Connect Bangor Econolite Centracs ATMS to MaineDOT Cloud Based Econolite Centracs ATMS and Expand Network to Remaining Intersections

The second phase would connect the Bangor Econolite Centracs ATMS to the MaineDOT Cloud-Based Econolite Centracs ATMS utilizing the Server to-Server module. The remaining intersections can then be connected to the MaineDOT Cloud-Based Econolite Centracs ATMS utilizing AI field monitor units with the built-in cellular modem. The following is a summary of the number of intersections per municipality.

- Bangor, 31 Intersections
- Brewer, 12 Intersections
- Hampden, 3 Intersections
- Hermon, 2 Intersections
- Milford, 1 Intersection
- Old Town, 3 Intersections
- Orono, 3 Intersections
- Veazie, 1 Intersection

56 Intersections in total.

4.3 Estimated Costs for Recommended TSCMS

Using the information collected from the municipalities and the signal inventories we developed a detailed cost estimate for each of the proposed phases for the TSCMS deployment. The following sections detail the summarized costs for all the signals within each municipality and any required network infrastructure upgrades; an **Intersection Cost Estimate** that details the costs for every intersection is included within the Appendix.

Sebago assumed the following unit costs (in 2024 dollars) for the required intersection improvements:

- Traffic Signal Controller with Ethernet Capabilities: $7,500
- Wireless Radio: $6,000
- Connecting to Existing Fiber Network: $2,600
- Connecting to Existing Copper Network: $2,000
- Field Monitor Unit with Cell Modem and VPN Router: $7,500
- Cell Service for 10 years: $4,500
- TSCMS Configuration $1,000
- TSCMS Service for 10 years: $6,000

4.3.1 Phase 1: Expand Bangor's Centracs ATMS to High Volume and High Priority Corridors

Municipality	# of Intersections	Hardware Costs	Ongoing Costs	Amount
Bangor	37	$307,600	$222,000	$529,600
Brewer	7	$52,000	$42,000	$94,000
Old Town	2	$22,200	$21,000	$43,200
Orono	3	50,600	31,500	$82,100
			Sub Total:	$748,900
			Engineering:	$75,000
			Total:	$823,900

4.3.2 Phase 2: Connect Bangor Econolite Centracs ATMS to MaineDOT Cloud-Based Econolite Centracs ATMS and Expand Network to Remaining Intersections

Municipality	# of Intersections	Hardware Costs	Ongoing Costs	Amount
Bangor	31	$338,500	$256,500	$595,000
Brewer	12	$154,500	$112,500	$267,000
Hampden	3	$48,000	$31,500	$79,500
Hermon	2	$24,500	$21,000	$45,500
Milford	1	$16,000	$10,500	$26,500
Old Town	3	$40,800	$31,500	$72,300
Orono	2	$37,200	$21,000	$58,200
Veazie	1	$16,000	$10,500	$26,500
			Sub Total:	$1,170,500
			Engineering:	$120,000
			Total:	$1,290,500

Total Estimated Phase 1 and Phase 2 Combined Costs: $2,114,400

5 – Conclusion

This Traffic Signal Central Management System Master Plan for the BACTS RTMS region represents the compilation of multiple discussions and information from previous projects in the region. These projects include the 2021 Traffic Signal Coordination and Evacuation Plan developed for the Town of Orono and the City of Old Town; the Region Wide 2021 Traffic Signal Inventory for all 104 traffic signals in the BACTS Region which provided detail on existing equipment; and the 2022 Penobscot Corridor Signal Project completed by the Cities of Bangor and Brewer that included the installation of Centracs traffic signal software for corridor operation and maintenance. These projects identified the traffic signal related needs for these municipalities and helped develop potential solutions.

The information from the previous projects was used to inform a high-level systems engineering process where each municipal representative was given a brief questionnaire. The system engineering process resulted in several defined use cases and minimum requirements for a proposed TSCMS. Three alternatives met the use cases and requirements including expanding the Bangor Econolite Centracs ATMS server to the entire region, connecting to the MaineDOT Cloud Based Econolite Centracs ATMS server, or a combination of the Bangor and MaineDOT Centracs ATMS servers.

Using a hybrid of the Bangor and MaineDOT Centracs ATMS servers is the recommended alternative to take advantage of the strengths of each system, such as having a local connection to the five corridors in Bangor and the broad-reaching capability of the MaineDOT cloud-based server. A Phased deployment approach was recommended prioritizing the major corridors in the region first and then connecting the Bangor Centracs ATMS to the MaineDOT Centracs ATMS along with the remaining intersections. The estimated costs for new signal equipment, networking equipment, and ongoing costs (for ten years), total $823,900 for Phase 1 and $1,290,500 for Phase 2.

6 – Appendix

A1 – 2021 Signal Inventory Summary Table and Estimated Cost per Intersection

BACTS RTMS

2021 Traffic Signal Inventory Summary Table and Estimated Cost per Intersection

Signal Inventory Information											Estimated Costs for Traffic Signal Imprvements										
Municipality	Phase	Minor St	Major St	Controller Type	Controller Brand	Controller Model	Available Interconnect	Connected System	Detecton Type	Detection Brand	Controller Replacement	Wireless Radio	Existing Fiber	Existing Copper	Procure FMU	Cellular Data	TSCMS Configuration	TSCMS Support	Hardware Costs	Software Costs	Total Costs
Bangor	2	Exchange St	Washington St	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	Loops,Video	Flir	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 1,000.00	$ 6,000.00	$ 7,000.00
Bangor	2	Kenduskeag Ave	Griffin Rd	NEMA TS1	Naztec	900 TS1	None	None	Microwave	Naztec	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	2	Cumberland St	Center St	NEMA TS1	Econolite	ASC/2-2100	None	None	Microwave	Unknown	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	1	To Bangor Mall Blvd	Stillwater Ave	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Microwave	Naztec	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Hannaford/Penn Plaza	Stillwater Ave	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Microwave	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	I-95 NB Exit 184 Ramps	Union St (SR 222)	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Microwave,Video	Flir,Smartmicro	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	1	I-95 SB Exit 184 Ramps/Sunset Ln	Union St (SR 222)	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Microwave,Video	Flir,Smartmicro	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	2	Mid Mall	Bangor Mall Blvd	NEMA TS1	Econolite	ASC/2-2100	Copper	Bangor	None	None	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Central St (US 2)/Center St	Harlow St (US 2)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	None	None	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Hammond St/Broad St	Central St/Main St (US 2/202)	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	None	None	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 1,000.00	$ 6,000.00	$ 7,000.00
Bangor	2	Water St/Middle St	Main St (US 202)	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	None	None	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 1,000.00	$ 6,000.00	$ 7,000.00
Bangor	2	Harlow St (US 2)/Exchange St	State St (US 2)	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	None	None	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 1,000.00	$ 6,000.00	$ 7,000.00
Bangor	1	Broadway Shopping Center	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2-1000	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Husson Ave	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2-1000	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Falvey St	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	School St	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	I-95 NB Exit 187 Ramps	Hogan Rd	NEMA TS2 Type 2	Econolite	ASC/2-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Hogan Rd	Stillwater Ave	NEMA TS2 Type 2	Econolite	ASC/2-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	PCHC Walk In Care	Union St (SR 222)	NEMA TS2 Type 1	Econolite	ASC/2-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	End of Bangor Mall Blvd	Bangor Mall Blvd	NEMA TS2 Type 1	Econolite	ASC/2-2100	Copper	Bangor	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Grandview Ave	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	I-95 NB Exit 185 Ramps/Center St	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	I-95 SB Exit 185 Ramps	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Mount Hope Ave	Hogan Rd	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Gridsmart	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Longview Dr	Hogan Rd	NEMA TS1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Gridsmart	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Drew Ln	Stillwater Ave	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	To Home Depot	Stillwater Ave	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Gridsmart	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Vermont Ave	Union St (SR 222)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Griffin Rd	Union St (SR 222)	NEMA TS1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Godfrey Blvd	Union St (SR 222)	NEMA TS2 Type 2	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	EMMC HealthCare Mall / Citgo	Union St (SR 222)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Griffin Rd/Burleigh Rd	Broadway (SR 15)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Ohio St	Griffin Rd	NEMA TS2 Type 1	Econolite	ASC/2S-2100	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	2	Deborah Carey Johnson Dr	Hancock St	NEMA TS2 Type 1	Econolite	ASC/2S-2100	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	2	Hammond St (US 2/SR 100)	Odlin Rd (US/SR 100)/Maine Ave	NEMA TS1	Econolite	ASC/2S-2100	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	2	Forest Ave/Boyd St	State St (US 2)	NEMA TS2 Type 2	Econolite	ASC/2S-2100	None	None	Video	Naztec	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	2	Hancock St/Otis St	State St (US 2)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	EMMC/Wing Park	State St (US 2)	NEMA TS2 Type 2	Econolite	ASC/2S-2100	Copper	Bangor	Video	Econolite,Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Cascade Pk Rd (Waterworks)	State St (US 2)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 18,000.00	$ 10,500.00	$ 28,500.00
Bangor	2	Howard St	Stillwater Ave	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Essex St	Stillwater Ave	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Copper	Bangor	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Haskell Rd/Sylvan Rd	Hogan Rd	NEMA TS2 Type 2	Econolite	ASC/3-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Bangor Mall Blvd/Springer Dr	Hogan Rd	NEMA TS2 Type 2	Econolite	ASC/3-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	To Bangor Mall Blvd/The Avenue	Stillwater Ave	NEMA TS2 Type 2	Econolite	ASC/3-2100	Copper	Bangor	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	1	Walmart/VIP-O'Reilly	Stillwater Ave	NEMA TS2 Type 1	Econolite	ASC/3-2100	Copper	Bangor	Video	Econolite	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Cumberland St	Broadway (SR 15 Business)	NEMA TS2 Type 2	Econolite	ASC/3-2100	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	2	Stillwater Ave/Park St	Broadway (SR 15 Business)	NEMA TS2 Type 1	Econolite	ASC/3-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Cumberland St/Harlow Ct	Harlow St	NEMA TS2 Type 1	Econolite	ASC/3-2100	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	2	State St	Hogan Rd	NEMA TS2 Type 1	Econolite	ASC/3-2100	Copper	Bangor	Video	Flir	$ 7,500.00	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 6,000.00	$ 16,500.00
Bangor	2	Odlin Rd (US 2/SR 100)	I-395/Hammond St (US 2/SR 100)	NEMA TS2 Type 2	Econolite	ASC/3-2100	None	None	Video	Gridsmart	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Bangor	1	I-95 SB Exit 187 Ramps	Hogan Rd	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Video	Flir	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	1	Quirk Auto/EMCC	Hogan Rd	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Video	Gridsmart	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	1	Bass Park Blvd/Dutton St	Main St (US 1A/202/SR 9)	NEMA ATC Type 1	Econolite	Cobalt	Fiber Optic	Bangor	Video	Flir	$ -	$ -	$ 2,600.00	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,600.00	$ 6,000.00	$ 9,600.00
Bangor	1	Patten St	Main St (US 1A/202/SR 9)	NEMA ATC Type 2	Econolite	Cobalt	Fiber Optic	Bangor	Video	Flir	$ -	$ -	$ 2,600.00	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,600.00	$ 6,000.00	$ 9,600.00
Bangor	1	Railroad St	Main St (US 1A/202/SR 9)	NEMA ATC Type 1	Econolite	Cobalt	Fiber Optic	Bangor	Video	Flir	$ -	$ -	$ 2,600.00	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,600.00	$ 6,000.00	$ 9,600.00
Bangor	1	Cedar St	Main St (US 1A/202/SR 9)	NEMA ATC Type 1	Econolite	Cobalt	Fiber Optic	Bangor	Video	Flir	$ -	$ -	$ 2,600.00	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,600.00	$ 6,000.00	$ 9,600.00
Bangor	1	I-395 Exit 3 Off Ramp	Main St (US 1A/202/SR 9)	NEMA ATC Type 1	Econolite	Cobalt	Fiber Optic	Bangor	Video	Flir	$ -	$ -	$ 2,600.00	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,600.00	$ 6,000.00	$ 9,600.00
Bangor	1	I-95 Exit 186 Ramps	Stillwater Ave	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Video	Econolite	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	1	Fourteenth St	Union St (SR 222)	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Video	Econolite	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	2	State St (US 2)	Broadway (SR 15 Business)	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Video	Flir	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	2	Ohio St	Fourteenth St	NEMA ATC Type 1	Econolite	Cobalt	None	None	Video	Econolite	$ -	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 10,500.00	$ 19,000.00
Bangor	2	Union St (SR 222)/4th St	Hammond St (US 2/SR 100)	NEMA ATC Type 1	Econolite	Cobalt	None	None	Video	Flir	$ -	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 10,500.00	$ 19,000.00
Bangor	2	Clinton St/High St/Ohio St	Hammond St (US 2/SR 100)	NEMA ATC Type 1	Econolite	Cobalt	Copper	None	Video	Flir	$ -	$ -	$ -	$ 2,000.00	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 10,500.00	$ 10,500.00	$ 21,000.00
Bangor	2	Broad St	Independent St/Washington St	NEMA ATC Type 1	Econolite	Cobalt	Copper	Bangor	Video	Flir	$ -	$ -	$ -	$ 2,000.00	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 3,000.00	$ 6,000.00	$ 9,000.00
Bangor	1	Buck St	Main St (US 1A/202/SR 9)	NEMA ATC Type 1	Econolite	Cobalt	Fiber Optic	Bangor	Video	Flir	$ 7,500.00	$ -	$ 2,600.00	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 11,100.00	$ 6,000.00	$ 17,100.00
Bangor	1	Union St (US 1A / SR 9 / US 222)	Main St (US 1A/202/SR 9)	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	Video	Gridsmart	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Bangor	2	Hancock St	Oak St (SR 15 Business)	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	Video	-	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Bangor	2	Washington St	Oak/State St (SR 15 Business)	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	Video	-	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	2	North Main St (SR 9/178)	State St	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	Video	-	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	2	Penobscot St (SR 15 Business)	State St	NEMA ATC Type 1	Econolite	Cobalt	Wireless	Bangor	Video	-	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	1	Parkway South	Wilson St (US 1A)	NEMA TS2 Type 1	Econolite	ASC/3-2100	Wireless	Brewer	Loops	Econolite	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	1	Acme Rd	Wilson St (US 1A)	NEMA TS2 Type 1	Econolite	ASC/3-1000	Wireless	Brewer	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	1	Sparks Ave/Pierce Rd	Wilson St (US 1A)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Wireless	Brewer	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	1	Greenpoint Rd	Wilson St (US 1A)	NEMA TS2 Type 2	Econolite	ASC/3-1000	Wireless	Brewer	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	1	State St	Wilson St (US 1A)	NEMA TS2 Type 1	Econolite	ASC/3-1000	Wireless	Brewer	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	1	Arista Dr/Dirigo Dr	Wilson St (US 1A)	NEMA ATC Rack	Econolite	Cobalt	Wireless	Brewer	Video	Econolite	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 1,000.00	$ 6,000.00	$ 7,000.00
Brewer	1	Walton Dr/Thompson St	Wilson St (US 1A)	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Wireless	Brewer	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	2	Greenpoint Rd	Dirigo Dr	NEMA TS2 Type 1	Econolite	ASC/2S-2100	None	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Brewer	2	Sparks Ave	Dirigo Dr	NEMA TS2 Type 1	Econolite	ASC/2-2100	None	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Brewer	2	Whiting Hill Rd	Dirigo Dr	NEMA TS2 Type 1	Econolite	ASC/2S-2100	None	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Brewer	2	Parkway South	Dirigo Dr	NEMA TS2 Type 1	Econolite	ASC/2S-2100	Wireless	Brewer	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ -	$ -	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 6,000.00	$ 14,500.00
Brewer	2	Betton St (SR 15 Business) / Parker St	N Main St (SR 9 / SR 15 Business)	NEMA ATC Type 2	Econolite	Cobalt	None	None	Video	Econolite	$ -	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 10,500.00	$ 19,000.00
Brewer	2	Cianbro	S Main St (SR 15)	NEMA TS2 Type 1	Econolite	ASC/3-1000	None	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Brewer	2	I-395 NB Exit 4 Ramps	S Main St (SR 15)	NEMA TS2 Type 1	Econolite	ASC/3-1000	None	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Brewer	2	Eastern Ave	State St	NEMA TS2 Type 1	Econolite	ASC/3-1000	None	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Brewer	2	Washington St	State St	NEMA ATC Type 2	Econolite	Cobalt	None	None	Video	Econolite	$ -	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 10,500.00	$ 19,000.00
Brewer	2	N/S Main St (SR 15 Business/SR 9)	Wilson St (US 1A/SR 9)	NEMA TS2 Type 1	Econolite	ASC/3-1000	None	None	Video	Econolite	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Hampden	2	Western Ave (SR 9)/Canoe Club Rd	Main Rd (US 1A/SR 9)	NEMA TS2 Type 2	Econolite	ASC/2-2100	None	None	Loops	Unknown	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Hampden	2	Western Ave (US 202/SR 9)	US 202	NEMA TS2 Type 1	Naztec	980 TS2	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Hampden	2	Coldbrook Rd	US 202	NEMA ATC Type 2	McCain	ATC eX	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Hermon	2	Emerson Mill / Odlin Rd	Coldbrook Rd	NEMA ATC Rack	Econolite	Cobalt	None	None	Video	Econolite	$ -	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 8,500.00	$ 10,500.00	$ 19,000.00
Hermon	2	Billings Rd	US 2	NEMA TS2 Type 1	Naztec	980-A2300-1	None	None	Loops	EDI	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Milford	2	Bradley Rd (SR 178)	Main Rd (US 2)	NEMA ATC Type 2	McCain	ATC eX2	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Old Town	1	Bennoch Rd (SR 16)	Stillwater Ave (US 2A)	NEMA ATC Rack	Econolite	Cobalt	Fiber Optic	None	Video	-	$ -	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 11,100.00	$ 10,500.00	$ 21,600.00
Old Town	1	College Ave (US 2A)	Stillwater Ave (US 2A)	NEMA ATC Rack	Econolite	Cobalt	Fiber Optic	None	Video	-	$ -	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 11,100.00	$ 10,500.00	$ 21,600.00
Old Town	2	Center St (US 2 / US 2A)	Main St (US 2 / SR 46)	NEMA ATC Rack	Econolite	Cobalt	Fiber Optic	None	Video	-	$ -	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 11,100.00	$ 10,500.00	$ 21,600.00
Old Town	2	University Forest Rd	Stillwater Ave (US 2A)	NEMA TS2 Type 1	Naztec	980-A0100-1	Fiber Optic	None	Video	Flir	$ 7,500.00	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 18,600.00	$ 10,500.00	$ 29,100.00
Old Town	2	Old Town Plaza	Stillwater Ave (US 2A)	NEMA ATC Type 2	Econolite	Cobalt	Fiber Optic	None	Video	Flir	$ -	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 11,100.00	$ 10,500.00	$ 21,600.00
Orono	1	Pine St/Bennoch Rd (ME Route 16)/Mill St	Main St (US 2)	NEMA TS2 Type 2	Econolite	ASC/3-2100	Fiber Optic	None	Video	Flir	$ 7,500.00	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 18,600.00	$ 10,500.00	$ 29,100.00
Orono	1	Godfrey Rd/I-95 Exit 193 Off Ramp	Stillwater Ave	NEMA TS2 Type 2	Naztec	981-A1200-1	Time Based	None	Loops,Video	EDI,Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Orono	1	University Mall	Stillwater Ave	NEMA TS2 Type 2	Naztec	980-A0200	Time Based	None	Loops	Naztec,EDI	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00
Orono	2	Kelley Rd	Main St (US 2)	NEMA TS2 Type 1	Econolite	ASC/3-1000	Fiber Optic	None	Video	Econolite	$ 7,500.00	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 18,600.00	$ 10,500.00	$ 29,100.00
Orono	2	College Ave (US 2A)	Park St/N Main St (US 2)	NEMA TS2 Type 2	Econolite	ASC/3-2100	Fiber Optic	None	Video	Flir	$ 7,500.00	$ -	$ 2,600.00	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 18,600.00	$ 10,500.00	$ 29,100.00
Veazie	2	Chase Rd/School St	State St (US 2)	NEMA TS1	Eagle	EPAC 3608M11S	None	None	Video	Flir	$ 7,500.00	$ -	$ -	$ -	$ 7,500.00	$ 4,500.00	$ 1,000.00	$ 6,000.00	$ 16,000.00	$ 10,500.00	$ 26,500.00

STI Project Number: 21387-01
C.Thompson
1/10/2024

A2 – Aerial Based GIS Maps and Communication Infrastructure

PROPOSED SIGNAL COMMUNICATIONS EQUIPMENT AND INTERCONNECT

TOWN OF ORONO, CITY OF OLD TOWN, TOWN OF MILFORD

HUDSON

GLENBURN

OLD TOWN

ORONO

MILFORD

BRADLEY

BANGOR

VEAZIE

EDDINGTON

OLD TOWN

ORONO

MAIN RD AT BRADLEY RD

CENTER ST AT MAIN ST AND WATER ST

STILLWATER AVE AT OLD TOWN PLAZA

STILLWATER AVE AT UNIVERSITY FOREST RD

STILLWATER AVE AT COLLEGE AVE

STILLWATER AVE AT BENNOCH RD

STILLWATER AVE AT UNIVERSITY MALL

STILLWATER AVE AT GODFREY RD/I-95 EXIT 193 RAMP

FIRSTLIGHT FIBER NETWORK

OTT/UMS FIBER NETWORK

MAIN ST AT COLLEGE AVE

MAIN ST AT BENNOCH RD

MAIN ST AT KELLEY RD

KEY

PROPOSED FIBER OPTIC

PROPOSED RADIO PAIR

PROPOSED CELLULAR ROUTER

PROPOSED CONNECTION INTO EXISTING INTERCONNECT

EXISTING FIBER

EXISTING COPPER

EXISTING RADIO

REPLACE CONTROLLER WITH ECONOLITE CENTRACS COMPATABLE ATC CONTROLLER

RETAIN EXISTING CONTROLLER

N

5000 0 5000 10000

Scale of Feet

PROPOSED SIGNAL COMMUNICATIONS EQUIPMENT AND INTERCONNECT

TOWN OF HERMON, TOWN OF HAMPDEN

ROUTE 2 AT BILLINGS RD

ODLIN RD AT COLD BROOK RD

ROUTE 202 AT COLD BROOK RD

ROUTE 202 AT WESTERN AVE

MAIN RD AT WESTERN AVE

CARMEL

HERMON

BANGOR

BREWER

HAMPDEN

ORRINGTON

KEY

PROPOSED FIBER OPTIC

PROPOSED RADIO PAIR

PROPOSED CELLULAR ROUTER

PROPOSED CONNECTION INTO EXISTING INTERCONNECT

EXISTING FIBER

EXISTING COPPER

EXISTING RADIO

REPLACE CONTROLLER WITH ECONOLITE CENTRACS COMPATABLE ATC CONTROLLER

RETAIN EXISTING CONTROLLER

N

5000 0 5000 10000

Scale of Feet

PROPOSED SIGNAL COMMUNICATIONS EQUIPMENT AND INTERCONNECT

CITY OF BANGOR, CITY OF BREWER, AND TOWN OF VEAZIE

BANGOR

BREWER

VEAZIE

HAMPDEN

KEY

- PROPOSED FIBER OPTIC
- PROPOSED RADIO PAIR
- PROPOSED CELLULAR ROUTER
- PROPOSED CONNECTION INTO EXISTING INTERCONNECT
- EXISTING FIBER
- EXISTING COPPER
- EXISTING RADIO
- REPLACE CONTROLLER WITH ECONOLITE CENTRACS COMPATABLE ATC CONTROLLER
- RETAIN EXISTING CONTROLLER

N

2500 0 2500 5000

Scale of Feet

INTERSECTION ID KEY

CITY OF BANGOR

1: HOGAN RD AT LONGVIEW DR
2: BANGOR MALL BLVD AT MID MALL
3: HOGAN RD AT BANGOR MALL BLVD
4: HOGAN RD AT I-95 SB EXIT 187 RAMPS
5: HOGAN RD AT I-95 NB EXIT 187 RAMPS
6: BANGOR MALL BLVD AT END OF BANGOR
7: HOGAN RD AT HASKELL RD AND SYLVAN RD
8: HOGAN RD AT QUIRK AUTO / EMCC ENT
9: HOGAN RD AT MOUNT HOPE AVE
10: HOGAN RD AT STATE ST
11: STATE ST AT CASCADE PD RD
12: STATE ST AT EMMC/WING PARK
13: STATE ST AT HANCOCK ST AND OTIS ST
14: HANCOCK ST AT DEBORAH CAREY JOHNSON DR
15: STATE ST AT FOREST AVE AND BOYD ST
16: STILLWATER AVE AT ESSEX ST
17: STILLWATER AVE AT BROADWAY
18: CUMBERLAND ST AT CENTER ST
19: BROADWAY AT CUMBERLAND ST
20: HARROW ST AT CENTRAL ST
21: BROADWAY AT STATE ST
22: OAK ST AT HANCOCK ST
23: OAK ST AT WASHINGTON ST
24: WASHINGTON ST AT EXCHANGE ST
25: WASHINGTON ST AT BROAD ST
26: MAIN ST AT RAILROAD ST
27: MAIN ST AT PATTEN ST
28: MAIN ST AT BUCK ST
29: MAIN ST AT BASS PARK BLVD
30: MAIN ST AT I-395 RAMP
31: MAIN ST AT CEDAR ST
32: MAIN ST AT UNION ST
33: MAIN ST AT WATER ST
34: MAIN ST AT HAMMOND ST
35: HAMMOND ST AT UNION ST
36: HAMMOND ST AT CLINTON ST
37: STATE ST AT EXCHANGE ST
38: HARLOW ST AT CUMBERLAND ST
39: UNION ST AT FOURTEENTH ST
40: HAMMOND ST AT ODLIN RD
41: HAMMOND ST AT MAINE AVE
42: UNION ST AT I-95 NB RAMPS
43: UNION ST AT I-95 SB RAMPS
44: FOURTEENTH STREET AT OHIO ST
45: UNION ST AT VERMONT ST
46: UNION ST AT EMMC ENT
47: UNION ST AT PCHC ENT
48: UNION ST AT GODFREY DR
49: UNION ST AT GRIFFIN RD
50: GRIFFIN RD AT OHIO ST
51: GRIFFIN RD AT KENDUSKEAG AVE
52: BROADWAY AT GRIFFIN RD
53: BROADWAY AT GRANDVIEW AVE
54: BROADWAY AT HUSSON AVE
55: BROADWAY AT SCHOOL ST
56: BROADWAY AT BROADWAY SHOPPING CENTER ENT
57: BROADWAY AT FALVEY RD
58: BROADWAY AT I-95 SB RAMPS
59: BROADWAY AT I-95 NB RAMPS
60: STILLWATER AVE AT HOWARD ST
61: STILLWATER AVE AT DREW LN
62: STILLWATER AVE AT I-95 RAMPS
63: STILLWATER AVE AT BANGOR MALL ENT
64: STILLWATER AVE AT HOME DEPOT ENT
65: STILLWATER AVE AT BANGOR MALL BLVD
66: STILLWATER AVE AT HANNAFORD PENN PLAZA
67: STILLWATER AVE AT WALMART ENT
68: STILLWATER AVE AT HOGAN RD

CITY OF BREWER

69: STATE ST AT PENOBSCOT ST
70: STATE ST AT NORTH MAIN ST
71: STATE ST AT WASHINGTON ST
72: STATE ST AT EASTERN AVE
73: WILSON ST AT ACME RD
74: WILSON ST AT STATE ST
75: WILSON ST AT PARKWAY SOUTH
76: WILSON ST AT GREENPOINT RD
77: WILSON ST AT SPARKS AVE
78: WILSON ST AT WALTON DR
79: WILSON ST AT DIRIGO DR
80: DIRIGO DR AT WHITING HILL RD
81: DIRIGO DR AT SPARKS AVE
82: DIRIGO DR AT GREENPOINT RD
83: DIRIGO DR AT PARKWAY SOUTH
84: N MAIN ST AT PARKER ST
85: N MAIN ST AT WILSON ST
86: S MAIN ST AT I-395 RAMPS
87: S MAIN ST AT CIANBRO ENT

TOWN OF VEAZIE

88: STATE ST AT CHASE RD