INTELLIGENT MOBILE BUSINESS AND FLEET MANAGEMENT SOLUTIONS

Proposal For

The City of Ramsey, MN Public Works

Navigo GPS/AVL Fleet Management System

Submitted By

Location Technologies, Inc.

4/25/2012

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Parkville, MO 64152
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Parties Involved

Proposed

City of Ramsey, MN
14100 Jaspar Street NW
Ramsey, MN 55303

Grant Riemer, Street Supervisor
griemer@ci.ramsey.mn.us
Phone (763) 433-9863

Proposing Company

Location Technologies, Inc. (LTI)
6214 NW Kelly Drive
Kansas City, MO 64152

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Proposal Contents

Location Technologies

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4/25/2012

Grant Riemer, Street Supervisor
City of Ramsey, MN
14100 Jaspar Street NW
Ramsey, MN 55303

Dear Mr. Riemer,

Location Technologies, Inc. (LTI) is pleased to provide the City of Ramsey, MN the attached proposal for a Navigo GPS/AVL Fleet and Operations Monitoring System for snow and ice control management.

LTI has manufactured and installed AVL and Wireless Data Systems around the world for nearly 20 years. We specialize in developing solutions for Public Works, Public Safety, and Transportation. We have 100's of satisfied public sector clients across the country in addition to a number of commercial clients.

We are proposing our Navigo GPS/AVL Fleet Management Solution for this project. The equipment and software proposed herein is fully compliant with the specifications of the project and we accept the terms and conditions given to provide a system.

LTI intends to continue our position as a leader in fleet management through a combination of participation in industry organizations, continued product improvement, and keeping abreast of current trends in all of the various technologies surrounding the industry. For example, the LT6 GPS/AVL Modem is literally the 6th generation of our GPS/AVL Modem devices.

As systems integrators and experienced engineers our approach to all projects is to partner with the customer to provide the best system to meet the particular needs of a customer and not try to 'force fit' a canned solution. From start to finish you will find that we will not only be responsive to your stated requirements but will also be flexible and able to handle changes in scope and requirements.

We sincerely believe that we are offering the overall best proposal for the following reasons:

- Unparalleled experience in the industry.
- Proven, field tested equipment.
- Full support from company management for the successful completion of project.
- A modular equipment approach that offers the greatest flexibility and maintainability.
- A financially strong, stable, and debt-free company with nearly 20 years experience.
- We are a fully certified Sprint Business Partner.

In closing, we would like to thank you again for the opportunity to provide a proposal for this important project and to ask you to please contact us should you require further information.

Sincerely,

Eric Cowger, President
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Executive Summary of Proposal

For the City of Ramsey, MN ("City") we are proposing our Navigo GPS/AVL Fleet Management System. The proposed Navigo GPS/AVL Fleet Management System is a solution that provides vehicle performance data, location tracking, operations monitoring, and reporting via a user-friendly web interface. Location Technologies, Inc. is proposing and is prepared to supply all project management, installation, and implementation services necessary to deliver a working solution.

The Proposed Navigo GPS/AVL Fleet Management System will provide the City with an automated real-time GPS/AVL system that is simple to operate and will reliably collect and disseminate data in a useable format based on information provided by on-vehicle sensors, monitors, and other sources (i.e., weather data, operator-generated data). This accumulated operations data can be used to plan maintenance activities and direct the maintenance vehicles to carry out their planned activities. The proposed system will give the City a holistic, department wide view of its operations and allow it to streamline its maintenance and operations functions by using aggregated data to make informed decisions simply and efficiently.

Location Technologies, Inc. takes a unique operations-centric approach to GPS/AVL Fleet Management. We are pushing the boundaries of GPS/AVL fleet management systems past the vehicle and on to the entire operation. Managers of fleet-based operations have been limited by the dot-on-a-map mentality for too long. We are pioneering a next-generation GPS/AVL fleet management approach that envisions the role of our systems as great aggregators of whole operations data, and as such must openly accumulate, interface, and extend all the operations data that is relevant to the tasks being performed. Operations managers need information from numerous sectors of their operations in order to make the correct decisions. These areas include environmental data, traffic data, geographic data, Route data, vehicle data, fleet data, operations data, inventory/asset data, HR/personnel data, fiscal data, and others.

The proposed NAVIGO GPS/AVL Fleet Management System is extremely beneficial in the management and daily operations of a statewide maintenance fleet program by providing:

- Tools to better monitor maintenance systems, including data necessary for managers and operators to make informed and timely operational decisions (e.g., understanding the necessary amount of de-icing chemicals to apply to particular stretches of road);
- Tools to better track the resources (vehicle, personnel, materials, etc) used to maintain specific roadway segments.
- Planning information to other stakeholders such as City and regional transportation agencies or metropolitan planning organizations with adjoining responsibilities;
- Useful traveler information for dissemination to the public (i.e., icy road alerts).

LTI is proposing, at the very high level, the following items:

<u>In-Vehicle Hardware</u>

- LT6 GPS/AVL CDMA Modem
- LT Vehicle Diagnostic Bus Interface Module
- Interface assemblies for Snow/Ice Control

<u>Network Servers</u>

- LT Wireless Data Server Software
- LT Events Engine
- .NET Web Services (3rd Party Interface)

<u>Management Software</u>

- LT Navigo Explorer WebMap Platform
- Public Works Management Module
- Fleet Management Module
- 3rd Party Dispatch & Mgmt SW Interface Module

<u>Field Communications</u>

- CDMA or GPRS Wireless Data Communications

The proposed City GPS/AVL Fleet Management System will give the following functionality:

- Vehicle Tracking
- Field Communications
- In-Vehicle Information Management
- Work Order Management and Dispatch Monitoring
- Maintenance Decision Making
- Inventory and Asset Management
- Data Archiving and Reports

In order to maximize the use of the equipment and the annual investment in communications the proposed Navigo GPS/AVL Fleet Management System will have the ability to move a device from vehicle to vehicle within the City fleet. This feature allows the same device to move from winter operations (plowing, sanding) to summer operations (mowing, weed, spraying and/or paint striping).

The GPS/AVL Fleet Management Systems offered by Location Technologies, Inc. help communities and agencies all across the United States to achieve many of their Environmental Protection Policy goals by minimizing vehicle emissions through reductions in fossil fuel use, reducing vehicle idle times, speeding, unauthorized use, and keeping vehicles in proper operating condition through automated vehicle diagnostic data reporting.

Experience

Dubuque, IA Public Works
John Klostermann
Street/Sewer Maintenance Supervisor
(563) 589-4250
City-wide AVL System including street maintenance and sanitation vehicles

Pierce County Public Works
Bruce Wagner
Road Operations Division Manager
Tacoma, WA
(253) 798-6051
Large Metro-area County (Tacoma, Seattle)
Multiple Vehicle types

Johnson Co KS Public Works
Bob Swanson
Maintenance Supervisor
Olathe, KS
(816) 806-8707
Large Metro Area County (Kansas City)
Multiple Vehicle Types/Operations

Kansas City Board of Public Utilities
Ron Wilson
Kansas City, KS
(913) 573-9459
Large Utility Service includes Water, Gas, Electric

Overland Park, KS Public Works
Mike Ross
Supervisor
Overland Park, KS
(913) 895-6038
Large Metro Area City (Kansas City)
Multiple Vehicle Types/Operations

Washington Department of Transportation
Debbi Achord
Project Manager
(509) 633-0629
AVL System for State DOT with combination Radio/Cellular System, Interface to MDSS
Multiple Vehicle types/Operations

Hydro Pure Technologies
Nelena Nelson
505-334-1765
Aztec, NM
Large Commercial Water Supplier in the 4-corners area of Nevada, New Mexico, Colorado, Arizona

Personnel

The primary staff for this project, and their estimated percentage of time required over the duration of the project are Project Manager: Eric Cowger (15%) and Project Engineer: Glenn Courtney (10%).

Eric Cowger
President
Mr. Cowger has over 20 years of experience in the electronics industry. He has served in a variety of management and lead technical positions at several companies. These include Vice President of Engineering for Information Technologies, Inc., Design Engineering Manager at Thomson-Wilcox (now Thales), and senior engineer at Rockwell Collins Avionics.
Education: BS Electrical Engineering, Kansas State University, 1984
MS Electrical Engineering, University of Iowa, 1986

Glenn Courtney
Principal Engineer
Mr. Courtney has over 25 years of varied experience in the navigation and radio communications industry. He has served on numerous national standards committees and is recognized nationally as an expert in the field of navigation. Mr. Courtney has been involved in the successful design and implementation of several large-scale data communication systems in a variety of industries including Rail, Public Safety, Construction, Avionics, ground-based Nav-Aids, and Fleet Management.
Education: Electrical Engineering, University of Missouri, 1981

Fern Tsukada
Lead Software and Firmware Engineer
Ms Tsukada is our lead Software Engineer. She has broad experience in the development and implementation of large database related applications, data communications applications, and embedded software.
Education: BS Computer Science, Park University, 1995
BS Electrical Engineering, California State University, Long Beach, 2000

All key employees who are associated with this project will have sufficient time and resources available to complete all work and obligations that are specified within the negotiated contract.

Location Technologies, Inc. and its key employees maintain registrations and relationships with numerous professional and industry organizations. These organizations include the American Public Works Association, Canadian Public Works Association, National Emergency Number Association, Association of Public Communications Officials, American Public Transportation Association, American Public Power Association, American Engineering Association, International Wireless Convention, and many more. Location Technologies, Inc. engineering staff and key employees have attained several certifications and credentials through these associations in the course of continuing education and professional development.

Location Technologies, Inc. (LTI) is organized in a traditional functional matrix fashion where individual project and product managers may pull on resources from the functional groups. In the event of the loss of key employee(s) LTI is sufficiently staffed and experienced to continue successful completion of work and obligations as stated in the negotiated contract.

Project Approach

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When in real time vehicle tracking mode the LT6 will send position and monitored input operations data packets over the Internet from the wireless network to our hosted LT Wireless Data Server software operating on a secure, designated AVL Server. Information received will include position, heading, speed and input status if status wires are connected to the modem. These packets are then decoded, time tagged and logged, and made available for manipulation from any internet browser with an HTTP connection. Mobiles can be programmed to transmit on a timed basis, on distance traveled, on event, or on command. The Logger Module (SW) of the LT Wireless Data Server monitors the size of the active log table and may be periodically burned to a more permanent medium such as CD and stored indefinitely for future retrieval and analysis. The active log is always available for immediate replay and analysis. The LT Wireless Data Server will reside outside the City network and remotely Interface with existing City resource management software. Garage supervisors and others can monitor fleet performance and generate stand-alone reports in near real-time via any standard, up-to-date web browser by logging into the Navigo Explorer WebMap. Supervisors can review and edit data and have the ability to transfer information to the Resource Management System and other systems including GIS.

Our Navigo Explorer WebMap Platform standard map views cover all of North America with the ability to import your existing GIS information in its native format. The Navigo Explorer WebMap Platform can import data from the City's Geospatial Infrastructure. On a periodic basis or on user command the map will refresh the position of the vehicle icons by refreshing its view of the vehicle position table maintained by the LT Wireless Data Server.

Field Communications
Field communications will be cellular using a 3G or better digital network for data transmission to and from the participating vehicles. The proposed field communication solution is satisfactory not only for initial deployment, but also for future expansion in the state. The proposed solution is scalable to the entire City maintenance fleet using commercial-off-the-shelf equipment.

Operations Status and Monitoring
A key feature available for Garage Supervisors is the ability to monitor the condition of the vehicle and material usage in near real-time. In-vehicle systems can provide the status of a number of vehicle and equipment conditions, including but not limited to:

- Status of vehicle equipment
- Vehicle speed
- Engine diagnostics
- Available on-board materials for dispersion

Vehicle routes, whether assigned to one vehicle or a group of vehicles, are able to be played back over a defined period of time for review by system operators and managers. This feature allows for review of

vehicle paths and operations as part of overall maintenance system function review processes. The proposed Navigo GPS/AVL Fleet Management System is able to track any fleet vehicle relative to its expected location at a desired system site at any time, including an estimate of arrival time based on current position and current speed.

Asset, Equipment, and Materials Management
Tracking material quantities allows system operators/managers to determine the appropriate amount of materials already loaded or to be loaded on maintenance vehicles. This system also tracks rate of material usage and amount of coverage possible based on remaining on-board material. The locations where materials are deployed or where activities such as plowing, mowing or road repair/maintenance are performed can be automatically geo-coded as maintenance vehicles respond. This information provides an accurate, historical log of all maintenance functions performed at any point within the network.

Keeping track of equipment necessary for maintenance functions can be done efficiently. The proposed Navigo GPS/AVL system has the capability to identify and document various pieces of maintenance equipment, facilities and roadside features. This system can be used to determine and document the location of existing maintenance equipment, facilities and a variety of roadside features. Maintenance personnel can view equipment inventory locations on-screen by type of equipment and region where equipment is stored. They can also easily identify equipment through the use and storage of maintenance equipment ID information.

Example unique inputs from snow plows:

- Plow position (up/down)
- Wing position (up/down)
- Under body position (up/down)
- Material Application(liquid/granular)
- Air Temperature
- Pavement temperature
- Odometer
- Fuel Mileage
- Total amount of material used
- Wind Direction
- Wind Speed

A number of these inputs can be added as future enhancements to the system; however, the ability to monitor over sixteen unique inputs to the data controller will allow for the expansion of the system as the City evaluates technology enhancements and operational requirements for the GPS/AVL System.

Environmental Conditions
Environmental conditions affect fleet operators and affect system performance. On-board systems that display the condition of the roadway on which the vehicle is traveling, show current weather conditions including wind speed and visibility (which greatly affect rate and flow of material dispersion upon the roadway and/or safety) or provide other real-time information for the operator are extremely valuable resources and available within the proposed Navigo GPS/AVL System.

System Architecture
The proposed NAVIGO GPS/AVL Fleet Management System includes an in vehicle device, connected to a data controller to collect in-vehicle, operational, and GPS data. This in vehicle device will have an interface with on-board diagnostics (OBD) which monitor engine operations through the vehicle bus. The in vehicle device will also connect to a vehicle data controller. This controller will monitor the specialized sensors on each of the state vehicles.

Alert Communications & Messaging

- Vehicle to Vehicle
- Vehicle to Center (Main Operations)
- Vehicle to Other (i.e., nearby devices, roadside DMS)
- Group Text Messages
- Individual Text Messages
- Blanket Alerts (i.e., Amber Alert)

Data Archiving and Reporting
System data can be archived and a number of reports can be customized to provide City management with accurate and up-to-date system performance statistics.

Reports that are standardized, including utilization, historical weather, roadway conditions, mileage, materials coverage, job completion and others, can be quickly accessed through existing report configurations. As necessary, City staff can use the user interface to select specific data and generate ad hoc reports at any time. City staff can interface directly to the database select specific data and generate specialized reports.

Power
Power for the data controller and the in-vehicle device are come from a power terminal. The additional power draw is not expected to be significant, however, separate fuses for installed GPS/AVL equipment is included. All in-vehicle devices being proposed are engineered to perform under extreme weather conditions and under normal rugged driving conditions while in operation. These in-vehicle units provide connectivity to all sensors and any external GPS antennas and/or equipment.

Communication System
The proposed City Navigo GPS/AVL Fleet Management System will communicate over a cellular data network. CDMA is the data service available over the Sprint wireless data service. The coverage area for CDMA covers the entirety of the City's operational footprint. A monthly fee is required for use of this service and is included in this proposal. Depending upon implementation the monthly fee will be contracted through the Sprint Corporation or Location Technologies, Inc. Location Technologies, Inc. is a certified Sprint Business Partner.

All data formats are the same between the different communication schemes. This allows the user to mix and match communication schemes across their fleet as appropriate.

LTI Hosting Services*
Location Technologies, Inc. Hosting Services utilize the Amazon Elastic Compute Cloud (Amazon EC2) web service to provide resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers. This web service interface allows for scaling, obtaining, and configuring capacity with minimal friction. It provides complete control of computing resources and operates on Amazon's proven computing environment. Amazon EC2 offers a highly reliable environment where replacement instances can be rapidly and predictably commissioned. The service runs within Amazon's proven network infrastructure and datacenters. The Amazon EC2 Service Level Agreement commitment is 99.95% availability for each Amazon EC2 Region.

Security
Amazon EC2 includes web service interfaces to configure firewall settings that control network access to and between groups of instances. When launching Amazon EC2 resources within Amazon Virtual Private Cloud (Amazon VPC), LTI can isolate instances by specifying the IP range, and connect to existing IT infrastructure using industry-standard encrypted IPsec VPN.

*Citation: **<** http://aws.amazon.com/ec2/ > **(accessed 11/3/ 2010).**

LT6 GPS/AVL Modem

The LT6 GPS/AVL AVL Modem is the backbone of the Navigo GPS/AVL Fleet Management System. Each vehicle to be monitored will utilize an LT6 AVL Modem device. GPS antenna options include a combo GPS/Cellular bulkhead mount antenna, mag-mount, and trunklip-mount antennas. The LT6 GPS/AVL Modem is capable of multiple and/or "dual" communication methodologies using either or both Cellular Data Network (GSM/CDMA), Bluetooth, WiFi (80211"x") technology, or passive 'log and dump' protocols to transmit accumulated AVL and operations data.

The LT6 is capable of monitoring and reporting a variety of analog and digital inputs. There are also up to four analog outputs available for remote control. This generic I/O capability is fully software configurable. Examples might include door lock control, ignition circuit defeat, light and emergency switch monitor, temperature, shock, and humidity. Standard interface packages are available for street maintenance vehicles such as plows, spreader, vacuum, and sweeper vehicles. Each AVL device may monitor up to 8 generic digital inputs. The 8 inputs may be used to trigger various events on the map. Digital inputs may be programmed to plot paths, display messages, mark spots on the map, or change the vehicles color. Six inputs may be used to monitor analog levels in the vehicle. An example would be battery voltage. Similar map actions as described for digital inputs are available when a given input drops below or rises above preset levels. Four remote controlled outputs are available to perform functions such as remote vehicle disable, flash lights, honk horn, unlock doors. All LTI GPS Modules use a state of the art SIRFIII high-sensitivity 20 Channel GPS receiver to ensure fast time-to-first-fix times and continuous tracking in the most challenging environments. The LT6 also hosts two RS-232 ports for connection to external peripherals such as laptop computers, text messaging terminals, and simple push button status heads. LTI offers laptop software for mobile data messaging, mobile mapping, remote database operation, LT MDT Mobile Data Terminal, and the LT MDC.

Physical Specifications:

Size: Extruded Aluminum Casing 5.5"x6"x1.5"
Power Requirements: 200mA at a 9-16VDC input
GPS Antenna Options: DualBand, trunklip, mag, bulkhead
Serial Interface: 2 RS-232 Msg. Slotting: Up to 62.5 mSec
Digital Inputs: 8 Analog Inputs: 6 Digital Outputs: 4

GPS System:

SIRFIII Chipset 20 parallel channels
RTC crash auto recovery 0.1 sec. reacquisition time
SBAS (WAAS, EGNOS, MSAS) support.
NMEA-0183 compliant protocol/custom protocol
Extremely fast TTFF at low signal levels

Garmin Navigation Device Integration

Several Garmin devices allow us to interface with them through their Fleet Management IO. This allows us to control in-vehicle guidance, multiple stop optimization, driver log-in and statusing, and generic messaging on these functional and economical devices.

LT Vehicle Diagnostic Bus Interface

LTI gives a standard list of possible parameters to monitor from vehicle maintenance bus setups including OBDII or J1708/1939 (heavy duty vehicles). Not all parameters will be available with all vehicle types.

- Throttle Position
- Road Speed
- Power Takeoff Status
- % Accelerator Pedal Position
- Fuel Level
- Average Fuel Rate
- Engine Speed
- Total Idle Hours
- Total Idle Fuel Used
- Total Vehicle Distance
- Total Vehicle Hours
- Total Engine Hours
- Instantaneous Fuel Rate
- Instantaneous Fuel Economy
- Average Fuel Economy
- Total PTO Hours
- Seatbelt Status
- Any Vehicle Maintenance Codes

LT Asset Tracking

Location Technologies, Inc. utilizes an asset tracking device designed to provide the user with a once per day daily locate. The device has been specifically engineered to update itself and then go back to sleep enabling this self contained battery powered device to last a minimum of 1 year without need to replace the battery. This device can be affixed to any asset, designed to provide intelligent monitoring of non-powered mobile and fixed assets. The Asset Tracker is a water resistant device, pursuant to the IP-66 code rating. This rating specifies that the device is protected against dust and high pressure jets of water.

Because it was designed to be installed exposed to the environment the GPS and Cellular antennas are completely integrated.

Spreader Controller Interface

Some Spreader Control Manufacturers require that certain components, modules, or keys be in place for data. For example the Force America Controller requires a key to enable data output. Certain Component Tech models require an additional add-on communication board. Other models may need firmware updates and/or calibration. If required prior to signing a contract we will inspect each of the vehicles to determine exactly what will be required for each of the controller types.

LT Plow Monitor

The LTI Blade Position Sensor is a rugged device for sensing blade position in winter road maintenance equipment. The Sensor has been specifically designed to survive the demanding environment of snow fighting and road surface treatment equipment. The heavy steel case is powder coated and the sensor is protected by a thick walled steel tube filled with potting compound.

Specifications:

Display Screen: 7 inch TFT LCD
Resolution: 800*4800 (1,152,000) pixels
Aspect ratio: 16:9
OS: Windows CE 5.0
CPU: Samsung S3C2410A,266 MHz
Memory: 64MB Flash ROM + 64 MB SDRAM
Data Storage: SD card/USB Flash memory
Expansion Slot: SD card, SD/IO (Up to 4GB)
USB 1.1(USB Host and Devide)
Internal Speaker: 1W
Working Temperature: -10 - +65 deg
Storage Temperature: -25- +80 deg

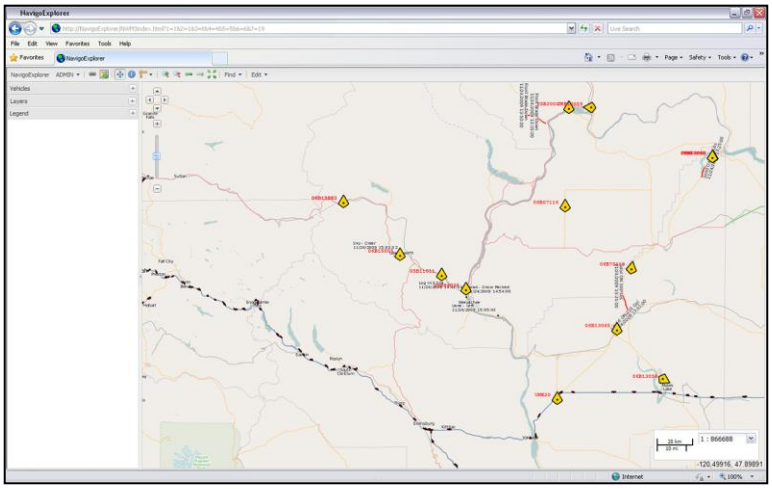
Key features:

7 inch TFT LCD with touchscreen
Windows CE 5.0 Operating System
External A/V Input
Memory with SD Card
2 USB Input
1 RS232 input
Earphone Output
Multi-language OSD

Power: AC/DC 12V Supp/Dir 12V dc
Dimension (mm): 188L*114W*35H

Mounting requires only two holes to be drilled into any mechanical surface that move angularly with the blade or on the blade itself. The sensor will require a minimum of 15˚ of movement between the up and down position of the blade to reliably indicate position. The adjustment slot provides 35˚ of adjustment, allowing the sensor to be mounted in a wide variety of locations and orientations.

Navigo Explorer WebMap Platform Software



The Navigo Explorer WebMap Platform includes standard map views that cover all of North America and allows you the ability to import your existing GIS information, often in its native format or using WMS. Like the Desktop Map vehicle position and status are displayed using colored icons with unique labels. On a periodic basis or on user command the map will refresh the position of the vehicle icons by refreshing its view of the vehicle position table maintained by the LT Wireless Data Server.

Our Navigo Explorer WebMap platform is available for user hosting or you may subscribe to our own internally hosted system. If you have data coming from a variety of device types or you have special archiving requirements or third party software interface requirements then we would suggest a user-hosted configuration. All two-way radio based systems must be user hosted.

Additionally, logging, replay, bread crumbing, and reporting options allow users to analyze every aspect of their fleets operations through analysis of the data logs. The ability to track and record status changes, switch closures, and sensor readings makes using the Navigo Explorer WebMap for reporting and analyzing your fleet's activities a very powerful tool. The Navigo Explorer WebMap provides all of the standard map features one would expect from a desktop mapping program including map display control tools (zoom, pan, etc.) along with vehicle display and reporting functionality.

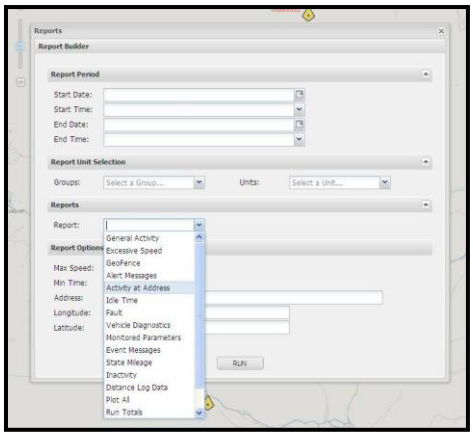
The Navigo Explorer WebMap Platform is user credential controlled and allows for administrator control over user groups for assigning user operation permissions and data views. All reporting and operations management functionality is controlled by individual and user group credentials that are defined by administrative (management) users. The LT Wireless Data Server allows for third party software integration.

Our LT Wireless Data Server may be easily configured for use with third-party software integration and third-party AVL devices. Once the packet format is defined a unique port will be configured to receive and process packets from the third-party device. LTI also produces a wide variety of AVL devices and have solutions for virtually all municipal operations.

Map Features

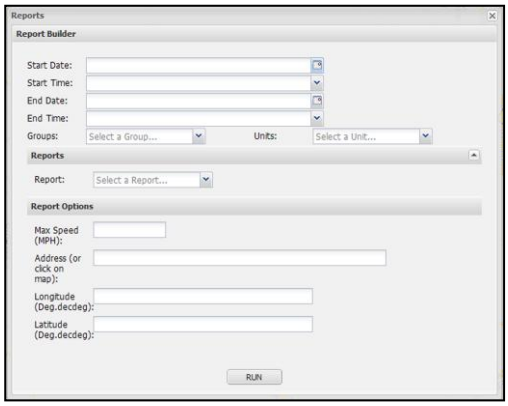
- Integrates with all GIS including WMS, and SQL Based Systems
- Path Length and Area Measurements
- Point or Interpolation Geocoding
- Path or Road Mile post Geocoding
- Snow and Sweeper Route Matching and Automatic Status Updates
- Public Facing Web Display Options for Street Maintenance During Snow Events
- Completely Browser Based – No software required on the desktop
- Dozens of pre-canned reports
- Ability to Schedule Reports to run automatically
- Fast Short-term History (24 Hour) Vehicle Activity Display
- Integration with NEXRAD Radar Products – Storm Reflectivity and Precipitation Amounts
- Integration with Fleet Management Package including Vehicle Diagnostic Bus, Mileage and fuel use tracking, scheduled and unscheduled maintenance tracking.
- Updated and improved SQL-based Wireless Data Server with new condition and event based engine for automatic monitoring and control of fleet activity.

Broad and Comprehensive Report Manager



Dozens of reports detailing all aspects of the fleets operation are available. Many can be scheduled to be run automatically.

Time and Distance Traveled in Region Report: This report will calculate the total time spent and distance traveled within in the specified region. If for example the user selects State as the region type then the program will compute the time and distance the a vehicle has traveled in each state the vehicle has entered for the specified time period.
General Activity Report: This option will report all activity for the selected vehicle over the specified time period.
Activity at an Address Report: This report will calculate and display the amount of time a given vehicle spends within a specified radius of the entered address. For example the user could find how long a specific unit spent within 0.25 miles of 100 Main St two days ago.
Time Between Status Changes: This report option will calculate and display the time between successive status changes over the specified time period for fleets.
Error or Fault Messages Report: Reports all fault messages received over the specified time period.
Excessive Speed Report: Reports all occurrences of exceeding the given speed. This is shown for each position update.



Idle Time Report: This report will show all instances when a vehicle remains idle for a specified period of time.
Inactivity Report: This report will show all instances when a vehicle has failed to send a message of any sort over a specified period of time.
Stop and Start Report: This report will show all instances of start and stop messages from a given vehicle or vehicles.
Digital and Analog Status Report: Shows the time, value, and location of all externally monitored analog and digital; inputs to the AVL Modem.

Reports may be viewed in text form or on the Map Display. The user may also opt to have the map reverse geocode the vehicle coordinates giving an address and closest intersection for each report element.

AVL Specific Mapping Operations

GeoFence
A geofence is a geographic area a user may define for reporting purposes. Along with defining the specific map area the user can also specify certain actions the map will take when a vehicle enters or departs from the geofenced area. These include map center and text message. Ten geofence areas may be loaded directly in the AVL Modem. The modem will then automatically send an arrival and departure message when entering or leaving the programmed areas. These are especially useful for fixed locations that your vehicles return to such as parking areas, fueling, dumping, remote staging, or office locations.

Analog/Digital Input Monitoring
Each AVL device may monitor up to eight digital and six analog inputs. These generic inputs may be used to trigger various events on the map. For instance a digital input may be tied to a hydraulic pressure switch that indicates the up or down position of a snow remove blade. When the blade is down the system could be set to plot a blue path behind the vehicle. This would indicate that the path had been plowed. Digital inputs may be programmed to plot paths, display messages, mark spots on the map, or change the vehicles color. Analog inputs may be used to monitor analog levels in the vehicle. An example would be battery voltage. Similar map actions as described for digital inputs are available when a given input drops below or rises above preset levels.

Closest Vehicle Request
A simple point and click closest vehicle function is available that provides and ordered list of all vehicles closest to an indicated point on the map.

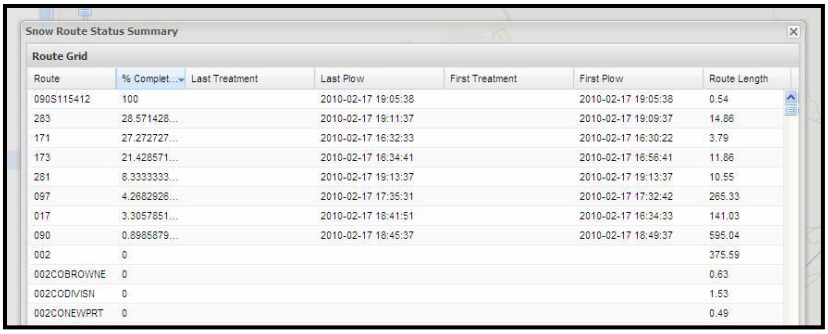
Map Follow
Any vehicle maybe selected for Map Follow, which forces the map to redraw on each position update from the specified vehicle. This keeps the vehicle in view at all times without requiring any interaction by the map user.

AVL Modem Commands
A variety of commands are available to the user to request information or force certain operating conditions on the AVL Modems. These include position polling, log downloads, remote turn off, and stop transmission requests to name a few.

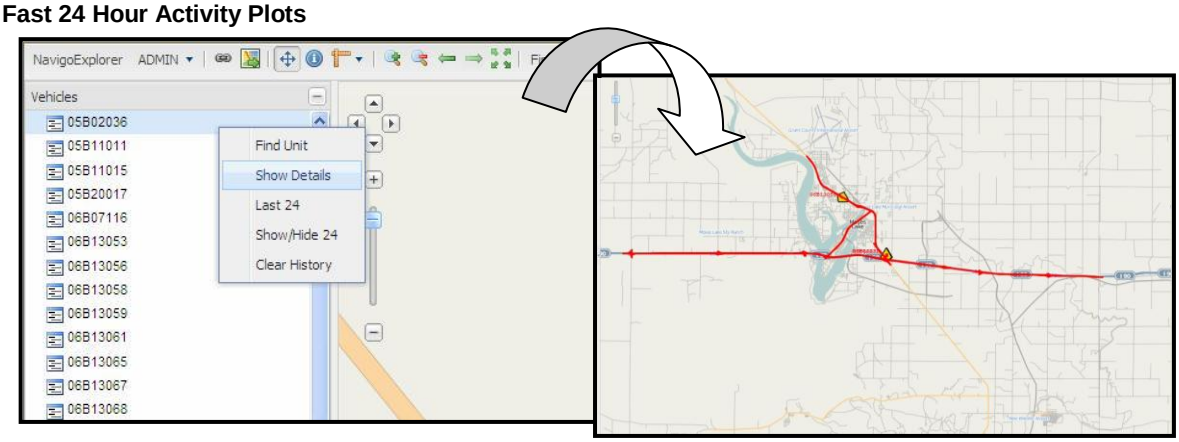
In-Modem Coordinates
Up to 10 coordinates may be programmed into each modem that will cause the modem to automatically generate arrive at and depart from messages for each location. These should be set for fixed locations in your operating area. Examples include landfills, fuel locations, jails, hospitals, garage, parking lot, material storage facilities, etc. All arrival and departure messages are logged to allow you to run 'dwell time' reports at each location (time between arrival and departure).

Intuitive Data Display Options

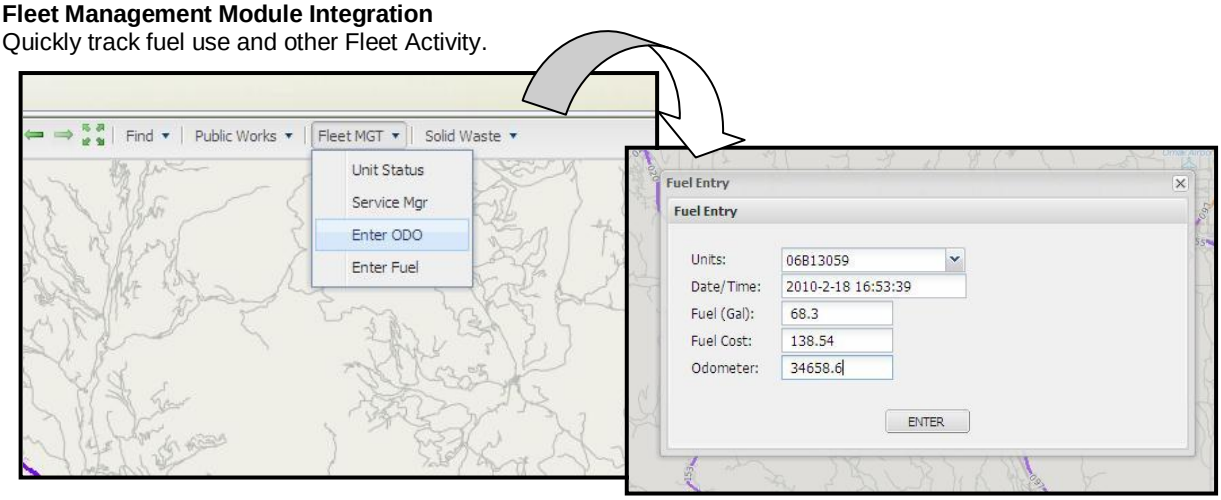
A Grid option is also available to view the percent completion of all routes in your area of responsibility.



Fast 24 Hour Activity Plots



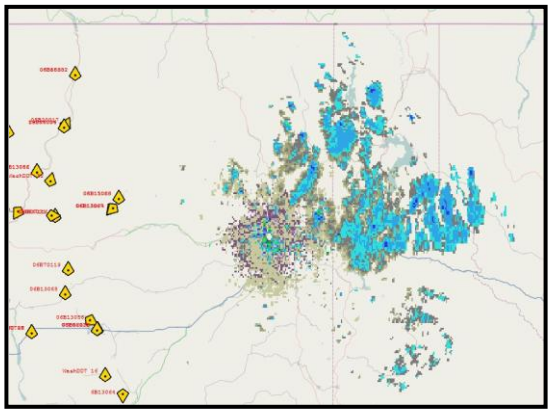
Fleet Management Module Integration
Quickly track fuel use and other Fleet Activity.



Integration with RWIS and Weather Radar products

The Navigo Explorer WebMap platform also allows for the overlay of commercial aerial imagery and real time weather information. You will be able to see your vehicle positions on top of images and street lines. This includes NEXRAD weather RADAR information.

Quickly display Storm intensities and Precipitation totals. Also shows all Weather Service produced Watch and Warning Boxes



Integration with Application Specific Modules
These include Public Works, Solid Waste Management, Transit Systems, Public Safety, Public Utility, and Work Order Management Systems.

Integration includes special handling of vehicle activities unique to the application. For example in the transit package the server automatically tracks the route compliance and ETA's to all scheduled stops for Fixed Route Bus fleets. The Solid Waste Package will track and display route exceptions such as can-not-out or yard waste in can and will assign and manage special pickup activity. Landfill activities are also tracked.

The work order package interfaces to in-vehicle personal navigation devices in the GARMIN line to allow for in-vehicle stop ordering, driver guidance, text messaging through the device, and stop ETA management.

SQL Based Wireless Data Server and Event Engine
The new LTWDS can utilize MS-SQL or the economical open-sourced MySQL.

Event Engine
The Event Engine will monitor all specified vehicle activities and take predefined actions based on the condition of the monitored activity. Conditions are defined for each vehicle and one or several events may be taken based on the condition.

Current Defined Conditions and Monitored Activity

- Engine On/Off
- Vehicle Start/Stop
- Equipment Fault
- Digital Input On/Off
- Analog Input On/Off
- Status Message Receipt
- In/Out of Geofenced Area
- On/Off Route
- Spreader ON/Off and rate
- Blade Up/Down
- Broom On/Off
- PTO On/Off
- Vehicle Speed
- Impact/Hard Brake
- Panic Switch
- Lights On
- Alarm On/Off
- Seatbelt
- Door Open
- Driver Log In/Out
- Text Message Received
- ETA Message Received
- Stop Order Message Received
- Painter On/Off
- Mower On/Off
- Sealer On/Off
- Sprayer On/Off
- Position Mark
- Vacuum On/Off
- Hopper Dump
- Hose Feedout Length
- Pump On
- Road or Air Temperature
- Wind Speed/Direction
- Compactor On/Off
- Pickup arm extend
- Siren/Lights On/Off
- Tilt Sensor
- In/Out of State Boundaries
- RFID Scans
- Passenger In/Out
- Arrive/Depart from one of 10 Home Coordinates
- Operation outside of prescribed Operating Times
- Engine Fault Message from Engine Diagnostic Bus
- Inactivity over a prescribed time period

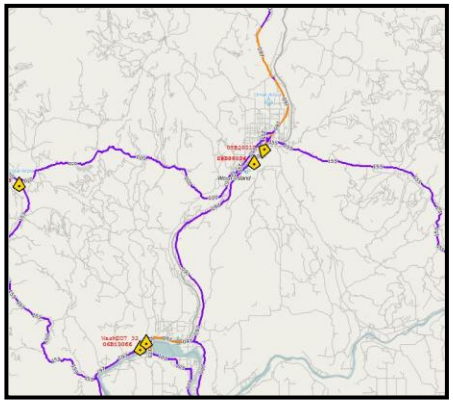
Defined Actions That May Be Taken On Any Of The Above Conditions

- Log Event
- Send an Email
- Send an SMS
- Plot Point
- Change Unit Symbol Color,
- Clear Output
- Query In-Modem Log
- Write out file
- Start Path
- Run Report and Email
- Disable a Vehicle
- Enable a Vehicle
- RouteUpdate-Solid Spread-Active
- RouteUpdate-liquid Spread-Active
- Clear In-Modem Log
- Poll Unit
- Hide Unit
- Unhide Unit
- Arm Alarm
- RouteUpdate-Reserved1-Active
- RouteUpdate-Reserved2-Active

- Start In-Modem Log
- Stop In-Modem Log
- Set Vehicle Output On – uses one of the 6 outputs available on each mode
- RouteUpdate-Blade-Active
- RouteUpdate-Sweeper-Active
- RouteUpdate-Reserved3-Active
- RouteUpdate-Reserved4-Active

Navigo Explorer WebMap and Public Works

With the Public Works option the user is able to monitor Route-based operations commonly performed. The Navigo Explorer will require a user supplied GIS layer that describes the operating routes. The Server software will then match Vehicle location to route line segments. The line segment will be updated with the time and activity of the vehicle. A range of colors are then assigned to each line segment to display the relative time since the last activity was performed on a given segment. Four colors are assigned to represent 0 – 6 Hours, 6 – 18 Hours, 18 – 24 Hours, and over 24 Hours. A fifth color is used to display the default or 'untouched' state.



For route based operations the Navigo Explorer will track monitored operating, atmospheric, and vehicle conditions. The server will automatically match the vehicles location to the nearest route segment when any of the monitored conditions listed above are active. The segment will be updated with the date and time and the condition of the monitored input. As vehicle and field events progress and operations are performed the Server will continually update the Route Layer database with current treatment times and amounts. To update the Map View with current Route Status the operator should select the Update Route item from the menu. The route display may be toggled off and on using a checkbox.

Using the Route Summary menu item will open a window showing all Routes. A column showing percent completion indicates the percentage of road segments have been treated for a given route. Segment completion is indicated by a valid Time and Date assigned to a segment. Material usage totals, distances travelled, and fuel usage may be reported using the ADMIN-Reports menu item and running the appropriate report from the Report Builder window.

Sweepers
All of the various brooms on a sweeper may be monitored for On/Off Status. The dumping of the hopper may also be monitored. If a sweeper route map layer is provided the user may use the automatic route matching functionality to track the completion status of each route. Specific Routes travelled and Hopper Dump Locations may be displayed using the Reports Builder.

Paint Trucks
On/Off Status of the Sprayer may be monitored on Paint Trucks. The path and distance travelled while spraying may be displayed using the Report Builder.

Weed Spraying
On/Off Status of the Sprayer may be monitored on Weed Control Trucks. The path and distance travelled while spraying may be displayed using the Report Builder.

Chipper/Sealers, Graders
On/Off Status of the Sealer Equipment and Graders may be monitored on the vehicles. The path and distance travelled while spraying may be displayed using the Report Builder.

Sanitary/Storm Sewer Maintenance
Hose feed out lengths may be monitored on vehicles along with pump status.

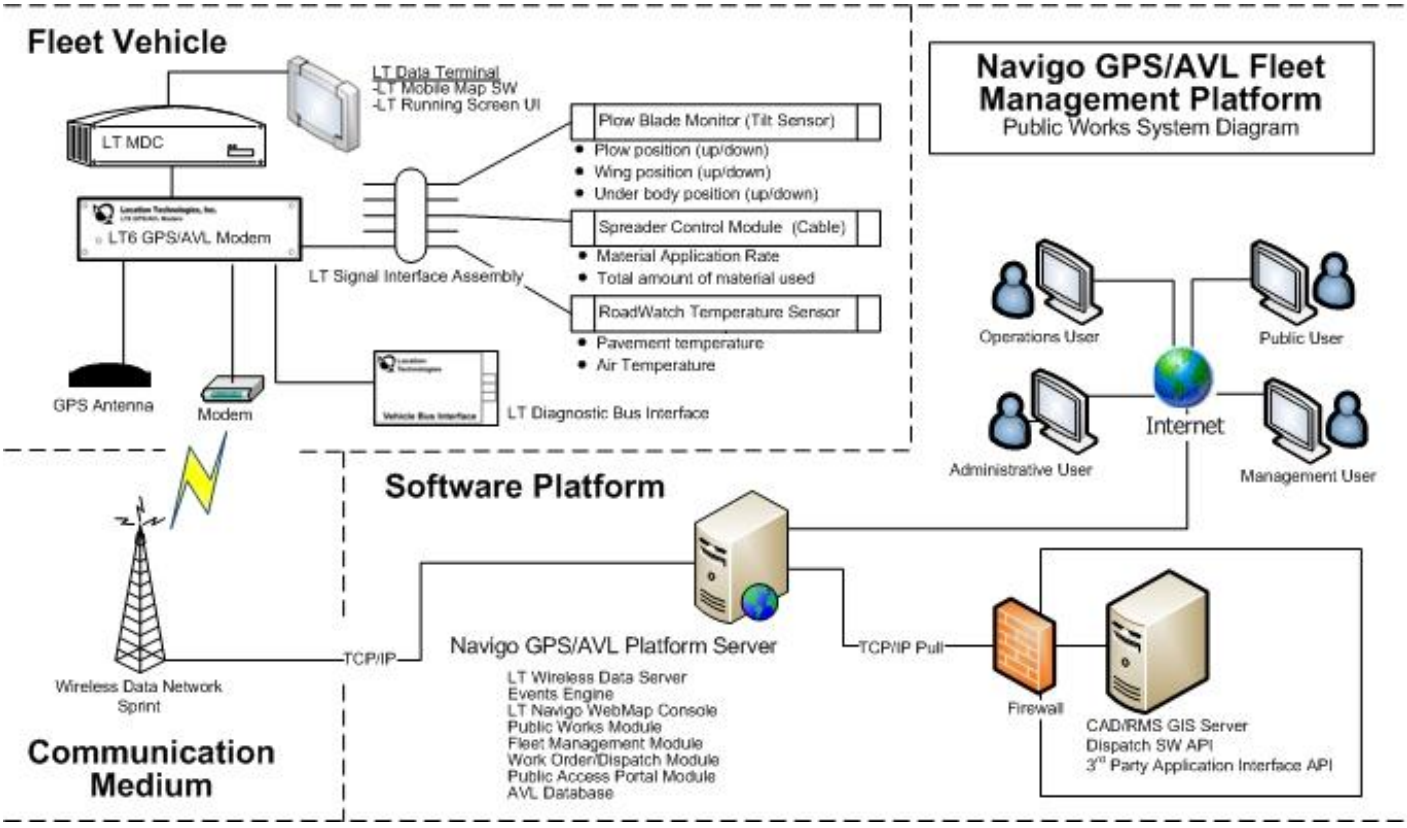
Public Safety
In the field of public safety, efficiency and performance translate to the safety and well-being of those you serve. Sheriffs, Chiefs, and Directors responsible for public safety depend on Location Technologies for accurate, detailed information that promotes quick assessment and action. With Intelligent Fleet Management and dispatch solutions from Location Technologies, public safety professionals leverage real-time intelligence on the operational efforts of the organization.

Our unique versatility and experience with operations of all shapes and sizes enables us to customize solutions for your unique needs. With a Location Technologies solution integrated seamlessly into your operation, you gain a level of awareness and flexibility that delivers safer, more efficient performance by empowering you and your public safety

professionals to deliver your very best. E911 support is available on Public Safety GPS/AVL Fleet Management systems implementing the LT 911 Server software. Computer Aided Dispatch (CAD) integration is available for certain 3rd party dispatching systems

Fleet Management
Vehicles equipped with our optional OBD interface can monitor all engine diagnostic information including engine fault codes as they appear. OBD data is polled on command or is automatically sent each time an engine fault occurs. We support the OBDII standard found on all cars and light trucks and the J1708 and J1939 standard used in heavy trucks, buses, and equipment. The Fleet Manager Package allows for the complete management of all scheduled and unscheduled service and repairs, tracks personnel, materials, and suppliers, and is also a browser-based application requiring no software to be loaded on the users workstation.

System Diagram



Implementation

Project Plan Development
Upon award of contract Location Technologies, Inc. (LTI) Project Managers will work closely with City Management on a jointly developed Project Plan Document. The LTI Project Manager will attend scheduled meetings during normal City business hours, Monday through Friday. LTI Project Managers are also available for online webinar meetings at the discretion of the City.

Software Configuration
Configuration of the Navigo Explorer WebMap Platform for the City GPS/AVL Fleet Management System is comprised of three interconnected tasks. These tasks are described below:

Load City GIS/Map data
LTI Project Managers will engage with the City Management Team and GIS Department to determine what Map Projections and Layers will be made available to the Navigo AVL System.

Load City vehicle and operations data
LTI Project Managers will engage with the City Operations and Fleet Management Team to acquire all necessary vehicle and operations data.

Configure City user/group credentials for Navigo AVL System access/functionality
LTI Project Managers will engage with the City Operations Management Team to determine the appropriate user/group credentials configurations for City staff.

System Report Configuration and Development
LTI Project Managers will engage with the City Operations Management and Fleet Management Team to set-up and configure system reports as identified in the mandatory requirements.

Software and Hardware Testing
LTI Project Managers will demonstrate that the GPS/AVL Fleet Management System successfully meets City business requirements using a City supplied test plan. LTI will remediate any critical or blocking issues before the System goes into full production.

Acceptance Field Testing
City end-users will conduct field testing the production GPS hardware and software solution noting any issues. LTI has read and understands its requirement to remediate any critical or blocking issues before the system is accepted.

Systems Documentation
LTI Project Managers will deliver a complete set of technical and end-user system documentation in electronic format to the City Operations Management and Fleet Management Teams.

Project Team
Location Technologies, Inc. (LTI) is organized in a traditional functional matrix fashion where individual project and product managers may pull on resources from the functional groups. In the event of the loss of key employee(s) LTI is sufficiently staffed and experienced to continue successful completion of work and obligations as stated in the negotiated contract.

Project Manager
Eric Cowger
Parkville, MO
P: (816)741-3169 x110
ecowger@loctech.com

Engineering Manager
Glenn Courtney
Parkville, MO
P: (816)741-3169 x111
gcourtney@loctech.com

Project Support
Benton Grayson
Parkville, MO
P: (816)741-3169 x120
bgrayson@loctech.com

Engineering Support
Fern Tsukada
Parkville, MO
P: (816)741-3169 x112
ftsukada@loctech.com

Mike Cowger
Parkville, MO
P: (816)741-3169 x125
mcowger@loctech.com

Chris Cowger
Parkville, MO
P: (816)741-3169 x113
ccowger@loctech.com

Support
Warranty, maintenance, and support is comprehensive, responsive, and benefits the City upon implementation and into the future. The vendor should describe how software maintenance and support is provided. Location Technologies provides technical and information technology support by phone Monday – Saturday 8:00am – 5:00pm CST and 24/7 support by email. Response time and escalation procedures are variable dependent upon support necessities. Software updates and upgrades are released as they become available. Software updates are available for download with an internet connection or can be shipped in CD/DVD-ROM format via US Mail or UPS/FedEx. The LT6 CDMA GPS/AVL Modem has many over-the-air programmable features as well as Ethernet/serial connectivity options for programming with our AVLCon software.

Training

All training sessions will be presented by Location Technologies, Inc. support and education specialists. Initial training programs will include hardware installation, hardware maintenance, software operations and software maintenance. These training sessions include onsite training for managers, dispatchers, operators and all support personnel and encompass all aspects of system use and maintenance.

Vehicle Hardware Maintenance and Installation Training
LTI Project Managers will engage the City Fleet Management Team to determine a feasible schedule and work plan for vehicle hardware installation training. Typical vehicle installations take one to two hours per vehicle depending upon location, vehicle, additional interface installation, and personnel availability.

Installation: LT Mobile Data Terminal GPS/AVL Unit
Location: On-Site Duration: 60-120 minutes per vehicle*

Navigo User Training
LTI Project Managers will engage the City Operations Management and Fleet Management Teams to determine a feasible schedule for systems training. All training sessions will be presented by Location Technologies, Inc. support and education specialists. Initial training programs will include hardware installation and maintenance, software operations and software maintenance. These training sessions include onsite training for managers, dispatchers, operators and all support personnel and encompass all aspects of system use and maintenance.

Course: Training for Navigo Explorer WebMap Platform Management Users
Learner: Dispatch User; Management User
Location: On-Site Duration: 2-3 hours*

Course: Training for LTI Navigo Mobile Map and Operations Users
Learner: Fleet Maintenance Personnel; Fleet Operations User
Location: On-Site Duration: 2-3 hours*

Cost Breakdown

Upfront Hardware Costs
Public Works Vehicle

Qty	Item	Description	Unit	Total
15	LT6 GPS/AVL Modem	Cellular Modem, Incl. 1yr Warranty	425.00	6,375.00
15	Cabling/Antennas	Combo GPS/Cellular, Mag-mount	55.00	825.00
28	LT Plow Monitor	HW & Cabling	59.00	1,652.00
4	LT Spreader Interface	HW & Cabling	65.00	260.00
15	LT Diagnostic Bus Interface	HW & Cabling (optional, not incl. in total)	325.00	4,875.00
		Public Works Vehicle Hardware Total		**$ 9,112.00**

Recurring Monthly Costs
Monthly Per Vehicle Costs

Qty	Item	Description	Unit	Total
15	Navigo Unit Subscription	1.65 per vehicle/month	1.65	24.75
15	Wireless Data Plan	10.99 per vehicle/month	10.99	164.85
		Monthly Per Vehicle Costs Total		**$ 189.60**

Monthly Per Account Costs

Qty	Item	Description	Unit	Total
1	LT Hosting Service		35.00	35.00
1	Public Works Module		35.00	35.00
1	Fleet Manager Module	(Diagnostic Bus option only, not incl. in total)	35.00	35.00
		Monthly Per Account Costs Total		**$ 70.00**

Professional Services

Qty	Item	Description	Unit	Total
1	User Training	On-site, unlimited attendance	1,250.00	1,250.00
1	HW Maint. & Install. Training	On-site, unlimited attendance	1,250.00	1,250.00
15	Ext. LT6 12month Warranty	Annual, per device (After 1st year)	30.00	450.00

Location Technologies, Inc. 12 Month Limited Warranty and Disclaimer

Limited Warranty
Location Technologies, Inc. (LTI) warrants all hardware products to be free from defective material and workmanship for a period of one (1) year from the original ship date from our factory. LTI agrees to repair or replace, at our sole discretion, a defective device that has been returned to LTI within the warranty period and has a proper RMA.

If service is required under this warranty:

1. Call 816-741-3169 or email: service@loctech.com to receive an RMA number. This number must be prominently displayed on the return box and on any shipping documents.

2. Send the device postage prepaid to the address listed below.

Note: All returned devices must be shipped in a static free container. This may be a static free bag within a regular cardboard box. The warranty may be immediately voided if the device is not protected from static discharge during shipping.

3. Location Technologies, Inc is not responsible for shipping damage.

This warranty does not extend to any LTI products that have been subject to misuse, neglect, accident, incorrect wiring, improper use, violation of instructions or operating parameters, damage caused by connected equipment, nor does the warranty extend to any units that have been altered or repaired by anyone other than LTI.

Limitation of Liability and Disclaimer
In no way shall LTI be liable for any loss, damage, fire, explosion, injury, including any incidental or consequential damages, or death as a result of operating and/or installing any LTI products.

ALL PRODUCTS SUPPLIED BY LOCATION TECHNOLOGIES, INC. ARE "AS IS" AND WITHOUT WARRANTIES EXPRESS OR IMPLIED. LTI DISCLAIMS ALL WARRANTIES INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. LTI DOES NOT WARRANT THAT FUNCTIONS AND FEATURES CONTAINED IN OUR PRODUCTS WILL BE UNINTERUPPTED OR ERROR-FREE, THAT DEFECTS WILL BE CORRECTED. LTI DOES NOT WARRANT OR REPRESENT THE USE OF OUR PRODUCTS IN TERMS OF THEIR CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE.

For further information regarding product warranties and return procedures please contact us at -

Location Technologies, Inc
Service Dept.
6214 NW Kelly Drive
Parkville, MO 64152
1-816-741-3169
support@loctech.com

Location Technologies, Inc.
Standard Terms and Conditions

Hardware and Network Requirements:

Please note the following minimum PC hardware requirements for our Software Products. LTI products will work over Windows NT or Novell networks running TCP/IP.

PC's must be a Pentium class machine with a minimum of 400 MHz processor speed, 128 Mb (256Meg recommended) RAM, at least one open serial port and a minimum of 1 Gb free space on a fixed disk drive. The operating system should be Windows '9X, Windows 2000 or Windows NT Workstation version 4.0.

Payment Terms:

Software Purchases

Payment terms from LTI are net 30 days from date of shipment subject to credit approval. Purchases made from licensed distributors of LTI's products are subject to the distributors payment terms.

On-site Installation / Engineering / Training

Payment for services must be made net 30 days from the date of service. Expenses, including travel, lodging and meals will be billed.

Past Due Accounts

Past due accounts are subject to a surcharge of 1.5% per month. Past due services invoices will result in technical support services being suspended.

Acceptance of Products:

Opened software cannot be returned. Hardware products may not be returned except for repair. **You must request an RMA from LTI prior to returning any item** for restock or repair. A 15% restocking fee is required and no returns will be accepted after 30 days from date of shipment. Product acceptance is indicated by accepting delivery from your requested shipper unless otherwise provided for in a separate written agreement.

Training:

LTI will provide training as arranged per each individual contract. We follow a "train the trainer" format and require that all personnel receiving training have a familiarity with the Windows operating system.

Licensing:

All software products are licensed for use on a single machine only unless otherwise specified by written agreement.

Our Liability:

Location Technologies, Inc. is only responsible for the repair or replacement of our hardware products under the terms of the attached warranty document. Specifically, LTI is not responsible and shall be held harmless for the consequential damage or injury of any attached or associated equipment, property, or persons which may be associated with the use of our products.