**DRAFT**
**Portable Non-Intrusive Traffic Detection System**

**Work Plan**
Revised January 27, 2003

This document presents a work plan for the development and test of a Portable Non-Intrusive Traffic Detection System (PNITDS). Many metropolitan areas have high-volume roadways that make the placement of conventional detectors not only difficult, but also unsafe for personnel. Non-intrusive technologies offer an alternative to conventional traffic data collectors, such as road tubes, by detecting traffic above or to the side of the roadway. A PNITDS system can monitor traffic on multi-lane, high volume facilities without exposing personnel to traffic.

The desire for safe, accurate and cost-effective portable traffic counters has led to the proposed initiative. The PNITDS project utilizes the experience and facilities that the Minnesota Department of Transportation and SRF Consulting Group, Inc. have acquired through previous evaluations of Non-Intrusive Technologies (NIT Project Phases I and II). Mn/DOT will make the NIT field test site at I-394 and Penn Avenue available for this project, providing a cost-effective platform for conducting continued research. SRF has been identified to conduct the study given their experience with previous phases of the NIT project.

The research facility first developed for the NIT project features a 10-foot by 20-foot environmentally controlled equipment shelter overlooking Interstate 394 in Minneapolis, Minnesota. The test site includes a catwalk over all three lanes of eastbound 394 and an adjustable tower for mounting sidefire devices. Refer to the project website for more information on this facility – http://projects.dot.state.mn.us/nit. This test site will provide an ideal location to develop and test a temporary count station.

The project will document prior PNITDS efforts conducted in Virginia, New York and Minnesota, prepare a detailed design specification for a portable system, and conduct field tests with a variety of sensors. The goal of the proposed project is to provide data collection practitioners with a cost-effective design of a PNITDS system and an independent assessment of a variety of detection technologies.

Specific tasks included in the Draft Work Plan are provided below. A Final Work Plan will be prepared based on budget available for the project.

## 1. Research Existing Portable Systems

- Several states have developed portable stations that are used to collect traffic data for temporary volume counts and speed studies. This task will involve contacting representatives from Virginia, New York and Minnesota to document how their systems were built and what experiences they have encountered. Any other agencies that have developed similar portable systems will also be contacted.

## 2. Design Portable System

- In this task a PNITDS system will be designed by taking into account the best features of prior efforts to develop portable stations. Since previous efforts have not been documented in enough detail to allow other agencies to easily replicate their approach, the PNITDS system will be documented in sufficient detail to allow agencies to release the specifications for bidding by a contractor or fabricate internally.
- The portable system will be designed to be flexible for installation in a variety of mounting configurations. The following will be accommodated:
    - Sidefire installations
    - Solar powered
    - Battery powered

## 3. Field Evaluation

- Build a portable system according to the design specifications.
- Write an *Evaluation Test Plan* to layout the approach for testing the portable system and sensors.
- Contact vendors and participating agencies to see if they would be willing to loan a van or trailer with a telescoping pole to serve as a portable test platform.
- Contact vendors and procure non-intrusive sensors for participation in the test. Participating agencies will be asked to loan any available sensors to the project for evaluation. By evaluating these sensors the agency has the opportunity to learn more about a sensor they already have some experience with. Vendors will also be contacted to request they loan sensors to the project for evaluation.
- Update sensors procured in previous NIT project phases.
- Maintain an updated list of sensors on the project website. Specific information about each sensor and vendor will be provided.
- Install and calibrate sensors.
- Maintain the data acquisition system developed for Phase II of the NIT project. Note: customized software will not be needed for this project. Previous project phases have revealed that sensors either provide their own software or provide outputs that are easily captured with off-the-shelf data collection equipment.
- Collect and analyze data under the following scenarios:
    - Varying mounting heights
    - Varying distances from roadway
    - Varying traffic levels
    - Varying weather conditions
    - Bicycle and pedestrian detection
    - Multi-lane
    - Single-lane
    - Attachment to existing roadside infrastructure
    - Attachment to van or trailer with telescoping pole
    - Bicycle/pedestrian detection

Note: the number of scenarios tested will depend on the budget available for the project. Scope of test may be revised depending on final budget available.

## 4. Report Results

- *Application Guidelines* will be developed to demonstrate how the portable system can be applied to real-world applications. The guidelines will assist transportation agencies in selecting detection techniques and mounting locations for specific needs. The guidelines will consider that more than one type of hardware configuration might be appropriate depending on the existing roadside infrastructure and the sensor being used. The *Application Guidelines* will include the following elements:
    - Where to install the portable system for most effective detection (i.e. distance from roadway)
    - How to take advantage of existing roadside infrastructure (i.e. roadside signs)
    - Feasibility of mounting in overhead locations (i.e. freeway sign structures)
    - Crash-worthiness concerns
    - Pros and cons of different sensors
    - Pros and cons of battery, solar or AC power supplies (i.e. how long will solar power run system)
    - Pros and cons of mounting to existing roadside infrastructure versus a van or trailer with a telescoping pole.
    - Ease of installation, maintenance and operation.
    - System costs, including all components and sensors
    - Considerations for use in specific applications
        - Urban interstate
        - Urban principal arterial
        - Major intersections
        - Rural interstate with more than 4-lanes
        - Work zones
        - Bicycle and pedestrian detection
- Post all results on project website – http://projects.dot.state.mn.us/nit
- Publish articles in appropriate trade journals
- Prepare paper and present findings at the 2004 North American Travel Monitoring Exhibition and Conference (NATMEC).

## 5. Traveling Demonstration

Mn/DOT and SRF will put together a traveling demonstration to bring the PNITDS system to participating agencies. The demonstration will be conducted with a van containing the PNITDS system and several non-intrusive sensors. The demonstration will allow participating states to have their data collection personnel attend and gain first hand experience with the system operation.

**Schedule**

| Task | Date |
|---|---|
| 1. Research Existing Portable Systems | March to April 2003 |
| 2. Design PNITDS | May to June 2003 |
| 3. Field Evaluation | July to December 2003 |
| 4. Report Results | January to February 2004 |
| 5. Traveling Demonstration | March to May 2004 |

## Budget Estimate

| Task | Description | Estimated Cost |
|---|---|---|
| 1. Research Existing Portable Systems | Contact other states and document findings | $5,000 |
| | Present findings at kickoff meeting | $1,000 |
| 2. Design Portable System | Prepare detailed design specifications | $12,000 |
| | Present design at interim meeting | $1,000 |
| 3. Field Evaluation | Procure sensors (1) | $10,000 |
| | Fabricate portable system | |
| | o Materials (pole, brackets, battery, solar panel, data collector, case, cables) | $3,000 |
| | o Component integration | $3,000 |
| | Write evaluation test plan | $5,000 |
| | Data acquisition system | $8,500 |
| | Install and calibrate sensors (2) | $40,000 |
| | Collect and analyze data (2) | $30,000 |
| 4. Report Results | Prepare application guidelines | $15,000 |
| | Present findings at final meeting | $1,000 |
| | Prepare paper and present findings at NATMEC 2004 | $3,500 |
| 5. Traveling Demonstration | Traveling demonstration for each participating agency | $35,000 |
| Other Expenses | Travel expenses for participating agency visits (3) | $27,000 |
| **Total** | | **$200,000** |

Assumptions:

(1) Cost of procuring sensors is dependent on number and type of sensor. Sensors costs range from approximately $1,000 to $10,000. Final cost will depend on the ability of pooled fund participants to provide sensors for the project and the number of vendors that will loan sensors. Includes cost to upgrade existing sensors.

(2) Field test expenses are dependent on number of test scenarios performed. Costs will be higher if all weather and mounting configurations are evaluated, if bicycle and pedestrian tests are performed, and if tested on a van/trailer with telescoping pole.

(3) Each participating agency will be reimbursed for travel related expenses for one representative to make two trips to Minnesota. Cost indicated assumes 15 agencies will participate.