Methodology User Guide

Welcome to the Low-Cost Improvement Analysis Tool (LCIAT)

This document is a guide to using the methodology for identifying and evaluating low-cost capital, operational, and regulatory actions to address freight mobility constraints for the primary modes: highway, rail, and deepwater ports/inland waterway. This User Guide is designed to help you use the Low-Cost Improvement Analysis Tool (LCIAT). The guide describes how the model works, and how you can use it to accomplish your objectives.

The Analysis Tool

Freight mobility is constrained not only by physical infrastructure inadequacies but also by operational, regulatory, policy, technological, and financial limitations. Federal, state, and local transportation agencies' ability to invest in system expansion and new system technology has been significantly constrained by inadequate revenue. There are opportunities to increase the capacity of existing freight networks through innovative operational strategies, performance-improving regulatory and policy changes, and low-cost capital improvements. These factors have significantly increased interest in addressing freight mobility constraints through implementation of low-cost physical, operational, and regulatory improvements.

The methodology developed in this project provides a structured approach to analyze freight mobility constraints and identify appropriate low-cost improvements that can be quickly implemented. The methodology considers highway, rail, and water modes of freight movement. The methodology is encapsulated in a software application tool designed to help private- and public-sector decision makers to identify, categorize, and evaluate quickly implementable, low-cost capital, operational, and regulatory (or public policy) actions to reduce mobility constraints in the freight transportation system.

Definition of Freight Mobility Constraint

In this methodology, a freight mobility constraint is generally defined as:

> a physical or infrastructure deficiency, regulatory requirement (Federal, state, or local), or operational action that impedes or restricts the free flow of freight either at the network level or at a specific location.

Mobility constraints increase costs, contribute to system inefficiencies, and delay on-time freight delivery. Examples of the three types of constraints are:

- *Physical Constraints*—inadequate capacity of the transportation system (e.g., mainlines, interchanges, port terminal connectors, rail sidings); geometric restrictions or limitations affecting efficient mobility
- *Operational Constraints*—events or occurrences that constrain legal operating speeds; poor signal phasing; terminal switching inefficiency; restricted terminal gate operating hours; inadequate traveler information
- *Regulatory Constraints*—safety and security requirements; truck restrictions; land use controls that restrict facility expansion; air quality requirements; labor contractual limitations.

Criteria for Low-Cost Improvements

A low-cost improvement that can be implemented quickly is:

> An action that modifies existing geometry and/or operational features of the freight transportation system and that can be implemented within a short period of time without extended disruption to traffic flow. Such an improvement may be physical, operational, or regulatory, as long as it enables greater throughput from existing facilities. These actions may be spot (location-specific) improvements or may be limited to short sections of the physical infrastructure. They may be specific to a given supply chain process point, regulation, or mode; they may also affect multiple modes of freight movement. Low-cost improvements do not involve massive reconstruction of infrastructure that usually takes many years to complete.

Key features of the criteria are summarized below.

Key features of low-cost and quickly implementable improvements.

Mode	Characteristics of Low-Cost Actions	Quickly Implementable
Highway	• Less than $1 million • Spot or location-specific improvements • No environmental clearances necessary • No right-of-way acquisition • No special programming required • Implementation at district lowest operation unit level (limited direct HQ oversight)	Less than 1 year
Rail	• Class I railroad – $1 million to $10 million	Less than 2 years
	• Regional railroad – less than $2 million	Less than 1 year
	• Short-line railroad – less than $500,000	Less than 6 months
Deepwater Ports & Inland Waterways	• Less than $1 million • Essentially incentive-based programs to influence demand and changes in operational practices, and technology deployments • Physical improvements coordinated with highway and rail projects within and outside the port terminals at links serving ports – location-specific actions • Uniqueness of each port acknowledged	Less than 2 years

Framework of Methodology

The methodology is designed to be a simple application tool where decision makers make selections to define the constraint and select possible actions to address it based on previously implemented improvements elsewhere. The user can review the characteristics of examples where the actions had been implemented or proposed. Examples are intended to validate improvements and to guide users in making suitable selections. The methodology is designed to be data driven where the database of implemented improvements can be updated and expanded as new project information becomes available. The overall framework of the methodology is depicted in Figure 1.

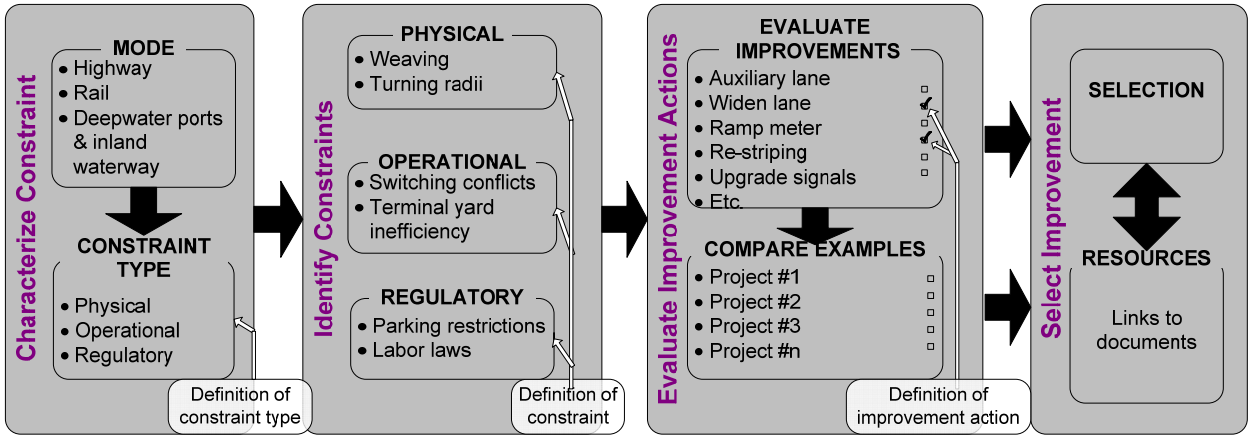

Figure 1. Framework of the Methodology

About this Program

LCIAT is a Microsoft® Windows application that allows the user to characterize freight mobility constraints on the highway, rail, or deepwater ports and inland waterway modal systems and select suitable low-cost improvements to address them. Figure 2 shows the flash screen of the program.

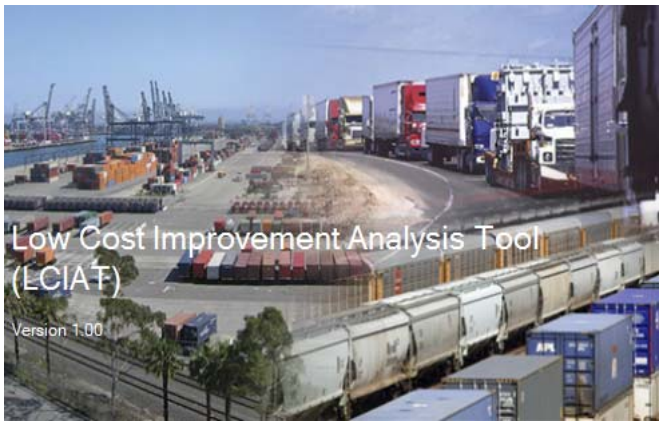

Figure 2. LCIAT flash screen.

The program also allows the user to compare alternative improvement options and to view details of examples of implemented low-cost improvement projects that address specific constraints. The program offers the user the option to use the wizard-style interface to navigate through the program using the "Next" and the "Back" buttons or query the database directly based on user-designed criteria.

The tool is entirely data driven where only information available in the database can be selected or displayed. The database was populated with data on implemented low-cost improvement projects. The data were gathered from state DOTs, railroad companies, and deepwater port terminal and inland waterway operators. The database can be updated as new data are gathered.

System Requirements

The following software must be installed to your computer:

- Microsoft .NET Framework 2.2
- Microsoft Data Access Components (MDAC) 2.8

Both are available on the program CD and can be downloaded from the Internet.

Hardware System Requirements:

- CD-ROM drive
- 1 GB RAM
- 1 GHz processing speed
- 100 MB of hard drive space

Operating System Requirement:
Windows 2000, Windows XP (Professional or Home Edition), or Windows Vista software.

Installation

The CD containing the software application includes an executable program. To install and run the program:

1. Download or copy the .zip file from the CD into the subdirectory;
2. Unzip the contents of the .zip file;
3. Double click on the file named "**setup.exe**" to install the program;
4. Designate or create a sub-directory on your computer where the software will be installed (or the software will be installed in C:\Program Files\Battelle\Low Cost Improvement Analysis Tool); and
5. Double click on the file named "**LCIAT.exe**" to start the program.

Running the Program

Figure 3 shows the introductory screen that states the purpose of the tool (top window) and defines low-cost and quickly implementable improvements (lower window).

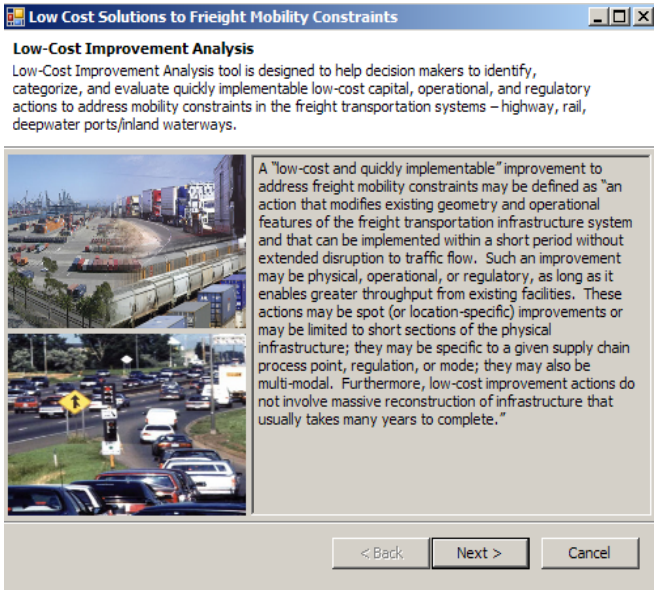

Figure 3. Introductory window.

Wizard vs. Query

The program allows the user to select the desired approach to running the program (Figure 4). Two options are available. The wizard approach allows the user to characterize the constraint under consideration and then select from a list of improvements that can be used to address that constraint based on experiences elsewhere. The query approach allows the user to search the database of projects based on user-defined criteria without having to navigate the entire program. The steps in using these two approaches are described in the following sections.

Wizard—Mode Selection

When using the wizard approach, the next screen (Figure 5) allows the user to select the freight transportation mode of interest and the subcategory under the selected mode:

- **Deepwater ports and inland waterways –** subcategories are "on terminal," "outside the fence," and "waterside."
- **Highways** – subcategories are the major functional classes of the highway system – e.g., Interstates, urban and rural principal arterials, and local roads.
- **Railroads –** subcategories are Class I, regional, and local operators.

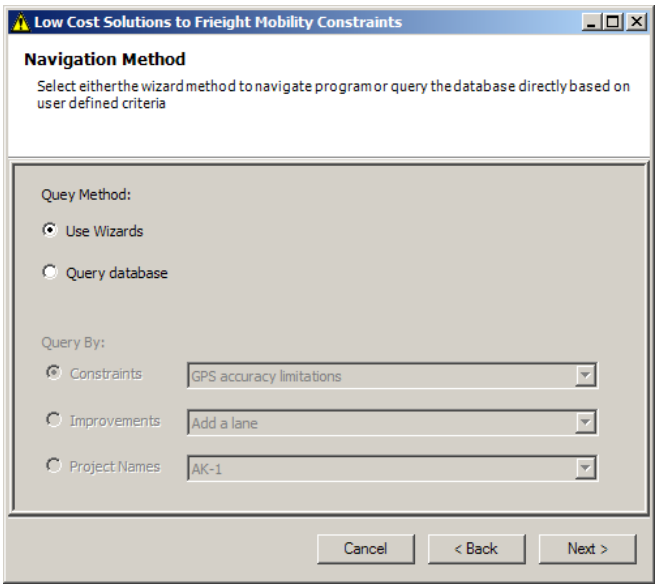

Figure 4. Navigation method.

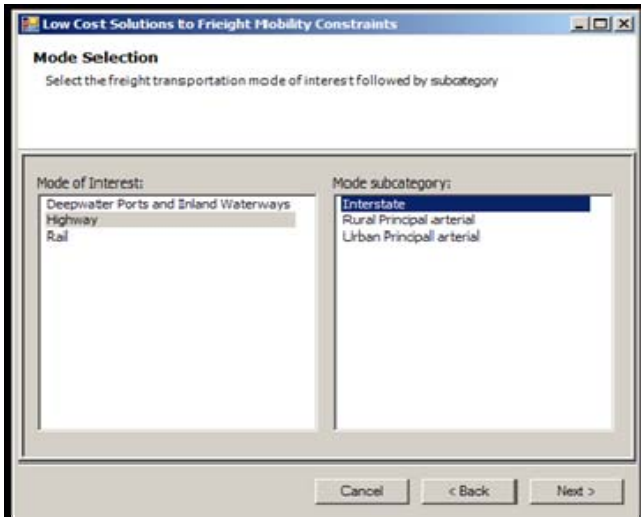

Figure 5. Mode selection.

Wizard—Constraint Evaluation

Once the mode and the subcategory are selected, the next screen displays the possible locations where freight constraints on the modal network can occur based on information contained in the database (Figure 6). Depending on the location of the constraint on the modal network selected, the corresponding examples of constraints organized by type are displayed on the right-hand side of the screen. Clicking on a different type of constraint in the window titled "Constraint Type" (in the lower left section of the screen) displays the corresponding examples of constraints in the window to the right. This feature allows the user to explore the various options depending on the type of constraint.

Moving or hovering the cursor over each of the constraint types—physical, operational, and regulatory (lower left window)—or over the corresponding constraints (in right window) displays the definitions in popup windows. These definitions are provided to guide the user to evaluate the constraints properly.

Wizard – Improvements Selection

The top window in the next screen displays the criteria for "low-cost and quickly implementable" improvements specific to the mode selected. The lower windows display the types of improvements

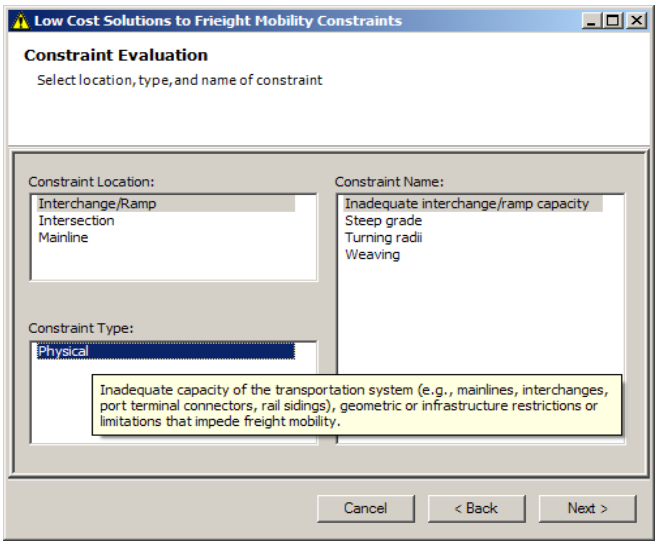

Figure 6. Constraint evaluation.

(physical, operational, regulatory) and the corresponding list of improvement options aligned to the constraint selected on the previous screen. The list represents improvements that have been implemented elsewhere to address the constraints identified in the previous screen. The improvements are also organized by type of improvement (physical, operational or regulatory). For example, Figure 7 shows the list of physical improvement options to address the constraint selected on the previous screen.

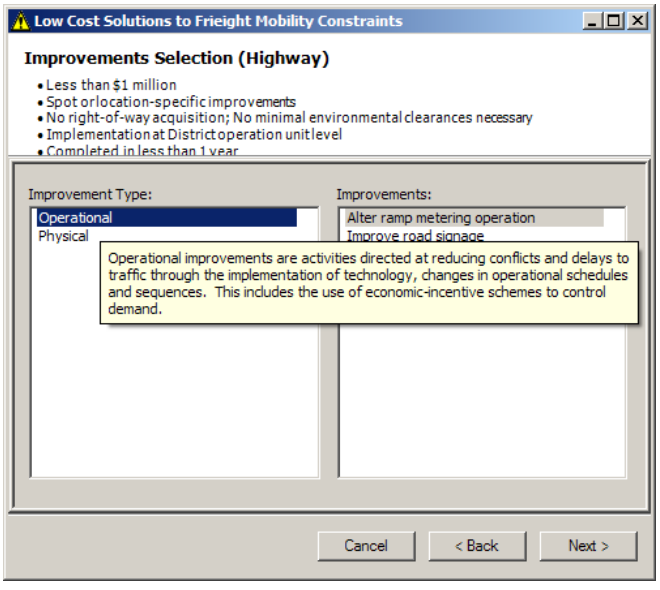

Figure 7. Improvement selection.

Wizard – Evaluating Improvement Projects

By clicking the improvements of interest, the user can go to the next screen to view and compare details of projects that have been implemented to address the particular constraint. Multiple selections are possible by holding down the "CTRL" key.

The middle window on this screen (Figure 8) shows the list of assigned numbers for implemented improvements contained in the database. Moving the cursor over the project number in the middle window displays the description of the project as shown in Figure 8.

The lower window on this screen displays the hierarchy of selections made on the previous screens that led to the applicable projects. This window also displays other project details such as descriptions of the project, cost, duration, performance measures, location, and lessons learned. The user evaluates the selected option by comparing the details of the projects.

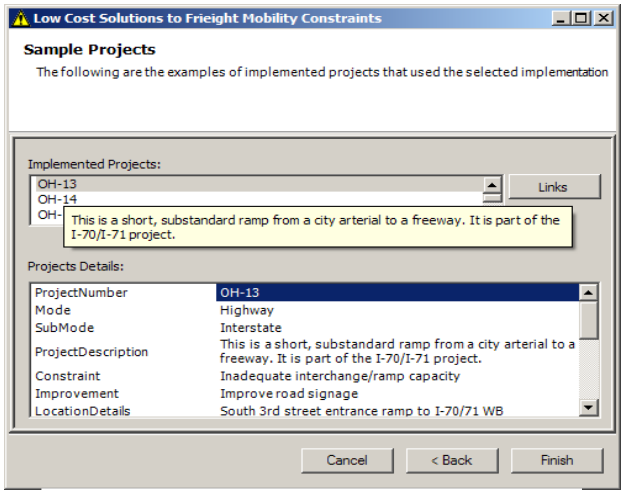

Figure 8. Evaluation of options.

Wizard – Links

For each project, a link is provided to relevant project documents and other sources of further information. Clicking on the "links" displays the document containing detailed information on the project of interest (Figure 8).

Query – Search Criteria

This approach allows the user to select the database query criterion (Figure 4). Clicking "Next" displays the list of projects satisfying the condition (Figure 8). As for the wizard approach, the user can then view and evaluate the projects and also access the sources of detailed information by clicking on the "links" button.

Ending Program

Regardless of which approach is being used, clicking on the "Cancel" button takes the user back to the approach selection screen (Figure 2). The rationale is to allow the user to begin another search, if desired. Clicking on the "Finish" button ends the program.

Applicable Documents

For additional information on the development of the tool, please refer to:

NCFRP Report 7: Identifying and Using Low-Cost and Quickly Implementable Ways to Address Freight-System Mobility Constraints.

Additional Information and Technical Support

Questions about the tool can be addressed to

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