Introducing the Transportation Air Quality System (TRAQS) software interface designed to simplify the process of conducting project-level analysis. The project is scheduled for completion in July 2016.
As of December 20, 2012, transportation project sponsors have been required to comply with new regulatory provisions for demonstrating compliance with the National Environmental Policy Act (NEPA) and transportation conformity requiring project-level conformity and hot-spot analyses. The new regulatory provisions apply to carbon monoxide (CO), coarse particulate matter (PM$_{10}$), and fine particulate matter (PM$_{2.5}$). Program updates include the development of new guidance, updates to existing guidance, and software model updates, including both mobile emissions models and air dispersion models (see sidebar "New Regulatory Provisions for CO, PM$_{10}$, and PM$_{2.5}$" on page 23).

Project-level conformity analysis requires setting up and running mobile emissions inventory models combined with performing air dispersion modeling in order to evaluate conformity with National Ambient Air Quality Standards (NAAQS). Forty-nine states require the use of the MOVES2014 model, while California uses the EMission FACtors (EMFAC) 2014 model to estimate vehicle emissions. In addition, project-level analyses also require the use of dispersion models, such as CAL3QHCR or AERMOD, to estimate air concentrations for CO, PM$_{10}$, and PM$_{2.5}$.

MOVES2014 and EMFAC2014 require much higher modeling expertise and more detailed traffic inputs than previous emissions models. In addition, most state departments of transportation are unfamiliar with dispersion models such as CAL3QHCR or AERMOD. The implication of these new requirements is that many state departments of transportation may find it difficult to perform or review air quality analysis projects.

The TRAQS Project
To satisfy this need, the National Academy of Sciences’ National Cooperative Highway Research Program (NCHRP) awarded project NCHRP 25-48 to Resource Systems Group and Lakes Environmental Software Inc. to develop an open-source software interface to simplify the process of conducting a project-level air quality study from start to finish. Upon completion of modeling runs, TRAQS will automatically import results into its database to facilitate subsequent modeling steps and ensure results are available to support visualization, analysis, and reporting. TRAQS will manage the mobile emissions and air dispersion models—MOVES, EMFAC, AERMOD, CAL3QHC, and CAL3QHCR—but these regulatory models will remain external to the graphical user interface, supported by intuitive wizards providing context-sensitive help, to guide practitioners through the process of conducting or reviewing a project-level mobile emissions analysis. The Transportation Air Quality System (TRAQS) project initiated activities in June 2014 and is scheduled for completion in July 2016 (see sidebar “TRAQS Project Tasks” on page 22). Figure 1 illustrates the major functional design elements and interactions recommended for inclusion in the proposed software solution.

The TRAQS development will follow modern industry design standards and rely on intelligent wizards to guide users through the process of conducting a project-level air quality study from start to finish. Subsequent to data input entry and model configuration definition, a model run manager will provide users with options for single or multiple runs using a batch-processing tool. Upon completion of modeling runs, TRAQS will automatically import results into its database to facilitate subsequent modeling steps and ensure results are available to support visualization, analysis, and reporting. TRAQS will manage the mobile emissions and air dispersion models—MOVES, EMFAC, AERMOD, CAL3QHC, and CAL3QHCR—but these regulatory models will remain external to the graphical user interface. This is essential to the
To facilitate and manage the collection and prioritizing of user feedback (see Project Task 2), it is first necessary to define a set of minimally acceptable product features. A set of minimum feature requirements will enable the project team to design a more effective outreach program. This feedback will provide practitioners with a basic understanding of which features have already been identified for inclusion in the software. With these objectives in mind, TRAQS will include the following minimally acceptable product feature recommendations:

1. A centralized graphical user interface to seamlessly integrate the process of selecting appropriate mobile emission and air dispersion models, prepare model inputs, configure model run options, execute model runs (including batch run manager), and generate results for further analysis and data visualization.
2. Quality assurance tools to provide real-time feedback on data quality and identify data quality issues that are outside anticipated ranges or of incorrect format, which would cause model run errors.
3. Ability to read and write data from common geographic information system (GIS)-based software, including shapefiles and geodatabases.
4. Standard report-ready summary templates designed based on project-level documentation requirements.
6. Reporting tools that enable users to compare results from multiple model runs.
7. Export options, including common file formats, such as .pdf, .xlsx, .csv, .txt, and .xml.

TRAQS will be released as an open-source software application following the GNU General Public License, Version 2 (GPL2) license provisions (or equivalent). These provisions provide the license rights to study, copy, modify, and redistribute the source code without copyright restrictions.

The TRAQS software development will abide by the following principles:

1. Open-source architecture.
2. Seamless integration between emissions and air quality models.
3. Automation of repetitive, burdensome, and unnecessary tasks.
4. Use of intuitive “wizards” to guide users through the entire process, including:
   a. project development (i.e., site characterization);
   b. data entry;
   c. model configuration;
   d. model execution; and
   e. reporting/data visualization options.
5. Rigorous data quality and validation checks.
6. Advanced data visualization and geospatial awareness through effective use of GIS and mapping technologies.

TRAQS: Easy to Use

To begin using TRAQS, a user will simply open an existing project for review or create a new project to conduct a project-level analysis. For new projects, users will start by entering general project data such as the project title, definition of project domain, and other relevant information such as geographic data. Thereafter, users will be able to choose from multiple data input options depending on desired model applications and available data. TRAQS will incorporate regulatory process intelligence into the system to guide users through

**TRAQS Project Tasks**

- **Task 1** – Assess State-of-Practice Tools, Models, and Existing Interfaces – **completed**
- **Task 2** – User Outreach to Advance Software Technical Specifications – **completed**
- **Task 3** – Interim Report – **completed**
- **Task 4** – Develop Interface
- **Task 5** – Validation: Compare Interface Results with Results from Manual Model Operation
- **Task 6** – Beta Testing of Interface with Practitioners
- **Task 7** – Develop Final Project Deliverables
the data input process. This way, the interface will only ask applicable questions and appropriate input information. For example, under certain applications, use of EPA-recommended defaults may be appropriate for evaluating a worst-case modeling scenario where the user can choose the most representative freeway or intersection configuration from a list of predefined layouts.

TRAQS will auto-populate data when appropriate and guide users through a step-wise entry process until minimum input requirements have been satisfied. Additionally, TRAQS will include sophisticated quality control checks throughout the data-entry and model-configuration process. Examples include range and error checking, formatting checks, unit checks and conversion, and missing data detection.

TRAQS will remove specific obstacles from the process, such as managing the large number of MOVES project runs required to complete a project-level analysis study. MOVES2014 can only run one pollutant at a time for a given scenario. To evaluate multiple pollutants, temporal periods, and build/no-build options, users may need to process more than 32 separate MOVES project runs. TRAQS will manage the runs and execute in a batch mode to reduce this complexity. Additionally, MOVES2014 and EMFAC2014 are both geo-spatially unaware and do not require coordinates on where road links are located in the real world. However, this information is required to perform air dispersion modeling. In addition, MOVES and EMFAC represent links inconsistently with dispersion models. TRAQS will address both these problems by enabling users to define links within a GIS mapping environment, which will automatically record necessary positional information.

Summary
The survey results collected as part of Project Task 2, combined with additional interaction with project stakeholders and the user community, confirm the importance of this project and need for a user-friendly software solution to streamline the process of conducting project-level analysis.

Anticipated benefits to the user community include:

- improved accuracy;
- consistency in how regulatory guidance and models are applied;
- time savings;
- shorter time required to submit, review, and receive permit approval; and
- improved quality assurance.

References