Air Quality Monitoring Computer Systems

Final Report

Identifying Number: Task No. 20

Budget: $47,400.00

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Project Background:
The New Jersey Department of Transportation (NJDOT) had been using a DOS-based air monitoring computer program that was transferred from a mainframe database many years ago. The program needed to be re-engineered to a user-friendly, windows-based environment. Meanwhile, staff reductions at NJDOT put air quality data collection in jeopardy because of the shortage of on-site engineers. The objective of this project was to automate the data collection and data entry processes by providing a connection between computers and the data logger, thereby reducing labor and potential data entry errors and providing greater assurance that transportation projects meet institutional and regulatory efficiency requirements. Developing the air quality monitoring systems for NJDOT furthers NCTIP’s productivity mission.

Project Objectives:
The aims of this project were to assist NJDOT to maintain and provide monitoring of the state air quality; automate the current air quality data entry process and generate clear and detailed air quality reports and statistical analysis; and interface the existing database and analytical tools within a windows-based monitoring systems capable of supporting projects planning decision.

Scope of Work:
To achieve these objectives the work team analyzed NJDOT’s current air quality monitoring systems; conducted interviews with NJDOT personnel to learn about current air quality data collection procedures, and tested the interface program provided by the manufacturer for automating the data entry process; designed windows-based air quality monitoring systems; presented the prototype systems to elicit additional feedback from NJDOT administrators; finalized the air quality monitoring systems; prepared a schedule for installation and implementation of the systems; trained engineers and managers in the use of the systems; and prepared a final report and User Manual.

Accomplishments:
Four meetings were held at NJDOT to discuss the existing air quality monitoring processes and air quality report formats. The original air quality monitoring systems were analyzed and a new system functional specification was proposed. A windows-
based air quality monitoring system was designed and demonstrated to air quality engineers and the NJDOT project manager. The final version of the system was completed and installed on a PC at NJDOT’s research and technology division. NJDOT was then provided with a User Manual and complete source codes.

**Products:**
1. The final report
2. A installation CD
3. A user manual
4. Program source codes

**Remarks:**
A computer hard drive and a printer toner cartridge were purchased and used solely for this project.
Introduction

The NJDOT Air Quality Management System (AQMS) is a computer program designed to help Division of Operations Engineering – Bureau of Project Support Engineering manages, tracks and reports air quality along the major highway in the State of New Jersey. It was developed by the NCTIP at NJIT and NJDOT’s Bureau of Research & Technology. With graphical interfaces and database developed in Microsoft Visual Basic 5, AQMS supports the following main functional areas:

1.  Air Quality Data Query
2.  Air Quality Data Input
3.  Air Quality Data Reporting

1. Starting AQMS

Click on Start => Programs => AirQuality to start the main menu of AQMS. As shown in Figure 1, at the top of the screen are the name of the division and today’s date, in the middle of the screen are data query and data entry areas, and at the bottom of the screen are various command buttons to add, save, delete, generate reports, and exit the program.

Figure 1: AQMS Main Menu
2. Data Query

Figure 2 shows the air quality data query drop-down combo buttons. With these buttons, users can query AQMS database by highway identifications, by the months and years of data collection, by the site where the data was collected, by different types of data collecting instruments, by different air pollutant, and by the measurement units. A query is done by selecting one or more criteria from above combo button and the query results are updated immediately after the query criterion is changed.

**Figure 2. Data Query Drop-Down Combo Buttons**

You can either pick a existing value from the drop-down combo button or type a new value. If you type a new value, the program will save it to the database for the future usages. Each combo button is explained as follows:

- **Identification**: You select or type highway identification here.
- **Month and Year**: Month and year can be selected from these buttons.
- **Site**: The site where the air quality data was collected can be selected here.
- **Instrument**: The instruments used to collect air pollutants are listed here.
- **Pollutant and Units**: Pollutants and its’ units can be set at here.
3. Data Input

To add new air quality data, you need to select or type an identification, a month, a year, a site, an instrument, a pollutant, and a unit before you click on the "Add New" button at the bottom of the screen. Otherwise, a message will pop up tell you to do so.

You can click on the ok button to get rid of the message. After you set all the data input criteria, click on “Add New” button and program will bring you an empty data entry form, as shown in figure 3. After data is entered, click the "Save" button to save it.

Figure 3. Data Input Screen

To delete data, follow the same steps to set all data criteria and then click on “Delete” button to remove the selected data from the database.

4. Data Reporting
You need to select highway identification, a month, a year, a site, an instrument, a pollutant, and a unit to retrieve the data for your report. To preview or print a one-hour air quality report or an eight-hour air quality report, simply click on the corresponding buttons at the bottom of the screen.

Examples of a one-hour air quality report and an eight-hour air quality report are shown in Figure 4 and Figure 5 respectively.

**Figure 4. One-Hour Air Quality Report**
The report shows the average and maximum measurements at each hour and on each day. It also calculates the overall average and the first and the second maximum readings in a month. The date and time for the first and the second maximum readings are also listed.

**Figure 5. Eight-Hour Air Quality Report**

5. Exiting AQMS

You may click on the “Exit” button to close the program.