
LOS2000 Overview

Introduction

The LOS2000 software application is part of an integrated program of roadway and roadside maintenance evaluation. The purpose of the program is to provide users with standardized techniques for evaluating roadway maintenance and conditions and for producing useful summary and detail reports for planning additional maintenance. The LOS2000 program has now been in use in California for more than four years and has been used to identify needed improvements and plan for budgeting.

In developing the LOS2000 software, it has been our goal to provide user-friendly techniques that require a minimum amount of training. Thus, the software consists of a graphical interface, and data entry that relies on point-and-click actions with a minimum amount of typing. Built-in data editing functions minimize user error and prevent the entry of invalid data. The data review application, designed to look like an Internet window, provides a familiar interface that reduces learning time.

The LOS2000 maintenance software consists of three applications: the program manager's application, the evaluator's application, and the data review application. Although essentially independent, these three applications share common data structures and functions such as data importing, so that the data review application, for example, receives its data from the files exported by the program manager's application.

California's maintenance evaluation schedule

In the spring of each year, Caltrans staff select a representative sample of roadway and roadside segments for evaluation. Trained evaluators throughout the state perform close inspections of the sampled one-mile segments and enter the data into the software. The completed data is submitted to headquarters and consolidated into a master file. Headquarters staff then generate statewide and district reports summarizing the numbers and types of needed repairs. These reports are used for planning and budgeting the summer maintenance efforts.

In the fall, a second sample is drawn and evaluators again perform on-site inspections. The data is submitted to headquarters and a second set of reports summarizes roadway and roadside conditions after the summer repairs have been completed. Spring-to-fall reports illustrate improvements in conditions as well as remaining needed repairs.

The LOS2000 software process

The LOS2000 applications work together in the following manner:

1. The manager's application maintains the inventory, selects the sample (based on a percentage or absolute number of segments), and exports the sample data to the evaluators. The manager's application can also be used to print the evaluation check sheets.
2. The evaluator's application imports the data from headquarters and provides functions for entering the data and printing sample segment check sheets. Once all data is entered, the evaluator's application exports the completed data for submission to headquarters.
3. The manager's application imports the completed data files and updates the master sample file with the new data. Once all data has been received, the manager's application exports the data as public files for use by the data review application.
4. The data review application imports the public files from the manager's application and provides functions for creating standard and customizable reports and for user-friendly drill-down queries and on-screen views.

The separation of functions into these three applications simplifies use for each type of user and helps keep the applications small and efficient.

Organization of this overview

This overview presents a brief description of the LOS2000 software. It discusses the various functions of the software and its integration into the overall LOS2000 maintenance effort in California. Because the software was developed specifically for the California Department of Transportation, it reflects the state's political organization of maintenance districts, as well as roadway characteristics that may be specific to California. The software can be customized as required to meet the needs of different states or agencies.

Political organization

Based on the Caltrans political divisions, road segments are organized into districts and regions (subsets of districts). Within the region, the road segments are listed by county-route-postmile, with each segment being approximately one mile long. The district-county-route-postmile serves as the segment's ID, so you'll notice on the enclosed reports that each segment is indicated by this identifier. Within this structure, the application can support as many districts and as many regions within districts as necessary.

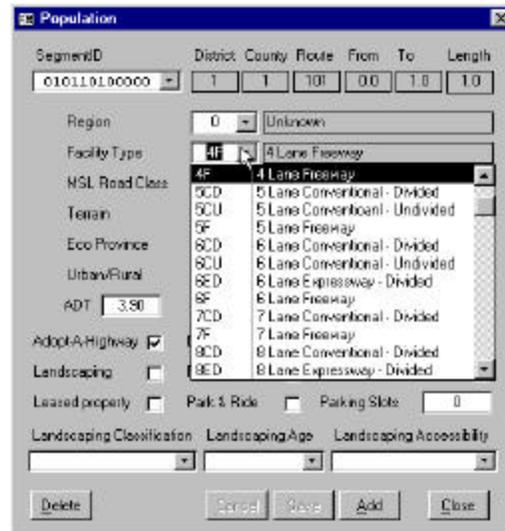
This organization of segments can be customized to meet state or agency requirements. While the districts consist of sets of counties, regions are independent of county lines, so that, for example, the Toll Plaza region of District Four (San Francisco Bay Area) is a small area within Alameda county. One of the modifications under consideration is an additional classification based upon cost centers.

Inventory

The User Guide for the Program Manager's application describes the process of maintaining population data beginning on page 36. Using this window, you can assign characteristics to each segment. Importing existing data is one of the functions that would need to be customized for each state or agency, depending on the characteristics of the data set. Figure 1 illustrates the process of assigning characteristics to a segment, in this case the facility type. Currently, the characteristics include those illustrated in Figure 1.

We expect that segment characteristics may have to be customized for each state or agency. Some, for example, may not use the eco-province information used by California. Others may have additional characteristics not used by California.

FIGURE 1. Selecting a facility type



Sampling

Chapter 5 of the User Guide for the manager's application describes the process of drawing samples for evaluation. Samples are selected by family, with separate samples being drawn for roadway (including travelway, slope and drainage, general roadside, and traffic guidance) and for each type of roadside family (landscape, rest areas, vista points, and park and ride lots). Samples are based on absolute numbers of segments, percentages of segments, or a combination of both for the various districts. Because of California's organization, sampling is representative at the state and district levels but not at sublevels such as regions. The sampling scheme can be customized according to the needs of the individual state or agency.

Sample distribution and remote submission

Once the sample is selected, headquarters distributes sample files along with the most recent version of the application files to the various districts which are then responsible for data collection. In California, the files are distributed on CDs to the districts. Distribution can be customized to provide for on-line distribution from an

Remote data submission

FTP site. DataStep has developed functions for automated FTP distribution and submission that can be incorporated into the application, as required.

Remote data submission

To this date, Caltrans has required local districts to submit evaluation data by e-mail or on disk or CD. This function can be modified to state requirements, however, to include automated upload to a secure FTP site. Thus, a user could select an "Export" command that would automatically log onto the site, supply the user name and password, upload the data, then log out of the site.

Standardized evaluation techniques

One of the most critical aspects of the LOS2000 maintenance effort is its use of standardized evaluation techniques supported by thorough training of evaluators. These standards were developed in concert with the California Department of Transportation and are based on industry-standard principles of maintenance and repair. To support the implementation of the LOS2000 maintenance techniques, training is available in both the use of the software and in the implementation of LOS2000 evaluation standards.

User-friendly data entry

Once the sample files are received by district staff, they are distributed to the individual evaluators. The district staff print check sheets for manual check-off as the evaluators walk or drive the road segments. The evaluators then enter the data from the check sheets into the software application.

To date, California has continued to use paper data collection forms for a number of reasons. One of the most important reasons, is that it is critical to an accurate and efficient review that the evaluators be able to see the entire set of characteristics and repair types at a glance. Vulnerability to weather and handling have also been considerations. Until recently, hand-held computers have not provided large enough screens to see all the data entry categories. Recently, however, development of full-screen "ruggedized" computers such as the WalkAbout computer have begun to make it feasible to do on-the-spot data entry. As a result, we are planning modifica-

User-friendly data entry

tions to the application to allow for on-the-spot data entry minimize the need for keyboard entry (such as narratives that can be added later).

The data entry windows are designed to correspond to the current check sheets (Figure 2). For each required repair, users enter a combination of L (Light), M (Medium), or H (Heave) and 1 (Immediate), 2 (within 60 days), 3 (within six months), or 4 (within one year) in the corresponding field. If users enter invalid information, a prompt displays the possible valid choices (Figure 3).

FIGURE 2. Data entry window, travelway

Attribute	Crack/Join/Seal			Base Patch	Base Repair	Thin Blanket	Chip/Seal	Edge Seal	Rehab/Repair	5/11/1 Repair/Other
	Pass 1	2	NA							
Rideability	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Cracks:	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Alligator Cracking	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Potholes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Wheel Rutting	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Coarse Raveling	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Bleeding	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Pavement Edge	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Paved Shoulders	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Unpaved Shoulders	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
Ramps	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						

FIGURE 3. Data entry window, data correction prompt



In addition to the individual repair information, users can enter an overall index score for the entire segment, comments about specific families of repairs, and additional characteristics information, as illustrated in the Evaluator's Tutorial. When

Historical data

data entry is complete for all the evaluator's segments, the evaluator exports the data and sends the exported file to headquarters.

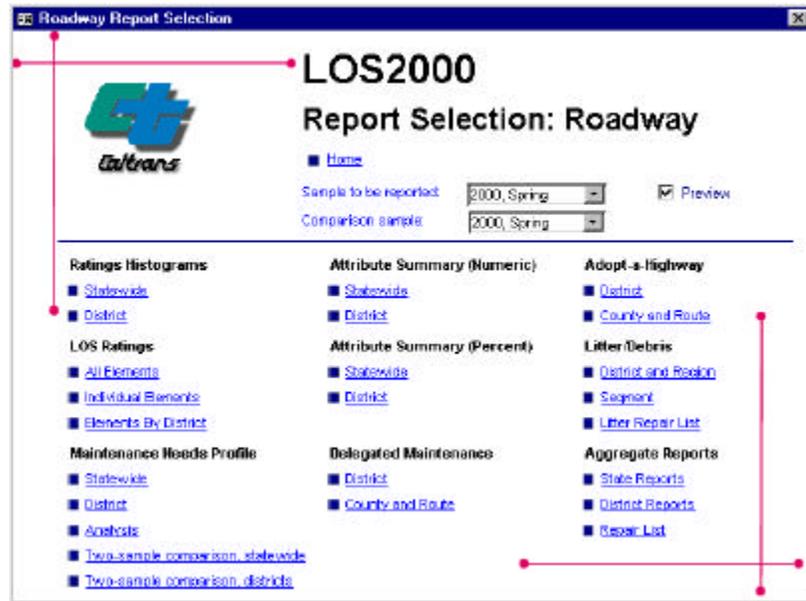
Historical data

The LOS2000 software can maintain an essentially unlimited amount of historical data. Currently, built-in reports compare conditions from one season to the next, allowing users to view the original conditions found before the repair season begins with those found once repairs have been completed. Similarly, comparing post-repair conditions to those in the subsequent spring assessment reveals the needed repairs resulting from the winter season or remaining from the previous year. The application also provides a "purge" command to delete samples that are no longer required.

Standard Reports

The LOS2000 software contains a twenty-four standard reports that can be produced quickly and easily from a "table of contents" list (Figure 4). Standard reports are those for which users can select only an evaluation period and, for district reports, one or more districts. Users select a report and an evaluation period and either print or preview the report. The "aggregated reports" functions allows users to print the entire set of reports at the state or district level from a single command.

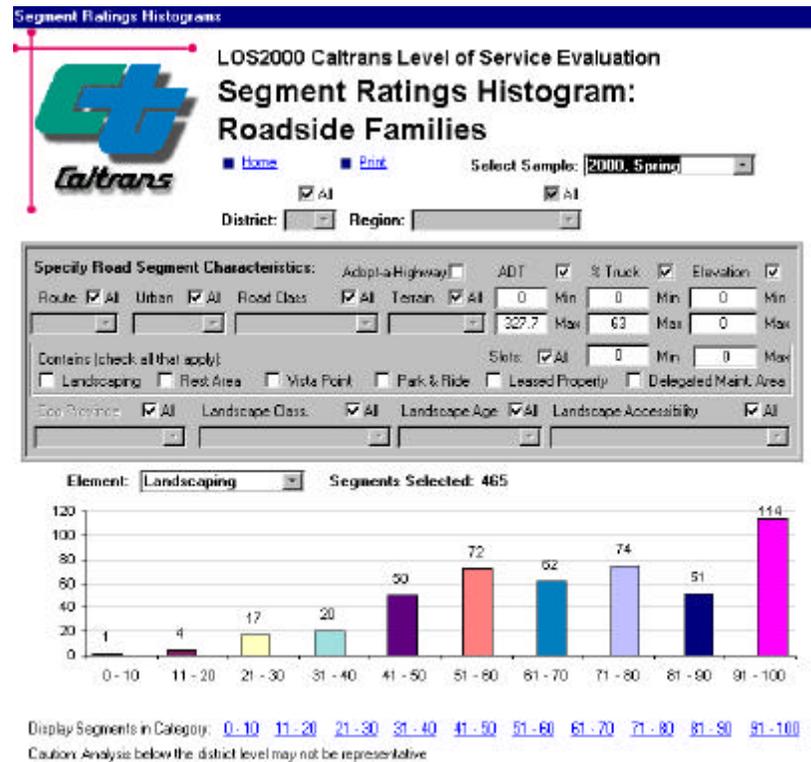
FIGURE 4. Roadway reports window



Ad Hoc Queries and Reports

By means of on-screen drill-down forms, users can customize reports for any of the characteristics in the inventory. Figure 5 provides an example of this type of intuitive query technique. As users select from the available choices, the screen is updated to display only the segments that meet those criteria, along with their characteristics. Thus, if users select District 4, the minimum and maximum values for ADT, percent truck traffic, elevation, and parking slots are updated to display only the values for segments in District 4. Reports printed from the drill-down windows display the criteria used to create the selection.

FIGURE 5. Sample drill-down query window



Planned development

LOS2000 has continued to evolve along with changes in technology. Planned development for future versions includes revising the data entry functions for mobile computers, further automating file dissemination and submission, and incorporating mapping functions in the data review application that will provide users with a window that combines the drill-down features of the current queries with colored-coded maps that indicate the type, severity, and urgency of the various needed repairs.

Planned development
