Chapter 5: Quewz Program

5.1 Introduction

Quewz is a computerized version of commonly used manual techniques for estimating the queue lengths and additional road user costs resulting from work zone lane closures. It simulates traffic flows through freeway segments both with and without a work zone lane closure in place and estimates the changes in traffic flow characteristics and additional road user costs resulting from a lane closure whose time schedule and lane configuration are described by the user. Quewz can also apply the same traffic flow simulations to identify time schedules for lane closures that will not produce excessive queue lengths and delays.

5.2 Process

I. INPUT DATA REQUIREMENTS

Lane closure configurations are described by the number of directional roadways in which lanes are closed (1 or 2), total number of lanes in each direction, number of open lanes through the work zone in each direction, length of the lane closure, and capacity of the work zone.

- The total number of lanes, number of open lanes, and per-lane capacities may be different in each direction. The length of the lane closure, however, must be the same when both directions are evaluated in the same run of the model. If necessary, a separate data set may be created and run for each direction.

Schedule of work activity is defined by the hours the lane closure begins and ends and the hours that work activity begins and ends.

- The hours the lane closure begins and ends define the time period during which the lane closure is in place. The hours of actual work activity must be totally contained within, and may be the same as or different from the hours when the lane closure is in place. That is, work activity may be underway during any part, or all, of the time period during which lanes are closed. Work activity may be specified only during hours when lanes are closed.

- For example, long-term lane closures may be implemented during a construction activity, for which lanes are closed from midnight to midnight on any given day, but the hours of actual work activity might be only from 7:00 am to 4:00 pm. On the other hand, for a short-term maintenance activity, lanes might be closed only from 9:00 am to 3:00 pm, and the hours of work activity would be essentially the same.
Traffic volumes are required and can be satisfied by providing either directional hourly volumes for the period of interest or AADT of the roadway, the day of the week when the lane closure will be in effect, and the general location of the freeway (urban or rural).

- The most accurate form of input would be directional hourly volumes obtained from traffic counts taken at the site of the work zone. The AADT volume option uses two sets of adjustment factors (one for urban freeways and the other for rural freeways) to estimate directional hourly volumes from the AADT input. These factors represent the average daily, hourly, and directional variations in traffic volumes.

- For Peak Hour restrictions, multiple Quewz runs are required and the total user cost must be added together. For night work, flip the hours. When inputting the hourly volumes, begin with noon being “0”. Therefore, the night work volumes will be continuous. For further explanation on each of these, see your supervisor.

Default values for model constants include cost update factor, percentage of trucks, speed-volume relationship, work zone capacity, definition of excessive queuing, and pollutant emissions rank.

1. Cost update factor: Adjusts the road user costs for the effect of inflation.
2. Percentage of trucks: Influences the calculations of work zone capacities and road user costs.
3. Speed-volume relationship: Used to estimate the normal approach speed on the freeway and the average speed through the work zone.
4. Work zone capacity: Appears to vary depending on whether or not there is work activity in the work zone.
5. Definition of excessive queuing: Either a critical length of queue in miles or a maximum acceptable delay to motorists in minutes.
6. Pollutant emission rates: The specific pollutants considered are hydrocarbons, carbon monoxide, and nitrogen oxide.
II. USING THE PROGRAM

- Once you have opened the QUEWZ program select Prompt 1 and enter. The following is guidance to help you answer the questions listed in this prompt:
  - For the Problem Title, enter the specific construction operation involved. If extra space is needed hand write information after the run is printed
  - For the Major Highway, enter the road name. If there will be multiple runs on this road, you may need to number each run for clarity.
  - The Free Flow Speed on a facility is generally the posted speed limit plus 10 MPH. The Highway Capacity Manual can provide further guidance on this topic.
  - The Level of Service D/E breakpoint is also based on information in the Highway Capacity Manual. You may determine this number for your specific project or you may select the default speed the program provides.
  - The Capacity Speed is also based on information in the Highway Capacity Manual. You may determine this number for your specific project or you may select the default speed the program provides.
  - Crossovers have a slightly greater effect on the user cost in each direction of travel than just a lane closure. This is why the program asks you if your lane closure is a cross over or not.
  - Since you are just using only 1 direction of traffic volumes, you may select inbound or outbound. However, in a special circumstance where a Quewz run is completed for each direction, it will be important to designate the change in direction.
  - Input the appropriate hours work is allowed. For example, a 24 hour run would show the traffic control being set up at “0” and removed at “24”.
  - The actual work will begin after the traffic control is set up.
  - Currently, we use 135% of 1981 dollars to determine the usercost.
  - Input the total number of lanes for the direction you are calculating.
  - Input the total number of open lanes once the lane closure is in place.
  - Input the % trucks of the roadway.
  - How long will the lane closure be? Refer to the General Notes of the project as guidance. Often for multilane facilities there will be a limit of approximately 1 mile for a lane closure. However, this distance may vary depending on the operation and traffic volumes.
  - For capacity information (the hourly capacity, the LOS DE Breakpoint volumes, and the Work Zone capacity), please see the below chart and the Highway Capacity Manual.
    - The following are guidelines for ideal conditions without work zone for the Maximum service flow rate and LOS DE Breakpoint:
Maximum service flow rate or capacity volumes:

Free Flow Speed, (FFS) - Level of Service, (LOS)

- FFS > 70 mph  
  2,400 pcphpl
- FFS = 65 mph  
  2,350 pcphpl
- FFS = 60 mph  
  2,300 pcphpl
- FFS = 55 mph  
  2,250 pcphpl

Level of service D/E breakpoint volumes:

- FFS = 75 mph  
  2,100 pcphpl
- FFS = 70 mph  
  2,050 pcphpl
- FFS = 65 mph  
  1,975 pcphpl
- FFS = 60 mph  
  1,875 pcphpl
- FFS = 55 mph  
  1,750 pcphpl

Work Zone volumes:

Refer to minimum requirements on page 1 because these change for the type of facility.

- Select Prompt 2. Volumes should be one directional (inbound or outbound). If you do not have hourly volumes for one direction, use the ADT and the higher directional split for one direction **DO NOT USE THE TOTAL ADT**.
- **Prompts 3-5** may be used to edit any information you entered and to check for accuracy.
- Run the program by selecting Prompt 6.
  - A 24 hour run, determines the highest hourly cost as well as the total daily cost for the worst case scenario. This cost is used in determining penalties if the contractor exceeds the time restrictions for lane closures. To print and save this run, see instructions below.
  - An allowable work hour run determines the Daily User Cost for that particular traffic control operation. This cost is used in determining final damages if contractor exceeds THE CONTRACT TIME (or project completion date) shown in the contract proposal. You can begin this by selecting **Prompt 3** and changing questions 7-10. This is a little tricky if you only have peak hour restrictions or if you only allow night work. See your supervisor on how best to handle your specific project. Once you have completed **Prompt 3**, select **Prompt 6** to analyze the data. To print and save this run, see instructions below.
- **Prompt 7** allows you to print the results or display then on the screen for review.
- **Prompt 8** will allow you to save the information before exiting or continuing to the time restriction run. This may be saved to the project file, but you will have to type the exact path.
• Prompt 10 allows you to exit the program.
• If there are no hourly lane closure restrictions, make the 24 hour run only.