

TECHNICAL SUMMARY

Evaluation of Predicting Water Usage, Wastewater Generation, and Traffic Volumes in LADOTD Rest Areas

Summary of Report Number 370

P.I.: Dr. Dixie Griffin, Jr.
Louisiana Tech University

LTRC Contact:
Art Rogers, P.E.
Phone (225) 767-9166

INTRODUCTION

Surprisingly, little current information for design purposes exists regarding water use and waste generation at interstate rest areas. The Waterways Experiment Station of the U.S. Army Corps of Engineers carried out the last major study in 1974. This was prior to the availability of microprocessors, computer-controlled flow measurement, and data-logging devices that are common today.

OBJECTIVES

Research is needed to develop a methodology to predict wastewater generation and water demand as a function of highway traffic volume and a set of other candidate variables including time-of-day, vehicle classification, occupants per vehicle, etc. Furthermore, the variability of the wastewater generated by different types of traffic will be established by analyzing and predicting the relationship between traffic, waste flow rates, and waste strengths. These predictions can then be used to design new facilities or upgrade existing facilities.

SCOPE

The research was carried out at several visitor center/rest areas located in Louisiana. The sites were chosen to represent the different geographic state: urban regions in the state; urban or very near urban areas (Pearl River), sites located some distance from major populations centers, perhaps in suburban areas (Kentwood, possibly Grand Prairie), and sites in rural areas (Mound). Originally, data was to be collected for a period of 180 days. However, for a variety of reasons, it was possible to obtain data for substantially longer periods at some sites (250 – 300 days). Because of power outages and equipment failure, none of the

data sets are continuous over the entire study period. Also, because of an improperly functioning main water meter, the data set from Mound is of limited usefulness.

METHODOLOGY

Research Sites

The research described herein was done simultaneously at three visitor center/rest areas and one rest area in Louisiana: Mound, Kentwood, Pearl River, and Grand Prairie.

The rest area/visitor center at Mound is on I-20. Restroom facilities are located on both sides of I-20 approximately one mile west of the "Delta" exit and approximately 10 miles west of the Louisiana-Mississippi border. This location is in the Mississippi Delta in north Louisiana, one of the most rural regions of the state. At the time of the study, the rest area/visitor center received water from the City of Tallulah, LA. Wastewater from facilities on both sides of the interstate flows by gravity to a pump station and treatment facility on the south side of I-20, adjacent to the east bound lane.

The rest area/visitor center at Kentwood is located adjacent to the southbound lane of I-55 on the Louisiana/Mississippi border, about 30 miles north of Hammond, LA. Water used in the rest area/visitor center comes from an on-site well connected to a hydro-pneumatic pressure tank. Wastewater flows to an on-site pump station and is treated on-

site using a package plant activated sludge process.

The rest area/visitor center at Pearl River is located adjacent to the northbound lane at the Louisiana-Mississippi border on I-59. It is about three miles north of Slidell, LA and approximately 30 miles north of New Orleans, LA. This is a highly urbanized region of the state. Water used from an on-site well connects to a hydro-pneumatic pressure tank. Wastewater flows by gravity to an on-site pump station and is treated on-site using an activated sludge process.

The rest area (not a visitor center) at Grand Prairie is located adjacent to the northbound lane of I-49; however, it serves both north and southbound traffic. It is located about 14 miles south of Alexandria, LA. This region of the state could be classified somewhere between suburban and rural. Potable water comes from an on-site well connected to a hydro-pneumatic pressure tank. Wastewater flows to a pump station and is treated on-site using a septic tank/rock plant filter system.

CONCLUSIONS

The mean and median water to waste ratio measured at Pearl River, Grand Prairie, and Kentwood were all very close to one (Grand Prairie, Pearl River) or slightly greater than one (Kentwood). This suggests that water measurement could be a surrogate for waste measurement. This has practical and beneficial consequences. In the simplest case, daily water use can be obtained from sequential readings of a mechanical water meter at an on-site well or the water line from the supplying municipality. Measuring water flow may be safer (from a disease standpoint) than the risk of contacting wastewater, and meters can be read by LA DOTD personnel with little technical expertise (as is done at Grand Prairie).

The sites studied exhibited widely varying traffic counts and traffic patterns. These variations appear to be primarily a function of the facility's location as well as its specific characteristics, i.e. one facility serving both sides of the interstate, as at Grand Prairie. Knowledge of such variations could be useful to LADOTD and other agencies such as the Department of Tourism. Data collected during this study, or similar studies in the future, can be analyzed

to provide information regarding optimal (cost-effective) times of operation for visitor centers as well as for sizing water supply and waste treatment systems.

Median values of water/vehicle and waste/vehicle varied by a factor of 2 to 3; corresponding 90 percentile values varied by a factor of 3 to 4. This suggests that extrapolation of such values between facilities for design purpose is risky.

It is quite easy to monitor and download large quantities of accurate data (traffic, waste flow, water) collected at very short time intervals over long time spans. Such data could be useful to LADOTD as well as other state agencies in addressing technical, economic, and political questions.

NOTICE: This technical summary is disseminated under the sponsorship of the Louisiana Department of Transportation and Development in the interest of information exchange. The summary provides a synopsis of the project's final report. The summary does not establish policies or regulations, nor does it imply LADOTD endorsement of the conclusions or recommendations. This agency assumes no liability for the contents of its use.