

Ferry Systems Data, Scheduling, and Billing

Data Analysis

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Final Report
May 1987



Washington State Department of Transportation

Planning, Research and Public Transportation Division

in cooperation with the
United States Department of Transportation
Federal Highway Administration

**FERRY SYSTEMS
DATA, SCHEDULING AND BILLING
DATA ANALYSIS**

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16 ABSTRACT This report contains findings and recommendations from work performed in Task 1 of the project, Ferry System Data, Scheduling and Billing. It describes the data required by the Washington State Ferry System management and staff for the operation and management of the system. It describes the collection, manipulation, storage and retrieval of those data, and it provides a list of recommended changes that should take place within those procedures to improve the entire data collection and manipulation process.			
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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Transportation Commission, Department of Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

FOREWORD

This report contains the findings and recommendations from the work performed in Task 1 of the project, Ferry System Data, Scheduling and Billing. It describes the data required by ferry system management and staff for the operation and management of the system. It describes the collection, manipulation, storage and retrieval of those data, and it provides a list of recommended changes that should take place within those procedures to improve the entire data collection and manipulation process.

Additional, forthcoming reports for this project will detail the benefits and costs of automating the vessel and crew scheduling functions of the ferry system, and describe the prospects for automating the collection of vehicle tolls with automatic vehicle classification (AVI) technology. These subsequent reports will be provided under separate cover.

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EXECUTIVE SUMMARY

This executive summary presents the basic findings and recommendations of the Washington State Transportation Center's review of the data collection needs and procedures of the Washington State Department of Transportation's Marine Division (WSF). The background information that led to the recommended actions described in this summary and a discussion of the surrounding issues are presented in the main body of this paper.

GENERAL OVERVIEW

With the exception of operations data, the WSF collects approximately the correct amount of information in the data categories examined in this study. However, the data that are collected are often not stored in a manner that makes them readily usable by WSF and they are often not well manipulated once they are collected. For the most part, too much data manipulation and storage is performed by hand. While several efforts are under way to computerize some data manipulation steps, several opportunities exist for additional computerization that should provide productivity increases and/or cost savings for the WSF. In addition, other opportunities exist to improve on WSF's current computerized systems, particularly in the areas of improved lines of responsibility and the streamlining of data manipulation.

TRAFFIC STATISTICS

Traffic statistics constitute the information that describes the WSF ferry fleet's ridership. These data are collected with the electronic cash register system (ECR), which records the sales of fares paid for passage on WSF vessels. For the most part, traffic statistics are stored on line on a WSDOT mainframe computer. The information is entered manually onto this computer and retrieved via the "Natural" database language. The recommended changes to the collection of traffic information are discussed below.

The WSF should transfer data electronically from the Electronic Cash Register (ECR) system to the WSDOT mainframe computer. The ECRs should maintain the level of traffic statistics information they

currently possess if that level of detail can be adequately stored and transmitted by the system that evolves from the ECR Phase II project.

The data transferred from the ECRs should be added to a temporary disk file (the monthly, on-line DETAIL file) on the WSDOT mainframe. This disk file can then be summarized by the computer to produce the SUMMARY file (which contains daily statistics) as well as any other files needed by WSF. It could also be used to produce monthly traffic statistics reports. At the end of each month, the on-line DETAIL file should be removed from disk and appended to the complete DETAIL file stored off-line.

The complete DETAIL file should be stored off-line. If all or part of the DETAIL file is needed for a special purpose analysis, that portion of the file should be moved to disk at the request of the user. A specific procedure should be written and implemented saying that a request to load a WSF dataset from tape to disk must include a date for removing the data from the computer. The data should be on-line no longer than two months. At the end of the scheduled time, MIS should automatically purge the on-line file (maintaining the tape version). The user of the file must also be able to extend the availability of that file on-line by providing MIS with a renewal request before the designated ending date. The renewal request should not be for more than one month at a time.

Data available on-line should include the last two years of the daily traffic statistics (i.e., two years of the SUMMARY file), a summarized version of the DETAIL file, which is described in the main body of this report, and the current month's additions to the complete DETAIL file. All other ferry traffic statistics should be stored off-line.

An updated list of procedures for directing MIS's work with the ferry system's traffic statistics needs to be developed. MIS needs more direct interaction with those individuals responsible for use of the data. In return, WSF needs someone to pay particular attention to the status of WSF datasets. Therefore, WSF needs to designate one person to be in charge of the WSF traffic statistics files. This person will provide the appropriate traffic information to whomever requires it and should maintain frequent communication with MIS to ensure that the data are properly maintained. This individual may need to devote as much as 1/10th of his or her time to maintaining the database and setting up computer programs. Furthermore, the person

should be available to assist all departments but most specifically the service planning and terminal agent management functions.

OPERATING STATISTICS

Operating statistics measure the service actually provided by WSF (as opposed to traffic statistics, which measure the usage of that service) and the necessary vessel activity to provide that service. WSF does not currently collect and store operations statistics in a manner that is useful to the wide range of staff who could utilize such information. Consequently, the following data items should be collected by the ferry system in a routine fashion and stored in an accessible manner:

1. number of trips (by route), per day and week,
2. presence of overload conditions: no overloads, small overloads (less than 10 cars), medium overloads (10 to 50 cars) and large overloads (more than 50 cars),
3. number of hours of service provided,
4. number of hours of revenue service provided,
5. on-time performance and missed or extra trips,
6. vessel miles traveled,
7. breakdowns,
8. accidents (employee, patron and vessel),
9. vessel moves, and
10. capacity provided (passenger and vehicle).

The above data can be collected through three separate "systems." The first is as a direct output of the vessel scheduling process. An automated scheduling assistant should provide items 1, 3, 4, 6, and 10 as part of its report generation. (These items can also be manually tabulated without too much difficulty as part of the current manual scheduling system.) Items 2 and 5 should be obtained from the ECR traffic statistics (missed/extra trips would be determined by comparing actual trips versus scheduled trips from item 1). Items 7, 8 and 9 should be recorded by terminal agents and/or vessel dispatchers and forwarded to the service planning office or a designated person who has continual contact with the service planning office. Terminal

agents might also be requested to transmit a log indicating why trips were added/missed so that the cause of such anomalies might be included into an operations database.

The operations information should be maintained in some type of computerized database. Reports from the database would be used to provide necessary management information. An outline of the potential database system is described in Appendix A. A sample reporting form used to report deviations from the planned schedule (moves, etc.) is also included in this appendix. Roughly 1/10th of an FTE should be allotted to entering this information into the database, maintaining the database, and providing the necessary reports out of the database. The estimated cost of developing the computerized database is \$10,000, a manpower breakdown of this estimate is included in Appendix A.

REVENUE

The review of revenue information in this project includes only those data required for management of the ferry fleet and staff personnel. It does not discuss audit or revenue control requirements. The primary recommendation of the project team for revenue reporting is for WSF to continue its active support of the elimination of manual record keeping by completing the ECR Phase II project, and by making other procedural changes that allow timely reporting of revenue information to WSF and Tippetts-Abbett-McCarthy-Stratton (TAMS) through the Revenue Accounting Transaction System (RATS).

The combination of revenue information with traffic statistics and their subsequent comparison against budgeted and previous levels should be continued. WSF might also wish to set up a reporting system for upper management that combines expense information in addition to the traffic and revenue data on one reporting form.

EXPENSE REPORTING

Expense information is collected and stored as part of the WSDOT accounting system and reported using the Budgeted Expenditure and Revenue System (BEARS). Expense information is recorded on a cost center approach. Recommended changes to the systems used for existing expense reporting procedures are well documented in the Touche Ross, *"Management Information Systems, Implementation Planning Report."*

WSF should develop route expense statements for making policy and management decisions. These statements should be produced at least annually and possibly quarterly. Route expense statements would give the WSF management a better grasp of how funds are being expended to provide service and where the most (and least) cost-effective service is being provided. In combination with reports produced by the operations database, such a reporting structure would allow WSF to develop and apply criteria for when a particular route warrants increased or decreased levels of service.

ACCIDENT INFORMATION

WSF manually maintains two accident files, one for accidents and injuries that occur to WSF employees and one for patron accidents. At this time, all accident records stored at the WSF are maintained manually.

The project team recommends that the WSF reduce the amount of manual effort used in storing and tracking accident data. To do this, WSF could obtain reports from the database system being implemented by the Claims Division. These reports would provide

- more flexibility for aggregating and summarizing accident information,
- the ability to analyze more combinations of variables,
- a faster turn-around time between requests for information and the receipt of data, and
- a lower cost for performing the required analyses.

WSF will need to discuss its needs with Claims Administration. Specifically, one person should be assigned to act as the liaison between WSF and Claims.

After the Claims system has been implemented and has started to provide information to WSF, WSF should consider automating the remainder of its accident and safety information. (Note that Claims Administration handles only a portion of the accident information required by the WSF.)

By waiting until after the Claims system is implemented, WSF staff will be better able to understand the advantages of such a system, as well as such a system's limitations. With this "hands on" experience, WSF staff will be able to devise an improved definition of its specific needs. At that point, WSF should begin the

design and/or acquisition of a system to meet those needs not satisfied by transfer of information from Claims.

DISPATCHING AND BIDDING

The staff scheduling and extra board functions of the WSF are currently handled manually. The individuals in charge of these functions maintain large paper file systems for tracking employees available for work, bids for new positions, and existing assignments.

The project team recommends that WSF develop a computerized database to assist in the scheduling of vessel and terminal staff. Such a database would provide management controls that do not currently exist in these areas. The system should also help dispatch vessel staff more smoothly when the people in charge of these systems are on vacation or are sick. A complete system should have access to the WSF payroll information. A limited system that could provide many of the necessary management tools could probably be developed on a microcomputer. Costs for developing the software for a limited microcomputer based dispatching system, are estimated to be around \$20,000. Manpower estimates used for making this estimate are presented in the main body of this report.

FERRY SYSTEMS DATA, SCHEDULING AND BILLING

This study reviewed the collection, storage, manipulation and application of information concerning the operation of the Marine Division of the Washington State Department of Transportation (WSF). The review included the following areas of data collection:

- traffic statistics,
- operating statistics,
- revenue reporting,
- expense reporting,
- accident analysis, and
- staff scheduling.

The emphasis of this project was on the traffic and operating statistic data elements. One data area not covered by the project was maintenance information. Since the maintenance section of the WSF is currently designing and installing a management information system, further investigation of this area was deemed unnecessary.

This report is structured by data category. Within each category, the following information is described:

- the collection of the data,
- the manipulation of that data,
- the storage of that data,
- the standard reporting of that data,
- the application of that data,
- issues to be resolved, and
- recommended actions that WSF should take.

BACKGROUND

The ferry system, like many agencies, collects large quantities of data simply because it has always collected that information. When this situation exists, a review of the data collection process often determines that changes in the data collection process can either reduce the cost of the data collection effort or improve the usefulness of the data that are being collected.

A similar review of the data collection process was recently completed for the transportation data office of the Washington State Department of Transportation. This review indicated that the resources being spent for data collection could be slightly reallocated to substantially improve the quality of the data used in many analyses performed by WSDOT. The improvement achieved with that data will result in savings of several million dollars to the Department.

In undertaking a review of the Ferry System's data collection effort, WSDOT hopes that improvements in WSF's data collection process will result in improvements to the Ferry System as a whole.

GENERAL OVERVIEW

In general, with the exception of operations data, the WSF collects the correct amount of information in the categories examined in this study. However, the data are not well manipulated once they are collected. For the most part, too much data manipulation and storage is performed by hand. While several efforts are under way to computerize some data manipulation steps, several opportunities exist for additional computerization that should provide productivity increases and/or cost savings for the WSF. Finally, systems already planned by WSF need to be implemented with all reasonable speed so that their benefits can be utilized.

TRAFFIC STATISTICS

Traffic statistics include counts of both passengers and vehicles carried by the system. This information is compiled for trips made by each vessel during the service day.

Data Collection and Manipulation

Traffic statistic data are collected through the sales of fares, coupon books and various passes. The data are initially stored (at the time of sale) electronically on the electronic cash register (ECR) master at each ferry terminal (with the exception of some of the San Juan Islands and Sydney, B.C., terminals, which are not currently equipped with ECRs). These data are dumped from each ECR at the end of each sailing, and manually recorded on a trip summary report form. These forms are sent to Colman Dock, where they are summarized and entered into a daily summary file (the SUMMARY file). The forms are then sent to Olympia where they are keypunched into the DETAIL file. The DETAIL file has the distinction of being the largest file in the WSDOT computer system.

Storage of Data

Currently, the DETAIL file and the SUMMARY file are maintained by the MIS section of WSDOT on the Service Center 5 mainframe computer. Both files maintain complete records of the traffic data collected at the ECRs (i.e., 17 categories of passengers and 17 categories of vehicles).

While some written instructions exist for the continued maintenance and upkeep of the files, little ongoing communication occurs between the MIS section and the WSF that ensures that these files are properly maintained for the WSF's benefit. For the most part, the DETAIL file should be stored off-line (i.e., on tape) where it can be kept inexpensively but accessed when needed. This is how MIS intends to keep it, but the file tends to be placed on-line for use, and then is not removed.

Similarly, all of the SUMMARY file (which contains data from 1977 to the present) does not need to be kept on-line, although having parts of it readily available would benefit the planning section of the WSF. Like the DETAIL file, the SUMMARY file should be kept on tape; however, it tends to end up on disk because someone at WSF needs it temporarily and then does not remove it.

Standard Reporting of Data

Traffic statistics are routinely aggregated and reported in several documents which are distributed to a wide range of WSF managers and the public. The most common of these reports are

- the weekly trend report,
- the monthly executive summary traffic report,
- the monthly rider segment report,
- the monthly trend report,
- the annual rider segment report, and
- the annual trend report.

In addition, internal staff compile a monthly report combining traffic statistics and revenue information which resembles the monthly rider segment report. This report is not made public but is primarily used by upper management to compare the system's performance with the budget, expected ridership levels and last year's ridership and revenue levels.

In addition to the regular reporting that is done, data that are stored on-line can be readily accessed using the Natural database language. Natural allows WSF to access any statistic stored on either the **DETAIL** or **SUMMARY** files and can provide any reasonable report required by WSF. Use of the Natural language requires some training in the language itself and some working knowledge of the database files (i.e., the **SUMMARY** and **DETAIL** files).

Uses of Data

The traffic statistics are one of the basic measures of system demand. They indicate the number of riders that the system is carrying and, in conjunction with the revenue collected, describe the basic functioning of the system.

For the most part, the WSF is concerned with traffic statistics in the basic forms of

- passengers,
- automobiles,
- commercial vehicles, and
- other vehicles.

In some instances each of these categories is further broken down. Automobiles and passengers are usually divided into commuter and full fare segments, while commercial and other vehicles are broken down into various size and payment type categories.

Other analyses are occasionally performed using the ad hoc reporting capabilities described earlier. Such analyses include determining the number (or percentage) of persons using the various fare categories or determining historical ferry usage by particular types of vehicles (i.e., large trucks) on particular routes or trips. However, such applications are relatively rare.

Historical ridership estimates are also used by Tippetts, Abbett, McCarthy and Stratton (TAMS) in its ongoing forecasting efforts, by Steve Smith in his vessel scheduling duties, and by the terminal management for determining staffing needs. The vast majority of these traffic statistic data needs are related to highly summarized data. The summaries are usually at the level of total passengers, automobiles, trucks and other vehicles per day or month for each route, with the occasional addition of information concerning the percentage of riders who make use of discounted fares. The other commonly used traffic information are the amount of ridership (auto and passenger) for particular vessel trips. This information is consulted when determining the need for a trip (or staffing) or the need for expanding service or staffing at a particular time of day.

One last major application of data is the reporting of operating and traffic statistics to the federal government as part of its annual Section 15 reporting requirements. This reporting process requires a fairly detailed breakdown of traffic information by route. For the most part, the traffic statistics portion of the Section 15 reporting requirement can be readily met by the existing reporting system.

Issues to be Resolved

Many issues need to be resolved in the storage, manipulation and reporting of traffic statistics. The primary issues are listed below:

- should the data be transferred from the ECRs to the WSDOT mainframe, and if so, in what way and at what time,
- how much traffic data should or can be stored on the ECRs,

- what procedures exist or should exist for storing and maintaining data on the WSDOT mainframe,
- in what format or aggregation should the data be stored (i.e., what aggregations should be made to the data before it is stored),
- how accessible should the data be,
- what new or modified reports are needed for the data, and
- does the WSF need extremely accurate passenger usage counts to fulfill Coast Guard regulations?

Each of these issues is described in detail below.

Transfer of Data. The transfer of data from the ECRs to the mainframe currently takes too long, requires too much manual intervention, and is too cumbersome. The solution for this problem is the automation of the transfer of ECR data. This is an ongoing WSF project commonly referred to as Automation of Revenue and Statistical Reporting (ECR Phase II).

ECR Data Storage. The ECRs have a limited amount of register storage capacity. This limited storage is currently accommodated by dumping traffic statistics from the ECR memory registers after every sailing and tabulating them by hand. Interviews performed as part of this report did not make clear whether the ECR system could record the necessary traffic information in its current form for later transmission to a central facility.

In addition, concern exists that the communications needs of the ECR Phase II system will be overwhelming if the daily additions to the DETAIL file (i.e., the trip summary sheets) must be transferred electronically every day. This concern emanates from the fact that only a limited amount of time may be available for data transmission during each day. Hardware specifics were not available for the ECR system at the time of this report, so this question will have to be answered as part of ECR Phase II.

If the ECR Phase II project proves either of the above possible restrictions to be real, a reduction in the number of traffic statistics categories stored on the ECRs by aggregating passenger or automobile sales categories (i.e., columns on the Trip Summary sheet) will be necessary. Such a change will reduce the amount

of data storage required for traffic statistics and at the same time reduce the time needed to transfer the data via modem. The "cost" of such a reduction in data storage is the loss of information concerning the types of fares paid by riders. This loss should not hurt the day-to-day operation of the ferry system but could result in some long-term repercussions to the system in that managers, legislators and researchers could no longer analyze the usage of certain fare categories. This might hinder the process of setting and changing fares by limiting managers' ability to determine the financial impacts of various alternative policies. If necessary, however, the split of riders between fare categories could be obtained through a series of small sample ridership counts. These surveys would cost roughly \$10,000 to \$40,000 each year or occurrence, depending on the sample design and the manner in which the data were collected.

Storing, Maintaining and Accessing Data on the Mainframe. At this point in time, no one individual has a good handle on the functioning of the DETAIL and SUMMARY files within the computer environment created by WSDOT's MIS division. While MIS maintains a book of procedures and basic maintenance instructions, the book is easily outdated, and since the MIS staff does not directly deal with the use of the data, they have no means of addressing the day-to-day needs of system maintenance. A symptom of this is that no one person at WSF or the MIS division is readily familiar with the database as it currently exists, nor does any one person know the quality of the data that are contained in the system.

Another MIS issue is that of accessing the available data. The Natural database language allows relatively simple ad hoc report generation. However, to use the system, an individual must be familiar with Natural and with the database itself. Both terminal agents and service planners have a need for ad hoc report generation (e.g., Is traffic heavy on Sunday evenings in March? Do we need more staff or bigger vessels on that route?). Therefore, the person or persons who understand the working of the WSF files must be readily available to provide the information required for these types of analyses.

A data manipulation issue that TAMS mentioned is that the categories used for aggregating and reporting vehicle statistics are different for revenue reporting than for traffic reporting. Summary traffic statistics differentiate between automobiles, commercial vehicles, recreational vehicles (oversized vehicles that are non-commercial and trailers) and other vehicles, while revenue reporting only breaks out commercial

vehicles versus all other vehicles. TAMS would like to improve its revenue forecasting capabilities by being able to more accurately account for changes in the revenue produced by other types of vehicles.

TAMS would also like to be able to download traffic information directly to its microcomputers or receive such information on floppy disk. This task should not be too difficult, if some help can be obtained from the MIS division or knowledgeable WSF personnel. The cost of such help could be initially estimated, and TAMS could be allowed to select either the assumption of those costs or the continued manual entry of traffic statistics.

Report Generation. The reports commonly generated for management use are adequate but have several shortcomings. Their greatest weakness is that they are hard to read for all except those persons who work with them continually. This is particularly true for the rider segment report (both monthly and annual reports). The alternatives for improving these reports are to reduce the amount of information presented in the reports, split the reports among several pages, or leave the reports as they now stand (with several minor alterations).

Splitting the information presented among several pages would make the information more readable. It would also allow graphic presentations of the data, which are more easily interpreted, to be included. Unfortunately, such steps would increase the amount of paper needed for producing the reports roughly eightfold, which might discourage the use of the reports and further clutter the desks of the WSF staff.

One final alteration could be made by either relabeling the column headings of the rider segment report or by adding some descriptive information to each column. For example, novice users of this report do not necessarily know the difference between "riders," "passengers," and "walk-on passengers," and how to determine their relationship to "vehicles." By adding notations that would indicate these relationships (total riders = total passengers plus total vehicles (drivers)), this confusion might be avoided. These relationships could be indicated by column descriptors such as Column 1 = Column 2 + Column 8, which could be included in the column headings. An example of a slightly modified version of the Monthly Rider Segment report is shown in Exhibit 1.

Exhibit 1
 Example Washington State Ferry System Monthly Rider
 Segment Report, May 26, 1986 To June 26, 1986

Route	Total Number of Riders (1)	Total Number of Passengers (2)	Fare Types as a % of Total Passengers			Number of Walk-ons (6)	Walk-ons as a % of Total Riders (7)	Number of Total Vehicles (8)	Fare Types As A % of Total Vehicles			
			Full (3)	Comm. (4)	Other (5)				Autos			
									Reg (9)	Comm. (10)	Other (11)	Other (12)
	(2) + (8)	(*)	(**)	(**)	(**)	(**)	(6) / (2)	(@)	(**)	(**)	(**)	(**)
Seattle / Bremerton	123,000	100,345	34.2	34.2	34.2	23,007	34.2	22,655	34.2	34.2	34.2	34.2
Seattle / Winslow	115,000	90,876	23.4	23.4	23.4	45,670	23.4	24,124	23.4	23.4	23.4	23.4
Fauntleroy / Vashon / Southworth	100,000	78,056	23.7	23.7	23.7	45,983	23.7	21,944	23.7	23.7	23.7	23.7
Point Defiance / Tahlequah	90,000	56,007	76.5	76.5	76.5	23,005	76.5	33,993	76.5	76.5	76.5	76.5
Edmonds / Kingston	85,567	34,009	45.6	45.6	45.6	34,607	45.6	51,558	45.6	45.6	45.6	45.6
Mukiteo / Clinton	87,098	45,986	23.7	23.7	23.7	23,576	23.7	42,012	23.7	23.7	23.7	23.7
Port Townsend / Keystone	34,007	23,097	45.8	45.8	45.8	63,997	45.8	10,910	45.8	45.8	45.8	45.8
Anacortes / Sidney, B.C.	34,990	23,005	34.9	34.9	34.9	24,682	34.9	11,985	34.9	34.9	34.9	34.9
Anacortes / San Juan	44,990	34,990	23.0	23.0	23.0	12,408	23.0	10,000	23.0	23.0	23.0	23.0
Percentage Change From Last Year												
	Total Riders	Total Passengers	Full Fare Pass.	Comm. Fare Pass.	Other Fare Pass.	Walk-ons	Total Vehicles	Full Fare Autos	Comm. Fare Autos	Comm. Vehicles	Other Vehicles	
Seattle / Bremerton	34.2	34.2	34.2	34.2	34.2	34.2	34.2	34.2	34.2	34.2	34.2	34.2
Seattle / Winslow	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4	23.4
Fauntleroy / Vashon / Southworth	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7
Point Defiance / Tahlequah	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5	76.5
Edmonds / Kingston	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6	45.6
Mukiteo / Clinton	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7	23.7
Port Townsend / Keystone	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8	45.8
Anacortes / Sidney, B.C.	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9	34.9
Anacortes / San Juans	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0

* Not Including Vehicle Drivers
 ** Total Passengers Or Vehicles By Category Not Shown In Table.
 *** Includes Only Passengers Purchasing Fares Unaccompanied By Vehicles
 @ This Is Also The Number Of Passengers Who Are Vehicle Drivers.

Coast Guard Regulations. One final but very important issue deals with the need to determine the exact number of persons on a vessel in case of an emergency (e.g., a sinking ship) and compliance with certificate requirements. The current one-point toll collection prevents the WSF from determining the number of passengers on eastbound cross sound vessels. In terms of planning and scheduling needs, the lack of these data is not critical. The management of WSF will need to decide whether the lack of such information is in violation of Coast Guard regulations or other laws or statutes. The determination that such information must be collected would require crew members, traffic directors or a combination of people at different positions to perform hand counts as the vessels were loaded. Such information could be entered into the ship's log or onto a special purpose form. Entry of that information into the normal data collection process would not be necessary but could also be used in place of the ECR traffic data.

Recommended Actions

Exhibit 2 lists recommended actions for WSF to take in collecting, manipulating, and storing traffic statistics. These recommendations are described below.

The level of traffic statistics being collected should be maintained unless the ECR Phase II project is canceled or limitations in the ECR storage capabilities require reduction in the amount of traffic statistics compiled. The current level of data collection serves a balance of needs, including

- trip statistics for terminal agents and service planners,
- policy discussions on the use of commuter discounts,
- federal requirements on the use of special fares and fare categories for disabilities, and
- basic statistics on the breakdown of vehicular traffic between commercial vehicles, passenger cars and recreational vehicles.

If changes in the specific collection categories could be made, the changes would provide only limited improvements for specific analyses and would result in reductions in usefulness of the data for other analyses, as well as reduce the compatibility of the data with historical information.

If the ECR Phase II project is canceled, WSF should consider entering only the daily summary statistics and summarized DETAIL data described later in this section onto the WSDOT mainframe. The trip

EXHIBIT 2
SUMMARY RECOMMENDATION FOR TRAFFIC STATISTICS

- Implement telemetry transfer of traffic statistics to the WSDOT mainframe,
- Maintain the existing level of data collection, unless ECR storage capacity will be exceeded, in which case, aggregate passenger and vehicle statistics as necessary to allow telemetry usage,
- Have monthly back-up of new traffic statistics onto tape,
- Keep DETAIL file off-line,
- Keep 2 years of SUMMARY file on-line, maintain entire file off-line,
- Create a trip summary file for the months of February, April and August to be kept on-line,
- Designate one person at WSF to specifically be in charge of maintaining the traffic databases, a lot 1/10 th of an FTE to this function.
- Write down specific procedures for managing the databases.

statistics should still be included on the existing forms, as these data are used by terminal agents and service planners, but the cost of continued data entry appears to outweigh its use on the mainframe. (Note that if ECR Phase II will be implemented, data entry of these statistics should continue in the interim to maintain the data sets' continuity.)

Data should be transferred electronically from the ECRs to the mainframe. As noted above, the ECRs should maintain the level of traffic statistics information they currently possess if that level of detail can be adequately stored and transmitted by the ECR system that evolves from the ECR Phase II project. Reductions in the amount of data collected (and therefore stored) may occur from the "Fare Simplification" project also ongoing, since some fare categories may no longer be needed. Any additional savings that need to occur to allow the successful completion of the ECR Phase II implementation should come from aggregating ticket categories (i.e., stage passenger, half fare passenger, senior passenger, and handicapped passenger could all be reported as "discount passenger"). The specific list of aggregated categories should be designed in conjunction with the results of the fare simplification study, federal requirements and ECR Phase II, with particular attention being paid to the limits of the ECR system.

The data transferred from the ECRs should be added to a temporary disk file (the monthly on-line *DETAIL* file). This disk file can then be summarized by the computer to produce the *SUMMARY* file and any other files needed by WSF, and it could also be used to produce the appropriate monthly reports. At the end of each month, the on-line *DETAIL* file should be removed from disk and appended to the complete *DETAIL* file stored off-line.

The complete *DETAIL* file should be stored off-line. If it is needed for a special purpose analysis, it should be requested from MIS. A specific procedure should be written and implemented which says that a request to load a WSF dataset from tape to disk must include a date at which these data should be removed from the computer. Each tape to disk request should have a maximum of two months duration for allowing the data on-line. At the end of the scheduled time, MIS should automatically purge the on-line file (maintaining the tape version). The user of the file must also be able to extend the availability of that file on-

line by providing MIS with a renewal request prior to the designated ending date. The renewal request should not be for more than one month at a time.

Data available on-line should include the last two years of the daily traffic statistics (i.e., two years of the SUMMARY file), a summarized version of the DETAIL file, which is described in the following paragraph, and the current month's additions to the complete DETAIL file. The remainder of the SUMMARY file should be stored off-line on tape.

The summarized version of the DETAIL file should include the three months of information for each route. The months chosen would be representative of the last year's traffic levels on each route for each schedule period (winter, spring, summer). August, February and April are suggested as the appropriate months for this database. The file should maintain trip records for each route, but the trip records should be aggregated to the level of

- total walk-ons,
- total other passengers,
- total automobiles,
- total commercial vehicles,
- total bicycles, and
- total other vehicles.

This scheme should provide sufficient amounts of information for of both basic vessel schedules and terminal employment schedules. At the same time, by reducing the classifications of data that are stored, the size (and therefore cost) of the dataset will be kept to a minimum.

An updated list of procedures needs to be developed for directing MIS's work with the ferry system traffic statistics. MIS needs more direct interaction with those individuals responsible for the use of the data. In return, WSF needs someone to pay particular attention to the status of WSF datasets. Therefore, WSF needs to designate one person to maintain the WSF traffic statistics files. This person will provide the appropriate traffic information to whomever requires it and should communicate frequently with MIS to ensure that the data are maintained properly. This individual may need to devote as much as 1/10th of his or

her time to maintaining the database and setting up computer programs. Furthermore, he or she should be available to assist all departments, but most specifically the service planning and terminal management functions.

OPERATING STATISTICS

Operating statistics measure the service actually provided by WSF (as opposed to traffic statistics, which measure the usage of that service) and the necessary vessel activity to provide that service. Operating statistics include such data items as the number of trips provided, the number of hours of service provided, the number of times vessels were moved to different routes, and many similar pieces of information.

WSF does not track operating statistics as a matter of course. At this time, no formal procedure is maintained to collect, report, or analyze these statistics. Consequently, some areas of service planning and ferry system management are difficult to perform for lack of information.

Data Collection, Manipulation and Storage

The operations data currently collected by the WSF is relatively sparse. Terminal agents submit a form every month detailing how many trips were made on a particular route by each vessel during that month. This information is stored in a notebook in the planning section of WSF and referred to when necessary. At one time, vessel hours were also tracked in this manner, although this is either no longer done, or the existence of this information is not common knowledge within the planning section of Colman Dock.

Vessel moves are historically tracked only in that the monthly deployment of vessels can be obtained by analyzing the trip descriptions outlined above. In addition, a daily vessel deployment sheet is maintained by the operations section. These sheets can be referenced as needed.

Finally, each ship captain maintains a written log sheet detailing the events of each day's sailings. The log sheets are stored in filing cabinets at Colman Dock.

Uses of Data

There are many potential uses for operations data if they can be accessed without unreasonable effort. The most significant of these uses is the examination and management of the ferry system using

cost/performance information. Performance (operations) information is also requested in the Section 15 reporting requirements.

The availability of operating information would allow the WSF to examine the levels of service provided on a route, how well the levels of service provided met planned service, the relationship of that amount of service to the cost of that service, how that level of operation relates to the revenue the route produces, and how many vessel moves and mechanical failures occur during operations and subsequently how much those actions cost the system. In addition, WSF managers could more accurately evaluate the effects and potential effects particular operating strategies might achieve if implemented and could determine where improvements in system performance need to be made.

TAMS should also have access to this type of information, as service factors can have significant impacts on the expected levels of revenue collection and passenger ridership, as well as their interrelationship, which TAMS forecasts for WSF.

Recommended Actions

The following data items should be collected by the ferry system in a routine fashion:

1. number of trips (by route) per day and week,
2. presence of overload conditions (e.g., no overloads, one to ten car overloads, 10 to 50 car overloads, greater than 50 car overloads),
3. number of hours of service,
4. number of hours of revenue service,
5. on-time performance and missed or extra trips,
6. vessel miles traveled,
7. breakdowns,
8. accidents (employee, patron and vessel),
9. vessel moves, and
10. capacity provided (passenger and vehicle).

The above data should be collected through three separate "systems." First, some of the data should be produced as a direct output of the vessel scheduling process. An automated scheduling assistant should provide items 1, 3, 4, 6, and 10 as part of its report generation. (These items can also be manually tabulated without too much difficulty as part of the current manual scheduling system.) Items 2 and 5 should be obtained from ECR traffic statistics (missed/extra trips would be determined by comparing actual trips versus scheduled trips from item 1). Items 7, 8 and 9 should be recorded by terminal agents and/or vessel dispatchers or their designee and forwarded to the service planning office, or a designated person who has continual contact with the service planning office. Terminal agents might also be requested to transmit a log indicating why trips were added/missed so that the cause of such anomalies might be included into an operations database, which would allow the easy summarization of the collected data.

The operations information should be maintained in some type of computerized database. Reports from the database and other sources would be used to provide necessary management information, particularly in the area of planned versus actual system performance. An outline of the potential database system is described in Appendix A. A sample reporting form used to report schedule changes (moves, etc.) is also included in this appendix. Roughly 1/10th to 1/20th of an FTE should be allotted to entering this information into the database, maintaining the database, and providing the necessary reports out of the database. The initial setup of the system should entail about \$10,000 worth of outside effort and two weeks of WSF staff time for training and assistance in database design. Exhibit A-7 presents a staffing breakdown of this estimate. Installation of the database software should be done on the microcomputer already located in the planning section of WSF. The database would be considered a "personal" system under WSDOT database guidelines. The system could be designed by WSF staff, TRAC, WSDOT or WSDOT MIS. Because of the small size of the project, going to outside consultants would require more effort than necessary.

REVENUE

This section documents the collection and reporting of revenue information for the ferry system. This section describes revenue information in relation to management of the ferry fleet and personnel

specifically for the areas of planning and policy decision-making. It does not discuss audit requirements nor constitute a review of financial procedures.

Collection, Manipulation, and Storage

WSF revenue information is initially collected with the ECR system, except for the San Juan Islands and Sidney, B.C., which are consolidated from manually kept records. Currently, the ECR information is dumped at each terminal and manually coded onto forms by the terminal agents. The forms are then sent to Colman Dock, where they are entered manually into records and entered into the Agency Financial Reporting System (AFRS). Data from the forms are also used by the terminal agents for determining ticket seller performance (transaction errors, rates of sales, etc.)

The manual records at Colman Dock are required because the revenue data are not available from the AFRS system quick enough meet WSF managerial needs.

Reporting

Standard revenue information is reported with the RATS system. The information contained in these reports is adequate for most needs of WSF, although the reports generated by RATS are not currently available on a sufficiently timely basis. As a result, the RATS reports are duplicated by the manual accounting system to meet WSF needs. Revenue information is available on a route basis.

Revenue information is also reported in the Section 15 report submitted annually to UMTA. These data need to be reported by urban area. The revenue information currently available is sufficient to meet these reporting needs. The primary difficulty in reporting Section 15 revenue data is determining what constitutes ridership within each "urban" area (as requested by UMTA). This is mostly a matter of definition as opposed to a deficiency in the revenue reporting system.

Revenue information is reported to mid-level WSF staff (Carla Sawyer, Steve Smith, Tom Opheim, etc.) in conjunction with ridership information on a monthly basis. These monthly data are compared with forecast estimates and previous year revenue and ridership. This information is analyzed and summarized and the results are reported to upper management (Jim Sainsbury and Admiral Parker). This report is among the most useful produced by the WSF.

Data Uses

Revenue information is primarily used to determine WSF's existing and future financial position. It could be used on a route basis (by month and year) in conjunction with traffic and expense data to determine the relative performance of particular routes. It is not routinely reported publicly on a route by route basis.

Some individuals expressed a desire to have revenue data reported on a two-week cycle. In some instances, particularly revenue control, this frequency of revenue reporting could be valuable. With the successful automation of the transfer of ECR data, cost-effectively achieving this level of revenue reporting might be possible. However, the true need for this information should be carefully weighed against the cost of providing the information, once the automated data transfer system is operational.

The revenue information and other sales statistics are also used by the terminal management as a means of rating seller and overall terminal job performance. Use of these data also has a very positive impact on the management of terminal personnel and provides excellent feedback to the sellers concerning the quality of their job performance.

Issues To Be Resolved

The automation of the ECR system under the ECR Phase II project will speed the transfer of data from the ECR terminals into the WSDOT revenue accounting system. However, the elimination of the revenue accounting records at Colman Dock will also be a result of software currently being written and various other changes in data transfer procedures between Colman Dock and WSDOT mainframes. The elimination of manually entered record keeping should retain a high priority for the WSF.

TAMS commented that it observed revenue surges from 90-day frequent user coupon sales preceding each fare increase. This problem is a direct result of the manner in which revenue is recorded by WSF. That is, revenue is recorded at the time of the sale of coupon books as opposed to the time of coupon usage. This causes some difficulty in forecasting monthly revenue, but it is still the best manner available in which to collect and report revenue information.

A switch away from the 90-day frequent user book to a monthly pass (or monthly coupon book) would reduce this problem and is under consideration as part of the fare simplification project. Both the pass

and smaller coupon book have advantages and disadvantages that should be discussed as part of the fare simplification study. Their impacts on the collection of management information are relatively minor in comparison to their impacts on the complexity of system tariffs, fare equity, total revenue generation, staffing requirements and user acceptance. Consequently, the management information issue should not be used as a deciding factor in selecting an appropriate alternative to the 90-day frequent user book.

Recommended Actions

The project team's primary recommendation for revenue reporting is for WSF to continue to actively support the elimination of the manually maintained revenue records through the completion of the ECR Phase II project and the revision of data transfer procedures with WSDOT's MIS department.

The practice of combining traffic and revenue information with traffic statistics and subsequently comparing them with budgeted and previous levels should be continued. After the ECR Phase II project is completed, an accurate estimate of the cost and benefit of weekly or bi-weekly reporting of revenue should be made and compared with the potential benefits that could be gained from obtaining this report.

EXPENSE REPORTING

This section documents the procedures for expense accounting and reporting within the ferry system. As with the previous section on revenue, this section is not to be construed as a review of financial systems, but as a review of whether appropriate amounts of information for the planning and operations functions of the WSF are being provided.

Collection, Manipulation and Storage

Expense information is currently stored on a cost center basis. That is, all expenses incurred by WSF are attributed to a "center." Centers include each vessel, each terminal, and the administration function. Expenses are not currently reported on a route basis. Historically, expenses were reported on a route basis, but this was discontinued in the early 1980s.

Expense information is collected and stored as part of the WSDOT accounting system and is reported using the BEARS system. Within this accounting process, expenses are recorded when payment is made rather than being recorded at the time of incurrence or at the time of invoice receipt.

Reporting

Expenses are reported monthly through the BEARS system. Standard reports include actual expenditures for the month, year-to-date expenditures, and the corresponding budgeted amounts. Expenses are reported by cost center, by organizational unit and for system wide totals. Reports are provided to those managers who have responsibility for those cost centers or organizational units.

One piece of data lacking from the expense reports is labor cost information. That is, the WSF does not have the capability at this time to produce labor expense reports by cost center or routes on a routine basis, although some work is currently being done to provide such reports by position by terminal.

Uses of Expense Data

Expense data are perhaps the most used information within WSF. Each of the managers of particular functions within WSF makes significant use of the expense reports to determine his or her ability to meet existing spending constraints and to provide significant input into management decisions regarding expenditure of available resources.

Expense information can be used to compare the financial performance of specific routes (cost/revenue). At this time, such comparisons are only done on an ad hoc basis. WSF might wish to set up a quarterly reporting form for upper management which includes expense information in addition to the traffic and revenue information described earlier. One potential form for combining this information is shown in Exhibit 3 and is based on a similar form developed by Bob Antrim. This form describes the financial performance of individual routes (i.e., the amount of subsidy they require) in relation to the amount of traffic carried.

Labor expense information, particularly overtime, sicktime, and vacation time by position, route, terminal and/or vessel would allow the WSF managers to determine the causes and occurrence of many of the expenses that significantly affect variations in the WSF budget. Such information would indicate whether some circumstance was causing excessive amounts of overtime and indicate if particular trips needed to be rescheduled or other remedies taken.

Exhibit 3

Example WSF Summary Information Sheet

Route	Total Vehicles (000)	Total Passengers (000)	Change From Last Year (%)	Forecast (%)	Revenue (\$000)	Regular (\$000)	Overtime (\$000)	Expenses Realization (\$)
Seattle - Winslow	1,345	2,344	3.4	-2.3	345	345	12	1.34
Seattle - Bremerton	548	678	4.1	2.3	234	276	19	2.34
Kingston - Edmonds	654	847	-2.3	3.5	426	432	56	2.45
Clinton - Mukilteo	529	1,356	1.6	-3.5	361	527	14	1.23
Port Townsend - Keystone	23	34	1.1	0.4	142	169	1	5.67
Pt. Defiance - Tahlequah	44	75	1.3	-0.2	256	317	2	0.45
Vashon - Fauntleroy - Southworth	345	1,235	2.0	-1.3	345	321	17	1.20
Anacortes - San Juans	23	87	2.5	2.2	321	538	16	1.00
Anacortes - Sidney	11	26	2.1	-1.0	247	247	15	1.87

* Figures included in this exhibit are for example purposes only, are not mathematically correct, and do not reflect actual WSF conditions.

Issues

Two significant issues emerged from discussions with WSF staff concerning the expense reports. These issues were

- route expenses versus cost center expenses, and
- labor expense reporting.

The need for Labor expense reporting was discussed above. The issue of route expenses is described below.

Route Versus Cost Center. From an accounting point of view, storing and reporting expense data on a cost center basis is correct. However, when using the cost center approach, additional steps must be taken before that information can be used for comparing the financial performance of alternative routes. From a private business perspective, the cost/revenue performance of different routes should determine the levels of service provided and the fares charged for those services. From a public agency perspective these cost/revenue relationships have less impact on the service provided (in that service is provided as a public good), but they do play a significant role in indicating the level of public subsidy for particular routes. As such, route reporting of expenses is more useful for service planning, and public policy making than cost center reporting.

Because different vessels operate on different routes at different times during the year (both as they are scheduled and as they are moved to cover for disabled vessels) accurately assigning specific vessel costs (and in some cases terminal costs) to specific routes is inexact. Such assignments can be done using various allocation strategies to make route by route expense comparisons, but as a means of actually recording expenses, such solutions are not accurate enough for correct management of ultimate expenses. Two alternative methods for allocating cost center expenses between routes are described below.

The first allocation technique is to treat the route costs as an average cost of service by type of vessel, as opposed to the actual costs of specific vessels. Vessel expenses are allocated based on the amount of service (hours, miles, etc.) provided by each type of vessel on that route. This system eliminates the need to allocate the major maintenance expenses of specific vessels to particular routes. Terminal expenses are

assigned in whole to routes where this is possible. Where two or more routes share a terminal, terminal expenses would be split on the basis of either vehicular traffic or number of vessel sailings.

To perform this type of expense allocation, annual expenses would be calculated at the end of the fiscal year, as would the total amount of service provided. This information would be used to determine unit costs of operation by vessel class. These costs would then be allocated to specific routes based on the number of hours of service each vessel type operated on a specific route. The drawback to this type of allocation method is that it masks the effects of overtime occurring on specific routes. One specific advantage is that the data used as unit costs can be used as a revised budgeting tool for planning future levels of service.

A second type of route allocation strategy is to code all expenses to a specific vessel and indicate to the accounting system which route each vessel operated on for each day of the year. Major maintenance expenses would need to be kept separately and allocated to routes based on hours of service by vessel class. This system is simpler to visualize, allows for the inclusion of overtime as a route expense, and if the appropriate data exists within the accounting system (i.e., vessels can be easily traced to routes and expenses can be accurately tracked by day), it would be easier to apply. The major drawbacks to this system are that it requires additional information to be stored in the accounting system (daily assignments of vessels and expenses) and it requires continual supervision (i.e., the daily vessel assignments must be carefully tracked and entered as opposed to being simply aggregated once per year).

Recommended Actions

The WSF should produce a route expense report at least annually, although a quarterly report would be very informative to upper management. The exact method of producing that report can be selected from either of the two systems described above, or from an alternative system developed within WSF. Such an expense reporting system, however, should be designed to operate with a minimum of staff effort and expense.

The current budgeting cost model used by the WSF is a good start in the direction of estimating route expenses at least for planning purposes. Some minor additions to this model should be made, and a version of this model should be included in a computerized vessel scheduling system, so that the costs of experimental schedules can be readily compared by service planners. Perhaps the most needed addition to the existing

model is the ability to determine the costs of operating vessels at different speeds. At this time, WSF acknowledges that slowing vessels down will save fuel, but the amount of fuel that slower speeds can save is unknown. Such fuel savings can be estimated either by careful monitoring of fuel consumption under specific conditions, or through mathematical computations involving the specific characteristics of different vessels and their engines.

ACCIDENT INFORMATION

The WSF maintains two basic accident information databases. One file is for accidents and injuries that occur to employees of the Ferry System. The second file is for accidents reported and claims filed by patrons of the system. The two databases are similar but separate. Each of these systems is discussed below.

Data Collection, Manipulation and Storage

Data collection and storage and the manipulation of both databases are currently performed by hand. Employee claims are maintained in the Payroll/Claims Department of WSF. Information on claims by patrons for personal and/or property damage are handled in the Claims Administration office. WSDOT is currently placing all claims information on a microcomputer based database system. This system should be operational in the near future.

Accurate employee claims information is available from 1980 to the present. The information is stored on card files and retrieved manually as needed. The information stored on card files is taken from the report forms returned by injured WSF employees.

Until completion of the Claims database, the standard reporting forms are used for tracking patron damage/injury claims. At the time of an accident, the patron is given a form (the "Claims for Damages" form) to fill out and return to the WSF. The Master or Mate of the vessel also fills out a form (the "Accident Report") and submits it to the Claims Department. When an accident report is submitted to Claims, it is given an "incident number." This incident number is then supplied to the patron when that person files the Claims for Damages form. The incident number is the only means by which WSF can locate accident reports. A copy of the report form is routed to the Claims Administration Office in Olympia, which handles the claim aspect of each report.

At WSF, a copy of the accident report is maintained in the Colman Building. Information regarding accident claims are kept in envelopes within a series of file drawers. Each envelope contains all of the information on one accident and is filed by incident number. When information on a particular case is required, the envelope is retrieved. Summaries of this information are currently performed by hand, although automated reporting will be possible with the new Claims Administration system.

Standard Reporting

Both types of accident reports are forwarded to the claims investigator and claims representative. These individuals receive detailed information, not summary data. In addition, each accident report is reviewed by a safety review committee at WSF to determine if specific changes are needed in standard WSF operating procedures. At this time, several aggregations of the accident reports (e.g., total number of accidents by vessel) are assembled each month. These aggregations are done manually.

Uses of the Data

WSF personnel have expressed a growing desire to track accident information in order to reduce the costs of accidents to the system. Approximately 1,200 injury and property accidents (employees and patrons combined) occur each year, with an average annual cost of roughly \$500,000. Several steps have been taken within the WSF to control these expenses by attempting to identify the causes of the various accidents. However, the current information filing system prevents much detailed analysis of existing data.

The detailed accident information included on the reporting forms is used to determine the damages owed by the WSF to patrons and employees suffering personal injury or property damage while on WSF vessels or property. The primary use of the data is to determine the liability of the WSF and the monetary reimbursement due the individual filing the claim. Accident data are also used by the Attorney General's office when lawsuits occur involving accidents that occur on the system.

Issues

At this time, the primary issue regarding accident data revolves around the need for automation of the available information and coordination of the different accident/safety databases. The current manual system makes the retrieval and use of the accident data slow and costly, and thus inhibits its use in better

managing the system. The database being implemented by the Claims Administration should be used by WSF whenever possible so that automated reports can be easily obtained concerning the accidents administered by that Division. WSF needs to improve its communications with the Claims Division in Olympia so that WSF can take advantage of the system being implemented there. If this communication link is strong enough, WSF might even be able to reduce the amount of record keeping performed at the Colman Building.

The Claims Administration database will not meet all of the needs of the WSF. Consequently, consideration should be given to automating the remaining portions of the WSF safety and accident databases.

Recommended Actions

The project team recommends that WSF arrange to routinely obtain summary information from the Claims Administration for the data that are stored in Olympia. This information will benefit the WSF considerably, and will be essentially free. After WSF determines how this information transfer can take place and how the analysis is limited, WSF should progress towards designing its own database system to maintain the rest of its accident information. This system might also be expanded to include hazardous materials data or other safety related information. By waiting until after the link to Claims is functioning, WSF will better understand the limitations of the Claims system so that it can design improvements into its own system.

BIDDING AND DISPATCHING

This section describes the data requirements for staff bidding and dispatching. The subject of staff schedule determination is described in another report resulting from this project. This second report examines the potential for automating the crew scheduling process, determining the work schedules that are bid on, and/or assigned to specific individuals. Regardless of whether an automated crew scheduling function is developed, the WSF must still maintain a dispatching system for tracking the daily assignments of crew members, relief crews, ticket sellers, traffic directors and on-call personnel, as well as keep a bidding system to allow those staff members to make orderly transfers between routes, vessels and terminals. These systems track which individuals are assigned to specific pieces of work and which staff are available for additional assignments. Dispatching and bidding require a considerable amount of data collection, manipulation and

reporting, often with a very short turn-around between knowing about a data need (i.e., a crew member calls in sick), and accessing the collected data (a vessel can not sail without a full crew complement).

Data Collection, Storage, and Manipulation

At this time, the day-to-day working of the crew dispatching function is handled by the Fleet Coordinator, Gerhard Wack (for unlicensed deck personnel and officers), and the Maintenance Coordinator, Mary Liuska (for engineers and oilers). Both of these individuals use a manual procedure for tracking what personnel are located on what shift, on what vessel, and who is available to relieve those crew members in case of sickness or scheduled vacation. Terminal agents at each dock fulfill this function for the various terminal employees. Mr. Wack and Ms. Liuska also maintain the crew bid lists and transfer staff between routes. These functions are performed by the Assistant Terminals Manager, Carol Andrews, for the terminal personnel.

Essentially, these individuals maintain WSF seniority and bid lists and apply the applicable work rules to those lists to determine which personnel are assigned normally scheduled shifts, which are on relief duty, and which are on call. (Also what order those on call should be called for work availability.) Seniority lists exist for each type of crew position. Bid lists exist for each route (and vessel for engineers). These lists are kept, updated and consulted manually. While most of this information is also included in the payroll system database, it is not available for use in the day-to-day functioning of the WSF.

Use

The basic use of the seniority lists is to determine what WSF employee has the rights to available work assignments. During schedule changes, this includes the rights of employees to switch routes or terminals, and move between shifts. After new schedules and shifts have been assigned, the terminal and vessel departments use slightly different procedures for filling in for sick and vacationing personnel. For terminals, part time and on-call personnel are used (by seniority) to replace sick and vacationing personnel. For vessels, the seniority lists are used to call in personnel not currently working 80 hours in the two week period. In addition, for vessels, records of what pieces of relief work are assigned must be manually tracked

against pay vouchers returned for payroll processing, if an audit is to be done to examine if pay requests match assigned work.

WSF maintains a list of vessel employees who are guaranteed 80 hours of pay over a two week period but are not assigned to specific vessels or routes. These "guaranteed relief" workers are used to move vessels between routes and fill in for sick or vacationing regularly assigned crew members. When the supply of guaranteed workers is used up, the seniority lists are consulted to determine the highest ranking member that does not have 80 hours of work, and is available to work the required shifts. For positions in which advanced notice of an absence is given, the highest seniority person on the "on-call" list is given the first opportunity at the job. When little notice is given about a crew need (i.e., a sick crew member calls in shortly before his or her shift begins) the highest seniority person who can reach the necessary dock by the required time is called.

Issues

The primary issues in this area of dispatching are the speed and efficiency of determining available workers, of updating the seniority and bid lists, and of auditing submitted payroll forms to ensure that they match the assigned work for fill-in positions.

While a new payroll system (proposed in 1979, and currently being designed) could provide a means for fulfilling these functions automating these functions without replacing the existing payroll system is possible. A relatively simple database program or programs could be written for a microcomputer that would maintain the various seniority and bid lists, provide biweekly assignment reports for use in auditing payroll forms, letters of seetime and settling pay disputes. Providing such a system with a selection function which would indicate the next available employee for call, given any specific assignment need, would also be possible. The system could also provide phone numbers and rank for the indicated personnel.

The specific design of the databases will require some additional work, but several aspects of the systems can be determined at this time. The crew dispatch function will need one or two terminals located near the dispatching working area. If terminal agents continue to perform the dispatching functions for terminal personnel, the bid lists for the terminal staff could be maintained on any of a number of microcomputers at Colman dock, as this system would be used only periodically.

If a new payroll system is scheduled to become available in the next year or two, and if that system can provide the required seniority and scheduling information, then a microcomputer based dispatching system is not required. If a new payroll system with the above functions is not to be implemented in such a time frame, the benefits to the ferry system of a micro-based database system will outweigh the costs of that development.

As with accident information, a similar system could be developed on the WSDOT mainframe. Such a solution would be reasonable, if ready access can be made to the payroll file seniority data. A microcomputer system would require the input of seniority information and periodic maintenance of that data. Such work is already being performed by the dispatching staff, so it would not be an additional cost to WSF when compared to existing practices. If the payroll system seniority lists are not accessible on the mainframe, the microcomputer system will most likely be less expensive to implement and maintain in the long term than a mainframe solution.

In light of the WSDOT data processing regulations, the database functions described above should be classified as an "office system" or a "personal system." The sole use of the crew database programs would be entirely within the dispatching section of the WSF, and therefore should not be considered as a "corporate" system. Similarly, only Carol Andrews or someone working in a similar capacity would need ready access to the terminal personnel seniority lists. These databases would rely on "corporate" data for seniority lists in that the seniority data is part of the payroll system which is a "corporate" system. Such data could either be periodically downloaded from the WSDOT mainframe or maintained separately (as is currently done) and compared for accuracy with the corporate database on a periodic basis. As an "office" system, the system could be developed on a microcomputer if so desired by the users.

Recommended Actions

The project team recommends that the WSF pursue the development of the bidding/dispatching database system described above. Such a system would provide several distinct advantages to the WSF:

- it would speed the process of determining available personnel and of filling temporary labor needs (sick and vacation time);

- it would provide an easy audit trail for comparing assigned work and submitted payroll forms;
- it would provide a relatively easy system to use for managing crews when Gerhard Wack, Sandy Rassmussen and/or Mary Liuska were sick or on vacation; and
- its cost would be reasonably small.

A limited system for assisting in the crew dispatching could be developed for roughly \$20,000. A preliminary staffing breakdown is shown in Exhibit 4. It would be maintained as part of the ongoing work of Gerhard Wack and Mary Liuska. It may or may not provide direct savings in these individuals' work times, but it would provide management controls that are not currently in existence, and provide some ability for the WSF staff to track labor expenses for hourly staff that are not regularly scheduled.

The \$20,000 development cost includes the cost of designing the databases, user interfaces with the database, and reporting programs. It also includes the cost of data entry for the seniority system and the initial entry into the database of current crew assignments. The cost does not include the roughly three staff-weeks of WSF employee time that would be required to help design the computer interface and train the appropriate staff. Nor does it include any WSDOT MIS staff time for ensuring the system meets WSDOT MIS database system controls, or provide a WSF or MIS manager to oversee the project. Approximately \$10,000 would be required for microcomputer equipment for such a system (based on advertised equipment prices). For another \$5,000 the bid lists could be automated for the terminal personnel. The terminal system could run on one of the existing WSF microcomputers or another \$5,000 would be required for an additional microcomputer. This terminal system would not have the analysis and reporting capabilities of the crew system. If the dispatch function for terminal personnel were to be centralized at a future point in time, these capabilities could be added with little difficulty.

EXHIBIT 4
ESTIMATED STAFF REQUIREMENTS FOR DEVELOPING A LIMITED COMPUTERIZED
BILLING/DISPATCHING SYSTEM

<u>Function</u>	<u>Person-Hours</u>		
	<u>WSF Staff</u>	<u>System Analyst*</u>	<u>Programmer**</u>
System Design	48	104	
WSF Review of System Design	32	24	
Finalize System Design	12	48	
Programming			350
Production of Documentation	4	40	50
Training	24	16	
Implementation Support	8	32	
Report Generation	—	16	—
Total	120	280	400

*Assumed to be familiar with Ferry System dispatching functions.

**Assumed to be familiar with the selected database package and associated programming tools.

APPENDIX A
DESCRIPTION OF THE RECOMMENDED OPERATIONS
DATABASE SYSTEM

APPENDIX A
DESCRIPTION OF THE RECOMMENDED OPERATIONS DATABASE SYSTEM

This appendix presents an overview of the basic parts of the operations database that is recommended for implementation by Washington State Ferries. The actual design and implementation of the required software must be completed as part of another project.

The operations database is intended to track the daily occurrences which effect the fulfillment of the planned vessel schedule. This includes vessel moves, missed and extra trips, vessel accidents, and breakdowns.

The recommended database system would consist of two basic files. The first would consist of a record of vessel moves. The second file would contain a record of deviations from the planned schedule. Upon entering the database system, the user would be presented with a series of menus designed to assist him/her in the use of the database programs. The initial menu would ask the user to choose which of the two database files (Vessel Moves or Trip Deviation) he/she wanted to use. After selecting the appropriate file, the user would have the option of entering new information into the data base, modifying previously entered data, querying existing information, or exiting the file and returning to the initial menu.

If the user chose any of the first three options, he/she would be presented a new menu or form for entering information. For entering new information, this form would look something like that shown in Exhibit A-1. If the user wanted to modify an existing entry, the system would ask for some identifying information (e.g., the date and route of the information that was to be modified). Once it was established which record in the file was to be altered, a form such as that in Exhibit A-1 would be presented to assist in making the modifications.

If a query of the data was to be performed, the user would be given a choice of routine applications, or the chance to run an ad hoc query. Printed reports of these queries would also be available. Exhibit A-2 shows an example of what the choice of routine queries might include. Selection of the ad hoc capabilities would allow the user to write a non-standard query using the database management system in its "native" mode, that is, without predesigned screen assistance such as the input forms shown in Exhibits A-1 and A-2.

Directions on how to perform these ad hoc queries would be included in a users manual for the operations database and in the software manual for the database system in which the operations programs were written.

The information to be included in the two database files described above are shown in Exhibits A-3 and A-4. This information would be gathered by having the terminal agents submit a form describing the occurrence of vessel moves and deviations from the planned schedule. The forms would be completed whenever a vessel was moved between routes, performed a gas trip, or when trips were either missed or added. Forms that might be used for transmitting that information to Colman Dock for entry into the database are shown in Exhibits A-5 and A-6.

**EXHIBIT A-1
EXAMPLE DATABASE ENTRY SCREEN**

Date: MMDDYY

Route: XXXX

Time of Occurrence (1st trip missed or extra, military time): XXXX

Number of Trips Missed XXX or Extra: XXX

Cause: Brkdwn Vsl Acc Per/Prop Acc Wthr Trafc Other: _____

(Note: if weather or accident was chosen above, a second screen would appear asking for additional information.)

EXHIBIT A-2
POSSIBLE SCREEN FOR DATABASE QUERY REPORTS

- 1.) Listing of vessel accidents
- 2.) Listing of missed trips by route
- 3.) Listing of breakdowns by route and vessel
- 4.) Listing of extra trips by route (dates provided)
- 5.) Ad Hoc inquiry of the database
- 6.) Return to Previous Screen

Directions: Highlight the desired action and hit the ENTER key.

EXHIBIT A-3
INFORMATION TO BE INCLUDED IN THE VESSEL MOVES DATABASE

Date of move: _____

Vessels Moved: 1) _____

from: _____

to: _____

EXHIBIT A-4
INFORMATION IN THE TRIP DEVIATION FILE

Date

Route

Time of initial occurrence

Number of Missed or Extra Trips

Cause of Deviation (weather, vessel accident, person or property accident, heavy traffic, other)

Type of weather which caused deviation (fog, wind, waves, tide, other)

Description of Accident which caused delay (vessel name, captain, description of accident)

EXHIBIT A-5
REPORT FORM FOR DEVIATION FROM SCHEDULE

Date: _____

Route: _____

Time of Occurrence (1st trip missed or extra): _____

Number of Trips Missed _____ or Extra _____

Cause (Circle One): Breakdown Vessel Accident Person/Property Accident Weather Heavy
Traffic Other: _____

If Weather was the cause, circle: Fog Wind Waves Tide

If Accident was the cause:

Vessel Name: _____

Captain's Name: _____

Description of Accident: _____

**EXHIBIT A-6
REPORT FORM FOR VESSEL MOVES**

Date of move: _____

Vessels Moved: 1) _____

from: _____

to: _____

Vessels Moved: 2) _____

from: _____

to: _____

Reason for Move (Check One):

_____ Planned Schedule Change

_____ Breakdown

_____ Gas Trip

_____ Other

**EXHIBIT A-7
STAFFING REQUIREMENTS FOR DEVELOPING THE OPERATIONS DATABASE**

<u>Function</u>	<u>Person-Hours</u>		
	<u>WSF Staff</u>	<u>System Analyst*</u>	<u>Programmer**</u>
System Design	24	30	
WSF Review of System Design	32	24	
Finalize System Design	8	16	
Programming			170
Production of Documentation		30	30
Training	16	8	
Implementation Support		16	
Report Generation		16	
Total	80	140	200

*Assumed to be familiar with Ferry System dispatching functions.

**Assumed to be familiar with the selected database package and associated programming tools.