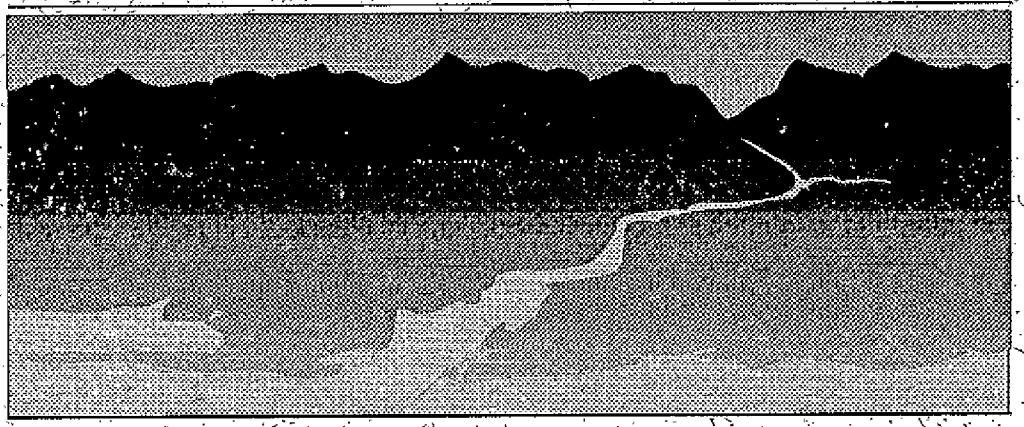
FINAL REPORT
TC 9161-04

LOWER COLUMBIA RIVER



BI-STATE PROGRAM

# DATA MANAGEMENT

## DATA MANAGEMENT SYSTEMS DEMONSTRATION REPORT

DECEMBER 30, 1993

Prepared By:
TETRA TECH

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DECEMBER 30, 1993

Prepared For:

The Lower Columbia River
Bi-State Water Quality Program

Prepared By:

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## ACKNOWLEDGEMENTS

This document was prepared by Tetra Tech, Inc. of Redmond, Washington and Ms. Roberta Feins, an independant environmental information consultant, for the Lower Columbia River Bi-State Water Quality Program under Contract Nos. C0091228 (WDOE) and 78-91 (ODEQ). Mr. Brian Offord of Oregon Department of Environmental Quality (ODEQ) and Mr. Neil Aaland of Washington Department of Ecology (WDOE) served as the Program Coordinators for the Bi-State Program. Dr. Steven Ellis served as Tetra Tech's Program Manager for the Lower Columbia River project. Mr. Gary Braun of Tetra Tech served as the Project Manager for this Work Assignment. Funding for this project was provided to the Bi-State Program by WDOE, ODEQ, public ports in Washington and Oregon, and the Northwest Pulp and Paper Association.

Mr. Gary Braun was the primary author of the report. Contributions to the report were provided by Ms. Roberta Feins. Technical review was provided by Dr. Steven Ellis. Illustrations were prepared by Ms. Kim Shaty. Word Processing and report production were performed by Ms. Lisa Fosse and Ms. Rosemary O'Brien. Copies of the draft version of this report were given to the attendees of the data management systems demonstration held on November 2, 1993 and members of the Bi-State Committee for review.

# 1.0 INTRODUCTION

This report provides a written summary of the Data Management Task System Demonstration that was presented to members of the Lower Columbia River Bi-State Program Steering Committee and other interested work group participants on November 2, 1993. A list of attendees is included as Table 1.

The demonstration was (and this report is) divided into three general areas as follows:

- A brief description of the Data Management Task background, including the purpose and objectives of the task, the reports produced, and the interactive process that has taken place to date.

- The demonstration of the Puget Sound Ambient Monitoring Program (PSAMP) system. This was the main focus of the demonstration and included a review of the short-, medium-, and long-term needs and options recommended in earlier reports. The demonstration focused on the short-term option; the selection of PSAMP data transfer formats as the standard to be used in the future. In addition, the PSAMP system was used to demonstrate some of the capabilities that would be useful for medium-term Bi-State Program needs, as well as, longer-term Program needs.

- The final portion of the demonstration was spent on questions and discussion about using the PSAMP data transfer formats as the recommended format for all future Bi-State Program data. A consensus agreement was reached by the work group and committee members present to make a recommendation to the full Bi-State Steering Committee.

Each of these topics is discussed in greater detail in the following sections of this report.

| TABLE 1. DATA MANAGEMENT SYSTEM DEMONSTRATION LIST OF ATTENDEES, NOVEMBER 2, 1993. | |
|---|---|
| NAME | ORGANIZATION |
| Bill Young | ODEQ |
| Andy Schaedel | ODEQ |
| Howard Knytych | ODEQ/Information Services |
| Don Yon | ODEQ, Program Coordinator |
| Doug Terra | ODEQ |
| Kate Dempsey | Ecology |
| Aaron Purcell | Ecology |
| Brain Offord | Ecology; Program Coordinator |
| Stu McKenzie | USGS, Bi-State Member |
| Jerry Heller | Port of Kalama; Bi-State Co-Chair |
| Alan Whitford | Longview Fibre Co; Bi-State Member |
| Gary Braun | Tetra Tech, Inc. |
| Roberta Feins | Consultant |

# 2.0 DATA MANAGEMENT TASK BACKGROUND

## 2.1 BACKGROUND AND STUDY OBJECTIVES

A major objective of the Lower Columbia River Bi-State Water Quality Program (Bi-State Program) is to collect environmental data for evaluating the water quality of the lower Columbia River. Studies performed under the Bi-State Program have in the past, and will in the future, produce data on a variety of topics. The Bi-State Program recognized the need to develop a framework for managing this information because they also recognized the need for continued monitoring and an ongoing need for information to support the management decisions of the Bi-State Program and of various agencies involved in the management of the lower river. Therefore, in the fall of 1992, the Bi-State Program issued this work assignment to help define its data management system.

A data management system will help to store and use data effectively. Major issues related to data management that the Bi-State Program needs to address include:

- Deciding how to store, organize, analyze, and display both existing and newly collected data (i.e., from the Bi-State Studies, as well as data from other agencies and sources).

- Making the data available to other agencies and entities that manage the Lower Columbia River and its resources.

- Making the data accessible to the public.

The purpose of the Data Management Task was to identify the data management needs and design options for the long-term management of existing and new data (e.g., water, sediment, and biological quality, source and beneficial use data) generated by the Bi-State Program. Additional purposes were to recommend an existing data management system to best meet these needs and demonstrate the system's capabilities. To meet these objectives, the work assignment was divided into four tasks:

- Development of a Work Plan
- Performance of a Data Management Needs Assessment
- Evaluation and Recommendation of a Data Management System
- Demonstration of the Selected System and Report Preparation (this document).

The specific steps involved in each of these tasks are discussed in separate documents previously prepared for the project (Tetra Tech 1992; 1993a,b) (Table 2). Only brief summaries of each document are provided herein to give the reader enough background to understand how the recommendations were made and how the system was selected for demonstration.

## 2.2 REPORTS AND PROCESS-TO-DATE

As discussed above, the data management task was divided into four major tasks. Several reports were generated for review and approval by the work group and Bi-State Committee members. A list of these reports are shown in Table 2. To date, 12 deliverables (including draft and final reports) have been submitted to, and accepted by, the Bi-State Program. Of these, the final Data Needs Assessment Report and the final Systems Evaluation and Recommendations Report will be discussed briefly below.

### 2.2.1 Data Management Needs Assessment

The main purpose of the data management needs assessment was to identify important criteria and factors to consider in the evaluation and recommendation of existing data management systems for the Bi-State Program. The needs assessment was completed in February, 1993 (Tetra Tech 1993a). The Programatic Needs assessment (Webster 1992) and a series of interviews were used to provide different views of an optimal data management strategy for the Bi-State Program.

| TABLE 2. DATA MANAGEMENT TASK: LIST OF DELIVERABLES | |
|---|---|
| Deliverables | Submittal Date |
| Draft Work Plan | 9/4/92 |
| Final Work Plan | 10/21/92 |
| Outline of Needs Assessment Report | 10/29/92 |
| Final Outline | 11/23/92 |
| Draft Needs Assessment Report | 1/4/93 |
| Final Needs Assessment Report | 2/10/93 |
| Draft List of Systems to Review | 2/11/93 |
| Final List of Systems to Review | 3/9/93 |
| Draft Evaluation and Recommendation Report | 4/16/93 |
| Final Evaluation and Recommendation Report | 5/28/93 |
| Progress Report on Data Entry | 9/30/93 |
| System Demonstration | 11/2/93 |
| Draft System Demonstration Report | 11/19/93 |
| Final System Demonstration Report | 12/30/93 |

The Needs Assessment had two primary objectives:

- Identify key programatic and technical issues to effectively manage data for the Bi-State Program

- Develop a list of elements that could be used to evaluate the ability of existing data management systems to meet the needs of the Bi-State Program.

Programatic issues considered in the needs assessment included program objectives and institutional requirements, program longevity, and economic constraints and long-term funding options. The technical issues considered in the needs assessment included system location, operation, and maintenance; system compatibility; database design; and data accessibility. A wide list of user needs and requirements was defined and were further broken down into those needed to meet short- and long-term Bi-State Program objectives. Elements of a potential data management system were categorized as required or preferred.

The list of evaluation criteria and time scales were further refined through discussions with work group members and resulted in the identification of short-, medium-, and long-term data management objectives for the Bi-State Program needs:

- Short-term (2 months - 1 year) data management objectives are to manage the data that have been collected or compiled through the program itself (e.g., reconnaissance survey data).

- Medium-term (1 - 5 years) data management objectives include managing, analyzing, and distributing data collected by the program and other related data about the lower Columbia River, encouraging the distribution of information on the lower River to interested parties - including the public and other agencies.

- Long-term (greater than 5 years) data management objectives of the Bi-State Program are to ensure cooperative sharing of all available information on the lower river, in order to improve environmental decision making.

The modified time scales and modified list of elements were then used to evaluate existing systems for use by the Bi-State Program.

### 2.2.2 Data Management System Evaluation and Recommendations

The data management systems evaluation and recommendations report had two major objectives:

- Evaluate existing data management systems according to the criteria developed by the needs assessment, as modified through work group meetings.

- Develop recommendations for data management systems to meet the short-, medium-, and long-term data management needs.

Recommendations were made for each time scale based on the evaluation of each system compared to the required, preferred, and technical elements that were defined previously. Briefly, the results for each time scale are summarized below. Each of these are discussed in greater detail in Tetra Tech (1993b) and in Section 3.0 of this document.

- **Short-term:** An existing data transfer format or archive is the recommended approach. The PSAMP data formats are recommended. The Oregon GIS standards are recommended for GIS data.

- **Medium-term:** Three approaches were identified and recommendations for each alternative approach were made.

  - Maintain data in the archive format selected for short-term. PSAMP format was recommended.

  - Place Bi-State Program data into an existing data management system that is managed and maintained by the Bi-State Program. PSAMP and COMPAS systems are possible choices.

- Place Bi-State Program data into an existing system that is managed and maintained by another organization. If a federal system is selected, ODES is recommended. If a local system is selected, then CRCIS is an attractive alternative.

- **Long-term:** Develop a committee of State and Federal data experts to explore the use of wide-area networks.

# 3.0 SUMMARY OF PSAMP SYSTEM DEMONSTRATION

This section provides summaries and discussion of the viewgraphs and copies of the computer screens that were used as part of the system demonstration. In addition, summaries of the questions and discussions raised by workshop participants are included at the end of each subsection.

## 3.1 SUMMARY OF SHORT-TERM NEEDS AND OPTIONS

The Bi-State Program's short-term needs are to manage the data that have been collected to date by the Bi-State Program itself. These data are monitoring data that were collected during the Reconnaissance survey, and data that will be collected in the next year.

Figure 1 shows the decisions to be made in selecting a short-term approach. Placing monitoring data into an existing **data archive** or **data transfer format** would be the best approach to meeting short-term needs. Examples of data archives are Storet and the Ocean Data Evaluation System (ODES) data submittal format. Examples of data transfer formats are the format used to submit data to Storet or ODES.

The advantages and disadvantages of using a data archive vs a data format were discussed. A data archive is attractive in that it is centrally maintained, and usually accessible to users. Bi-State Program staff would not have to maintain the data but could direct users to the archives. Major disadvantages of archives are that submitters may be charged for loading their data to the archive (e.g., it would cost about $7,000 to transfer Reconnaissance survey data to ODES), and that some kinds of information may not be stored (i.e., Storet has limited ability to store biological data).

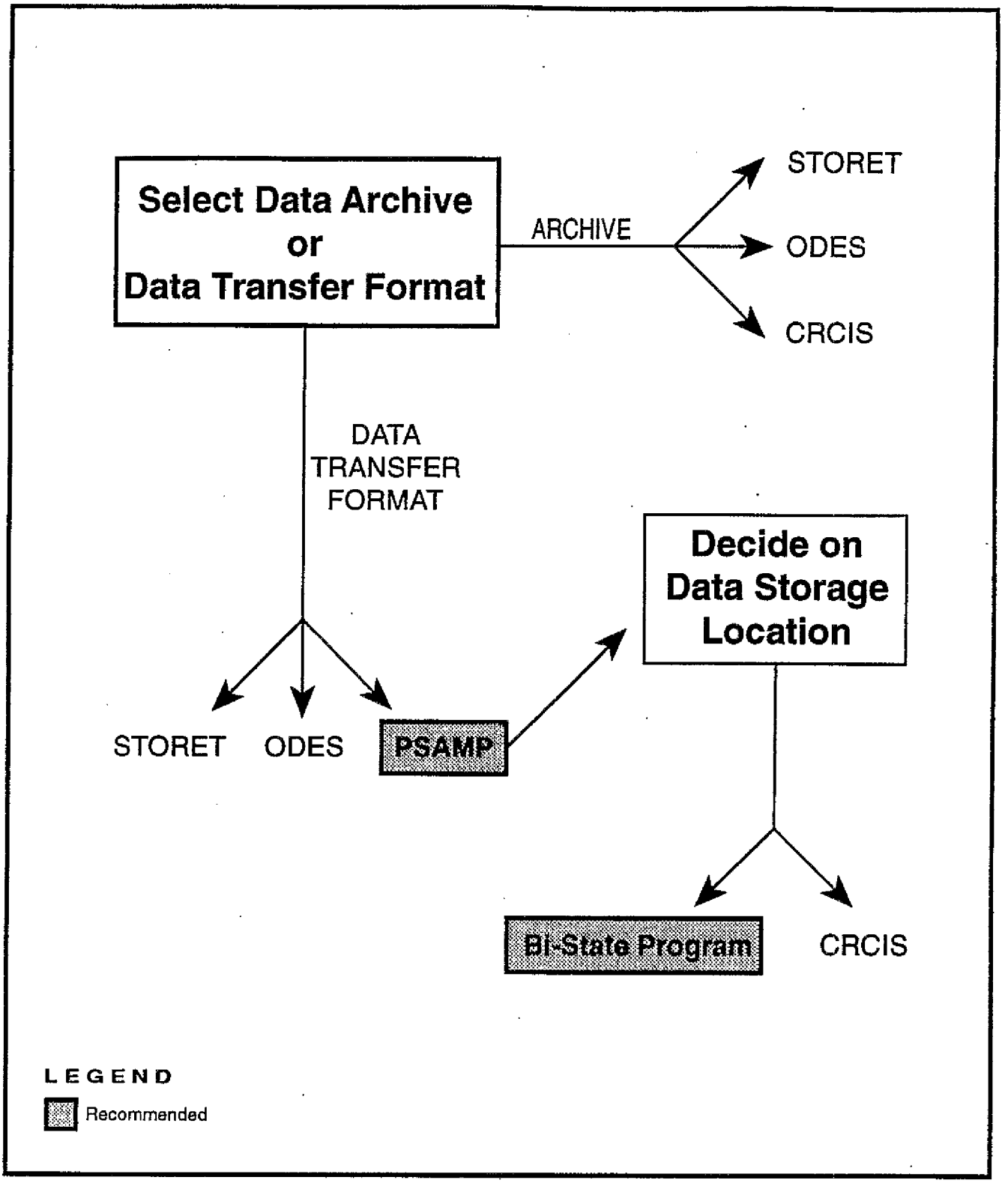


Figure 1. Short-term Data Management Options and Recommended Approach.

A data transfer format is therefore recommended for storing data in the short-term. Data transfer formats have the advantage of allowing a user to move the data into whatever database, spreadsheet or other software they find useful. There is a low cost to the Bi-State Program in using the formats, since contractors can be required to submit formatted data files as a project deliverable.

A number of different available formats were evaluated. Desirable characteristics of a transfer format are:

- Data are adequately documented,
- Data are logically organized,
- The format itself is well-documented
- Data are easy to transfer into software such as databases, and spreadsheets.

The data transfer formats used by the Puget Sound Ambient Monitoring Program (PSAMP) are recommended as the best for program needs. These formats include specifications for transferring data on sediments, fish, shellfish, water, marine mammals and birds. Features of the formats include:

- Data are adequately documented by references to the original survey report, by extensive station location and sampling information, by information on analytical methods, data quality, data qualifiers and significant digits.
- Data are logically organized (Figure 2 shows the relationship among files used to report data from a sediment survey).
- The format is documented in a report (Figure 3)
- Data are stored in comma-delimited ASCII files which can easily be used to transfer the data into many different software packages.

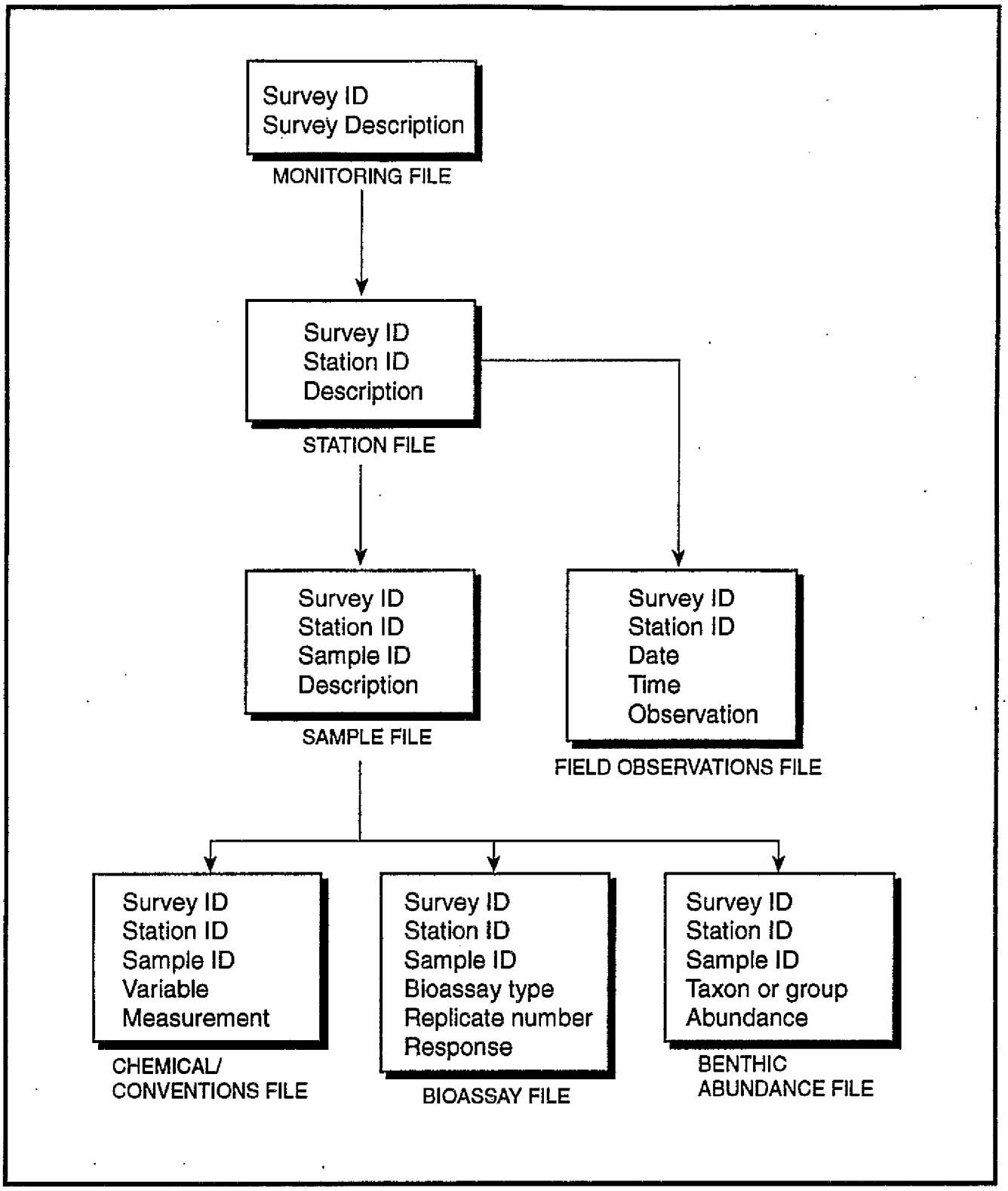


Figure 2. Organization of Files for Sediment Data Transfer.

**PUGET SOUND AMBIENT MONITORING PROGRAM**

**DATA TRANSFER FORMATS**

**VERSION 2**

**FEBRURARY 1991**

PUGET SOUND WATER QUALITY AUTHORITY
PSAMP STEERING COMMITTEE
P.O. BOX 40900
OLYMPIA, WA 98504-0900

Figure 3. Title Page of PSAMP Data Transfer Format Specifications.

The ease of transferring data was demonstrated. Figure 4 shows a printout of a portion of a file used for reporting monitoring station names and locations. During the demo, this file was easily loaded into Excel (Figure 5), Microsoft Access (Figure 6), and into a Dbase application (the PSAMP database system).

### 3.1.1 Summary of Workshop Participant Discussions

- Is sufficient data quality information required by the PSAMP format?

  Generally, the formats provide more quality information than Storet formats, but do not provide as much detail as a specialist (e.g., a chemist) might like.

- What are the costs to put data into this format?

  Costs are minimal (less than $5,000 per year), if contractors know the requirement in advance and plan ahead to collect and format the necessary information.

- Why are these formats preferable to Storet format?

  Storet formats are based on 80-column punch cards, and are hierarchical: therefore, not easy for microcomputer software such as Excel to read. Storet formats are not designed to deal with biological data and do not store adequate quality assurance information.

- Where can documentation of the PSAMP formats be obtained?

  Copies of the specifications are available from the Puget Sound Water Quality Authority in Olympia, WA.

- What are the costs of not making a decision on a recommended format?

  Waiting to select a reporting format will result in higher costs to reformat and document data later on.

- Is Ecology comfortable with use of the formats?

```
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"CRSEDS","E11","","","L","",4538.448,12243.011,,,,,"","920101"
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Figure 4. Printout From a File in PSAMP Data Transfer Format. File Reports Station Locations.

| | | | | | |
|---|---|---|---|---|---|
| CRSEDS | D1 | L | 4612.274 | 12356.99 | 920101 |
| CRSEDS | D10 | L | 4612.198 | 12326.64 | 920101 |
| CRSEDS | D11 | L | 4614.49 | 12332.91 | 920101 |
| CRSEDS | D12 | L | 4612.463 | 12323.38 | 920101 |
| CRSEDS | D13 | L | 4609.78 | 12320.14 | 920101 |
| CRSEDS | D14 | L | 4608.914 | 12323.42 | 920101 |
| CRSEDS | D15 | L | 4608.347 | 12313.93 | 920101 |
| CRSEDS | D16 | L | 4611.244 | 12305.43 | 920101 |
| CRSEDS | D17 | L | 4609.87 | 12302.76 | 920101 |
| CRSEDS | D18 | L | 4607.429 | 12301.31 | 920101 |
| CRSEDS | D19 | L | 4608.32 | 12300.52 | 920101 |
| CRSEDS | D2 | L | 4618.042 | 12402.49 | 920101 |
| CRSEDS | D20 | L | 4603.596 | 12252.11 | 920101 |
| CRSEDS | D21 | L | 4604.324 | 12253.93 | 920101 |
| CRSEDS | D22 | L | 4600.584 | 12250.91 | 920101 |
| CRSEDS | D23 | L | 4557.378 | 12248.06 | 920101 |
| CRSEDS | D24 | L | 4552 | 12247.8 | 920101 |
| CRSEDS | D25 | L | 4550.408 | 12246.65 | 920101 |
| CRSEDS | D26 | L | 4546.921 | 12246.16 | 920101 |
| CRSEDS | D27 | L | 4545.27 | 12246.67 | 920101 |
| CRSEDS | D28 | L | 4541.195 | 12246.14 | 920101 |
| CRSEDS | D29 | L | 4540.12 | 12245.86 | 920101 |
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| CRSEDS | D34 | L | 4535.604 | 12233.98 | 920101 |
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| CRSEDS | D40 | L | 4537.327 | 12201.21 | 920101 |
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| CRSEDS | E12 | L | 4534.078 | 12231.19 | 920101 |

Figure 5. Printout of Columbia River Sediment Survey Station Data Loaded to Excel.

| SURVEY | STATION | 3 | 4 | 5 | 6 | LATITUDE | LONGITUDE | 9 | 10 | 11 | 12 | 13 | 14 | RECORD DT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRSEDS | D1 | | | L | | 4612.274 | 12356.986 | | | | | | | 920101 |
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| CRSEDS | D25 | | | L | | 4550.408 | 12246.648 | | | | | | | 920101 |
| CRSEDS | D26 | | | L | | 4546.921 | 12246.156 | | | | | | | 920101 |
| CRSEDS | D27 | | | L | | 4545.27 | 12246.669 | | | | | | | 920101 |
| CRSEDS | D28 | | | L | | 4541.195 | 12246.14 | | | | | | | 920101 |
| CRSEDS | D29 | | | L | | 4540.12 | 12245.86 | | | | | | | 920101 |
| CRSEDS | D3 | | | L | | 4610.9 | 12351.72 | | | | | | | 920101 |
| CRSEDS | D30 | | | L | | 4539.46 | 12244.68 | | | | | | | 920101 |
| CRSEDS | D31 | | | L | | 4536.41 | 12240.49 | | | | | | | 920101 |
| CRSEDS | D32 | | | L | | 4537.03 | 12239.54 | | | | | | | 920101 |
| CRSEDS | D33 | | | L | | 4536.678 | 12237.613 | | | | | | | 920101 |
| CRSEDS | D34 | | | L | | 4535.604 | 12233.992 | | | | | | | 920101 |
| CRSEDS | D35 | | | L | | 4534.62 | 12226.781 | | | | | | | 920101 |
| CRSEDS | D36 | | | L | | 4533.516 | 12227.441 | | | | | | | 920101 |
| CRSEDS | D37 | | | L | | 4534.589 | 12223.73 | | | | | | | 920101 |
| CRSEDS | D38 | | | L | | 4533.464 | 12220.052 | | | | | | | 920101 |
| CRSEDS | D39 | | | L | | 4532.604 | 12215.721 | | | | | | | 920101 |
| CRSEDS | D4 | | | L | | 4615.981 | 12358.261 | | | | | | | 920101 |
| CRSEDS | D40 | | | L | | 4537.327 | 12201.21 | | | | | | | 920101 |
| CRSEDS | D41 | | | L | | 4534.62 | 12226.781 | | | | | | | 920101 |
| CRSEDS | D42 | | | L | | 4541.195 | 12246.14 | | | | | | | 920101 |
| CRSEDS | D43 | | | L | | 4557.378 | 12248.058 | | | | | | | 920101 |
| CRSEDS | D44 | | | L | | 4609.87 | 12302.76 | | | | | | | 920101 |
| CRSEDS | D45 | | | L | | 4614.49 | 12332.91 | | | | | | | 920101 |
| CRSEDS | D46 | | | L | | 4610.9 | 12351.72 | | | | | | | 920101 |
| CRSEDS | D5 | | | L | | 4611.638 | 12342.104 | | | | | | | 920101 |
| CRSEDS | D6 | | | L | | 4617.882 | 12343.113 | | | | | | | 920101 |

Figure 6. Printout of Columbia River Sediment Survey Data Loaded to Microsoft Access.

Yes, Ecology sees the PSAMP formats as the most useful of available formats, since data are so easy to transfer into almost any software the user would want.

## 3.2 SUMMARY OF MEDIUM-TERM NEEDS AND OPTIONS

The Bi-State Program's medium-term needs are to manage, analyze, and distribute data collected by the Bi-State Program, and other related data about the lower Columbia River. Results need to be communicated to the public, and to policy-makers about the condition of the River.

The recommended choice of a medium-term system depends on the Bi-State Programs's answers to the following questions:

- How frequently do Bi-State Program staff need to access and use Program data?
- Does the Bi-State Program want to, and is the Bi-State Program able to manage its own database system?

Three possible approaches were identified (Figure 7):

- Maintain the data archive
- Select a database system to be managed by the Bi-State Program
- Select a database system managed by another organization.

### 3.2.1 Maintain the Data Archive

If the Program staff do not need frequent data access, data could be maintained in the data transfer format selected to meet short-term needs. This option is the simplest and lowest-cost option (<$5,000/year) for the Bi-State Program, but also limits the ability to use and analyze data.

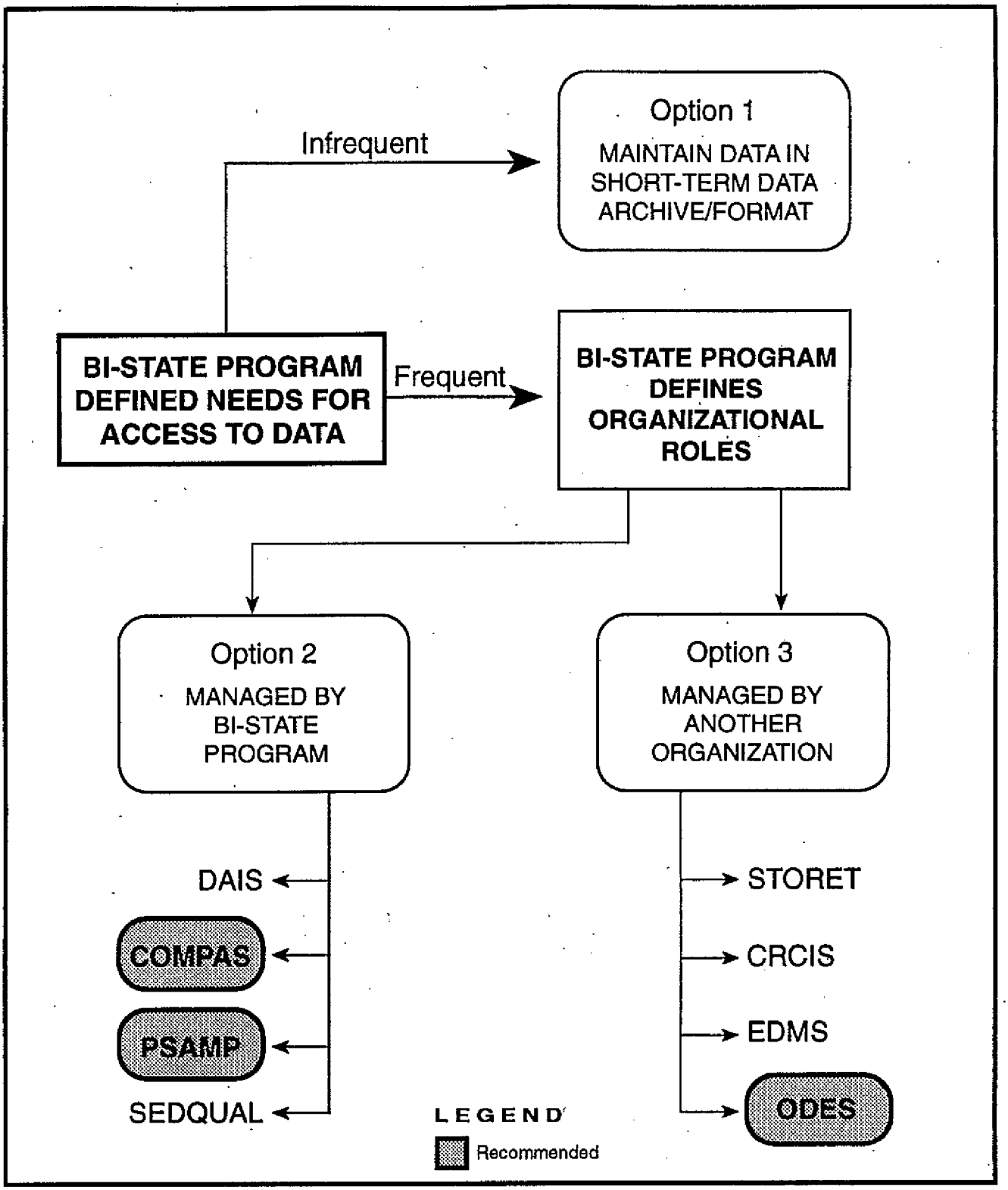


Figure 7. Medium-term Data Management Options and Recommended Approach.

### 3.2.2 Select a Database System to be Managed by the Bi-State Program

If the Bi-State Program needs frequent, direct, and flexible access to information, then an existing database system should be selected and managed by the Bi-State Program. This approach is the most expensive one, requiring from $15,000 to $35,000 in set-up costs, and about $15,000 a year to maintain. However, it would provide the Bi-State Program with the most extensive capabilities for data analysis and presentation.

Two possible options for a Program-managed database system were discussed:

- NOAA's Coastal Ocean Mapping, Planning and Assessment System (COMPAS)
- Puget Sound Ambient Monitoring Program (PSAMP) database system

*3.2.2.1 COMPAS.* COMPAS is an Apple computer-based database in development by the NOAA Strategic Environmental Assessment Program in Rockville, MD. It combines database and mapping capabilities, using Oracle database management software and Atlas Pro mapping software.

As described by NOAA staff, COMPAS will contain maps of shoreline and coastal features; along with different types of monitoring information. Menus will be available to set up the data files, manage data entry and editing, and to retrieve data from the files. By making a set of choices from a menu, a user will be able to selectively retrieve monitoring data, calculate some simple statistics (e.g., count, mean, minimum), and place the data onto an existing shoreline map.

Advantages of using COMPAS would include the mapping and analysis capabilities. However, neither Washington Department of Ecology or Oregon DEQ use Apple Computers. COMPAS is still in development, so it cannot be fully evaluated.

*3.2.2.2 PSAMP DATABASE SYSTEM.* The PSAMP database system is a DOS microcomputer-based database system developed for use in managing data from the Puget Sound Ambient Monitoring Program. Developed using dBase IV, it has been used by 3 state agencies and several consultants for managing monitoring data.

Several features of PSAMP were demonstrated to indicate the advantages of using a local, micro-computer-based database:

- The main menu was explained (Figure 8)
- Data in PSAMP data transfer format were loaded into PSAMP (Figure 9)
- A standard report of fish tissue metals data was produced (Figures 10 and 11)

Advantages of using PSAMP include:

- User-friendly
- Can load data in PSAMP format, and output data in PSAMP or ODES format.
- In use for several years at 3 different state agencies in Washington
- Flexible data retrievals
- Stores almost all desired data types

Disadvantages include:

- No mapping capabilities.
- Slow in retrievals and formatting
- Very limited custom report capability
- Uses dBase IV software, considered by some to be out-of-date.

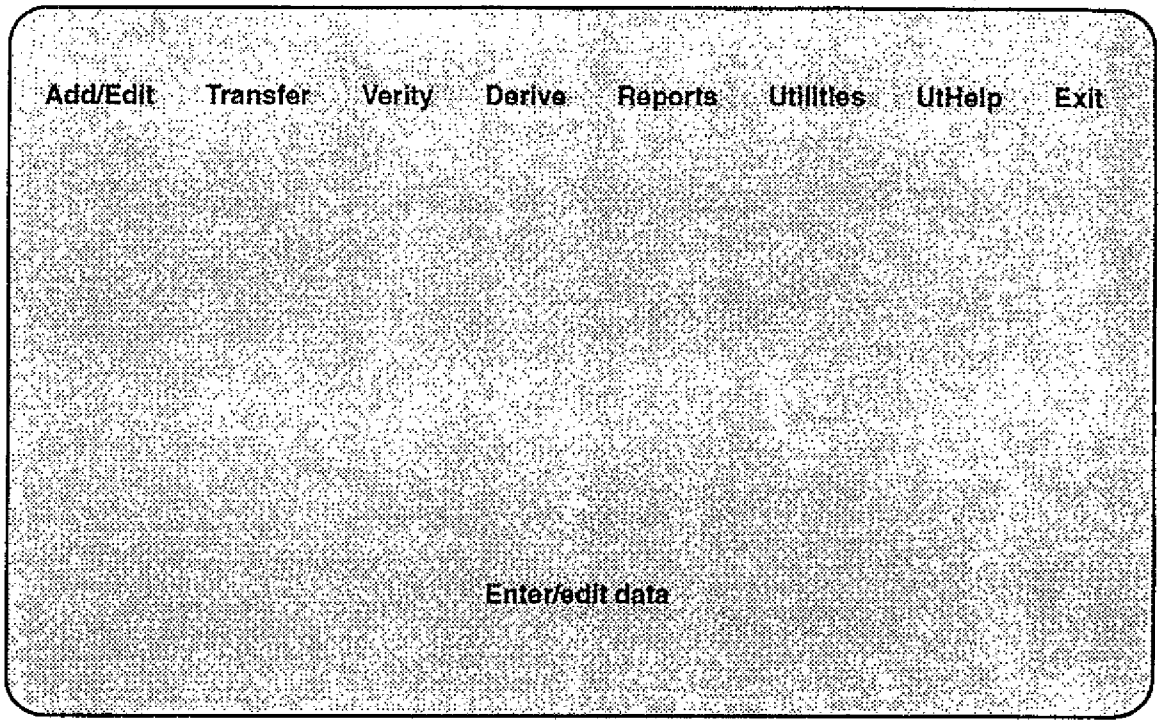


Figure 8. PSAMP Database System Main Menu.

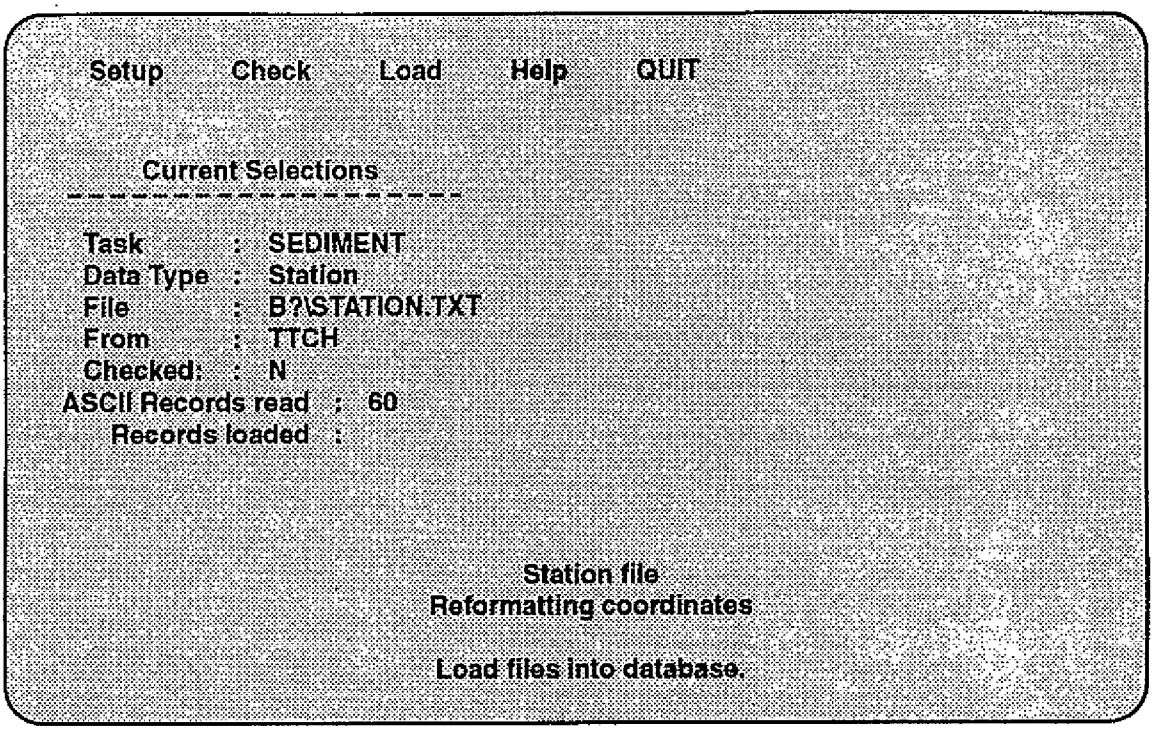


Figure 9. PSAMP Database System, Sample Screen for Loading Data.

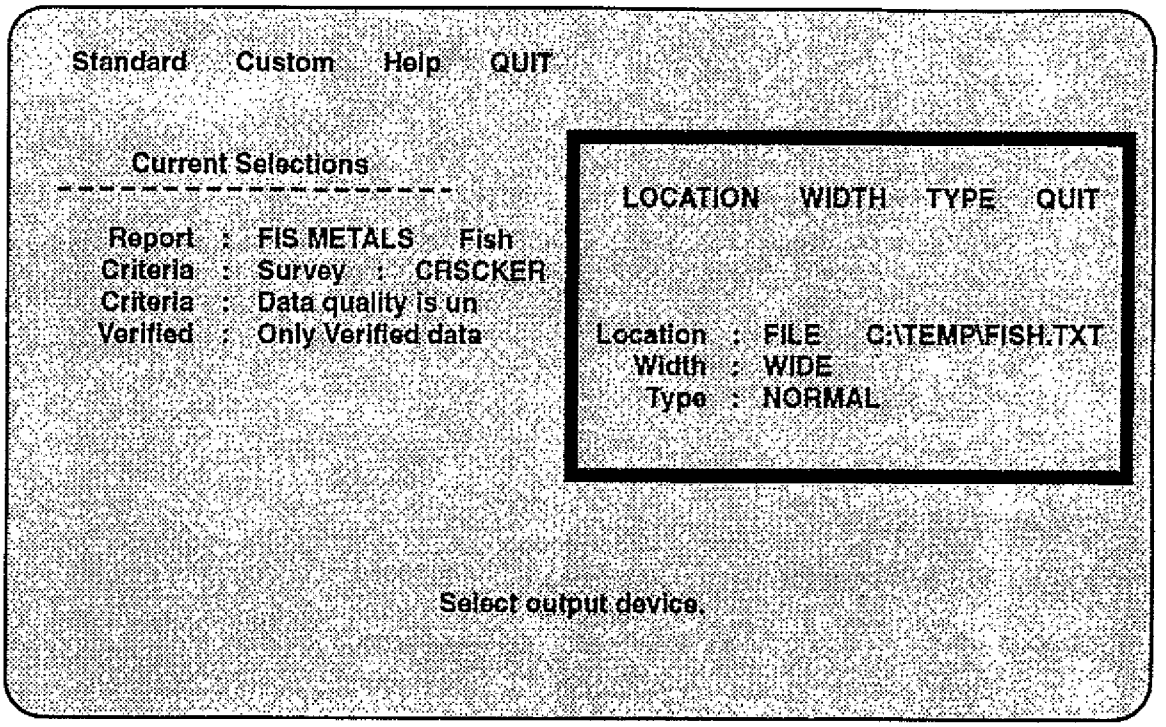


Figure 10. PSAMP Database System, Sample Screen Showing Specifications for Generating a Report.

Fish Metals Report
11/12/93 Page : 1

Only Verified data.
Survey : CRSCKER
Data quality is unspecified.

| SURVEY | STATION | SAMPLE | REP | SAMPLE DATE | WATER BODY | QUAL | manganese | mercury | nickel | selenium | silver | thallium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRSCKER | D10 | D10 | | 01/01/93 | 1C | 2 | | E0.117 | U0.82 | U0.47 | U0.21 | |
| CRSCKER | D12 | D12 | | 01/01/93 | 2A | 2 | | E0.071 | U0.74 | U0.42 | U0.19 | |
| CRSCKER | D15 | D15 | | 01/01/93 | 2B | 2 | | E0.065 | U0.91 | U0.52 | U0.23 | |
| CRSCKER | D16 | D16 | | 01/01/93 | 2C | 2 | | E0.054 | U0.75 | U0.43 | U0.19 | |
| CRSCKER | D19 | D19 | | 01/01/93 | 2C | 2 | | E0.061 | U0.61 | U0.35 | U0.16 | |
| CRSCKER | D20 | D20 | | 01/01/93 | 2C | 2 | | E0.072 | U0.74 | U0.42 | U0.19 | |
| CRSCKER | D22 | D22 | | 01/01/93 | 3A | 2 | | E0.094 | E1.05 | U0.45 | U0.21 | |
| CRSCKER | D23 | D23 | | 01/01/93 | 3A | 2 | | E0.137 | U0.73 | U0.42 | U0.19 | |
| CRSCKER | D24 | D24 | | 01/01/93 | 3A | 2 | | E0.038 | U0.81 | U0.46 | U0.21 | |
| CRSCKER | D26 | D26 | | 01/01/93 | 3B | 2 | | E0.137 | U0.65 | U0.37 | U0.17 | |
| CRSCKER | D28 | D28 | | 01/01/93 | 3B | 2 | | E0.071 | E1.36 | U0.40 | U0.18 | |
| CRSCKER | D29 | D29 | | 01/01/93 | | 2 | | E0.022 | E1.08 | U0.49 | U0.22 | |
| CRSCKER | D31 | D31 | | 01/01/93 | 4A | 2 | | E0.087 | U0.79 | U0.45 | U0.20 | |
| CRSCKER | D35 | D35 | | 01/01/93 | 4A | 2 | | E0.070 | E0.96 | U0.33 | U0.15 | |
| CRSCKER | D38 | D38 | | 01/01/93 | 4B | 2 | | E0.051 | U0.73 | U0.42 | U0.19 | |
| CRSCKER | D40 | D40 | | 01/01/93 | 4B | 2 | | E0.131 | U0.75 | U0.43 | U0.19 | |
| CRSCKER | D6 | D6 | | 01/01/93 | | 2 | | E0.082 | U0.59 | U0.34 | U0.15 | |
| CRSCKER | D8 | D8 | | 01/01/93 | | 2 | | E0.093 | U0.92 | U0.52 | U0.24 | |

Figure 11. PSAMP Database System, Sample Report Output.

### 3.2.3 Select a Database System Managed by Another Organization

If the Program needs frequent access to information, and does not want to manage its own database management system, then an existing database system managed by another organization should be selected. A mainframe-based Federal database system would be the best approach if the Bi-State Program wanted to minimize local responsibility for and control over the data, and minimize costs ($7,500 in set-up costs, $7,000 - $22,000 per year).

Two possible options for an Other-managed database system were discussed:

- Storet, EPA's basic database for the Storage and Retrieval of Water Quality Information.
- ODES, the Ocean Data Evaluation System, an EPA database designed to management and analysis of marine monitoring data.

*3.2.3.1 STORET.* Storet is EPA's oldest and largest ambient monitoring database. It is not currently adequate for Bi-State Program medium-term needs since it is designed to store water quality data, and has very limited capabilities for data retrieval and analysis. Since Storet is currently being extensively redesigned, we cannot predict with any certainty what the database will look like or what its capabilities will be in 5 years.

*3.2.3.2 ODES.* ODES is the recommended option as an other-managed system. ODES is known for its extensive menu-drive capabilities for data analysis using graphics, statistics, and some maps. The future of ODES is somewhat in doubt - funding has been tight in recent years, and there is talk that it will be merged with the redesigned Storet system.

### 3.2.4 Summary of Workshop Participant Discussions

- Would COMPAS be available for DOS computers?

  COMPAS is written using Oracle and C. There is no obvious technical reason why it could not be moved to a DOS system, but more information is needed for a definite answer.

- Isn't Ecology rewriting the PSAMP database in Oracle?

  There has been talk of rewriting PSAMP, using Oracle, but the funding has not been found. PSAMP's current database is dBase IV which was state-of-the-art software when PSAMP was written in 1989. DBase IV is not an Ecology or DEQ software standard.

- Would USGS's new database system, the National Water Information System (NWIS2) be available for use by the Bi-State program?

  A representative of USGS present at the demonstration indicated that NWIS2 will not be available for another year, and that it would require a substantial policy shift for USGS to go into the business of managing data for other organizations.

- What about other systems?

  A few other systems were evaluated, such as Idaho's Environmental Data Management System, but it was found to be limited to groundwater data. Neither Ecology nor DEQ has anything but the most general of plans for the development of a state-of-the-art database for monitoring data.

- Where can the PSAMP database system be obtained?

  Copies of the database are available from the Puget Sound Water Quality Authority in Olympia, WA. A form releasing the state from liability must be signed.

## 3.3 SUMMARY OF LONG-TERM NEEDS AND OPTIONS

Bi-State Program long-term data management needs are to ensure cooperative sharing of all available information on the River, in order to improve environmental decision-making.

The presentation of the long-term options focused on the technological changes that are underway that will allow extensive data sharing among organizations. Instead of creating a database for each project or program, computer networks will link databases together in ways that facilitate data integration (Figure 12). Users can get on these networks and ask questions that are pertinent to their particular focus.

Such technology has become available in the last several years, and agencies are beginning to implement it. For example, Ecology is currently running their Water Quality Permit Database across an agency-wide network, that allows a user in Olympia to query data that is managed by and located in the Eastern Regional Office in Spokane.

To demonstrate a simple example of the new technological capabilities, a demonstration of how Microsoft Access could be used to access data in the PSAMP database was performed (Figure 13). The data are still maintained in the dBase files, but Access allows a user to generate reports without knowing dBase or having the PSAMP system. In the future, users will be able to combine data stored at different locations, and in different software, provided that data have been standardized enough to allow their combination.

While the Bi-State Program cannot single-handedly take on the task of building such a system, it should encourage the discussion of data sharing, integration and standardization as part of the Steering Committee's development of a long-term institutional framework for Columbia River monitoring and management. A working group of data experts from the states and interested Federal agencies should meet to explore issues, and make recommendations to the Steering Committee for a long-term approach. The Program should seek to take advantage of and encourage efforts to improve access to existing agency data needed to make management decisions.

### 3.3.1 Summary of Workshop Participant Discussions

- Doug Terra, ODEQ, described a current effort underway in Oregon to development a set of data standards for agencies, and others involved in the implementation of President Clinton's forest plan. A Memorandum of Understanding is being developed which will require participating organizations to adhere to these standards in order to be able to share and analyze data.

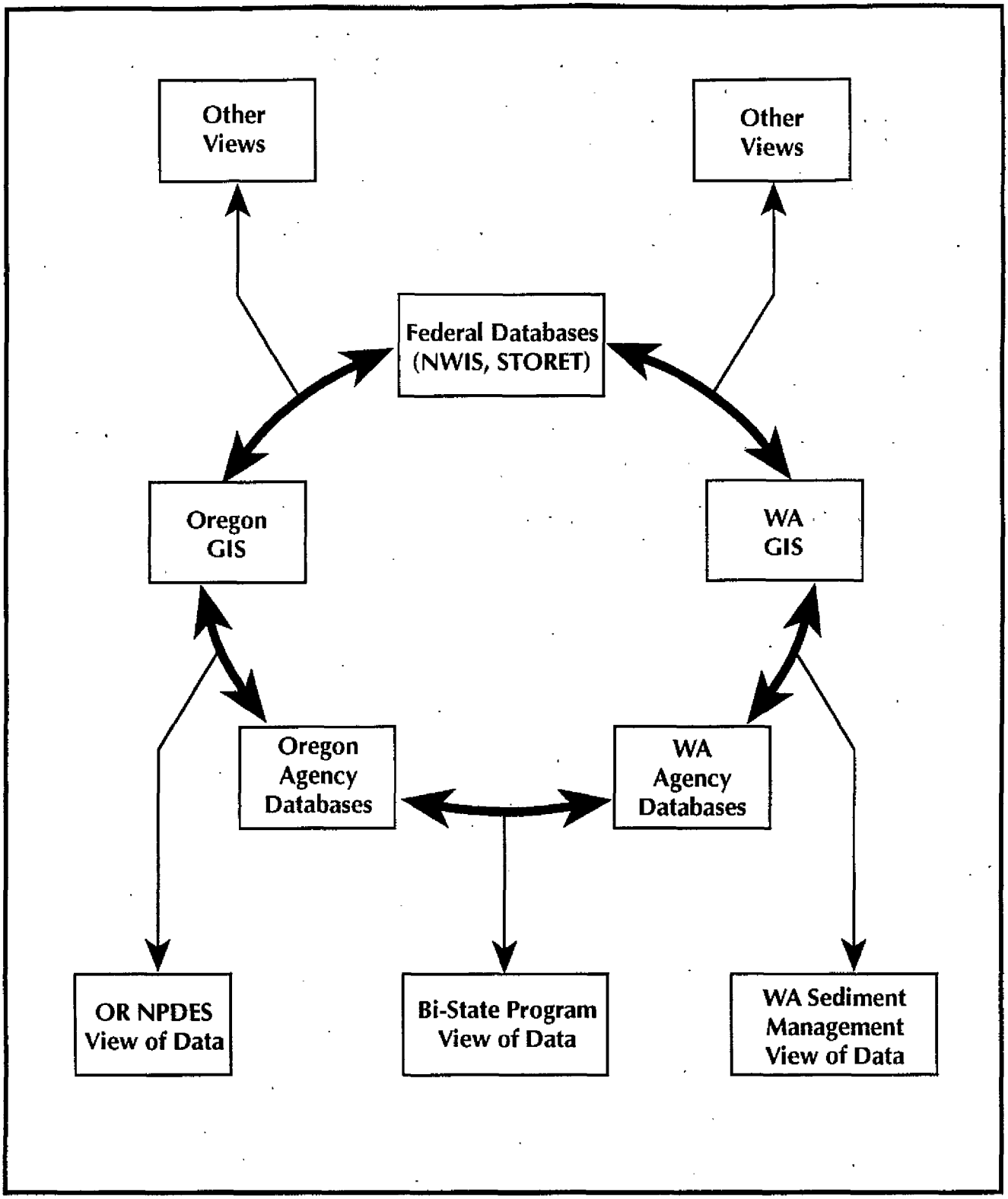


Figure 12. Schematic Diagram of Ideal Long-Term System.

| SURVEY | STATION | SAMPLE | REPLICATE | TOTAL PCBS | METHOLXYCHLOR |
|---|---|---|---|---|---|
| CRCRAY | D6 | D6 | | | U30 |
| CRCRAY | D8 | D8 | | | U30 |
| CRCRAY | D10 | D10 | | | U30 |
| CRCRAY | D12 | D12 | | | U30 |
| CRCRAY | D15 | D15 | | | E32 |
| CRCRAY | D16 | D16 | | | U30 |
| CRCRAY | D19 | D19 | | | U30 |
| CRCRAY | D20 | D20 | | | U30 |
| CRCRAY | D22 | D22 | | | U30 |
| CRCRAY | D23 | D23 | | | U40 |
| CRCRAY | D24 | D24 | | | 34 |
| CRCRAY | D26 | D26 | | | U30 |
| CRCRAY | D28 | D28 | | | U30 |
| CRCRAY | D29 | D29 | | | U30 |
| CRCRAY | D31 | D31 | | | U30 |
| CRCRAY | D35 | D35 | | | U30 |
| CRCRAY | D38 | D38 | | | U30 |
| CRCRAY | D40 | D40 | | | U30 |
| CRSCKER | D6 | D6 | | 110 | U30 |
| CRSCKER | D8 | D8 | | 70 | R |
| CRSCKER | D10 | D10 | | 210 | U30 |
| CRSCKER | D12 | D12 | | 110 | U30 |
| CRSCKER | D15 | D15 | | 66 | 65 |
| CRSCKER | D16 | D16 | | 76 | U30 |
| CRSCKER | D19 | D19 | | 63 | U30 |
| CRSCKER | D20 | D20 | | 130 | U30 |
| CRSCKER | D22 | D22 | | 61 | U30 |
| CRSCKER | D23 | D23 | | 160 | U30 |
| CRSCKER | D24 | D24 | | 120 | U30 |
| CRSCKER | D26 | D26 | | 150 | U30 |
| CRSCKER | D28 | D28 | | 390 | U30 |
| CRSCKER | D29 | D29 | | 160 | U30 |
| CRSCKER | D31 | D31 | | 210 | U30 |
| CRSCKER | D35 | D35 | | 55 | U30 |
| CRSCKER | D38 | D38 | | 130 | U30 |
| CRSCKER | D40 | D40 | | 130 | U30 |

Figure 13. Sample Screen Showing a Microsoft Access Retrieval of Columbia River Crayfish and Sucker Pesticide Data From PSAMP Files.

## 4.0 SYSTEM DEMONSTRATION SUMMARY AND RECOMMENDATIONS

At the conclusion of the presentation, questions and discussions among the presenters and among workshop participants, particularly between ODEQ and Ecology representatives were encouraged. A review of the outstanding issues for this project were made and we raised the question of whether the participants could agree on recommending that the PSAMP data formats should be used by the Bi-State Program to organize the existing and future data. There was a fair amount of discussion among the state agency participants and some reluctance by ODEQ to accept this recommendation. However, through further discussions about other alternatives and their disadvantages, and the fact that this work had been held up long enough, a consensus was reached by all workshop participants that the PSAMP data formats should be recommended to the Bi-State Sterring Committee as the formats to be used in all future Bi-State work. In addition, it was recommended that this requirement be added to all future data collection task orders issued by the Bi-State Program to ensure that all data are received and are in a standard format.

Finally, it was also agreed upon by consensus, that the Bi-State Program was not the appropriate group to solve the long-term data integration efforts. However, a recommendation should be made to the Steering Committee involving:

- The establishment of a working group data experts from the states and federal agencies that would meet to explore issues, and make recommendations to the Steering Committee for a long-term approach.

- The Bi-State should encourage the discussion of data sharing and data integration as part of the Steering Committee's development of a long-term institutional framework for Columbia River monitoring and management.

## 5.0 REFERENCES

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