



Office of Inspector General

Audit Report

**INFORMATION RESOURCES
MANAGEMENT**

**OFFICE OF WATER
DATA INTEGRATION EFFORTS**

Report No. E1NWG6-15-0001-8100177

June 22, 1998

**Inspector General Divisions
Conducting the Audit:**

**ADP Audit and Assist Staff
Washington, DC**

**Regional and Program Offices
Involved:**

**Office of Water
Washington, D.C.**

**Office of Information Resources Management
Washington, D.C.**

MEMORANDUM

SUBJECT: Office of Water Data Integration Efforts
Audit Report No. E1NWG6-15-0001-8100177

FROM: Michael Simmons
Deputy Assistant Inspector General for Internal Audits (2421)

TO: Robert Perciasepe
Assistant Administrator for Water (4101)

Mark E. Day, Acting Director
Office of Information Resources Management (3401)

The objectives of our survey were to review the Office of Water's (OW) development of plans to integrate automated water systems data, and to determine whether Federal, Agency and OW guidance was provided to ensure use of standard data elements for sharing information. We also reviewed OW activities to increase the public's access to key water data.

Our survey indicated OW has started to address water data integration, but progress is slow and a more significant effort is needed. Data management and cross integration of media has been a long-standing problem for the Agency. In 1994, the Office of Information Resources Management (OIRM) acknowledged data management as a Federal Managers' Financial Integrity Act (FMFIA) weakness. The OW has not developed Information Technology (IT) plans, data standards or standard guidance that will facilitate data sharing or integration of data across OW systems, except for Order 7500.1A (dated 10/29/92), Minimum Set of Data Elements for Ground Water Quality.

In this report, we have incorporated ongoing OW and OIRM initiatives, summarized Federal and Agency IT policies, identified intergovernmental activities in this area, and recommended corrective actions which would effectively address the identified weaknesses.

ACTION REQUIRED

In accordance with EPA Order 2750, we have designated the Assistant Administrator for Water as the action official for this report. As the action official, you are required to provide us with a written response within 90 days of the final audit report date. The response should

incorporate actions from the Office of Information Resources Management. For corrective actions planned, but not completed by the response date, reference to specific milestones dates will assist in deciding whether to close this report.

This audit report contains findings that describe problems the Office of Inspector General has identified and corrective actions the OIG recommends. The audit report represents the opinion of the OIG and the findings do not necessarily represent the final EPA position. Final determinations on matters in this audit report will be made by EPA managers in accordance with established EPA audit resolution procedures. Accordingly, the findings described in this audit report are not binding upon EPA in any enforcement proceeding brought by EPA or the Department of Justice.

Should you or your staff have any questions regarding this report, please contact Patricia Hill, Director, ADP Audits and Assistance Staff at (202) 260-3615. Please refer to the report number on all related correspondence. We have no objection to the further release of this report to the public.

Attachment

OFFICE OF WATER
DATA INTEGRATION EFFORTS
Report No. E1NWG6-15-0001-8100177

INTRODUCTION

Our survey indicated that the Office of Water (OW) has started to address water data integration, but progress is slow and a more significant effort is needed. Data management and cross integration of media has been a long-standing problem for the Agency. In 1994, the Office of Information Resources Management (OIRM) acknowledged data management as an Agency-level Federal Managers' Financial Integrity Act (FMFIA) weakness. However, OIRM has made limited progress towards establishing a fully operational data standards program. In addition, OW's only progress has been the issuance of Order 7500.1A (October 1992), *Minimum Set of Data Elements for Ground Water Quality*. OW has not developed Information Technology (IT) plans, data standards or standard guidance that will facilitate data sharing or integration of data across OW systems. Data standardization is key to the Agency's goal to integrate data across its information systems. Without data standardization and integration, EPA will continue operating stovepipe systems and may not have the necessary environmental data needed to monitor state water programs. The OW's lack of progress toward standardization and integration can be attributed, in part, to the absence of a *formal* Information Resource Management (IRM) structure. It is critical that OW and OIRM management work together to establish a structure to share data across environmental systems, programs and media. To pursue the Agency's Reinventing Environmental Information (REI) reforms, the OW Senior Information Resource Management Officer (SIRMO) function should start acting as a central clearing house for information across the program and be responsible for developing OW's strategic information resource plans.

PURPOSE

The objectives of our survey were to review the Office of Water's development of plans to integrate automated water systems data, and to determine whether Federal, Agency and OW guidance was provided to ensure use of standard data elements for sharing information. We also reviewed OW activities to increase the public's access to key water data.

SCOPE

We conducted this survey in Washington, D.C. Headquarters from October 1996 to September 1997. We performed our audit in accordance with generally accepted Government Auditing Standards, (1994 revision) issued by the Comptroller General of the United States, and included

such tests as necessary to complete our objectives. Our survey did not include an evaluation of management controls as it relates to OW's FMFIA process.

METHODOLOGY

We started the analysis with system and data information from the 1992 OW Environmental and Program Information Systems Compendium, which identified 20 key systems and information files as critical to OW programs. We concentrated on the national systems which support either Safe Drinking Water or Water Quality Programs. We interviewed key personnel and reviewed system documents to summarize the purpose and operation of three OW mission-critical systems -- Clean Water Needs Survey (CWNS), Storage and Retrieval System (STORET), and Safe Drinking Water Information System (SDWIS). We also summarized the purpose and operation of the Permit Compliance System (PCS), which is an Enforcement system under the Office for Enforcement and Compliance Assurance.

We developed a profile of OW IRM by interviewing management personnel and reviewing IRM policy, budget, and planning documents for OW and OIRM. We interviewed key Agency personnel and reviewed documentation associated with OW and OIRM projects to provide environmental information to the public and integrate environmental data. We also documented activities related to major systems modernization and attended related OW conferences. Further, we documented major OW and OIRM systems projects and initiatives for public dissemination of OW environmental data, such as *Surf Your Watershed*, *Index Watershed Indicators* and *Envirofacts*. In addition, we summarized those problems and recommendations related to OW data management from Federal and Agency workgroups or reported in notable audits conducted by the Office of Inspector General (OIG) or General Accounting Office (GAO) during fiscal years 1995, 1996 and 1997.

BACKGROUND

The OIG initiated the survey to assist OW in implementing its vision of standardizing and integrating water data. With the current structure of laws, regulations and program infrastructure, OW believes it is time to view water systems as a whole (i.e., watershed), rather than on an individual basis (e.g., lake or river). The OW information systems inventory, dated 1992, identified 20 key systems and information files as critical to OW programs.

In December 1993, the National Performance Review (NPR) addressed the need for a seamless interactive government, linking hundreds of systems across Federal, regional, state and local government operations through a network of data highways. In the same year, EPA acknowledged the lack of an Agency data structure as an Agency weakness, based on an OIG

report (# E1SKG3-15-0098-4400038) entitled “Special Review of EPA’s Information Systems Program,” dated March 24, 1994. The OIG report identified more than 50 previously issued OIG, GAO and Agency reports, as well as 19 testimonies which addressed Agency data management problems. The OIG report identified IRM management structure, lack of a IRM Strategic Plan, systems development, and data management as the principal areas of *long-standing* IRM problems. Specifically, the OIG reported that:

- Management did not treat information as a strategic resource nor IRM as a core function and valuable tool to empower the public; and
- Data sharing was critical to the Administrator’s four top priorities which cut across all environmental media, but the link between data sharing and these priorities was not widely recognized. EPA did not have an information data architecture, data standards, or administrative structure to facilitate sharing data Agency-wide. Data quality problems exist in many EPA systems because of changing data definitions, lack of data ownership, inconsistent quality assurance processes in program offices, and EPA’s inability to compel the states to provide quality data.

In February 1995, Environmental Data Standards were recognized by the Intergovernmental Task Force for Monitoring (ITFM), chaired by EPA and vice-chaired by the United States Geological Service (USGS), as a government-wide concern. Also, the April 1995 National Academy of Public Administration (NAPA) report to Congress, entitled “Setting Priorities, Getting Results,” discussed the need to change the way EPA does business. NAPA pointed out that the single-media program approach had resulted in more than 500 systems serving individual programmatic needs. In addition, NAPA said that a particularly important problem was the lack of high quality data on environmental conditions to measure progress toward environmental goals.

NAPA’s 1997 report entitled “Resolving the Paradox of Environmental Protection” addressed EPA’s progress since the 1995 report. The report noted that EPA had been working to build a base of environmental data to support performance-based management, but that progress was slow. It further stated that the Agency still had not established institutions to ensure data was reliable, objective, credible, and consistent across programs and media. NAPA’s progress report also stated EPA’s environmental data systems were not adequate to measure environmental trends because of data management problems. NAPA noted that, in 1997, EPA’s National Advisory Council on Environmental Policy and Technology warned EPA that, absent improved information management, the success of regulatory flexibility, place-based approaches and cross-media approaches could be at risk. It proposed simplified reporting and use of environmental data by

establishing data standards for EPA's programs and a bureau of environmental statistics. As a result of the REI initiative, Agency management is developing a plan for standardizing data and accepting a stewardship role over environmental information. On July 21, 1997, at a Common Sense Initiative (CSI) Council Meeting, EPA's Administrator and Deputy Administrator announced EPA would pursue three important information management reforms: establishing key data standards, providing universal voluntary access to electronic reporting, and implementing these data standards and electronic reporting reforms through the One Stop program. The resulting REI Action Plan, dated February 4, 1998, identified thirteen national systems which are expected to incorporate EPA's data standards, policies and protocols.

In March 1996, EPA's Administrator asked the National Advisory Council for Environmental Policy and Technology (NACEPT) to review EPA's information requirements and processes. In January 1998, NACEPT issued their report, *Managing Information As A Strategic Resource*, citing the following findings:

1. EPA cannot develop the required information resources unless:
 - The agency establishes information as a strategic tool,
 - The public is provided information to monitor performance,
 - Industry has information needed to develop prevention options, and
 - All stakeholders are provided required information.

2. Current EPA systems for the most part were not designed to support and do not provide place-based, multi-media, and cross-media approaches to environmental protection.

Additional detailed background information is presented in Appendix II to this survey report.

PRIOR AUDIT COVERAGE

The following reports do not represent a complete listing of reports concerning EPA's Water Program, but rather feature recent, key reports dealing with the questionable quality of collected water data and the need for automated data management systems to ensure more consistent and efficient data management.

In GAO/RCED report number 96-42, dated January 23, 1996, "Water Pollution - Differences Among the States in Issuing Permits Limiting the Discharge of Pollutants," GAO stated that permit limits for controlling pollution within watersheds differ widely because of differences in the (1) states' water quality standards and (2) implementation policies that come into play when the permitting authorities "translate" general water quality standards into limits for specific facilities in specific locations. In response, EPA management said they plan to enhance reviews of state implementation policies.

OIG report number E1HWF6-07-0017-6100312, dated September 30, 1996, entitled "Region 7's Efforts to Address Water Pollution From Livestock Waste," identified the need to use state water quality information for controlling waste through permits in delegated programs. The report concluded that EPA could support the states by analyzing trends to demonstrate the benefits, effects and scope of pollution.

Likewise, OIG report number E1HWF4-07-0036-5100226, dated March 24, 1995, entitled "Region 7 and States Improved Drinking Water Programs Through Alternative Measures," identified that states needed automated data management systems for more consistent and efficient data management. EPA was relying on manual or partially automated systems which were inefficient and vulnerable to inaccuracies. Subsequently, several OW systems were modernized with the help of state participation, but OW still cannot mandate use of these systems.

In OIG report number E1HWE5-23-0001-5100516, entitled "EPA Procedures to Ensure Drinking Water Data Integrity," dated September 29, 1995, we projected that about 12 percent of nationwide public water services reported erroneous data one or more times from 1991 through 1994. Small public water services most often reported erroneous data and about 58 percent of the erroneous data cases involved invalid data, rather than data which might have been elaborately falsified.

In addition, GAO/RCED report number 94-9, dated February 17, 1994, entitled "Water Pollution: Poor Quality Assurance and Limited Pollutant Coverage Undermine EPA's Control of Toxic Substances," found that some of the information used to analytically support in-stream water quality for toxic pollutants may be of doubtful quality, thereby raising questions about the effectiveness of these activities in controlling toxic pollutants. At that time, GAO also found that the permit process did not limit the vast majority of toxins being discharged from the nation's factories and sewage treatment plants. GAO's audit results showed that five of the seven core activities did not measure up to EPA's enunciated information quality assurance policies and principles. GAO's findings raise questions about the quality of information generated and used

within these activities. Many of the EPA interviewees noted that data on in-stream water quality for toxic pollutants was generally lacking. GAO was able to confirm the accuracy of these responses through a review of the data in STORET, EPA's principal repository of water quality data. For a group of streams around the nation on which large manufacturing facilities are situated, GAO found that only 9 percent had any in-stream data for organic toxic pollutants or pesticides entered in STORET since 1988.

RESULTS IN BRIEF

Our survey indicated OW has begun addressing water data integration, but progress is slow and a more focused effort is needed. Except for Order 7500.1A (October 1992), *Minimum Set of Data Elements for Ground Water Quality*, no IT plans, data standards, or guidance to facilitate the sharing or integration of data across OW mission-critical systems have been developed. Without standardization and integration, EPA will continue operating stovepipe systems and may not have the necessary environmental data needed to monitor state water programs. Both OIRM and OW's lack of progress toward standardization and integration can be attributed, in part, to the absence of a formal Information Resources Management structure.

The OW is starting to address the cross media, data standards and sharing of water data in the following ways:

- OW is involved on an intergovernmental level with the ITFM's successor organization, the National Water-Quality Monitoring Council, which is working on implementing ITFM recommendations for Federal agencies.
- The recent national OW systems modernization efforts are moving in the right direction. For example, OW is conducting meetings and conferences to determine users' needs (including the States). SDWIS, a mission-critical system, has begun to address data standards for reporting for that program. Also, STORET data has been entered into the Environmental Data Registry (EDR).
- At the time of our review, OW had numerous, division-level projects to (1) increase public access to key water data through the Internet, (2) organize water data by watershed and (3) establish environmental indicators. OIRM is providing more OW data through EPA's Envirofacts Warehouse, a project to provide data through EPA's Internet

home page. Several of these pilots are now operational sites providing data to the public.

The OW should support EPA's REI initiatives, which will require aggressively addressing environmental data standards and integration. In addition, OW should establish long-range strategic plans with measurable goals over the next three to five years for its major information systems. The present management structure allows each program, division, region and state to establish different data definitions. Therefore, to accomplish the REI plan, OW should centralize its IRM structure and work with OIRM to adopt an environmental data standardization process that will be mandatory for national water systems. On July 21, 1997, at a CSI Council Meeting, the Administrator and Deputy Administrator announced that EPA would pursue three important information management reforms: (1) establishing key data standards, (2) providing universal voluntary access to electronic reporting, and (3) implementing these data standards and electronic reporting reforms through the One Stop program. To pursue the reforms, the OW SIRMO function should start acting as a clearing house for information across the program. Then the SIRMO would be in a position to reduce duplication of systems, institutionalizing the lessons learned in pilots and enhancing the mission-critical national systems through action plans, environmental data standards or environmental data guidance.

FINDINGS AND RECOMMENDATIONS

Water Data Integration Needs A Centralized Focus

Despite NPR goals for establishing a seamless interactive government, ITMF's recognizing the need for water data standards, and the OMB requirement for the Agency to address information system standard architecture in its budget, OW has been slow to address water data integration and a more focused effort is needed to meld various OW activities and systems. As of yet, OW has not developed data standards or standard guidance that will facilitate data sharing or integration of data across OW systems. The OW is modernizing its mission-critical systems: SDWIS, CWNS, and STORET. However, each OW system is being modernized independently of the others. Thus, the modernization efforts are not resulting in standard water data elements as envisioned by the ITFM. Although the modernized systems will be more useful, relational-type databases, they will continue to be stovepipe systems that will not standardize or share their data. While OIRM management acknowledged data management as an agency-level weakness in 1994, progress has been slow in establishing an operational data standards process and data standards. In September 1997, the Agency took a first step toward IT planning by submitting proposals for EPA's IT Investment Report to OMB. Also, at the time of our audit, OW and OIRM had initiated pilot projects to: (1) provide the public with OW data from the national water systems, (2) organize water data by watershed, and (3) establish environmental indicators that are being provided to the public through the Internet. OIRM is also piloting a data standards process in conjunction with the EDR, a data standards registration tool, for the six standards identified in the REI Action Plan. Data standards established to date include standards for location, facility IDs, and a four-digit year date.

OIRM management is planning to establish a standard Agency architecture and formally adopt a new data standards process that uses the EDR. These particular actions are currently scheduled for completion by March 1999, but it appears that it will be at least fiscal 2003 before minimal data standards are actually implemented. The REI Action Plan, dated February 4, 1998, established implementation milestones for the next three to five years for incorporation of the Agency data standards. For example, an electronic reporting policy will be published by the end of fiscal 1999 for the systems identified in the REI Action Plan, and these systems will use electronic reporting standards by fiscal 2003. Therefore, OW should incorporate electronic reporting standards resulting from the REI effort for SDWIS and STORET by fiscal 2003. The OW should also coordinate with Office of Enforcement and Compliance Assurance on incorporating these standards into PCS. Without standardization and integration, EPA will continue operating stovepipe systems and may not have the necessary environmental data needed to monitor state water programs. Standardizing data elements would ease integration of systems

which, in turn, could foster cost-effective sharing of available water information required for effective decision-making and management of environmental protection.

The OW's lack of progress toward standardization and integration resulted primarily from the absence of a formal IRM structure and lack of formal guidance from EPA OIRM.

- Currently, the OW does not have a *formal* IRM structure to provide oversight and approval of water systems development. At the time of our survey, the OW used a decentralized team management process to address its information requirements and had not tasked anyone with developing a standard architecture. In addition, the SIRM function had no control over OW systems projects, leaving systems development to be managed at a director or branch manager level. Since our audit fieldwork, OW has established an office-wide IRM committee as the focal point for increasing efforts to share and integrate data across OW programs. However, the committee is operating without a charter which means they have no binding authority to make IRM decisions across OW programs or accountability for those decisions. It is critical that OW management establishes a structure to share data across environmental programs and media. To pursue the REI reforms, the OW SIRM function should start acting as a clearing house for information across the program.
- Although EPA's OIRM has taken preliminary steps to set up an EDR, management has not yet established formal policy or procedural guidance for either the EDR or data standardization. Also, EPA's OIRM has not required programs to address environmental data element standards as part of new systems development, although the *IT Investment - Draft Data Call* dated February 24, 1998, requires managers to identify whether or not they are complying with Agency data standards when requesting ESC review and approval. Upon reviewing the number and nature of Agency initiatives since this weakness was first acknowledged, it appears that the Agency predominantly focused its resources on projects to provide public access to environmental information, rather than investing effort in projects to increase cross-media integration of environmental data.

Federal And Agency IT Policies And Procedures

OMB Memorandum 97-16, dated June 18, 1997, requires Federal agencies to develop and implement Information Technology Architectures (ITA). The ITA describes the relationships among the work the agency does, the information the agency uses, and the agency's IT needs. It includes standards to guide the design of new systems. An ITA makes it easier to share information internally and to reduce the number of information systems that perform similar functions. The ITA provides the technology vision to guide resource decisions that reduce costs and improve mission performance. In addition, OMB Memorandum 97-02, *Funding Information*

Systems Investments, dated October 25, 1996, requires Agency investments in major information systems to be consistent with Federal, agency, and bureau Information Technology Architectures (ITAs). Also, the Clinger-Cohen Act of 1996, (Public Law 104-106), assigns the Chief Information Officer (CIO) the responsibility of developing, maintaining, and facilitating the implementation of the ITA. Agencies are to be prepared to indicate the status of the development, implementation, and maintenance of the agency ITA during the formulation of the fiscal 1999 President's budget. This is a new requirement which EPA must comply with starting this year.

OW INFORMATION TECHNOLOGY PROJECTS
ESTIMATED SPENDING THROUGH FISCAL 2003

<u>LIFE CYCLE COSTS</u> ¹	<u>NAME</u>
\$30,553,000	Storage and Retrieval of Water Quality Information
\$61,710,000	Safe Drinking Water Information System Modernization ²
\$11,233,000	Surf Your Watershed
\$18,560,000	Information Collection Rule
\$12,710,000	The Index of Watershed Indicators - formerly NWAP

The preceding chart identifies major capital investments for OW major systems, initiatives, and IT infrastructures with Life Cycle Costs more than \$ 5 million, as reported to OMB in September 1997. Major capital IT investments are being managed under Circular A-11, Part 3, and the Information Technology Management Reform Act (ITMRA) of 1996. EPA's Directive 2100, Chapter 17, establishes policies and procedures for management of systems enhancements and modernizations. The Directive mandates EPA's Assistant Administrators to directly approve investment of information resources for major systems costing \$1 million a year or having a total life-cycle cost of \$10 million or considered mission-critical. In April 1997, the CIO also established an Investment Review process, under ITMRA, in which the Executive Steering Committee performs reviews of initiatives or infrastructure greater than \$1 million a year.

¹ Life cycle costs contain estimates of *all* operational and developmental costs, including full time equivalents for personnel.

² Costs include SIDWIS/FED, SDWIS/State, and National Contaminants Occurrence Data Base.

Program guidance includes EPA Order 7500.1A (October 1992), *Minimum Set of Elements for Ground Water Quality*, which established a policy for a minimum set of data elements for ground water quality to be collected and managed by the EPA ground water data collection activities. A second EPA Order 5360.1 (April 1984), *Policy and Program Requirements to Implement the Mandatory Quality Assurance Program*, established EPA program quality assurance requirements and policies for all environmentally-related measurements performed by or for EPA.

Need To Establish Formal IRM Structure For Oversight Of Information Management

The recently implemented REI Action Plan affects all program offices and requires a more robust Agency and OW IRM oversight structure. This will require clear lines of authority within OW to establish policy, schedule changes, and allocate resources. In addition, OW should work with OIRM to establish a standard architecture and water data standards for EPA. Without standardization and integration, EPA will continue operating fragmented systems and may not have the necessary environmental data needed to adequately monitor state water programs. Standardizing data elements would be a first step to the integration of OW systems and environmental data required for effective decision-making and management purposes.

Similar to attributing EPA's slow progress towards data standardization and integration to the absence of a formal AA-level IRM control structure and the lack of USGS or OIRM guidance, OW's lack of progress can be ascribed to its treatment of IRM as a support structure and the absence of formal OW IRM guidance. At the time of our survey, the OW used a decentralized team management process to address its information requirements and had not tasked anyone with developing a standard architecture. And while the SIRM reported to the AA, that individual had no direct oversight of operations or budgets for OW systems projects, initiatives or infrastructure, leaving systems development to be managed at a director or branch manager level. Since our audit fieldwork, OW has established an office-wide IRM committee as the focal point for increasing efforts to share and integrate data across OW programs. However, the committee is operating without a charter which means they have no binding authority to make IRM decisions across OW programs or accountability for those decisions.

Until recently, EPA treated information management as a support function rather than a central tool to manage its programs and inform the public. Some recent management decisions have sought to recognize the contribution information makes to environmental protection and elevate the information management function. For example, in 1995, the Executive Steering Committee was established to manage cross-Agency Information Resource needs. In addition, on February 27, 1997, the Agency instituted a Center for Environmental Information and Statistics (CEIS) to centralize EPA's information management efforts and provide a strategic focus to EPA's information collection, assessment and access efforts. CEIS formally began operations in January

1998. OIRM has also taken preliminary steps to set up an EDR, but it has not yet established formal policies or procedures necessary for the registry's operation or data standardization program. Additionally, EPA's OIRM has not required programs to address environmental data element standards as part of new systems development, although the *IT Investment - Data Call*, dated February 24, 1998, does request managers to report on compliance with Agency data standards for ESC review of major projects.

OIRM established an Information Management/Data Administration group in 1992, to define and establish data management policies like Facility ID and Locational Data Policy. In addition, EPA management formally acknowledged Data Management issues in fiscal 1994, as an Agency-level weakness in their annual FMFIA report. The original targeted corrective action date was December 1998. However, progress has been slow and only recently did OIRM start to put into place formal Agency processes to establish data standards. To date, standards established or in-process include standards for a four-digit year date, location (i.e., latitude and longitude), facility ID, Biological Taxonomy, Chemical ID, and Industrial Classification (SIC/NAICS) codes. EPA's date for establishing environmental data standards has slipped twice since fiscal 1994, and is currently set for March 1999. The REI plan calls for finalizing a total of six standards by 1999. Considering the focus of ongoing Agency initiatives, it appears that the slippage is a result of the Agency targeting projects to provide "public access" to environmental information, rather than investing resources in projects to improve cross-media integration of environmental data.

In our opinion, without a formal IRM structure and direction from EPA OIRM, OW will not achieve standardization of data elements and integration of systems needed to manage based on water bodies. The shifting of program IRM resources to a centralized basis should allow OW to address data standardization and system integration while reducing division-level resources needed for national systems.

Federal And State Agencies Have Not Made Standard Architectures And Data A Priority

The creation of standard architectures and data are not a government-wide priority for all Federal and State water programs. USGS has not developed Federal data standards for collecting water data by Federal Organizations, and there are few interagency agreements between EPA and other Federal Organizations currently providing data for EPA's programs. In addition, there is much missing data that is not available from other Federal Organizations or States.

In 1995, the ITFM identified the need to address two data related areas (1) information automation, accessibility and utility and (2) data quality. In general, the ITFM noted the need to develop additional tools to facilitate information searches and provide capability for retrievals across data bases. One such tool was a set of minimum data elements for sharing existing data.

However, after about three years, there are still no formal intergovernmental water standards in operation today, because a formal coordination structure is just starting to operate and the study's recommended actions were "voluntary."

The recently established Federal CIO Council formed a subcommittee on inter-operability that plans to study interagency integration issues. Also, in October 1997, the CIO council published a reference guide on Information Systems Interoperability. Although State and Federal Organizations are modernizing their computing platforms, installing more open systems and upgrading their networks, they have not necessarily made integration with each other a priority. For example, the CIO for California said "We're dealing with things on a state level, and a lot of the time we don't have the luxury to deal with projects an intergovernmental way." The primary reason data does not match from state to state is that one state may call something a road, while some other state calls it a highway or a byway. Frequently, these definitions are legal ones, which means new laws or regulations are needed to create common definition requirements.

OW Information Systems Will Continue To Be Fragmented With Inadequate And Unreliable Data

Under existing circumstances, OW will continue operating fragmented information systems with inadequate and unreliable environmental data and, as a result, will not effectively manage or monitor state water programs. The quality of OW's systems data is a recognized long-standing problem, reported by NAPA, NACEPT, GAO and the OIG. From 1990 through 1994, numerous OIG and GAO reports, as well as Agency reports and testimonies addressed EPA's information systems data problems. In addition, NAPA's 1997 report stated that data available to EPA is incomplete, fragmented, unreliable and difficult to use. In January 1998, NACEPT also reported that EPA should establish environmental information as a strategic tool for all stakeholders. Since 1994, the OIG and GAO issued additional reports addressing water program data management by states and regions.

Attainment of the "seamless, interactive" government imagined by the NPR is threatened by the lack, so far, of a comprehensive strategy for electronically stitching together the hundreds of Federal organizations and state systems. There is much missing data that is not available from other Federal organizations or states. Also, EPA is receiving data of unknown quality from other Federal organizations and putting it in our national systems to monitor water quality. In 1992, the USGS was assigned responsibility to develop mandatory Federal data standards for collecting water data by Federal organizations. Only recently, the National Water-Quality Monitoring Council was established with procedures to coordinate, provide guidance and technical support for the implementation of the recommendations presented in the Strategy for Improving Water-Quality Monitoring by U. S. government organizations and the private sector. However, the Council has yet to establish Federal data standards for water programs. Therefore, EPA's

ability to obtain Federal data needed to monitor water quality is still heavily dependent on *informal* agreements with numerous organizations.

Recommendations

Due to the complex nature of the issues, it is our opinion that both OW and OIRM need to implement corrective actions to effectively address these weaknesses. We recommend that the Assistant Administrator for Water:

1. Establish a centralized IRM management organization by a formal charter which assigns responsibility for oversight and budget of programs' IT capital planning investments, operation of major systems, approval and oversight of initiatives, and development of a standard OW Infrastructure.
2. Establish an architecture and coordinate data management activities with USGS for developing Federal water data standards, adhering to technology standards and a common design, and providing guidance for OW programs.
3. Aggressively support the implementation of the REI Action Plan by working with OIRM to develop EPA-level environmental data standards.

In addition, we recommend that the Director for Information Resource Management:

4. Formally adopt policies and procedures in Agency Directive 2100 to support an Agency data standards program using the EDR as EPA's central repository for publishing and recording data standards.

AGENCY COMMENTS

In responding to the draft report, the Acting Director for Information Resources Management and the Acting Director for Policy and Resources Management, Office of Water, generally agreed with the recommendations. Further, they acknowledged that much remains to be done and stated that both offices are committed to continuing and strengthening their efforts. OW has established an office-wide IRM committee as the focal point for increasing efforts to share and integrate data across OW programs. OW also stated that they have been actively engaged in coordinating data management activities with USGS and other Federal Agencies. Currently, OW is involved in the National Water Quality Monitoring Council, which OW co-chairs with USGS, and the Federal Geographic Data Committee on the River Reach File, Version 3. OW has also been active in several committees implementing the REI initiative. OIRM management stated that they were committed to establishing policies and procedures to ensure an operational program, and plan to incorporate data standards into the new IT investment review process and other Agency business practices. OIRM management stated that they plan to use the EDR as the primary tool to publish data standards. There was a general concern that the OIG implied OW should move ahead on its own to establish water data standards for its systems and, therefore, the joint response suggested revisions to correct this impression.

OIG EVALUATION

We agree that the Agency's proposed actions generally address our findings and recommendations, and we modified recommendations 1 and 4 to clarify their intent. In recommendation 1, we believe the Office of Water should establish a *formal charter* for their new IRM committee. At present, the committee is operating without a charter which, in our opinion, is required to establish (1) a formal decision process, (2) authority for the committee to make IRM decisions that are binding across the OW programs and (3) accountability. We would anticipate that one of the first products this committee would establish would be a plan addressing significant OW IRM projects, including each project's objective(s), budget and expected milestones. In recommendation 4, we also agreed with some suggested wording changes to clarify the recommendation. We believe OIRM should formally adopt policies and procedures for data management by modifying OIRM's Directive 2100. The March 1999 FMFIA schedule for completing these actions is ambitious, but management assured us that it will be completed on schedule. Finally, based on management's response, the OIG made some changes to the final report which should clarify our desire for OW to work with both OIRM and other Federal programs to develop OW data standards.

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ABBREVIATIONS

CEIS	Center for Environmental Information and Statistics
CIO	Chief Information Officer
CSI	Common Sense Initiative
CWNS	Clean Water Needs Survey
EDR	Environmental Data Registry
FMFIA	Federal Managers' Financial Integrity Act
GAO	General Accounting Office
IRM	Information Resources Management
IT	Information Technology
ITA	Information Technology Architecture
ITFM	Intergovernmental Task Force for Monitoring
ITMRA	Information Technology Management Reform Act
NAPA	National Academy of Public Administration
NACEPT	National Advisory Council for Environmental Policy and Technology
NPR	National Performance Review
OIG	Office of Inspector General
OIRM	Office of Information Resources Management
OW	Office of Water
PCS	Permit Compliance System
REI	Reinventing Environmental Information
SDWIS	Safe Drinking Water Information System
SIRMO	Senior Information Resource Management Officer
STORET	Storage and Retrieval System
USGS	United States Geological Service

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FEDERAL DATA MANAGEMENT

National Performance Review

The 1993 NPR report on EPA identified the need for pilot projects to test (1) the usefulness of and access to environmental information and (2) access and exchange of environmental information among Federal, states, tribal, local and foreign governments. In addition, the report noted that EPA must improve the data quality and analysis for regulations. In 1993, the NPR addressed the need for a seamless interactive government, linking hundreds of systems across Federal, regional, state and local government operations through a network of data highways.

Principal Areas of Long-standing IRM Problems

OIRM acknowledged the lack of an Agency data structure as an Agency weakness based on an OIG report number E1SKG3-15-0098-4400038 entitled "Special Review of EPA's Information Systems Program," dated March 24, 1994. The report identified more than 50 OIG, GAO and Agency reports, as well as 19 testimonies addressing Agency problems over a four year period. It identified four principal areas of *long-standing* IRM problems:

1. IRM management and organizational structure did not understand how critical IRM was to accomplishing environmental protection. Management did not treat information as a strategic resource, IRM as a core function and information as a valuable tool to empower the public.
2. Resource planning and performance management needed to be integrated into EPA's budgeting process.
3. Information systems development did not adequately consider users and customers.
4. Data sharing was critical to the Administrator's four top priorities which cut across all environmental media, but the link between data sharing and these priorities was not widely recognized. EPA did not have an information data architecture, data standards, or administrative structure to facilitate sharing data Agency-wide. Data quality problems exist in many EPA systems because of changing data definitions, lack of data ownership, inconsistent quality assurance processes in program offices, and EPA's inability to compel the states to provide quality data.

EPA still does not have an information management structure which includes a data architecture, data standards and supporting administrative functions that would permit sharing of environmental data Agency-wide. The corrective action date has slipped twice since fiscal 1994,

and the Acting Chief Financial Officer's FMFIA report, dated December 12, 1997, now indicates that corrective action will be completed by March 1999.

Intergovernmental Task Force for Monitoring

In February 1995, Environmental Data Standards was recognized as a government-wide concern by an ITFM report which recommended a strategy for nationwide, integrated, voluntary water-quality monitoring. The ITFM, chaired by EPA and vice-chaired by the USGS, declared water data standards as necessary for Federal governmental programs. The 1995 ITFM study identified the need to address two data-related areas: (1) information automation, accessibility and utility, and (2) data quality. In general, the ITFM noted the need to develop additional tools to facilitate information searches and provide capability for retrievals across data bases. One such tool is a set of minimum data elements for sharing existing data. The study stated that EPA should *voluntarily* incorporate the following during modernization of its old systems or when new systems are being developed:

- Common data-element definitions and formats.
- An expanded set of recommended data elements or qualifiers (in addition to the minimum data elements) to facilitate the sharing and exchange of information.
- Common reference tables, such as taxonomic and hydrologic unit codes, and River Reach File 3 codes.
- Metadata standards to describe the content, quality, condition, and other characteristics of data. Metadata helps secondary users to judge whether the data would be useful for other application.
- Facilitate the sharing of water-quality information that would be useful to secondary users, but that currently is not readily available. For example, major public-water suppliers have offered to share such information holdings.
- Share, and where advantageous, jointly maintain ancillary data sets that are widely used for water-quality purposes, such as land use, land cover, demographics, and water use. Working with the Federal Geographic Data Committee and other groups, use standard data sets when they are available. An example would be the River Reach File that is being jointly developed and adapted as part of the FGDC's National Spatial Data Infrastructure.
- Use Internet or other widely-recognized standard communications and access systems when they are available.

EPA should also *voluntarily* establish, for all environmental water monitoring programs, data-quality objectives to identify the precision and accuracy of data needed to achieve monitoring goal(s).

NAPA Studies

NAPA's report to Congress in April 1995, entitled "Setting Priorities, Getting Results," discussed the need to change the way EPA does business in six areas. One of these areas addressed how EPA was allocating its resources and establishing priorities to accomplish its mission. NAPA recommended that EPA develop strong central management systems to manage its activities, and refine and expand the use of risk analysis and cost benefit analysis to make decisions. The report also recommended establishing an independent statistics organization to assess data needs, assemble data, analyze data, and disseminate information. It pointed out that the single-media program approach had resulted in more than 500 systems serving individual programmatic needs. In addition, NAPA said that a particularly important problem was the lack of high quality data on environmental conditions to measure progress toward environmental goals.

In September 1997, NAPA reported to Congress on Resolving the Paradox of Environmental Protection, which addressed EPA's progress since 1995. The report noted that EPA has been working to build a base of environmental data to support performance based management, but that progress is slow. It further stated that the Agency still has not established institutions to ensure data is reliable, objective, credible, and consistent across programs and media. NAPA's progress report also stated EPA's environmental data systems are not adequate to measure environmental trends because:

- Data available to EPA is incomplete.
- Data is fragmented and difficult to use. The systems were designed by separate program offices to meet their individual needs. EPA relies on other agencies to collect data and those agencies have their own standards. In fact, State and local data systems contain three or four times more data than is reported to EPA. EPA has not exerted much quality control over the data being collected.
- Until recently, EPA treated information management as a support function rather than a central tool for managing and interacting with the public.

NAPA noted that, in 1997, EPA's National Advisory Council on Environmental Policy and Technology warned EPA that, absent improved information management, the success of regulatory flexibility, place-based approaches and cross-media approaches could be at risk. It criticized the Agency's Executive Steering Committee as ineffective and again recommended

creating a bureau for Environmental Statistics. It also proposed simplified reporting and use of environmental data by establishing data standards for EPA's programs and a bureau of environmental statistics.

EPA's Common Sense Initiative

On July 21, 1997, at a CSI Council Meeting, the Administrator and Deputy Administrator announced EPA would pursue three important information management reforms: establishing key data standards, providing universal voluntary access to electronic reporting, and implementing these data standards and electronic reporting reforms through the One Stop program. The resulting Action Plan for Reinventing Environmental Information, dated February 4, 1998, identified thirteen national systems which are expected to incorporate data standards, policies and protocols. OW'S STORET and SDWIS are among the thirteen systems targeted in that plan. Each system will incorporate the standards within three years. Also, as each new data and reporting standard becomes ready for implementation, each national system has two years in which to incorporate it either through retrofitting existing systems or including the standard in system re-engineering efforts. The present management structure allows each program, division, region and state to establish different data definitions. Therefore, to accomplish the REI plan, OW should centralize information resources management and work with OIRM to adopt an environmental data standardization process which will be mandatory in all OW mission-critical systems. This will then support goals for (1) integration of water data for the general public, (2) monitoring the states' water programs, and (3) managing the national water programs.

NACEPT Report

NACEPT is a public advisory committee chartered on July 7, 1988 that provides recommendations and advice to EPA's Administrator. NACEPT was requested in March 1996 to review EPA's information requirements and processes and make recommendations to make EPA's information resources support Community-Based Environmental Protection and other initiatives like the Common Sense Initiative. In January 1998, NACEPT issued a report, *Managing Information As A Strategic Resource*. As a result the Committee offered the following findings:

1. EPA is moving toward defining the information needed, but it can't develop the required information resources unless:
 - EPA establishes information as a strategic tool,
 - The public is provided information to monitor performance,
 - Industry has information to develop prevention options, and

- All stakeholders are provided required information.
2. Current EPA systems for the most part were not designed to support and do not provide place-based, multi-media, and cross-media approaches to environmental protection. Thus, the systems do not support:
- Informed decision making,
 - Ensure accountability, or
 - Document results and achievements.

The committee also recommended actions and time frames to go beyond EPA's current approach of pollution control oriented systems to a place-based, cooperative approach with stakeholders. The goal is to make IRM a strategic tool that is integrated into accomplishing its mission. Some of the actions included:

1. Information Policy Leadership
 - Appoint a full time CIO;
 - Designate one official over information to use it as a strategic resource;
 - Make permanent selections for all senior IRM positions currently filled in a acting capacity;
 - Agency should expand the role of the Executive Steering Committee for IRM.
2. Data Integration (develop a plan to integrate systems and resolve Federal-State barriers.)
3. Data Accuracy (develop an implementation plan to establish Agency system architecture and address improving the precesses record and correct data).
4. Public Access (immediately take various actions to improve access and establishing a Public Access Program)
5. Stakeholder Involvement (immediately set up a Information Users Group).

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May 7, 1998

MEMORANDUM

SUBJECT: OW and OIRM Response on the Draft Report on the Office of Water's Data Integration Efforts Audit Report No. E1NWX6-15-0001

FROM: Diane Regas, Acting Director /signed/
Policy and Resource Management Office, Office of Water (4101)

Mark Day, Acting Director /signed/
Office of Information Resources Management (3401)

TO: Michael D. Simmons
Deputy Assistant Inspector General for Internal Audits (2421)

We have reviewed the draft report and generally agree with the recommendations. While both of our offices have been actively working, in some cases for years, toward these goals, we acknowledge that much remains to be done and are committed to continuing and strengthening our efforts.

Recommendation 1. Establish a centralized IRM management organization. Within the last year, OW established an office-wide senior IRM committee consisting of Deputy Office Directors, the Deputy Assistant Administrator, the Acting Director of the Policy and Resource Management Office (PRMO), the SIRM and IRM staff from the Immediate Office. This committee has been involved in guiding development of OW's IRM strategic plan; discussion of cross-office information initiatives; indexing of programmatic data to the River Reach File for sharing and use of OW data in a geographical, or place-based, context; and common OW budget initiatives for enhancing our program's effectiveness through use of common data elements. This group is the logical focal point for increasing OW efforts to share and integrate our data across our offices.

Recommendation 2. Establish an architecture and coordinate data management activities with USGS. OW has been actively engaged in coordinating data management activities with USGS and other Federal and State agencies through the National Water Quality Monitoring Council, which OW co-chairs with USGS. A key goal of this organization is to develop consistent standards for data on water monitoring. We also participate in the Federal Geographic Data Committee and work collaboratively with USGS on establishment and implementation of the River Reach File, Version 3 (RF3). The OW IRM committee is considering a long-term project to index water data to the RF3 to enable better spatial data analysis and is examining resource availability for this effort.

Recommendation 3. Aggressively support the implementation of the REI plan. OW has also been actively engaged in the Reinventing Environmental Information initiative. OW was represented on the REI subcommittee by Diane Regas, Acting Director, PRMO, and was also represented on the various REI-related suborganizations. OW is represented on the REI National Systems Board and the data and EDI standards workgroups. We have planned for OW cross-office representation on these workgroups to ensure that all offices are aware of and participating in standards that affect their data and systems. Senior OW management is kept apprized of REI progress at meetings of the OW IRM committee. We have committed to REI and will continue to work for its effective implementation.

Recommendation 4. Formally adopt policies and procedures establishing the EDR as EPA's data standards and data architecture. OIRM is committed to establishing a strong Data Standardization Program under the Agency's Reinventing Environmental Information (REI) Plan. That commitment carries with it the requirement to put into place the necessary administrative structure, i.e., the policies and procedures, to ensure an operational program. Our action plan includes plans to revise the IRM Data Standards Policy (Chapter 5 of the IRM Policy Manual) and to create procedural pieces to explain how the standards program will operate. New policies are being considered to clearly define the role and responsibilities of the Data Steward and the Data Registrar, two critical elements to a successful standards program. In addition, OIRM is planning to use the EDR web site as the primary tool for publishing policies and procedures pertaining to the Agency's standards program to ensure their ongoing visibility. OIRM plans to move the data standards mandated by the REI Plan through the new standards setting processes. Finally, OIRM is incorporating data standards into routine agency business practices and reviews such as the IT investment review mandated by the Clinger-Cohen Act. For the first time this spring, Agency program offices must include in their IT funding requests descriptions of how their information systems will comply with agency data standards.

In reviewing the draft audit, there was a general concern about inconsistencies in the suggestions on how the Agency should operate its data standards program. Some language in the audit recognizes that the establishment and use of data standards is an Agency-wide responsibility, other sections of the audit imply that OW should move ahead on its own to establish water data standards. By recommending that OW establish data standards for its systems without at the same time recognizing the Agency-wide implication, we risk continuing the stovepipe approach to information system management. Such an approach would jeopardize the Agency's effort to integrate data across all Agency systems through the use of standardized data. Because we do not believe that the OIG is willfully endorsing a stovepipe approach to data standards, we have provided revised language to correct this impression.

Our review also noted some minor factual inaccuracies for which we have provided corrected language or comments in the attachment.

Attachment

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