July 12, 1999

MEMORANDUM

TO: Delegate W. Tayloe Murphy, Jr., Co-Chair
Senator Thomas K. Norment, Jr., Co-Chair
Senator Joseph V. Gartlan, Jr.
Delegate Harry J. Parrish

FROM: Philip A. Leone, Director

SUBJECT: Preliminary Inquiry: DEQ and VDH Activities to Identify Water Toxic Problems and Inform the Public

At the May 10th meeting of JLARC, the Commission approved a preliminary inquiry by JLARC staff into concerns regarding the State's performance in making water toxics information available to the public. The request for a JLARC assessment of these issues came from Delegate W.W. "Ted" Bennett of Halifax, Virginia. Delegate Bennett expressed concerns in an April 29th letter that toxic data may have been withheld from the general public that would have been helpful in assessing toxic issues regarding the Staunton River. He indicated that a JLARC review might "help us try to determine whether important information may have been withheld from the public."

A subcommittee of JLARC was appointed to consider the findings from a preliminary staff inquiry and receive whatever further testimony or information it wishes to collect. To perform the inquiry, I asked that JLARC staff members Robert Rotz, Steven Ford, and Melissa King conduct a review of toxics monitoring and reporting issues. The two State agencies having the primary responsibilities in this area are the Virginia Department of Environmental Quality (DEQ), which monitors Virginia's waters, and the Virginia Department of Health (VDH), which receives data from DEQ and makes decisions about the need for public health warnings or restrictions on certain public uses of Virginia waters. (The State Water Control Board was the agency responsible for monitoring the State's waterways prior to July 1993 when DEQ was formed by merging the State Water Control

Board, the Department of Air Pollution Control, the Department of Waste Management, and the Council on the Environment.) For this review, the study team contacted numerous individuals at various levels of DEQ, and cooperation was good. While VDH staff needed to be contacted less frequently, cooperation by that agency was also good.

As will be described later in this memorandum, the preliminary inquiry focused on several topics related to the handling of toxic issues by DEQ and VDH. There are three major themes that emerge from this evaluation.

- There are several positive aspects to recent DEQ and VDH actions on the topics that were reviewed. After years of delay, DEQ has released the Virginia Toxics Database to EPA and other interested parties. In addition, DEQ's director has initiated policies to provide the public with rapid access to new fish and sediment data, and has shown responsiveness to citizen concerns regarding PCBs in the Roanoke (Staunton) River. Also, while questions are raised about whether VDH's approach to health advisories should be more aggressive in order to provide more cautious public health protection, the particular guidance and decisions reviewed for this inquiry appear to be made within the bounds of a nationally-recognized range for risk assessments.

- There are, however, some serious questions about the timeliness with which DEQ and VDH respond to data that raises possible concerns about environmental quality. A time lag that occurred between DEQ's 1993 study of the Roanoke River and the 1998 VDH issuance of a health advisory on eating fish is only a fraction of the total time since a report prepared for the State Water Control Board documented the same toxic issue in the Roanoke River more than a quarter century ago. The report found concentrations in fish and sediment samples

of a toxic substance, polychlorinated biphenyls (PCBs), that appeared to ascend in approximately the same section of the Roanoke River that is under suspicion today. Furthermore, high concentrations of PCBs in fish taken from Levisa Fork at the Virginia/Kentucky state line and at Mountain Run in the Rappahannock River System require immediate attention.

Based on the findings from this preliminary inquiry, there is a concern that unsystematic management and delays in the use of data on water quality may be hindering State efforts to thoroughly assess water toxic problems and protect the public.

- There also is a concern about the apparent reactive rather than proactive nature of DEQ and VDH actions on the Roanoke River. The evidence indicates that without pressure from the United States Environmental Protection Agency (EPA) which began over a decade ago, it is unlikely that a public warning on the river would exist today. In addition, DEQ's recent change in strategy to focus more now on identifying the source or sources of PCBs, as had been envisioned by State Water Control Board (SWCB) management in 1992, was in response to substantial pressure from citizens in that river basin. DEQ's current director, however, deserves credit for taking a personal interest in addressing this issue and for making recent data on DEQ sampling results for the river publicly available on a timely basis.

Because DEQ management appears to be generally on course now in responding to concerns raised about public access to toxics data and the Roanoke River issue, and given that VDH's decision-making appears to occur within nationally-recognized parameters, **we do not recommend a continued review by JLARC staff at this time**.

DEQ is encouraged to address what appears to be a long-standing need to do a better job of maintaining, linking, accessing, and using the results from past and present water quality analyses or studies. DEQ is moving in the direction of integrating its data and making it easier to access with the development of its new computer network. Unlike many types of records held by organizations that might reasonably be destroyed after a few years, a long trail of historical records documenting river problems over decades may provide useful information for finding and addressing environmental problems today. Therefore, DEQ needs to ensure that its new computer system adequately manages this historical data. Also, as part of its effort to increase its responsiveness on toxics issues in Virginia rivers, DEQ may need to examine the adequacy of its current capacity for special water quality studies and biological monitoring.

The remainder of this memorandum discusses: (1) the issues, scope, and methodology of this preliminary inquiry, and (2) additional details about the findings that resulted from this inquiry, with staff recommendations to address concerns based on the inquiry.

Issues, Scope, and Methods for the Inquiry

This section of the memorandum describes the issues and the scope of the preliminary inquiry conducted by JLARC staff. It also identifies the methods used, and references a list of the individuals who were interviewed during this review.

Issues Leading to Preliminary Inquiry

Between July 1998 and May 1999, several specific issues related to DEQ's release of information on water quality and VDH's role in issuing fish advisories have raised concern among the news media and public. The focus of this concern is a belief by some that DEQ and VDH may not efficiently and effectively release water quality data to the public and that this data does not result in fishing advisories which are adequate to protect the public from harmful toxins found in some fish.

In July 1998, a fish advisory for segments of the Staunton River was issued by VDH based on high levels of polychlorinated biphenyls (PCBs) found in some fish samples collected by DEQ as part of a special study in 1993. PCBs were

used in coolants until the 1970s when the federal government banned the compounds after learning that they may cause skin and liver damage as well as cancer. Citizens living in the area in which these fish were caught were upset that they were not informed of the results of this 1993 study for five years. Citizens wanted to know why a fish advisory was not issued sooner by VDH, and what DEQ was doing to eliminate the PCB problem.

During April 1999, several articles were published by the news media that stated that DEQ had a toxics database known as the Virginia Toxics Database (VTD) which might be used to assist in determining a source for the PCBs found in the fish in the Staunton River. However, DEQ had not released information from this database for approximately five years even for internal DEQ use.

Also during April 1999, the Chesapeake Bay Foundation issued a report that indicated that the fish advisory for the Shenandoah River was not adequate to protect the public. The report also stated that the level of mercury found in the fish collected in sampling done for DEQ suggested that mercury levels are rising. Some national studies have found that chronic exposure to mercury, which is a heavy metal, may cause harm to the central nervous system. The Chesapeake Bay Foundation concluded that not only should fish advisories in the area be strengthened but remediation of the mercury should also be reconsidered.

Scope of the Inquiry

The issues related to the Staunton River and the Virginia Toxics Database described briefly above prompted Delegate W.W. “Ted” Bennett, Jr. to ask JLARC, by letter dated April 29, 1999, to “determine whether important information may have been withheld from the public.” In addition, the report issued by the Chesapeake Bay Foundation (CBF) cited what appeared to be a similar situation in which DEQ was not acting appropriately concerning water toxins. In response to these related issues, JLARC staff developed a list of potential issues to address the concerns voiced by Delegate Bennett and the related CBF report. This list of potential issues was presented to JLARC at its regular May 1999 meeting. The preliminary inquiry was then approved by JLARC, and staff began research of the issues. Specifically, JLARC staff identified the following potential research questions at the May JLARC meeting:

1. Why had the program that produced the toxic database in question been terminated? Has it now been reactivated?

2. What is the current availability and accuracy of DEQ water monitoring data (including the Toxic Fingerprinting Program) and who conducts this monitoring?

3. To what extent have the JLARC recommendations for water monitoring from the 1997 study of DEQ been addressed by the agency?

4. To what extent has DEQ met the requirements of the Water Quality Monitoring, Information and Restoration Act of 1997?

5. Does DEQ/VDH have unanalyzed monitoring data that could provide information on the environmental health of State waters?

6. Does DEQ/VDH know of any environmental hazards in State waters that have not been shared with the general public?

7. What is DEQ/VDH doing, or planning to do, to address the Staunton River PCB situation, and other situations as they arise (Potomac River, Shenandoah River)?

8. How much State funds have been expended for special monitoring studies, and what actions have been taken as a result of these studies?

It became apparent early in the research that both staff and time constraints would not allow full examination of each of the potential issues identified for the May 1999 Commission meeting for inclusion in the preliminary inquiry. In particular, the preliminary inquiry does not fully address the extent to which previous JLARC recommendations concerning DEQ monitoring have been addressed, to what extent DEQ has met the requirements of the Water Quality Monitoring, Information and Restoration Act of 1997, and the amount of State funds expended by DEQ for special monitoring studies and the results of these studies. While these issues are not fully addressed in and of themselves, they are addressed as they relate to the specific

situations concerning the Staunton River, the Virginia Toxics Database, and the Shenandoah River. Further, JLARC staff research did uncover situations of unanalyzed monitoring data and known environmental hazards that have not been addressed, but this inquiry in no way serves to present a comprehensive list of such occurrences, again due to staff and time constraints.

In addition to the issues identified at the May JLARC meeting, subsequent research led to the development and inclusion of other closely related issues within the scope of the preliminary inquiry. Primarily, the issue of the relationship between DEQ and VDH on issues of human health concerns was not explicitly identified for examination. However, as both the Staunton River and Shenandoah River situations involved fish consumption advisories, this issue was deemed pertinent to the inquiry.

Methods

The primary methods used in this preliminary inquiry were a review of selected documents, in-person interviews, and telephone interviews with various individuals having a perspective on the issues under review.

JLARC staff reviewed a wide range of documents relating to the issues identified above. Documents from DEQ included reports and special studies, regulations and legislation relating to monitoring, and staff memos and e-mails. Similar document types from VDH were reviewed as well. The VDH documents that were reviewed related primarily to individual fish advisories and the methods utilized by VDH staff to develop the advisories. In addition, JLARC staff reviewed documents from the Department of Game and Inland Fisheries as they pertained to the two rivers in question. Documents from other sources outside of State government were also reviewed. In particular, information from the EPA and FDA were reviewed. Also, reports issued by laboratories contracted to analyze DEQ monitoring data were reviewed. Reports from other organizations (such as CBF) conducting environmental studies were examined as well. Finally, JLARC staff reviewed newspaper articles related to the Staunton River, the Virginia Toxics Database, and the Shenandoah River.

JLARC staff conducted an entry interview with the DEQ Director and staff on May 17th. An initial meeting with the State Epidemiologist and staff of the Division of Health Hazards Control of VDH was conducted on May 21st. Numerous in-person and

telephone interviews were subsequently conducted with current and former DEQ staff, VDH staff, and outside parties during this inquiry. The schedule of interviews is presented in Attachment A of this memo. In addition to the interviews listed, follow-up interviews, both in-person and by telephone, were conducted on an as-needed basis.

JLARC Staff Findings

This section provides additional details on the JLARC staff findings based on the preliminary inquiry. The five major topics that are addressed in this memorandum are: the Virginia toxics database; DEQ's management of water quality data in general; the PCB issue in the Roanoke (Staunton) River; the mercury issue in the Shenandoah River; and the interaction between DEQ and VDH on toxic issues. The findings contained in the section form the basis for the overall staff conclusions. In sum, those conclusions are that: (1) recent actions on the toxics database, the Roanoke River, and the Shenandoah River have generally been appropriate, although (2) a review of the path that led to these outcomes reveals shortcomings in the timeliness of DEQ and VDH actions, a lack of proactive conduct by the agencies in addressing issues, and concerns about DEQ's tracking and use of information.

No Compelling Reason Has Been Offered for Why the Virginia Toxics Database Was Not Given For Several Years to EPA and Others

The Virginia Toxics Database (VTD) was created in 1984 as part of a special study to research and track unknown toxic compounds, a process that is often referred to as toxics fingerprinting. By the time the VTD program was eliminated in 1994, it included toxics fingerprinting data, other special studies data, and additional toxics data collected by the State Water Control Board. The toxics data included some of the information the State Water Control Board (SWCB) collected regarding the State's surface-water environment, including ambient water, sediment, fish tissues, effluents, influents and storm water. However, it was never a comprehensive set of the Department of Environmental Quality's toxics data.

The information collected in the Virginia Toxics Database assisted the SWCB staff and the Department of Environmental Quality (DEQ) staff in several ways. The data was

used to keep a record of toxic compounds, both identified and unidentified, which were found in water, fish tissue, and sediment. Tracking these unknown compounds allowed scientists to look for them in areas in the environment where they might accumulate and cause environmental problems. The database was organized in such a way that if it was determined that these unknown toxics were accumulating in the environment, it would assist in determining the source of these pollutants. The information in the database was also used by some permit writers to assist in determining permit limits. In addition, the VTD was used by DEQ to determine the compounds that should be included in the list of compounds for which water quality standards were developed. Finally, review of VTD data assisted DEQ staff in determining areas where additional studies should be conducted.

The VTD was paid for by State general funds appropriated to the State Water Control Board, but the Board had a contract with the Virginia Institute of Marine Science (VIMS) to create and maintain the database until 1993. In 1993, the State Water Control Board, which was in the process of becoming part of DEQ, made the decision to begin managing the database at DEQ. This decision seems to have been largely based on the fact that VIMS's computer systems were undergoing a major upgrade, and it appeared that as part of this upgrade, the VTD would be inaccessible for a prolonged period of time.

The VTD was successfully transferred to DEQ during 1993, and it was managed and housed in the Office of Environmental Research and Standards. At that time, there was a DEQ employee charged with managing the database. This individual's responsibilities included adding new data to the VTD, formatting the data so that it was more usable, and responding to data requests. In addition, this individual's supervisor spent some time managing the VTD and a P-14 worker sometimes assisted in entering the data.

Exhibit 1 provides a timeline of the major events that took place regarding the Virginia Toxics Database since its creation in 1984. This timeline focuses on the management of the database as well as requests for and release of information in the VTD. Subsequent sections of this memorandum provide information on the context within which the events described in this timeline took place.

Exhibit 1
Virginia Toxics Database (VTD) Timeline

1984	Database developed as part of a special study by the State Water Control Board (SWCB) to perform toxics fingerprinting. The SWCB contracts with the Virginia Institute of Marine Science (VIMS) to manage the database.
1984 – 1993	Water toxics data collected from routine monitoring and special studies continues to be added to the VTD.
July 1993	The VTD is transferred from VIMS to the SWCB.
December 1993	The decision is made to eliminate the VTD program. Over the next few months, program staff are transferred to other areas within DEQ.
January 1994	In response to a request from the Chesapeake Bay Program of the Environmental Protection Agency (EPA) for the VTD, DEQ sends EPA a filtered portion of the VTD data.
1994	DEQ staff remove the VTD data from all personal computers and archive the database on computer tapes which are placed in a locked firebox within the agency.
1994 – 1997	EPA continues to request verbally and in writing the VTD data excluded from DEQ's previous submittal of the data.
June 1998	Director of EPA's Chesapeake Bay Program informs the new DEQ director of EPA's need for VTD data.
August 1998	The DEQ director sends a letter to EPA stating that DEQ will cooperate in accessing the VTD with the help of EPA's Chesapeake Bay Office.
September 1998	EPA agrees to send a contractor to assist in the recovery of the VTD information.
October 1998	DEQ staff access the VTD from the computer tapes on which it had been stored and determine that the data is in good working condition.
January 1999	A computer contractor working for EPA comes to DEQ for one day to assist DEQ staff in writing a program to "screen" the VTD data to check for data points which could indicate environmental problems.
February 1999	DEQ staff provide the DEQ director with a report of the findings from this "screening." Reportedly, no problem areas were found for which DEQ and the Virginia Department of Health were not already aware.
February 1999	DEQ staff submits to EPA the VTD data that EPA requested.
Spring 1999	The entire VTD is provided to some institutions of higher education as well as members of the public who request it.
May 1999	The VTD is transferred to the Office of Water Quality Assessment and Planning.

Source: JLARC staff analysis of documents and interviews related to the Virginia Toxics Database.

The following three sections discuss the discontinuation of the VTD program after it was transferred to DEQ as well as JLARC staff's preliminary findings regarding this issue. The following statements summarize these preliminary findings regarding the Virginia Toxics Database program:

- The decision to eliminate the funding for the Virginia Toxics Database was made in December 1993 for budget saving reasons.

- DEQ was not responsive to data requests from EPA and others for Virginia Toxics Database information and sought to filter certain data.

- After the Virginia Toxics Database was recently reviewed for possible environmental problems, the data was released to EPA and the public.

The Decision to Eliminate the Funding for the Virginia Toxics Database Was Made in December 1993 for Budget Saving Reasons. In December 1993, the announcement was made that the VTD program would be terminated along with other programs in the area of water toxics research due to budget cuts. As a result of the termination of the funding for the Virginia Toxics Database program, all the human resources that were devoted to it were transferred to other areas within DEQ during the first few months of 1994.

During the summer of 1993, the Department of Planning and Budget along with the cabinet secretaries asked each agency to prepare for possible reductions in their budget so that the Governor could make plans to compensate for a projected budget shortfall for the biennium beginning July 1994. In order to accomplish this, the agencies of the executive branch were asked to prioritize outlines of programs they would cut from their budgets. It appears that the Department of Planning and Budget notified these agencies that they should plan for a four, ten, or 17 percent budget cut. It seems that the Department of Planning and Budget and the cabinet secretaries reviewed these proposals and eliminated items in those plans as necessary to handle the projected budget shortfall.

The proposal to eliminate the funding for the section of DEQ which performed much of the agency's water toxics

research, including the Virginia Toxics Database program, was listed among 12 other items as "Alternative E" which was stated to be the "least desirable option" in a memo to the Secretary of Natural Resources in September 1993. DEQ had outlined a series of other programs in alternatives "A" to "D" which agency management determined should be considered for reduction or elimination before alternative "E" programs were considered for elimination. In addition to proposed program cuts, some of these alternatives also proposed increases in permit fees to help cover projected budget shortfalls.

Despite the fact that the elimination of a considerable component of DEQ's water toxics research capabilities including the Virginia Toxics Database were among the programs for possible termination in DEQ's "least desirable" alternative, they were eliminated by the Department of Planning and Budget and the Secretary of Natural Resources. The Governor's Executive Budget for 1994-96 included a reduction of $1.1 million in DEQ's general fund budget for the fiscal year beginning July 1994. Approximately $730,000 of the $1.1 million was eliminated from DEQ's budget in the area of water quality research, and an estimated $90,000 of this had supported the operation of the Virginia Toxics Database.

DEQ Was Not Responsive to Data Requests from EPA and Others for Virginia Toxics Database Information and Sought to Filter Certain Data. During the approximately five years prior to February 1999, requests for the information in the VTD were not fulfilled. The manager who had authority over the VTD stated that he considered the database "dead" during this timeframe because all funding for the program had been terminated and he no longer had a staff position to manage the database. Due to this position, as well as the fact that the database had been stored on computer tapes and erased from the personal computers in his division, he told staff within DEQ, EPA staff, and others outside the agency that the data were not "accessible." This led to the perception that the VTD was somehow damaged or was otherwise unrecoverable. However, it appears that the only reason the data were not "accessible" is that there was not a DEQ staff person assigned to access it in order to respond to data requests; but the individual who had previously worked with the VTD was still employed by DEQ in another division.

It appears that staff from EPA's Chesapeake Bay Program was the most persistent requestor of the information on the database after funding for VTD was terminated. The EPA

wanted information from the VTD to assist with the revision of the Chesapeake Bay Toxics of Concern list and the implementation of the Chesapeake Bay Chemical Contaminant Geographical Targeting Protocol. These represented two commitments made through the 1994 Chesapeake Bay Basinwide Toxics Reduction and Prevention Strategy. DEQ responded to a request for VTD information from EPA in January 1994, just prior to the cancellation of the program. However, the data provided did not include all the information from the VTD that EPA had requested.

It appears that the DEQ manager who had authority for the database made the decision to heavily filter the Virginia Toxics Database information submitted to EPA in January 1994. As a result, EPA was given only a relatively small percentage of all the data that was on the Virginia Toxics Database. DEQ filtered out data from west of the fall line and data that was not confirmed at level three, the very highest level at which a chemical compound can be confirmed. JLARC staff have been told that by filtering out all the data that was not at level three, almost 90 to 95 percent of all the data on the Virginia Toxics Database was excluded.

It does not appear that filtering out this data for the submission to EPA was appropriate for three primary reasons. First, it is well-documented that EPA staff wanted the Virginia Toxics Database information without these restrictions, and DEQ was responsible for maintaining a cooperative relationship with the EPA to meet Virginia's commitments with the federal agency including Chesapeake Bay initiatives. Second, the information on the VTD is public information. Therefore, it should have been provided to EPA or anyone else who requested it. Third, the rationale provided by the DEQ manager who apparently made the decision to filter the data does not appear to be supported by other DEQ staff or environmental scientists outside the agency.

This DEQ manager decided that only data east of the fall line should be included because it was EPA's Chesapeake Bay Program who requested the data, and therefore it was the data most relevant to the Chesapeake Bay. However, EPA and some DEQ staff state that this cut-off was somewhat arbitrary and that a more comprehensive set of data points was needed.

In terms of the filter to exclude all but the level three data, internal DEQ documentation from 1993 suggests that only the data confirmed at the very highest level was included because it was perceived to be the only data in which the

compounds involved could be confirmed with certainty. However, JLARC staff interviews with representatives from DEQ, EPA, and others in the scientific community suggest that data does not need to be confirmed at that level to be useful. In addition, they stated that most data is not confirmed to the level of certainty that DEQ was requiring for this submittal to EPA. Internal memos from DEQ staff to the DEQ manager with authority over the database question the rationale for excluding all but data confirmed at level three, stating that there is "essentially no difference between the confidence in levels 2 and 3." In addition, EPA staff stated that they consider the data they are analyzing in the context of the confirmation level. Therefore, even data with a very low level of confirmation is useful, but it would not be used in the same way as data that had been confirmed at a higher level.

Despite the continuation of EPA's attempts to acquire additional VTD information, and the requests for the data from DEQ staff and those within other environmental research organizations, DEQ did not release any additional VTD information between January 1994 and January 1999. No compelling reason for failing to provide access to VTD during this time frame has been given.

In February 1999, After the Virginia Toxics Database Was Reviewed for Possible Environmental Problems, It Was Released to EPA and the Public. The process for finally delivering this data to EPA began in June 1998. At this time, the director of EPA's Chesapeake Bay Program Office met with the new DEQ director and expressed EPA's need for information from the VTD. In August 1998, the DEQ director submitted a letter to EPA stating his willingness to cooperate in an effort to get VTD information to EPA. However, the DEQ director also informed EPA that he needed some assistance in accessing and analyzing the data in the database.

The DEQ director was under the impression that significant work had to be done on the database to make it usable. In addition, he told DEQ and EPA staff that he wanted to be provided with information regarding what was on the database before it was released. Specifically, it appears that the DEQ director wanted to be apprised of any indications of environmental problems for which he and possibly others in the agency were not aware. The DEQ director as well as other DEQ staff have stated that all the VTD information requested would

have been supplied to EPA and others regardless of the findings of this analysis.

DEQ staff were able to access the Virginia Toxics Database using the computer tapes on which it had been stored after working on this effort for less than a day in October 1998. At this point, the data was determined to be in good condition and ready to be analyzed. DEQ waited for assistance from a computer contractor paid for by EPA until January 1999. The job of this contractor was to develop a computer program to screen the data for potential environmental problem areas. When the contractor came to assist with the development of the computer program he determined that the database was in good working order, and he was able to develop the program during his one-day visit to DEQ. During the following few weeks, DEQ staff fine-tuned this program, analyzed the results, and presented their findings to the DEQ director. According to DEQ staff, this review of the data did not identify any area of environmental concern for which DEQ and the Virginia Department of Health were not already aware.

On February 24, 1999, DEQ staff sent EPA's Chesapeake Bay Program the VTD data they had originally requested more than five years prior. Since the release of the VTD data to EPA, DEQ has also submitted the data to several research institutions and members of the public who have requested it. DEQ has also moved responsibility of the VTD to the Office of Water Quality Assessment within DEQ and has assigned the responsibility of further reviewing the database and responding to additional requests for the information to an individual within that division. It is the intent of the director of the Office of Water Quality Assessment to use the data in compiling several water quality assessment reports to be released in the next year.

Database Management at DEQ Has Been Fragmented and Inefficient, But Improvements Are Underway

DEQ currently has more than 100 databases, which contain air, water, and waste environmental data. These databases stem from the many monitoring and research activities within the department. It appears that the current framework of most of these databases prohibits efficient sharing of the information within and outside of the organization. Therefore, it is difficult to determine if DEQ staff are aware of and use all possible data when writing permits, preparing documents which inform State and federal decision-makers as well as the public of

the quality of Virginia's waters, and determining plans of action that should be taken to improve impaired waterways. In addition, some of these databases overlap, which may indicate that some data is being entered multiple times, and a significant percentage of this data is not year 2000 compliant.

While the current status of DEQ's database management may be fragmented and inefficient, the department is currently undergoing a significant initiative intended to improve this function. DEQ is in the process of consolidating most of its databases into one data management software program for all environmental media and functions. This new software program is year 2000 compliant; and in a later phase of the project, which will begin in the year 2000, DEQ plans to make considerable data on this system available to the public through the internet. Although these appear to be positive steps, it is too soon to know whether the specific objective of making all relevant water quality data available and readily accessible by segment of waterway will be achieved.

DEQ Collects a Large Quantity of Water Quality Data That Should Be Automated in a way to Maximize Its Use Within and Outside the Department. Approximately 60 of the more than 100 databases DEQ has contain information about Virginia's waterways. These databases include information on the hundreds of samples taken each year by DEQ staff to provide chemical and biological assessments of water quality. In addition, these databases include data that are collected by permittees and reported to DEQ.

DEQ collects water quality data from a variety of sources throughout Virginia's waterways. Specifically, DEQ collects ambient water, fish tissue, and water sediment samples each year that are analyzed for various chemical contaminants. These data are collected by the central DEQ office as well as the regional offices through special studies and routine monitoring. DEQ also performs biological surveys each year to collect data to determine the health of living organisms in and around Virginia's waterways. In addition, DEQ has data that is reported by facilities as a condition of their water permits. These facilities primarily report data regarding the toxicity of their effluent and the impact this effluent has on tests involving biological organisms. DEQ sends the data it collects to several laboratories outside the department for analysis. However, DEQ staff are responsible for assessing these results to determine their potential impact on the State's waterways.

It Does Not Appear that DEQ Currently Maximizes the Use of the Water Quality Data It Collects. Many DEQ staff members JLARC staff spoke with, as well as environmental scientists outside of the organization, stated that the water quality data collected by DEQ is very valuable. However, the concern was raised that it is not efficiently managed and as a result, it is not always fully utilized. Two areas of particular concern are the usage of special study data, and the consideration of all water quality data in preparing water quality assessment reports.

DEQ's central office and the regional offices conduct thousands of dollars worth of special studies to analyze the quality of Virginia's waterways each year, but this information is not widely circulated or used even within DEQ. Prior to 1994, DEQ had a database that catalogued and provided some information on special studies regarding water quality that had been conducted by DEQ and the State Water Control Board back to the 1970s. In addition, the agency had a technical library in the central office that included a hard copy of each of these studies that could be easily referenced using the special studies database. However, when DEQ was downsized in the mid- 1990s and the regions were no longer required to report information regarding their special studies to the central office, the agency lost track of this special studies database. In addition, the technical library was dissolved. Agency staff were told that they could take what they wanted from the library and the remaining documents were destroyed.

Failure to maintain a centralized database to manage the information collected in special studies has probably contributed to DEQ's apparent failure to efficiently use and follow-up on at least two special studies with findings indicating possible public health concerns associated with fish consumption. These special studies were of the Mountain Run portion of the Rappahannock River and of selected portions of the Roanoke River. The issues surrounding these special studies are discussed in more detail in subsequent sections of this memorandum.

As mentioned previously, due to the difficulty and time-consuming nature of accessing some data, the Office of Water Quality Assessment does not analyze some water quality data for the Water Quality Assessment Report, often referred to as the 305(b), or other reports regarding the quality of Virginia's

waterways. The primary data not used for these purposes appears to be industry-reported data. This is particularly concerning because this is the primary source of data regarding the effluent of permittees.

Due to these and other limitations that currently hinder DEQ's ability to fully analyze water quality data, it appears that a more integrated and efficient database management approach would better enable DEQ staff and others to access and analyze data housed at DEQ. In addition, DEQ needs to ensure that those within and outside the agency are aware of the information managed by the agency and the manner in which it can be accessed.

DEQ Is Now Taking Steps to More Effectively Manage Its Data. As mentioned previously, it appears that DEQ management understands the limitations of the department's current databases and is taking steps to improve its efforts in this area. The DEQ director stated that improving database management internally and more efficiently making data available to the public through the internet is one of his top priorities. It appears that DEQ is working to meet these objectives, but it will be several months and in some cases years before these objectives are scheduled to be achieved.

The focus of this initiative to improve database management is the development of a software package called the Comprehensive Environment Data System (CEDS) 2000. Approximately 14 full-time DEQ computer staff along with 22 full-time contractors from a computer consulting firm are creating CEDS 2000 with the assistance of a large user's group which is composed of DEQ employees representing all functions of the agency.

The goal of CEDS is to manage nearly all the environmental data for water, air, and waste as well as all the data for the functional areas of permitting, monitoring, compliance, and enforcement. Placing all these data in a single database will enable those in different areas at DEQ to easily find and use data collected throughout the agency. The new system is also supposed to make the transfer of information to EPA and the public more efficient.

The effort to consolidate the data held by DEQ onto CEDS 2000 is occurring in stages. The first priority for CEDS 2000 is to consolidate all the permitting, enforcement and

compliance databases for all media in addition to some water quality monitoring data. This portion of CEDS 2000 is scheduled to be completely operational by October 1, 1999. Also by October 1999, DEQ plans to have established an interface with EPA and at least one of the labs which performs the analysis of some samples collected by DEQ. This interface should allow data to be easily sent and received electronically between these organizations. In January 2000, DEQ is planning to begin its efforts to incorporate additional data onto CEDS and to develop through CEDS an interface with the internet that would allow the public to easily access some of the information collected by DEQ.

While it appears that DEQ is working towards fully integrating its environmental data into a comprehensive data management system, the complexity of the goal means that special precautions must be taken. It seems that the staff who are developing the new database system are working very closely with an extensive user's group to address their needs, but the specific goals for CEDS 2000 have not been fully documented. Due to the high expectations of DEQ staff members as well as those outside of DEQ that CEDS 2000 be able to provide all data collected by the agency regarding water quality in an integrated manner, DEQ should more clearly articulate its plans to meet this objective. Once the data are fully integrated, DEQ staff and others outside the agency should be able to easily access all data collected by the agency on any given segment of a Virginia waterway.

In addition, DEQ should make every possible effort to include not only data that are already automated in CEDS 2000, but also data that are not presently available in an automated format. In particular, data from or regarding special studies, even those conducted many years ago, should be included or at least referenced in CEDS 2000. DEQ's responsibility to monitor, track, and reduce harmful pollutants in the environment is made more efficient and effective when considering all possible data. In particular, data from ten or more years ago assists the agency in establishing a "baseline" which makes it easier to identify and assess current environmental trends.

Recommendation (1). **DEQ management should develop written plans which detail the expectations of the CEDS 2000 software program. These expectations should include the full integration of all data collected related to water quality into CEDS 2000. In addition, CEDS 2000 should allow its users to efficiently extract this information in an integrated manner.**

Recommendation (2). **DEQ management should make every effort to include all data related to water quality into CEDS. This should encompass all historical data including information from special studies that could be useful in current or future studies.**

PCBs Were First Identified in the Roanoke (Staunton) River in 1973, But the State Response Has Been Slow

The Roanoke River Basin covers 6,382 squares miles or about 16 percent of Virginia's total area. The headwaters of the river begin in mountainous terrain in eastern Montgomery County. The river then flows in a southeasterly direction to the State line between Virginia and North Carolina.

In 1993, DEQ started a detailed fish collection study in the Roanoke River. By the time the sampling of fish was completed in August 1993, DEQ had collected 647 fish specimens at 15 stations and examined 21 different species. DEQ's director of the Division of Water Program Coordination has said that it was the largest study that DEQ has ever undertaken. The samples were delivered to the Virginia Institute of Marine Sciences (VIMS) between October 1993 and May 1994. VIMS's final report was received by DEQ in June 1995, and DEQ's analysis and report preparation began in the fall of 1995.

The resulting report, entitled 1993 Roanoke River Basin Study: Assessment of Polychlorinated Biphenyls and Organochlorinated Pesticides Contamination in Fish Tissue, found that "throughout the Roanoke River basin, there is widespread contamination of fish tissue with PCBs, DDE, and chlordane", and that the concentrations of PCBs in the fish specimens were much higher than DDE or chlordane levels at most stations.

The report also stated the following:

> Only one fish specimen exceeded the U.S. Food and Drug Administration's (FDA) action or tolerance levels for PCB, DDE, or chlordane – a carp specimen collected at the Long Island station in which PCB concentration was reported at 2,724.5 parts per billion (ppb). On the other hand, 407 specimens consisting of all 21 species from

> each of the 15 stations exceeded EPA's risk-based screening value (SV) at 10 ppb for PCB."

DEQ's report containing these findings was sent to VDH in October 1996, and VDH acknowledged receipt of the report on December 17, 1996.

On July 24, 1998 VDH issued an advisory against eating too much of three types of fish caught in certain parts of the river. Specifically, the advisory recommended that people eat no more than two eight-ounce meals a month of striped bass, white bass, and carp in a 50-mile stretch of the river running downstream from Seneca Creek.

These events concerned local citizens, who established a Staunton River Citizens Advisory Committee to work with DEQ on these issues. Citizens were concerned with understanding the nature of the health risk, determining more specifically what precautions they needed to take, and learning about the source or sources of the PCBs to facilitate some remediation, if possible. This committee has had a substantial, on-going dialogue with DEQ (and to a lesser degree, VDH) since the advisory was issued. DEQ staff verbal accounts of what was known about the PCB problem in the river prior to conducting its 1993 study have been somewhat sketchy.

There are seven key findings of this preliminary inquiry regarding DEQ and VDH monitoring and reporting activities in the Roanoke River. These findings include:

- There was a 1973 State Water Control Board report on PCBs in the Roanoke River basin that raised concerns remarkably similar to more recent studies;

- It appears unlikely that a fish consumption advisory would exist today for this portion of the river if not for pressure beginning over a decade ago from the U.S. EPA;

- The State Water Control Board's intent in 1992 was to follow the fish sampling study with an effort to isolate specific potential sources of the PCBs;

- Delays in State action since 1993, as well as other State performance issues such as an apparent reticence by DEQ staff to begin looking for PCB sources, have been upsetting to local citizens;

- As illustrated by its current PCB guidance and by some staff remarks on the Roanoke River situation, VDH does not fully exhibit a "better safe than sorry" approach to PCB contamination issues;

- Recent DEQ decisions and actions regarding the river appear generally appropriate, and DEQ's director deserves credit for taking a personal interest in the issue; and

- The events that transpired, however, do not generally project an image of a proactive State response since a PCB issue was first identified in the river about a quarter century ago.

The remainder of this section elaborates on these findings.

Concern About PCBs in the Roanoke and Dan Rivers was Expressed in a 1973 State Water Control Board Report. On April 20, 1999 there was a meeting between certain DEQ staff and the Staunton River Advisory Committee, which is composed primarily of citizens, including some elected officials, who are from the river basin. According to a local newspaper account, a DEQ official at the meeting indicated that finding a source of contamination might prove fruitless because the source is likely not active and because there is little documented history to use as a guide. According to this report, this statement upset the committee, provoking the founder of the committee to comment: "Has no toxic data in the entire Commonwealth of Virginia existed prior to 1993?"

In fact, interest in toxic data and knowledge of Roanoke River PCB concerns does date to at least the early 1970s. House Joint Resolution No. 51 from the 1970 Session of the General Assembly directed the Virginia Department of Agriculture and Commerce to "conduct a study to determine the need or desirability of further regulation and control of the use in the

Commonwealth of all pesticides, insecticides, fungicides, rodenticides, or other 'economic poisons' as defined in §3.1-198 of the Code of Virginia, particularly DDT and its derivatives and [certain] chlorinated hydrocarbons…" This study was to be conducted in collaboration with a number of State agencies, including the Department of Game and Inland Fisheries and the State Water Control Board.

The agencies collected samples of water and fish from March to August 1971. An analysis of some fish samples taken from the Roanoke River Basin indicated the presence of PCBs, or Polychlorinated Biphenyls. At that point, the Water Control Board initiated a more comprehensive study which expanded the number of stations from which samples were taken. From the Roanoke and Dan Rivers, 24 sediment samples were taken from eight stations, and 59 samples were taken representing 119 fish.

Results from the more comprehensive study are provided in a preliminary February 1973 report by a Water Control Board biologist entitled The Occurrence of Polychlorinated Biphenyls (PCBs) in the Roanoke and Dan Rivers. The report states:

> More fish sampling will be done in the future in an attempt to further ascertain the degree of PCB contamination. But from the data collected thus far it is safe to say that contamination exists in the Roanoke River from below the Leesville Dam to at least the upper limits of the Kerr Reservoir. Similarly, a contamination (or at least the potential for contamination) of lesser gravity exists in the Dan River from below Danville to at least the upper limits of the Kerr Reservoir.

DEQ staff's project plan for its 1993 fish study, which was included in Appendix D of the DEQ final report, provided a page overview of data from the 1973 study, but did not provide the full 1973 report or much other information about its content. Further, the existence of this report seems to have received little to no attention at DEQ. Comments by some agency staff have suggested that other than some limited results that triggered the 1993 study, there is little information available on how long PCBs may have been in the river or where hot spots in the Roanoke might be. The existence of the 1973 study was not mentioned in a lengthy public meeting on August 20, 1998 with the

citizens of the area, even though portions of that meeting did consider the historical context for the 1993 assessment of PCBs in the river.

Consistent with current thought, the 1973 report indicated that a primary location of the PCBs in the basin was in the Roanoke River downstream of Leesville Dam, and that lesser concentrations could be found in areas such as the Dan River. An area of possible difference is that whereas the prior study appears suggestive of a hot spot at that time somewhere around or between Altavista and Brookneal, DEQ's latest sampling results are suggestive that Brookneal may be a hot spot. In the 1973 study, the PCB concentration in the sediment samples taken at one, two, and three inches deep found that: (1) the reported PCB value for the one-inch sample at Altavista was 170 percent of the value shown for the same-depth sample six river miles upstream; (2) the reported PCB value for the second-inch sample at Altavista was ten times greater than the value shown upstream; and (3) the reported PCB value for the third-inch sample at Altavista was about four times greater than the upstream value. For fish, the percent of fish reported by the study as above the federal Food and Drug Administration (FDA) guideline at that time for edible fish tissue was 10 and 16 percent for samples taken above Altavista, but was 80 percent for the first sampling below Altavista but above Brookneal. It is possible that some movement of the sediment occurred since 1973, or that there have been one or more additional sources of PCBs since the time of the 1973 study.

The idea that PCBs may pose a potential human health risk was understood in the early 1970s. The 1973 report noted that about one year earlier, the FDA had reported that "PCBs are toxic substances which are very stable and highly persistent in the environment", and that the FDA had established a five parts per million (equivalent to 5,000 parts per billion) maximum allowable concentration in the edible meat of fish.

The 1973 report was identified as a preliminary report. It indicated that there were many questions that remained to be answered about the PCB situation in the rivers. The report also stated that:

> In order to determine the source of PCB it is necessary to sample industrial and municipal effluent. Some samples have been collected in the vicinity of Altavista,

> Brookneal, Halifax, South Boston, and Danville and sampling trips are scheduled for the Dan River basin in the immediate future to sample the remaining effluents below the dam in Martinsville to determine if there may be a problem in that area.

This is interesting, because to JLARC staff's knowledge, findings from this prior historical work on possible sources have not been communicated to the public, nor is the status or availability of the findings from the work specifically cited in DEQ's 1999 draft source assessment plan. It is unclear whether the results and conclusions that were reached at that time from the source review have been "lost in time", or if the information may yet be retrievable from DEQ or other archives. However, such information if located might be useful as DEQ currently sets about the task of identifying PCB sources. Even if no significant source or sources were located during the old study, valuable information might be gained in knowing what sources might have been ruled out at that time, based on the evidence that was obtained.

Recommendation (3). **DEQ staff need to conduct a search to determine if the results from a Water Control Board search in the 1970s for PCB sources along the Roanoke and Dan Rivers can be located, or if current or former DEQ staff recollect the findings, if any, from such a search.**

Without EPA Pressure Starting Over a Decade Ago, It Appears Unlikely that a Roanoke PCB Advisory Would Exist Today. Starting in 1979, the State Water Control Board did establish several stations along the Roanoke River for monitoring purposes. Several samples taken over time at the Route 360 Bridge station in Clover (which is substantially downstream of both Altavista and Brookneal) indicated high concentrations of PCBs. Specifically, from 1983 to 1986, five of the nine composite samples had a concentration above 2,000 ppb (parts per billion). Largemouth bass samples in 1983 and 1985 showed concentrations of 3,800 and 2,800 ppb respectively.

In 1987, EPA became involved in two data collection projects in Virginia. In the larger EPA data collection effort, data were collected at six stations along the Roanoke River. These data, which were not published as a final report, showed relatively small concentrations upstream at Smith Mountain Lake

and the Leesville Reservoir, but two whole fish composites at Altavista showed PCB levels of 3,400 and 3,600 ppb respectively, and one whole fish composite at Clover showed PCB levels of 2,400 ppb. Also, as part of a fish sample done in 1987 for EPA's National Bioaccumulation Study (NBS), EPA found a fish fillet sample at Brookneal in the Roanoke River with a PCB content of 1,064 ppb, as well as a fish fillet sample in the Elizabeth River of 630 ppb. EPA's NBS data were sent to the Virginia Water Control Board in November, 1989.

In February 1990, SWCB sent the NBS data from EPA, as well as data obtained by SWCB's Office of Environmental Research and Standards (OERS), to VDH's Bureau of Toxic Substances Information. The OERS data contained several samples with values above 2,000 ppb (at Altavista and Clover), although it is not clear that all of these samples were edible meat samples. According to documents, EPA's PCB findings from the NBS process for the Roanoke and Elizabeth rivers constituted two of the four findings for EPA region III that fell into the category of exceeding EPA's upper bound for health (cancer) risk, but for which no public health advisory was yet in existence. (The other two Region III sites were in the Susquehanna River in Pennsylvania). EPA indicated its belief that advisories should be considered for these rivers.

According to a SWCB staff memorandum, however, "following discussions with the Health Department and VWCB it was determined that an advisory could not be based on such limited data." EPA notified Virginia in June 1991 that if the states would collect additional data, it had funding available for that purpose. Therefore, SWCB staff sampled three stations on the Roanoke River and three stations on the Elizabeth River during the fall of 1991.

On November 9, 1992, SWCB staff informed VDH staff of the findings from this additional sampling activity. In the Roanoke River, none of the six fish sampled exceeded the FDA advisory criteria of 2,000 ppb, but five of the six fish exceeded the EPA's proposed trigger concentration. One of two fish sampled from Clover at Route 360 was a fillet composite with a value of 1,922 pbb. The two samples from Brookneal were identified as a redhorse suckers fillet composite (745 ppb), and channel catfish fillet composite (672 ppb). The SWCB staff member transmitting the data stated that "I have learned that EPA may be planning to release this information and this data would

be presented as being from waters in Virginia where no advisory for PCBs exist."

A November 17, 1992 letter from the State Health Commissioner to the SWCB Director thanked SWCB for the communication advising the agency of EPA plans to release the data, but indicated that adequate data for an advisory were lacking. The VDH commissioner wrote:

> Members of my staff have reviewed these results. Data concerning PCB concentration in fish tissue samples from these rivers are sparse. In view of the paucity of data, issuing a fish consumption advisory for the referenced rivers would be both premature and scientifically unsound at the present time. Since the Roanoke River has several resort areas which are frequently visited by the public for recreational fishing, it would behoove us to collect and analyze additional fish tissue from these sites in order for VDH to adequately assess the extent of PCB contamination in fish tissue and its potential impact, if any, on human health.

On November 19, 1992 EPA publicly released its data. SWCB and VDH agreed that more data would be collected to determine the extent of the contamination. This agreement, in response to the pressure from EPA for an advisory, led to the 1993 DEQ Roanoke River fish study. One of the two purposes of the 1993 sampling, as stated by the DEQ director, was to "eliminate the paucity of data and therefore, enable the Virginia Department of Health to make decisions concerning human health impacts via tissue consumption."

Thus, without pressure from EPA, it appears unlikely that there would have been a perceived need for a major 1993 Roanoke River study. Further, EPA's role with regard to the advisory issue did not end at that point. Once the 1993 study data were provided to VDH in 1996, VDH found that the PCB levels in the fish did not exceed the tolerance levels used by the U.S. Food and Drug Administration for fish that is bought and sold commercially. On the basis of this standard, VDH decided that an advisory was not needed. According to a joint letter by the DEQ

and VDH directors from October 1998, EPA played a critical role again at this point. The letter states:

> Communications from [EPA] to DEQ questioned whether the FDA standard was appropriate… Specifically, EPA indicated that because fishermen eat more than average amounts of fish, fishermen on the Staunton River would consume more fish and possibly more PCBs than someone who bought fish… Using EPA's technical guidance, the Health Department began to develop a standard based on the information being provided by EPA… [this] culminated in a new standard being established in July 1998.

The new VDH guideline set a trigger level of 600 ppb rather than 2,000 ppb, and VDH declared the Roanoke River advisory using this new guideline. Thus, EPA's pressure and input appears to have led to the adoption of the lower threshold by VDH and the subsequent advisory.

SWCB Stated an Intent in 1992 to Use Roanoke River Sampling to Isolate Specific Potential Sources. On the same day in November 1992 that EPA publicly released the PCB fish tissue results for the Roanoke and Elizabeth Rivers, SWCB's director sent a memorandum to the Secretary of Natural Resources informing the Secretary of the situation. A handwritten note by the Secretary written at the top of the SWCB director's memo asked two questions. First, "what is [the] likely source of PCB contamination?" Second, "what are you doing to follow up here?"

In December 1992 the SWCB director submitted another memorandum to the Secretary on PCB contamination in the Roanoke and Elizabeth Rivers. The director noted that "tissue data from the Roanoke River has sporadically indicated varying concentrations of PCBs", and that "as indicated by the data, detectable levels of PCBs are being seen along the entire stretch of the Roanoke."

The SWCB's director wrote that "the staff is investigating potential sources and contacts are being made with other state agencies to establish a sampling plan to evaluate the levels of PCBs in fish tissue." The memorandum also reflects the agency's thoughts at that time about potential PCB sources. The director wrote:

> Ongoing sources have not been identified. Potential sources may be linked to the flooding in 1985 in the Roanoke River, which impacted numerous industrial facilities. The staff is requesting information from Appalachian Power on the amount of PCB material which may have been lost during that flood. In a recent development, work on the Roanoke River flood control project in the Roanoke-Salem area has uncovered wastes possibly contaminated with PCBs, however, the impact of this material on the Roanoke River has not been determined. Source(s) identification will be dependent on field activities described below…

SWCB's director then indicated that staff were considering a "two-phased" approach to the problem. He stated that the first phase "is designed to respond to the concerns of human health via tissue consumption. The staff has contacted the Department of Game and Inland Fisheries (DGIF) for guidance in developing a sampling plan…" Much of the first part of this plan appears consistent with the activities that DEQ staff ultimately carried out in 1993. Specifically, the 1993 Roanoke River study used 15 sampling stations that appear to have been generally oriented toward more frequent fishing areas, and not to source identification.

Then, the director went on to state plans for a source assessment to be conducted in a second phase:

> The second phase of the Roanoke River approach is conducting a study to identify sources. This phase will be conducted on the entire length of the river system… In general, the staff proposes to conduct a survey of the river sediment in order to determine increasing or decreasing trends in PCB concentrations. This study is envisioned to involve the collection of sediment samples every ten miles or so to bracket potential sources and the staff is proposing 20 stations for sediment collection. After the initial second phase

> work is completed, follow up investigations will be necessary to isolate specific potential sources. The follow up investigations will involve more intensive sediment sampling at locations of higher concentrations.

This portion of the SWCB's original intent when it began its activities appears to have become lost to the agency as it proceeded. This is evidenced in part by DEQ's need in May 1999 to task DEQ staff with the task of developing a source assessment plan, over six years after this intent had been identified by the SWCB director. DEQ's seeming confusion in 1998 and early 1999 over how it would proceed from collecting the monitoring data to doing a source assessment did not enhance its standing with local citizens during that timeframe. It is beyond the scope of this review, however, to assess whether SWCB's original proposed action to identify a source(s), including its plan to conduct bracketing studies for each ten miles or so of river, is fully sufficient, necessary, or appropriate at this time. This question may need to be a source of discussion once DEQ exposes its source assessment plan to the public.

Time Delay Between 1993 Roanoke River Study and 1998 Advisory, as Well as Some Other State Performance Issues, Have Been Upsetting to Local Citizens. Some attention has been given to the fact that the fish samples taken by DEQ in the Roanoke River involved data collection activities in 1993, but it was not until 1998 that an advisory for PCBs was issued by the Department of Health based upon that data. This fact was very upsetting to local citizens who felt that for about five years, they did not have health risk information in their possession that they should have had. As a citizen commented: "You've got a lot of citizens here who have been part of an experiment for the last five years."

DEQ has admitted mistakes during the timeframe from 1993 to 1998. DEQ's Director of Water Program Coordination has said that:

> We didn't do everything right… We didn't include the public to the extent that we probably should have. We're not pleased with the length of time it took to get the report issued. It took too long. No question about that. We had some internal

problems, we had some problems with the data, a lot went wrong in the process.

According to the documentation obtained for this inquiry, the following are key dates for examining the length of time that was taken before DEQ provided the study to VDH:

- February 1993 – SWCB began fish tissue sampling;
- August 1993 – sampling of fish completed;
- October 1993 – contract for analysis of fish samples officially awarded to VIMS, and initial samples delivered;
- May 1994 – last samples delivered to VIMS;
- June 1995 – last data sets and VIMS final report given to DEQ;
- Fall 1995 – DEQ data analysis and report development began; and
- October 1996 – Final DEQ report sent to VDH.

As indicated by these dates, DEQ's process took more than three years. Approximately one year elapsed between the start of sample collection and the delivery of the last sample to VIMS. A second year elapsed, during which time VIMS performed sample analysis and drafted its report. A third year elapsed while DEQ performed its data analysis and developed its report. It is not clear why the VIMS analysis and report development took so long after delivery of the last sample, except that the number of samples was large. VIMS staff have indicated that if DEQ requests a priority for data, it can expedite processing. Once DEQ obtained the data from VIMS, it should have made the data available to VDH and the public more rapidly.

In addition to the time delay issue, local citizens were concerned about a lack of DEQ consultation with them on the sampling strategy, and the incompleteness of survey information. For example, no survey work was done between Leesville Dam and Goat Island Forge, which meant that no samples were taken right above, at, and below Altavista, site of the largest business

community on the stretch of the river that was under concern. When questioned in August 1998, DEQ staff acknowledged that in the preliminary work that led to the 1993 study, one of the "hot spots" for PCBs was in the general area of Altavista." DEQ staff stated that "we tried to cover the entire basin the best we could with finances low."

Local citizens were also concerned about what appeared to be a lackadaisical approach to assessing potential sources of the PCBs. The August 1998 meeting took place almost two years after DEQ sent its report to the Department of Health. However, in response to a citizen question about whether "the records of local industry have been checked", DEQ's Director of the Office of Water Program Coordination said, "I was just checking with my staff in the Lynchburg [sic] Office and as far as we know we have not followed up on any activity like that. Perhaps our Waste Division has done some in that area. But I am not aware of anything specific right now."

Although Acting Within the Bounds of EPA Guidance, VDH Staff Have Not Fully Exhibited a "Better Safe Than Sorry" Approach to PCBs. In addition to concerns about DEQ-related issues, citizens in the Roanoke River area had many questions about the impacts of PCBs following VDH's issuance of the 1998 advisory. There is a substantial debate as to the likelihood and degree to which PCBs pose a danger to human health, including cancer. Some experts argue that studies on PCBs have failed to find evidence of harmful effects on humans, but there is general agreement in the scientific community that PCBs are at least a suspected or even probable cancer agent in human beings.

At some point in the future, the preponderance of scientific evidence may more clearly document the impact of PCBs on human health. Until that time, the question faced by public health officials is how to address the issue of PCB contamination. VDH staff have stated that the department takes a "very, very conservative approach to PCBs. We feel that it is better to be safe than sorry." However, the evolving nature of VDH's Roanoke River advisory, comments made by VDH staff, and even the department's recently developed guidance on PCBs do not fully exemplify a cautionary approach.

For example, VDH staff chose not to include special population precautions as part of its advisory, even though in public forums staff describe these precautions as prudent. Specifically, VDH's advisory does not include any special

warnings for pregnant women and young children. In contrast, the Maryland Department of the Environment posts its advisories with these warnings; a staff member of that department has described such action as "just trying to err on the side of caution." VDH staff have explained that they have taken a different position "because there are no known effects" and because their major concern is cancer. VDH's PCB guidance document states that studies indicating development problems in fetuses of pregnant women exposed to PCBs have "several methodological problems" and "confirmation of these results is not available at this time."

However, the following is an excerpt from an August 20, 1998 meeting in the area covered by the Roanoke advisory in which a VDH representative responded to questions from the public:

> Q: Are there groups of people… deemed more at risk such as pregnant women and children?
> A: Prudence would dictate that child bearing age women, pregnant women and young children, in general, are more sensitive… basically they should be more careful and take more precautions than an average adult.
> Q: Does that mean that they should be more prudent than, and more conservative than the advisory recommends? That advisory is directed toward an average adult?
> A: That is correct.
> Q: So they should be more prudent and eat less?
> A: Should eat less, yes.
> Q: None?
> A: Should eat less. I wouldn't restrict it to none completely.

A "better safe than sorry" approach might also suggest taking a conservative approach to the level of risk that is deemed acceptable. However, within the range of risk values considered acceptable by the Environmental Protection Agency, VDH has chosen the value that allows the greatest risk. (As will be discussed later in this memorandum, the value VDH uses is inconsistent with and allows for greater risk than the value used by DEQ). Further, VDH's discussion in its guidance of the risk factor chosen has raised concerns among some members of the public. VDH's guidance states:

> …recreational or subsistence fishermen have voluntarily chosen a higher risk when they decide to go fishing. Although a risk level of 10^{-4} appears to be less conservative, it is within the range of acceptable risk levels (10^{-4} to 10^{-7}) employed in various U.S. EPA programs and is protective of public health.

VDH staff have elaborated that fishermen are "already taking a risk by driving to the boating ramp, boating and swimming in there and catching fish." There are, VDH staff indicate, risks involved in sitting in a boat and there is a chance of drowning. However, as has been argued by a leader of the citizens advisory group on the Staunton River, there is a lack of evidence suggesting that the fishermen have knowingly accepted a higher level of cancer risk as a result of their activity.

A "better safe than sorry" approach also would suggest caution in asserting that certain behaviors entail no risk, especially when the data are mixed or lacking. However, at times VDH staff have made fairly emphatic statements about the adequacy of its existing warning that were not warranted. For example, at the time of the August 1998 meeting, VDH's advisory covered three species of fish: striped bass, white bass, and carp. The transcript for the August 1998 meeting indicates that VDH's representative said to the public: "[PCBs] are not present in all the species, only three stations and only three species of fish where we found levels of concern. Nineteen of the species of the fish, in our opinion, are absolutely safe to consume."

However, a review of the results of various EPA and SWCB sampling over the years would not have provided the basis for this level of confidence, as values above 600 ppb were found in other fish such as channel catfish. Further, DEQ's 1993 sampling effort had produced no samples of flathead catfish. This was another factor that suggested caution in making statements about other species. Subsequent to the meeting, or in the Spring of 1999 when results from DEQ's Fall sampling effort became available, three more species of fish needed to be added to the advisory: smallmouth bass, channel catfish, and flathead catfish. One flathead catfish had the highest test value in the DEQ sampling effort, at 2,548 ppb.

In addition, a cautious approach should lead to the selection of criteria for use in guidance that match the degree of protection that the public is told to expect. Based on its guidance, VDH calculates its threshold for concern based on an assumption of fish consumption for a period of 30 years. VDH's guidance states:

> In risk assessments calculations for carcinogens, a lifetime exposure of 70 years is assumed, which is considered the worst-case scenario… The VDH used a 30-year exposure duration.

The use of the 30-year exposure assumption increases the level of PCB concentration that is considered acceptable in VDH's calculations and the allowable number of meals that may be consumed. The opposite side of permitting higher PCB concentrations through this assumption, though, is that the determination of unacceptable concentration levels and the number of meals allowed are rooted in an assumption of just 30 years of exposure. VDH staff explanations at the August 1998 public meeting, however, were not consistent with the thirty-year exposure duration assumed in its guidance. For example, VDH staff stated that:

> The Advisory is based on precautionary measures… Based on the science that which is available today, that presents our best judgment that we should be cautious and for those who are consuming the fish everyday or over a lifetime, which is almost 70 years of life, there may be a potential for risk… The only possible human health threat may be from lifelong consumption…"

VDH's thirty-year exposure assumption, as well as an assumption VDH makes about fish preparation, are factors that have a substantial impact on the concentration levels that trigger an advisory and on the allowable meal determination. (The use of a "fish preparation factor" is supported, although not actually used by EPA, if the public is made aware of the methods of trimming and cooking the fish that would reduce exposure to the contaminants). VDH's health advisory warning for the Roanoke states that "when preparing fish from these waters, the VDH advises removing the skin and other fatty portions, then broiling instead of frying." In its PCB guidance and its

calculations, VDH assumes that an average of 50 percent of the PCB content will be lost through the use of appropriate cooking techniques. Use of the fish preparation factor at 50 percent doubles the number of meals per year which can be eaten, while use of the 30-year instead of 70-year exposure factor increases the number of allowable meals per year by a factor of 2.33 times as much. Advice on the number of meals that is based on these factors may not adequately protect all members of the public, if there are individuals who eat fish from the river for longer than the 30-year period, or who eat the fish without using methods of cooking the fish that obtain 50 percent PCB loss.

Finally, VDH guidelines on the issuance of fish advisories related to PCB contamination require that 50 percent or more of the samples for each species at each sampling location exceed the trigger value before the advisory is issued. This approach appears to attempt to address the problem of "outliers" (for example, one or two fish exhibiting significantly higher concentrations than found in the other fish sampled) skewing the average concentration level upward. In practice, an average concentration level could exceed the trigger value, but not warrant an advisory because less than half of the samples producing that average were above it.

EPA staff indicated to JLARC staff that this was a "less stringent approach" than EPA would like to see. EPA staff recommend that advisories should be determined for specific species of fish, and within that, for specific sizes of fish. This is based upon the notion that apparent outliers may actually be representative of a particular species or size of fish, and should not be discounted necessarily, as the VDH guidance may serve to do.

It should be noted that VDH has adopted a more conservative fish consumption rate than that used by DEQ. DEQ, in its human health calculations uses 6.5 grams of fish per day, the average consumption rate of the U.S. population. VDH has adopted a consumption rate of 30 grams per day, the average consumption rate for typical recreational fishermen. The effect of this more conservative variable is a significant reduction in the trigger level. On this variable alone, it does appear that VDH has taken a more conservative approach.

Recommendation (4). **VDH should revisit its PCB guidance document and consider whether all assumptions are**

compatible with the goal of a cautious approach to protecting public health.

Recent DEQ Decisions and Actions on the River Appear Generally Appropriate. Following the August 1998 meeting and the formation of the Citizens Advisory Committee on the Staunton River, DEQ staff in the West Central Regional Office began checking some files for potential PCB sources. This activity proceeded on a relatively low-key basis, and appears to have been often prompted by specific questions or leads that came from the citizen advisory committee.

During May and June of 1999, a number of events transpired that indicated a heightened DEQ response to the Roanoke River issue. On May 17, 1999 DEQ's director designated a member of the central office who had worked on the 1993 study to be the project coordinator for river issues. This individual was to coordinate activities between the central office and the two DEQ regional offices with responsibility for at least a portion of the river – the West Central and Piedmont regions – and was to be the lead DEQ contact person for providing information to the committee. A DEQ regional staff person stated to JLARC staff that this coordination was a "wise move", because "there are pieces of the picture that were beyond each region" and there was a need to have a single operating unit.

Also on May 17th, the decision was made to look for potential sources. Discussions were held with EPA as to the assistance that agency might be able to provide with this effort. DEQ's project coordinator, as well as a staff member of one the regional offices, was charged with developing a source assessment plan. As of June 23, 1999 that document reportedly had been through several drafts.

DEQ's director also visited the area and discussed river concerns. Further, the director instituted a policy which required the PCB results from the samples to be posted on the internet. The director has explained:

> We're doing something that is really new ground for DEQ… It used to be, in the old days, 20 years ago, it was irresponsible for an agency to give that data out without interpretation explaining it to the public. Now in this age of information it's almost

> the reverse. It's irresponsible not to give it out and then explain it later and I think we have maybe failed to see that transition over the course of two decades.

The creation of a project coordinator, the development of a source assessment plan, the sharing of raw PCB data that facilitates the flow of information and opportunities for independent analysis, the hands-on interest by DEQ's director, and what appears to be improving relations with the citizens advisory committee all appear to be positive developments at DEQ. However, DEQ's future plans for addressing the PCB problem in the Roanoke River are somewhat unclear, as are the costs or resource levels that may be required. In part, this is because the source assessment plan has not been finalized. A critical point will be whether DEQ can maintain the focus and bear the costs associated with this effort without major collateral impacts on the priority given to other issues in Virginia's river basins.

Recent Events Have Raised Questions About the Shenandoah River's Recovery From Mercury Contamination

In 1976, E.I. duPont de Nemours and Company (DuPont) discovered mercury contamination in the soil at its Waynesboro plant. Mercury had been used there between 1929 and 1950 in the manufacture of acetate fiber. Subsequently, mercury contamination was found in portions of the South River and the South Fork of the Shenandoah River. It was estimated by DuPont, through their contractors, that approximately 99,000 pounds of mercury had been released into the river systems.

In 1977, the State Department of Health closed 130 miles of these rivers to the taking of fish for human consumption. This ban was reduced to approximately 90 miles in 1979, and in 1980, the ban was replaced with an advisory recommending consumption of no more than one meal (eight ounces) of fish per week caught from the waters in question. Pregnant women and children were advised not to consume any fish from the rivers in question. This same advisory is currently in place on these river areas.

Due to its responsibility for the mercury contamination, DuPont agreed to pay the Commonwealth nearly $2 million dollars, of which $480,000 was to establish a trust fund to be used to monitor the South River and the South Fork of the Shenandoah River. It was contemplated that the trust fund would

cover expenses for 100 years of mercury monitoring. The agreement released DuPont from “any and all claims, demands, actions or liability of any kind on account of and relating to damages incurred by the Commonwealth for injury to, destruction of, or loss of natural resources.” However, nothing in the agreement was to be construed to affect other types of liabilities (such DuPont’s liability to claims by private citizens or claims by any political subdivision or federal agency). Also, the agreement left open the possibility that DuPont would pay for remediation of the mercury should “new technology to remove mercury become technologically and environmentally desirable" with consideration of the economic and social costs and benefits of such action. This type of remediation was deemed impractical at the time of the agreement, and it was agreed that the mercury would be allowed to dilute over time (thus, the requirement to monitor for 100 years).

DuPont also agreed to conduct monitoring for an additional five years (through 1987), at which point the Valley Regional Office of SWCB took over the monitoring of the waters in question, and this has been paid for by the previously mentioned trust fund. Most recently, DEQ contracted with the Applied Marine Research Laboratory (AMRL) of Old Dominion University to collect and analyze fish, water, and sediment samples from the rivers for mercury. AMRL collected samples in 1992, 1994, and 1996, and provided a series of reports to DEQ outlining the results of the sampling.

The Chesapeake Bay Foundation (CBF) contracted with AMRL to conduct a risk analysis of consumption of fish caught from the mercury contaminated advisory area, based upon the same data that AMRL had collected for DEQ. The result of this contract was a report issued by CBF asserting that the current consumption advisory was inadequate to protect human health. The study concluded that mercury contamination in the area is much worse than previously reported, and that it is worsening over time. This stance is in conflict with the predicted dilution of mercury over time that was inherent in the agreement with DuPont.

JLARC staff examination of this issue indicated four preliminary findings:

- Sampling data from the Shenandoah appears to have been shared with other State agencies and interested parties who requested it.

- Although initial DEQ staff concerns appear to be overstated, a change in sampling technique has rendered comparison of recent data to historical data a matter of scientific debate.

- There are differing opinions as to whether the increasing mercury concentrations from the 1992, 1994, and 1996 data conclusively show that mercury concentrations in the Shenandoah are rising over the long-term.

- While DEQ is planning to continue monitoring for mercury in the Shenandoah to address the apparent uncertainties of the AMRL-collected data, the public perception may be that DEQ is unwilling to revisit the strategy of non-remediation.

Sampling Data from the Shenandoah Appears to Have Been Shared with Other State Agencies and Interested Parties Who Requested It. Unlike the apparent lack of access to the Virginia Toxics Database expressed previously in this document, it appears from various documents and interview information acquired by JLARC staff that the data collected on mercury in the South River and the South Fork of the Shenandoah River were accessible to the relevant State agencies and to the public. Documentation from DEQ, DGIF, and VDH indicate that these agencies were involved in discussions of the apparent increased concentrations of mercury in fish tissue well before these entities were aware of the CBF report. In addition, JLARC staff found no evidence that this data was denied to the general public. This conclusion is reached based on the access to the data granted to CBF by the DEQ Valley Regional Office in May, 1997.

Although Initial DEQ Staff Concerns Appear to be Overstated, A Change in Sampling Technique has Rendered Comparison of Recent Data to Historical Data a Matter of Scientific Debate. A major conclusion of the CBF report is that mercury contamination "is much worse than Virginia environmental and health officials have previously reported..." In response to this claim, DEQ staff from both the central office and from the Valley Regional Office initially stated that the data collected in 1992, 1994, and 1996 by AMRL cannot be compared to previous data because of a methodological change in sampling techniques. DEQ staff have explained that the method was different from

previous sampling methodology in that the samples included more fatty tissue for analysis. Some DEQ staff have stated that the type of mercury that bioaccumulates (methyl mercury) is attracted to fatty tissue, so "an increase in the relative amount of fats, or lipids, in the fish tissue samples could result in higher fish tissue mercury levels" than found in the previous samples that did not include as much fatty tissue.

It appears, however, that this explanation may not be accurate according to a 1994 report conducted for the DEQ Valley Regional Office (VRO) by AMRL, and according to a JLARC staff interview with a toxicologist from the FDA. Subsequent to the receipt of the 1992 sampling data by SWCB from AMRL which indicated elevated total mercury concentrations from previous mercury sampling in the 1980s, VRO staff responsible for the study apparently realized that the sampling methodology agreed to by SWCB and executed by AMRL was different from the previous studies. In order to determine the possible effect of the change in technique on mercury concentration levels found, VRO staff decided to conduct an analysis of three different areas of fish tissue from a sample of 64 individual fish representing nine species.

The results of this analysis indicated that there were significant differences in the mercury concentrations between the types of tissue for certain species. However, it was the same muscular tissue (dorsal tissue) that the previous monitoring had focused upon in which the highest concentrations were found, not the fatty portions of the fish. Taking this result one step further, if there were significantly lower methyl mercury concentrations within the fatty portions compared to the muscular portions of the same fish, the sampling data based upon the larger cross section of the fish (the AMRL sampling that included three tissue types) could be expected to produce lower concentration levels than the sampling that only included the muscular portion (the old technique) would. The lower mercury concentrations associated with the non-muscular portion of the fish could serve to dilute the level detected in the muscular portion when considered together to produce the total concentration level for the fish.

The findings of this additional study are similar to the scientific opinion of an FDA toxicologist interviewed by JLARC staff. According to the FDA toxicologist, methyl mercury does not have a particular affinity for fatty tissue, but rather for proteins, so the samples collected by each technique would

not produce dissimilar results due to the technique used. The implications of this view are that the comparison problems attributed to the two sampling techniques would be minimal. While JLARC staff are not in a position to determine the validity of these two opposing views, it seems that the initially stated DEQ position is based upon experience with other metal contaminants (not direct experience with mercury). However, the other view appears to be based on actual mercury studies. Thus, at the very least, there is reason to believe that comparison of the AMRL data to previous sampling events based upon sampling technique is not as problematic as had been stated by some DEQ staff. At an exposure meeting for this memorandum, DEQ management indicated that it is not the agency's official view that this change in technique is problematic.

AMRL has indicated that the data from their analysis may not be comparable to earlier data as well. AMRL stated in the final report produced for DEQ that "data between the decades is not comparable though it is clear that serious mercury contamination" is present. First, AMRL states that data from the 1970s and 1980s are available only in the form of "mean mercury" as compared to individual concentrations in the data from the 1990s. Secondly, AMRL stated that no quality control data were available for the previous studies.

There are reasons that suggest, however, that these comparability concerns may also be overstated. JLARC staff interviews with former AMRL staff indicate that the first concern was primarily that cross-species composite samples (multiple fish species blended together and then analyzed) may have been utilized in the data from the 1980s. It appears, however, based upon the actual report containing the data from the 1980s, that mean mercury concentrations were determined by species, trophic level, and age, thus indicating that species-specific data was available. In terms of quality assurance, the report from the 1980s indicates that EPA sampling protocols were followed and that all samples fell within the 95 percent confidence level generated by EPA.

Regardless of the debate, the change in sampling method does, however, illustrate a previously identified concern with consistency in monitoring data. In the 1997 JLARC Report, Review of the Department of Environmental Quality, JLARC staff found that inconsistencies in sampling technique had contributed to a lack of data comparability across regions of DEQ. JLARC staff recommended that statewide sampling techniques be developed

and that central office monitoring staff be given the authority to ensure that these techniques are followed in the regions. The recent monitoring illustrates once again that the absence of such an oversight function has led to a situation where the new data, while valuable in and of itself, is subject to scientific debate as to its comparability with previous data.

Recommendation (5). **The Department of Environmental Quality should revisit statewide sampling protocols for application in all routine and special study monitoring. Central office staff should have the authority to verify that protocols are followed prior to execution of the monitoring projects. Variances from protocols could be developed in conjunction with the central office and regional staffs, provided that historical comparability questions are resolved.**

There are Differing Opinions as to Whether the Increasing Mercury Concentrations from the 1992, 1994, and 1996 Data Conclusively Show that Mercury Concentrations in the Shenandoah are Rising Over the Long-term. There seems to be a general consensus between DEQ, VDH, and DGIF, and with CBF and AMRL, that the data from the 1992, 1994, and 1996 monitoring events indicate increasing mercury concentrations in fish tissue over that time period. Within those three sampling events, the same methods were utilized to collect the data, so comparing 1992 to 1996 data is not methodologically problematic.

The breakdown in this consensus occurs in terms of the conclusiveness of the AMRL data. While CBF believes that the three AMRL sampling events are probably a part of an overall upward trend in mercury fish tissue concentrations since the time that the special monitoring began, DEQ considers these results to indicate a need for subsequent monitoring to establish a historical trend. Specifically, Valley Regional Office staff indicates that “without clear information on the impact of environmental influences, such as the major flood in January 1996, on mercury levels...[DEQ] would be hard pressed to conclude that clear trends were demonstrated.” In order to account for the environmental influences, DEQ staff have stated that more data points (to be obtained through subsequent sampling events) are needed in order to be historically representative of conditions in the rivers.

DEQ had begun the process of determining the sampling strategy for the next round of sampling, with input from DGIF and

VDH, prior to the issuance of the CBF report. Documentation from DEQ indicates that AMRL conducted a presentation of their final report to DEQ, DGIF, and VDH regional staff in September, 1998 (the final report had been published in June 1998). In December of that year, a meeting between those agencies' regional staff was held to discuss future monitoring of the rivers. The summary of the meeting indicates that the general discussion was "on the subject of future monitoring needs to ensure that adequate data are available to make informed human health decisions." VDH had decided in April 1998 that because there was an existing advisory on the rivers, no further action was warranted in light of the AMRL data. At that time, VDH had indicated to DEQ that fish tissue monitoring should be continued in the future.

Documentation indicates that DGIF regional personnel were also interested in providing input to the future monitoring strategy so that they could better fit their fishing regulations with the health advisory (for example, limiting harvest to particular sizes of species if future monitoring showed a correlation between mercury concentration and fish species and size). DGIF also indicated that a particular species of fish had been underrepresented in previous sampling, and that data from a survey conducted by DGIF on anglers of the rivers indicated that this particular species may be the most consumed on the river. DGIF appears to have been attempting a proactive approach to provide, as DGIF staff state, "more backbone" to the health advisory.

Based upon the documentation obtained by JLARC staff, it does appear that DEQ has reacted to the AMRL data as an indication that a problem may exist with the previous belief that mercury concentrations would show a decreasing trend over time, and their current approach appears to be one of verifying a trend and obtaining more specific information on the fish affected.

While DEQ Is Planning to Continue Monitoring for Mercury in the Shenandoah to Address the Apparent Uncertainties of the AMRL-collected Data, the Public Perception May Be that DEQ is Unwilling to Revisit the Strategy of Non-remediation. In 1982, Lawler, Matusky and Skelly (LMS) Engineers produced the Engineering Feasibility Study of Rehabilitating to South River and South Fork Shenandoah River under contract by DuPont. This document was the basis of the State Water Control Board (SWCB) decision to pursue no mitigation action, monitor the rivers for 100 years, and allow the mercury to dilute over time (as predicted in the LMS report). The LMS report presented two

possible mitigation techniques, sediment removal and chemical fixation, of which chemical fixation was deemed "environmentally unacceptable" from the onset. Within the sediment removal technique, LMS considered both partial and complete removal options in the South River only. Because the area of mercury contamination in the South Fork covered a much larger area than that of the South River, LMS deemed any mercury abatement on the South Fork "cost-prohibitive." However, LMS estimated how the two sediment removal options in the South River would impact the South Fork (as the South River flows into the South Fork of the Shenandoah) and presented this information as well. Thus, the costs and benefits of partial and complete sediment removal in the South River were compared with each other, and to the remaining option of no mitigation. The following table presents the analysis of the mitigation options by LMS conducted in 1982.

Table 1
LMS Analysis of Mitigation Options: 1982

Mitigation Alternative	Cost*	Percent of Mercury Abated in South River (after 10 years, after 100 years)	Percent of Mercury Abated in South Fork (after 100 years)
Partial Sediment Removal in South River	$4,100,000	30% , 82%	39%
Complete Sediment Removal in South River	$15,500,000	91% , 95%	41%
No Action	$0	17% , 74%	38%

*Does not include the cost of continuous monitoring as recommended by LMS regardless of the action taken.

Source: JLARC staff analysis of the Engineering Feasibility Study of Rehabilitating the South River and South Fork Shenandoah River, Volume II, Final Report, June 1982, Lawler, Matusky and Skelly Engineers.

SWCB chose the "no action" option by concluding that the mitigation options were not technologically and environmentally desirable. This decision appears to be based upon the belief that no mitigation would still result in mercury abatement at similar levels to those reached through the sediment removal scenarios, especially in the South Fork which appears to have been viewed as the more important fishery of the two. It is

this underlying belief that has been called into question by the AMRL monitoring data of the 1990s. Even in 1989, LMS concluded that "mercury concentrations have remained fairly constant or increased only slightly." If the data show a historical upward or even level trend in the mercury concentrations of fish, then the predicted mercury abatement associated with the "no action" alternative is in question.

An apparent public perception of this issue, as evidenced in the CBF report and subsequent newspaper articles, is that DEQ has refused to consider that the underlying reason that no mitigation was undertaken has been contradicted, and that DEQ has not made any effort to re-examine possible mitigation efforts. DEQ management stated that until the most recent data became available, they had not seen a need to reconsider remediation options. It appears clear in the consent agreement with DuPont that should mitigation technology be feasible (based on a number of factors including cost), the company could be liable for some or all of the costs associated with that effort. It is fairly clear from document review and interviews with DEQ staff that mitigation options had not been revisited since the signing of the consent agreement in 1983 through the release of the CBF report in 1999. However, in light of the recent events, DEQ staff from both the Valley Regional Office and from the Central Office have indicated that they will be examining the mitigation technologies that are currently available to assess their feasibility, and the cost of this examination will come out of the trust fund established by the DuPont settlement.

Interaction Between DEQ, VDH, and the General Public on Human Health Concerns in State Waters Has Been Problematic in Many Regards

DEQ and the Virginia Department of Health (VDH) have a cooperative role in the protection of human health from contaminants found within State waters. Since 1986, DEQ (in the form of the previous State Water Control Board and the Department of Waste Management, which both became part of DEQ) has been the State agency responsible for assessing the water quality of State waters. Within that role, DEQ monitors State waters for a range of contaminants to determine if water quality is being undermined. DEQ determines the status of water quality through the comparison of monitoring data to the Water Quality Standards, which are enforceable regulations promulgated by the agency on a three-year cycle. In terms of human health, DEQ's Water Quality Standards include human health related numerical standards that

are intended to prevent fish from concentrating toxic chemicals to a degree that would be harmful for the average consumer. The water-based human health standards are readily translated mathematically into fish tissue concentration limits. These human health standards are utilized by DEQ to identify areas of concern for human fish consumption. However, DEQ has no authority to issue consumption advisories, as this is the responsibility of VDH.

As indicated above, VDH's role in the protection of human health from contaminants in State waters is in the issuance of consumption advisories. DEQ submits monitoring data to VDH for interpretation of the human health effects. Within VDH, the Division of Health Hazards Control is responsible for this interpretation. The division bases its decisions upon internally developed guidelines and resulting contaminant specific "trigger levels" for the consideration and issuance of fish consumption advisories. The guidelines are chemical specific, and according to VDH staff, are based upon research of guidance from various entities charged with protection of human health (the FDA, EPA, Center for Disease Control, and the World Health Organization, for example). Fish advisories, and the guidance that VDH utilizes to determine the issuance of the advisories, are not regulatory in nature, as the term advisory implies.

As part of this preliminary inquiry by JLARC, it became apparent early on that the process by which fish advisories are issued was in need of examination, as both the Staunton River and Shenandoah River situations involved consumption advisories. JLARC staff examination of this issue indicated a number of preliminary findings:

- It is unclear why it took so long for VDH to issue the fish advisory in the Staunton River after its new guidance was established.

- Despite the debate over the EPA and FDA risk assessment procedures, it appears that VDH has been diligent in its responsibilities toward the protection of human health from mercury in the Shenandoah River system.

- It appears that other areas of suspected PCB contamination had been identified by DEQ, or

its predecessor the SWCB, that have not been resolved in an acceptable fashion.

- Two State agencies, DEQ and VDH, have differing opinions on the level of cancer risk to humans that is acceptable through exposure to PCBs.

It Is Unclear Why It Took So Long for VDH to Issue the Fish Advisory in the Staunton River After Its New Guidance Was Established. One of the initial concerns voiced by citizens in the affected area of the Staunton River fish advisory was that the advisory was issued based on monitoring data that had been available to VDH long before the advisory was issued. Subsequent to hearing this concern, DEQ and VDH have both explained that the delay was primarily the result of the necessary process undertaken by VDH to revise its PCB guidance based upon input from EPA and other sources of information (as described previously in this memo). Notwithstanding that explanation, documentation and interview data obtained by JLARC staff indicate that there was still a considerable and unexplained delay between when the new PCB guidance was available for application by VDH, and when the fish advisory was issued.

Specifically, VDH staff indicated to JLARC staff that the new PCB guidelines were complete as early as October, 1997. This was approximately nine months prior to the issuance of the Staunton River advisory. VDH staff did indicate that at that point, DEQ, EPA, and Virginia's neighboring states had not examined the guidance. VDH staff indicated that DEQ was provided the draft guidelines in December, 1997. There is no indication obtained to date of how or when DEQ responded to the draft guideline. Nevertheless, it appears that at least seven months passed in which no action was taken despite the availability of data and the availability of the new VDH decision tool that clearly indicated an advisory was warranted for the Staunton River.

When asked about this delay, VDH staff stated that the advisory was not issued until VDH and DEQ had worked out a sampling plan to further clarify the issue. Again, no indication of DEQ's recollection of this has been obtained. While JLARC staff do not question the necessity of formulating a plan for further sampling in areas with consumption advisories, it does not appear necessary to delay public notification of human health concerns until such a plan has been developed.

Recommendation (6). **The Department of Health should inform the public immediately after a determination has been made that a fish advisory is warranted. This information could be in the form of a press release, internet posting, and/or other feasible means determined by the Department of Health in consultation with the Department of Game and Inland Fisheries. The posting of signs and other means of long-term notice should follow in a timely basis.**

Despite the Debate Over the EPA and FDA Risk Assessment Procedures, It Appears that VDH Has Been Diligent in Its Responsibilities Toward the Protection of Human Health from Mercury in the Shenandoah River System. The CBF report questioned VDH's current fish consumption advisory related to mercury. CBF's report concluded that the current advisory was 10 times less protective than it should be based upon the most recent monitoring data. This risk assessment was based upon the EPA protocol for calculating acceptable consumption levels which are generally more conservative than the FDA protocol which VDH guidance more closely follows. When interviewed by JLARC staff, VDH staff asserted that their stance was that the current advisory was sufficient for the protection of human health, primarily because the main threat to human health associated with the levels of mercury found in the river system was to fetal development, and that the current advisory recommended that pregnant women consume no fish from the waters in question.

VDH asserted that the FDA had concurred that the advisory was adequate. JLARC staff verified this concurrence with a FDA toxicologist. This toxicologist asserted to JLARC staff that based on his understanding of the methyl mercury concentrations found in the fish tissue (in the range of one to three parts per million), the Virginia advisory was "very conservative health advice." He reiterated VDH's position that the primary population in need of protection from mercury at those levels were unborn fetuses (protected by advising pregnant women not to consume any fish).

While there may be differing scientific opinions as to whether the FDA risk assessment or the apparently more conservative EPA risk assessment procedures used by CBF is the correct procedure to follow, it is clear that VDH was at least diligent in examining the new data relevant to the current advisory and in seeking input on the adequacy of the advisory.

An associated issue with the recommended consumption limit expressed in the CBF report is that the risk assessment conducted by AMRL for CBF appears to have been unintentionally based upon a skewed subset of the available sample. DEQ Valley Regional Office staff indicated to JLARC staff that the only samples for which AMRL analyzed methyl mercury concentrations (upon which the risk assessment was conducted) were those samples that were found to have total mercury concentrations above one part per million. The result of this appears to be that the only fish considered in the risk assessment were those known to have high mercury concentrations. This excludes the impact in the risk assessment of fish that had lower mercury levels (approximately 49 percent of the available 1996 data), even though these fish were present and could be consumed by the general public. In effect, analysis based on this skewed subset obscures the possible debate between the EPA and FDA risk assessment procedures in the case of the Shenandoah mercury situation.

One area involving the advisory in which it appears that VDH and DGIF could be more diligent is ensuring that warning signs are consistently posted over time in locations covered by the advisory. Along the stretch of the Shenandoah River covered by the advisory, JLARC staff found in visits to selected river locations that at some sites signs were posted, but at other locations signs were not. At two of the sites that were visited, there were "stocked trout fishing" signs but there was no advisory posting.

It Appears That Other Areas of Suspected PCB Contamination Have Been Identified by DEQ, or Its Predecessor the SWCB, That Have Not Been Resolved in an Acceptable Fashion. In conducting the research for this preliminary inquiry, JLARC staff were given documentation on other State waters for which potential PCB contamination had been identified by the then SWCB, which had not been resolved (in terms of a decision on the human health risks by VDH) to date. Specifically, documentation concerning two waterbodies, Levisa Fork at the Virginia/Kentucky State line and Mountain Run of the Rappahanock River system, were examined. In both cases, it appears that the lack of resolution was related to inaction on the part of the SWCB and subsequently DEQ.

Levisa Fork at the Virginia/Kentucky State line was sampled in 1985 and 1986 as part of the normal rotation of fish

tissue and sediment sampling conducted by the then SWCB. At that time, multiple samples indicated PCB concentrations above the FDA action level of 2,000 parts per billion (ppb). Due to those findings, the sampling station that produced the elevated results was sampled again in 1987. Those results indicated lower concentrations of PCBs, none of which exceeded the FDA action level. Based upon the 1987 sampling, the SWCB advised VDH that the human health risk associated with fish from that area of Levisa Fork was not believed to be high. The SWCB recommended continued monitoring and VDH concurred.

Monitoring was not conducted in 1988, but was conducted again in 1989, at which time multiple samples again exhibited concentrations above the FDA action level, and were generally higher than the 1986 monitoring results. These data were submitted to VDH in April 1990. In June of that same year, VDH requested a meeting to discuss the historical and current data. It is unclear from documentation if this meeting ever occurred, and recollection on the part of current DEQ and VDH staff is that it did not. From that point, it appears that the SWCB and subsequently DEQ did not do anything in that particular water body until Levisa Fork came up in the 1997 rotation of the fish and sediment sampling program, at which time DEQ found PCB concentrations in excess of the VDH 600 ppb level of concern. Table 2 presents the 1997 data.

Table 2
1997 Sampling of the Levisa Fork at the Virginia/Kentucky State Line

Composite Sample of:	PCB (ppb)	Exceeds 600 ppb?
Gizzard Shad	1181.7	Yes
Red Eye	735.1	Yes
Northern Hogsucker	102	No
Golden Redhorse Sucker	1447.8	Yes

Source: DEQ Office of Water Quality Standards via phone interview.

According to the Office of Water Quality Standards (OWQS) staff, these data have been available since November 1998, but to date have not been shared with VDH. Both the lack of action between 1990 and 1997, and the failure to provide the 1997 data to VDH, currently indicate a serious problem concerning

DEQ's role in the protection of human health. The reason for this inaction, be it lack of agency resources or otherwise, needs to be resolved.

The other area of PCB concern examined is that of Mountain Run in the Rappahannock River system. Within the past year, DEQ staff found a 1972 SWCB report entitled Mountain Run PCB Study. The data reported in this study indicate alarmingly high levels of PCBs across nearly all species sampled in the three sampling areas of the waterbody. As a whole, 69 percent of all the fish samples collected would have exceeded the VDH trigger level of 600 ppb had it been applied back then (the FDA action level then was 5,000 ppb, a significantly less stringent value than today's values). More alarmingly, some of the concentrations reported were of incredible magnitude. At one sampling station, five out of six samples exceeded 10,000 ppb (with one at 56,000 ppb). Another sampling station found a smallmouth bass with a total PCB concentration of over 47,000 ppb (78 times the current trigger value).

While these results need to be examined in the context of the sampling methodology and quality assurance of the data (which is not discussed in adequate detail in the report), as well as the time that has passed since the data were collected, DEQ staff have indicated that this is still a clear indication that further clarification of the situation in that waterbody is warranted. Current DEQ staff apparently had no previous knowledge of this data, but OWQS has informed JLARC staff that they are planning on revisiting this waterbody during next year's sampling rotation. However, it does appear that the SWCB did not follow-up on this information in a manner that the data indicate would be warranted. Thus, a potential human health concern may have remained unchecked for over 25 years, first by SWCB and then by DEQ.

Recommendation (7). **The Department of Environmental Quality should endeavor to ensure that agency-identified water quality issues are acted upon in a timely fashion. The Department should routinely notify the Department of Health and other relevant agencies of potential areas of concern in a more expeditious manner than current practices illustrate. The Department should reevaluate staff and other resource needs to ensure prompt identification and notification of potential water quality problems.**

Two State Agencies, DEQ and VDH, Have Differing Opinions on the Level of Cancer Risk to Humans That Is Acceptable Through Exposure to PCBs. During this preliminary inquiry on the issue of how human health concerns are addressed, it was strikingly apparent that DEQ and VDH differed in a key assumption utilized to determine what fish tissue contaminant concentration levels indicate a cause for concern. As part of the risk assessment calculations that produce the "trigger value" for PCB tissue concentrations, one of the variables used is a policy choice of the acceptable additional risk of contracting cancer related to eating the contaminated fish. On this issue, VDH, through internal guidance, has chosen this value to be 10^{-4}, which means that according to VDH, the acceptable risk of contracting cancer is one additional cancer per 10,000 people. DEQ, on the other hand, has adopted through regulation a value of 10^{-5}, which means that the acceptable risk of contracting cancer according to DEQ is one additional cancer per 100,000 people. DEQ's policy decision on this variable, therefore, is ten times more protective of human health than is VDH's policy decision.

While it is clear that this is entirely a policy decision, and it should be added that both values are acceptable under guidance from EPA, it poses a significant issue that two State agencies charged with the protection of human health are operating under assumptions of accepted risk to human health that are 10 times different from each other. On the issue of PCBs, this difference contributes to trigger values concerning fish tissue concentrations that are 10 time different as well (DEQ's trigger value is 60 parts per billion, while VDH's trigger value is 600 parts per billion). This results in DEQ flagging monitoring data that indicates concentration values greater than 60 parts per billion (ppb) which are then sent to VDH staff who determine that there is no immediate cause for concern because they do not exceed 600 ppb.

In fact, this is not a theoretical situation. A recent report commissioned by the EPA and conducted by the Center for Environmental Studies at Virginia Commonwealth University and the Virginia Institute of Marine Science at the College of William and Mary found elevated PCB levels in fish samples from the James River near Hopewell. The data were provided to VDH for an assessment of the human risk of exposure to these contaminated fish. VDH concluded that only a small percentage (20 percent) of the samples from three sampling stations exceeded the 600 ppb threshold and that the average across all samples was 397.7 ppb, well below the 600 ppb threshold. Only one of the sampling

stations exhibited a average PCB concentration of greater than 600 ppb. None of the sampling stations exhibited 50 percent of the samples above the trigger value. However, at the station that did have an average concentration of greater than 600 ppb (614 ppb), if one more fish in the group that was analyzed had exhibited that level of concentration, the guidelines for issuance of an advisory would have been met in that area (thus illustrating the importance of the assumptions behind the risk assessment). As this was not the case, no advisory was warranted according to the VDH guidance.

DEQ regulation, on the other hand, would indicate that the average around the Hopewell stations is well above the 60 ppb level indicating that a human health problem related to PCBs may exist in that stretch of the James. DEQ itself found PCB levels in fish tissue from that areas above the 600 ppb level in its 1997 fish tissue and sediment sampling program, but it is unclear if VDH has had an opportunity to review that data.

JLARC staff are not in a position to make the judgement between the acceptable levels of cancer risk associated with PCBs. However, it is clear that this inconsistency between DEQ regulations and VDH guidance assumptions should be addressed by policy makers under the advisement of the agencies involved.

Recommendation (8). **The Secretary of Health and Human Resources and the Secretary of Natural Resources should work together, under advisement of the relevant agencies within the Secretariats, to develop a formal State policy in regards to the acceptable level of risk to human health associated with exposure to carcinogens and other toxins in the environment. In addition, input from national organizations charged with the protection of human health from contaminants in the environment should be solicited in determining this policy.**

Attachment A

JLARC staff conducted the following interviews during this review:

- On May 19, Mr. Bob Burnley, former Department of Environmental Quality (DEQ) employee
- On May 21, Dr. Robert Stroube and Dr. Khizar Wasti, Virginia Department of Health (VDH)
- On May 27, Ms. Eileen Rowan, former DEQ employee responsible for managing the Virginia Toxics Database
- On June 7, Mr. Alan Anthony, Director of Office of Water Quality Standard, DEQ
- On June 9 and June 28, Mr. Durwood Willis, former manager in the division which housed the Virginia Toxics Database, current project manager of Roanoke River PCB study, DEQ
- On June 9, Mr. David Grimes, former supervisor in division which housed the Virginia Toxics Database, currently environmental engineer, DEQ
- On June 16, Mr. Mark Richards, responsible for getting the Virginia Toxics Database operational, DEQ
- On June 16, Mr. John Kennedy, Program Manager, Chesapeake Bay and Coastal Programs, DEQ
- On June 17, Mr. Alan Pollock, Administrator, Chesapeake Bay and Coastal Programs, DEQ
- On June 18, Mr. Mike Murphy, Director, Division of Environmental Enhancement, DEQ
- On June 18, Mr. Dale Phillips, Administrator, Office of Water Permit Programs, Technical Support, DEQ (telephone only)
- On June 21, Mr. Bill Hayden, Public Relations Coordinator, DEQ
- On June 22, Mr. Lou Seivard, Program Planner, Office of Water Quality Standards, DEQ
- On June 22, Ms. Deborah DeBiasi, Environmental Engineer, Office of Water Permit Programs, Technical Support, Toxics, DEQ
- On June 23, Mr. Shelton Miles, Chair, Staunton River Citizens Advisory Group

- On June 23, Dr, Mike Scanlan, Environmental Manager, West Central Region, DEQ
- On June 24, Mr. Bradley Chewning, Regional Director, Valley Regional Office, DEQ
- On June 24, Mr. Donald Kain, Environmental Manager, Valley Regional Office, DEQ
- On June 24, Mr. Ray Tesh, Environmental Manager, Valley Regional Office, DEQ
- On June 24, Mr. Keith Fowler, Permit Writer, Valley Regional Office, DEQ
- On June 24, Mr. Ron Gregory, Administrator, Office of Water Quality Assessment, DEQ
- On June 24, Mr. Gabriel Darkwah, Analyst, Office of Water Quality Standards, DEQ
- On June 24, Ms. Jean Gregory, Program Manager, Office of Water Quality Standards, DEQ
- On June 25, Dr. Robert Hale, Dr. Morris Roberts, and Dr. Michael Unger, Virginia Institute of Marine Science
- On June 28, Ms. Kelly Eisenmann and Mr. Richard Batiuk, Chesapeake Bay Program, EPA (telephone only)
- On June 28, Mr. Troy DeLung, Office of Information Services, DEQ (telephone only)
- On June 28, Mr. Dave Paylor, Director, Program Coordination, DEQ
- On June 28, Mr. Larry Lawson, Director of Operations, Water Program Coordination, DEQ
- On June 29, Mr. Joe Maroon, Executive Director, and Jeff Corbin, Staff Scientist, Chesapeake Bay Foundation
- On June 29, Mr. Martin Ferguson, Director, Water Permit Programs, DEQ
- On June 29, Dr. Khizar Wasti and Dr. Peter Sherertz, Toxicologists, Bureau of Toxic Substances, VDH
- On June 30, Mr. Dennis Treacy, Director, DEQ
- On June 30, Mr. Kirk Batsel, Permit writer, DEQ (telephone only)
- On June 30, Mr. Darrell Bowman, Fisheries Biologist, Region IV Office, DGIF (telephone only)
- On July 1, Mr. John Cunningham and Mr. Frances Campbell, DEQ (telephone only)

- On July 1, Mr. Charles Lunsford, former manager of the Virginia Toxics Database at DEQ (telephone only)
- On July 1, Dr. Mike Bolger, Toxicologist, FDA (telephone only)
- On July 1, Mr. Mark Alling, Environmental Specialist, Piedmont Regional Office, DEQ (telephone only)
- On July 1, Mr. Mike Shelor, Environmental Engineer, Piedmont Regional Office, DEQ (telephone only)
- On July 1, Mr. James Sydnor, Division Director, Office of Air Quality Programs, DEQ (telephone only)
- On July 1, Dr. Greg Garman, Center for Environmental Studies, Virginia Commonwealth University (telephone only)
- On July 6, Mr. Charles Kanetsky, Regional Water Quality Monitoring Coordinator, EPA (telephone only)
- On July 6, Ms. Vicki Harlow, former Principal Investigator, AMRL (telephone only)
- On July 6, Dr. Raymond Alden, III, former Senior Editor, AMRL (telephone only)
- On July 6, Mr. Thomas Felvey, Policy Analyst, Division of Policy and Legislation, DEQ (telephone only)
- On July 6, Mr. Larry Mohn, Regional Fisheries Manager, Region IV Office, DGIF (telephone only)