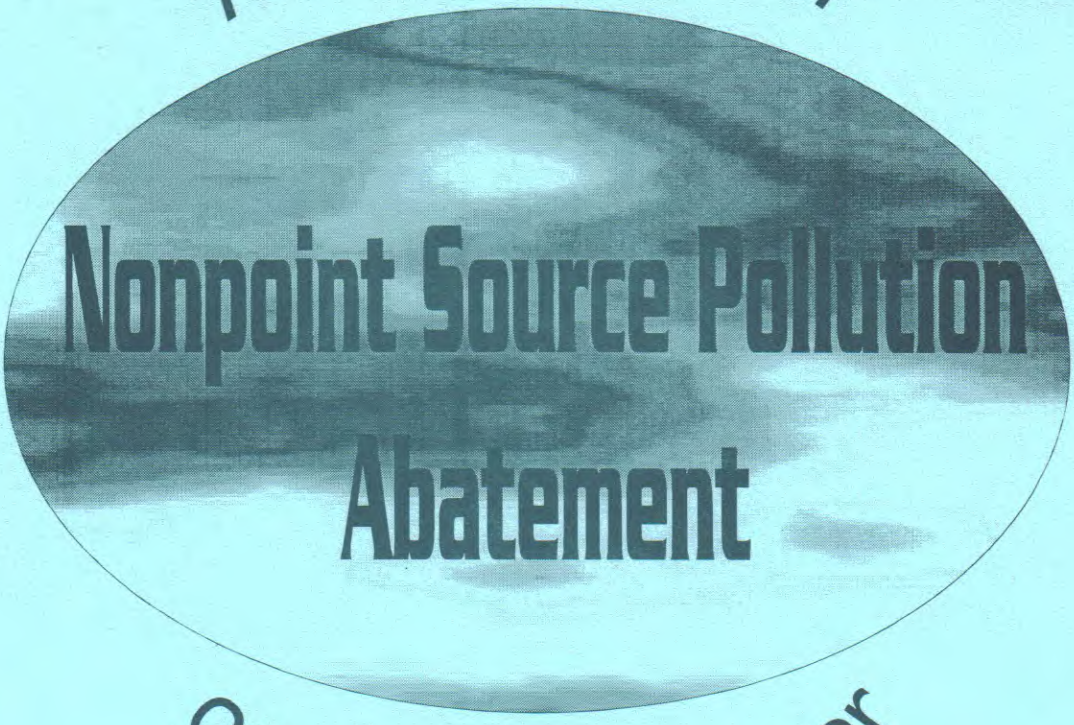
A strategy for



Nonpoint Source Pollution Abatement

on the Ohio River

Ohio River Valley Water Sanitation Commission

A Strategy for

NONPOINT SOURCE POLLUTION ABATEMENT

on the Ohio River

OHIO RIVER VALLEY WATER SANITATION COMMISSION

Cincinnati, Ohio
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EXECUTIVE SUMMARY

Though little work has been done to determine the impacts of nonpoint source (NPS) pollution on the Ohio River, the possibility of NPS pollution adversely affecting river water quality is undeniably present. The Ohio River Valley Water Sanitation Commission (ORSANCO) has recognized NPS pollution as a threat to the water quality of the Ohio River and is addressing this issue through a Nonpoint Source Pollution Abatement Strategy. In January 1993, ORSANCO created the Nonpoint Source Pollution Task Force, which is responsible for the development and implementation of the NPS Pollution Abatement Strategy.

Nonpoint source pollutants can be generally characterized as those which "arise from diffuse sources associated with the land and human use of it. Nonpoint source pollutants are transported from the land by individual, or combined aerial, surface water and groundwater mechanisms" (WPCF 1991). There are numerous types of pollutants associated with NPS impacts, including, but not limited to: siltation, nutrients, pathogens, metals, pesticides, organic enrichment, flow/habitat alteration and acidity. Likewise, there exists a variety of sources of NPS pollutants. Some of these include agriculture, atmospheric deposition, construction, hydrologic and habitat modification, land disposal, resource extraction, silviculture and urban runoff.

The first two goals of the strategy are to determine the degree to which NPS pollutants adversely affect the water quality of the Ohio River, and to achieve a coordinated approach among efforts to abate NPS pollution valley-wide, if a problem is shown to exist. The first step in achieving this goal will be the compilation of information to determine NPS impacts on the main stem of the river. In order to supplement the existing information, a NPS pollution monitoring strategy will be developed and implemented. The monitoring strategy will be dependent upon information gathered during the data compilation phase. A task associated with the determination of NPS impacts is the development of a consistent approach for monitoring and reporting NPS pollutant impacts among Ohio River basin states. If results from data compilation and monitoring programs indicate a NPS problem on the River, pollutant sources of concern will be investigated.

If impacts are shown to exist and the sources are known, ORSANCO will recommend pollutant loading limits to the states based on available data from past studies. The states will be responsible for developing alternative approaches and selecting a final abatement plan based on ORSANCO's recommendations. Abatement plans will be implemented through the states' existing NPS programs. Long-term monitoring stations will be established by ORSANCO in order to document any improvements in water quality resulting from the implementation of the programs.

The third goal of the strategy is to involve the public in the NPS abatement decision-making process. This will be achieved by accepting public comment as each discrete component of the strategy is being developed or implemented, and by publicizing results and information after each component has been completed. It is only through the cooperation of all affected parties, including local, state and federal government agencies, private businesses and the general public, that the issue of nonpoint source pollution on the Ohio River can be successfully addressed.

1.0 INTRODUCTION

1.1 Ohio River Basin

1.1.1 Basin Description

The Ohio River Basin covers 203,940 square miles, an area roughly the size of France, and constitutes six and a half percent of the continental United States. The basin is located in the east-central part of the country and includes portions of 14 states. A map of the basin and river system is shown in Figure 1 on the following page. The Ohio River extends 981 miles from Pittsburgh, Pennsylvania southwest to Cairo, Illinois where it joins the Mississippi River. Along the way, the river forms the border between Ohio, Indiana and Illinois to the north, and West Virginia and Kentucky to the south.

The topography of the basin varies from the Appalachian mountains in the east to the mid-western prairies in the west. Land use varies similarly; most of the land is forested in the southeast portion of the basin, while agricultural cropland dominates the northwestern area. Almost three quarters of the nation's identified coal reserves are located within the basin. Due in part to this fact, there are a considerable number of electric power plants. Generating facilities along the Ohio River alone account for over five percent of the nation's electricity. Other major industries in the basin include the production of steel and petrochemicals.

The population of the basin is over 26 million. Large cities include Pittsburgh, Cincinnati, Louisville and Evansville on the Ohio River main stem, as well as Columbus, Indianapolis, Chattanooga and Nashville. Major tributaries to the Ohio include the Allegheny, Monongahela, Kanawha, Kentucky, Green, Wabash, Cumberland, and Tennessee Rivers.

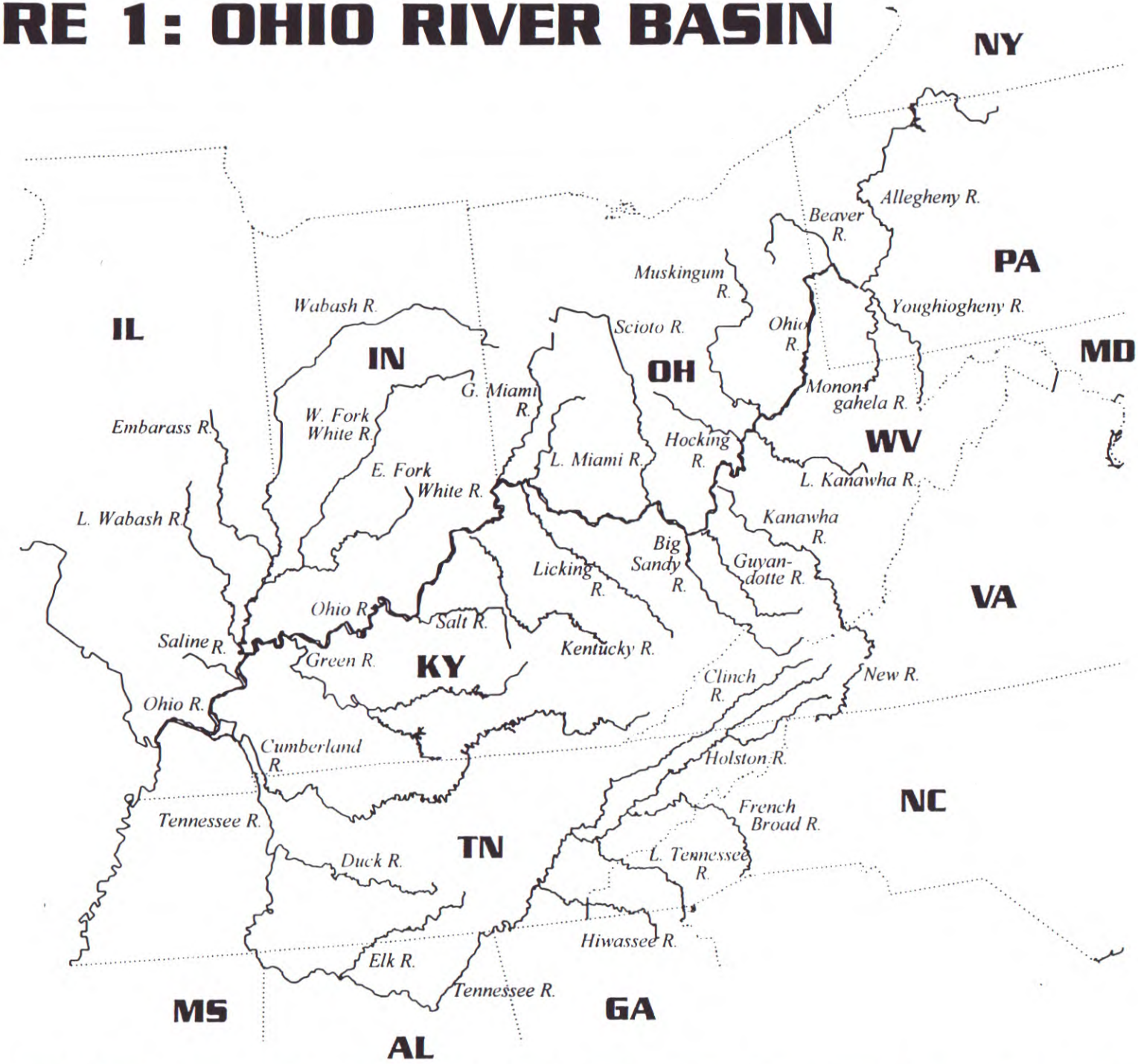
1.1.2 Water Use

The Ohio River Basin averages approximately 45 inches of precipitation per year. Rainfall is generally sufficient that irrigation is not necessary. As a result of the abundant precipitation, the long term average flow of the Ohio River is greater than that of the Mississippi River at their point of confluence, even though the drainage area of the Mississippi at that point is over three times that of the Ohio.

There are 2,584 miles of navigable waterways in the basin; over 40 percent of the nation's waterborne commerce is transported on this system. Coal and petroleum products comprise the largest share of commodities carried by barge on the navigable waterways, which include all 981 miles of the Ohio, 652 miles of the Tennessee, 381 miles of the Cumberland, 129 miles of the Monongahela, and lesser portions of the Green, Kanawha, Kentucky, Allegheny, Clinch and Little Tennessee Rivers.

The waters of the basin are used for a variety of industrial purposes, including processing and cooling. In addition to coal fired power plants, electricity is produced at several nuclear facilities, both of which use large amounts of cooling water. There are also a number of hydropower facilities on the Ohio River main stem and its tributaries, particularly the Tennessee and Cumberland Rivers.

FIGURE 1: OHIO RIVER BASIN



Water uses of primary concern are those which depend on good water quality conditions - public water supply, water contact recreation, aquatic life habitat and fish consumption. Most of the rivers, streams and lakes throughout the basin are classified for one or more of these uses. About 10 million people are served by public water supply systems that depend on surface waters of the basin as their source. Most of the waters in the basin are classified as warm water aquatic habitat streams, and their use for sport fishing is steadily increasing. Some commercial fishing and mussel harvesting take place on the Tennessee and lower Ohio Rivers. While designated swimming beaches are, for the most part, located on the many lakes and reservoirs in the basin, water skiing and swimming also take place on the larger rivers. Several rivers such as the New and the Gauley in West Virginia, the Ocoee in Tennessee, and the Nantahala in North Carolina are widely used for white water canoeing, kayaking and rafting.

1.2 Ohio River Valley Water Sanitation Commission

The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate agency established in 1948 whose major charge is the control and abatement of water pollution in the Ohio River Valley. ORSANCO draws its authority from the Ohio River Valley Water Sanitation Compact, which was approved by the United States Congress in 1936 and signed by the governors of the states of Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, West Virginia and Virginia in 1948. A guiding principle of the Compact is that pollution from one state should not affect the uses of interstate waters such as the Ohio River.

Although the concept of nonpoint source (NPS) pollution did not exist when the Compact was drafted, the document provides the mechanism by which ORSANCO can address the issue from a basin-wide perspective. Article I of the Compact states "Each of the signatory States pledges...faithful cooperation in the control of future pollution in and abatement of existing pollution from the rivers, streams and water in the Ohio River basin which flows through, into or border upon any of such signatory States, and in order to effect such object, agrees to enact any necessary legislation..."[1]

ORSANCO's authority to address nonpoint source impacts on the main stem of the Ohio River is best illustrated by Article VIII of the Compact, which mandates the following:

> *The Commission shall conduct a survey of...the District, shall study the pollution problems of the District, and shall make a comprehensive report for the prevention or reduction of stream pollution therein. The Commission shall confer with any national or regional planning body which may be established, and any department of the Federal Government authorized to deal with matters relating to the pollution problems of the District...The Commission shall consult with and advise the various States, communities, municipalities, corporations, persons, or other entities with regards to particular problems connected with the pollution of waters...*[1]

The Compact thus gives the Commission the authority to develop a strategy to abate interstate NPS pollution by identifying problems and achieving cooperation among all parties dealing with or affected by nonpoint source pollution. In the implementation of this strategy, ORSANCO's primary roles will be characterizing the degree of NPS

impacts on the main stem of the Ohio River, identifying the origins of any impacts found, and recommending pollutant load reductions to the states if necessary.

1.3 State Nonpoint Source Programs

Section 319 of the Clean Water Act was amended in 1987 to require each state to conduct an assessment of NPS impacts and to formulate a management plan before August 1988. In its 1992 Report to Congress, the US EPA stated that 44 management programs had been fully approved and that portions of all the remaining states' programs had also been approved. In general, each program coordinates the different regulations that pertain to NPS control and identifies best management practices for specific land uses. It is the intent of this strategy that, although ORSANCO may recommend loading reductions and suggest solutions, any problems discovered on the main stem of the Ohio River attributable to NPS pollution will primarily be addressed through the state NPS programs.

1.4 Creation of the NPS Pollution Abatement Task Force

Because nonpoint source pollution results from many diverse land uses, and since the Ohio River passes through or borders six states and drains parts of 14 states, a successful NPS pollution control program can only be implemented with the support and cooperation of all affected parties. Based on this principle, ORSANCO created a NPS Pollution Abatement Task Force in January 1993 representing local, state and federal environmental agencies, agricultural agencies, agribusiness, mining and public interests. The task force is co-chaired by the Director of the Ohio Environmental Protection Agency and the Commissioner of the Kentucky Department of Agriculture, and currently has 13 members, excluding ORSANCO staff. The inclusive make up of this task force will ensure that this strategy is based on cooperation and consensus, and that efforts be targeted at the most serious NPS water quality problems in the Valley.

1.5 Intent of NPS Pollution Abatement Strategy

The ultimate goal of this strategy is to achieve a coordinated approach among efforts to abate nonpoint source pollution valley-wide, if a problem is shown to exist. It is not the intent of this strategy to create a new regulatory apparatus or to impose any mandates in order to achieve this goal. Rather, the intent is for the regulatory agencies to work closely with the organizations associated with NPS impacts of concern. Together, public agencies and private organizations will develop alternative approaches for achieving the loading reductions necessary to achieve water quality objectives on the main stem of the Ohio River.

2.0 BACKGROUND

2.1 Definition of Nonpoint Source Pollution

Nonpoint sources (NPS) of pollution are defined in Section 502(14) of the Clean Water Act as any sources of water pollution that do not meet the legal definition of "point source" pollution. Although concise, the definition given above is not very descriptive. The Water Pollution Control Federation (currently the Water Environment Federation) gave a more positive definition, describing NPS pollutants as those which "arise from diffuse sources associated with the land and human use of it. Nonpoint source pollutants are transported from the land by individual, or combined aerial, surface water and groundwater mechanisms".[2]

2.2 Federal Nonpoint Source Legislation

One of the most important pieces of federal water pollution control legislation addressing the issue of NPS pollution is Section 319 of the Clean Water Act. Section 319 outlines a two-step process which states must follow if they are to qualify for federal grant money. The first step is the completion of a state Nonpoint Source Assessment Report, which identifies state waters which are adversely impacted by NPS pollutants and require controls to attain their use designations. States are required to update this inventory every two years as part of their 305(b) reports. Second, the states must develop a statewide Nonpoint Source Management Plan to bring nonpoint source pollution under control. The management plans form the basis of each state's nonpoint source control plan and includes an identification of best management practices (BMP) programs and an implementation schedule of these programs. The US EPA allocates 319(h) funds each year to states with approved management plans to implement NPS control projects.[3]

Another important piece of legislation addressing nonpoint source pollution is the Food Security Act, also known as the Farm Bill. This provides for agricultural buffer zones and encourages conservation planning and implementation. In the past, it was common practice to plow fields up to the property lines and stream banks, which resulted in the decrease or elimination of critical buffer areas that functioned to intercept pollutant-laden storm runoff. The Food Security Act contains provisions that substantially reduce the amount of agricultural pollution by leaving some of the most sensitive lands fallow and encouraging conservation tillage and planning.[3]

The Surface Mining Control and Reclamation Act of 1977 addresses NPS pollution resulting from mining activities. The Act also provides for the issuance of permits to coal mining operations under Section 515. The permits must contain certain general performance standards, including a requirement to "minimize the disturbances to the prevailing hydrologic balance at the mine site and in associated off-site areas, and to the quality and quantity of water in surface and ground water systems both during and after surface coal mining operations."[4] Title IV of the Act created the Abandoned Mine Reclamation Fund, from which moneys may be used for the reclamation and restoration of land and water resources adversely affected by past coal mining.

Other pieces of federal regulation either directly or indirectly addressing nonpoint source pollution include the Safe Drinking Water Act and the Federal Insecticide, Fungicide and

Rodenticide Act. The Safe Drinking Water Act sets drinking water regulations and maximum contaminant levels for microbiological, viral, radiological, organic and inorganic contaminants, which may be found in surface waters as a result of point and nonpoint sources of pollution.[5] The registration of pesticides is regulated under the Federal Insecticide, Fungicide and Rodenticide Act. Under this Act, the US EPA will register a pesticide if it "performs its intended function without unreasonable adverse effects on the environment."[5] The sale or use of a pesticide may be halted by the US EPA if, even when used properly, its use causes such adverse effects.

2.3 Nonpoint Source Pollutants

There are numerous types of pollutants associated with NPS impacts. These include, but are not limited to: siltation, nutrients, pathogens, metals, pesticides, organic enrichment, flow and habitat alteration, and acidity. According to the US EPA's 1992 Report to Congress on Section 319 of the Clean Water Act, siltation is the leading NPS pollutant impacting use support in rivers, based on the 33 states reporting the causes of NPS impacts.[6] Of the NPS pollutants impacting the nations rivers, siltation was designated as the major cause 38 percent of the time, followed by nutrients (16 percent), pathogens (9 percent), pesticides (7 percent) and metals (7 percent).[6]

Although siltation and nutrients have not historically been a concern on the Ohio River, the impacts of both of these pollutants will be explored in the implementation of the strategy. Waterborne pathogens have been more of a concern on the Ohio River, particularly because of the large number of people that use the River for both drinking water and recreation. Two organisms in particular, *Cryptosporidium* and *Giardia*, have received a great deal of attention due to their effects on human health. The most recent evidence of this was the 1993 outbreak of crypto-sporidiosis in Milwaukee, in which 403,000 people were affected, including over 40 deaths and 4,400 hospitalized.[7]

Pesticides are a major nonpoint source pollutant of concern in both agricultural and urban areas. Runoff from urban areas may contain significant amounts of pesticides as a result of chemical application to residential lawns and gardens. Nonpoint source pollutants associated with agricultural activities include pre-emergent herbicides such as atrazine, alachlor, metachlor and cyanazine, which are widely used in the production of corn, soybean, sorghum and wheat. These crops are produced heavily in the lower half of the Ohio River basin, with atrazine being the most commonly used pesticide.[8] ORSANCO recently completed an initial investigation during Spring 1994 to characterize atrazine in the lower Ohio River and certain tributaries. The findings of this study showed that atrazine concentrations increased consistently in a downstream direction, although remaining below the drinking water maximum contaminant level (MCL) of 3 ug/L.[8] On the day they were sampled, 11 out of 65 tributaries exhibited atrazine concentrations above the allowable MCL. It should be stressed that this study was based on one round of samples, and additional work must be done to determine if atrazine concentrations in the Ohio River are a problem.

Metals as a NPS pollutant are also of concern along the Ohio River. ORSANCO operates a number of monitoring programs on the River, including the Bimonthly Sampling program. Samples are taken from 29 stations located along the main stem once every two months. The samples are analyzed for 24 water quality parameters, including 15 metals.

Recently, the upper Ohio River has exhibited warm water aquatic life use impairments due to elevated copper concentrations. Runoff-related NPS sources were identified as causing use impairments due to zinc in the Cincinnati area, and copper downstream of Louisville. Lead, zinc and copper levels in the lower river have caused aquatic life use impairments in the Paducah area.[9]

2.4 Land Use Activities Associated With NPS Pollution

As with NPS pollutants, there are also a wide variety of land use activities from which NPS pollutants originate. These include agriculture, resource extraction, hydrologic and habitat modification, urban runoff, land disposal, silviculture and construction, among others. According to the US EPA's 1992 Report to Congress on Section 319 of the Clean Water Act, agriculture is the largest source of NPS impacts to rivers nationwide.[6] Non-irrigated crop production and livestock (including feedlots, animal holding/management areas and pasture lands), are the top two agricultural subcategories, accounting for 36 percent and 32 percent of agricultural NPS pollution, respectively.[6] The State of Ohio, which has 72 percent of its land area located in the basin, has the greatest amount of river problems associated with animal holding and management areas.[6] The most miles of rivers and streams affected by pasture land is claimed by Illinois, of which 20 percent is located in the basin.[6] Pollutants of concern associated with agricultural activities include sedimentation/siltation, nutrients, pathogens and pesticides.

The second largest source of NPS impacts to the nation's rivers and streams, according to US EPA is resource extraction.[6] This source includes surface and subsurface mining as well as petroleum activities and brine disposal. The most common pollutants from mining activities are sediments, metals and acidity. Abandoned mines, which include underground or surface mines abandoned illegally or before mining regulations took effect, generally contribute the most severe problems to receiving streams in the way of increased acidity and metal concentrations. Acid mine drainage from abandoned coal mines may result from diffuse, nonpoint sources as well as point source discharges. Although a relatively small percentage of the land in the Ohio River basin is used for mining, environmental impacts from mining operations on water quality can be devastating. US EPA reports that resource extraction activities in five states account for half the total impacts resulting from these activities to rivers and streams nationwide, three of which are located in the Ohio River basin.[6]

Urban runoff is a particular nonpoint source of interest along the Ohio River, as several major urban areas are located along either side of the River, including the major metropolitan areas of Pittsburgh, PA, Cincinnati, OH, and Louisville, KY. Urban runoff resulting from rainfall and snow melt becomes contaminated while moving over the land, picking up residue and sediment from parking lots, sidewalks, gutters, streets and construction sites. Contaminated runoff can also result when pollutants in the air from vehicles, factories, utilities and homes mix with precipitation. The large amount of impervious areas in urbanized areas decreases the rate of infiltration and in turn causes an increase in both runoff rate and volume, resulting in a quicker transport of a greater volume of pollutants to the receiving waters. This may result in the degradation of both the immediate and downstream portions of the receiving stream. Pollutants associated with urban runoff include sediments and suspended solids, BOD, nutrients, bacteria, metals and organic compounds.

Other sources of NPS impacts are hydrologic and habitat modification, runoff from facilities sited along waterways, and land disposal. Hydrologic and habitat modifications account for six percent of the total impacts to the country's rivers and streams.[6] Land disposal, which includes the sub-categories of septic tanks, sanitary landfills, hazardous waste disposal and sludge application, is a source of concern in the Ohio River Basin. In 1992, the State of Ohio reported the greatest number of river miles affected by land disposal in the country[6]. Additional sources of NPS pollution which will be investigated as part of the Nonpoint Source Pollution Abatement Strategy are silviculture, construction, atmospheric deposition, spills, recreational activities and natural sources.

3.0 NONPOINT POLLUTION ABATEMENT STRATEGY

3.1 Determination of Nonpoint Source Impacts on the Ohio River

The first goal of the NPS Pollution Abatement Strategy for the Ohio River is to determine the degree of water quality impairment of the river resulting from nonpoint sources of pollution, if in fact any water quality impairment does exist. Impairment of the main stem of the Ohio River will be defined as exceedences of the Water Quality Criteria as stated in the Commission's Pollution Control Standards (see Attachment A). A second goal of the strategy is to achieve a coordinated approach among efforts to abate nonpoint source pollution valley-wide, if a problem is shown to exist, in order to meet water quality standards on the Ohio River. A flow chart depicting general implementation steps of the strategy may be seen in Attachment B.

Efforts will be focused on determining impacts on the main stem of the Ohio River rather than its tributaries. If it is found that pollutant loadings from a specific tributary are impacting the water quality of the Ohio River, this information and the recommended load reductions will be provided to the appropriate state agency, and that state will further investigate the nonpoint source problem of the tributary in question. The first objective that must be met in achieving the above goals is to determine whether or not NPS pollutants are negatively impacting the Ohio River, and if so, determine what the pollutants of concern are and to what degree they are impacting the River.

3.1.1. Compilation of Available Information to Determine NPS Impacts

The first step in determining the degree to which NPS pollutants impact the main stem of the Ohio River must be the review and compilation of existing information and data. Pollutant loadings from tributaries will also be examined. Through the investigation and compilation of this data, an indication will be given on where efforts should be focused and on what additional monitoring needs to be done. Data are available through past studies conducted by several federal, state and municipal organizations, as well as private organizations (consulting firms, universities, etc..) throughout the basin. Examples include, but are not limited to, state nonpoint source assessments, state 305(b) water quality reports, USGS NAWQA studies, and best management practice (BMP) demonstration projects. Information is also available through NPS impact assessments conducted by universities and professional organizations (such as the Water Environment Federation and the American Water Resources Association, among many others), watershed projects involving the Natural Resources Conservation Service (formerly the Soil Conservation Service), as well as studies conducted outside the basin, such as those conducted on Puget Sound and the Chesapeake Bay.

As the information becomes available, it will be necessary to analyze this information in order to determine if NPS pollution problems do or do not exist on the Ohio River; or, if existing data is inadequate to substantiate a problem, to identify where holes exist in the data and determine the scope of effort necessary to fill the information gaps.

Once a significant amount of information has been collected, ORSANCO will generate a report summarizing the NPS impacts (or lack thereof) on the main stem of the Ohio River. Since the effort to compile data on Ohio River NPS impacts must be an ongoing one, this

report will be a living document, subject to revisions as more information is gathered. As results from past studies are assimilated, new studies undoubtedly will be underway or just beginning. In order to determine the NPS impacts on the River, as well as the effects abatement programs have on the impacts, it is essential that NPS-related information continue to be collected and documented over time.

A flow chart illustrating major implementation steps associated with this component of the strategy is included as Attachment C. It is estimated that it will take 11 months to complete this project. Status reports will be provided to the NPS Task Force at regular intervals. A schedule with approximate completion dates is outlined below. Milestones for subsequent elements of the strategy will be developed following completion of this component.

1. Compilation of available information	Six months after project initiation
2. Analysis of information	Eight months after project initiation
3. Generation of draft report	Ten months after project initiation
4. Completion of final report	Twelve months after project initiation

3.1.2. Development of a Nonpoint Source Pollution Monitoring Strategy

If in fact the current information available on NPS impacts on the River needs to be supplemented, which is highly probable, the next task to be completed is development of a monitoring strategy to determine the impacts of NPS pollutants on the Ohio River. The focus of the monitoring strategy to be developed will be dependent upon information gathered during the data compilation phase. Based on the information available, it will be determined what additional information is needed to accurately identify water quality conditions, and how to best go about collecting this information. Sources of funding to conduct the studies deemed to be necessary will continuously be investigated by ORSANCO staff.

It may be the case that more than one monitoring strategy is required, depending on the pollutant of concern. For example, the monitoring program developed to track the impacts of urban runoff may be significantly different than one developed to assess impacts of acid mine drainage. In any case, ORSANCO will work in conjunction with federal and state agencies, local organizations, and experts in the appropriate fields to develop each strategy. Once developed, the draft monitoring strategy will be made available for comment to all interested parties.

Results from one study or a group of studies may indicate that a particular pollutant is or is not a problem on the River, or that additional monitoring needs to be done. Results may even indicate potential problems other than the one being investigated. In any case, monitoring activities, as well as the monitoring strategy, will probably need to be adjusted as the results from previous studies are assimilated. As revisions become necessary, ORSANCO again will seek input from outside interests.

3.1.3. Guidance for Consistent Monitoring and Reporting Approaches

Since the Ohio River passes through or borders six states and drains approximately five percent of the contiguous United States, including parts of 14 different states, it is essential that monitoring and reporting of NPS pollution information be conducted in a similar matter by all agencies and organizations. In doing so, accurate accounts of the

NPS problems facing the Ohio River can be given and problems that do exist can be addressed in a more efficient and timely manner.

Given the number of local, state and federal agencies and private organizations involved in monitoring effects of NPS pollution, it is expected that the degree to which methods and results of different monitoring programs varies widely. One of the tasks involved in determining impacts of NPS pollutants is to develop a consistent approach for monitoring and reporting NPS pollutant impacts among the Ohio River basin states. Inconsistent approaches or problems in monitoring and reporting will be identified and defined throughout the compilation of information effort and guidance document on consistent monitoring and reporting methods will be collectively developed by ORSANCO, federal and state agencies, private organizations and any other group which may be affected.

3.2 Assessment of NPS Pollutant Origins

If results from the compilation of existing NPS information and monitoring efforts indicate that there are NPS impacts on the main stem of the Ohio River, the next step will be to determine the origin of NPS pollutants of concern. Pollutant origins to be investigated include, but are not limited to, agricultural activities, atmospheric deposition, construction, hydrologic and habitat modifications, land disposal, resource extraction, silviculture and urban runoff. Efforts will be made to determine the loadings from tributaries to the Ohio River, which will be treated as point sources to the main stem. The tasks to be undertaken in order to complete this objective will be similar to those taken to determine what impacts exist, if any, on the Ohio River. The first step will be to review information that already exists, such as state NPS assessments and management plans, 305(b) reports and existing NPS pollution abatement projects, to name a few. ORSANCO has already begun a project which would result in the compilation of a comprehensive land use database for the Ohio River Basin. As part of this project, ORSANCO will work toward compiling geographical data for: soil types, pesticide use data, feedlots, abandoned mines and acid mine drainage, urban boundaries, routine water quality monitoring stations and locations of precipitation gaging stations. Compiling and reporting NPS origin data will be on ongoing project, much like the effort in compiling information on impacts.

It is suspected that methodologies in reporting the origins of NPS pollutants vary widely from state to state and agency to agency. In order to more accurately and efficiently address NPS impacts, the federal, state and local agencies, ORSANCO and private organizations within the basin must work together toward developing guidance for consistent monitoring and reporting methods. As information relating to the origin of NPS pollutants is compiled, ORSANCO staff will work in conjunction with government agencies and the private sector to identify and define areas of inconsistent reporting, and in the development of a guidance document which recommends more consistent approaches for monitoring and reporting.

Once a sufficient amount of data is compiled, it will be necessary to identify holes or gaps in the data and determine the scope of effort necessary to obtain the lacking information. Efforts to collect data will continue until known NPS impacts can be traced to the origin or origins of the pollutant or pollutants in question. Any NPS impacts and sources of impacts found on the Ohio River will be summarized in reports generated by

ORSANCO and displayed using the Commission's Geographic Information Systems (GIS) capabilities. A flow chart illustrating major implementation steps associated with this component of the strategy is included as Attachment D.

It must be stressed that efforts to identify both NPS impacts and their origins will be undertaken simultaneously. Primary focus will first be on identifying reaches of the Ohio River main stem that are negatively impacted by nonpoint sources of pollution. Once an impact is found, if indeed any impacts are found, efforts will be undertaken to determine the source of that impact. At the same time, efforts toward identifying other NPS-impacted areas will continue.

As mentioned previously, it is unknown at this time if there are reaches of the Ohio River that are negatively impacted by NPS pollutants. It is conceivable that, after compiling existing NPS information and conducting instream monitoring, no NPS impacts will be found. If this is the case, the focus must be placed on maintaining the existing level of NPS control. It would be beneficial at this point to step back and evaluate the existing assessment and management programs that effect the Ohio River. While many of the programs may be essential for maintaining the existing level of controls, it may be determined that some programs are no longer necessary. Regardless, it will be important to maintain benchmark monitoring stations so any NPS problems that might originate could be quickly identified and addressed.

3.3 Nonpoint Source Pollution Abatement

If impacts from NPS pollutants are shown to exist on the main stem of the Ohio River, the next objective will be defining goals and actions needed to reduce or eliminate nonpoint sources of pollution through local, state and federal programs. Once the pollutant(s) and degree(s) of impact are known, ORSANCO will recommend the loading reductions necessary to achieve Ohio River water quality objectives. Based on these recommendations, appropriate state agencies, together with other agencies and organizations, will develop alternative approaches and select a final plan (or plans) to attain desired loading reductions. Monitoring to characterize impacts must be included in the final abatement plan in order to track its effectiveness. It is important that all affected parties be involved in developing alternative approaches and selecting a final abatement plan, including ORSANCO, appropriate local, state and federal agencies, private organizations and the general public. However, responsibility of selecting a final abatement program should rest in the hands of the states and should be addressed within the states' NPS pollution abatement programs.

As results from NPS abatement programs become available, it will be necessary to reassess the programs as well as this NPS Pollution Control Strategy itself. At this point in time, it is impossible to accurately predict what the results of NPS monitoring efforts and management/ abatement programs will be. It is very likely that unexpected situations will occur; therefore, focal points will need to be shifted at times, and existing programs and strategies will most likely need to be reevaluated and fine-tuned.

3.4 Establishing Long-term Monitoring to Document Progress

An important objective of the strategy is to continue monitoring impacts of NPS pollution on the Ohio River in order to determine the effectiveness of control measures and

abatement programs, as well as to identify any future problems that may arise. This will primarily be accomplished through establishment of permanent benchmark monitoring stations at strategic locations along the River. In addition, ORSANCO will provide recommendations to appropriate state agencies for establishment of long-term monitoring stations on the most severely impacted tributaries. Funding for future monitoring projects will continue to be sought as the need for these projects arises.

4.0 PUBLIC PARTICIPATION

The third goal of the strategy is to involve the public, whether specific individuals, businesses or other organizations, to the greatest extent possible, in the NPS abatement decision-making process. This will be achieved by accepting public comment as each discrete component of the strategy is being developed or implemented, and by publicizing results and information after each component has been completed. Public involvement is critical to the success of the strategy. Lack of public support can make implementation of the strategy difficult, either through public resistance to specific actions needed to implement the plan, or through a general lack of awareness concerning NPS issues. In other words, if the public is not adequately informed about the threat of NPS pollution, they will be apathetic to the entire issue, or worse, resist efforts to address the problem.

Public involvement is also necessary in that success of a NPS pollution abatement program often depends upon the public changing or modifying behavior and land use practices to reduce water pollution. Because NPS pollution arises largely from human-centered land uses, often privately owned land, it is imperative that any controls implemented have public support. Sensitive political land issues are more likely to be addressed successfully when people are given good information about the risks NPS pollution pose to their health and the environment.

The public involvement component of the strategy will be in effect throughout implementation of the strategy. To date, the public is already represented on the NPS Pollution Abatement Task Force through ORSANCO's Public Interest Advisory Committee (PIACO). Continued public involvement will be accomplished in the following ways:

Continued involvement of PIACO: As PIACO is represented on the NPS Pollution Abatement Task Force, this group will continue to play an important role in development of projects and studies, and in disseminating information to the general public.

Create a companion document to the strategy geared toward the general public: This document would contain general concepts of the NPS Pollution Abatement Strategy and be designed in such a way to capture the interest of the general public. The document would follow the recommendations made by the Assessment and Reporting Task Group (ARTG) of the Intergovernmental Task Force on Water Quality Monitoring (ITFM). This task force was created to develop a plan to achieve effective collection, interpretation, and presentation of water quality data and to improve availability of information for decision making at all levels of government.[10]

NPS Pollution Abatement Strategy as a "living document:" As information is collected and projects are completed, knowledge of the degree of NPS impacts on the Ohio River will increase. As more is learned, the direction needed to be taken may change; therefore, it is important to re-evaluate the strategy periodically. Information collected by ORSANCO will be publicized so that an informed public may provide input on revising the strategy.

Publicize each component of the strategy: As ORSANCO begins to implement different components of the strategy, the nature of each component will be publicized. Public notification can be accomplished through such means as state agency newsletters, newspaper articles and television and radio news segments. The public can get involved with management and abatement issues through participation in PIACO or through cooperative management products with government agencies or private sector parties.

Distribute information/results to general public: ORSANCO will produce reports geared to the public following completion of each component of the study. This will enable the public to make informed decisions in matters relating to NPS pollution, and may serve to illustrate that people's actions can effect water quality.

Participate in regional public workshops: ORSANCO will endeavor to participate in regional public workshops addressing nonpoint source pollution. This will provide a good opportunity for ORSANCO to present information collected on the Ohio River main stem to the organizations sponsoring the workshops as well as those in attendance.

5.0 SUMMARY

Although little work has been done to determine the impacts of NPS pollution on the Ohio River, the possibility of NPS pollutants adversely affecting river water quality is certainly present. In January 1993, ORSANCO created the Nonpoint Source Pollution Task Force to address this concern. The task force is made up of representatives from ORSANCO, US EPA, US Geological Survey, the Office of Surface Mining, state environmental protection agencies, agricultural agencies, storm water management utilities, and ORSANCO's Public Interest Advisory Committee. As a result of a cooperative effort from many different interests, the task force was able to create this strategy to abate any nonpoint source pollutants which may be impacting the main stem of the Ohio River.

The first two goals of the strategy are to determine the degree to which NPS pollutants adversely affect the water quality of the Ohio River, and to achieve a coordinated approach among efforts to abate NPS pollution valley-wide, if a problem is shown to exist. Initial efforts will focus on documenting water quality impacts which may be related to NPS pollutants. Once an impact has been demonstrated, efforts will be made t locate the source or sources of the pollutant of concern. Based on the type and origin of the NPS pollutant, and the degree to which the river is impacted, ORSANCO will recom mend reductions in pollutant loadings necessary to meet water quality criteria to the states. In general, abatement plans will be implemented through the states' existing NPS programs. Long term monitoring stations will be established by ORSANCO in order to document any improvements in water quality resulting from the pollutant load reductions.

Throughout the implementation of the strategy, ORSANCO will make every attempt to involve the public in the NPS abatement decision making process. It is only through the cooperation of all affected parties, such as local, state and federal government agencies, private businesses and the general public, that the issue of nonpoint source pollution on the Ohio River can be successfully addressed.

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4. US Department of the Interior, Office of Surface Mining, *Surface Mining Control and Reclamation Act of 1977: Public Law 95-87*, 1993.

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6. US EPA, Office of Water, *Managing Nonpoint Source Pollution: Final Report to Congress on Section 319 of the Clean Water Act (1989)*, EPA-506/9/90, January 1992.

7. "City faces 1,419 claims for illness." *The Milwaukee Journal*, March 20, 1994.

8. Ohio River Valley Water Sanitation Commission, *Atrazine Survey of the Lower Ohio River and Selected Tributaries: An Investigation of Sources of Atrazine to the Ohio River* (Draft), November, 1994.

9. Ohio River Valley Water Sanitation Commission, *Assessment of Water Quality Conditions: Ohio River 1992-1993*, July 1994.

10. Intergovernmental Task Force on Monitoring Water Quality, *Ambient Water-Quality Monitoring in the United States: First Year Review, Evaluation, and Recommendations*, December 1992.

ATTACHMENT A

ORSANCO POLLUTION CONTROL STANDARDS - DESIGNATED USES AND WATER QUALITY CRITERIA

SECTION III. DESIGNATED USES

The Ohio River, as hereinbefore, defined, has been designated by the Compact as available for safe and satisfactory use as public and industrial water supplies after reasonable treatment, suitable for recreational usage, capable of maintaining fish and other aquatic life and adaptable to such other uses as may be legitimate. It is for the purpose of these Pollution Control Standards to safeguard the waters of the Ohio River for these designated uses. No degradation of the water quality of the Ohio River which would interfere with, or become injurious to, these uses shall be permitted.

SECTION IV. WATER QUALITY CRITERIA

A. General

The minimum conditions which the wastewater discharge requirements (Section V) are intended to achieve in the receiving waters outside the mixing zone are as follows:

1. Freedom from anything that will settle to form objectionable sludge deposits which interfere with designated water uses.

2. Freedom from floating debris, scum, oil and other floating material in amounts sufficient to be unsightly or deleterious.

3. Freedom from materials producing color or odors to such a degree as to create unaesthetic conditions or a nuisance.

4. Freedom from substances in concentrations which are toxic or harmful to humans, animals, or fish and other aquatic life; which would in any manner adversely affect the flavor, color, odor, or edibility of fish and other aquatic life, wildlife, or livestock; or which are otherwise detrimental to the designated uses specified in Section III.

B. Aquatic Life Protection

To provide protection of warm water aquatic life habitats, the following criteria shall be met outside the mixing zone:

1. BIOLOGICAL: The biological integrity of the Ohio River shall be protected and preserved.

2. DISSOLVED OXYGEN: Concentrations shall average at least 5.0 mg/L per calendar day and shall not be less than 4.0 mg/L at any time provided that a minimum of 5.0 mg/L at any time is maintained during the April 15 - June 15 spawning season.

3. TEMPERATURE: Allowable stream temperatures are:

Month/Date	***Period Average***		***Instantaneous Maximum***	
January 1-31	45°F	7.2°C	50°F	0.0°C
February 1-29	45	7.2	50	10.0
March 1-15	51	10.6	56	13.3
March 16-31	54	12.2	59	15.0
April 1-15	58	14.4	64	17.8
April 16-30	64	17.8	69	20.6
May 1-15	68	20.0	73	22.8
May 16-30	75	23.9	80	26.7
June 1-15	80	26.7	85	29.4
June 16-30	83	28.3	87	30.6
July 1-31	84	28.9	89	31.7
August 1-31	84	28.9	89	31.7
September 1-15	84	28.9	87	30.6
September 16-30	82	27.8	86	30.0
October 1-15	77	25.0	82	27.8
October 16-31	72	22.2	77	25.0
November 1-30	67	19.4	72	22.2
December 1-31	52	11.1	57	13.9

4. pH: No value below 6.0 nor above 9.0.

5. AMMONIA: The concentration of un-ionized ammonia as (NH_3) shall not exceed 0.05 mg/L; un-ionized ammonia shall be determined from values for total ammonia (as nitrogen), pH and temperature, by means of the following equation:

$$Y = \frac{1.2\ (\text{Total ammonia-N})}{[1 + 10^{(pk_a - pH)}]}$$

$$pk_a = 0.0902 + \frac{2730}{(273.2 + T_c)}$$

Where:

T_c = Temperature, degrees Celsius

Y = Un-ionized ammonia, milligrams per liter

Combinations of values for total ammonia (as nitrogen), pH, and temperature which yield an un-ionized ammonia concentration of 0.05 mg/L are shown in Appendix A.

6. CHEMICAL CONSTITUENTS:

a. Not to exceed the following concentrations:

Concentration Constituent	Chronic Criteria Concentration ug/L	Acute Criteria ug/L
Cadmium	$e^{(.7852[\ln Hard.] - 3.490}$	$e^{(1.128[\ln Hard.] - 3.828)}$
Chromium (hexavalent)	11	16
Copper	$e^{(.8545[\ln Hard.] - 1.465)}$	$e^{(.9422[\ln Hard.] - 1.464)}$
Cyanide (free)	5	22
Lead	$e^{(1.273[\ln Hard.] - 4.705)}$	$e^{(1.273[\ln Hard.] - 1.464)}$
Mercury	.012	2.4
Selenium	5	20
Zinc	$e^{(.8473[\ln Hand.] + .7614)}$	$e^{(.8473[\ln Hard.] - .8604)}$

b. Concentrations for metals are total recoverable (except hexavalent chromium which is dissolved) unless it can be demonstrated to the satisfaction of the Commission and the member states, that a more appropriate analytical technique is available which provides a measurement of that portion of the metal present which causes toxicity to aquatic life.

c. Wastewater discharge requirements for these constituents shall be calculated based on the chronic criteria concentrations, the in-stream concentration above the point of discharge, and the minimum 7-day, 10-year stream flow as contained in Appendix B. The acute criteria concentrations shall not be exceeded in the stream at any time. Criteria for cadmium, copper, lead, and zinc at specified hardness values are listed in Appendix C.

7. OTHER TOXIC SUBSTANCES:

Water quality criteria for substances not otherwise specified in this section shall be derived based on the following:

b. For the Protection of Aquatic Life:

i. Non-Persistent Substances - not to exceed an average of one-twentieth (0.05), nor at any time exceed one-tenth (0.1) of the 96 hour LC_{50} of representative important species indigenous to the Ohio River or standard test organisms.

ii. Persistent Substances - not to exceed an average of one one-hundredth (0.01), nor at any time exceed one-twentieth (0.05) of the 96 hour LC_{50} of representative important species indigenous to the Ohio River or standard test organisms.

b. Limiting concentrations other than those derived from the above may be used for the protection of aquatic life when justified on the basis of scientifically defensible evidence.

C. Human Health Protection

To provide protection to human health, the following criteria shall be met outside the mixing zone:

1. BACTERIA:

a. Maximum allowable level of fecal coliform bacteria for use as a source of public water supply -- For the months of November through April, content shall not exceed 2,000/100 mL as a monthly geometric mean based on not less than five samples per month.

b. Maximum allowable level of fecal coliform bacteria for contact recreation -- For the months of May through October, content shall not exceed 200/100 mL as a monthly geometric mean based on not less than five samples per month; nor exceed 400/100 mL in more than ten percent of all samples taken during the month.

c. Maximum allowable level of *Escherichia coli* bacteria for contact recreation -- For the months of May through October, measurements of *Escherichia coli* bacteria may be substituted for fecal coliform. Content shall not exceed 130/100 mL as a monthly geometric mean, based on not less than five samples per month, nor exceed 240/100 mL in any sample.

2. CHEMICAL CONSTITUENTS:

Not to exceed the following concentrations:

Constituents	**Concentration mg/L**
Arsenic	.05
Barium	1.0
Chloride	250
Fluoride	1.0
Nitrite + Nitrate Nitrogen	10.0
Nitrite Nitrogen	1.0
Phenolics	.005
Silver	.05
Sulfate	250

3. RADIONUCLIDES: Gross total alpha activity (including radium-226 but excluding radon and uranium) shall not exceed 15 picocuries per liter (pCi/L) and combined radium-226 and radium-228 shall not exceed 4 pCi/L. Concentration of total gross beta particle activity shall not exceed 50 pCi/L; the concentration of total Strontium-90 shall not exceed 8pCi/L.

4. OTHER TOXIC SUBSTANCES: Water quality criteria for substances not otherwise specified in this section shall be derived based on the following:

   a. For the protection of human health, criteria published by the United States Environmental Protection Agency pursuant to Section 304(a) of the Federal Clean Water Act shall be used.

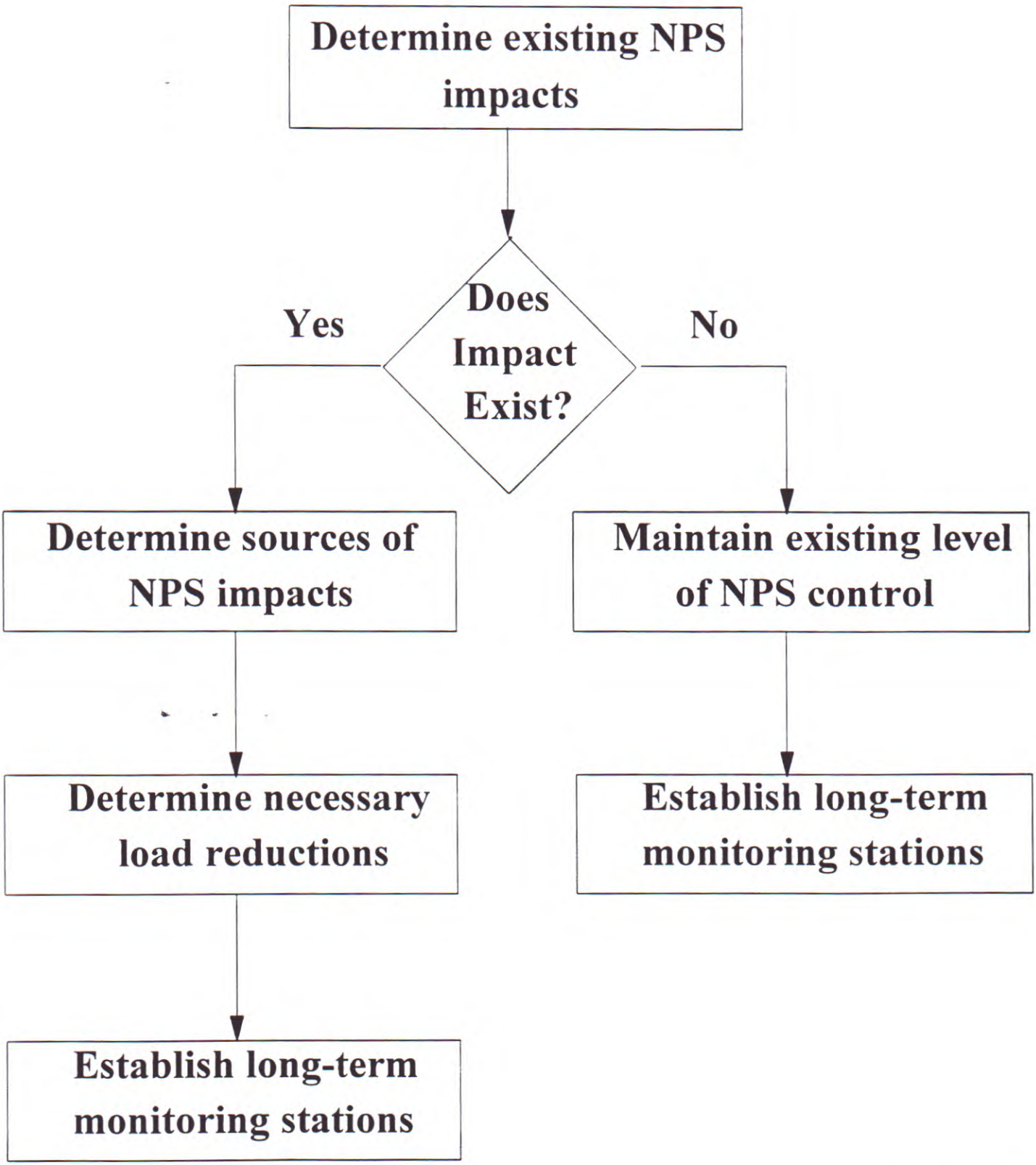
      i. For substances identified as human carcinogens, wastewater discharge requirements shall be developed based on the in-stream concentration above the point of discharge, and calculated so as to prevent one additional cancer per one million population at the harmonic mean stream flow (see Appendix B).

      ii. For substances not identified as human carcinogens, wastewater discharge requirements shall be developed based on the in-stream concentration above the point of discharge and calculated to meet the water quality criteria at the minimum 7-day, 10-year flow (see Appendix B).

   b. Limiting concentrations other than those derived from the above may be used for the protection of human health when justified on the basis of scientifically defensible evidence.

ATTACHMENT B

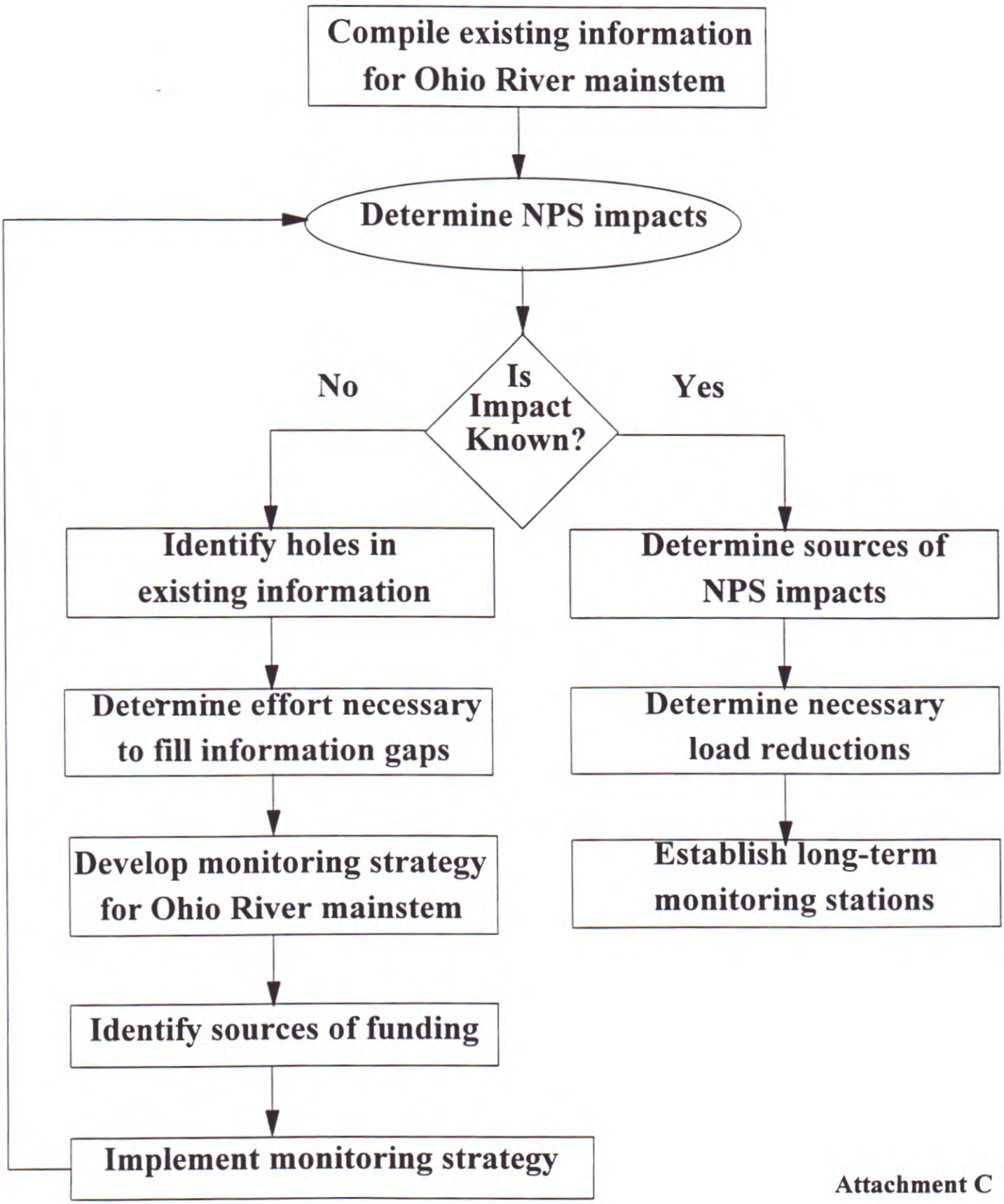
ORSANCO
NPS POLLUTION ABATEMENT STRATEGY



Attachment B

ATTACHMENT C

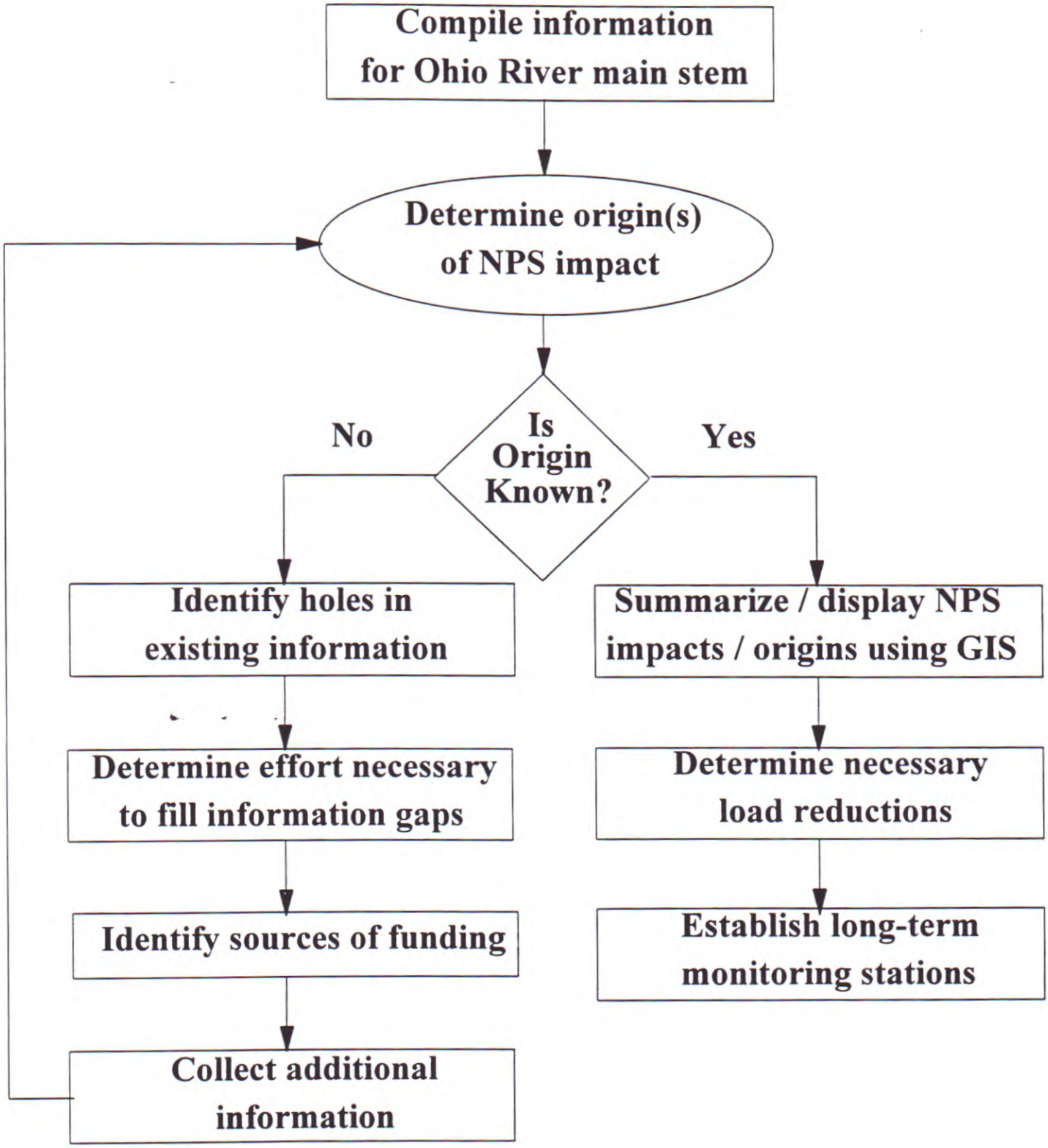
ORSANCO
DETERMINATION OF OHIO RIVER NPS IMPACTS



Attachment C

ATTACHMENT D

ORSANCO
ASSESSMENT OF NPS POLLUTANT ORIGINS



Attachment D