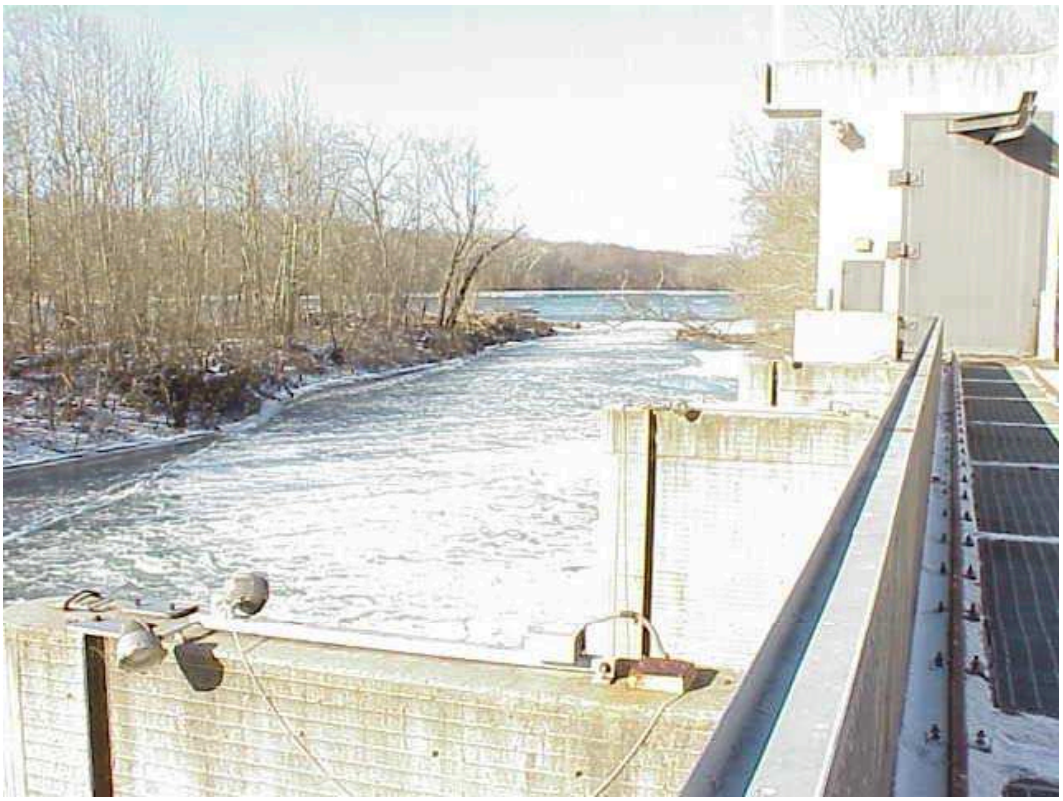
Initiation Report

Washington Suburban Sanitary Commission

Potomac WFP Submerged Channel Intake Feasibility Study
Contract BF2028F97, CIP No. 73.30



Potomac River Ice Event Blocking Existing Shoreline Intake (January 2003)

Prepared by

MWH Americas

February 2004

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I. Introduction

The purpose of the Potomac Water Filtration Plant (WFP) Submerged Channel Intake Feasibility Study is to determine where to locate a submerged offshore raw water intake and to develop and document the related public health, operational, and environmental considerations. Recent studies by the WSSC and the Maryland Department of the Environment (MDE) have determined that a submerged channel intake will reduce risks to public health by improving operation of the Potomac WFP. A submerged offshore intake will provide access to a consistently cleaner, more stable raw water source thereby reducing susceptibility to pathogens such as *cryptosporidium* and *giardia*, decreasing the frequency of rapid raw water quality fluctuations and improving the treatability of the source water.

The WSSC has carried out four major studies since 1979 aimed at improving raw water quality. Three of these identified a submerged offshore intake as a means to this end. WSSC's recent Source Water Assessment (SWA) supervised by the MDE and funded by the U.S. Environmental Protection Agency (USEPA), identified a new submerged channel intake as an alternative that should be given serious consideration because it would allow the Potomac WFP to avoid the significant negative impacts associated with local storms. The submerged intake will maintain, and not increase, the onshore intake capacity, improve raw source water quality, increase Potomac WFP reliability and reduce operating costs.

The existing onshore intake was constructed with the plant expansion in the late 1970s. During local storms, high turbidity, low pH and low alkalinity levels as well as rapid fluctuations in these levels often affect the quality of the raw water and WFP operations. These characteristics increase the raw water's susceptibility to pathogens, requiring frequent and significant changes in plant operations and increasing operational costs.

This study will include the development and evaluation of several intake options. Alternatives will be evaluated for public health benefits, improvements to plant operations, engineering feasibility, environmental considerations, constructibility and economy. Environmental considerations, including coordination with the National Park Service (NPS) in relation to the C&O Canal National Historical Park, will be a key element of all study phases. The study will result in the production of a decision document that describes the feasibility of the alternatives.

This project is expected to be very visible and of high interest to the public, government agencies and interested stakeholders. Accordingly, a comprehensive outreach program will be developed through the WSSC Office of Communications to coordinate the distribution of information regarding project progress and provide opportunities for review and comment. The WSSC will utilize a Policy Review Group (PRG) to maintain communications with stakeholders and to review the various aspects of the study.

The study will be completed by May 2005. The first several phases of the study will be to develop technical requirements, define environmental issues and generate several intake options. The subsequent months will be used to develop the recommended

alternative and complete the environmental assessment.

This Initiation Report summarizes the issues relevant to evaluating where a new intake should be located including the following:

- Public Health
- Plant Operation and Planning Issues
- Permitting
- Alternative Development
- Environmental Assessment based on National Environmental Policy Act (NEPA) Guidelines
- Public Outreach Program.

II. Public Health

Improving the raw water quality is the most effective way for WSSC to reliably provide the highest quality product at the Potomac WFP. Obtaining the highest quality raw water provides an important first barrier to the transmission of *cryptosporidium*, *giardia* and other pathogens and contaminants. The American Water Works Association states the following:

> "The purpose of an intake system is to furnish, under all conditions, an adequate supply of water of the best quality available. An intake system must, therefore, possess a high degree of reliability."[1]

The 1996 Safe Drinking Water Act Amendments required states to conduct SWAs for each drinking water intake. The Potomac River SWA confirmed that the WSSC should give serious consideration to a new intake. The MDE and the WSSC retained a team headed by the firm of Becker & O'Melia, LLC to conduct the Potomac River intake SWA. The reference water quality standards for that study were the Maximum Contaminant Levels (MCLs) developed by the USEPA. The report notes that " . . .WSSC finished water has always met these limits and other applicable water quality standards" and that WSSC has undertaken efforts to improve its Potomac River raw water quality over a long period of time.

The SWA is characterized as " . . . an additional, proactive, and conservative effort toward achieving higher quality drinking water and creating an additional barrier against contaminants which are or may be present in the raw water." It is a comprehensive evaluation of the Potomac River watershed and includes a number of findings and recommendations relative to providing high quality drinking water. In addressing the raw water quality, the SWA reached the following conclusion:

> "Watts Branch causes sudden negative changes in raw water quality and

[1] American Water Works Association, American Society of Civil Engineers, 1990, *Water Treatment Plant Design,* Second Edition, McGraw-Hill.

> treatability at the Potomac WFP intake. Negative changes are characterized by sudden and extreme increases in suspended solids, fecal coliforms, as well as decreases in pH and alkalinity. The rapid changes in water quality make it challenging for the plant operational staff to accurately adjust coagulant dosage and pH to achieve optimum particle removal. These impacts are out of proportion with the upper watershed impacts relative to watershed size. A submerged channel intake (at a mid-channel location) would allow the Potomac WFP to effectively avoid these impacts."

The SWA recommended: "Serious consideration should be given to an upgraded intake structure with flexibility to withdraw water from a submerged mid-channel location."

The SWA conclusions with regard to the submerged channel intake were based on sampling and modeling studies. This data demonstrates that the raw water offshore is consistently of higher quality than the near shore area proximate to the onshore intake during local storms. Both offshore and near shore water quality are adversely affected by storm events in the larger Potomac River watershed. It follows that the offshore intake will provide higher quality water during local storm events and that both the onshore and offshore intakes will provide similar quality water during storm events over the larger basin. Additionally, the rapidity and magnitude of raw water quality changes is much greater at the onshore intake location than the offshore location. For example, basin-wide storm events may result in turbidities in the 20 to 100 NTU[2] range, whereas localized storm events may result in turbidities in the hundreds to thousands of NTU range.

Inconsistent, rapid and wide variations in levels of turbidity, solids, pH, alkalinity, nutrients and other contaminants can potentially cause a public health issue since the plant's unit processes must react in a timely manner to maintain a high quality product. The Potomac WFP is designed to provide adequate sedimentation and filtration accompanied with automatic chemical feed adjustment, but the fluctuating levels do cause major challenges at the plant. More consistent raw water would allow the Potomac WFP to meet stringent finished water quality standards more efficiently.

The offshore intake will be designed to provide a continuous and adequate quantity of treatable raw water. The current onshore intake is affected by periodic blockages caused by floating debris including ice, leaves, limbs and aquatic grasses. Further, there is the potential for petroleum product contamination since five pipelines cross the river upstream and within approximately 1,000 feet of the intake. Either intake can be impacted by debris or by a ruptured pipeline that may render it temporarily inoperable or the raw water untreatable. An offshore intake located at a sufficient distance from the onshore intake improves the supply reliability since the likelihood that both intakes would be affected is significantly lower than the likelihood that either one would be affected. Either intake can be operated while the other is out of service.

[2] NTU is an abbreviation for nephelometric turbidity unit. This is a measure of the light transmissibility of water. Turbidity is affected by suspended and dissolved materials, color and other factors. Turbidity, expressed in NTUs, increases as light transmissibility decreases.

In summary, the offshore, submerged channel intake is expected to improve public health by providing more consistent and higher quality raw water, and by improving reliability thereby reducing the risk of *cryptosporidium, giardia* and other pathogens and contaminants in the finished water.

III. Plant Operations and Planning Issues

This study will address several key planning issues that affect intake location, overall dimensions, economy and operation including the following:

- Assessing the impact on plant operational costs and the costs of facilities in order to comply with future MDE and EPA standards;
- Providing for the current plant capacity without increase;
- Facilitating maintenance of the proposed offshore submerged intake and existing onshore intake; and
- Maintaining plant operations during construction.

Operational Costs

A submerged channel intake will access water that is consistently lower in turbidity and suspended solids, has a higher pH and higher alkalinity. Reduced solids loadings will improve the efficiency of plant operations including reduced hauling and disposal costs, and reduced chemical costs. Plant operations will be improved, as the frequency of rapid changes in raw water quality will be significantly reduced. Capital costs of plant facilities potentially required to meet future EPA and MDE finished water quality standards may also be reduced. This study will review the impacts of intake options on these operational and cost considerations.

Capacity

The capacity of the intake refers to the flow rate that can be conveyed to the two raw water pumping stations. The required capacity affects the dimensions and overall cost of the alternatives. The design capacity will be compatible with plant design and will not increase Potomac River withdrawals. The offshore, submerged channel intake will be a gravity flow facility, similar to the existing onshore intake. The capacity of the existing onshore intake will not be affected by the offshore intake. The achievable flow rate depends on the difference between the river level and the minimum pump wet well level. Intake planning will be based on providing the plant design hydraulic capacity. Conduit and intake dimensions will be provided that achieve the design capacity at conservative values of hydraulic parameters such as pipe roughness.

Maintenance and Accessibility

Periodic maintenance of the offshore, submerged channel intake will involve removal of accumulated debris and sediment. Additionally, during extremely cold periods, operation

of the onshore intake may be advantageous to avoid potential ice restrictions to the offshore intake. Although access to the offshore intake for maintenance will be more difficult than the onshore intake, potentially requiring a boat and divers, the frequency of required maintenance may be reduced. Access at this site may be a concern due to limited opportunities for boat launching and landing. Opportunities for improving accessibility will be discussed with the NPS.

The development of alternatives will include planning for accessibility and maintenance. The inclusion of features such as bulkheads and stop plates to allow dewatering and/or devices to allow cleaning without dewatering will be considered.

Constructibility

Constructibility is a key issue in the submerged channel intake study and involves five key considerations:

- Maintaining plant operations during construction;
- Addressing constraints on access to the river for construction;
- Connecting the offshore submerged intake to the existing facilities;
- Maintaining C&O Canal National Historical Park operations during construction; and
- Addressing potential short-term environmental impacts

Planning for the submerged channel intake will include development of alternative methods of connecting to the existing structures so that operation of the existing intake can be maintained. Access to the river in the area of the intake is limited due to the high banks, the historic C&O Canal and the limited area available on the Potomac WFP site. The developed options will include trenching, tunneling, marine construction methods and combinations of some or all of these techniques. The river's relatively high velocities and irregular river bottom may require consideration of options such as cofferdams. Environmental and permitting issues (discussed in subsequent sections) will also affect the development of alternatives.

A concrete diversion weir was built across the north channel of the Potomac in 1979 to maintain a minimum pool level (El. 159.0) for the onshore intake. The existing diversion weir may provide adequate depth for shallow draft barges, allowing certain marine construction methods to be considered. However, the location of shore access points and boulders that can impact navigability may affect the ability of barge-mounted equipment to excavate trenches and place pipe.

In-river construction requires dewatering if open-cut trenching is used. A number of alternatives have been developed and investigated for other projects including the use of earthfill and rockfill cofferdams and other proprietary methods such as PortaDams™. The PortaDam™ method has been accepted by MDE for other projects and is preferred over earthfill cofferdams. MDE has also accepted the use of rockfill cofferdams constructed from material excavated from the site. In-river monitoring of turbidity during construction

will be required. PortaDams™ have limited height (maximum of 12 ft.) and may be subject to frequent overtopping during construction, a situation that might expose both the WSSC and the contractor to significant risk. Earthfill and rockfill cofferdams would likely be less susceptible to damage during high flows.

Tunneling is an alternative to open-cut trenching methods. This may significantly reduce requirements for construction in the river. Access to the onshore shaft would still be required for construction equipment and for removal of tunnel debris. Disturbance of protected areas could be minimized. Access to the river would be required for construction of the intake terminal structure.

Connecting the new intake to the existing intake pipes is another challenging design issue. Key considerations in the selection of the method of connection will be:

- Maintaining the existing intake in service;
- Providing the required hydraulic capacity for the new intake;
- Maintaining the structural integrity of the existing intake;
- Simplifying construction;
- Providing for independent operation of both intakes so that either can be removed from service while still maintaining plant capacity;
- Providing security against contamination of both intake chambers; and
- Maintaining C&O Canal Park operations.

Two possible methods for connecting the new intake pipeline to the existing intake were previously identified in the Facility Plan[3]. These include connecting directly to the six intake outlet pipelines and constructing a new transition structure at the east end of the existing intake. Other options include connecting the existing facilities at the raw water pumping stations and connecting to the existing intake in a chamber to be located below the existing intake. Measures to maintain operation of the C&O Canal Park during construction will be discussed with the NPS.

IV. Permitting

Applicable Maryland, Federal and local permits and authorizations that will be required to construct and operate the new submerged channel intake will be identified and tracked in a separate document. This report will present a logical progression of the applicable federal requirements, state and local provisions necessary for the project. Appropriate "Points of Contact" will be identified and presented within each regulatory agency as well as an estimate of review turnaround times. An overall permitting schedule and flow chart will be developed. The document will include, as addenda, blank copies of the application documents for the required permits as well as templates for required data (including a data acquisition plan).

[3] O'Brien & Gere Engineers, Inc., *Potomac WFP Facility Plan*, September 2002.

The permits will be divided into two general categories – those that are in place during construction and those regarding the actual operation of the intake. Anticipated permit issues include the following:

- Impacts on river turbidity
- Impacts on aquatic habitat, fisheries and benthic organisms
- Impacts to the C&O Canal National Historical Park
- Noise
- Traffic
- Aesthetics
- Impacts to recreation

Experience in permitting other intakes has shown that river turbidity may receive the most attention since it may have visual as well as environmental impacts on aquatic life during construction. MDE will be involved in discussions of alternate construction methods to minimize potential impacts on the Potomac River. Contractors also have their preferred means and methods for working in water bodies and therefore permitting is typically a dynamic process considering both regulations and constructibility. The final permits for the other issues can be just as dynamic as various alternatives warrant different permit requirements. Mitigation requirements will be included in schedule and cost analyses of the alternatives.

Operations related permits are also likely from aquatic and fishery groups. For example, the U.S. Fish and Wildlife Service (USFWS) has stated a concern about potential entrainment of fish in the intake on other projects and may request consideration of alternative intake screening methods. In another nearby project, the USFWS expressed concern over the American Eel and bivalves. American Eels have been shown to move around in large river systems such as the Potomac River. Adult eels like dark and secluded sites and hence could be entrained in an intake. Young eels returning from the ocean and estuaries can also be entrained by water intakes. Operational parameters may also impact threatened or endangered clams or mussels.

Recreational and aesthetic issues are also expected to be important. Certain in-river construction methods may affect recreational use of the river and the C&O Canal Park. Intake design will consider minimization of impacts to recreational boats. These and any other construction period and operational impacts identified during the project will be addressed. Potential mitigation activities will be developed.

The NPS will be involved in relation to the C&O Canal National Historical Park, on which the onshore intake is located and on which some construction may be required. Permits will be required for special uses such as surveying, borings and construction.

V. Alternative Development

Alternatives will be developed to meet public health goals, operational requirements and to comply with environmental standards. The alternatives will improve plant operations,

generate economic benefits such as reduced hauling, disposal, chemical and capital costs, and decrease the amount of solids generated for disposal. The latter is also a National Pollutant Discharge Elimination System (NPDES) permit benefit.

Each alternative will include three components:

- A new submerged offshore intake;
- A conduit, either trenched or tunneled, between the intake and the vicinity of the existing onshore intake; and
- A connection to the existing facilities whether it is the intake, the pumping stations, or the raw water pipelines.

Alternative construction methods will also be developed and evaluated.

A common set of criteria will be developed and applied to each alternative or combination of alternatives. The criteria will reflect the project objectives and constraints. Typical criteria include:

- Public health objectives
    - Improved raw water quality
    - More consistent raw water quality
    - Improved intake reliability
    - Reduced risk of contamination
- Operational objectives
    - Operational costs
    - Capital costs
    - Life cycle costs
- Environmental objectives
    - Impacts to the environment
    - Impacts to the community
- Constructibility

The criteria will be refined as the study progresses. Quantitative measures will be developed for evaluating performance in meeting public health, operational and constructibility objectives. These will include statistical and economic comparisons of the alternatives demonstrating issues such as the differences in raw water quality, consistency of raw water quality, and operational and capital costs of alternatives. Compliance with environmental issues will be discussed in terms of regulatory requirements and with respect to specific criteria such as avoidance or minimization of impacts. Conformance with environmental requirements is required for permitting and will be discussed in detail in the NEPA Assessment.

Alternatives will be developed in a two-step process. In the first step, a large number of alternatives will be brainstormed and a preliminary evaluation will be made to discard unreasonable or impractical options. A “short list” of three to five alternatives will be

carried into a final evaluation, developed to feasibility level detail and evaluated on a quantitative basis.

VI. Environmental Assessment based on NEPA Guidelines

The C&O Canal National Historical Park will require an Environmental Assessment (EA) be conducted using NEPA guidelines for the alternatives reaching the final evaluation process to consider potential impacts to park resources. The EA will evaluate both the adverse and beneficial, long-term and short-term impacts and the irreversible or irretrievable commitments of resources including those from temporary construction activities. The EA will serve as a tool in the decision making process and will lead either to a Finding of No Significant Impact (FONSI) or to the requirement for an Environmental Impact Statement (EIS).

The EA will be organized to meet the requirements of the NPS and will include the following information:

1. Abstract
2. Table of contents
3. Purpose and need
4. Alternatives including the proposed action
5. Affected environment
6. Impacts (to include mitigation and cumulative impacts)
7. Consultation and coordination
8. References

It is expected that many of the potential impacts will be similar among the alternatives. The discussion of the assessment provided here is intended to enumerate the expected issues. The assessment will address the following areas:

1. Impacts to the environment

    a. Air quality; dust and exhaust emissions from equipment.
    b. Surface water and groundwater quality and uses (drinking and recreational); erosion and sedimentation, impact on residual discharges to the river, and ability of alternatives to meet Federal, State and local water quality regulations.
    c. Environmentally sensitive areas; wildlife habitats, flood plains and wetlands, prime agricultural land, water reservoirs, and forests.
    d. Endangered and threatened species.
    e. Archeological and historical resources, parkland and other recreational areas in accordance with Section 106 of the National Historic Preservation Act.
    f. Residuals handling and disposal from the plant.

2. Impacts to the Community

    a. Noise and aesthetics; tree removal and other disruptions to property.
    b. Socioeconomic: traffic and parking disruption, interference with businesses, safety, and disruption in water supply service.
    c. Public health implications.
    d. Changes in future land use.
    e. Cost to ratepayers.
    f. Recreational usage of the Potomac River.

3. Mitigative Measures - Where adverse impacts are unavoidable, discuss methods, both structural and nonstructural, to mitigate them.

4. Identification of costs for mitigating direct, adverse, physical impacts.

5. Analysis and description of potential recreational and open space opportunities.

6. Identification of institutional issues such as short-term and long-term impacts on the maintenance and accessibility of the C&O Canal and National Park Service lands, and political issues such as opposing viewpoints.

7. Identification of implementation problems.

The development of the EA will be carried out simultaneously with the development and evaluation of alternatives and information obtained in this process will influence the intake planning process. Completion of the EA will be concurrent with the completion of the Feasibility Study document and the resulting document will be submitted for review by the NPS. The EA review process includes opportunity for public review and agency comment and may require up to six months after the submission of the document.

VII. Public Outreach

A public outreach program will be developed and implemented in order to inform and involve the WSSC customers, the community, elected officials, government agencies, environmental groups and other interested stakeholders. The program will be developed by the WSSC Office of Communications with the review of the PRG. The program will include regular meetings with the PRG, as well as meetings with customers, residents, elected officials and other interested stakeholders. Information regarding the meetings will be published in local newspapers, included on the WSSC website and included in mailings. Additional contacts will be made between the WSSC, the consultant and agencies involved in permitting the potential projects.

The PRG will be involved in developing the schedule for meetings. The following organizations will be requested to provide representation.

- Montgomery County
    - Department of Environmental Protection
    - County Council Staff
    - Park and Planning Commission
- Prince George's County
    - Department of Environmental Resources
    - County Council Staff
    - Park and Planning Commission
- National Park Service/C&O Canal Historical Park
- Maryland Department of the Environment

WSSC will provide representatives from the following departments:

- Engineering & Construction
- Production
- Public Communications
- Budget