Application of Pennsylvania-American Water Company for Acquisition of the Wastewater Assets of the Borough of Brentwood

66 Pa. C.S. § 1329
Application Filing Checklist – Water/Wastewater
Docket No. A-2021-3024058

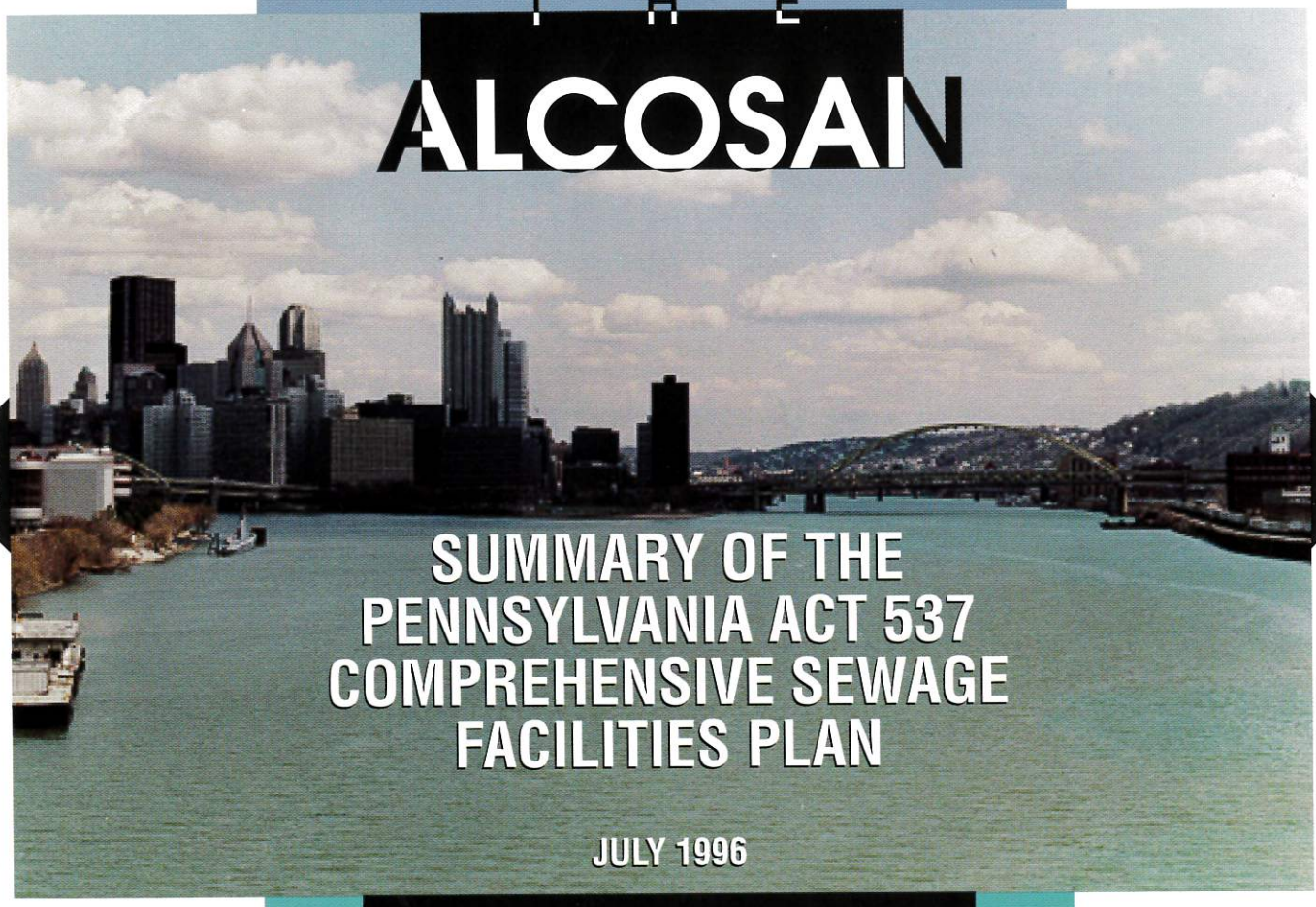
22. Other requirements. Demonstrate compliance with the following:

b. For **wastewater** system acquisitions, provide a copy of the DEP-approved Act 537 Official Sewage Facilities Plans for the affected municipalities.

RESPONSE:

b. Please see **Appendix A-22-b**. Page i. of the Table of Contents is missing in the original and is not provided.

Appendix A-22-b



THE ALCOSAN

SUMMARY OF THE PENNSYLVANIA ACT 537 COMPREHENSIVE SEWAGE FACILITIES PLAN

JULY 1996

CDM CH2MHILL
EPM TEAM
ALCOSAN

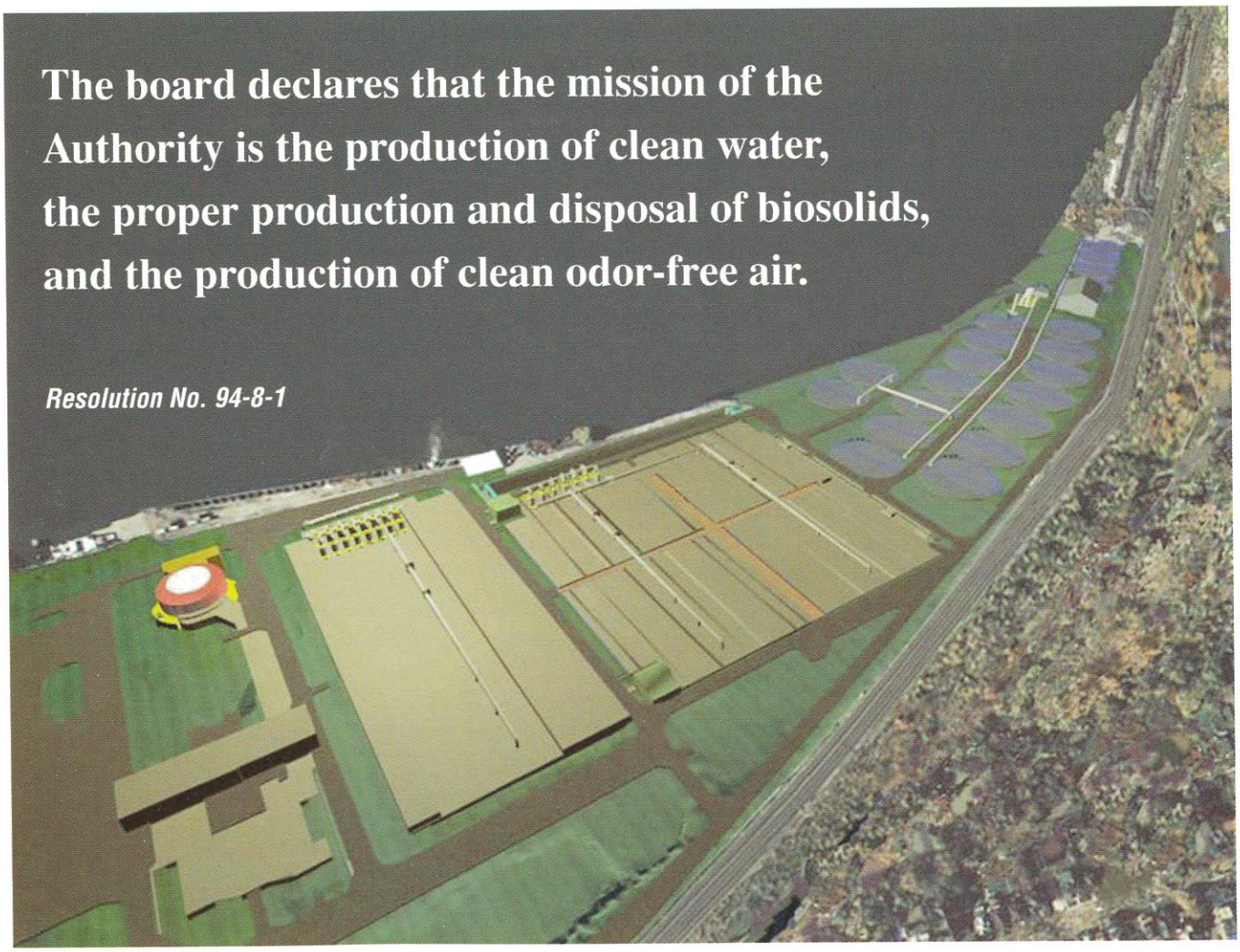
SUMMARY OF PENNSYLVANIA ACT 537 COMPREHENSIVE SEWAGE FACILITIES PLAN

INTRODUCTION

ALCOSAN is at an important crossroads. The Authority's fore-fathers accurately predicted the point at which we stand, near the end of a 27-year period of treating wastewater in the most cost-effective, environmentally beneficial manner available. Today, the Authority has a plan for meeting new requirements and addressing community issues.

Because the changes will dictate how ALCOSAN operates for the next 20 years, you, the public, must understand the many changes planned at ALCOSAN. In addition, your opinions and ideas, which will further develop the successful long-term program, are encouraged.

This booklet will inform you about program goals, projects, cost implications, and most importantly, how you will be affected by the changes.



View of ALCOSAN treatment plant with tanks covered for odor control.

KEY COMPONENTS OF ACT 537

- What construction is planned?
- Why is it needed?
- What alternatives were considered?
- How will the program be funded?
- Plan allows for enough but not too much capacity
- Plan includes a service-area analysis
- Plan will be amended for long-term control of CSOs
- Public input

SUMMARY

The Pennsylvania Department of Environmental Protection (PADEP) requires ALCOSAN to prepare a comprehensive facilities plan in accordance with the requirements of Act 537, enacted in 1966.

The Act 537 Comprehensive Sewage Facilities Plan was developed by the Engineering Program Management (EPM) team with the participation, assistance, and direction of ALCOSAN management, engineering, and operation and maintenance staffs. The plan represents the results of intense technical evaluation and field testing at the treatment plant and in the interceptor sewer network. In addition, the plan is based on the group's assessment of future regulatory requirements and community needs. The Act 537 Plan defines improvements to the treatment plant and sewers into the next century and presents a logical stepwise approach for implementing a long-range master plan. The plan comprises a series of major projects. The plan incorporates projects being designed and constructed including: new Saw Mill Run parallel relief interceptor, odor-control facilities at the treatment plant, and part of the treatment plant capacity expansion.

GOALS AND PRIORITIES

The Act 537 Plan was developed in response to the goals and priorities established by the Board and the Executive Director. The objectives of the plan are to:

- Operate the treatment plant in compliance with the Clean Air Act and its associated regulations without creating nuisance odors in the community.
- Expand the capacity of the wastewater treatment plant to serve growth and redevelopment of the service area.
- Expand the capacity of the primary treatment part of the treatment plant to treat wet-weather flows to reduce untreated overflows to the waterways in compliance with the Clean Water Act and PADEP regulations.
- Implement the Environmental Protection Agency-mandated "nine minimum CSO controls".
- Develop a long-term control plan for overflows from the sewage collection system.
- Construct a Saw Mill Run parallel interceptor to alleviate sewer overflows.
- Cost-effectively use rate payers' funds to meet goals.
- Develop a plan that will serve for the planning period of 20 years (2015).

PROJECT DESCRIPTION

FINAL CLARIFIER UPGRADE

The final clarifiers are 12 circular tanks that remove sludge from the water before it is discharged to the Ohio River.

The Board has approved rehabilitating the existing final clarifier mechanisms, which are severely corroded after 20 years of service. The improvements are included in the overall plan and are under construction.

HYPOCHLORITE DISINFECTION

Sodium hypochlorite is a chlorine solution similar to household bleach, which is used to disinfect wastewater.

ALCOSAN uses gaseous chlorine for disinfecting wastewater and for controlling odor. The chlorine gas is delivered in rail cars on a deteriorating rail spur. Chlorine gas is a potential hazard to both operating staff and the neighbors of the plant. ALCOSAN will discontinue using gaseous chlorine within two years and will convert to sodium hypochlorite solution as the primary disinfectant. Sodium hypochlorite, although more costly to purchase and store on site, is considerably safer.

Regulatory action is being considered to restrict use and transport of gaseous chlorine in various jurisdictions. The EPM team and ALCOSAN staff believe that now is the time to change to a less-hazardous disinfection approach.

Required for hypochlorite disinfection are: storage and containment facilities, a new rail spur and unloading facility, a barge unloading facility, and chemical pumping and injection equipment.

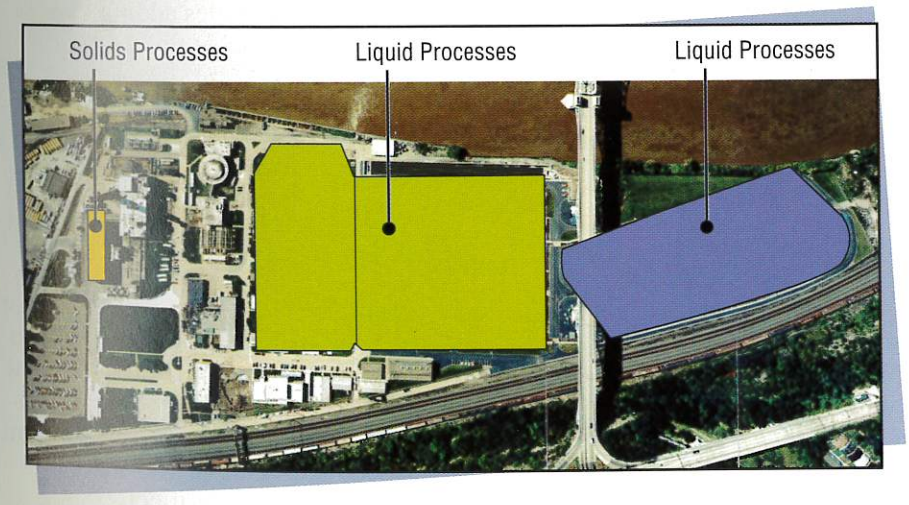
LIME BUILDING IMPROVEMENTS

ALCOSAN mixes lime with sludge to produce an agricultural product for reuse.

The ALCOSAN staff recognizes that a source of current offsite odor originates in the area where dewatered sludge is mixed with lime and loaded onto vehicles of varying size for hauling to land-application sites. Recommended improvements include replacing mixers, conveyors, load-out bins, and the dust-control system. In addition, the loading area will be expanded to accommodate truck loading in a controlled environment with ventilation and scrubbing of the air before it is released.

PRELIMINARY AND PRIMARY ODOR PROJECTS

Preliminary and primary wastewater treatment processes include screening to remove debris, removal of sand or grit, and removal of solids simply by quiescent settling.



Odor will be controlled by modifying several treatment processes.

These are the most odorous liquid processes at the point where wastewater enters the open air. The first steps toward odor control in these areas were undertaken by ALCOSAN as part of recent incinerator improvements. The plan recommends process changes as well as additional containment and treatment of the remaining odorous air associated with these operations.

The preaeration process will be eliminated and the preaeration tanks converted to additional primary clarifiers to eliminate a major odor source. In addition, a new primary

clarifier tank, which will serve as the base for placing the primary odor scrubbers, will be constructed near the Ohio River. All primary processes will be in contained air spaces; ventilated air will receive full two-stage scrubbing to remove odors before it is released. The scrubbers, resembling tanks, remove odorous materials from the air by chemical reaction. The primary clarifier tanks will be covered with precast concrete. This project will significantly prevent and control odors.

AERATION BASIN COVERS

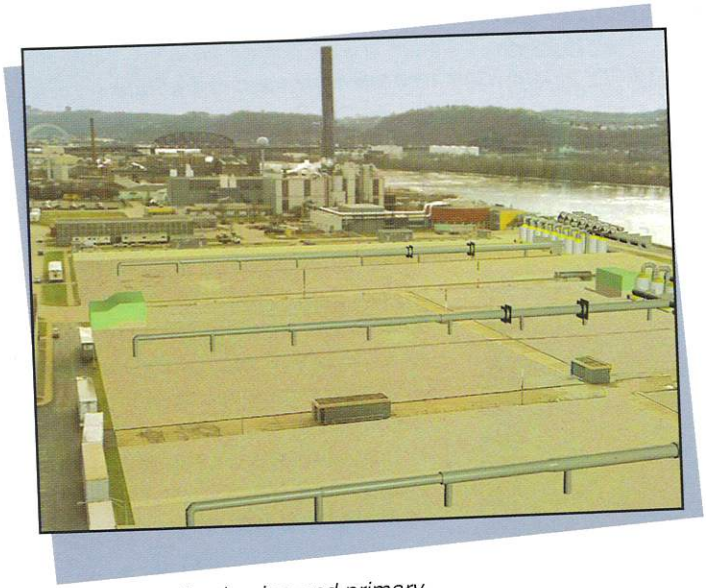
Aeration basins are large rectangular concrete tanks in which air is pumped to the biological culture, which removes pollutants from the wastewater.

Odor will be contained by placing precast concrete covers on new and existing aeration basins and channels. Odorous air will be treated using single-stage scrubbers constructed on top of one of the new aeration basins.

SECONDARY SLUDGE THICKENING

Sludge removed from biological treatment processes is termed secondary sludge and requires thickening for incineration or hauling.

The current system combines the sludge from primary and secondary treatment for co-thickening in the primary clarifiers. The co-thickening can create conditions that cause significant odors. The new design includes separating the primary and secondary sludge and installing gravity belt thickeners for rapidly thickening secondary sludge before it is dewatered and disposed of. These changes will greatly reduce the risk of odor from both primary tanks and sludge dewatering facilities, and improve air quality in the dewatering building.



View of aeration basins and primary clarifiers with proposed covers.

TREATMENT PLANT EXPANSION FROM 200 MGD TO 250 MGD

Results of the Act 537 planning effort indicate that additional plant capacity will be required by 1999. The first capacity expansion includes adding two new aeration basins on either side of the existing open basins, equipped with new air diffusion systems. Also included are two new circular final clarifiers with associated sludge-pumping system improvements.

FINAL CLARIFIER ODOR CONTROL

Final clarifiers typically are not a source of odors that could be considered a nuisance on the plant site or to adjacent neighborhoods. However, a biological plant upset caused by toxic discharges or for other reasons can occur. A final level of odor capture and treatment would be accomplished by investing in covers and scrubbers for the 16 circular final clarifiers.

Combined Sewer Overflow Problems

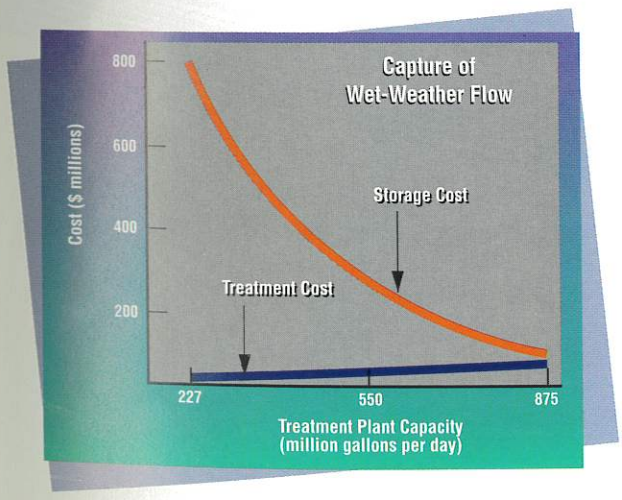
The water and wastes from homes and work places are transported to the ALCOSAN treatment plant by many miles of underground sewers and tunnels. In many parts of Allegheny County, this sewage collection system also carries rainfall and melting snow runoff from streets, roofs, parking lots, and lawns. These dual purpose sewers, called a COMBINED SEWER SYSTEM, collect and convey the combination of sanitary sewage and storm runoff water in the same sewers.

During the time when it is not raining or snow is not melting, all of the water and wastes travel to ALCOSAN for treatment and the treated effluent is discharged from the ALCOSAN plant to the Ohio River. However, the sewer pipes do not always work the same way during times of rainfall and snowmelt. Storm water runoff often cause the pipes to fill beyond their capacity and ability to carry the flows to the treatment plant. Even if the sewers could carry the entire wet weather combined sewage volume, it would have been exorbitantly expensive to have built the treatment plant big enough to handle the flow experienced during storms. Anticipating these conditions, collection sewer systems were installed with special structures at various points where the sewers can be relieved of mounting flows during wet weather by discharging the untreated excess combined sewage to streams and rivers. These discharges are called COMBINED SEWER OVERFLOWS OR CSOs.

The recent issuance of the Environmental Protection Agency's National Combined Sewer Overflow Policy requires changes in the method of dealing with CSO's.



A typical combined sewer overflow structure



Maximizing treatment capacity achieves maximum capture at lowest cost.

Furthermore, if open water is observed on these tanks, ALCOSAN could be held responsible for odors originating elsewhere. The tanks are readily visible from the McKees Rocks Bridge and from areas in Brighton Heights. This final investment in odor control will be deferred until the other, more crucial, odor-control facilities are operating and this final level of odor control is determined to be necessary.

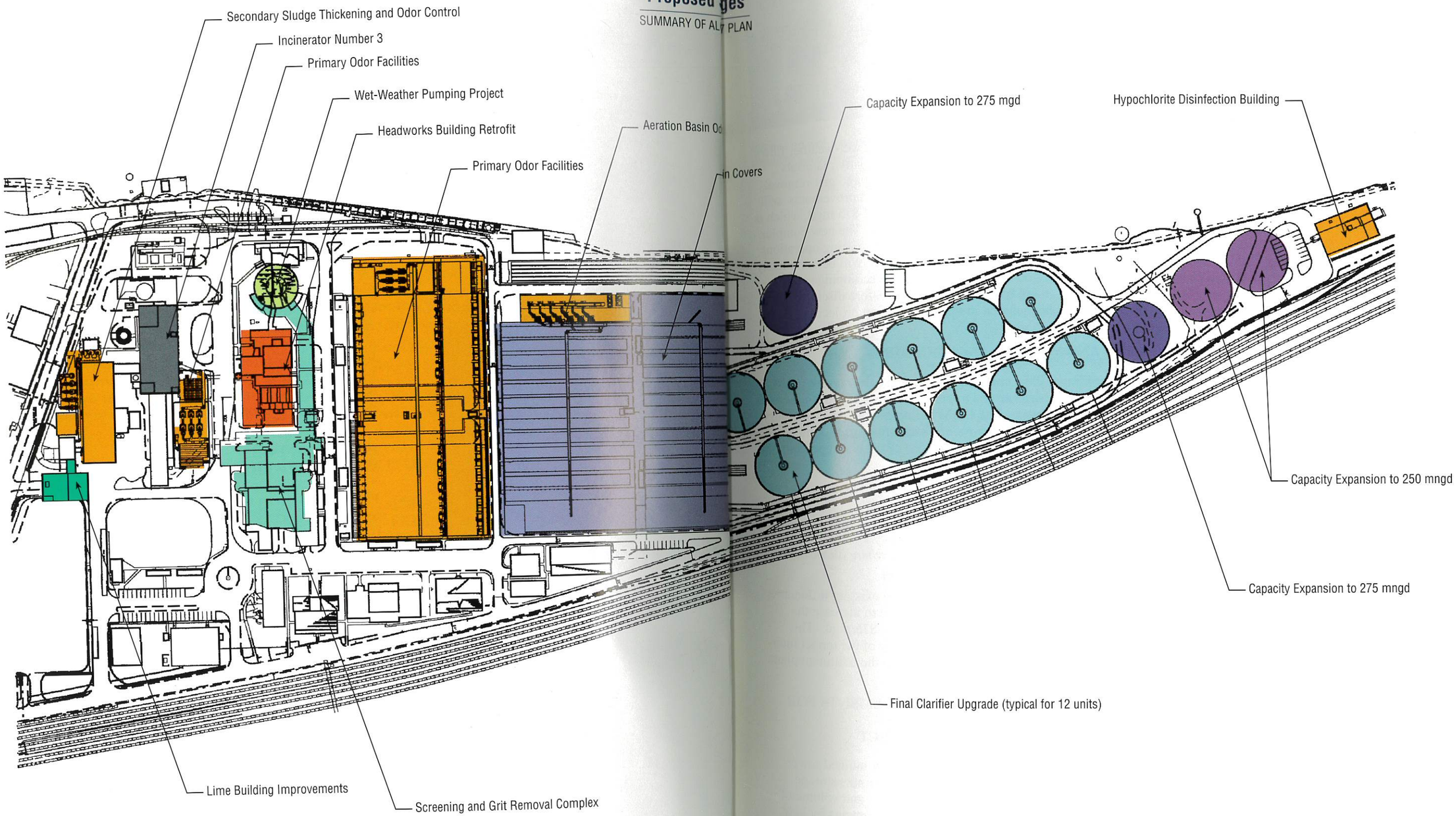
PLANNING FOR WET-WEATHER SEWER OVERFLOWS

Planning is ongoing for enabling ALCOSAN to comply with recent United States Environmental Protection Agency (USEPA) National Combined Sewer Overflow Control Policy for improving water quality in rivers and tributaries. The planning will consider alternatives for collecting and treating the higher flows that occur during wet weather. Currently, part of the peak flows discharge directly to nearby rivers and streams. During wet-weather overflows, floatable debris, sand or gritty materials, and organic pollutants degrade the use of the rivers for recreation and may pose public health risks. In addition, many separate sanitary sewer systems in the county overflow because of hydraulic overloading during wet-weather.

In keeping with ALCOSAN's permit requirements and the intent of the National CSO Policy, additional study of the sewer system of Pittsburgh and other communities in the service area is ongoing, and will be the basis of a Long-Term Control Wet-Weather Sewer Overflow Plan to reduce overloading and overflowing. Clearly the most cost-effective investment in wet-weather overflow prevention will be the construction of treatment plant improvements to maximize treatment of the current CSOs. These improvements will result in an immediate reduction of overflows

Allegheny County Authority Wastewater Plant Proposed ges

SUMMARY OF AL PLAN



and will reduce costs that ALCOSAN communities will face in meeting federal and state requirements.

SAW MILL RUN INTERCEPTOR

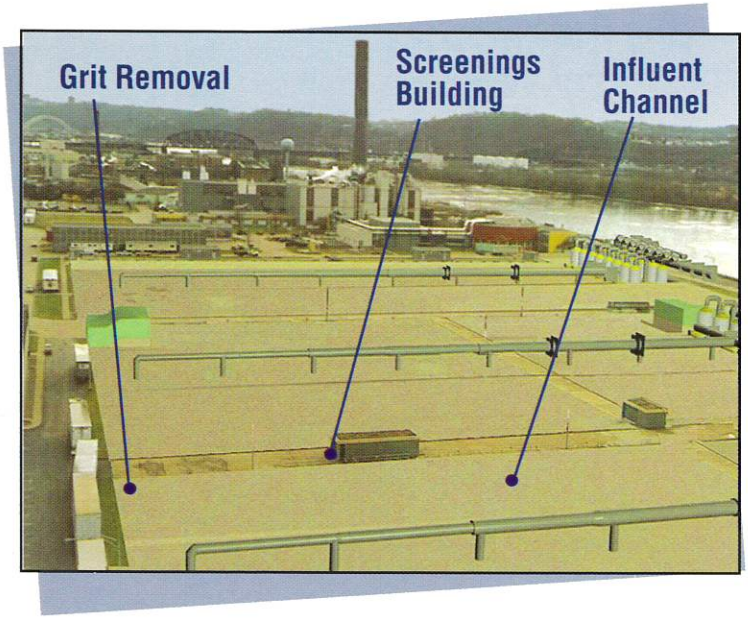
A parallel relief interceptor sewer will be constructed from Woodruff Street to McNeilly Road along Saw Mill Run. Construction will be completed in mid-1998.

SCREENING AND GRIT-REMOVAL COMPLEX – CSO REDUCTION PROJECT

The major pollutant-removal function required during wet-weather flows is removing bacterial pollution, floatable debris, and gritty materials washed from streets into the sewers. A new screening and grit-removal complex, along with primary settling tank (clarifier) improvements, will remove these pollutants up to a maximum flow rate of 875 mgd, which is four times the current capacity of the treatment plant. The new complex will be constructed on land partially occupied by the existing operations and maintenance (O&M) building. The new complex will be completely enclosed. Interior air will be treated by a two-stage scrubbing system. Disinfection facilities, to kill bacteria in the water before discharging it to the Ohio River, will be included in this construction project.

OPERATION AND MAINTENANCE BUILDING

A new O&M building will be constructed to replace the current O&M building, which must be demolished to permit construction of the screening and grit-removal complex. The O&M building will house carpentry and electrical shops, storage, locker rooms, and office space, similar to the existing facilities but designed for the needs of the staff operating the expanded plant.



Wet-weather improvements maximize using the existing infrastructure and ensure compliance. Increasing wet-weather treatment capacity will minimize river pollution.

WET-WEATHER PUMPING – CSO REDUCTION PROJECT

The influent pump station is where all wastewater enters the plant for treatment.

Mechanical equipment in the existing influent pump station will be replaced to increase the station's pumping capacity to 875 mgd. This flowrate matches the capacity of the tunnel interceptors for delivering flow to the treatment plant.

INTERCEPTOR IMPROVEMENTS FOR WET-WEATHER FLOWS – CSO REDUCTION PROJECT

Modifications to the existing combined sewer system will be required to maximize storage capacity and reduce the number and volume of overflow events. These improvements include modifying gates, overflow structures, interceptors, and other control structures.



Increasing wet-weather treatment capacity will minimize river pollution.

ADDITIONAL SOLIDS IMPROVEMENTS

Mechanical improvements to the sludge-processing system are recommended for improving efficiency and reliability.

EXPAND SECONDARY TREATMENT CAPACITY FROM 250 TO 275 MGD

Expansion of secondary treatment to 275 mgd would accommodate the needs of the ALCOSAN service communities, as projected by planning agencies, to the year 2015 or beyond. This phase of capacity expansion includes a new air-diffusion system and two additional final clarifiers.

ADDITIONAL INCINERATION

The expressed policy of ALCOSAN is to possess the capability to dispose of 100 percent of sludge either by land application or by incineration. Current incineration capacity will be insufficient for processing 100 percent of the sludge under projected future operating demands. The additional capacity will be provided by replacing the inoperable multiple-hearth incinerator with a fluidized-bed process similar to the two current operating units. Additional incineration also will help reduce odors.

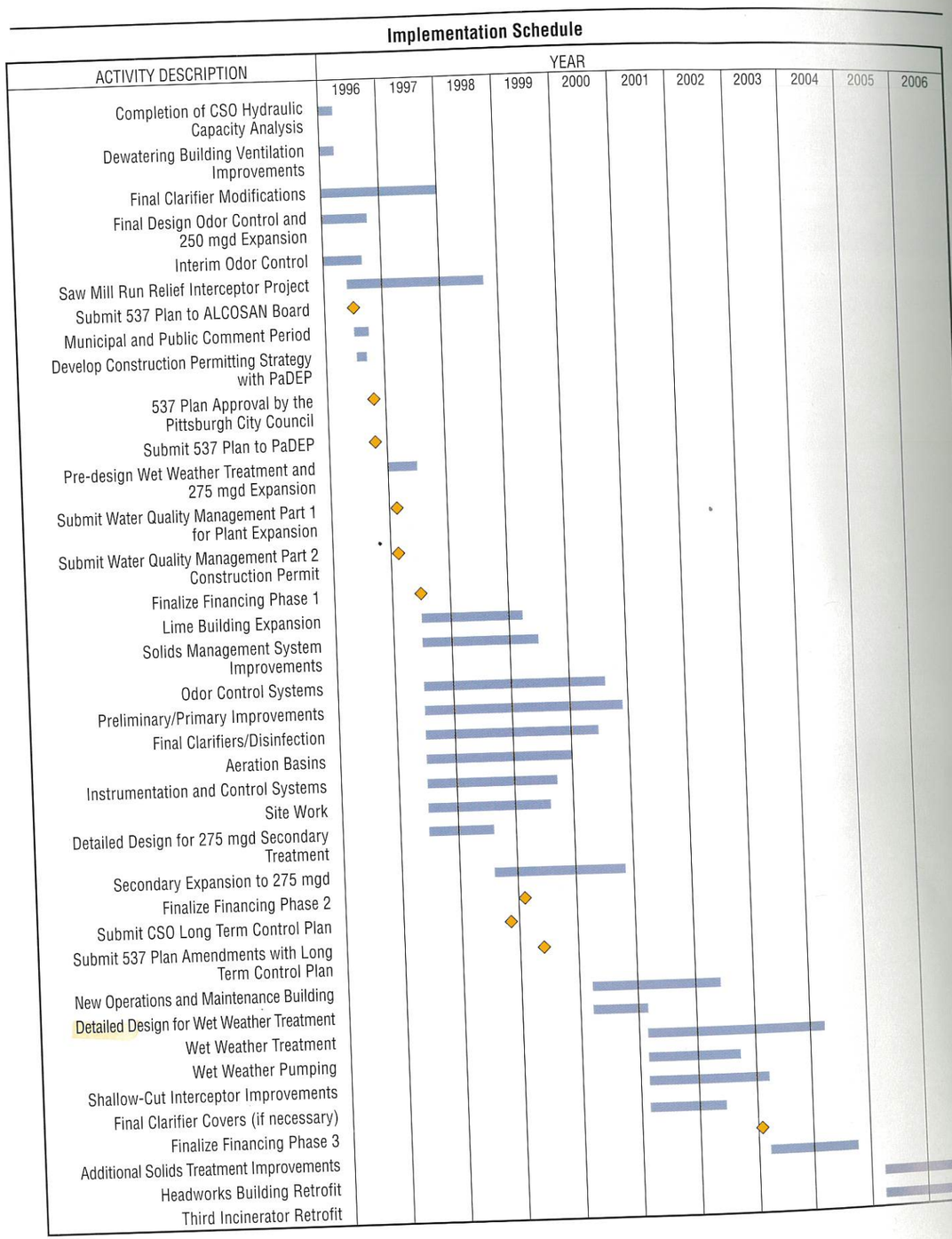
HEADWORKS BUILDING RETROFIT

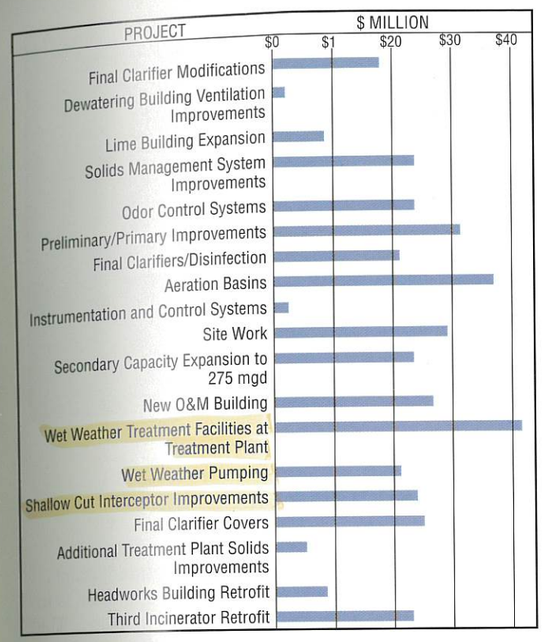
After completing the screening and grit-removal complex, ALCOSAN will remodel the existing headworks building as the operations control center of the treatment plant. The center will house the central computer-control system, instrumentation support, and other functions.

IMPLEMENTATION SCHEDULE

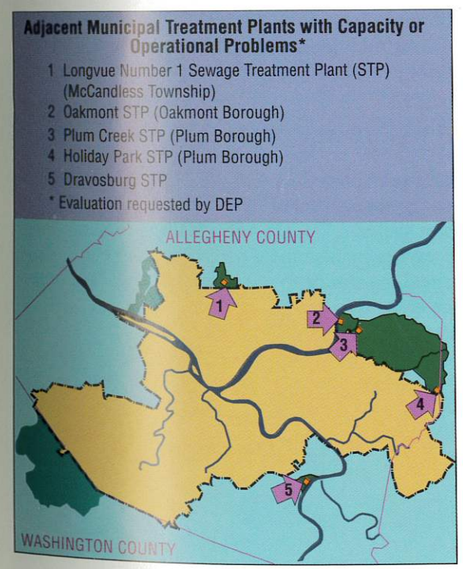
The projects described in the Act 537 Plan are scheduled for design and construction during the next 10 years at a pace that facilitates efficient construction, relatively level cash flow, and operation of the treatment plant under current permits.

Implementation Schedule





Estimated Project Cost



EFFECTS OF IMPLEMENTING THE PLAN ON USER RATES

The current average domestic user pays ALCOSAN a monthly fee of approximately $10. Compared to other major cities, this is an extremely favorable rate. The current average rate for other U.S. metropolitan sewerage agencies is more than $16 per month. Implementing the 537 Plan is es-timated to result in a gradual increase from around $9.50 per month to $22 over 20 years, or an average rate increase of 61¢ per month per year. This future rate projection is based on an assumed annual inflation rate of 3 percent for operating costs and 3.7 percent for construction costs. The construction funds would be borrowed as revenue-backed municipal bonds at an assumed tax-free interest rate of 6 percent.

MONTHLY RATES

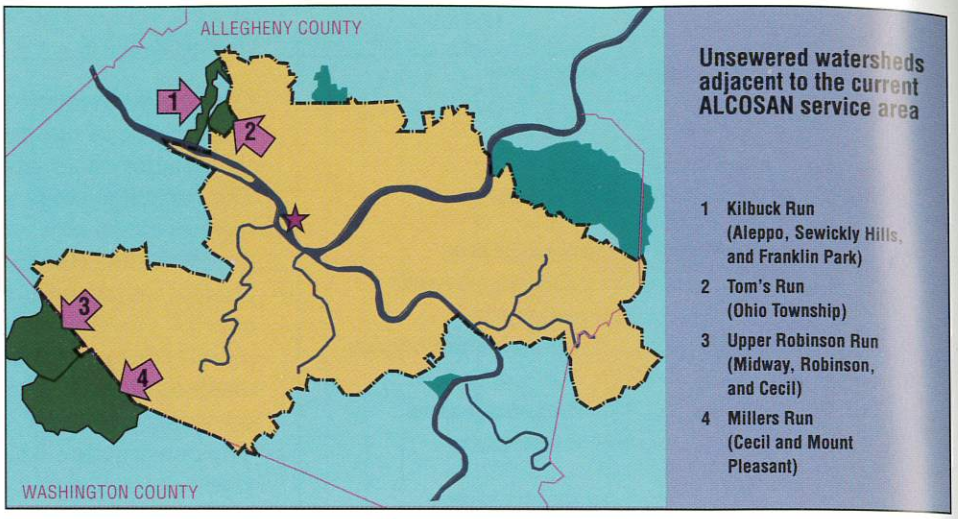
ALCOSAN	
1995	$9.50
2015	$21.75
National Average	
1994	$16.24
2015	$27.65

(150 largest cities)

PADEP-DESIGNATED STUDY AREAS

PADEP directed ALCOSAN to investigate the feasibility of extending services to certain communities and watersheds which may have water quality problems. The 537 Plan makes no recommendation concerning the expansion of the current service area. ALCOSAN is willing to accept new service areas if:

- Existing treatment plant odor problems are corrected first
- Additional flows do not create more odor problems
- Expansion of the service area does not preclude new development or redevelopment in the current service area
- Expansion of the service area does not worsen wet-weather-flow management problems in the current service area
- The expansion benefits the current rate payers through economies of scale



DIRECT PROVISION OF WASTEWATER TREATMENT

The Act 537 Plan develops two approaches for directly connecting the collection systems of the communities to the ALCOSAN treatment plant through the existing interceptor system. One minimum-cost approach is to establish the closest possible connection through other municipalities. The more costly approach is to directly connect the sewer to the ALCOSAN interceptors, bypassing other existing interceptors of uncertain capacity. The two approaches result in a range of construction costs and user rates for consideration, which are included in the full plan.

If any of these communities request to be served by ALCOSAN, the user fees of current member communities will not be increased. Estimates of costs to nonmember communities include a connection fee calculated for reimbursing ALCOSAN for infrastructure investment in place, which if paid would stabilize ALCOSAN user rates.

OTHER POTENTIAL ROLES FOR ALCOSAN

Within the Pennsylvania Municipal Authorities Act. ALCOSAN can also pursue economical alternatives to connection of new communities to the existing ALCOSAN interceptor system. ALCOSAN is willing to assist municipalities in developing sewage management programs, and can provide operational and technical assistance to municipalities who become part of the ALCOSAN service area.

PROCEDURE FOR ADOPTING THE ACT 537 PLAN

The recommended plan was approved by the ALCOSAN Board at their July 25, 1996, public meeting. The complete plan is available for public inspection at the following locations for a 30-day period:

Woods Run Branch Library
1201 Woods Run Avenue
Pittsburgh, PA 15212
761-3730

County Law Library
921 City-County Building
414 Grant Street
Pittsburgh, PA 15219
350-5353

Carnegie Library
4400 Forbes Avenue
Pittsburgh, PA 15213
622-3114

ALCOSAN Administration Building
3300 Preble Avenue
Pittsburgh, PA 15233-1092
734-8353

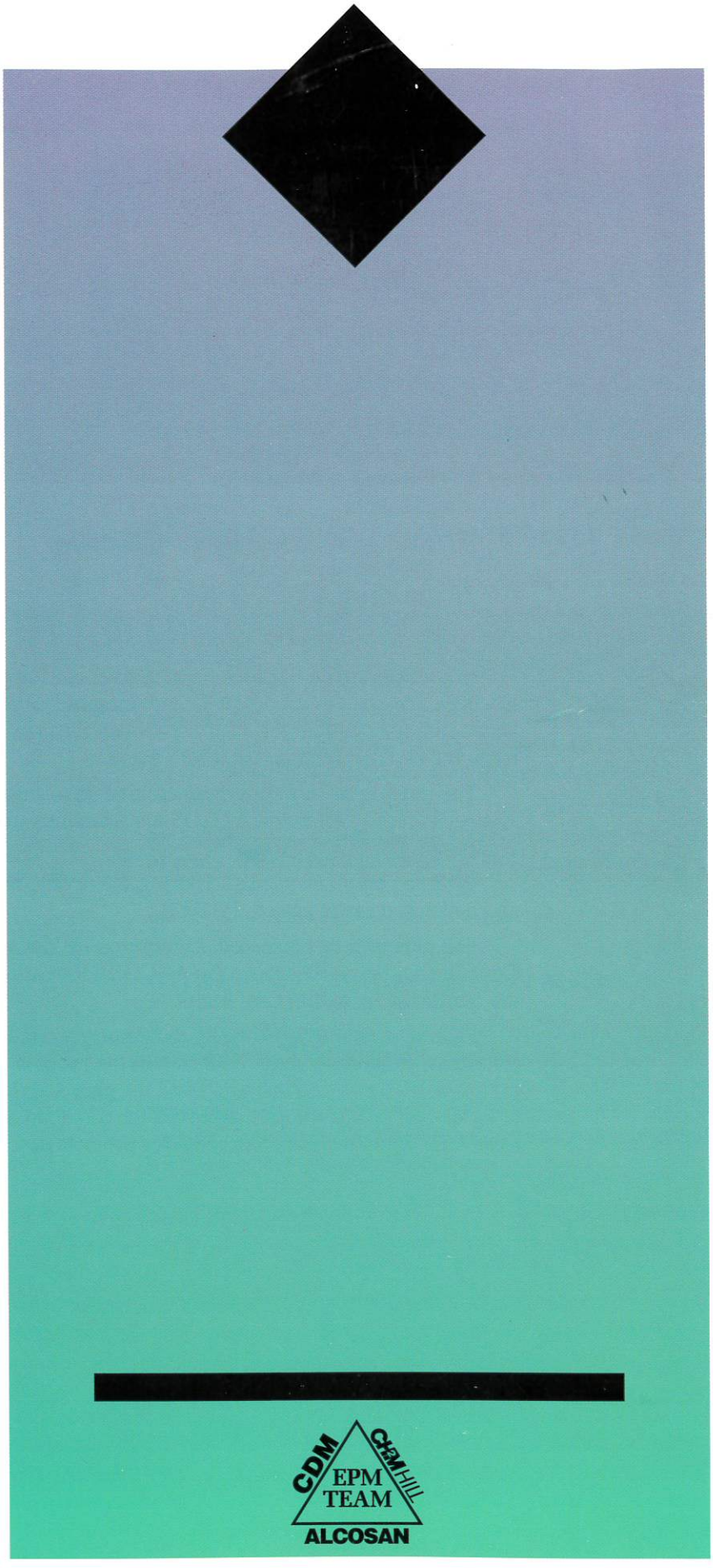
In addition to the libraries listed above, one copy of the complete plan has been provided to each ALCOSAN member municipality, each wastewater authority with in the ALCOSAN service area and to each municipality in the PADEP Designated Study Areas.

The public can submit written comments to Joseph W. Lengyel, P.E. Acting Executive Director, ALCOSAN Administration Building, Pittsburgh, PA 15233-1092

Written comments received during the review period will be included and addressed in the plan to PADEP.

The plan will be presented, as required by law, to the Pittsburgh City Council for approval because the ALCOSAN treatment plant, located on the Northside, is within City limits.

Final review and approval by the Pennsylvania Department of Environmental Protection is the final step in the process. The PADEP has preliminarily reviewed and approved the plan and the implementation schedule. After PADEP has approved the 537 Plan, ALCOSAN can apply to PADEP for construction permits for projects described in the plan.


CDM
CH2MHILL
EPM
TEAM
ALCOSAN

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SECTION 1
Plan Summary

1.1 INTRODUCTION

In 1994, the Board of Directors of the Allegheny County Sanitary Authority (ALCOSAN) declared its preeminent role in wastewater management in southwestern Pennsylvania:

....The Board declares that the mission of the Authority is the production of clean water, the proper production and disposal of biosolids, and the production of clean, odor free air.

Resolution No. 94-8-1

Toward these ends, ALCOSAN is pursuing a number of programs that comprise a ***Comprehensive Water Management Program.*** The projects include the ***Combined Sewer Overflow Program***, the treatment plant ***Capital Improvements Program***, interceptor system reliability projects such as the ***River Crossing*** and ***Access Shaft*** studies, and interceptor upgrade projects such as the ***Saw Mill Run Parallel Interceptor Extension*** and the ***Upper Allegheny Interceptor Extension.*** This Act 537 Plan, which fulfills requirements of the Pennsylvania Sewage Facilities Act of 1965 (Act 537), sets forth ALCOSAN's vision for future wastewater management in southwestern Pennsylvania in accordance with the 1994 Federal Clean Water Act and directives received from PaDEP. The vision includes:

- Elimination of odors detectible off-site from the ALCOSAN Wastewater Treatment Plant
- Expansion of secondary treatment capacity to site limits for anticipated growth, redevelopment and increased wet weather capacity.
- Maximization of flows to the treatment plant during wet weather to reduce the discharge of sewage to the rivers and streams of southwestern Pennsylvania
- Assumption of broader technical and institutional roles in managing wet weather flows in the member communities
- Institution of a long-range comprehensive plan that uses funds efficiently for capital improvements and operations

SECTION 1
Plan Summary

Recognizing ALCOSAN's anticipated new role, the Pennsylvania Department of Environmental Protection (PaDEP) also requested that ALCOSAN include in its 537 Plan a provision for potentially providing wastewater treatment services to communities that are in watersheds with inadequate collection and treatment facilities, as well as communities that are served by wastewater treatment plants (WWTPs) that have had operational problems. These communities are in areas that are subsequently referred to as the PaDEP-designated study areas in this Plan.

1.2 PLAN ORGANIZATION

The 537 Plan is organized into eight sections, which logically progress from a description of current conditions and problems to the proposed implementation schedule for the treatment plant Capital Improvement Program (CIP). Problems within the ALCOSAN Interceptor System are currently under study in accordance with a schedule included in ALCOSAN's current Part 1 NPDES Permit as part of the Combined Sewer Overflow (CSO) abatement effort. The topics of the eight sections are as follows:

Section 1: Plan Summary

This section places ALCOSAN's existing Wastewater Management Program within the context of the Act 537 Plan and summarizes the technical findings and recommendations in the Plan.

Section 2: Wastewater Planning

This section reviews ALCOSAN's role in regional wastewater management as documented through previous regional wastewater management plans.

Section 3: Current Conditions

This section addresses the current conditions in the ALCOSAN service area and in the PaDEP designated study areas. Specific topics are:

- The systems of interceptor sewers that collect wastewater from the municipalities
- ALCOSAN service area municipalities' Corrective Action Plans (CAPs)
- Location of streams conveying wet-weather flows into municipal combined sewer systems
- PaDEP-designated study areas
- Current conditions at the ALCOSAN WWTP

Section 4: Projected Flows and Loadings

Future flows and loadings are estimated for the current ALCOSAN service area as well as for the PaDEP-designated study areas by using historical per-capita wastewater generation data and population projections. This information then is used to predict design flows and loadings for the treatment plant. Factors that could affect future wastewater generation, such as riverfront redevelopment in the City of Pittsburgh and changes in industrial activities, also are considered.

Section 5: Alternatives Analysis

Technical alternatives are presented for resolving the issues identified in Section 3, considering the future flows and loadings projected in Section 4. Technical alternatives for odor control, hydraulic expansion and solids management at the ALCOSAN treatment plant are evaluated. Potential approaches for managing wet-weather flows, which will be finalized in the ***CSO Long Term Control Plan,*** are described. Conceptual designs for the connection of the PaDEP-designated study areas into ALCOSAN are presented, as are planning-level cost estimates. The conceptual designs are intended to assist the municipalities and ALCOSAN in determining the merits of connection. Institutional alternatives to connection into ALCOSAN's interceptor system also are evaluated. Similar conceptual designs are presented for removal of stream inflows from the combined sewer systems that contribute to ALCOSAN.

Section 6: Environmental Assessment

This section addresses the environmental impacts of implementing the proposed CIP, and conversely, the implications of the no-action alternative. The consistency of the proposed CIP with previous area-wide wastewater management plans also is addressed.

Section 7: Financial and Institutional Issues

ALCOSAN's financial and institutional settings are described in the context of ALCOSAN's Capital Programs. Operation and maintenance (O&M) and capital budgets for five-year increments are presented. Future annual residential user charges are presented under a number of scenarios, including the implementation and non-implementation of ALCOSAN's programs and the addition of the projected populations in the PaDEP-designated study areas.

Section 8: Implementation Schedule

The anticipated schedule for implementing the proposed CIP is presented in this section. Schedules for connecting the PaDEP-designated study areas to ALCOSAN are not presented because decisions to pursue connection will be made by the individual municipalities.

1.3 PLANNING AREA

The planning area considered in the 537 Plan is shown in Figure 1-1. The planning area consists of the current ALCOSAN service area and parts of 16 municipalities, which PaDEP requested to be included in this Plan. These areas include:

1.3.1 Watersheds with Inadequate Wastewater Collection and Treatment Facilities

- Millers Run drainage area in Cecil and Mount Pleasant Townships, Washington County
- Upper Robinson Run area, comprised of Midway Borough, Robinson Township, and Cecil Township in Washington County
- Toms Run drainage area in Ohio Township, Allegheny County
- Kilbuck Run drainage area in Aleppo Township, Glenfield Borough, Sewickley Hills Borough; and Franklin Park Borough in Allegheny County

1.3.2 Existing Treatment Plants

- Dravosburg Sewage Treatment Plant, servicing the Borough of Dravosburg and a small area of West Mifflin
- Holiday Park Sewage Treatment Plant, serving parts of Plum Borough, Allegheny County and Murrysville Borough, Westmoreland County
- Longvue No. 1 Sewage Treatment Plant in the Township of McCandless, Allegheny County
- Oakmont Sewage Treatment Plant, serving the Borough of Oakmont, Allegheny County
- Plum Creek Sewage Treatment Plant, serving parts of Plum Borough and the Municipality of Penn Hills in Allegheny County and Murrysville Borough in Westmoreland County

Map Source: ALCOSAN Combined Sewer Overflow Program

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

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Legend

- Treatment Plant Service Areas
- Watershed Areas
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

Longvue No. 1 STP
Toms Run
Kilbuck Run
Oakmont STP
Plum Creek STP
Holiday Park STP
Dravosburg STP
Upper Robinson Run
Millers Run

BEAVER COUNTY
WASHINGTON COUNTY
WESTMORELAND COUNTY

RICHLAND TWP
PINE TWP
WEST DEER TWP
FRANKLIN PARK BORO
BELL ACRES BORO
TOWN OF MCCANDLESS
HAMPTON TWP
LEE TWP
SEWICKLEY HEIGHTS BORO
CRESCENT TWP
INDIANA TWP
FRAZER TWP
SPRINGDALE TWP
SPRINGDALE BORO
NEW KENSINGTON CITY
LOWER BURRELL CITY
UPPER BURRELL TWP
OHIO TWP
ROSS TWP
SHALER TWP
HARMAR TWP
FOX CHAPEL BORO
O'HARA TWP
OAKMONT BORO
PLUM BORO
ALEPPO TWP
KILBUCK TWP
MOON TWP
FINDLAY TWP
KENNEDY TWP
STOWE TWP
RESERVE TWP
ROBINSON TWP
PENN HILLS TWP
CITY OF PITTSBURGH
MURRYSVI
NORTH FAYETTE TWP
CHURCHILL BORO
MONROEVILLE BORO
ROBINSON TWP
COLLIER TWP
SCOTT TWP
CARNEGIE BORO
GREENTREE BORO
MT LEBANON TWP
BALDWIN BORO
BRENTWOOD BORO
MUNHALL BORO
DUQUESNE CITY
NORTH VERSAILLES TWP
PENN TWP
SOUTH FAYETTE TWP
BRIDGEVILLE BORO
CASTLE SHANNON
WHITEHALL BORO
UPPER ST CLAIR TWP
WEST MIFFLIN BORO
PLEASANT HILLS BORO
PORT VUE BORO
MCKEESPORT CITY
WHITE OAK BORO
NORTH HUNTINGTON TWP
CECIL TWP
BETHEL PARK BORO
GLASSPORT BORO
LIBERTY BORO
LINCOLN BORO
MOUNT PLEASANT TWP
PETERS TWP
SOUTH PARK TWP
JEFFERSON BORO
CLAIRTON
CHARTIERS
NORTH STRABANE
CANONSBURG
ELIZABETH TWP
SEWICKLEY TWP

CDM EPM TEAM CH2MHILL
ALCOSAN
Camp Dresser & McKee

Figure 1-1
537 Plan Study Area
(Current Service Area and PaDEP-Designated Areas)

1.4 PROPOSED SERVICE AREA

The 537 Plan does not contain recommendations for altering the current service area. If mutually agreed to by ALCOSAN and the municipalities in the PaDEP-designated study areas, the future service area could be expanded to include parts or all of these areas. The PaDEP-designated areas were investigated at the request of PaDEP. ALCOSAN is neither proposing to expand its service area, nor is it recommending that the PaDEP-designated areas be added to its service area. The analysis of the PaDEP-designated study areas in this plan is intended solely to assess the technical, financial, and institutional feasibility of accepting wastewater from the PaDEP study areas. ALCOSAN is willing to accept new service areas if:

- Existing treatment plant odor problems are corrected before any additional flows are conveyed to the plant
- Additional flows do not create additional odor problems
- Expansion of the service area does not preclude redevelopment or new development in the existing service area
- Expansion of the service area does not exacerbate problems of managing wet-weather flow in the current service area
- The expansion of the service area benefits the current rate payers

1.5 MAJOR ISSUES ADDRESSED IN THE PLAN

The 537 Plan addresses major problems that have been encountered with the interceptor sewer systems, the WWTP, and the PaDEP-designated study areas.

1.5.1 Interceptor Sewer Systems

- Limitations of the hydraulic capacities that result in sewage overflows during wet weather
- Problems in municipal collection sewer systems that have led PaDEP to require corrective action plans
- Physical anomalies in the sewer systems, e.g., locations where streams flow into combined sewers

1.5.2 ALCOSAN Treatment Plant

- Odors emanating from the liquid process train and solids-handling facilities
- Average plant flows approaching permitted volumes and currently-rated plant capacity
- Ability to use the ALCOSAN interceptor system and treatment plant for capturing and treating combined sewer overflows (CSOs) during wet weather

1.5.3 PaDEP-designated Study Areas

- Watersheds with limited or no wastewater collection and treatment facilities
- Wastewater treatment plants that have operational problems caused by hydraulic overloading during wet weather

1.6 SELECTED ALTERNATIVES

1.6.1 Improvements to the Interceptor System

Construction Phase Projects

The Saw Mill Run interceptor has a long history of problems with overflowing and flooding. A parallel interceptor was constructed from the Ohio River to Woodruff Street by the City of Pittsburgh to mitigate some of the problems, but a number of problems remain. Extension of the parallel interceptor above Woodruff Street and construction of wet-weather storage basins are anticipated. Designs have been completed for an extension of the parallel interceptor along Route 51. The planning study, which led to this project, also recommended replacing the existing sewer along Route 88 from Route 51 to McNeilly Road, completing the rehabilitation of the sewer from McNeilly Road to Conner Road, and constructing four storage basins for capturing CSOs.

ALCOSAN has also agreed to accept flow from the Municipality of Penn Hills. To accommodate the flow, the Allegheny Interceptor was extended and a new pump station at Sandy Creek Road was completed in 1995. The future wastewater flows and loadings from Penn Hills are included in the 537 planning.

Combined Sewer Overflow Program

Based upon prior meetings and correspondence, ALCOSAN anticipates that the U.S. Environmental Protection Agency (USEPA) and PaDEP will require ALCOSAN to act as the coordinating agency for CSO planning and reporting for all municipalities in its service area. Under the requirements of its Part I NPDES Permit, ALCOSAN has completed the Phase 1 CSO study titled, *System Inventory and Characterization*, and is continuing planning and data collection. ALCOSAN completed a *System Hydraulic and Hydrologic Characterization Study* and a *Flow Monitoring Report.* The modeling and analysis will enable ALCOSAN to document implementation of the *Nine Minimum CSO Controls*, and to develop a comprehensive *CSO Long-Term Control Plan* (LTCP) for overflows throughout the system. After it is approved by PaDEP, the LTCP will be incorporated into the ALCOSAN 537 Plan by amendment.

1.6.2 ALCOSAN Treatment Plant

The proposed improvements to the ALCOSAN treatment plant are intended to eliminate odors detectible off-site, to provide treatment capacity for projected growth and redevelopment, and to provide primary treatment disinfection for a peak flow of 875 million gallons per day (mgd) from combined sewer areas. Hydraulic limitations in the existing interceptor system preclude resolving most of the wet-weather flow problems (e.g., sanitary sewer overflows) by expanding of the ALCOSAN treatment plant further.

Additional steps for managing wet-weather flows will be determined in the LTCP. The LTCP will consider all feasible alternatives for managing wet-weather flows, e.g., conveyance and/or storage and satellite primary and secondary treatment facilities.

The combination of technical alternatives for implementing the WWTP-related aspects of the 537 Plan comprise the Capital Improvement Program (CIP). The CIP is divided into 19 major packages or projects that will be constructed between 1995 and 2005. The projects will be scheduled so that a relatively level flow of funds will be required for construction, and so that treatment operations can continue uninterrupted. The selected process trains are summarized below:

Liquid Treatment Alternatives

The recommended liquid process train and design capacities are summarized in Table 1.1. Construction cost and schedule information are summarized in subsections 1.7 and 1.8, respectively.

Primary and secondary (biological) treatment capacity at the ALCOSAN Wastewater Treatment Plant (WWTP) will be expanded to 275 mgd to increase capacity for projected population growth, urban redevelopment, and treatment of additional flows during wet weather. To maximize the capture and treatment of wet-weather flows, wet-weather treatment and disinfection

facilities will be expanded to a peak capacity of 875 mgd. This flow rate reflects the projected combined capacity of the deep tunnel interceptors that parallel the three rivers.

Table 1.1
Summary of Selected Liquid Treatment Alternatives

Process	Selected Alternative	Design Flow (mgd)
Influent Pumping	Modification of existing Main Pump Station	875
Preliminary Treatment Screening Grit	Building of reciprocating rake screens building of vortex grit chambers	875
Primary Treatment	Conversion of preaeration tanks to primary sedimentation tanks and the addition of one new primary sedimentation tank	600
Secondary Treatment	Modification of existing basins and construction of two new aeration basins, construction of four new final clarifiers.	275
Disinfection	Hypochlorination	875

Liquid Process Odor Control

Odor emissions from the ALCOSAN treatment plant can occur from the liquid processes and from the solids-management processes. The selected alternatives for addressing liquid-phase odor sources are summarized on Table 1.2. Solids-phase odor control will include enclosing sludge conveyance and dewatering systems, upgrading the lime stabilization facilities, controlling odor from the liquid waste receiving facilities and other improvements.

Table 1.2
Summary of Selected Alternatives for Liquid Treatment Odor Control

Process	Selected Odor-Control Alternative
Headworks & Preliminary Treatment	Full enclosure two-stage wet scrubbers with the option to use the existing fluidized bed Incineration/afterburner system.
Primary Treatment	Low profile concrete covers (removable only in emergency) over middle portion of tanks. Buildings over chain-and-flight area and effluent end. Two-stage wet scrubber system for all foul air.
Secondary Treatment Aeration Basins	Prefabricated concrete covers with single-stage packed-tower wet scrubbers
Clarifiers	Low profile dome aluminum covers with single-stage packed-tower wet scrubbers
Disinfection	None required

1.6.3 PaDEP-designated Study Areas

Nonstructural Alternatives

Nonstructural approaches to resolving localized wastewater management problems have been considered in the 537 Plan. ALCOSAN is willing to assist in developing sewage management programs in cooperation with the PaDEP-designated municipalities, and can provide operational and technical assistance to the wastewater systems that become part of the ALCOSAN service area.

If a municipality requests to become part of the ALCOSAN service area, and an appropriate service agreement can be negotiated with the ALCOSAN Board and be approved by the City of Pittsburgh, ALCOSAN can operate and maintain existing municipal facilities if deemed economical. Within the constraints of the Pennsylvania Municipality Authorities Act, ALCOSAN can pursue economical alternatives to connection of these communities to the existing ALCOSAN interceptor system. The first important step is for a PaDEP-designated municipality to request in writing that the ALCOSAN Board of Directors consider its inclusion in the ALCOSAN service area.

Structural Alternatives

Conceptual level designs and cost estimates have been developed for the connection of the PaDEP-designated study areas to the ALCOSAN interceptor system. They do not include trunk sewers and lateral sewers that would be required throughout the communities' watershed to connect all existing and future customers. The general routing of potential interconnection sewers is shown on Figure 1-2.

Two hypothetical design concepts are presented for each PaDEP study area:

> ***Concept A:*** is the closest, least-cost approach to connecting the PaDEP-designated areas to the ALCOSAN interceptor system. Under Concept A, the PaDEP-designated area collection sewers would discharge to a neighboring municipality's sewers for conveyance to the ALCOSAN interceptor system. It is recognized that capacity may not be available in the neighboring municipality's sewers.
>
> ***Concept B:*** is generally a service route that would require the construction of a new trunk sewer from the study area to the ALCOSAN system. The routing of the trunk sewers for the areas follow the topography of the drainage basins, and so would frequently parallel the alignment of the existing municipal interceptors located down watershed between the designated areas and the ALCOSAN system.

Any interconnecting interceptors which may be built would be owned and financed by the municipalities. As noted, the design concepts shown on Figure 1-2 are intended to allow for policy considerations by the PaDEP-designated study area municipalities. They should not be viewed as a "selected alternative". ALCOSAN makes no recommendations regarding the construction of interconnecting interceptors by the municipalities.

1.7 IMPLEMENTATION COSTS

1.7.1 Capital Costs of the Improvements to the ALCOSAN Treatment Plant

The total estimated capital costs of the treatment plant Capital Improvement Program are approximately $387 million (in inflated dollars). The costs, by project, are shown in Table 1.3. CIP costs were originally estimated in 1995. An inflation rate of 3.7 percent per year, based on the *Engineering News Record Construction Cost Index* for Pittsburgh, was applied to the 1995 costs. Each project cost listed in Table 1.3 has been inflated to its construction midpoint date.

Project costs were broken down into annual costs, and debt service was calculated based on annual capital expenditures. Three debt issues were assumed between 1997 and 2003 at a six

Map Source: ALCOSAN Combined Sewer Overflow Program

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ALCOSAN

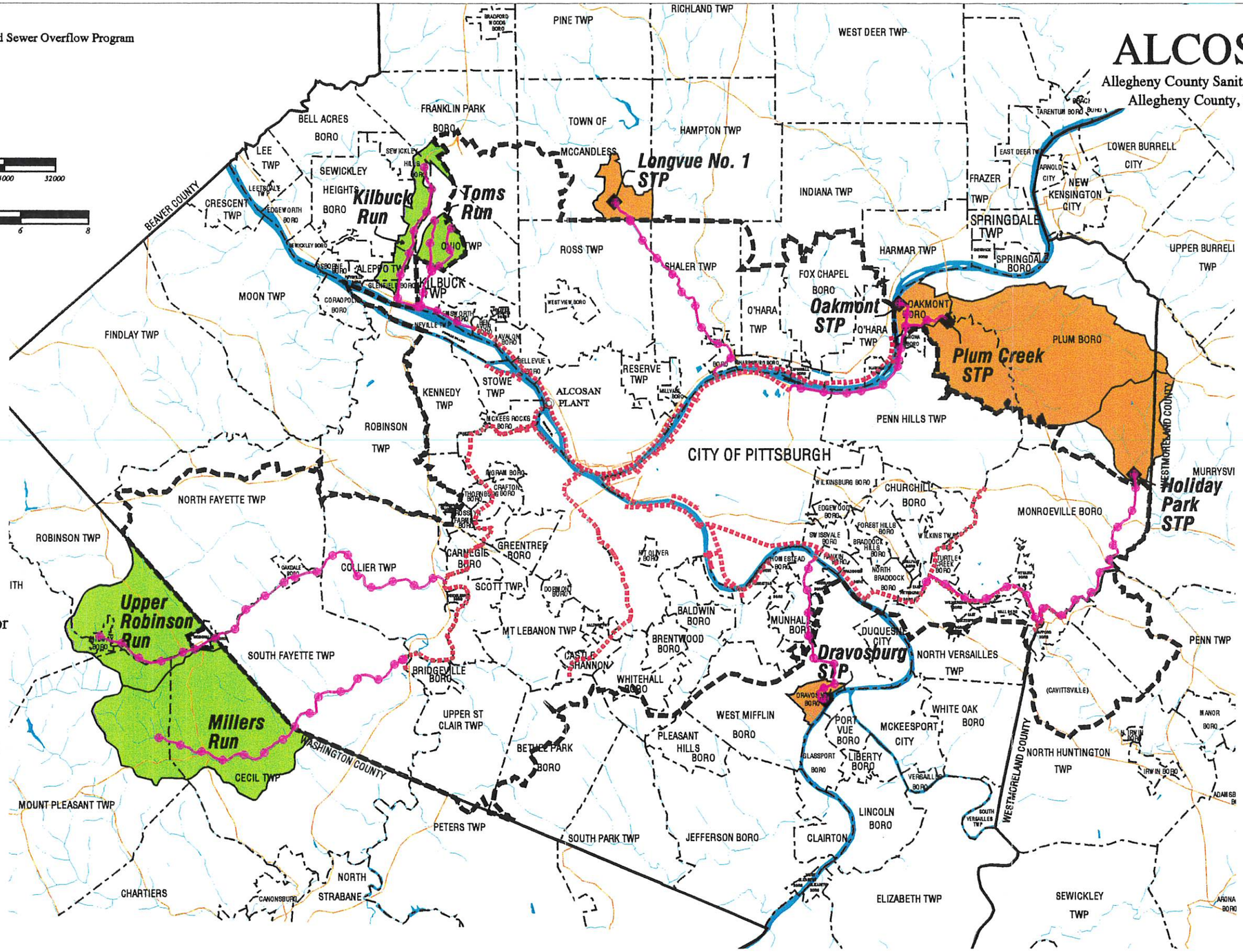
Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

Legend

- Treatment Plant Location
- Potential Route to ALCOSAN Interceptor
- Interceptor Sewer
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Hydrologic Features



CDM CH2MHILL EPM TEAM ALCOSAN

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Figure 1-2
Generalized Alignment of Potential Interconnecting Sewers

percent interest rate. Additionally, a four percent issuance cost was added to the costs in Table 1.3. Deducted from the capital costs was an estimated return on investment of unspent capital monies at a rate of approximately five percent. This was based on the rate of return on United States Treasury Bills (90 to 360 days) for the first quarter of 1996. Debt service, as well as new operations and maintenance costs associated with the CIP, were incorporated into expenditure projections based on ALCOSAN's 1996 operating budget and debt service on currently outstanding issues.

Table 1.3
Cost and Start Date for Projects Included in Capital Improvement Plan

Project	Cost in Millions	Midpoint of Construction
Final Clarifier Modifications	$18.4	Jan, 1997
Dewatering Building Ventilation Improvements	2.1	Jan, 1996
Lime Building Expansion	8.7	May, 1998
Solids Management System Improvements	23.8	May, 1998
Odor Control Systems	23.8	May, 1998
Preliminary/Primary Improvements	31.4	May, 1999
Final Clarifiers/Disinfection	21.3	Oct, 1998
Aeration Basins	37.0	Oct, 1998
Instrumentation and Control Systems	2.2	Oct, 1998
Site Work	29.2	Oct, 1998
Secondary Capacity Expansion to 275 mgd	23.4	Jan, 1999
New O&M Building	26.4	Jun, 2001
Wet Weather Treatment Facilities at Treatment Plant	41.4	Jun, 2002
Wet Weather Pumping	12.4	Jan, 2002
Shallow Cut Interceptor Improvements	23.6	Jan, 2002
Final Clarifier Covers*	24.9	Jun, 2001
Additional Treatment Plant Solids Improvements	5.3	Jan, 2004
Headworks Building Retrofit	8.6	Jan, 2006
Third Incinerator Retrofit	23.0	Jan, 2006
Total Capital Improvements Plan Costs	**$386.9**	

*Covers for the final clarifiers may be unnecessary upon completion of other, more critical, odor control steps. Therefore, a decision on installing the covers has been deferred to the year 2001.

1.7.2 Future User Charge

Annual revenues required from user charges were calculated and the treatment charges per 1,000 gallons was calculated by dividing user charges by flow projections through the year 2015. Table 1.4 shows the results of these rate calculations for the design year, 2015, using five different scenarios of project completion and population projections.

Table 1.4
Projected Rates in 2015 for 1,000 Gallons Discharged

	Current ALCOSAN Service Area No Growth	Current ALCOSAN Service Area with Growth	Current ALCOSAN Service Area Plus Unsewered Areas of ALCOSAN	Current ALCOSAN Service Area Plus Unsewered and PaDEP-designated Areas
Current Facilities and Related Improvements	Case 1 $2.28			
CIP	Case 2 $3.49	Case 3 $3.26	Case 4 $2.95	Case 5 $2.73

Based on a typical residential use of 20,000 gallons per quarter; the following represents the average annual bills for each case in the year 2015:

Case 1	$182
Case 2	$279
Case 3	$261
Case 4	$236
Case 5	$219

1.7.3 PaDEP-designated Study Area Costs

Capital and O&M Costs

Costs of construction, O&M, and annual debt service associated with connecting the PaDEP-designated study areas to ALCOSAN have been estimated, excluding local collection sewers and laterals and any necessary improvements to the ALCOSAN interceptor system. Uncertainties in hydraulic capacity and institutional arrangements led to the need for both a best and worst case cost to be presented. The actual cost is likely to fall somewhere between the two extremes. The estimated costs are shown in Table 1.5.

Estimated Annual Costs Per Household

Customer costs were estimated using an equivalent dwelling unit (EDU) rate structure approach, which enables developing customer units for apportioning system costs. The EDU approach establishes the residential dwelling unit as the base unit, with other customer groups such as commercial and industrial users being allocated system costs on the basis of a base residential dwelling unit.

Total annualized costs were apportioned to the estimated number of EDUs for each of the study areas, which yielded annual EDU costs, monthly EDU costs were also calculated. Estimated monthly cost per EDU for the study areas in the year 2015 ranges between $34 and $191 (range of best and worst case scenarios) as shown in Table 1.6. The costs do not include O&M or debt service for local collection systems for the currently unsewered areas.

Table 1.5
PaDEP-designated Study Areas Costs of Connection to ALCOSAN Interceptor System (Million $)

PaDEP-designated Study Area	Concept A	Concept B
Kilbuck/Toms Run		
Capital Cost	$18.36	Not Applicable
Annual O&M	$0.25	
Robinson Run		
Capital Cost	$5.32	$16.66
Annual O&M	$0.45	$0.46
Millers Run		
Capital Cost	$9.21	$16.16
Annual O&M	$0.77	$0.78
Dravosburg STP		
Capital Cost	$4.74	$7.43
Annual O&M	$0.43	$0.44
Oakmont STP		
Capital Cost	$8.14	$14.78
Annual O&M	$1.39	$1.41
Plum Creek STP		
Capital Cost	$16.53	$26.62
Annual O&M	$2.77	$2.81
Oakmont/Plum STPs		
Capital Cost	$23.51	$34.45
Annual O&M	$4.17	$4.12
Holiday Park STP		
Capital Cost	$7.22	$26.91
Annual O&M	$1.57	$1.60
Longvue #1 STP		
Capital Cost	$5.58	$15.69
Annual O&M	$1.05	$1.06

Table 1.6
Connection of PaDEP-designated Study Areas to ALCOSAN
Estimated Annual Cost Per EDU

	2000		2015	
PaDEP-Designated Study Area	**Concept A**	**Concept B**	**Concept A**	**Concept B**
Kilbuck/Toms Run				
Cost Per EDU Per Year	$2,840	--	$2,293	--
Cost Per EDU Per Month	$237	--	$191	--
Robinson Run				
Cost Per EDU Per Year	$603	$1,281	$593	$1,167
Cost Per EDU Per Month	$50	$107	$49	$97
Millers Run				
Cost Per EDU Per Year	$642	$907	$603	$806
Cost Per EDU Per Month	$53	$76	$50	$67
Dravosburg STP Service Area				
Cost Per EDU Per Year	$573	$738	$623	$774
Cost Per EDU Per Month	$48	$62	$52	$64
Oakmont STP Service Area				
Cost Per EDU Per Year	$515	$664	$588	$733
Cost Per EDU Per Month	$43	$55	$49	$61
Plum Creek STP Service Area				
Cost Per EDU Per Year	$374	$461	$402	$478
Cost Per EDU Per Month	$31	$38	$34	$40
Oakmont/Plum Creek STP Service Areas				
Cost Per EDU Per Year	$406	$466	$447	$497
Cost Per EDU Per Month	$34	$39	$37	$41
Holiday Park STP Service Area				
Cost Per EDU Per Year	$419	$781	$456	$770
Cost Per EDU Per Month	$35	$65	$38	$64
Longvue No. 1 STP Service Area				
Cost Per EDU Per Year	$557	$901	$603	$895
Cost Per EDU Per Month	$46	$75	$50	$75

1.8 PROPOSED IMPLEMENTATION SCHEDULE

1.8.1 Treatment Plant Capital Improvement Program

The proposed implementation schedule for the CIP extends over a 11 year construction period from 1995 through 2006. Odor control, solids handling improvements and initial plant expansion design work is underway. The preliminary schedule, which is subject to revision by the ALCOSAN Board of Directors, is detailed in Figure 1-3.

1.8.2 PaDEP-designated Study Area Interconnections

An implementation schedule has not been proposed for the regionalization of the PaDEP-designated study areas into the ALCOSAN service area. The municipalities within the PaDEP study areas will decide whether to pursue this option further with ALCOSAN. As noted in Section 4, the flow projections used in the planning of the ALCOSAN plant expansion schedule assumes a minimum 3-year lag time between a municipal decision to pursue regionalization and the completion of interconnections into the ALCOSAN interceptor system.

1.9 RESOLUTION OF ADOPTION

As host community to the ALCOSAN WWTP, a resolution of adoption is required from the City of Pittsburgh. A copy of this resolution will be provided in Appendix A prior to submittal of the Plan to the Pennsylvania Department of Environmental Protection.

1.10 MUNICIPAL and PUBLIC COMMENTS

Copies and/or summaries of municipal and public comments are provided in Appendix B.

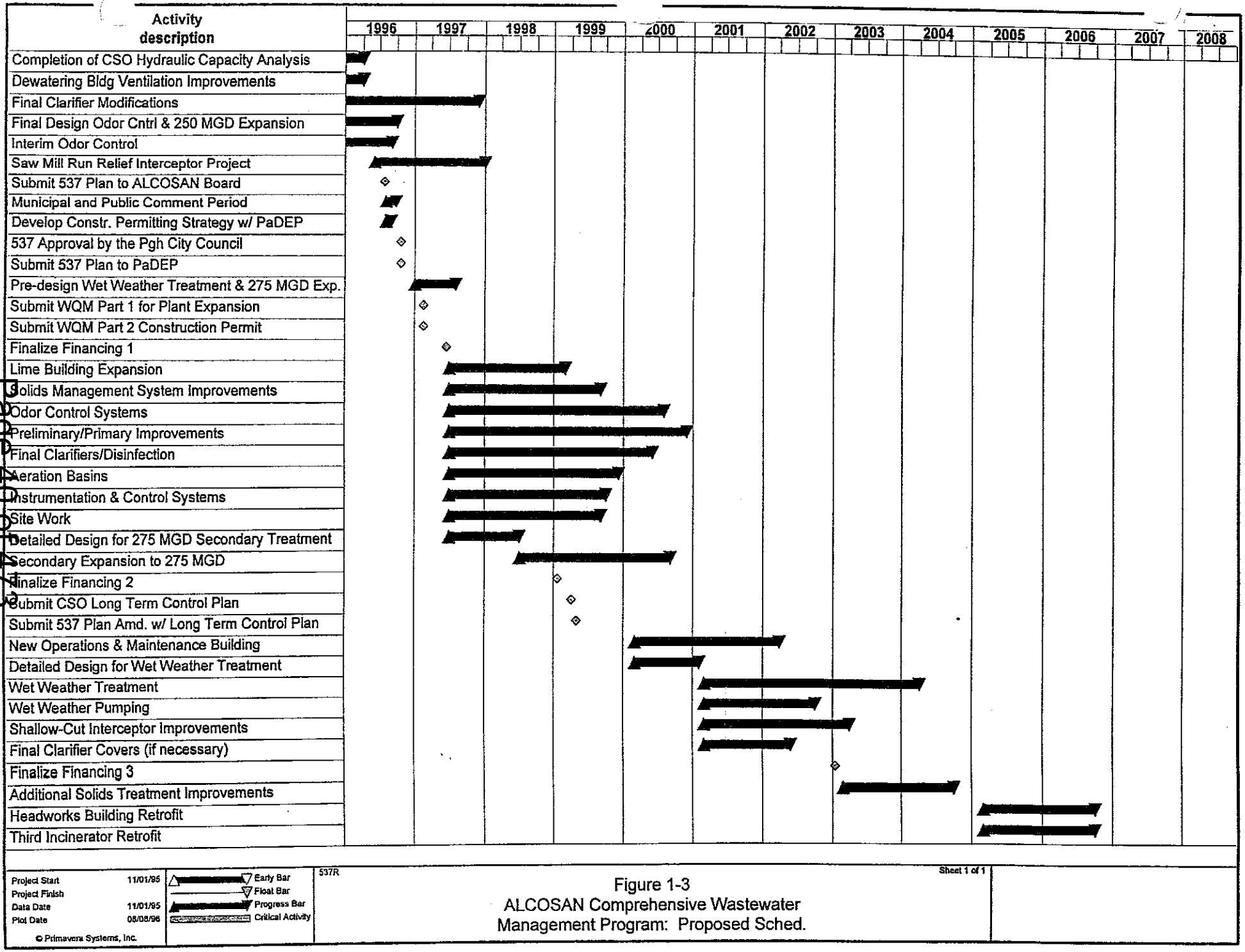


Figure 1-3
ALCOSAN Comprehensive Wastewater Management Program: Proposed Sched.

SECTION 2
Wastewater Planning

2.1 INTRODUCTION

This section identifies previous and current wastewater planning relevant to ALCOSAN's role in regional wastewater management. Current ALCOSAN planning activities are described in subsection 2.2. Previous countywide and municipal planning under the Sewage Facilities Act and other regional planning that was carried out under the federal Clean Water Act and the Pennsylvania Clean Streams Law are reviewed in subsection 2.3. City and county comprehensive planning under Act 247 are addressed in subsection 2.4. Improvements to ALCOSAN's interceptor system and wastewater treatment plant that have occurred subsequent to the 1970 Allegheny County 537 Plan are described in subsection 2.5. Wastewater planning that is anticipated or under development is summarized in subsection 2.6.

2.2 CURRENT ALCOSAN WASTEWATER MANAGEMENT PLANNING

2.2.1 Combined Sewer Overflow Program

In conjunction with the 537 planning process, ALCOSAN is conducting a comprehensive ***Combined Sewer Overflow Abatement Program.*** ALCOSAN completed the Phase 1 CSO study, system inventory, and characterization in September 1995. The results of the inventory are summarized in subsection 3.2. ALCOSAN is progressing with the planning and data-collection effort required to enable it to meet the CSO requirements of its National Pollutant Discharge Elimination System (NPDES) permit.[1] ALCOSAN submitted *the Hydraulic Characterization Report* to PaDEP in March 1996. ALCOSAN also submitted the *CSO Flow Monitoring Report.* ALCOSAN will submit its *Documentation of Implementation of Nine Minimum Controls* within 18 months of the effective date of its NPDES permit. ALCOSAN will submit its CSO long term control plan as required, within 18 months after PaDEP approval of the nine minimum controls. The plan is intended to be submitted in October 1998. Upon regulatory approval, the CSO long term control plan will be incorporated into ALCOSAN's 537 Plan by amendment.

ALCOSAN anticipates that USEPA and PaDEP will require ALCOSAN to act as the coordinating agency for CSO planning and reporting activities for all municipalities within its service area. This effort will be similar to the coordinating and consolidated reporting that ALCOSAN does for wasteload management under Chapter 94 of Pennsylvania Code. Extensive data collection as well as coordinated community planning and public education may be required. All monitored and sampled data are used to update the ALCOSAN computerized hydraulic model of the Interceptor System.

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[1] Permit Number PA0025984, September 30, 1993.

2.2.2 Toxic Reduction Evaluation and Limits Review

A toxic reduction evaluation (TRE) is required under ALCOSAN's NPDES permit. The TRE is done to determine the sources and strengths of toxic materials that may enter the plant. The TRE will require extensive sampling, analysis and field investigation in 1996.

2.3 PREVIOUS WASTEWATER MANAGEMENT PLANNING

PaDEP, the Southwestern Pennsylvania Regional Planning Commission (SPRPC), the Allegheny County Planning Department (ACPD), and ALCOSAN were contacted about the existence of relevant planning studies of wastewater management for the planning area. Table 2.1 presents planning studies identified as relevant for the ALCOSAN 537 Plan, in chronological order.

A summary of each planning study document reviewed is presented as follows. Plan recommendations and actions taken in response to the recommendations are summarized at the end of subsection 2.3.

2.3.1 Comprehensive Sewerage Needs Plan 1970-2000/Allegheny County

This 1970 plan was prepared by Green Engineering Company for Allegheny County to fulfill requirements of Act 537. The county prepared the plan on behalf of 90 of the 129 municipalities in the county (recommendations also were made in the plan for municipalities that had not authorized the county to prepare plans on their behalf).

General data for wastewater management planning such as geological features, soil classifications, drainage basins, population and economic development projections, and descriptions of existing wastewater management systems and sewerage-related problems are presented. On the basis of analysis of these data, recommendations for three and ten year wastewater management plans for each drainage basin and corresponding municipality in the county were formulated. The plan was prepared as a guidance document, with implementation of the plan intended to be conducted by individual municipalities in the county.

The plan contained recommendations for a combination of new wastewater management systems and expansion of existing systems for individual drainage basins in the plan. Parts of Franklin Park Borough, McCandless Township, Bethel Park Borough, Collier Township, and North Fayette were recommended for inclusion into the ALCOSAN system.

SECTION 2
Wastewater Planning

Table 2.1
Previous Wastewater Management Planning Studies

Preparing Entity	Document	Date
Allegheny County	*Comprehensive Sewerage Needs Plan 1970-2000/Allegheny County, Pennsylvania (537 Plan)*	December 1970
Westmoreland County	*Official Sewerage Facilities Plan for Westmoreland County and Its Constituent Municipalities (537 Plan)*	January 1970
Washington County	*The Sewerage Facilities Plan/Washington County, Pennsylvania (537 Plan)*	January 1972
SPRPC	*Short Range Program of Sewer and Water Facility Improvements*	May 1974
PaDEP	*Comprehensive Water-quality Management Plan/Southwestern Pennsylvania Region/Study Area 9/Plans and Choices*	October 1978
	Comprehensive Water-quality Management Plan/Ohio Valley Study Area/Study Area 9/Chapter XIII Recommended Water-quality Management Plan ("208 Plan")	October 1979
ALCOSAN	*Allegheny County Sanitary Authority Sludge Management Plan ("201 Plan")*	June 1980
PaDEP	*The State Water Plan/Sub-basin 18/Lower Allegheny River*	July 1982
	The State Water Plan/Sub-basin 19/Monongahela River	July 1982
	The State Water Plan/Sub-basin 20/Ohio River	January 1983

2.3.2 Official Sewerage Facilities Plan for Westmoreland County and Its Constituent Municipalities

This 1972 plan presents the results of Westmoreland County's Act 537 planning. The plan was prepared by the Westmoreland County Department of Planning. Similar to Allegheny County's plan, Westmoreland County's plan addressed general wastewater management planning issues and described existing wastewater management conditions and sewerage-related problems in the county.

Recommended sewerage plans were prepared for the 13 watersheds in the county. The plan recommended forming a county-wide sewage authority that would coordinate the implementation of the watershed sewerage plans. According to the plan, in 1970, Trafford Borough and the Level Green area of Penn Township were the only areas of the county connected to the ALCOSAN system. A three year plan was identified for the Level Green area to construct a pump station to transport additional sewage to the ALCOSAN treatment facility. The plan also recommended constructing an interceptor for Cavittsville, crossing Brush Creek into the Borough, that would transport sewage to an existing interceptor that would connect to the ALCOSAN system.

2.3.3 The Sewerage Facilities Plan/Washington County, Pennsylvania

This 1972 plan presents Washington County's Act 537 planning. The plan was prepared by the Washington County Planning Commission. Similar to Allegheny County's and Westmoreland County's Act 537 plans, Washington County's plan addressed general wastewater management planning issues and existing wastewater management conditions and sewerage-related problems in the county.

Sewerage deficiencies in the county were characterized as numerous and worsening unless cooperative programs for improvement were established among all levels of government. The plan recommended forming an inter-municipal authority -- the Washington County Sewer Authority -- that would emphasize developing of watershed wide, instead of individual municipality, systems. Three and ten-year wastewater management plans related to the creating or improving 35 municipal or multi-municipal sewerage districts were recommended. The plan was prepared as a guidance document, with implementation intended to be conducted by individual municipalities in the county.

The plan recommended that Upper Robinson Run sewerage district (McDonald Borough, Midway Borough, Cecil Township, Mt. Pleasant Township, Smith Township, and Robinson Township) connect to the ALCOSAN system at the boundary between Allegheny and

Washington Counties. However, the plan stated that ALCOSAN did not intend to increase the capacity to the district because ALCOSAN's system was already over capacity at the time. The second-best alternative identified in the plan for the Upper Robinson Run District was a joint project of the six municipalities with a single treatment plant located below McDonald in South Fayette Township. No other county sewerage districts' plans recommended connecting to the ALCOSAN system.

2.3.4 Short Range Program of Sewer and Water Facility Improvements

This 1974 report prepared by SPRPC sets forth a short-range program for sewer and water facilities in the six-county (Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland) southwestern Pennsylvania region during the 5-year periods 1974 through 1978. The report summarized SPRPC's responsibilities in evaluating proposed water and sewer projects as authorized under the Demonstration Cities and Metropolitan Government Act of 1966 and the Intergovernmental Cooperation Act of 1968. Water and sewer projects that were eligible for federal grants and that had been reviewed and endorsed by SPRPC were identified for the short-range program.

2.3.5 Comprehensive Water-quality Management Plan/Southwestern Pennsylvania Region/Study Area 9/Plans and Choices

This 1978 plan presents a summary of the planning for PaDEP's Comprehensive Water-quality Management Program (COWAMP) for the southwestern Pennsylvania area. The plan was prepared by SPRPC. The COWAMP was initiated by PaDEP in response to Pennsylvania's Clean Streams Law and Section 208 of the federal Water Pollution Control Act Amendments of 1972 and 1977. The goal of the COWAMP/208 program was to develop a viable plan for statewide water-quality management that was *implementable, environmentally sensitive, and economically feasible*[2]. The state was divided into nine planning areas for the program, with a separate plan for each area. The southwestern Pennsylvania area was identified as Study Area 9 and comprised Allegheny, Armstrong, Beaver, Butler, Washington, Westmoreland, Fayette, Greene, and Indiana counties. Recommendations for managing wastewater were prepared for each of the nine counties in the study area. A summary finding of the study was that Allegheny, Beaver, Butler, and Washington counties had the greater part of their future wastewater management capacity requirements in place or under construction and that Armstrong, Fayette, Indiana, and Westmoreland Counties would require large-capacity additions to treat future wastewater flows.

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[2] PaDEP. October 1978. *Comprehensive Water-quality Management Plan/Southwestern Pennsylvania Region/Study Area 9/Plans and Choices*, page 1. Prepared by Southwestern Pennsylvania Regional Planning Commission. Pittsburgh, Pennsylvania.

2.3.6 Comprehensive Water-quality Management Plan/Ohio Valley Study Area/ Area 9

This 1979 document presents the procedures and findings of PaDEP's COWAMP/208 planning for Study Area 9, which was is also referred to as the Ohio Valley Study Area. Through a series of agreements, SPRPC was responsible for the public participation program in the entire region, and PaDEP was responsible for preparing the technical elements of the plan. PaDEP retained Green International, Inc., of Sewickley, Pennsylvania, as the program's engineering consultant. The plan addressed the following water-quality management issues (PaDEP 1979).[3]

- *Identification of the present status and results of water-quality management activities in the area*
- *Projection of future conditions*
- *Establishment of water-quality management activities that must be undertaken in the future*
- *Specification of entities responsible for carrying out the activities*
- *Development of costs for carrying out the activities*
- *Identification of constraints that might inhibit implementing the activities in a timely manner*

One element of the COWAMP/208 planning study consisted of identifying water-quality problems in the study area by watershed. Abatement procedures then were recommended for each watershed. ALCOSAN was referenced in the recommended abatement procedures for the following watersheds:

- **Watershed 19A (Turtle Creek Segment)**. Sewage from areas with on-lot disposal problems was recommended to be conveyed to the following facilities: Murrysville (Penn Township, Westmoreland County), Penn Level Green (North Huntingdon Township, Westmoreland County), Western Westmoreland (North Huntingdon Township, Westmoreland County), Jeannette (Hempfield Township, Westmoreland County), Holiday Park (Plum Boro, Allegheny County), Gascola (Penn Hills Township, Allegheny County), and ALCOSAN.

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[3] PaDEP. October 1979. *Comprehensive Water-quality Management Plan/Ohio Valley Study Area/Study Area 9/Chapter XIII/Recommended Water-quality Management Plan*, page XIII-1. Prepared by Green International, Inc. Sewickley, Pennsylvania.

- **Watershed 20F (Tributaries of Chartiers Creek [Source to Millers Run, except Little Chartiers Creek])**. An upgrade of the Brush Run (Peters Township, Washington County) facility was recommended. In addition, sewage from surrounding problem areas was recommended to be conveyed to the following other facilities: Washington (Chartiers Township, Washington County), Canonsburg (Cecil Township, Washington County), Donaldsons Crossroads (Cecil Township, Washington County), and ALCOSAN (areas recommended to be connected to ALCOSAN were in Collier and South Fayette townships).

- **Watershed 20G (Lowries Run)**. Sewage inadequately treated at the Thompson Terrace facility (in Franklin Park Boro), in addition to sewage from other problem areas, was recommended to be conveyed to ALCOSAN's facility. Other recommendations included naming the watershed a high priority for an urban runoff study, meeting best available technology (BAT) requirements for industrial wastewaters, and increasing the capacity of the ALCOSAN Lowries Run interceptor.

The analysis of municipal wastewater impacts on water-quality in the study area led to identification of apparent best alternative recommendations for a regional treatment facility. The recommendations were based on comparisons of quantitative criteria, including cost-effectiveness, for achieving water-quality standards. For the ALCOSAN service area, the Ottawa Hills (O'Hara Township), Chapel Highlands (Indiana Township), Dorsey Manor (O'Hara Township), Longvue (Ross and McCandless townships), Kings Ridge (Franklin Park Boro), and Thompson Terrace (Franklin Park Boro) wastewater treatment facilities were recommended to be abandoned between 1980 and 1985, The respective service areas were recommended to be connected to the ALCOSAN system.

Additional capacity also was recommended for treating urban runoff from some combined sewer flows in the study area. In particular, Saw Mill Run was identified as the single case in the study area where water-quality standards were violated because of urban runoff. Other priority areas in the ALCOSAN service area recommended for further urban runoff study were Shaler Township (Pine Creek), McKees Rocks (Chartiers Creek), Emsworth -- Ohio Township (Lowries Run), Mt. Oliver -- Pittsburgh (Becks Run), Avalon/Bellevue -- Pittsburgh (Spruce/Jacks Run), Millvale -- Ross Township (Girtys Run), Sharpsburg -- O'Hara Township (Guyasuta Run), West Mifflin (Streets Run), East Pittsburgh -- Turtle Creek (Turtle Creek), and Fox Chapel (Squaw Run).

Zero growth was projected for industries in the study area for the planning period. In fact, economic activity for certain major installations was predicted to decline during the planning period.

With regard to residues, the potential for a combined management program for both municipal water and sewer sludges and industrial residues was recommended for evaluation jointly by the *ALCOSAN 201 Facilities Planning Study* and the continuation of the *Allegheny County Industrial Residue Study.*

2.3.7 Allegheny County Sanitary Authority Sludge Management Plan

This 1980 plan presents the findings of a federal Act 201 facility planning study that was conducted to address problems associated with sludge handling and disposal at the ALCOSAN treatment facility, which had been upgraded to secondary treatment between 1970 and 1972. Four major problems were associated with sludge handling and disposal processes at the time of the study: 1) odor, 2) energy consumption, 3) unreliability, and 4) operational inflexibility. The recommended improvement plan for the facility consisted of eight individual projects and was estimated to cost approximately $51 million in 1980 constant dollars. An interim sludge handling and disposal plan was also presented in the plan.

In addition to the engineering analyses related to improving the sludge handling and disposal processes at the facility, a general analysis of the wastewater management planning for physical features; population, employment, and land use; wastewater flow volumes; and institutional conditions was conducted for the ALCOSAN service area.

2.3.8 The State Water Plan (Subbasins 18, 19, and 20)

These 1982 and 1983 plans present water resources management policies developed by PaDEP in response to a directive from the Pennsylvania General Assembly. The State Water Plan was developed as a management tool to guide the "conservation, development, and administration of the Commonwealth's water and related land resources on a comprehensive and coordinated basis" (PaDEP 1982)[4]. For this planning effort, the state was divided into 20 subbasins, with a separate plan prepared for each subbasin. The relevant subbasins for the ALCOSAN Act 537 plan are Subbasin 18 (Lower Allegheny River), Subbasin 19 (Monongahela River), and Subbasin 20 (Ohio River).

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[4] PaDEP. July 1982. *The State Water Plan/Subbasin 18/Lower Allegheny River.* Harrisburg, Pennsylvania.

SECTION 2
Wastewater Planning

Water-policy issues addressed in the plan were water-quality, flood-damage reduction, water supply, water-related outdoor recreation, wild and scenic rivers, and navigation. Goals and objectives were established for each of the policy issues; an assessment of each policy issue for the individual subbasins was conducted; and problems and solution alternatives for each policy issue assessed were identified. Summaries of the water-quality-related issues identified in the plans for Subbasins 18, 19, and 20 are presented below.

Subbasin 18 (Lower Allegheny River)

Acid mine drainage and nutrient enrichment caused by inadequately treated municipal and industrial waste discharges were the major water-quality problems identified in Subbasin 18. More detailed water-quality assessments were presented for each watershed in the subbasin. Projects that were under way or planned at the time of the study were discussed with regard to water-quality improvement. PaDEP's COWAMP/208 plan was referenced for recommendations for water-quality management solutions.

Subbasin 19 (Monongahela River)

Water-quality was identified as a critical problem in Sub-basin 19. According to the plan, mine acid drainage had been significantly reduced; however, total dissolved solids (TDS) and sulfates were documented as exceeding standards during periods of low flow. Augmenting stream flow from storage facilities during periods of low flow was recommended for the general water-quality problems.

The following additional general water-quality problems were identified in the subbasin (detailed water-quality assessments were presented by watershed in the subbasin):

- Untreated or inadequately treated municipal and industrial discharges
- Urban stream drainage, including combined sewer flows
- A variety of nonpoint sources, including erosion, agricultural land runoff, feedlot runoff, and de-icing activities
- Thermal pollution
- Landfill leachate
- Excessive mineral concentrations in surface and groundwaters.

As with the plan for Subbasin 18, projects that were under way or planned at the time of the study were discussed with regard to water-quality improvement impacts and PaDEP's COWAMP/208 plan was referenced for recommendations for water-quality management solutions.

Subbasin 20 (Ohio River)

General surface water-quality in Subbasin 20 was reported to be primarily affected by acid mine drainage, although municipal and industrial wastes also were identified as causing some degradation. Erosion and sedimentation rates, in comparison to other subbasins, were reported to be high. Detailed water-quality assessments were presented for each watershed in the subbasin.

As with the plans for Subbasins 18 and 19, projects that were under way or planned at the time of the study were discussed with regard to water-quality improvement, PaDEP's COWAMP/208 plan was referenced for recommendations for water-quality management solutions.

2.3.9 Implementation of Service Area Recommendations

A review of previous wastewater plans revealed several recommended modifications to ALCOSAN's service area during the period covered by the plans (1970 to 1983). Modifications recommended for ALCOSAN's service area that are in the reviewed planning documents and actions following the recommendations are summarized in Table 2.2. Figure 2-1 shows areas that were recommended for inclusion in ALCOSAN's service area and areas that were subsequently added to the service area on the basis of recommendations in the planning documents.

Table 2.2
Recommended ALCOSAN Service Area Modifications (1970 to 1983)

Year	Planning Study Document	Recommended ALCOSAN Service Area Modification	Action on Recommendation
1970	*Official Sewerage Facilities Plan for Westmoreland County and Its Constituent Municipalities*	A pump station was recommended for the Level Green area of Penn Township to transport additional sewage to ALCOSAN's facility; an interceptor was recommended to be constructed to connect areas in Cavittsville to the ALCOSAN system.	Additional sewage from the Level Green area of Penn Township and sewage from Cavittsville was eventually conveyed to ALCOSAN's facility.
1970	*Comprehensive Sewerage Needs Plan 1970-2000/Allegheny County, Pennsylvania*	Parts of Franklin Park Borough, McCandless Township, Bethel Park Borough, Collier Township, and North Fayette were recommended for inclusion in the ALCOSAN system	All recommended areas, except McCandless Township, were incorporated into ALCOSAN's system. The McCandless Township area is currently served by treatment plants owned by the McCandless Township Sanitary Authority.
1972	*The Sewerage Facilities Plan/Washington County, Pennsylvania*	Municipalities in the Upper Robinson Run sewerage district (McDonald Borough, Midway Borough, Cecil Township, Mt. Pleasant Township, Smith Township, and Robinson Township) were recommended to be connected to the ALCOSAN system; according to the plan; however, ALCOSAN did not intend to provide capacity to the district.	McDonald Borough was incorporated into ALCOSAN's system.
1979	*Comprehensive Water-quality Management Plan/Ohio Valley Study Area/Study Area*	Ottawa Hills (O'Hara Township), Chapel Highlands (Indiana Township), Dorsey Manor (O'Hara Township), Longvue #2 (Ross and McCandless Townships), Kings Ridge (Franklin Park Boro), and Thompson Terrace (Franklin Park Boro) wastewater treatment facilities were recommended to be abandoned, with accompanying service areas recommended to be connected to the ALCOSAN system.	The Ottawa Hills (O'Hara Township) and Chapel Highlands facilities were abandoned and the Dorsey Manor (also O'Hara Township) facility was converted to a pump station; the Kings Ridge (Franklin Park Boro) and Thompson Terrace (Ohio Township) facilities were abandoned; areas served by these facilities were incorporated into ALCOSAN's system.

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Appendix A-22-b

Map Source: ALCOSAN Combined Sewer Overflow Program

FEET
0 4000 8000 12000 16000 24000 32000

MILES
0 1 2 3 4 6 8

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

Legend

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Hydrologic Features
- Area recommended for incorporation into ALCOSAN system in previous wastewater management plans but not incorporated
- Area recommended for incorporation or expansion into ALCOSAN system in previous wastewater management plans and subsequently incorporated or expanded

CDM CH2MHILL EPM TEAM ALCOSAN

Camp Dresser & McKee

Figure 2-1
Current ALCOSAN Service Area and Recommended Service Area Modifications From Previous Wastewater Management Plans

SECTION 2
Wastewater Planning

2.4 City and County Comprehensive Planning (ACT 247)

2.4.1 Introduction to Act 247

Act 247, the Municipalities Planning Code in Pennsylvania, gives local governing bodies the power to develop plans and land-use controls to regulate development in their boundaries. Under the code, municipalities are encouraged to prepare comprehensive plans, as a first step in the planning process. By law, the plans must contain several components, which include a statement of community development objectives, a land-use plan, a transportation plan, a community facilities plan, and a housing plan. In addition, comprehensive plans must address the interrelationships between plan components and contain a statement about the relationship of the plan to the surrounding municipalities.

The plan also must present short-range and long-range implementation strategies. Although the plans are strongly recommended under the Pennsylvania planning code, local governing bodies are not required to prepare the plans. Many counties, cities and municipalities across the state prepared comprehensive plans in the 1960 and 1970 when federal funding was widely available; many of these plans were never updated. Many other counties, cities, and local governing bodies never prepared comprehensive plans, choosing to prepare land-control ordinances without the guidance offered by the comprehensive planning process. ACPD and the City of Pittsburgh Planning Department are both presently preparing comprehensive plans.

2.4.2 Allegheny County Planning Department Comprehensive Plan

PaDEP has asked ALCOSAN to coordinate their Act 537 with the comprehensive planning effort under way by ACPD. The ACPD's plan is in the early stages of development; much of the work performed to date has been in the preparation of graphically based soils information, land use/land cover, and zoning districts. The ACPD retained Chester Environmental to conduct a countywide study of the water supply under the community facilities portion of the plan. ACPD anticipates preparing a comprehensive sewage component after ALCOSAN completes it's Act 537 plan.

2.4.3 City of Pittsburgh Comprehensive Plan (working draft), Oct., 1993.

In October 1993, the City's Department of City Planning published a working draft of their comprehensive plan. The working draft solidifies the land use and development directives from various separate reports including: the *Six Year Development Program*, the *Long Range General Land Use Plan*, the *Comprehensive Housing Affordability Study*, and the *Plan for the Pittsburgh Riverfronts*. The plan details current City policies and develops policies to effectuate the City's development goals and objectives.

SECTION 2
Wastewater Planning

The long-range general land use plan is the framework for zoning and land use decisions. The plan guides public investment policy and is reflected in the City's capital budget. Recognizing that the City is a mature urban area, the major goals of the plan are to enhance the quality of life for City residents by preserving and enhancing existing development and guiding the reuse of the land and structures. Major development areas are anticipated in the downtown and Oakland areas of the City and along the 35 miles of riverfront.

Consistent with these development goals is the preservation of the existing infrastructure. The capability of the existing infrastructure to handle anticipated growth is central to maintaining a positive climate for economic development. ALCOSAN's Act 537 plan is being prepared to respond to the need for adequate wastewater collection and treatment facilities to assist the City in satisfying its major development goals, which include:

- Maximizing opportunities for riverfront usage in accordance with the Riverfront Plan
- Preserving land for manufacturing uses to maintain a diverse economic base, and preserve the City's housing stock
- Coordinating neighborhood commercial districts with adjacent neighborhoods
- Enhancing commercial opportunities in the Golden Triangle
- Providing for adequate supply and variety of open spaces and institutional services
- Maintaining and enhancing a safe and efficient transportation system.

2.4.4 Allegheny County Planning Department Riverfront Policy Plan, April 1993

The Allegheny County riverfront policy plan completed in April 1993, incorporated the riverfront development concepts originally presented in the City's riverfront plan and addressed the remainder of the riverfront land in Allegheny County. To accomplish the three policy goals of protecting natural resources, promoting development and coordinating public facilities, and providing for river access, the County's riverfront policy plan includes a riverfront policy, a riverfront development and access plan, and an implementation action plan.

The riverfront development and access plan identifies under-used or vacant land totaling 2,700 acres, with great potential for development. The plan calls for the land to be marketed with municipal cooperation between Allegheny County and the home municipality of the site. To assist

with the development of the sites, the plan proposes instituting a coordinated permit-approval process.

One element of the process is to develop a system for monitoring of public facility capacity. When established, the system would ensure that capacity is available in the appropriate public facilities to accommodate the proposed development and would provide a mechanism for establishing where public funding is warranted. If public facilities are not available to serve the proposed development, the project would be postponed until the necessary improvements are made to provide the needed capacity. This system would monitor sewer and water systems as well as roads and bridges.

ALCOSAN's efforts to enlarge its treatment facility to accommodate the growth expected from its service area is in complete agreement with the County's riverfront policy plan. The proposed plant expansion is based on population projections for the region and should be capable of providing the anticipated demand for the treatment facility until the year 2015.

2.5 ALCOSAN IMPROVEMENTS NOT INCLUDED IN THE 1970 537 PLAN

Major improvements to the ALCOSAN WWTP the ALCOSAN interceptor system that have occurred since the completion of the 1970 Act 537 Plan are summarized below.

2.5.1 Treatment Plant[5]

The ALCOSAN WWTP was placed on line as a primary treatment facility in 1959 with an initial capacity of 150 mgd. The facility was upgraded to secondary treatment in 1973. A number of modifications to the process equipment have been made since the 1973 secondary treatment project, primarily solids management equipment.

Lime Slurry System Modifications (1979)

Lime slaking and slurrying facilities were added to the plant in 1979. The slurry was used to condition sludge for dewatering in the sludge dewatering vacuum filters. The vacuum filters and the slurry system were subsequently removed from service.

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[5] Information concerning improvements to the ALCOSAN WWTP that have occurred subsequent to the Allegheny County Act 537 Plan (1970) has been excerpted from the Allegheny County Sanitary Authority ALCOSAN Wastewater Treatment Plant Facility Update Report prepared by SE Technologies, Inc. in 1992.

Belt Filter Presses (1981 - 1988)

The 1972 secondary treatment project included installing 10 vacuum filters for sludge dewatering. The vacuum filters were gradually replaced by 10 belt filter presses. Three sludge pumps and polymer pumps were installed in conjunction with the belt filter presses.

Multiple Hearth Incinerators (1983 - 1985)

A Zimpro multiple-hearth incineration system was installed to thermally destruct part of the dewatered sludges. The system consisted of one multiple-hearth furnaces, an external afterburner, heat-recovery system, and air pollution control equipment. The system was taken out of service in 1993 because the equipment failed. The incinerator will be converted to a fluidized bed unit to provide additional capacity to meet design-year demands.

Effluent Defoaming System (1984)

The ALCOSAN WWTP had foaming problems on the Ohio River downstream of its discharge since the start up of the secondary treatment process train in 1973. After taking interim steps, a 6,000- gallon fiberglass storage tank and chemical feed pump system was completed. Defoaming chemicals are fed to the plant outfall downstream of the chlorine contact basin.

Effluent Flushing Water and Chlorine Building (1984 - 1986)

Improvements were made to the high-pressure effluent flushing water system in the effluent flushing water and chlorination building. Four high-pressure 3,400 gallons per minute (gpm) flushing water pumps were installed and other modifications were made to the system.

Lime Stabilization and Loading Facility (1988)

The lime stabilization and loading facility was constructed in 1988. Thirty to 100 percent of the dewatered sludge is conveyed to lime mixers, where pulverized pebble lime is mixed into the sludge for stabilization. The sludge/lime mixture is loaded into trucks for transport to land application or land-disposal sites.

Potassium Permanganate System (1989)

A potassium permanganate feed system was added to control sludge dewatering odor.

Dewatering Building Odor Control (1990)

An odor control system for the dewatering building and lime mixing room was installed in 1990. Exhaust air from the dewatering building undergoes two-stage treatment consisting of caustic solution scrubbing and carbon adsorption. Air from the lime mixing room and truck loading dock undergoes wet particulate removal and carbon adsorption. Hydrogen sulfide is removed in the caustic scrubbers. Additional malodorous compounds are adsorbed in the carbon beds. The carbon adsorbers can be regenerated using caustic and water baths.

Main Pump Station Modifications (1991 - 1992)

The main pump station consists of six centrifugal pumps arrayed radially around a circular wet-well. Three pumps (Pumps 1, 2, and 4) were replaced in 1991 with larger capacity units (66,000 gpm) at 68 ft total dynamic head (TDH). The remaining three pumps were mechanically rehabilitated and their capacities were increased to 95,200 gpm at 56 ft. TDH.

Residuals Disposal Project (Operational 1994)

The residuals disposal project encompasses a number of interrelated projects for disposing of sludge, scum, grit, and screenings. The centerpiece of the project is the incineration and energy-recovery system. The system includes thermal dewatering units, two fluidized-bed incinerators with external afterburners, waste-heat recovery, and power generation. Emission controls include a multi-clone cyclone, a venturi scrubber, and a tray tower scrubber. The residuals disposal project also includes grit, screenings, scum, and grease collection systems that convey the materials to the incinerators. Odor control facilities were added to the rack and chlorination building, truck loading garage, and grit handling building. Exhaust air from these areas is discharged to the wetwell of the main pump station, from which the air is used as combustion air in the incinerators and/or afterburners

2.5.2 Interceptor System Improvements

Penn Hills/ALCOSAN Connection (1994 - 1995)

ALCOSAN agreed to accept flows generated from the Municipality of Penn Hills. The quantity of average daily flow requested to be discharged by the Municipality of Penn Hills Township to the ALCOSAN interceptor system is 4.58 mgd. Wastewater from Penn Hills flows to the Monongahela interceptor and the Allegheny interceptor. The additional flow did not require modifying the Monongahela Interceptor. The Allegheny interceptor was extended to accommodate the conveyance of flows from Penn Hills. The project modified the Allegheny River interceptor, including reversing the direction of flow between the Montrose and Verona

pump stations; installing 5,800 linear feet of gravity sewer and force main from the Verona pump station to a new pump station at Sandy Creek Road; and installing 16,500 linear feet of gravity sewer and force main from the new Sandy Creek pump station to the Allegheny River interceptor at Washington Boulevard. Also constructed was a 16-inch ductile iron force main from the Verona pump station to a point adjacent to the Quigley Run. From Quigley Run to the new Sandy Creek pump station, the gravity main is constructed of 27-inch reinforced concrete pipe. The alignment of this segment of the interceptor parallels the CONRAIL railroad tracks.

The new Sandy Creek pump station connects with existing manhole A-42 at existing ALCOSAN structure A-42. Approximately 9,100 feet of 42-inch gravity sewer were installed upstream of structure A-42 to a point just below the Ryan's Run tributary to the Allegheny River near Nadine Road in Penn Hills. Approximately 7,400 feet of 30-inch ductile iron force main were installed from this point to the Sandy Creek pump station.[6] The reversal of flow direction between the Montrose and Verona pump stations decreased the flow conveyed in the upper end of the Allegheny interceptor, which parallels the north shore of the Allegheny River.

Saw Mill Run Parallel Interceptor Extension (1996)

The wet-weather flows generated in the Saw Mill Run watershed exceed the capacity of the Saw Mill Run Interceptor. ALCOSAN has embarked on a project to construct a parallel relief interceptor to the Saw Mill Run interceptor. Additional information may be obtained in Section 3.2 of this 537 Plan.

Montrose Pump Station (1980)

The Montrose pump station serves the Montrose and Powers Run areas of O'Hara Township. The station pumps the flow from these areas to discharge into the Upper Allegheny interceptor. The station is equipped with two 1,350-gpm variable frequency drive pumps.

Ella Street Pumping Station (1979)

The Ella Street pumping station is in McKees Rocks Borough. The pumps are owned and operated by ALCOSAN; however, the pumping station is owned by the borough. The station is equipped with two 1,400-gpm pumps. Dry-weather flows are handled by one pump. The second pump operates during high-flow periods.

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[6] Source: Allegheny River Interceptor Extension, Project No. S-303: Part II - Water-quality Management Permit Application (February, 1994) prepared by Killam Associates, DLA Division, Warrensdale, Pa.

2.6 Anticipated Planning in Allegheny County

PaDEP has not identified any municipalities that it anticipates will be required to complete 537 plans in the near future. Plans that are under development or under review by PaDEP are listed in Table 2.3

Most municipalities that are in the current ALCOSAN service area accepted the county-wide 537 plan of 1970 as their municipal plan. Four municipalities have plans that predate the county plan. A number of municipalities have subsequently modified their plans to reflect current conditions. The dates of existing municipal plans are provided on Table 2.4, as based on information provided in the municipal Chapter 94 reports.

Table 2.3
Status of Current Municipal Act 537 Planning

Municipality	Watershed	Date	Status
Fox Chapel Township	Little Pine Creek	1993	Under review
Indiana Township	Little Pine Creek	1993	Under review
O'Hara	East Little Pine Creek	1993	Under review
Penn Hills	Volk STP	1993	Partially approved, revisions being prepared
Plum	Plum Creek	1989	Under development
Shaler	Little Pine Creek	1993	Under review

Table 2.4
Existing 537 Plans

Municipality	Date
Current ALCOSAN Municipalities	
Aspinwall Borough	1970
Avalon Borough	1970
Baldwin Borough	1970
Baldwin Township	1970
Bellevue Borough	1970
Ben Avon Borough	1970
Ben Avon Heights Borough	1970
Bethel Park Municipality	1970
Blawnox Borough	1970
Braddock Borough	1970
Braddock Hills Borough	1970
Brentwood Borough	1970
Bridgeville Borough	1970
Carnegie Borough	1970
Castle Shannon Borough	1970
Chalfant Borough	1970
Churchill Borough	1975
Collier Borough	1970
Crafton Borough	1970
Dormont Borough	1970
East McKeesport Borough	1970
East Pittsburgh Borough	1970
Edgewood Borough	1970
Emsworth Borough	1970
Etna Borough	1970
Forest Hills Borough	1970
Fox Chapel Borough	1993
Franklin Park Borough	1988
Girtys Run Joint S.A.	After 1970[7]
Greentree Borough	1968
Heidelberg Borough	1970
Homestead Borough	1970
Indiana Township	1993

[7] Formed after 1970.

Table 2.4
Existing 537 Plans

Municipality	Date
Ingram Borough	1970
Kennedy Township	1970
Kilbuck Township	1970
McCandless Township	1970
McDonald Borough	1970
McKees Rocks Borough	1970
Millvale Borough	1970
Monroeville Municipality	1970
Mt. Lebanon Municipality	1969
Mt. Oliver Borough	1970
Munhall Borough	1970
Neville Township	1970
North Braddock Borough	1970
North Fayette Township	1970
North Versailles Township	1970
Oakdale Borough	1970
O'Hara Township	1993
Ohio Township	1989
Penn Township	1966
Penn Hills Municipality	1993
Peters Township	1970
Pitcairn Borough	1970
Pittsburgh City	1970
Plum Borough	1989
Rankin Borough	1970
Reserve Township	1970
Robinson Township	1985
Ross Township	1970
Rosslyn Farms Borough	1970
Scott Township	1970
Shaler Township	1993
Sharpsburg Borough	1970
South Fayette-Robinson Run	1970
South Fayette-Chartiers Creek	1970
Stowe Township	1970
Swissvale Borough	1970
Thornburg Borough	1970

Table 2.4
Existing 537 Plans

Municipality	Date
Trafford Borough	1970
Turtle Creek Borough	1970
Upper Saint Clair Township	1970
Verona Borough	1970
Wall Borough	1970
West Homestead Borough	1970
West Mifflin Borough	1970
West View Borough	1970
Western Westmoreland MU	1970
Whitaker Borough	1970
Whitehall Borough	1967
Wilkins Township	1970
Wilkinsburg Borough	1969
Wilmerding Borough	1970
PaDEP Designated Municipalities Allegheny County	
Dravosburg Borough	1970
Franklin Park Township	1970
Glenfield Borough	1970
McCandless Borough	No Record
Oakmont Borough	1970
Ohio Township	1970
Penn Hills Borough	1993
Plum Borough	No Record
Sewickley Hills Township	1970
PaDEP Designated Study Areas Washington County	
Cecil Township	1982
Midway Borough	1989
Mt. Pleasant Township	1989
Smith Township	1989
Robinson Township	1989

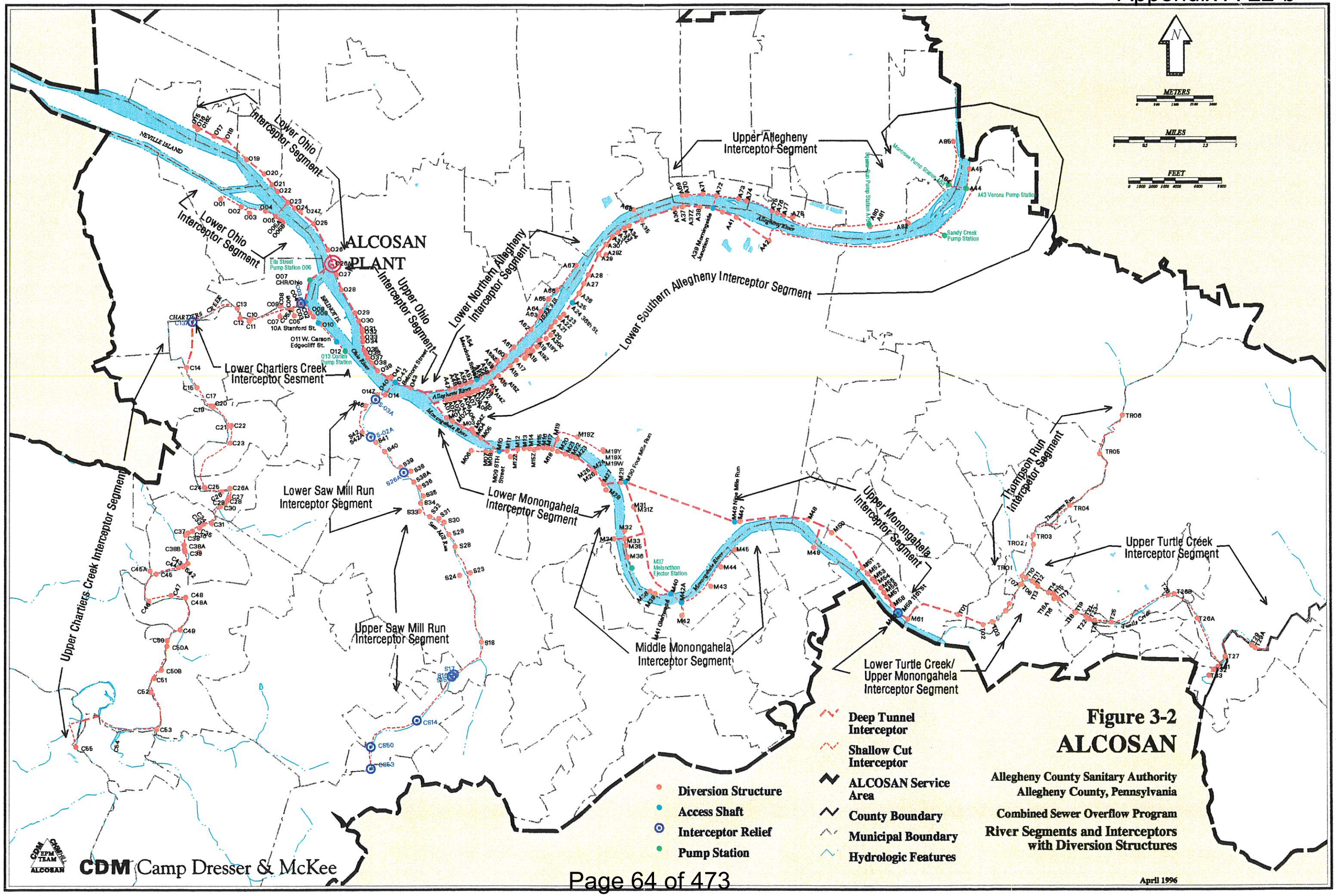
SECTION 3
Current Conditions

3.1 INTRODUCTION

In this section, the existing ALCOSAN interceptor system and treatment plant are described. The descriptions include the physical configuration of the interceptors and the treatment plant, current capacities, management practices and a description of problems with the current facilities.

Interceptors and major trunk sewers which discharge to the ALCOSAN interceptor system are described. Problems with municipal collection systems within the current ALCOSAN service area are also described in this section. Included are those municipalities which are currently developing or implementing a Corrective Action Plan (CAP) as well as other municipalities with wastewater management problems which have been identified by PaDEP or the Allegheny County Department of Health.

The current wastewater management situations in those suburban municipalities which are located within the study areas designated by PaDEP for consideration in this 537 Plan are addressed. This analysis includes unsewered areas which are experiencing failed on-lot systems or growth which would outpace the assimilative capacities of on-lot systems, as well as those sewered municipalities with inadequate treatment plants.


ALCOSAN PLANT
Upper Allegheny Interceptor Segment
Lower Ohio Interceptor Segment
Lower Ohio Interceptor Segment
Lower Ohio Interceptor Segment
Upper Ohio Interceptor Segment
Lower Northern Allegheny Interceptor Segment
Lower Southern Allegheny Interceptor Segment
Lower Chartiers Creek Interceptor Sesment
Upper Chartiers Creek Interceptor Segment
Lower Saw Mill Run Interceptor Segment
Upper Saw Mill Run Interceptor Segment
Lower Monongahela Interceptor Segment
Middle Monongahela Interceptor Segment
Upper Monongahela Interceptor Segment
Lower Turtle Creek/ Upper Monongahela Interceptor Segment
Thompson Run Interceptor Segment
Upper Turtle Creek Interceptor Segment
Ella Street Pump Station 006
CHR/Ohio
10A Stanford St.
011 W. Carson Edgecliff St.
013 Cortez Pump Station
Montrose Pump Station
Sandy Creek Pump Station
A43 Verona Pump Station
Melancthon Elector Station
Diversion Structure
Access Shaft
Interceptor Relief
Pump Station
Deep Tunnel Interceptor
Shallow Cut Interceptor
ALCOSAN Service Area
County Boundary
Municipal Boundary
Hydrologic Features
Figure 3-2
ALCOSAN
Allegheny County Sanitary Authority
Allegheny County, Pennsylvania
Combined Sewer Overflow Program
River Segments and Interceptors with Diversion Structures
April 1996
CDM Camp Dresser & McKee

3.2 ALCOSAN INTERCEPTOR SYSTEM

3.2.1 System Description

The ALCOSAN service area and major interceptors are shown on Figure 3-1. ALCOSAN serves 82 municipalities, and 124 permitted major industries. It serves an area of approximately 310 square miles. The municipalities, and the area of each municipality served by ALCOSAN, are listed in Table 3.1. The total population served by ALCOSAN was approximately 843,000 based on the 1990 block level census data for Allegheny County.

Construction of sewers in Allegheny County began in the 1800s. The sewers were constructed to follow the natural contours of the land and discharged directly to receiving waters. Small systems were developed to serve individual communities. In 1945, the State Department of Health, under authority of the Clean Streams Act of 1937, ordered municipalities and industries to stop pollution of area waterways. One hundred and two municipalities, and 90 industries in Allegheny County were notified of this order. In 1946, 96 of the municipalities and 36 of the industries agreed to participate in a county-wide collection and treatment system.

In 1946, ALCOSAN was chartered to implement a plan for meeting a state mandate for controlling pollution. In 1956, construction of the ALCOSAN interceptor system began, with service agreements from 66 municipalities and 18 industries. The original interceptor design featured 69 miles of intercepting sewers, including 30 miles of tunnels, 260 regulator structures, three pump stations, and three ejector stations. The interceptors, constructed along the Allegheny River, Monongahela River, Ohio River, and Chartiers Creek, served an area of approximately 206 square miles.

Since the original design, ALCOSAN has expanded to include interceptor lines along three major tributaries: Saw Mill Run, Turtle Creek, and Thompson Run. A total of 82 municipalities and 124 permitted industries are served by ALCOSAN. The interceptor system is a combination of deep tunnels (20 to 175 feet deep; primarily in the 80- to 100- foot range) and shallow-cut interceptors. ALCOSAN maintains more than 85 miles of interceptor sewers, six pumping stations, 315 regulator structures, 10 access shafts and one ejector station. ALCOSAN is the permittee for three CSO outfalls.

Table 3.1
Municipalities Currently Served by ALCOSAN
Service Population and Acreage

	Municipality	Service Population (1990)	Acres
1	Aspinwall Borough	2,876	193
2	Avalon Borough	5,784	413
3	Baldwin Borough	12,747	2,230
4	Baldwin Township	2,331	323
5	Bellevue Borough	9,015	618
6	Ben Avon Borough	2,088	261
7	Ben Avon Heights Borough	343	97
8	Bethel Park Borough	11,898	2,423
9	Blawnox Borough	1,533	173
10	Braddock Borough	4,675	325
11	Braddock Hills Borough	1,727	574
12	Brentwood Borough	10,468	864
13	Bridgeville Borough	5,314	663
14	Carnegie Borough	8,400	913
15	Castle Shannon Borough	8,525	945
16	North Huntington Township (Cavittsville)	327	391
17	Chalfant Borough	959	101
18	Churchill Borough	3,587	1,068
19	Collier Township	1,844	1,059
20	Crafton Borough	7,070	595
21	Dormont Borough	9,731	457
22	East McKeesport Borough	1,958	185
23	East Pittsburgh Borough	2,115	196
24	Edgewood Borough	3,581	378
25	Emsworth Borough	2,742	358
26	Etna Borough	4,025	436
27	Forest Hills Borough	7,335	998
28	Fox Chapel Borough	4,678	4,273

	Municipality	Service Population (1990)	Acres
29	Franklin Park Borough	2,885	2,014
30	Greentree Borough	4,861	1,310
31	Heidelberg Borough	1,135	148
32	Homestead Borough	4,179	355
33	Indiana Township	525	224
34	Ingram Borough	3,901	279
35	Kennedy Township	4,767	1,684
36	Kilbuck Township	29	43
37	McCandless Township	7,464	1,617
38	McDonald Borough	2,146	308
39	McKees Rocks Borough	7,485	549
40	Millvale Borough	4,003	351
41	Monroeville Municipality	26,343	10,425
42	Mt. Lebanon Municipality	32,887	3,667
43	Mt. Oliver Borough	4,160	217
44	Munhall Borough	13,052	1,445
45	Neville Township	964	601
46	North Braddock Borough	7,036	944
47	North Fayette Township	1,478	638
48	North Versailles Township	2,404	956
49	Oakdale Borough	1,453	232
50	O'Hara Township	7,719	3,357
51	Ohio Township	840	1,562
52	Penn Hills Municipality	2,591	476
53	Penn Township	2,974	1,350
54	Peters Township	--	70
55	Pitcairn Borough	3,888	269
56	Pittsburgh City	358,675	30,415
57	Plum Borough	358	520
58	Rankin Borough	2,345	158
59	Reserve Township	3,277	890
60	Robinson Township	250	950

	Municipality	Service Population (1990)	Acres
61	Ross Township	30,162	7,437
62	Rosslyn Farms Borough	339	233
63	Scott Township	16,840	2,355
64	Shaler Township	27,604	5,992
65	Sharpsburg Borough	3,730	267
66	South Fayette Township	6,845	3,109
67	Stowe Township	7,319	987
68	Swissvale Borough	10,418	711
69	Thornburg Borough	372	151
70	Trafford Borough	2,658	589
71	Turtle Creek Borough	5,413	461
72	Upper St. Clair Township	19,397	6,073
73	Verona Borough	3,154	262
74	Wall Borough	400	156
75	West Homestead Borough	2,124	345
76	West Mifflin Borough	2,724	1,189
77	West View Borough	7,687	642
78	Whitaker Borough	1,412	193
79	Whitehall Borough	13,702	1,939
80	Wilkins Township	5,990	1,241
81	Wilkinsburg Borough	19,334	1,372
82	Wilmerding Borough	1,271	177
		842,645	**125,415**

The interceptor system is shown in Figure 3-2. The main interceptors are:

- Ohio River
- Allegheny River
- Monongahela River

Along the tributaries, the interceptors are:

- Chartiers Creek
- Saw Mill Run
- Thompson Run
- Turtle Creek

SECTION 3
Current Conditions

The majority of ALCOSAN sewered drainage areas have separate sanitary sewer systems. The total drainage area is approximately 310 square miles. Of the total areas, approximately 147 square miles are served by sanitary sewers and 61 square miles are served by combined sewers. Approximately 102 square miles are noncontributing areas (Table 3.2).

Table 3.2
ALCOSAN Service Area
Summary of Combined and Separate Sewershed Areas

Classification	Area in Square Miles
Combined Sewer	61
Separate Sewer	147
Noncontributing	102
Total	310

All of the interceptor segments receive flows from both combined- and separate-sewer municipal collection systems. The combined and separate sewershed areas are shown in Table 3.3 by type of sewershed.

Table 3.3
ALCOSAN Interceptors and Contributing Sewersheds by Type

Upstream Diversion Structure (from)	Downstream Diversion Structure (to)	Type(s) of Contributing Sewersheds	Sewershed Acres	%
Allegheny Interceptor				
A85	A78	Sanitary	1,405	3.9%
A78	O43	Combined and Sanitary	34,863	96.1%
			36,268	100.0%
Chartiers				
C55	C44-06	Sanitary	20,081	73.1%
C44-06	O7	Combined and Sanitary	7,391	26.9%
			27,472	100.0%
Monongahela Interceptor				
		Sanitary		0.0%
M61		Combined and Sanitary	20,090	100.0%
			20,090	100.0%
Ohio Interceptor				
O15	O18	Sanitary	6,953	45.5%
O18	O43	Combined and Sanitary	8,328	54.5%
			15,281	100.0%
Thompson Run Interceptor				
TR06	TR02	Sanitary	3,541	97.7%
TR02	Turtle Creek	Combined and Sanitary	83	2.3%
			3,624	100.0%
Turtle Creek Interceptor				
T33	T26	Sanitary	9,670	50.4%
T26	M61	Combined and Sanitary	9,519	49.6%
			19,189	100.0%

Upstream Diversion Structure (from)	Downstream Diversion Structure (to)	Type(s) of Contributing Sewersheds	Sewershed Acres	%
Saw Mill Run				
SMR200	SMR170	Sanitary	2,155	19.2%
SMR170	O14+	Combined and Sanitary	9,063	80.8%
			11,218	100.0%
Total Interceptors				
A85	A78	Sanitary	43,804	32.9%
A78	O43	Combined and Sanitary	89,338	67.1%
			133,142	**100.0%**

The points above which municipalities are sanitary sewered are shown on Figure 3-3.

Lower Ohio River

The Lower Ohio River segment consists of a deep-tunnel interceptor on the northern bank of the Ohio River and a shallow-cut interceptor on the southern bank. The interceptor on the northern bank runs through Emsworth Borough, Ben Avon Borough, Avalon Borough, Bellevue Borough and the City of Pittsburgh. The interceptor on the southern bank is entirely in Stowe Township.

On the northern bank of the Ohio River, 3.3 miles of deep tunnel convey flow between the Lowries Run control structure (O15) and the treatment plant (O26A). The interceptor enters the plant wet well as a 42-inch diameter pipe at an invert elevation of approximately 652 feet. The pipe diameters range between 30 and 42 inches. Flows to the interceptor enter at structures O15 through O26.

One and three tenths miles of shallow-cut interceptors convey flow on the southern bank of the Ohio River. The diameters range between 8 and 24 inches. Flows to the system enter at structures O1 through O5B, which are in Stowe Township. The interceptor is partially tunneled under the Ohio River just upstream from Neville Island and connects to the deep tunnel on the northern bank between structures O22 and O23.

The water intake for the Westview water treatment plant is located on the southeastern end of Neville Island, downriver from the ALCOSAN Wastewater Treatment Plant and across from the Lower Ohio River Interceptor.

Map Source: ALCOSAN Combined Sewer Overflow Program

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

FEET
0 2000 4000 6000 8000 12000 16000

MILES
0 1 2 3 4

Legend

- Most Upstream Combined Diversion Structures
- Combined Sewer Interceptor
- Separate Sewer Interceptor
- Service Area Boundary
- County Boundary
- Municiple Boundaries
- Primary Roads
- Hydrologic Features

018
A78
A42
TR02
T26
C-44-06
McNeilly Road
ALCOSAN PLANT

OHIO TWP
ROSS TWP
SHALER TWP
HARMAR TWP
FOX CHAPEL BORO
O'HARA TWP
OAKMONT BORO
SPRINGDALE BORO
PLUM BORO
LEPPO TWP
GLENFIELD BORO
KILBUCK TWP
EMSWORTH BORO
BEN AVON BORO
AVALON BORO
BELLEVUE BORO
NEVILLE TWP
NEVILLE ISLAND
WEST VIEW BORO
ETNA BORO
SHARPSBURG BORO
ALLEGHENY BORO
BLAWNOX BORO
FERNDALE BORO
RESERVE TWP
KENNEDY TWP
STOWE TWP
MCKEES ROCKS BORO
NOBLE VALLEY BORO
PENN HILLS TWP
CITY OF PITTSBURGH
INGRAM BORO
CRAFTON BORO
THORNBURG BORO
FENNSBURY VILLAGE BORO
ROSSLYN FARMS BORO
GREENTREE BORO
CARNEGIE BORO
MT OLIVER BORO
WILKINSBURG BORO
CHURCHILL BORO
EDGEWOOD BORO
FOREST HILLS BORO
SWISSVALE BORO
BRADDOCK HILLS BORO
WILKINS TWP
MONROEVILLE BORO
HOMESTEAD BORO
BANKER BORO
BRADDOCK BORO
NORTH BRADDOCK BORO
TURTLE CREEK BORO
PITCAIRN BORO
WEST HOMESTEAD BORO
WHITAKER BORO
EAST PITTSBURGH BORO
WILMERDING BORO
EAST MCKEESPORT BORO
WALL BORO
TRAFFORD BORO
R TWP
SCOTT TWP
HEIDELBERG BORO
DORMONT BORO
MT LEBANON TWP
BALDWIN TWP
BALDWIN BORO
BRENTWOOD BORO
MUNHALL BORO
DUQUESNE CITY
NORTH VERSAILLES TWP
CASTLE SHANNON
BRIDGEVILLE BORO
WHITEHALL BORO
UPPER ST CLAIR TWP
WEST MIFFLIN BORO
DRAVOSBURG BORO
CAVITTSVILLE
WHITE OAK BORO
PLEASANT HILLS BORO
PORT VUE BORO
MCKEESPORT CITY
GLASSPORT BORO
LIBERTY BORO
BETHEL PARK BORO
ALLEGHENY COUNTY

GDM EPM TEAM CH2MHILL ALCOSAN

Camp Dresser & McKee

Figure 3-3
Point of Upstream Combined Interceptor

April 1996

Upper Ohio River

The Upper Ohio River segment consists of a deep-tunnel interceptor on the northern bank of the Ohio River and a shallow-cut and deep-tunnel interceptor on the southern bank. The deep tunnel on the northern bank is in the City of Pittsburgh. The interceptor on the southern bank is in the City of Pittsburgh in the West End area and in McKees Rocks Borough.

On the northern bank, 3 miles of the deep-tunnel interceptor convey flow from the confluence of Allegheny and Monongahela rivers (O43-04) to the treatment plant (O26A).

The upstream end of the Upper Ohio River deep-tunnel interceptor is formed by the confluence of the Allegheny and Monongahela deep-tunnel interceptor segments, which are described below. Pipe diameters of the deep tunnel range between 10 and 10.5 feet. Flows to this segment enter at structures O27 through O43. Structure O42 is the junction of the Saw Mill Run and Upper Ohio River Interceptor segments and is the location of the Belmont Street access shaft.

There is a 0.4-mile-long shallow-cut interceptor on the southern bank of Ohio River. This interceptor conveys flow from the West End section of the City of Pittsburgh just upstream of Brunot Island to the confluence with the Chartiers Creek Interceptor at structure O07. Junction chamber O07 also is an access shaft. Pipe diameters of the shallow-cut segment of the Upper Ohio River Interceptor range between 18 and 24 inches. Flows enter the shallow-cut interceptor at structures O8 through O13. The Corliss pumping station (O12) pumps flows from several wards in the Pittsburgh West End area. A force main approximately 0.64-mile long conveys the flow from the Corliss pumping station to the shallow-cut interceptor.

Approximately 0.82 miles of deep-tunnel interceptor convey flow from the confluence of the Upper Ohio shallow interceptor and the Chartiers Creek deep tunnel to the treatment plant. The deep tunnel crosses under the Ohio River just downstream of Brunot Island. The 54-inch diameter interceptor enters the plant wet well at an invert elevation of approximately 610 feet. Flows to the deep-tunnel segment enter at structure O07. The Upper Ohio River Interceptor enters the plant wet well of the WWTP as a 10.5-foot-diameter pipe with an invert elevation of 618.25 feet.

Lower Allegheny River

The Lower Allegheny River segment consists of a deep-tunnel interceptor on the southern bank of the Allegheny River and a shallow-cut and deep-tunnel interceptor on the northern bank. The interceptor on the northern bank is in the City of Pittsburgh and Millvale Borough. The interceptor on the southern bank is entirely in the City of Pittsburgh.

On the northern bank of the Allegheny River, approximately 2.1 miles of deep-tunnel interceptor and 1.3 miles of shallow-cut interceptor convey flow from Girty's Run (A67) to the Upper Ohio River Interceptor (located at the confluence of the Allegheny and Monongahela Rivers, O43-02). Flows enter the deep-tunnel part of the interceptor at structures A46 through A62. Flows enter the shallow part of the interceptor at structures A63 through A67. Pipe diameters in the deep tunnel range between 36 and 60 inches. The shallow interceptor has a 36-inch diameter.

On the southern bank of the Allegheny River, approximately 7 miles of deep-tunnel interceptor convey flow from a point just upstream of the Highland Park Bridge near Washington Boulevard (A42) to the confluence with the Monongahela River Interceptor at Point State Park (O43-04). The interceptor crosses under the Allegheny River and intersects with the deep tunnel on the northern bank of the Allegheny River near Three Rivers Stadium and becomes the Upper Ohio River Interceptor. Pipe diameters in the southern bank range between 48 and 72 inches. Flows to the interceptor enter at structures A1 through A42.

Three access shafts are located along the deep-tunnel parts of the Lower Allegheny segment. The Mendota Street access shaft (A54) is on the northern bank of the Allegheny River. The remaining two shafts are on the southern bank: the 36th Street access shaft (A24) and the Morningside Junction chamber (A39) where the Upper Allegheny River Interceptor connects to the Lower Allegheny River Interceptor near Six Mile Island.

Upper Allegheny River

The Upper Allegheny River Interceptor segment consists of approximately 5 miles of shallow-cut interceptor and force main primarily on the northern bank of the Allegheny River. A small part of the segment is on the southern bank of the river in Verona Borough. The interceptor is in Sharpsburg Borough, Aspinwall Borough, O'Hara Township, Blawnox Borough, and Verona Borough. Intakes for water treatment plants exist on the Allegheny River in the City of Pittsburgh, Penn Hills, and O'Hara Township.

Flows to the interceptor on the northern bank of the Allegheny River enter at structures A68 through A81. The interceptor crosses under the river near Pine Creek (A68), in Etna Borough, and joins the Lower Allegheny River Interceptor at structure A35 on the southern bank. Flows to structures A69 through A72 in Sharpsburg Borough are conveyed eastward to a deep tunnel and then are conveyed under the river to the Lower Allegheny River Interceptor. The tunnel under the river is downstream of Six Mile Island and connects to the Lower Allegheny River Interceptor at the Morningside Junction Chamber (A39). Flows entering the system at structures A72 through A81 are conveyed westward to the deep tunnel connecting the interceptor to the Lower Allegheny segment. Flows on the shallow-cut southern bank of the river enter the system at structure A45.

At the completion of the Allegheny Interceptor Extension Project, the Montrose pump station discharges to the north shore Allegheny Interceptor. The discharge from the Verona pump station is conveyed to the Sandy Creek pump station. Approximately 2,300 linear feet of 16-inch-diameter ductile-iron force main has been installed between the Verona pump station and a point adjacent to the confluence of Quigley Run at the Allegheny River. Approximately 3,500 feet of 27-inch gravity sewer has been installed between Quigley Run and the Sandy Creek pump station.

The Squaw Run pump station, on the north shore of the Allegheny River, continues to serve O'Hara Township and Blawnox Borough.

Monongahela River

The Monongahela River Interceptor conveys flows from both sides of the river between Point Park in the City of Pittsburgh and Braddock Borough. The interceptor consists of approximately 16.2 miles of both deep-tunnel and shallow-cut interceptor. The part of the Monongahela River Interceptor constructed under Contract 50 is located along the downstream end of Monongahela River from Nine Mile Run to Point State Park. Approximately 5.7 miles of deep-tunnel interceptor and 0.46 miles of shallow-cut interceptor convey the flow from structures M1 through M30 and from M46. Pipe diameters of the deep-tunnel range between 66 and 90 inches. This part of the interceptor is primarily on the northern bank of the river, but crosses to the southern side for a distance in the City of Pittsburgh (between structures M28 and M6).

One part of shallow-cut interceptor conveys flow from the City of Pittsburgh on the northern bank of the river near the Birmingham Bridge. Flows to the shallow interceptor enter the system at structures M19, M19A, M19B. The interceptor crosses under the river as a deep-tunnel near the Brimingham Bridge and intersects with the main branch of the Monongahela Interceptor at structure M18. Flows to the part of the interceptor serving the Glenwood area of the city of Pittsburgh and the boroughs of Homestead and West Homestead enter the system at structures M45 through M31. Approximately 2.4 miles of deep-tunnel interceptor and 2.0 miles of shallow-cut interceptor convey the flow from this part of the service area. Pipe diameters range between 12-inch and 48-inch.

A shallow-cut interceptor conveys the flow along the southern bank of the Monongahela River to structure M42A at Streets Run. The interceptor crosses under the river near Glenwood Bridge to a deep-tunnel at structure M41. The deep-tunnel extends from structure M41 to the confluence of the interceptor at structure M30. A segment of deep tunnel conveys flow from structure M34 at Becks Run in Baldwin Borough, under the river, and to the deep-tunnel between structures M40 and M31. Shallow-cut interceptors convey the flow from the Glenwood and Hazelwood areas of the city of Pittsburgh along the northern bank of the river and connect to the deep-tunnel interceptor.

SECTION 3
Current Conditions

The most upstream part of the Monongahela River Interceptor is primarily on the northern bank of the river. Flows enter the system at structures M46 through M61. Approximately 3.6 miles of deep-tunnel interceptor convey the flow from structure M61 near the border of Braddock Borough and North Braddock Borough to structure M46 at the downstream end of the interceptor. Pipe diameters in this part of the system range between 30-inch and 72-inch. Flows from the southern bank of the river enter at structure M49 at Whitaker Run in Munhall Borough. These flows are conveyed under the river and connect with the main interceptor near structure M50.

At structure M59, an overflow structure controls the hydraulic grade for the upstream Turtle Creek Interceptor. The structure, at 11th Street in Braddock Borough, is designed to submerge a majority of the approximately eight-mile Turtle Creek Interceptor during storm flows. The double-orifice-type overflow structures along Turtle Creek are designed to operate under submerged conditions. The overflow at 11th Street controls the discharge to the Monongahela Interceptor with an adjustable sluice gate at the bottom of the chamber and two fixed orifices at the top of the chamber. The overflow is designed to discharge approximately one third of the flow through the bottom gate and the remaining flow through the top openings. By directing the flow through the top opening in wet-weather, the over flow increases the hydraulic gradient in the Turtle Creek Interceptor.

Five access shafts are located along the Monongahela River Interceptor. The South 8th Street access shaft, structure M9, is on the southern bank of the river at the foot of south 8th Street. The Four Mile Run access shaft, structure M30, is upstream of the river crossing at Four Mile Run. The structure is at the confluence of Glenwood / Homestead Interceptor and the downstream end of the 2-mile interceptor, which conveys flow under the Greenfield area of the city of Pittsburgh. The Nine Mile Run access shaft, structure M46, is near Nine Mile Run at the upstream end of the 2-mile pipe under Greenfield. The fourth access shaft, the Glenwood access shaft, structure M41, is at the downstream end of the deep-tunnel crossing the river near Glenwood Bridge. The fifth access shaft, the 11th Street access shaft, is at structure M59. The shaft is in Braddock Borough and marks the upstream end of the Monongahela River Interceptor.

Turtle Creek

Turtle Creek is one of the largest tributaries of the Monongahela River. Approximately 1.8 miles of deep-tunnel interceptor and 4.9 miles of shallow-cut interceptor convey flow from the basin to the Monongahela River Interceptor. Pipe diameters range from 24 to 54 inches and the interceptor extends to the Borough of Trafford. Flows to the interceptor come from structures T1 through T33.

Flows from the Thompson Run Interceptor enter the Turtle Creek Interceptor at structure T9. Discharge from the Turtle Creek Interceptor enters the Monongahela Interceptor upstream of structure M59. The regulator structures on the Turtle Creek Interceptor operate under controlled submergence and are controlled by structure M59, as described above in the summary of the Monongahela River Interceptor.

Thompson Run

The Thompson Run Interceptor consists of 3.8 miles of shallow-cut interceptor that collects flows from the Turtle Creek Borough, Monroeville Municipality, Churchill Borough, Plum Borough and Wilkins Township. Pipe diameters of the segment range between 24 and 15 inches. Flows from the drainage basin enter the interceptor at structures TR1 through TR6. The confluence of this segment with the Turtle Creek Interceptor occurs at structure T9. ALCOSAN does not own the Thompson Run Interceptor, but maintains it. Turtle Creek, Monroeville, Churchill, and Wilkins Township reimburse ALCOSAN for maintenance costs.

Six diversion structures are in the Thompson Run Interceptor, TR01 through TR06, which are shown in Plate II of the *System Inventory and Characterization Report (SIAC).* Of these, TR03 through TR06 are sanitary sewer overflows (SSOs). The sewersheds tributary to each of the diversion structures are shown and labeled on Plate III of the *SIAC*. The combined and separate sewered areas of the sewershed tributary to each regulator are shown in Table 3.4.

Table 3.4
Breakout of Combined and Sanitary Sewershed
Thompson Run Interceptor

Regulator I.D.	Thompson Run Sewershed	Combined Sewered Area (acres)	Separate Sewered Areas (acres)
TR1	Turtle Creek P.S.	63	22
TR2	Church Street	20	0
TR3	Larimar Ave.	0	309
TR4	Chalfant Ave	0	793
TR5	Eastmont Ave	0	77
TR6	Lick Run	0	2,341
		83	3,541

Chartiers Creek

The Chartiers Creek drainage basin is among the largest basins in Allegheny County. Thirteen and three-tenths miles of shallow-cut interceptor conveys flow from the City of Pittsburgh and several municipalities in southern Allegheny County to the Upper Ohio River deep-tunnel Interceptor. The Chartiers Creek interceptor begins at structure O7, extends along Chartiers Creek, and terminates near the confluence of Millers Run and Chartiers Creek in Bridgeville Borough. Pipe diameters range between 24 and 45 inches. Flows to the Chartiers Creek system enter at structures C1 through C55.

In 1992, the capacity of the Chartiers Creek Interceptor was analyzed. The study assessed the capability of the interceptor to convey existing dry- and wet-weather flows, as well as dry- and wet-weather flows under future build-out scenarios. The study concluded that the existing capacity was adequate for convey existing peak dry-weather flows, however, interceptor surcharges could be expected during existing wet-weather flows and future dry- and wet-weather flows. Two areas that have surcharging and overflow problems during wet- weather are Bridgeville, and the junction of the Chartiers Creek Interceptor with the Ohio River Interceptor.

Saw Mill Run

The Saw Mill Run Interceptor collects discharges from several municipalities and the City of Pittsburgh in south-central Allegheny County. This segment consists of approximately 10.2 miles of shallow-cut interceptor, with pipe diameters ranging between 15 and 48 inches. The downstream end ties in to the Upper Ohio River Interceptor at structure O14 near the West End Bridge; the upstream end terminates in the Borough of Castle Shannon. A parallel relief interceptor runs between structure O14 and Woodruff Street, approximately 2.0 miles upstream of Structure O14.

The Saw Mill Run Interceptor is situated in the Saw Mill Run drainage basin. The basin is approximately 19.5 square miles, consisting primarily of hilly terrain. The basin is approximately seven miles long and varies in width from two to four miles. The Saw Mill Run Interceptor commences at the Ohio River in the West End section of the City of Pittsburgh. From the West End section, the interceptor runs south following the approximate alignment of Saw Mill Run Boulevard (Route 51) and Saw Mill Run to the intersection of Route 88 and Canal Street. At the intersection, the interceptor proceeds southwest, following the approximate alignment of Route 88, to the intersection of Route 88 and Canal Street. From there the interceptor continues along Canal Street to the intersection with Connor Road in the Borough of Castle Shannon. The distance from the Ohio River to Connor Road is approximately 8.13 miles.

The Saw Mill Run Interceptor has a long history of overflowing and flooding. A parallel interceptor was constructed to mitigate some of these problems, yet a number of problems still exist. Construction of additional interceptor relief pipes and storage basin is anticipated for the Saw Mill drainage basin. A plan has been submitted to extend the parallel interceptor along Route 51 (Saw Mill Run Boulevard) to the intersection of Route 88 (Library Road). In addition, the plan recommends replacing the existing sewer along Route 88 from Route 51 to McNeilly Road, rehabilitating the sewer from McNeilly Road to Conner Road, and constructing four storage basins for capturing combined sewer overflows.

ALCOSAN has determined that under wet weather conditions, the flow collected in the Saw Mill Run Interceptor upstream of Woodruff Street reaches peaks such that surcharging and flooding occurs in various segments of the system. In order to determine the magnitude of these conditions, to identify the specific locations where the conditions exist, and to arrive at a solution to alleviate the situation, ALCOSAN conducted an engineering study of the existing interceptor. In addition, ALCOSAN studied the effect of an additional 30.5 cubic feet per second (cfs) of flow at Weyman Street on the existing Saw Mill Run interceptor system. The additional flow resulted from a City of Pittsburgh relief sewer project.

After conducting a thorough study, Chester Environmental concluded that conditions in the existing interceptor under wet-weather flow warranted constructing a parallel relief interceptor. Chester Environmental recommended that the parallel interceptor be built from McNeilly Road to Woodruff Street, approximately 24,500 linear feet, with provisions being made for future storage facilities to be added later. Approximately 11 acres will be disturbed during construction of the parallel interceptor. The recommended system accounts for the 30.5 cfs of flow being added at Weymen Street and future requirements for managing CSOs. Chester Environmental further recommended that the parallel relief interceptor be constructed to follow the alignment of Saw Mill Run since the Route 51 right-of-way is not conducive for constructing a major interceptor.

3.2.2 Pump Stations

ALCOSAN owns and maintains five pump stations excluding the main pump station at the treatment plant. Four of the five pump stations are located along the Upper Allegheny River Interceptor: Squaw Run, Montrose, Verona, and Sandy Creek Pump Stations. The fifth pumping station, the Corliss Pump Station, is along the Upper Ohio River Interceptor on the south side of the river. ALCOSAN also owns and maintains one ejector station, the Melancthon ejector station in the Hazelwood area of the City of Pittsburgh. One pump station in the ALCOSAN system is not owned by ALCOSAN, the Ella Street pump station. However, ALCOSAN owns and maintains the Ella Street Pump Station sewage pumps.

Verona Pump Station

This pump station is located on Arch Street in Verona borough. It pumps flow from Verona Borough and Penn Hills. Placed into operation in 1959, this station was renovated during 1994 and 1995. Two new 1,500 GPM variable frequency drive (VFD) pumps were installed along with odor control facilities, new electrical controls, HVAC, and an emergency generator. Flow and overflow monitoring facilities with telemetry to ALCOSAN will be completed in 1996. The operating scenario for which this renovation was designed requires one pump to operate during all flow conditions with one pump in reserve. Maximum flow through this station is estimated at 1.79 MGD (average flow plus inflow/infiltration multiplied by 1.5 peaking factor). It is not expected that the capacity of this station will be exceeded in the near future.

Montrose Pump Station

This station is located in O'Hara Township. It pumps flow from the Montrose and powers Run areas of O'Hara Township. The pump station pumps flows to the North Shore Allegheny Interceptor and the recently rehabilitated Sqaw Run Pump Station. Placed into operation in 1980, this station was renovated during 1994 and 1995. Two new 1,350 GPM VFD pumps were installed along with odor control facilities, new electrical controls, HVAC, and an emergency generator. Flow and overflow monitoring facilities with telemetry to ALCOSAN will be completed in 1996. The operating scenario for which this renovation was designed requires one pump to operate during all flow conditions with one pump in reserve. Maximum flow through this station is estimated at 1.19 MGD (average flow plus I/I multiplied by 1.5 peaking factor). It is not expected that the capacity of this station will be exceeded in the near future.

Squaw Run Pump Station

This pump station is located on Old Freeport Road in O'Hara Township. It pumps flow from the Upper Allegheny Systems to the Lower Allegheny System. Placed into operation in 1959, this station was renovated during 1994 and 1995. Two new 4,850 GPM VFD pumps were installed along with odor control facilities, new electrical controls, HVAC, and an emergency generator. Flow and overflow monitoring facilities with telemetry to ALCOSAN will be completed in 1996. The operating scenario for which this renovation was designed requires one pump to operate during all flow conditions with one pump in reserve. Maximum flow through this station is estimated at 4.71 MGD (average flow plus I/I multiplied by 1.5 peaking factor). It is not expected that the capacity of this station will be exceeded in the near future.

Corliss Pump Station

This pump station is located in the West End area of the City of Pittsburgh. It pumps flow from several Wards in the City to the Chartiers Creek Interceptor. Placed into operation in 1959, this station was renovated during 1994 and 1995. Two new 3,500 GPM VFD pump were installed along with odor control, new electrical controls, HVAC, and an additional electrical feed. Flow overflow monitoring with telemetry to ALCOSAN will be completed in 1996. The operating scenario for which this renovation was designed requires one pump to operate during all flow conditions with one pump in reserve. Maximum flow through this station is estimated at 1.77 MGD (average flow plus I/I multiplied by 1.5 peaking factor). The capacity of this station will not be exceeded in the near future.

Melancthon Ejector Station

Located in the Hazelwood area of the City of Pittsburgh, the ejector station lifts flow generated in the drainage basin to the downstream Courtland Street sewer. The flow then travels by gravity to the Monongahela Interceptor. The ejector station was put into operation in 1959 with one 100 gpm ejector. The ejector is adequate to handle normal flows. This station is to be upgraded. Design and construction will begin in 1996.

Ella Street Pump Station

This station is located in McKees Rocks Borough at the foot of Ella Street. The sewage pumps in this station are owned and maintained by ALCOSAN. The pump station pumps flow from an area in the McKees Rocks municipal sewer system into the ALCOSAN interceptor sewer system. The station is equipped with two 1,400 gpm pumps. The pumps are controlled by a wet well bubbler system. One pump handles the normal flow. During periods of wet weather, the second pump starts automatically. A replacement pump is available should a mechanical failure arise with one of the installed pumps. The building and other equipment are owned by McKees Rocks Borough

Sandy Creek Pump Station

This new station is located in Penn Hills. It is designed to convey flows from Penn Hills, the Verona Pump Station and the Montrose Pump Station to the Allegheny interceptor at Chamber A42. The station is equipped with two variable speed drive and one constant speed drive dry well sewage pumps. Each pump has a maximum capacity of 9.5 MGD. The station pumping capacity with two of three pumps operating at full speed is 16.6 MGD. The design peak flow rate of the station is 13.7 MGD. This facility is a conventional wet-well/dry-well station and contains mechanically cleaned bar screens, odor control and HVAC facilities. Flow and over-flow monitoring facilities with telemetry to ALCOSAN will be completed in 1996.

3.2.3 Regulator Structures

Overview

The purpose of a regulator structure is to intercept and convey dry-weather flows from the municipal combined sewer systems to the ALCOSAN interceptors and then to the wastewater treatment plant. The dry-weather flow is conveyed by a connector pipe to the interceptor and excessive wet-weather flows are diverted to the receiving streams or rivers. The wet weather discharges to the receiving waters, combined sewer overflows, occur when the hydraulic grade line (HGL) in the structure rises high enough to cause an overflow. The overflows are conveyed to the receiving stream through an overflow pipe or directly from the regulator structure. Often, the pipe is equipped with a backwater gate to prohibit inflow from the receiving watercourse. Many of the regulator structures in the ALCOSAN system have overflow elevations below the river pool or stream surface elevation. In these structures, the HGL in the overflow pipe must overcome the river- or stream water surface elevation on the outside of the flapgate before an overflow occurs. Two situations cause a CSO in wet-weather:

1) The structure or connector pipe is limiting. In this case, the structure or connector pipe flowing at capacity is not able to convey all of the incoming combined sewer flows to the interceptor. The flows begin to back up in the diversion chamber until the hydraulic grade rises, eventually causing an overflow.

2) The interceptor is limiting. When the interceptor becomes surcharged, the HGL can rise high enough to reach the regulator. Excess interceptor flows the can overflow to the receiving stream. In this case, the regulator is actually acting as an interceptor relief.

Dry-weather discharges at CSO outfalls can occur in any combined sewer system on either a chronic (i.e., regular or even frequent) basis or on a random basis (i.e., as a result of unusual conditions). Dry-weather discharges can occur at virtually any CSO outfall after the sewer is suddenly clogged by unusual debris, structural failure of the regulator, or hydraulic overloading by an unusual discharge of flow to the combined sewer system. Chronic dry-weather discharges can and should be prevented from occurring at all CSO outfalls. Random discharges cannot be prevented, but can and must be promptly detected and eliminated by cleaning, repairing, or identifying and eliminating of excessive flow or debris sources.

Flows are diverted to the ALCOSAN interceptor system by 315 regulator structures. Names for all structures, including diversion structures, pump stations, and access shafts have been assigned

by ALCOSAN personnel. A list of regulator structures is in the CSO Program System Hydraulic and Hydrologic Characterization Report (March 1996).

Four classifications of diversion structures regulate flow into the ALCOSAN interceptor system: dam or elevated overflow pipe, single orifice, double orifice, and tipping gate. An additional type was included to describe structures that are combinations of the four types of diversion structures or those structures that are not regulator structures (i.e., access shafts). The different structure types are described below and are shown in Appendix C.

Dam or Elevated Overflow Pipe

All diversion structures described in the following paragraphs have either an elevated diversion dam or overflow pipe. A structure consisting solely of a raised dam or elevated overflow pipe (i.e., no other orifices, gates, or plates) that diverts flow to a connector pipe leading to the interceptor is referred to as a dam. A schematic of this type of regulator is shown in Appendix C. Usually, the incoming combined sewer pipe and the overflow pipe are the same size and the connector pipe to the interceptor is much smaller. The purpose of the structure is to direct dry-weather flow to the interceptor. Higher flows increase the HGL or water level in the structure, which results in overflows through the diverted sewer's outlet to the river. Usually dam-type diversion structures are located in shallow-cut interceptors.

Where physically possible, raising dam elevations or overflow pipes so that more flow is conveyed to the interceptor could reduce the frequency and volume of overflows. However, to do so, the overflow pipe capacity must not be restricted and the raised HGL must not cause flooding in upstream basements.

Single-Orifice Diversion Structure

Single-orifice (SO) diversion structures are a modification of the DAM structure consisting of a fixed plate or gate on the upstream end of the connector pipe. The gate or plate places additional restrictions beyond that of the connector pipe on the flow diverted to the interceptor. SO structures are in the shallow-cut interceptors of Turtle Creek and Chartiers Creek as circular orifice plates on the upstream end of connector pipes. In the Saw Mill Run Interceptor, many fixed-gate structures are classified as single orifice.

In the future, removing plates and gates, or resetting gates could reduce the frequency and volume of overflows. By enlarging the openings in the diversion structures, the interceptor capacity rather than the regulator will limit the flow to the interceptor.

Double-Orifice Diversion Structures

Double-orifice (DO) diversion structures are a further modification of the SO and DAM type diversion structures, consisting of two chambers. A fixed constriction or orifice connects the first and second chambers. The downstream chamber contains another orifice that restricts flow to the connector pipe. The purpose of the additional upstream chamber and connecting restriction is to separate debris, provide some (minimal) storage, and limit backflow if the interceptor becomes surcharged. Typically, only the downstream orifice is adjustable (by plate replacement or removal) but not the upstream orifice or gate. Typically, the downstream orifice is more constrictive by area than the upstream orifice. In the DO structure, the diversion dam or overflow pipe are located in the upstream chamber. Most of the DO structures in the ALCOSAN system are located in the shallow-cut interceptors on the Ohio River, Chartiers Creek, Turtle Creek, and Thompson Run.

Future operating scenarios to reduce the frequency and volume of overflows may range from removing any plates or gates from the downstream orifice to enlarging the upstream orifice. Because enlarging the upstream orifice would usually involve physical changes to the structure, changes to the downstream orifice or gate will be considered first.

Tipping Gate

Tipping gates are designed to pass a large volume of flow that decreases with time during a storm. Typically, gates come in widths of 8, 12, 18, 24, and 36 inches. The tipping gate operates on a pivot point located between 11 and 13 inches above the structure invert elevation. Hydrodynamic and hydrostatic forces cause the gate to open and close. Under low-flow conditions, the gate is in its fully open position. Under high flow conditions, the gate can close until it reaches its minimum opening. Manually adjustable pins are set to prevent the gate from exceeding the desired maximum and minimum openings. Recent field investigations by ALCOSAN personnel indicate that most gate pin settings have changed since the original installations. For tipping gates in ALCOSAN's interceptor system, the average minimum and maximum gate openings are 0.5 inches and 6 inches, respectively.

Information available from the original ALCOSAN interceptor design report indicates that the gates are designed to remain open until the upstream HGL reaches about 2 feet, with no significant downstream backwater conditions. The tipping gate openings were originally designed to convey 2.5 times the dry-weather flow in the open position and 1.5 times the dry-weather flow in the closed position. According to ALCOSAN maintenance personnel, the gates close quickly once they begin to close. If the flow reverses through the regulator structure (because of interceptor surcharge), the gate will probably remain in the closed position. Either a dam or elevated overflow pipe is located upstream of the tipping gate to divert low or dry-weather flows

through the gate to the interceptor. When the HGL exceeds the overflow elevation, an overflow occurs.

After passing through a tipping gate structure, flows are conveyed to the interceptor through a connector pipe. However, most of the tipping gates in the ALCOSAN system are located along the deep-tunnel interceptors, which can be as deep as 175 feet below the surface, although the average interceptor depth is from 80 to 100 feet. Conveying flow from the surface to the deep tunnels requires a special type of connector pipe, a vortex dropshaft. Vortex dropshaft structures convey diverted flow from the surface structure to the deep-tunnel interceptor, dissipating energy and facilitating the removal of entrained air. Flows entering the vortex are directed around the perimeter of a cylinder that creates a vortex or swirl flow pattern.

The usual configuration of the tipping gate/vortex structure consists of a double-chamber. The incoming flows must pass through the tipping gate to get to the vortex. Occasionally, the tipping gate chamber will be upstream of a connector pipe leading to the vortex chamber. Typical dropshaft diameters range from 8 to 36 inches.

The tipping gate structures were installed to prohibit excess flows from entering the interceptor system to protect the treatment plant. To reduce the frequency and volume of overflows in the future, the gate settings could be closed, the gates removed, and the vortex capacity increased by enlarging the existing structure or adding a parallel downshaft.

3.2.4 Maintenance Practices

Maintenance activities and associated documentation for the ALCOSAN interceptor system are provided by the ALCOSAN Interceptor Maintenance Department (also called the Outside Maintenance Department). The Outside Maintenance Department comprises a work force of 21 people, which includes four working supervisors and four working foremen.

The department is managed by three supervisors who report directly to the maintenance manager, who in turn oversees all ALCOSAN maintenance of the interceptor system. The work force is divided into six operating teams which perform all maintenance: four truck crews, a pump station crew, a boat crew, and a water truck operator. The general intent of the maintenance program is to ensure that:

- Deposition of solids, floatables, and general debris does not cause obstructions that could result in overflows.

- Regulator devices are in good working order.

- Ongoing maintenance prevents dry-weather overflows.

Shallow-Cut Interceptors

The ALCOSAN crews also maintain more than 50 miles of shallow-cut interceptors that extend along the upstream part of the Allegheny River and along Chartiers Creek, Saw Mill Run, Thompson Run, and Turtle Creek. The interceptors are usually less than 20 feet deep and range in size from 15 inches to 4 feet in diameter. Manholes were constructed at regular intervals along the lines for access to maintain the shallow-cut interceptors. Maintenance generally consists of removing debris and gravel deposits, and inspecting the pipes and joints for structural integrity and signs of excess infiltration.

Diversions and Outfall Structures

During and after storm or snowmelt events, the crews take wet-weather maintenance measures, including inspection of each diversion structure for proper operation. Weather permitting, ALCOSAN interceptor maintenance personnel are scheduled to regularly maintain each of the diversion structures at least three times per week. Regulator preventative maintenance activities are conducted only during dry-weather. Additional information can be found in Chapters 6 and 9 of the *System Inventory and Characterization - CSO Program Phase 1 Activity Report* (September, 1995).

3.2.5 Interceptor System Operation

Regulator Operation

Before the interceptors were installed, municipal combined sewer systems discharged directly to the rivers and creeks without treatment. The ALCOSAN interceptors were designed to capture dry-weather discharges from the municipal sewer systems. The interceptors were sized to accept 350 gallons per capita per day (gpcd) from areas with combined sewers and 250 GPCD from areas with sanitary sewers. The ALCOSAN interceptor system intercepted the municipal outfall sewers and 260 regulator structures were installed. A brief overview of the design and operational concepts of combined sewer systems is given below.

Most combined sewer systems are designed to use static CSO regulators. Static CSO regulators, such as the fixed overflow pipes, bottom sumps, or unequal leaf tipping gates are designed to discharge as a simple orifice under surcharge. Once an orifice size is chosen by the designer, the depth of water, or hydraulic head, behind the orifice governs the rate of discharge through the orifice, and hence the rate of the overflow.

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The sizing of a CSO regulator orifice is the result of a compromise made by the designer, balancing the desire to maximize the treatment of combined sewage by admitting as much as possible to the interceptor against, the desire to maintain a design flow rate in the interceptor and to the wastewater treatment works. If the orifice is so small, or restrictive, that a targeted flow rate designed to use the full interceptor capacity is admitted only under the most severe storm conditions, then those regulator settings will allow CSO to occur during smaller storms before to the interceptor can develop a full-capacity flow. Also, the designer knows that if the regulator setting is conservatively too small, then during localized rainfall, overflows will occur locally although interceptor and treatment capacity still is available because there is no contributions from downstream combined sewer (CS) areas where it may not be raining. However, if the designer provides too large an orifice, the interceptor will surcharge too often, even during more modest storms, potentially causing undesirable or even unsafe conditions in downstream segments of the interceptor.

The solution to the problem of sizing the static orifice regulator is to choose a setting that is not too restrictive, while preventing some degree of interceptor overloading, and to design interceptor relief structures, or hydraulic control points, at key down-pipe locations. Hydraulic control points of combined sewer systems typically consist of an overflow at an appropriate elevation and may or may not include a device with the capacity to alter or adjust flow in the interceptor, such as a siphon or a sluice gate. The function of the hydraulic control points is to ensure that if too much flow is admitted to the interceptor during large storms, the interceptor can be relieved at the hydraulic control points and dangerous surcharge conditions that could threaten life or property can be prevented. Also, the hydraulic control points provide a mechanism that enables the designer to be more liberal in sizing the regulators to maximize the carrying capacity and treatment capacity of the system during small storms and localized rainfalls, such as the convective thunderstorms that occur frequently during summer months in southwestern Pennsylvania. This process is called interceptor design optimization and has been practiced in one form or another since the advent of interceptor construction in the United States earlier in this century.

The National CSO Control Policy of 1994 suggested that operators of combined sewer systems in the U.S. review their systems and seek ways to optimize operations and maximize flows of combined sewage to the plant. Part C of the ALCOSAN discharge permit that was issued March 28, 1995, requires that ALCOSAN perform a system inventory and characterization and a hydraulic characterization, to identify hydraulic bottlenecks and to document the actions being taken to maximize the flow of combined sewage to the treatment plant.

In response to the national CSO policy and to comply with their National Pollution Discharge Elimination System (NPDES) permit, ALCOSAN and many other sewage agencies across Pennsylvania and the rest of the country are studying their systems, looking for ways to optimize

operations by maximizing flows to the plants and reducing the volume and frequency of overflows. The most common way to optimize the operations is to open regulators as much as possible and thus shorten the time for filling the interceptors and increasing the number of time full surcharge conditions occur.

The PaDEP has long recognized the importance of maintaining hydraulic control-point mechanisms along interceptors that carry combined sewage. The NPDES permit issued to ALCOSAN for the current permit cycle, includes coverage for three such hydraulic control points, outfalls 005 (M59), 006 (C3a), and 007 (C13A). The permit states that the three outfalls "...serve as combined sewer overflows necessitated by stormwater entering the sewer system and exceeding the hydraulic capacity of the sewers and/or the treatment plant and are permitted only to discharge for such reason." These hydraulic control points have interceptor overflows located at a siphon (C13A), a river crossing (C3A), and an interceptor sluice gate (M59).

Wet Well Operation

The main pump station is controlled by computer. Pumping operations are optimized to maintain the water surface in the wet well approximately at elevation 680 feet which is approximately 62 feet from the bottom of the wetwell. During wet weather, the pump operation is automatically adjusted to increase pumping rates up to approximately 225 mgd, holding the wet well level for as long as possible. As the wet well elevation begins to increase indicating that bypassing has begun in the interceptor system, the pumping rate is maintained at 225 mgd.

3.2.6 Interceptor Capacity

This section describes the results of the hydraulic analysis of the ALCOSAN interceptor system. The analysis:

- Describes the overall hydraulic performance of the system of regulators and interceptors in each interceptor subsystem that captures wet-weather flows from the combined system for treatment at the plant.

- Identifies and describes the hydraulic constraints and control points in each system that limit the capacity to capture wet-weather combined sewer flows.

- Determines the wet-weather capture rate (referred to as the "treatment" rate in the STORM model used to simulate CSO characteristics) for each of the 15 interceptor sub-systems within the ALCOSAN interceptor system.

Interceptor System Modeling

As a key component of ALCOSAN's CSO Program, a dynamic hydraulics computer model of the ALCOSAN interceptor system was created. The model simulates how the system responds to rainfall in the ALCOSAN service area with respect to location and magnitude of CSOs.

Interceptors typically are designed based on open channel flow concepts using Manning's formula for full pipe flow. Manning's equation can be used to estimate the existing interceptor segment capacities. However, the existing system is subject to complex flow conditions, such as backwater, that affect the interceptor conveyance capacities. The USEPA's SWMM Model's EXTended TRANsport block (EXTRAN), a detailed hydraulic computer model that can handle the complex flow conditions, enables better estimates of the existing interceptor capacities.

As the wet-weather flows were added to the models of the shallow cut interceptor systems, individual interceptor segments were examined using Model Turbo View EXTRAN (MTVE) to determine their full-flow capacities prior to a surcharge. Ideally, each segment along the interceptor would become full at the same time during a storm, transmitting its maximum full-flow capacity just before reaching full-flow conditions. In this case, a simple flow calculation using Manning's equation could be used to estimate interceptor capacity. In reality however, segments become surcharged at different times, which results in backwater effects and pressure flow. For example, during a ramp hydrograph scenario that is based on a constant increase in loading rate for all load points, flows in a particular interceptor segment may increase steadily, then decrease, and then increase again before surcharging.

The experienced modeler must interpret the EXTRAN results to determine the capacities of the individual interceptor segments. For this analysis, the basic definition of the interceptor segment's capacity is the maximum flow observed through the segment before surcharge. The observed maximum capacities may be less than or greater than the full-flow rates calculated using Manning's equation, because of the system's configuration and flow interactions. This is the reason that a detailed hydraulic model is necessary rather than depending solely on an open channel flow equation. Also, a change in the system, (i.e., replacing a length of undersized interceptor or changing the wet-well water surface elevation) may alter the capacity of the interceptor segments.

Capacity Modeling Assumptions

The preliminary hydraulic analyses have shown that the water surface elevation in the main pump station wetwell has a significant effect on the interceptor system conveyance, because of the resulting surcharge conditions in the deep tunnel interceptors and occasionally in the downstream reaches of the shallow cut interceptors. From October 1994 through April 1995 (excluding

February 1995 when the wetwell monitor was not operational) the wetwell operating levels ranged from about 622 (during drawdown events) to 710 feet, with a target water surface elevation of about 680 feet maintained during dry periods. Future operating conditions being investigated include maintaining the wetwell at lower levels, **but to simplify this preliminary capacity analysis, a single constant plant wetwell operating level of 680 feet was selected.**

Determining Existing Interceptor Capacity

PaDEP design guidelines require that separate sanitary interceptors be sized to convey 250 gpcd and combined sewer interceptors to be able to convey 3.5 times the average daily flow (ADF). After the interceptor segment capacities were determined using EXTRAN, they were compared to the required interceptor capacities which are based on PaDEP's guidelines.

Turtle Creek Interceptor

The results of this analysis show that much of the existing interceptor is at least half full during dryweather flow conditions. Figure 3-4 is a graph of the actual interceptor capacities from manhole T29A10 (upstream) to T03-00 (downstream). Above manhole T26A00, the contributing area is sanitary sewered only. Along the Turtle Creek Interceptor, the calculated capacity is greater than the PaDEP-required capacity (based on 3.5 times the ADF for combined areas plus 250 gpcd for separate areas). The Turtle Creek Interceptor can thus adequately convey PaDEP-required flows if the wetwell water surface level is held at an elevation of 680 or below and the flows in the downstream Monongahela Interceptor do not cause an increased HGL at the downstream end of the Turtle Creek Interceptor.

Thompson Run Interceptor

Figure 3-5 contains graphs of the EXTRAN-simulated interceptor capacities from manhole TR06 (upstream) to T08-02 (downstream) for each segment along the interceptor, as well as the existing cumulative dryweather flow. PaDEP-required flow capacities are also shown. Above manhole TR02-01, the contributing area is sanitary only. Along the Thompson Run Interceptor below manhole TR03-01, the actual capacity is less than PaDEP-required capacity.

The results of the analysis show that the Thompson Run Interceptor can adequately convey the existing dryweather flows if the wet-well is held at an elevation of 680 feet or below and the flows in the downstream Monongahela and Turtle Creek interceptors do not cause an increased HGL at the downstream end of the Thompson Run Interceptor. However, the downstream 0.7 miles of the Thompson Run Interceptor cannot convey the PaDEP-required capacities.

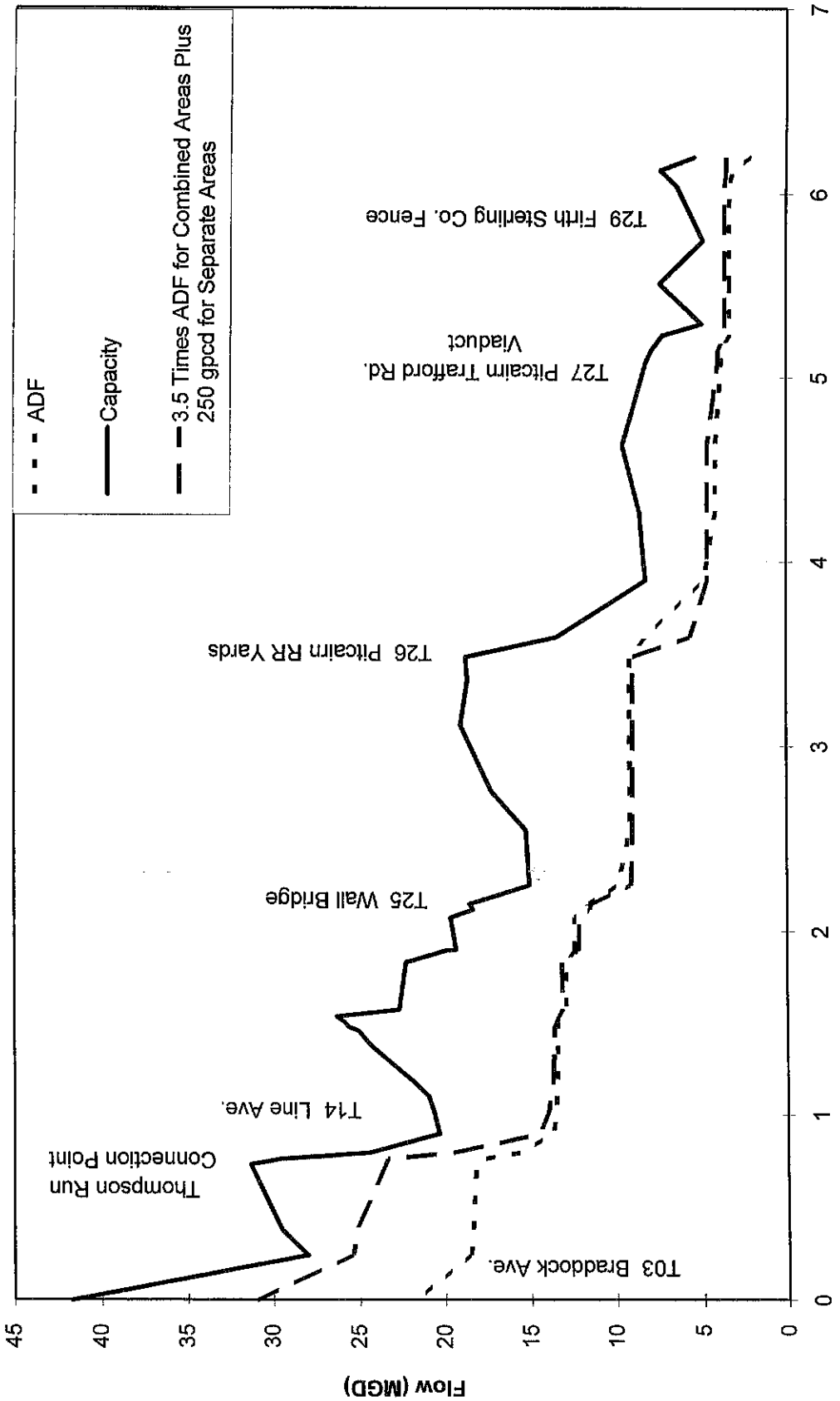


Figure 3-4.

Turtle Creek Capacity Analyses From T03-00 to T29A10

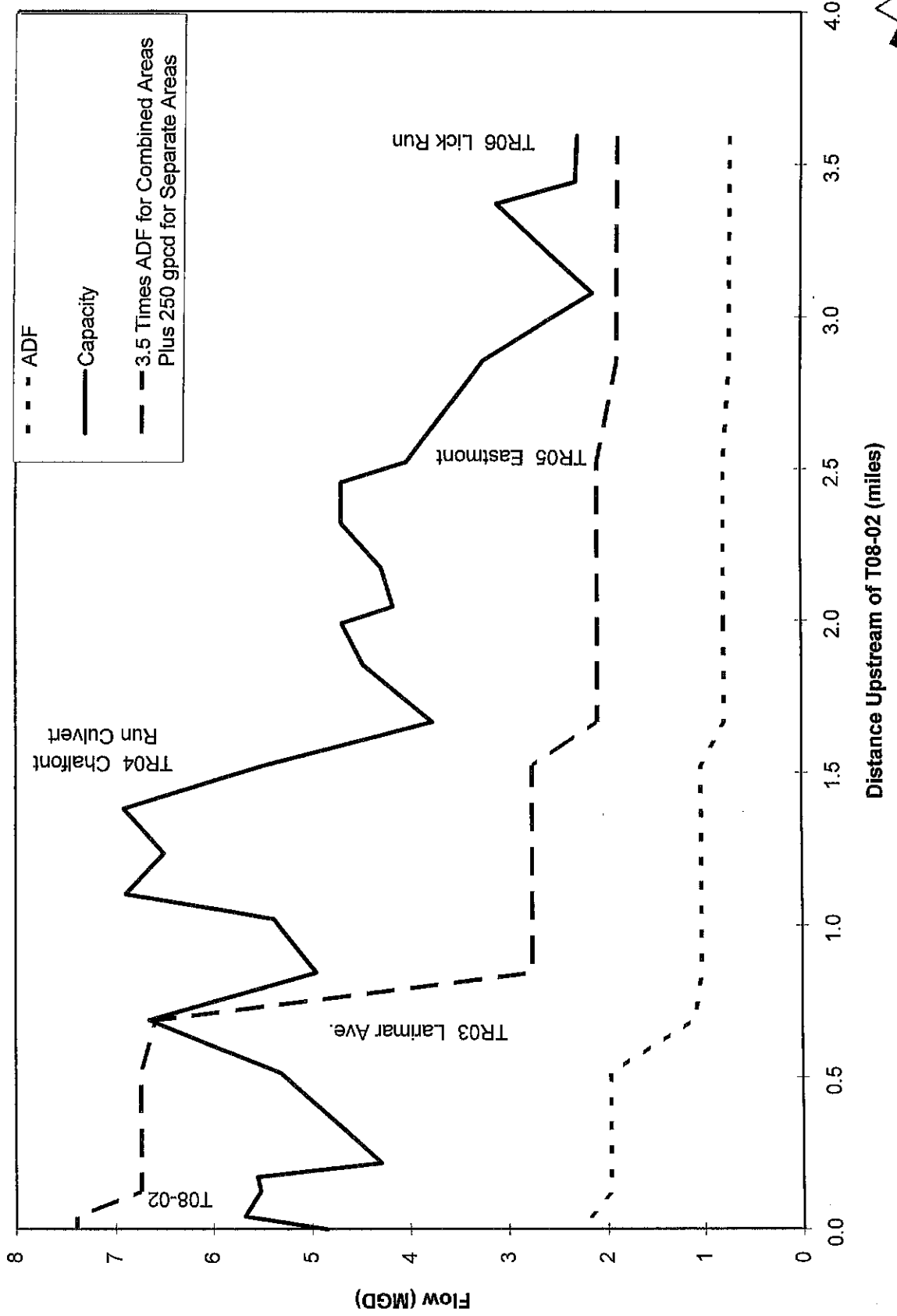


Figure 3-5.

Thompson Run Capacity Analyses From T08-02 to TR06-00

Monongahela Shallow Cut Interceptor

Figure 3-6 is a graph of the actual interceptor capacities from manhole M45 (upstream) to M42A00 (downstream) as determined from the EXTRAN analyses of each segment along the interceptor, along with the existing cumulative dryweather flow. PaDEP-required flow capacities also are shown. The contributing area is served by both combined and separate sewers. Along the upstream segments of this interceptor, the actual capacity is greater than required, but is less than required at the downstream end.

The results of this analysis show that much of the existing interceptor is less than half full during dryweather flow conditions. The shallowcut Monongahela Interceptor can convey adequately the existing dryweather flows if the wetwell is held at a water surface elevation of 680 feet or below and the flows in the downstream Monongahela Interceptor do not cause an increased water surface elevation at the downstream end of this shallow cut interceptor. However, for the boundary conditions used, the downstream 0.2 miles of the shallow cut Monongahela Interceptor does not have PaDEP-required capacity.

Chartiers Creek Interceptor

To model the capacity of the Chartiers Creek Interceptor, the existing 30-inch diameter plate in the 36-inch diameter interceptor at C03A was removed to prevent backwater effects and to maximize the potential flow in the interceptor. EXTRAN runs that include this plate indicate that upstream restrictions cause interceptor surcharging prior to the effects of this plate.

Figure 3-7 is a graph of the interceptor capacities from manhole C55-00 (upstream) to junction O07 (downstream) as determined by the EXTRAN analysis of each segment along the interceptor with the existing cumulative dryweather flow. The PaDEP-required capacities also are shown. Above manhole C46-02, the contributing area is sanitary sewer only. Along most of the Chartiers Creek Interceptor, the actual capacity is less than PaDEP-specified guidelines except for its uppermost reaches.

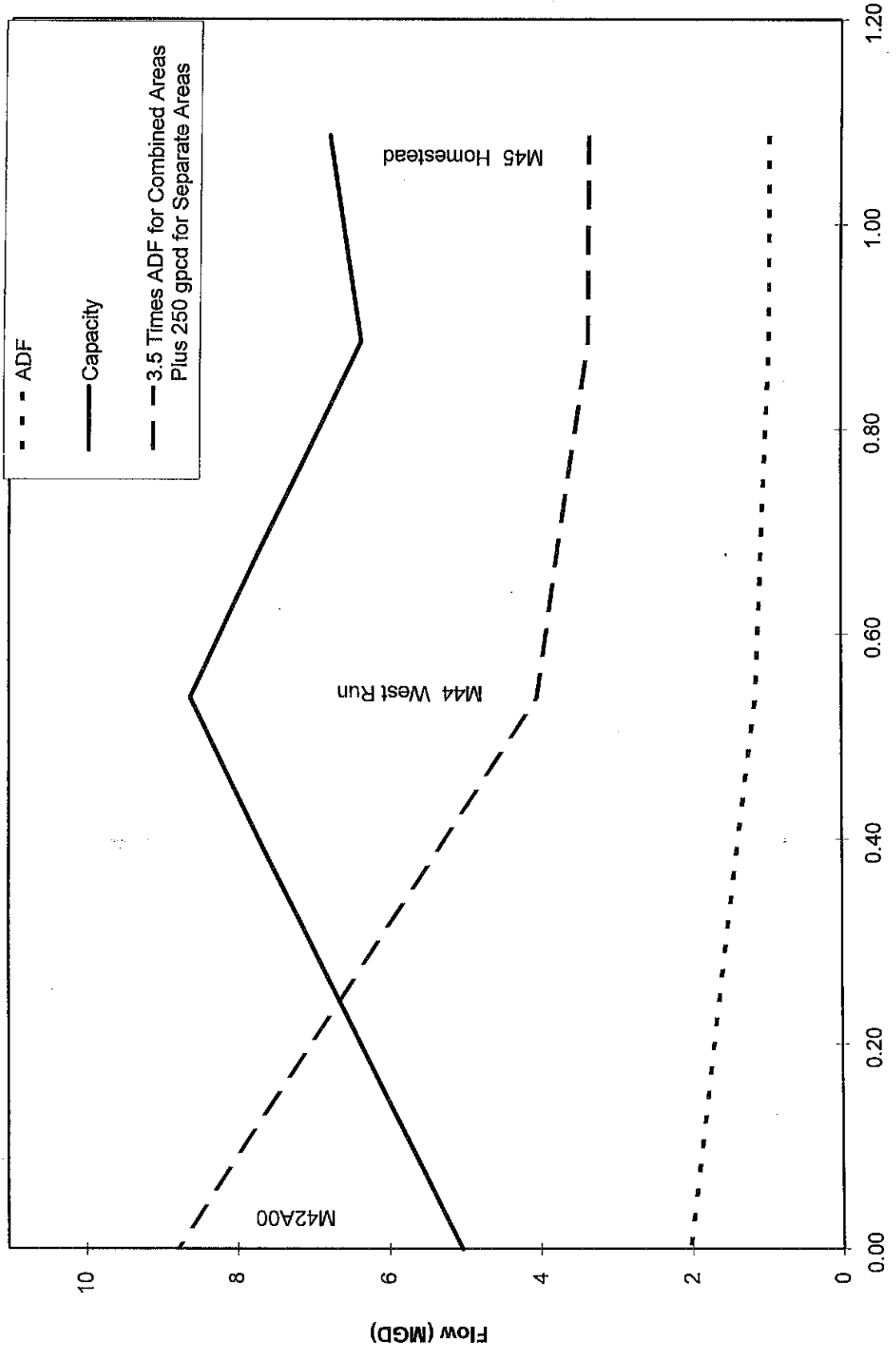


Figure 3-6.

Monongahela Shallow Cut Capacity Analyses From M42A00 to M45-00

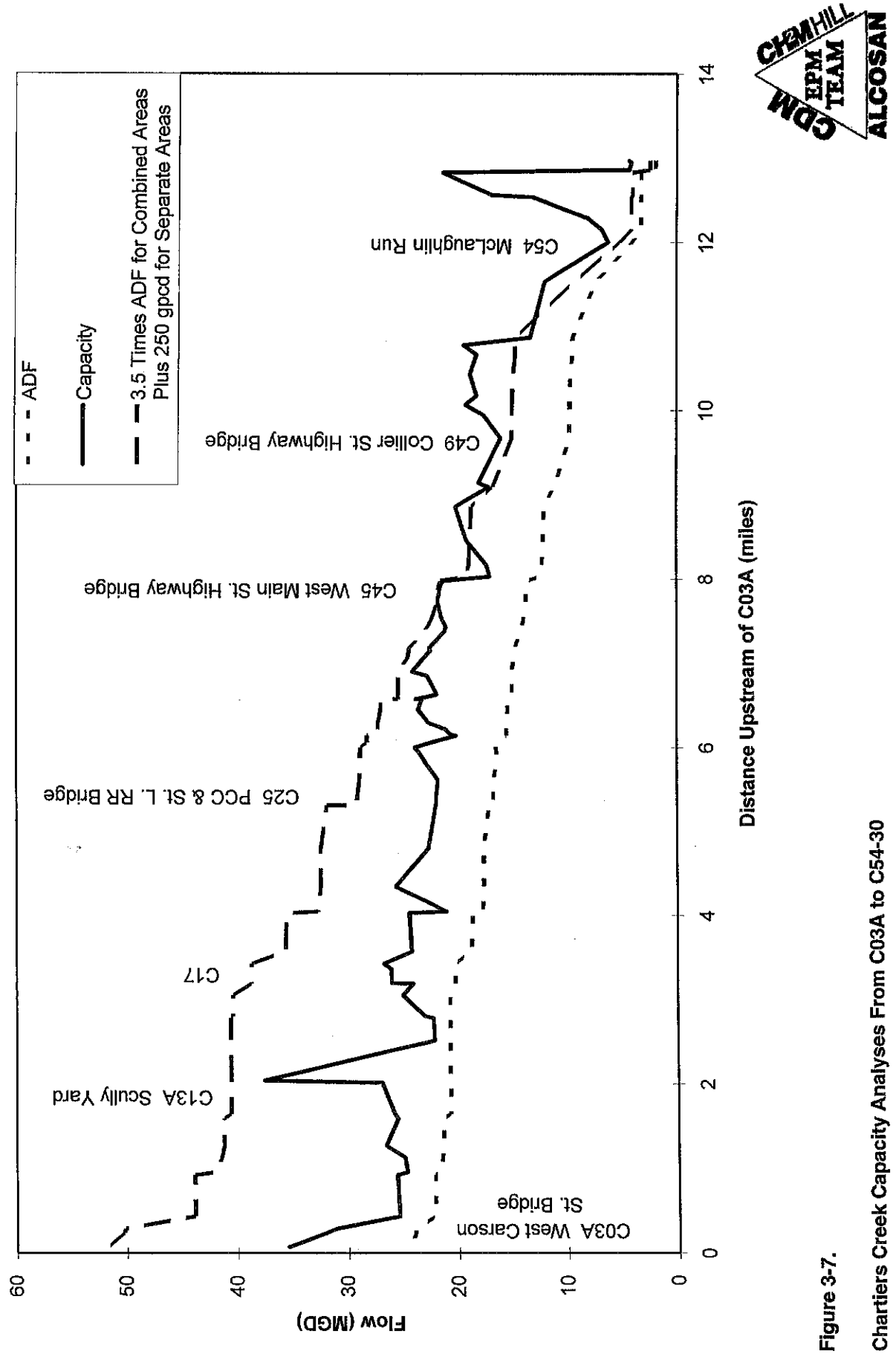


Figure 3-7.

Chartiers Creek Capacity Analyses From C03A to C54-30

The results of the analysis show that the existing interceptor is at least half full during dryweather flow conditions. Most of the Chartiers Creek Interceptor can convey adequately the existing dryweather flows if the wetwell is held at an elevation of 680 feet or below. However, for the boundary conditions used, the downstream reaches (the eight miles upstream of the West Carson Street Bridge) cannot adequately convey the PaDEP-required capacity.

Upper Allegheny Interceptor (East)

Figure 3-8 is a graph of the interceptor capacities from manhole A82-05 (upstream) to A39-VOR (downstream) as determined from the EXTRAN analyses from each segment along the interceptor and the existing cumulative dry-weather flow. The PaDEP-required flow capacities also are shown. Above manhole A77-02, the contributing area is sanitary only. Along most of the Upper Allegheny East Interceptor, the actual capacity is greater than PaDEP requirements except for the most downstream section. As may be seen from the figure, a bottleneck occurs near A78, Brilliant Avenue.

The results of the analysis show that much of the existing interceptor is less than half full during dry-weather flow conditions. Most of the Upper Allegheny East Interceptor can convey adequately the existing dryweather flows and PaDEP-required flows if the wetwell water surface elevation is held at an elevation of 680 feet or below and the flows in the downstream Allegheny Interceptor do not cause an increased water surface elevation at the downstream end of the Upper Allegheny East Interceptor.

Upper Allegheny Interceptor (West)

Figure 3-9 is a graph of the interceptor capacities from manhole A69 (upstream) to A39-VOR (downstream) as determined from the EXTRAN analyses for each segment along the interceptor, along with the existing cumulative dryweather flow. The PaDEP-required flow capacities also are shown. The contributing areas along this interceptor segment are both combined and separate sewers. Along most of the Upper Allegheny West Interceptor, except for the downstream end (0.1 miles), the interceptor capacity is greater than that required by PaDEP.

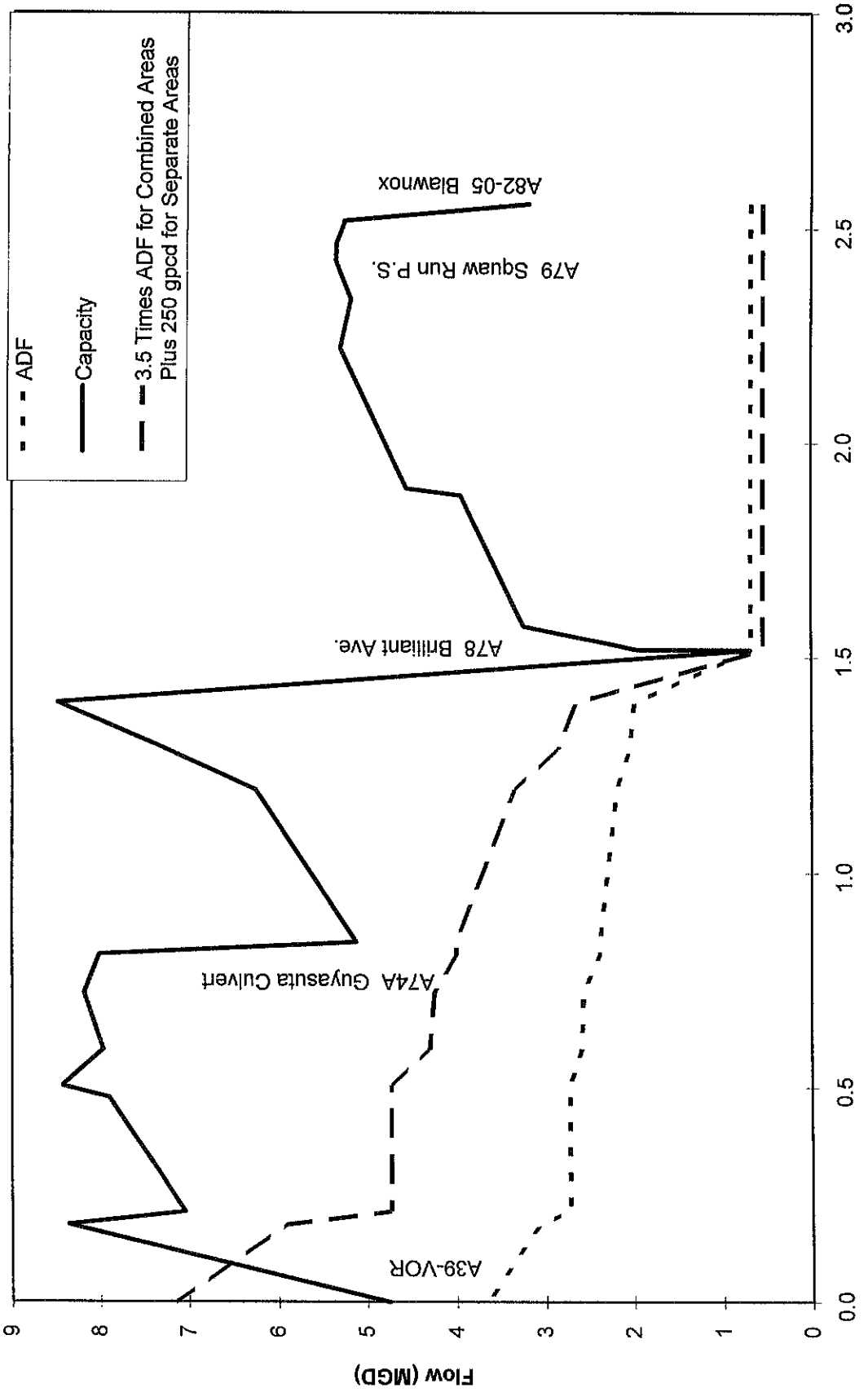


Figure 3-8.

Upper Allegheny East Capacity Analyses From A39-VOR to A82-05

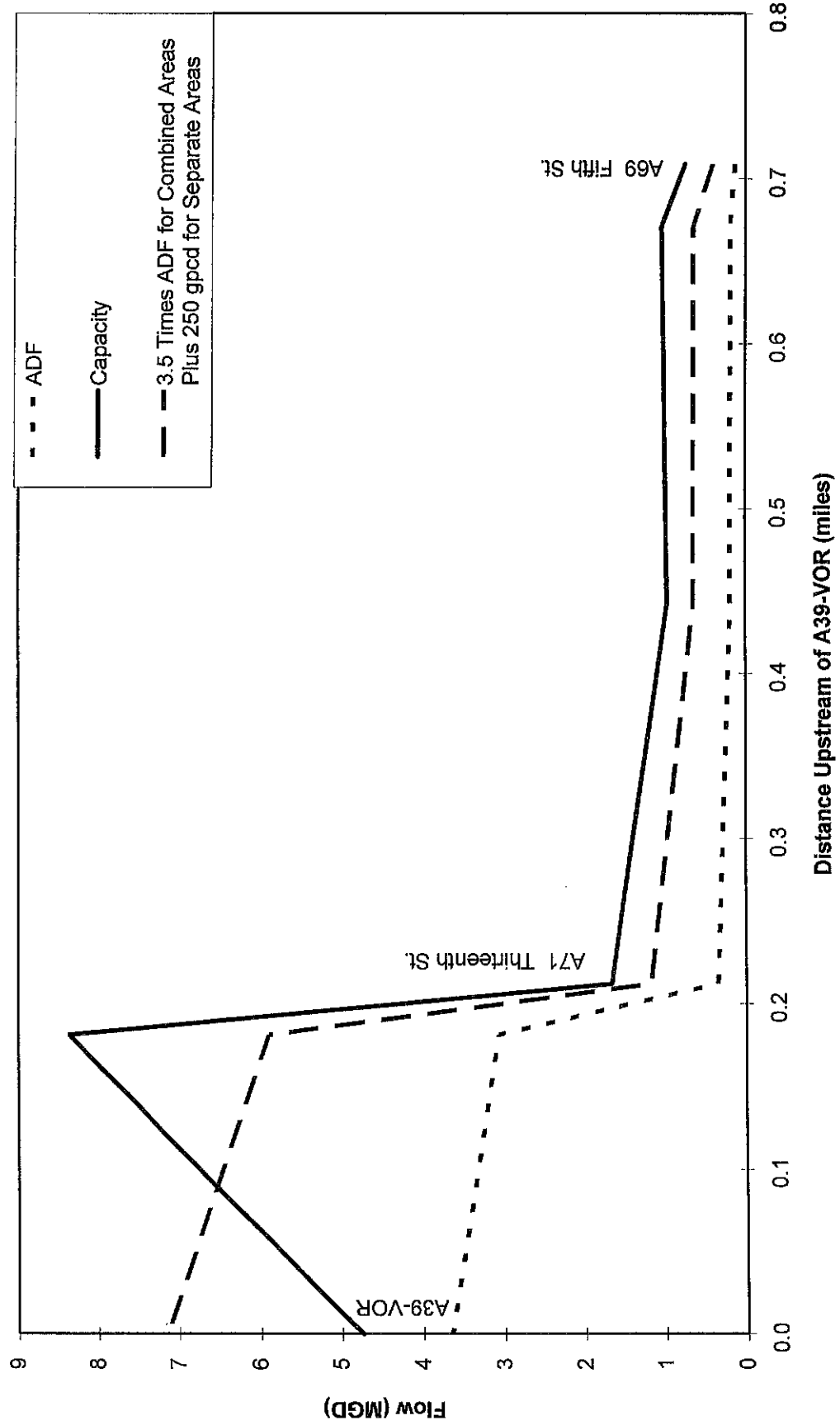


Figure 3-9.

Upper Allegheny West Capacity Analyses From A39-VOR to A69

The results of the analysis show that much of the existing interceptor is less than half full during dryweather flow conditions. Most of the Upper Allegheny West Interceptor can adequately convey the existing dryweather flows and the PaDEP-required flows if the wetwell water surface elevation is held at an elevation of 680 feet or below and the flows in the downstream Allegheny Interceptor do not cause an increased HGL at the downstream end of the Upper Allegheny Interceptor.

Lower Allegheny Shallow Cut Interceptor

Figure 3-10 is a graph of the interceptor capacities from manhole A67 (upstream, Girty's Run) to A62-01 (downstream) as determined from the EXTRAN analyses from each segment along the interceptor and with the existing cumulative dryweather flow. PaDEP-required flow capacities also are shown. The contributing areas are both combined and separate. Along the Lower Allegheny Shallow Cut Interceptor, the interceptor capacity is greater than that required by PaDEP. Also note that the ADF is greater than the capacity based on 3.5 times the ADF for combined areas plus 250 gpcd for separate areas at the downstream end of this interceptor. This difference is probably caused by infiltration and inflow.

The results of this analysis show that much of the existing interceptor is less than half full during dryweather flow conditions. The Lower Allegheny Shallow Cut Interceptor should convey adequately the existing dryweather flows and PaDEP-required flows if the wet-well is held at an elevation of 680 feet or below and the flows in the downstream interceptors do not cause an increased HGL at the downstream end of this interceptor.

Wet-Weather Capacity Analysis - Deep Tunnel Interceptor Capacity

Flows to the plant are limited by either the transmission capacities of the diversion structures, the downshafts, or the interceptors, and ultimately the treatment plant, as discussed above. The results of the preliminary hydraulic analyses indicate that the diversion structures are typically the most limiting factor of all the hydraulic elements of the interceptor system, particularly in the deep tunnel interceptor system. The CSO Program will explore optimization scenarios, addressing the potential modifications to the diversion structures for increasing their transmission capabilities under the assumption of a large treatment capacity increase in the future. For the hydraulic characterization, the EXTRAN model was modified to determine the maximum deep-tunnel transmission capacities with and without downshaft limitations, if the diversion structures and the plant were not limiting.

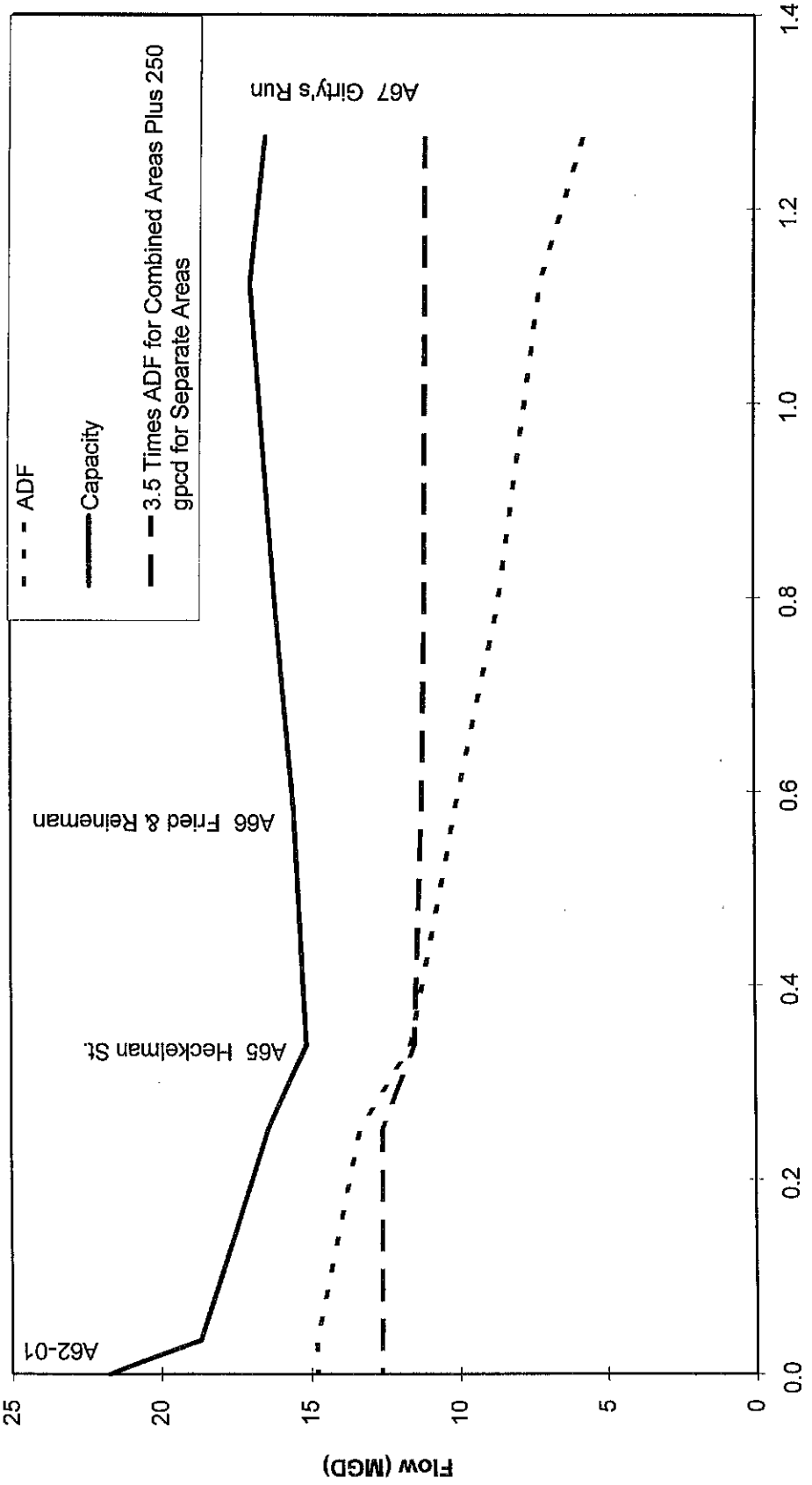


Figure 3-10.

Lower Allegheny Shallow Cut Capacity Analyses From A62-01 to A67-00

However, the system-wide capacity of the regulators far exceed the current maximum treatment rate of the ALCOSAN wastewater plant. Without a considerable increase in the plant's capacity, adjustment of regulators will do little to optimize the interceptor operation or reduce overflows.

Vortex Limiting Scenario

The diversion structures were eliminated from the hydraulic model, and the flows were loaded directly to the upstream ends of the vortexes. The plant was simulated in an extreme drawdown condition with the wetwell water surface elevation at 624 feet, which is the minimum water surface elevation during dry-weather flow in the incoming Upper Ohio River Interceptor. No restrictions were placed on pumping or outfall from the plant. The conditions enabled EXTRAN to determine the maximum capacity of the interceptor system with no modifications other than those mentioned above. The EXTRAN model was run until the system reached capacity. The total peak flow reaching the plant in the vortex limiting scenario is estimated to be 815 mgd.

Interceptor Limiting Scenario

To estimate the peak transport capacity of the interceptor, the model was further modified to simulate the interceptor response to the removal of the diversion structures and the vortices so that the runoff flows from the sewersheds were loaded directly into the interceptor. The plant was simulated in the extreme drawdown condition described above. The results of this EXTRAN model run indicated that a total flow of 975 mgd could be transported to the plant through the deep tunnels. Figure 3-11 shows a profile of the interceptors near the plant and the corresponding HGL for this run. Notice that the system capacity is greater for the interceptor limiting model than the vortex limiting model by 160 mgd.

Initial model-based estimates indicate that approximately 60 mgd of additional peak flow, in excess of the vortex-limited flow rate of 815 mgd, could be brought into the deep tunnel portions of the interceptor by implementing system modifications in the Upper Monongahela, the lower Saw Mill Run, and lower Chartiers Creek interceptors. This results in an estimate of 875 mgd as a reasonable upper limit estimate of the transport capacity of the interceptor system, with an estimated margin of safety of approximately 100 mgd.

System Wet-weather Capacities

Table 3.5 summarizes the hydraulic capacity analysis of the ALCOSAN interceptor system. Table 3.5 also indicates the number of locations where regulators limit flow to the interceptor and lists the system's current wet-weather capacity limits. The lower limit generally represents the lowest capacity of the regulators in the interceptor. The upper limit generally represents the maximum

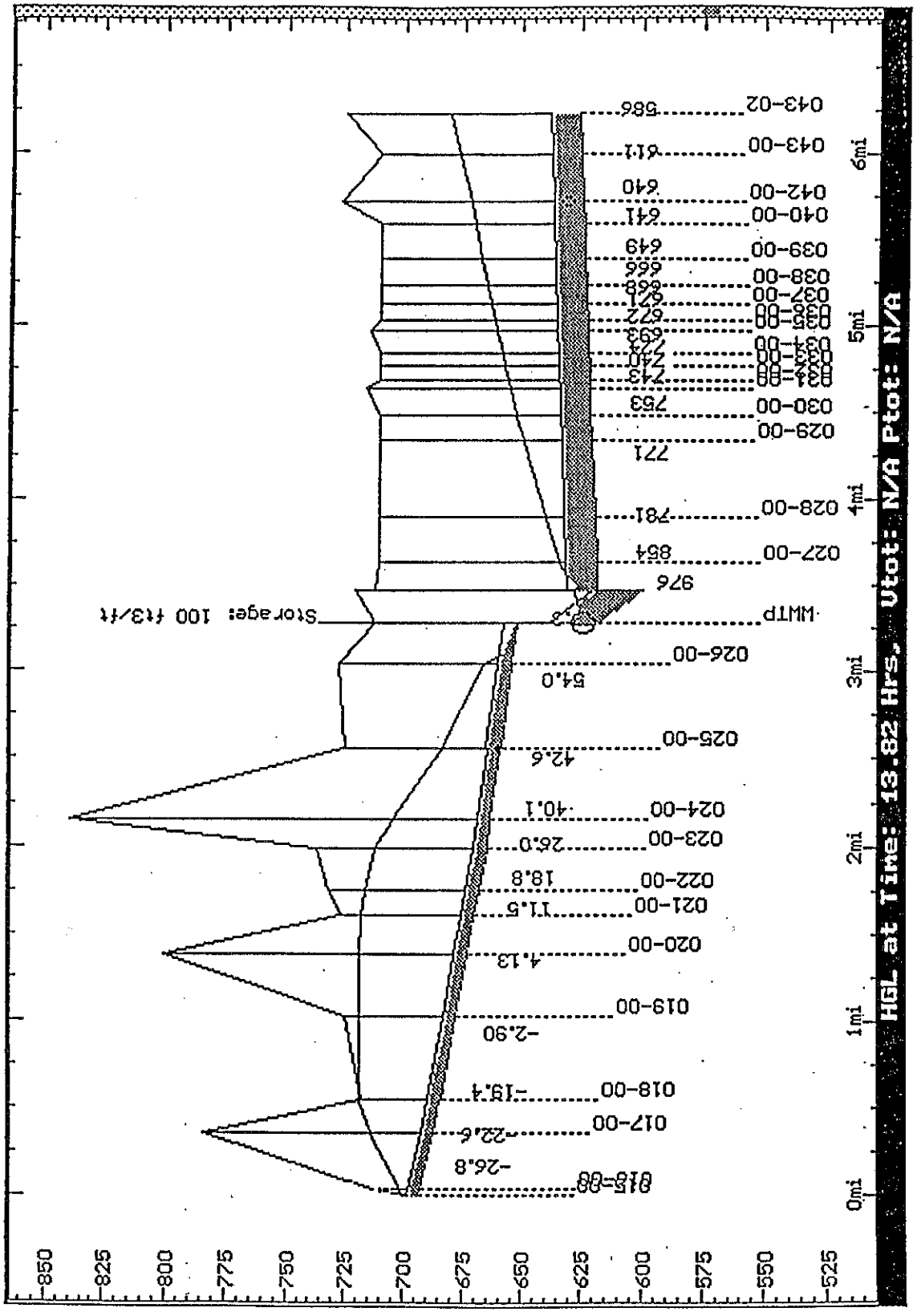


Figure 3-11. Interceptor Limiting Scenario Profile Near Plant

Table 3.5
ALCOSAN Interceptor System Hydraulic Capacity Analysis

Interceptor Segment	Number of Structures	Locations Limited by Regulator Wet-weather Capacity	Existing System Wet-weather Capacity (cfs/acre)
Ohio River			
Lower	21	18	<0.001 - 0.071
Upper	17	15	0.005 - 0.240
Allegheny River			
Lower Northern	18	13	<0.001 - 0.470
Lower Southern	54	32	<0.001 - 0.464
Upper	11	1	0.002 - 0.070
Monongahela River			
Lower	34	25	<0.001 - 0.242
Middle	14	8	<0.001 - 0.049
Upper	12	11	<0.001 - 0.124
Upper Mon./Lower Turtle Creek	8	7	<0.001 - 0.060
Upper Turtle Creek	26	21	<0.001 - 2.341
Thompson Run	6	6	0.002 - 0.178
Saw Mill Run			
Lower	11	6	0.001 - 0.155
Upper	20	6	<0.001 - 0.276
Chartiers Creek			
Lower	18	10	<0.001 - 0.138
Upper	45	35	<0.001 - 0.192
Totals	**315**	**214**	

hydraulic capacity of the interceptor sub-system to convey flow from the sub-system to the plant. For the comparisons between different locations to be meaningful, the capacities are presented on a unit area basis (i.e., capacity in cfs per acre of tributary sewer area). This information will be used in the CSO Program for development of the nine minimum control documentation; in particular the information will be the foundation for fourth of the Nine Minimum Controls (maximize flow to the plant).

Available Deep-Tunnel Storage Capacity

The average wet-well water surface elevation at the plant is 680 feet. At this elevation, surcharged conditions are maintained in the deep-tunnel interceptors. Periodically during dry-weather, the wet well water surface elevation is drawn down to flush out the deep tunnel interceptors. Future CSO control alternatives may include drawing the wet-well down to create storage capacity in the deep tunnel interceptors prior to a wet-weather event.

ALCOSAN has 30 miles of deep tunnel interceptor, 7.1 miles are along the Ohio River, 9.1 miles are along the Allegheny River, and 13.5 miles are along the Monongahela River. Diameters of the deep-tunnel interceptors range from 2.5 to 10.5 feet. The average length-weighted diameter for the deep-tunnel interceptors is 5.4 feet.

To determine the maximum storage capacity available in the deep-tunnel interceptors, a modified version of the EXTRAN interceptor model was developed. The wet-well water surface elevation was set at 624 feet, which is the maximum water surface elevation during dry-weather flow in the incoming Upper Ohio River Interceptor, to represent a minimum wet-well level. The average dry-weather flows were input into the EXTRAN model to determine the flow depths in the deep-tunnel interceptors for the minimum wet-well water surface elevation. The total average dry-weather flow is about 176 mgd.

The total volume of the deep-tunnel interceptors is 28.2 million gallons. The volume occupied by dry-weather flow in each interceptor tunnel operating at the minimum wet-well water surface elevation was determined using the depth of flow in the tunnel at steady state (average dry-weather flow). Table 3-6 presents the calculations of deep-tunnel interceptor volumes for all three rivers.

The steady-state average dry-weather flow occupies 13.0 MG of the total interceptor volume. Therefore, 15.2 MG is potentially available for storage of wet-weather flows.

Interceptor Hydraulic Effects of Main Pump Station Wet-Well Water Surface Elevations

The ALCOSAN collection system is made up of both deep-tunnel and shallow cut interceptors. The deep-tunnel interceptors are 80 to over 100 feet below the ground surface, and typically operate in a surcharged condition. The water levels in the deep-tunnel interceptors are directly

affected by the water surface elevation at the wet-well. The operating procedure at the wet-well is to attempt to maintain the main pump station wet-well water elevation at 680 feet until the pumping rate exceeds 220 mgd. In 1995, a digital control system was installed to automatically control pumping rates to maintain the wet-well elevation. Prior to this, operators manually controlled pumping rates.

Table 3-6
Volumes of Storage in Deep-tunnel Interceptor

Interceptor	Volume (MG)	Dry-Weather Flow Volume (MG)	Available Volume (MG)
Allegheny River	6.8	3.6	3.2
Monongahela River	11.2	4.9	6.3
Ohio River	10.2	4.5	5.7
Total (MG)	28.2	13.0	15.2

Overflows occur at regulators when either the structure or the interceptor is limiting. The structure is limiting when the regulator or connector pipe flowing at capacity is unable to convey all of the flows entering the diversion structure to the interceptor. Flows begin to back up in the diversion chamber until the water level rises above the overflow elevation. The interceptor is limiting when the interceptor becomes surcharged and the hydraulic grade line in the interceptor rises above the overflow elevation, resulting in an overflow caused by the higher hydraulic head in the interceptor forcing reverse flow out through the regulator.

The EXTRAN model of the ALCOSAN system was used to determine the structures that overflowed early in the run and to determine which of these overflowed because of increased water levels in the deep-tunnel interceptors. Then the deep-tunnel water elevation data were analyzed to determine the frequency that the increased water levels caused overflows at the different sites.

Analyses of Deep-tunnel Water Level Elevation Data

As part of the CSO Monitoring Program, 10 stations for monitoring deep-tunnel water level elevation have been installed and maintained throughout the ALCOSAN deep-tunnel system. In addition to the ALCOSAN wet-well monitor, five monitors are located on the Monongahela River Interceptor, three on the Allegheny River Interceptor, and one on the Ohio River Interceptor. Water level elevation data are collected at each of the stations at 15-minute intervals.

SECTION 3
Current Conditions

This section summarizes the analyses performed on the deep-tunnel HGL data collected to-date. One way to analyze the large data set generated from the monitoring program is to analyze the cumulative distribution function (CDF). For each station, the percent of time that the water level is less than or equal to a chosen level was calculated. The chosen levels varied from the lowest to the highest recorded levels at a particular station in increments of 0.1 feet. CDFs were generated for nine deep-tunnel monitors and one shallow cut monitor (A6202, located at an upstream end of the Allegheny interceptor). Overlays of the individual CDF graphs show the relationships between several stations from downstream to upstream along the interceptor system For example, this analyses shows that the ALCOSAN main pump station wet-well water surface elevation was less than or equal to 685 feet approximately 83 percent of the time.

Several factors affect the reliability of the existing CDF curves. First, the monitoring period is only two years or less, and the main pump station wet-well water surface elevation period of record is shorter than for the other monitors. Periods when the monitors were not operational, or were not recording correctly, were eliminated from the CDF analyses, further shortening the period of record. The period of record includes 1995, one of the driest years on record. (The ALCOSAN plant rain gage recorded 25.1 inches of rain in 1995, compared with an annual average rainfall at the airport of about 38 inches). Both of these factors will tend to skew the distribution increasingly with distance from the mean value (i.e. in the tails on the CDF curves, or the upper and lower 25 percent of time that the water level is less than or equal to the indicated value). As more data are collected, the CDF curves will be updated and refined and the CDFs will assume greater reliability for characterizing the deep-tunnel operating level conditions.

Relationships between Wet-well and Deep-tunnel Water Elevations on Overflows

The wet-weather run of the EXTRAN model on the ALCOSAN interceptor system was analyzed to determine which structures were affected by increased water levels in the deep-tunnel interceptors, which can be related back to the wet-well water level elevations. Figure 3-12 shows a portion of the wet-well water level CDF curve and indicates the structures which overflow according to the corresponding wet-well water surface elevations below 702 feet.

Table 3.7 lists the structures that overflow because of increased deep-tunnel water elevations, corresponding to the operating a wet-well water level. The structures are listed in order of overflow occurrence in the EXTRAN run, (i.e. A68 overflowed first). The overflow elevation is listed in the second column. If the river surface elevation is greater than the structure's overflow elevation, the river surface elevation is used since an overflow will not occur until the river elevation is exceeded for the particular structures. The corresponding wet-well water surface elevation at the time the overflow occurs is included in the third column.

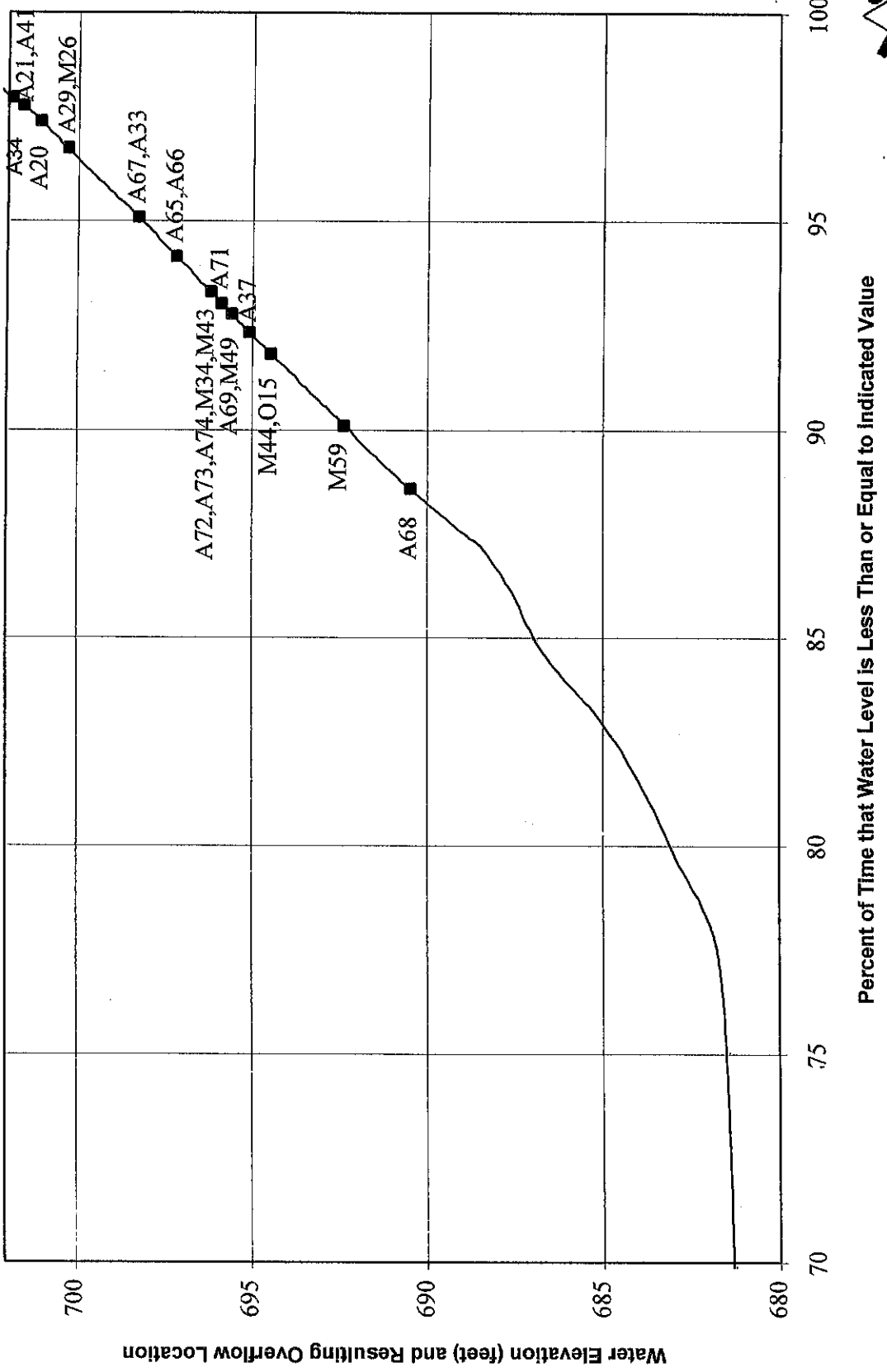


Figure 3-12.

ALCOSAN Main Pump Station Wet Well Frequency Plot

Table 3.7
Structures that Overflow Because of Increased Water Levels in the Deep-tunnel Interceptors

	Structure	Controlling Overflow Elevation	Wet Well Water Surface Elevation at time of Overflow (ft.)
1	A68	710 (River)	690.4
2	M59	712.3	692.4
3	M44	712.8	694.5
4	O15	698.4	694.5
5	A37	710 (River)	695.1
6	A69	710 (River)	695.6
7	M49	713.5	695.6
8	A71	710.97	695.9
9	A72	713.5	696.2
10	A73	713.49	696.2
11	A74	714.36	696.2
12	M34	710 (River)	696.2
13	M43	716	696.2
14	A65	711.25	697.2
15	A66	710	697.2
16	A67	715.5	698.3
17	A33	710 (River)	698.3
18	A29	710.38	700.3
19	M26	710	700.3
20	A20	710 (River)	701.1
21	A21	710 (River)	701.6
22	A41	716.9	701.6
23	A34	711.43	701.9

3.2.7 Current Performance of the Interceptor System

This section describes the results of the systemwide rainfall analyses and STORM analyses. The STORM analyses were performed for each of the 15 interceptor subsystems in ALCOSAN's interceptor sewer system. The results are expressed in terms of the frequencies and volumes of overflows on an average annual basis and as the systemwide percentage capture over a range of treatment plant capacities.

Preliminary Rainfall Characterization

From Airport

The long-term precipitation record (1948-1995) used in STORM was characterized as follows: the number of precipitation events exceeding 0.10 inches and 0.05 inches of precipitation was computed for four minimum inter-event time (MIT) conditions: one, two, three and six hours. The results are presented in Table 3.8.

Table 3.8
Frequency of Precipitation Events in the ALCOSAN Service Area

Minimum Inter-event Duration (hours)	Average Annual Number of Precipitation Events	
	Exceeding 0.10 inches:	Exceeding 0.05 inches:
1	86	122
2	82	112
3	79	106
6	74	94

The events listed in the Table 3.8 cannot be directly correlated to the frequency of sewer system overflows, though they can be used to infer the upper limit of the range of overflow events. Because the analysis is based solely on rainfall, i.e., without consideration of the capacity of the interceptor system to capture runoff, and not accounting for in-system or depression storage. For similar reasons, attempts to correlate overflow volumes with rainfall characteristics, such as intensity and duration, is at best a flawed approach. The non-linear relationship between volumes of rainfall, runoff, and overflow is the principle reason that deterministic, mathematical models of the rainfall-runoff-overflow processes are used. The use of the STORM model is described below.

Preliminary Overflow Characteristics

Statistics on the frequency and volume of sewer system overflows were generated for different interceptor segments using the STORM analysis, as discussed above. The STORM analysis was based on applying a 47-year rainfall record from 1948 through 1995 on the individual combined sewer drainage areas to generate surface runoff estimates. Treatment rates derived from the EXTRAN model as well as storage data dependent on the individual basin characteristics were input to the STORM model, which estimates the annual frequency and volume of overflows. The results for the individual combined sewersheds were composited by interceptor segment, to achieve the estimates presented.

The ALCOSAN interceptor system was divided into 15 interceptor segments as shown in Table 3.9. The delineation of segments was based on the characteristics of the interceptor, including the tributary watercourse, the type of interceptor (deep-tunnel or shallow cut), and locations of key control points, e.g. the 11th Street control structure on the Monongahela River Interceptor. Table 3.9 also lists the number of structures corresponding to each interceptor segment. The number of structures includes those that can overflow combined sewage and that were included in the EXTRAN model. The number of structures does not included:

- Structures that are not diversion structures, including access shafts, junction chambers, pump stations, and structures that at one time diverted combined sewage but are no longer in service.

- Structures not modeled individually in the EXTRAN model. Most diversion structures were included in the EXTRAN hydraulic model; a few that are directly upstream of other, more restrictive in the interceptor were not modeled for the preliminary study. The exclusion of these structures does not affect the volume statistics, but does affect the frequency statistics.

Explain

- Interceptor manholes not classified as diversion structures that overflowed during the EXTRAN model simulation but which are either suspected to have incorrect rim elevations or are bolted down to prevent overflows.

Runoff volume at each time step is computed in STORM. The STORM computation of event frequencies is based on the physical system response to runoff. For each hour in that runoff occurs, the "treatment" facilities (i.e. the CSO regulators) are used to divert flows to the plant for treatment. The flow includes the dry-weather flow. When runoff exceeds the treatment rate (as defined by EXTRAN), the in-system storage begins to fill.

Table 3.9
Description of Interceptor System Segment

Interceptor Segment	Description	No. of Structures
Lower Ohio River	Loweries Run to treatment plant. Both deep-tunnel (O15 through O26) and shallow cut (O01 through O05B).	21
Upper Ohio River	Between Point State Park and treatment plant. Deep-tunnel (O27 through O43). O14 included in the Lower Saw Mill Run interceptor segment.	17
Lower Northern Allegheny River	From Girty's Run to Point State Park. Both shallow cut (A63 through A67) and deep-tunnel (A46 through A62).	18
Lower Southern Allegheny River	From Verona including the Penn Hills Interceptor to Point State Park including contributions from Pine Creek. Primarily deep-tunnel (A01 through A42), except for the Pine Creek (A68), Verona (A83 through A85 and the Penn Hills connection.	54
Upper Allegheny River	Upstream of river crossing at 16th Street. Shallow cut (A69 through A78).	11
Lower Monongahela River	From Four Mile access shaft (M30) to Point State Park. Primarily deep-tunnel (M01 through M29). Includes contributions from Brady Street structure across river (M19).	34
Middle Monongahela River	Shallow-cut and deep-tunnel interceptor (M31 to M45), upstream of Four Mile access shaft (M30) to Homestead.	14
Upper Monongahela River	From downstream of 11th Street control structure (M59) to Nine Mile access shaft (M46). Deep-tunnel interceptor (M47 through M58).	12
Lower Turtle Creek/ Upper Monongahela River	From confluence of Thompson Run with Turtle Creek to the 11th Street control structure. Deep-tunnel (M59 through T02) and shallow-cut interceptor (T03 through T07).	8

Table 3.9
Description of Interceptor System Segment

Interceptor Segment	Description	No. of Structures
Upper Turtle Creek	Upstream of confluence of Thompson Run and Turtle Creek. Shallow-cut (T10 through T33).	26
Thompson Run	Upstream of confluence of Thompson Run and Turtle Creek. Shallow-cut (TR01 through TR06).	6
Lower Saw Mill Run	Parallel interceptors downstream of Woodruff Street to the Ohio River. Shallow-cut (S38 through S46). Includes O14.	11
Upper Saw Mill Run	Upstream of Woodruff Street (1A). Shallow-cut (S18 through S36).	20
Lower Chartiers Creek	Downstream of C13A to the treatment plant. Includes Ohio River segment downstream of Corliss pump station (O06 through O13). Primarily shallow-cut (C02 through C13).	18
Upper Chartiers Creek	Upstream of C13A. Shallow-cut interceptor (C13A through C44 and including Robinson Run connection).	45

When storage capacity is exceeded, the excess runoff overflows from the system. As the rate of runoff recedes to less than the treatment rate, the in-system storage is emptied. Thus, an event is defined as beginning when storage is required and continuing until in-system storage is emptied. Because this approach to computing event statistics considers how the physical system actually responds to runoff, it is an acceptable method for generating system overflow statistics.

Table 3.10 includes the average annual overflow frequency and total volume statistics for each of the interceptor segments. The average annual overflow frequency for each segment is defined as the sum of the total number of overflows from structures in the segment, divided by the total number of structures in the segment. The maximum and minimum frequencies show the range of overflow frequencies estimated for the segment. A minimum overflow frequency of 5 means that at least one structure in that segment is estimated to overflow 5 times per year and that no other

If we look at an overflow frequency range of 6-106 overflows per year What is the point of guestimating volumes ?

structure overflows less frequently. The total annual overflow volumes are presented as a range of values for each interceptor segment.

We aren't exactly talking precise engineering !

Table 3.10
Sewer System Overflow Statistics

We are experts at averages

Interceptor Segment	Number of Structures	Overflow Frequency Range / Structure / Year	Frequency Average per Structure / Year	Estimated Overflow Volume in Billion Gal./Year	
Ohio River					
Lower	21	6 - 106	36	1.00	1.50
Upper	17	<1 - 65	37	0.30	0.70
Allegheny River					
Lower Northern	18	2 - 122	37	0.90	1.50
Lower Southern	54	2 - 114	36	1.80	2.80
Upper	11	21 - 116	59	0.50	1.00
Monongahela River					
Lower	34	7 - 108	35	1.20	1.50
Middle	14	13 - 78	46	0.90	1.30
Upper	12	5 - 58	44	0.60	0.90
Upper Mon./Lower Turtle Creek	8	8 - 101	48	1.60	2.30
Upper Turtle Creek	26	<1 - 112	30	0.20	1.10
Thompson Run	6	1 - 96	44	0.20	0.40
Saw Mill Run					
Lower	11	4 - 112	48	0.20	0.40
Upper	20	3 - 122	39	0.55	1.00
Chartiers Creek					
Lower	18	5 - 62	32	0.30	0.80
Upper	48	2 - 102	33	1.50	2.70

System-Wide Storm Analysis

Although flows into the ALCOSAN system are regulated by individual diversion structures along the major interceptors, the ultimate treatment capacity of the system is controlled by the ALCOSAN treatment plant. Currently, the average daily pumping rate at the plant is 176 mgd during dry-weather, and the maximum daily pumping rate is 227 mgd in wet-weather, yielding an available wet-weather treatment capacity of approximately 50 mgd. Predicting the frequencies of different runoff flows to the plant can help determine the benefits of increasing the treatment plant capacity. By running the STORM model for the entire ALCOSAN area, the runoff frequency statistics can be determined. Figure 3-13 shows the simulated wet-weather contributions from combined and separate areas (including the average dry-weather daily flow of 176 mgd) of the service area versus the annual frequency of occurrence of hourly runoff rates. For example, the hourly system-wide flows (runoff plus dry-weather flows) are predicted to exceed 400 mgd for approximately 380 hours per year.

3.2.8 Implications of Interceptor System Capacity

Regulator Optimization

ALCOSAN is actively pursuing the optimization of regulator settings in the diversion structures. The adjustment of regulator controls is being studied and implementation plans are being formulated as part of ALCOSAN's NPDES permit compliance program for alleviating CSOs. The documentation of the fourth minimum CSO control (optimization of flow to and through the wastewater treatment facility) will include a detailed analysis of the regulator optimization steps taken to date, and of the opportunities for further refining the operation of the regulators. The documentation of the implementation of the nine minimum controls will be completed and submitted under the agreed-upon schedule as detailed in the NPDES permit.

Although ALCOSAN is pursuing optimization, the potential of regulator adjustments significantly reducing the volumes or frequencies of CSO should not be overstated. Analyses of historic plant flow and wet-well operating level records indicate that, very little time elapses between the onset of rainfall and runoff and the point at that the pumping rate at the plant increases to 225 mgd.

In the ALCOSAN system, the typical CSO regulating structure admits between the equivalent to 0.004-0.006 inches per hour to the interceptor before it overflows. This equates to approximately two to three times the amount of wet-weather flow that the plant can treat currently. Even at the ultimate secondary capacity of 275 mgd, the aerial combined sewer service area treatment rate increases to only 0.0037 in./hour, and the regulators would still admit about 10 percent to 60 percent more to the interceptors than could be treated at the plant wet-weather treatment rate of

Is this rainfall intensity and how is this number determined?

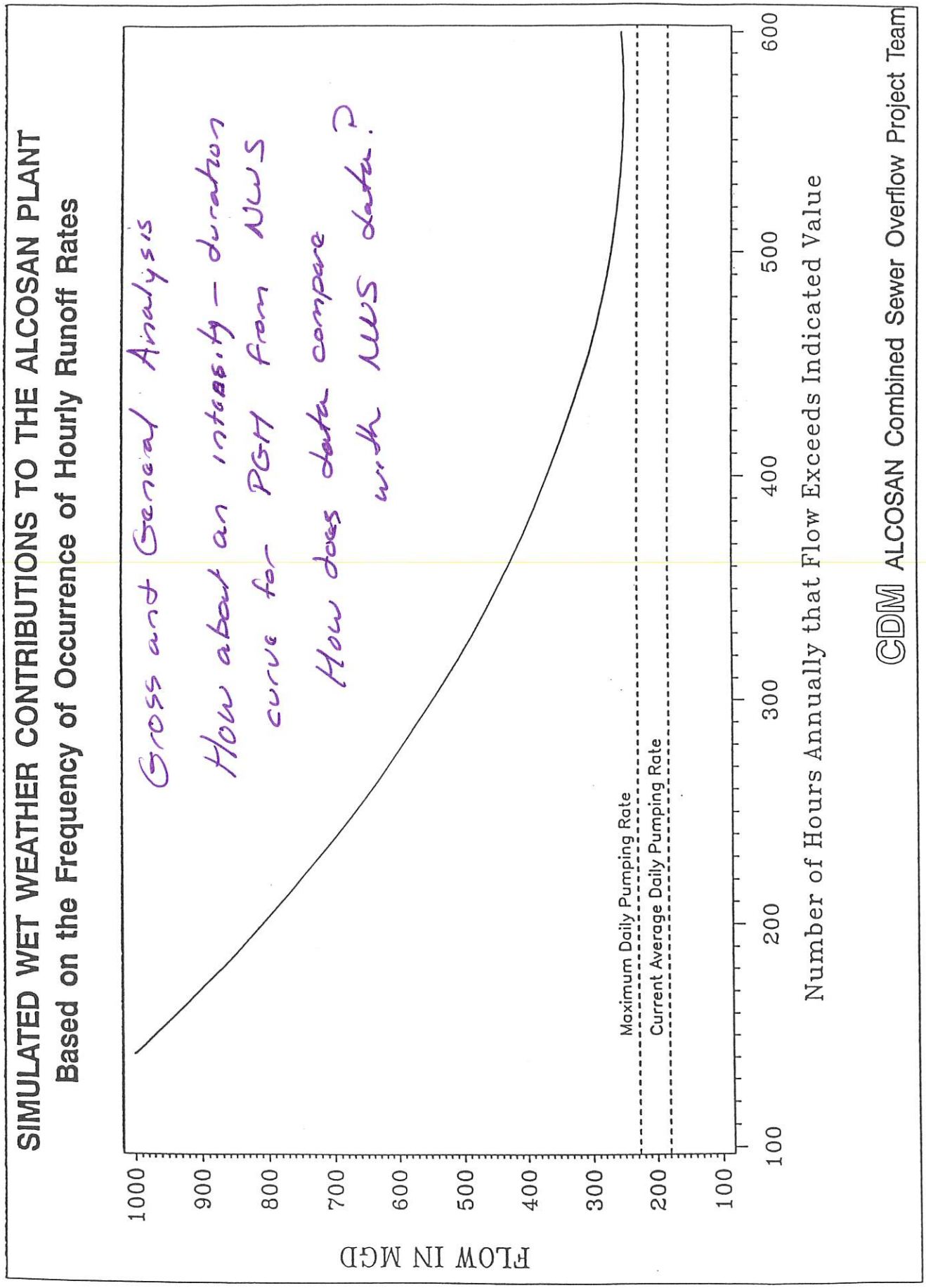

SIMULATED WET WEATHER CONTRIBUTIONS TO THE ALCOSAN PLANT
Based on the Frequency of Occurrence of Hourly Runoff Rates
FLOW IN MGD
1000
900
800
700
600
500
400
300
200
100
Maximum Daily Pumping Rate
Current Average Daily Pumping Rate
100
200
300
400
500
600
Number of Hours Annually that Flow Exceeds Indicated Value
CDM ALCOSAN Combined Sewer Overflow Project Team
Gross and General Analysis
How about an intensity - duration
curve for PGH from NWS
How does data compare
with NWS data?

Figure 3-13.

100 mgd. With the completion of the proposed 875-mgd wet-weather treatment facilities at the plant, the treatment rate for the combined sewer areas would be approximately 0.01 in./hour.

Although adjusting the regulators is important for optimizing flow to the wastewater treatment plant as part of the implementation of the fourth minimum control, the regulators should be expected to provide only modest reductions in overflows volumes and frequencies unless the available wet-weather treatment rate at the plant significantly increases or the flow volumes from the contributing sewer sheds reduces.

Changes in Wet-well Management Procedures

In addition to the overflow estimates shown in Table 3.10, capture-for-treatment characteristics of the existing interceptor system have also been estimated. The capture value represents the percentage of the average annual wet-weather runoff and the intra-storm base-flow volume that is captured in the sewer system and delivered to the treatment plant. The percentage was estimated by comparing the average annual wet-weather combined sewer flow (i.e., runoff volume plus the volume of base wastewater flow during wet-weather) and the average annual overflow volume for the sewer system. For the existing maximum treatment plant treatment rate of 227 mgd, the estimated annual average capture is 30 percent. If treatment capacities at the plant were increased to 275 mgd, 550 mgd or 875 mgd, the corresponding estimates of capture would increase to 35 percent, 53 percent or 65 percent, respectively. The percent capture estimates represent wet-weather contributions from both combined sewered and separate sewered areas.

3.3 NON-ALCOSAN INTERCEPTORS and TRUNK SEWERS

3.3.1 Overview

In addition to the nine interceptors owned or operated by ALCOSAN, several municipal interceptors and trunk sewers that are not owned by ALCOSAN collect wastewater from municipalities within the ALCOSAN service area and transport it to the ALCOSAN interceptor system. PaDEP requested that eleven major municipal sewers be addressed in ALCOSAN's 537 Plan. These systems are summarized in Table 3.11. The approximate alignment of these interceptors and trunk sewers is shown in Figure 3-14.

As a component of the CSO long term control plan (LTCP), the non-ALCOSAN sewers and interceptors will be mapped and described, and tributary municipalities will be identified. The contributing municipal sewer sheds will be mapped, and subareas will be classified as being served either by combined interceptors or separate sewers. Where possible, problems with the operations of these sewers will be identified, and capital improvement plans will be described. The effects of wet-weather flows on the ALCOSAN interceptor system will be incorporated in the LTCP alternatives analysis. This information will be incorporated into the 537 Plan by amendment upon completion of the LTCP.

As is generally true throughout Southwestern Pennsylvania, these trunk sewers and interceptors have experienced high peak wet-weather flows. ALCOSAN's CSO Program has been including monitoring the flows in representative non-ALCOSAN interceptors. Peak hourly flow rates from sanitary sewer service areas have ranged from approximately 650 gallons per capita per day (gpcd) to 1,060 gpcd. Information on the physical and institutional nature of the non-ALCOSAN interceptor systems is summarized below. The information was obtained from PaDEP and/or the Allegheny County Health Department (ACHD).

3.3.2 Becks Run

Becks Run services a watershed area of 1,298 acres, or 2.03 square. miles. The Becks Run drainage basin lies entirely within the ALCOSAN service area. The system is composed of combined and separate sanitary sewer segments. Becks Run ties into ALCOSAN's Monongahela River Interceptor at structure M34.

Becks Run serves all or parts of the following municipalities:

- Baldwin Borough
- City of Pittsburgh
- Mt. Oliver Borough

Table 3.11
Non-ALCOSAN Contributing Interceptors and Trunk Sewers

Interceptor/ Trunk Sewer	Responsible Parties	Type(s) of Contributing Sewershed	Discharge to ALCOSAN Interceptor	Point of Connection
Becks Run	City of Pittsburgh, Baldwin, Mt. Oliver Boroughs	combined separate	Monongahela	M34
Girtys Run	Westview Borough and Girtys Run Joint Sewer Authority (GRJSA) - Ross, Shaler, Reserve, Townships, Millvale Borough	combined separate	Allegheny	A67
Lowries Run	Ross Township, McCandless Township Sanitary Authority (MTSA)	separate	Ohio	O15
McLaughlin Run	Bridgeville Borough, Bethel Park , Upper St. Clair Townships	separate	Chartiers	Between C53& C54
McNeilly Road	Dormont, Baldwin, Castle Shannon Boroughs, Municipality of Mt. Lebanon, City of Pittsburgh	combined separate	Saw Mill Run	SMR15, SMR16, SMR17
Ninemile Run	City of Pittsburgh, Edgewood, Swissvale, Wilkinsburg Borough	combined separate	Monongahela	M47
Painters Run	Upper St. Clair Township, Mt. Lebanon Municipality	separate	Chartiers	C53
Pine Creek/Little Pine Creek	Etna Borough, Shaler, Ross, O'Hara, Indiana Townships	combined separate	Allegheny	A68
Robinson Run	North Fayette, South Fayette Townships, McDonald, Oakdale Borough	separate	Chartiers	C45B
Streets Run	City of Pittsburgh, Baldwin, Brentwood, West Mifflin, Whitehall Boroughs	combined separate	Monongahela	M42
Whitaker Run	Munhall, West Mifflin, Whitaker Boroughs	combined separate	Monongahela	M49

Map Source: ALCOSAN Combined Sewer Overflow Program

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET
0 2000 4000 6000 8000 12000 16000

MILES
0 1 2 3 4

Legend

- Non-ALCOSAN Interceptors and Trunk Sewers
- Deep Tunnel Interceptor
- Shallow Cut Interceptor
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

CRESCENT TWP
HEIGHTS
INDIANA TWP
OHIO TWP
ROSS TWP
HARMAR TWP
FOX CHAPEL BORO
O'HARA TWP
OAKMONT BORO
MOON TWP
ALEPPO TWP
KILBUCK TWP
NEVILLE TWP
STOWE TWP
KENNEDY TWP
ROBINSON TWP
RESERVE TWP
ALCOSAN PLANT
CITY OF PITTSBURGH
PENN HILLS TWP
NORTH FAYETTE TWP
COLLIER TWP
SCOTT TWP
SOUTH FAYETTE TWP
MT LEBANON TWP
BALDWIN BORO
BRENTWOOD BORO
WHITEHALL BORO
CASTLE SHANNON
MUNHALL BORO
DUQUESNE CITY
WEST MIFFLIN
PLEASANT
CHURCHILL BORO
WILKINSBURG BORO
EDGEWOOD BORO
SWISSVALE BORO
FOREST HILLS BORO
BRADDOCK HILLS BORO
NORTH BRADDOCK BORO
HOMESTEAD BORO
MT OLIVER BORO
DORMONT BORO
CARNEGIE BORO
GREENTREE BORO
CRAFTON BORO
INGRAM BORO
THORNBURG BORO
MCKEES ROCKS BORO
BELLEVUE BORO
AVALON BORO
BEN AVON BORO
EMSWORTH BORO
OSBORNE BORO
GLENFIELD BORO
CORAOPOLIS BORO
OAKDALE BORO
BRIDGEVILLE BORO
DRAVOSBURG BORO
PORT VUE BORO
MCKEESPORT CITY
SHARPSBURG BORO
WEST VIEW BORO

Lowries Run
Girty's Run
West Little Pine Creek
Pine Creek
East Little Pine Creek
Ping Creek
Nine Mile Run
Becks Run
Whitaker Run
Streets Run
McNeilly Road
Painters Run
McLaughlin Run
Robinson Run

CDM EPM TEAM CH2MHILL
ALCOSAN
Camp Dresser & McKee

Figure 3-14
Non-ALCOSAN Interceptors and Trunk Sewers
Approximate Alignments (For Illustration Only - Not Field Validated)

Infiltration and Inflow and structural problems have been reported in the Becks Run system. Several areas have reported surcharging sewers, overflows, and backups, which have been attributed to I/I. The structural problems also have been predominantly reported in Mt. Oliver Borough.

3.3.3 Girtys Run

Girtys Run services a watershed area of 7,190 acres or 11.24 square miles. The entire area of the Girtys Run Drainage Basin is contained within ALCOSAN's service area. The system is a combination of combined interceptors and separate sanitary trunk sewers. The existing trunk sewers range in size from 8 to 30 inches. The main line was constructed jointly by Millvale and West View Boroughs and Shaler and Ross Townships in 1932. Girtys Run ties into ALCOSAN's Allegheny River Interceptor at structure A67. There are no pump stations in the system.

The Girtys Run interceptor serves all or parts of the following municipalities:

- Millvale Borough
- Reserve Township
- Ross Township
- Shaler Township
- West View Borough

Are we the consultant?

Is it a hydraulic capacity issue or I/I?

These are not the same !!!

According to information from ACHD and previous planning documents, the sewer is hydraulically overloaded because of excessive inflow and infiltration and is structurally deficient in certain locations e.g., reductions in pipe size and an undersized siphon. Eight overflow structures on Girtys Run require reconstruction to prevent the entrance of receiving water and to control bypassing properly. Dry-weather bypassing also has been reported.

The interceptor is owned by the member municipalities which have formed the Girtys Run Joint Sewer Authority (GRJSA). Maintenance and repair work for these municipalities is conducted by the individual municipalities under the direction of the GRJSA. West View Borough is served by Girtys Run but is not currently a member of the GRJSA. As a result, West View Borough conducts maintenance and repair work on its own system under an agreement with the West View Municipal Authority and the North Hills Council of Governments.

The GRJSA has an approved Corrective Action Program (CAP, 1994), that identifies all known sanitary sewer overflows and addresses the continuous flow monitoring of all bypass points for frequency, duration, cause, and quantity. In addition, seven non-CSO bypass points within the watershed were identified and investigated, and a report was submitted to PaDEP in August, 1994 which outlined the findings of the study and presented recommendations.

Two overflows were sealed. The remaining overflows were sealed or were equipped with overflow monitors, as required by the CAP. West View Borough has also jointly conducted CAP activities with the GRJSA.

3.3.4 Lowries Run

Lowries Run services a watershed area of 6,862 acres, or 10.72 square miles. The entire area of the Lowries Run Drainage Basin is in ALCOSAN's service area except for two small areas, the Ohio Township Elementary School and the Royal Ridge Field Club. The system is composed entirely of separate sanitary trunk sewers ranging in size from 8 inches to 24 inches and ends at manhole O15 at the upstream terminus of ALCOSAN's Ohio River Interceptor. Kingsland Pump Station and Kaylor Pump Station convey flows in the Lowries Run system.

Lowries Run serves all or parts of the following municipalities:

- Ben Avon Borough
- Emsworth Borough
- Franklin Park Borough
- Kilbuck Township
- Ohio Township
- Ross Township
- McCandless Township

I'm sure the restrictor plate at O-15 does not help.

Lowries Run has experienced surcharges because of excessive inflow and infiltration and has bypassed sewage in Ohio, Ross, Kilbuck, and McCandless Townships, and Emsworth Borough. The system also has structural problems.

Lowries Run is jointly owned and operated by Ross Township and the McCandless Township Sanitary Authority (MTSA). Ross and McCandless recently formed a board for managing the interceptor system. An engineering firm has been contracted to conduct flow monitoring, which is intended to quantify each municipality's contribution to the interceptor. Two flow monitoring stations were installed on the Lowries Run Interceptor in 1995 to measure flow from McCandless Township and McCandless and Ross Township joint areas.

Each municipality is responsible for creating and executing its own CAP. In a 1988 letter to the commissioners of Allegheny County, ACHD requested that ALCOSAN be required to assist the communities in formulating CAPs. Frequent bypasses and sewage backups, as well as a shortage of resources were cited as the major reasons for the request. A CAP was prepared and approved in 1995 for the MTSA portion of the Lowries Run Drainage Basin.

3.3.5 McLaughlin Run

McLaughlin Run serves a watershed area of 1,330 acres, or 2.08 square miles. The entire system is classified as a separate sanitary sewer. McLaughlin Run ties into ALCOSAN's Chartiers Creek Interceptor between structures C53 and C54.

McLaughlin Run serves all or parts of the following municipalities:

- Bridgeville Borough
- Bethel Park Borough
- Upper St. Clair Township

Several problems have been documented with McLaughlin Run. Overflows and sewage discharges in the system have been attributed to wet-weather flows and I/I. The incidents have led to tap restrictions and have hindered development in the area.

Upper St. Clair undertook a CAP in 1993. Actions taken to alleviate problems in McLaughlin Run include flow monitoring, evaluation of the Bridgeville restriction plate, and an internal TV inspection of the sewer system. In the CAP update, the municipality recommended wet-weather equalization facilities to prevent overflows. Upper St. Clair also requested approval of their tap request on the basis of the CAP progress thus far.

3.3.6 McNeilly Road

The McNeilly Road Interceptor services a watershed area of 1,394 acres or 2.18 square miles. The system is composed of combined interceptors and separate sanitary sewers. The McNeilly Road trunk sewer connects into ALCOSAN's system at the Saw Mill Run Interceptor structures SMR15, SMR16, SMR17.

McNeilly Road serves all or parts of the following municipalities:

- Baldwin Borough
- Castle Shannon Borough
- Dormont Borough
- Mt. Lebanon Municipality
- City of Pittsburgh

A City of Pittsburgh Ordinance dated June 1927 states that Dormont Borough, Municipality of Mt. Lebanon, and Baldwin Borough will provide for shared payment of the cost of construction, maintenance, and repair of the McNeilly Road Trunk Sewer.

Overflows, backups, and basement flooding have been reported in the watershed. At one point, backflow-prevention valves were installed as a temporary solution to the problem of basement flooding. Although usage limits have been imposed, residential and commercial development has continued, accentuating the problems.

ACHD has stipulated that Dormont, Baldwin, and Mt. Lebanon will be held jointly responsible for developing a CAP that will eliminate sewage backups and manhole surcharging.
PaDEP is not granting tap-in requests, pending system improvements and CAP progress.

Dormont Borough developed a CAP for the McNeilly Road System in 1994. The CAP consisted of dye testing, televised sewer inspections, sanitary sewer repairs, and inspecting and repairing manholes.

3.3.7 Ninemile Run[1]

The Ninemile Run Watershed is a natural drainage basin of the Monongahela River. The watershed includes portions of the City of Pittsburgh, The Boroughs of Swissvale, Wilkinsburg and Edgewood, and covers an area of approximately 71 square miles. Approximately 34 percent of the watershed is classified as undeveloped land, much of this being within the City of Pittsburgh (Frick Park). Frequent raw sewage discharges to Ninemile Run and corresponding high fecal coliform levels within the waters of the creek have been reported.

The Ninemile Run trunk sewer was installed by the City of Pittsburgh in the 1920s and was tied into the ALCOSAN system in the 1950s. The Boroughs of Edgewood, Swissvale and Wilkinsburg tied into the City trunk sewer in the early 1980s. Early in 1994, Swissvale and Wilkinsburg began a program of routine site examinations and scheduled maintenance on their respective sewer systems. The Ninemile Run trunk sewer has been experiencing operational and maintenance difficulties. The Allegheny County Health Department has issued notices of violations of the Pennsylvania Clean Streams Law to Pittsburgh and the three boroughs concerning high fecal coliform counts in Ninemile Run.

At the request of the City of Pittsburgh, ALCOSAN authorized Chester Environmental to prepare a study of the Ninemile Run trunk sewer between its point of connection to ALCOSAN structure M-47 of the Monongahela Interceptor and upstream to the point where the Boroughs of Swissvale and Wilkinsburg are connected.

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1 Information on the Ninemile Run trunk sewer has been excerpted from the Ninemile Run Trunk Sewer Study, November 1995, prepared for ALCOSAN by Chester Environmental, Moon Township, Pa.

The study revealed that portions of the Ninemile Run trunk sewer are in poor condition and are in need of major repair. Lose, cracked or separated terra cotta invert liner tiles, excessive leakage, fractured pile, and heavy debris buildup may all contribute to surcharge conditions during wet weather flow and the resultant discharge of wastewater into Ninemile Run. The situation is especially critical in areas where the trunk sewer crosses the creek. Due to the conditions of the pipe, a vigorous cleaning program could result in serious damage.

The flow monitoring conducted for the study confirmed that a significant amount of storm flow enters the trunk sewer system. During storm events, daily maximum flow rates within the trunk sewer increases significantly from normal, dry-weather flow rates. The study determined that the hydraulic capacity of the Ninemile Run trunk sewer is sufficient to handle dry-weather flow without dry weather overflows and the resulting water quality impacts on the creek.

During wet weather, the storm drains which discharge into Ninemile Run may be a factor influencing the sewage discharges. Subarea wet-weather inflows greater than the diversion chamber capacity are bypassed to the creek as combined sewer overflows.

It was recommended that a trunk sewer rehabilitation program be implemented to reduce or eliminate the amount of sewer obstructions and infiltration, thereby decreasing the potential for surcharge conditions during wet weather, and reducing the occurrences of raw wastewater discharge into the creek. Estimated rehabilitation costs ranged between $1.3 million and $2.6 million, and an overall budget of $3 million to upgrade the Ninemile Run trunk sewer was recommended.

3.3.8 Painters Run

Painters Run services a watershed area of 2,833 acres, or 4.43 square miles, and a population of 21,578. The system is composed entirely of separate sanitary trunk sewers. ALCOSAN estimates that the average dry-weather flow from this system is one to three MGD, and that the peak daily flows are up to 10 MGD. Painters Run ties into the ALCOSAN system at Chartiers Creek structure C53.

Painters Run serves all or parts of the following municipalities:

- Bethel Park Borough
- Bridgeville Borough
- Castle Shannon Borough
- Mt. Lebanon Municipality
- Scott Township
- Upper St. Clair Township

Basement flooding, surcharging manholes, and unwarranted bypassing have been reported along Painters Run. These problems have stalled economic development and tap-in requests. In an attempt to address the issue, visual inspections were completed in 1994 by all contributing municipalities. Although no overflows were visually verified, more flow monitoring was suggested by PaDEP. A March 1995 meeting, attended by ALCOSAN, PaDEP, ACHD, and municipality representatives centered on the future of granting taps to the municipalities. In response to the requests, PaDEP requested the following from the municipalities:

- GIS mapping of each municipality's sewer system tributary to the trunk sewer, conforming to Allegheny County's format

- Enactment of a joint flow-monitoring program to identify problem areas

Smoke and dye testing was conducted in the system to comply with terms of the CAP. Flow monitoring also is scheduled per the CAP.

3.3.9 Pine Creek/Little Pine Creek

Pine Creek

Pine Creek services a watershed area of 6,127 acres, or 9.57 square miles. The lower part of the Pine Creek Basin, which is in ALCOSAN's service area, is served by an interceptor next to Pine Creek. The Pine Creek system is comprised of combined interceptors and separate sanitary trunk sewers, ranges in size from 8 to 36 inches. This interceptor connects to ALCOSAN's system at the confluence of Pine Creek and the Allegheny River (structure A68).

The Pine Creek System serves all or parts of the following municipalities:

- Etna Borough
- Indiana Township
- O'Hara Township
- Ross Township
- Shaler Township

I/I, structural, and malfunctioning on-lot septic system problems have been reported in the Pine Creek System. Surcharging sewer lines and bypasses into Pine Creek and out of manholes have been documented. Hydraulic overloading, which has been attributed to I/I and wet-weather flows, also has caused basement flooding. In some segments of the Pine Creek System, collapsed or broken municipal sanitary sewers have been observed. Besides I/I and structural problems, several reported cases of malfunctioning on-lot systems have been reported.

Map Source: ALCOSAN Combined Sewer Overflow Program

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Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

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MILES
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Legend

- Deep Tunnel Interceptor
- Shallow Cut Interceptor
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Hydrologic Features

CDM CHMHILL EPM TEAM ALCOSAN

Camp Dresser & McKee

Figure 3-1
Current ALCOSAN Service Area and Interceptor System

A 1969 agreement added Indiana Township to the system and allocated maintenance, repair, replacement, and relocation responsibilities as follows:

- Etna: 29 percent
- Shaler: 29 percent
- Ross: 29 percent
- Indiana: 13 percent

Sewer repairs, flow monitoring, sewer reconstruction improvements were slated in a 1994 CAP update. Etna Borough and Indiana Township have participated in a maintenance/rehabilitation program that has been successful in reducing I/I. In 1995 the Pine Creek system was reported to be functioning properly, with no apparent significant structural or I/I problems. A limited number of tap requests in the Pine Creek System are being granted by PaDEP to the contributing municipalities.

Little Pine Creek

Little Pine Creek services a watershed area of 4,000 acres, or 6.25 square miles, and a population of 66,540 (1990 census). The system includes five pump stations are along the Little Pine Creek System: Hartwood, Fox Hall #1, Fox Hall #2, Middlecrest, and Saxonburg. All of the pump stations pump wastewater to the ALCOSAN system except Hartwood, which pumps wastewater to the Allegheny Valley Joint Sewer Authority (AVJSA). Most of the pump stations were reported to be operating below capacity.

The Little Pine Creek System serves all or parts of the following municipalities:

- Etna Borough
- Shaler Township
- Ross Township
- Indiana Township

The Little Pine Creek System has experienced hydraulic overloading and overflows, on-lot system malfunctioning, and nonstandard treatment problems. Hydraulic overloading, overflows, and basement flooding have been reported in Shaler, Etna, and Ross Townships (Pine Creek and Little Pine Creek Systems). Problems in the Little Pine Creek System have restricted development in Etna, Shaler, and Ross Townships, all of which have ongoing CAPs.

3.3.10 Robinson Run

The entire Robinson Run Watershed is located within ALCOSAN's service area. The system is composed of separate sanitary sewers and the Oakdale Pump Station. The Robinson Run Interceptor ties into ALCOSAN's Chartiers Creek Interceptor at structure C45B.

Robinson Run serves all or parts of the following municipalities:

- North Fayette Township
- South Fayette Township
- Oakdale Borough
- McDonald Borough

Robinson Run has experienced surcharging events during wet weather. The system was visually inspected with a video camera in an I/I study (1993). Results of this study will assist in determining the integrity of the system and sections that may need to be replaced. A monitoring system, consisting of four permanent flow meters, is maintained to quantify flow and I/I for each municipality.

The Municipal Authority of the Township of South Fayette (MATSF), under an agreement between the contributing Robinson Run municipalities, is responsible for operation and maintenance of jointly-owned sewers and the Oakdale Pump Station. Each municipality is responsible for operating and maintaining their own collection systems.

3.3.11 Streets Run

Streets Run services a watershed area of 5,212 acres, or 8.14 square miles. The entire area of the Streets Run Drainage Basin is within ALCOSAN's service area. The system is composed of combined and separate sanitary sewers. The Streets Run interceptor ties into ALCOSAN's Monongahela River Interceptor at structure M42.

Streets Run serves all or parts of the following municipalities:

- Baldwin Borough
- Brentwood Borough
- City of Pittsburgh
- West Mifflin Borough
- Whitehall Borough

Streets Run has had I/I and structural problems. Sewage backups and overflows have been attributed to excessive I/I and a lack of system capacity. A CAP was requested by PaDEP in 1986 and is currently being executed.

3.3.12 Whitaker Run

Whitaker Run services a watershed area of 1,074 acres, or 1.68 square miles. The system is composed of both combined interceptors and separate sanitary sewers. Whitaker Run ties into the ALCOSAN system at structure M-49 (Monongahela).

Whitaker Run serves all or parts of the following municipalities:

- Munhall Borough
- West Mifflin Borough
- Whitaker Borough

3.4 SUBSCRIBING MUNICIPALITIES CORRECTIVE ACTION PROGRAMS

During wet weather and high groundwater table conditions, many of the municipally owned interceptors tributary to the ALCOSAN system are hydraulically overloaded. The condition of hydraulic overload is due primarily to excessive I/I entering the municipal system. Recurring incidences of surcharging manholes and basement flooding are the primary problem with systems in this condition. To address the conditions of hydraulic overloads within a sewage system, PaDEP has developed the Corrective Action Program under PA Code 25.94.

PaDEP requested that the ALCOSAN 537 plan consider municipalities that have been implementing CAPs to reduce excessive amounts of I/I. In response to PaDEP's request, ALCOSAN conducted an extensive review of PaDEP and ACHD records in an attempt to estimate the effects of the CAPs on the quantities of wastewater flowing to the ALCOSAN treatment plant. All available PaDEP and ACHD files for the 29 municipalities listed in PaDEP's letter of May 24, 1994, were examined. In addition, letters were sent to each municipality explaining the ALCOSAN 537 planning and soliciting information.

The Corrective Action Program authorizes PaDEP to issue tap bans on the problem systems. It also gives PaDEP the power to require the development of a CAP by the municipality to reduce the hydraulic effects on I/I to the system. After the municipality has implemented its CAP additional taps and sewer extensions are regulated by PaDEP on the basis of the success of the corrective actions.

Most CAPs are developed by using a phased approach in response to an order from PaDEP to investigate the causes of problems with the system. This usually involves reviewing complaints, identifying contributory subsystems, and monitoring flows in the primary interceptor to determine actual flows.

The municipality's commitment to the CAP within problem sewersheds has varied among communities. Communities most likely to implement a CAP aggressively are those that will benefit most from its implementation (e.g., the ability to add new connectors). Communities that are completely built-out do not face the same loss of economic development and may be less likely to pursue a CAP. Similarly, municipalities that are in the upper parts of the sewershed may pass the hydraulic consequence of excessive I/I downstream to neighboring communities. In such situations, the relative responsibilities for hydraulic problems may be ambiguous and may lead to the inaction of the part of municipalities. The majority of the municipalities implementing CAPs has been directed by PaDEP to complete the plans by December 1996. The municipalities also have been ordered to have alternative plans ready to implement in case hydraulic-overload conditions persist, so that all flows can be conveyed to the treatment plant.

Table 3.12 summarizes the municipal collection sewer problem area of the municipalities subscribing to ALCOSAN and identifies the municipalities currently under PaDEP-mandated tap restrictions because of hydraulic-overload conditions. The table also identifies those municipalities or municipal authorities currently implementing CAPs. Because of the lack of post-remediation flow data for municipalities that are implementing CAPs, no verifiable reductions in average daily flow to the ALCOSAN treatment plant can be estimated. Wet-weather I/I may be reduced by eliminating cross connections, downspouts, and other point sources. Because of infiltration from building service laterals, hydrostatic pressures on collection sewer joints downstream of rehabilitation areas and other factors, significant reductions in average-day quantities of infiltration have historically been difficult to achieve. One 1989 study reported I/I reductions levels ranging from 0 to 60 percent, with an average reduction of 20 percent. Consequently, average daily infiltration volumes were assumed to remain constant in the flow projections for the ALCOSAN Treatment Plant presented in Section 4.

	Squaw Run	Sanitary	I/I, Surcharging	Yes	Restricted	Sewer rehabilitation Sewer extension	3	
Franklin Park Borough	Lowries Run	Sanitary	None reported in 1995		Restricted	Sewer extensions	>4	
Indiana Township	Pine Creek	Sanitary	None reported in 1995	Yes	Restricted	Completed sewer renovation Planning flow monitoring	3-4	
Kennedy Township	Broadway	Combined	None reported in 1995	No Information				PaDEP has ordered a joint approach to problems by Kennedy, McKees Rocks and Stow.
McCandless Township	Lowries Run	Sanitary	I/I, Surcharging Basement flooding Wet weather capacity	Yes	Restricted	Sewer extension Manhole rehabilitation Sewer rehabilitation Flow monitoring	2-3	
McKees Rocks	Broadway	Combined	Surcharging	No	No Information	Retention/siltation basin	No Information	PaDEP has ordered a joint approach to problems by Kennedy, McKees Rocks and Stow.
Monroeville	Thompson Run	Sanitary	None reported in 1995	No	Temporary Prohibition	Sewer extensions I/I study Sewer/manhole rehabilitation	<1	Joint CAP (Churchill, Monroeville, Turtle Creek,Wilkins).
	Turtle Creek	Sanitary	None reported in 1995			Sewer extensions I/I study Sewer/manhole rehabilitation		Recent problems will trigger municipal evaluation
Mount Lebanon	Saw Mill Run	Sanitary	I/I, Surcharging, Overflows Basement flooding Sewers are 50+ years old	Yes	Restricted	Sewer extensions Manhole inspection Sewer rehabilitation Storm drain disconnection	4	Continuing surcharging despite I/I reduction.
	Painters Run	Sanitary	No Information	No Information				Potential Municipal evaluation
Mt. Oliver	Saw Mill Run	Sanitary	None reported in 1995	No Information				
Millvale Borough (part of GRJSA)	Girtys Run	Combined	I/I, Surcharging Basement flooding Wet weather capacity	Yes	Restricted	No Information	No Information	Millvale is part of GRJSA, however it is developing its own CAP to reflect combined sewers. Due to PaDEP early 1995
Munhall Borough	West Run	Combined	Back-ups, surcharges	No Information	No Information	Planning sewer rehabilitation	No Information	PaDEP requiring joint remediation by Munhall, Pittsburgh, W. Homestead. Pittsburgh will not act without participation by the other two municipalities.
O'Hara	Little Pine Creek	Sanitary	None reported in 1995	No	Open	Completed flow monitoring Sewer inspection program	>4	No excessive I/I based on flow monitoring.
Penn Hills	East Branch Turtle Creek	Sanitary	None reported in 1995	Yes	Restricted	Regionalizing with ALCOSAN has been completed	No Information	

Table 3.12
ALCOSAN Subscribing Municipalities
Summary of Municipal Collection Sewer Problem Areas

Municipality	Interceptor	Sewer Type	Problems	CAP	New Connection Status	Current Activities	Cap Phase	Comments/Status
City of Pittsburgh	Saw Mill Run	Combined	I/I, Surcharging, CSOs, 100 - 150 yrs old	Yes	Yes	Sewer & manhole maintenance Rerouting of storm sewers Plan to construct parallel sewer	2-3	
	Thompson Run	" "	Basement flooding				<1	Municipal evaluation is anticipated.
	Ninemile Run	" "	Old system in poor condition					
	West Run	Combined	Back-ups, surcharges	Yes	Open	No Information	No Information	PaDEP requiring joint remediation by Munhall, Pittsburgh, W. Homestead. Pittsburgh will not act without participation by the other two municipalities.
Plum Borough	Thompson Run	Sanitary	None reported in 1995	No Information		Sewer cleaning	N/I	
Reserve Township Ross Township Shaler Township	Girtys Run Joint Sanitary Authority	Sanitary	I/I Surcharging Basement flooding Wet weather capacity	Yes	Yes	Manhole rehabilitation Sewer rehabilitation	2-3	Girty's Run Joint Sewerage Authority is developing a CAP for all subscribing municipalities.
Ross Township	Lowries Run	Sanitary	None reported in 1995	Yes	Yes	Started manhole rehabilitation Started sewer rehabilitation ID of Storm drain connections	2-3	
	West Branch Little Pine Creek	Sanitary	None reported in 1995	Yes	No Information	Limited manhole rehabilitation Limited sewer rehabilitation		
Scott Township	Painters Run	Sanitary	I/I	No Information	No Information	Sewer replacement Sewer extensions		Potential Municipal evaluation
Shaler Township	Little Pine Creek	Sanitary	None reported in 1995	Yes	Yes	I/I study Manhole rehabilitation Sewer rehabilitation Storm drain disconnections	2-3	
Stowe Township	Broadway	Combined	Surcharging	No Information				PaDEP has ordered a joint approach to problems by Kennedy, McKees Rocks and Stowe.
Swissvale Borough	Ninemile Run	Combined	None reported in 1995	No Information		Interceptor evaluation/ mgmt program		
Turtle Creek Borough	Thompson Run	Combined	No Information			Flow monitoring ordered by ACDH for municipalities in Thompson Run basin	<1	Joint CAP (Churchill, Monroeville, Turtle Creek, Wilkins).
Upper Saint Clair Township	McLaughlin Run	Sanitary	I/I, surcharging, wet weather capacity, basement flooding	Yes	Yes	Sewer/manhole rehabilitation Sewer replacement Design of equalization tank Storm drain disconnection	1-3	
	Painters Run	Sanitary	No Information					Potential municipal evaluation
West Homestead Borough	West Run	Combined	Back-ups, surcharges	No Information				PaDEP requiring joint remediation by Munhall, Pittsburgh, W. Homestead. Pittsburgh will not act without participation by the other two municipalities.
West View Borough	Girtys Run	Combined	None reported in 1995	Yes	Yes	Cooperating with GRJSA Sewer rehabilitation Sewer maintenance/cleaning	2-3	
Whitehall Borough	Saw Mill Run	Sanitary	None reported in 1995	Yes	Yes	Manhole rehabilitation Sewer rehabilitation	2-3	
	Saw Mill Run	Sanitary	None reported in 1995	Yes	Yes	Manhole rehabilitation Sewer rehabilitation Storm drain disconnection	2-3	
Wilkins Township	Thompson Run	Sanitary	None reported in 1995	No	No	Sewer extensions	<1	Joint CAP (Churchill, Monroeville, Turtle Creek, Wilkins).
Wilkinsburg Borough	Ninemile Run	Combined	Old system in poor condition	No Information				

Table 3.12
ALCOSAN Subscribing Municipalities
Summary of Municipal Collection Sewer Problem Areas

Municipality	Interceptor	Sewer Type	Problems	CAP	New Connection Status	Current Activities	Cap Phase	Comments/Status
Baldwin Borough	Streets Run	Sanitary	Hydraulic overloading	Yes	Restricted	Manhole rehabilitation Sewer rehabilitation Storm drain disconnection Sewer extensions	2-3	
Baldwin Township	Saw Mill Run	Sanitary	None reported in 1995	Yes	Restricted	I/I reduction activities	N/I	Problems reported at lower end of Queensboro Ave.
Brentwood Borough	Streets Run	Sanitary	None reported in 1995 beyond scope of CAP	Yes	Restricted	Manhole rehabilitation Sewer rehabilitation Storm drain disconnection	2-3	
	Saw Mill Run	Sanitary	None reported in 1995 beyond scope of CAP	Yes	Restricted	" "	2-3	
Bethel Park Borough	Saw Mill Run	Sanitary	None reported in 1995	Yes	Restricted	System investigations complete	2-3	
	McLaughlin Run	Sanitary	None reported in 1995	Yes	Restricted	Manhole rehabilitation Sewer rehabilitation Sewer extensions	2-3	
	Painters Run	Sanitary	None reported in 1995	Yes	Restricted	Municipal investigation Sewer rehabilitation	1-2	
Bridgeville Borough	McLaughlin Run	Sanitary	Minor clogging	Yes	Restricted	Manhole & sewer inspections Storm drain disconnection	1-2	
	Painters Run	Sanitary	Minor clogging				<1	Municipal Investigation
Castle Shannon Borough	Saw Mill Run	Sanitary	None reported in 1995	Yes	Restricted	Manhole rehabilitation Sewer rehabilitation Flow monitoring	2-3	
Churchill Borough	Thompson Run	Sanitary	None reported in 1995	No	Temporary Prohibtion	No Information	<1	Joint CAP (Churchill, Monroeville, Turtle Creek,Wilkins).
Dormont Borough	Saw Mill Run	Sanitary	Flooding	No Information	Banned	Sewer rehabilitation dye testing	Being Organized	Reported $1,000,000 spent on storm and sanitary trunk lines in flooding areas
	McNeilly Rd	Sanitary	Flooding	Yes	No Information		<1	
Edgewood Borough	Ninemile Run	Combined	None reported in 1995	No Information				
Etna Borough	Pine Creek	Combined	None reported in 1995	Yes	Restricted	Sewer rehabilitation CSO maintenance	3	
Fox Chapel Borough	Guyasuta Run	Sanitary	I/I	No Information			<1	Potential municipal evaluation
	Squaw Run	Sanitary	I/I, Surcharging	Yes	Restricted	Sewer rehabilitation Sewer extension	3	
Franklin Park Borough	Lowries Run	Sanitary	None reported in 1995	No	Restricted	Sewer extensions	>4	
Indiana Township	Pine Creek	Sanitary	None reported in 1995	Yes	Restricted	Completed sewer renovation Planning flow monitoring	3-4	
Kennedy Township	Broadway	Combined	None reported in 1995	No Information				PaDEP has ordered a joint approach to problems by Kennedy, McKees Rocks and Stow.
McCandless Township	Lowries Run	Sanitary	I/I, Surcharging Basement flooding Wet weather capacity	Yes	Restricted	Sewer extension Manhole rehabilitation Sewer rehabilitation Flow monitoring	2-3	
McKees Rocks	Broadway	Combined	Surcharging	No	No Information	Retention/siltation basin	No Information	PaDEP has ordered a joint approach to problems by Kennedy, McKees Rocks and Stow.
Monroeville	Thompson Run	Sanitary	None reported in 1995	No	Temporary Prohibition	Sewer extensions I/I study Sewer/manhole rehabilitation	<1	Joint CAP (Churchill, Monroeville, Turtle Creek,Wilkins).
	Turtle Creek	Sanitary	None reported in 1995			Sewer extensions I/I study Sewer/manhole rehabilitation		Recent problems will trigger municipal evaluation
Mount Lebanon	Saw Mill Run	Sanitary	I/I, Surcharging, Overflows Basement flooding Sewers are 50+ years old	Yes	Restricted	Sewer extensions Manhole inspection Sewer rehabilitation Storm drain disconnection	4	Continuing surcharging despite I/I reduction.
	Painters Run	Sanitary	No Information	No Information				Potential Municipal evaluation
Mt. Oliver	Saw Mill Run	Sanitary	None reported in 1995	No Information				
Millvale Borough (part of GRJSA)	Girtys Run	Combined	I/I, Surcharging Basement flooding Wet weather capacity	Yes	Restricted	No Information	No Information	Millvale is part of GRJSA, however it is developing its own CAP to reflect combined sewers. Due to PaDEP early 1995
Munhall Borough	West Run	Combined	Back-ups, surcharges	No Information	No Information	Planning sewer rehabilitation	No Information	PaDEP requiring joint remediation by Munhall, Pittsburgh, W. Homestead. Pittsburgh will not act without participation by the other two municipalities.
O'Hara	Little Pine Creek	Sanitary	None reported in 1995	No	Open	Completed flow monitoring Sewer inspection program	>4	No excessive I/I based on flow monitoring.
Penn Hills	East Branch Turtle Creek	Sanitary	None reported in 1995	Yes	Restricted	Regionalizing with ALCOSAN has been completed	No Information	

3.5 STREAM CONVEYANCE

ACHD has expressed concerns about the discharge of stream flows into the combined sewer systems of Pittsburgh and other municipalities. Stream flows came to be conveyed in the combined sewer systems historically as local storm and sanitary sewers were routed to the stream channels. Eventually, the streams were enclosed and became parts of the current combined sewer systems. The system characterization conducted for the ALCOSAN CSO Evaluation identified 11 locations where streams or runs enter the combined sewer system (see Figure 3-15). The drainage areas range from 43 acres to 859 acres, and the combined drainage area for these locations of approximately 2,800 acres.

The 11 stream conveyance locations discharge a total estimated 683 million gallons on an average annual basis. The estimate is based on annual precipitation of 38 inches and runoff coefficients ranging from 0.20 to 0.35. On the basis of approximately 100 days of precipitation annually, the estimated average combined wet-weather runoff rate of the 11 of areas is 6.9 mgd.

In addition to average wet-day contributions to the interceptor system, the peak flow rates during storm events are relevant to the behavior of the combined sewer systems. As a worst case (design storm), a storm intensity of 0.5 inch/hour has been used to calculate peak daily stormwater flows from the stream drainage areas. Peak flow rates range from 2.8 mgd from the 43-acre drainage area to 70 mgd from the 859-acre area. The 0.50 inch/hour storm intensity is the 99.5 percentile storm, meaning that 99.5 percent of storms are less intense. A more typical storm intensity would be 0.028 inches/hour. This intensity is the median intensity for storms recorded at the Pittsburgh International Airport from 1948 through 1992. The peak flow rates at this median storm intensity range from 0.15 mgd for the 43-acre drainage area to 3.8 mgd for the 70-acre area. Under maximum-flow conditions, the effects of the stream conveyance may be primarily on the downstream municipal interceptors, e.g., surcharging. A detailed analysis of hydraulic problems that are attributable to these stream-inflow areas is beyond the scope of this 537 plan. The locations and estimated flows for the 11 areas are shown in Table 3.13.

If warranted by peak flow conditions, the stream inflows could possibly be removed from the combined sewer systems to which they discharge. The technical and financial feasibility of providing alternative storm sewerage for these areas is discussed in Section 5.

Map Source: ALCOSAN Combined Sewer Overflow Program

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Allegheny County, Pennsylvania

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April 1996

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KILBUCK TWP
SHALER TWP
WEST VIEW BORO
EMSWORTH BORO
BEN AVON HEIGHTS BORO
BEN AVON BORO
AVALON BORO
LLE TWP
NEVILLE ISLAND
BELLEVUE BORO
STOWE TWP
KENNEDY TWP
MCKEES ROCKS BORO
CHARTIERS CREEK
INGRAM BORO
CRAFTON BORO
THORNBURG BORO
PENNSBURY VILLAGE BORO
ROSSLYN FARMS BORO
CARNEGIE BORO
GREENTREE BORO
RESERVE TWP
O'HARA TWP
ETNA BORO
SHARPSBURG BORO
MILLVALE BORO
BRUNOT IS.
HERR'S IS.
Ohio River
Allegheny River
Monongahela River
Spring Hill Run
MT OLIVER BORO
HOMESTEAD
CITY OF PITTSBURGH

1 2 3 4 5 6 7 8 9 10 11

Legend

- Stream Inflow Areas
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Figure 3-15
Stream Inflow Sources

Table 3.13
Stream-Inflow Locations and Estimated Discharge Volumes

	Location	Drainage Area in Acres	Receiving Structure	Runoff Coefficient	Runoff Rate @ 0.5 in/hr storm (mgd)	Runoff Rate @ 0.03 in/hr storm (mgd)	Annual Runoff Volume (mgd)	Avg. Wet-Day Runoff (mgd)
1	Southern Ross Township on Jacks Run	859	O25	0.25	70.00	3.82	207.9	2.10
2	City of Pittsburgh on Woods Run (Westhall Street)	258	O27	0.20	16.80	0.92	49.9	0.50
3	City of Pittsburgh: Riverview Park (Westhall Street)	70	O27	0.20	4.56	0.25	13.6	0.14
4	City of Pittsburgh (Westhall Street)	224	O27	0.20	14.60	0.80	43.4	0.43
5	Reserve Township: Spring Garden Run	440	A67	0.30	43.00	2.35	127.8	1.28
6	Highland Park: Heths Run	77	A41	0.20	5.02	0.27	14.9	0.15
7	Boundary Street	303	M29	0.35	34.60	1.89	102.7	1.03
8	West End: Corks Run	43	O13	0.20	2.80	0.15	8.3	0.08
9	City of Pittsburgh: Sheraden Park	54	C7	0.20	3.52	0.19	10.5	0.11
10	St Mary's Cemetery: Broadway Int.	68	C9	0.25	5.54	0.30	16.5	0.17
11	Forest Grove: Broadway Interceptor	362	C9	0.25	29.50	1.61	87.6	0.88
	Totals	2,758					683.1	6.87

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Appendix A-22-b

3.6 NONCONTRIBUTING AREAS

3.6.1 Housing Density

Approximately 102 of the 310 square miles within the ALCOSAN service area do not discharge wastewater flows to the ALCOSAN interceptor system. Approximately 65 square miles, or 41,000 acres are residential areas. Shown on Figure 3-16 are the noncontributing areas of municipalities within ALCOSAN's service area, broken out by housing density. Low-density residential areas are defined as having zero through 0.3 housing units per acre. Medium- and high-density residential areas have 0.3 through 4.0 housing units per acre and greater than 4.0 housing units per acre, respectively.

About 55 percent of the noncontributing residential acreage has low density housing. Forty-three percent of the acreage has medium-density housing ranging from 0.3 houses per acre to 4.0 houses per acre, or homes on quarter acre lots. High-density housing (>4.0 homes/acre) exists on 570 acres. The high density areas tend to be scattered throughout the ALCOSAN service area, and represent potential sources of water-quality or public health problems. Information about housing densities by municipality is shown on Table 3.14.

Also shown on Table 3.14 are the percentages of land in the municipalities which does not contribute flows to ALCOSAN. More than half of several municipalities is noncontributing, e.g. Kilbuck Township (73 percent), Collier Township (54 percent), South Fayette (52 percent) and Wall Borough (40 percent).

3.6.2 Soil Suitability

One measure of the viability of non-contributing areas supporting on-lot sewage facilities such as septic tanks and absorption fields is defined the by the USDA Soil Conservation Service soil classifications. Based upon the USDA Soil Survey for Allegheny County, the following soil types are considered unsuitable for on-lot wastewater systems:

- Atkins
- Brinkerton
- Cavode
- Clarksburg
- Culleoka
- Dormont
- Ernest
- Gilpin
- Guernsey
- Hazleton
- Huntington
- Library
- Lindside
- Newark
- Philo
- Rainsboro
- Upshur
- Vandergrift
- Wharton
- Wiekert

Using the digitized soils map from the Allegheny County Planning Department, a map showing the noncontributing areas with the soil suitability highlighted is provided as Figure 3-17.

Table 3.14
Non-Contributing Residential Areas

Municipality	Low Density 0 - 0.3 House/Acre	Medium Density 0.3 - 4.0 House/Acre	High Density > 4.0 House/Acre	Total Non-Contributing Residential Area (acres)	% Municipality Non-contributing
Aspinwall Borough	0	1	0	1	0.35%
Avalon Borough	0	0	0	0	0.00%
Baldwin Borough	0	456	5	461	15.90%
Baldwin Township	0	23	1	24	6.81%
Bellevue Borough	0	23	0	23	3.32%
Ben Avon Borough	0	2	0	2	0.62%
Ben Avon Heights Borough	0	11	0	11	10.22%
Bethel Park Borough	2	62	0	64	2.58%
Blawnox Borough	0	26	1	27	9.75%
Braddock Borough	11	0	1	12	2.89%
Braddock Hills Borough	30	0	15	45	7.19%
Brentwood Borough	0	53	1	54	5.78%
Bridgeville Borough	0	12	7	19	2.77%
Carnegie Borough	0	104	19	123	11.69%
Castle Shannon	0	86	9	95	9.08%
Churchill Borough	124	139	0	263	18.69%
Collier Township	3,740	1,043	0	4,782	53.30%
Crafton Borough	38	28	1	67	9.24%
Dormont Borough	0	15	0	15	3.22%
Duquesne City	0	0	0	0	0.00%
East McKeesport Borough	0	14	1	15	7.51%
East Pittsburgh Borough	0	7	0	7	2.92%

SECTION 3
Current Conditions

Municipality	Low Density 0 - 0.3 House/Acre	Medium Density 0.3 - 4.0 House/Acre	High Density > 4.0 House/Acre	Total Non-Contributing Residential Area (acres)	% Municipality Non-contributing
Emsworth Borough	0	25	0	25	5.81%
Etna Borough	0	35	0	35	7.39%
Fox Chapel Borough	563	122	0	684	13.78%
Franklin Park Borough	42	693	0	735	26.71%
Glenfield Borough	0	0	0	0	0.00%
Greentree Borough	20	14	0	34	2.55%
Heidelberg Borough	0	18	1	19	5.83%
Homestead Borough	0	0	0	0	0.00%
Indiana Township	0	14	0	14	6.06%
Kennedy Township	795	951	0	1,746	50.15%
Kilbuck Township	793	397	9	1,199	72.87%
Town of McCandless	0	170	0	170	9.49%
McDonald Borough	0	12	0	12	0.00%
McKees Rocks Borough	3	32	8	44	6.16%
Millvale Borough	0	43	2	45	9.62%
Mt Lebanon Township	0	155	0	155	4.01%
Munhall Borough	0	5	0	5	0.36%
Monroeville Borough	0	0	0	0	0.00%
Municipality of Monroeville	562	1,179	41	1,782	14.02%
Neville Township	0	26	23	49	3.43%
North Braddock Borough	0	0	0	0	0.00%
North Fayette Township	3,214	729	6	3,949	31.69%
North Versailles Township	148	239	2	389	23.40%
Oakdale Borough	23	77	1	101	30.46%
O'hara Township	161	846	3	1,010	21.82%

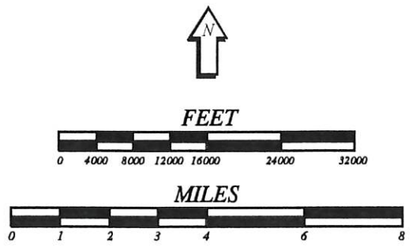
SECTION 3
Current Conditions

Municipality	Low Density 0 - 0.3 House/Acre	Medium Density 0.3 - 4.0 House/Acre	High Density > 4.0 House/Acre	Total Non-Contributing Residential Area (acres)	% Municipality Non-contributing
Ohio Township	950	136	0	1,086	39.56%
Municipality of Penn Hills	512	1,306	2	1,820	19.52%
Pitcairn Borough	0	44	3	48	15.53%
Pittsburgh City	326	2,698	184	3,208	8.59%
Rankin Borough	0	9	17	26	8.22%
Reserve Township	50	305	0	355	27.88%
Robinson Township	0	2	0	2	0.24%
Ross Township	373	1,369	0	1,743	18.96%
Rosslyn Farms Borough	0	110	0	110	28.65%
Scott Township	0	58	7	65	2.65%
Shaler Township	93	971	26	1,089	15.07%
Sharpsburg Borough	0	3	3	5	1.30%
South Fayette Township	5,460	1,257	0	6,717	51.57%
Stowe Township	46	103	5	154	10.26%
Swissvale Borough	0	56	0	56	7.50%
Thornburg Borough	85	43	0	128	44.38%
Trafford Borough	9	3	0	12	1.89%
Turtle Creek Borough	0	128	21	149	23.79%
Upper St Clair Township	0	57	0	57	0.91%
Verona Borough	0	0	0	0	0.00%
Wall Borough	0	95	17	112	39.72%
West Homestead Borough	38	69	3	110	17.05%
West Mifflin Borough	221	171	0	393	24.63%
West View Borough	0	0	4	4	0.63%
Whitaker Borough	0	0	0	0	0.00%

SECTION 3
Current Conditions

Municipality	Low Density 0 - 0.3 House/Acre	Medium Density 0.3 - 4.0 House/Acre	High Density > 4.0 House/Acre	Total Non-Contributing Residential Area (acres)	% Municipality Non-contributing
Whitehall Borough	0	53	0	53	2.64%
Wilkins Township	0	272	73	345	20.58%
Wilmerding Borough	13	39	33	85	29.58%
Western Westmoreland Municipal Authority	2,912	270	13	3,196	0.00%
Penn Township	1,653	345	0	1,999	0.00%
Total	23,011	17,858	570	41,440	

Map Source: ALCOSAN Combined Sewer Overflow Program

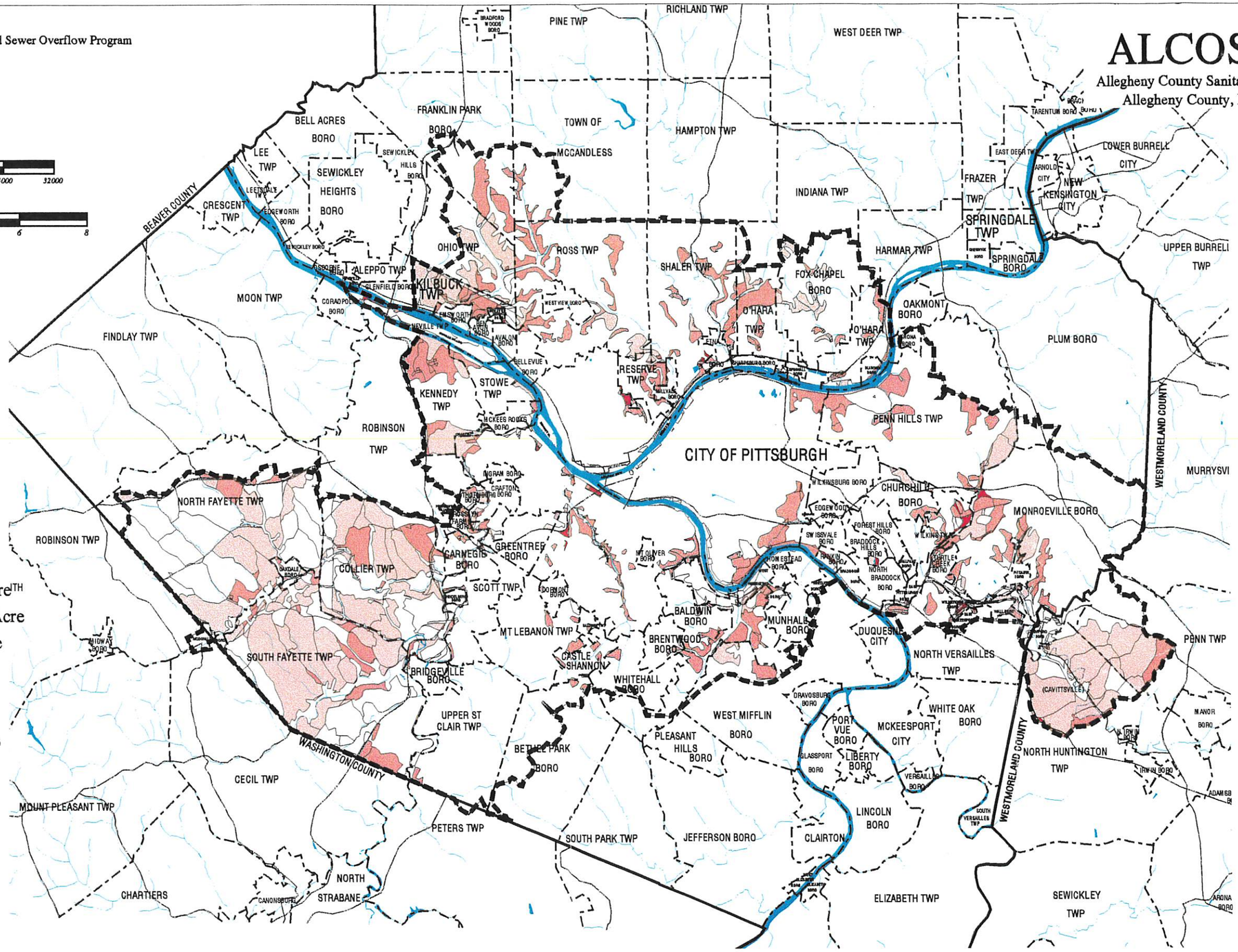


ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

May 1996



Legend

- Unpopulated
- 0 - 0.3 Houses per Acre
- 0.3 - 4.0 Houses per Acre
- > 4.0 Houses per Acre
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

CDM EPM TEAM CH2MHILL ALCOSAN

Camp Dresser & McKee

Figure 3-16
Housing Density in Non-contributing Areas

Map Source: ALCOSAN Combined Sewer Overflow Program

FEET
0 4000 8000 12000 16000 24000 32000

MILES
0 1 2 3 4 6 8

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

May 1996

Legend

- Unpopulated
- 0 - 0.3 Houses per Acre[TH]
- 0.3 - 4.0 Houses per Acre
- > 4.0 Houses per Acre
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

Figure 3-16
Housing Density in Non-contributing Areas

CDM CH2MHILL EPM TEAM ALCOSAN

Camp Dresser & McKee

Map Source: ALCOSAN Combined Sewer Overflow Program

FEET
0 4000 8000 12000 16000 24000 32000

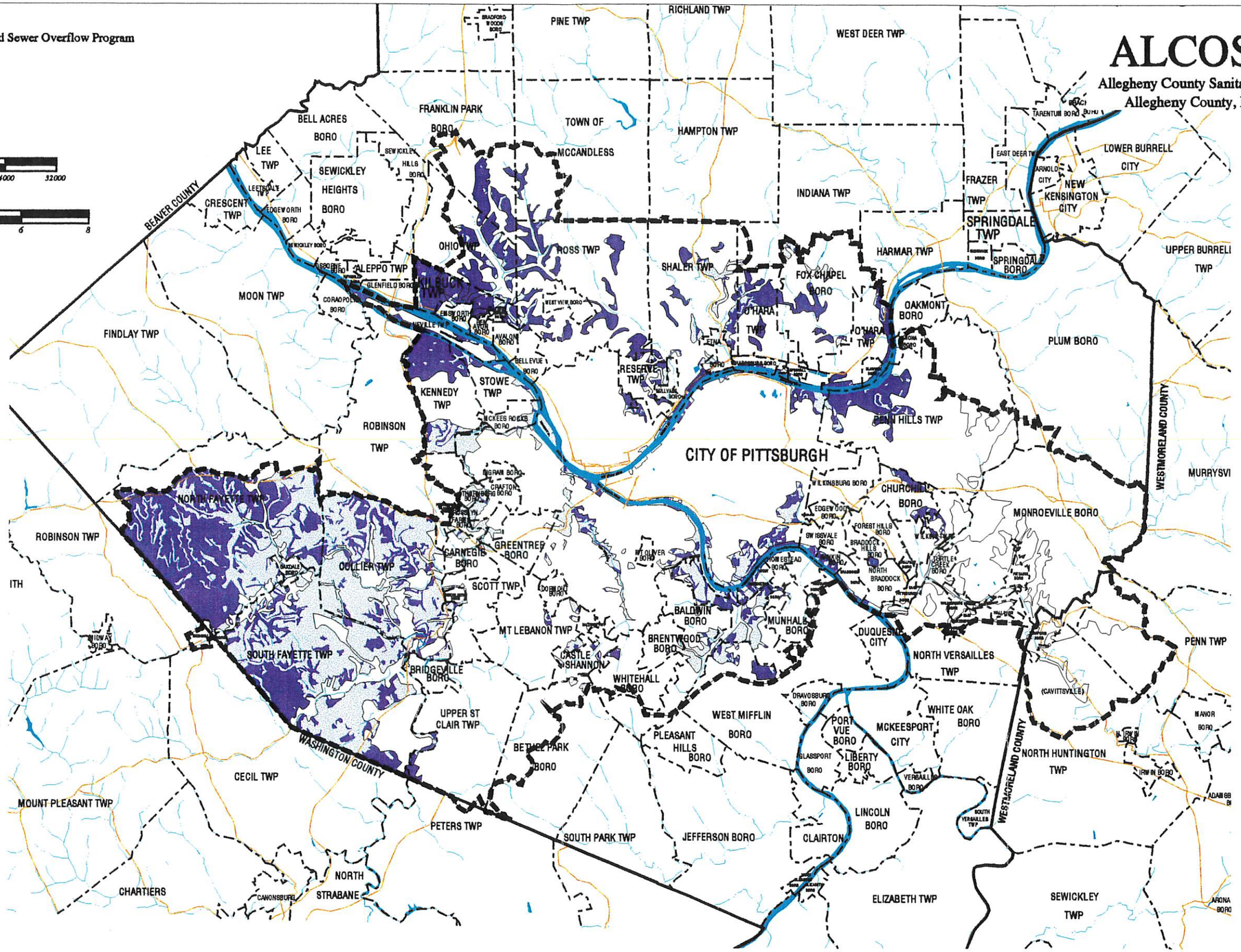
MILES
0 1 2 3 4 6 8

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996



Legend

- Soils Suitable for Septic Systems
- Soils Not Suitable for Septic Systems
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

CDM EPM TEAM CH2MHILL
ALCOSAN

Camp Dresser & McKee

Figure 3-17
Septic System Soil Suitability in Non-contributing Areas

3.7 PaDEP DESIGNATED STUDY AREAS

Sewage treatment facilities within Allegheny County are regulated jointly by PaDEP and the ACHD. As a part of planning efforts for the proposed expansion of the ALCOSAN sewage treatment facilities, PaDEP mandated that the plan include: certain areas that have existing regional sewage treatment needs as evidenced by malfunctioning on-lot sewage disposal systems, illegal "wildcat sewers," and general lack of adequate sewerage facilities; developing areas that will need future sewage service; and areas sewered by existing sewage systems plants with hydraulic or other problems. Current wastewater management conditions in these areas are described below. The locations of the PaDEP designated watersheds and treatment plant service areas are shown in Figure 3-18.

3.7.1 Watersheds

Toms Run and Kilbuck Run Watersheds

The Toms Run and Kilbuck Run Watersheds are located in the western part of Allegheny County. Toms Run drains a 1,435 acre area that includes parts of Kilbuck Township, Glenfield Borough, Aleppo Township and Ohio Township, and discharges to the Ohio River approximately at mile 7.8. Kilbuck Run watershed drains 3,309 acres within parts of Glenfield Borough, Aleppo Township, Sewickley Heights Borough, Sewickley Hills Borough, Ohio Township, and Franklin Park Borough discharging to the Ohio River approximately at mile 8.6. Within these two watersheds, PaDEP has identified Glenfield Borough, Ohio Township, Sewickley Hills Borough, and Franklin Park Borough as areas with existing needs for public sewage facilities.

<u>Glenfield Borough</u>

Glenfield Borough is on the north bank of the Ohio River and consists of a total land area of 550 acres. The 1990 census identifies 78 households in the Borough with a total population of 201 people. Development within the community is concentrated along the shore of the Ohio River and along Kilbuck Run. Sewage disposal within the municipality is primarily on-lot and single residence sewage treatment plants. ACHD is concerned about the potential for on-lot system malfunctioning through dye testing structures with drainage to the loose river sediment has not confirmed this problem.

Map Source: ALCOSAN Combined Sewer Overflow Program

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET
0 4000 8000 12000 16000 24000 32000

MILES
0 1 2 3 4 6 8

Legend

- Treatment Plant Location
- Treatment Plant Service Areas
- Watershed Areas
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

Kilbuck Run
Toms Run
Longvue No. 1 STP
Oakmont STP
Plum Creek STP
Holiday Park STP
Dravosburg STP
Upper Robinson Run
Millers Run

BEAVER COUNTY
WASHINGTON COUNTY
WESTMORELAND COUNTY

PINE TWP
RICHLAND TWP
WEST DEER TWP
FRANKLIN PARK BORO
BELL ACRES BORO
LEE TWP
SEWICKLEY HEIGHTS BORO
CRESCENT TWP
TOWN OF MCCANDLESS
HAMPTON TWP
INDIANA TWP
FRAZER TWP
SPRINGDALE TWP
LOWER BURRELL CITY
NEW KENSINGTON CITY
UPPER BURRELL TWP
OHIO TWP
ROSS TWP
SHALER TWP
HARMAR TWP
FOX CHAPEL BORO
O'HARA TWP
MOON TWP
FINDLAY TWP
KILBUCK TWP
ALEPPO TWP
RESERVE TWP
PLUM BORO
KENNEDY TWP
STOWE TWP
ROBINSON TWP
PENN HILLS TWP
CITY OF PITTSBURGH
NORTH FAYETTE TWP
CHURCHILL BORO
MONROEVILLE BORO
COLLIER TWP
SCOTT TWP
MT LEBANON TWP
BALDWIN BORO
BRENTWOOD BORO
MUNHALL BORO
DUQUESNE CITY
NORTH VERSAILLES TWP
PENN TWP
SOUTH FAYETTE TWP
BRIDGEVILLE BORO
CASTLE SHANNON
WHITEHALL BORO
UPPER ST CLAIR TWP
WEST MIFFLIN BORO
PLEASANT HILLS BORO
BETHEL PARK BORO
PORT VUE BORO
MCKEESPORT CITY
WHITE OAK BORO
NORTH HUNTINGTON TWP
CECIL TWP
MOUNT PLEASANT TWP
PETERS TWP
SOUTH PARK TWP
JEFFERSON BORO
CLAIRTON
LINCOLN BORO
LIBERTY BORO
ELIZABETH TWP
SEWICKLEY TWP
CHARTIERS
NORTH STRABANE

CDM CH2MHILL EPM TEAM ALCOSAN

Camp Dresser & McKee

Figure 3-18
PaDEP-Designated Treatment Plant Locations and Watershed Areas

Franklin Park

Franklin Park Borough is in the northernmost part of the Kilbuck Run Watershed. The Borough consists of 8,672 acres, of which approximately 279 contribute to the Kilbuck Run Watershed. Remaining acreage of the municipality drains to the Pine Creek, Bear Run, Big Sewickley Creek, Little Sewickley Creek, and Lowries Run Watersheds. Public sewage treatment is available in the Lowries Run, Bear Run and Pine Creek drainage basins. Lowries Run and Bear Run, are tributary to ALCOSAN. The Pine Creek drainage basin is tributary to the Pine Creek Wastewater Treatment Plant owned and operated by the McCandless Township Sanitary Authority. Census data for 1990 identify 3,243 households with a population of 10,109 within the community. Sewage disposal in the Kilbuck Run drainage area consists of on-lot systems or private single-residence STPs.

In 1988, Franklin Park Borough developed an Act 537 plan that was updated in 1990. In the study, a total of 45 well-water samples were collected within the areas serviced by on-lot sewage treatment systems. Data collected were combined with additional information provided by ACHD on well sampling conducted between 1983 and 1987. Data provided by ACHD consisted of the analysis of 421 samples, many of which were repeat samplings of the same well. The combined results of the two sampling programs identified a total of 88 wells contaminated with coliform. Although the contaminated wells were disbursed throughout the Borough, no wells were located within the Kilbuck Run drainage area.

Ohio Township

Ohio Township is at the headwaters of the Toms Run Watershed and the central part of the Kilbuck Run Watershed. The township consists of 4,774 total acres. Drainage areas contributory to the study area are approximately 979 acres in Toms Run and 28 acres in Kilbuck Run. Remaining drainage within the Township is contributory to the Lowries Run Watershed. Census data for 1990 identifies 823 households within the township with a population of 2,356.

Public sewage disposal is available in the Township through ALCOSAN within the Lowries Run drainage basin, and the Windy Knoll Sewage Treatment Plant, owned by the Ohio Township Sanitary Authority. The Windy Knoll STP serves approximately 58 residential properties in the Windy Knoll Plan of Lots in the Toms Run Watershed. The remaining parts of the Toms Run and Kilbuck Run watersheds are serviced by on-lot sewage disposal systems or small privately owned sewage treatment plants.

The Windy Knoll STP has had a history of problems. In 1991, a compliance order was issued by the ACHD for the treatment plant that described the plant as a health hazard and a nuisance as

evidenced by repeated exceedances of its NPDES permit. Since the issuance of the consent order, the ACHD inspection reports indicate violations for discharges in exceeding the NPDES permit.

Ohio Township had asked ALCOSAN to include the Toms Run Watershed in ALCOSAN's service area, and ALCOSAN had agreed to the inclusion of the area. Sewage for the area was to be pumped via pump station and force main to the Bear Run interceptor sewer, which is tributary to the Lowries Run interceptor. Construction of this collection system would eliminate the Windy Knoll STP, that the Verland "private" STP, and the remaining on-lot systems within the Toms Run drainage area. The township drainage areas that are tributary to the Kilbuck Run Watershed are serviced by on-lot sewage disposal systems and individual private STPs. The ACHD indicated in December of 1995 that Ohio Township now plans to enlarge the Windy Knoll WWTP to accept a flow of 0.1 mgd from part of the Toms Run drainage area within the Township

Sewickley Hills Borough

Sewickley Hills Borough is in the central and northern parts of the Kilbuck Run Watershed. The Borough consists of a total of 1,542 acres, of which approximately 815 acres are tributary to the Kilbuck Run Watershed. Census data for 1990 identifies 212 households within the Borough with a population of 622.

Sewage disposal for the Kilbuck Run drainage area is provided by the Sewickley Hills Sewage Treatment Plant, owned by the Sewickley Hills-Kilbuck Run Sanitary Authority. The plant serves approximately 70 homes in the northern part of the watershed. The plant has a history of operating problems and discharges in exceedence of its NPDES permit. In 1989, regulatory agencies directed the development of a CAP. The plan addressed maintenance problems and system deficiencies. A second CAP was ordered in 1991. ACHD's position again was that the operation and maintenance (O&M) program was not being carried out consistently and that adherence to an O&M program would prevent NPDES violations and limit complaints. A second privately owned sewage treatment plant, the Woodland STP, serves 18 homes in the central part of the watershed. The Woodland STP was placed in service in 1991, and has not appeared to have any problems associated with this plant. The remaining unsewered parts of the watershed within Sewickley Hills Borough are serviced by on-lot systems and private single-residence STPs.

ACHD indicated that, as of December 1995, the Sewickley Hills-Kilbuck Run Sanitary Authority is proposing to replace the existing STP, which has a design capacity of 25,300 gallons per day, with a new facility that will be rated at 50,000 gallons per day. The existing STP will be abandoned, and sewage flows will be transmitted to the new STP. The new STP will be approximately one-third of a mile downstream of the existing STP.

Millers Run Watershed

Millers Run Watershed is in the southwestern part of Allegheny County and the northern part of Washington County. The total drainage area consists of 15,669 acres within South Fayette, Cecil, and Mount Pleasant townships. Millers Run is a tributary of the Chartiers Creek Watershed. Public sewerage is provided only to the part of the watershed within South Fayette Township. Service is provided by the South Fayette Township Municipal Authority (SFTMA), whose collection facilities within this watershed are tributary to ALCOSAN. Cecil Township recently entered into an agreement with SFTMA to allow the connection of up to 300 equivalent dwelling units (EDUs) to the SFTMA system.

Cecil Township

Cecil Township is in Washington County, along the Allegheny County border and south of South Fayette Township. Within the Township, approximately 7,400 acres are within the Millers Run Watershed. The remaining acreage of the municipality drains to other tributaries of Chartiers Creek. Sewage disposal within the watershed is provided by on-lot septic systems, private single-family STPs, and small package STPs. Township officials estimate that between 400 and 600 on-lot systems are malfunctioning within their areas of the watershed. Six package STPS have been permitted by PaDEP in the watershed. The two largest of these plants are the two Fleeher STPs, which service between 350 and 400 housing units. PaDEP considers on-lot systems, single-residence STPs, and small package STPs temporary until regional facilities can be justified and provided economically.

The Township historically has been interested in connecting three watersheds - Millers Run, Robinson Run and Chartiers Creek - to the ALCOSAN system. Available capacity within the ALCOSAN Chartiers Creek Interceptor, however, has been the limiting factor in extending the service area to Washington County.

Although the agreement with South Fayette provides a solution for certain existing problem areas, it does not allow for correction of the area-wide problems and proposed future development within the watershed. The Township recently developed an updated Act 537 sewage facilities plan. The updated plan proposes the transfer of the 300 EDUs to the Chartiers Creek Watershed and the construction of an STP on Millers Run at the Washington, Allegheny County line. Estimated construction costs for the plant and the collection system are $11 million and the estimated monthly customer service fee is $70.

Mount Pleasant Township

Mount Pleasant Township is in Washington County, west of Cecil Township. Approximately 3,176 acres of the Township are within the Millers Run Watershed. No public sewage service is available in the Township. PaDEP has permitted one small package STP at Fort Cherry High School. PaDEP has identified the community of South View within the Township as an area with existing sewage needs. South View is serviced by on-lot septic sewage disposal systems. The majority of which may be malfunctioning.

As a part of the study area for the Act 537 sewage facilities plan prepared by Cecil Township, South View was included as a potential customer base because it is located just west of the Cecil Township corporate boundary. For South View to be included in the proposed collection system, the plan will also have to be adopted by Mount Pleasant Township, which then will have to assume a proportionate share of the funding and construction debt.

Robinson Run Watershed

Robinson Run Watershed drains 26,374 acres in Washington and Allegheny counties and is a major tributary of Chartiers Creek. The headwaters of the watershed originate in Smith and Robinson townships in Washington County. The total drainage area for Washington County consists of 6,559 acres, with the remaining 19,815 acres of drainage area being located in Allegheny County. Public sewage disposal extends along Robinson Run from Carnegie Borough to McDonald Borough, and includes all of the Allegheny County portion of the watershed and approximately 207 acres in Washington County. Sewage is conveyed via the Robinson Run Interceptor to the ALCOSAN-owned Chartiers Creek Interceptor, then to the ALCOSAN wastewater treatment plant.

PaDEP has identified Robinson Township, Cecil Township, and Midway Borough within the Upper Robinson Run Watershed as communities with an existing need of access to public sewerage.

Cecil Township

Cecil Township contributes 174 acres of drainage to the Robinson Run drainage area, and includes the communities of Laurel Hill and Gladden Heights. In 1990, 219 dwelling units and two commercial establishments were within the drainage area. All are served by on-lot systems and are regulated by the township sewage enforcement office. PaDEP has determined that existing soil in the drainage area is not suitable for any type of on-lot sewage disposal system.

Slightly over half of the soils types could be evaluated for an approved alternative type of on-lot disposal.

The Township was a participant in plans and studies for sewering the entire Robinson Run Watershed and conveying flows to the ALCOSAN wastewater treatment plant. The proposed plan was eliminated when it was determined that ALCOSAN conveyance facilities originally were designed and installed solely for Allegheny County and that the existing system did not have the capacity to include the upper watershed communities.

PaDEP has proposed the construction of a regional facility near McDonald Borough to provide service to the upper watershed communities, with the areas of Smith and Cecil townships adjacent to McDonald connecting to the McDonald collection system. To date, no action has been taken on this alternative.

Midway Borough

The corporate boundaries of Midway Borough are entirely within the Robinson Run Watershed boundaries. Midway is at the confluence of several unnamed tributaries that join to form Robinson Run. Sewage disposal is provided by on-lot septic disposal systems and wildcat sewers. Wildcat sewers are pipes that convey wastewater directly to a stream without treatment. Because of poor soil drainage, many of the septic tank effluent pipes appear to discharge directly into the stream.

The Midway Sewage Authority was incorporated in 1987 to address sewage concerns in Midway Borough. Both the Authority and the Borough council were participants in the planning and study efforts associated with the proposed connection to ALCOSAN. After the rejection of the proposed connection by ALCOSAN because of inadequate capacity within the Chartiers Creek Interceptor, the Authority proposed and submitted planning modules to construct a STP for serving Midway Borough and Smith and Robinson Townships. This option was determined to be economically infeasible. The Authority later resubmitted the planning modules, proposing to build an STP to serve just Midway Borough. PaDEP denied approval of the resubmitted planning modules on the basis that the proposed Midway sewage project is not consistent with a program of comprehensive watershed management and that construction of the plant could hinder the future development of regional facilities. The decision was appealed to the Environmental Hearing Board (EHB), which ruled in favor of the PaDEP's decision. Since the 1991 decision of the EHB, no further action has been taken on a regional wastewater treatment plant.

Robinson Township

Robinson Township is along the Allegheny County and Washington County border north of Cecil and Mount Pleasant Townships. Within Robinson Township, 4,418 acres are contributory to Robinson Run. Remaining acreage in the Township is a part of the Raccoon Creek Watershed. Sewage disposal is primarily by on-lot sewage disposal systems. PaDEP has permitted one private sewage treatment plant within the watershed. The permit allows the discharge of both treated industrial wastewater and sanitary wastewater.

Public sewerage planning for the Township is the responsibility of the Robinson Township Municipal Authority. The Township and the Authority also were participants in the plans and studies for connecting all of the Robinson Run Watershed municipalities to ALCOSAN. ALCOSAN's rejection of the proposed connection forced the Township to investigate alternative solutions to the existing sewage disposal problem. Planning modules were submitted for the construction of a regional wastewater treatment plant to be located in Midway. PaDEP agreed with the conclusion in the submitted economic feasibility study construction of the treatment plant and the collector system is beyond the economic capability of the contributing communities. In 1991, the Authority again approached ALCOSAN to consider a "limited connection" to their conveyance facilities. The connection would be limited to the areas of the Township adjacent to McDonald Borough, which includes 294 homes. To date, no action has been taken on this request.

3.7.2 Sewage Treatment Plants

Dravosburg STP

Dravosburg is on the west shore of the Monongahela River between miles 17.2 and 15.9 at 320 Washington Avenue. It is owned and operated by the Borough of Dravosburg and serves both the Borough and a small part of the Borough of West Mifflin. A total of 920 housing units and 65 commercial establishments are served by the treatment plant. No industrial users are within the collection system, and the Borough does not have an ordinance regulating discharges of industrial waste to the system.

The sewage collection system is primarily a combined sanitary and stormwater system with minimal sanitary-only collection. One pump station, which is located along Bettis Road, is operated by the Borough. The pump station has a design capacity of 0.252 mgd and is operating at a peak flow of 0.039 mgd.

The wastewater treatment plant is an extended-aeration activated sludge treatment facility. Flows enter the treatment plant at two locations. Primary flows from the main combined interceptor enter the plant though a diversion structure and a flow regulator. Excessive flows are diverted around the plant diversion structure, mixed with the plant effluent, and discharged to the Monongahela River. Sewage entering through the flow regulator is combined with a secondary influent line and flows to the comminutor for grinding and discharge to the plant's wet well. Raw sewage then is pumped from the wet well to a grit tank that uses a mechanical grit-removal system. From the grit tank, wastewater flows to one of two aeration tanks and then to one of two settling tanks. Flows from the settling tank continue to one of two chlorine-contact tanks for disinfection. Treated wastewater then is directed to the pipe on the downstream side of the diversion chamber for discharge to the Monongahela River under NPDES permit number PA0028401. The current NPDES effluent limits are: 0.48 mgd monthly average flow, 30 mg/l BOD_5, and 30 mg/l TSS. Reported average daily flows for 1993 were 0.32 mgd with an influent organic loading of 259 pounds per day, or 97 mg/l.[1] The plant flow meter is downstream of the influent diversion structure, so the total flow to the plant is not recorded.

The plant and its associated collection system has a history of problems. According to ACHD data, approximately 325 dwelling units within the service area discharge directly to abandoned mines beneath the municipality. The existing collection system collects large volumes of mine

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[1] Source: Dravosburg Borough Municipal Wasteload Management 1993 annual report, prepared by Glenn Engineering & Associates, Ltd.

drainage and carries it to the treatment plant, causing hydraulic overloads of the plant and by-passing. According to ACDH inspection reports, the plant also has numerous structural and operational deficiencies. PaDEP has considered enforcement action against Dravosburg.

Longvue No. 1 STP

Longvue No. 1 STP is in McCandless Township, along Little Pine Creek between Hazelett Road and Elaine Drive. The treatment plant is owned by the McCandless Township Sanitary Authority (MTSA) and serves the southeastern part of McCandless Township. MTSA's 1992 Chapter 94 Municipal Wasteload Management Report identifies 1,742 customers within the service area. Plant contributors are primarily residential, and there are some additional small commercial establishments. There are no major industrial users are within the collection system. To preserve the residential status of the system, the MTSA requires potential industrial users to develop detailed reports containing the quantities, time of disposal, discharge rates, and other facts required by the MTSA for properly analyzing and evaluating such wastes.

The sewage collection system is a sanitary-only collection system. Sewage flows generated north and west of the plant are transported by gravity flow to the treatment plant. Flows generated south and east of the plant are transported via five pump stations: Bush, Hazelett, Grebrooke No. 10, Grebrooke No. 11, and Briarwood No. 4. At present, one pump station, Grebrooke No. 11, is operating above 90 percent of maximum capacity based on maximum flow conditions. The remaining pump stations are operating at less than 70 percent of maximum capacity.

Longvue No. 1 uses a contact stabilization process. Treated wastewater from the plant is discharged to Little Pine Creek under NPDES Permit Number PA0025992. Sludge generated at the Longvue No. 1 plant is transported to the MTSA's Pine Creek STP for processing. Permitted capacities for the treatment plant are a flow of 1.2 mgd and an organic loading of 2,040 pounds per day. Average hydraulic and organic loadings for 1992 are 1.028 mgd and 1,092 pounds per day, respectively.

Historically, the Longvue No. 1 STP has had problems with excessive I/I entering the collection system, causing bypassing at both the pump stations and the treatment plant. The Township adopted a CAP in 1987 that subsequently was approved by PaDEP for the Longview No. 1 treatment plant and its collection system. Rehabilitative work for addressing the reduction of I/I began in 1993. In 1994, as a result of corrective actions completed in 1993 and 1994, 65 new sewer taps were approved for use in 1994. However, the ACHD pump station inspection report, issued on March 16, 1994, indicates that chronic wet-weather bypassing still is a problem at the Briarwood and Bush pumps stations. As a result, PaDEP ordered MTSA to submit a proposal for either facility's expansion or flow retention basins at all points where overloads exist.

Oakmont STP

Oakmont STP is on Ann Street where it terminates at the Allegheny River. The treatment plant is owned by the Borough of Oakmont, which also is the plant's service area. Estimated service population taken from the 1993 Chapter 94 Municipal Wasteload Management Report is 7,203 people. Contributors to the STP include residential, commercial, and six industrial users. Industrial contributors are regulated by pretreatment regulations that were approved by PaDEP in April of 1993.

The sewage collection system is primarily sanitary only, with several small sections of the Borough having a combination of sanitary and stormwater collection. Existing collection facilities include approximately 22 miles of gravity sewer line ranging in size from 8 to 24 inches in diameter, three pump stations, and approximately 1.3 miles of force main ranging in size from 10 to 12 inches in diameter. Two of the pump stations, Washington Avenue and Plum Creek, are monitored. Average flows to the pump stations reportedly are well below their rated capacities. The remaining pump station, Fairways, is not monitored, but no problems or complaints have been reported to the Borough about that pump station.

Primary treatment is provided by screening and grit-removal units. Secondary treatment is provided through a conventional activated sludge treatment process. Solids produced through the activated sludge process are thickened, anaerobically digested prior to disposal. Treated wastewater generated at the plant is discharged to the Allegheny River.

Permitted capacities for the treatment plant are a flow of 1.2 mgd and a corresponding organic loading of 2,040 pounds per day. Average hydraulic and organic loadings for 1993 were 1.359 mgd and 1,618 pounds per day, respectively. The average flow of 1.36 mgd is 0.16 mgd above the plant's permitted capacity, and the plant is hydraulically overloaded. Historically, the plant has had problems with discharges from industrial users of the system. The discharges have caused interruptions in individual treatment systems used at the plant, causing effluent discharges in exceedence of its NPDES discharge limits. Because of continued discharges exceeding NPDES parameters, the Borough has entered into a consent order and agreement with both the ACHD and PaDEP. The consent order required a comprehensive performance evaluation (CPE) of the existing sewage treatment facilities, development of a composite correction plan (CCP) to address deficiencies identified in the CPE, and review, modification, and implementation of the industrial waste pretreatment program.

Actions taken as a result of the CPE involved hiring a new plant superintendent, additional training of plant operators, pump station upgrades, process operations modifications, and plant upgrades. Another problem identified by the CPE was excessive I/I entering the collection

system. PaDEP approved a CAP to address the I/I problem in 1990. The first corrective action taken as a part of the CAP was installing a flood gate on the Plum Creek Pump Station to prevent back flow from the Allegheny River during high water levels, from entering the pump station. The most recent CAP for the Oakmont collection system was for May 1991. That report indicates that flow monitoring was completed and suggests that inflow is not a problem. However, peak infiltration combined with actual sewage flows still exceeds the plant's permitted capacity, The Borough's Chapter 94 Municipal Wasteload Management Report for 1993 indicates numerous cross connections between storm and sanitary sewers, which the Borough is working to eliminate. The expectation was that completion of the work proposed for 1994 will reduce flows to the plant to within its permitted hydraulic capacity. Information from the ACHD indicated that the facility remained hydraulically overloaded as of December 1995, causing Oakmont has submitted a new Corrective Action Program.

Plum Creek STP

Plum Creek STP is on Colorado Street in the municipality of Penn Hills. The treatment plant is owned by Penn Hills. Its service area includes the northwestern part of Penn Hills and part of Plum Borough. The estimated service population is 26,909. Each contributory municipality manages the collection system within its political boundaries. Primary contributors to the treatment plant are residential, but some commercial and industrial users are included in the service area. Penn Hills is developing an industrial waste pretreatment program. Penn Hills has obtained approval of is Enforcement Response Plan from the EPA. After the pretreatment program is developed, enforcement will be concentrated within the Plum Creek service area because of the connection to the ALCOSAN system.

The sewage collection system within the two contributing municipalities is sanitary only. Flows are conveyed to the plant by gravity sewer and force main. Penn Hills operates three pump stations within the system - Plum Creek, Jade and Meadow. Plum Borough operates two additional pump stations within the system: East Oakmont and Ramparts. Flows to the Penn Hills pump stations are not monitored, and their percent maximum operating points are not known. Plum Borough's East Oakmont and Ramparts facilities are operating at approximately 53 and 94 percent of their maximum capacity, respectively.

Plum Creek STP is a secondary activated sludge wastewater treatment plant. Treatment units at the plant include two comminutors, a degritter, three primary clarifiers, two aeration tanks, two secondary clarifiers, two chlorinators, and a chlorine-contact tank. Treated wastewaters are discharged to Plum Creek under NPDES permit number PA0026417. Sludge processing includes anaerobic digestion and dewatering using a belt filter press. Supernatant liquor is drained into the supernatant conditioning tank for further processing. Dewatered sludge is hauled to Chambers

Development Company landfill for disposal. Permitted capacities for the treatment plant are a flow of 3.70 mgd and an organic loading of 6,290 pounds per day. The average hydraulic loading is 2.417 mgd, and average organic loading is 3,021 pounds per day.

The plant was constructed in 1966 and renovated in 1989 in a joint venture of Penn Hills and Plum Borough at a cost of $19 million. Excessive I/I is entering the collection system, causing surcharging and basement backups. I/I effects on the treatment have been elevated effluent flows. Average effluent flows have exceeded those permitted by the NPDES permit during March of 1992 and 1993.

The two contributory municipalities are under a PaDEP mandated tap restriction and have had their CAP approved by PaDEP. Plum Borough implemented their CAP for the Plum Creek system in 1989. Although this CAP was completed in 1993, excessive I/I remains a problem. PaDEP has denied an extension of the CAP provisions until they include flow equalization or provide additional capacity in the interceptor system.

Holiday Park STP

Holiday Park STP is on Golden Mile Highway (State Route 286) in Plum Borough. The treatment plant is owned by the Plum Borough Municipal Sewer Authority (PBMSA) and serves the southeastern part of Plum Borough in Allegheny County and the western part of the Municipality of Murrysville and the southwestern tip of Washington Township, both in Westmoreland County. Service is provided to approximately 4,140 customers within the service area. Holiday Park's 1993 Chapter 94 Municipal Wasteload Management Report states that no industrial wastewaters are discharged into the collection system. PBMSA has an industrial waste ordinance in effect to regulate potential industrial users.

The sewage collection system is a gravity flow sanitary-only system, reportedly consisting of 174,200 feet of pipe ranging in size from 8 to 18 inches in diameter. Holiday Park STP is a rotating biological contactor (RBC) plant. Wastewater treatment systems used are traveling bar screen, grit removal, primary sedimentation, biological process (RBC), final clarification, and chlorination. Treated wastewater is discharged to Arbers Creek under NPDES permit number PA0035360. Generated sludge is digested aerobically, thickened, dewatered, and disposed of at a permitted landfill. Permitted capacities for the treatment plant are a flow of 1.8 mgd and an organic loading of 3,060 pounds per day. Average hydraulic and organic loadings for 1993 were 1.356 mgd and 1,667 pounds per day, respectively.

Both the collection system and the treatment plant have been susceptible to hydraulic overloads in wet-weather conditions. There are reportedly seven sanitary sewer overflows within the

collection and treatment system. PaDEP and USEPA have taken enforcement action concerning these situations. A PaDEP-mandated tap ban for the Holiday Park system is in effect. The authority has implemented a CAP. Submitted quarterly reports indicate successful removal of I/I in one subsystem as a result of corrective actions. In 1993 the authority submitted to PaDEP preliminary design for an overflow detention facility.

3.8 ALCOSAN TREATMENT PLANT

3.8.1 Overview

The ALCOSAN treatment plant provides secondary treatment by using a conventional plug flow activated sludge process. The plant layout is shown in Figure 3-19. A process flow schematic of the existing plant is shown in Figure 3-20. The plant has a permitted monthly average capacity of 200 mgd. Although ALCOSAN serves a combined sewer system, the flow to the plant does not vary significantly during wet and dry weather. The average annual flow to the plant is approximately 190 mgd. Typical flows during wet and dry weather are approximately 225 mgd and 175 mgd, respectively. Dry-weather flows are influenced by significant infiltration in the collection system and therefore approach the annual average. Table 3.15 summarizes the current influent flows and loads.

The preliminary and primary treatment systems have been in operation since 1959. The secondary treatment system was brought on-line in 1972. There are a few operational concerns with certain facilities, but the overall plant performs well. Effluent limits are met consistently at current plant flow rates. Individual process descriptions, plant hydraulic and treatment capacities, and the problems and limits of each process are discussed in the following sections. Current NPDES permit limits are summarized in Table 3.16, with pending changes highlighted. The anticipated changes include a future total residual chlorine (TRC) limit and a modification of the seasonal months for the ammonia-nitrogen limit, based on historical receiving-water temperatures. Permitted flows and corresponding loadings also will be changed to reflect plant expansion.

3.8.2 Main Pump Station

The Main Pump Station pumps all flow from the interceptors and maintains a relatively constant wet well level under all influent flow conditions. Three incoming interceptors, located as low as 100 feet below grade, empty into a circular wet well in the Main Pump Station. Six variable-speed pumps are used to pump the raw sewage from the wet well to a sewage conduit from which it can flow by gravity through the treatment plant. The Main Pump Station is operated under computer control. Pumping operations are optimized to maintain the target water surface in the wet well at 680 feet. During wet weather, pump operation is adjusted automatically to increase pumping rates up to approximately 225 mgd, while holding the wet well at 680 feet for as long as possible. As the wet well elevation begins to increase, the pumping rate is maintained at 225 mgd, the current effective treatment capacity.

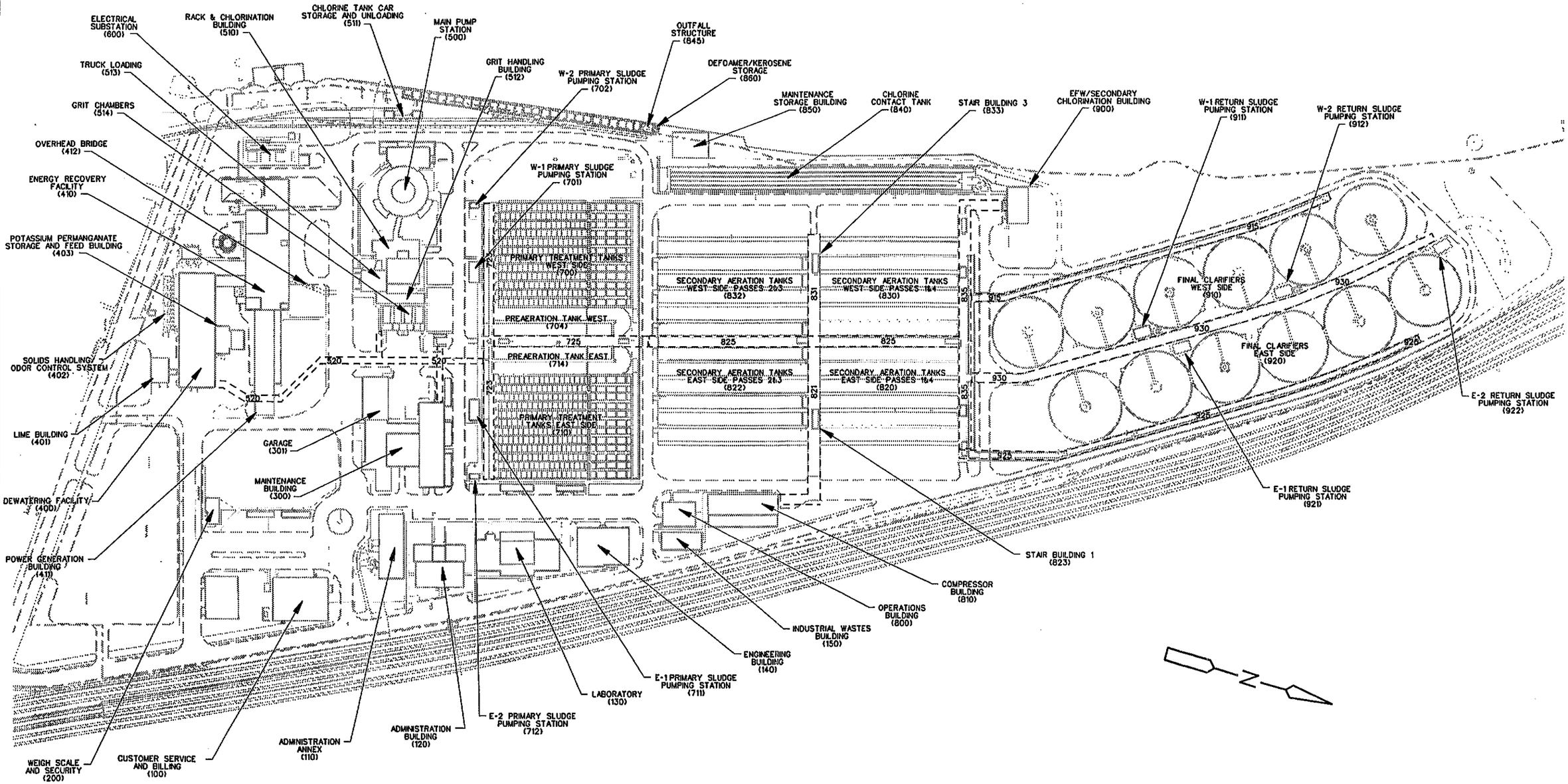


FIGURE 3-19
ALCOSAN Wastewater Treatment Plant Layout

FIG_3-19.DGN 8-5-96

INFLUENT FLOW

EFFLUENT FLOW

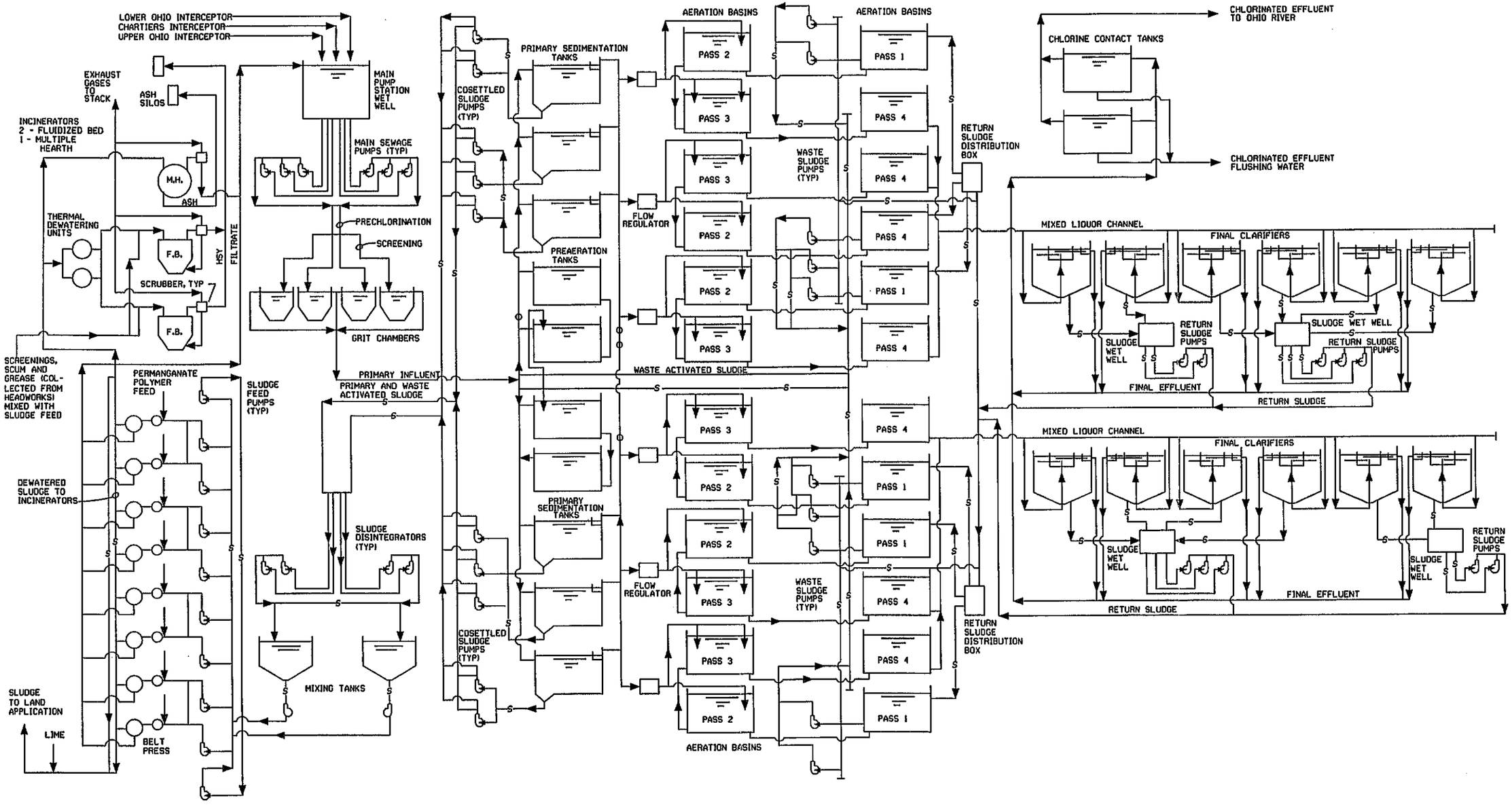


FIGURE 3-20
ALCOSAN WASTEWATER TREATMENT PLANT
PROCESS SCHEMATIC

PROSFLOW.DGN 8-5-98

Table 3.15
Current Plant Influent Flows and Loads

Loading Condition	Flow (mgd)	BOD	TSS
Average Day	190	163,700	288,000
Peak Month[a b]	220	224,400	450,600
Peak Week	225	261,000	722,200

[a] Peak loadings do not correspond with peak flows.
[b] Maximum month average day 1989 - 1995 (March 1994).

Flows exceeding the pumping rate are discharged to the receiving waters through combined sewer regulators upstream of the plant. There also is a bypass at the Main Pump Station that diverts flow around the plant directly to the Ohio River. This is used only if it appears that process tanks may overflow as a result of high influent flows combined with flood-stage elevations in the river. The hydraulic relationship between the water level in the wetwell and the incidences of overflows upstream in the interceptor system is discussed in Subsection 3.2.

3.8.3 Liquid Treatment Process

A general description of the existing facilities follows. This information, along with the age and general condition of facilities, is summarized in Table 3.17. The condition of the facilities is discussed in more detail in the following subsection titled "Problems and Limitations".

Table 3.16
Current NPDES Permit Limits
ALCOSAN Wastewater Treatment Plant

Discharge Parameter	Concentrations (mg/l unless otherwise indicated)			Mass (lbs/day)	
	Average Monthly	Average Weekly	Instantaneous Maximum	Average Monthly	Average Weekly
Flow (mgd)	200	N/A	N/A	N/A	N/A
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)					
May 1 to Oct 31	20[a]	30	40	33,360	50,040
Nov 1 to Apr 30	25[a]	37.5	50	41,700	62,550
Total Suspended Solids (TSS)	30[a]	45	60	50,040	75,060
Ammonia-Nitrogen					
April 1 to Oct 31[c]	15	22.5	30	25,020	37,530
Nov 1 to May 31[c]	25	37.5	50	41,700	62,550
Dissolved Oxygen	5.0 minimum daily average, 4.0 minimum grab sample				
Fecal Coliform (MPN/100 ml)					
May 1 to Oct 31	200[b]				
Nov 1 to Apr 30	2,000				
pH	6.0 to 9.0				
Total Residual Chlorine (TRC)[d]	0.5 mg/l average monthly limit				

[a] In addition, a minimum of 85 percent of influent $CBOD_5$ and suspended solids must be removed.

[b] Nor exceed 400 MPN/100 ml in more than 10 percent of the samples.

[c] Reflects a revised PaDEP policy that May is considered as a winter month for the ammonia- nitrogen limit in future ALCOSAN permits.

[d] PaDEP's estimated limit at the time of this study.

Table 3.17
Unit Process Descriptions

Unit Process	Number	Description	Year Constructed / Installed	Condition[a]
Main Sewage Pump	3	*New* • Mixed-flow centrifugal pumps • Dry pit, nonclog, vertical shaft • 2,000-hp motor • Variable frequency drive (300 to 400 rpm) • Designed for 66,000 gpm (95 mgd) @ 68-ft TDH each	1991	Good
	3	*Retrofitted* • Mixed-flow centrifugal pumps • Dry pit, nonclog, vertical shaft • 1,500-hp motor • Variable-frequency drive (300 to 400 rpm) • Designed for 45,250 gpm (65 mgd) @ 56-ft TDH each	1959	Good (retrofitted in 1991 with entirely new rotating assemblies)
Bar Screens	4	• Mechanically cleaned • 3/4-inch openings • 5 feet wide by 7.75 feet deep channel	1976	Good (refitted in 1994 with chains, sprockets, and bars)
Aerated Grit Chambers	4	• Coarse-bubble aeration • 20 feet wide by 60 feet long • 12.5-foot sidewater depth	1959	Good (new chain and bucket collectors installed in 1994)
Preaeration Tanks	2	• Coarse-bubble aeration • Two passes per tank • 30 feet wide by 280 feet long per pass • 15-foot sidewater depth	1959	Fair

Unit Process	Number	Description	Year Constructed / Installed	Condition[a]
Primary Sedimentation Tanks	6	• Four bays per tank • 67 feet wide by 280 feet long per tank • 15-foot sidewater depth	1959	Good, but settled sludge pumps require frequent maintenance
Aeration Basins	6	• Ceramic tube aeration • Four passes each with basin volumes: - Pass 1 (RAS) .96 MG - Pass 2 .95 MG - Pass 3 .95 MG - Pass 4 .94 MG Total 3.80 MG	1972	Good, but gate operators for step-feed operation are inoperable
Final Clarifiers	12	• 141-foot diameter • 12.83-foot sidewater depth	1972	• Structures - good • Collector mechanisms are corroded and are being replaced • RAS pump drives are inefficient and are being replaced.
Chlorine Contact Tanks	2	• Flow path of 7.5 ft by 1,810 ft long, each tank • 14.5 ft sidewater depth	1972	• Structures - good • Chlorinator feed equipment is in poor condition • Dosage monitoring and control system is not working

[a] As part of the EPM Project, the structural condition of several process tanks has been evaluated. The general findings are as follows:

- Concrete appears to be in sound structural condition
- Miscellaneous freeze/thaw damage (spalling)
- Missing sealant in expansion joints - some seepage is evident
- Miscellaneous corrosive damage - surface sealant required
- Minor corrosion on aeration piping

SECTION 3
Current Conditions

Process Descriptions

Influent Pumping

Three incoming interceptors located as low as 100 feet below grade empty into a circular wet well in the Main Pump Station. Six variable-speed pumps are used to pump the raw sewage from the wet well to a sewage conduit from which it can flow by gravity through the treatment plant.

Preliminary Treatment

The raw sewage is pre-chlorinated to reduce odor before the sewage enters the screening facility. The wastewater flows through four mechanically cleaned bar screens. Solids removed by the screens are shredded and can be conveyed to a truck bay for hauling to landfills or to the Energy Recovery Facility for incineration.

Four aerated grit chambers are used for removing sand and sand-like material (grit) to protect downstream equipment and to conserve downstream solids-removal capacity. Grit is collected and removed by a chain-and-bucket system. From the buckets, the grit either is transported by trucks to a landfill or is pneumatically conveyed to the Energy Recovery Facility for incineration with dewatered sludge cake in the recently constructed fluidized-bed incinerators (FBIs).

Flow from the grit chambers passes through a flow-metering station and then is divided between two preaeration channels. Waste activated sludge (WAS) is pumped to the preaeration tanks from the first pass of the activated-sludge aeration basins. The influent sewage flows from the preaeration tanks to the aerated influent channels for distribution to the primary sedimentation tanks. Influent flow can bypass the preaeration tanks and flow directly to the aerated influent channels.

Primary Treatment

Six rectangular primary-sedimentation tanks remove heavy organic solids (primary sludge), WAS, and primary scum and grease from the plant flow. Each tank has four bays, with chain and flights to remove floatable material. Collected sludge is pumped to the Dewatering Building. Primary scum and grease is pumped to the Energy Recovery Facility and is concentrated, heated, and fed directly to the incinerators.

Secondary Treatment

Plug-flow activated sludge is used as the secondary treatment process for removing dissolved and colloidal suspended organic material. The wastewater is aerated in six aeration basins, each consisting of four passes. In Pass 1, return activated sludge (RAS) from the final clarifiers is aerated. Excess activated sludge is wasted from this pass and pumped to the preaeration tanks for later removal in the primary-sedimentation tanks. In Pass 2, the RAS is mixed with the primary effluent. The aeration process continues through Pass 3 and Pass 4.

Twelve circular final clarifiers are used to remove the solids from the effluent of the aeration basins. The mixed-liquor suspended solids (MLSS) settle to the bottom to form secondary sludge. Secondary sludge is pumped to the first pass of the aeration basins, as described above. When the solids concentration in Pass 1 of the aeration process reaches a predefined level, part of the MLSS is pumped to the preaeration tanks to co-settle with the primary sludge and is then transferred to the dewatering building. Effluent from the final clarifiers flows to the chlorine-contact tanks.

Disinfection

Chlorination is used for final disinfection before the effluent is discharged to the Ohio River. Four chlorinators inject chlorine solution into the effluent from the secondary clarifiers. Two chlorine-contact tanks retain the effluent for at least 15 minutes at the peak flow rate. The chlorine is brought to the site and stored in 90-ton rail tank cars.

3.8.4 Plant Hydraulic and Treatment Capacities

Hydraulic Capacities

Two types of models have been used to evaluate performance at the ALCOSAN plant. The HYDRO model (described below) provided a detailed assessment of the facility's hydraulic characteristics. The model was calibrated for several operating conditions at the plant and was used to estimate the plant's hydraulic capacity and establish profiles for a range of operating conditions.

A GPS-X plant process simulation model also has been calibrated to simulate process kinetics of the expanded facilities. The purpose of the model is to test treatment strategies for the proposed improvements. The model simulates treatment-process kinetics and performs mass-balance calculations, and can be used to estimate treatment capabilities. The model is dynamic and can be used to evaluate flow hydrographs from the EXTRAN models developed for ALCOSAN's interceptor system. Results from the GPS-X model will be summarized in Section 5.

SECTION 3
Current Conditions

Hydraulic analyses have been performed using HYDRO, a computer model in which hydraulic elements (channels, weirs, gates, etc.) are sequenced together to simulate the WWTP. The model calculates the hydraulic profile on the basis of backwater calculations, starting at the downstream end of the plant. HYDRO is based on standing water levels and does not consider surface waves that might be caused by aeration or changes in momentum or other transient phenomena.

Results from the HYDRO model indicate that the limiting zones in the plant (the first to overtop at high flow rates) are the preaeration tanks, the aerated grit tanks, and the bypass weirs in the Main Pump Station discharge conduit. The analysis indicates that the preaeration tanks have a capacity of approximately 285 mgd (based on one foot of freeboard) and would overtop the concrete at approximately 320 mgd, assuming a quiescent water surface. The aerated grit chambers and the bypass weirs overflow nearly simultaneously with the preaeration tanks.

Results from the HYDRO model also indicate that the existing plant can handle the permitted average daily flow of 200[2] mgd with one unit from each process out of service. With all units in service, the plant can pass flows up to approximately 285 mgd while maintaining a minimum freeboard of one foot. The current peak hourly flow is 235 mgd.

For the 25-year flood conditions,[3] results from the HYDRO model indicate that the plant remains fully operational for influent flows up to 175 mgd. At flows above 175 mgd, the chlorine-contact tanks begin to short circuit over the baffle walls. If the top of the concrete of the baffle walls were raised, water levels in the final clarifiers would rise over the stilling wells, causing short circuiting. Regardless of the probable process failures, the plant's process basins should not overflow under the 25-year flood conditions.

In summary, from a purely hydraulic standpoint, the plant has adequate capacity for conveying the current permitted average daily flow but will require significant modifications to convey flow rates beyond 285 mgd. According to this analysis, the major limiting zones (points of less-than-acceptable freeboard and first overtopping) are the preaeration tanks, the aerated grit chambers, and the bypass weirs in the Main Pump Station.

Treatment Capacities

The estimated current process capacities based on the criteria listed are shown on Table 3.18. Although the plant's hydraulic capacity is estimated to be 285 mgd, operational experience shows

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2 Capacities are in terms of plant influent flow rate, including plant recycles. For the secondary aeration basins, the model assumes that RAS flow rate is 33 percent of the influent flow rate. Source: EPM Technical Memorandum 5

3 The 25-year flood-stage elevation is 721 feet above mean sea level (msl). Normal pool elevation is 710 feet.

that its effective treatment capacity is approximately 225 mgd. Therefore, present operations restrict flow through the plant to 225 mgd to ensure effective treatment and compliance with flow and load restrictions described in ALCOSAN's NPDES permit.

Co-settling of WAS is not a major constraint on the plant's effective treatment capacity. WAS is only a concern at the higher overflow rates that would occur during the wet-weather combined sewer overflow (CSO) treatment hydraulic strategy of providing 875 mgd of primary treatment capacity. By the time this strategy is implemented, the WAS will be processed without using the primary clarifiers.

Units that limit the plant's effective treatment capacity are the grit chambers, the secondary aeration basins, and the secondary clarifiers. The effective capacity for each of these units is approximately 225 mgd. Operating experience indicates that flow rates in excess of 225 mgd will significantly reduce the effectiveness of these units. Exceeding the capacity of the grit chambers will create operational problems by allowing significant grit loss and associated wear on downstream facilities. Exceeding 225 mgd in the secondary treatment system will reduce hydraulic retention time to a point that eliminates any flexibility that the treatment plant has in varying the mixed-liquor concentration and mean cell residence time. Also, increasing the flow rate over 225 mgd results in a final clarifier overflow rate that exceeds the PaDEP criteria.

3.8.5 Liquid Process Problems and Limits

Except for total flow and removal percentages, the wastewater treatment plant (WWTP) consistently meets all NPDES permit requirements, including monthly and weekly ammonia limits, at the current flow and loading conditions. The requirement to remove 85 percent of the BOD and TSS, based on a 30-day average, are periodically not met during wet weather when the influent sewage is diluted. Regardless of the percent removal, the effluent concentrations for these parameters are consistently within the permitted values of 20 mg/l and 30 mg/l, respectively, on the basis of a monthly average flow.

Although plant performance is good under existing conditions, there are some operational concerns about isolated processes, (e.g., odor-control issues) that are receiving ALCOSAN's attention. The following section contains a discussion of each unit process for physical conditions of facilities, operational performance, and process limits.

Table 3.18
Process Capacities

Process	Estimated Capacity (mgd)		Criteria/Remarks
	All units	Largest Unit Out of Service	
Influent Pumping	505	404	Based on a wet-well water surface elevation of 680 ft (current operating level).
Bar Screens	300	225	Original Design Capacity.
Grit Chambers	285-114	213-85.5	Range corresponds to WEF/ASCE[a] recommended range of detention times: 2 minutes - 5 minutes.
	190	143	Based on typical 3-minute detention time.
Preaeration Tanks	363	181	Based on 15-minute detention time for odor control
Primary-Sedimentation Tanks	281	234	Based on 2,500 gpd/ft^2 surface-overflow rate. Criteria for tanks not receiving WAS.
	169[3]	140	Based on 1,500 gpd/ft^2 surface-overflow rate. Criteria for tanks with WAS recycle.
Aeration Basins	225	188	Based on steady-state activated-sludge modeling so that all effluent permit limits are met.
Final Clarifiers	225	206	Based on PaDEP criteria of 1,200 gpd/ft^2 overflow rate.
Chlorine Contact Tanks	280	140	Based on PaDEP criteria of 15-minute detention time at peak hourly flow[1].

[a] Water Environment Federation/American Society of Civil Engineers

Influent Pumping

The suction and discharge piping for the main sewage pumps appears to be in good condition. The hydraulically controlled valves and the siphon breaker systems function well and show no signs of requiring replacement. Similarly, an inspection of the outside of the wet well indicated that the structure is sound, revealing no obvious problems or need for repairs.

The existing hydraulic capacity of the pump station is sufficient to handle current flows and future peak flows up to 505 mgd with all units in service (404 mgd with the largest unit out of service). The capacity assumes that the pumps are operating at their design operating speed and that the wet-well operating level is maintained at its typical elevation, approximately 680 feet.

Preliminary hydraulic analyses indicate that installing higher capacity pumps, with minimal structural modifications, will make it possible to expand total influent pumping capacity to 900 mgd or 750 mgd with the largest unit out of service. The existing wet-well, originally designed for a peak flow of 300 mgd, can handle the additional flow.

The first part of a detailed hydraulic analysis of the wet well was completed in September 1995. The Alden Research Laboratory built and tested a physical scale model of the ALCOSAN wet-well. The purpose of the test was to evaluate the potential to increase the pump station's capacity to 875 mgd by installing six high-capacity pumps. The tests concluded that the wet-well could operate within acceptable limits of swirl angle and vorticity for the majority of the evaluated operating conditions. Excessive swirl angle could be reduced to acceptable levels by installing anti-swirl vanes in the pump intake or by other means. Both excessive swirl and surface vortex activity could be prevented by selecting pump operating combinations.

Bar Screens

Plant personnel report no operational concerns about the bar screens and that maintenance requirements are routine. All four screens have been upgraded within the last 6 months to include new sprockets, new chains, new bars, and automated screenings conveyance. Their estimated capacities are adequate for handling the current maximum-month flows (225 mgd) but will require an expansion to meet projected flows.

Grit Chambers

The aerated grit chambers are in good condition. Each chamber has a newly installed chain-and-bucket grit collector. There is no obvious need for repair. The aeration facilities are adequate for the recommended air-flow rates, but the estimated tank capacity, in terms of detention time at maximum-monthly flow, is nearing its useful level. The estimated detention time at current

maximum-month flows is 2.4 minutes. This is within the acceptable range of 2 to 5 minutes as designated by WEF/ASCE, but less than the recommended time of 3 minutes for 95 percent grit capture. The plant experiences significant grit carryover into the preaeration and primary-sedimentation tanks, as evidenced by the large quantities of grit encountered during routine maintenance. The grit-removal facilities will have to be expanded to handle additional flows.

Preaeration Tanks

The purpose of the preaeration tanks is to reduce septicity and odor. The volume of the preaeration tanks is sufficient to retain the current flow rates for 15-minutes if both tanks are in service which is within the acceptable range of 10 to 15 minutes for odor control. Past field observations indicate that the airflow to the preaeration tanks is not sufficient for aerating the incoming flow to the degree necessary for odor control. As a result, the preaeration tanks do not serve a vital function for liquid process treatment but are a significant source of odors. The preaeration tanks strip out a great deal of the odor-producing compounds in the wastewater. For future expansion, the existing preaeration tanks will be converted to primary-sedimentation tanks to supplement the capacity of that process.

Primary-Sedimentation Tanks

ALCOSAN's primary-sedimentation tanks are used for primary treatment of raw sewage and for co-thickening of WAS. At the current peak hourly influent flow rate of 235 mgd, the surface overflow rate is 2,088 gpd/ft^2. Although the rate exceeds PaDEP's design guideline for primary settling tanks receiving WAS (1,500 gpd/ft^2) plant performance indicates that the primary settling tanks are performing well. Data collected from 1988 to 1992 indicate that the primary settling tanks reduced the BOD load by an average of 45.4 percent. This removal rate corresponds with flow rates ranging from 178 to 205 mgd and exceeds PaDEP's guidelines for efficient primary treatment. The PaDEP guidelines state that BOD removal of 30 to 35 percent indicates efficient primary treatment.

Because high-rate treatment of wet-weather flows has proven effective for other communities, a testing program was conducted at the ALCOSAN preaeration and primary settling tanks from November 1994 though April 1995. The objective of the program was to determine the feasibility of operating the tanks (and new tanks) at surface-overflow rates higher than 3,000 gpd/ft^2. Results from the ALCOSAN test program and summaries of treatment practices at other communities are included in Section 5, "Alternatives Analyses".

Aeration Basins

The existing aeration basins can provide two hours of detention time at the current maximum-monthly flow of 220 mgd with a corresponding organic loading of 60 lbs/day/1,000 ft^3. NPDES permit mass limits have not been exceeded at this organic loading rate, although the 85 percent removal criterion is not always met. Based on ALCOSAN'S average influent concentrations, compliance with the 85 percent removal criteria would require effluent concentrations of 13.5 mg/l and 24.7 mg/l, respectively, which are considerably lower than the permitted effluent concentrations.

Steady-state modeling of the aeration basins indicates that the existing system can treat maximum-month flows and loads adequately within a MLSS operating range of 1,500 to 2,000 mg/l.

The current medium-bubble diffused-air system can deliver required air volumes and a transfer the required oxygen. The ceramic tubes are delivering less than 2 cubic feet per minute (cfm) per diffuser, within the normal operating range for ceramic tubes (1 to 10 cfm per diffuser). The diffuser system has not been inspected or cleaned since it was installed but, visual observation of the aeration basins does not reveal dead zones or evidence that any bank of diffusers is not in service.

The aeration basins were designed so that they could be operated in a step-feed mode by opening gates along the influent channel, which would allow direct feeding to Pass 3 and Pass 4, as well as to Pass 2. The aeration basins have not been operated in the step-feed mode recently and cannot be operated until the influent gates to Pass 3 and Pass 4 are remounted.

Final Clarifiers

The final clarifiers can treat the maximum-month flow of 220 mgd with a MLSS concentration of 2,000 mg/l. At these values, the surface-overflow rate of the clarifiers is 1,175 gallons per day/square foot (gpd/sf) and the solids-loading rate is 25 lb/day/sf, based on an underflow concentration of 6,000 mg/l. The corresponding PaDEP standards are 1,200 gpd/sf and 50 lb/day/sf[1], respectively. The clarifiers are hydraulically limited, and using the PaDEP surface-overflow rate of 1,200 gpd/sf, the clarifiers are capable of treating 225 mgd. Using the PaDEP solids-loading rate of 50 lb/day/sf, their capacity is 440 mgd. Therefore, hydraulic loading is the limiting criterion.

The final clarifiers mechanisms are severely corroded and in need of replacement. As a result, the CIP includes a rehabilitation project in which all of the final clarifier mechanisms will be replaced.

Another area of concern about the final clarifiers is the scum-removal system. The system consists of a single-arm skimmer delivering scum to a 4-foot beach. This is a low-volume scum-removal system that probably would have difficulty removing scum during any Nocardia event or other time when scum production is excessive. Normally, clarifiers of this size are equipped with dual skimmer arms and larger (6-foot) beaches. Baffles could be installed to prevent the scum from escaping the beach. There have been problems with scum removal in the past, and according to the plant operators, excess surface scum has been correlated with releases of odor.

Historically, there has been evidence of short circuiting of solids through the clarifiers and over the effluent weirs. The clarifiers are not equipped with flow baffles. Typically, baffles are located on the launder trough to direct the flow current back toward the center feed well, redirecting finer solids that normally would escape over the weir back into the flow stream and settle out. Another modification that has been used recently is the mid-radius baffle. This circular baffle is attached to the center feed well at the mid-radius of the clarifier to prevent short circuiting of the flow stream by directing the current downward.

Problems with flow splitting and scum transport also exist for the final clarifiers. No practical means of flow splitting is available.

Disinfection System

The disinfection equipment is approaching the end of its useful life. The chlorine-contact tanks appear to be in good condition. The estimated capacity of the chlorine-contact tanks is 280 mgd, based on PaDEP's criteria for 15-minute detention time at peak hourly flow. This capacity assumes both tanks are in operation. A detention time of 19 minutes is attained at ALCOSAN's maximum-month flow of 220 mgd. ALCOSAN's coliform effluent limits of 200 colonies per milliliter (col/100 ml) in summer and 2,000 col/100 ml in winter are met consistently.

The chlorination system is manually controlled. The dose is adjusted twice daily and is targeted to achieve a total residual chlorine (TRC) of between 0.3 and 0.5 mg/l. New statewide TRC regulations adopted by the Environmental Quality Board (EQB) require that all WWTPs discharging to Commonwealth waters comply with the new TRC water quality criteria. The draft NPDES permit, dated June 7, 1994, indicates a maximum TRC limit of 0.5 mg/l and includes the possibility of enforcing a limit as low as 0.011 mg/l. Such a limit would require a dechlorination process to be implemented at the ALCOSAN plant.

3.8.7 Solids-Handling Systems

SECTION 3
Current Conditions

Figure 3-21 shows a flow schematic of the existing ALCOSAN solids-handling processes. Table 3.19 lists the major components of the solids-handling systems and shows sizing information for each. The solids-handling systems process the following five flow streams:

- Screenings
- Grit
- Primary Sludge (PS)
- Waste Activated Sludge (WAS)
- Primary Scum and Grease

The current facilities for each processes are described in Table 3.19.

Screening

Four 3/4-inch bar racks are used for screening. Screenings grinders are installed on each screen discharge chutes which discharge to a conveyor system. The system conveys ground screenings from the bar rack room into the adjacent truck bay, where they either are discharged into a parked dump truck for hauling or are transferred to a pneumatic ejector system for transport to the Energy Recovery Facility for incineration.

Grit

Four aerated grit chambers are provided for grit removal. Collected grit is dropped into one of two screw conveyors for transport to the adjacent truck bay. Grit can either be conveyed into a dump truck for hauling to a landfill or dropped into a pneumatic ejector system for conveyance to

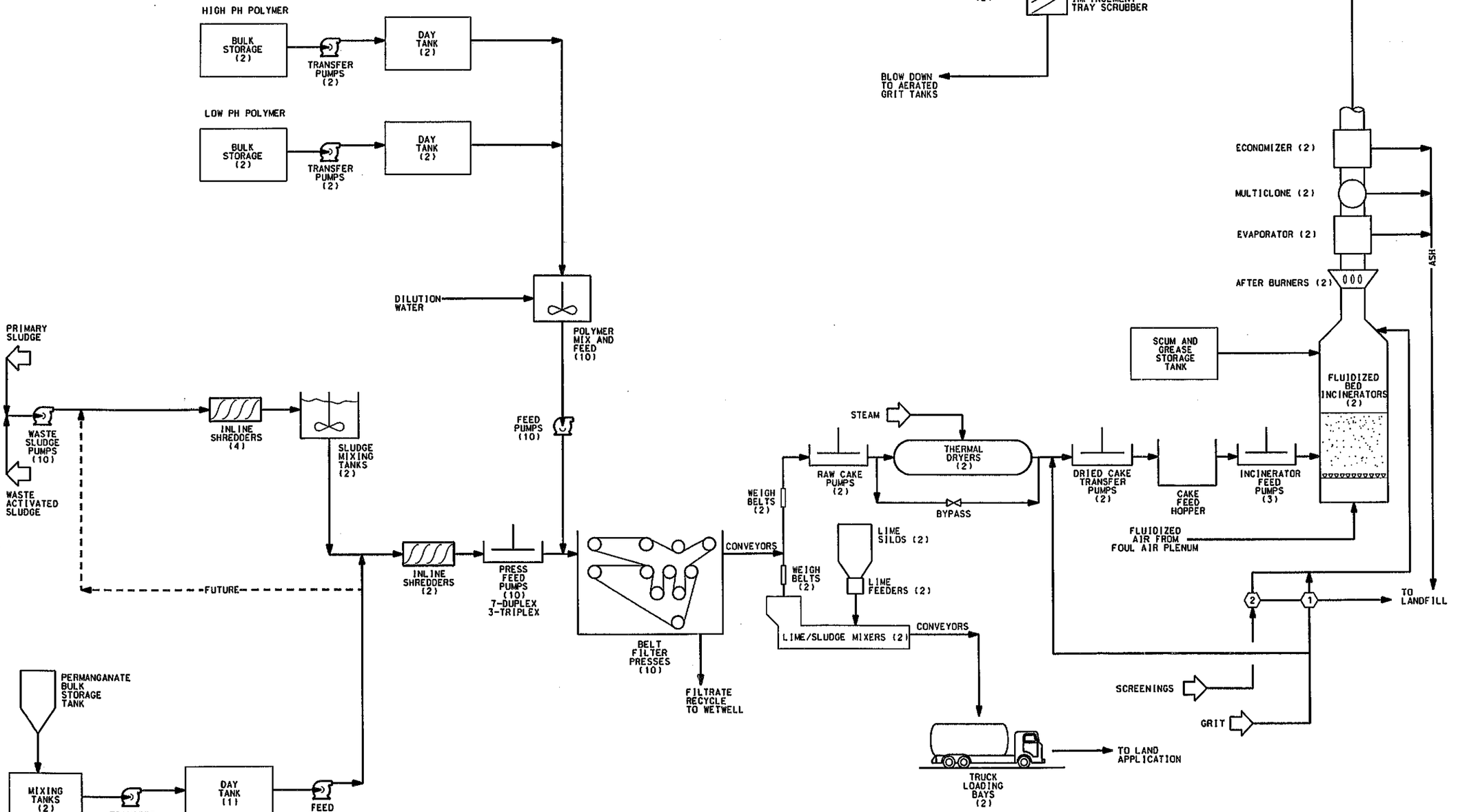


FIGURE 3-21
SOLIDS HANDLING PROCESS
SCHEMATIC FOR EXISTING FACILITIES

FIG_3-21.DGN 8-5-96

Table 3.19
Existing Sludge-Handling Processes and Design Criteria

Process Component	Design Criteria
Cosettled Pumping and Distribution	
Cosettled Primary and Waste Activated Sludge Pumps	10 units (capacity: 300 gpm @ 65 ft TDH)
In-Line Sludge Shredders (upstream of mixing tanks)	4 units (capacity: 1,150 gpm each)
Sludge-Mixing Tanks	2 tanks (65,000 gallons each) 2 mixers (125 hp)
In-Line Sludge Shredders (downstream of mixing tanks)	2 units (capacity: 1,150 gpm each)
Press Feed Pumps	10 units (capacity: 150 gpm each)
Permanganate System	
Bulk Chemical Storage	1 bulk storage silo (capacity: 45,000 lbs)
Mixing Tanks/Transfer Pumps	2 mixing tanks 3 transfer pumps (1/3 hp)
Day Tanks/Feed Pumps	1 tank (volume: 1,000 gallons) 3 feed pumps (½ hp)
Polymer System	
Transfer Tanks	2 high-pH units (volume: 8,300 gallons each) 2 low pH units (volume: 6,100 gallons each)
Transfer Pumps	4 units (1.5 hp)
Day Tank Storage	2 high-pH units (volume: 850 gallons each) 2 low-pH units (volume: 850 gallons each) 10 agitators (1/3 hp) 10 chemical-feed pumps (1/8 hp)
Belt Filter Presses	10 2-meter units (capacity: hydraulic loading 70 gpm/meter, solids loading 1,400 lbs/hr/meter) 10 wash water pumps (capacity: 75 gpm each)
Thermal Drying System	
Raw-Cake Feed Pumps	2 units (capacity: 100 gpm each)
Thermal Dryers	2 units (capacity: 10,000 dry lbs H_2O evaporative capacity per hour each)
Dried-Sludge-Cake Transfer Pumps	2 units (capacity: 100 gpm each)
Incineration System	
Incinerator-Cake Feed Pumps	3 units (capacity: 50 gpm each)
Incinerators	2 fluidized sand bed units (Total solids capacity: 96.12 DTPD each)

Process Component	Design Criteria
Scum and Grease System	
Scum Grinder	4 units (capacity: 300 gpm)
Scum Pumps	4 units (capacity: 300 gpm @ 171 ft TDH)
Rotary Screens	4 units (capacity: 200 gpm)
Scum Concentrators	4 units (capacity: 150 gpm)
Scum Grinder	1 unit (capacity: 1,150 gpm)
Scum-Recirculation Pumps	2 units (capacity: 45 gpm @ 30 psi)
Scum Heat Exchanger	1 unit
Scum and Grease Feed Pumps	8 units (capacity: 0.0-10 gpm @ 30 psi)
Lime-Stabilization System	
Lime Silos	2 units (capacity: 50 tons each)
Lime Feeders	2 units (capacity: 6000 lbs/hr pebble lime)
Lime Crushers	2 Hammer mill units (capacity: 3 Tons / hr)
Lime/ Sludge Mixers	2 units (capacity: 1,400 ft^3/hr)

the Energy Recovery Facility. The pneumatic ejectors deposit grit into a hopper that feeds a shaftless auger. The auger feeds grit into a transfer hopper, where the grit mixes with dried sludge cake before being transferred and pumped into the incinerators.

Co-settled Primary And Waste Activated Sludge

PS and WAS are cosettled in the primary-sedimentation tanks and pumped to the Dewatering Building. Co-settling of the WAS and PS in the primary-sedimentation tanks can result in generation of odors that can be released in the primary-sedimentation tanks and in subsequent solids-handling processes. Odors are generated because of long residence times that allow the sludge to become septic and odorous, and the situation is aggravated by the oxygen consumption of the biologically active WAS while using the PS as a food source. For odor control, potassium permanganate is be injected into the sludge stream where the piping enters the Dewatering Building. On entering the Dewatering Building, the sludge is shredded, and then enters mixing tanks for blending. The mixing tanks also act as a surge point for sludge flow from the primary-sedimentation tanks to solids-handling. The sludge is pumped from the mixing tanks to the belt filter presses. In the pump suction piping, the sludge is shredded, and potassium permanganate is injected into the sludge for odor control in the belt filter press room. The sludge is pumped to the belt filter presses by 10 piston pumps. Each pump is dedicated to a single press. There are seven duplex and three triplex piston pumps. The pumps are aging (15 to 22 years) and are high-maintenance items.

Polymer System

Polymer is injected into the sludge lines in the basement, downstream of the belt filter press feed pumps. Two types of polymer are used for sludge conditioning: "high-pH"(cationic polymer, pH 10-11) and "low-pH"(cationic copolymer, pH. 3.5-5.0). The high-pH polymer is used for sludge that is lime-stabilized, and the low-pH polymer is used for sludge that is incinerated. Both polymers are diluted and fed with 10 dedicated Polyblend units. The units appear to be in good condition. One Polyblend unit is provided per belt filter press.

Belt Filter Presses

After being conditioned with polymer, the sludge is dewatered using ten 2-meter belt filter presses (BFPs). The presses are arranged in two rows, four on the south side and six on the north side of the belt filter press room. The existing 2-meter units were placed in service in the late 1980s (1987 to 1989). Assuming a useful life span of 12 to 15 years, the existing presses will require either major overhaul or replacement by around the year 2000. Replacement presses could be provided with more rollers, resulting in a larger high-pressure dewatering zone. The result would be a cake solids at an approximately 2 to 3 percent higher solids concentration. Higher cake solids could result in decreased cost in incinerator operation and reduced volumes of limed sludge to be hauled.

Dewatered-Sludge Conveying Systems

The northside and southside presses are serviced by two separate belt conveyor systems, with two belt conveyors to each system (one high belt and one low belt). Four of the BFPs (two north and two south) discharge onto the high conveyors. The high conveyors can discharge either to incineration through a dedicated pair of inclined conveyors or to the lower conveyors. The lower conveyors can transport dewatered sludge either to lime stabilization or to the inclined conveyors to incineration. The high-low conveyer arrangement gives the plant flexibility in the number of BFPs being directed toward either incineration or lime stabilization. The high conveyors have been used to convey dewatered cake to incineration, and the low conveyors have been used to convey cake to lime stabilization.

Dewatering Building

Belt conveyors are used to convey dewatered sludge cake from the belt filter presses to the incinerators and to lime stabilization. The lower-level cross conveyors are original equipment installed during the 1975 vacuum drum construction and remained in service after the conversion to belt filter presses. Despite their age, the belt conveyors are reliable, are in relatively good

condition, and appear to provide sufficient capacity. The only drawback of the belt conveyors is that they are an open conveyance system that allows odors from the dewatered cake to be released throughout the dewatering room.

Energy Recovery Facility

In the Energy Recovery Facility, three sets of Schwing hydraulically-driven piston pumps convey dewatered raw cake to the thermal drying units (TDUs) and then transfer dried cake to the incinerator feed pumps.

Lime-Stabilization System

Dewatered sludge is conveyed from the BFPs onto one of two weigh belts that discharge into lime mixers, where pulverized pebble lime is mixed into the sludge for stabilization. The weigh belts are not operable. The lime-sludge mixture is conveyed to the truck-loading bay, where it is loaded into dump trucks for hauling. The plant currently produces a Class B lime-stabilized sludge that is hauled either to landfill or land application by ALCOSAN trucks and BIOGRO. The existing lime-sludge truck-loading bays were sized for short-bed ALCOSAN dump trucks, but the plant also loads the product into tractor trailers used by BIOGRO. Truck garage doors to the loading bays cannot be closed when the large trucks are being loaded, resulting in the release of odors from the truck-loading bay. The current system also is limited in how quickly a truck can be loaded. On average, ALCOSAN triaxle dump trucks and BIOGRO tractor trailer trucks take 1 to 3 hours to load, depending on how many BFPs are in operation. This complicates the logistics of loading trucks and getting them off the site. As a result, odors released from the trucks are increased. Plant staff have asked for the ability to load trucks much more quickly (less than 30 minutes each). These odor-related problems must be addressed in each alternative being considered for lime stabilization.

Fluidized-Bed Incinerators

Two inclined conveyors convey dewatered sludge from the belt filter press room to the Energy Recovery Facility. The conveyors feed the dewatered sludge cake onto two inclined serpentex conveyors in the Energy Recovery Facility, which discharge into a raw-cake bin. The bin feeds into two hydraulic piston pumps that pump the raw cake into two parallel thermal drying units (TDUs). The TDUs dry the raw cake further and discharge it into a transfer bin that feeds two transfer pumps. The transfer pumps then pump the dried cake to an incinerator-feed bin on the first floor. Dried cake is fed from the bin into three incinerator cake pumps and is injected into the incinerators. The plant has two 20-foot 3 inch diameter fluidized sand bed incinerators. A single multiple-hearth incinerator also exists, but it is not operational.

Scum and Grease System

Scum and grease are collected from the primary-sedimentation tanks and stored in two mixed-storage tanks in the central pipe gallery. The scum and grease then are shredded and pumped to a distribution box on the third floor of the Energy Recovery Facility. Debris is removed from the scum and grease with rotary screens and is dropped into the incinerator feed bin. Screened scum and grease are thickened to approximately 30 to 50 percent solids in four scum and grease concentrators and are pumped through an in-line shredder to a scum and grease header and storage-tank loop. This loop provides for storage, mixing, and heating of the scum and grease. Scum and grease are pumped from the header loop to the incinerators.

This relatively new system was designed originally when the plant was receiving large amounts of scum and grease because of the contribution of a large meat processor. The processor left the service area, so ALCOSAN's scum and grease loads were reduced. Because the system was sized for larger volumes, it provides more than enough capacity.

Liquid-Waste Receiving Facilities

Receiving facilities at ALCOSAN consist of a manhole between the Main Pump Station and the ash pits along the Ohio River side. The manhole is connected to a drain pipe that discharges into the influent wet well. Liquid wastes (septage, liquid sludge, and landfill leachate) are unloaded at the manhole by tank trucks. The trucks are equipped with flexible hoses that discharge into the manhole. The unloading of liquid wastes at the manhole results in an unacceptable release of significant odors.

The average daily volume of liquid wastes (sludge, septage, and leachate) received at ALCOSAN and the number of tank-truck deliveries are summarized in Table 3.20. The average volume of liquid waste is relatively small - 56,950 gallons per day. Most of the liquid waste is landfill leachate, comprising 90 percent of the total. The remaining 10 percent is liquid sludge and septage that constitute a small fraction of the plant's solids loading (less than 0.5 percent). Liquid grease is not accepted by ALCOSAN at this time because of O&M problems that were attributed to the waste.

Table 3.20
Liquid-Waste Deliveries to Receiving Facility at ALCOSAN[a]

TYPE AND SOURCE OF LIQUID WASTE	AVERAGE DAILY GALLONS/DAY	AVERAGE DAILY NUMBER OF TRUCK DELIVERIES
Septate from five registered haulers	1,640	1
Liquid Sludge from WWTPs in Robinson Township	3,930	2
Landfill Leachate from BFI	51,380	10
Totals	56,950	13

[a] The quantities of liquid waste are based on data from January 1, 1993, to August 31, 1994

Current and Future Sludge Generation

Current and projected future sludge generation is summarized in Table 3.21. The figures shown in Table 3.21 include plant recycle streams, which are returned to the influent wet well. Major recycle streams include secondary-clarifier floatables, belt filter press filtrate, and supernatant from the scum and grease concentrators.

Table 3.21
Current and Future Sludge Generation
(Dry Tons/Day)

Loading Conditions	Flow (mgd)	Waste Activated Sludge	Primary Sludge	Total Sludge Production
Existing Loads				
Average Annual	190	36	70	106
Peak Month	220	52	94	130 - 146
Peak Week	225	69	136	172 - 205
Loads @ 250 mgd				
Average Annual	214	45	82	127
Peak Month	249	65	107	152 - 172
Peak Week	258	86	154	199 - 240
Loads @ 275 mgd				
Average Annual	242	54	93	147
Peak Month	278	77	120	174 - 197
Peak Week	290	103	172	226 - 275

3.8.6 Air-Quality and Odor-Control Systems

There are two odor- and VOC-control systems at ALCOSAN: a new system treating emissions from the Headworks and another for the Dewatering Building.

Headworks Odor Control

The new fluidized bed incinerators (FBIs) are equipped with afterburners designed to raise the temperature of incinerator exhaust air, as well as supplemental foul air, to a temperature sufficiently high to eliminate odors. Foul air is exhausted from the wet well of the Main Pump Station, the Rack and Chlorination Building, the truck-loading station, the Grit Handling Building, and occasionally the service tunnel. The air is used as make-up air either to the FBIs or to the afterburners. In either case, the foul air stream is subjected to a temperature of between 1400 ° F and 1600 ° F for approximately one second. Under these conditions, the foul air should be completely oxidized and thus deodorized.

Sludge-Processing Odor Control

The odor-control system for the Dewatering Building treats foul air from the sludge- storage tanks, the dewatering room, and the basement of the Lime-Stabilization Building. These areas are the most odorous areas of the plant. A two-stage process consisting of packed-tower caustic scrubbers followed by caustic impregnated activated carbon filters treats the foul air from all the areas except the lime-stabilization room before it is discharged to the atmosphere. The air from the lime-stabilization room undergoes particulate removal in a wet particulate scrubber before it joins the remainder of the foul air upstream of the activated carbon filters.

Problems and Limits

Odor Control

Odor control is a continuing source of concern for ALCOSAN. The plant is highly visible from the McKees Rocks bridge and is close to the Brighton Heights neighborhood. Because of its central location, even the slightest odor has the potential to offend community residents. Several sources of fugitive odor were identified by plant personnel and in an initial odor-control survey. They are ranked in Table 3.22.

Table 3.22
Ranking of Plant Sources of Offsite Odors

Source Group	Rank
Sludge-Conveyor Roof Vent	1
Preaeration	2
Sludge-Processing Exhaust	3
Aerated Grit	4
Aeration Basins	5
Primary Clarifiers	6
Septage Receiving	7
Secondary Clarifiers	8
Truck Bay (may be substantially underestimated because of sampling conditions)	9
RAS Box	10
Chlorine-Contact Tanks	11
Mixed-Liquor Channel	12

Air Quality

ALCOSAN has demonstrated compliance with regulations for controlling emissions of VOCs and hazardous air pollutants (HAPs) at publicly owned treatment plants (POTWs). Estimates of current VOC and HAP emissions were prepared after a 3-day sampling event from April 18 to April 21, 1994, and a second sampling event from July 25 to July 27, 1994. During those events, liquid concentrations of total VOCs and of selected speciated compounds were sampled at the plant influent, primary influent, aeration basin influent, and plant effluent. A limited number of air-emission samples also were collected during the second sampling event.

Emissions were estimated by using a combination of direct measurement (during the sampling events) and by using a compound-specific fate model, BASTE, that was developed for POTWs.

The model is a complex intermodal mass-transfer model that accounts for HAP loss pathways, such as air emissions, biodegradation, and solids sorption.

Results of the analysis are summarized in Table 3.23. According to the estimated emissions listed in Table 3.23, ALCOSAN will not trigger the need for applying the required control technology for VOC or HAP control.

Table 3.23
Estimated VOC and HAP Emissions

Process Train	VOCs (tpy)	HAPs (tpy)
Liquid and Solid Treatment	20.2	5.1
Combustion Sources	5.5	0
Total Estimated ALCOSAN Emissions	26.3	5.1
Trigger Limit Above Which Controls Are Required[a]	50	25 tpy combined or 10 tpy single HAP

[a] Based on the potential to emit.

3.8.7 Instrumentation and Control System

ALCOSAN has a Westinghouse Distributed Processing Family (WDPF) Distributed Control System (DCS), which was installed in 1992. It monitors and controls the Main Pump Station, Energy Recovery Facility, the Rack and Chlorination Building, primary-sedimentation tanks, and associated unit processes. The existing DCS provides integrated modulating control, sequential control, and data acquisition for the unit processes on the system. The major functions of the I&C system are as follows:

- Continuous closed-loop control (analog proportional integral derivative [PID] control)
- Sequential and/or logic control (discrete equipment control)
- Alarm and event annunciation and status monitoring
- Equipment protection
- Personnel safety
- Maintenance and troubleshooting
- Historical data collection, storage, retrieval, and display

The system has two control and monitoring centers, one in the Main Pump Station and one in the Energy Recovery Facility. Each location has two dual-operator stations and one engineering station. The operator stations enable the operator to view the status for the process and to monitor and control both normal and abnormal events. The engineering stations provide a programming and operator interface with the system.

The I&C system for the secondary-treatment system, the air-compression system, chemical-feed systems, and the solids pumping systems were installed in 1972.

3.8.8 Operation and Maintenance Program

ALCOSAN has three operator shifts per day. Each shift consists of 16 union workers and a shift superintendent. Of the 16 union workers, 5 are licensed operators and 11 are assistant operators or general workers.

The plant has an interactive computerized operations manual that contains equipment descriptions, operating procedures, sampling and laboratory procedures, engineering drawings, and on-line vendor manuals. The operations manual is installed and is accessible from several managers' offices. It also is on-line in the Energy Recovery Facility. Eventually, the manual will be accessible from all major control areas of the plant and all managers' offices, approximately 15 stations total. About half of the stations also will have the capability to access the DCS.

In addition, ALCOSAN recently purchased a new computerized maintenance-management program that can track routine and preventive maintenance procedures, equipment and parts replacement, and spare-parts inventory. The maintenance-management package has been installed but is not fully operational. ALCOSAN is in the process of tying it into the purchasing and accounting systems so that the spare-parts inventory can be accessed and the preventive maintenance program can be expanded. Overall, the majority of the maintenance done at the plant can be described as corrective maintenance.

3.8.9 Interim Improvements

Through its Engineering Program Management (EPM) efforts, ALCOSAN has been developing an integrated long-term program of treatment plant upgrades and potential capacity expansion. The programs are discussed in the Capital Program Implementation Plan (CIP). ALCOSAN also is pursuing interim physical and institutional improvements to the treatment plant.

The ALCOSAN plant historically has had periodic odor problems, as do many other large municipal WWTPs. ALCOSAN has policies and procedures for the operation and maintenance of the facilities, including odor-control systems, and has developed specific polices and procedures related to odor mitigation and response to odor emergencies.

Many of ALCOSAN's odor problems are due to limited flexibility in the solids-handling and related odor-control systems. The ongoing EPM plant expansion and upgrade project will result in changes to the existing facilities, including odor control for the liquid treatment processes. The proposed improvements to the liquid treatment systems may have a significant effect on the solids facilities. In addition, the solids-handling facilities are a major potential source of odors at the plant. Therefore, liquid and solids treatment were be considered together to develop a comprehensive odor-control program.

The ALCOSAN Board of Directors has authorized the EPM to conduct a systems analysis of the entire plant, planned capital improvements, and plant operation and maintenance and to make recommendations for abating odors. The project will be conducted in two phases. Phase 1 developed immediate and interim procedures for enabling ALCOSAN to minimize odor generation at the existing plant and respond to odor emergencies when they occur. The following are major components of Phase 1:

- Odor Prevention and Response Plan
- Interim Facilities Plan
- Systems Analysis Overview and Work Plan
- Solids-Handling Facilities Plan

Phase 2 will be a long-term look at the physical facilities, policies, procedures, and organizational structure necessary to meet the objectives of ALCOSAN:

- Protecting staff and public health, safety and comfort
- Preserving and protecting water quality in the ALCOSAN service area
- Eliminating odor complaints and air-pollution discharges beyond the property lines

- Managing solid residuals as a resource, returning them to the environment safely
- Complying with all applicable laws, regulations, and permits
- Operating efficiently and cost-effectively while preserving the public investment in facilities
- Providing the opportunity for continuous staff improvements and high quality service to the public.

3.8.10 Vulnerability Analysis

The plant's vulnerability to process failures that are due to insufficient component redundancy or the reliability of the supporting systems was evaluated. The evaluation of process flow paths considered the potential for events that cause cessation or hydraulic interruption of the treatment flow process or tunnel flooding. The evaluation considered each major facility and flow path at the existing plant, including vital process-support systems like the compressed-air system and the effluent-flushing water system.

Among other studies, a detailed design and cost evaluation was performed to address alternatives for providing a bypass channel around the aerated grit chambers and into the primary-sedimentation tanks. Because only one flow path is in this area, unusual tankage or equipment failures in this area could cause the plant to be bypassed. This type of failure occurred on Thanksgiving Day of 1993. The following three design alternatives were evaluated:

1. Construct a temporary bypass channel around the aerated grit chambers from the bar rack discharge through the existing Venturi/Mag Meter during the initial phase of plant construction.

2. Construct a temporary bypass channel around the aerated grit chambers from the bar rack to the west end of the Primary Clarifier Influent Channel during the initial phase of plant construction.

3. Construct a permanent bulkhead isolating the Venturi/Mag Meter during the initial phase of construction and a permanent bypass channel during the wet-weather expansion of the plant.

Because alternatives 1 and 2 required temporary facilities that would be removed and replaced during the wet-weather expansion of the plant, they will cost from $1.3 to $2.4 million more than Alternative 3. In addition, these alternatives introduce the potential for accidental plant disruptions that are due to construction mishaps during work on existing channels that must

remain in service. Given the added costs, the added potential for plant disruption, and the limited useful life of a temporary bypass, Alternative 3 is recommended.

Recommendations for reducing process vulnerability systemwide are summarized below.

- Place a pipe-repair kit on the pump room of the main pump station.
- Concrete-encase each main sewage pump 8-inch bypass line.
- Add redundancy to the main pump station pump-discharge pool area.
- Provide an additional drainage pump and sump in the main pump station pump room.
- Concrete-encase the existing main pump station drainage pump's suction piping.
- Provide an isolation valve in the influent-sampling pump's suction line.
- Add redundancy for the single conduit that runs from the aerated grit chambers to the primary-sedimentation tanks.
- Compartmentalize the primary-effluent channel with bulkhead notches.
- Add a cross-tie and isolation valves in the return-sludge piping in the pipe gallery between the final clarifiers.
- Institute a structural inspection and repair program on the existing effluent conduits.
- Provide isolation valves on all compressed air lines branching from the main air header.
- Institute a structural inspection program for the main air header.
- Replace the existing 6-inch EFW line running east-to-west between the primary sedimentation tanks and the aeration basins with an 18-inch line.

- Install an isolation valve on the 8-inch EFW line in the service tunnel just north of the Power Generation Building.

- Discontinue using rail car delivery of gaseous chlorine.

Plant Operation During Floods

The plant's hydraulic profile was modeled and analyzed for the effects of the 25-year river stage. The model predicts that the plant will continue to operate normally up to a flow of 175 mgd during a 25-year storm event. Flow capacity is limited to 175 mgd by the surface elevation of the river water. At flows higher than 175 mgd, the chlorine-contact baffle walls and the final clarifier weirs become submerged, causing short-circuiting. The recommendation is that the final clarifiers' weirs be leveled to minimize the short-circuiting effect during flood conditions.

Electrical Distribution Vulnerability

The plant electrical system was evaluated for its vulnerability to flooding, equipment age and degradation, code issues, power outages, and redundancy:

- To alleviate the electrical system's vulnerability to tunnel flooding, construct an addition to the existing stair buildings for sludge-pumping stations E-2 and W-2. The additions will house new motor-control centers (MCCs) that will replace the existing sludge-pumping stations' motor-control centers within the tunnel. Also construct an addition to the existing stair building near MCC-8 above the central pipe gallery. This addition will house the new motor-control center that will replace existing MCC-8 and a new instrumentation panel. The new equipment will be mounted at elevation 732 for flood protection.

- Construct a flood wall around the Main 4160V outdoor service switchgear for flood protection, or construct a new platform at elevation 732.

- Replace indoor switchgear no. 1 with a new double-ended switchgear in a new electrical equipment building.

- Replace existing substations 5 and 16 with a new double-ended 480V substation.

- Determine the proper code classification of the Main Pump Station, the Rack and Chlorination Building, and the Grit Chambers and replace electrical and control equipment as required.

- Provide adequate ventilation in the Main Pump Station, the Rack and Chlorination Building, and the Grit Chambers to qualify them as Division II (NFPA-802) so that the electrical cable in the trays is acceptable.

- Replace existing substations 13 and 14 with new double-ended substations.

- Replace the existing return-sludge pump wound rotor motors with new squirrel cage induction motors and VFDs.

- Replace the 4160V cables and splices in manhole MH-E-111.

- Provide new electrical feeders in new concrete-reinforced ductbanks routed along opposite sides of Tracy Street.

- Test the main switchgear for possible degradation, and inspect cable and bus connections.

- Perform preventative maintenance on the main switchgear.

- Replace switchgear substation 4 and MCC-9 with new double-ended equipment in a new building adjacent to the main pumping station, and include a new emergency generator in the building.

- Change substation no. 2 to a double-ended substation. Change MCC-3 and MCC-4 to a single double-ended motor-control center.

- Test all cross-linked polyethylene (XLPE) cables for viable insulation. Replace failures with ethylene propylene rubber (EPR) cable.

- Fireproof all cables in manholes.

- Use sealing bushings in all conduit penetrations at buildings, tunnels, and outdoor switchgear.

Tunnel-Flooding Vulnerability

The plant's tunnel system extends from the Dewatering Building on the south end of the plant site to the final clarifiers on the north. The tunnels house important process lines, pumps, electrical conduits, and mechanical and electrical equipment. Sections of the tunnel or the entire tunnel system are vulnerable to flooding from river inundation and pipe rupture. The following was recommended to alleviate vulnerability:

- Install bulkheads throughout the tunnel system to limit damage from potential flooding.
- Raise the floor elevation at the Dewatering Building garage to keep water from entering the tunnel at this point.
- Improve the tunnel drainage system by increasing capacity and reliability.
- Inspect the internal condition of the existing drainage piping and replace as necessary.
- Check the adequacy of supports of the two 36-inch return lines from the RAS pump stations.
- Improve the piping support system on the chlorine-injection piping.

Tank Rupture Vulnerability

The existing tankage at ALCOSAN is up to 40 years old and was therefore evaluated for its vulnerability to structural failure. The following was recommended as a result of the analysis:

- Structurally inspect and test the tanks and conduits that are known to leak.
- Structurally inspect the tanks and conduits that have sections that are constantly submerged.
- Design a repair or reconstruction program to coincide with the construction of the new facilities to minimize disrupting operations.

- Inspect the structure of the interceptor sewer tunnels at the plant.

Tunnel Fire and Smoke Vulnerability

The tunnel system connects a series of building lower levels and contains chambers housing equipment, motors, and electrical gear. No smoke barriers or fire walls compartmentalize the tunnels to meet any contemporary standard. A fire at a pump might generate only localized flame and heat but could send smoke billowing through significant lengths of the tunnel. The recommendation is that measures be taken to limit fire and smoke propagation in the tunnel system. The measures include installation of the flood bulkheads discussed earlier to provide smoke barriers and fire walls and installation of concrete block fire walls to separate lower-level areas that house equipment from tunnel runs.

SECTION 4
Projected Flows and Loading

4.1 INTRODUCTION

In this section, projected average day flows and loadings to ALCOSAN's current treatment plant are developed through the planning year of 2015. The projections of flows and loading are based on average-day-per-capita wastewater generation for the current and projected service populations. The projected population reflects the growth expected in the current ALCOSAN service area and population growth in areas that PaDEP requested be included in the planning area as potential additions to the ALCOSAN service area. The methodology for determining the boundaries of the PaDEP designated areas is described. Population projections in the potential expansion area and in the current ALCOSAN service area are developed.

Plant flow and loading records, municipal water consumption, PaDEP design standards, and other data were used to develop per-capita average-day wastewater generation and loading quantities. The projected population and the per-capita flow and load quantities then were used to develop design-year average daily sanitary sewage flows and loadings to the ALCOSAN treatment plant.

The product of the calculations are design flows and loadings that are based on projected maximum-month-average-day (MMAD) quantities. The MMAD flows and loadings are the basis for estimates of the secondary treatment requirements. The design flows for secondary treatment at the ALCOSAN Treatment Plant were also predicted utilizing a base flow technique to verify the projection. As will be shown in subsection 4.7, the projected MMAD secondary treatment capacity approximated the build-out capacity at the plant site.

During wet weather some combination of storage and additional secondary treatment capacity will be required to handle peak flows from areas with sanitary sewer systems. Additional primary treatment capacity will also be required for the implementation of ALCOSAN's Combined Sewer Overflow management strategy. The role of the current ALCOSAN treatment plant in providing wet-weather secondary treatment capacity beyond that required by the projected MMAD flows is discussed in Section 5.2. The plant's role is defined by site constraints and ALCOSAN deep tunnel capacity limitations (subsection 3.2). This role also will be defined by the optimal blend of source reduction, storage, and treatment of wet-weather flows from sanitary sewer areas. This will be determined during the development of ALCOSAN's CSO long term control plan.

4.2 PLANNING AREA

The Pennsylvania Department of Environmental Protection (PaDEP) also requested that ALCOSAN include in its 537 Plan a provision for potentially providing wastewater treatment services to communities that are in watersheds with inadequate collection and treatment facilities, as well as communities that are served by wastewater treatment plants (WWTPs) that have had operational problems. These communities are in areas that are subsequently referred to

as the PaDEP designated study areas in this Plan. The planning area consists of t
service area, plus those communities that PaDEP designated to be addressed in the ...

PaDEP asked ALCOSAN to study four areas with long-standing sewage needs in the context of the Plan:

- Millers Run drainage area in Cecil and Mount Pleasant townships, Washington County
- Upper Robinson Run area, comprising Midway Borough, Robinson Township, and Cecil Township in Washington County
- Toms Run drainage area in Ohio Township, Allegheny County
- Kilbuck Run drainage area in Aleppo Township, Glenfield Borough, Sewickley Hills Borough, and Franklin Park Borough in Allegheny County.

PaDEP also identified several sewage treatment plants that are having difficulty either achieving their NPDES permit requirements, or in satisfying the local needs for sewage treatment services. PaDEP requested that these areas also be studied in the ALCOSAN 537 Plan:

- Dravosburg STP servicing the Borough of Dravosburg and a small area of West Mifflin
- Holiday Park STP serving parts of Plum Borough, Allegheny County and Murrysville Borough, Westmoreland County
- Longvue No. 1 STP in the Township of McCandless, Allegheny County
- Oakmont STP serving the Borough of Oakmont, Allegheny County,
- Plum Creek STP serving parts of Plum Borough and the Township of Penn Hills in Allegheny County and Murrysville Borough in Westmoreland County.

A geographic information system (GIS) was used to delineate the geographic boundaries of the PaDEP designated areas. Digitized watershed maps were obtained from the Southwestern Pennsylvania Regional Planning Commission (SPRPC) for the areas of Allegheny, Westmoreland and Washington counties that lie outside of the current ALCOSAN service area. The watershed delineations were layered with topographic information and the political boundaries of the potential service areas. The resulting maps portray the PaDEP designated watersheds.

SECTION 4
Projected Flows and Loading

Approximately 57,000 people who are not served by a public wastewater system live in the existing ALCOSAN service area. Most of the residents live in an area of approximately 102 square miles of non-contributing areas (Figure 4-1). As build-out development occurs in the less-dense suburbanized parts of the ALCOSAN service area, sewering may become cost-effective. The addition of the unsewered areas could substantially increase the sewage flows to the ALCOSAN treatment plant. Additional information on the non-contributing areas is in Section 3.6.

4.3 FUTURE POPULATION PROJECTIONS

4.3.1 Methodology

The population data presented in this study were developed by using a number of resource materials, including digitized census tract information from the 1990 U.S. Census and the SPRPC's most recent population projections, known as the *Cycle 5 Forecast of Population and Employment.* The SPRPC is a six-county metropolitan planning organization whose area includes the City of Pittsburgh, and the counties of Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland. SPRPC forecasts population and employment for the region, counties and municipalities in the six-county region, supporting the counties' long-range transportation planning. Historically, the SPRPC has been responsible for this activity in the Pittsburgh area.

The GIS was used to layer the census tract and the Cycle 5 data onto the amorphously shaped current ALCOSAN service area, the municipal parts of the four PaDEP designated watersheds, and the service areas of the five PaDEP designated treatment plants. Populations reported by the 1990 census at the block level were the basis for determining ALCOSAN's current service area population, as well as the populations for the PaDEP designated watersheds and sewage treatment plants. Census block data were used to develop the current population of the service area, watersheds and treatment plants for this study because the data most accurately describe the distribution of the existing population. The census block is the smallest geographic area for which population data are collected.

Map Source: ALCOSAN Combined Sewer Overflow Program

FEET
0 4000 8000 12000 16000 24000 32000

MILES
0 1 2 3 4 6 8

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

Legend

- Non-contributing Areas
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Hydrologic Features

Figure 4-1
Non-contributing Areas of ALCOSAN Service Area

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Camp Dresser & McKee

SECTION 4
Projected Flows and Loading

Estimates of future populations were obtained by using the *Cycle 5 Forecast.* The *Cycle 5 Forecast* is the SPRPC's most current regional forecast of population and employment trends for the southwestern Pennsylvania area. The *Cycle 5 Forecast* includes population and employment data for the year 2015 for the City of Pittsburgh, by ward, and for the surrounding counties, by municipality. Population projections are provided for 2015 for household populations, average household size, group quarters population, and total population. The forecast also includes employment data, by work-place, for retail, manufacturing, other services and total employment.

SPRPC developed its forecast from a regional forecast prepared by Regional Economic Modeling, Inc. (REMI), an economics forecasting company in Cambridge, Massachusetts. REMI created and integrated an economic-demographic model for the six-county region. By using the results of the model as a control total, SPRPC allocated the population to the individual municipalities and to smaller sub-areas known as the traffic analysis zones (TAZ). SPRPC uses its own Mature Economic Region Land Use Allocation Model (MERLAM). The model uses data about each TAZ analysis zone, such as growth trends, tax rates, and accessibility measures, to project growth at the local level. SPRPC developed the methodology for determining the zone-by-zone projections with the services of a forecast committee comprising city and county planners, and University of Pittsburgh staff. The *Cycle 5 forecast* considered the effects of sewered and non-sewered areas on population growth and shifted growth into the sewered areas. The forecast did not consider the effects of available treatment capacity on population growth. SPRPC plans to recognize the effects of available treatment plant capacity on population growth in their next forecast.

The TAZs divide most municipalities into several sub-districts by using major transportation routes as the boundaries between the TAZs. In certain cases, a TAZ may encompass the same geographic area as the municipality. The projections developed for this study used SPRPC's year 2015 projections at the TAZ level because these projections provide the most detailed information about the spatial location of future populations.

For capital planning, ALCOSAN's 537 Plan requires an estimate of the various service area populations for every five year period between 1995 and 2015. By using a straight line growth methodology, incremental population estimates were developed from the year 2015 TAZ populations. This methodology was applied uniformly to each TAZ whether its population was growing or declining.

The PaDEP designated watersheds or treatment plants and their corresponding census tracts and TAZs are shown in Appendix D. By using the census tracts and the SPRPC TAZs, the GIS calculated the current and design year populations for the current ALCOSAN service area and for the areas identified by PaDEP for inclusion in the plan. The population model developed for the 537 Plan assumes an even distribution of population throughout traffic zones. For parts of the

PaDEP treatment plant service areas or the PaDEP watersheds that straddle a traffic zone, the population projections may be slightly distorted because, in actuality, the population will be clustered in the more developable land. The distortions were corrected manually during the analysis of the data.

4.3.2 Total Projected Service Population

The 1990 service population in the current ALCOSAN service area was approximately 843,000. If the population growth projected by SPRPC were to occur, the unsewered parts of ALCOSAN's current service area were sewered, and the PaDEP designated areas were all added to the ALCOSAN service area, the service population for the ALCOSAN treatment plant would increase by approximately 283,000 to 1.126 million. This figure reflects a 34 percent increase through 2015 (Figure 4-2). The potential increase in service population is summarized in Table 4.1.

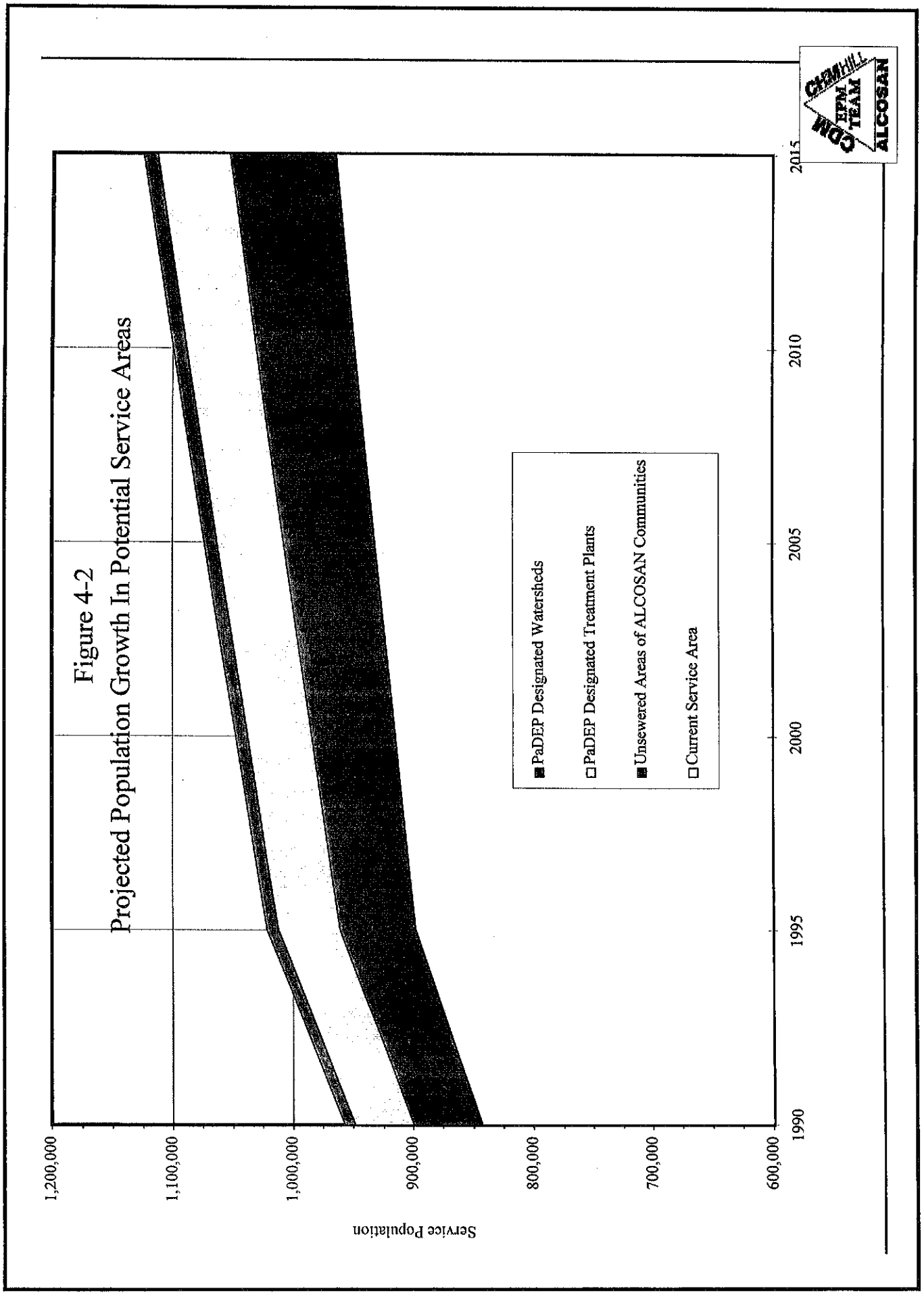
Of the potential design year service population, as much as ninety-four percent will be in the current ALCOSAN service area boundaries. Eighty-six percent of the service area population will be in the currently sewered parts of the ALCOSAN service area. Hypothetically, an additional eight percent of the future service population could come from areas that are not currently sewered. The remaining six percent of the potential service population would come from the PaDEP designated study areas. The percentages are shown graphically in Figure 4-3.

4.3.3 Population Projections for the ALCOSAN Service Area

ALCOSAN's service area includes all or parts of the City of Pittsburgh, 79 municipalities in Allegheny County, one municipality (McDonald Borough) in Washington County, and two municipalities (North Huntingdon and Penn Townships) in Westmoreland County. With the inclusion of the Gascola, Long Road, Sandy Creek and Lincoln Road WWTP treatment plant service populations in Penn Hills Township, the service area population increased by approximately seven percent to 897,000 in 1995. By the year 2015, the population in the currently sewered existing service area (including Penn Hills) is projected to increase to approximately 965,000. This represents an increase of 122,000 (or 15%) more than the 1990 service population.

4.3.4 Unsewered Areas in the ALCOSAN Service Area

In addition to the current and future users in ALCOSAN's service area, another 57,000 people residing in the service area are not on sewer systems. The number is projected to increase to approximately 89,000 by 2015. For planning wastewater facilities, the assumption is that this population will eventually be connected to public sewers during the planning period.

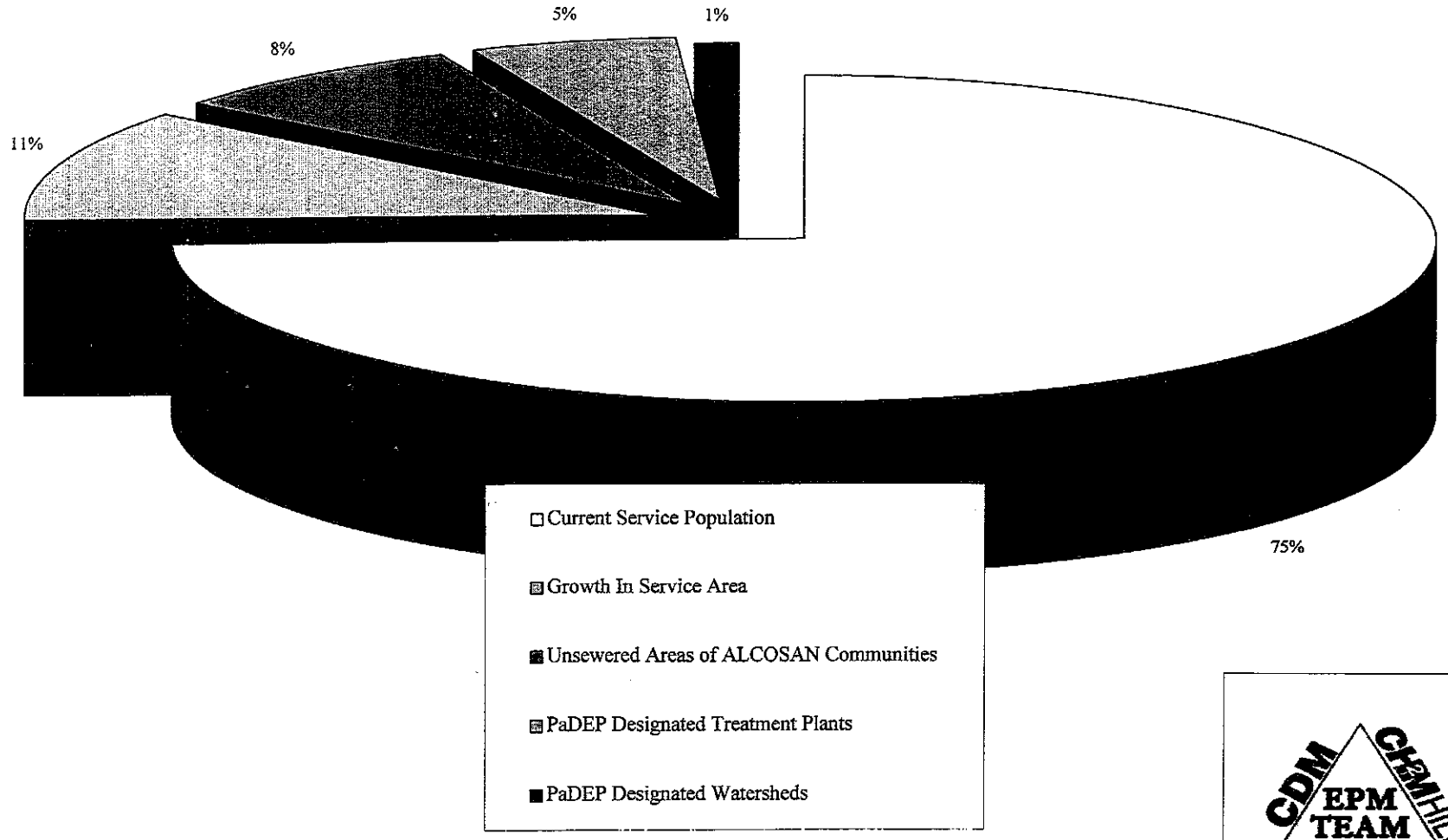

Figure 4-2
Projected Population Growth In Potential Service Areas
Service Population
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
1990
1995
2000
2005
2010
2015
PaDEP Designated Watersheds
PaDEP Designated Treatment Plants
Unsewered Areas of ALCOSAN Communities
Current Service Area
CH2MHILL
CDM
EPM TEAM
ALCOSAN
5/7/96 8:59 PM
MODEL2.XLS popgrowth

SECTION 4
Projected Flows and Loading

Table 4.1
Summary of Potential Service Population - 2015

Service Area	Estimated Population
ALCOSAN Service Area	
1990 Service Population (excluding Penn Hills)	842,645
Projected Growth (including Penn Hills)	122,198
Subtotal	964,843
ALCOSAN Unsewered Areas	
Current Population	56,925
Projected Growth	31,781
Subtotal	88,706
Total ALCOSAN Service Area	1,053,549
PaDEP Watersheds of Concern	
Current Population	8,842
Projected Growth	3,235
Subtotal	12,077
PaDEP Treatment Plants of Concern	
Current Population	48,679
Projected Growth	11,544
Subtotal	60,223
Total Potential New Service Areas	72,300
Total Potential Service Population	**1,125,849**
Change from 1990 Service Population	**283,204**

Figure 4-3
Origins of Potential Service Populations



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There is evidence that municipalities are attempting to expand their local collection systems to meet the needs of these areas. For example, the City of Pittsburgh's 1995 capital budget included $500,000 in anticipated expenditures for the extension of sewers into unsewered areas.[1]

4.3.5 Population Projections for the Total ALCOSAN Service Area

The estimated total current (1995) sewered population in the ALCOSAN service area is 897,000, including the Municipality of Penn Hills. The potential design year population for the current service area is approximately 1,054,000, a projected increase of 17 percent. The increase includes projected growth of approximately 122,000 in the currently sewered areas and the addition of approximately 89,000 in the currently unsewered areas. Projected populations in the ALCOSAN service area at five year increments are shown in Table 4.2.

Table 4.2
Projected Population in ALCOSAN Service Area

Service Area	1990	1995	2000	2005	2010	2015	Change %	Change Total
City of Pittsburgh	358,675	362,482	366,289	370,096	373,903	377,710	5%	19,035
Penn Hills	0	38,655	39,366	40,078	40,790	41,501	7%	41,501
Allegheny Co.	476,330	488,325	500,320	512,315	524,310	536,305	13%	59,975
Subtotal	835,005	889,462	905,975	922,489	939,003	955,516	14%	120,511
Washington Co.	1,737	1,728	1,720	1,711	1,702	1,694	-2%	-43
Westmoreland Co.	5,903	6,249	6,595	6,941	7,287	7,633	29%	1,730
Subtotal	7,640	7,977	8,315	8,652	8,989	9,327	22%	1,687
Total Sewered Areas	842,645	897,439	914,290	931,141	947,992	964,843	15%	122,198
Unsewered Areas	56,925	63,281	69,637	75,994	82,350	88,706	56%	31,781
Total	**899,570**	**960,720**	**983,927**	**1,007,135**	**1,030,342**	**1,053,549**	**17%**	**153,979**

[1] City of Pittsburgh 1995 Capital Budget, Water and Sewer Authority - line item 44.

4.3.6 PaDEP Designated WWTP Service Area Populations

Population projections for the service areas of the five treatment plants are in Table 4.3. The combined 1990 service populations for the five plants was approximately 48,700. The combined service population is projected to increase by approximately 11,500 to 60,200 by 2015, a projected increase of 24 percent.

Table 4.3
Service Area Populations PaDEP Designated Treatment Plants

Treatment Plant	1990	1995	2000	2005	2010	2015	Change %	Change Total
Dravosburg	2,377	2,492	2,606	2,721	2,836	2,951	24%	574
Holiday Park	10,866	11,380	11,893	12,407	12,920	13,434	24%	2,568
Longvue No. 1	5,508	5,865	6,222	6,579	6,936	7,293	32%	1,785
Oakmont	6,961	7,066	7,171	7,276	7,381	7,486	8%	525
Plum Creek	22,967	24,185	25,404	26,622	27,841	29,059	27%	6,092
Total	**48,679**	**50,987**	**53,296**	**55,605**	**57,914**	**60,223**	**24%**	**11,544**

4.3.7 Population Projections for the PaDEP Designated Watersheds

Population projections for the parts of the four watersheds that PaDEP requested be included in the 537 Plan are provided in Table 4.4. The current and future populations in the Allegheny County watersheds are not projected to be significant. The current population in the unsewered parts of Kilbuck Run is approximately 460 persons, increasing to approximately 900 in 2015. The current population in the unsewered parts of Toms Run is approximately 770, increasing to 1,100 in the design year.

The populations in the Millers Run and Upper Robinson Run watersheds in Washington County are projected to generate significantly more wastewater. The current unsewered population in the Miller's Run watershed is approximately 4,500 and will increase to 6,500 by 2015. The current unsewered population in the Upper Robinson Run watershed is approximately 3,100, increasing to 3,600 by the design year.

Table 4.4
PaDEP Designated Watersheds Population Projections

	1990	1995	2000	2005	2010	2015	Change %	Change Total
Allegheny Co.								
Kilbuck Run	464	549	635	721	807	893	92%	429
Toms Run	768	831	895	958	1,021	1,085	41%	317
Subtotal	1,232	1,380	1,530	1,679	1,828	1,978	61%	746
Washington Co.								
Millers Run	4,501	4,904	5,307	5,709	6,112	6,515	45%	2,014
Upper Robinson	3,109	3,204	3,299	3,394	3,489	3,584	15%	475
Subtotal	7,610	8,108	8,606	9,103	9,601	10,099	33%	2,489
Total	8,842	9,488	10,136	10,782	11,429	12,077	37%	3,235

4.4 AVERAGE DAY PER-CAPITA WASTEWATER GENERATION

Wastewater flows and loading have been projected using an estimated average day per-capita wastewater quantity multiplied by the anticipated service area population production at five year increments for the years between 1995 and 2015.

4.4.1 Recorded Per-capita Wastewater Generation

Historical per-capita wastewater data were calculated for the ALCOSAN service area, as well as for each of the PaDEP designated treatment plants and watersheds, which are shown in Table 4.5.

The figures are based on a review of ALCOSAN treatment plant influent volumes, potable water consumption, extraneous flows (inflow and infiltration) as measured at the ALCOSAN treatment plant, flow data from the PaDEP designated treatment plants (Chapter 94 Reports), and PaDEP design standards.

Table 4.5
Recorded Gallons of Wastewater
Generated per Capita per Day

Municipality	Recorded GPCD
ALCOSAN Service Area	
City of Pittsburgh	222
Penn Hills (1993 Agreement)	132
Allegheny County	222
Washington County	222
Westmoreland County	222
Currently Unserved	**no record**
PaDEP Designated Treatment Plants	
Dravosburg	135
Holiday Park STP	125
Longvue No. 1 STP	187
Oakmont STP	195
Plum Creek STP	105
PaDEP Designated Watersheds (unsewered)	**no record**

4.4.2 Per-capita Flow History In ALCOSAN Service Area

A per-capita average day wastewater generation of 222 gallons was calculated. The figure is based on a review of plant influent flow data for the previous seven years.[2] Plant flow data and the estimated service populations are provided in Table 4.6.

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[2] The influent flow meter is downstream of the influent pumps, and hence records recycled streams; however, return activated sludge is not included.

Table 4.6
ALCOSAN Per-capita Flow History

Year	Plant Flow	Population	GPCD
1989	184.6	839,454	220
1990	205.9	842,645	244
1991	179.3	845,848	212
1992	187.4	849,064	221
1993	191.9	852,292	225
1994	196.5	855,532	230
1995[3]	183.2	897,439	204
Mean	**189.8**	**854,610**	**222**

Components of ALCOSAN Per-capita Flow

Billable Flow

The average daily plant flows and per-capita flow for the period of 1989 through 1995 were 190 mgd and 222 gpcd, respectively. Of the total plant flow, 48 percent is estimated to have been billable flow with the remaining 52 percent attributable to storm water from the combined sewer areas and inflow/infiltration from the sanitary sewer areas. The average daily per-capita billable flow of 108 gallons represents total wastewater production by all user classes expressed on a per-capita basis (Table 4.7).

On the basis of an analysis of billed water consumption data, the residential water user class accounts for approximately 65 percent of the billable flow. Combined domestic and small commercial users account for an additional six percent of the average daily flow; therefore, approximately 71 percent of the billable flow is domestic in origin. The second largest user class is the commercial class at 15 percent. Public users, such as schools, account for eight percent of the billed flow. The industrial class, that includes major users under the Industrial Pretreatment Program, account for 6.5 percent of the billed wastewater generation.

[3] Includes the Municipality of Penn Hills that connected to ALCOSAN during 1995.

Table 4.7
ALCOSAN Billable Wastewater Flow
By User Class

User Class	Billable Flow (mgd)	Percent
Public	7.6	8.3%
Industrial	5.8	6.4%
Commercial	13.4	14.7%
Domestic/Commercial	5.4	5.9%
Domestic	58.9	64.7%
Total Billable Flow	91.1	100.0%

Per-capita daily water use rates for municipalities in ALCOSAN's current service area were calculated by dividing the total average daily volume of billed water in each municipality by the population of the municipality. The total average daily volume of billed water for municipalities was obtained by ALCOSAN from water consumption records. For municipalities that are not wholly served by ALCOSAN, only customers in the municipality that are served by ALCOSAN were included for calculating the average daily volume of water used. The calculations result in the per-capita figures shown in Table 4.8.

Table 4.8
Per-capita Billable Flows by User Class
in Gallons per Day

	Public	Industrial	Commercial	Domestic/ Commercial	Domestic	Total
Billable Flow	9.0	6.9	15.8	6.9	69.8	108.4
Percent	8.31%	6.33%	14.58%	6.37%	64.42%	100.00%

Nonbillable Flow

Approximately 52 percent of the average daily flow to the ALCOSAN treatment plant is non-billable flow. Nonbillable flow consists of inflow/infiltration from the areas served by sanitary

sewers as well as storm water drainage and groundwater infiltration from the combined sewer areas. Average daily nonbillable flow is approximately 98 mgd. Flows entering the ALCOSAN interceptor system that exceed the current 225 mgd plant capacity are bypassed through interceptor system regulators. As outlined in Section 3.2, the overflows occur periodically in response to storm events and cannot be meaningfully described in terms of average daily flows.

4.4.3 Per-capita Flows of Non-ALCOSAN Municipalities

Average daily per-capita wastewater flows to the five PaDEP designated treatment plants were derived by dividing the five year average daily flows at each plant by the estimated 1990 service populations of each plant, as shown in Table 4.9.

The average daily flows shown in Table 4.9 represent wastewater reaching the respective treatment plants. As described in subsection 3.7, the collection systems that are associated with the PaDEP designated treatment plants are subject to excessive inflow and infiltration. The average daily flows listed above **do not** include overflows and bypassing that occur upstream of the plant influent meter.

Table 4.9
Average Daily Per-Capita Wastewater Generation
Recorded by WWTP Flow Meters
PaDEP Treatment Plants of Concern

Treatment Plant	1990 Service Population	Average Daily Flows (mgd) to Plant	GPCD at Treatment Plant
Dravosburg	2,377	320,000	135
Holiday Park	10,866	1,356,000	125
Longvue No. 1	5,508	1,028,000	187
Oakmont	6,961	1,359,000	195
Plum Creek	22,967	2,417,000	105

4.5 PROJECTED WASTEWATER GENERATION

4.5.1 Total Average Day Wastewater Generation

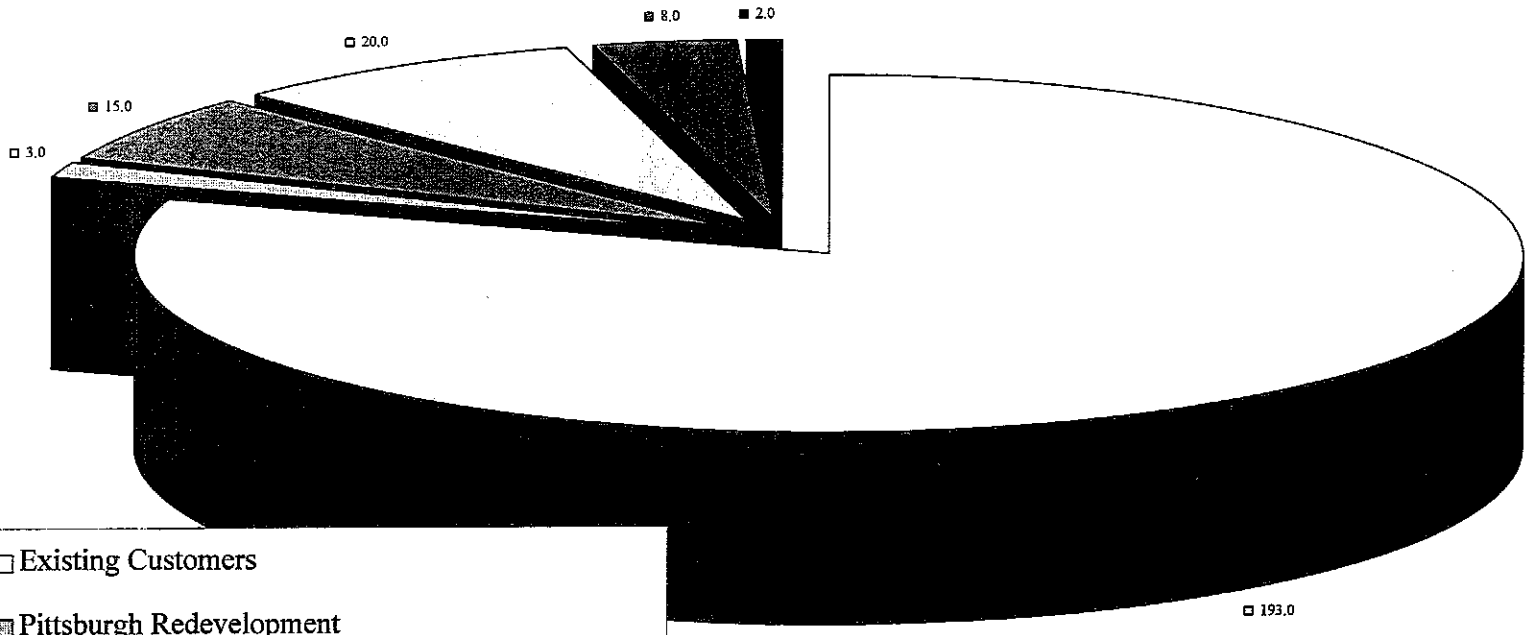
Projected design year average day wastewater generation is summarized in Table 4.10. On the basis of projected population growth, projected per-capita wastewater generation, and the addition of the PaDEP designated study areas to the existing ALCOSAN service area, an average day design flow of 240 million gallons may be projected. The sources of the design year projected average daily wastewater generation are shown in Figure 4-4.

Table 4.10
Summary of Projected Wastewater Generation

Flows Generated From:	Flow (MGD)
ALCOSAN Service Area	
Current Service Population	196.1
Projected Growth	14.7
Subtotal	210.8
ALCOSAN Unsewered Areas	
Current Population	14.2
Projected Growth	5.7
Subtotal	19.9
Total ALCOSAN Service Area	230.7
PaDEP Designated Watersheds	
From Current Population	1.3
Projected Growth	0.3
Subtotal	1.6
PaDEP Designated Treatment Plants	
Current Population	6.8
Projected Growth	1.2
Subtotal	8.0
Total Potential Flows from New Service Areas	9.6
Total Potential Average Daily Flow	**240.3**
Change from Current Service Population Wastewater Generation	**44.2**

Figure 4-4

Origins of Potential Future Average Day Wastewater Generation



CDM CHMHILL EPM TEAM ALCOSAN

4.5.2 Existing Service Area

If the projected population growth in the existing service area occurs, the average daily wastewater generation in the sewered parts of the current ALCOSAN service area is projected to be 211 mgd.

The average day wastewater generation rates shown in Table 4.10 are based on a per-capita wastewater generation rate of 222 gpd for the current service area. For planning purposes, 222 gpcd has been used for both current and new users in the ALCOSAN service area. The 222 gpcd is based on **average** day wastewater flows, and do not reflect average **dry** weather flows. According to flow monitoring data obtained by the ALCOSAN CSO Program, average dry-weather flow to the treatment plant is approximately 176 mgd. At a per-capita flow rate of 222 gallons, the unsewered population in the ALCOSAN service area generates approximately 14 mgd of wastewater (including assumed inflow/infiltration at the overall service area rate). The unsewered population is projected to increase from 57,000 to 89,000 in the design year of 2015, generating an additional 5.7 mgd of wastewater generation from 1990 to 2015. If the unsewered areas of the current ALCOSAN service area are sewered during the planning period, the projected design year average day wastewater generation in the current ALCOSAN service area will be 231 mgd.

4.5.3 PaDEP Designated Study Areas

The combined current average daily flows from the five PaDEP designated treatment plants is estimated at 6.8 mgd in 1995. For average day wastewater generation projections, per-capita wastewater generation rates derived from the data for the ALCOSAN service area were used. The historical estimates for the five treatment plants ranged from 105 gpcd to 195 gpcd. As detailed in Section 3.7, the problems of the wastewater systems are primarily attributable to hydraulic overloading and sanitary sewer overflow during wet weather. *The estimated per-capita figures provided in Table 4.9 are based on recorded flows reaching the treatment plant, and do not account for upstream bypassing or flows in excess of the plants' influent metering capacities.* On the basis of the projected populations in the service areas, the average daily wastewater generation will increase to 8.0 mgd by 2015.

The four watershed areas identified by PaDEP for consideration in the plan would not constitute a significant demand for treatment capacity in the overall context of the ALCOSAN treatment plant. The current population in the watersheds is estimated to generate approximately 1.3 mgd. This is projected to increase to 1.6 mgd in 2015. Hence, if the projected growth occurs and all current and future population in the PaDEP watersheds is connected to the ALCOSAN system, the design year flow would represent less than one percent of the projected 1995 average day flow from the current ALCOSAN service area.

SECTION 4
Projected Flows and Loading

Flow projections for five year increments for each of the service areas are in Table 4.11. The projected flow increases assume linear growths in populations and connections of local collection sewers to the ALCOSAN interceptor system. Actual growth patterns will be more uneven as housing projects and other development lag behind the installation of sewer and water systems in the growth areas.

Table 4.11
Projected Average Day Wastewater Generation

Service Area	GPCD	Estimated Wastewater Generation (mgd) 1995	2000	2005	2010	2015
ALCOSAN Service Area						
City of Pittsburgh	222	80.61	81.46	82.31	83.15	84.00
Penn Hills	132	5.10	5.20	5.29	5.38	5.48
Allegheny County	222	108.60	111.27	113.93	116.60	119.27
Subtotal		194.31	197.93	201.53	205.13	208.75
Washington County	222	0.38	0.38	0.38	0.38	0.38
Westmoreland County	222	1.39	1.47	1.54	1.62	1.70
Subtotal		195.70	199.40	203.07	206.75	210.45
Currently Unserved	222	14.24	15.67	17.10	18.53	19.69
Total ALCOSAN Service Area		209.94	215.07	220.17	225.28	230.14
PaDEP Designated Study Areas						
Treatment Plants						
Dravosburg	135	0.34	0.35	0.37	0.38	0.40
Holiday Park STP	125	1.42	1.48	1.55	1.61	1.68
Longvue No. 1 STP	187	1.09	1.16	1.23	1.29	1.36
Oakmont STP	195	1.38	1.40	1.42	1.44	1.46
Plum Creek STP	105	2.55	2.67	2.80	2.93	3.06
Subtotal		6.78	7.06	7.37	7.65	7.96
Allegheny County Watersheds						
Kilbuck Run	135	0.07	0.09	0.10	0.11	0.12
Toms Run	135	0.11	0.12	0.13	0.14	0.15
Subtotal		0.18	0.21	0.23	0.25	0.27
Total Allegheny County		6.96	7.27	7.60	7.90	8.23
Washington County Watersheds						
Millers Run	135	0.66	0.72	0.77	0.83	0.88
Upper Robinson Run	135	0.43	0.45	0.46	0.47	0.48
Total Washington County		1.09	1.17	1.23	1.30	1.36
Total PaDEP Municipalities		8.05	8.44	8.83	9.20	9.59
Grand Total		217.99	223.51	229.00	234.48	239.73

4.6 PROJECTED LOADINGS

Organic loading and solids loading have been projected for the design period of 1995 through 2015 using assumed per-capita loading that have been derived from ALCOSAN plant operating data. Because the calculated per-capita loading factors are in published design parameters, the factors have also been used for loading projections for the PaDEP designated treatment plants and watersheds that PaDEP requested be evaluated in the plan. The projected organic, solids, and total Kjeldahl nitrogen (TKN) loading are summarized in Table 4.12.

Table 4.12
Summary of Projected Organic, Solids, and Total Kjeldahl Nitrogen Loading
Design Year 2015 (lb/Day)

Service Areas	BOD_5	TSS	TKN
ALCOSAN Service Area			
1995 Service Population	188,176	207,041	31,990
Projected Growth	14,133	15,548	2,403
Subtotal	202,309	222,589	34,393
ALCOSAN Unsewered Areas			
Current Population	13,269	14,393	2,256
Projected Growth	5,331	5,783	906
Subtotal	18,600	20,176	3,162
Total ALCOSAN Service Area	220,909	242,765	37,555
PaDEP Designated Watersheds			
From Current Population	1,989	2,585	338
Projected Growth	543	705	92
Subtotal	2,532	3,290	430
PaDEP Designated Treatment Plants			
From Current Population	10,691	13,946	1,818
Projected Growth	1,936	2,550	329
Subtotal	12,627	16,496	2,147
Total Potential From PaDEP Designated Areas	15,159	19,786	2,577
Total Potential Average Daily Loading	**236,068**	**262,551**	**40,132**
Change from Current Service Population	**47,892**	**55,510**	**8,142**

4.6.1 Organic Loading

Projected organic loading, as expressed in pounds of BOD_5 per day were calculated using ALCOSAN plant influent data. Monthly average daily organic loading for the period 1989 through 1995 are shown in Table 4.13. The average daily loading was approximately 177,000 lb/day. The maximum month average daily loading , 308,200 lb/day occurred in January 1990. The monthly minimum occurred in December 1990.

Average loading decreased from 199,000 lb/day in 1990 to 147,000 lb/day in 1993. The decline from 1990 through 1993 apparently was caused by the cessation of several industrial users such as a meat packer and chemical manufacturer. Average loading increased to 170,000 lb/day in 1994 and to 188,000 lb/day in 1995. Maximum loading rates also have increased in 1994 and 1995. The increases are assumed attributable to a general increase in economic activity rather than the addition of one or more major high strength users. Monthly mass loading for 1989 through 1995 are provided in Table 4.13. The average per-capita loading was 0.20 lb/day in 1994 and 0.22 lb/day in 1995. Using the estimated service population, per-capita organic loading were calculated for the six year period. The average per-capita organic load is 0.21 lb/day. This figure may be compared with design parameters, such as the PaDEP design criteria of 0.20 lb/day.[4] The seven year history of influent organic loading is shown in Table 4.13. The derivation of the per-capita organic loading used in the plan is shown in Table 4.14.

If the projected population growth occurs, the average daily organic loading from the current service area will be 202,300 pounds in the design year of 2015. If the unsewered areas in the current ALCOSAN service area, the PaDEP watersheds, and the PaDEP treatment plants are added to the ALCOSAN system, the average daily organic loading in 2015 will increase to 236,100 pounds.

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[4] 25 PAC 73.17 et seq.

Table 4.13
History of Organic Loading
(BOD5 lb/day)

	1989	1990	1991	1992	1993	1994	1995	Average
January	198,000	308,200	118,800	183,800	175,800	176,000	171,700	190,300
February	214,500	170,500	172,800	195,600	147,000	169,300	190,526	180,000
March	170,000	232,500	203,300	167,800	124,200	136,100	228,059	180,300
April	169,700	263,900	259,400	150,500	159,300	152,000	204,689	194,200
May	170,900	231,900	205,000	146,000	151,000	184,200	173,022	180,300
June	155,000	233,100	196,300	138,400	125,900	170,800	168,586	169,700
July	161,300	169,600	180,600	131,900	144,100	165,700	164,840	159,700
August	211,100	219,300	205,000	131,200	122,700	149,400	163,910	171,800
September	159,700	158,100	179,800	144,900	130,200	176,000	203,548	164,600
October	143,400	157,400	178,600	151,400	132,200	213,900	184,788	166,000
November	196,900	128,200	189,500	155,200	151,800	160,200	187,350	167,000
December	307,400	116,800	199,400	160,800	200,200	182,800	217,883	197,900
Average	188,200	199,100	190,700	154,800	147,000	169,700	188,208	176,800
Minimum	143,400	116,800	118,800	131,200	122,700	136,100	163,910	116,800
Maximum	307,400	308,200	259,400	195,600	200,200	213,900	228,059	308,200

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Table 4.14
Per-Capita Organic Loading

Year	Population	lb/Day	lb /Per-capita/Day
1989	839,454	188,148	0.22
1990	842,645	199,134	0.24
1991	845,848	190,718	0.23
1992	849,064	154,792	0.18
1993	852,292	147,042	0.17
1994	855,532	169,708	0.20
1995	897,439	188,241	0.21
Mean	854,610	176,826	0.21

4.6.2 Total Suspended Solids Loading

Per-capita solids loading has been projected using a factor of 0.34 lb/day. The factor is taken from ALCOSAN plant operating data. Monthly plant influent data were reviewed to determine the average daily solids loading for the period of 1990 through 1995. The data are summarized in Table 4.15. Average daily solids loading for the period was approximately 292,000 pounds. The six year average daily concentration was 185 mg/l. The 0.34 lb/day per capita includes grit that is discharged to the treatment plant through the combined sewer system. Current grit production is approximately five pounds per million gallons. Excluding the grit, the total suspended solids levels decrease to approximately 0.20 lb/capita/day.

The projected solids loading at five year increments is shown in Appendix E. The anticipation is that the average daily solids loading to the treatment plant could increase somewhat after the plant is expanded because there will be a drawdown of accumulated grit. This phenomenon is expected to be short-lived, and has not been factored into the design average day loading projections.

Table 4.15
Per-Capita Solids Loading

Year	Population	lb/Day	lb /Per-capita/Day
1990	842,645	374,072	0.44
1991	845,848	347,228	0.41
1992	849,064	250,922	0.30
1993	852,292	263,227	0.31
1994	857,532	294,495	0.34
1995	897,439	221,232	0.25
Mean	857,470	291,863	0.34

4.6.3 Nitrogen Loading

Projected TKN influent loading is based on influent monitoring data for 1991 through 1993. Average influent TKN was 9.37 mg/l, or 0.024 lb/capita/day. The TKN data are presented in Table 4.16.

Table 4.16
Influent TKN Loading

Year	Population	lb/Day	lb /Per-capita/Day
1991	845,848	20,591	0.0243
1992	849,064	19,880	0.0234
1993	852,292	20,758	0.0244
Mean	849,068	20,410	0.0240

4.7 DESIGN FLOWS AND LOADING

The flows and loading presented in Subsection 4.6 represent hypothetical annual average day conditions. For determining the design flow and load for the ALCOSAN treatment plant, the maximum month average day (MMAD) conditions will be used. After a review of monthly average daily ALCOSAN influent flow and loading data, weighting factors have been developed for flow, BOD_5, TSS, and TKN (Table 4.17).

Table 4.17
Maximum Monthly/Average Day Flow and Loading Factors

Parameter	MMAD Factor
Flow	1.15
BOD_5	1.35
TSS	1.34
TKN	1.55

By applying the peaking factors to the projected annual average daily flows and loading for the design year, a design flow of 242 mgd is derived for the current ALCOSAN service area. If the unsewered areas of the current ALCOSAN service area are added to the system, the design year flow is 265 mgd. The PaDEP designated watersheds and treatment plant service areas would add an additional 11 mgd increasing total potential design flow of 276 mgd in 2015. Potential design year BOD_5 and TSS would be 319,000 lb/day and 352,000 lb/day respectively. The design year design flow and loading are summarized in Table 4.18.

Table 4-18
Design Flows and Loadings
Using Maximum Month Average Days

ALCOSAN SERVICE AREA								
1995 Service Population	196.1	225.5	188,176	254,038	207,041	278,215	31,990	49,584
Projected Growth	14.7	16.9	14,133	19,080	15,548	20,892	2,403	3,724
Subtotal	210.8	242.4	202,309	273,118	222,589	299,107	34,393	53,309
ALCOSAN Unsewered Areas	14.0	16.2	13,269	17,913	14,488	19,469	2,256	3,496
Projected Growth	5.6	6.5	5,331	7,197	5,821	7,822	906	1,405
Subtotal	19.7	22.6	18,600	25,110	20,309	27,291	3,162	4,901
Total ALCOSAN Service Area	230.5	265.1	220,909	298,228	242,898	326,398	37,555	58,210
PaDER Designated Watersheds								
Current Population	1.3	1.5	1,989	2,686	2,585	3,474	338	524
Projected Growth	0.3	0.4	543	733	705	948	92	143
Subtotal	1.6	1.9	2,532	3,419	3,290	4,421	430	667
PaDER Designated Treatement Plants								
Current Population	6.8	7.8	10,691	14,433	13,946	18,740	1,818	2,817
Projected Growth	1.2	1.4	1,936	2,614	2,550	3,426	329	510
Subtotal	8.0	9.1	12,628	17,047	16,496	22,166	2,147	3,327
Total Potential From Designated Areas	9.6	11.0	15,160	20,466	19,786	26,588	2,577	3,995
Total Potential Design Year Quantities	240.1	276.1	236,069	318,694	262,684	352,986	40,132	62,204
Change From Current Service Population	44.0	50.6	47,893	64,656	55,643	74,771	8,142	12,620

4.7.1 Hydraulic Loading Factor

The hydraulic loading factor of 1.15 is based on the seven year average of the ratios between the annual average daily flow and the maximum month average daily flow. During the five year period 1989 through 1995, the maximum-month flows occurred during the months of January through March, with March being the maximum month for three of the five years.

Table 4.19
Ratios of Maximum Month Average Daily Flow/Annual Average Daily Flow
ALCOSAN Treatment Plant

Plant Flow	1989	1990	1991	1992	1993	1994	1995	Average
Average Month	184.6	205.9	179.3	187.4	191.9	196.5	183.2	189.8
Minimum Month	168.3	187.8	147.7	167.1	172.2	177.9	163.8	169.3
Maximum Month	207.5	222.2	215.9	208.2	222.1	229.9	199.6	215.1
Max./Avg. Month	1.12	1.08	1.20	1.11	1.16	1.17	1.09	1.13

Analysis

Historical Hydraulic Peaking Factors

The historic hydraulic peaking factor at the treatment plant is unusually low because of several factors. The plant capacity of 225 mgd, average daily flow to the plant of approximately 190 mgd, and the average dry-weather flow of approximately 176 mgd, create a relatively narrow operating range. Plant influent flow rates have been held to not exceed 225 mgd to maintain proper plant performance. Regulators upstream of the treatment plant may limit the quantity of wet-weather flows into the plant, and thereby create an artificially low peaking factor. As detailed in Subsection 3.2.8, ALCOSAN is pursuing the optimization of regulator settings in the diversion structures.

Future Hydraulic Peaking Factors

As discussed in subsection 5.2, the ultimate secondary capacity of the treatment plant is approximately 275 MGD due to site limitations. The primary treatment facilities at the plant will be expanded to 600 mgd, for a total wet-weather treatment capacity of 875 mgd. At a secondary treatment capacity of 275 mgd, the regulators would admit to the interceptors about 10% to 60% more than the plant wet-weather treatment capacity. The remaining wet weather flows will be handled through a combination of the 875 mgd total wet weather capacity and upstream source

reduction/storage/treatment schemes to handle overflows from sanitary sewered areas. The optimal combination of reduction, storage and treatment will be developed for the CSO long term control plan.

After the implementation of the plant capacity expansion, the secondary treatment facilities (275 mgd) peaking factor will range between 1.2 and 1.4. The wet weather treatment peaking (875 mgd) factor will be approximately 4.4. The peaking factors are based on a design year dry weather base flow of approximately 202 mgd. This base flow was derived as shown in Table 4.20.

Table 4.20
ALCOSAN Wastewater Treatment Plant
Future Peaking Factors

Parameter	Value
System Average Day Dry Weather Flow	176 mgd
Average Day Billed Water Consumption	90 mgd
Average Dry Day Base Infiltration/Inflow	86mgd
Historic Per-Capita Billed Consumption	108 gallons
Design Year Population (Best Case)	1.126 million
Design Year Billed Consumption (108gpcd X 1.126)	122 mgd
Design Year Dry Day Base Infiltration/Inflow	80 - 114 mgd
Design Year Average Day Dry Weather Flow	202 - 236 mgd
Secondary Treatment Peaking Factor (275/200) to (275/234)	1.4 - 1.2
Wet Weather Peaking Factor (875/200) to (875/234)	4.4 - 3.75

4.7.2 Organic Loading Factor

A MMAD factor for BOD_5 of 1.35 has been used to forecast the organic loading to the treatment plant. The factor was derived using the average of the 30-day moving MMAD/annual average day ratios from 1990 through 1995. The derivation of the organic loading factor is shown in Table 4.21.

Table 4.21
Ratios of Maximum Month Average Daily BOD_5/Annual Average BOD_5

	1990	1991	1992	1993	1994	1995	Avg.
Average	199,134	190,718	154,792	147,042	169,708	188,241	174,939
Minimum	116,818	118,839	131,200	122,666	136,133	163,910	131,594
Maximum	308,226	259,407	195,600	200,230	213,891	228,059	234,236
Max./Avg. Month	1.55	1.36	1.26	1.36	1.26	1.21	1.34

4.7.3 Total Suspended Solids Loading Factor

A MMAD factor for TSS of 1.5 has been used to forecast the solids loading to the treatment plant. This factor was derived using the average of the 30-day moving average MMAD/annual average day ratios from 1991 through 1995. Influent TSS during 1991 was approximately 347,000 lb/day. This has been declining, and an average daily load of 221,000 was recorded in 1995. The six year average daily loading was approximately 292,000 lb/day. The six year maximum month average day solids loading was 612,000 lb/day, resulting in a peaking factor of 1.5. The derivation of the TSS loading factor is shown in Table 4.22.

Table 4.22
Ratios of Maximum Month Average Daily TSS/Annual Average Daily TSS
ALCOSAN Treatment Plant

	1991	1992	1993	1994	1995	Average
Average	347,228	250,922	263,227	294,495	221,232	287,389
Minimum	216,073	204,351	135,219	186,388	171,694	188,300
Maximum	568,228	286,349	433,606	463,701	282,781	433,816
Max./Avg. Month	1.64	1.14	1.65	1.57	1.28	1.51

4.7.4 Nitrogen Loading Factors

A TKN loading factor of 1.55 has been used based plant influent data from 1991 through 1993. This loading factor is based on the MMAD/annual average day ratios from 1991 through 1993. The data are presented in Table 4.23.

Table 4.23
Ratios of Maximum Month Average Daily TKN/Annual Average Daily Pounds of TKN
ALCOSAN Treatment Plant

	1991	1992	1993	Average
Average	20,591	19,880	20,758	20,410
Minimum	12,528	14,967	10,355	12,617
Maximum	30,772	27,626	36,972	31,790
Max./Avg. Month	1.49	1.39	1.78	1.55

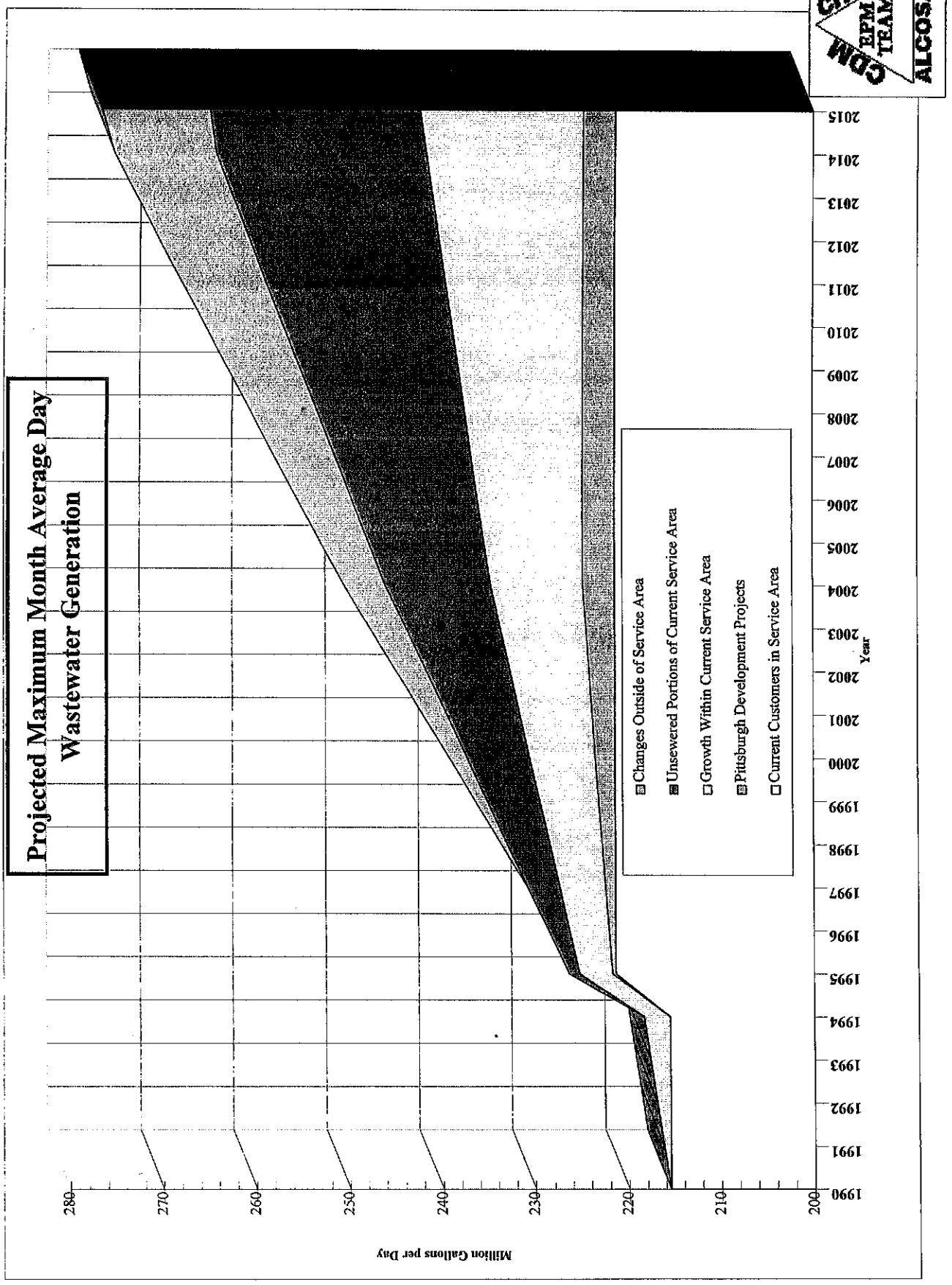
4.8 RATES AND PROBABILITIES OF GROWTH IN FLOWS

As detailed in subsection 4.3, growth in the potential service population has been projected to occur linearly from 1990 through the design year 2015. The growth in wastewater flows to ALCOSAN is likely to be somewhat non-linear because of the time required to design and construct local collection systems in response to planned development. The projected growth in potential MMAD flows to ALCOSAN is shown in Figure 4-5.

Approximately 3 mgd in new flows is anticipated from development projects in the City of Pittsburgh (see subsection 4.9). The development projects that would contribute to this flow are expected to take ten years to complete, starting in 1995. The estimate is that it would take approximately three years for flows from the PaDEP designated watersheds or treatment plants to start reaching the ALCOSAN system. The interval reflects time required for institutional arrangements, design, financing, and construction of the required local collection systems and municipal interceptors. Unsewered areas in the current ALCOSAN service area could start discharging to ALCOSAN as population density and other factors warrant.

The flow and loading projections developed for the 537 plan are intended to be used as a planning tool for identifying wastewater treatment capacity needs. Physical, financial and institutional impediments to sewering of the unsewered ALCOSAN areas and to the connection of the PaDEP designated areas into ALCOSAN are likely.

Figure 4-5



MODEL2.XLS Flowgraphs

5/7/96 5/7/96

4.9 FACTORS THAT COULD AFFECT FLOW AND LOADING PROJECTIONS

The flow and loading projections presented in subsections 4.6 and 4.7 are based on the premise that the physical and institutional nature of the ALCOSAN service area will remain similar to current situations. Trends in the nature and size of flows and loading have been evaluated to ascertain the continued validity of the per-capita flow and loading assumptions that have been used.

4.9.1 I/I and CSO Flows

Inflow and Infiltration

The current per-capita I/I averages 116 gallons/capita/day or 98.5 mgd at the treatment plant in the ALCOSAN service area. The flow projections are based on the assumption that there will be no net reduction in inflow and infiltration during the design period. For planning purposes, the assumption is that the corrective action plans being implemented in contributing ALCOSAN municipalities may reduce I/I in certain areas. Without replacing or rehabilitating the municipal collection systems and building laterals and rigorously enforcing prohibitions on the connection of downspouts, sump pumps, total I/I will increase over time.

Sewer Overflow Remediation

ALCOSAN is conducting a comprehensive CSO Program. Although the rubric of CSO, the program is a *wet weather flow management program,* and addresses both combined and sanitary sewer overflows. ALCOSAN recognizes the need for a comprehensive approach to managing wet weather flow that includes both sanitary and combined sewer areas.

The CSO Program studies are performed mostly in support of ALCOSAN's efforts to comply with the CSO requirements of their NPDES discharge permit. The work and work products of the program are scheduled to coincide with the product delivery timing requirements of the permit. The permit requires that the System Inventory and Characterization report be submitted in September 1995. That report was completed and submitted to PaDEP on schedule. The CSO program staff submitted the Hydraulic Characterization Report to PaDEP in March, 1996.

ALCOSAN CSO Program

In September 1994, ALCOSAN was issued a new NPDES permit that reflected additional requirements related to CSOs as outlined in USEPA's National CSO Control Policy. Among the requirements of the new policy is documentation that nine minimum controls are implemented on

the combined sewer system. Minimum control number four is the maximization of flow to the treatment plant.[5]

The combined sewer system in the ALCOSAN service area is unique because although the collective conveyance capacity of the contributing municipal combined sewers is much greater than that of ALCOSAN's interceptor sewers, the difference is not as great as in most other cities with combined sewer systems. In fact, the capacity of the interceptor sewers in most cities is usually only somewhat greater than the capacity of the WWTP, the conveyance capacity of the ALCOSAN main tunnel interceptors are more than four times the treatment capacity of the plant. This implies that although most interceptor sewers, not combined sewers, control wet-weather system conveyance to the wastewater treatment plant, at ALCOSAN, the deep tunnels are so big that it is the plant capacity itself that is a significant limiting factor with respect of reducing untreated discharges of wastewater.

A significant finding of the hydraulic modeling that has been completed for the CSO Evaluation is that the ALCOSAN deep-tunnel interceptor system has the capacity to deliver approximately 875 mgd of combined sewage flow to the ALCOSAN treatment plant.

Future operating scenarios under consideration are modifying the interceptor system and increasing the treatment rate at the wastewater treatment plant. Simulations of the rainfall-runoff characteristics of the entire ALCOSAN service area and the hydraulic response of the system were performed with the STORM model to asses the effects of different treatment rates at the treatment plant. For example, the plant can potentially experience wet weather flows in excess of 400 mgd for about 380 hours per year. The relationship between plant capacity and overflows was shown graphically on Figure 3-13.

The implication inherent in Figure 3-13 is that the flows must be treated or they will overflow. Increasing the treatment rate at the plant will decrease the frequency and volume of overflows. Another way to interpret Figure 3-13 is that if the maximum treatment rate at the ALCOSAN plant is held at the current 225 mgd, overflows will occur for more than 600 hours in a year of average rainfall. If the plant wet weather treatment capacity were increased to 500 mgd, the number of hours of overflow annually would be reduced to about 320. The technical feasibility and cost effectiveness of including capacity for levels of treatment outlined in the USEPA CSO Policy for CSO flows are addressed in Section 5 of this Plan.

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5 USEPA *Combined Sewer Overflow (CSO)Control Policy* EPA 830-B-94-001, April 1994.

4.9.2 Industrial Trends

Industrial Flows

Industrial dischargers, or users, of a publicly owned treatment works (POTW) facility can significantly affect hydraulic and pollutant loading on a facility. Therefore, the hydraulic and loading from industrial users to the ALCOSAN plant was assessed as a check on the veracity of the wastewater flow and loading projections discussed in this section. Although methodologies for projecting wastewater flow and loading used gpcpd rates that account for flows from industrial users, an assessment of flows from this group was considered important because even a small change -- for example, the loss or addition of a single large industrial facility -- could result in significant changes in wastewater system hydraulic and pollutant loading.

Industrial Pretreatment Program

Wastewater flows from industrial facilities are managed through ALCOSAN's Industrial Pretreatment Program, that was established in September 1984 to meet the requirements of USEPA's National Pretreatment Program, that became effective in March 1981. The program has been tailored to meet the requirements of Section 402(b)(8) of the Clean Water Act and General Pretreatment Regulations (40 CFR Part 403). The pretreatment regulations require a POTW with a total design flow greater than 5 mgd and receiving pollutants from industrial users that could pass through or interfere with the operation of the POTW to establish a pretreatment program. The objectives of ALCOSAN's program are as follow:

- To prevent the introduction of pollutants into the ALCOSAN system that will interfere with the operation of the system or adversely affect the resulting sludge
- To prevent the introduction of pollutants into the ALCOSAN system that will pass through the system, inadequately treated, into receiving waters or the atmosphere, or otherwise be incompatible with the system
- To improve the opportunity to recycle and reclaim wastewater and sludges from the system

An industrial user in the ALCOSAN service area is defined as an entity that discharges or introduces pollutants from any nondomestic source regulated under Sections 307 of the Federal Water Pollution Control Act.

SECTION 4
Projected Flows and Loading

ALCOSAN's Industrial Pretreatment Program classifies industrial users into two groups: 1) *significant industrial users* and 2) *other industrial users*. Significant industrial users are further divided into two categories: *categorical significant industrial users* and *non-categorical significant industrial users*, as defined below (ALCOSAN 1993):

- Categorical Significant Industrial Users -- all industrial users subject to National Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N.

- Non-categorical Significant Industrial Users -- any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, non-contact cooling, and boiler blowdown wastewater) or discharges an average of 100,000 gallons per day or more of combined process and non-process wastewater to the POTW; contributes a process waste stream that makes up 5 percent or more of the average dry-weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the POTW on the basis that the industrial user has a reasonable potential for affecting the POTW's operation or for violating any pretreatment standard or requirement.

According to ALCOSAN, other industrial users are defined as users that ALCOSAN believes warrant attention because of discharge characteristics but have not been classified as a non-categorical significant industrial user. A non-categorical significant industrial user is regulated under federal authority with regard to enforcement activities; other industrial users are regulated under ALCOSAN's authority with regard to enforcement activities.

ALCOSAN serves 22 categorical significant industrial users, 25 non-categorical significant industrial customers, and 77 other industrial users: a total of 124 industrial users. The number and classification of industrial users changes routinely based on discharge monitoring results, facility process changes, and other variables.

Prohibited Discharges

ALCOSAN's pretreatment regulations prohibit the introduction, directly or indirectly, into the POTW of any pollutant or wastewater that will interfere with or adversely affect the operation or performance of the POTW or pass through the POTW into the waters of the Commonwealth of Pennsylvania and cause, alone or in conjunction with other discharges, a violation of any requirement of the POTW's NPDES permit or adversely affect the use or disposal of the POTW's sludge (ALCOSAN 1993). The general categories of prohibited substances are:

- Ignitable wastes
- Reactive/explosive wastes
- Corrosive wastes
- Hazardous wastes
- Thermal wastes
- Radioactive wastes
- Solid or viscous substances, and
- Malodorous or noxious substances

Certain industrial users also must comply with national categorical pretreatment standards that are promulgated by USEPA pursuant to Section 307 of the Federal Water Pollution Control Act, as amended, including the general and specific prohibitions found in CFR 403.5. The standards specify quantities or concentrations of pollutants or pollutant properties that may be discharged to the POTW.

ALCOSAN has established specific pollutant concentration limits for 121 parameters in the five following categories:

- Metals (13)
- Organics (81)
- Restricted pollutants (23)
- Pass through substances (2)
- Miscellaneous (2)

Industrial User Permits

ALCOSAN requires all significant industrial users to obtain a permit to discharge to the POTW; selected other industrial users are required to obtain permits on the basis of discharge characteristics. To obtain a permit, a user must prepare a permit application and pay a permit fee. An industrial user permit establishes the hydraulic and pollutant loading that can be discharged to the POTW from an industrial user. General industrial user permit requirements are as follow:

- Discharge characterization
- Determination of flow rates
- Submission of facility plans
- Descriptions of facility processes
- Determination of applicable National Categorical Pretreatment Standards
- Certification of permit compliance status
- Description of products produced

- Identify type and amount of raw materials processed
- Identify the number and type of employees and facility hours of operation
- Identify any environmental control permits held by the facility

All significant industrial users receive permits with a 1-year duration. Other industrial users receive permits with 1-year or 5-year durations, depending on discharge characteristics. Permit fees vary according to user class and volume of flow and currently range from $225 to $10,400.

Industrial Pretreatment Program Data

In accordance with its NPDES permit, ALCOSAN is required to submit an annual report describing industrial pretreatment program activities from the previous calendar year to PaDEP and USEPA. As part of its program activity monitoring, ALCOSAN maintains a database of industrial user information, that includes, among other information, users' average daily flow and pollutant loading data.

For the 537 plan, flow, BOD, and TSS loading data from ALCOSAN's database were assessed to determine the contribution of the parameters to the ALCOSAN plant from industrial users. Information is not currently available for all industrial users; however, ALCOSAN is continually updating its database of information.

Table 4.24 presents a summary of industrial user flow and loading data (noting that data are not available for all industrial users). The total average daily flow from industrial users is 5.9 mgd, or 6.5 percent of the estimated 1993 total average daily billed plant flow of 90 mgd; the total average daily BOD_5 loading from industrial users is 26,611 pounds per day (lb/day), or 18.1 percent of the estimated 1993 total average daily plant BOD_5 loading of 147,042 lb/day; and the total average daily TSS loading from industrial users is 9,243 lb/day, or 3.5 percent of the estimated 1993 total average daily plant TSS loading of 263,803 lb/day.

A small number of industrial users account for the largest part of flow, BOD, and TSS loading in the industrial users group. Nine users account for approximately 60 percent of flow; three users account for approximately 70 percent of BOD loading; and six users account for approximately 50 percent of TSS loading.

Table 4.24
Summary of Industrial User Flow and Loading Data

	Avg. Daily Flow (mgd)	Avg. Daily BOD (lb/day)	Avg. Daily TSS (lb/day)
Total From Industrial Users	5.88	26,611	9,243
Average Day Flow to Plant	192	147,042	263,803
Percentage of Flow to Plant From Industrial Users	6.5	18.1	3.5
Average Day Concentrations (mg/l)	--	543	188

Conclusions about Industrial Flow

According to ALCOSAN, flow from industrial users has been declining since 1979. Data on historical flow data by customer classification are not available; however, according to ALCOSAN, flow from industrial users circa 1979 was approximately 10 to 14 percent of total billed flow, compared to the current estimated 6.5 percent. According to ALCOSAN, the current number of industrial users, and associated flows and loading, represent a stabilized scenario for planning purposes. This general assessment has been corroborated through discussions with the Allegheny County Planning Department and Department of Development, the City of Pittsburgh Mayor's Office and Department of City Planning, and SPRPC, that do not foresee significant industrial development in the current or expanded ALCOSAN service area in the short-term. In fact, SPRPC's Cycle 5 projections projects are 18 percent decrease in manufacturing employment between 1990 and 2015.

ALCOSAN estimates that the number of permitted industrial users will increase in the future through an expansion of federal regulations that require specific types of facilities to obtain discharge permits -- not, however, through the addition of new industrial facilities. An expansion of industrial user regulations would be expected to reduce flows and loading slightly.

For the purpose of wastewater management planning for the current and expanded ALCOSAN service area, no significant changes in the volume or chemical characteristics of

flow from industrial users are projected that would warrant modifying the wastewater flow projection methodology identified earlier in this section. In addition, because the percentage of flow, BOD_5, and TSS loading to the ALCOSAN plant from industrial users is relatively minor, gains or losses in the number or magnitude of users in this group would not be expected to materially affect plant design capacities.

4.9.3 New Developments in the City of Pittsburgh

Numerous development and rehabilitation projects are under way in the City of Pittsburgh, including those that may be described as riverfront redevelopment projects. Some of the projects are already in the design or construction phases, while others are in the conceptualized planning phase. Table 4.25 identifies the various projects recognized by the City Planning Department. These projects could generate additional wastewater flows that will contribute to the ALCOSAN system. The projected growth created by the projects was accounted for by the Cycle 5 projections for the City's population.

The reality of the projects being constructed varies from project to project and developer to developer; however, the Mayor's initiative, the Pittsburgh Development Fund, will serve as a catalyst to bring about the redevelopment projects. The $60 million public fund, was proposed to the City Council by Mayor Murphy in early December 1994 as a major economic stimulus package with private matching funds of nearly $50 million to be established by the Allegheny Conference. Funds could be used to conduct real estate appraisals, acquire property, conduct environmental clean-ups or for financing construction for new residential, commercial or industrial projects. Although the actual projects to use the funds have not yet been named, potential projects will be located throughout the City.

Table 4.25
City Development Projects

NAME & LOCATION	TYPE OF PROJECT	SIZE IN HOUSING UNITS, ACREAGE, OR SQ. FT.	Estimated Wastewater Generation (gpd)
Residential Projects			
Broadhead Manor	Private housing project	300 new units	169,000
Aliquippa Terrace	Private housing project	200 existing units; 300 new units	169,000
Crawford Square	Private housing project	100 new units	56,000
Nine Mile Run, Squirrel Hill	Private housing project	300 - 500 units	225,000
Lincoln Properties, North Shore Housing	Private housing project	200 units	113,000
Heights of South Hills, 31st Ward	Private housing project	200 units	113,000
Mon Valley/LTV Site, South Side	Mixed Use: residential, commercial, & light industrial	110-acre riverfront site; 150 housing units (minimum)	150,000
South Side, (16th-19th Streets) Fox Way Commons	Private housing project	300 new units	169,000
Warriors' Hill, Kerns Avenue	Private residential	40 single family units	22,500
Carnahan Road area	Private residential	20-30 single family units	14,000
Brookline (White Street)	Private housing project	50 units	28,000

NAME & LOCATION	TYPE OF PROJECT	SIZE IN HOUSING UNITS, ACREAGE, OR SQ. FT.	Estimated Wastewater Generation (gpd)
Brookline (Dunster Street)	Private residential	30 units	17,000
Washington's Landing	Mixed residential/commercial/ industrial	100 new housing units and additional office with riverfront trails and pedestrian bridge connection to island	26,000
		Total Residential	1,271,500
Commercial Projects			
Intermodal Transportation Center (ITC), Three Rivers Stadium Parking Lots	ITC; commercial development; hotels	40 acres	80,000
ITC, Between LRT and Liberty Bridges/First Ave. and Parkway	ITC with public safety center on top	No data	50,000
Strip/Lawrenceville Center, Strip to 31st St. Bridge	Major business expansion; property acquisition for new project	Expansion of 10-11 businesses; major new project	50,000
Convention Center	Expansion project by Year 2000/new hotel	250,000 additional floor space; new 150 room hotel	100,000

SECTION 4
Projected Flows and Loading

NAME & LOCATION	TYPE OF PROJECT	SIZE IN HOUSING UNITS, ACREAGE, OR SQ. FT.	Estimated Wastewater Generation (gpd)
Buyer's Mart Building, Strip District		300,000 s.f. building	65,000
Station Square - Phase II	Residential housing; waterfront park; hotels; marina; restaurants; plus restoration of Lawrence Paint Building	52 acre site with some existing development	104,000
Pittsburgh Cultural Trust, Downtown Cultural District	Major office complex and plaza; two tier park along Allegheny Riverfront	500,000 s.f. building; expansion of existing small businesses/offices anticipated	110,000
B&O/Public Safety Bldg., Grant Street	Residential/commercial complex	200 residential units plus commercial space	113,000
Tippin Site	2-3 buildings	13 acre site; each building approx. 100,000 s.f.	26,000
Greentree Area	Office complex (Kossman interests)	20 acres; 200 - 300,000 s.f. office complex	40,000
City Center	Office/commercial structure	400 - 600,000 s.f. structure	109,000
Oxford Site	Office building	400 - 600,00 s.f. building	109,000

NAME & LOCATION	TYPE OF PROJECT	SIZE IN HOUSING UNITS, ACREAGE, OR SQ. FT.	Estimated Wastewater Generation (gpd)
North Shore Riverfront Development, Northside (between 7th & 9th Street Bridges)	Residential, recreational, and other development (ALCOA Headquarters)		50,000
Former Sears Site, East Liberty	Commercial		50,000
New Baseball Park - Potential locations include the old B&0 train station on Grant Street, the Strip District and the North Side abutting Federal Street.	Commercial	Assumes 50,000 seats @ 5 gallons / seat (Game days only)	250,000
River Gaming Site, North Side at old U.S. Steel Supply Site	Commercial	10 - 12 acres	25,000
		Subtotal Commercial Projects	1,331,000
Commercial/Research Projects			
Federal North Project	Allegheny General Hospital Research building	90 - 100,000 s.f. building	21,000
High Technology Center	2 - 3 Office buildings	each building - 100,000 s.f.	50,000

NAME & LOCATION	TYPE OF PROJECT	SIZE IN HOUSING UNITS, ACREAGE, OR SQ. FT.	Estimated Wastewater Generation (gpd)
Robotics Center, 43rd Street, Lawrenceville			100,000
		Subtotal Commercial/Research	121,000
		Total Flow From Pittsburgh Redevelopment Projects	2,723,500

Source: City of Pittsburgh Department of City Planning; City of Pittsburgh Mayor's Office; City of Pittsburgh 1995 Capital Budget; Pittsburgh *Business Times* - "Retailers like gambling aspect of new Station Square," June 20 - 26, 1994; Pittsburgh *Post-Gazette* - "Job Fund Ready," Dec. 6, 1994.

Effects of Large Development Projects on Future Wastewater Flows

The major developments proposed for City will contribute an estimated 3.0 mgd to the ALCOSAN plant. Additional wastewater flows from five prospective gaming operations are estimated to contribute another 0.25 mgd to the plant[6] for a total of approximately 3.3 mgd to ALCOSAN on the completion of the various projects. The flow rate assumes is based on the assumption that each major project is completely built out and all residential units and commercial/office space are completely occupied. Of the 32 redevelopment projects listed by the City of Pittsburgh, 13 involve residential or mixed residential development. If constructed, the projects would result in approximately 2,400 new housing units. At an average household size of 2.5, this would result in 6,000 residents.

The projected average day wastewater generation from the residential development would be approximately 1.3 mgd. The commercial and commercial/research developments that have been identified by the City would result in an estimated wastewater generation of approximately 1.6 mgd, for a total projected redevelopment related average daily generation of 2.9 mgd. The estimate includes 50,000 gpd from each of five projects about that no flow predicting information was available. Wastewater generation from the proposed new baseball park is estimated to be approximately 500,000 gallons during game days, based on 50,000 seats and ten gallons/seat wastewater generation. Based on a schedule of 80 home games per

6 Based on contributing wastewater flows generated from 500 room hotel at each gaming site with two occupants per room, full occupancy, with generation rates of 50 gallons per person per day.

year, the average daily wastewater generation from the ball park would be approximately 110,000 gpd.

Predicting wastewater generation from the potential commercial projects is uncertain, due to the unknown types of activities that would occur, the numbers of employees and the numbers of customers that would be drawn to the facilities. The projected commercial wastewater volumes for this Plan assume an average of 2,000 gallons/day/acre of sanitary wastes and storm water runoff, based on findings in Phase 1 of the ALCOSAN CSO Evaluation Project.

4.9.4 Relationship Between SPRPC Cycle 5 Projections and City Redevelopment Projects

A 15.0 mgd increase in average daily flows over the 1995 flows of 196 mgd has been projected from the existing ALCOSAN service area by the Year 2015. Each of the major projects identified for the City of Pittsburgh are located in the limits of the existing ALCOSAN service area. The projected wastewater flows from these projects represent twenty percent of the projected flows leaving ample capacity for growth from other developments throughout the service area.

The increase in average day wastewater generation of 15 mgd for the current ALCOSAN service area was based on the SPRPC Cycle 5 population projections. The MERLAM model utilized in the Cycle 5 projections accounted for redevelopment projects such as those described in Table 4.25 above. The regional planners at SPRPC coordinated their planning efforts with the City Planning Department, the Allegheny County Planning Department and other agencies. Therefore, the wastewater generation that will result from the City of Pittsburgh's redevelopment efforts are reflected in the overall flow projections. The proposed capacity expansion outline in Section 5 of the plan will accommodate the City's redevelopment efforts.

SECTION 5
Alternatives Analysis

5.1 INTRODUCTION

This section addresses technical alternatives for future capacity and treatment. Issues for handling odor and solids at the ALCOSAN treatment plant and their relationship to management strategies for wet-weather flow that will be developed by the CSO long term control plan (LTCP) are also discussed. Technical alternatives for upgrading and expanding the ALCOSAN treatment plant are described. The technical evaluations that were performed constituted the conceptual design activities. They are summarized in this 537 Plan. These technical evaluations include odor control, liquid treatment processes, and management of solids.

Structural and non-structural alternatives for addressing the wastewater management issues in the PaDEP designated study areas are presented in this section. Conceptual designs and cost estimates for regionalizing the PaDEP study areas into ALCOSAN also are presented. Estimated annual costs per household for connecting the PaDEP areas into ALCOSAN are described to allow for the policy considerations of the municipalities in the study area. Conceptual designs for removing the stream inflow sources from the combined sewer systems in the current ALCOSAN service area also are presented.

SECTION 5
Alternatives Analysis

5.2 OVERVIEW OF FLOW MANAGEMENT STRATEGIES

This subsection summarizes ALCOSAN's strategies for managing flows within the study area. These strategies are designed to comply with PaDEP 537 planning requirements and the USEPA's CSO control policy. Hydraulic characteristics of the ALCOSAN interceptor system and treatment plant are discussed in section 3.0. The development of flows and loads relevant to the strategy is described in section 4.0 of this report.

5.2.1 Secondary Treatment Strategy

The criteria used to evaluate secondary treatment alternatives at the ALCOSAN site require that the proposed plant provide secondary treatment for existing and projected design year dry weather flows and loads and an appropriate peaking factor. The facilities must accommodate growth and redevelopment in the existing service areas, and also allow for adding the PaDEP designated study areas to the ALCOSAN system if desired by ALCOSAN and the affected municipalities. On the basis of the flow and loading projections that were developed in section 4.0, a demand for secondary treatment capacity of 275 mgd was calculated for the current treatment plant. The proposed expansion to 275 mgd will accommodate maximum month average daily flows from all of the PaDEP designated study areas.

Capacity limitations in the ALCOSAN shallow cut interceptors may need to be mitigated to accommodate flows from the PaDEP designated study areas. Managing wet-weather flow also may require some combination of interceptor upgrading, in-line storage, and new treatment facilities. Additional studies that will be performed for the CSO LTCP will determine whether it is more cost effective to transport the flows from the PaDEP areas to the existing plant or treat these flows at new, outlying facilities. The LTCP also will determine the PaDEP areas' pro-rated share of the costs for upgrading the ALCOSAN interceptors, providing remote treatment or both. The projected design year (2015) maximum-month daily wastewater that is generated from the PaDEP study areas is approximately 10 mgd, or 4 percent of the build-out capacity for secondary treatment. If this capacity is not utilized at an expanded ALCOSAN treatment plant, it will be available for managing wet-weather flow.

The 275 mgd secondary capacity is the nominal maximum-month average day value. Actual unit treatment process equipment will have higher capacities to handle diurnal flow variations. Preliminary design studies completed for the 537 Plan have shown that it is not cost effective to design for the plant's original "nameplate" build-out capacity of 300 mgd. This conclusion is driven by changes in PaDEP's effluent criteria for the plant. At PaDEP's request, ALCOSAN conducted modeling for wasteload allocation for a discharge of 275 mgd (PaDEP's Water Quality Analysis Model, WQAM6.3, was utilized). The modeling indicated that the summer (April through October) limit for ammonia-nitrogen would fall from 15 mg/L to 10 mg/L. The decrease

in the allowable concentration of ammonia-nitrogen results in a decrease in the effective capacity of the existing aeration basins. The decrease in capacity is due to an increase in detention time that is required for the nitrification process. ALCOSAN considered obtaining an additional 25 mgd secondary treatment capacity through an increase in the depth of the two new aeration basins that will be required for 275 mgd capacity. Increasing the side water depth (SWD) of the new aeration basins would require installation of an intermediate pump station between the primary settling basins and the aeration basins. Increasing the depth of the new aeration basins also would complicate flow splitting operations and require two separate air supply systems (or inefficient throttling of one system).

The design year maximum-month average day flow of 275 mgd does not justify expanding the secondary capacity to 300 mgd at this time. Space has been left for the intermediate pump station, and the SWD of the new aeration basins could be increased in the future. Increasing the secondary capacity to 300 mgd could be justified in the future to treat wet-weather flows from sanitary sewer system. The CSO LTCP will investigate the cost effectiveness of these changes compared with other wet-weather flow management strategies.

5.2.2 Wet-Weather Flow Management Strategy

Subsection 3.2 estimated the quantity of average annual overflow volumes from areas with combined and separate sewer systems that can be captured by the existing ALCOSAN interceptor system. For the existing treatment plant configuration with a maximum treatment capacity of 225 mgd, the estimated annual average capture is 30 percent. The capture rate would increase to as much as 65 percent if the treatment capacity was increased to the 875 mgd carrying capacity of the deep-tunnel interceptor system and wet well. However, compliance with the national CSO policy and the Pennsylvania Clean Streams Law will require the development of an optimization strategy that may require more than a 65 percent capture rate.

There are basically three options for reducing wet-weather sewage overflows from an interceptor system:

- Transport the flow through expanded interceptors and treat using expanded wet-weather treatment capacity
- Store the flows temporarily and gradually release them back into the interceptors for transport and treatment
- Reduce wet-weather flows to the interceptors through sewer separation (in combined sewered areas) and inflow reduction (in sanitary sewered area)

SECTION 5
Alternatives Analysis

Determining the best combination of these approaches is the purpose of the CSO LTCP. Because reaching the required capture rate will involve some combination of transport and treatment, it is necessary to determine what the role of the current interceptor system and treatment plant could be (i.e. is expanding the wet-weather treatment capacity at the ALCOSAN plant to 875 mgd justifiable without the completion of the CSO LTCP?).

The expansion of the wet-weather treatment capacity to 875 mgd is justifiable along two lines of analysis. The 875 mgd treatment capacity will be a critical step towards optimizing the capture and treatment of wet-weather flows from the areas with combined sewer systems (e.g. the City of Pittsburgh and other riverfront towns). Additional capacity for transport and treatment will be required for complete compliance with the CSO Policy and to eliminate wet-weather overflows from the sanitary sewer systems. The issue is whether it would be feasible technically and cost effective to expand the transport capacity in the existing deep tunnel interceptors and the proposed wet-weather treatment capacity at the current plant beyond 875 mgd.

Expanding the wet-weather treatment capacity to 875 mgd at the existing plant is cost effective compared to all other potential alternatives to be considered in the CSO LTCP. Most of the infrastrucuture required to provide the 875 mgd treatment capacity already is in place due to the foresight of the original designers of the facilities and to the fortuitous "extra" deep-tunnel interceptor capacity that resulted from construction technologies that were available when the deep-tunnel system was built. Acheiving the 875 mgd treatment capacity will require upgrading the treatment plant's main pump station, preliminary treatment facilities, and modifications to the primary treatment and disinfection systems. These modifications will boost the primary treatment capacity to 600 mgd. Coupled with the proposed 275 mgd secondary capacity, the 875 mgd treatment capacity may be reached.

The estimated incremental cost associated with increasing the facility's capacity from 225 mgd to 875 mgd is $165 million or $0.25 million per million gallons per day. Typical cost for treatment capacity at new treatment plants usually exceeds $1.00 per mgd nationwide. This figure does not include the cost of interceptor improvements. Therefore, raising the wet-weather treatment capacity of the existing plant to 875 mgd is very cost effective. Conversely, it would not be cost effective to expand the treatment capacity of the existing plant beyond 875 mgd.

Expansion beyond 875 mgd would require modifications of the interceptor at the river crossings, deep-tunnel interceptors, and at the main pump station wet well to deliver higher flow rates to the plant site. Expanding the treatment capacity beyond 875 mgd is not considered feasible due to site constraints that would impose the need for expensive non-conventional treatment technologies. It is estimated that the incremental costs for capacity beyond 875 mgd at the treatment plant could reach $8 million per mgd.

On the basis of the evaluations described above, it is recommended that 275 mgd of secondary treatment and 600 mgd of primary treatment be provided at the ALCOSAN site. The 275 mgd secondary treatment rate will accommodate growth and redevelopment in the existing service area, and also will allow adding each of the PaDEP study areas. The 600 mgd primary-treatment rate will balance the total treatment capacity with the capacity of the interceptor tunnels and wet well. The proposed strategy for primary treatment will address CSO-related flows in a manner that is consistent with the USEPA's CSO control policy.

5.3 TREATMENT PLANT CAPITAL IMPROVEMENT PROGRAM

The technical approaches described in this Plan were evaluated under the conceptual design phase of the ALCOSAN engineering program management (EPM) project. The EPM is intended to provide an integrated analysis of current and future wastewater treatment facilities required at ALCOSAN, including liquid treatment, solids management and control of odor and air pollution. The outcome of the conceptual design phase of the EPM has been the development of an integrated capital improvement plan (CIP) that addresses a planning period of 20 years (1995 to 2015).

ALCOSAN identified the following priorities as the basis for preparing the CIP:

- Operate the treatment plant without creating nuisance odors in the community and in compliance with the Clean Air Act (CAA) and associated regulations.
- Expand the wastewater treatment plant capacity to service growth and development within the service area.
- Expand the preliminary and primary treatment and disinfection capacity of the plant to treat wet-weather flows to reduce untreated overflows to the waterways in compliance with the Clean Water Act (CWA) and PaDEP regulations.
- Develop a plan that would make the most cost-effective use of the rate payers' funds in compliance with these goals.
- Develop a plan that will serve for the planning period of 20 years.

The CIP has been divided into 19 major packages or projects in order of priority over a 12-year period. Projects schedules for construction in 1997 are known as Phase I. "Phase I" comprises odor prevention, odor treatment, and the first phase of capacity expansion. This phase addresses ALCOSAN's commitment to the community to resolve existing odor problems, and is currently in final design. The remaining projects deal with the treatment of wet-weather flows, lower-priority odor control and process improvement projects, additional secondary treatment capacity, and reducing the plant's vulnerability to events that may cause a bypass of treatment facilities. These projects will be distributed over 10-years period in a way that will require a relatively level flow of funds for construction and will permit treatment operations to continue uninterrupted. The projects that comprise the CIP are summarized below. Figure 5-1 shows the existing site layout with the proposed facilities highlighted.

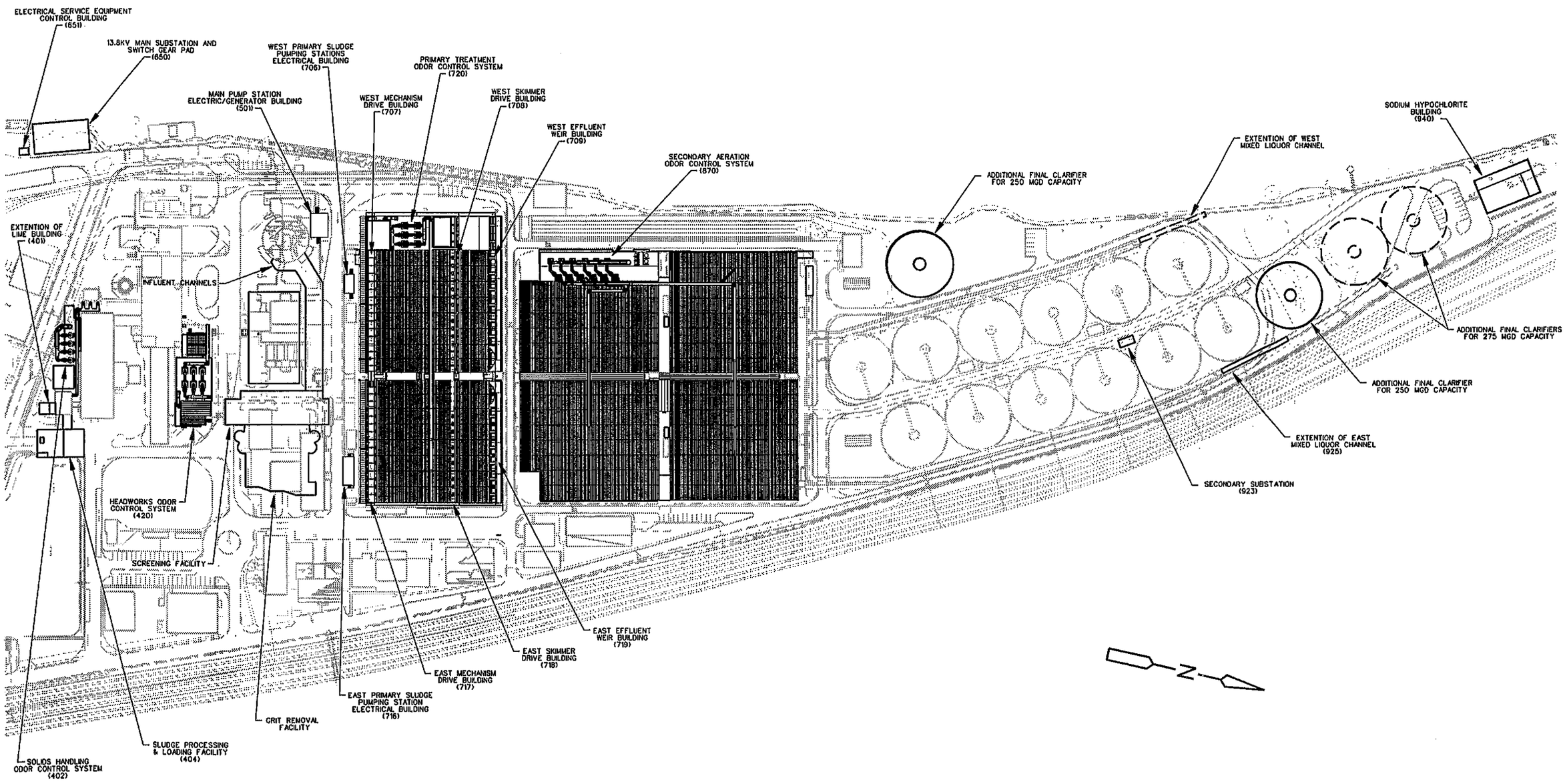


FIGURE 5-1
ALCOSAN PLANT SITE
PROPOSED PLANT & IMPROVEMENTS

CDM CH2MHILL EPM TEAM ALCOSAN

FIG_5-1.DGN 4-5-96

The ALCOSAN Board approved the implementation of Phase I of the CIP for the plant in March 1995. Phase I projects go into construction in 1997. Implementation of the remainder of the CIP projects that were not approved as part of the Phase I will be planned and scheduled as part of the overall Act 537 Plan. Controlling factors include the limited area for multiple contract execution, the maintenance of operations during construction, and project financing. The design and construction related to both expanding the treatment plant's secondary treatment capacity to 275 mgd, and improving the interceptors are scheduled for construction in March, 1998.

5.3.1 Odor Control And Plant Capacity Improvement Projects

The following projects have been recommended for immediate implementation, and are in the final design phase. The descriptions below reflect the latest design information:

Package 1: Final Clarifier Modifications

The structures of the existing final clarifier mechanisms are corroding and showing other signs of deterioration. The clarifier mechanisms will be replaced with rapid sludge removal (RSR) units utilizing a continuous collection manifold. The clarifiers will have Stamford Baffles at the launder area and enlarged scum beaches. The height of the existing access bridges will be raised to elevation 732 feet to protect drive mechanisms from the 500-year flood.

As verified by an analysis of odor sources conducted during the conceptual design phase, the final clarifiers are not a source of nuisance level odors. However, toxic discharges or other causes that upset the biology of the plant can occur periodically causing odors at the final clarifiers. Installing covers and scrubbers for the 16 (existing and new) final clarifiers would provide a final level for capturing and treating odors. This final investment in controlling odors is being deferred until the other, more crucial, odor-control facilities are operating and it is determined that this final level of odor control is necessary.

Package 2: Lime Building Expansion

One current source of offsite odor originates in the area where dewatered sludge is mixed with lime and loaded onto transport vehicles of varying size for hauling to land disposal. Improvements will include replacing the lime and sludge mixers, conveyors, truck loadout bins, and the dust-control system. In addition, the loading area will be expanded to accommodate the loading of tractor-trailer sized trucks in a controlled, enclosed environment with ventilation and scrubbing of the ventilated air.

Package 3: Dewatering Building Ventilation Improvements

Plans are being developed for modifications to the ventilation and dewatering system to improve the quality of air in the dewatering building. In addition, the existing odor scrubbers will be modified to accommodate the ventilation system for air treatment.

Package 4 - Dewatering System Improvements

Overall, the system for handling solids will be improved to allow for three modes of operation:

1. Pumping the waste activated sludge (WAS) directly to gravity-belt thickeners (GBTs) to be thickened mechanically and thickening the primary sludge (PS) by gravity in the primary-sedimentation tanks. Blending of the thickened sludges will occur before dewatering. This is the preferred mode of operation.

2. Pumping the WAS and un-thickened primary sludge to GBTs to be co-thickened mechanically. This is the backup mode of operation.

3. Co-thickening the WAS and primary sludge in the primary-sedimentation tanks before dewatering. This will be used only in emergency situations.

Preliminary Sludge Treatment

Both un-thickened WAS and gravity-thickened PS will be shredded before mechanical thickening or dewatering. The shredded WAS will enter the GBT feed tanks before being pumped to the GBTs. The shredded PS will enter the new belt filter press (BFP) feed tanks where it will be mixed with the thickened WAS. The combined WAS and PS will be pumped from the mixing tanks to the BFPs.

Sludge Thickening

Normal operations for thickening sludge will consist of thickening WAS mechanically with GBTs and thickening PS with gravity in the primary-sedimentation tanks. The thickening system is designed to handle both un-thickened WAS and PS.

From the GBT feed tanks, un-thickened sludge will be pumped to the GBTs. Sludge that is thickened mechanically by the GBTs will flow by gravity to new thickened-sludge sumps. New pumps will pump the thickened sludge to one of two new BFP feed tanks. To minimize odor release from this process and to provide operators with a better working environment, the GBTs will be installed in enclosures.

Sludge Dewatering

Thickened sludge will be fed to the BFPs from either of two new feed tanks. Under normal operating conditions, thickened WAS from the GBT system and gravity-thickened PS will be blended in the BFP feed tanks. From the BFP feed tanks, thickened sludge will be shredded and pumped to the BFPs. Dewatered sludge from each BFP will drop into a new conveyor system that can transport the sludge either toward lime stabilization or incineration. To minimize odor release from this process and to provide operators with a better working environment, the BFPs and conveyors will be installed in enclosures.

Package 5 - Odor Control Systems

Headworks Odor Control System Process Description

The headworks odor control system will replace the existing capacity for thermal treatment provided by the fluidized bed incinerators (FBIs) and related afterburners. Once the headworks odor control system is in service, the thermal treatment capacity will be used to treat odor sources in the energy recovery building and the influent wet well while the headworks odor control system also will treat the odorous air from the headworks facilities, including air from the existing bar rack room, existing grit collection room, truck bays, and from the aerated grit chambers (which are to be covered in an interim project).

Air from the aerated grit chambers will be scrubbed through a carbon adsorption unit until the new odor control system is in service. Once the headworks odor control system is in service, the carbon adsorber will be taken out-of-service, and the odorous air from the grit chambers will be ducted into the main header leading to the headworks packed tower system.

The headworks odor control system includes the two-stage scrubber trains, a chemical storage and feed building, and a combined fan and electrical building. The fans will occupy one room of the new building with an adjacent room housing transformers, switchgear, and motor control centers (MCCs) for the fans.

Fiberglass fans will draw odorous air into the two-stage scrubbers for treatment and then discharge the treated exhaust air through an elevated stack for dispersion. By drawing the air into the ducting and through the towers, a negative pressure is created that ensures that any leakage infiltrates into the system.

The chemical feed building stores caustic, sodium hypochlorite, and hydrochloric acid. This building also contains a smaller elevated MCC for the recirculation pumps, sump pumps, and

chemical metering pumps. All chemical metering pumps, except the acid feed pumps, will be furnished with variable frequency drives (VFDs).

Scrubber blowdown and drainage is drained by gravity to a common sump in a dry well/wet well arrangement. Drainage is discharged by the dry-well mounted sump pumps through a new pressure main and returned to the liquid processes at the influent wet well.

Primary Treatment Odor Control System Process Description

The primary treatment odor control system uses a combination of flat concrete covers and raised houses to cover the primary-sedimentation tanks and related influent and effluent channels and scum troughs. The scrubber complex will be located on top of the new structural concrete cover over a new primary-sedimentation tank.

Odorous air is captured under the covers, collected through a ducting system, and scrubbed through two-stage, countercurrent packed-tower scrubber systems. As with the headworks system, odorous air is drawn into the ducting system through the two-stage packed towers. The discharge from the fans is collected into a common ductwork inside the fan building that discharges the treated exhaust through an elevated stack.

Scrubber blowdown and drainage is drained by gravity to the primary effluent channel.

Aeration Basin Odor Control System Process Description

Odorous air from the aeration basins and mixed liquor channels will be captured under concrete and aluminum covers, respectively. Odorous air will be collected by the odor-control ductwork system and drawn through single-stage countercurrent packed towers for treatment.

The odor control system will consist of the ductwork and single stage scrubber, a chemical storage and feed building, exhaust fans, and a stack. The fans draw the odorous air from the aeration basins and mixed liquor channels through the scrubber and the treated discharge exhaust through an elevated stack. All of the scrubber trains, fans, and the chemical building are located on top of the new westerly aeration basin. Scrubber blow down and drainage flows by gravity back into the primary effluent channel.

Solids Processing Odor Control System Process Description

The solids processing odor control system is designed to handle odorous air collected from the operations in the dewatering building, the lime stabilization process, and related truck loading bays for the lime-stabilized sludge.

All odorous air from the basement, and first and second floors of the dewatering building will be captured and treated through two-stage countercurrent packed towers. The existing fans will provide sufficient pressure to exhaust the foul air from the dewatering building, through both stages of scrubbing and out the exhaust stack.

Odorous air from the lime/truck loading facility will be treated with wet cyclones to remove particulate and airborne lime dust prior to scrubbing with second-stage oxidizing packed tower scrubbers.

Package 6 - Preliminary/Primary Improvements

Main Pump Station

A drainage pump will be installed in the pump room of the main pump station. The pump will provide redundancy to the existing emergency drainage pump. The pump will discharge into the existing discharge conduit for the pump station on the south side of the station.

A new flowmeter will be installed on the vertical discharge piping of each main sewage pump. The flows measured by these meters will be used as input for controlling plant processes.

Primary-Sedimentation

The primary-sedimentation system consists of six 280-foot long by 67-foot wide, four bay, rectangular sedimentation tanks. Primary influent flows into the east and west aerated-influent channels from the flow-splitting division chamber at the south end of the central pipe gallery. The aerated influent channels distribute the flow to the primary-sedimentation tanks, either directly or through a pre-aeration process.

Three additional primary-sedimentation tanks will be constructed. Two will be created from the conversion of the two existing pre-aeration tanks into 280-foot long by 61-foot wide sedimentation tanks, and one from a new 280-foot long by 70-foot wide tank.

Each tank will have four chain-and-flight collector mechanisms (one per bay). Solids that settle in the primary-sedimentation tanks will be conveyed to sludge hoppers at the influent end of the tanks by the chain-and-flight collector mechanisms and screw-type cross collectors. The chain-and-flight collectors also will transport floatables toward scum and grease skimmers that will be installed at a skimmer platform, approximately two-thirds of the distance down the tanks.

Each primary-sedimentation tank will have four rotating weir-type skimmers. The skimmers will pivot to allow any floatables on the tanks to flow into the skimmer troughs. Once scum enters the skimmer, it will flow by gravity to two existing scum collection surge tanks.

Primary Sludge System

Primary sludge collected in the tank hoppers will be removed and pumped to the dewatering building by new primary sludge pumps. The ten existing primary-sludge pumps will be replaced with new units, and three additional pumps will be installed to service the new primary-sedimentation tanks.

The pumps must be capable of operating over a range of concentrations of primary-sludge solids, depending on the plant's operating mode. In one mode, "thin" primary sludge will be pumped from the primary-sedimentation tanks to the dewatering building, where it will be processed through GBTs before dewatering. In the second (normal) mode, "thick" primary sludge will be pumped directly to dewatering, bypassing the gravity belt thickening step. The pumps will be driven by VFDs to provide the flexibility required by these processes.

Package 7 - Final Clarifiers/Disinfection

Final Clarifiers and Mixed-Liquor Channels

The final clarifier system consists of 12 circular clarifiers. Mixed liquor flows into the mixed-liquor channels from the fourth pass of the aeration basins. The mixed-liquor channel splits into an east and west channel to distribute the flow evenly between the east and west sides of the final clarification system.

The capacity of the final-clarification system will be expanded in phases. In Phase I, the capacity of the final clarifiers will increase to 250 mgd. Following Phase I of the CIP, the capacity will increase to 275 mgd.

The two clarifiers included in Package 7 will be the same size and configuration as the existing clarifiers. One clarifier will be fed by the west mixed-liquor channel. The other clarifier will be fed by the east mixed-liquor channel and will be north of the existing east clarifiers.

Sodium Hypochlorite Facilities

Sodium hypochlorite will be used primarily for disinfection and odor control. Sodium hypochlorite also can be used intermittently for chlorinating the return activated sludge (RAS) line and the aeration basins.

The CIP does not include dechlorination equipment. Although dechlorination alternatives were evaluated in the concept design phase of the CIP, operating experience indicates that an average chlorine residual of 0.5 mg/L can be achieved by controlling chlorination. However, the 0.5 mg/L cannot reliably be held as an absolute under all conditions. Therefore, provisions will be made in the design of the facilities to allow for installing of dechlorination equipment if required in the future.

The chemical feed system will be housed in a new sodium hypochlorite building, that will include chemical unloading stations, chemical storage and containment, and chemical pumping equipment and piping.

Unloading and Storage Facilities

The new receiving and storage facility will be sized to meet requirements for all phases of the CIP. The unloading and storage facility will be able to receive sodium hypochlorite by barge, rail, or truck.

Chemical Feed Systems

Sodium hypochlorite will be delivered through a pressure header to the various chemical application points in the plant. At each application point, flow metering typically will be controlled using a meter and control valve arrangement. For the odor-control facilities, sodium hypochlorite delivery will be determined on the basis of storage tank level.

Low-pressure effluent flushing water (EFW) will be used as carrier water to transport sodium hypochlorite to the aeration basins. High-pressure EFW will be used as carrier water for pre-chlorination and secondary effluent disinfection. High-pressure EFW currently is used at the plant as injector water for both feed points. The EFW system will be improved as necessary to increase the reliability and redundancy of the system.

Chlorine Contact Tanks

Sodium hypochlorite will be added upstream of the chlorine contact tanks by using a series of existing diffusers in the secondary effluent channel. There are two 3-pass chlorine contact tanks. Each pass is approximately 600 feet (long) by 7.5 feet (wide) by 14.5 feet SWD. At a flow of 275 mgd, the contact tanks can provide 15.2 minutes of disinfection contact. New chlorine-residual analyzers will be used to pace and trim the sodium hypochlorite feed rate.

Package 8 - Aeration Basins

Aeration Basins

The existing aeration basin system consists of two treatment batteries (eastside and westside), each with three, four-pass aeration basins. The aeration basins are configured to allow the plant to operate in either plug-flow or step-feed mode. Primary effluent will typically be mixed with the RAS at the entrance of Pass 2. The mixed liquor will flow through Passes 2, 3, and 4 before entering the mixed liquor channels for transport to the final clarifiers.

Two additional aeration basins will be constructed, resulting in a total of four aeration basins per treatment battery. A new flow-regulator chamber will meter and control primary effluent flow to the influent channels of each new aeration basin. The influent channel for each new basin will be configured to allow either plug-flow or step-feed operation. The existing mixed-liquor channel at the north end of the aeration basins will be extended to accommodate the new basins. Effluent flow from aeration basins will exit from Pass 4 of each new aeration basin to the mixed liquor channel.

The existing and new aeration basins will be covered. Precast, prestressed concrete double tees will cover the majority of the tanks, while a reinforced concrete slab will cover Pass 2 and Pass 3 of the new aeration basin on the westside.

The existing aeration basins have a coarse bubble-air diffusion system. Fine bubble aeration will improve the efficiency and reduce energy costs for the expanded plant. Although fine bubble aeration is included in the CIP to increase the system's capacity, it was determined that it is not cost effective to install the fine-bubble diffusers before they are needed. The consultant responsible for the final design of the additional aeration basins and related improvements has proposed re-evaluating this issue, the results of which are not yet available. A fine bubble-air diffusion system will be provided in the new aeration basins.

The foam-control system will be upgraded. The headers in the existing basins will be replaced, and in the new basins, new headers will feed spray water nozzles for foam control.

The low pressure EFW system used for foam control will be connected to a new hypochlorite distribution header. Hypochlorite solution will be sprayed on the surface of the aeration basins only when control of Nocardia is necessary.

Compressed Air System

The four existing main-air compressors will supply air to (1) the aeration basins for mixing and oxygen transfer, (2) the aerated-grit chambers, and (3) various flow channels. The compressors are connected to a single air discharge header for service to the aeration basins and other unit processes. Isolation valves will be added to each air-distribution header near the point where it branches from the main air header. The existing control system for compressed air will be upgraded.

WAS Pumping System

The upgraded WAS pumping system will consist of twelve pumps arranged into four pumping stations (three pumps per station) and will be controlled by variable frequency drives (VFDs). Each pump station will withdraw sludge from two aeration basins.

WAS will be pumped from the first pass of the eight aeration basins directly to the dewatering building, where it will be thickened by new gravity-belt thickeners. The current practice of pumping WAS to the primary-sedimentation tanks for co-thickening with primary sludge will be discontinued except for emergency operations.

Package 9 - Instrumentation and Control System

The existing plant distributed control system (DCS) will be expanded to suit the upgraded plant. The DCS is the central instrumentation and control system for all of the facilities. Interfaces with the other Phase I packages' specific instrumentation and control systems will be provided.

Package 10 - Site Work

Package 10 will upgrade the entire plant site to be compatible with the other Phase I packages and the future facilities, and includes paving, grading, storm drainage, landscaping, yard piping, power distribution, and site electrical work.

Traffic Flow

One-way truck traffic is the pattern for traffic flow on the ALCOSAN site because it separates passenger cars from trucks. This pattern has been created to provide for the future volume of truck traffic, that is centered around hauling solids and chemical delivery. It will improve safety by controlling the movement of passenger vehicles and restricting visitor access to the site.

Safety

Site planning will consider adequate lane widths, acceptable turning radii, optimized travel distances, managed traffic volumes, controlled plant site ingress and egress, vehicle size and weight characteristics, and signed routing patterns.

Future Site Security

The entire site will be secured by providing a fence around its perimeter. There will be three access points to the site that will be controlled at the security building. Each access point will have a gate with audio and visual surveillance. A new security building will monitor all entrance to and egress from the site. A new visitor's parking area at the security building will supply visitors with parking outside the secured area of the plant.

Truck Stacking

Tracy Street will be widened to provide for three 12-foot lanes, of which the right westbound lane will be designated exclusively for truck stacking. Stacking of trucks for delivery to the sodium hypochlorite building will be provided for on the east side of Preble Avenue inside the plant.

Parking

There will be an increase of approximately 20 personnel after the site expansion. The current parking capacity will suffice for this increase. Because of new construction, a total of 107 parking spaces, 23 near the river, 28 near the maintenance and power generation buildings, 14 near the compressor building, and 42 near the security building, will be replaced by 107 spaces distributed around the site. Parking spaces are provided for ALCOSAN operations and maintenance vehicles at the main pump station, the primary treatment odor control building, the compressor building, the final clarifier odor control building, and the sodium hypochlorite building.

Property Acquisition

Additional property may need to be acquired for locating the new Operations and Maintenance Building. ALCOSAN also intends to request that the City of Pittsburgh vacate Preble Avenue. A security fence would be used to enclose Preble Avenue within the plant site. Provisions must be made to facilitate CONRAIL access to the site. A strip of land on the east side of ALCOSAN's property is needed for construction of a 24-foot road that will provide truck access from the south end of the plant to the proposed sodium hypochlorite building. The strip of land will be of

varying width, providing for a minimum 12-foot offset from the centerline of the main track. This offset will be several feet greater in other locations along the improved roadway.

Chemical Delivery

Trucks that deliver chemicals will be routed along an improved, Preble Avenue (24-feet wide) northward along the east side of the final clarifiers to the new sodium hypochlorite building. After the chemicals are delivered, the trucks will loop around a small parking area and back to Preble Avenue where they will proceed southward and exit the site at the gate on Preble Avenue.

Rail deliveries of chemicals also will be possible. Placing the sodium hypochlorite building at the far north end of the site will improve safety by separating rail traffic from the remainder of plant operations. River delivery will be facilitated by constructing a barge dock adjacent to the building.

Sludge Hauling

Trucks will enter the plant at the southwest corner of the site and proceed north and east to the Lime/Truck Loading Facility. They will be weighed empty on scales inside the facility, loaded, weighed full, and continue forward and out of the site, exiting onto Tracy Street.

Tunnel Compartmentalization

The plant's tunnel system extends from the dewatering building at the south end of the plant site to the final clarifiers at the north. The tunnels house important process lines, pumps, electrical conduits, and mechanical and electrical equipment. Sections of the tunnel or the entire tunnel system are vulnerable to flooding from river inundation and pipe rupture.

The tunnel system will be modified to minimize the effect of river inundation and pipe rupture. The tunnels will be compartmentalized in order to contain these events to limited portions of the tunnel. Compartmentalization would be accomplished by constructing watertight barrier walls or bulkheads at various locations. The bulkhead includes watertight doors that normally would be open but would be closed automatically from a remote control panel in emergency situations.

Tunnel Drainage System

The plant's system for draining the tunnels serves to dispose of process drainage and flood waters in the service tunnels and basement areas. A network of sump pumps is dispersed throughout the tunnel system to empty collection sumps and recycle drainage water to the wet well.

Improvements required to the system include installing new sump pumps and replacing some of the existing sump pumps.

City Water Distribution System

The city water distribution system will be upgraded to serve both existing facilities and the new facilities as they are placed in service.

5.3.2 Major Plant Capacity Improvement Projects

Simultaneous with the construction of the Phase I improvements, other projects will be designed to enable ALCOSAN to capture and treat a significant percentage of wet-weather flows. Those improvements will facilitate ALCOSAN's compliance with the USEPA CSO Policy concerning the reduction of overflow events. These projects are consistent with the system inventory and hydraulic-characterization studies that were recently completed as part of ALCOSAN's CSO program. These projects also include further expansion of the treatment capacity of the plant to meet projected long-term growth and providing additional incineration capacity.

Wet-Weather Treatment

The major pollutants that are required to be removed during wet-weather flows are bacteria, floatable debris, and gritty materials that are washed from streets into combined sewers. Combining new facilities for screening and removing grit with new flow-control structures used to maximize unit process capacities will remove these pollutants at a maximum flow rate of 875 mgd. Mechanical equipment in the existing main pump station will be replaced to increase the pumping capacity to 875 mgd when existing units reach their useful life.

New Operations and Maintenance Building

A new O & M Building will be constructed to replace the current building, which must be demolished to permit subsequent construction of the wet-weather treatment facilities. The O&M Building will house shops, storage, locker rooms, and office space similar to the existing building, but will designed to meet the needs of the expanded plant.

Interceptor Improvements for Wet-Weather Flow

Modifications to the existing interceptor sewer system will be required in order to maximize storage capacity and to reduce the number and volume of overflow events. These improvements may include modifying gates and overflow structures and optimizing the overflow controls.

Capacity Expansion to 275 MGD

Expansion of the secondary treatment facilities to 275 mgd would accommodate the needs for the ALCOSAN community, as projected by SPRPC and other agencies, to the year 2015 and beyond. This second phase of dry-weather capacity expansion includes a new air diffusion system for the six existing aeration basins and two additional final clarifiers. This system may be added to Phase 1 depending on ongoing evaluations.

Headworks Building Retrofit

After the new wet-weather treatment facilities are constructed, the existing headworks facilities no longer will be used. The existing headworks building will be retrofitted to fulfill plant build out requirements.

Third Fluidized Bed Incinerator

The expressed policy of ALCOSAN is to possess the capability to dispose of 100 percent of the solids by either lime treatment and land application or by incineration. Current incineration capacity will be insufficient for processing 100 percent of the plant's sludge under projected future operating demands. The additional capacity required can be provided by converting the existing multiple-hearth incinerator, which is not in service, to a fluidized-bed incinerator similar to the operating units.

5.4 LIQUID TREATMENT PROCESSES

This subsection describes conceptual design phase alternatives, which considered expansion and/or upgrades for all liquid treatment processes and systems. In each case, the recommended alternative for each unit process or major system is identified along with the evaluation criteria. Cost estimates are presented only for those processes where cost was factored into the decision process. More detailed costs will be calculated as the design proceeds. All present worth costs are based on a $6^1/_8$ percent interest rate and an assumed useful life of mechanical equipment of 20 years.

5.4.1 Hydraulic Design Criteria

ALCOSAN has outlined a two-pronged strategy behind the hydraulic expansion at the treatment plant. The first is to provide adequate capacity for the projected dry-weather flows and loadings from the current- and future-service population. The second objective is to maximize the plant's role in managing wet weather flows. As outlined in the CIP, secondary treatment capacity will be expanded to 275 mgd, or combined primary and secondary treatment capacities would be increased to handle peak wet-weather flow rates of 875 mgd. This value corresponds to the delivery capacity of the deep-tunnel interceptor system.

5.4.2 Non-Economic Selection Criteria

Alternatives were evaluated both in terms of cost and non-economic criteria. The following non-economic selection criteria were used in the liquid-process evaluations:

- Technology status (i.e. proven vs. innovative)
- Odor control issues
- Reliability and redundancy
- Operations and maintenance requirements
- Space requirements
- Flexibility
- Environmental considerations (i.e., noise, visual aesthetics, public safety)

Table 5.1 summarizes the selected alternatives and their corresponding anticipated design capacity.

Table 5.1
Summary of Selected
Liquid Treatment Alternatives

Process	Selected Alternative	Maximum Month Average Day Design Flow (mgd)	Maximum Wet Weather Design Flow (mgd)
Influent pumping	Upgrading the main pump station	275	875
Preliminary treatment, screenings removal, grit removal	Reciprocating rake bar screens Vortex grit chambers	275	875
Primary treatment	Modifying existing primary sedimentation tanks for high surface overflow rate, and conversion of two pre-aeration tanks for additional primary sedimentation capacity.	275	600
Secondary treatment	Modifying aeration basins for optional step feed operation and construction of two new aeration basins. Construction of four new final clarifiers.	275	275
Disinfection	Hypochlorination	275	875

5.4.3 Influent Pumping

In accordance with the USEPA CSO Control Policy, (*USEPA Combined Sewer Overflow Control Policy, April 1994, EPA 830-B-94-001*) the wet well will be operated in a manner that maximizes the availability of interceptor storage and minimizes bypasses in the interceptor system. This will be accomplished by maintaining a surface elevation of 680 feet or below for wet-well water during dry weather and drawing down the elevation of the water surface in anticipation of a wet-weather event.

The existing pumps cannot meet the maximum 875 mgd design criterion for wet-weather flow, and upgraded facilities are required. EPM recommended replacing the existing pumps with larger capacity pumps. This solution is recommended because it would be relatively simple to implement, requiring no major structural modifications.

SECTION 5
Alternatives Analysis

Alternatives

Three alternatives were considered for the expansion of the Main Pump Station for the peak wet-weather flow rate: 1) Upgrading the main pump station by replacing the existing pumps with larger capacity pumps; 2) constructing an auxiliary pump station to handle wet-weather flows; and 3) constructing a mezzanine-level pump station, concentric with the existing wet and dry well, to handle wet-weather flows.

The alternatives were evaluated on the basis of both cost and non-economic criteria. The estimated costs are presented in Table 5.2.

Table 5.2
Comparative Conceptual Cost Estimates for Influent Pumping Alternatives[1]
($ 1000)

Alternative	Description	Capital Cost	Annual O&M Cost	Present Worth Cost
1	Upgrading the main pump station	$16,500	$2,900	$50,100
2	Auxiliary pump station	$28,900	$2,900	$63,600
3	Mezzanine-level pump station	$27,500	$3,000	$62,200

[1] All conceptual costs are total, and are used for the purpose of comparing alternatives. Cost estimates will be continually refined as the design proceeds.

Recommendation

Alternative 1, upgrading the main pump station, is the recommended alternative. This alternative was selected on the basis of cost and non-economic factors. The non-economic advantages associated with Alternative 1 include:

- Odor Control - No additional equipment for odor control (beyond what is currently recommended) will be required.
- O & M - The number of installed pumps, motors, drives, and controls is about one-half that of the other alternatives.

- Space Requirements - No additional site area is required

- Flexibility - The existing pumps can be replaced on an as-needed basis, offering flexibility in scheduling the upgrades.

5.4.4 Preliminary Treatment

The preliminary treatment facilities (screening and grit removal) will be expanded to a peak wet-weather capacity of 875 MGD.

Screenings Removal

Alternatives

Three types of bar screens that can be cleaned mechanically were evaluated: 1) catenary screens, 2) reciprocating rake bar screens, and 3) chain/cable-operated screens. Manufacturers quotes indicated that the costs for the alternatives are virtually the same. Because conceptual-cost estimates were not used to recommend one alternative over another, screening technologies were evaluated on a non-economic basis.

Recommendation

Alternative 2, reciprocating-rake bar screens, is the recommended screening alternative on the basis of the following non-economic factors:

- Reliability - The reciprocating-rake bar screens are less likely to fail before their expected life because they have no submerged mechanical parts (as opposed to chain/cable operated screens). They also have less tendency to become clogged.

- Maintenance - Maintenance is minimal due to the above reasons.

- Flexibility - The reciprocating-rake screens are easily placed in and out of service to accommodate intermittent wet-weather flows.

Grit Removal

Alternatives

Two alternatives were considered for removing grit: 1) aerated grit chambers and 2) vortex grit chambers. The alternatives were evaluated in terms of cost and non-economic factors. The

comparative capital, O&M, and present-worth costs for the grit alternatives are shown in Table 5.3. The costs shown include the cost of the recommended screening alternative, reciprocating-rake bar screens.

Table 5.3
Comparative Conceptual Cost Estimates for Grit Removal Alternatives [a,b]
($ 1000)

Alternative	Description	Capital Cost	Annual O&M Cost	Present Worth Cost
1	Aerated chambers	$18,700	$350	$22,600
2	Vortex chambers	$21,500	$280	$24,700

[a] All conceptual costs are total, and are used for the purpose of comparing alternatives. Cost estimates will be refined continually as the design proceeds.
[b] All costs include reciprocating-rake bar screens.

Recommendation

Alternative 2, vortex-grit chambers, is the recommended alternative for removing grit. Due to the similar costs for both alternatives, the decision was based on the following non-economic factors:

- Odor Control - Vortex-grit chambers have a lower capacity for generating odors. This is primarily due to smaller tank-surface area and lack of aeration.
- O & M - O & M of a vortex system is simple due to lack of aeration equipment and minimal number of submerged mechanical parts.
- Flexibility - The vortex system is flexible because it maintains consistent removal over large and rapid changes in flow rate. This is very important given the typical fluctuations associated with wet-weather flow.

5.4.5 Primary Treatment

Design Concept

The primary treatment system will be expanded to handle a peak daily flow of 600 mgd during wet-weather conditions. The ALCOSAN strategy for managing wet weather flows proposes that

a combination of secondary and primary treatment be provided for all flows that can be conveyed to the ALCOSAN site. The proposed facilities match the capacity with the capacity of the existing interceptor tunnels, and the pump station's wet well. A total of 875 mgd of treatment capacity will be provided: 600 mgd of primary treatment capacity and 275 mgd of secondary treatment capacity.

This treatment strategy is consistent with the USEPA's CSO control policy. This policy contains provisions that allow treatment of CSO-related flows at publicly owned treatment works (POTWs). This policy states that CSO-related flows passing the headworks of a POTW "will receive at least primary clarification and solids and floatables removal and disposal, and disinfection, where necessary, and any other treatment that can reasonably be provided." Accordingly, it is proposed to use ALCOSAN's primary sedimentation tanks for high-rate treatment and disinfection of wet-weather flows.

To evaluate the potential for treating CSO-related flows, actual simulations have been completed at the ALCOSAN plant. These simulations indicate that the primaries will perform satisfactorily at the proposed 3,225 gallons per day per square foot (gpd/sf) loading rate. Testing programs completed at ALCOSAN and other WWTPs have concluded the following:

- The percent reduction in BOD is not significantly effected by high overflow rates. Tests performed at ALCOSAN indicate that an average reduction of 41 percent can be achieved for BOD at rates between 3,000 and 4,100 gpd/sf. This rate exceeds the 30 to 35 percent reduction outlined in PaDEP's design guidance for primary sedimentation facilities.

- Primary settling at rates between 3,000 and 4,100 gpd/sf can be effective in reducing suspended solids by 36 percent.

- Chlorination within primary sedimentation tanks at high rates can be effective in achieving organism kills to less than 200 colonies per 100 ml, which will comply with ALCOSAN's existing national pollutant discharge elimination system (NPDES) permit.

- Primary settling and disinfection at high rates provides an effective method of treating wet-weather flows.

The testing program was conducted on ALCOSAN's pre-aeration and primary-sedimentation tanks from November 1994 through April 1995. The objective of the program was to determine the feasibility of running these tanks (and any new tanks) at surface overflow rates greater than 3,000 gpd/sf. Influent for the test included dry- and wet-weather sewage. WAS was recirculated throughout these tests. BOD, CBOD, and TSS samples were collected during the program.

Samples were collected during the testing program from both the influent and effluent streams for rates ranging from 1,800 to 4,100 gpd/sf. As shown in Figure 5-2, the difference in removal

efficiencies for BOD was small. For rates ranging from 1,800 to 2,000 gpd/sf, the average removal efficiency for BOD was 48 percent. During periods of high flow (3,800 to 4,100 gpd/sf) the average removal efficiency for BOD was 41 percent. The average effluent concentration for BOD was 34 mg/L, which is actually less than the 65 mg/L average for low-flow periods. BOD effluent concentration data is summarized in Figure 5-3.

Removal efficiencies measured for TSS are shown in Figure 5-4. The removal efficiencies for TSS showed a larger difference for the higher overflow rates. During periods of high flow, the average removal efficiency decreased from 75 percent to 36 percent, due in part to broad fluctuations in the settling characteristics of dry- and wet-weather flows. The average TSS concentration in the primary effluent during high flows was 72 mg/L. As demonstrated at other facilities (and described below), this concentration is sufficient for disinfection purposes. TSS effluent concentration data collected during the ALCOSAN field tests are summarized in Figure 5-5. A complete summary of all ALCOSAN test data is provided in Table 5.4.

Table 5.4
Summary of Primary Sedimentation Performance Data
ALCOSAN High Rate Treatment Study

Parameter	Flow Regime	TSS	CBOD	BOD
Average Influent concentration (mg/L)	High	120	44	59
	Low	223	95	141
Average Effluent concentration (mg/L)	High	72	32	34
	Low	45	52	65
Percent removed	High	36	29	41
	Low	75	39	48
Note: High Flows:	*3,800 to 4,100 gpd/sf*			
Low Flows:	*1,800 to 2,000 gpd/sf*			

Figure 5-2
Primary BOD Removal

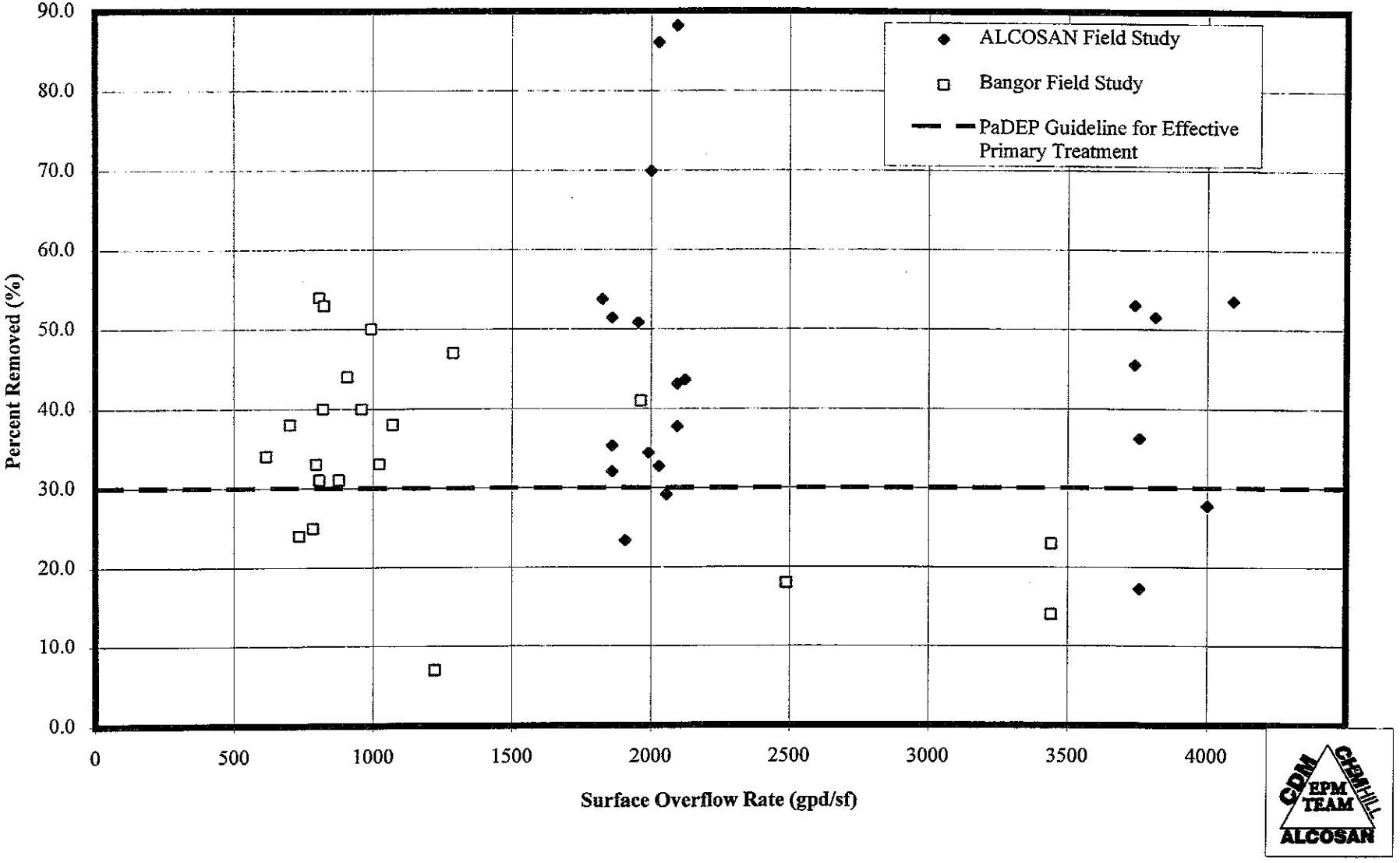


Figure 5-3
Primary Effluent CBOD Concentrations

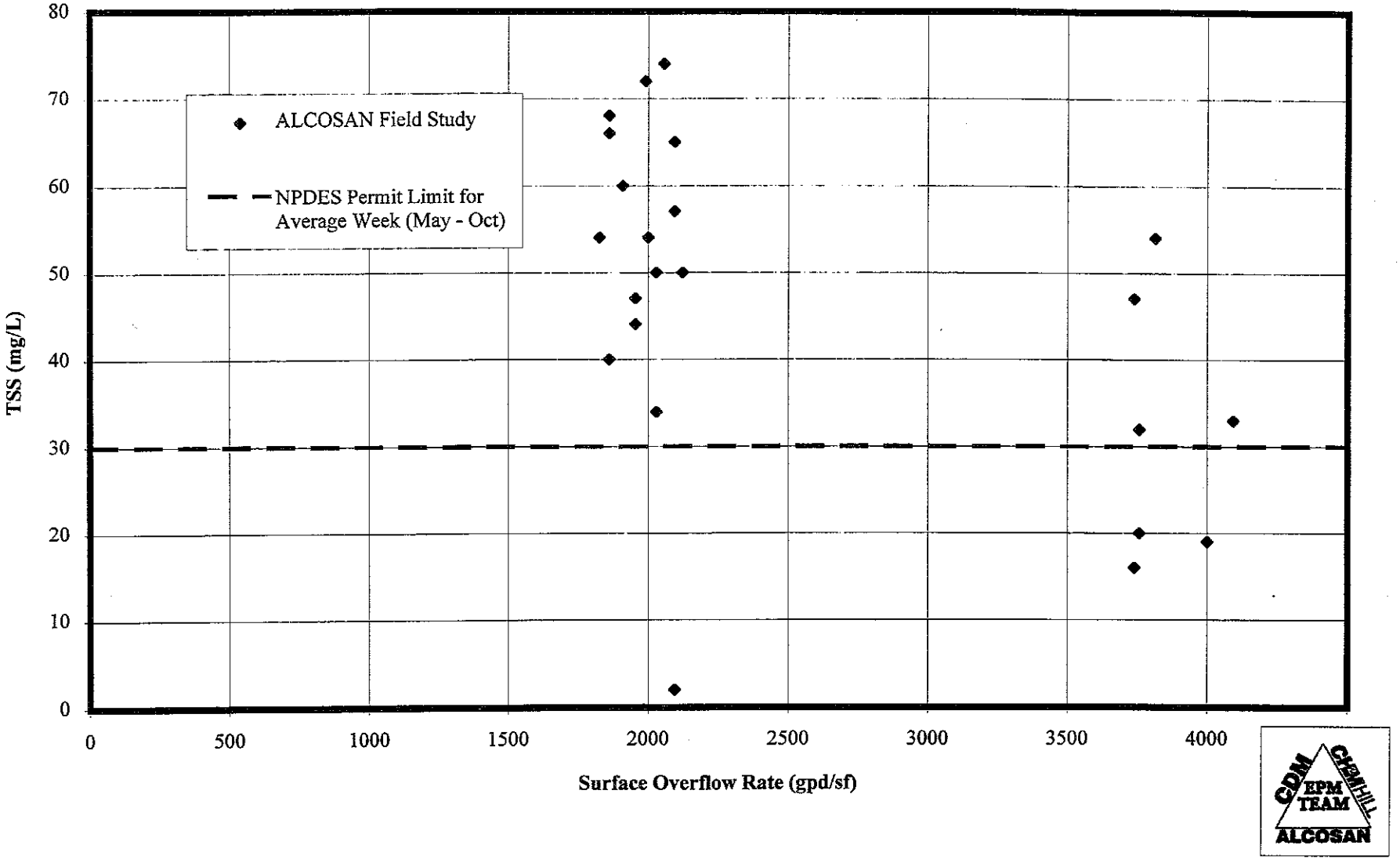


Figure 5-4
Primary TSS Removal

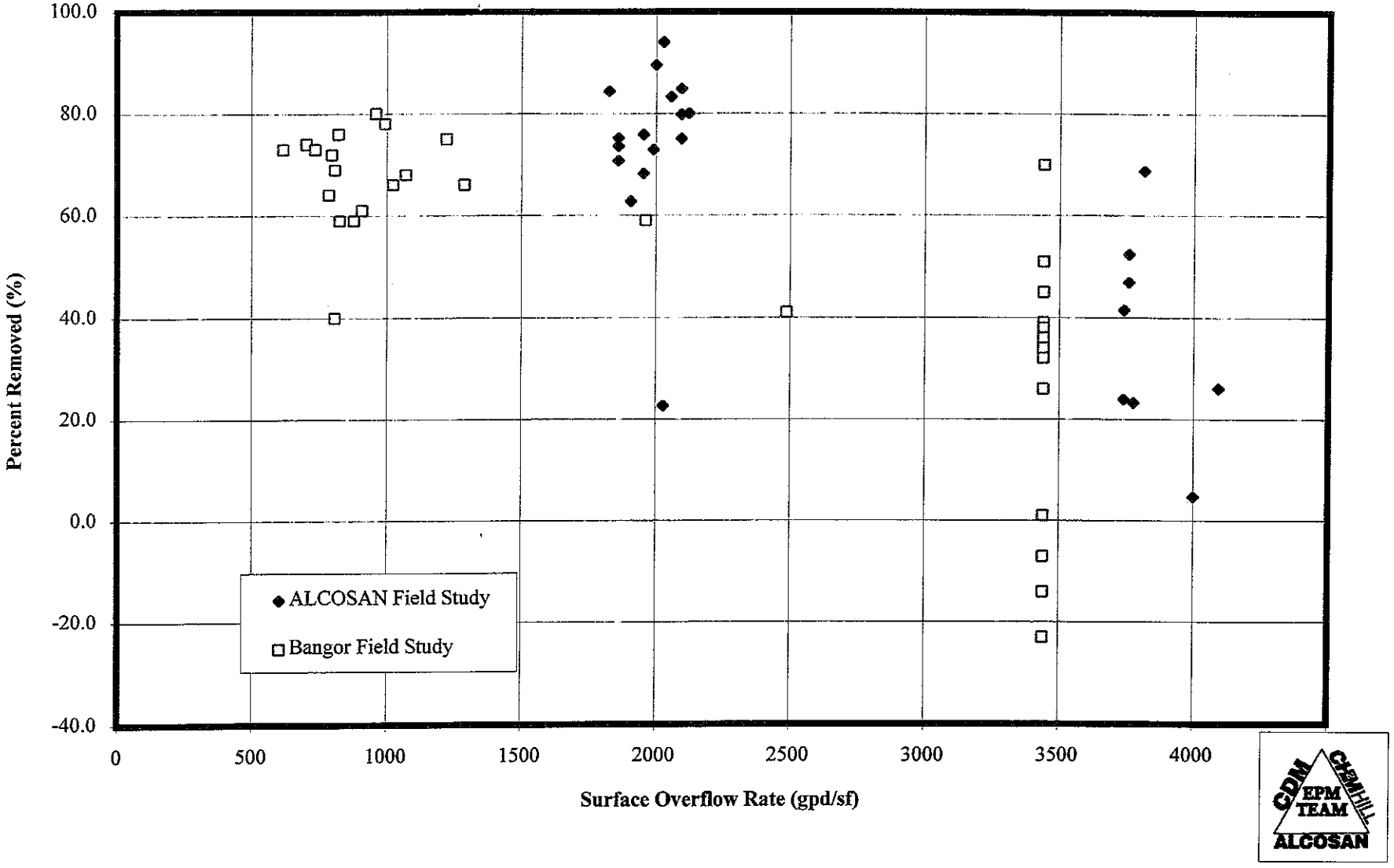
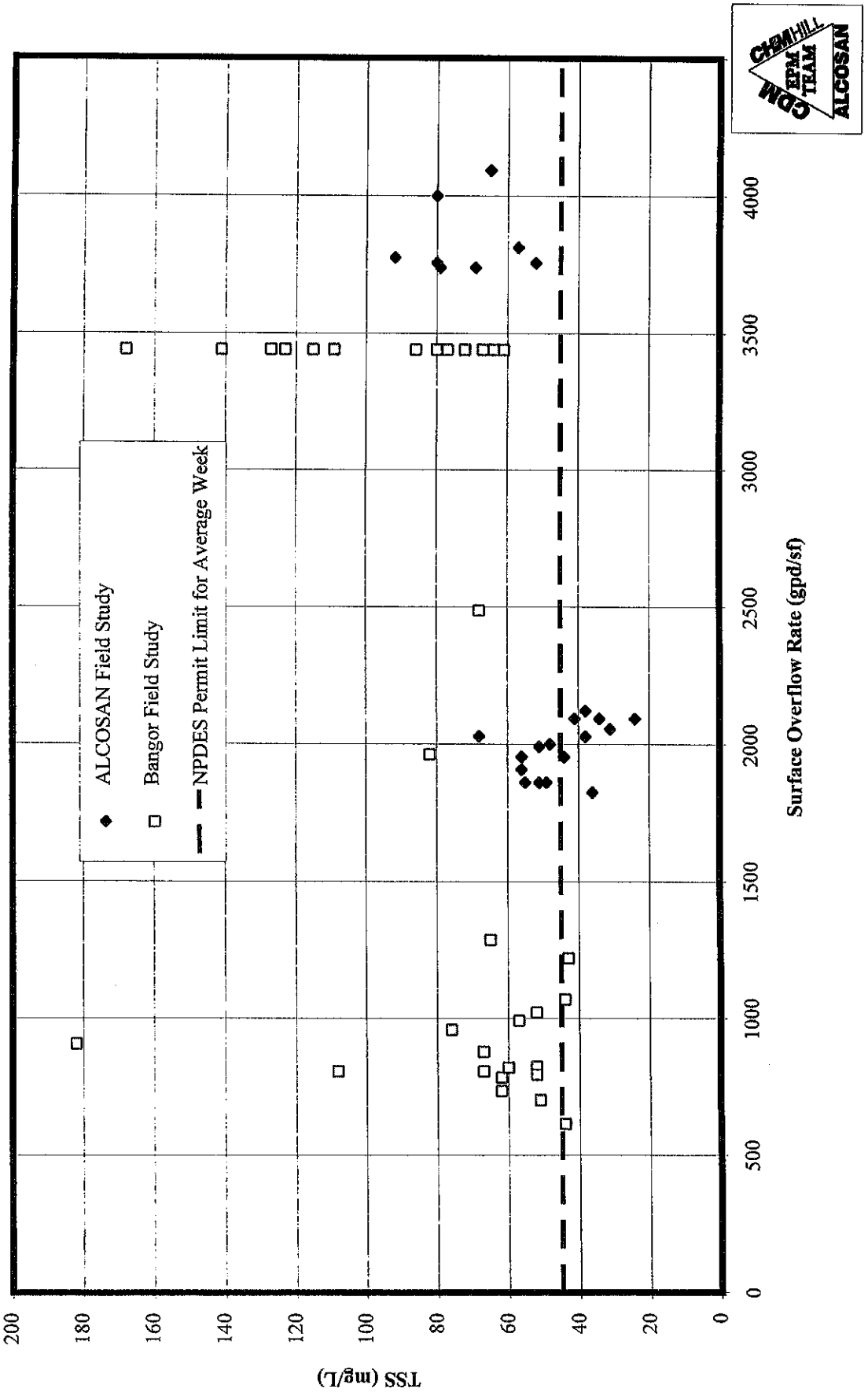


Figure 5-5
Primary Effluent TSS Concentrations



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Although the field tests were performed with WAS being recycled, it was decided to curtail the practice of returning WAS to the primary-sedimentation tanks as part of the CIP. This modification was made on the basis of issues for handling solids and controlling odor. Data from long-column settling tests can be used to estimate potential (TSS) reductions with and without WAS. Samples were collected from the influent channel to the primary sedimentation tanks on February 10, 1995. Two samples were collected: one with WAS and one without. In relative terms, the tests indicate that the removal efficiency for samples without WAS is 25 percent higher than the removal efficiencies for the samples with WAS.

In addition to the testing at ALCOSAN, data collected for other facilities also demonstrates that the proposed configuration will perform satisfactorily. A similar testing program was conducted in Bangor, Maine during September 1994. The Bangor program evaluated the performance of the primary clarifier for removal and disinfection. A design flow rate of 3,440 gpd/sf was adopted for the treatment of wet-weather flows at the Bangor plant. At this flow rate, TSS effluent concentrations ranged from 40 to 80 mg/L. More significantly, the testing demonstrated that, all but one of the samples met their permit's monthly average coliform limits of 142 colonies per 100 ml. TSS data collected during the Bangor field tests is included in Figures 5-4 and 5-5.

Alternatives

Three alternatives were considered:

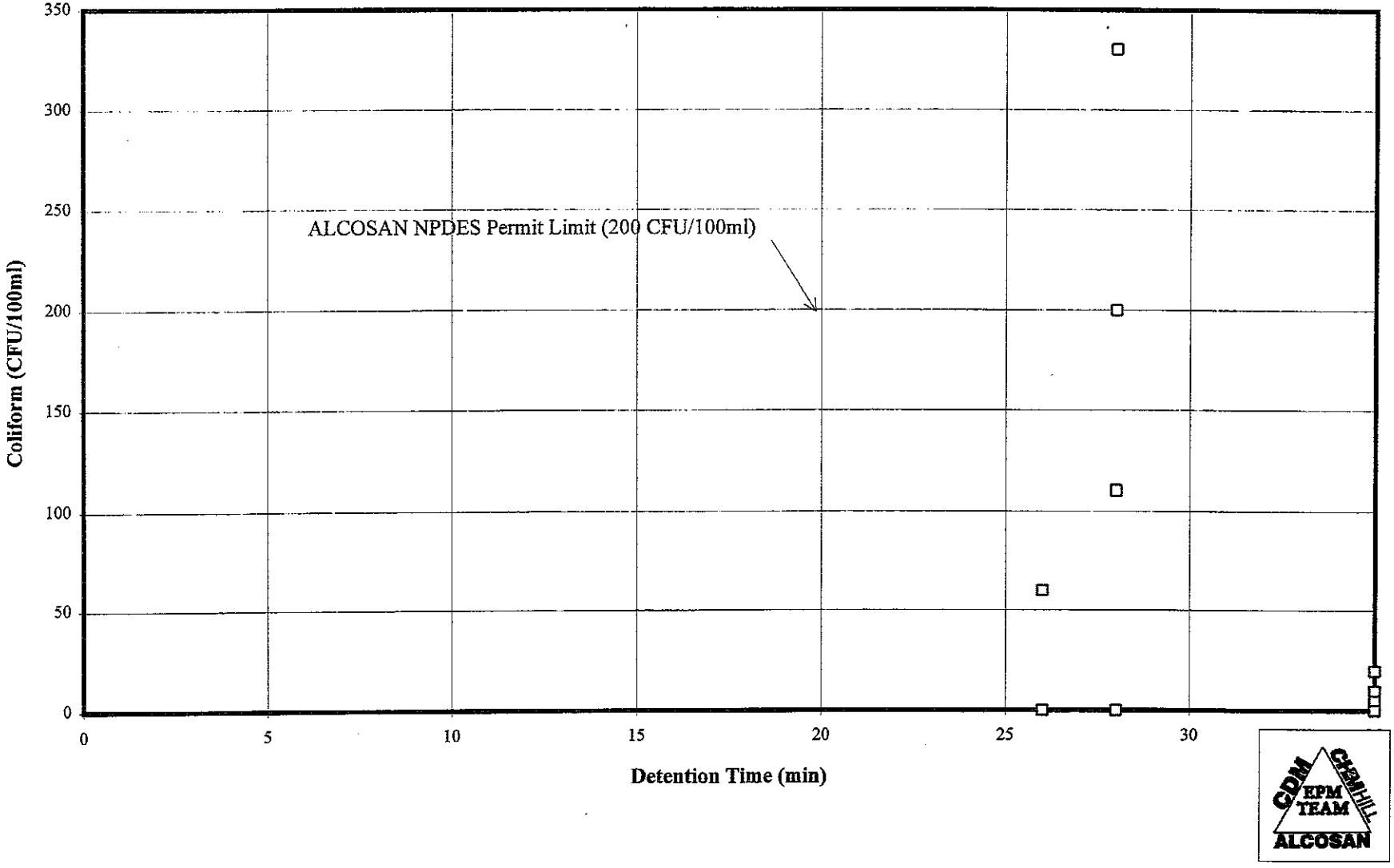
- Conventional rectangular sedimentation tanks with high surface overflow rate. This alternative would use the existing primary-sedimentation tanks. The pre-aeration tanks would be converted to additional primary-sedimentation tanks, and a new tank would be constructed.

- Conventional rectangular sedimentation tanks with inclined plate settlers. This alternative would install plate settlers, which improve the settling characteristics of the tank, in existing primary-sedimentation tanks to achieve additional capacity.

- Stacked clarifiers. The existing primary-sedimentation tanks would be converted to two-level stacked clarifiers to achieve the needed capacity.

Initial evaluations led to the elimination of both Alternatives 2 and 3 on the basis of preliminary cost estimates and implementation criteria. Alternative 2 would require a multi-million dollar purchase (not including installation) of inclined plates. In addition, there would be a considerable cost associated with retrofitting the existing weirs, launders, and chain-and-flight system to accommodate the new plates. A structural analysis indicated that Alternative 3 would require demolition of 80 to 90 percent of the existing primary-sedimentation tanks. In addition, structural reinforcement of the remaining structure might still be necessary to support the stacked clarifier. Therefore, Alternatives 2 and 3 were eliminated.

Figure 5-6
BANGOR Field Test Disinfection Data



*dis sum Chart 2

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Recommendation

Alternative 1 is the recommended alternative. The only major structural modification will be converting the pre-aeration tanks to primary sedimentation tanks. The recommendation is based on cost and the non-economic factors that include:

- O & M - Alternative 1 is the simplest of the three systems to maintain. There are no submerged plates requiring upkeep or stacked clarifiers that would inhibit access to the bottom clarifier.
- Flexibility - Alternative 1 requires the least construction and retrofitting. It offers the flexibility to add inclined plates at a later date if needed.
- Compatibility with the existing primary-sedimentation tanks.

5.4.6 Secondary Treatment

The upgrade and expansion of the secondary system to 275 mgd will require two new aeration basins and the construction of four additional final clarifiers. Ten alternatives originally were considered for the aeration system. They involved various combinations of the following concepts:

Mode of Operation:	Step feed vs. plug flow
RAS Re-aeration:	Existing basins vs. new deep basins vs. thickening (centrifuges) / re-aeration facility
New Aeration Basins:	Same depth as existing basins vs. deeper basins
Ammonia Removal:	Suspended growth vs. combined suspended growth and attached growth

Alternatives

As a result of a preliminary evaluation, 4 of the 10 alternatives were identified as the most feasible. These alternatives were developed and compared on the basis of cost and non-economic criteria. The alternatives considered in the detailed evaluation are:

- Step feed/standard re-aeration. Existing RAS re-aeration and aeration basins and two new aeration basins of the same depth.

- Step feed/standard re-aeration/new deep basins. Existing RAS re-aeration and aeration basins and two new deeper aeration basins.

- Step feed/standard re-aeration/new deep basins/fixed media. Existing RAS re-aeration and aeration basins and two new deep aeration basins. The basins would have fixed media installed to increase treatment capacity.

- Step feed/standard re-aeration/increased HGL with fixed media. Existing RAS re-aeration and aeration basins and two new aeration basins of the same depth. Basins would be operated at an increased hydraulic grade level (HGL) (less freeboard than at present) and would have fixed media installed to increase treatment capacity.

Conceptual designs were developed for each alternative. All alternatives included four new final clarifiers. The estimated costs for each alternative are presented in Table 5.5.

Table 5.5
Comparative Conceptual Cost Estimates for Secondary Treatment Alternatives[a,b]
($ 1000)

Alternative	Description	Capital Cost	Annual O&M Cost	Present Worth Cost[c]
1	Step feed/standard re-aeration	$82,000	$1,350	$104,000
2	Step feed/standard re-aeration/new deep basins	$100,000	$1,700	$120,000
3	Step feed/standard re-aeration/new deep basins/ fixed media	$93,000	$1,500	$130,000
4	Step feed/standard re-aeration / increased HGL with fixed media	$100,000	$1,600	$136,000

[a] All conceptual costs are total, and are used for the purpose of comparing alternatives. Cost estimates will be continuously refined as the design proceeds.
[b] All alternative costs include 4 new final clarifiers.
[c] Present worth calculations include periodic equipment repairs and replacements not shown in annual O&M Costs.

Recommendation

Alternative 1 is the recommended alternative. Alternative 1 was selected on the basis of cost and the following non-economic factors.

- O & M - The operation and maintenance of the aeration diffusers will be easier for Alternative 1 than for Alternatives 3 and 4 because there will not be any fixed media.

- Reliability - Conventional aeration is a more proven concept then the use of fixed media within aeration basins.

The final clarifiers were sized for a peak-month loading rates of 35 lb/d/ft^2 and a peak month hydraulic loading rate of 1200 gpd/sf. They will be provided with Stamford Baffles at the launders to divert density currents away from the effluent weirs.

5.4.7 Disinfection

Alternatives

The disinfection facility will be expanded to an ultimate peak capacity of 875 mgd. Five disinfection alternatives were evaluated to meet the current NPDES permit limits for fecal coliform and residual chlorine: 1) chlorination for all flow; 2) hypochlorination for all flow; 3) ultra-violet disinfection (UV) for all flow; 4) chlorination with UV for wet-weather secondary effluent; and 5) hypochlorination with UV for wet-weather secondary effluent.

The disinfection alternatives were evaluated both in terms of cost and non-economic factors. The comparative capital, O&M, and present worth costs are shown in Table 5.6. All alternatives, except Alternative 3, include the cost of dechlorination with sodium bisulfite.

Table 5.6
Comparative Conceptual Cost Estimates for Disinfection Alternatives[a,b]
($ 1000)

Alternative	Description	Capital Cost	Annual O&M Cost	Present Worth Cost
1	Chlorination	$27,000	$1,200	$44,000
2	Hypochlorination	$25,000	$3,000	$64,000
3	UV	$109,000	$2,100	$181,000
4	Chlorination / UV	$40,000	$1,300	$62,000
5	Hypochlorination / UV	$37,000	$2,700	$79,000

[a] All conceptual costs are total, and are used for the purpose of comparing alternatives. Cost estimates will be continually refined as the design proceeds.
[b] All costs, except for Alternative 3, include dechlorination with sodium bisulfite.
[C] Present worth calculations include periodic equipment repairs and replacements not shown in annual O&M Costs

Recommendation

Alternative 2, Hypochlorination, is recommended. Alternative 3 was eliminated on the basis of cost. Non-economic factors led to the elimination of the chlorination alternatives (1 and 4) even though they were less expensive than their hypochlorination counterparts. Of the remaining alternatives (2 and 5), Alternative 2 was recommended because it has the lower estimated present worth cost. Following are the non-economic reasons for selecting the hypochlorination alternatives over the chlorination alternatives:

- O & M - Less operation and maintenance, in terms of manpower and skill, is required for a hypochlorination system. The only major pieces of equipment required are chemical metering pumps. Chlorination requires evaporators and chlorinators.

- Environmental Considerations - Hypochlorination uses a liquid (sodium hypochlorite) rather than a compressed gas that is used in chlorination. The liquid solution presents less of a hazard to workers and is less of a public safety concern in the event of a spill or leak.

Dechlorination equipment is not included in the CIP. Although dechlorination alternatives were evaluated in the concept design phase of the CIP, operating experience indicates that an average chlorine residual of 0.5 mg/L can be achieved by controlling chlorination. However, because the 0.5 mg/L cannot reliably be held as an absolute under all conditions. Provisions will be made in designing the facilities to allow for installing of dechlorination equipment if required in the future.

5.5 LIQUID PROCESS ODOR CONTROL

The major sources of odor that have been identified at the plant include the main pump station, grit chambers, open pre-aeration and primary-sedimentation tanks, aeration basins and final clarifiers, the grit and screenings truck-loading station, and the lime/truck loading facility.

Five treatment technologies and one reuse option were evaluated initially for odor control at ALCOSAN: Wet scrubbing, thermal treatment, biofiltration, carbon adsorption, and foul air reuse for aeration. After a detailed review and analysis of each option, wet scrubbers and thermal treatment were evaluated for preliminary treatment. Wet scrubbers were evaluated in detail for the primary sedimentation tanks, aeration basins, and final clarifiers.

Due to the site layout, three separate odor-control systems are recommended: one each for the preliminary treatment, primary treatment, and secondary treatment processes. Odor capture and treatment alternatives were developed and evaluated for each of the three systems. In general, alternatives were evaluated both in terms of cost and non-economic criteria. The following non-economic (selection) criteria were used in the odor-control evaluations:

- Accessibility and maintainability
- Implementation
- Reliability
- Instrumentation and control
- Safety issues
- Environmental effects (noise, aesthetics, waste [e.g., spent carbon])
- Space requirements

Table 5.7 summarizes the selected alternatives. The following sections contain a discussion of the alternatives for each of the three systems.

5.5.1 Headworks and Preliminary Treatment

The current odor-control system treats foul air from the wet well, rack room, rack channel, grit room, screenings and grit truck-loading station, and grit-handling room. Foul air is routed to the FBIs and afterburners (ABs) for thermal treatment. This system will not provide sufficient capacity and redundancy for the entire air stream of the expanded preliminary treatment facilities. The proposed headworks and preliminary treatment odor-control system will take advantage of the existing thermal-treatment system but provide new facilities for additional capacity and redundancy. The selected alternatives include one complete redundant process train for each odor-control facility.

Table 5.7
Summary of Selected Alternatives for Liquid Treatment Odor Control

Process	Selected Odor Control Alternative
Headworks and preliminary treatment	Two-stage wet scrubbers with the option to use the existing FBI/AB system.
Primary treatment	Low profile concrete covers (removable only in emergency) over middle portion of tanks. Buildings over chain-and-flight areas at each end. Two-stage wet scrubber system for all foul air.
Secondary treatment Aeration basins	Low profile concrete covers with single-stage packed-tower wet scrubbers
Final clarifiers	Low profile dome aluminum covers with single-stage packed-tower wet scrubbers
Disinfection	None required

Alternatives

Three alternatives were considered for the headworks and preliminary treatment odor control system:

1. Packed-tower scrubbers. The full headworks/preliminary treatment air flow will be treated by two-stage packed-tower scrubbers.

2. Recuperative afterburners. The full headworks and preliminary treatment air flow will be treated by new recuperative ABs in which heat is recovered for in-plant energy uses.

3. Recuperative afterburners and packed-tower scrubbers. The headworks and preliminary treatment air flow will be split between one train of recuperative ABs in which heat is recovered for in-plant steam and power generation and two trains of packed-tower scrubbers.

The alternatives were evaluated in terms of both cost and non-economic criteria. The conceptual cost estimates are included in Table 5.8.

Table 5.8
Comparative Conceptual Cost Estimates for Headworks and Preliminary Treatment Odor-Control Alternatives[a,b]
($ 1000)

Alternative	Description	Capital Cost	Annual O&M Cost	Present Worth Cost
1	Packed tower scrubbers	$5,600	$770	$13,700
2	Recuperative afterburners	$20,400	$2,120	$43,200
3	Recuperative afterburners and packed-tower scrubbers	$7,800	$1,390	$20,800

[a] All conceptual costs are total, and are used for the purpose of comparing alternatives. Cost estimates will be refined continually as the design proceeds.
[b] All alternatives include the option to utilize the existing FBI/AB system.

Recommendation

Alternative 1, Packed-tower scrubbers, is the recommended alternative. All alternatives provide the same degree of odor treatment, which is the main concern, but Alternative 1 was recommended because it is considerably less expensive than the other two alternatives. Non-economic benefits of the selected alternative are as follows:

- Maintainability - Only one new system must be maintained compared with two new systems in Alternative 3.
- Reliability - A higher degree of redundancy, at a lower cost, can be provided using wet scrubbers than using afterburners.
- Flexibility - Wet scrubbers can be run as single-stage during periods of low loadings and as two-stage during periods of high loadings.
- Environmental effects - Scrubbers do not create NOx emissions.

5.5.2 Primary Treatment Odor Control

It was determined that every odor-control alternative would include covers. The covers must perform two functions: capture odorous air during normal operations, and capture odorous air during tank maintenance. Unless combined with an enclosed structure, flat portable covers alone were eliminated from further consideration because they would not capture odors during maintenance.

Three configurations of covers, each having two treatment scenarios, were evaluated for the primary treatment odor-control systems. Treatment Scenario A is based on the assumption that all odorous air is sent to the primary odor-control system. Treatment Scenario B is based on the assumption that the odorous air is split between reuse in aeration and the odor-control system. The alternatives are as follows:

1A. Metal building, no intermediate covers. Single-stage wet scrubbers would treat all air flow from building.

1B. Metal building, no intermediate covers, air reuse. A portion of the air will be reused for aeration air, the remainder will be treated with single-stage wet scrubbers.

2A. Metal building with intermediate flat covers. Flat, removable covers will be placed directly over the tanks. Some building air will be used for make-up air under the tank covers, the remainder will be treated in single-stage wet scrubbers. Two-stage scrubbers will treat the more concentrated tank-ventilation air.

2B. Metal building with intermediate flat covers and air reuse. Same as alternative 2A except a portion of the building air will be reused as aeration air.

3A. Flat concrete covers in middle, buildings on ends. Buildings will be constructed over the chain-and-flight areas to province easy access for routine maintenance. The remaining middle portion of the tanks will have permanent covers (removable in emergency). Building air will be drawn under the tank covers and routed to two-stage scrubbers for treatment.

3B. Flat concrete covers in middle, buildings on ends, air reuse. Same as alternative 3A except that a portion of the building air will be reused as aeration air.

The alternatives were evaluated on the basis of both cost and non-economic criteria. The conceptual cost estimates are shown in Table 5.9.

Table 5.9
Comparative Conceptual Cost Estimates for Primary Treatment Odor-Control Alternatives
($ 1000)

Alternative	Description	Total Capital Costs	Annual O&M Costs	Present Worth Cost
1A	Metal building, no covers	$18,800	$1,340	$31,500
1B	Metal building, no covers, air reuse	$18,100	$1,180	$29,200
2A	Metal building, intermediate flat covers	$20,300	$830	$28,200
2B	Metal building, intermediate flat covers, air reuse	$20,000	$730	$26,900
3A	Permanent flat covers in the middle, metal buildings on ends	$12,800	$710	$19,500
3B	Permanent flat covers in the middle, metal buildings on ends, air reuse	$11,100	$480	$15,700

Recommendation

Alternative 3A, flat concrete covers over each tank with buildings over the open influent and effluent ends, is the recommended alternative.

Scenario B of each alternative was eliminated from further consideration after reviewing the projected present worth costs. The projected cost savings of such a system do not outweigh the complexity it imparts on operation and upkeep. Alternative 3A was recommended on the basis of low present-worth cost and the following non-economic factors:

- Reliability - The tight concrete covers over the majority of the tanks cannot be removed by hand and ensure that odors are contained.

- Accessibility and Maintainability - The open chain-and-flight areas provide easier access to the critical mechanical parts for maintenance and repair. In addition, this alternative has the least number of scrubbers, therefore it is easy to maintain.

- Environmental Effects - This alternative has a two-stage scrubbing system for maximum odor control. In addition, because it has the least number of scrubbers, it creates the least amount of noise pollution.

5.5.3 Secondary Treatment

Similarly to the primary treatment, it was determined that all secondary treatment odor-control alternatives would include covers. Alternatives were evaluated separately for the aeration basins/mixed-liquor channels and the final clarifiers.

5.5.3.1 Aeration Basins and Mixed-Liquor Channels

Alternatives

Two alternatives were considered for the aeration basins and the mixed-liquor channels:

1. Covers and Stack Dispersion - Each basin would have a separate cover. Air would be collected and conveyed to a 40-foot stack for dispersion.

2. Covers and Wet Scrubbing - Similar to the first alternative except that the captured air would be sent to packed tower wet scrubbers for treatment.

It is recommended that the covers be concrete with multiple hatches and skylights for maintenance and observation. The aeration basin odor-control alternatives were evaluated both in terms of cost and non-economic factors. The comparative capital, O&M, and present worth costs are shown in Table 5.10. The estimated costs are essentially equal and therefore, non-economic issues were the deciding factors.

Recommendation

Because the aeration basin and mixed-liquor channel off-gas is considered a large source of significantly odorous air, Alternative 2, packed-tower wet scrubbers, is recommended. Although both the estimated capital and O&M costs are slightly higher for the wet scrubbers, the non-economic benefits of Alternative 2, compared to Alternative 1, outweigh the difference in cost.

Stack dispersion does not provide treatment and therefore has the potential to emit odors during periods of particularly concentrated odorous air. Scrubbers tend to provide more consistent control even during periods of fluctuating influent concentrations.

Table 5.10
Comparative Conceptual Cost Estimates for Aeration Basin Odor-Control Alternatives[a]
($ 1000)

Alternative	Description	Capital Cost	Annual O&M Cost	Present Worth Cost
1	Covers and stack dispersion	$10,800	$186	$12,600
2	Covers and packed-tower wet scrubbers	$13,500	$428	$17,600

[a] All costs include odor control for the existing plus and new basins.

Final Clarifiers

Alternatives

Three alternatives were considered for the final clarifiers:

1. Covers and stack dispersion. Each clarifier would have a separate cover made of aluminum or fiberglass reinforced pipe (FRP). Air would be collected and conveyed to a 40-foot stack for dispersion.

2. Covers and wet scrubbing. Similar to the first alternative except that the captured air would be sent to packed-tower wet scrubbers for treatment.

3. Covers and activated carbon adsorption. Similar to the latter alternative except that the captured air would be sent to activated carbon scrubbers.

Both flat and dome covers, made out of FRP or aluminum, were considered, and flat, aluminum covers are recommended. With dome covers, the clarifier drive mechanism would have to be placed underneath. This is undesirable because maintenance workers would have to enter the covers to maintain the drives, center well, and sludge return box. In addition, the added space under the dome will increase the air volumes and require larger odor-control equipment. Aluminum is recommended over FRP because FRP manufacturers have not had experience with installations of this size.

The comparative capital, O&M, and present worth costs are shown in Table 5.11. They were developed assuming low-profile dome aluminum covers were used.

Table 5.11
Comparative Conceptual Cost Estimates for Final Clarifiers
Odor-Control Alternatives[a]
($ 1000)

Alternative	Description	Capitnl Cost	Annual O&M Cost	Present Worth Cost
1	Flat covers and stack dispersion	$17,400	$142	$19,013
2	Flat covers and packed-tower wet scrubbing	$19,200	$356	$23,243
3	Flat covers and activated carbon scrubbers	$19,000	$439	$23,985

[a] All costs include odor control for the existing and new final clarifiers.

Recommendation

Alternative 2, packed-tower scrubbers, is the recommended alternative. The present worth cost of all three alternatives is approximately equal. However, the cost of Alternatives 2 and 3 is slightly higher due to the higher O&M costs associated with the scrubbers. As discussed for the aeration alternatives, the non-economic benefits of the scrubber alternatives as compared with dispersion stack outweigh the difference in cost. Alternative 2 is recommended over Alternative 3 for both aesthetic and maintainability reasons. The non-economic factors which led to the selection of Alternative 2 are:

- Accessibility and Maintainability - Alternative 2 requires less maintenance than Alternative 3 because it does not need carbon replacement or regeneration.
- Reliability - Stack dispersion does not provide treatment and therefore has the potential emit odors during periods of particularly concentrated odorous air. Scrubbers tend to provide more consistent control even during periods of fluctuating influent concentrations.
- Environmental Effects - Alternative 2 generates less waste than Alternative 3 (spent carbon).

Preliminary investigations indicate that the existing clarifiers should be able to support the lightweight covers and snow load without any structural modifications.

5.6 SOLIDS HANDLING COMPONENT ALTERNATIVES

This subsection addresses individual solids-handling components that will comprise the overall scheme for handling solids. Alternatives for the physical integration of these components are evaluated in Subsection 5.6.

5.6.1 Preliminary Sludge Treatment

Grit removal reduces the wear and failure of equipment, especially in sludge pumping and feed equipment. Using a vortex process (such as a "teacup") to degrit sludge was considered, but was not included in the final proposal for solids-process trains because improved grit removal from the raw wastewater is proposed as part of the future hydraulic expansion.

In order to assure that processes for down stream solids are not adversely affected by debris in the sludge, a unit process is required to remove the debris before thickening and dewatering. Screening is the simplest and most effective way to remove debris from thin sludge. Pressure screens, rotary screens, and channel screens were considered. Channel screens were recommended.

5.6.2 Thickening and Dewatering

When PS and WAS settle together, they are a major source of odors. Therefore, the practice of co-thickening WAS with the PS in the primary-sedimentation tanks should be eliminated. Regardless of the future intent to cover, capture, and treat the odors from the primary-sedimentation tanks, the generation of odors should be reduced at the origin. This will help ensure reduced odors in plant emissions in general, improve the odor and corrosion conditions that will exist under the covers, and decrease odor release in the solids-handling processes downstream.

Consequently, it was recommended that WAS should bypass the primary-sedimentation tanks and be pumped directly to solids processing for mechanical thickening. Primary sludge would be gravity thickened in the primary sedimentation tanks. The mechanically thickened WAS would be combined with the gravity thickened PS before dewatering.

Alternatively, PS blankets could be minimized by continuously pumping a "thin" sludge. The WAS and thin PS must be thickened prior to dewatering in order to achieve maximum dryness in the dewatering process and efficiently size the dewatering equipment. Two processes were evaluated for thickening, horizontal solid-bowl centrifuges and GBTs. Experience in other wastewater treatment facilities has shown that the combined sludges do not co-thicken well in centrifuges. Also the centrifuges are much more capital intensive than GBTs. The capital cost for

thickening, including odor control is estimated at 82 percent less than thickening with centrifuges, and the present worth is estimated at 40 percent less. GBTs also require less power, provide more operational flexibility, and do not introduce a new type of technology to the ALCOSAN solids processes. Therefore, GBTs were selected for the sludge-thickening process.

Two processes also were evaluated for dewatering. These were centrifuges and BFPs. Both processes would provide effective dewatering of the thickened sludge. The centrifuges would use more power and the BFPs would use more chemicals. The centrifuges represent a higher capital expenditure. The capital cost for BFP dewatering, including odor control is estimated at 6 percent less than dewatering with centrifuges. In terms of present-worth cost BFPs and centrifuges are approximately equal. In addition, because BFPs are not a new technology to ALCOSAN, they were recommended for dewatering PS and WAS.

5.6.3 Sludge Conveyance

The current belt conveyor is an open conveyance system that allows odors from the dewatered cake to be released throughout the dewatering room. Due to the effects of odors, the use of open-belt conveyors for transporting dewatered sludge is not desirable. Therefore, it was recommended that all belt conveyors in the dewatering building and the lime stabilization area be replaced with screw conveyors that will more readily contain odors.

Two reversible screw conveyors would be located in the dewatering room along the discharge end of each row of BFPs. The two screw conveyors would enable the sludge cake from any BFP to be discharged to either incineration or lime stabilization. At the connection between the dewatering building and energy recovery building, replacing the inclined-belt conveyors with screw conveyors is not recommended due to the steep incline. Therefore, these existing belt conveyors will be completely enclosed and the air in the enclosure will be drawn to the dewatering building odor-control system.

5.6.4 Drying and Incineration

The two thermal drying units (TDUs) have the capacity to dry the projected peak week sludge production. Therefore, the capacity of the TDUs is adequate and no additional units are recommended.

The FBI facility has the capacity to process 100 percent of future Phase I peak-week sludge projections under normal operations; however, each of the FBIs can be expected to be out of service for 5-6 weeks per year for scheduled and unscheduled maintenance. During the maintenance periods, the incinerator capacity would not be sufficient to treat average day loads. While the two existing incinerators provided sufficient capacity for existing and Phase I demands,

the combined capacity of the existing incinerators is not sufficient to meet the ultimate peak-week demand. Therefore, it is recommended that a third FBI be installed.

5.6.5 Lime Stabilization

Two 50-ton lime silos are used for bulk storage of pebble lime. A third silo is available but is not connected. It is recommended that the third silo be connected in order to add additional useful storage.

Although the existing lime/sludge mixers appear to provide sufficient capacity, the mixers do not always adequately mix the lime and sludge, which results in large amounts of fugitive lime dust. In addition, plant management has stated the desire to be able to produce a Class-A sludge product at some point in the future, which will require increased quantities of lime and increased mixing efficiency. Therefore, it is recommended that the mixers be replaced because new mixers will provide more efficient lime mixing and use, provide a more uniform product, and will reduce dust and odor emissions.

The existing truck loading bays were sized for short-bed ALCOSAN dump trucks but also are used to load the lime/sludge product into tractor trailers used by BIOGRO. The garage doors to the truck loading bays cannot be closed when the large trucks are being loaded. This results in significant release of odors from the truck loading bay. These odor-related problems must be addressed in any of the alternatives being considered for lime stabilization.

5.6.6 Polymer System

The existing polymer feed systems are not capable of feeding dry polymer. Current vendor-supplied pricing indicates that using dry polymers at ALCOSAN would provide an economic advantage (up to about 10 percent annual savings on polymer costs). Future advances in polymer technology could conceivably increase this economic advantage. Therefore, it is recommended that a new polymer feed system be installed which provides the flexibility to feed both dry and liquid polymers.

5.6.7 Scum and Skimmings

The existing scum and skimmings collection and treatment system is sufficiently sized to treat anticipated loads collected from the primary sedimentation tanks. This system generally appears to be adequate and no major problems were identified. Modifications to this system should only be considered in the future.

5.6.8 Liquid Waste Receiving Facilities

The present method for unloading liquid wastes at the plant results in significant odors. As an interim solution to the odor problems, it is recommended that the existing manhole used to receive liquid waste be modified and retrofitted with odor control. The odor control system will become permanent upon completion of the primary-sedimentation odor control system.

5.7 SOLIDS-PROCESSING ALTERNATIVE EVALUATION

Three solids-processing alternatives (Nos. 1A, 1B, and 2) were developed utilizing the components discussed above. All of the alternatives rely on the same basic unit-process scheme but differ in location, layout, and to a lesser degree, number and sizing of equipment. The general unit-process scheme for all three alternatives can be summarized as follows:

- Reducing odor generation by removing WAS from the primary-sedimentation tanks
- Providing the capability to pump a "thin" or thickened primary sludge
- Screening the mixed WAS and PS through channel screens
- Co-thickening the WAS and PS using GBTs
- Providing odor containment and control for the thickening processes
- Dewatering the WAS and PS using BFPs
- Providing odor containment and control for the dewatering processes and related sludge cake conveying equipment
- Providing incineration capacity to handle 100 percent of projected peak week demands
- Providing odor containment and control for conveying and processing equipment in the energy recovery building
- Providing lime stabilization capacity to handle 100 percent of projected peak-week demands
- Providing odor containment and control for the lime stabilization processes

Descriptions of the alternatives and economic and non-economic comparisons are provided below.

5.7.1 Alternative Descriptions and Layouts

Alternative 1A - Upgrade existing facilities, no quick lime/sludge loadout capability

Alternative 1A and 1B are identical in almost all respects. The major difference is that Alternative 1B provides a quick loadout storage bin for storing and loading lime-stabilized sludge into trucks, and 1A does not. Both alternatives rely on using the existing dewatering and lime/truck loading buildings to the greatest extent possible. The dewatering building would be modified internally but would not be physically expanded. The lime/truck loading building would be expanded to house full-length tractor trailers, providing odor containment that is not possible today.

Co-thickening WAS and PS in the primary-sedimentation tanks will not be part of future routine operations. Rather, WAS will bypass primary sedimentation and PS will be thickened in the primary clarifiers.

The two sludges will be screened. Screened sludge will flow by gravity into one of the two existing sludge mixing tanks. The existing permanganate system will continue to provide odor control by injecting permanganate into the discharge piping from the existing and proposed mixing tanks.

GBT feed pumps will charge a sludge header feeding the new GBTs. Polymer injection into the individual GBT feed loops will be provided by the new polymer system.

Thickened sludge will be discharged from the GBT's into hoppers that will feed progressing cavity pumps. These thickened sludge pumps will feed sludge into a BFP feed tank provided for thickened sludge storage. Ten BFP feed pumps, (one for each BFP) will pump sludge from the tank to the BFP's. Each BFP will have its own dedicated pump. Polymer injection will be provided into the sludge piping for each BFP.

Each BFP will discharge into a chute that will direct the cake on to one of two belt conveyors. One conveyor will direct the cake to the lime building while the other will direct it to pumps that will pump to the Energy Recovery Building. All conveyors will be enclosed for odor containment. The GBT and BFP rooms, overall BFP room air, BFP building first floor, BFP building basement, and belt conveyor air all will be collected and treated for odors.

No sludge handling or process modifications are proposed under Alternatives 1A and 1B for the energy recovery building. However, under all three alternatives (1A, 1B and 2) a third FBI is proposed in Phase III in order to provide needed capacity and redundancy to the incineration process. Odor control for the energy recovery building will be based on returning the building is foul air streams to the foul air plenum and treating them with the incinerator/afterburner systems.

The existing lime/truck loading building will be expanded in both length and width. The overall building length will be expanded to allow full-length tractor trailers to load inside with the garage bay doors closed. This will allow odor containment that is not possible today.

The existing lime silos will be reused. The third silo, currently not connected, will be used in the new bay to the south.

Alternative 1B - Upgrade existing facilities, provide quick loadout

Alternative 1B is identical to 1A except the expansion of the existing lime/truck loading building provides a lime/sludge storage bin and quick loadout capability for rapid truck loading. This capability provides significant process flexibility, especially with regard to truck logistics, and the ability to get trucks loaded and off site, reducing the potential for odor.

Alternative 2 - Construct New Thickening and Dewatering Facilities

Under Alternative 2, a new thickening and dewatering facility is proposed. The existing dewatering facility would remain in service until the new one was completed. Once the new system is on line, the existing dewatering building would be converted into O & M work and office space. A new lime stabilization facility also is proposed, to be located adjacent to the new thickening and dewatering facility. The new dewatering facility would consist of a building on stilts above the existing power generation building and attached to the existing energy recovery building. The new lime stabilization building will be attached to the new dewatering building. These new facilities are collocated with the energy recovery building, keeping all sludge handling in a central location. This minimizes conveying requirements, reduces odorous air volumes requiring treatment, and centralizes operations.

Cost Estimates

Cost estimates were prepared for the purpose of evaluating process alternatives. Table 5.12 summarizes the capital cost by major process and provides a total cost for each Alternative. Costs are separated into those incurred in Phase I and those incurred later.

Table 5.12
Solids Processing Alternatives Conceptual Capital Cost Summary

Process	Alternative 1A: Upgrade existing facilities, no quick loadout		Alternative 1B: Upgrade existing facilities, provide quick loadout		Alternative 2: Construct new facilities, providing quick loadout	
	Phase I ($ millions)	Remaining ($ millions)	Phase I ($ millions)	Remaining ($ millions)	Phase I ($ millions)	Remaining ($ millions)
Thickening	6.0	0.0	6.0	0.0	6.4	0.0
Dewatering	2.8	9.8	2.8	9.8	10.4	0.0
Lime stabilization	2.1	0.0	4.4	0	4.4	0.0
Incineration	0.0	11.6	0.0	11.6	0	11.6
Odor control	13.6	0.0	13.6	0.0	12.1	0.0
Building rehab / new construction	2.4	0.0	2.4	0.0	8.3	0.0
Construction credit [a]	0.0	0.0	0.0	0.0	-4.0 [a]	0.0
Phase totals	26.9	21.4	29.2	21.4	37.6	11.6
Project totals		48.3		50.6		49.2

[a] Under Alternative 2, a 4 million dollar credit is given for the value of the existing dewatering building shell, which will be retrofitted to provide operations and maintenance working spaces.

Table 5.13 Provides a summary of the annual O&M cost. These costs should only be used for comparison of the three alternatives.

Table 5.13
Annual O&M Conceptual Cost Summary

Item	Alternative 1 A and 1B Annual Cost ($/year)	Alternative 2 Annual Cost ($/year)
Utilities / power	$1,526,000	$1,526,000
Chemicals	$1,602,000	$1,602,000
Labor	$1,526,000	$1,526,000
Maintenance materials	$76,000	$76,000
Odor control	$398,000	$241,000
Total annual cost	$5,128,000	$4,971,000

Table 5.14 provides a summary of the phased capital cost, O&M cost, and the resulting project present-worth cost based on a 20-year project life cycle.

Table 5.14
Present Worth Cost Summary for the Solids Processing Alternatives

Cost Component	Alternative 1A: Upgrade existing facilities, no quick loadout	Alternative 1B: Upgrade existing facilities, provide quick loadout	Alternative 2: Construct new facilities, providing quick loadout
Capital cost phase I	26.9	29.2	37.6
Capital cost remaining	21.4	21.4	11.6
Total project capital cost	48.3	50.6	49.2
Present worth of annual cost	58.3	58.3	56.5
Total project present worth	106.6	108.9	105.7

Non-Economic Factors

The alternatives also have been subjected to non-economic analyses. The ranking of the alternatives for the non-economic factors is presented in Table 5.15.

Table 5.15
Non-Economic Factor Comparison

Criteria	Alternative 1A: Upgrade existing facilities, no quick loadout	Alternative 1B: Upgrade existing facilities, provide quick loadout	Alternative 2: Construct new thickening and dewatering facilities
Technical reliability and redundancy	2	4	4
Odor control	1	4	4
Odor control implementation schedule	4	4	3
Operation and maintenance	2	2	3
Space requirements	2	2	3
Flexibility	3	4	4
Environmental considerations	3	3	3
Constructability	2	2	3
Total Score	**19**	**25**	**27**

Based on non-economic factors, construction of a new thickening and dewatering facility (Alternative 2) is preferred. The considerations in reaching this conclusion are presented below.

Technical Reliability and Redundancy

The technical reliability of all of the alternatives is equal (because the same basic process equipment is used), but Alternative 1A is considered inferior to the other alternatives because no quick-loadout/storage ability is provided for the lime facility. Therefore, Alternatives 1B and 2 have more flexibility (and system reliability) provided by the quick loadout.

Odor Control

Alternatives 1B and 2 are rated higher because the quick-loadout/storage capability maximizes truck loading efficiency, which has a well-documented effect on plant odors. The storage provided minimizes the need to park loaded trucks on-site overnight.

Odor Control Implementation Schedule

Alternatives 1A and 1B are rated higher than Alternative 2 because they can be implemented faster. It is anticipated that by using the existing facilities and not waiting to construct the new buildings, improving odor control in solids handling can be implemented faster than for Alternative 2 due to construction requirements.

Operations and Maintenance

Alternatives 1A and 1B require the same degree of O & M effort (the systems are virtually identical). Alternative 2 is rated slightly higher because the conveying systems are less complex and all of the solids treatment processes are more centrally located.

Space Requirements

Although Alternative 2 requires the construction of a new facility, it is rated slightly higher than the other alternatives because the total new facility footprint does not require additional land and it frees the existing dewatering building space for other uses (i.e., the O & M building).

Flexibility

Alternative 1A is considered inferior to Alternatives 1B and 2 because no quick-loadout and storage capability is provided. Quick loadout/storage provides Alternatives 1B and 2 with the flexibility to process sludge (including peak loads) with relative independence of truck availability.

Environmental Considerations

All three alternatives are rated the same in terms of visual aesthetics, noise, and operator comfort.

Constructability

Alternative 2 is considered superior under this criterion because the entire facility can be built without interfering with plant operations.

Recommendation

As discussed above, Alternative 1A does not provide solutions to the several odor-control problems related to the lime/truck loading building, and therefore it is not recommended. The other two alternatives, 1B and 2, are considered equal based on economic criteria. On the basis of non-economic criteria, Alternative 2 is preferred; however, Alternative 1B can be implemented one year earlier, which is considered of vital importance in controlling odor emissions from the solids processes. Because timeliness is considered the premiere issue, Alternative 1B is recommended.

5.8 PLANT SIMULATION MODELING

A dynamic plant simulation model has been developed of the expanded ALCOSAN plant. A general purpose simulator (GPS-X) model was used as a simulation platform for model development and calibration. The benefits of various operational control strategies can be investigated using this simulation platform.

The model can be used for several purposes, including predicting the quality of plant effluent under various dynamic (as opposed to steady-state) loading conditions, operating configurations, and process optimization. For the ALCOSAN plant, GPS-X was used to model primary sedimentation, biological treatment, and final clarification. Step-feeding the aeration basins, and by-passing of primary and secondary treatment are some of the operating strategies investigated with GPS-X.

This model simulates treatment process kinetics and performs mass balance calculations. The biological treatment models incorporated in GPS-X and used for the ALCOSAN plant modeling exercise can simulate carbon oxidation, nitrification, and denitrification. The settler models used in GPS-X are able to predict the height of the sludge blanket and provide a solids profile within the primary-sedimentation tanks and final clarifiers, including effluent suspended solids and underflow concentrations.

A sampling and process monitoring program was conducted in the summer of 1994 to collect data that was used to calibrate the model of the existing plant. Comparison of the measured plant data and the model-predicted data indicates that the calibration is sufficiently complete to predict plant behavior. The expanded plant model incorporates the results of the model calibration, including stoichiometric, kinetic, and settling coefficients that best simulate the treatment processes at ALCOSAN.

The calibration conducted on the model of the existing plant was translated to a new model developed to represent the expanded plant as proposed by the CIP. The expanded plant model incorporates the following process expansion and upgrade projects over the multi-phased improvement program:

- Construction of one new primary sedimentation tank
- Conversion of the two pre-aeration tanks into primary-sedimentation tanks
- Discontinued WAS co-settling in the primary-sedimentation tanks under normal conditions
- Construction of new primary and secondary bypass capability
- Construction of two new four-pass aeration basins
- Construction of four new final clarifiers (two in the first expansion phase and two at a later date).

SECTION 5
Alternatives Analysis

The calibrated model of the expanded plant was used to predict plant performance under a variety of influent flow and load conditions for dry-weather (250 mgd) expansion and wet- weather (300 mgd to 875 mgd) expansion .

Dry-Weather Modeling Scenarios

For dry-weather expansion modeling scenarios, the plant's primary-sedimentation tanks, aeration basins, and final clarifiers physical design criteria reflected the first phase of the plant expansion: 3 new primary-sedimentation tanks (9 total); 2 new aeration basins (8 total); and 2 new final clarifiers (14 total). No flow was bypassing primary or secondary treatment. The following dry-weather scenarios that were tested by the model and their results were:

- Performance at Phase I Maximum-Month Flow (250 mgd) with All Units Operating and Plug-Flow Mode in the Aeration Basins

  Flow and loading was based on the flow-and-mass balance developed for the preliminary design. Input data to the model was taken from the mass balance for raw sewage plus recycle streams, because the model does not include a separate recycle flow stream. Influent loading was as follows: Flow of 250 mgd, carbonaceous biochemical oxygen demand ($CBOD_5$) concentration of 138 mg/L, and TSS concentration of 224 mg/L.

  This scenario predicts steady-state plant performance for a maximum-month flow rate of 250 mgd with diurnal variations. The expanded plant will provide very good quality effluent ($CBOD_5$ concentration of 6 mg/L, and TSS concentration of 16 mg/L).

- Determination of Maximum Allowable Sustained Dry-Weather Flow, Plug-Flow Mode in the Aeration Basins

  In order to determine the maximum treatable sustained flow, the influent flow was increased gradually until the plant was unable to meet permit limitations in plug-flow mode. Average influent plus recycle stream $CBOD_5$ and TSS concentrations were used for loading the model, 102 mg/L and 146 mg/L, respectively.

  The phase-one expanded plant will be able to treat a maximum sustained dry-weather flow of 290 mgd with all process units in service and still meet current effluent $CBOD_5$ and TSS discharge criteria. Final effluent $CBOD_5$ and TSS concentrations were predicted to be 6 mg/L and 18 mg/L, respectively. (Note that the previous hydraulic modeling by EPM determined that the hydraulic capacity of

the plant is (and will be after Phase I expansion) 285 mgd. The headworks limits the hydraulic capacity.)

Wet-Weather Modeling Scenarios

The wet-weather treatment model scenarios concentrated on the effects of treating various quantities of high wet-weather flows at the expanded plant and optimizing bypass quantities. The proposed operating strategy was different for each of the three different peak flow rates (500 mgd, 750 mgd, and 875 mgd). The following wet-weather scenarios that were tested by the model and their results were:

- Performance of Plant with Wet-Weather Peak Flow of 528 mgd

  The typical dry-weather flow and load and stormwater influent flow and load were combined as the plant influent. The peak flow rate was set at approximately 528 mgd. No primary bypass was initiated, and the optimal secondary bypass flow rate was determined as indicated by the water quality of the plant effluent. Influent flow and loading data was generated from the following assumptions: dry-weather influent $CBOD_5$ and TSS concentrations of 100 mg/L and 160 mg/L, respectively; ramp-time (elapsed time from the start of the wet-weather flow contribution until the peak combined flow of 528 mgd is reached) of 0.1 days; combined wet-weather $CBOD_5$ and TSS concentrations of 30 mg/L and 40 mg/L, respectively; and linear interpolation of influent wastewater strength between the dry-weather and combined wet-weather concentrations.

  Results of the analysis indicate that initiating a secondary bypass during wet-weather events peaking at approximately 528 mgd will optimize plant performance. The model predicts that bypassing approximately 211 mgd around the secondary system (and treating approximately 317 mgd) will provide the best combined effluent water quality. Predicted $CBOD_5$ and TSS concentrations are 16 mg/L and 28 mg/L, respectively.

- Performance of Plant with Wet-Weather Peak Flow of 750 mgd

  This scenario is the same as that for the previous run except that the flow rate was set as 750 mgd rather than 528 mgd. Also, a ramp time of 0.2 days was used instead of 0.1 days.

  During wet-weather events that peak at about 750 mgd, primary and secondary process bypasses should be initiated to optimize effluent water quality. When a

primary bypass of 250 mgd and a secondary bypass of 500 mgd are used, the predicted combined effluent $CBOD_5$ concentration is 21 mg/L and the TSS concentration is 30 mg/L. The model predicts that not initiating bypasses at high flow rates results in solids washout from the primary-sedimentation tanks and the final clarifiers.

- Performance of Plant with Wet-Weather Peak Flow of 875 mgd

  The influent data was generated using the same assumptions that were used for the 750 mgd peak flow rate scenario.

  At a peak wet-weather flow of 875 mgd, the plant will be able to produce fair-quality effluent. When utilizing a primary bypass of 250 mgd and a secondary bypass of 625 mgd, the predicted combined effluent quality is 22 mg/L $CBOD_5$ and 31 mg/L TSS.

5.9 STREAM INFLOW SOURCES

The ALCOSAN Combined Sewer Evaluation has identified 11 locations in the ALCOSAN service area where streams flow into the municipal combined sewer systems. As outlined in Section 4, these sources have been estimated to contribute an average of 683 million gallons annually to the ALCOSAN influent. The water from these stream inflow sources can potentially displace wastewater that otherwise would enter the ALCOSAN deep-tunnel interceptors and the treatment plant. The elimination of these stream inflows would represent additional capacity at the ALCOSAN treatment plant and within the interceptor system.

To provide a basis for further analysis and policy considerations, conceptual designs and cost estimates have been prepared for removing the 11 stream inflow points from the existing combined sewer systems in the ALCOSAN service area. Under the conceptual designs, projects would be limited to removing the stream inflows, and the conveyance of the stream flows through dedicated storm conduits. Storm drainage appurtenances that discharge to the combined sewer systems downstream of the stream inflow sources would remain in place. Hence, the conceptual designs in this Plan do not constitute conventional sewer separation projects.

In sewer separation projects, the sanitary laterals and collection sewers are removed from the combined trunk sewer or interceptor and are reconnected to new sanitary sewers that parallel the old combined sewer. The old combined sewer generally would be used for the storm sewage system because it has been sized to handle the large volumes of stormwater captured by the catch basins. Conventional sewer separation projects currently are considered to be generally cost-prohibitive. The high cost of sewer separation, and a recognition of the high percentage of pollutants that are contained in the initial quantities of storm flows within a combined sewer system, have led to alternative storm and combined sewer management policies such as those contained in the USEPA's CSO Policy.

Under the stream inflow removal concept which has been developed for this Plan, storm sewer piping has been sized to handle the peak flow rate for a 10-year, 24-hour storm using the PaDEP maximum allowable slope of 0.001 ft/ft. The pipes were sized using Manning's uniform flow equation with a Mannings *N* of 0.013. A storm intensity of 0.50 inch/hour was utilized as the design storm for pipe sizing. Preliminary potential alignments of stream conduits are shown on Figure 5-7. These potential alignments are based upon topography, and have not been field verified for constructability.

The estimated combined cost of removing the 11 stream inflow sources from the municipal combined sewer systems is approximately $24 million. The derivation of this figure is shown on Table 5.16.

Map Source: ALCOSAN Combined Sewer Overflow Program

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Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET
0 1000 2000 3000 4000 6000 8000

MILES
0 0.5 1 1.5 2

Legend

- Stream Inflow Areas
- Potential Stream Conduit Routes
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Hydrologic Features

KILBUCK TWP
EMSWORTH BORO
BEN AVON HEIGHTS BORO
BEN AVON BORO
AVALON BORO
WEST VIEW BORO
SHALER TWP
O'HARA TWP
ETNA BORO
SHARPSBURG BORO
LLE TWP
NEVILLE ISLAND
BELLEVUE BORO
STOWE TWP
KENNEDY TWP
RESERVE TWP
MILLVALE BORO
MCKEES ROCKS BORO
CHARTIERS CREEK
BRUNOT IS.
HERRS IS.
Ohio River
Allegheny River
Monongahela River
CITY OF PITTSBURGH
INGRAM BORO
CRAFTON BORO
THORNBURG BORO
PENNSBORO VILLAGE BORO
ROSSLYN FARMS BORO
CARNEGIE BORO
GREENTREE BORO
Saw Mill Run
MT OLIVER BORO
HOMESTEAD
1
2
3
4
5
6
7
8
9
10
11

CDM EPM TEAM CH2MHILL ALCOSAN
Camp Dresser & McKee

Figure 5-7
Stream Inflow Sources and Potential Stream Conduit Routes

Table 5.16
Estimated Cost of Removing Stream Inflow Sources[a]

	Location[b]	Stormwater Conduit Size (42" Min)	Unit	Quan.	Unit Cost[c]	Headwalls No.	Cost[c]	Subtotal	Other Construction Site-work 10%	R.O.W. 15%	Environ.[d] 20%	Subtotal	Engineering @ 15%[e]	Adm. 10%	Contingency @ 40%	Total Capital Cost
1	Southern Ross Township on Jacks Run (Pipe alignment along Jack's Run Rd.)	72	LF	5,800	$216	2	$7,500	$1,267,800	$230,509	$345,764	$461,018	$2,305,091	$345,764	$230,509	$1,152,546	$4,033,910
City of Pittsburgh																
2	Woods Run	42	LF	1,060	$100	2	$7,500	$121,000	$22,000	$33,000	$44,000	$220,000	$33,000	$22,000	$110,000	$385,000
3	Riverview Park	42	LF	1,060	$38	2	$7,500	$55,280	$10,051	$15,076	$20,102	$100,509	$15,076	$10,051	$50,255	$175,891
4	Kilbuck Drive	42	LF	3,170	$100	2	$7,500	$332,000	$60,364	$90,545	$120,727	$603,636	$90,545	$60,364	$301,818	$1,056,364
Conduit to Ohio River for locations 2 - 4		60	LF	6,350	$168	2	$7,500	$1,081,800	$196,691	$295,036	$393,382	$1,966,910	$295,036	$196,691	$983,455	$3,442,092
5	Spring Garden Run	60	LF	13,750	$168	2	$7,500	$2,325,000	$422,727	$634,091	$845,455	$4,227,274	$634,091	$422,727	$2,113,637	$7,397,729
6	Highland Park - Heths Run	42	LF	2,400	$43	2	$7,500	$118,200	$21,491	$32,236	$42,982	$214,909	$32,236	$21,491	$107,455	$376,091
7	Boundary Street	60	LF	5,280	$168	2	$7,500	$902,040	$164,007	$246,011	$328,015	$1,640,073	$246,011	$164,007	$820,037	$2,870,128
8	West End - Cork Run	42	LF	3,170	$32	2	$7,500	$116,440	$21,171	$31,756	$42,342	$211,709	$31,756	$21,171	$105,855	$370,491
9	City of Pittsburgh Sheraden Park	42	LF	1,060	$38	2	$7,500	$55,280	$10,051	$15,076	$20,102	$100,509	$15,076	$10,051	$50,255	$175,891
10	Kennedy Township - St Mary's Cem.	42	LF	4,230	$43	2	$7,500	$196,890	$35,798	$53,697	$71,596	$357,982	$53,697	$35,798	$178,991	$626,468
11	Kennedy Township - Forest Grove	48	LF	7,920	$118	2	$7,500	$949,560	$172,647	$258,971	$345,295	$1,726,473	$258,971	$172,647	$863,237	$3,021,328
	Totals							$7,521,290	$1,367,508	$2,051,261	$2,735,015	$13,675,07	$20,512	$1,367,50	$6,837,538	$23,931,38

[a] Represents estimated costs of re-routing stream inflow points away from existing combined sewers. Costs of catch basin removals and other activities would be included in a full sewer separation project and are therefore excluded.

[b] Source: ALCOSAN Combined Sewer Overflow Evaluation Project - Phase 1.

[c] Installed Costs.

[d] Environmental Contingencies - e.g. rock excavation.

[e] Includes design and resident engineering activities.

5.10 PaDEP DESIGNATED STUDY AREAS

5.10.1 Introduction

As detailed in section 4.0, PaDEP requested that the ALCOSAN 537 Plan address the provision of wastewater treatment at the ALCOSAN treatment plant for communities in watersheds with inadequate collection and treatment facilities and communities that are served by wastewater treatment plants that reportedly have experienced operational problems. Figure 5-8 shows the PaDEP designated study areas with respect to the existing ALCOSAN service area. In this subsection, non-structural and structural roles that ALCOSAN could play in resolving the wastewater management problems in the areas are considered.

The 537 Plan does not contain recommendations for adding the PaDEP designated study areas to the current service area. If mutually agreed to by ALCOSAN and the municipalities in the PaDEP designated study areas, the future service area could be expanded to include parts or all of these areas. The PaDEP designated areas were investigated at the request of PaDEP. ALCOSAN is neither proposing to expand its service area, nor is it recommending that the PaDEP designated areas be added to its service area. The analysis of the PaDEP designated study areas in this plan is intended solely to assess the technical, financial, and institutional feasibility of accepting wastewater from the PaDEP study areas. ALCOSAN is willing to accept new service areas if:

- Existing treatment plant odor problems are corrected before any additional flows are conveyed to the plant
- Additional flows do not create additional odors
- Expansion of the service area does not preclude redevelopment or new development in the existing service area
- Expansion of the service area does not exacerbate problems of managing wet-weather flow in the current service area
- The expansion of the service area benefits the current rate payers

5.10.2 Non-Structural Alternatives

This 537 Plan evaluated connecting the PaDEP designated study areas to ALCOSAN as one approach to addressing localized wastewater management problems. It is possible that some of these problems could be resolved effectively without physical connection to the existing ALCOSAN interceptor system and WWTP through changes to the management, operations and

Map Source: ALCOSAN Combined Sewer Overflow Program

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Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

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FEET
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MILES
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Legend

- Treatment Plant Location
- Treatment Plant Service Areas
- Watershed Areas
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

Kilbuck Run
Toms Run
Longvue No. 1 STP
Oakmont STP
Plum Creek STP
Holiday Park STP
Upper Robinson Run
Millers Run
Dravosburg STP

BEAVER COUNTY
WASHINGTON COUNTY
WESTMORELAND COUNTY
ALLEGHENY COUNTY
CITY OF PITTSBURGH
RICHLAND TWP
PINE TWP
WEST DEER TWP
FRANKLIN PARK BORO
BELL ACRES BORO
LEE TWP
SEWICKLEY HEIGHTS BORO
SEWICKLEY HILLS BORO
CRESCENT TWP
EDGEWORTH BORO
SEWICKLEY BORO
OSBORNE BORO
ALEPPO TWP
GLENFIELD BORO
KILBUCK TWP
CORAOPOLIS BORO
MOON TWP
FINDLAY TWP
EMSWORTH BORO
AVALON BORO
BELL ACRES BORO
NEVILLE TWP
BELLEVUE BORO
KENNEDY TWP
STOWE TWP
MCKEES ROCKS BORO
ROBINSON TWP
NORTH FAYETTE TWP
ROBINSON TWP
OAKDALE BORO
COLLIER TWP
ITH
INGRAM BORO
CRAFTON BORO
THORNBURG BORO
ROSSLYN FARMS BORO
CARNEGIE BORO
GREENTREE BORO
SCOTT TWP
DORMONT BORO
MT OLIVER BORO
TOWN OF MCCANDLESS
HAMPTON TWP
INDIANA TWP
ROSS TWP
SHALER TWP
WEST VIEW BORO
O'HARA TWP
FOX CHAPEL BORO
HARMAR TWP
SPRINGDALE TWP
SPRINGDALE BORO
EAST DEER TWP
TARENTUM BORO
ARNOLD CITY
LOWER BURRELL CITY
NEW KENSINGTON CITY
FRAZER TWP
UPPER BURRELL TWP
OAKMONT BORO
O'HARA TWP
PLUM BORO
RESERVE TWP
SHARPSBURG BORO
MILLVALE BORO
PENN HILLS TWP
WILKINSBURG BORO
EDGEWOOD BORO
SWISSVALE BORO
FOREST HILLS BORO
PARKIN BORO
BRADDOCK HILLS BORO
NORTH BRADDOCK BORO
CHURCHILL BORO
WILKINS TWP
TURTLE CREEK BORO
MONROEVILLE BORO
MURRYSVI
HOMESTEAD BORO
MUNHALL BORO
BALDWIN BORO
BRENTWOOD BORO
DUQUESNE CITY
NORTH VERSAILLES TWP
PENN TWP
(CAVITTSVILLE)
MT LEBANON TWP
CASTLE SHANNON
WHITEHALL BORO
BRIDGEVILLE BORO
SOUTH FAYETTE TWP
UPPER ST CLAIR TWP
BETHEL PARK BORO
WEST MIFFLIN BORO
PLEASANT HILLS BORO
PORT VUE BORO
GLASSPORT BORO
LIBERTY BORO
VERSAILLES BORO
MCKEESPORT CITY
WHITE OAK BORO
NORTH HUNTINGTON TWP
IRWIN BORO
MANOR BORO
ADAMSBURG BORO
SOUTH VERSAILLES TWP
LINCOLN BORO
CLAIRTON
JEFFERSON BORO
SOUTH PARK TWP
PETERS TWP
MOUNT PLEASANT TWP
CECIL TWP
CHARTIERS
CANONSBURG
NORTH STRABANE
ELIZABETH TWP
SEWICKLEY TWP
ARONA BORO

EPM TEAM ALCOSAN
CDM CH2MHILL
Camp Dresser & McKee

Figure 5-8
PaDEP-Designated Treatment Plant Locations and Watershed Areas

maintenance practices in the PaDEP designated study areas. ALCOSAN is willing to assist in developing sewage management programs in cooperation with the PaDEP designated municipalities, and can provide operational and technical assistance to the wastewater systems who become part of the ALCOSAN service area.

If a municipality requests to become part of the ALCOSAN service area, and an appropriate service agreement can be negotiated with the ALCOSAN Board, and be approved by the City of Pittsburgh, ALCOSAN can operate and maintain existing municipal facilities if deemed economical. Within the constraints of the Pennsylvania Municipality Authorities Act, ALCOSAN can pursue economical alternatives to connection of these communities to the existing ALCOSAN interceptor system. The first important step is for a PaDEP designated municipality to request in writing that the ALCOSAN Board of Directors consider its inclusion in the ALCOSAN service area.

5.10.3 Structural Approaches

Under structural approaches, the ALCOSAN service area would be expanded to include those PaDEP designated study area municipalities that wished to regionalize. To assist the municipalities and ALCOSAN assess the viability of this approach, conceptual level designs have been developed for the connection of the PaDEP designated study areas to the ALCOSAN interceptor system. Based on the conceptual designs, capital and operation & maintenance (O&M) costs have been developed for facilities to convey wastewater conveyance to the ALCOSAN interceptor system. Projected design year wastewater generation from each study area are shown in Table 5.17.

The conceptual designs and cost estimates in the ALCOSAN 537 Plan include only the major interceptor facilities between the study areas and the receiving interceptor. They do not include trunk sewers and lateral sewers that would be required throughout the watershed to connect all existing and future customers. Nor do they include the cost of connecting existing or future customers within the existing service area (e.g., the riverfront development areas). Because the cost to construct these facilities may be significant, the expense must be considered if the concept is selected for further consideration.

Table 5.17
PaDEP Designated Study Areas
Projected Design Year Flows (2015)

PaDEP Designated Planning Area	Design Flow (mgd)
Designated Watersheds	
Millers Run	0.88
Upper Robinson Run	0.48
Toms Run	0.15
Kilbuck Run	0.12
Designated Treatment Plants	
Dravosburg STP	0.40
Holiday Park STP	1.68
Longvue No. 1 STP	1.36
Oakmont STP	1.46
Plum Creek STP	3.08

Two hypothetical service concepts are presented for each target area. Figure 5-9 shows the general routing of potential interconnection between sewers.

Concept A - is the closest, least-expensive approach to connecting the PaDEP designated areas to the ALCOSAN interceptor system. Under Concept A, collection sewers in the PaDEP designated area would discharge to sewers in a neighboring municipality where the discharge would be conveyed to the ALCOSAN interceptor system. Concept A is intended as a hypothetical best case from the standpoint of lowest capital costs. The hydraulic or institutional capacity that is available within the neighboring municipality's sewer system has not been evaluated.

Concept B - is a service route that would require constructing a new trunk sewer from the study area to the ALCOSAN system. Routing of the trunk sewers for the areas follows the topography of the drainage basins and frequently parallels the alignment of the existing municipal interceptors located down watershed between the designated areas and the ALCOSAN interceptors. For planning purposes, Concept B assumes that new, parallel interceptors would be installed adjacent to the existing municipal sewers. In practice, upgrading existing municipal interceptors to carry the existing flow and the proposed new flow may be more logical in some cases than others. The intent of Concept B however, is to provide a plausible worst-case-capital cost for transporting the sewage from the PaDEP designated study areas to the ALCOSAN interceptor system.

Design Assumptions

Due to limited information on the existing sewer facilities in the PaDEP designated study areas and the municipal-owned facilities within the existing service area, it was necessary to make the following assumptions during the conceptual design. The validity of these assumptions will have to be verified before final determinations of the technical, institutional, and economic feasibility of these alternatives is made.

- All wastewater from PaDEP study areas with an existing sewer system and Sewage Treatment Plant will be conveyed from the location of the existing STP. For the best-case scenario, it was assumed that existing tankage would be used to equalize flow and, therefore, intercepting facilities are designed for an average daily per capita flow of 100 gallons plus a 250 percent peaking factor.

- Flows from existing STPs can be conveyed to the receiving interceptor by gravity if the topography is relatively flat and the distance to the ALCOSAN interception is less than one mile.

Map Source: ALCOSAN Combined Sewer Overflow Program

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Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

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FEET
0 4000 8000 12000 16000 24000 32000

MILES
0 1 2 3 4 6 8

Legend

- Treatment Plant Location
- Potential Route to ALCOSAN Interceptor
- Interceptor Sewer
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Hydrologic Features

Longvue No. 1 STP
Kilbuck Run
Toms Run
Oakmont STP
Plum Creek STP
Holiday Park STP
Upper Robinson Run
Millers Run
Dravosburg STP
ALCOSAN PLANT
BEAVER COUNTY
WASHINGTON COUNTY
WESTMORELAND COUNTY
CITY OF PITTSBURGH
PINE TWP
RICHLAND TWP
WEST DEER TWP
FRANKLIN PARK BORO
BELL ACRES BORO
TOWN OF MCCANDLESS
HAMPTON TWP
INDIANA TWP
FRAZER TWP
SPRINGDALE TWP
SPRINGDALE BORO
LOWER BURRELL CITY
NEW KENSINGTON CITY
UPPER BURRELL TWP
HARMAR TWP
FOX CHAPEL BORO
O'HARA TWP
PLUM BORO
PENN HILLS TWP
CHURCHILL BORO
MONROEVILLE BORO
PENN TWP
SEWICKLEY HEIGHTS BORO
LEE TWP
CRESCENT TWP
EDGEWORTH BORO
SEWICKLEY BORO
OHIO TWP
ROSS TWP
SHALER TWP
ALEPPO TWP
GLENFIELD BORO
KILBUCK TWP
MOON TWP
CORAOPOLIS BORO
FINDLAY TWP
NEVILLE TWP
AVALON BORO
BELLEVUE BORO
STOWE TWP
KENNEDY TWP
RESERVE TWP
MILLVALE BORO
MCKEES ROCKS BORO
ROBINSON TWP
NORTH FAYETTE TWP
INGRAM BORO
CRAFTON BORO
THORNBURG BORO
ROSSLYN FARMS BORO
CARNEGIE BORO
GREENTREE BORO
COLLIER TWP
SCOTT TWP
DORMONT BORO
MT OLIVER BORO
HOMESTEAD BORO
SWISSVALE BORO
EDGEWOOD BORO
FOREST HILLS BORO
BRADDOCK HILLS BORO
NORTH BRADDOCK BORO
TURTLE CREEK BORO
WILKINSBURG BORO
WILKINS TWP
EAST DEER TWP
ARNOLD CITY
TARENTUM BORO
OAKMONT BORO
SOUTH FAYETTE TWP
MT LEBANON TWP
BALDWIN BORO
BRENTWOOD BORO
CASTLE SHANNON BORO
WHITEHALL BORO
MUNHALL BORO
DUQUESNE CITY
NORTH VERSAILLES TWP
BRIDGEVILLE BORO
UPPER ST CLAIR TWP
BETHEL PARK BORO
WEST MIFFLIN BORO
PLEASANT HILLS BORO
DRAVOSBURG BORO
PORT VUE BORO
GLASSPORT BORO
LIBERTY BORO
MCKEESPORT CITY
WHITE OAK BORO
VERSAILLES BORO
SOUTH VERSAILLES TWP
NORTH HUNTINGTON TWP
IRWIN BORO
(CAVITTSVILLE)
MANOR BORO
ADAMSBURG BORO
LINCOLN BORO
CLAIRTON
JEFFERSON BORO
SOUTH PARK TWP
PETERS TWP
MOUNT PLEASANT TWP
CECIL TWP
CHARTIERS
CANONSBURG
NORTH STRABANE
ELIZABETH TWP
SEWICKLEY TWP
ARONA BORO
MURRYSVI

CDM CH2MHILL EPM TEAM ALCOSAN
Camp Dresser & McKee

Figure 5-9
Generalized Alignment of Potential Interconnecting Sewers

flow contribution from this area is 0.27 mgd, with a peak flow of 0.7 mgd. The closest ALCOSAN interceptor is the Ohio River Interceptor, which ends at the eastern border of Emsworth Borough.

While the projected population for this sewer shed is small (1990 census population was approximately 1,231 people over 2,300 acres) development is projected to occur throughout the entire sewer shed. Therefore, the conceptual design included interceptors along both the Kilbuck and Toms Run Valleys and along the Ohio River to the existing tunnel at Emsworth. Because there were no other alternatives that would provide service to the entire watershed, only one service concept was included. This sewer-service concept is consistent with the original Allegheny County comprehensive plan (*Comprehensive Sewerage Needs Plan 1970 - 2000, Allegheny County, Pennsylvania*. Green Engineering Company, 1970.).

The major facilities that would be required in the Toms Run and Kilbuck Run Area include:

- Approximately 9 miles of gravity sewer along Toms Run, Kilbuck Run, and the Ohio River.
- One 480-gpm pump station (assumed to be equipped with 3 submersible pumps, each designed for 240 gpm at 66-feet total dynamic head [TDH]).
- One mile of force main from the proposed pump station to ALCOSAN's deep tunnel interceptor in Emsworth.

Table 5.20 contains a summary of the facilities and estimated costs. The potential alignment for the conceptual design is shown in Figure 5-10.

Upper Robinson Run Watershed

This area is located along Robinson Run in Washington County, just outside the southwest boundary of Allegheny County. It includes all of Midway Borough and portions of Cecil, Smith, Mount Pleasant, and Robinson Townships. The projected average daily flow contribution from this area in 2015 is 0.48 mgd, with a peak flow of 1.16 mgd. The closest ALCOSAN interceptor is the Chartiers Creek Interceptor, which passes through Carnegie Borough and ends in Bridgeville. There are two municipally owned interceptors in the vicinity. The first is the Robinson Run Interceptor (owned by North Fayette Township, South Fayette Township, Oakdale Borough, and McDonald Borough), which extends from McDonald Borough to the Chartiers Creek Interceptor near Carnegie Borough. The second is the Collier Township Interceptor, which runs parallel to the downstream section of the Robinson Run Interceptor, between the western border of Collier Township and Carnegie Borough.

Table 5.20
Kilbuck Run Study Area
Planning Level Estimated Costs of Connection to ALCOSAN Interceptors[a]

Item	Concept A Quantity	Concept A Units	Concept A Cost	Concept B Quantity	Concept B Units	Concept B Cost
Capital Cost						
Connection Fee	0.27	mgd	$1,044,900			
Construction Cost						
Gravity Sewer	48,900	LF	$7,584,862			
Forcemain	6,350	LF	$301,904			
Pump Stations	1	new	$49,921			
Env./R.O.W./Misc.	45	% of const.	$6,493,653			
Subtotal			$14,430,340			
Engr./Constr. Admin.	20	percent	$2,886,068		Not Applicable	
Total Construction Cost			$17,316,408			
Total Capital Cost			**$18,361,308**			
Annual O&M Cost						
Gravity Sewer	9.26	miles	$23,243			
Pump Stations			$5,460			
Treatment Cost			$223,818			
Total Annual Cost			**$252,521**			
Present Worth Cost			**$21,229,003**			

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

The *Upper Robinson Run Sewerage Study* (Allegheny County, Pennsylvania. Chester Environmental, October 1993.) summarized hydraulic analyses that were performed for this same service concept. The study indicated that if the Upper Robinson Run Watershed were included, the Chartiers Creek interceptor, without any improvements, would not have enough capacity to handle wet-weather flows in 2020. However, with some improvements (removal of the 30-inch restriction at the downstream end of Chartiers Creek Interceptor) the study indicated that wet-weather flows could be conveyed without any overflows or excessive surcharging. In addition, expansion of the ALCOSAN plant and the on-going efforts of the municipalities along Chartiers Creek to reduce I/I should have positive effects on the available capacity of the Chartiers Creek Interceptor. This must be analyzed in more detail. The availability of this potential capacity, given capacity reservations by the municipalities within the current service area, also must be considered.

Two scenarios were considered for this area, both ultimately result in the flow from the Robinson Run Watershed entering ALCOSAN's system at the Chartiers Creek Interceptor in Carnegie Borough.

Concept A

All wastewater would be collected through a new interceptor constructed along Robinson Run in the main valley of the watershed. The new interceptor would tie into the existing Robinson Run Interceptor at the western boundary of McDonald Borough and be conveyed to ALCOSAN's Chartiers Creek Interceptor at Carnegie Borough. Flow would be conveyed through the existing Robinson Run Pump Station at Oakdale. For the purpose of this analysis, it was assumed that new pumps would be needed to increase the capacity of the pump station but that no major structural modifications would be required.

The following facilities would be required:

- Approximately 3 miles of gravity sewer along the Robinson Run Valley in Washington County.
- An expansion of the existing Robinson Run Pump Station at Oakdale, including the installation of 3 new submersible pumps, each designed for 400 gpm at 132-feet TDH.

Concept B

Concept B assumes that the existing Robinson Run Interceptor does not have the capacity to convey wastewater from the Robinson Run Watershed. All wastewater would be collected

through a new interceptor constructed in the main valley of the watershed along Robinson Run. In addition, a new interceptor would be constructed, parallel to the existing Robinson Run Interceptor along the North Fayette/South Fayette boundary, to the Chartiers Creek Interceptor at Carnegie Borough.

The major facilities that would be required include:

- Approximately 10.7 miles of gravity sewer along Robinson Run in both Washington County and in Allegheny County, paralleling the existing Robinson Run Interceptor.
- A new 1.16-mgd pump station in Oakdale, equipped with 3 403-gpm submersible pumps at 104-feet TDH.
- 1.8 miles of force main from the proposed pump station.

Table 5.21 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-11.

Millers Run

This area is located along Millers Run in Washington County, just outside the southwest boundary of Allegheny County. It includes Southview in Mt. Pleasant Township.

The projected average daily flow contribution from this area in 2015 is 0.88 mgd with a peak flow of 2.20 mgd. The Chartiers Creek Interceptor, which ends in Bridgeville is the closest ALCOSAN interceptor. The Millers Run Interceptor, owned by South Fayette, extends from the boundary of Allegheny County along Millers Run to the Chartiers Creek Interceptor in Bridgeville.

Two scenarios were considered for this area, both of which ultimately resulted in the flow from Millers Run entering the ALCOSAN system at the Chartiers Creek Interceptor in Bridgeville. It should be noted that because of past studies (*Upper Robinson Run Sewerage Study*) which indicated that there is potentially limited hydraulic capacity in the Chartiers Creek Interceptor, the interceptor should be studied in more detail if this service concept is considered further.

Table 5.21
Upper Robinson Run
Planning Level Estimated Costs of Connection to ALCOSAN Interceptors[a]

Item	Concept A Quantity	Concept A Units	Concept A Cost	Concept B Quantity	Concept B Units	Concept B Cost
Capital Cost						
ALCOSAN Connection Fee	0.47	mgd	$1,818,900	0.47	mgd	$1,818,900
Construction Cost						
Gravity Sewer	15,550	LF	$1,556,469	56,600	LF	$6,142,488
Forcemain	0	LF	$0	9,320	LF	$541,579
Pump Stations	1	expansion	$45,959	1	new	$116,483
Env./R.O.W./Misc	45	% of Const.	$1,311,077	45	% of const.	$5,564,086
Subtotal			$2,913,505			$12,364,636
Engr./Constr. Admin.	20	percent	$582,701	20	percent	$2,472,927
Total Construction Cost			$3,496,206			$14,837,563
Total Capital Cost			**$5,315,106**			**$16,656,463**
Annual O&M Cost						
Gravity Sewer	2.95	miles	$7,391	10.72	miles	$26,902
Pump Stations			$19,648			$13,726
Treatment Cost			$419,659			$419,659
Total Annual Cost			**$446,698**			**$460,287**
Present Worth Cost			**$10,387,924**			**$21,883,601**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

- For watersheds without sewers, the proposed facilities include an interceptor up the major valley of the watershed.

- The parallel interceptor through the neighboring municipality required under the worst case scenario (Concept B) is sized for the PaDEP study area wastewater only.

In reality, if a parallel interceptor is required, it may make sense to abandon the existing interceptor and size the new interceptor for the flow in the PaDEP designated study areas and the flow in the neighboring municipality. This is especially true if the existing interceptor is old and has high inflow/infiltration (I/I) or high maintenance requirements. While such joint projects would result in lower unit costs, they would require negotiations and consent between the entities involved and, therefore, were not considered in the conceptual design.

5.10.4 Basis for Conceptual Design

Conceptual designs for the interceptors and pump stations are in accordance with PaDEP guidelines (*Domestic Wastewater Facilities Manual: A Guide for the Preparation of Applications, Reports, and Plans*, PaDEP.). The general basis for design is as follows:

- Interceptors are sized for 2.5 times the average daily design year (2015) flow.

- Interceptors are designed for a velocity greater than or equal to 2 feet per second (fps) (but less than 15 fps) at full flow using Manning's uniform flow equation.

- Interceptors are designed with a Manning's *N* of 0.013.

- Interceptors are designed at the minimum slope allowed for the required pipe size. This is a conservative approach, resulting in larger pipe sizes than actually may be required if the sewer follows the natural topography. This approach was taken because the alignments are only conceptual and have not been site verified.

- The interceptors in the PaDEP designated study areas that are not served by sewers were designed in thirds. In other words, the future population is assumed to be uniformly distributed over the length of the interceptor. The sections of the interceptor are designed for one third, two thirds and three thirds respectively of the projected flow of the entire watershed.

- Pump stations are designed for a peak flow of 2.5 times the average daily flow except in the case where they are located at an existing STP that is to be

abandoned. In that case, the existing tankage is assumed to equalize the flow fluctuations and the new facilities are designed for average daily flow.

- Pump stations are designed with three pumps, each at half the design flow capacity of the pump station. Therefore, all pump stations will have full redundancy.

- Force mains are designed using the Hazen William's equation with a C factor of 100.

- Force mains are designed for a peak velocity of approximately 5 fps.

5.10.5 Basis of Conceptual Design Cost Estimates

Where possible, unit costs are calculated on the basis of actual costs incurred during previous ALCOSAN projects or facility operations. Table 5.18 shows the unit costs that were used for the estimates. Other assumptions used in developing planning level cost estimates are discussed below.

Capital Costs

- Costs of pipe installation and tunneling are calculated on the basis of costs incurred in 1994 during the ALCOSAN/Penn Hills construction projects (*ALCOSAN/Penn Hills Study Summary Report*, SE Technologies, Inc. July 14, 1992.).

- Pump stations are assumed to be wet pit pump stations with submersible pumps. Station costs are a lump sum equal to costs for vendor pumps plus a mark-up for station construction. The mark-up is based on past projects.

- Costs are determined on average construction conditions (i.e. they do not account for construction in rock or high groundwater tables unless noted.).

- Construction costs include a total of 45 percent for miscellaneous site work, right-of-ways, and contingency and 20 percent for engineering and construction administration.

Annual O&M Cost

- O&M for interceptors and the force main consists of staff and materials for routine inspection and repair. Average annual cost, in dollars per mile, was calculated from the ALCOSAN 1994 accounting records for the interceptors.

- O&M for pump stations consists of the cost for power, staff, and materials for routine inspection and repair. The cost of power is calculated on the basis of pump horsepower, operating time, and an electric cost of 0.06 dollar per kWh. The average annual maintenance cost, in dollars per mgd, was calculated from the ALCOSAN 1994 accounting records for the collection system pump stations.

Table 5.18
Unit Costs Utilized for Connection Sewer Conceptual Designs

Item	Units	Unit Cost	Source
Capital Costs			
PVC Gravity Sewer (installed cost)			
8" - 18"	$/LF	$70 - $111	ALCOSAN/Penn Hills Project
21" - 40"	$/LF	$123 - $200	
DIP Force main (installed cost)			
8" - 18"	$/LF	$40 - $125	ALCOSAN/Penn Hills Project
21" - 30"	$/LF	$147 - $168	
Tunnels including sewer pipe (installed cost)	$/LF	$950	ALCOSAN/Penn Hills Project
Pump Stations[a]	Lump Sum	Pump$ x3.5	Historical Records
Connection Fee	$/MGD	$3.87 million	ALCOSAN
Operation and Maintenance Costs			
Sewer Maintenance	$/Mile	$2,400/yr	ALCOSAN Accounting Records
Pump Station Operation (Power)	$/KW-hr	$0.06/yr	ALCOSAN
Pump Station Maintenance	$/MGD	$2,700/yr	ALCOSAN Accounting Records
ALCOSAN Treatment Cost	$/MGD	$370,000/yr	ALCOSAN Accounting Records

[a] Pump costs are based on vendor quotes

Present Worth Cost

- Based on an interest rate of $6^1/_8$ percent over a project life of 20 years.
- Include a one-time connection fee of approximately $3.87 million/mgd paid to ALCOSAN.
- Projected ALCOSAN average planning period treatment cost of $2,555 per million gallons.

5.11 INTERCONNECTION FACILITIES AND ESTIMATED COSTS

Table 5.19 summarizes the estimated capital, annual, and present-worth costs associated with each interconnection, excluding the cost of local collection sewers and laterals in the PaDEP-designated watersheds. Due to uncertainties in hydraulic capacity and institutional arrangements, best and worst case costs are presented. The actual cost probably will fall somewhere in between the two extremes. The two conceptual design approaches for each of the PaDEP designated study areas, including a discussion of required facilities, are presented in the following pages.

Table 5.19
PaDEP Designated Study Areas
Costs of Connection to ALCOSAN Interceptor System
(millions)

PaDEP Study Area		Concept A	Concept B
Kilbuck/Toms Run			
Connection Fee		$1.04	
Construction Cost		$17.32	
	Subtotal	$18.36	Not Applicable
Annual O&M		$0.25	
Present Worth		$21.23	
Robinson Run			
Connection Fee		$1.82	$1.82
Construction Cost		$3.50	$14.84
	Subtotal	$5.32	$16.66
Annual O&M		$0.45	$0.46
Present Worth		$10.39	$21.88
Millers Run			
Connection Fee		$3.41	$3.41
Construction Cost		$5.80	$12.76
	Subtotal	$9.21	$16.16
Annual O&M		$0.77	$0.78
Present Worth		$17.96	$25.05
Dravosburg STP			
Connection Fee		$1.55	$1.55
Construction Cost		$3.19	$5.88
	Subtotal	$4.74	$7.43
Annual O&M		$0.43	$0.44
Present Worth		$9.64	$12.41

PaDEP Study Area		Concept A	Concept B
Oakmont STP			
Connection Fee		$5.65	$5.65
Construction Cost		$2.49	$9.13
	Subtotal	$8.14	$14.78
Annual O&M		$1.39	$1.41
Present Worth		$23.91	$30.79
Plum Creek STP			
Connection Fee		$11.92	$11.92
Construction Cost		$4.61	$14.70
	Subtotal	$16.53	$26.62
Annual O&M		$2.77	$2.81
Present Worth		$47.95	$58.58
Oakmont/Plum STPs			
Connection Fee		$17.57	$17.57
Construction Cost		$5.94	$16.88
	Subtotal	$23.51	$34.45
Annual O&M		$4.17	$4.12
Present Worth		$70.92	$81.23
Holiday Park STP			
Construction Cost		$6.54	$6.54
Connection Fee		$0.68	$20.37
	Subtotal	$7.22	$26.91
Annual O&M		$1.57	$1.60
Present Worth		$25.02	$45.04
Longvue #1 STP			
Connection Fee		$4.68	$4.68
Construction Cost		$0.90	$11.01
	Subtotal	$5.58	$15.69
Annual O&M		$1.05	$1.06
Present Worth		$17.46	$27.75

Toms Run and Kilbuck Run Area

This area is located along Kilbuck and Toms Runs in Allegheny County, just outside the northwest boundary of the ALCOSAN service area. It includes Glenfield Township, which is along the Ohio River, just downstream from Kilbuck Run. In 2015, the projected average daily

Map Source: ALCOSAN Combined Sewer Overflow Program

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Allegheny County, Pennsylvania

537 Plan

April 1996

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Legend

- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

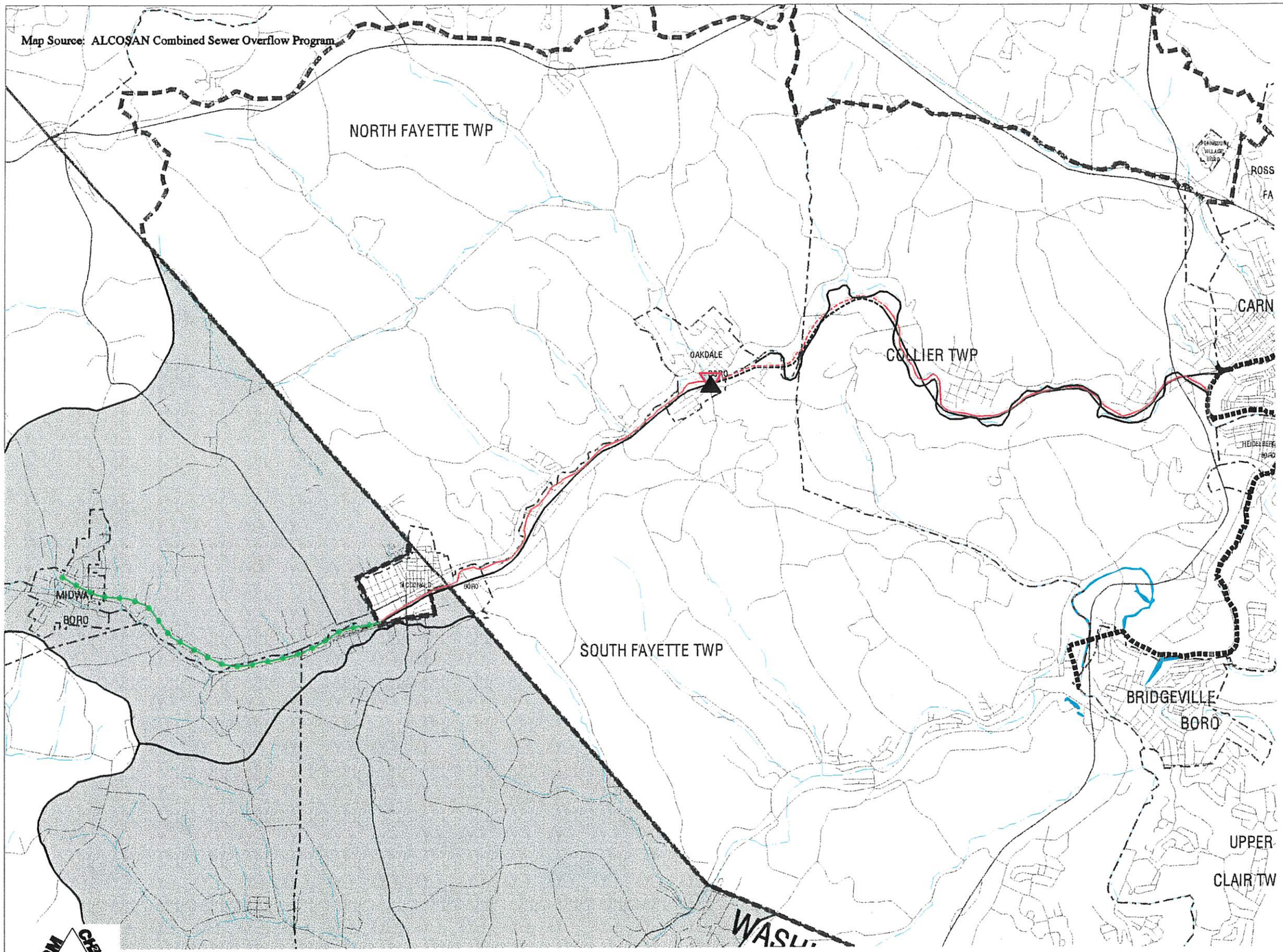
Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

Camp Dresser & McKee

Figure 5-10
Toms Run Watershed and Kilbuck Run Watershed Study Areas
Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program



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Allegheny County, Pennsylvania

537 Plan

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FEET
0 1000 2000 3000 4000 6000 8000

Legend

- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Figure 5-11
Upper Robinson Run Watershed Study Area
Potential Connection Routes to ALCOSAN Interceptor

Concept A

All wastewater would be collected through a new interceptor constructed in the main valley of the watershed, along Millers Run. The new interceptor would tie into the existing Millers Run Interceptor at the Allegheny County boundary line and be conveyed to ALCOSAN's Chartiers Creek Interceptor at Bridgeville. Flow would be conveyed through the existing Chartiers Creek Pump Station, in South Fayette. For the purpose of this analysis, it was assumed that new pumps would be needed to increase the capacity of the pump station but that no major structural modifications would be required.

The following facilities would be required:

- Approximately 4.6 miles of gravity sewer along the Millers Run Valley in Washington County.

- An expansion of the existing Chartiers Creek Pump Station, including the installation of 3 new submersible pumps, each designed for 760 gpm at 49-feet TDH.

Concept B

Concept B assumes that the existing Millers Run Interceptor does not have the capacity to convey wastewater from the Millers Run Watershed. All wastewater would be collected through a new interceptor constructed in the main valley of the watershed, along Millers Run. In addition, a new interceptor would be constructed. The new interceptor would be parallel to the existing Millers Run Interceptor in South Fayette Township and the Chartiers Creek Interceptor at Bridgeville.

The major facilities that would be required include:

- Approximately 9.3 miles of gravity sewer along Millers Run in both Washington County and in Allegheny County, paralleling the existing Millers Run Interceptor.

- A new 2.20-mgd pump station in South Fayette, equipped with 3 760-gpm submersible pumps at 46 feet TDH.

- 600 feet of force main from the proposed pump station to the Chartiers Creek Interceptor.

Table 5.22 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-12.

Table 5.22
Millers Run
Planning Level Estimated Costs of Connection to ALCOSAN Interceptors[a]

Item	Concept A Quantity	Concept A Units	Concept A Cost	Concept B Quantity	Concept B Units	Concept B Cost
Capital Cost						
ALCOSAN Connection Fee	0.88	mgd	$3,405,600	0.88	mgd	$3,405,600
Construction Cost						
Gravity Sewer	24,250	LF	$2,635,474	49,100	LF	$5,714,317
Force main	0	LF	$0	600	LF	$46,910
Pump Stations	1	expansion	$24,406	1	new	$85,421
Env. Env./R.O.W./Misc.	45	% of const.	$2,176,266	45	% of const.	$4,783,621
Subtotal			$4,836,146			$10,630,269
Engr./Constr. Admin.	20	percent	$967,229	20	percent	$2,126,054
Total Construction Cost			$5,803,375			$12,756,323
Total Capital Cost			**$9,208,975**			**$16,161,923**
Annual O&M Cost						
Gravity Sewer	4.59	miles	$11,526	9.30	miles	$23,338
Pump Stations			$13,179			$13,179
Treatment Cost			$746,060			$746,060
Total Annual Cost			**$770,765**			**$782,577**
Present Worth Cost			**$17,961,986**			**$25,049,074**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

Map Source: ALCOSAN Combined Sewer Overflow Program

MCDONALD BORO

SOUTH FAYETTE TWP

WASHINGTON COUNTY

CECIL TWP

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

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April 1996

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Legend

- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Figure 5-12
Millers Run Watershed Study Area
Potential Connection Routes to ALCOSAN Interceptor

Dravosburg

This area is served by sewers and has an STP located in Dravosburg Borough on the Monongahela River, just southeast of the ALCOSAN service area boundary of West Mifflin. The projected average daily flow contribution from this area in 2015 is 0.4 mgd, with a peak flow of 1.0 mgd. The closest ALCOSAN interceptor is the Monongahela Interceptor in Braddock Borough. The closest municipally owned interceptor is the Whitaker Run Interceptor in the Whitaker and Munhall Boroughs.

Two scenarios were considered for this area. Both assumed that flow would be conveyed from the existing STP location to the ALCOSAN system at the Monongahela Interceptor in Braddock Borough. Both scenarios would require two pump stations with very high operating heads (295-feet TDH and greater) in order to convey the flow over the ridge to the northwest of Dravosburg. A gravity sewer along the Monongahela River from Dravosburg to the river crossing at Structure 49 was not considered due to the great distance and congestion caused by railroad tracks along the riverfront.

It should be noted that the McKeesport STP is located directly across the Monongahela River from the Dravosburg STP. Another viable alternative would be to convey the Dravosburg flows to this plant through a new river crossing. This option may be particularly desirable if it would eliminate the high-head pumping required under the following two scenarios. However, conveying the flow to the McKeesport STP was not considered in this 537 plan because PaDEP requested that the feasibility of interconnection with ALCOSAN be addressed.

<u>Concept A</u>

All wastewater from Dravosburg would be collected at the existing STP, where existing tankage would be used to equalize the peak flows. A series of two new pump stations, force main, and gravity sewer would be required to convey the flow over the ridge to the existing Whitaker Run Interceptor.

The major facilities that would be required include:

- A new 0.4-mgd pump station at the existing Dravosburg STP equipped with two sets of series pumps, each set containing 2 600-gpm submersible pumps at 220-ft TDH each (total TDH = 440 feet). The 600-gpm pumps are twice the capacity that is needed; however, they are the smallest pumps that can achieve such a high head.

- A new 1.0-mgd pump station at the top of the hill on Duquesne Road, equipped with two sets of series pumps, with each set containing two 800-gpm submersible pumps at 148-ft TDH each (total TDH = 286 ft.). The pumps are oversized; however, given the high head and low flow, they are the closest match.

- A total of approximately 2.3 miles of force main from the proposed pump stations.

- Approximately 0.5 miles of gravity sewer between the end of the first force main and the second pump station.

Concept B

It assumes that the Whitaker Run Interceptor does not have enough capacity to convey the Dravosburg flow and that the tankage at the existing STP will not be sufficient to equalize the peak flow. All wastewater from Dravosburg would be collected at the existing STP. As in Scenario A, a series of two new pump stations, force main, and gravity sewer would be required to convey the flow over the ridge to the existing Whitaker Run Interceptor. In addition, a parallel interceptor would be required along Whitaker Run.

The major facilities that would be required include:

- A new 1.0-mgd pump station at the existing Dravosburg STP, equipped with 2 sets of series pumps, with each set containing 2 950-gpm submersible pumps at 204-feet TDH each (total TDH = 408 feet). The pumps are slightly oversized; however, given the high head and low flow, they are the best match.

- A new 1.0-mgd pump station at the top of the hill on Duquesne Road, equipped with 2 sets of series pumps, each set containing 2 800-gpm submersible pumps at 148-feet TDH each (total TDH = 286 feet) The pumps are slightly oversized; however, given the high head and low flow, they are the closest match.

- A total of approximately 2.3 miles of force main from the proposed pump stations.

- Approximately 2.7 miles of gravity sewer.

Table 5.23 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-13.

Table 5.23
Dravosburg Planning Level Estimated Costs of Connection to ALCOSAN Interceptors[a]

Item	Concept A Quantity	Concept A Units	Concept A Cost	Concept B Quantity	Concept B Units	Concept B Cost
Capital Cost						
ALCOSAN Connection Fee	0.40	mgd	$1,548,000	0.40	mgd	$1,548,000
Construction Cost						
Gravity Sewer	2,650	LF	$263,822	14,250	LF	$1,413,261
Force main	12,150	LF	$622,034	12,150	LF	$706,028
Pump Station	2	new	$575,811	2	new	$575,811
Env./R.O.W./Misc.	45	% of const.	$1,195,909	45	% of const.	$2,205,082
Subtotal			$2,657,574			$4,900,181
Engr./Constr. Admin.	20	percent	$531,515	20	percent	$980,036
Total Construction Cost			$3,189,089			$5,880,217
Total Capital Cost			**$4,737,089**			**$7,428,217**
Annual O&M Cost						
Gravity Sewer	0.50	miles	$1,260	2.70	miles	$6,773
Pump Stations			$76,085			$77,779
Treatment Cost			$354,379			$354,379
Total Annual Cost			**$431,724**			**$438,931**
Present Worth Cost			**$9,639,855**			**$12,412,828**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

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Appendix A-22-b

Map Source: ALCOSAN Combined Sewer Overflow Program

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET

0 500 1000 1500 2000 3000 4000

Legend

- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

Figure 5-13
Dravosburg STP Study Area
Potential Connection Routes to ALCOSAN Interceptor

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Camp Dresser & McKee

Oakmont & Plum Creek

These areas have existing sewer systems and STPs. The STPs are located relatively close to one another. It is likely that any new interconnection facilities for either of these areas would be sized to accommodate flows from both areas. Given this proximity, conceptual designs and cost estimates have been prepared for these areas individually and together.

Oakmont

Oakmont has an existing collection system and STP located in Oakmont Borough on the south bank of the Allegheny River, just northeast of the ALCOSAN service area boundary of Verona Borough. The estimated contribution to the average daily flow from this area in 2015 is 1.46 mgd, with a peak flow of 3.65 mgd. The closest ALCOSAN sewerage facility is the Verona Pump Station on the Allegheny River Interceptor. As part of the Penn Hills project, a new force main/interceptor is being constructed between this pump station and the Allegheny River Deep Tunnel Interceptor in the City of Pittsburgh.

Two scenarios were considered for this area. Both scenarios resulted in the flow from the Oakmont area entering the 48-inch Allegheny River Interceptor near the Highland Park Bridge.

Concept A

All wastewater from Oakmont would be collected at the existing STP, where existing tankage would be used to equalize the peak flows. A new pump station would be required at the existing plant to convey flows uphill to Washington Street. The flows then would be conveyed by gravity to the existing Verona Pump Station, where the existing force main and gravity sewer would convey it to the Sandy Creek Pump Station and finally to the 48-inch Allegheny River Interceptor near the Highland Park Bridge. Both the Verona Pump Station and the Sandy Creek Pump Station would need to be expanded. On the basis of the existing design information, the wet well in the Sandy Creek Pump Station probably could accommodate the extra flow without major modifications, other than new pumps for the additional flow. However, the wet well in the Verona Pump Station probably would have to be expanded. On the basis of a preliminary review, both force mains appear to be adequately sized to accommodate the additional flow.

The major facilities that would be required include:

- A new 1.5-mgd pump station at the existing Oakmont STP equipped with 3 510-gpm submersible pumps at 55-feet TDH.
- A 1.5-mgd expansion of the existing Verona Pump Station, including 3 510-gpm submersible pumps at 37-feet TDH and an expanded wet well.

- A 1.5-mgd expansion of the existing Sandy Creek Pump Station, including 3 510-gpm submersible pumps at 83-feet TDH.
- Approximately 0.5 miles of force main from the proposed Oakmont Pump Station.
- Approximately 1.5 miles of gravity sewer.

Concept B

Concept B assumes that without major modifications, the existing Verona and Sandy Creek pumping facilities cannot be retrofitted for the additional flow. In addition, because it is assumed that the existing STP tankage is insufficient to equalize all the peaks, new facilities are sized for the peak flow. As in Scenario A, wastewater from Oakmont would be collected at the existing STP. A new pump station and force main would be required at the existing plant to convey flows up the hill to Washington Street. Flows then would be conveyed by gravity to a location near the existing Verona Pump Station, where a new pump station and force main would be built to pump flow to Nadine Road. From there, a new gravity sewer would take flows to the existing 48-inch Allegheny River Interceptor near the Highland Park Bridge.

The major facilities that would be required include:

- A new 3.6-mgd pump station at the existing Oakmont STP, equipped with 3 1,270-gpm submersible pumps at 57 feet TDH.
- A new 3.6-mgd pump station near the location of the existing Verona Pump Station, equipped with 3 1,270-gpm submersible pumps at 140 feet TDH.
- Approximately 2.3 miles of force main from the proposed pump stations.
- Approximately 3.4 miles of gravity sewer.

Table 5.24 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-14.

Table 5.24
Oakmont Planning Level Estimated Costs of Connection to ALCOSAN Interceptors*

Item	Concept A Quantity	Units	Cost	Concept B Quantity	Units	Cost
Capital Cost						
ALCOSAN Connection Fee	1.46	mgd	$5,650,200	1.46	mgd	$5,650,200
Construction Cost						
Gravity Sewer	7,650	LF	$854,614	17,700	LF	$2,658,475
Force main	2,400	LF	$139,462	11,900	LF	$1,093,829
Pump Stations	1	new	$63,234	2	new	$432,650
	2	expansions	$83,202			
Env. /R.O.W./Misc.	45	% of Const.	$933,146	45	% of const.	$3,424,053
Subtotal			$2,073,657			$7,609,007
Engr./Constr. Admin.	20	percent	$414,731	20	percent	$1,521,801
Total Construction Cost			$2,488,389			$9,130,809
Total Capital Cost			**$8,138,589**			**$14,781,009**
Annual O&M Cost						
Gravity Sewer	1.45	miles	$3,636	3.35	miles	$8,413
Pump Stations			$51,670			$67,640
Treatment Cost			$1,333,582			$1,333,582
Total Annual Cost			**$1,388,888**			**$1,409,635**
Present Worth Cost			**$23,911,171**			**$30,789,200**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

Map Source: ALCOSAN Combined Sewer Overflow Program

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET
0 500 1000 1500 2000 3000 4000

Legend

- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

OAKMONT BORO
O'HARA TWP
VERONA BORO
BLAWNOX BORO
ASPINWALL BORO
O'HARA
O'HARA
Allegheny River

CDM EPM TEAM CH2MHILL ALCOSAN
Camp Dresser & McKee

Figure 5-14
Oakmont STP Study Area
Potential Connection Routes to ALCOSAN Interceptor

Plum Creek STP

Plum Creek has an existing collection system and an STP located in Penn Hills Township on the south bank of Plum Creek, just northeast of the ALCOSAN service area boundary at Verona Borough. The projected average daily flow contribution for this area in 2015 is 3.08 mgd, with a peak flow of 7.7 mgd. As described previously for Oakmont, the closest ALCOSAN sewerage facility is the Verona pump station.

Two scenarios that were considered for this area are similar to those that were developed for Oakmont. Both scenarios resulted in the flow from the Plum Creek area entering the 48-inch Allegheny River Interceptor near the Highland Park Bridge.

Concept A

All wastewater from Plum Creek would be collected at the existing STP, where existing tankage would be used to equalize the peak flows. A new gravity sewer would convey flows to the existing Verona Pump Station. The existing force main and gravity sewer then would convey the wastewater to the Sandy Creek Pump Station and finally to the 48-inch Ohio River Interceptor near the Highland Park Bridge. As discussed for the Oakmont scenarios, both the Verona Pump Station and the Sandy Creek Pump Station would need to be expanded.

The major facilities that would be required include:

- A 3.08-mgd expansion of the existing Verona Pump Station, including 3 1,070-gpm submersible pumps at 49-feet TDH and an expanded wet well.
- A 3.08-mgd expansion of the existing Sandy Creek Pump Station, including 3 1,070-gpm submersible pumps at 89-feet TDH.
- Approximately 2.5 miles of gravity sewer.

Concept B

This concept assumes that without major modifications, the existing Verona and Sandy Creek pumping facilities cannot be retrofitted for the additional flow and new facilities will be needed. In addition, because it is assumed that the existing STP tankage is insufficient to equalize all the peaks, the facilities are sized for the peak flow. As in Scenario A, flows from Plum Creek STP will be conveyed to the location of the existing Verona Pump Station, where a new pump station and force main would be built to pump flow to Nadine Road. From there, a new gravity sewer

would take flows to the existing 48-inch Allegheny River Interceptor near the Highland Park Bridge.

The major facilities that would be required include:

- A new 7.7-mgd pump station near the location of the existing Verona Pump Station, equipped with 3 2,670-gpm submersible pumps at 113 feet TDH.
- Approximately 1.8 miles of force main from the proposed pump station.
- Approximately 4.4 miles of gravity sewer.

Table 5.25 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-15.

Oakmont and Plum Creek Combined

Two scenarios that were considered for this area are similar to those that were developed individually for Oakmont and Plum, but with the common facilities designed for the entire flow from both areas. Both scenarios resulted in the flow from the Oakmont and Plum Creek areas entering the 48-inch Allegheny River Interceptor near the Highland Park Bridge.

Concept A

Flows from both STPs will be conveyed to the junction of Plum Creek and Allegheny River Boulevard through the new facilities discussed previously for the individual areas. A new gravity sewer will carry the entire flow to the Verona Pump Station. The existing force main and gravity sewer then would convey it to the Sandy Creek Pump Station and finally to the 48-inch Allegheny River Interceptor near the Highland Park Bridge. As discussed for the Oakmont scenarios, both the Verona Pump Station and the Sandy Creek Pump Station would need to be expanded.

The major facilities that would be required include:

- A new 1.5-mgd pump station at the existing Oakmont STP, equipped with 3 510-gpm submersible pumps at 55-feet TDH.

- A 4.54-mgd expansion of the existing Verona Pump Station, including 3 1,570-gpm submersible pumps at 64-feet TDH and an expanded wet well.

Table 5.25
Plum Creek
Planning Level Estimated Costs of Connection to ALCOSAN Interceptors[a]

Item	Concept A Quantity	Units	Cost	Concept B Quantity	Units	Cost
Capital Cost						
ALCOSAN Connection Fee	3.08	mgd	$11,919,600	3.08	mgd	$11,919,600
Construction Cost						
Gravity Sewer	13,200	LF	$1,982,257	23,250	LF	$4,576,273
Force main	0	LF	$0	9,500	LF	$1,405,189
Pump Stations	2	expansions	$131,380	1	new	$754,365
Env./R.O.W./Misc.	45	% of const.	$1,729,339	45	% of const.	$5,511,131
Subtotal			$3,842,976			$12,246,957
Engr./Constr. Admin.	20	percent	$768,595	20	percent	$2,449,391
Total Construction Cost			$4,611,571			$14,696,348
Total Capital Cost			**$16,531,171**			**$26,615,948**
Annual O&M Cost						
Gravity Sewer	2.50	miles	$6,274	4.40	miles	$11,051
Pump Stations			$65,446			$108,135
Treatment Cost			$2,695,142			$2,695,142
Total Annual Cost			**$2,766,862**			**$2,814,328**
Present Worth Cost			**$47,952,385**			**$58,576,198**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

Map Source: ALCOSAN Combined Sewer Overflow Program

OAKMONT BORO

O'HARA TWP

VERONA BORO

O'HARA

ASPINWALL BORO

BLAWNOX BORO

Allegheny River

PENN HILLS TWP

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET
0 500 1000 1500 2000 3000 4000

Legend

- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Camp Dresser & McKee

Figure 5-15
Plum Creek STP Study Area
Potential Connection Routes to ALCOSAN Interceptor

- A 4.54-mgd expansion of the existing Sandy Creek Pump Station, including 3 1,570-gpm submersible pumps at 94-feet TDH.

- Approximately 2.9 miles of gravity sewer.

Concept B

This concept assumes that without major modification, the existing Verona and Sandy Creek pumping facilities are unable to be retrofitted for the additional flow and new facilities will be needed. In addition, because it is assumed that the existing STP tankage is insufficient to equalize all the peaks, the facilities are sized for the peak flow. As in Scenario A, flows from both STPs will be conveyed to the junction of Plum Creek and Allegheny River Boulevard through the new facilities discussed previously for the individual areas. A new gravity sewer will carry the entire flow to a location near the existing Verona Pump Station, where a new pump station and force main would be built to pump flow to Nadine Road. From there, a new gravity sewer would take flows to the existing 48-inch Allegheny River Interceptor near Highland Park Bridge.

The major facilities that would be required include:

- A new 3.65-mgd pump station at the existing Oakmont STP, equipped with 3 1270-gpm submersible pumps at 57-feet TDH.

- A new 11.4-mgd pump station near the location of the existing Verona Pump Station, equipped with 3 3,940-gpm submersible pumps at 102-feet TDH.

- Approximately 2.3 miles of force main from the proposed pump station.

- Approximately 4.8 miles of gravity sewer.

Table 5.26 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-16.

Holiday Park STP

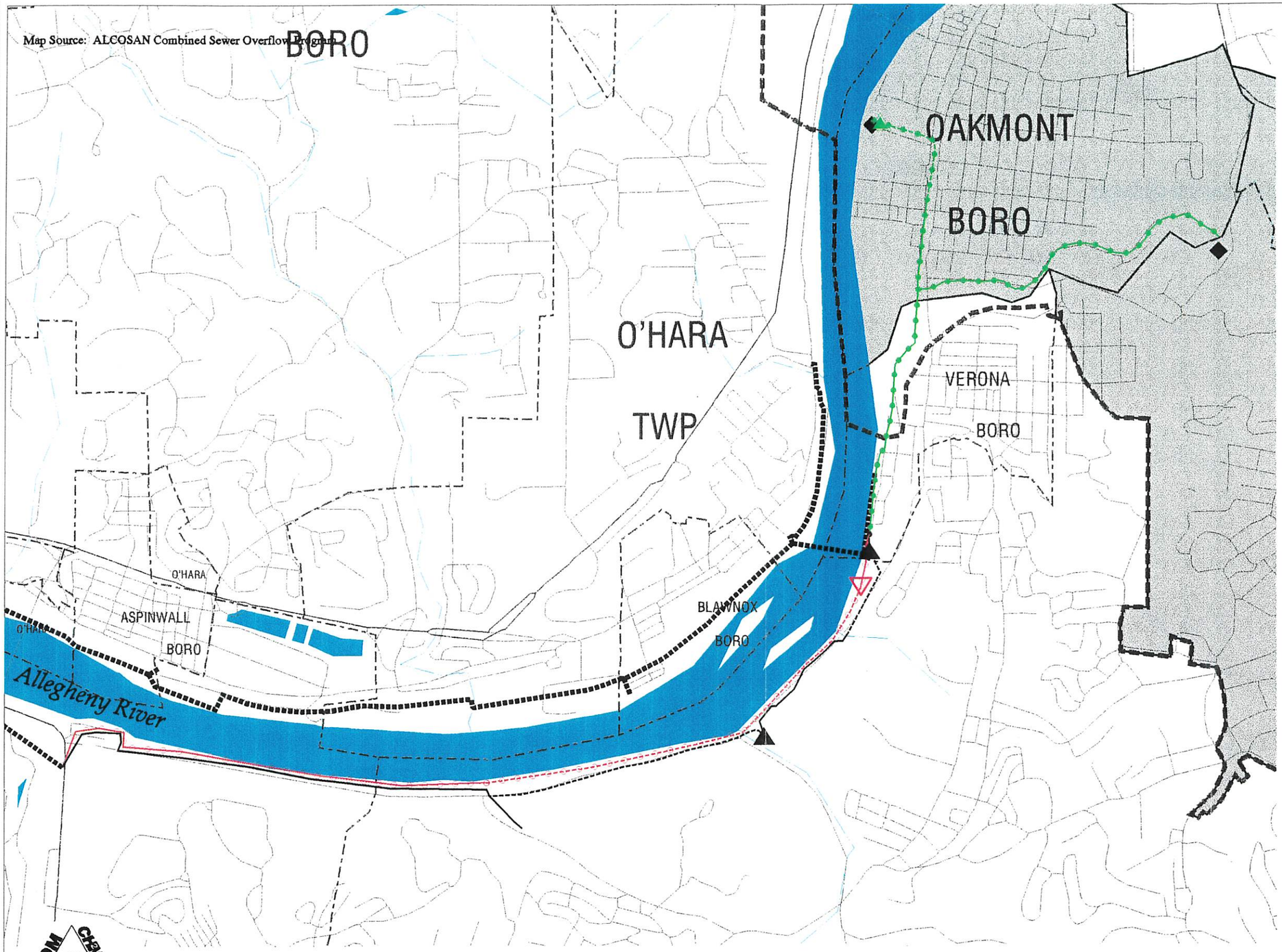
This area is currently served by a sewer system and has an STP located in Plum Borough on Abers Creek, just north of the ALCOSAN service area boundary in Monroeville. The projected average daily flow contribution from this area in 2015 is 1.68 mgd (see Table 4.11) with a peak flow of 4.2 mgd. The closest interceptors that flow to ALCOSAN are the Thompson Run Interceptor, extending to the northern border of Wilkins Township and the Turtle Creek Interceptor, extending to the western ALCOSAN service area boundary in Monroeville Borough.

Table 5.26
Oakmont & Plum Creek Combined
Planning Level Estimated Costs of Connection to ALCOSAN Interceptors[a]

Item	Concept A Quantity	Concept A Units	Concept A Cost	Concept B Quantity	Concept B Units	Concept B Cost
Capital Cost						
ALCOSAN Connection Fee	4.54	mgd	$17,569,800	4.54	mgd	$17,569,800
Construction Cost						
Gravity Sewer	15,050	LF	$2,171,577	25,100	LF	$5,190,182
Force main	2,400	LF	$139,462	11,900	LF	$1,826,534
Pump Stations	1	new	$63,234	2	new	$721,084
	2	expansions	$349,448			
Env./R.O.W./Misc.	45	% of const.	$2,228,499	45	% of const.	$6,330,927
Subtotal			$4,952,220			$14,068,727
Engr./Constr. Admin.	20	percent	$990,444	20	percent	$2,813,745
Total Construction Cost			$5,942,664			$16,882,473
Total Capital Cost			**$23,512,464**			**$34,452,273**
Annual O&M Cost						
Gravity Sewer	2.85	miles	$7,153	4.75	miles	$11,930
Pump Stations			$166,605			$106,101
Treatment Cost			$4,000,747			$4,000,747
Total Annual Cost			**$4,168,067**			**$4,108,041**
Present Worth Cost			**$70,919,244**			**$81,226,203**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

Map Source: ALCOSAN Combined Sewer Overflow Program



ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET
0 500 1000 1500 2000 3000 4000

Legend

- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Camp Dresser & McKee

Figure 5-16
Oakmont STP and Plum Creek STP Study Areas
Potential Connection Routes to ALCOSAN Interceptor

Two scenarios were considered for this area. In one scenario, flows would enter the ALCOSAN system at the end of the Turtle Creek Interceptor in Monroeville. In the other scenario, flows would enter the Turtle Creek Interceptor at a location just upstream of the junction of the Thompson Run Interceptor. Service to Holiday Park through Thompson Run was not considered, because of the limited available capacity. (*ALCOSAN/Penn Hills Study, 1992*)

Concept A

All wastewater from the Holiday Park Service Area would be collected at the existing STP and existing tankage would be used to equalize the peak flows. A new gravity sewer would convey the flow to the existing Monroeville Interceptor at the boundary for the ALCOSAN Service Area.

The Monroeville Interceptor System would convey flow to its junction with the Turtle Creek Interceptor at the western Monroeville border. The only major facility that would be required is a gravity sewer, approximately 0.5 miles long, from the existing STP to the Monroeville Interceptor System.

Concept B

This concept assumes that the existing Monroeville Interceptor System does not have enough capacity to handle the additional flows from the Holiday Park Service Area. In addition, because this concept assumes that the existing tankage at the plant is insufficient to provide flow equalization for all the peaks, the new facilities are designed for the peak flow. As in Scenario A, all wastewater from the Holiday Park Service Area would be collected at the existing STP. A new gravity sewer would be required from the existing STP to the existing Turtle Creek Interceptor at station 11+09, in East Pittsburgh, just downstream of the Thompson Run Interceptor connection.

This location was chosen on the basis of the limited available capacity upstream of this location. (*ALCOSAN/Penn Hills Study, 1992*) The only major facility that would be required is a gravity sewer, approximately 11.8 miles long, from the existing STP to the connection point with the Turtle Creek Interceptor in East Pittsburgh. For the purposes of this study, the new sewer was assumed to follow the alignment of the existing Monroeville and Turtle Creek Interceptors which it parallels.

Table 5.27 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-17.

Table 5.27
Holiday Park
Planning Level Estimated Costs of Connection to ALCOSAN Interceptors[a]

Item	Concept A Quantity	Units	Concept A Cost	Concept B Quantity	Units	Concept B Cost
Capital Cost						
ALCOSAN Connection Fee	1.69	mgd	$6,540,300	1.69	mgd	$6,540,300
Construction Cost						
Gravity Sewer	2,500	LF	$309,643	62,150	LF	$9,338,337
Force main	0	LF	$0	0	LF	$0
Pump Stations	0		$0	0		$0
Env./R.O.W./Misc.	45	% of const.	$253,345	45	% of const.	$7,640,457
Subtotal			$562,988			$16,978,794
Engr./Constr. Admin.	20	percent	$112,598	20	percent	$3,395,759
Total Construction Cost			$675,586			$20,734,553
Total Capital Cost			**$7,215,886**			**$26,914,853**
Annual O&M Cost						
Gravity Sewer	0.47	miles	$1,188	11.77	miles	$29,540
Pump Stations			$0			$0
Treatment Cost			$1,566,726			$1,566,726
Total Annual Cost			**$1,567,914**			**$1,596,266**
Present Worth Cost			**$25,021,532**			**$45,042,472**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

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Appendix A-22-b

Map Source: ALCOSAN Combined Sewer Overflow Program

MONROEVILLE BORO

WILKINS TWP

Thompson Run

TURTLE CREEK BORO

PITCAIRN BORO

EAST

Turtle Creek

WILMERDING BORO

WALL BORO

EAST

MCKEESPORT BORO

TRAFFORD

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET

Legend

- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

CDM CH2MHILL EPM TEAM ALCOSAN

Camp Dresser & McKee

Figure 5-17
Holiday Park STP Study Area
Potential Connection Routes to ALCOSAN Interceptor

Longvue No. 1

This area currently is served by a sewer system and has an STP located in McCandless Township on the west branch of Little Pine Creek, just north of the ALCOSAN service area boundary. The projected average daily flow contribution from this area in the year 2,015 is 1.36 mgd (see Table 4.11) with a peak flow of 3.0 mgd. The closest ALCOSAN interceptor is the Allegheny River crossing in Etna Borough at the mouth of Pine Creek. The western branch of the Little Pine Creek Interceptor (serving portions of McCandless, Ross, Shaler, and Etna) extends from the Allegheny River deep tunnel interceptor in the City of Pittsburgh to the northern ALCOSAN Service Area boundary in Ross Township.

Two scenarios were considered for this area. In both scenarios, flows from the Longvue STP No. 1 Service Area would enter the ALCOSAN system at the Allegheny River crossing in Etna at the base of Pine Creek.

Concept A

All wastewater from the Longvue STP No. 1 Service Area would be collected at the existing STP, where existing tankage would be used to equalize the peak flows. A new gravity sewer would convey the flow to the existing western branch of the Little Pine Creek Interceptor System at the ALCOSAN Service Area boundary in Ross Township. The western branch of the Little Pine Creek Interceptor System would convey flow to its junction with the Pine Creek Interceptor at Etna and on to the river crossing to the Allegheny River Deep Tunnel Interceptor. The only major facility that would be required is a gravity sewer, approximately 0.7 miles long, from the existing STP to the western branch of the Little Pine Creek interceptor system.

Concept B

This concept assumes that the existing western branch of the Little Pine Creek Interceptor System does not have enough capacity to handle the additional flows from the Longvue STP No. 1 Service Area. In addition, it assumes that because the existing plant tankage is insufficient to provide flow equalization for all the peaks, the new facilities are designed for the peak flow. As in Scenario A, all wastewater from the Longvue STP No. 1 Service Area would be collected at the existing STP. A new gravity sewer would be required from the existing STP to the Allegheny River crossing near Pine Creek. Flow would then be conveyed under the river to the Allegheny River Deep Tunnel Interceptor.

The only major facility that would be required is a gravity sewer, approximately 7.0 miles long, from the existing STP to the connection point with the ALCOSAN system at the Allegheny River crossing near the base of Pine Creek. Table 5.28 contains a summary of the facilities and estimated costs. The potential alignments for the two conceptual designs are shown in Figure 5-18.

Table 5.28
Longvue No. 1 Planning Level Estimated Costs of Construction To ALCOSAN Interceptors[a]

Item	Concept A Quantity	Concept A Units	Concept A Cost	Concept B Quantity	Concept B Units	Concept B Cost
Capital Cost						
ALCOSAN Connection Fee	1.21	mgd	$4,682,700	1.21	mgd	$4,682,700
Construction Cost						
Gravity Sewer	3,700	LF	$412,719	36,950	LF	$5,045,326
Forcemain	0	LF	$0	0	LF	$0
Pump Stations	0		$0	0		$0
Env./R.O.W./Misc.	45	% of const.	$337,679	45	% of const.	$4,127,994
Subtotal			$750,398			$9,173,320
Engr./Constr. Admin.	20	percent	$150,080	20	percent	$1,834,664
Total Construction Cost			$900,477			$11,007,984
Total Capital Cost			**$5,583,177**			**$15,690,684**
Annual O&M Cost						
Gravity Sewer	0.70	miles	$1,759	7.00	miles	$17,563
Pump Stations			$0			$0
Treatment Cost			$1,044,484			$1,044,484
Total Annual Cost			**$1,046,243**			**$1,062,047**
Present Worth Cost			**$17,464,589**			**$27,751,571**

[a] Includes interceptor sewers and related appurtenances required to transport flows to ALCOSAN interceptor system only.

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Appendix A-22-b

Map Source: ALCOSAN Combined Sewer Overflow Program

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET

Legend

- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

O'HARA TWP
SHARPSBURG BORO
ETNA BORO
SHALER TWP
MILLVALE BORO
RESERVE TWP
TWP

CDM EPM TEAM CH2MHILL ALCOSAN

Camp Dresser & McKee

Figure 5-18
Longvue #1 STP Study Area
Potential Connection Routes to ALCOSAN Interceptor

5.12 ANNUAL COSTS OF CONNECTING PaDEP DESIGNATED STUDY AREAS

Annual customer costs to connect to the ALCOSAN interceptor system in the PaDEP designated study areas were estimated on the basis of the infrastructure cost estimates presented in Subsection 6.3. The procedures used for estimating customer costs are discussed as follow.

5.12.1 Cost Allocation Basis

Customer costs were estimated using an equivalent dwelling unit (EDU) rate structure approach, which allows development of customer units for apportioning system costs. The EDU approach establishes the residential dwelling unit as the base unit, with other customer groups such as commercial and industrial users being allocated system costs on the basis of a factor relative to the base residential dwelling unit. For example, a commercial or industrial facility typically produces more wastewater than a residence; therefore, these facilities are assigned a greater number of equivalent dwelling units per facility than a residential dwelling.

5.12.2 Estimation of Equivalent Dwelling Units

The number of EDUs was estimated using available population, household size, employment projection, and wastewater generation rate data (population, household size, and employment data were from SPRPC's Cycle 5 projections). The available data allowed for estimation of residential dwelling units and three categories of nonresidential EDUs: retail, manufacturing, and other.

The number of residential dwelling units was estimated for each study area by dividing the population of the area by the number of persons per household. Population projections used for the study areas were the same projections presented in Section 4. Projections of the number of persons per household for the study areas were determined by calculating the mean household size projections for the municipalities associated with the study areas.

Results of the residential EDU analysis for the study areas are presented in Table 5.29. Table 5.29 shows, each of the PaDEP study areas is projected to increase in population, with the projected size of households decreasing during the planning period. The mean population increase for the study areas is 18 percent, while the mean household size is projected to decrease 4 percent from 2.59 in 1995 to 2.49 in 2015. Despite the projected decrease in average household size, the number of residential dwelling units is projected to increase in each of the study areas.

Table 5.29
Residential Dwelling Units in PaDEP-Designated Study Areas

PaDER-Designated Study Area	1995	2000	2005	2010	2015
Kilbuck/Toms Run					
Population	1,380	1,529	1,678	1,828	1,977
Persons Per Household	2.84	2.81	2.77	2.74	2.71
Residential EDUs	486	545	605	667	730
Millers Run					
Population	4,904	5,307	5,710	6,112	6,515
Persons Per Household	2.72	2.68	2.65	2.62	2.59
Residential EDUs	1,805	1,977	2,154	2,335	2,520
Robinson Run					
Population	3,061	3,157	3,253	3,349	3,445
Persons Per Household	2.57	2.54	2.51	2.48	2.45
Residential EDUs	1,190	1,242	1,295	1,350	1,406
Dravosburg STP Service Area					
Population	2,492	2,607	2,721	2,836	2,950
Persons Per Household	2.34	2.33	2.31	2.30	2.28
Residential EDUs	1,065	1,121	1,178	1,236	1,294
Holiday Park STP Service Area					
Population	11,117	11,630	12,144	12,657	13,171
Persons Per Household	2.79	2.76	2.73	2.70	2.67
Residential EDUs	3,985	4,214	4,448	4,688	4,933
Longvue No. 1 STP Service Area					
Population	5,865	6,222	6,579	6,935	7,292
Persons Per Household	2.62	2.60	2.59	2.57	2.55
Residential EDUs	2,237	2,389	2,544	2,701	2,860
Oakmont STP Service Area					
Population	7,066	7,171	7,276	7,381	7,486
Persons Per Household	2.17	2.15	2.13	2.11	2.09
Residential EDUs	3,256	3,335	3,416	3,498	3,582
Plum Creek STP Service Area					
Population	24,183	25,402	26,620	27,839	29,057
Persons Per Household	2.68	2.65	2.62	2.59	2.56
Residential EDUs	9,037	9,596	10,168	10,753	11,351
Oakmont/Plum Creek STP Service Areas					
Population	31,249	32,573	33,896	35,220	36,543
Persons Per Household	2.42	2.40	2.37	2.35	2.33
Residential EDUs	12,293	12,932	13,584	14,251	14,932

The number of nonresidential EDUs (retail, manufacturing, and other categories) was calculated by establishing a ratio of wastewater generated by residential dwelling units to wastewater generated by a nonresidential group. For example, the rate of wastewater generated per residential dwelling unit for each of the study areas was calculated by multiplying a per-capita wastewater generation rate by the population of the service area and dividing the resulting wastewater generation value by the number of residential dwelling units in the service area.

Wastewater generated by the nonresidential customer category in the study areas was determined by multiplying the estimated number of employees (from the SPRPC Cycle 5 projections) in the three nonresidential categories in the study areas by typical per-employee wastewater generation rates for the different categories. The number of employees by employment category for the study areas was estimated by apportioning the total number of employees in the study area municipalities by the percentage of the total associated municipal population in the study area.

The rates used for wastewater generation for the categories were 15 gallons per employee per day (gpepd) for retail employees, 35 gpepd for manufacturing employees, and 15 gpepd for other employees. For each nonresidential customer category, the estimated volume of wastewater generated was then was divided by the residential dwelling wastewater generated to obtain the estimated number of EDUs by nonresidential category. The estimated number of nonresidential EDUs for each study area is presented in Table 5.30. Total EDUs for the study areas are presented in Table 5.31.

The trend for the number of EDUs for nonresidential customers is different from population trends, with opposite trends projected within certain study areas for different categories. The importance of this projected occurrence is that the number of nonresidential EDUs in a service area affects the average EDU charge, which is the average residential customer charge. For example, the population of a particular service area could be projected to increase, with corresponding EDU growth; however, the average EDU charge could increase if there was a large decrease in nonresidential EDUs.

5.12.3 Identification of Annual System Costs

Annual system costs for the study areas were projected beginning in 2000, which assumes a 5-year lead time for preconstruction activities.

Table 5.30
Nonresidential Equivalent Dwelling Units in PaDEP-Designated Study Areas

PaDER-Designated Study Area	1995	2000	2005	2010	2015
Kilbuck/Toms Run					
Retail EDUs	3	3	3	3	3
Manufacturing EDUs	10	11	11	11	12
Other EDUs	36	39	42	46	49
Millers Run					
Retail EDUs	33	46	60	75	89
Manufacturing EDUs	47	63	79	95	112
Other EDUs	69	88	107	127	147
Robinson Run					
Retail EDUs	23	33	42	52	62
Manufacturing EDUs	33	44	55	66	77
Other EDUs	45	57	70	84	97
Dravosburg STP Service Area					
Retail EDUs	58	62	65	69	73
Manufacturing EDUs	135	125	115	104	93
Other EDUs	52	56	60	64	68
Holiday Park STP Service Area					
Retail EDUs	28	28	29	30	30
Manufacturing EDUs	108	99	91	82	73
Other EDUs	123	141	159	178	197
Longvue No. 1 STP Service Area					
Retail EDUs	31	31	32	33	34
Manufacturing EDUs	5	5	5	5	6
Other EDUs	1	1	1	1	1
Oakmont STP Service Area					
Retail EDUs	45	45	46	46	46
Manufacturing EDUs	220	190	160	129	98
Other EDUs	184	193	203	212	221
Plum Creek STP Service Area					
Retail EDUs	62	63	64	65	66
Manufacturing EDUs	115	108	101	94	87
Other EDUs	253	273	293	313	335
Oakmont/Plum Creek STP Service Areas					
Retail EDUs	107	108	110	111	113
Manufacturing EDUs	335	298	261	223	185
Other EDUs	437	466	495	525	556

Table 5.31
Total Equivalent Dwelling Units in PaDEP-Designated Study Areas

PaDER-Designated Study Area	1995	2000	2005	2010	2015
Kilbuck/Toms Run					
Residential Dwelling Units	486	545	605	667	730
Nonresidential EDUs	49	52	56	60	64
Total EDUs	535	597	661	727	794
Millers Run					
Residential Dwelling Units	1,805	1,977	2,154	2,335	2,520
Nonresidential EDUs	149	197	246	297	349
Total EDUs	1,954	2,174	2,400	2,632	2,869
Robinson Run					
Residential Dwelling Units	1,190	1,242	1,295	1,350	1,406
Nonresidential EDUs	101	134	167	201	236
Total EDUs	1,291	1,376	1,463	1,551	1,642
Dravosburg STP Service Area					
Residential Dwelling Units	1,065	1,121	1,178	1,236	1,294
Nonresidential EDUs	246	243	240	237	234
Total EDUs	1,311	1,364	1,418	1,473	1,528
Holiday Park STP Service Area					
Residential Dwelling Units	3,985	4,214	4,448	4,688	4,933
Nonresidential EDUs	259	269	279	289	300
Total EDUs	4,243	4,483	4,727	4,977	5,233
Longvue No. 1 STP Service Area					
Residential Dwelling Units	2,237	2,389	2,544	2,701	2,860
Nonresidential EDUs	36	37	38	40	41
Total EDUs	2,273	2,427	2,582	2,740	2,900
Oakmont STP Service Area					
Residential Dwelling Units	3,256	3,335	3,416	3,498	3,582
Nonresidential EDUs	449	429	408	387	366
Total EDUs	3,705	3,764	3,824	3,885	3,947
Plum Creek STP Service Area					
Residential Dwelling Units	9,037	9,596	10,168	10,753	11,351
Nonresidential EDUs	430	444	458	473	488
Total EDUs	9,467	10,040	10,626	11,226	11,838
Oakmont/Plum Creek STP Service Areas					
Residential Dwelling Units	12,293	12,932	13,584	14,251	14,932
Nonresidential EDUs	879	873	866	860	853
Total EDUs	13,172	13,804	14,450	15,111	15,786

Capital Costs

Capital costs included the following:

- Connector interceptor construction costs.
- ALCOSAN's connection fee.

Connector interceptor costs were identified and discussed in Subsection 5.11. These costs do not include costs for the installation or operation of local collection sewers. ALCOSAN's connection fee is a fee assessed to new service areas. Through the connection fee, new customers buy into the equity reflected by the trended capital investment in ALCOSAN's facilities.

Procedures for calculating connection fees have been established by Pennsylvania Act 203. According to Act 203 guidelines, ALCOSAN's current maximum allowable connection fee is $3,873,434 per mgd of treated wastewater.

In addition to the capital costs identified above, new ALCOSAN customers are required to pay a prorated portion of any improvements to ALCOSAN'S interceptor system that would be required to convey additional sewage.

Capital costs were assumed to be amortized using 25-year general obligation bonds, with an interest rate of six percent and a four percent issuance cost. Table 5.32 provides a summary of annualized capital costs for each study area.

O&M Costs

O&M costs included the following:

- Costs for maintenance of connector interceptors.
- ALCOSAN treatment costs.

Maintenance costs for connector interceptors were identified and discussed in Subsection 5.11. These costs were assumed to be inflated by three percent annually.

ALCOSAN's treatment costs are calculated on the basis of an estimated annual unit charge per million gallons, as developed in Subsection 7.12. Annual treatment costs are based on multiplying ALCOSAN's treatment cost by the projected annual volume of wastewater generated in each study area. Table 5.33 provides a summary of annual O&M costs for each study area.

Table 5.32
Summary of PaDEP-Designated Study Area
Annualized Capital Costs to Connect to the ALCOSAN Interceptor System

PaDER-Designated Study Area	Concept A	Concept B
Kilbuck/Toms Run		
Construction Costs	$ 1,399,862	--
ALCOSAN Connection Fee	$ 83,564	--
Total Annualized Capital Costs	$ 1,483,427	--
Millers Run		
Construction Costs	$ 469,146	$ 1,031,224
ALCOSAN Connection Fee	$ 275,413	$ 275,413
Total Annualized Capital Costs	$ 744,560	$ 1,306,638
Robinson Run		
Construction Costs	$ 282,634	$ 1,199,472
ALCOSAN Connection Fee	$ 145,629	$ 145,629
Total Annualized Capital Costs	$ 428,263	$ 1,345,101
Dravosburg STP Service Area		
Construction Costs	$ 257,807	$ 475,358
ALCOSAN Connection Fee	$ 125,645	$ 125,645
Total Annualized Capital Costs	$ 383,451	$ 601,003
Holiday Park STP Service Area		
Construction Costs	$ 54,615	$ 1,647,084
ALCOSAN Connection Fee	$ 527,885	$ 527,885
Total Annualized Capital Costs	$ 582,499	$ 2,174,968
Longvue No. 1 STP Service Area		
Construction Costs	$ 72,795	$ 889,888
ALCOSAN Connection Fee	$ 379,045	$ 379,045
Total Annualized Capital Costs	$ 451,839	$ 1,268,933
Oakmont STP Service Area		
Construction Costs	$ 201,162	$ 738,137
ALCOSAN Connection Fee	$ 457,097	$ 457,097
Total Annualized Capital Costs	$ 658,259	$ 1,195,233
Plum Creek STP Service Area		
Construction Costs	$ 372,800	$ 1,188,056
ALCOSAN Connection Fee	$ 964,465	$ 964,465
Total Annualized Capital Costs	$ 1,337,265	$ 2,152,521
Oakmont/Plum Creek STP Service Areas		
Construction Costs	$ 480,406	$ 1,364,783
ALCOSAN Connection Fee	$ 1,418,908	$ 1,418,908
Total Annualized Capital Costs	$ 1,899,315	$ 2,783,691

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Table 5.33
Summary of PaDEP-Designated Study Area O&M Costs to Connect to the ALCOSAN Interceptor System

PaDER-Designated Study Area	2000 Concept A	2000 Concept B	2005 Concept A	2005 Concept B	2010 Concept A	2010 Concept B	2015 Concept A	2015 Concept B
Kilbuck/Toms Run								
Interceptor Maintenance	$ 33,275	–	$ 38,574	–	$ 44,718	–	$ 51,841	–
ALCOSAN Treatment Cost	$ 179,336	–	$ 223,299	–	$ 253,055	–	$ 285,402	–
Total Annual O&M Costs	$ 212,611	–	$ 261,873	–	$ 297,773	–	$ 337,243	–
Millers Run								
Interceptor Maintenance	$ 28,640	$ 42,333	$ 33,201	$ 49,076	$ 38,490	$ 56,892	$ 44,620	$ 65,954
ALCOSAN Treatment Cost	$ 622,352	$ 622,352	$ 759,619	$ 759,619	$ 846,340	$ 846,340	$ 940,637	$ 940,637
Total Annual O&M Costs	$ 650,992	$ 664,686	$ 792,821	$ 808,695	$ 884,829	$ 903,232	$ 985,257	$ 1,006,591
Robinson Run								
Interceptor Maintenance	$ 31,346	$ 47,099	$ 36,338	$ 54,601	$ 42,126	$ 63,297	$ 48,835	$ 73,379
ALCOSAN Treatment Cost	$ 370,236	$ 370,236	$ 432,787	$ 432,787	$ 463,712	$ 463,712	$ 497,374	$ 497,374
Total Annual O&M Costs	$ 401,581	$ 417,335	$ 469,125	$ 487,388	$ 505,838	$ 527,009	$ 546,210	$ 570,753
Dravosburg STP Service Area								
Interceptor Maintenance	$ 89,664	$ 98,019	$ 103,945	$ 113,631	$ 120,501	$ 131,729	$ 139,694	$ 152,710
ALCOSAN Treatment Cost	$ 307,952	$ 307,952	$ 364,717	$ 364,717	$ 395,561	$ 395,561	$ 429,122	$ 429,122
Total Annual O&M Costs	$ 397,616	$ 405,971	$ 468,662	$ 478,348	$ 516,062	$ 527,290	$ 568,815	$ 581,832
Holiday Park STP Service Area								
Interceptor Maintenance	$ 1,377	$ 34,245	$ 1,597	$ 39,699	$ 1,851	$ 46,022	$ 2,146	$ 53,353
ALCOSAN Treatment Cost	$ 1,293,226	$ 1,293,226	$ 1,531,868	$ 1,531,868	$ 1,661,678	$ 1,661,678	$ 1,802,918	$ 1,802,918
Total Annual O&M Costs	$ 1,294,603	$ 1,327,471	$ 1,533,464	$ 1,571,567	$ 1,663,529	$ 1,707,700	$ 1,805,064	$ 1,856,271
Longvue No. 1 STP Service Area								
Interceptor Maintenance	$ 2,039	$ 20,360	$ 2,364	$ 23,603	$ 2,740	$ 27,363	$ 3,177	$ 31,721
ALCOSAN Treatment Cost	$ 897,210	$ 897,210	$ 1,076,213	$ 1,076,213	$ 1,180,807	$ 1,180,807	$ 1,294,575	$ 1,294,575
Total Annual O&M Costs	$ 899,249	$ 917,570	$ 1,078,577	$ 1,099,816	$ 1,183,547	$ 1,208,169	$ 1,297,752	$ 1,326,296
Oakmont STP Service Area								
Interceptor Maintenance	$ 64,115	$ 88,166	$ 74,327	$ 102,209	$ 86,165	$ 118,488	$ 99,889	$ 137,360
ALCOSAN Treatment Cost	$ 1,214,742	$ 1,214,742	$ 1,398,247	$ 1,398,247	$ 1,476,213	$ 1,476,213	$ 1,561,151	$ 1,561,151
Total Annual O&M Costs	$ 1,278,857	$ 1,302,909	$ 1,472,574	$ 1,500,456	$ 1,562,378	$ 1,594,701	$ 1,661,040	$ 1,698,511
Plum Creek STP Service Area								
Interceptor Maintenance	$ 83,143	$ 138,169	$ 96,386	$ 160,176	$ 111,737	$ 185,688	$ 129,534	$ 215,263
ALCOSAN Treatment Cost	$ 2,339,035	$ 2,339,035	$ 2,780,826	$ 2,780,826	$ 3,026,604	$ 3,026,604	$ 3,293,996	$ 3,293,996
Total Annual O&M Costs	$ 2,422,178	$ 2,477,204	$ 2,877,212	$ 2,941,002	$ 3,138,341	$ 3,212,292	$ 3,423,531	$ 3,509,259
Oakmont/Plum Creek STP Service Areas								
Interceptor Maintenance	$ 201,433	$ 136,830	$ 233,516	$ 158,624	$ 270,709	$ 183,888	$ 313,826	$ 213,177
ALCOSAN Treatment Cost	$ 3,508,681	$ 3,508,681	$ 4,142,183	$ 4,142,183	$ 4,479,275	$ 4,479,275	$ 4,846,086	$ 4,846,086
Total Annual O&M Costs	$ 3,710,115	$ 3,645,512	$ 4,375,700	$ 4,300,807	$ 4,749,985	$ 4,663,164	$ 5,159,912	$ 5,059,263

Total Annual Costs

Table 5.34 provides a summary of total annual costs for each study area.

5.12.4 Calculation of Costs Per EDU

Total annual costs were apportioned to the estimated number of EDUs for each of the study areas, which yielded annual EDU costs; monthly EDU costs also were calculated (see Table 5.35). As shown in Table 5.35, the estimated monthly cost per EDU for the study areas in 2000 ranges from $30 to $244 (range of best and worst case scenarios) and from $37 to $202 in 2015.

Table 5.34

Summary of PaDEP-Designated Study Area Total Annual Costs to Connect to the ALCOSAN Interceptor System

PaDER-Designated Study Area	2000 Concept A	2000 Concept B	2005 Concept A	2005 Concept B	2010 Concept A	2010 Concept B	2015 Concept A	2015 Concept B
Kilbuck/Toms Run								
Capital Costs	$ 1,483,427	–	$ 1,483,427	–	$ 1,483,427	–	$ 1,483,427	–
O&M Costs	$ 212,611	–	$ 261,873	–	$ 297,773	–	$ 337,243	–
Total Annual Costs	$ 1,696,037	–	$ 1,745,300	–	$ 1,781,199	–	$ 1,820,669	–
Millers Run								
Capital Costs	$ 744,560	$ 1,306,638	$ 744,560	$ 1,306,638	$ 744,560	$ 1,306,638	$ 744,560	$ 1,306,638
O&M Costs	$ 650,992	$ 664,686	$ 792,821	$ 808,695	$ 884,829	$ 903,232	$ 985,257	$ 1,006,591
Total Annual Costs	$ 1,395,552	$ 1,971,323	$ 1,537,381	$ 2,115,333	$ 1,629,389	$ 2,209,870	$ 1,729,817	$ 2,313,228
Robinson Run								
Capital Costs	$ 428,263	$ 1,345,101	$ 428,263	$ 1,345,101	$ 428,263	$ 1,345,101	$ 428,263	$ 1,345,101
O&M Costs	$ 401,581	$ 417,335	$ 469,125	$ 487,388	$ 505,838	$ 527,009	$ 546,210	$ 570,753
Total Annual Costs	$ 829,844	$ 1,762,435	$ 897,388	$ 1,832,488	$ 934,100	$ 1,872,109	$ 974,473	$ 1,915,854
Dravosburg STP Service Area								
Capital Costs	$ 383,451	$ 601,003	$ 383,451	$ 601,003	$ 383,451	$ 601,003	$ 383,451	$ 601,003
O&M Costs	$ 397,616	$ 405,971	$ 468,662	$ 478,348	$ 516,062	$ 527,290	$ 568,815	$ 581,832
Total Annual Costs	$ 781,067	$ 1,006,974	$ 852,113	$ 1,079,350	$ 899,513	$ 1,128,293	$ 952,266	$ 1,182,834
Holiday Park STP Service Area								
Capital Costs	$ 582,499	$ 2,174,968	$ 582,499	$ 2,174,968	$ 582,499	$ 2,174,968	$ 582,499	$ 2,174,968
O&M Costs	$ 1,294,603	$ 1,327,471	$ 1,533,464	$ 1,571,567	$ 1,663,529	$ 1,707,700	$ 1,805,064	$ 1,856,271
Total Annual Costs	$ 1,877,103	$ 3,502,439	$ 2,115,963	$ 3,746,535	$ 2,246,028	$ 3,882,668	$ 2,387,563	$ 4,031,239
Longvue No. 1 STP Service Area								
Capital Costs	$ 451,839	$ 1,268,933	$ 451,839	$ 1,268,933	$ 451,839	$ 1,268,933	$ 451,839	$ 1,268,933
O&M Costs	$ 899,249	$ 917,570	$ 1,078,577	$ 1,099,816	$ 1,183,547	$ 1,208,169	$ 1,297,752	$ 1,326,296
Total Annual Costs	$ 1,351,088	$ 2,186,503	$ 1,530,416	$ 2,368,749	$ 1,635,387	$ 2,477,102	$ 1,749,591	$ 2,595,228
Oakmont STP Service Area								
Capital Costs	$ 658,259	$ 1,195,233	$ 658,259	$ 1,195,233	$ 658,259	$ 1,195,233	$ 658,259	$ 1,195,233
O&M Costs	$ 1,278,857	$ 1,302,909	$ 1,472,574	$ 1,500,456	$ 1,562,378	$ 1,594,701	$ 1,661,040	$ 1,698,511
Total Annual Costs	$ 1,937,116	$ 2,498,142	$ 2,130,832	$ 2,695,689	$ 2,220,637	$ 2,789,934	$ 2,319,298	$ 2,893,745
Plum Creek STP Service Area								
Capital Costs	$ 1,337,265	$ 2,152,521	$ 1,337,265	$ 2,152,521	$ 1,337,265	$ 2,152,521	$ 1,337,265	$ 2,152,521
O&M Costs	$ 2,422,178	$ 2,477,204	$ 2,877,212	$ 2,941,002	$ 3,138,341	$ 3,212,292	$ 3,423,531	$ 3,509,259
Total Annual Costs	$ 3,759,443	$ 4,629,725	$ 4,214,477	$ 5,093,523	$ 4,475,606	$ 5,364,812	$ 4,760,796	$ 5,661,780
Oakmont/Plum Creek STP Service Areas								
Capital Costs	$ 1,899,315	$ 2,783,691	$ 1,899,315	$ 2,783,691	$ 1,899,315	$ 2,783,691	$ 1,899,315	$ 2,783,691
O&M Costs	$ 3,710,115	$ 3,645,512	$ 4,375,700	$ 4,300,807	$ 4,749,985	$ 4,663,164	$ 5,159,912	$ 5,059,263
Total Annual Costs	$ 5,609,429	$ 6,429,203	$ 6,275,014	$ 7,084,499	$ 6,649,299	$ 7,446,855	$ 7,059,227	$ 7,842,954

Table 5.35
Summary of PaDEP-Designated Study Area EDU Costs to Connect to the ALCOSAN Interceptor System

PaDER-Designated Study Area	2000		2005		2010		2015	
	Concept A	Concept B	Concept A	Concept B	Concept A	Concept B	Concept A	Concept B
Kilbuck/Toms Run								
Cost Per EDU Per Year	$ 2,840	--	$ 2,639	--	$ 2,450	--	$ 2,293	--
Cost Per EDU Per Month	$ 237	--	$ 220	--	$ 204	--	$ 191	--
Millers Run								
Cost Per EDU Per Year	$ 642	$ 907	$ 641	$ 881	$ 619	$ 840	$ 603	$ 806
Cost Per EDU Per Month	$ 53	$ 76	$ 53	$ 73	$ 52	$ 70	$ 50	$ 67
Robinson Run								
Cost Per EDU Per Year	$ 603	$ 1,281	$ 614	$ 1,253	$ 602	$ 1,207	$ 593	$ 1,167
Cost Per EDU Per Month	$ 50	$ 107	$ 51	$ 104	$ 50	$ 101	$ 49	$ 97
Dravosburg STP Service Area								
Cost Per EDU Per Year	$ 573	$ 738	$ 601	$ 761	$ 611	$ 766	$ 623	$ 774
Cost Per EDU Per Month	$ 48	$ 62	$ 50	$ 63	$ 51	$ 64	$ 52	$ 64
Holiday Park STP Service Area								
Cost Per EDU Per Year	$ 419	$ 781	$ 448	$ 793	$ 451	$ 780	$ 456	$ 770
Cost Per EDU Per Month	$ 35	$ 65	$ 37	$ 66	$ 38	$ 65	$ 38	$ 64
Longvue No. 1 STP Service Area								
Cost Per EDU Per Year	$ 557	$ 901	$ 593	$ 917	$ 597	$ 904	$ 603	$ 895
Cost Per EDU Per Month	$ 46	$ 75	$ 49	$ 76	$ 50	$ 75	$ 50	$ 75
Oakmont STP Service Area								
Cost Per EDU Per Year	$ 515	$ 664	$ 557	$ 705	$ 572	$ 718	$ 588	$ 733
Cost Per EDU Per Month	$ 43	$ 55	$ 46	$ 59	$ 48	$ 60	$ 49	$ 61
Plum Creek STP Service Area								
Cost Per EDU Per Year	$ 374	$ 461	$ 397	$ 479	$ 399	$ 478	$ 402	$ 478
Cost Per EDU Per Month	$ 31	$ 38	$ 33	$ 40	$ 33	$ 40	$ 34	$ 40
Oakmont/Plum Creek STP Service Areas								
Cost Per EDU Per Year	$ 406	$ 466	$ 434	$ 490	$ 440	$ 493	$ 447	$ 497
Cost Per EDU Per Month	$ 34	$ 39	$ 36	$ 41	$ 37	$ 41	$ 37	$ 41

5.13 ENVIRONMENTAL ANALYSIS

In this section, the environmental impacts of carrying out the CIP improvements at the ALCOSAN treatment plant site are considered. A preliminary environmental assessment of the conceptual designs for connecting the PaDEP study areas into ALCOSAN is discussed. The environmental permitting requirements for the Sawmill Run Parallel Interceptor project are also summarized.

5.13.1 County Stormwater Management Plans

Stormwater management activities at the ALCOSAN treatment plant site are regulated under the Pennsylvania Clean Streams Law and the Allegheny County Stormwater Management Ordinance. Publicly owned wastewater treatment plants are categorically included under the statewide general stormwater permitting program. Stormwater within treatment areas of the ALCOSAN plant site currently is captured and flows to the influent wetwell for treatment. This arrangement will continue despite changes to the treatment plant, e.g., the installation of concrete covers on the primary sedimentation tanks. Therefore, there will be no net increase to stormwater runoff because of the treatment plant improvements.

Construction activities during the implementation of the treatment plant CIP will be conducted according to Allegheny County stormwater management regulations pursuant to the Storm Water Management Act. None of the earth disturbance activities that may be required during construction will exceed twenty-five acres in area; therefore, an Earth Disturbance Permit will not be required. An approved Soil Erosion and Sediment Control Plan will be followed during construction.

The construction of the Sawmill Run Parallel Interceptor and the construction of interconnecting sewers will be conducted in conformance with the requirements of Soil Erosion and Sediment Control Plans to be submitted to the Allegheny County Soil Conservation District.

5.13.2 Wetlands

Wetlands possess three essential characteristics: 1) hydric soils; 2) wetland hydrology; and 3) hydrophytic vegetation. All characteristics must be fulfilled for an area to be classified as a wetland.[1] The U. S. Fish and Wildlife Service (FWS) has identified wetlands throughout the United States primarily by stereoscopic analysis of high altitude aerial photographs. Wetlands

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1 USEPA/USCOE Field Guide for Determining Wetlands, 1989.

were identified on the photographs based on vegetation, visible hydrology and geography by Classification of Wetlands and Deep Water Habitats of the United States.[2]

Hydric soils information for both Allegheny and Washington Counties was provided by the U. S. Department of Agricultures' Soil Conservation Service (SCS). The SCS has identified those soils, within each county, with the potential of containing hydric components. These soils are subdivided into soils with major components hydric and soils with inclusions of hydric components. Soils with major hydric components have a high probability of being classified as hydric soils and supporting hydrophytic vegetation. Those soils with inclusions of hydric components have the potential for being classified as hydric soils and must be field checked for an actual determination.

ALCOSAN Treatment Plant Site

The Pittsburgh West, PA Wetlands Map prepared by the FWS does not show any wetlands on the ALCOSAN site. However, the map does identify a Riverine Wetland, the Ohio River, next to the site. Based on soils information provided by the SCS it does not appear that any of the soil types with major hydric components, located within Allegheny County (i.e., Atkins Silt Loam, Brinkerton Silt Loam), appear on the site. The primary soil type on the site is classified as Urban Land, which the SCS has determined has the potential for the inclusion of hydric components.

The ALCOSAN treatment plant site was inspected to determine areas that could potentially meet the wetlands criteria. As shown on figure 5-19, there are several small areas along the riverbank perimeter of the plant site that could potentially meet the definition of wetlands. The impacts of the proposed additional final clarifiers and the hypochlorite barge dock on these areas will be evaluated during the respective designs of these facilities.

Sawmill Run Relief Interceptor Project

The Sawmill Run Parallel Interceptor will include some parallel stream occupancies and stream crossings. These locations have been documented in the Joint Permit (PaDEP and Army Corps of Engineers) application filed for the project.

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[2] FWB/OBS 79/31

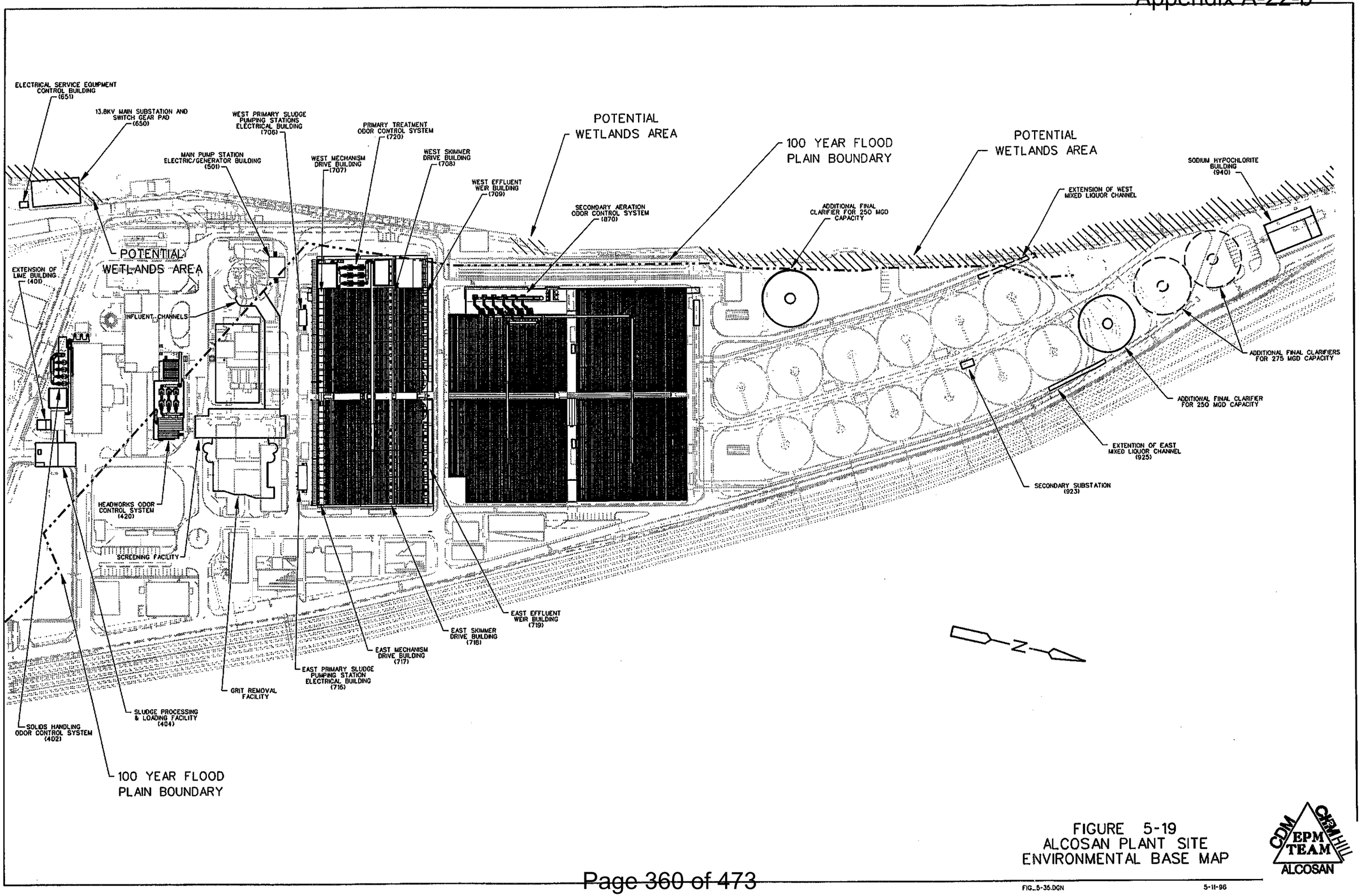


FIGURE 5-19
ALCOSAN PLANT SITE
ENVIRONMENTAL BASE MAP

CDM CH2MHILL EPM TEAM ALCOSAN

FIG_5-35.DGN 5-11-96

PaDEP Designated Study Areas

The conceptual designs presented in subsection 5.10 of this Plan are intended to permit planning level cost and feasibility analysis. The routings of potential interconnecting interceptors have not been sufficiently detailed to allow a meaningful delineation of impacts on environmentally sensitive areas. However, for planning purposes, the Federal Wildlife Service wetland maps for the areas were reviewed to provide an overview of potentially sensitive areas. Federally delineated wetlands within five hundred feet of the potential alignments are shown on figures 5-20a through 5-20i.

5.13.3 Waterway Disturbances and Floodplain Impacts

Most of the treatment plant site is located upland of the 100-year flood elevation (725 feet).[3] Based upon this elevation, the existing Energy Recovery Building, Dewatering Building and related appurtenances are within the 100-year floodplain. The sodium hypochlorite barge dock and the sixteenth final clarifier are likely to trigger the need for a Joint Waterways Obstruction and Encroachment permit. Waterway and floodplain impacts from the Sawmill Run project were discussed above. The potential alignments for sewer lines from the PaDEP designated study areas follow natural stream topography, and therefore would likely encroach on the streams and their flood plains during construction.

5.13.4 Rare, Endangered or Threatened Plan and Animal Species

A *Pennsylvania National Diversity Inventory (PNDI)* search request was filed with the PaDEP Bureau of Forestry. The Bureau affirmed that no rare or endangered species are found at the ALCOSAN treatment plant or within the Sawmill Run Interceptor Project disturbance area. (Appendix F). Due to their uncertain locations, no information is available on the PaDEP study area potential alignments.

5.13.5 Historical and Archaeological Resources Protection

Construction of the ALCOSAN treatment plant began in 1956 and was completed in 1959. Between 1970 and 1972, the plant was expanded and modified to provide secondary wastewater treatment. A brief history of the plant site has been compiled by using historical USGS maps from 1906, 1956, 1960, 1979 and 1993; Sanborne Fire Insurance Maps form 1926 and 1950; and information provided by the Authority.

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[3] Source: FEMA Flood Boundary and Floodway Map - City of Pittsburgh (Panel No. 420063-0030) 1981.

Map Source: ALCOSAN Combined Sewer Overflow Program, NWI Maps

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET

Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Camp Dresser & McKee

Figure 5-20a
Toms Run Watershed and Kilbuck Run Watershed Study Areas
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program NWI Maps

NORTH FAYETTE TWP

COLLIER TWP

SOUTH FAYETTE TWP

OAKDALE BORO

MIDWAY BORO

BRIDGEVILLE BORO

UPPER CLAIR TW

CARN

ROSS

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FEET
0 1000 2000 3000 4000 6000 8000

Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Figure 5-20b
Upper Robinson Run Watershed Study Area
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program, NWI Maps

MCDONALD BORO

SOUTH FAYETTE TWP

WASHINGTON COUNTY

CECIL TWP

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Allegheny County, Pennsylvania

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Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Figure 5-20c
Millers Run Watershed Study Area
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program NWI Maps

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Allegheny County, Pennsylvania

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Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

EPM TEAM ALCOSAN

Camp Dresser & McKee

Figure 5-20d
Dravosburg STP Study Area
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program, NWI Maps

O'HARA TWP

OAKMO BORO

VERONA BORO

O'HARA

ASPINWALL BORO

BLA... BORO

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

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0 500 1000 1500 2000 3000 4000

Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Figure 5-20e
Oakmont STP Study Area
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program, NWI Maps

OAKMONT BORO

O'HARA TWP

VERONA BORO

O'HARA

ASPINWALL BORO

BLA... BORO

PENN HILLS TWP

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Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

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FEET
0 500 1000 1500 2000 3000 4000

Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

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Figure 5-20f
Plum Creek STP Study Area
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program, NWI Maps

BORO

O'HARA TWP

OAKMONT BORO

VERONA BORO

O'HARA

ASPINWALL BORO

BLAWNOX BORO

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

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FEET
0 500 1000 1500 2000 3000 4000

Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

CDM CH2MHILL EPM TEAM ALCOSAN

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Figure 5-20g
Oakmont STP and Plum Creek STP Study Areas
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program, NWI Maps

MONROEVILLE BORO

WILKINS TWP

Thompson Run

TURTLE CREEK BORO

PITCAIRN BORO

WILMERDING BORO

Turtle Creek

WALL BORO

EAST

MCKEESPORT BORO

TRAFFORD

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

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April 1996

FEET

Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

CDM EPM TEAM CH2MHILL ALCOSAN

Camp Dresser & McKee

Figure 5-20h
Holiday Park STP Study Area
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Source: ALCOSAN Combined Sewer Overflow Program, NWI Maps

ALCOSAN

Allegheny County Sanitary Authority
Allegheny County, Pennsylvania

537 Plan

April 1996

FEET

Legend

- NWI Wetlands within ~500 ft. of Potential Sewer
- Treatment Plant Location
- Existing Interceptor Sewer

Gravity Sewers:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Force Mains:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

Pump Stations:
- Existing
- Potential "Best Case"
- Potential "Worst Case"

- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

Camp Dresser & McKee

Figure 5-20i
Longvue #1 STP Study Area
NWI Wetlands Along Potential Connection Routes to ALCOSAN Interceptor

Map Sources: ALCOSAN Combined Sewer Overflow Program
Intakes & Wells from *The Allegheny County Riverfront Policies Plan*, Environmental Planning & Design, Pittsburgh, PA
Note: Locations of Intakes and Wells are approximate

FEET
0 4000 8000 12000 16000 24000 32000

MILES
0 1 2 3 4 6 8

ALCOSAN

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Allegheny County, Pennsylvania

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August 1996

Legend

- Drinking Water Intake - Surface Water
- Drinking Water Intake - Well Field
- Current ALCOSAN Service Area
- County Boundary
- Municipal Boundaries
- Primary Roads
- Secondary Roads
- Hydrologic Features

EPM TEAM
CDM CH2MHILL
ALCOSAN

Camp Dresser & McKee

Figure 6-1
Surface Water Intakes and Well Fields

Quantifying the effects of combined and sanitary sewer overflow induced water-quality problems on recreational use is difficult. No records are kept by public agencies concerning the number of recreation days lost because of elevated sewage contamination levels of the rivers. The moving nature of the river environment, along with the delay between the time of sampling and the reporting of results make issuing warnings difficult. However, the CSO Program has observed fecal coliform counts that exceed water-quality criteria during both wet and dry weather. Thus, pending additional water-quality information from the ongoing CSO Program water-quality monitoring, a qualitative assumption may be made that a failure to implement the strategy for capturing and treating wet-weather CSOs would negatively affect recreational use of the rivers in Allegheny County.

6.2.4 Drinking-Water Sources

The locations of water intakes and wellfields along the receiving streams are shown in Figure 6-1. By implementing the wet-weather treatment strategy, the pollutant loading in the public water system's sources of supply will be reduced, which should result in more reliable and cost effective water treatment by the public water suppliers. In addition, the reduction in discharges from combined sewer overflows should reduce the chances of an accidental release of a hazardous chemical to the sewer systems, e.g., a chemical spill in a combined sewer area entering a public water system.

6.3 CONSISTENCY DETERMINATIONS

PaDEP guidelines require the proposed facility upgrade plan be evaluated for consistency with existing sewerage and water-quality plans. Key existing plans are discussed below:

6.3.1 Chapter 94

PaDEP requires owners of wastewater treatment facilities to prepare and submit an annual report describing the previous year's activities and hydraulic and organic loading projections. This report is required by Chapter 94 of the Sewage Facilities Act and is referred to as an Annual Wasteload Management Report. ALCOSAN identified the following issues in its 1993 annual report:

- Plant flows in excess of permitted capacity were documented during wet-weather periods as a result of ALCOSAN's efforts to minimize combined sewer overflows to the rivers and streams of the Commonwealth.

  This issue is being addressed through the increased wet-weather capacity component of the CIP.

- An agreement was entered into with the Municipality of Penn Hills to accept flows generated from the municipality.

  The hydraulic expansion of the treatment plant will allow for the additional projected flow from Penn Hills in addition to projected increased flows from the existing service area.

- A plan was developed to construct a parallel interceptor to the Saw Mill Run interceptor to convey wet-weather flows.

  This plan is being implemented through ALCOSAN's ongoing capital improvement process.

- Pump station upgrade projects at Squaw Run, Verona, Corliss, and Montrose were described.

  The projects have been completed through ALCOSAN's ongoing capital improvement process.

6.3.2 Comparison with Clean Water Act Plans

As discussed in Section 2, all of the recommendations in the COWAMP study to expand ALCOSAN's service area were implemented, with the exception of adding the Longvue STP service area (in McCandless Township).

In addition, a recommendation was made in the COWAMP study to evaluate a combined management program for municipal water, sewer sludge, and industrial residue management program during ALCOSAN's 1980 201 facility upgrade plan. In fact, the principal purpose of ALCOSAN's 201 plan was to address sludge handling and disposal.

ALCOSAN currently accepts water and wastewater treatment sludge for disposal from service area municipalities.

6.3.3 Anti-Degradation Policies

As outlined in section 6.2.1, the proposed improvements to the ALCOSAN's treatment plant will enable ALCOSAN to continue complying with current and future NPDES' discharge limits. In addition, the wet-weather treatment strategy is in keeping with USEPA's Combined Sewer Overflow Control Policy (April 1994) and is designed to enhance the water-quality in the receiving streams of Allegheny County.

6.3.4 State Water Plan Compliance

As discussed in Section 1, the state water plan was developed primarily to guide the conservation of the Commonwealth's water and related land resources. General recommendations related to wastewater management for the relevant sub-basins that comprise ALCOSAN's service area were to limit inadequately treated wastewater discharges. The state water plan referenced the COWAMP study for specific water-quality management recommendations. ALCOSAN's wet-weather management component will greatly reduce the volume of inadequately treated wastewater discharges, thus fulfilling a recommendation of the plan.

SECTION 6
Environmental Assessment

6.1 INTRODUCTION

This section addresses the environmental impacts of implementing ALCOSAN's ***Comprehensive Water Management Program*** which is described in the 537 plan, including the treatment plant CIP, the CSO Program and the Saw Mill Run parallel interceptor extension project. The implications of the no-action alternative also are addressed. The consistency of the proposed CIP with previous area-wide wastewater management plans is reviewed.

6.2 NO-ACTION ALTERNATIVE

This subsection addresses the water-quality impacts of not implementing ALCOSAN's capital programs, i.e., the proposed Capital Improvement Program, the Combined Sewer Overflow Program (nine minimum controls and CSO long term control plan) and the Saw Mill Run parallel interceptor extension project.

6.2.1 Water-quality Impacts

Treatment Plant Capital Improvement Program

The average daily flow of the treatment plant is approaching the permitted average daily flow of 200 mgd. If the treatment plant is not expanded, future development in the ALCOSAN service area could be limited by the lack of wastewater treatment capacity. Conversely, future growth in the ALCOSAN service area could negatively affect the quality of receiving stream water by increasing wet weather bypassing from municipal combined and sanitary sewer overflows. A lack of additional plant capacity in the future could result in localized water-quality impacts if unsewered areas are developed. Also, ALCOSAN's ability to play a leading role in resolving localized water-quality impacts would be diminished.

The proposed facilities and hydraulic-control strategy for a total of 875-mgd wet-weather flows will result in the capture and treatment of a significant amount of floatables, BOD_5, and TSS, that is being discharged directly to the rivers and creek through combined sewer overflows. The capture of CSOs will assist in the presumptive compliance with water-quality standards mandated under the USEPA's Combined Sewer Overflow Control Policy. If the wet-weather treatment strategy is not implemented, the pollutant loading in the CSOs would continue to be discharged to the rivers without treatment. In addition, the ability of the ALCOSAN treatment plant to adequately treat future waste loads could be questionable.

Combined Sewer Overflow Program

The implementation of the nine minimum controls and the development of a CSO long term control plan are mandated in ALCOSAN's NPDES permit. In addition to being a violation of the NPDES permit, the failure to implement the nine minimum controls and the CSO long term control plan would result in continued water-quality degradation resulting from sewer overflows.

Saw Mill Run Parallel Interceptor Extension Project

If the Saw Mill Run parallel interceptor extension project is not constructed, the localized interceptor overflowing and flooding will continue, with the resulting public health and water-quality impacts.

6.2.2 Economic Impacts

The economic impacts of a no-action alternative were evaluated against the economic impacts of implementing ALCOSAN's capital programs. Major economic impact variables associated with the lack or presence of wastewater management capacity were identified and then evaluated as being negatively or positively affected by the two alternatives. Negatively affected variables are assumed to have a negative affect on the local economy, with the opposite being true for positively affected variables. Table 6.1 summarizes the results of the analysis. The impacts of the two alternatives on each of the identified major economic variables are discussed below.

Commercial and Industrial Development

According to ALCOSAN, commercial and industrial customers (including public customers) accounted for approximately 35 percent of billed flows to the treatment plant in 1993. As discussed in Section 3, industrial development in the ALCOSAN service area is not projected to increase from current levels during the planning period. However, commercial development (such as service-sector businesses), which is more closely related to population growth, is expected to increase during the planning period. According to SPRPC, industrial activity in the service area, as measured by employment, is projected to decrease by approximately 18 percent from 1990 to 2015, while commercial activity (including agricultural and public sector operations), also as measured by employment, is projected to increase by approximately 35 percent during the same period.

By 1926 most of the site was owned by three industries: Pressed Steel Car Company, Pittsburgh Forge and Iron Company, and the Pennsylvania Railroad. One small commercial and residential section was also located within the confines of the current property where the preaeration and primary sedimentation tanks are currently located. Most of the industrial builders were demolished by 1951. Remaining industrial, residential and commercial buildings were demolished between 1956 and 1958. No structures presently on site predate 1956.

The Bureau of Historic Preservation within the Pennsylvania Historical and Museum Commission have said that there are no known historic sites and potential impacts on known archaeological and historical sites relevant to the proposed treatment plant improvements or within the Sawmill Run disturbance area (Appendix G). Due to their uncertain locations, no information is available on the PaDEP Study Area potential alignments.

5.14 WATER-QUALITY IMPACTS

In this section, the water-quality impacts of ALCOSAN's Comprehensive Wastewater Management Program are considered.

5.14.1 Plant Effluent

Each of the technical alternatives for the upgrading and expansion of the treatment plant which were considered would enable ALCOSAN to achieve compliance with NPDES discharge limits at design flows and loadings. ALCOSAN has been working closely with PaDEP in the determination of effluent limits for the expanded treatment plant. PaDEP provided preliminary effluent limitations for average design flows at 300 mgd and 350 mgd in September, 1994. With the refinement of flow and loading projections during the conceptual design, PaDEP requested that ALCOSAN estimate effluent limits for 275 mgd. The resulting potential effluent limits for 275 mgd are shown on Table 5.36.

Table 5.36
Estimated Effluent Limits
275 mgd Discharge

Parameter	Summer	Winter
$CBOD_5$ (mg/l)	20	25
NH_3-N	10	25
Dissolved Oxygen (Min.)	5	5

The maximum daily limits for $CBOD_5$ and NH_3-N would be 150 percent of the values given above.

The potential limits were determined using PaDEP's standard wasteload allocation model, Water-Quality Analysis Model (WQAM6.3). This model was developed by PaDEP in the mid 1980s and has been approved by USEPA Region III for wasteload allocations in Pennsylvania. The resulting effluent limits are believed conservative for the ALCOSAN outfall site. Final limits will be developed by PaDEP and may reflect further analysis concerning headwater conditions and model coefficients.

5.14.2 Water-Quality Benefits of Wet-Weather Flow Capture and Treatment

Mass Loadings Analysis

The water-quality benefits of capturing and treating up to 875 mgd at the current treatment plant during wet weather can be estimated from a mass-loading standpoint. The preliminary CSO statistics estimated for the discharges from the CSO municipalities in the ALCOSAN service area indicate that about 15 billion gallons of combined sewage overflows to area rivers and streams in a year of average rainfall. Additional quantities are discharged from municipal sanitary sewer overflows during wet weather.

ALCOSAN CSO Program data indicate that typical wet-weather, end-of-pipe concentrations of $CBOD_5$ and TSS are as follows:

Table 5.37
Typical CSO Contaminant Concentrations

Parameter	Minimum	Maximum	Average
$CBOD_5$ (mg/l)	39	95	64.2
TSS (mg/l)	48	165	93.3

Preliminary analysis by the ALCOSAN CSO Program indicates that expansion of the ALCOSAN WWTP to a wet weather capacity of 875 mgd the 875 mgd wet weather treatment capacity at the ALCOSAN Treatment Plant will allow for approximately 65 percent capture. Compliance compliance with the national CSO policy and the Pennsylvania Clean Streams Law will require the development of an optimization strategy that may require more than a 65 percent capture rate. Alternatives for wet weather compliance with regulatory requirements will be evaluated in the CSO long term control plan, due to be completed in 1998.

Receiving Stream Water-Quality Benefits

The ALCOSAN CSO Combined Sewer Overflow Program will model the impacts of wet weather induced overflows to the rivers and streams. From sampling performed to date, the CSO Evaluation Project has observed fecal coliform bacteria counts which exceed water-quality criteria during both wet and dry weather. Implementation of the 875 mgd treatment capacity at the treatment plant and other approaches (e.g. satellite plants on the upstream interceptors) will address bacteriological contamination which results from sewer overflows. Aesthetic and public health improvements will occur in the rivers and contributing streams. Additional data on the

water-quality benefits of alternative wet weather flow control strategies will be developed in the CSO long term control plan.

SECTION 7
Financial and Institutional Issues

7.1 INTRODUCTION

This section addresses the institutional arrangements under which ALCOSAN and Pennsylvania municipalities operate wastewater treatment facilities. Statutory issues in the Commonwealth of Pennsylvania are discussed, as well as governmental funding that is made available for complying with those mandates.

A history of ALCOSAN and its organizational structure follow. An overview of its current financial status also is presented. An outline of the proposed CIP and its associated costs and schedule are presented. Following that, a financing plan and schedule are discussed, and the effect of expenses associated with the plant expansion on user charges is analyzed.

7.2 LEGAL FRAMEWORK

7.2.1 The Pennsylvania Clean Streams Law

Recognizing that the discharge of sewage and industrial waste into the waters of the Commonwealth was a public nuisance, the Pennsylvania legislature enacted the Clean Streams Law in 1937. The purpose of the legislation was not only to prevent pollution of waters, but also to remedy existing pollution through a comprehensive program of watershed management.

The Department of Health was originally authorized to be the administrative agency for the Clean Streams Law. Upon its creation, the Pennsylvania Department of Environmental Protection was given the responsibility for formulating, adopting, and repealing rules and regulations necessary to implement the Clean Streams Law. Further, the agency was given responsibility for monitoring levels of sewage discharges into the waters of the Commonwealth, issuing permits to municipalities and individual landowners for discharging sewage, requiring the construction of municipal sewage treatment facilities, and ordering municipalities to file reports with the Commonwealth. The reports document sewage discharges and outline the remediation plans of the municipality, and are subject to PaDEP approval.

The borrowing powers of municipalities were broadened by the Clean Streams Law to include the issuing of revenue bonds for constructing the sewage treatment facilities required by PaDEP. This was in addition to the existing authorization for municipalities to issue general obligation bonds for such construction.

7.2.2 The Pennsylvania Sewage Facilities Act

The Pennsylvania Sewage Facilities Act of 1965 (Act 537) expanded several of the key mandates of the Clean Streams Law. Guidelines were made more specific for the reports required by

PaDEP, and they were classified as official plans. Grants and reimbursements for preparing the official plans requested by the environmental agency were addressed, as were permits and permit enforcement.

Official Plans

The information specified to be part of official plans includes:

- A delineation of existing sewage systems, including a description of problems in the area served by the municipality and areas where services are planned to be provided for the next ten years
- A plan for extending community interceptor sewers that is consistent with a comprehensive plan for the area
- Demonstration that adequate sewage treatment facilities will be provided
- A schedule and methods for both constructing and financing proposed community sewage systems

The plans are required to take into consideration population growth and economic expansion in the communities affected. The plan must be approved by both PaDEP and by the appropriate planning agencies in the municipality.

Because wastewater management can be an intermunicipal function, county entities are sometimes responsible for formulating official plans. The Allegheny County Planning Department developed a plan in 1970. PaDEP has requested a plan from the Authority, covering the relationship between the CIP and the future wastewater treatment needs of the current ALCOSAN service areas and the PaDEP designated study areas. This differs from what is specified in Act 537, which states that municipalities are responsible for preparing official plans.

The approval sequence will vary somewhat because the plan is the product of an authority rather than a municipality. ALCOSAN has approved the plan. Approval will next be required by Pittsburgh's City Council after 30 days of public review. The council must approve the plan because the facility is in the City of Pittsburgh. The plan is subject to PaDEP approval after it has been approved by the local government.

Grants and Reimbursements

Municipalities and authorities were made eligible for grants, administered by PaDEP, for one-half of the cost of preparing the official plan. The reimbursement includes costs incurred for studies, surveys, research, and analyses.

Permits and Permit Enforcement

Although PaDEP was responsible for issuing permits throughout the Commonwealth of Pennsylvania, enforcement of permit requirements was moved to the local level under the Pennsylvania Sewage Facilities Act. Section 8 of the Act stipulates that county health departments are responsible for monitoring discharges into waters to assure that they are within the conditions of the PaDEP permits. In the absence of a county, or a joint county health department, municipalities were given the monitoring function.

7.3 PENNSYLVANIA MUNICIPAL CODE - SEWERS

Responsibility for providing the necessary infrastructure was given to local government units, although the regulatory functions rested with the Commonwealth. Therefore, Chapter 12 of the Pennsylvania Municipal Code (Act 39), addressed the rights and responsibilities of local governments for providing sewage treatment capabilities.

Municipalities were given the right to enter onto all public and private lands in order to excavate and lay sewers and drains, making just compensation to the owner. Further, they were empowered to set and collect rates, rentals, or charges for the use of sewers, sewer systems, or sewage treatment works by the owners of these lands. Municipalities also were given the ability to relinquish their responsibility for providing sewage treatment to municipal authorities.

7.3.1 Rentals or Charges

According to the municipal code, rentals and charges can be calculated in a variety of ways. Three specific methods are described in the code, although they are not meant to preclude any other manner for setting rates. The methods for setting revenues are:

- Revenues can be set to equal operating expenses.
- Revenues can be set to equal operating expenditures plus debt service.
- Revenues can be set to equal operating expenses, debt service, and a ten percent margin of safety. If the third method is used, any unused surplus beyond the ten percent is stipulated to go into a sinking fund, and can be used for no other purpose.

Rates, rentals, and charges set by the institution were based on water consumption data, which the code mandated that water utilities would supply to the agency providing sewage treatment

service. Non-payment of rates, rentals, and charges for sewage treatment can result in termination of water services.

7.3.2 Contracts with Authorities

The Pennsylvania Municipal Code states that "it shall be lawful for any county, city, borough, incorporated town, or township to execute such agreements and contracts ... with an authority" to provide "sewer, sewerage, or sewage treatment service to it or to its inhabitants." Any rights granted to an authority through the municipal code are in addition to the powers and privileges granted to authorities by the Municipality Authorities Act. The municipal code was construed to expand, rather than limit, the powers set forth in the Municipality Authorities Act.

7.4 MUNICIPALITY AUTHORITIES ACT

Authorities, in general, gained wide acceptance in the United States in the 1930s at the height of Roosevelt's New Deal. Authorities were established as a means of borrowing available government monies beyond debt limits imposed on the municipalities underlying them. Based on their counterparts established in Europe several centuries earlier, most authorities were created to operate a single project.

Pennsylvania passed its Municipality Authorities Act in 1945 with the primary purpose of expanding municipal borrowing powers. Further, authorities are a means of bringing officials who are unburdened with other governmental responsibilities to the administration of projects and the authorities also are a way to take advantage of the economies of scale by providing services to a large area.

ALCOSAN has all the necessary rights and powers to build, finance, and implement the CIP, the subject of this 537 official plan, under the Pennsylvania Municipality Authorities Act.

Municipal sewage authorities were given the power to fix charges and rates, although the Municipality Authorities Act specifies that both operating expenses and debt service must be covered. Special assessments for recovering some construction costs also are outlined in the authorities act. The authority is permitted to use either the benefits method or the front-foot method in setting the special assessments. Whatever methodology is chosen, it has to equally reflect the benefit received by the customer; the front-foot method is usable only for areas of uniform lot sizes.

7.5 FUNDING SOURCES FOR PROVIDING SEWAGE SERVICES

ALCOSAN is outlining a financial plan, focusing primarily on issuing revenue bonds pursuant to the Municipality Authorities Act, for funding the CIP. In addition, the Authority will continue to investigate other sources of revenues that would be applicable to the project. One of the funding sources is the grant program authorized by Act 339. The program also would provide funding for PaDEP designated study areas.

7.5.1 Act 339 Grants Program

The Pennsylvania Department of Environmental Protection administers the Act 339 Grants Program, which assists with costs incurred for complying with the Clean Streams Law. The grant is made annually in the amount of as much as two percent of the undepreciated cost of capital assets after a particular project that is related to treatment is completed.

7.5.2 Other Funding Sources

The Commonwealth of Pennsylvania has made other funding sources available that would assist PaDEP designated areas in meeting sewage treatment regulations.

Rural Economic and Community Development Services

The Rural Economic and Community Development Services offer a program of loans and grants to rural communities for constructing improved sewage facilities, including collection and treatment facilities.

PENNVEST

PENNVEST is a loan and grant program for local communities, established to assist with the cost of new facilities or improvements to existing facilities.

Small Communities Development Block Grant Program

The Small Communities Development Block Grant Program assists with a grant of as much as $350,000 per eligible municipality for sewage facilities.

Community Facilities Program/Site Development Grants

The Community Facilities Program consists of grants of as much as $75,000 to municipalities with populations of less than 12,000. Site Development Grants provide as much as $100,000, but projects must meet a public-benefits criterion for industrial development. The grants are made to

municipalities without population restrictions. Both programs are administered by the Pennsylvania Department of Commerce.

7.6 SEWER MANAGEMENT PROGRAMS

The 82 municipalities that are served by ALCOSAN own the combined or sanitary sewer systems that discharge to ALCOSAN. Municipal ownership extends to combined sewer outfalls and sanitary sewer bypass outfalls. The municipalities are responsible for operating and maintaining their sewer systems. The municipalities also are responsible for wastewater facility planning within their municipality under Act 537. Recent determinations made by USEPA indicate that municipalities and ALCOSAN are jointly responsible for complying with the federal CSO policy at the diversion structure.

Of the 82 municipalities served by ALCOSAN, 38, or almost one-half, are under PADEP orders to develop corrective action plans or otherwise have experienced problems with their collection systems. Although the details vary in the municipalities, the problems in the municipal collection systems are primarily related to extraneous flows, which lead to hydraulic overloading.

Although further analysis is necessary before recommendations are formulated, the concept of intermunicipal or regional sewer management programs (SMP) may merit further evaluation. The goals of an intermunicipal SMP would be to provide the technical, financial, and institutional tools necessary for municipalities to correct problems in their sewer systems, particularly as they relate to neighboring communities.

Examples of potential SMP activities are:

- Pool technical resources and expertise to achieve economies of scale, e.g., joining I/I studies performed for several municipalities by consulting engineering firms
- Provide a non-adversarial institutional framework for resolving disputes between municipalities about responsibilities for hydraulic problems
- Provide model ordinances and local enforcement mechanisms for removing illicit inflow sources, e.g., downspouts or sump pumps
- Share costly equipment and capital improvement projects, e.g., relief sewers
- Share technical staffs
- Combine community relations and public awareness projects

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The institutional framework for intermunicipal sewer management programs could include one or more of the following:

- Formal or informal intermunicipal agreements and contracts
- Councils of governments
- Joint wastewater authorities
- A countywide sewer management authority

To determine what institutional framework, if any, is appropriate for the various municipalities requires understanding the hydraulic and institutional conditions of the municipal sewer systems, which is beyond the scope of this 537 Plan.

7.7 THE ALLEGHENY COUNTY SANITARY AUTHORITY

7.7.1 History

The Allegheny County Sanitary Authority was incorporated in March 1946 under the Pennsylvania Municipality Authorities Act. The original configuration of the collection and treatment system, designed in 1948, consisted of 69 miles of interceptor sewers; 260 diversion structures; three pump stations; three ejector stations; and a 150 mgd average daily flow, primary sewage treatment plant.

In 1949, ALCOSAN and the City of Pittsburgh signed intermunicipal agreements with 58 communities, which comprised the original service area. Construction contracts were awarded in 1956. Ground breaking ceremonies were held the same year, and the plant was placed in operation in June 1959. The original plant and interceptor system cost more than $81 million.

Between 1970 and 1973, the treatment plant was modified and expanded to provide secondary treatment, and its capacity was expanded to the current 200-mgd average daily flow. Currently ALCOSAN serves 82 municipalities.

In 1984, ALCOSAN implemented an industrial pretreatment program. The program included issuing discharge permits, monitoring industrial discharges, and regulating industries that discharge into the ALCOSAN system.

Since 1989, ALCOSAN has concluded the following major capital improvements:

- Upgrades to the main pump station with an increase in pumping capacity
- Improvements to the grit and screening system and the scum and grease handling system
- Installation of new incinerators for energy recovery
- Installation of odor-control facilities at the dewatering building
- Improvements to the interceptor system

ALCOSAN billed 301,281 accounts in the municipalities that it served in 1994. The billing area encompasses 225 square miles and a 1995 population of 857,850. Penn Hills was included in the service area during 1995, which increased the population served by 38,644, and ALCOSAN estimated that 18,000 new accounts were added.

ALCOSAN also has approved a CIP that will further expand the treatment capacity and improve odor control at the facility. The approved upgrade is included in the Act 537 official plan.

7.7.2 Organizational Structure

The ALCOSAN Board of Directors is authorized under the Articles of Incorporation to have seven members. Three members are appointed by the City of Pittsburgh, three members by Allegheny County, and one member is appointed jointly by the two entities. Board members serve five-year terms. ALCOSAN's administrative staff is headed by the Executive Director, who carries out the Board's policies. The Executive Director's senior staff includes the Director of Engineering and Construction, Director of Operations and Maintenance, Director of Environmental Compliance, Director of Finance and Administration, Manager of Human Resources, and the Public Relations Manager.

The Director of Engineering and Construction oversees the planning, design, and construction of facilities. The position is supported by an engineering manager, a construction manager, a manager of residuals, and a manager of combined sewer overflows.

The Director of Operations and Maintenance is responsible for all facilities operations and maintenance and for training personnel in these areas. The director is supported by a manager of operations and a manager of maintenance.

The Director of Environmental Compliance ensures compliance with state and federal environmental regulations. A laboratory manager and a manager of industrial waste are the first-line support for the position.

The Director of Finance and Administration is supported by the manager of billing and collecting, the manager of accounting, the manager of information science, and the purchasing manager.

The Manager of Human Resources oversees employment practices and policies and manages the benefits programs, and is supported by a manager of loss control, a benefits coordinator and a training specialist. The Public Relations Manager maintains a positive image for ALCOSAN.

ALCOSAN employs approximately 290 personnel. This includes a management cadre of foremen; assistant foremen; professional, supervisory, and confidential employees; as well as approximately 240 employees represented by the Utility Workers of America and five guards represented by the Teamsters Union.

7.8 ALCOSAN FINANCIAL SUMMARY

On a cash basis, projected operating revenues and expenses in ALCOSAN's 1995 operating budget, as well as annual debt service for 1994, 1995 and 1996 are shown on table 7.1.

Table 7.1
Summary Revenue and Expenses

	1994 Actual	1995 Projected	1996 Budget
Operating Revenue	$52,824,249	$54,898,200	$57,272,600
Operating Expenses	$30,554,450	$33,605,800	$35,949,400
Debt Service	$15,533,000	$17,990,266	$19,339,725
Net Revenues	$6,736,799	$3,302,134	$1,983,475

The operating ratio for 1994 was 1.15 percent and is projected at 1.06 percent for 1995 1.04 percent for 1996.[1]

7.9 ALCOSAN'S OPERATING BUDGET

7.9.1 Revenues

ALCOSAN's operating budget contains four categories of revenues:

- Customer Charges
- State Grant
- Interest Income
- Other Charges

Customer Charges

Customer charges comprise 80 to 90 percent of each year's operating income. The charges are a function of all other operating revenues, operating expenses, and debt service. Operating revenues must be set to ensure that 110 percent of the annual debt service remains after deducting operating expenditures.[2]

General sewage charges are based on customer water use at the 1996 rate of $1.30 per thousand gallons of water each quarter year. There is an additional customer-service charge of $2.53 per bill. Flat-rate water users are billed on the assumption of 20,000 gallons of water use per quarter; other water users are billed at a general use rate that ALCOSAN estimates. Upper Allegheny Zones 1, 2, and 3, and high-strength dischargers pay at differing rates. There is an additional fee for garbage disposal. Penalties (five percent) and interest (one-half percent) are charged on 105 percent of the amount billed if payment is late.

Bills are sent either directly to customers or an aggregate bill is sent to the municipality, which is reimbursed by its individual customers. The agreements covering approximately 160,000 customers call for individual billings and approximately 140,000 pay sewage charges through their municipality. In terms of municipalities, approximately 50 percent are in each of the two categories.

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[1] The operating ratio is determined by dividing operating revenue by the sum of operating expenses and debt service.

[2] *Official Statement of the Allegheny County Sanitary Authority*, Series 1994A, Appendix C, Covenants of the Authority.

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ALCOSAN charges each municipality for its customers who are more than 90-days delinquent in payment of sewage charges. The municipality subsequently is responsible for recouping payment from its delinquent customers.

During the 14-year period, 1975 to 1989, ALCOSAN did not raise its rates. As the Authority implemented its first CIP, the effects of bond issues were reflected in annual rate increases thereafter. The rate increase for the year 1995 is the last that was needed to cover the cost of all debt that is currently outstanding. Rate increases have not been enacted since 1975 to cover operating expenses. A 20-year history of the ALCOSAN rate structure is presented in Table 7.2.

Table 7.2
Twenty-Year Rate History
Allegheny County Sanitary Authority

4-1-75 to 1-21-89

First 100,000 gal.	$.45 per 1,000 gal.
Next 1,000,000 gal.	$.3875 per 1,000 gal.
Next 2,500,000 gal.	$.326 per 1,000 gal.
Excess over 3,600,000 gal	$.2625 per 1,000 gal.

Subject to minimum charge of $3.50 per quarter year.

1-21-89 to 1-21-90

First 100,000 gal.	$.71 per 1,000 gal.
Next 1,000,000 gal.	$.51 per 1,300 gal.
Next 2,500,000 gal.	$.41 per 1,000 gal.
Excess over 3,600,000 gal.	$.41 per 1,000 gal.

Subject in addition to customer-service charge of $1.39 per bill.

1-22-90 to 1-21-91

First 1,100,000 gal.	$.71 per 1,000 gal.
Next 2,500,000 gal.	$.61 per 1,000 gal.
Excess over 3,600,000 gal.	$.51 per 1,000 gal.

Subject in addition to customer-service charge of $1.39 per bill.

1-21-91 to 1-20-92

First 3,600,000	$.80 per 1,000 gal.
Excess over 3,600,000 gal.	$.68 per 1,000 gal.

Subject in addition to customer-service charge of $1.56 per bill.

1-21-95 to 1-20-93
All quantities $.89 per 1,000 gal.
Subject in addition to customer-service charge of $1.74 per bill.

1-21-93 to 1-20-94
All quantities $1.05 per 1,000 gal.
Subject in addition to customer-service charge of $2.05 per bill.

1-21-94 to 1-22-95
All quantities $1.18 per 1,000 gal.
Subject in addition to customer-service charge of $2.30 per bill.

1-23-95 to 1-22-97
All quantities $1.30 per 1,000 gal.
Subject in addition to customer-service charge of $2.53 per bill.

State Grant

The state grant category of operating revenues includes Act 339 reimbursements. The grants amount to two percent of undepreciated capital assets that have been constructed in compliance with the Clean Streams Law.

Interest Income

Interest income is the return on ALCOSAN's invested operating fund balances.

Other Income

Other income includes, but is not limited to, connection fees. ALCOSAN's current connection fee is $3.87 million per mgd of projected flows from the connecting municipality. In its most recent connection agreement, ALCOSAN received 60 percent of the connection fee up-front; the remaining 40 percent is scheduled to be amortized over a ten-year period at a 7.26 percent interest rate.

7.9.2 Expenditures

ALCOSAN's operating expenditures are classified into ten categories, plus annual debt service, in its operating budget. In terms of financial outlay, the largest budget items are operations, maintenance, and benefits.

7.10 THE CAPITAL BUDGET

7.10.1 Capital Funding

On July 25, 1996, ALCOSAN's outstanding principal on its debt was approximately $195.9 million, interest totalled $205.3 million, and the balance on its securities purchase agreement was $6.6 million. Debt service totalled $407.8 million. All current debt is scheduled to be retired on December 1, 2016. Principal and interest on outstanding issues is paid on June 1 and December 1 of each year. The schedule for debt service for the currently outstanding debt is presented in Table 7.3.

In addition to paying for capital projects, the Authority has used proceeds of various bond issues for refunding parts of its outstanding debt. The Series 1991 A, B, and C issues were used to establish a trust to defease part of the Authority's 1986 issue and the 1993 series was subsequently issued to refund the 1991 Series C bonds in advance. Further, a special investment program was established to pay a portion of the 1985 bond series principal that was due on June 1, 1995, and to pay the balance of the $35,150,000 outstanding principal on the 1986 issue, not covered by the 1991 trust, on June 1, 1999. Further borrowing was completed with the 1994 Series A and B bonds. These bonds were refunding issues as well, and will save approximately $2.7 million in debt service over the life of ALCOSAN's borrowings.

7.10.2 Capital Expenditures

During 1994 and 1995, several capital projects were completed, among them:

- The upgrading of the main pump station
- Additions to the administration building facilities
- New billing software for lump-sum municipalities
- New engineering building
- Disinfection system upgrade
- Plant and safety upgrade
- Grit and screenings/scum and grease handling facilities
- Primary tank chain and rail strips

Capital expenditures for 1994 were approximately $26 million and the capital fund balance on December 31, 1994, was $78.9 million. Expenditures for 1995 were approximately $22.2 million, a major part of which was spent on odor-control projects. The Saw Mill Run interceptor improvements, upgrade of the remote pump stations, and the plant expansion and facilities improvements are slated for 1996 and 1997.

Table 7.3
ALCOSAN Debt Service Schedule
as of July 25, 1996

Date	Series of 1985		Securities Purchase Agreement	Series of 1991		Series of 1991A		Series of 1991B		Series of 1992		Series of 1993		Series of 1994A		Series of 1994B		Semi Annual Total Due	Annual Due
	Principal	Interest		Principal	Interest	Principal	Interest	Principal	Interest	Principal	Interest	Principal	Interest	Principal	Interest	Principal	Interest		
12/1/96			$3,938,008						$634,400		$2,191,713	$455,000	$777,512		267,065	$60,000	$1,348,605	9,672,303	9,672,303
6/1/97			2,630,354						634,400		2,191,713	460,000	768,868	1,260,000	267,065	65,000	1,347,345	9,624,745	
12/1/97									634,400		2,191,713	470,000	759,438	3,995,000	225,485	85,000	1,345,850	9,706,886	19,331,631
6/1/98									634,400		2,191,713	480,000	749,802	2,580,000	89,655	1,615,000	1,343,895	9,684,465	
12/1/98									634,400		2,191,713	490,000	739,482			4,295,000	1,319,670	9,670,265	19,354,730
6/1/99									634,400		2,191,713	500,000	728,948			4,395,000	1,214,442	9,664,503	
12/1/99						$2,395,362	$1,544,638		634,400		2,191,713	510,000	717,698			575,000	1,104,568	9,673,379	19,337,882
6/1/00						2,509,767	1,765,233		634,400		2,191,713	525,000	706,222			590,000	1,090,192	10,012,527	
12/1/00	$365,755	$1,369,245				1,448,487	1,096,513		634,400		2,191,713	535,000	693,885			600,000	1,075,000	10,009,998	20,022,525
6/1/01	348,162	1,386,838				1,397,765	1,147,235		634,400		2,191,713	550,000	681,312			620,000	1,059,550	10,016,975	
12/1/01	329,718	1,396,282				1,354,729	1,190,271		634,400		2,191,713	560,000	667,838			635,000	1,043,275	10,003,226	20,020,201
6/1/02	306,219	1,377,781				1,302,208	1,247,792				2,191,713	575,000	654,118			813,791	1,482,816	9,951,438	
12/1/02				$547,578	$642,422	1,263,984	1,291,016				2,191,713	590,000	639,455			1,860,000	1,026,606	10,052,774	20,004,212
6/1/03						1,208,470	1,341,530			$1,675,000	2,191,713	610,000	624,410			205,000	976,851	8,832,974	
12/1/03				993,566	1,341,434	1,170,144	1,379,856			1,725,000	2,145,231	620,000	608,550			215,000	971,265	11,170,046	20,003,020
6/1/04						1,121,517	1,433,483			1,770,000	2,097,362	640,000	592,430			220,000	965,406	8,840,198	
12/1/04				913,074	1,411,926	1,085,415	1,469,585			1,820,000	2,048,688	655,000	575,470			225,000	959,301	11,163,459	20,003,657
6/1/05						1,049,742	1,520,258			1,870,000	1,998,638	670,000	558,112			230,000	953,058	8,849,808	
12/1/05				847,701	1,462,299	1,013,739	1,551,261			1,920,000	1,947,212	690,000	539,688			240,000	946,502	11,158,402	20,008,210
6/1/06						972,083	1,587,917			1,975,000	1,894,412	710,000	520,712			245,000	939,662	8,844,786	
12/1/06				786,070	1,523,930	942,176	1,622,824			2,030,000	1,840,100	730,000	501,188			250,000	932,496	11,158,784	20,003,570
6/1/07						908,100	1,666,900			2,085,000	1,784,275	750,000	481,112			260,000	925,184	8,860,571	
12/1/07				730,986	1,569,014	876,524	1,693,476			2,140,000	1,726,938	770,000	460,488			265,000	917,449	11,149,875	20,010,446
6/1/08						842,566	1,732,434			2,200,000	1,668,088	790,000	439,312			275,000	909,565	8,856,965	
12/1/08				675,396	1,619,604	814,678	1,760,322			2,260,000	1,607,588	815,000	417,588			285,000	901,246	11,156,422	20,013,387
6/1/09						782,540	1,797,460			2,325,000	1,545,438	835,000	395,175			468,585	1,634,040	9,783,238	
12/1/09				379,127	1,000,873	482,314	1,162,686			2,390,000	1,475,688	860,000	372,212			447,072	1,645,553	10,215,525	19,998,763
6/1/10										2,465,000	1,403,988	880,000	348,562			1,446,808	3,455,817	10,000,175	
12/1/10										2,540,000	1,330,038	905,000	324,362			4,015,000	892,625	10,007,025	20,007,200
6/1/11										2,615,000	1,253,838	930,000	299,475			4,130,000	772,175	10,000,488	
12/1/11										2,690,000	1,175,388	955,000	273,900			4,255,000	648,275	9,997,563	19,998,051
6/1/12										2,775,000	1,094,688	985,000	247,638			4,385,000	520,625	10,007,951	
12/1/12										2,855,000	1,011,438	1,010,000	220,550			4,525,000	383,594	10,005,582	20,013,533
6/1/13										2,940,000	925,788	2,660,000	192,775			3,060,000	242,188	10,020,751	
12/1/13										3,025,000	844,938	4,350,000	119,625			1,505,000	146,562	9,991,125	20,011,876
6/1/14										3,105,000	761,750	1,255,444	3,214,556			1,570,000	99,531	10,006,281	
12/1/14										3,190,000	676,362	1,218,299	3,251,702			1,615,000	50,469	10,001,832	20,008,113
6/1/15										3,280,000	588,638	1,183,548	3,291,452					8,343,638	
12/1/15				596,405	2,723,595					3,370,000	498,438	1,148,554	3,326,446					11,663,438	20,007,076
6/1/16										3,460,000	405,762	1,113,298	3,356,702					8,335,762	
12/1/16												2,824,148	8,860,852					11,685,000	20,020,762
Total	**$1,349,854**	**$5,530,146**	**$6,568,362**	**$6,469,903**	**$13,295,097**	**$24,942,310**	**$31,002,690**	**$0**	**$6,978,400**	**$66,495,000**	**$66,434,694**	**$38,263,291**	**$43,699,622**	**$7,835,000**	**$849,270**	**$50,546,256**	**$37,591,253**	**$407,851,148**	**$407,851,148**

Note: 1996 debt service does not include payment of $9,667,420, which was made on June 1, 1996.

7.11 COSTS OF THE CAPITAL IMPROVEMENT PROGRAM

The CIP has been developed in response to the needs identified by the ALCOSAN Board of Directors and the Authority's Executive Director. A list of projects, their costs in inflated dollars, and their construction mid-point dates is in Table 7.4.

Table 7.4
Cost and Construction Mid-Point Date for
Projects Included in Capital Improvement Plan

Project	Inflated Cost in Millions	Construction Mid-Point Date
Final Clarifier Modifications	$18.4	Jun, 1996
Dewatering Building Ventilation Improvements	2.1	Jan, 1996
Lime Building Expansion	8.7	May, 1998
Solids Management System Improvements	23.8	May, 1998
Odor-Control Systems	23.8	May, 1998
Preliminary/Primary Improvements	31.4	May, 1999
Final Clarifiers/Disinfection	21.3	Oct, 1998
Aeration Basins	37.0	Oct, 1998
Instrumentation and Control Systems	2.2	Oct, 1998
Site Work	29.2	Oct, 1998
Secondary Treatment Capacity Expansion to 275 mgd	23.4	Jan, 1999
New O&M Building	26.4	Jun, 2001
Wet-Weather Treatment Facilities at Treatment Plant	41.4	Jun, 2002
Wet-Weather Pumping	12.4	Jan, 2002
Shallow Cut Interceptor Improvements	23.6	Jan, 2002
Final Clarifier Covers[a]	24.9	Jun, 2001
Additional Treatment Plant Solids Improvements	5.3	Jan, 2004
Headworks Building Retrofit-	8.6	Jan, 2006
Third Incinerator Retrofit	23.0	Jan, 2006
Total CIP Costs	**$386.9**	

[a] Covers for the final clarifiers may prove to be unnecessary after other, more critical odor-control steps are taken. Therefore, a decision on installing the covers has been deferred until the completion of all other CIP projects.

The cost of the entire CIP has been estimated at $386.9 million in inflated dollars.[3]

7.12 FUTURE REVENUE REQUIREMENTS

In order to accurately assess the effects that the plant improvements will have on ratepayers, the following must be considered:

- The capital financing plan for the CIP and other projects that are currently in the ALCOSAN capital budget
- Operation and maintenance costs for the current plant and O&M costs associated with the CIP
- Revenues for the current plant and the effect of expansion on future revenues
- The number of customers in the service area among whom the costs will be divided

7.12.1 Capital Financing Plan

A brief review of ALCOSAN's current capital budget is needed to form a basis for the Authority's future capital needs and its financing plan for both the Capital Improvement Program projects and other projects in ALCOSAN's capital budget.

ALCOSAN'S Capital Fund

ALCOSAN's capital fund balance on December 31, 1994, was $78.9 million. Capital expenditures during 1995 were $22.2 million, including $7.2 million in spending for CIP projects. The capital fund balance on December 31, 1995, was $56.7 million.

Other ALCOSAN Capital Improvement Projects

In addition to the $386.9 million in CIP projects, ALCOSAN's capital budget contains other projects, e.g. the Saw Mill Run Parallel Interceptor Project. On December 31, 1995, $61.1 million (in 1996 and 1997 dollars) in capital expenditures remained for ALCOSAN capital projects unrelated to the CIP, which are scheduled for completion in 1996 and 1997.

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[3] An inflation rate of 3.7 percent per year was used to inflate capital costs to their construction mid-point date, based on the *ENR Index of Construction Costs* for Pittsburgh for 1993, 1994 and 1995.

Capital Improvements Program Projects

The annual expenditures for the $386.9 million CIP costs are shown in Table 7.5 in inflated dollars. These CIP costs do not include ALCOSAN's $61.1 million capital plan. ALCOSAN's capital plan includes such projects as the Saw Mill Run Parallel Interceptor Extension.

Table 7.5
Annual Cost for CIP
(in Inflated Dollars)

Year	Cost (in Millions)
1995	$7.2
1996[a]	13.3
1997	67.5
1998	101.0
1999	32.5
2000	37.1
2001	36.4
2002	32.3
2003	20.3
2004	5.3
2005	17.5
2006	16.5
Total	**$386.9**

[a]The CIP schedule does not include any project starts in 1996. The $13.3 million is for completing the two contracted CIP projects started in 1995.

Requirements for Future Funding

Capital needs were projected for two scenarios. The first scenario addresses funding for the $61.1 million in non-CIP capital projects in the current ALCOSAN capital budget, plus $13.3 million, the balance needed for currently contracted CIP projects. The contracted projects include the replacement of the final clarifier drive mechanisms and dewatering building ventilation improvements.

The remaining spending balance on CIP projects that are currently under contract and the non-CIP projects in the ALCOSAN capital budget is $74.4 million. Since the capital fund balance as of December 31, 1995 was $56.7 million, approximately $18 million in additional financing would be needed to complete these projects. Table 7.6 shows the calculation of this amount to be borrowed. ALCOSAN has, however, approved a plan that includes borrowing for the full cost of future capital projects.

The second scenario called for completion of the non-CIP improvements, the CIP projects that are currently under contract, and the implementation of the remaining $379.7 million (i.e., $386.9 million less $7.2 million already expended) in future CIP projects.

Table 7.6
Calculation of Total to be Borrowed
for ALCOSAN's Capital Spending Plan
and Completion of Contracted CIP Projects

	Dollars in Millions
ALCOSAN Capital Fund Balance 12/31/94	$78.9
CIP Spending - 1995	-$7.2
Other Capital Spending - 1995	-$15.0
ALCOSAN Capital Fund Balance 12/31/95	$56.7
Completion of Contracted CIP in 1996	-$13.3
Other Capital Spending - 1996 and 1997	-$61.1
Capital Money Needed from Borrowing	-$17.7
Issuance Costs	-$.7
Total Borrowing for Case 1	-$18.4

To complete the currently budgeted non-CIP projects, the CIP projects which are under contract, plus the remaining CIP projects, approximately $400 million in additional financing will be required. The capital projects costs net of interest earnings[4] is $383 million, including debt issuance costs of four percent. To this amount, an approximate five percent contingency has been added, pending review by bond counsel. This brings the total to $401 million. The derivation of this figure is shown on Table 7.7.

For planning purposes, three borrowings have been scheduled. The first borrowing is scheduled for the second half of 1997, in the amount of approximately $190 million. This amount includes the $18 million in new capital required to complete the CIP projects that are under contract and the non-CIP improvements. The second borrowing would be scheduled for early 1999 in the amount of $134 million; and the third borrowing would take place in 2003 in the amount of $59 million. Of this amount, $379 million is attributable to the Capital Improvements Program and contingency, with the remaining $22 million due to other items on the ALCOSAN capital budget.

The effects of financing the costs of each scenario through debt issuance is shown in Table 7.8. In each case listed in the table, the effects of borrowing are added to ALCOSAN's current debt service for monies borrowed through 1994. Debt service for all amounts borrowed was calculated using the following assumptions:

- The inflation rate for capital cost is 3.7 percent per year
- A four percent cost of issuance
- A six percent interest rate for debt service on 25-year bonds

[4] An interest earnings of approximately five percent annually was used, based on the rate of return on United States Treasury Bills (90 to 360 days) for the first quarter of 1996.

Table 7.7
Derivation of Borrowings for Complete CIP

			Borrowing Amount	CIP Cost
a	ALCOSAN Capital Fund Balance 12/31/94	$79		
b	CIP Spending - 1995	($7)		($7)
c	Other Capital Spending - 1995	($15)		
d	ALCOSAN Capital Fund Balance 12/31/95 (sum a+b+c)	$57		
e	CIP Spending - 1996	($13)		($13)
f	CIP Spending - 1997	($68)		($68)
g	CIP Spending - 1998	($101)		($101)
h	Subtotal (sum d+e+f+g)	($125)		
i	Other Capital Spending - 1996 and 1997	($61)		
j	Capital Needed from First Debt Issuance (sum h+i)	($186)		
k	Reduction in Borrowing from Interest Earned to 1998	$3		
l	Issuance Costs	($7)		
m	**Net Borrowing For First Debt Issuance in 1997 (sum j+k+l)**		**($190)**	
n	CIP Spending - 1999	($33)		($33)
o	CIP Spending - 2000	($37)		($37)
p	CIP Spending - 2001	($36)		($36)
q	CIP Spending - 2002	($32)		($32)
r	Subtotal (sum n+o+p+q)	($138)		
s	Reduction in Borrowing from Interest Earned to 2002	$9		
t	Issuance Costs	($5)		
u	**Net Borrowing For Second Debt Issuance in 1999 (sum r+s+t)**		**($134)**	
v	CIP Spending - 2003	($20)		($20)
w	CIP Spending - 2004	($5)		($5)
x	CIP Spending - 2005	($18)		($18)
y	CIP Spending - 2006	($17)		($17)
z	Subtotal (sum v+w+x+y)	($60)		
aa	Reduction in Borrowing from Interest Earned to 2006	$3		
bb	Issuance Costs	($2)		
cc	**Net Borrowing for Third Debt Issuance in 2003 (sum z+aa+bb)**		**($59)**	
dd	**Subtotal**		**($383)**	**($387)**
ee	Five Percent Contingency (Pending review by bond counsel)		**($18)**	
ff	**Total**		**($401)**	

Table 7.8
Annual Debt Service for Two Plans
for ALCOSAN Capital Projects and CIP Improvements
(in millions)

Year	Current ALCOSAN Debt Service	Case 1 ALCOSAN Capital Plan, and Currently Contracted CIP	Case 2 ALCOSAN Capital Plan and Complete CIP
1996	$19.3	19.3	19.3
1997	19.3	20.8	26.7
1998	19.4	20.8	34.1
1999	19.3	20.8	44.6
2000	20.0	21.5	45.3
2001	20.0	21.5	45.3
2002	20.0	21.5	45.2
2003	20.0	21.5	49.8
2004	20.0	21.5	49.8
2005	20.0	21.5	49.8
2006	20.0	21.5	49.8
2007	20.0	21.5	49.8
2008	20.0	21.5	49.8
2009	20.0	21.5	49.8
2010	20.0	21.5	49.8
2011	20.0	21.5	49.8
2012	20.0	21.5	49.8
2013	20.0	21.5	49.8
2014	20.0	21.5	49.8
2015	20.0	21.5	49.8

7.12.2 O&M Costs for Current Plant and O&M Associated with CIP

In addition to the cost of capital financing, future operation and maintenance costs must be evaluated to determine the effects of the CIP on rates. O&M costs are projected to increase at a rate of three percent per year for the current plant, with the exception of expenditures for electricity.

The current trend in electricity charges for industrial users is toward a decrease in rates. In addition, predicted regulatory changes affecting the power industry lead to the possibility of further long-term decreases in costs for electricity. Therefore, electricity expenditures for the current plant, comprising approximately 30 percent of ALCOSAN's 1996 budgeted O&M costs exclusive of salaries, have been held constant over the 20-year planning period. No new O&M costs will be associated with the partial CIP completion scenario.

With the completion of the CIP, there will be new O&M costs and additional power costs added to O &M costs for the current facilities. A breakdown of electricity and inflated operation and maintenance costs for the current plant and the power costs and other costs associated with completing the CIP improvements appear in Table 7.9. All amounts shown exclude salary expenditures.

7.12.3 Revenues for the Current Plant and the Effect of Expansion on Future Revenues

The third factor to consider in determining rates is the increased revenue that will result from the CIP. The first source of increased revenues is additional grant money received from the Commonwealth of Pennsylvania under Act 339 provisions. These monies are calculated at two percent of undepreciated assets that have been constructed in compliance with the Clean Streams Law.

The second source of increased revenues is the additional income from connection fees as new municipalities join the ALCOSAN system. Both of these factors would alleviate some of the reliance on revenues from user charges.

7.12.4 Number of Customers in the Service Area

User charges are determined by dividing the revenues required by the projected flows. Therefore, the size of the service area and population growth in the area served also are factors needed to determined ALCOSAN's future user charges. Any increase in the number of customers mitigates the effects of increased customer charges.

Table 7.9
Calculation of Operation and Maintenance Costs for Current Plant and Phased CIP Improvements (Inflated Dollars in Millions)

	Electricity Costs for Current Plant[a]	All Other O&M for Current Plant and Contracted CIP	Total O&M for Current Plant	Additional O&M for Complete CIP	Total O&M for Complete CIP
1995	$3.9	$9.9	$13.8	$0	$13.8
1996	4.3	9.8	14.1	0	14.1
1997	4.3	10.1	14.4	.9	15.3
1998	4.3	10.4	14.7	2.4	17.1
1999	4.3	10.7	15.0	3.2	18.2
2000	4.3	11.0	15.3	3.7	19.0
2001	4.3	11.3	15.6	3.9	19.5
2002	4.3	11.7	16.0	4.0	20.0
2003	4.3	12.0	16.3	4.1	20.4
2004	4.3	12.4	16.7	6.4	23.1
2005	4.3	12.7	17.0	9.5	26.5
2006	4.3	13.1	17.4	9.8	27.2
2007	4.3	13.5	17.8	10.7	28.5
2008	4.3	13.9	18.2	11.1	29.3
2009	4.3	14.4	18.7	11.4	30.1
2010	4.3	14.8	19.1	11.7	30.8
2011	4.3	15.2	19.5	12.1	31.6
2012	4.3	15.7	20.0	12.4	32.4
2013	4.3	16.2	20.5	12.8	33.3
2014	4.3	16.6	20.9	13.2	34.1
2015	4.3	17.1	21.4	13.6	35.0

[a] There will be no new O&M costs for completing the CIP projects currently under contract; increases are due to inflation only.

Flows have been determined according to population growth, as described in Section 4, for both the current service area and the proposed areas of expansion. Section 4 describes total flow projections; billable flows are approximately 50 percent of total flows.

In considering the effects of the CIP on user charges, four population-growth/service-area cases were combined with the two scenarios for completing the CIP. The four population and service area cases were:

- Current service area, no population growth
- Current service area, with population growth
- Current service area plus the unsewered areas in that area, with population growth
- Current service area, unsewered areas, plus PaDEP designated study areas, with population growth

PaDEP requested ALCOSAN to include portions of 16 municipalities with wastewater management problems in the Plan. These PaDEP-designated study areas include portions of the Killbuck/Toms Run, Millers Run, Robinson Run watersheds, and the service areas of the Dravosburg, Holiday Park, Longvue No. 1, Oakmont, and Plum Creek sewage treatment plants.

7.13 THE EFFECT OF THE CIP ON ALCOSAN'S USER CHARGES

Combining the two cases of CIP completion (improvements currently under contract or complete CIP) with the four cases of size and population of the service area produced five analyses of possible rates. They are listed below and shown on the matrix in Table 7.10.

- Case 1. ALCOSAN capital spending plan and completion of contracted CIP projects, current service area, no population growth
- Case 2. ALCOSAN capital spending plan and completion of the entire CIP, current service area, no population growth
- Case 3. ALCOSAN capital spending plan and completion of the entire CIP, current service area, with population growth
- Case 4. ALCOSAN capital spending plan and completion of the entire CIP, current service area plus unsewered areas within the current service area, with population growth
- Case 5. ALCOSAN capital spending plan and completion of the entire CIP, current service area plus unsewered areas withing the current service area, plus PaDEP-designated study areas, with population growth

Table 7.10
Conditions for Rate Impact Analyses

	Current ALCOSAN Service Area No Growth	Current ALCOSAN Service Area with Growth	Current ALCOSAN Service Area Plus Unsewered Areas of ALCOSAN with Growth	Current ALCOSAN Service Area Plus Unsewered Plus PaDEP designated Areas with Growth
ALCOSAN Plan, CIP-Contracted Packages	Case 1			
ALCOSAN Plan, Complete CIP	Case 2	Case 3	Case 4	Case 5

Table 7.11 contains a summary of the rates for treatment costs per 1,000 gallons that resulted from each of the analyses for the year 1997, for the year 2006, and for the design year, 2015. A detailed description of each analysis and a presentation of annual rates through 2015, as well as average annual residential charges, follows the summary. Tables containing budget projections used for calculating user charges are in Appendix H.

7.14 FACTORS THAT COULD AFFECT PROJECTED RATES

The rates that result from the five analyses are subject to influence by additional factors not reflected in the projections presented above. One such factor is the final clarifiers cover project. The project will cost $24.9 million dollars, and is scheduled to be financed in the year 2001. However, the covers may prove to be unnecessary after other, more critical odor control steps are completed. If a decision is made to exclude this project from the CIP, the effect on debt service would be a reduction of approximately $1 million per year, resulting in lower user charges.

Although interest earnings on capital monies have been calculated to reduce future borrowings, excess revenues from operations have not been considered for the same purpose. By including excess revenues, revenues needed for debt-service coverage could also be reduced.

Table 7.11
Initial, Mid-Point, and Design-Year Rates Resulting from Five Analyses of Treatment Costs per 1,000 Gallons

Case	1997	2006	2015
Case 1	$1.60	$1.91	$2.28
Case 2	$1.81	$3.00	$3.49
Case 3	$1.80	$2.89	$3.26
Case 4	$1.81	$2.73	$2.95
Case 5	$1.80	$2.61	$2.73

A factor that could increase the revenues needed from user charges would be the inclusion of a renewal and replacement fund in the rate calculations. Changes in the bond market could either increase or decrease user charges, depending on tax-exempt interest-rate fluctuations and the timing of bond sales.

7.15 RATE PROJECTIONS

Case 1.

The first analysis serves as a baseline measure for minimum charges to the ratepayers over the next 20 years. The analysis includes CIP projects that are currently contracted and ALCOSAN's 1996 capital spending plan for improvements to the existing plant, as well as the associated O&M costs. The contracted CIP projects are final clarifier improvements and dewatering building ventilation and they will not add to current O&M costs.

Revenues are increased to include additional state grant money that will be associated with final clarifier improvements. Operating expenditures are increased at a rate of three percent per year for all categories. Debt service includes all currently outstanding debt plus a $18 million borrowing in 1997 that would be needed to complete all projects on ALCOSAN's capital projects schedule.

The required revenues from user charges are divided by constant flows to reflect lack of population growth. The results are an average annual increase of approximately three percent per year during the next 20 years. The average annual residential bill in 1996 is $114; the average residential bill in 2015 would be $182. Estimated average annual bills for the planning period under Case 1 are presented in table 7.12.

Case 2.

This analysis projects the greatest amount that current customers would pay in user charges during the next 20 years. No population growth is assumed for the current service area, meaning that the entire $383 million in capital financing, all new O&M expenses, and the effects of inflation would be borne by the current rate payers. Revenue is increased from the level of the previous analysis because of the eligibility for more state grant money as more projects are completed that qualify for Act 339 reimbursement.Under this scenario, the average annual increase in user charges is approximately seven percent during the 20-year planning period, with the average annual residential charge increasing from $114 in 1996 to $279 in 2015. Estimated average annual bills for the planning period under Case 2 are presented in table 7.13.

Case 3.

This analysis examines the effects of the complete CIP, its associated debt service and O&M costs, shared by an increased number of customers in the current service area. Revenues would increase as a result of growth in the service population and through increased Act 339 funding.

In this case, the average annual increase during the next 20 years is approximately six percent. Average annual residential bills would increase from $114 to $261. Estimated average annual bills for the planning period under Case 3 are presented in table 7.14.

Case 4.

Debt service and O&M expenditures increase in the same amounts for this analysis as in the previous two. However, the expenditures are shared by an increased population in the current service area as well as new ALCOSAN customers in the service area who are not currently served.

There are new revenues not only from state grant monies, but also from connection fees paid by new municipalities. According to this analysis, user charges will increase at an average annual rate of five percent. Residential users would pay $236 in 2015, compared to $114 in 1996. Estimated average annual bills for the planning period under Case 4 are presented in table 7.15.

Table 7.12
Case
1

Year	Required Revenues from User Charges	Annual Billable Flow (in 1000 gals.)	User Charge per 1000 Gallons	Average Annual Residential Charge
1995	$47,680,700	33,343,147	$1.43	$114.40
1996	$51,576,098	35,341,318	$1.46	$116.75
1997	$56,683,912	35,341,318	$1.60	$128.31
1998	$57,676,627	35,341,318	$1.63	$130.56
1999	$58,654,777	35,341,318	$1.66	$132.77
2000	$60,434,829	35,341,318	$1.71	$136.80
2001	$61,490,384	35,341,318	$1.74	$139.19
2002	$62,563,010	35,341,318	$1.77	$141.62
2003	$63,684,982	35,341,318	$1.80	$144.16
2004	$64,843,024	35,341,318	$1.83	$146.78
2005	$66,340,456	35,341,318	$1.88	$150.17
2006	$67,563,905	35,341,318	$1.91	$152.94
2007	$68,837,237	35,341,318	$1.95	$155.82
2008	$70,144,575	35,341,318	$1.98	$158.78
2009	$71,472,075	35,341,318	$2.02	$161.79
2010	$72,865,611	35,341,318	$2.06	$164.94
2011	$74,281,687	35,341,318	$2.10	$168.15
2012	$75,768,003	35,341,318	$2.14	$171.51
2013	$77,279,905	35,341,318	$2.19	$174.93
2014	$78,905,261	35,341,318	$2.23	$178.61
2015	$80,510,761	35,341,318	$2.28	$182.25

Case 1 includes ALCOSAN's capital spending plan and completion of contracted CIP projects.
It assumes the current service area with no population growth.

Table 7.13
Case
2

Year	Required Revenues from User Charges	Annual Billable Flow (in 1000 gals.)	User Charge per 1000 Gallons	Average Annual Residential Charge
1995	$47,680,700	33,343,147	$1.43	$114.40
1996	$51,576,098	35,341,318	$1.46	$116.75
1997	$64,119,577	35,341,318	$1.81	$145.14
1998	$74,696,337	35,341,318	$2.11	$169.09
1999	$87,998,593	35,341,318	$2.49	$199.20
2000	$89,297,911	35,341,318	$2.53	$202.14
2001	$90,071,800	35,341,318	$2.55	$203.89
2002	$91,296,629	35,341,318	$2.58	$206.66
2003	$97,603,080	35,341,318	$2.76	$220.94
2004	$100,912,392	35,341,318	$2.86	$228.43
2005	$104,906,376	35,341,318	$2.97	$237.47
2006	$106,147,739	35,341,318	$3.00	$240.28
2007	$108,382,147	35,341,318	$3.07	$245.34
2008	$110,078,565	35,341,318	$3.11	$249.18
2009	$111,804,807	35,341,318	$3.16	$253.09
2010	$113,607,037	35,341,318	$3.21	$257.17
2011	$115,442,057	35,341,318	$3.27	$261.32
2012	$117,357,876	35,341,318	$3.32	$265.66
2013	$119,310,157	35,341,318	$3.38	$270.08
2014	$121,387,093	35,341,318	$3.43	$274.78
2015	$123,455,710	35,341,318	$3.49	$279.46

Case 2 includes ALCOSAN's capital spending plan and completion of the entire CIP.
It assumes the current service area with no population growth.

Table 7.14
Case
3

Year	Required Revenues from User Charges	Annual Billable Flow (in 1000 gals.)	User Charge per 1000 Gallons	Average Annual Residential Charge
1995	$47,680,700	33,343,147	$1.43	$114.40
1996	$51,576,098	35,434,563	$1.46	$116.44
1997	$64,119,577	35,561,599	$1.80	$144.24
1998	$74,696,337	35,689,119	$2.09	$167.44
1999	$87,998,593	35,817,126	$2.46	$196.55
2000	$89,297,911	35,942,371	$2.48	$198.76
2001	$90,071,800	36,068,051	$2.50	$199.78
2002	$91,296,629	36,194,974	$2.52	$201.79
2003	$97,603,080	36,322,371	$2.69	$214.97
2004	$100,912,392	36,450,244	$2.77	$221.48
2005	$104,906,376	36,575,745	$2.87	$229.46
2006	$106,147,739	36,701,776	$2.89	$231.37
2007	$108,382,147	36,828,994	$2.94	$235.43
2008	$110,078,565	36,956,681	$2.98	$238.29
2009	$111,804,807	37,084,837	$3.01	$241.19
2010	$113,607,037	37,209,652	$3.05	$244.25
2011	$115,442,057	37,334,979	$3.09	$247.36
2012	$117,357,876	37,461,711	$3.13	$250.62
2013	$119,310,157	37,588,899	$3.17	$253.93
2014	$121,387,093	37,716,546	$3.22	$257.47
2015	$123,455,710	37,842,545	$3.26	$260.99

Case 3 includes ALCOSAN's capital spending plan and completion of the entire CIP
It assumes the current service area with population growth.

Table 7.15
Case
4

Year	Required Revenues from User Charges	Annual Billable Flow (in 1000 gals.)	User Charge per 1000 Gallons	Average Annual Residential Charge
1995	$47,680,700	33,343,147	$1.43	$114.40
1996	$51,576,098	35,369,707	$1.46	$116.66
1997	$64,119,577	35,399,622	$1.81	$144.90
1998	$72,996,360	35,732,402	$2.04	$163.43
1999	$86,277,653	36,085,970	$2.39	$191.27
2000	$87,504,172	36,377,977	$2.41	$192.43
2001	$88,281,055	36,672,496	$2.41	$192.58
2002	$89,483,954	36,969,548	$2.42	$193.64
2003	$95,768,262	37,269,154	$2.57	$205.57
2004	$99,055,216	37,571,337	$2.64	$210.92
2005	$102,981,471	37,876,119	$2.72	$217.51
2006	$104,223,068	38,183,522	$2.73	$218.36
2007	$106,434,298	38,493,568	$2.76	$221.20
2008	$108,107,314	38,806,281	$2.79	$222.87
2009	$109,809,928	39,121,683	$2.81	$224.55
2010	$111,527,911	39,439,798	$2.83	$226.22
2011	$113,369,201	39,760,649	$2.85	$228.10
2012	$115,260,485	40,084,258	$2.88	$230.04
2013	$117,187,996	40,410,651	$2.90	$231.99
2014	$119,239,924	40,739,851	$2.93	$234.15
2015	$121,305,755	41,068,358	$2.95	$236.30

Case 4 includes ALCOSAN's capital spending plan and completion of the entire CIP. It assumes the current service area plus unsewered areas within the current service area, with population growth.

Case 5.

The costs associated with the CIP expansion are shared in this analysis by a larger population than the previous analyses. Revenues are increased from previous levels because of additional connection fees received from new municipalities. User charges will increase from $114 in 1996 to $219 in 2015. This is an average annual increase of four percent. Estimated average annual bills for the planning period under Case 5 are presented in table 7.16.

Table 7.16
Case
5

Year	Required Revenues from User Charges	Annual Billable Flow (in 1000 gals.)	User Charge per 1000 Gallons	Average Annual Residential Charge
1995	$47,680,700	33,343,147	$1.43	$114.40
1996	$51,576,098	35,434,571	$1.46	$116.44
1997	$64,119,577	35,561,610	$1.80	$144.24
1998	$71,682,084	35,879,429	$2.00	$159.83
1999	$84,935,909	36,294,527	$2.34	$187.21
2000	$86,134,524	36,714,731	$2.35	$187.68
2001	$86,883,063	37,140,104	$2.34	$187.15
2002	$88,057,170	37,570,708	$2.34	$187.50
2003	$94,312,232	38,006,609	$2.48	$198.52
2004	$97,569,479	38,447,872	$2.54	$203.02
2005	$101,465,561	38,894,562	$2.61	$208.70
2006	$102,676,511	39,346,747	$2.61	$208.76
2007	$104,856,614	39,804,493	$2.63	$210.74
2008	$106,498,016	40,267,869	$2.64	$211.58
2009	$108,168,523	40,736,946	$2.66	$212.42
2010	$109,853,897	41,211,791	$2.67	$213.25
2011	$111,662,071	41,692,478	$2.68	$214.26
2012	$113,519,723	42,179,077	$2.69	$215.31
2013	$115,413,081	42,671,660	$2.70	$216.37
2014	$117,430,325	43,170,303	$2.72	$217.61
2015	$119,426,454	43,673,732	$2.73	$218.76

Case 5 includes ALCOSAN's capital spending plan and completion of the entire CIP. It assumes the current service area plus unsewered areas within the current service area, plus PaDEP-designated study areas, with population growth.

SECTION 8
Implementation Schedule

8.1 COMPREHENSIVE WASTEWATER MANAGEMENT PROGRAM

As detailed in Section 5, ALCOSAN has developed an integrated ***Comprehensive Wastewater Management Program*** that consists of the ***Treatment Plant Capital Improvements Program***, the ***Combined Sewer Overflow Program***, interceptor system reliability projects such as the ***River Crossing and Access Shaft Studies***, and the interceptor upgrade program such as the ***Saw Mill Run Parallel Interceptor Extension Project***. The implementation schedule for these programs will be ongoing through 2005 and beyond. A schedule for specific program elements is provided in Figure 8-1.

8.2 PaDEP DESIGNATED WATERSHED INTERCONNECTIONS

An implementation schedule has not been proposed for the regionalization of the PaDEP designated study areas into the ALCOSAN service area. The municipalities in the PaDEP study areas will decide whether to pursue this option further with ALCOSAN. As noted in Section 4, the flow projections used in the phasing of the ALCOSAN plant expansion schedule assumes a minimum 3-year lag time between a municipal decision to pursue regionalization and the completion of interconnections into the ALCOSAN interceptor system.

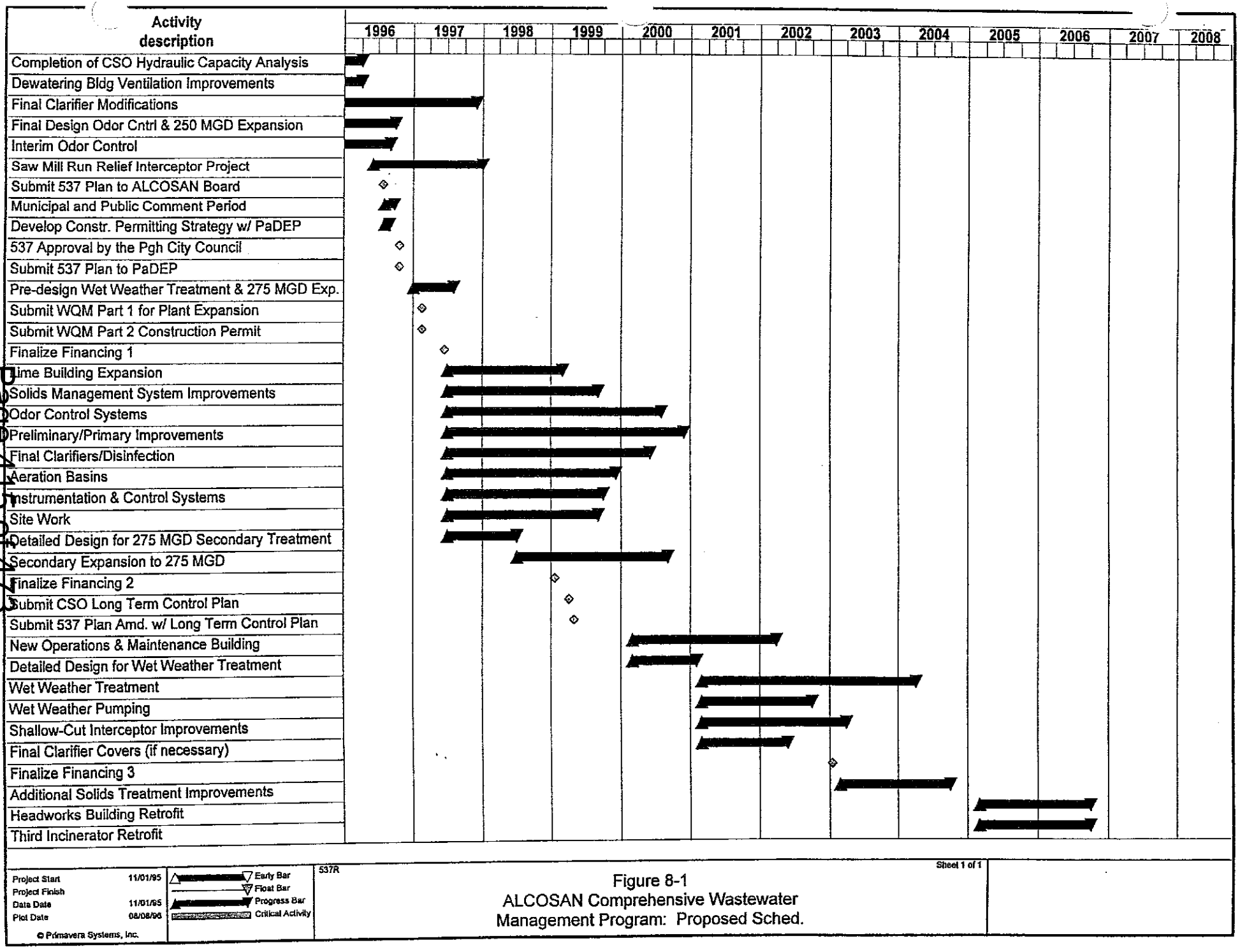


Figure 8-1
ALCOSAN Comprehensive Wastewater
Management Program: Proposed Sched.

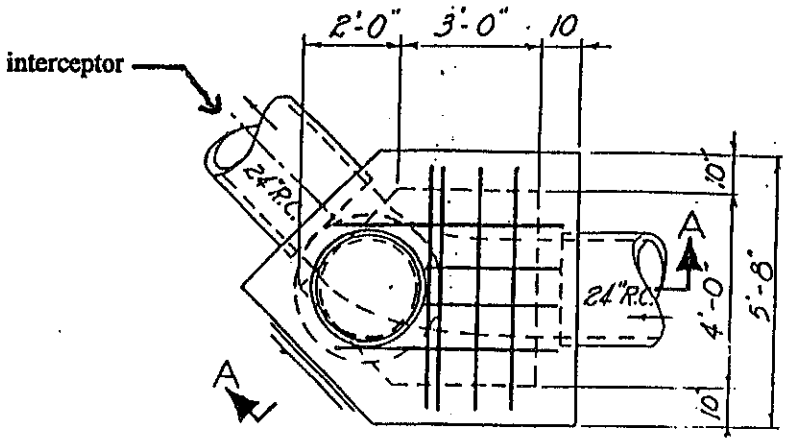
Page 415 of 473

APPENDIX A
City of Pittsburgh Resolution of Acceptance
(to be added)

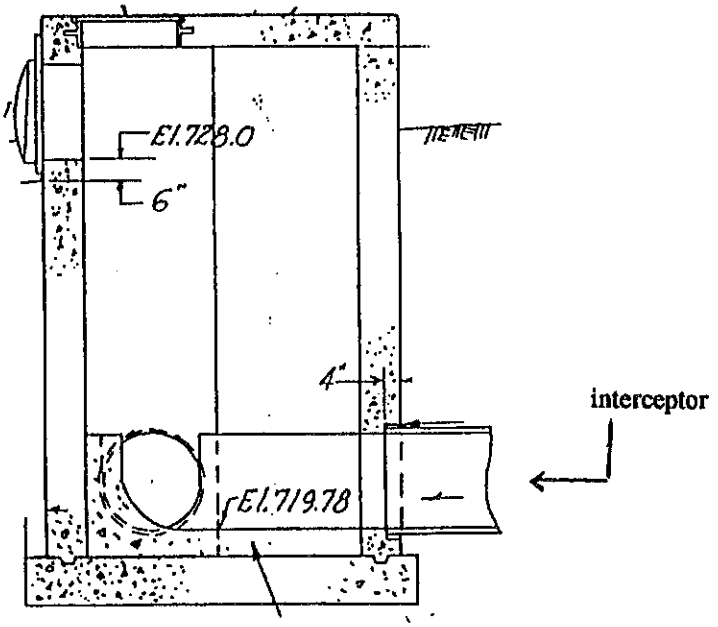
APPENDIX B
Public and Municipal Comments
(to be added)

APPENDIX C
ALCOSAN Interceptor System Regulator Structures

Figure 2-17
Dam or Elevated Pipe Diversion Structure

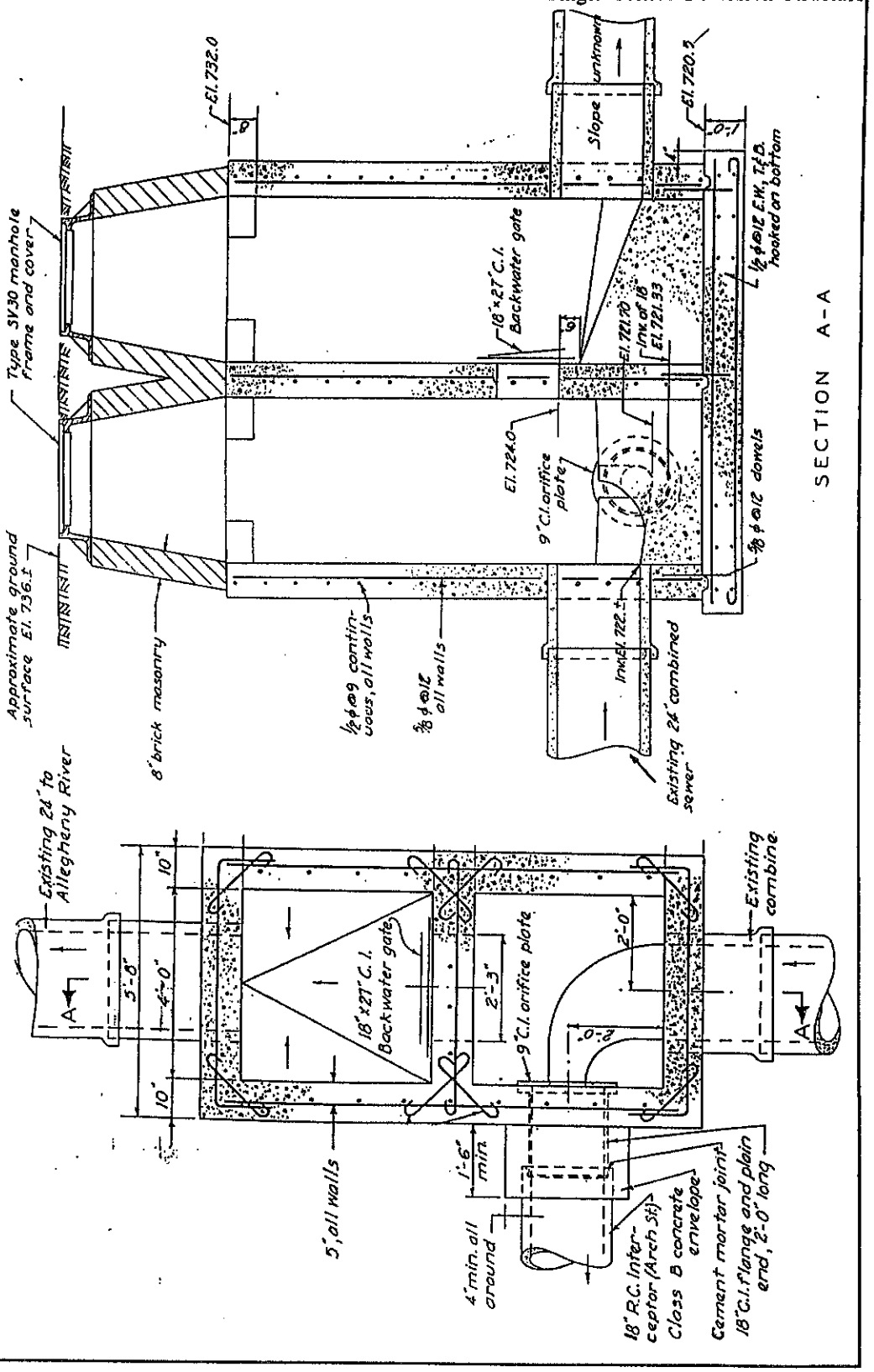


PLAN



SECTION A-A

Figure 2-18
Single Orifice Diversion Structure



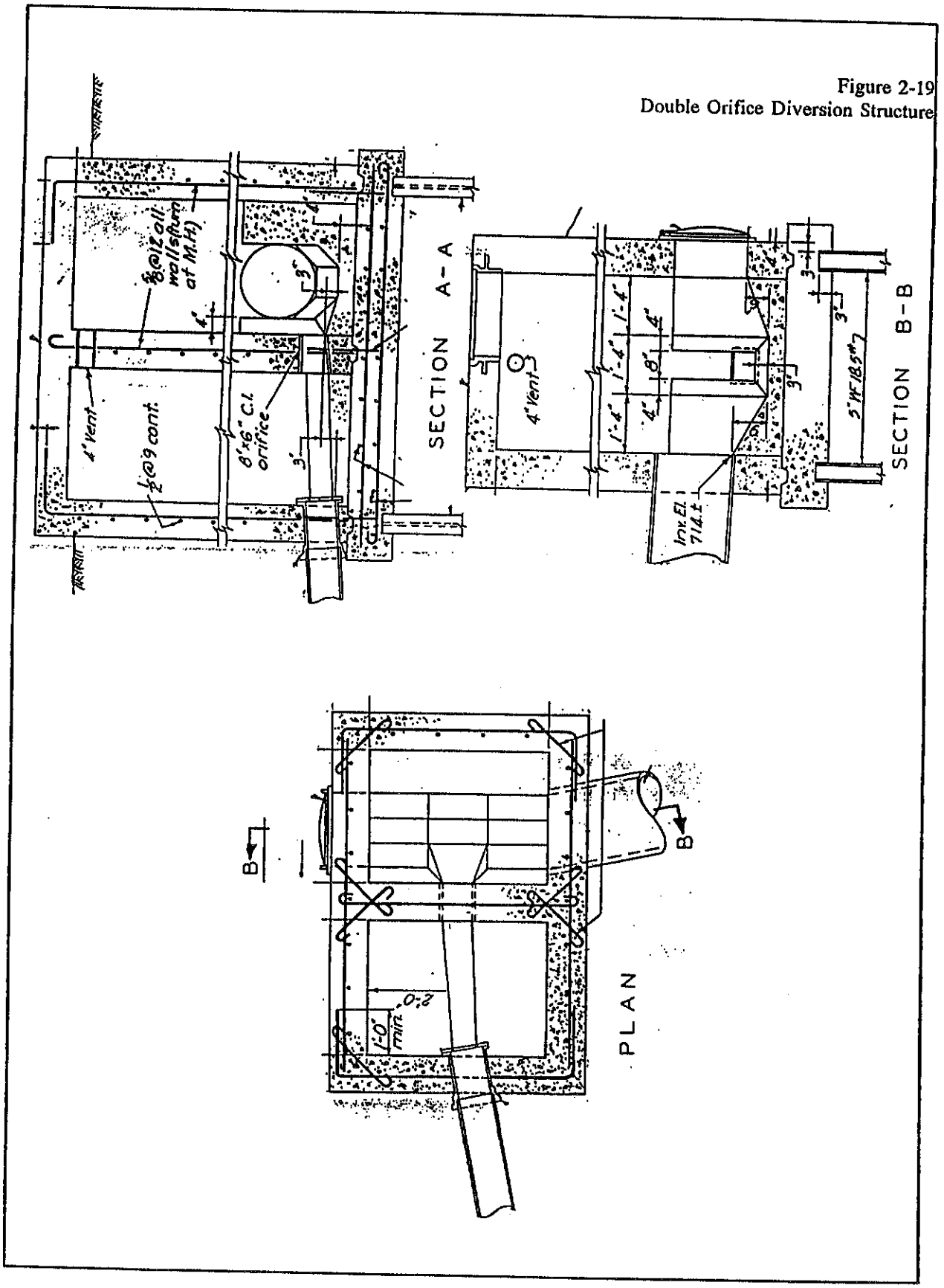
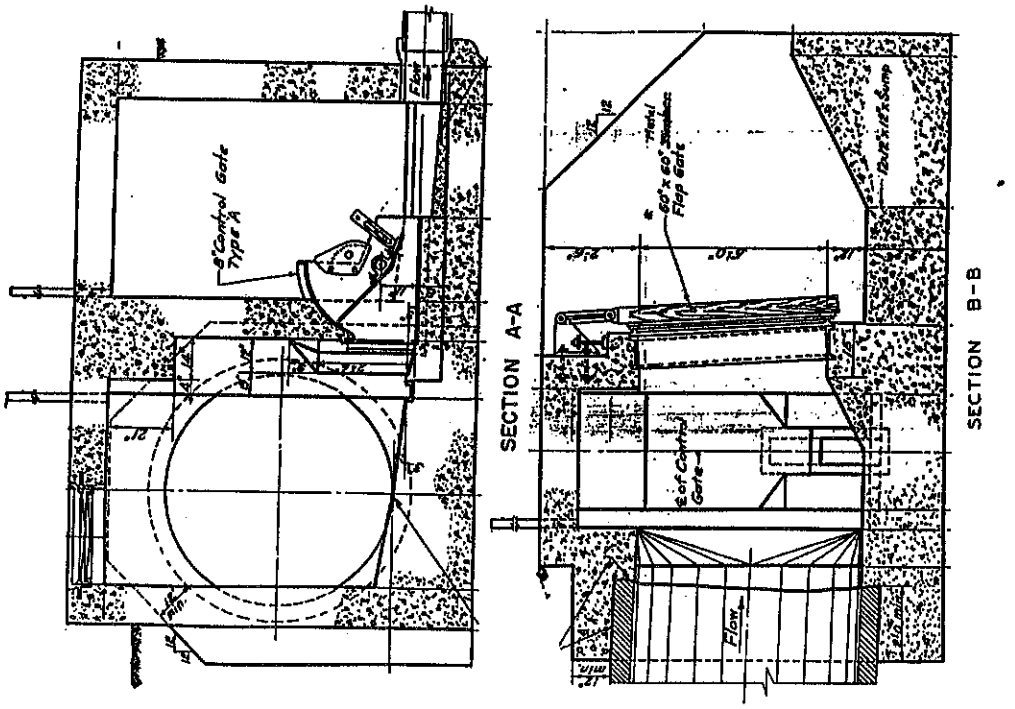


Figure 2-19
Double Orifice Diversion Structure

Figure 2-20
Tipping Gate Diversion Structure



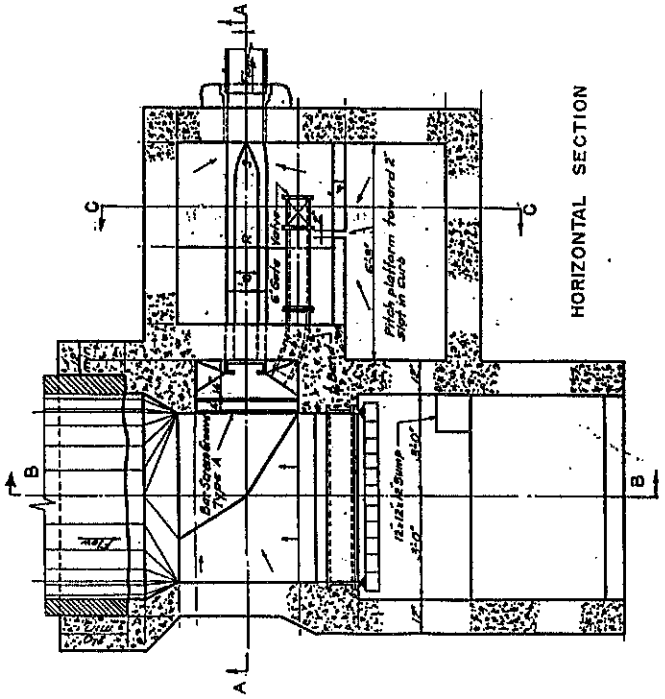
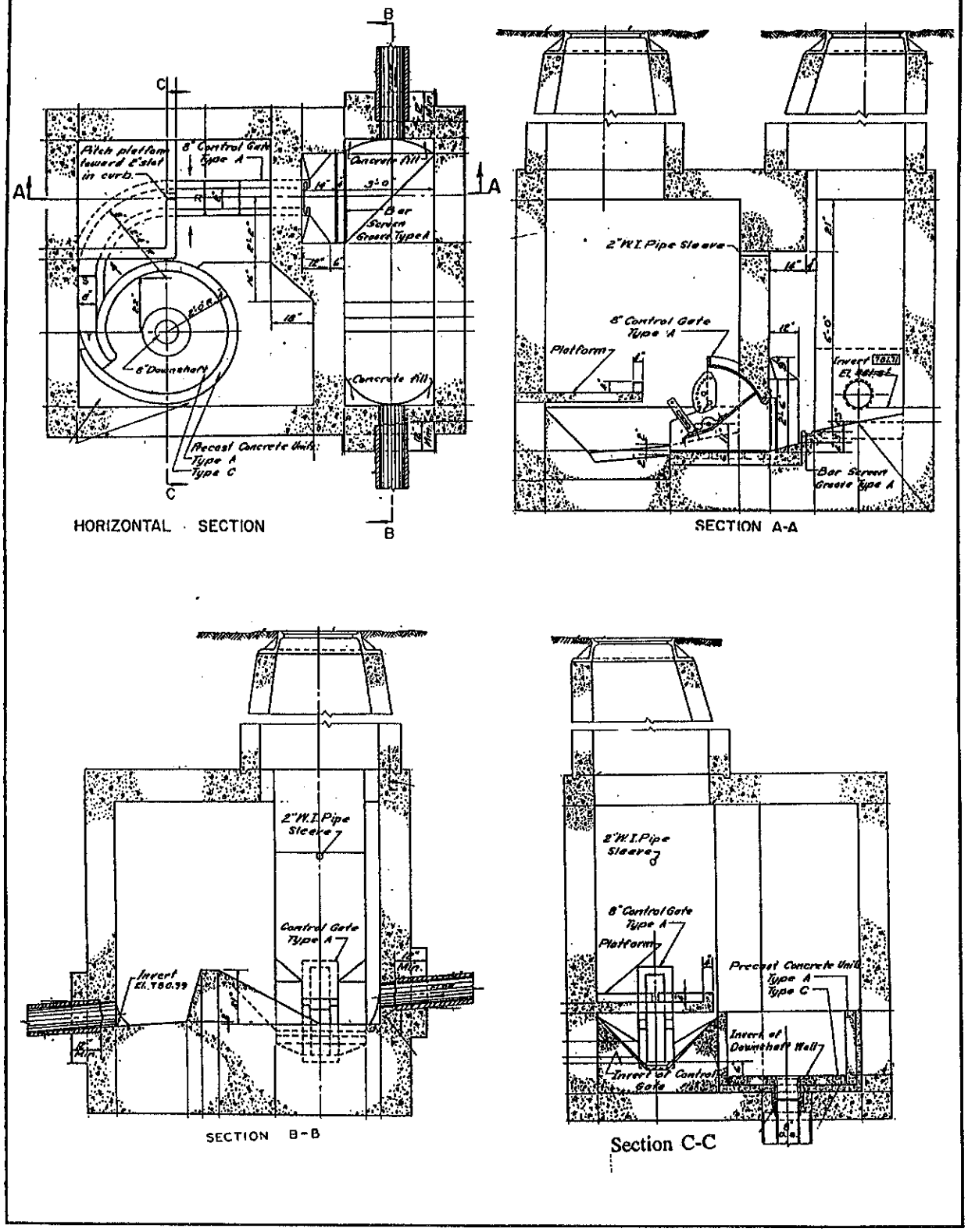
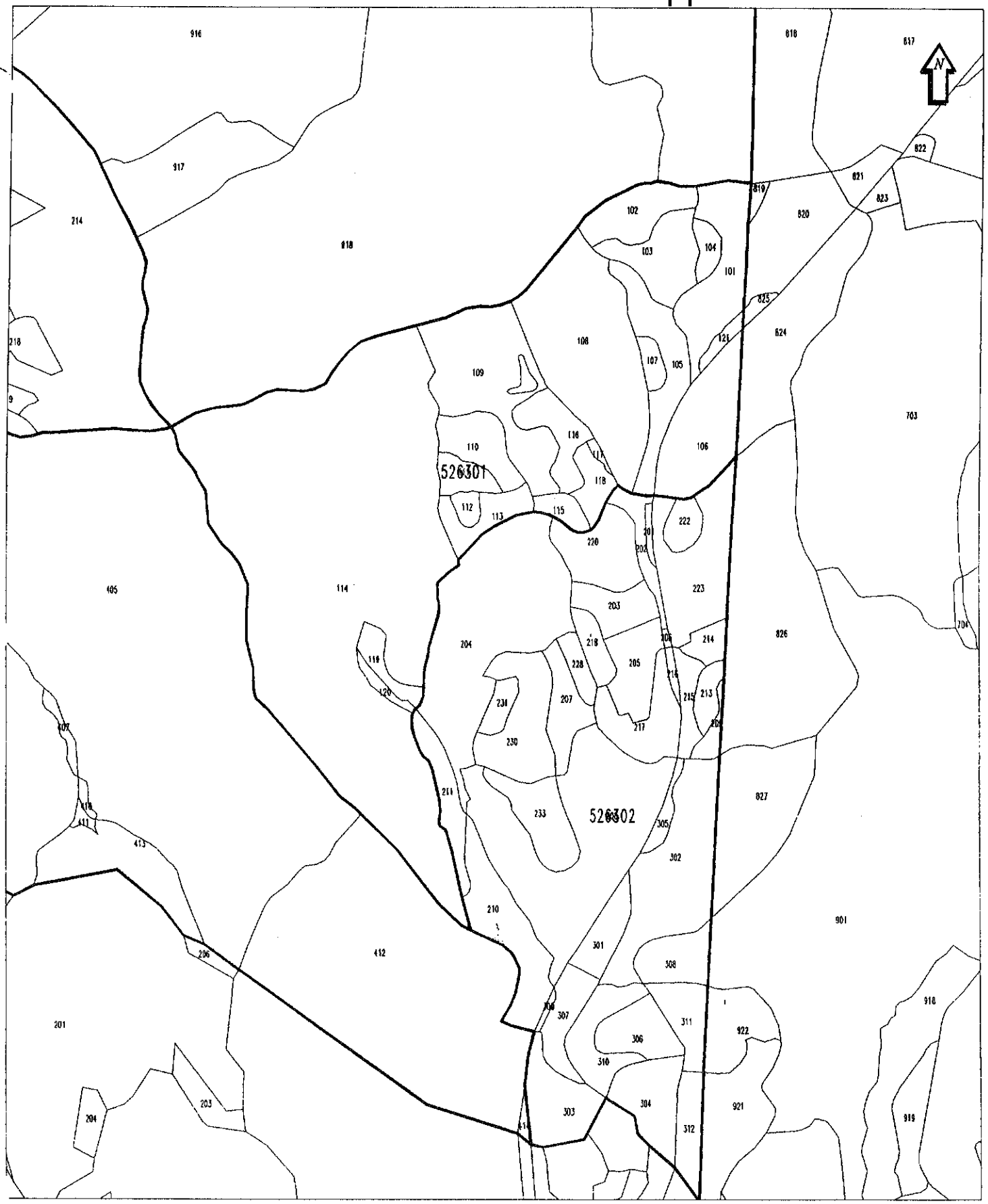


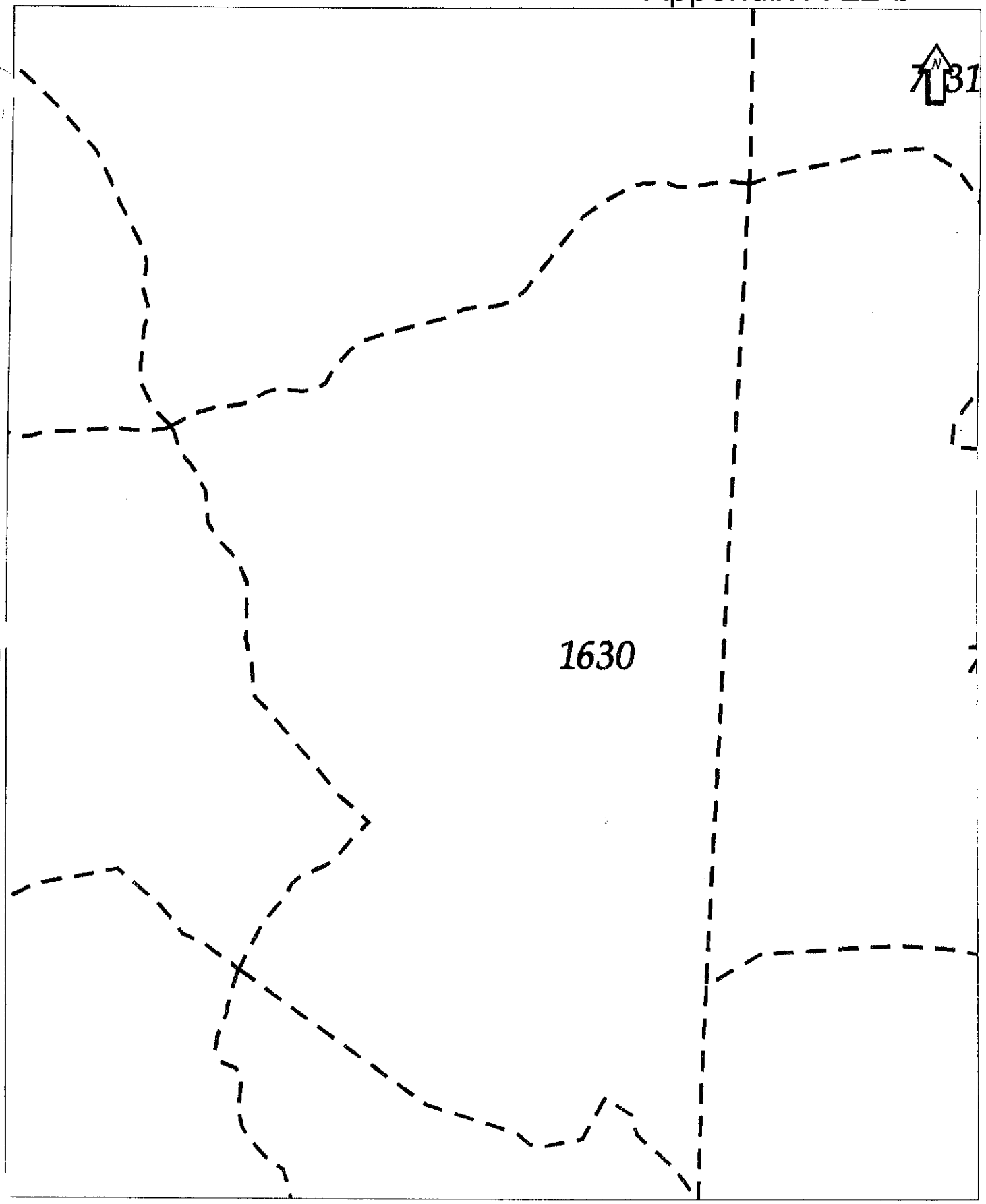
Figure 2-21
Tipping Gate/Vortex Diversion Structure



APPENDIX D
PaDEP Designated Study Area Population Polygons



Census Blocks and Tracts



Traffic Analysis Zones

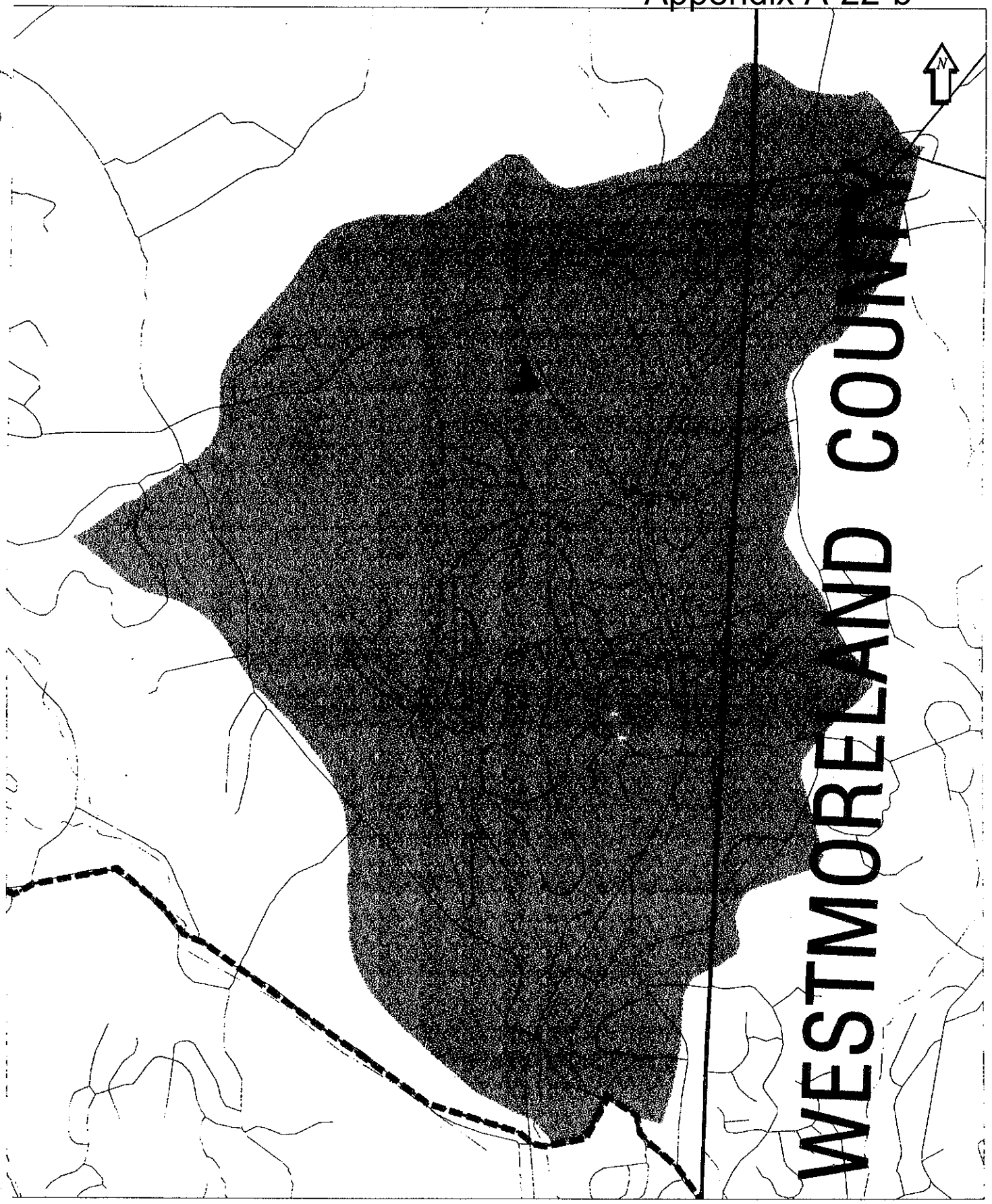
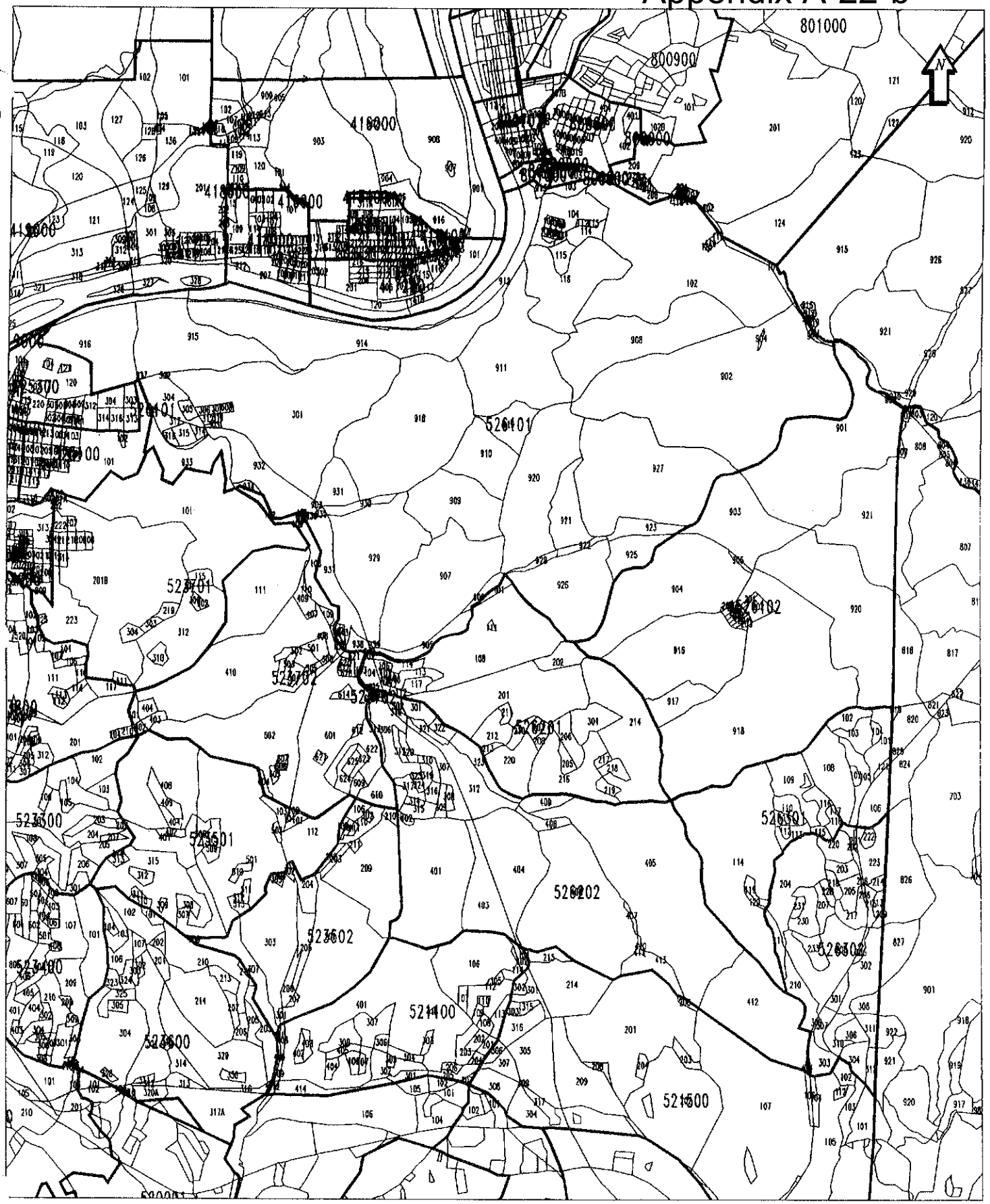


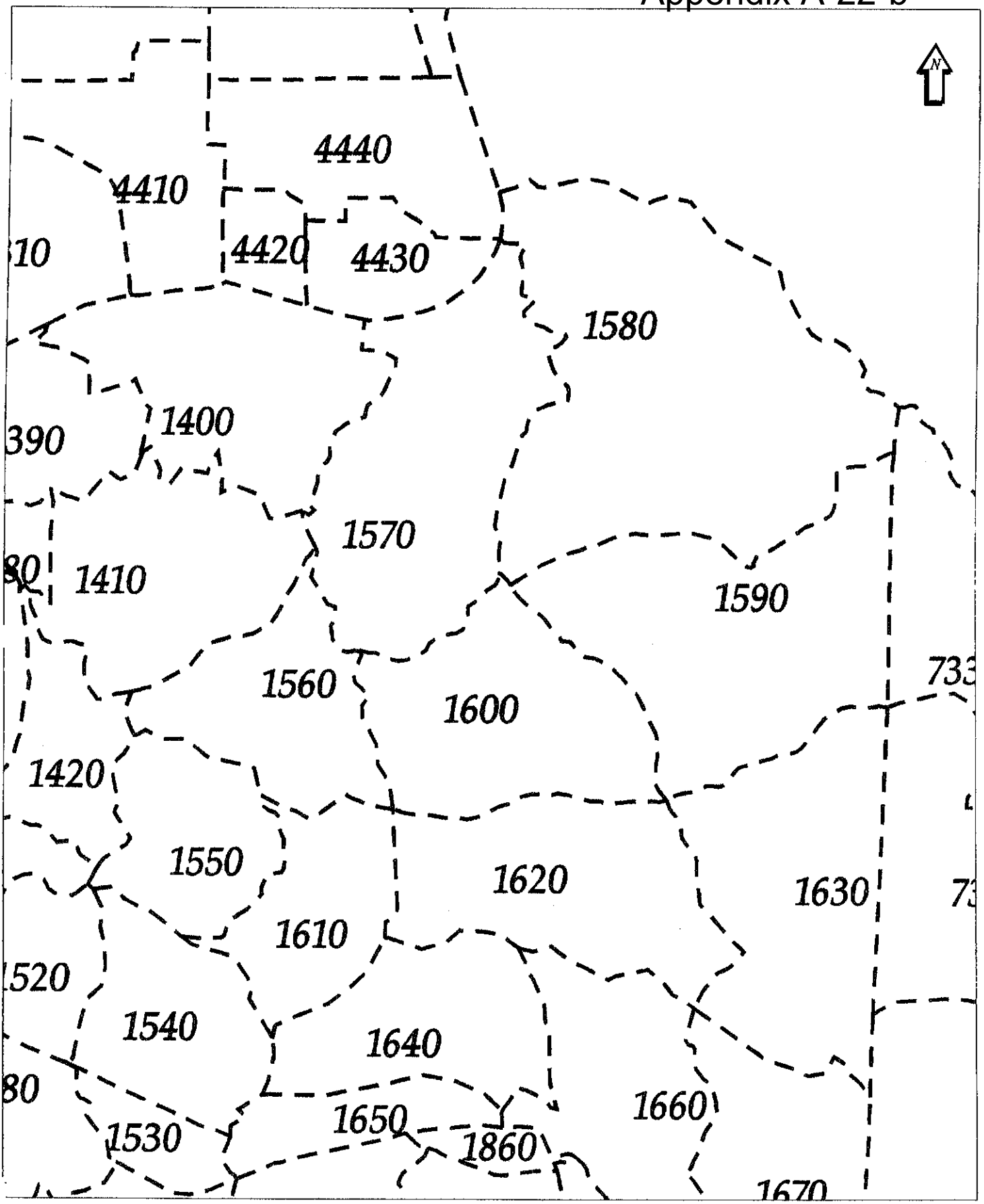
Figure PDSA-9
Holiday Park STP Study Area

CDM CH2MHILL EPM TEAM ALCOSAN

Camp Dresser & McKee



Census Blocks and Tracts



Traffic Analysis Zones

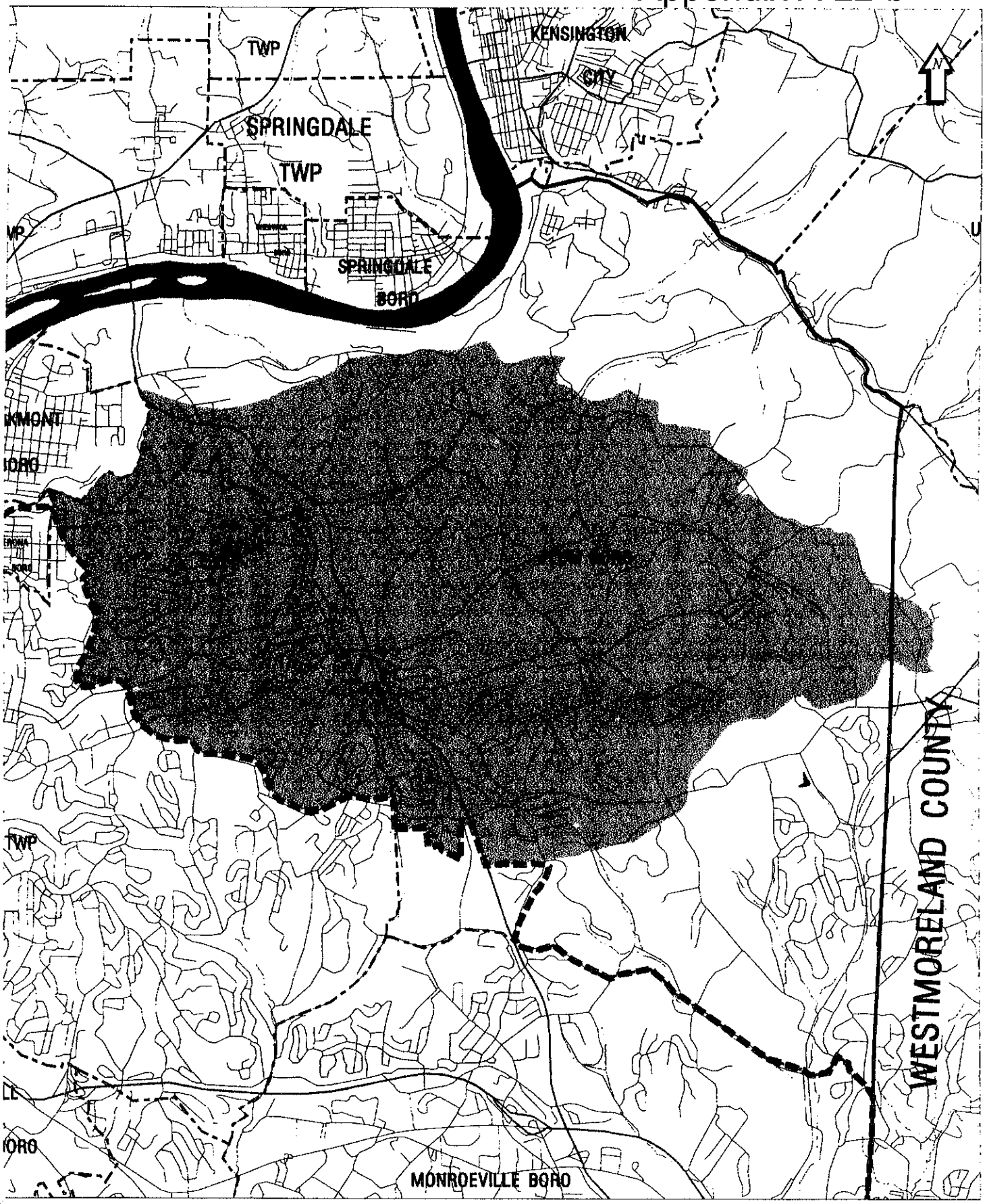
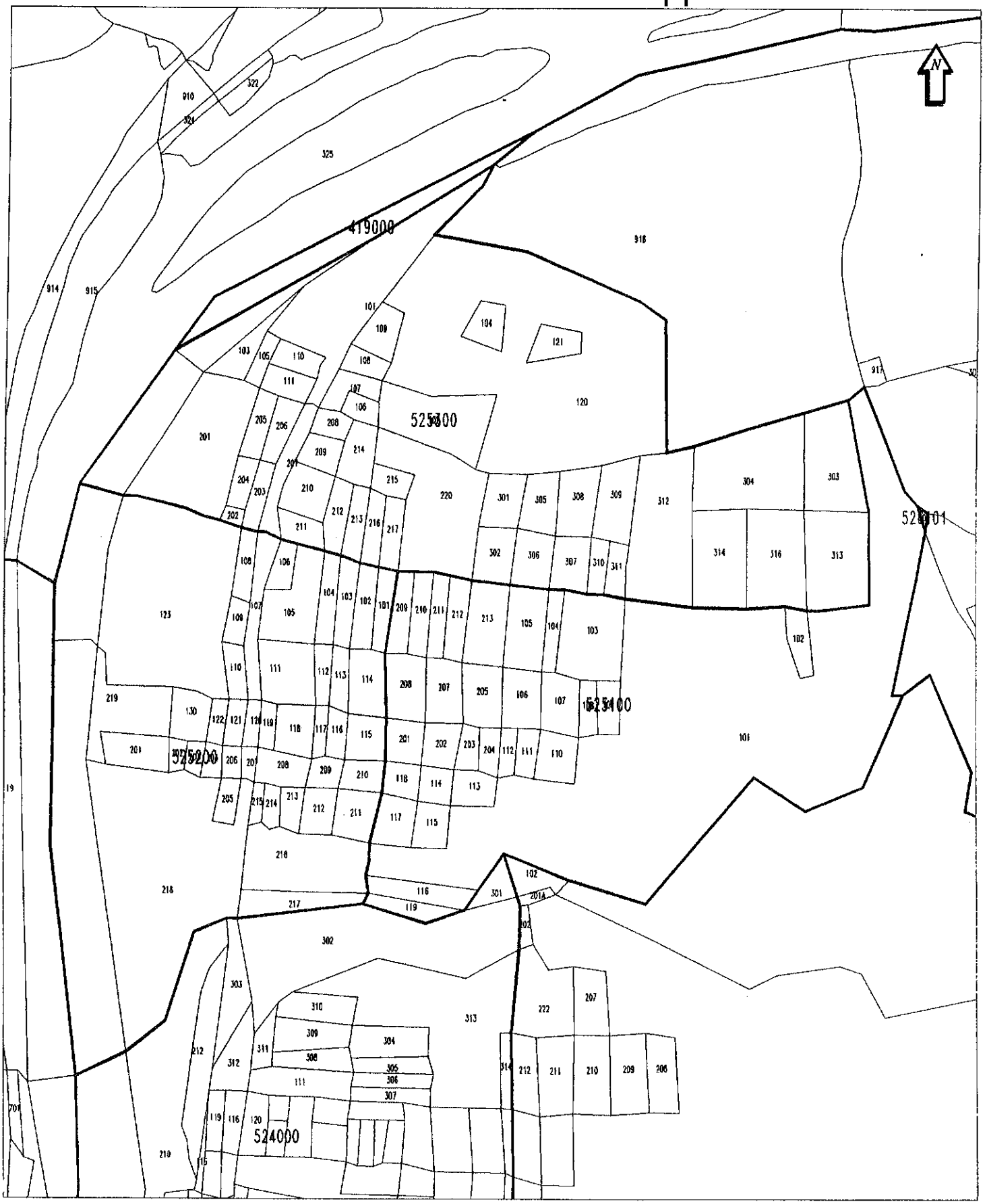
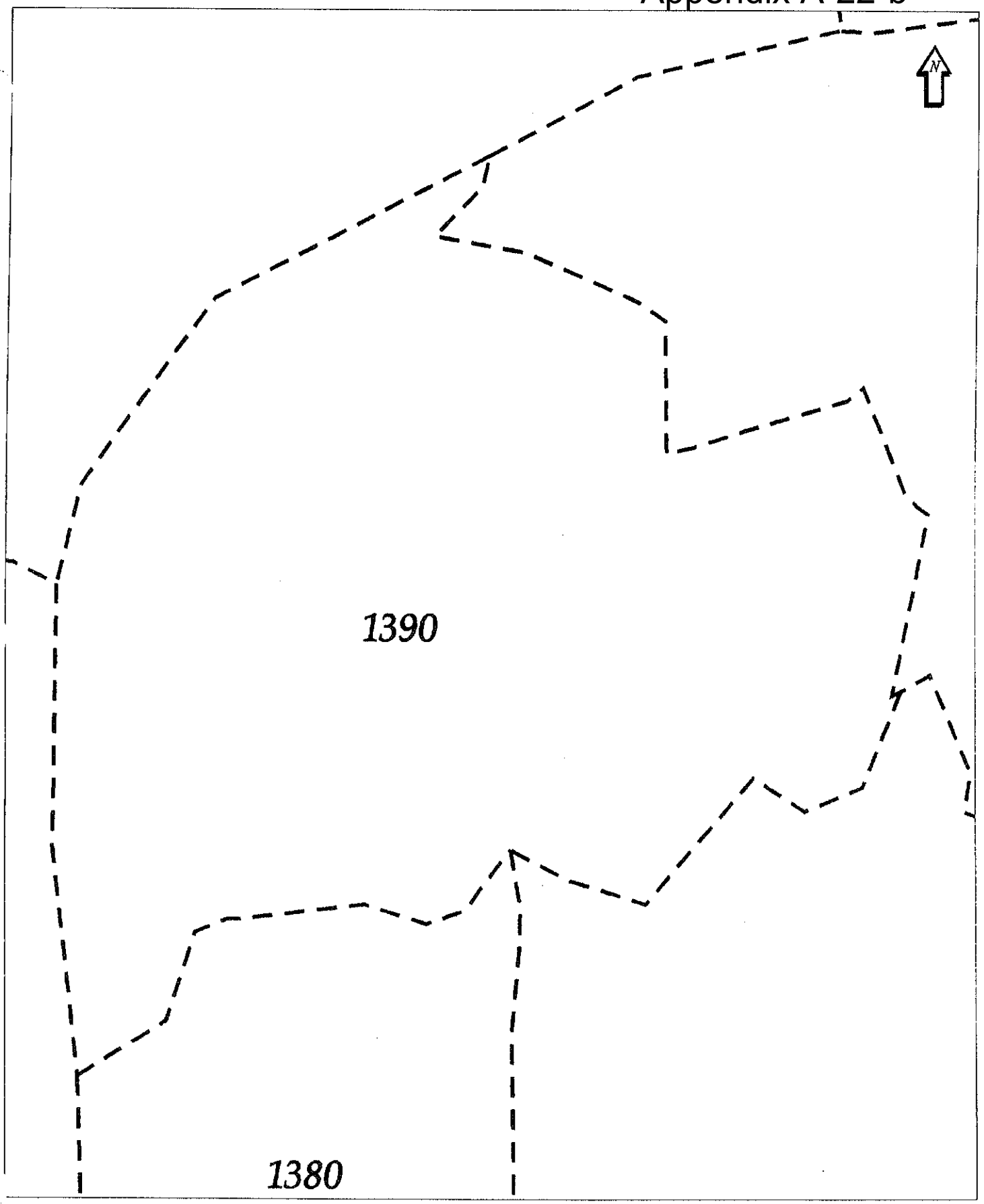


Figure PDSA-8
Plum Creek STP Study Area



Census Blocks and Tracts



Traffic Analysis Zones

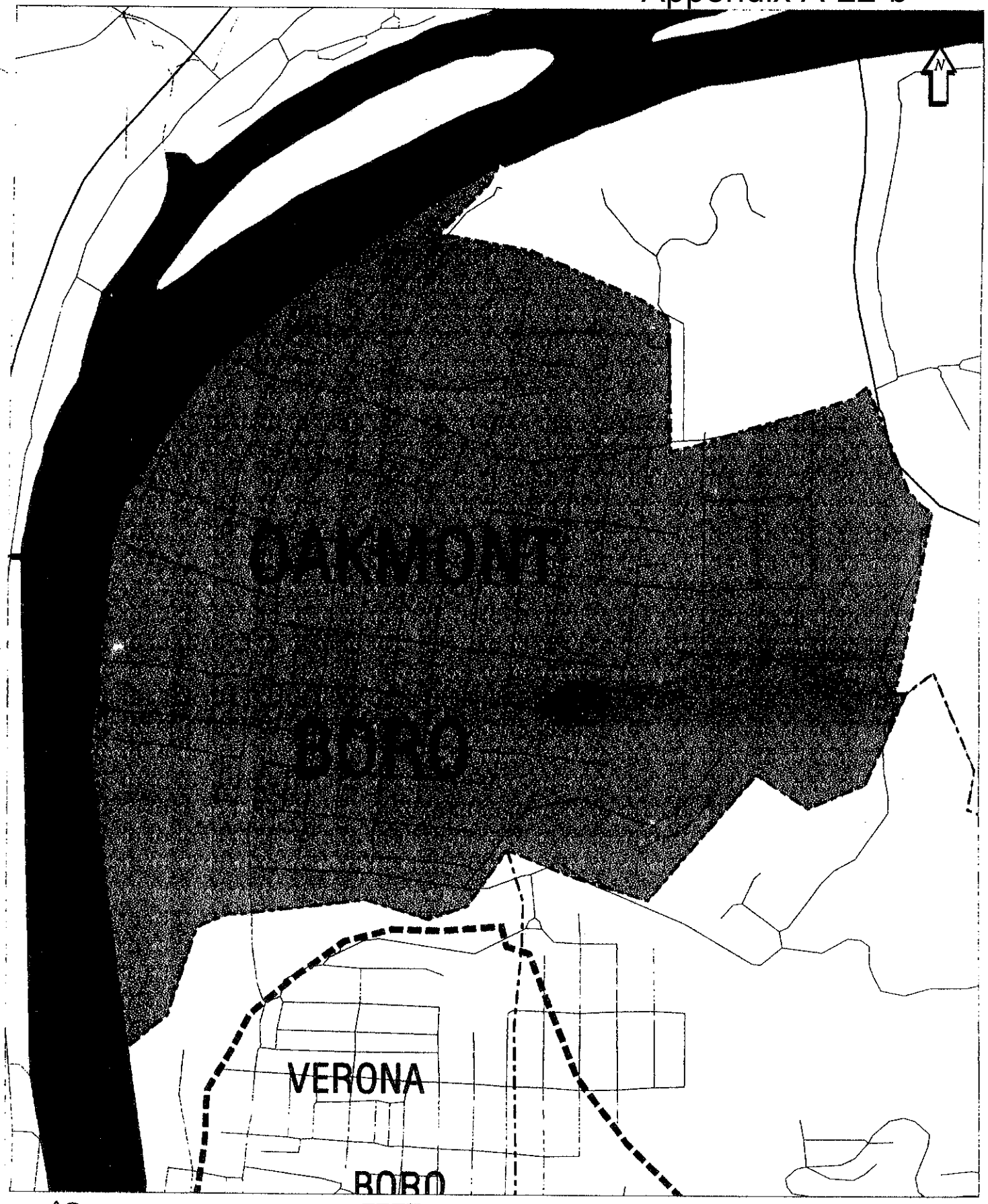
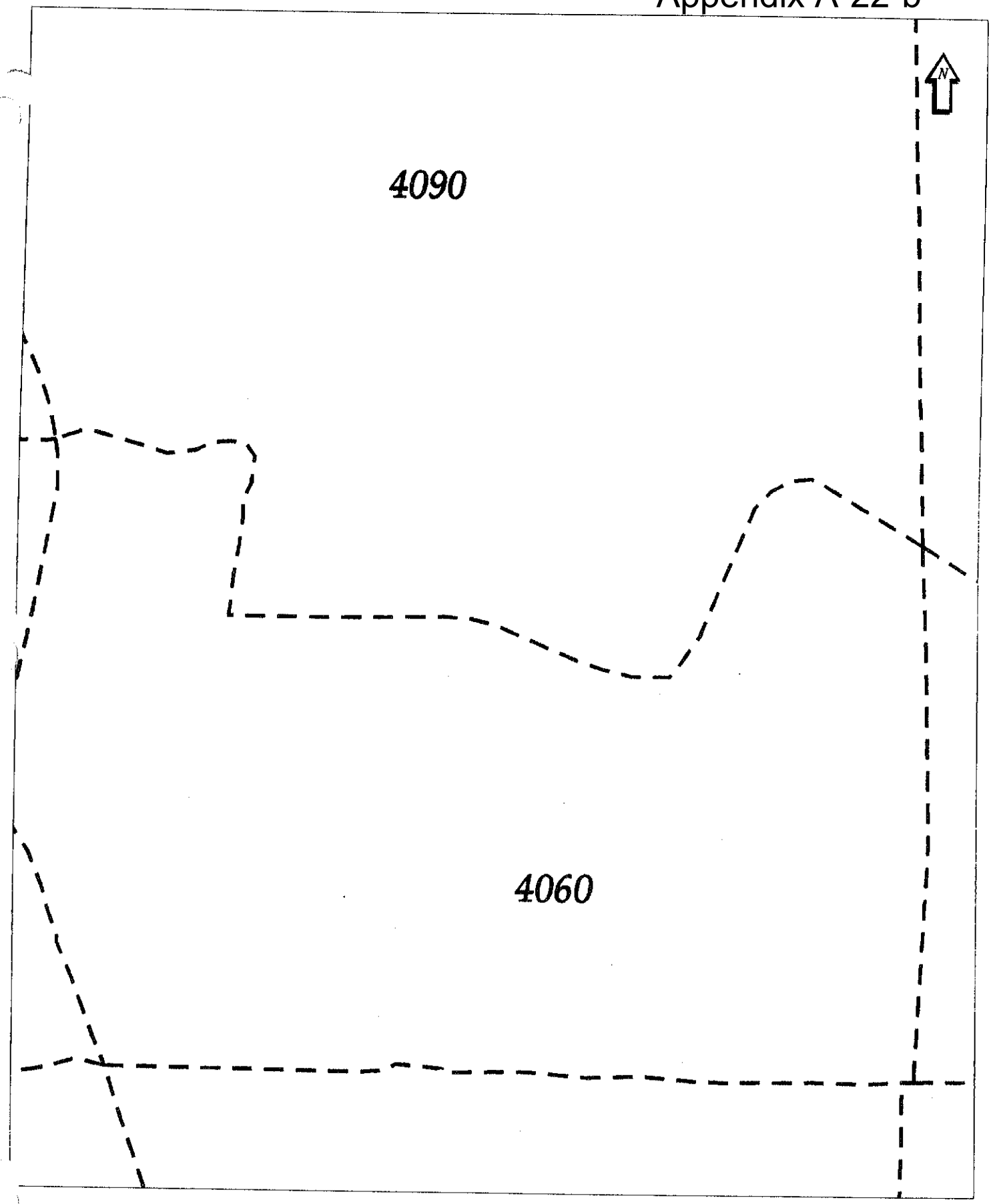


Figure PDSA-7
Oakmont STP Study Area



Census Blocks and Tracts



Traffic Analysis Zones



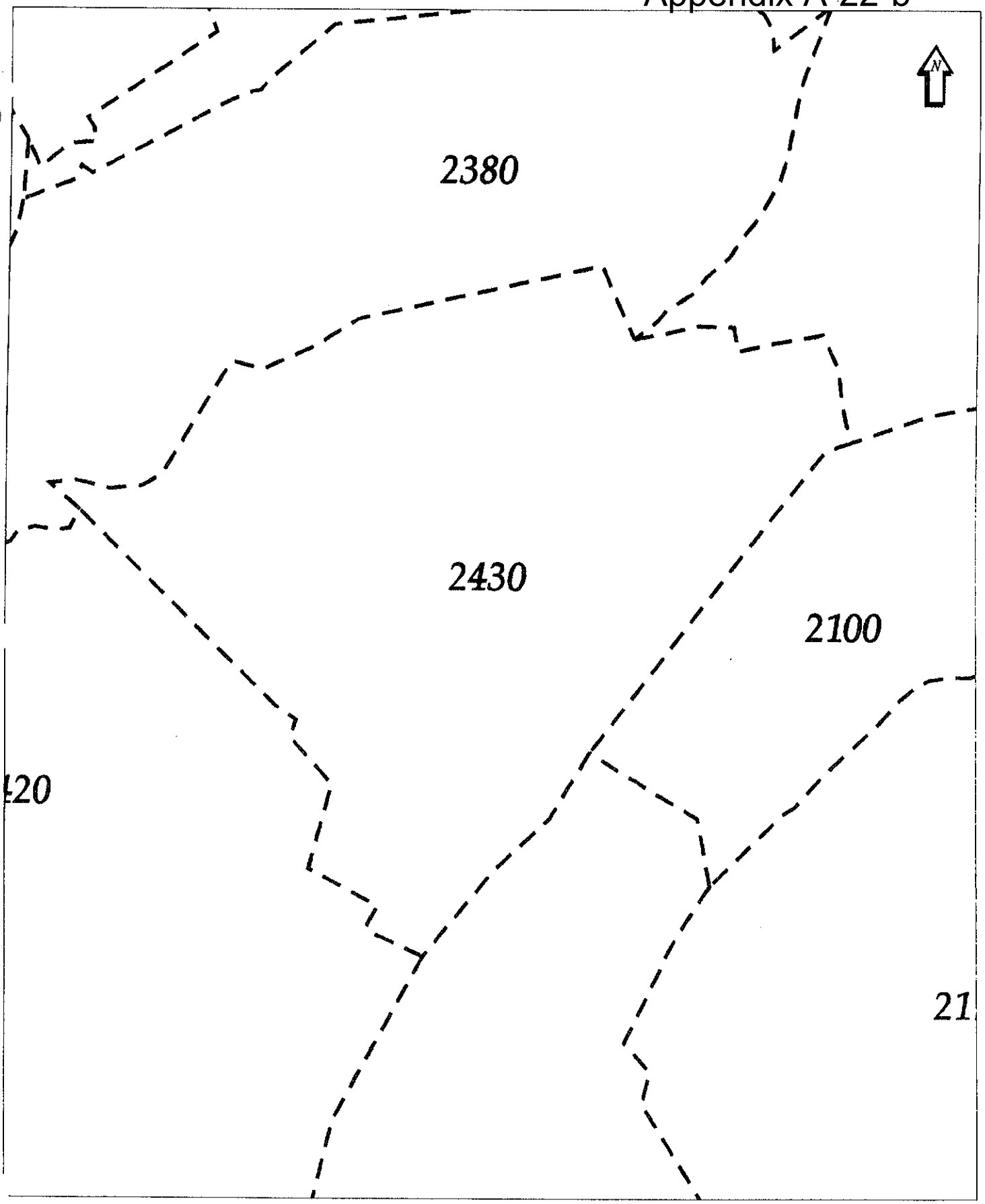
Figure PDSA-6
Longvue #1 STP Study Area

CDM CH2MHILL EPM TEAM ALCOSAN

Camp Dresser & McKee



Census Blocks and Tracts



Traffic Analysis Zones

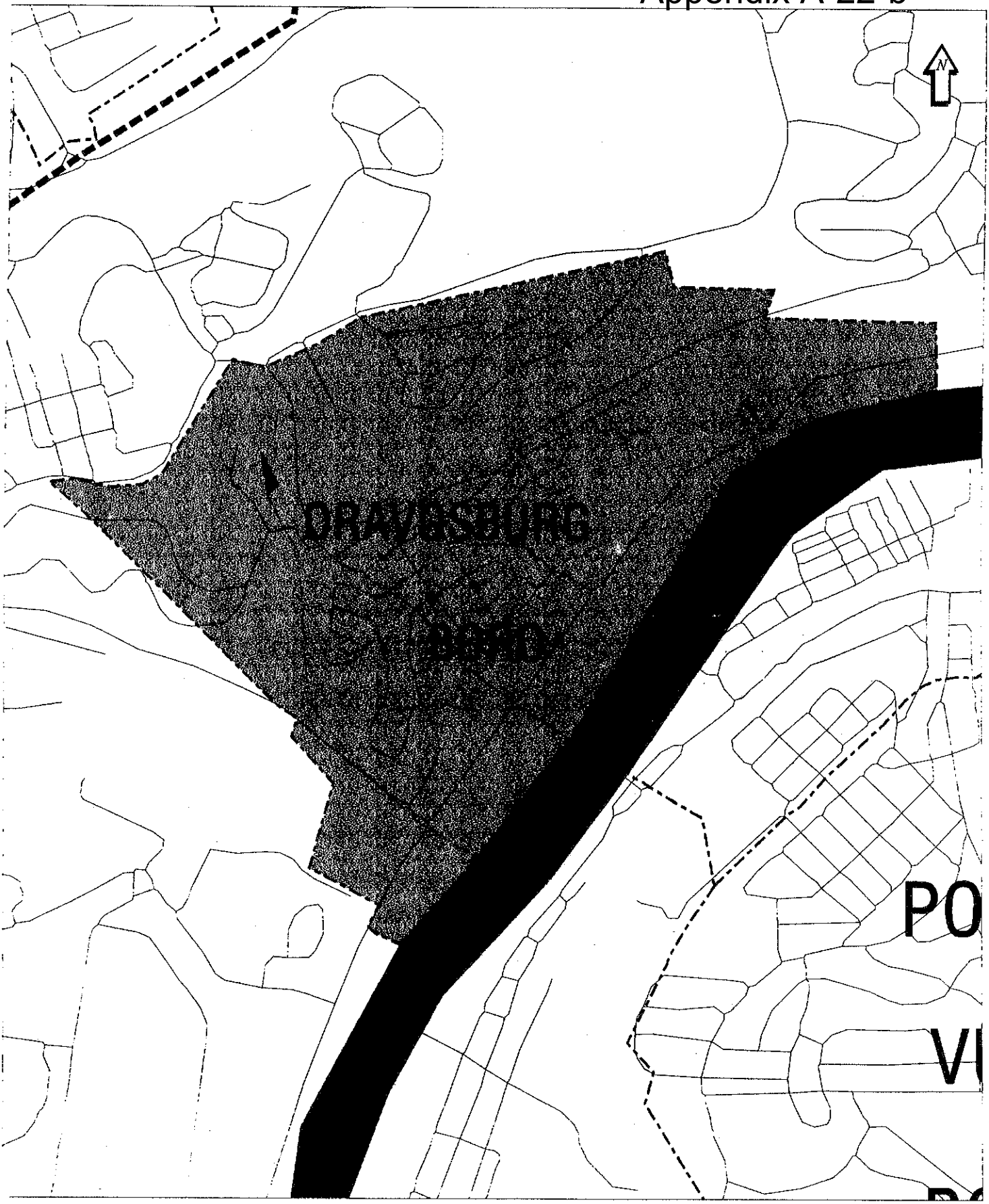
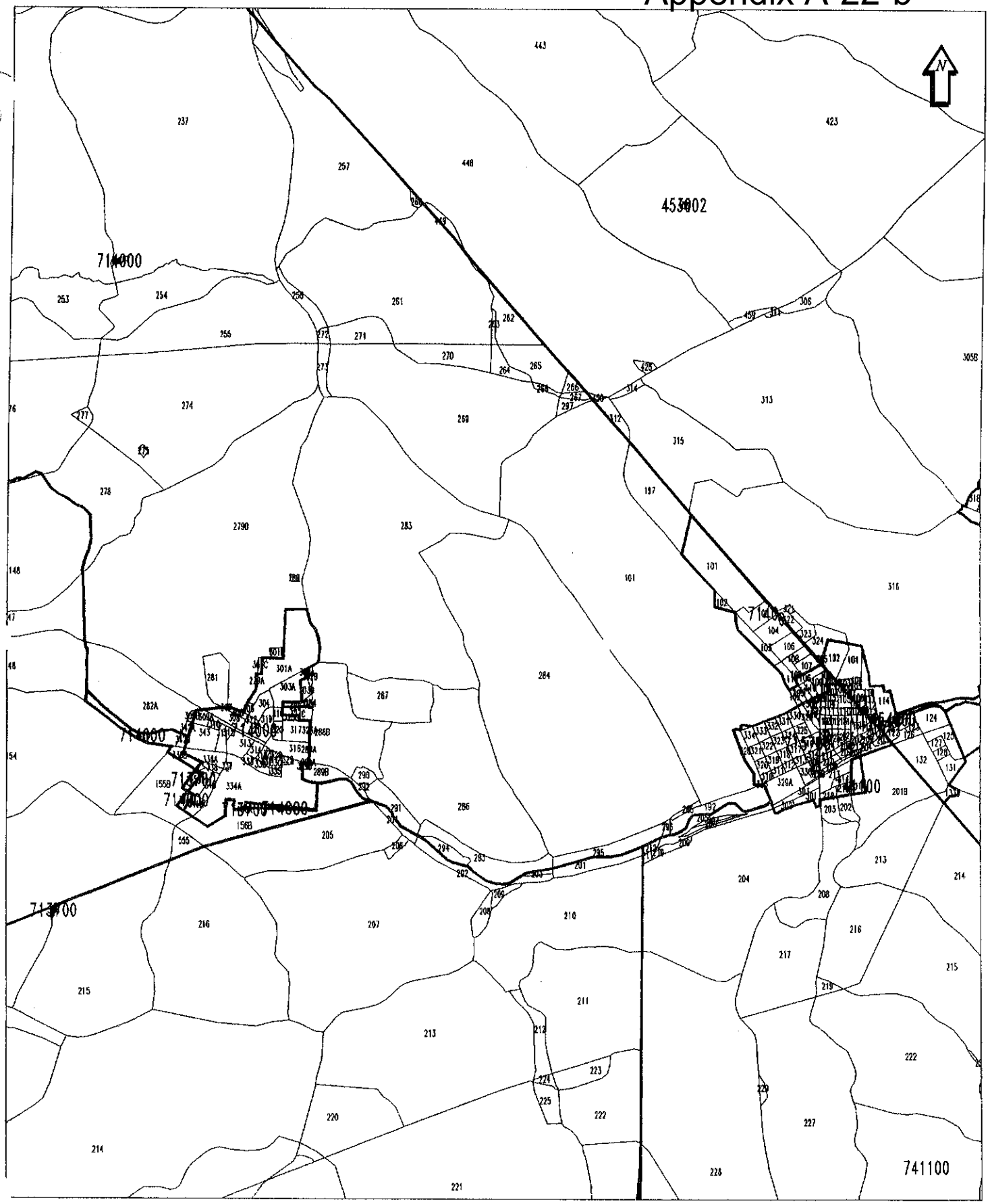


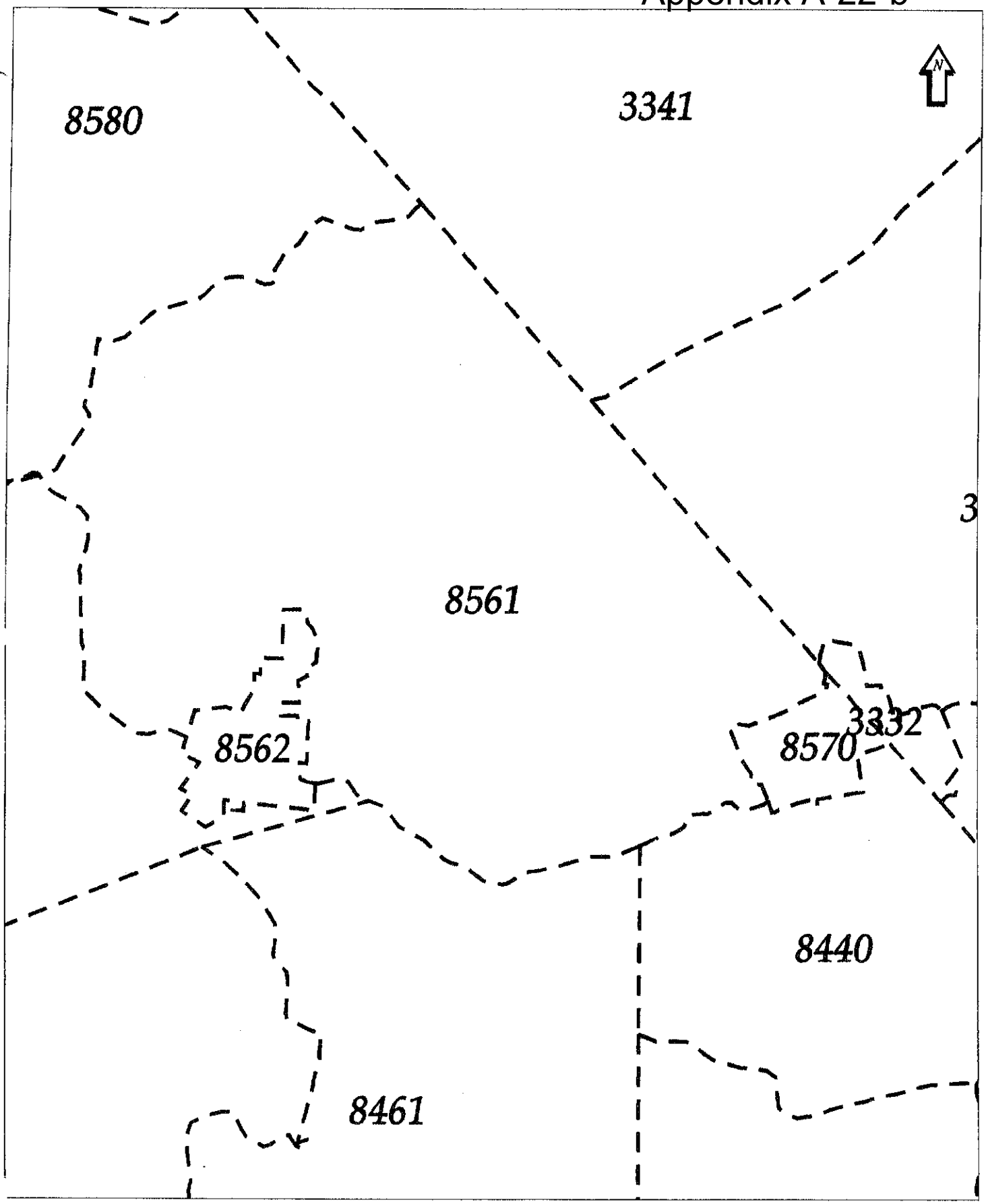
Figure PDSA-5
Dravosburg STP Study Area

CDM CH2MHILL EPM TEAM ALCOSAN

Camp Dresser & McKee



Census Blocks and Tracts



Traffic Analysis Zones

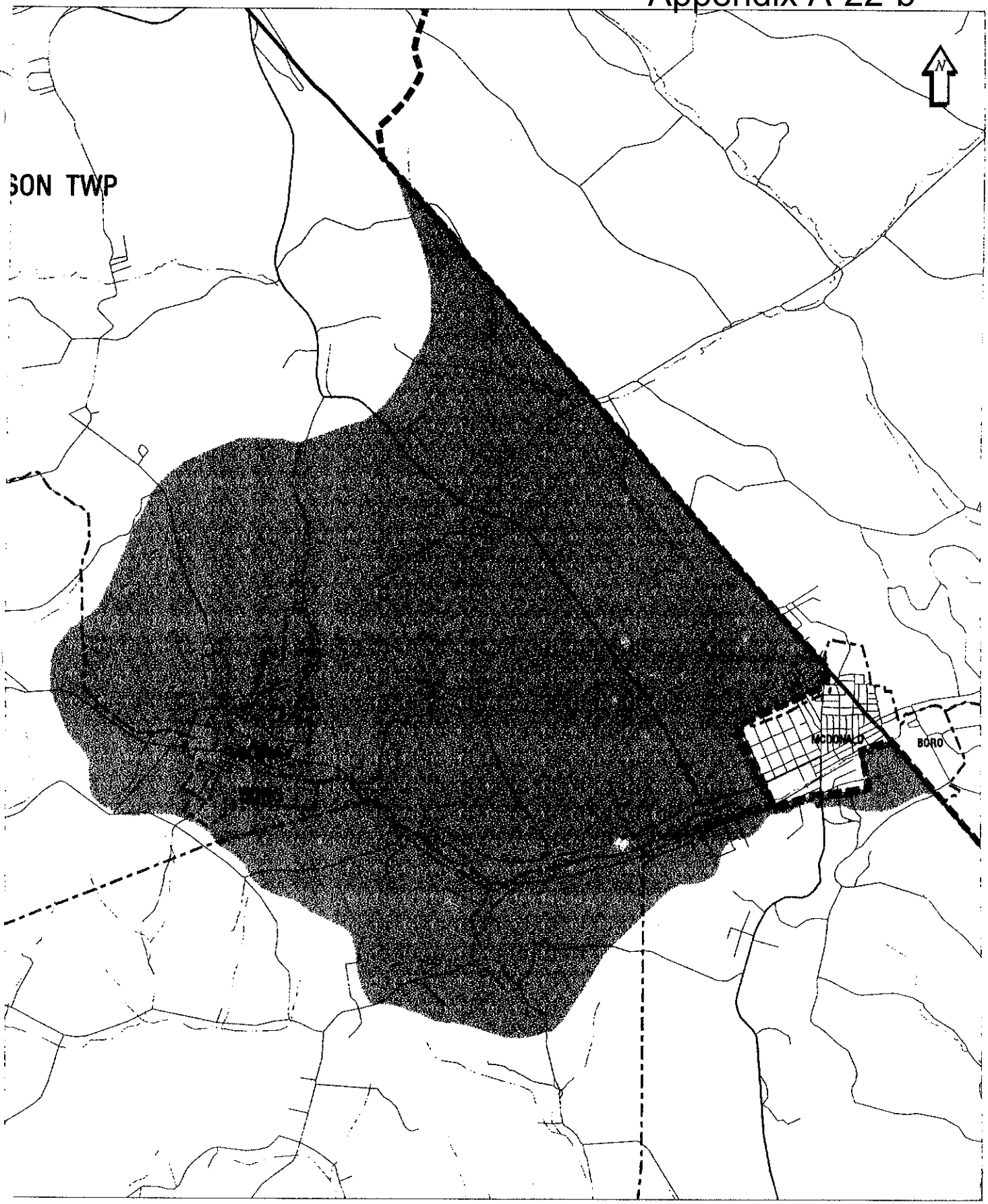
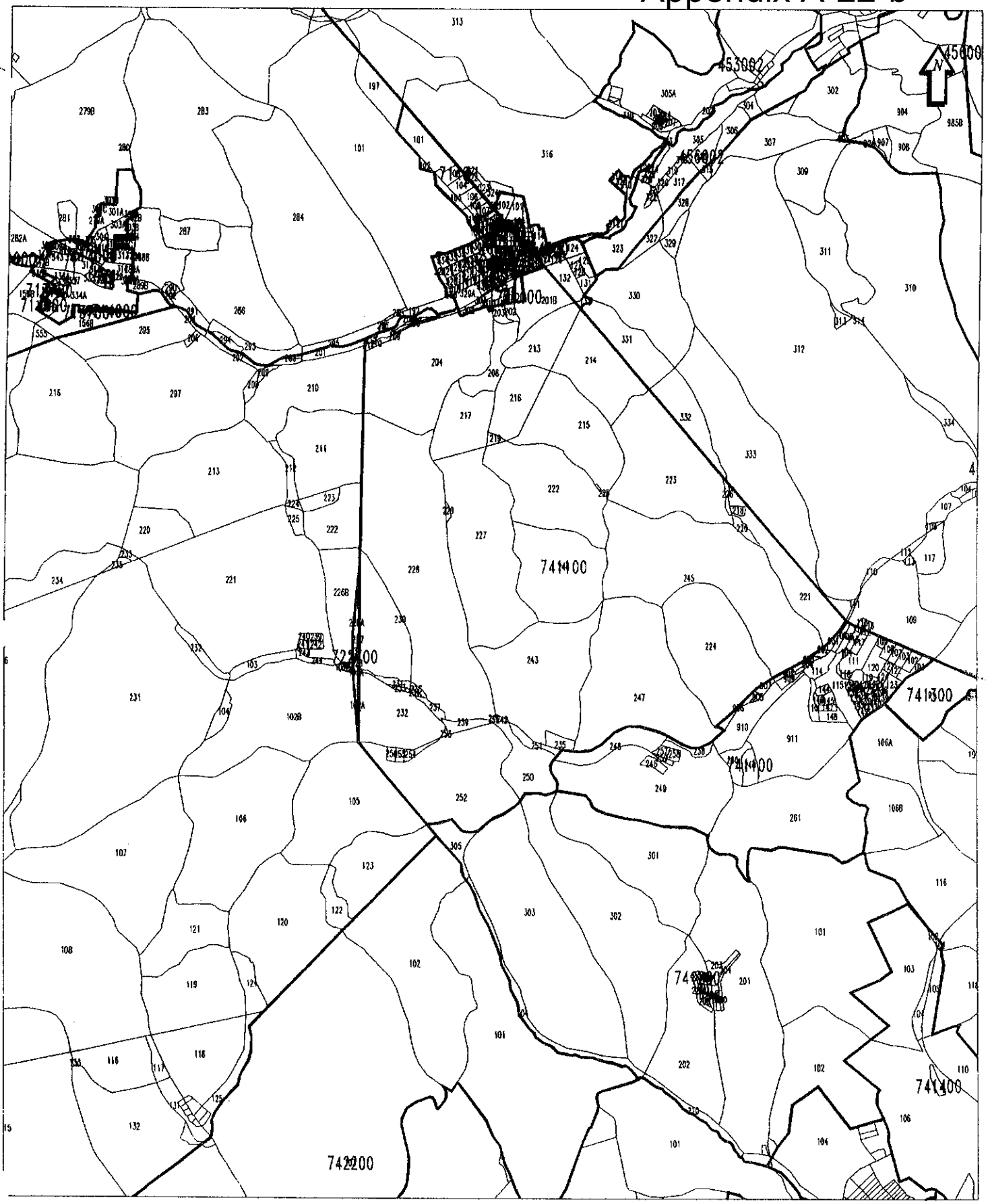
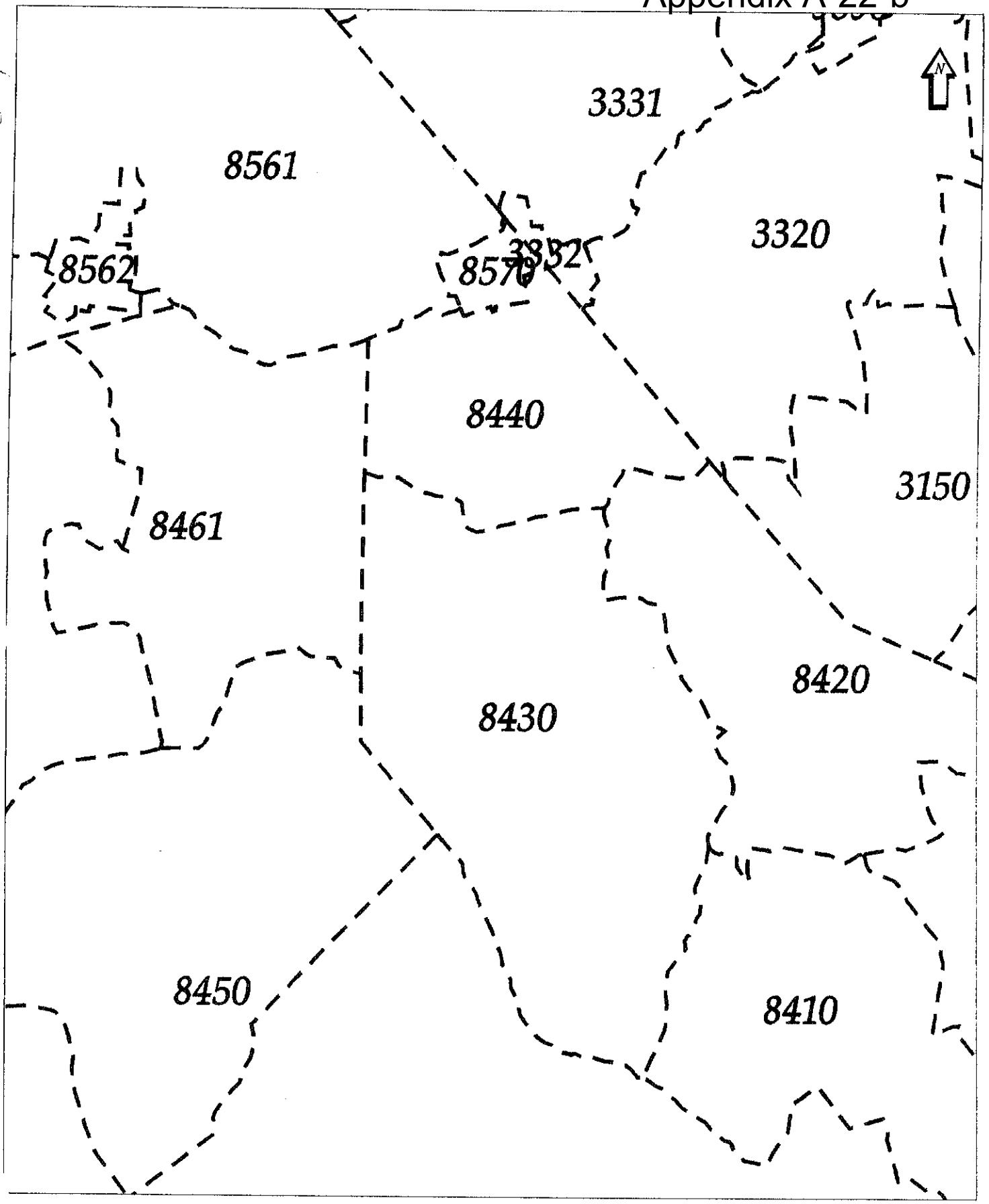


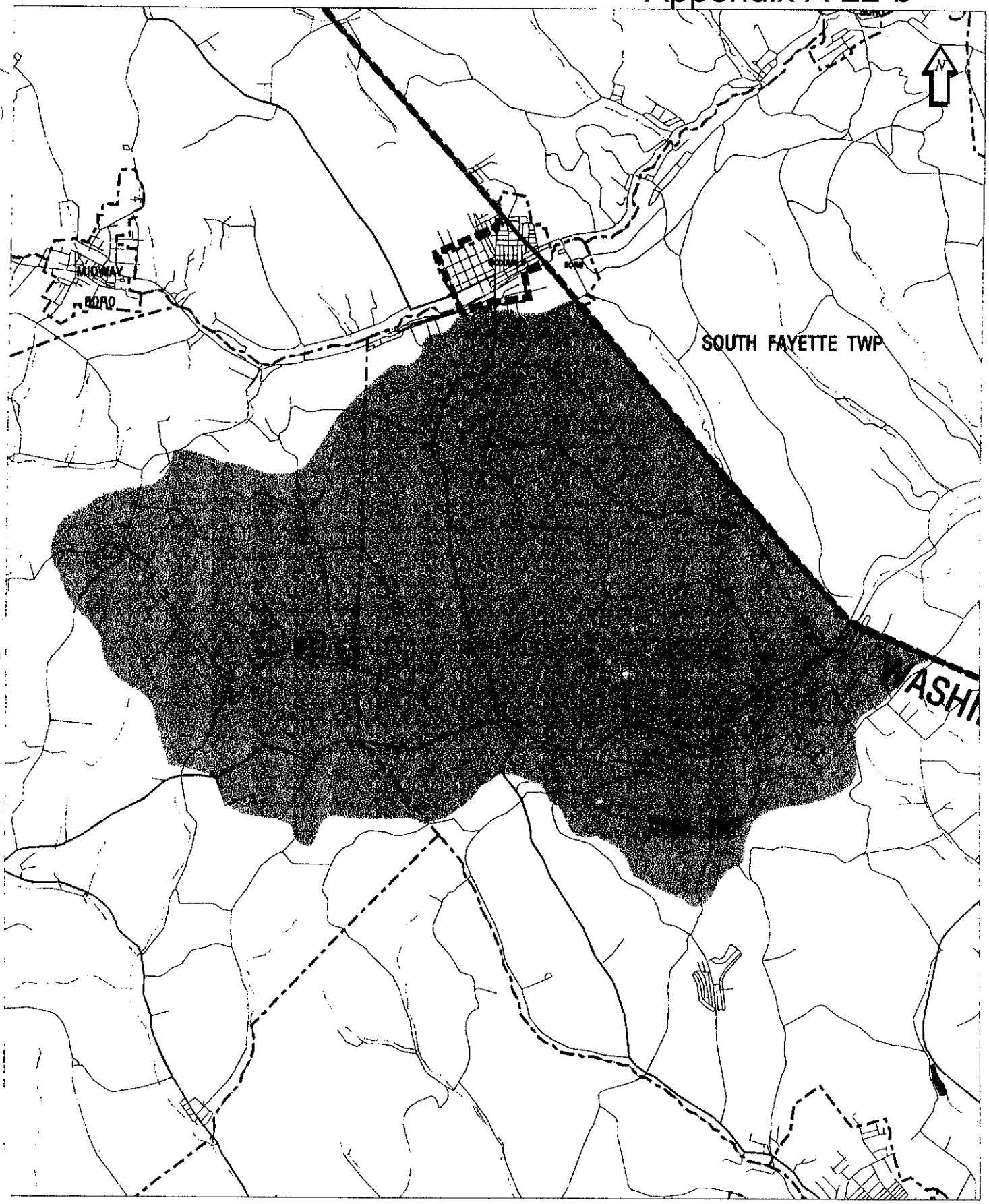
Figure PDSA-4
Upper Robinson Run Watershed Study Area



Census Blocks and Tracts



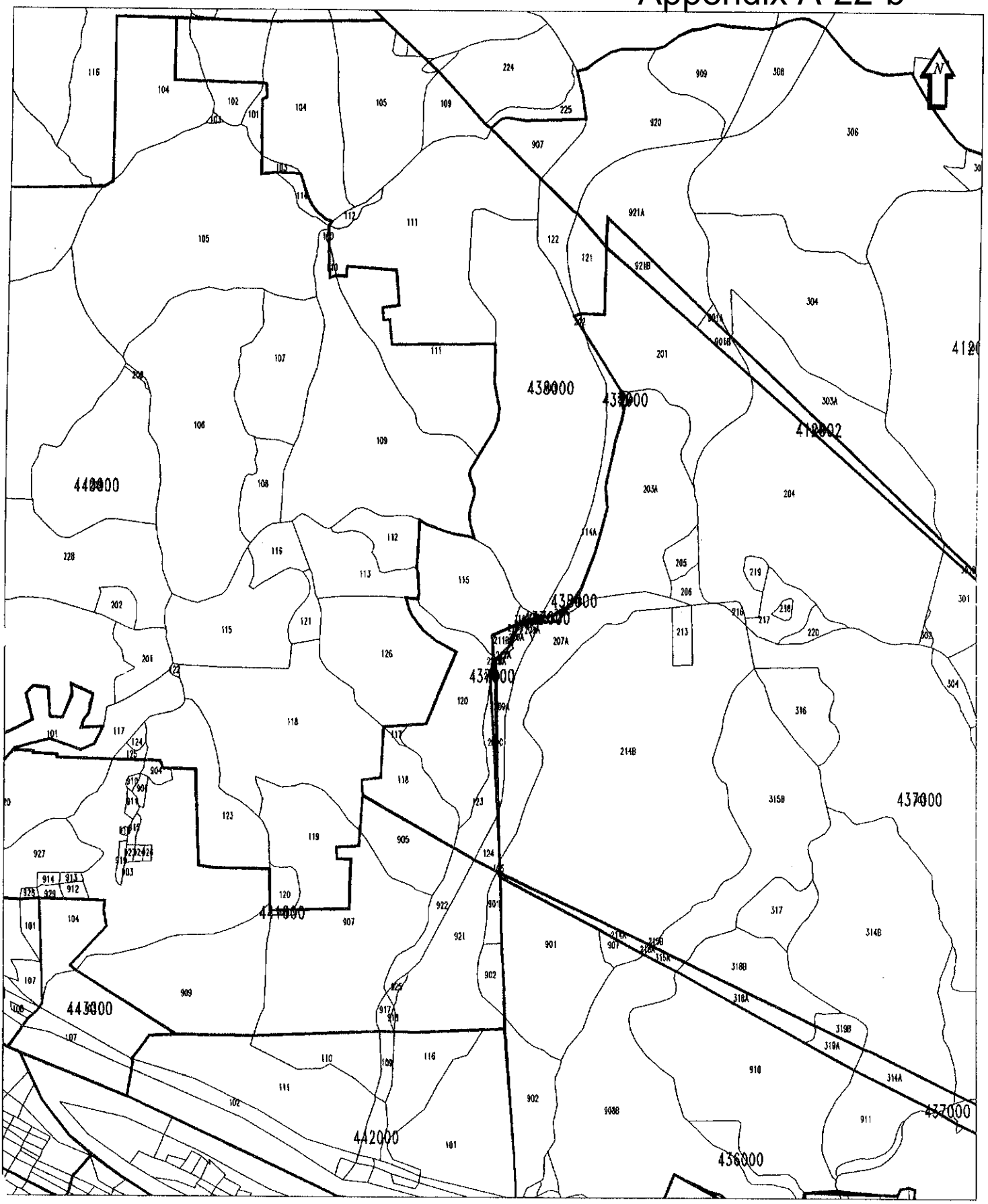
Traffic Analysis Zones



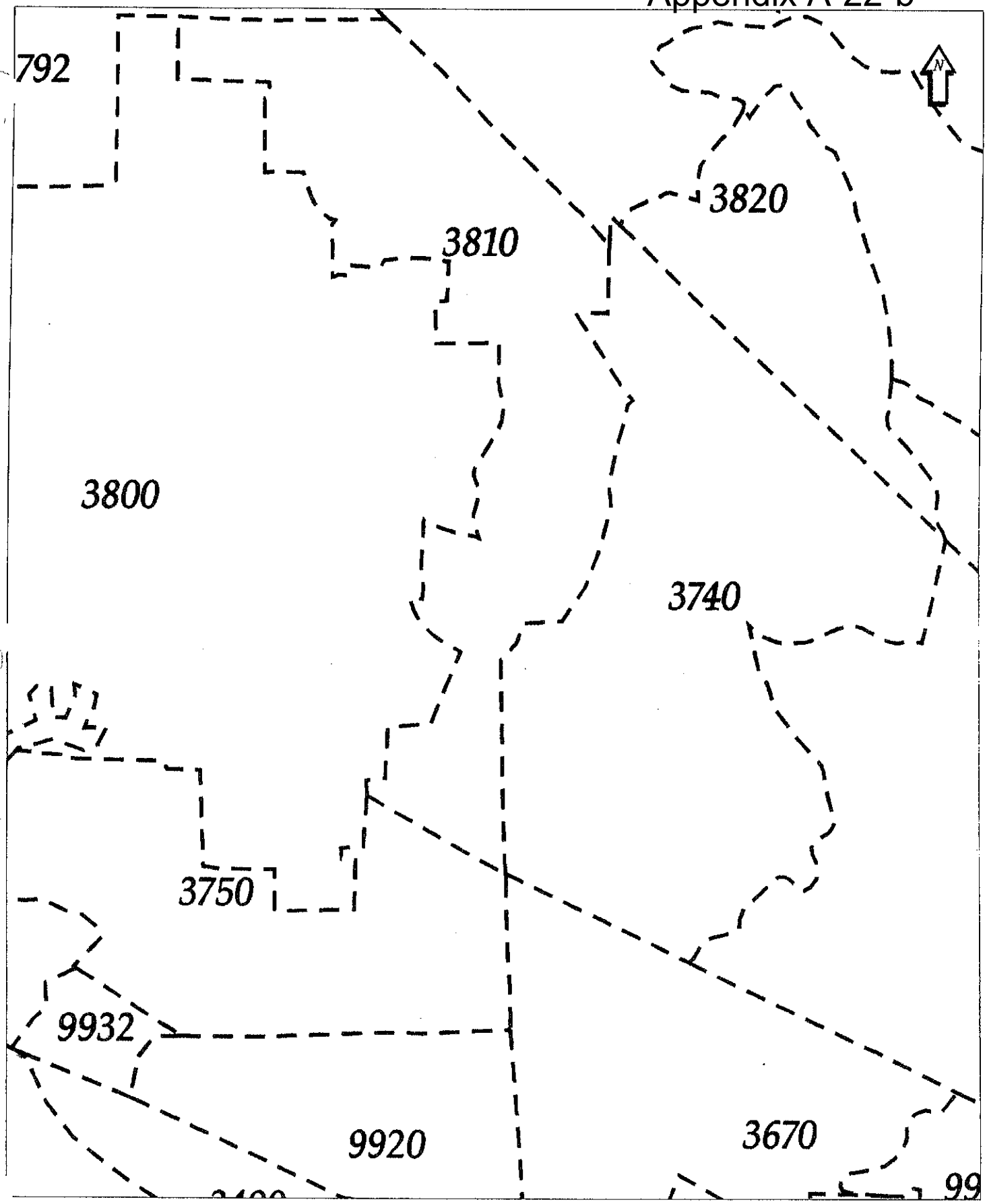
FEET
0 1000 2000 3000 4000 6000

Figure PDSA-3
Millers Run Watershed Study Area

CDM CH2MHILL KPM TEAM ALCOSAN



Census Blocks and Tracts



Traffic Analysis Zones

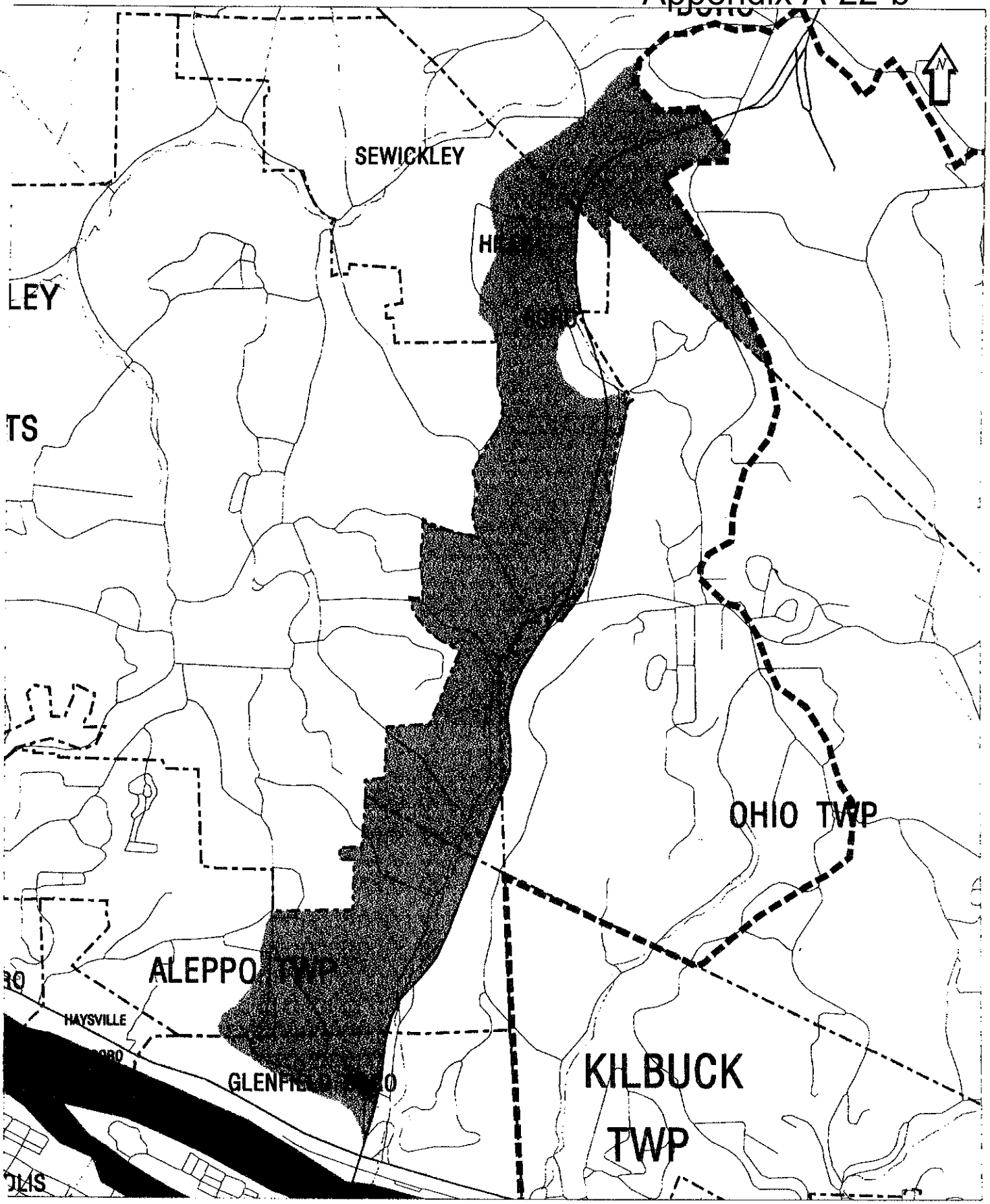
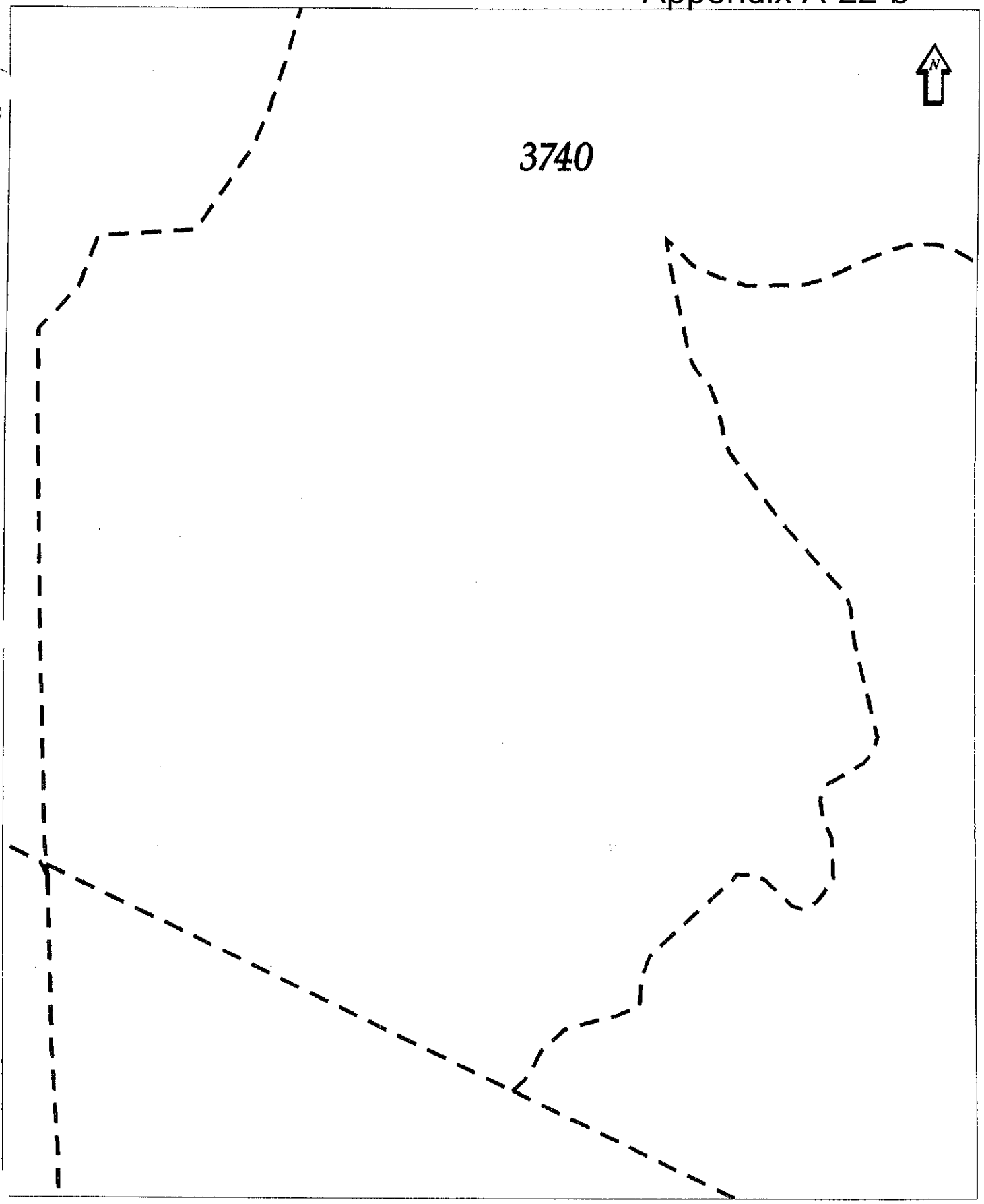


Figure PDSA-2
Kilbuck Run Watershed Study Area



Census Blocks and Tracts



Traffic Analysis Zones

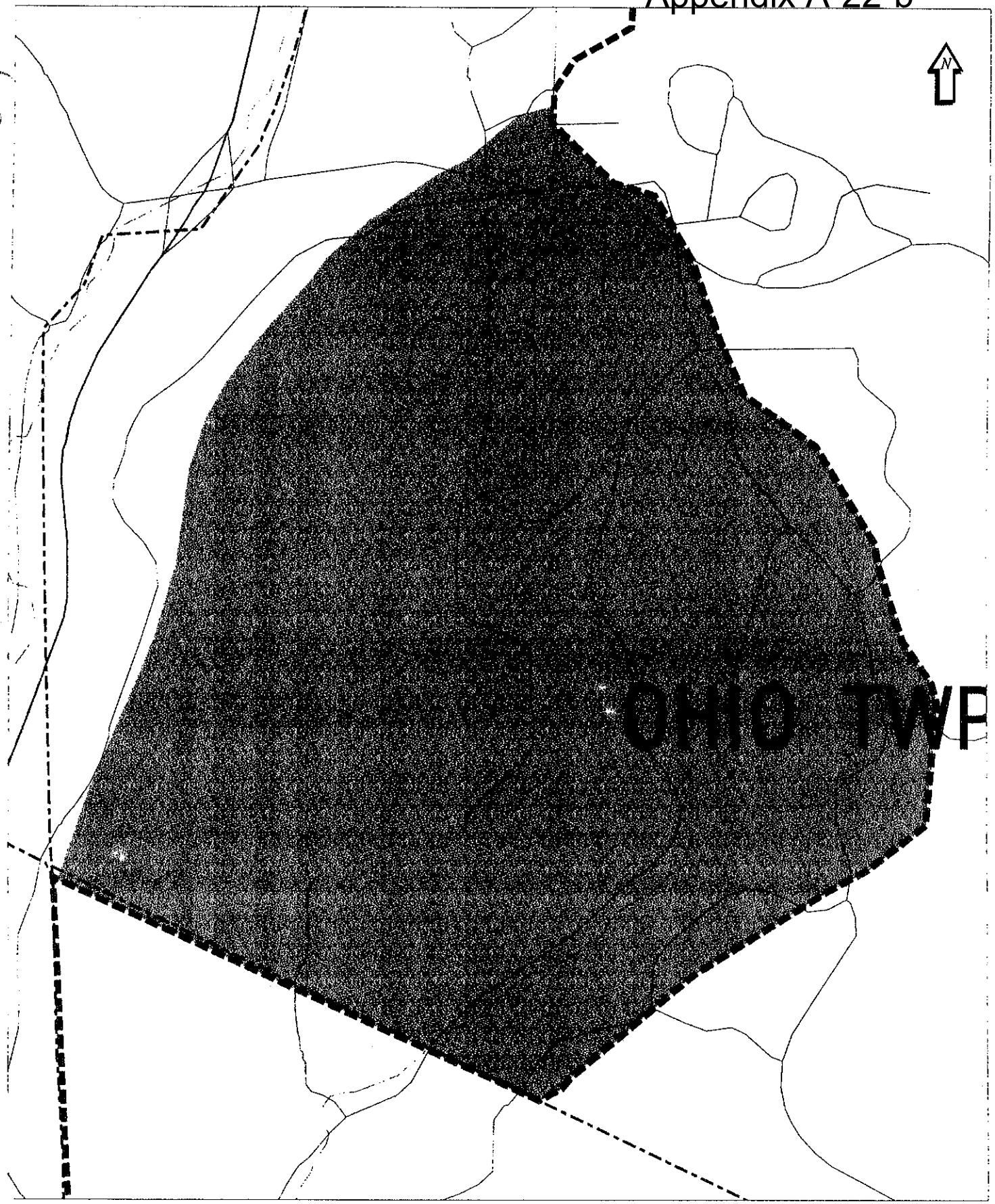


Figure PDSA-1
Toms Run Watershed Study Area

CDM EPM TEAM CH2MHILL ALCOSAN

Camp Dresser & McKee

APPENDIX E
ALCOSAN Treatment Plant Flow and Loading Projections

Estimated Wastewater Generation(a)
Based Upon Per-Capita Volume and Projected Populations
(MGD)

	b	c	d	e	f	g	h
		Estimated Wastewater Generation					
Service Area	Average Day GPCD	1990	1995	2000	2005	2010	2015
ALCOSAN Service Area							
City of Pittsburgh	222	79.77	80.61	81.46	82.31	83.15	84.00
Penn Hills (1993 Agreement)(b)	132	0.00	5.10	5.20	5.29	5.38	5.48
Allegheny County	222	105.93	108.60	111.27	113.93	116.60	119.27
Subtotal		185.70	194.31	197.92	201.53	205.14	208.74
Washington County	222	0.39	0.38	0.38	0.38	0.38	0.38
Westmoreland County	222	1.31	1.39	1.47	1.54	1.62	1.70
Total Currently Sewered Areas		187.39	196.09	199.77	203.45	207.14	210.82
Currently Unserved	225	12.81	14.24	15.67	17.10	18.53	19.96
Total ALCOSAN Service Area		200.20	210.32	215.44	220.55	225.66	230.78
PaDEP Study Areas							
Treatment Plants	(d)						
Dravosburg	135	0.32	0.34	0.35	0.37	0.38	0.40
Holiday Park STP	125	1.36	1.42	1.48	1.55	1.61	1.68
Longvue No. 1 STP	187	1.03	1.09	1.16	1.23	1.29	1.36
Oakmont STP	195	1.36	1.38	1.40	1.42	1.44	1.46
Plum Creek STP	105	2.42	2.55	2.67	2.80	2.93	3.06
Total Treatment Plants		6.48	6.77	7.07	7.36	7.66	7.95
Allegheny County Watersheds							
Kilbuck Run	135	0.06	0.07	0.09	0.10	0.11	0.12
Toms Run	135	0.10	0.11	0.12	0.13	0.14	0.15
Subtotal		0.17	0.19	0.21	0.23	0.25	0.27
Subtotal Allegheny County		6.65	6.96	7.28	7.59	7.91	8.22
Washington County Watersheds							
Millers Run	135	0.61	0.66	0.72	0.77	0.83	0.88
Upper Robinson Run	135	0.42	0.43	0.45	0.46	0.47	0.48
Subtotal Washington County		1.03	1.09	1.16	1.23	1.30	1.36
Total PaDEP Study Areas		7.67	8.06	8.44	8.82	9.20	9.58
Grand Total		207.88	218.38	223.88	229.37	234.87	240.36

c) Municipalities listed in PaDER correspondence of 5/24/94.

d) Per capita flows average of five years (Chapter 94 Reports)

Estimated Organic Loading
Based Upon Per-Capita Pounds/Day and Projected Populations
(Lb./Day)

Service Area	Per Capita Lb/Day	Estimated Organic Loading 1990	1995	2000	2005	2010	2015
ALCOSAN Service Area							
City of Pittsburgh	0.21	75,207	76,006	76,804	77,602	78,400	79,199
Penn Hills (1993 Agreement)(b)	0.21	0	8,105	8,254	8,404	8,553	8,702
Allegheny County	0.21	99,877	102,393	104,908	107,423	109,938	112,453
Subtotal		175,085	186,503	189,966	193,429	196,891	200,354
Washington County	0.21	364	362	361	359	357	355
Westmoreland County	0.21	1,238	1,310	1,383	1,455	1,528	1,600
Subtotal		1,602	1,673	1,743	1,814	1,885	1,956
Currently Unserved	0.21	11,936	13,269	14,602	15,935	17,267	18,600
Total ALCOSAN Service Area		188,623	201,445	206,311	211,177	216,043	220,909
PaDEP Study Areas							
Treatment Plants	(d)						
Dravosburg	0.21	498	522	546	571	595	619
Holiday Park STP	0.21	2,278	2,386	2,494	2,602	2,709	2,817
Longvue No. 1 STP	0.21	1,155	1,230	1,305	1,379	1,454	1,529
Oakmont STP	0.21	1,460	1,482	1,504	1,526	1,548	1,570
Plum Creek STP	0.21	4,816	5,071	5,327	5,582	5,838	6,093
Subtotal		10,207	10,691	11,175	11,659	12,143	12,628
Allegheny County Watersheds							
Kilbuck Run	0.21	97	115	133	151	169	187
Toms Run	0.21	161	174	188	201	214	228
Subtotal		258	289	321	352	383	415
Subtotal Allegheny County		10,465	10,981	11,496	12,011	12,527	13,042
Washington County Watersheds							
Millers Run	0.21	944	1,028	1,113	1,197	1,282	1,366
Upper Robinson Run	0.21	652	672	692	712	732	751
Subtotal Washington County		1,596	1,700	1,804	1,909	2,013	2,118
Total PaDER Municipalities		12,061	12,681	13,300	13,920	14,540	15,160
Grand Total		200,684	214,126	219,611	225,098	230,583	236,069

a) Does not reflect the potential timing of future connections.
b) Assumes Penn Hills will be connected in 1995.
c) Municipalities listed in PaDER correspondence of 5/24/94.

Estimated Solids Loadings
Based Upon Per-Capita Pounds/Day and Projected Populations
(Lb./Day)

Service Area	Per Capita Lb/Day	Grit @ 5 cf/million gallon 1990	1995	2000	2005	2010	2015	Dedicated Solids lb/day (dry) 1990	1995	2000	2005	2010	2015
ALCOSAN Service Area													
City of Pittsburgh	0.34	39,883	40,306	40,729	41,153	41,576	41,999	82,049	82,920	83,791	84,662	85,532	86,403
Penn Hills (1993 Agreement)(b)	0.34	0	2,551	2,598	2,645	2,692	2,739	0	10,590	10,784	10,979	11,174	11,369
Allegheny County	0.34	52,965	54,299	55,633	56,966	58,300	59,634	108,963	111,707	114,451	117,195	119,939	122,683
Subtotal		92,848	97,156	98,960	100,764	102,568	104,372	191,012	205,217	209,026	212,836	216,646	220,455
Washington County	0.34	193	192	191	190	189	188	397	395	393	391	389	388
Westmoreland County	0.34	656	695	733	772	810	849	1,350	1,429	1,509	1,588	1,667	1,746
Subtotal		93,697	98,043	99,885	101,726	103,568	105,409	192,760	207,041	210,928	214,815	218,702	222,589
Currently Unserved	0.34	6,404	7,119	7,834	8,549	9,264	9,979	12,948	14,393	15,839	17,285	18,731	20,176
Total ALCOSAN Service Area		100,101	105,162	107,719	110,275	112,832	115,389	205,708	221,435	226,767	232,100	237,433	242,765
PaDER "Municipalities of Concern"(													
Treatment Plants													
Dravosburg	0.34	160	168	175	183	191	199	648	679	710	742	773	805
Holiday Park STP	0.34	678	710	742	774	806	838	3,016	3,159	3,301	3,444	3,586	3,729
Longvue No. 1 STP	0.34	514	547	581	614	647	681	1,358	1,446	1,535	1,623	1,711	1,799
Oakmont STP	0.34	680	690	700	710	720	731	1,687	1,712	1,738	1,763	1,789	1,814
Plum Creek STP	0.34	1,209	1,273	1,337	1,401	1,465	1,529	6,599	6,949	7,299	7,649	8,000	8,350
Subtotal		3,240	3,387	3,535	3,682	3,830	3,977	13,308	13,946	14,583	15,221	15,858	16,496
Allegheny County Watersheds													
Kilbuck Run	0.34	31	37	43	49	54	60	126	150	173	196	220	243
Toms Run	0.34	52	56	60	65	69	73	209	227	244	261	278	296
Subtotal		83	93	103	113	123	134	336	376	417	457	498	539
Subtotal Allegheny County		3,323	3,481	3,638	3,796	3,953	4,111	13,644	14,322	15,000	15,678	16,356	17,034
Washington County Watersheds													
Millers Run	0.34	304	331	358	385	413	440	1,226	1,336	1,446	1,556	1,665	1,775
Upper Robinson Run	0.34	210	216	223	229	236	242	847	873	899	925	951	976
Subtotal Washington County		514	547	581	614	648	682	2,073	2,209	2,345	2,480	2,616	2,751
Total PaDER Municipalities		3,837	4,028	4,219	4,410	4,601	4,792	15,717	16,531	17,345	18,158	18,972	19,786
Grand Total		103,938	109,190	111,938	114,686	117,433	120,181	221,425	237,966	244,112	250,258	256,405	262,551

Estimated NH3-N
Based Upon Per-Capita Pounds/Day and Projected Populations
(Lb./Day)

		c	d	e	f	g	h
ALCOSAN Service Area							
City of Pittsburgh	0.017	6,133	6,198	6,264	6,329	6,394	6,459
Penn Hills (1993 Agreement)(b)	0.017	0	661	673	685	698	710
Allegheny County	0.017	8,145	8,350	8,555	8,761	8,966	9,171
Subtotal		14,279	15,210	15,492	15,775	16,057	16,339
Washington County	0.017	30	30	29	29	29	29
Westmoreland County	0.017	101	107	113	119	125	131
Subtotal Currently Served		14,409	15,346	15,634	15,923	16,211	16,499
Currently Unserved	0.017	973	1,082	1,191	1,299	1,408	1,517
Total ALCOSAN Service Area		15,383	16,428	16,825	17,222	17,619	18,016
PaDER "Municipalities of Concern"(Treatment Plants							
Dravosburg	0.017	41	43	45	47	48	50
Holiday Park STP	0.017	186	195	203	212	221	230
Longvue No. 1 STP	0.017	94	100	106	113	119	125
Oakmont STP	0.017	119	121	123	124	126	128
Plum Creek STP	0.017	393	414	434	455	476	497
Subtotal		832	872	911	951	990	1,030
Allegheny County Watersheds							
Kilbuck Run	0.017	8	9	11	12	14	15
Toms Run	0.017	13	14	15	16	17	19
Subtotal		21	24	26	29	31	34
Subtotal Allegheny County		853	896	938	980	1,022	1,064
Washington County Watersheds							
Millers Run	0.017	77	84	91	98	105	111
Upper Robinson Run	0.017	53	55	56	58	60	61
Subtotal Washington County		130	139	147	156	164	173
Total PaDER Municipalities		984	1,034	1,085	1,135	1,186	1,236
Grand Total		16,366	17,462	17,910	18,357	18,805	19,252

APPENDIX F
Request for PNDI Search



CAMP DRESSER & McKEE
CH²M HILL
ALCOSAN EPM Project Office

3300 Preble Avenue
Pittsburgh, PA 15233 - 1092
Office: (412) 761 - 1051
Fax: (412) 761 - 2947

May 9, 1995

Pennsylvania Department of Environmental Resources
Bureau of Forestry
Attention: Botanist
P.O. Box 1467
Harrisburg, Pennsylvania 17120

Subject: Allegheny County Sanitary Authority
Act 537 Sewage Facilities Plan
Request for PNDI Search

Dear Sir/Madam:

This is to request that you conduct a search of the Pennsylvania Natural Diversity Inventory to identify any species of concern which may be impacted by the modification of the existing ALCOSAN Wastewater Treatment Plant which is being proposed as part of a plan developed under the Pennsylvania Sewage Facilities Act.

As outlined in the 537 Plan, the Allegheny County Sanitary Authority (ALCOSAN) is proposing to upgrade its existing secondary wastewater treatment plant through the implementation of a comprehensive Capital Improvements Program (CIP). Key objectives of the CIP are the control of plant odors, the expansion of dry weather treatment capacity to meet projected wastewater generation within its service area and the expansion of wet-weather treatment capacity. The expansion of wet weather treatment capacity will enable the maximization of flows to the treatment plant during wet weather as specified by the United States Environmental Protection Agency's *Combined Sewer Overflow Control Policy.*

The combination of technical alternatives which have been selected by ALCOSAN comprise the Capital Improvement Program. The CIP has been divided into 17 major packages, or projects, which are presented in three phases in order of priority over a 12-year period. Phase 1 comprises primarily odor prevention, odor treatment and the first phase of capacity expansion to 250

million gallons per day (mgd). Phase II projects primarily deal with the treatment of wet weather flows by increasing primary treatment and disinfection capacities to 875 mgd. Phase III consists of lower-priority odor control and process improvement projects and additional capacity expansion, should that be required.

The location of the proposed project components are shown on the attached figure 1. It is understood that you will notify ALCOSAN of any identified protected species within the proposed project area. It is further understood that your agency will assist ALCOSAN in identifying the appropriate contact agency to provide assistance in the evaluation and mitigation of potential impacts on the protected species under their jurisdiction.

Thank you for your attention to this matter. If you have any questions, please do not hesitate to contact me at the above address.

Very truly yours,

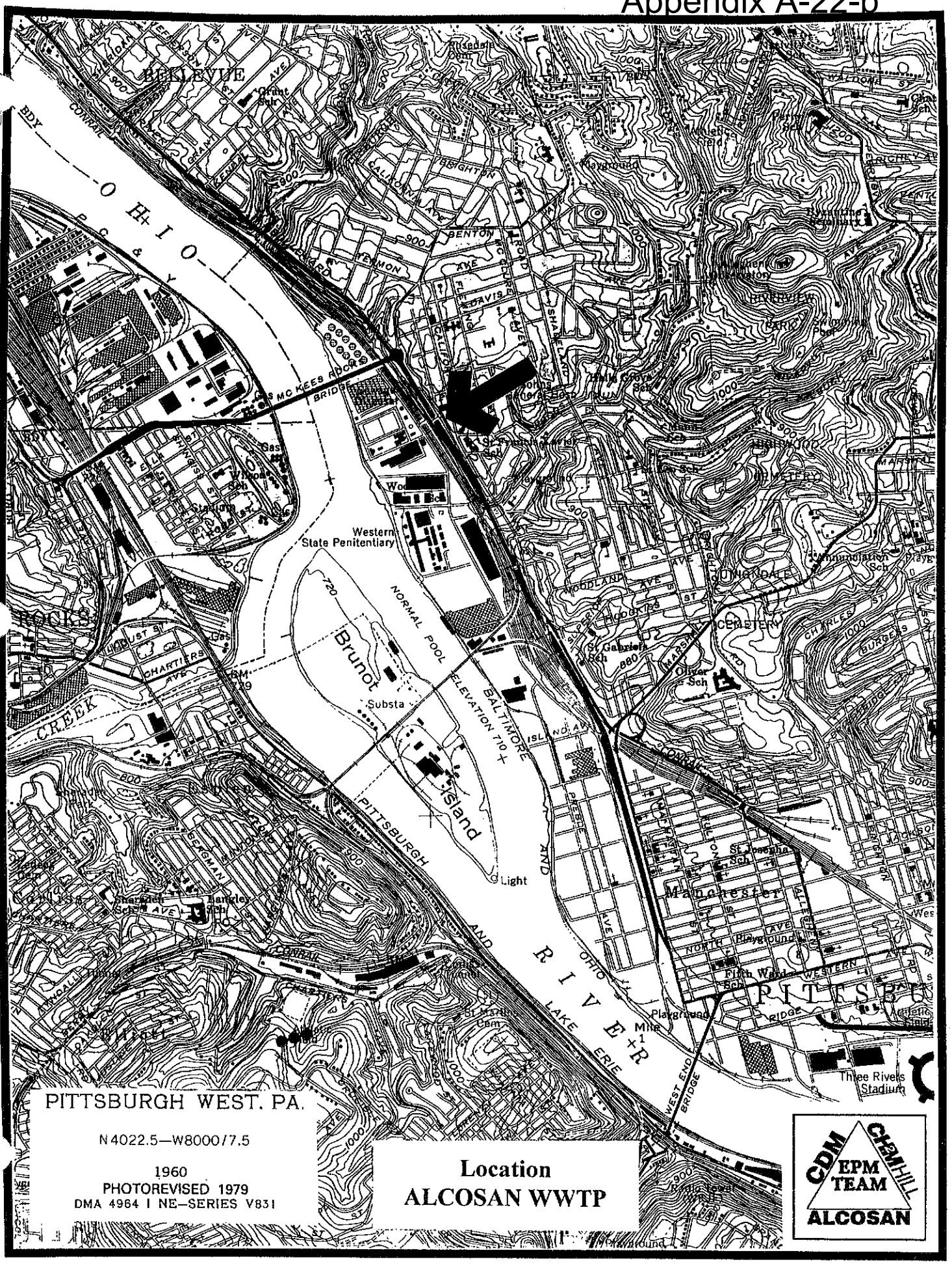
ALCOSAN Engineering Program Management

Thomas A. Schevtchuk
537 Plan Project Manager

enclosures

cc: J. Lengyel, ALCOSAN
537 Project File

5/9/95


BERKELEVUE
OHIO
Western State Penitentiary
Brunot Island
NORMAL POOL ELEVATION 710 +
BALTIMORE AND OHIO R I V E R +
LAKE ERIE
Manchester
PITTSBURGH
Three Rivers Stadium
Light
Mile 1
PITTSBURGH WEST, PA.
N4022.5—W8000/7.5
1960
PHOTOREVISED 1979
DMA 4964 I NE—SERIES V831
Location
ALCOSAN WWTP
CDM
CH2MHILL
EPM TEAM
ALCOSAN

APPENDIX G
Pennsylvania Historical Museum Commission



CAMP DRESSER & McKEE
CH2M HILL
ALCOSAN EPM Project Office

3300 Preble Avenue
Pittsburgh, PA 15233 - 1092
Office: (412) 761 - 1051
Fax: (412) 761 - 2947

May 9, 1995

Mr. Kurt Carr, Chief
Preservation Department
Pennsylvania Historical Museum Commission
P.O. Box 1026
Harrisburg, Pennsylvania 17108

Subject: Allegheny County Sanitary Authority
Act 537 Sewage Facilities Plan
Historical Resources Determination Notice

Dear Mr. Carr:

The Allegheny County Sanitary Authority (ALCOSAN) is preparing a Sewage Facilities Plan (Plan) pursuant to the Pennsylvania Sewage Facilities Act (Act 537). The scope of the Plan includes the proposed upgrading of its existing secondary wastewater treatment plant and a conceptual analysis of providing wastewater treatment services to communities outside of the current service area which PaDER has identified as having inadequate local treatment capacities.

On behalf of ALCOSAN, the following documents are being submitted for your review pursuant to the Pennsylvania Historic Preservation Act:

- One copy of the PaDER "Notification of Potential Effect of Proposed Action on Archaeological and Historical Resources" form.
- A location map for the ALCOSAN Wastewater Treatment Plant
- A brief site and project description

This request for review is limited in scope to work which is to be completed within the confines of the existing treatment plant.

5/9/95
O:\TAS\537\TASK9\PHMC.WPD

Thank you for your attention to this matter. If you have any questions, please do not hesitate to contact me at the above address.

Very truly yours,

ALCOSAN Engineering Program Management

Thomas A. Schevtchuk
537 Plan Project Manager

enclosures

cc: J. Lengyel, ALCOSAN
537 Project File

5/9/95
O:\TAS\537\TASK9\PHMC.WPD

Commonwealth of Pennsylvania
Department of Environment Resources
Bureau of Water Quality Management

FORM A
NOTIFICATION OF POTENTIAL EFFECT OF PROPOSED ACTION ON ARCHAEOLOGICAL AND HISTORICAL RESOURCES

This is to notify the Pennsylvania Historical and Museum Commission in writing of the potential effect of a proposed action on an archaeological or historical resource in accordance with the Pennsylvania Historic Preservation Act, 37 PA. CSA, Sections 501-512.

This action involves: DER 537 Program

Development Name ALCOSAN Wastewater Treatment Plant Upgrading

Development Location, including County and Municipality: 3300 Preble Avenue

City of Pittsburgh, Allegheny County

Enclosed is a copy of the U.S.G.S. 7.5 minute topographic map which clearly outlines the specific project boundaries. The name of the map is Pittsburgh West.

This sewage facility plan encompasses 50 acres (total project area).

There are No buildings over 40 years old within the project area. Pictures and a description of the plans for these buildings are included.

A brief description of this development project is included that indicates the nature of the development, number and size of lots to be subdivided, previous land use.

It is understood that your agency will advise the applicant within 60 days of the receipt of this notice if the project will not affect a known archaeological or historical resource or, if a significant known archaeological or historic resource, as determined by the PHMC using Secretary of Interior criteria for determining resource significance, requires protection or if a "high probability archaeological area" could be affected by the proposed sewage facilities.

Questions concerning this proposal and the results of the search should be directed to:

Applicant's Name: Allegheny County Sanitary Authority

Address: c/o ALCOSAN Engineering Program Management Team

3300 Preble Avenue, Pittsburgh, PA 15233-1092

Telephone: Attention: Tom Schevtchuk (412) 761-1051

This form must be forwarded to the:

Pennsylvania Historical and Museum Commission
Bureau of Historic Preservation
P.O. Box 1026
Harrisburg, PA 17108
Telephone: 717-783-8946

ALCOSAN Act 537 Plan
Archaeological and Historical Notification

1.0 Site Description and History

The ALCOSAN Wastewater Treatment Plant is located at 3300 Preble Avenue in Pittsburgh. The plant site is approximately acres in size, and is situated between the CONRAIL railroad tracks and the Ohio River. The plant site is beneath, and approximately bisected by the McKees Rocks Bridge. The plant location is shown on figure 1.

Construction of the ALCOSAN treatment plant began in 1956 and was completed in 1959. Between 1970 and 1972, the plant was expanded and modified to provide secondary wastewater treatment. A brief history of the plant site has been complied through the use of historical USGS maps from 1906. 1956, 1960, 1979 and 1993; Sanborne Fire Insurance Maps form 1926 and 1950; and information provided by the Authority.

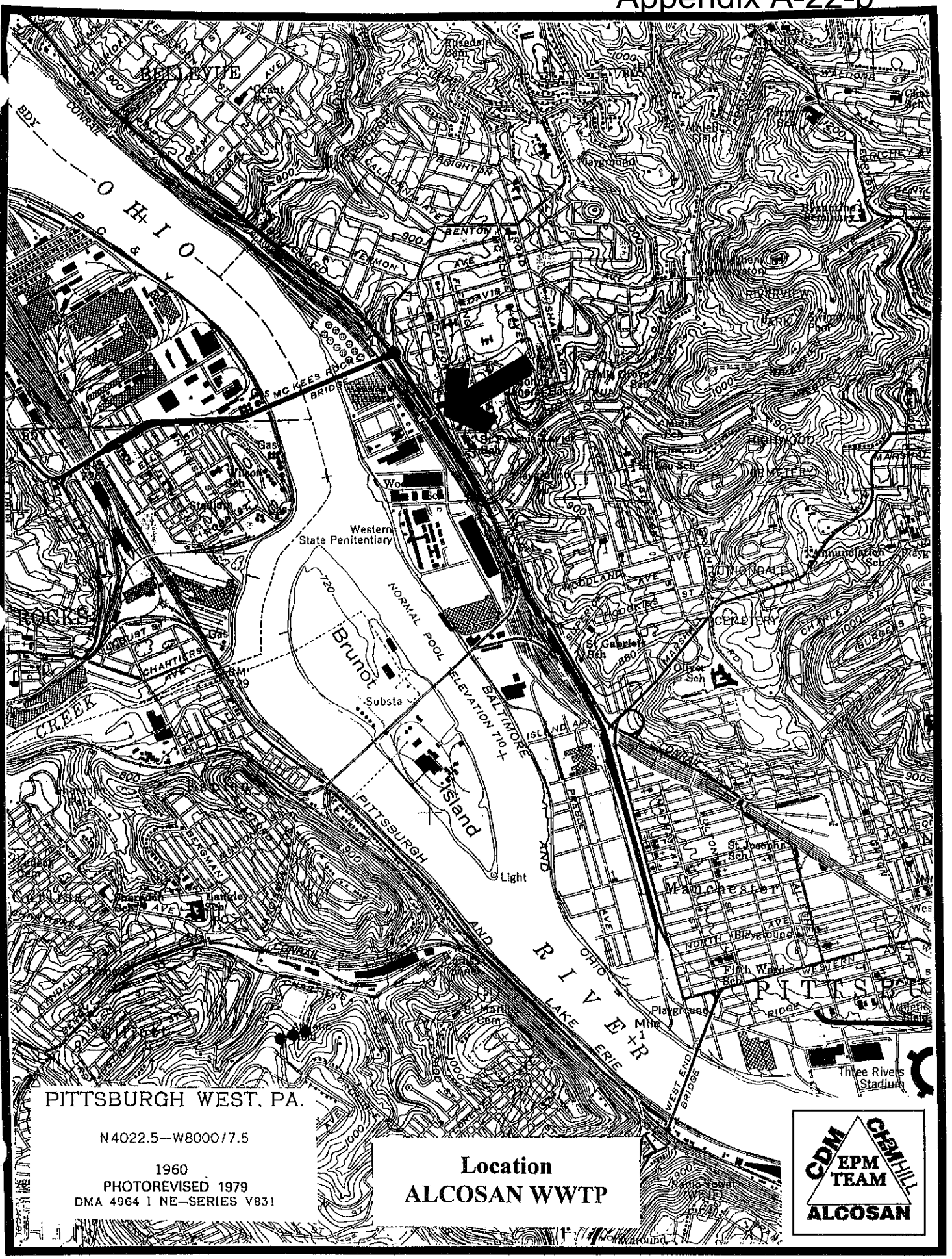
By 1926 the majority of the site was owned by three industries: Pressed Steel Car Company, Pittsburgh Forge and Iron Company, and the Pennsylvania Railroad. One small commercial and residential section was also located within the confines of the current property where the prearation and primary clarifier tanks are currently located. Most of the industrial builders were demolished by 1951. Remaining industrial, residential an commercial buildings were demolished between 1956 and 1958. No structures presently on site predate 1956. A layout of the treatment plant as currently configured is provided as figure 2.

2.0 Project Description

The Allegheny County Sanitary Authority (ALCOSAN) is proposing to upgrade its existing secondary wastewater treatment plant through the implementation of a comprehensive Capital Improvements Program (CIP). Key objectives of the CIP are the control of plant odors, the expansion of dry weather treatment capacity to meet projected wastewater generation within its service area and the expansion of wet-weather treatment capacity. The expansion of wet weather treatment capacity will enable the maximization of flows to the treatment plant during wet weather as specified by the United States Environmental Protection Agency's *Combined Sewer Overflow Control Policy.*

The combination of technical alternatives which have been selected by ALCOSAN comprise the Capital Improvement Program. The CIP has been divided into 17 major packages, or projects, which are presented in three phases in order of priority over a 12-year period. Phase 1 comprises primarily odor prevention, odor treatment and the first phase of capacity expansion to 250 million gallons per day (mgd). Phase II projects primarily deal with the treatment of wet weather flows by increasing primary treatment and disinfection capacities to 875 mgd. Phase III consists of lower-priority odor control and process improvement projects and additional capacity expansion, should that be required. The projects will be distributed over 12 years in such a way

as to require a relatively level flow of funds for construction and will permit treatment operations to continue uninterrupted.


BELLEVUE
OHIO
RIVER
Western State Penitentiary
Brunot Island
Substa
NORMAL POOL ELEVATION 710 +
ROCKS
CREEK
Manchester
PITTSBURGH
Three Rivers Stadium
WEST END BRIDGE
Location
ALCOSAN WWTP
PITTSBURGH WEST, PA.
N4022.5—W8000/7.5
1960
PHOTOREVISED 1979
DMA 4964 I NE—SERIES V831
CDM CHMHILL
EPM TEAM
ALCOSAN

APPENDIX H

Determination of Revenues from User Charges for Allegheny County Sanitary Authority, ALCOSAN Capital Projects and CIP Expansion

Determination of Revenues from User Charges for Allegheny County Sanitary Authority

Case 1

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operating Revenue																					
Required User Charges	$47,680,700	$51,576,098	$56,683,912	$57,676,627	$58,654,777	$60,434,829	$61,490,384	$62,563,010	$63,684,982	$64,843,024	$66,340,456	$67,563,905	$68,837,237	$70,144,575	$71,472,075	$72,865,611	$74,281,687	$75,768,003	$77,279,905	$78,905,261	$80,510,761
State Grant	3,000,000	3,484,000	360,000	351,000	342,000	333,000	324,000	315,000	306,000	297,000	288,000	279,000	270,000	261,000	252,000	243,000	234,000	225,000	216,000	207,000	198,000
Interest	560,000	943,000	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700
Other	823,000	1,220,000	1,042,000	1,063,000	1,084,000	1,105,000	1,126,000	1,147,000	1,168,000	1,189,000	910,000	931,000	952,000	973,000	994,000	1,015,000	1,036,000	1,057,000	1,078,000	1,029,000	1,050,000
Total Operating Revenue	**$52,063,700**	**$57,223,098**	**$59,765,612**	**$60,770,327**	**$61,760,477**	**$63,552,529**	**$64,620,084**	**$65,704,710**	**$66,838,682**	**$68,008,724**	**$69,218,156**	**$70,453,605**	**$71,738,937**	**$73,058,275**	**$74,397,775**	**$75,803,311**	**$77,231,387**	**$78,729,703**	**$80,253,605**	**$81,820,961**	**$83,438,461**
Operating Expenditures																					
Plant O & M	$13,848,400	$14,033,500	$14,326,804	$14,628,907	$14,940,073	$15,260,575	$15,590,691	$15,930,710	$16,280,931	$16,641,658	$17,013,206	$17,395,902	$17,790,078	$18,196,079	$18,614,260	$19,044,987	$19,488,636	$19,945,594	$20,416,261	$20,901,048	$21,400,378
O & M Salaries	7,634,200	8,331,700	8,581,651	8,839,101	9,104,274	9,377,402	9,658,724	9,948,486	10,246,940	10,554,348	10,870,979	11,197,108	11,533,021	11,879,012	12,235,382	12,602,444	12,980,517	13,369,933	13,771,031	14,184,162	14,609,686
Benefits	3,879,300	4,560,500	4,697,315	4,838,234	4,983,381	5,132,883	5,286,869	5,445,475	5,608,840	5,777,105	5,950,418	6,128,931	6,312,799	6,502,183	6,697,248	6,898,165	7,105,110	7,318,264	7,537,812	7,763,946	7,996,864
A & E	694,500	782,700	806,181	830,366	855,277	880,936	907,364	934,585	962,622	991,501	1,021,246	1,051,883	1,083,440	1,115,943	1,149,421	1,183,904	1,219,421	1,256,004	1,293,684	1,332,494	1,372,469
A & E Salaries	1,456,500	1,606,900	1,655,107	1,704,760	1,755,903	1,808,580	1,862,838	1,918,723	1,976,284	2,035,573	2,096,640	2,159,539	2,224,325	2,291,055	2,359,787	2,430,580	2,503,498	2,578,603	2,655,961	2,735,640	2,817,709
Other	2,057,900	2,267,100	2,335,113	2,405,166	2,477,321	2,551,641	2,628,190	2,707,036	2,788,247	2,871,894	2,958,051	3,046,793	3,138,197	3,232,343	3,329,313	3,429,192	3,532,068	3,638,030	3,747,171	3,859,586	3,975,374
Other Salaries	4,035,000	4,367,000	4,498,010	4,632,950	4,771,939	4,915,097	5,062,550	5,214,426	5,370,859	5,531,985	5,697,944	5,868,883	6,044,949	6,226,298	6,413,087	6,605,479	6,803,644	7,007,753	7,217,986	7,434,525	7,657,561
Total Operating Expenditures	**$33,605,800**	**$35,949,400**	**$36,900,181**	**$37,879,485**	**$38,888,169**	**$39,927,113**	**$40,997,225**	**$42,099,441**	**$43,234,723**	**$44,404,064**	**$45,608,485**	**$46,849,039**	**$48,126,809**	**$49,442,912**	**$50,798,498**	**$52,194,752**	**$53,632,894**	**$55,114,180**	**$56,639,904**	**$58,211,400**	**$59,830,041**
Net Revenue	**$18,457,900**	**$21,273,698**	**$22,865,431**	**$22,890,842**	**$22,872,308**	**$23,625,416**	**$23,622,859**	**$23,605,269**	**$23,603,959**	**$23,604,660**	**$23,609,671**	**$23,604,567**	**$23,612,128**	**$23,615,363**	**$23,599,277**	**$23,608,559**	**$23,598,493**	**$23,615,523**	**$23,613,701**	**$23,609,561**	**$23,608,420**
Debt Service Requirement	**17,990,268**	**19,339,725**	**20,786,755**	**20,809,856**	**20,793,007**	**21,477,651**	**21,475,326**	**21,459,335**	**21,458,144**	**21,458,782**	**21,463,337**	**21,458,697**	**21,465,571**	**21,468,512**	**21,453,888**	**21,462,326**	**21,453,175**	**21,468,657**	**21,467,001**	**21,463,237**	**21,462,200**
Percent Debt Coverage	**102.60%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**

Determination of Revenues from User Charges for Allegheny County Sanitary Authority

Case 2

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operating Revenue																					
Required User Charges	$47,680,700	$51,576,098	$64,119,577	$74,696,337	$87,998,593	$89,297,911	$90,071,800	$91,296,629	$97,603,080	$100,912,392	$104,906,376	$106,147,739	$108,382,147	$110,078,565	$111,804,807	$113,607,037	$115,442,057	$117,357,876	$119,310,157	$121,387,093	$123,455,710
State Grant	3,000,000	3,484,000	360,000	351,000	342,000	1,373,000	1,758,000	1,712,500	1,667,000	1,821,500	2,411,000	2,724,500	2,648,500	2,572,500	2,496,500	2,420,500	2,344,500	2,268,500	2,192,500	2,116,500	2,040,500
Interest	560,000	943,000	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700
Other	823,000	1,220,000	1,042,000	1,063,000	1,084,000	1,105,000	1,126,000	1,147,000	1,168,000	1,189,000	910,000	931,000	952,000	973,000	994,000	1,015,000	1,036,000	1,057,000	1,078,000	1,029,000	1,050,000
Total Operating Revenue	**$52,063,700**	**$57,223,098**	**$67,201,277**	**$77,790,037**	**$91,104,293**	**$93,455,611**	**$94,635,500**	**$95,835,829**	**$102,117,780**	**$105,602,592**	**$109,907,076**	**$111,482,939**	**$113,662,347**	**$115,303,765**	**$116,975,007**	**$118,722,237**	**$120,502,257**	**$122,363,076**	**$124,260,357**	**$126,212,293**	**$128,225,910**
Operating Expenditures																					
Plant O & M	$13,848,400	$14,033,500	$15,260,396	$17,043,834	$18,125,263	$19,005,030	$19,447,480	$19,903,203	$20,372,598	$23,048,094	$26,514,695	$27,237,804	$28,526,057	$29,254,138	$30,004,061	$30,776,482	$31,572,075	$32,391,537	$33,235,582	$34,104,948	$35,000,396
O & M Salaries	7,634,200	8,331,700	8,581,651	8,839,101	9,104,274	9,377,402	9,658,724	9,948,486	10,246,940	10,554,348	10,870,979	11,197,108	11,533,021	11,879,012	12,235,382	12,602,444	12,980,517	13,369,933	13,771,031	14,184,162	14,609,686
Benefits	3,879,300	4,560,500	4,697,315	4,838,234	4,983,381	5,132,883	5,286,869	5,445,475	5,608,840	5,777,105	5,950,418	6,128,931	6,312,799	6,502,183	6,697,248	6,898,165	7,105,110	7,318,264	7,537,812	7,763,946	7,996,864
A & E	694,500	782,700	806,181	830,366	855,277	880,936	907,364	934,585	962,622	991,501	1,021,246	1,051,883	1,083,440	1,115,943	1,149,421	1,183,904	1,219,421	1,256,004	1,293,684	1,332,494	1,372,469
A & E Salaries	1,456,500	1,606,900	1,655,107	1,704,760	1,755,903	1,808,580	1,862,838	1,918,723	1,976,284	2,035,573	2,096,640	2,159,539	2,224,325	2,291,055	2,359,787	2,430,580	2,503,498	2,578,603	2,655,961	2,735,640	2,817,709
Other	2,057,900	2,267,100	2,335,113	2,405,166	2,477,321	2,551,641	2,628,190	2,707,036	2,788,247	2,871,894	2,958,051	3,046,793	3,138,197	3,232,343	3,329,313	3,429,192	3,532,068	3,638,030	3,747,171	3,859,586	3,975,374
Other Salaries	4,035,000	4,367,000	4,498,010	4,632,950	4,771,939	4,915,097	5,062,550	5,214,426	5,370,859	5,531,985	5,697,944	5,868,883	6,044,949	6,226,298	6,413,087	6,605,479	6,803,644	7,007,753	7,217,986	7,434,525	7,657,561
Total Operating Expenditures	**$33,605,800**	**$35,949,400**	**$37,833,773**	**$40,294,412**	**$42,073,359**	**$43,671,568**	**$44,854,014**	**$46,071,934**	**$47,326,391**	**$50,810,500**	**$55,109,974**	**$56,690,941**	**$58,862,788**	**$60,500,971**	**$62,188,299**	**$63,926,247**	**$65,716,333**	**$67,560,122**	**$69,459,225**	**$71,415,301**	**$73,430,059**
Net Revenue	**$18,457,900**	**$21,273,698**	**$29,367,504**	**$37,495,625**	**$49,030,934**	**$49,784,043**	**$49,781,485**	**$49,763,895**	**$54,791,390**	**$54,792,091**	**$54,797,102**	**$54,791,998**	**$54,799,559**	**$54,802,794**	**$54,786,708**	**$54,795,990**	**$54,785,924**	**$54,802,954**	**$54,801,132**	**$54,796,992**	**$54,795,851**
Debt Service Requirement	**17,990,268**	**19,339,725**	**26,697,731**	**34,086,932**	**44,573,577**	**45,258,221**	**45,255,896**	**45,239,905**	**49,810,354**	**49,810,992**	**49,815,547**	**49,810,907**	**49,817,781**	**49,820,722**	**49,806,098**	**49,814,536**	**49,805,385**	**49,820,867**	**49,819,211**	**49,815,447**	**49,814,410**
Percent Debt Coverage	**102.60%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**

Determination of Revenues from User Charges for Allegheny County Sanitary Authority

Case 3

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operating Revenue																					
Required User Charges	$47,680,700	$51,576,098	$64,119,577	$74,696,337	$87,998,593	$89,297,911	$90,071,800	$91,296,629	$97,603,080	$100,912,392	$104,906,376	$106,147,739	$108,382,147	$110,078,565	$111,804,807	$113,607,037	$115,442,057	$117,357,876	$119,310,157	$121,387,093	$123,455,710
State Grant	3,000,000	3,484,000	360,000	351,000	342,000	1,373,000	1,758,000	1,712,500	1,667,000	1,821,500	2,411,000	2,724,500	2,648,500	2,572,500	2,496,500	2,420,500	2,344,500	2,268,500	2,192,500	2,116,500	2,040,500
Interest	560,000	943,000	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700
Other	823,000	1,220,000	1,042,000	1,063,000	1,084,000	1,105,000	1,126,000	1,147,000	1,168,000	1,189,000	910,000	931,000	952,000	973,000	994,000	1,015,000	1,036,000	1,057,000	1,078,000	1,029,000	1,050,000
Total Operating Revenue	**$52,063,700**	**$57,223,098**	**$67,201,277**	**$77,790,037**	**$91,104,293**	**$93,455,611**	**$94,635,500**	**$95,835,829**	**$102,117,780**	**$105,602,592**	**$109,907,076**	**$111,482,939**	**$113,662,347**	**$115,303,765**	**$116,975,007**	**$118,722,237**	**$120,502,257**	**$122,363,076**	**$124,260,357**	**$126,212,293**	**$128,225,910**
Operating Expenditures																					
Plant O & M	$13,848,400	$14,033,500	$15,260,396	$17,043,834	$18,125,263	$19,005,030	$19,447,480	$19,903,203	$20,372,598	$23,048,094	$26,514,695	$27,237,804	$28,526,057	$29,254,138	$30,004,061	$30,776,482	$31,572,075	$32,391,537	$33,235,582	$34,104,948	$35,000,396
O & M Salaries	7,634,200	8,331,700	8,581,651	8,839,101	9,104,274	9,377,402	9,658,724	9,948,486	10,246,940	10,554,348	10,870,979	11,197,108	11,533,021	11,879,012	12,235,382	12,602,444	12,980,517	13,369,933	13,771,031	14,184,162	14,609,686
Benefits	3,879,300	4,560,500	4,697,315	4,838,234	4,983,381	5,132,883	5,286,869	5,445,475	5,608,840	5,777,105	5,950,418	6,128,931	6,312,799	6,502,183	6,697,248	6,898,165	7,105,110	7,318,264	7,537,812	7,763,946	7,996,864
A & E	694,500	782,700	806,181	830,366	855,277	880,936	907,364	934,585	962,622	991,501	1,021,246	1,051,883	1,083,440	1,115,943	1,149,421	1,183,904	1,219,421	1,256,004	1,293,684	1,332,494	1,372,469
A & E Salaries	1,456,500	1,606,900	1,655,107	1,704,760	1,755,903	1,808,580	1,862,838	1,918,723	1,976,284	2,035,573	2,096,640	2,159,539	2,224,325	2,291,055	2,359,787	2,430,580	2,503,498	2,578,603	2,655,961	2,735,640	2,817,709
Other	2,057,900	2,267,100	2,335,113	2,405,166	2,477,321	2,551,641	2,628,190	2,707,036	2,788,247	2,871,894	2,958,051	3,046,793	3,138,197	3,232,343	3,329,313	3,429,192	3,532,068	3,638,030	3,747,171	3,859,586	3,975,374
Other Salaries	4,035,000	4,367,000	4,498,010	4,632,950	4,771,939	4,915,097	5,062,550	5,214,426	5,370,859	5,531,985	5,697,944	5,868,883	6,044,949	6,226,298	6,413,087	6,605,479	6,803,644	7,007,753	7,217,986	7,434,525	7,657,561
Total Operating Expenditures	**$33,605,800**	**$35,949,400**	**$37,833,773**	**$40,294,412**	**$42,073,359**	**$43,671,568**	**$44,854,014**	**$46,071,934**	**$47,326,391**	**$50,810,500**	**$55,109,974**	**$56,690,941**	**$58,862,788**	**$60,500,971**	**$62,188,299**	**$63,926,247**	**$65,716,333**	**$67,560,122**	**$69,459,225**	**$71,415,301**	**$73,430,059**
Net Revenue	**$18,457,900**	**$21,273,698**	**$29,367,504**	**$37,495,625**	**$49,030,934**	**$49,784,043**	**$49,781,485**	**$49,763,895**	**$54,791,390**	**$54,792,091**	**$54,797,102**	**$54,791,998**	**$54,799,559**	**$54,802,794**	**$54,786,708**	**$54,795,990**	**$54,785,924**	**$54,802,954**	**$54,801,132**	**$54,796,992**	**$54,795,851**
Debt Service Requirement	**17,990,268**	**19,339,725**	**26,697,731**	**34,086,932**	**44,573,577**	**45,258,221**	**45,255,896**	**45,239,905**	**49,810,354**	**49,810,992**	**49,815,547**	**49,810,907**	**49,817,781**	**49,820,722**	**49,806,098**	**49,814,536**	**49,805,385**	**49,820,867**	**49,819,211**	**49,815,447**	**49,814,410**
Percent Debt Coverage	**102.60%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**

Determination of Revenues from User Charges for Allegheny County Sanitary Authority

Case 4

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
										Operating Revenue											
Required User Charges	$47,680,700	$51,576,098	$64,119,577	$72,996,360	$86,277,653	$87,504,172	$88,281,055	$89,483,954	$95,768,262	$99,055,216	$102,981,471	$104,223,068	$106,434,298	$108,107,314	$109,809,928	$111,527,911	$113,369,201	$115,260,485	$117,187,996	$119,239,924	$121,305,755
State Grant	3,000,000	3,484,000	360,000	351,000	342,000	1,373,000	1,758,000	1,712,500	1,667,000	1,821,500	2,411,000	2,724,500	2,648,500	2,572,500	2,496,500	2,420,500	2,344,500	2,268,500	2,192,500	2,116,500	2,040,500
Interest	560,000	943,000	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700
Other	823,000	1,220,000	1,042,000	2,762,977	2,804,940	2,898,739	2,916,745	2,959,675	3,002,818	3,046,176	2,834,905	2,855,671	2,899,850	2,944,251	2,988,879	3,094,126	3,108,856	3,154,391	3,200,161	3,176,169	3,199,955
Total Operating Revenue	**$52,063,700**	**$57,223,098**	**$67,201,277**	**$77,790,037**	**$91,104,293**	**$93,455,611**	**$94,635,500**	**$95,835,829**	**$102,117,780**	**$105,602,592**	**$109,907,076**	**$111,482,939**	**$113,662,347**	**$115,303,765**	**$116,975,007**	**$118,722,237**	**$120,502,257**	**$122,363,076**	**$124,260,357**	**$126,212,293**	**$128,225,910**
										Operating Expenditures											
Plant O & M	$13,848,400	$14,033,500	$15,260,396	$17,043,834	$18,125,263	$19,005,030	$19,447,480	$19,903,203	$20,372,598	$23,048,094	$26,514,695	$27,237,804	$28,526,057	$29,254,138	$30,004,061	$30,776,482	$31,572,075	$32,391,537	$33,235,582	$34,104,948	$35,000,396
O & M Salaries	7,634,200	8,331,700	8,581,651	8,839,101	9,104,274	9,377,402	9,658,724	9,948,486	10,246,940	10,554,348	10,870,979	11,197,108	11,533,021	11,879,012	12,235,382	12,602,444	12,980,517	13,369,933	13,771,031	14,184,162	14,609,686
Benefits	3,879,300	4,560,500	4,697,315	4,838,234	4,983,381	5,132,883	5,286,869	5,445,475	5,608,840	5,777,105	5,950,418	6,128,931	6,312,799	6,502,183	6,697,248	6,898,165	7,105,110	7,318,264	7,537,812	7,763,946	7,996,864
A & E	694,500	782,700	806,181	830,366	855,277	880,936	907,364	934,585	962,622	991,501	1,021,246	1,051,883	1,083,440	1,115,943	1,149,421	1,183,904	1,219,421	1,256,004	1,293,684	1,332,494	1,372,469
A & E Salaries	1,456,500	1,606,900	1,655,107	1,704,760	1,755,903	1,808,580	1,862,838	1,918,723	1,976,284	2,035,573	2,096,640	2,159,539	2,224,325	2,291,055	2,359,787	2,430,580	2,503,498	2,578,603	2,655,961	2,735,640	2,817,709
Other	2,057,900	2,267,100	2,335,113	2,405,166	2,477,321	2,551,641	2,628,190	2,707,036	2,788,247	2,871,894	2,958,051	3,046,793	3,138,197	3,232,343	3,329,313	3,429,192	3,532,068	3,638,030	3,747,171	3,859,586	3,975,374
Other Salaries	4,035,000	4,367,000	4,498,010	4,632,950	4,771,939	4,915,097	5,062,550	5,214,426	5,370,859	5,531,985	5,697,944	5,868,883	6,044,949	6,226,298	6,413,087	6,605,479	6,803,644	7,007,753	7,217,986	7,434,525	7,657,561
Total Operating Expenditures	**$33,605,800**	**$35,949,400**	**$37,833,773**	**$40,294,412**	**$42,073,359**	**$43,671,568**	**$44,854,014**	**$46,071,934**	**$47,326,391**	**$50,810,500**	**$55,109,974**	**$56,690,941**	**$58,862,788**	**$60,500,971**	**$62,188,299**	**$63,926,247**	**$65,716,333**	**$67,560,122**	**$69,459,225**	**$71,415,301**	**$73,430,059**
Net Revenue	**$18,457,900**	**$21,273,698**	**$29,367,504**	**$37,495,625**	**$49,030,934**	**$49,784,043**	**$49,781,485**	**$49,763,895**	**$54,791,390**	**$54,792,091**	**$54,797,102**	**$54,791,998**	**$54,799,559**	**$54,802,794**	**$54,786,708**	**$54,795,990**	**$54,785,924**	**$54,802,954**	**$54,801,132**	**$54,796,992**	**$54,795,851**
Debt Service Requirement	**17,990,268**	**19,339,725**	**26,697,731**	**34,086,932**	**44,573,577**	**45,258,221**	**45,255,896**	**45,239,905**	**49,810,354**	**49,810,992**	**49,815,547**	**49,810,907**	**49,817,781**	**49,820,722**	**49,806,098**	**49,814,536**	**49,805,385**	**49,820,867**	**49,819,211**	**49,815,447**	**49,814,410**
Percent Debt Coverage	**102.60%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**

Determination of Revenues from User Charges for Allegheny County Sanitary Authority

Case 5

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
										Operating Revenue											
Required User Charges	$47,680,700	$51,576,098	$64,119,577	$71,682,084	$84,935,909	$86,134,524	$86,883,063	$88,057,170	$94,312,232	$97,569,479	$101,465,561	$102,676,511	$104,856,614	$106,498,016	$108,168,523	$109,853,897	$111,662,071	$113,519,723	$115,413,081	$117,430,325	$119,426,454
State Grant	3,000,000	3,484,000	360,000	351,000	342,000	1,373,000	1,758,000	1,712,500	1,667,000	1,821,500	2,411,000	2,724,500	2,648,500	2,572,500	2,496,500	2,420,500	2,344,500	2,268,500	2,192,500	2,116,500	2,040,500
Interest	560,000	943,000	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700	1,679,700
Other	823,000	1,220,000	1,042,000	4,077,253	4,146,684	4,268,387	4,314,737	4,386,460	4,458,849	4,531,913	4,350,815	4,402,228	4,477,533	4,553,549	4,630,284	4,768,140	4,815,987	4,895,153	4,975,077	4,985,767	5,079,256
Total Operating Revenue	**$52,063,700**	**$57,223,098**	**$67,201,277**	**$77,790,037**	**$91,104,293**	**$93,455,611**	**$94,635,500**	**$95,835,829**	**$102,117,780**	**$105,602,592**	**$109,907,076**	**$111,482,939**	**$113,662,347**	**$115,303,765**	**$116,975,007**	**$118,722,237**	**$120,502,257**	**$122,363,076**	**$124,260,357**	**$126,212,293**	**$128,225,910**
										Operating Expenditures											
Plant O & M	$13,848,400	$14,033,500	$15,260,396	$17,043,834	$18,125,263	$19,005,030	$19,447,480	$19,903,203	$20,372,598	$23,048,094	$26,514,695	$27,237,804	$28,526,057	$29,254,138	$30,004,061	$30,776,482	$31,572,075	$32,391,537	$33,235,582	$34,104,948	$35,000,396
O & M Salaries	7,634,200	8,331,700	8,581,651	8,839,101	9,104,274	9,377,402	9,658,724	9,948,486	10,246,940	10,554,348	10,870,979	11,197,108	11,533,021	11,879,012	12,235,382	12,602,444	12,980,517	13,369,933	13,771,031	14,184,162	14,609,686
Benefits	3,879,300	4,560,500	4,697,315	4,838,234	4,983,381	5,132,883	5,286,869	5,445,475	5,608,840	5,777,105	5,950,418	6,128,931	6,312,799	6,502,183	6,697,248	6,898,165	7,105,110	7,318,264	7,537,812	7,763,946	7,996,864
A & E	694,500	782,700	806,181	830,366	855,277	880,936	907,364	934,585	962,622	991,501	1,021,246	1,051,883	1,083,440	1,115,943	1,149,421	1,183,904	1,219,421	1,256,004	1,293,684	1,332,494	1,372,469
A & E Salaries	1,456,500	1,606,900	1,655,107	1,704,760	1,755,903	1,808,580	1,862,838	1,918,723	1,976,284	2,035,573	2,096,640	2,159,539	2,224,325	2,291,055	2,359,787	2,430,580	2,503,498	2,578,603	2,655,961	2,735,640	2,817,709
Other	2,057,900	2,267,100	2,335,113	2,405,166	2,477,321	2,551,641	2,628,190	2,707,036	2,788,247	2,871,894	2,958,051	3,046,793	3,138,197	3,232,343	3,329,313	3,429,192	3,532,068	3,638,030	3,747,171	3,859,586	3,975,374
Other Salaries	4,035,000	4,367,000	4,498,010	4,632,950	4,771,939	4,915,097	5,062,550	5,214,426	5,370,859	5,531,985	5,697,944	5,868,883	6,044,949	6,226,298	6,413,087	6,605,479	6,803,644	7,007,753	7,217,986	7,434,525	7,657,561
Total Operating Expenditures	**$33,605,800**	**$35,949,400**	**$37,833,773**	**$40,294,412**	**$42,073,359**	**$43,671,568**	**$44,854,014**	**$46,071,934**	**$47,326,391**	**$50,810,500**	**$55,109,974**	**$56,690,941**	**$58,862,788**	**$60,500,971**	**$62,188,299**	**$63,926,247**	**$65,716,333**	**$67,560,122**	**$69,459,225**	**$71,415,301**	**$73,430,059**
Net Revenue	**$18,457,900**	**$21,273,698**	**$29,367,504**	**$37,495,625**	**$49,030,934**	**$49,784,043**	**$49,781,485**	**$49,763,895**	**$54,791,390**	**$54,792,091**	**$54,797,102**	**$54,791,998**	**$54,799,559**	**$54,802,794**	**$54,786,708**	**$54,795,990**	**$54,785,924**	**$54,802,954**	**$54,801,132**	**$54,796,992**	**$54,795,851**
Debt Service Requirement	**17,990,268**	**19,339,725**	**26,697,731**	**34,086,932**	**44,573,577**	**45,258,221**	**45,255,896**	**45,239,905**	**49,810,354**	**49,810,992**	**49,815,547**	**49,810,907**	**49,817,781**	**49,820,722**	**49,806,098**	**49,814,536**	**49,805,385**	**49,820,867**	**49,819,211**	**49,815,447**	**49,814,410**
Percent Debt Coverage	**102.60%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**	**110.00%**