Town of Bedford

DRAFT

Sanitary Sewer Extension and Plant Capacity Analysis

July 2003

MALCOLM PIRNIE

July 28, 2003

Mr. John R. Dinin
Supervisor
Town of Bedford
321 Bedford Road
Bedford Hills, New York 10507 – 1398

Re: Mapping and Planning of Sanitary Sewer System Extension and Existing Wastewater Treatment Plant Capacity Analysis

Dear Supervisor Dinin:

With the cooperation of Town, County, State and City of New York personnel, we have completed our evaluation of the existing wastewater treatment plant at the Bedford Correctional Facility and have developed a map and plan for the proposed sewer district to serve critical areas of the hamlets of Bedford Hills and Katonah. In sum, our major conclusions are as follows:

- The densely populated areas of hamlets of Bedford Hills and Katonah are served by old subsurface disposal (septic) systems with many documented failures. These problem septic systems are undoubtedly contributing to water quality degradation in the New York City watershed. A sanitary sewer system is the obvious solution in cases such as this where septic system rehabilitation is impractical or extremely expensive in consideration of current day subsurface disposal standards.
- For planning purposes, we estimate that approximately 460,000 gallons per day of sanitary wastewater would be generated from existing parcels currently being served by septic systems. In addition, four small treatment plants currently scheduled for watershed program upgrade could be eliminated and construction cost avoided. Considering their SPDES permitted flows and related factors, we estimate that the total flow thorough a new sewer district would be about 550,000 gallons per day.
- The existing wastewater treatment plant serving the Bedford Correctional Facilities can be expended on its existing site to provide treatment for the additional 550,000 gallons per day, including the flows from the four small plants that would be eliminated.

We recommend that the Town move forward with the formation of a sewer district and begin formal meetings with the involved County, State and City of New York agencies relative to the funding of the project and the expansion of the plant at the Bedford Correctional Facilities. We strongly believe that the construction of a sanitary sewer system in the hamlets of Bedford Hills and Katonah is the best long term solution for the protection and enhancement of water quality in the watershed as well as the drinking water aquifer underlying the Town.

As stated previously, much has been accomplished since this project began during March of 2003. It is noteworthy to say that Malcolm Pirnie enjoyed a very high level of cooperation from Town of Bedford, Westchester County, New York State and City of New York project and management personnel involved with the work. We believe that this cooperative atmosphere has made for a better project than otherwise would have been achievable during the short timeframe of this work. We appreciate it.

If you have any questions or desire additional information, please feel free to call us.

Very truly yours,

MALCOLM PIRNIE, INC.

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Vice President

Patricia A. O'Loughlin, P.E.
Project Manager

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Senior Associate

ACKNOWLEDGEMENTS

The development and successful completion of this work required the cooperation and interfacing of many individuals and groups of individuals at the municipal and state levels. Without this cooperation, we would not have been able to deliver this project within the short duration of its proposed schedule. In particular, Malcolm Pirnie very much appreciates the participation and support provided by the following individuals and members of their staff.

New York City Department of Environmental Protection

Mr. Robert Ravallo - Capital Facilities Coordinator
Mr. Edwin Polese – Chief, Bureau of Water Supply
Dr. Kimberly Kane – Supervisor, Watershed Management Studies
Mr. Michael Meyer – Assistant Project Manager

New York State Department of Correctional Services

Mr. Keith Rupert – Facilities Planning

Westchester County

Mr. Ralph Butler – Commissioner, Department of Public Works
Ms. Sabrina Charney – Principal Planner
Mr. Edward Delaney – Area Supervisor, Department of Health

Town of Bedford

Mr. John R. Dinin – Supervisor
Ms. Lee Roberts – Deputy Supervisor
Mr. Jeffrey Osterman – Town Planner

Sanitary Sewer Extension and Plant Capacity Analysis

Summary of Major Findings, Conclusions and Recommendations

Background

During the summer and fall of 2002, the Town of Bedford (the Town) initiated a competitive procurement process to select a professional engineering firm to assist in evaluating a possible major infrastructure project. The Town issued a Request for Proposals (RFP) which included two activities: first, evaluation of providing sanitary sewer service to portions of the Hamlets of Bedford Hills and Katonah that historically had problems with traditional subsurface disposal (septic) systems; and second, evaluation of the ability of an existing wastewater treatment plant, which is owned by the Department of Correctional Services, to treat sanitary wastewater from the Town.

In 2002 the Town issued an RFP to evaluate a major infrastructure project. The Town selected environmental engineers, scientists and consultants, Malcolm Pirnie, Inc. to study the possibility of providing sanitary sewer service to certain areas and to evaluate the capability of the existing treatment plant at the Bedford Hills Correctional Facility to treat the additional wastewater.

Based on the procurement process, the Town selected Malcolm Pirnie, Inc. of White Plains, NY as its engineering consultant for the project, *Sanitary Sewer Extension and Wastewater Treatment Plant Capacity Analysis* (the Project). Work began on the Project in February 2003.

To satisfy the scope of work developed by the Town and the requirements of the State of New York, Malcolm Pirnie prepared two separate but closely related documents:

The first, *Sanitary Sewer Extension and Wastewater Treatment Plan Capacity Analysis,* contains all the technical evaluations and engineering recommendations for the total project to provide sanitary sewer service to the affected areas of Bedford Hills and Katonah and treat the collected wastewater at an expanded facility onsite at the Department of Corrections Services.

The second document, *Sewer District Formation Report – Bedford Town Sewer District No.1,"* is intended to satisfy the "map and plan" requirements of the Town Law of New York State as it relates to the formation of a district to provide sanitary sewer service within a municipality.

Findings (Wastewater Treatment Facility)

The Wastewater Treatment Facility (WWTF) in Bedford Hills was originally constructed around 1900 to service what was then Westfield State Farms, before the present correctional facilities were built. Over the years, the correctional facilities evolved into two separate centers, and a series of modifications and upgrades were performed to the WWTF.

At the present time, the WWTF serves both the Taconic and Bedford Hills Correctional Facilities, as well as a regional Department of Correctional Services (DCS) medical center and the rest area along southbound Interstate 684. The WWTF has a New York State Pollution Discharge Elimination System (SPDES) permitted capacity of 500,000 gallons per day (gpd).

In 2001, the DCS WWTF was upgraded to its current state of high technology in accordance with what are commonly known as the New York City Watershed Rules and Regulations. The receiving stream for the WWTF discharge is Broad Brook, a tributary to the Muscoot Reservoir, which is a water supply reservoir for New York City located within the Croton watershed.

For a two-year period ending in December 2002, the calculated average daily flow at the WWTF was approximately 316,000 gpd – well within SPDES limitations. The Town has requested in writing from the Department of Corrections Services an indication of how much of the remaining average capacity it will need for its own purposes (that is, of the 500,000 gpd permitted, with a current actual usage of 316,000 gpd, there would be 184,000 gpd remaining of the permitted capacity).

The Bedford Hills WWTF has a permitted capacity of 500,000 gpd, and has been recently upgraded to a high technology process. Its discharge currently meets water quality requirements for its receiving stream, a tributary to a New York City water supply reservoir.

During the two-year period of our evaluation, the DCS WWTF achieved compliance with its SPDES effluent characteristic requirements. Overall, plant performance with respect to its permit has been excellent, and the plant is well operated and maintained by its contract service provider, US Filter.

The evaluation did show deficiencies in several buildings in terms of either their physical infrastructure (such as poor condition of windows, inadequate ventilation, peeling paint and the like) or current code/guideline issues (such as buildings not compliant with the Americans with Disabilities Act or National Fire Protection Agency guideline 820).

In the highly developed Hamlets of Bedford Hills and Katonah, failing septic systems threaten the Town's ground water supply as well as a New York City water supply reservoir.

Findings (Bedford Hills/Katonah Sanitary Systems)

The Hamlets of Bedford Hills and Katonah are densely populated, with relatively well-defined commercial and light industrial areas surrounded by single and multiple-family homes and apartments. Zoning regulations have served the Town well. Within the project area, parcels have been developed consistent with the regulations, and very little developable land remains for new construction.

Septic System Issues. Sanitary wastewater is discharged to subsurface disposal (septic) systems, except for four cases noted below. Over 140 reports concerning septic system failure have been recorded by the Westchester County Department of Health; many more problems are believed to be unreported and unrecorded.

Failing septic systems in Bedford and Katonah constitute a threat to the Town's water supply, which is withdrawn from an aquifer underlying the central portions of both hamlets. These failing septic systems also constitute a threat to New York City's Muscoot Reservoir, part of the Croton system immediately adjacent to Katonah. Thus, both groundwater and surface water are adversely impacted by such septic system failures.

Other Existing Treatment Facilities. Four small on-site wastewater treatment facilities exist within the Project area. They serve: St. Mary's School, Katonah Elementary School, Bedford Park Apartments and Bedford Lake.

Each facility has an existing SPDES permit and all are in various stages of planning for upgrade under the watershed rules and regulations program, although no construction has begun at any of these facilities. The total SPDES permitted flow from these four facilities is 115,500 gallons per day. However, existing records show the actual discharge to average only about 32,000 gallons per day, or about 28 percent of the permitted flow.

Conclusions

It will be very difficult to maintain adequate septic systems in the densely populated areas of Katonah and Bedford Hills. Moreover, the problem of failing septic systems will worsen over time, and will continue to threaten the Town's drinking water system and the New York City water supply. The obvious conclusion -- that a sanitary sewer system to serve the Project area is necessary – has been reached several times in the past few decades as a result of different studies.

Conclusion 1: A sanitary sewer system is necessary to safeguard the Town's drinking water system and the New York City water supply.

Malcolm Pirnie has proposed formation of a sewer district that largely follows the boundaries of zoning districts and drainage basins so as to achieve the goal of providing service to properties in areas with numerous reported septic failures. A map of the proposed sewer district (Figure 1) is attached to this Summary.

The proposed sewer district encompasses the four existing onsite wastewater treatment plants at St. Mary's School, Katonah Elementary School, Bedford Park Apartments and Bedford Lake.

The proposed sewer district also encompasses a total of 1,520 individual properties as recorded on the Town's tax roles. Of this total, only 92 are listed as "vacant" parcels although not all vacant parcels are developable as a result of physical constraints.

Conclusion 2: The proposed sewer district will encompass 1,520 properties in the Project area. This includes four properties served by existing, small wastewater plants that will be abandoned and their associated up-

Wastewater flow from existing parcels in the proposed sewer district has been estimated at about 460,000 gallons per day using water meter records for the Project area. Allowing for some development of vacant parcels and assuming that the four on-site wastewater treatment plants would cease operation and their flow be directed to the new collection system, an estimate of the average daily total flow from the Project area is 550,000 gallons per day.

A preliminary layout of a collection system has been developed consisting of gravity sewers, six pumping stations and associated force (pressure) mains.

The DCS WWTF can be physically expanded within its existing site to accommodate the anticipated 550,000 gallons per day from the Project area.

After considering three expansion alternatives, it was concluded that the most effective process alternative would be to use rotating biological contactors with second stage nitrification to achieve biological treatment consistent with watershed requirements. An expansion of the microfiltration system will also be required to meet watershed criteria.

Conclusion 3: The existing Bedford Hills WWTF has sufficient land area to accommodate an expansion to treat estimated flows from the Project area.

Conclusion 4: Construction of sanitary sewers will prevent further degradation of the drinking water aquifer and enhance water quality in the Muscoot Reservoir.

Recommendations

1. **Form a Sewer District.** The Town should proceed with the formation of a sewer district to provide long-term, effective and reliable collection of sanitary wastewater from the residents and businesses in the Bedford/ Katonah Project area.
2. **Develop a Sanitary Sewer System.** Collection by a sanitary sewer system will prevent further degradation of water quality in the aquifer underlying the area, and will also protect and enhance water quality in the Muscoot Reservoir consistent with watershed regulations.
3. **Redirect Existing Flows to the Sewer System.** The four existing wastewater treatment plants in the Project area should be abandoned and their flows re-directed

to the new collection system. The projected costs of the upgrades at these four facilities and financial assistance offered by New York City should be directly transferable to the Project.

4. **Expand/Upgrade the DCS WWTF.** The DCS WWTF should be expanded to receive the average daily total flow (550,000 gpd) from the Project area, with major process modifications to include the addition of rotating biological contactors and additional microfilters. This would increase the total plant capacity to 1,050,000 gpd.

5. **Perform Pilot Study; Modify Microfiltration Design Criteria.** The Town should attempt to modify the design criteria for microfiltration required by the watershed regulations by performing a pilot study at the DCS WWTF. These watershed criteria are very conservative compared to both manufacturer and nationally-applied criteria and could account for over $2 million of the project cost.

Costs

We have completed estimates of construction cost and related project costs in order to develop an overall opinion of total project cost for the collection system and WWTF expansion. These are summarized in the following Table. The intent of the table is to show "raw" costs, in addition to the anticipated financial offset that should be available from New York City, Westchester County, New York State Environmental Facilities Corporation and the Department of Corrections Services.

OPINION OF PROBABLE PROJECT COST INCLUDING AGENCEY CONTRIBUTION*	
Item	**Probable Cost**
Construction of Collection System and Pump Stations	$17,534,000
Construction of Service Laterals and Grinder Pump Stations	$1,716,000
Expansion of WWTF	$7,000,000
Subtotal, Construction Cost	$26,250,000
Construction Contingencies @ 20%	$5,250,000
Related Project Costs **	$7,650,000
Total Estimated Project Cost	**$39,150,000**
Agency Contribution*	$20,000,000
Local Project Cost	**$19,150,000**

*Grants and financial contributions from the Department of Correctional Services, New York State Environmental Facilities Corporation, New York City Department of Environmental Protection and Westchester County.

** Related Project costs include land acquisition, preliminary and final design engineering, engineering during construction, field inspection, start-up services, legal & administrative services, interest during construction, bonding and related financing costs.

The project will also have operation and maintenance costs for the collection system, pump stations and WWTF. We have completed estimates of those operations and maintenance costs, which are summarized in the following table below. This table shows "raw" costs without any of the offsetting contributions from the agencies noted above, although annual contributions are expected for operation and maintenance also.

OPINION OF PROBABLE OPERATION AND MAINTENANCE COSTS FOR INITIAL YEAR OF OPERATION	
Description	**Total**
Collection System and Pumping Stations	$112,000
Expanded DCS WWTF	$775,000
Total Estimated Annual O&M Cost*	**$887,000**

*Exclusive of grants and financial contributions from the Department of Correctional Services, New York State Environmental Facilities Corporation, New York City Department of Environmental Protection and Westchester County.

In considering the cost to a typical homeowner, the final total cost after determining offsets from New York City, Westchester County, New York State Environmental Faculties Corporation and the Department of Correctional Services will be distributed among the users. Depending upon the amount of overall agency contribution, the annual user cost could range from less than $800 to about $1,300 per year with no agency contribution.

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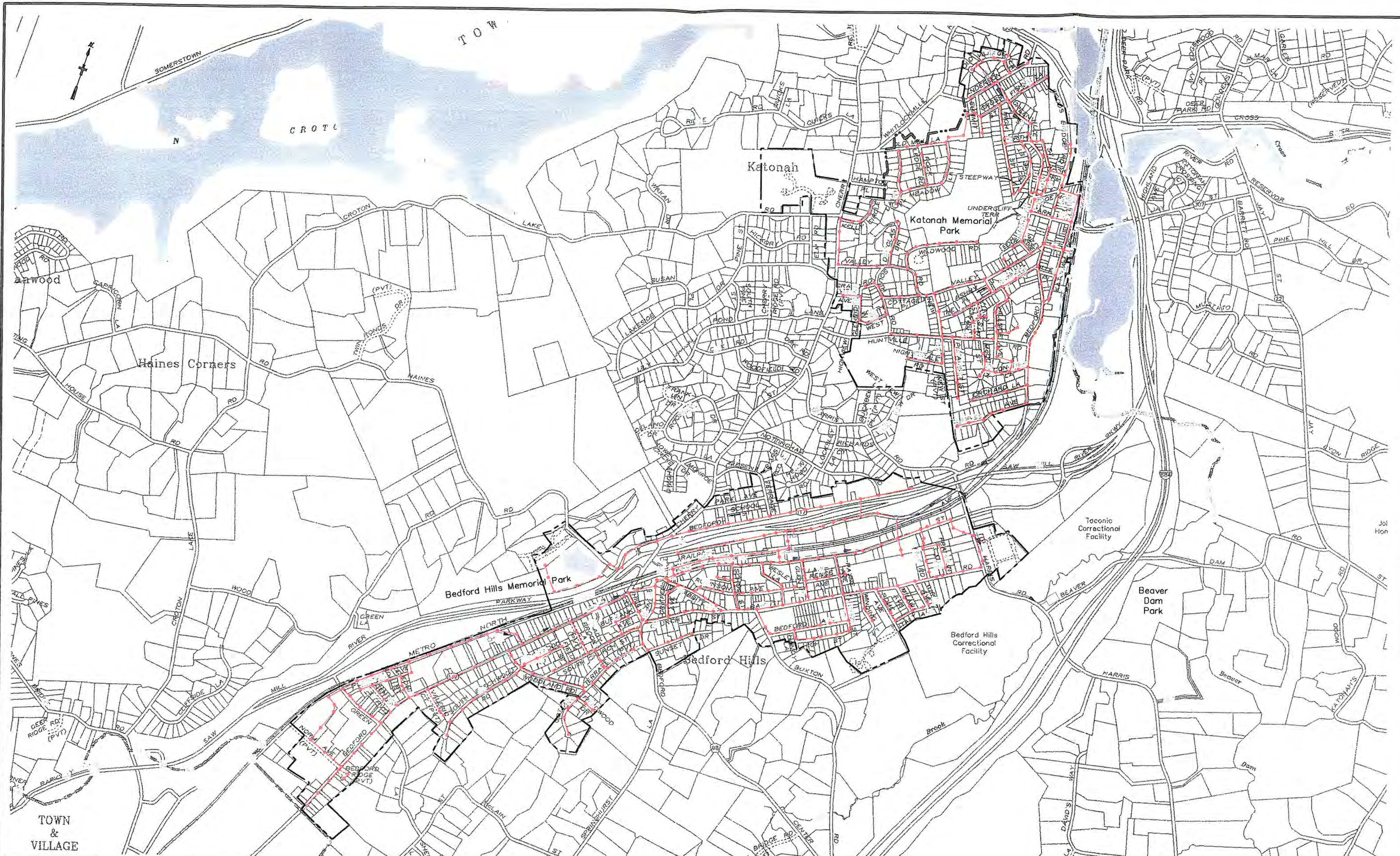

MALCOLM PIRNIE

TOWN OF BEDFORD
SEWER DISTRICT FORMATION REPORT

PROPOSED SEWAGE COLLECTION SYSTEM

750 0 750 1500

SCALE: 1" = 1500'

FIGURE 1

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1.0 INTRODUCTION

The hamlets of Bedford Hills and Katonah in the Town of Bedford (Town), Westchester County, New York are densely populated areas consisting of relatively well-defined, commercial and light industrial areas surrounded by single and multiple family homes and apartments. In Bedford Hills and Katonah, as in most of the Town of Bedford, wastewater is disposed of in privately owned, subsurface disposal systems. Numerous failures of these systems have been recorded over the years, and failing septic systems can be expected to remain a problem for the indefinite future. Small lot sizes, shallow bedrock, a seasonal high water table and other factors limit the possibilities for replacing old, undersized systems with systems built to current standards and capable of serving for an extended period of time.

The presence of failing septic systems in Bedford and Katonah constitutes a threat to the entire Town's water supply, which is taken from an aquifer underlying the central portions of both hamlets, and New York City's (City) Croton Reservoir System which is immediately adjacent to Katonah. Excessively well drained soils, underlying the central commercial districts of the hamlets, provide poor treatment to the wastewater and allow it to percolate rapidly to the groundwater table. Shallow bedrock, in the higher elevations of the hamlets, provides numerous fissures and other pathways for the septic tank effluent wastewaters to reappear on the ground surface as seeps and enter the surrounding reservoirs and streams. In short, there is an urgent need for a public sewerage system to serve these hamlets.

In addition to the subsurface disposal systems that serve most residential, commercial and light industrial properties, there are four, on-site wastewater disposal systems which consist of septic tanks followed by subsurface sand filters with surface water discharges. These systems are located at the Bedford Park Apartments, St. Mary of the Assumption School, the Katonah Elementary School, and Bedford Lake. Each of these systems has an existing State Pollution Discharge Elimination System Permit (SPDES Permit) and has been targeted for improvements as part of New York City's East-of-Hudson Water Quality Investment Program. However, difficulties in finding adequate space on these properties to construct microfiltration systems or other advanced wastewater treatment facilities, public objections to locating the treatment plants in densely developed residential areas, and concerns about the cost of constructing, operating and maintaining these systems have delayed their implementation. The construction of public sewers and a single wastewater treatment plant (WWTP) to serve Bedford Hills and Katonah would eliminate the need for individual treatment systems at these four locations, as well as protect and enhance water quality.

Chapter 62 of the Consolidated Laws of New York State, referred to as "Town Law", provides a town board with the legal authority to establish a town sewer district for the purpose of planning, designing, constructing, operating and maintaining a local sewerage system. Articles 12, 12A and 12 C set forth the procedures for forming a Town Sewer District and require that a map, plan and report be prepared and filed with the Town Clerk for public inspection, prior to establishing such a district. The purpose of this document is to provide the information needed by the Bedford Town Board and the public to form a Town Sewer District, encompassing the two hamlets, so that the long-standing subsurface disposal system problems in the area may be definitively addressed.

2.0 PLANNING AREA

2.1 GENERAL

The Planning Area encompasses the unincorporated areas of Bedford Hills and Katonah and immediately adjacent, densely developed areas as shown on Figure 2-1. These hamlets are among the oldest developed areas of the Town and have documented wastewater disposal problems. They contain just a few vacant lots that could be developed. The area does not present an opportunity for undesirable growth should sewers be installed.

2.2 ENVIRONMENTAL SETTING

The hamlets of Bedford Hills and Katonah are situated in a narrow valley formed by tributaries of the Croton River. The valley floor contains relatively deep deposits of sand and gravel while bedrock outcrops are visible along the sides of the valley.

The Metro North Railroad and the Saw Mill River Parkway run along the valley floor and pass through these hamlets, while Interstate 684 (I-684) passes to the east of Bedford Hills and intersects the Saw Mill River Parkway immediately east of Katonah. These three major transportation corridors provide easy access to employment opportunities in the New York City area and have contributed to a high density of residential development.

Bedford Hills and Katonah lie within the Croton River Watershed, which provides a portion of the water supply for New York City. A branch of the Muscoot Reservoir, one of 12 reservoirs in the Croton water system, extends along the northerly edge of Katonah and receives runoff from this hamlet and the northern portion of Bedford Hills via a small tributary which follows the railroad and the Saw Mill River Parkway. The southern portion of Bedford Hills, near the Village of Mount Kisco boundary, drains to the south through another small tributary of the reservoir. Thus, poorly treated or untreated wastewater from failing septic systems in these hamlets readily reaches the

Muscoot Reservoir. A map showing the topography within the Planning Area is presented on Figure 2-2.

A high yielding, sand and gravel aquifer is located along the valley floor from the easterly end of the Muscoot Reservoir to the Mount Kisco village boundary. The Bedford Public Water Supply obtains its water from wells developed in this aquifer. In addition, a well owned by the Village of Mount Kisco is located on Green Street in Bedford Hills. This well has been abandoned due to contamination.

2.3 LAND USE AND ZONING

Land use within the Planning Area is closely controlled by zoning and consists of a mix of single- and two-family homes, apartment complexes, public uses and business and light industrial uses. Figure 2-3 shows the current zoning district boundaries within the Planning Area.

Residential uses predominate in the Planning Area, and the zoning provides for 1/4-, 1/2-, 1-, 2-, and 4-acre lot sizes, depending upon location. Village Apartments, (VA), Diversified Housing (DH), Elderly Housing (EL), and Two-Family (TF) zoning districts also exist. Most of the 1/4-acre and some of the 1/2-acre zoning districts cover older developments in the Town. The 1-, 2-, and 4-acre districts are generally located in steeply sloping areas where bedrock is close to the ground surface. Abrupt changes in zoning densities occur, with zoning districts requiring 4-acre minimum lot sizes abutting 1/4-acre districts or districts zoned for apartment complexes.

Public land uses include town parks and lands owned by New York City for watershed protection and operations. Central Business (CB) and Light Industrial (LI) zones are generally located along Bedford Road (NYS Route 117), which follows the valley floor through Katonah and Bedford Hills, and Adams Street in Bedford Hills.

The New York State Department of Correctional Services (DCS) operates two prisons, the Bedford Hills Correctional Facility and the Taconic Correctional Facility, at the northerly edge of Bedford Hills. A Regional Medical Facility has recently been added to the complex, to provide medical care to prisoners from all state correctional

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SEWER DISTRICT FORMATION REPORT

Town of Bedford, New York

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July 2003
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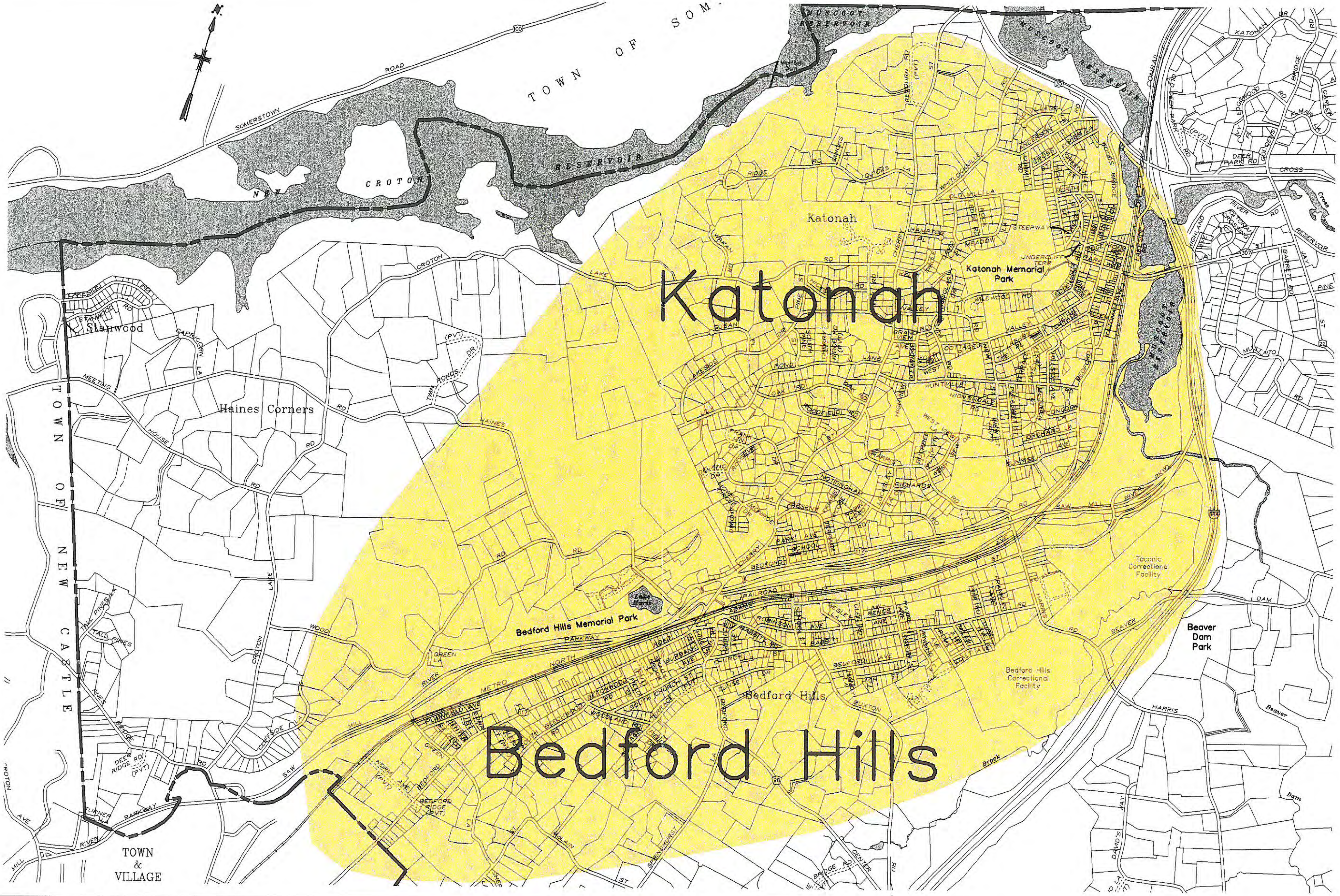

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TOWN OF BEDFORD
SEWER DISTRICT FORMATION REPORT

PLANNING AREA

FIGURE 2–1

facilities in the area. State-owned and operated water, sewage collection, and sewage treatment systems are located on the site. These systems also serve a rest area along I-684.

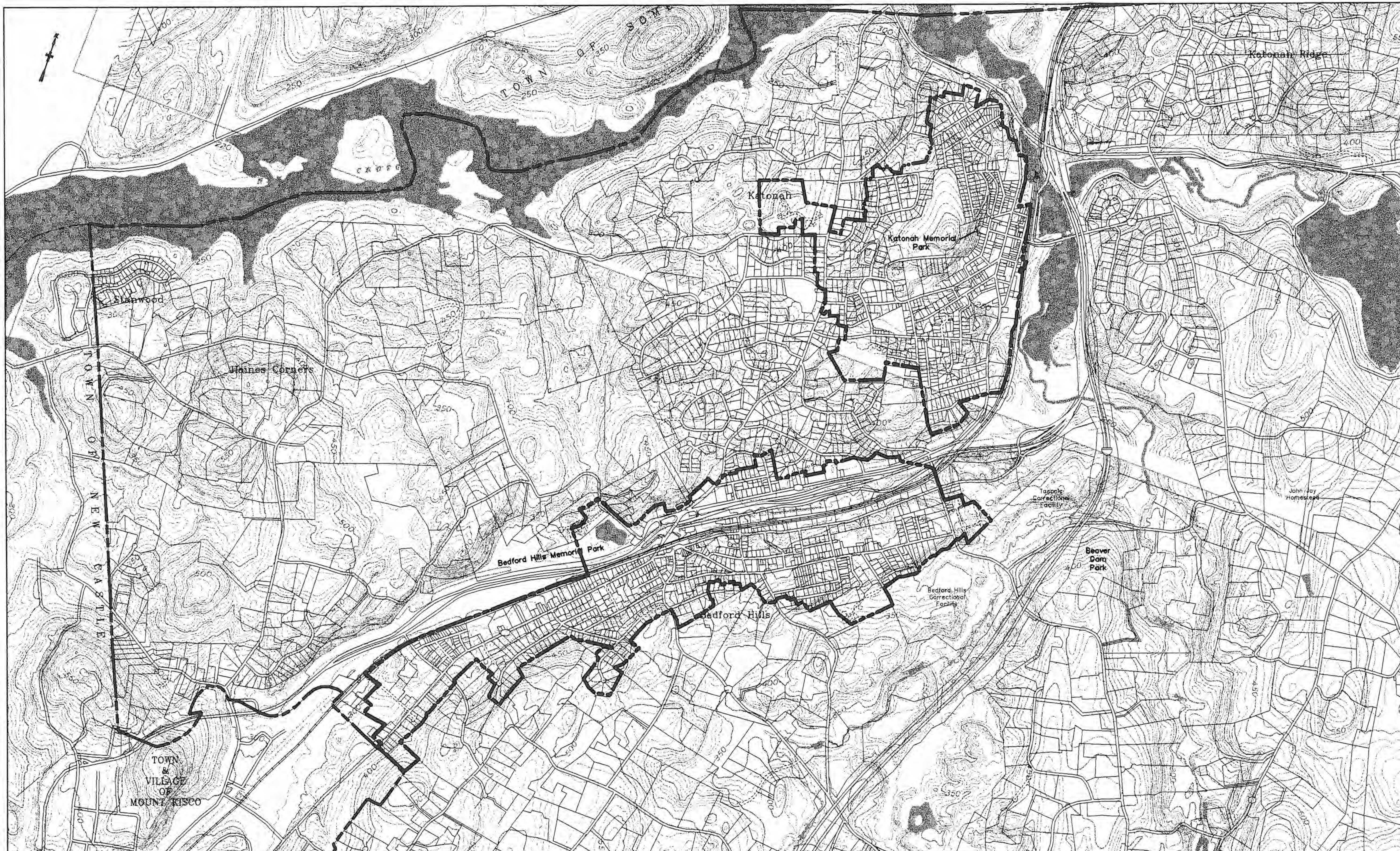
In 1986, following the identification of chemical contaminants in a town water supply well, an Aquifer Protection Zone was added to the town's zoning code. This addition to the code recognized the value of the aquifer that provides drinking water throughout the Town and prohibits certain uses such as dry cleaning, gasoline stations, printing and photo processing operations within its boundaries.

2.4 GROWTH TRENDS

The Planning Area is already heavily developed and very little developable land remains. As a result, population growth is very low and results, primarily, from the construction of new housing or apartments on the few remaining vacant lots. No significant increase in population is anticipated for the foreseeable future. One noticeable trend, however, is the upgrading or improving of existing housing stock within the area. Katonah and Bedford Hills are considered very desirable places to live and land prices are relatively high. In recent years, there has been a trend toward rebuilding or expanding small, older homes with larger, more elaborate dwellings. The addition of extra bedrooms and bathrooms will likely result in a gradual increase in water use per home, a consequent increase in wastewater flow and exacerbation of the subsurface disposal problems and negative impacts on reservoir water quality.

2.5 EXISTING UNDERGROUND UTILITY LINES

Bedford Hills and Katonah are served by public water and natural gas. Buried telephone and electric lines also exist in some areas. Storm drains exist along the state highways and in some of the more heavily developed, downtown areas. The design of sanitary sewers will have to take these existing buried utility lines into account and comply with New York State Department of Health guidelines for separation distances between sewer lines and water main.



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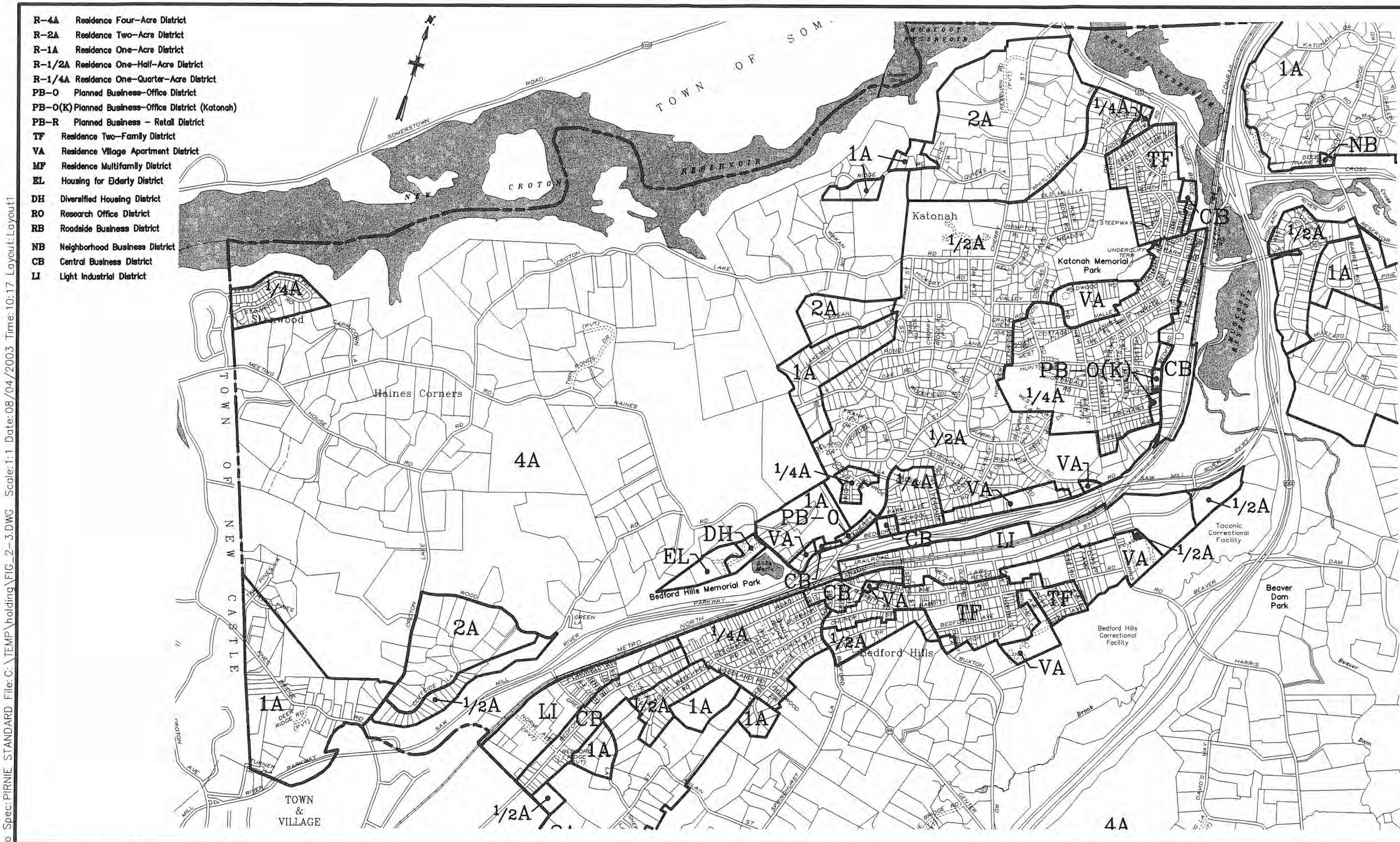
TOWN OF BEDFORD
SEWER DISTRICT FORMATION REPORT

PLANNING AREA TOPOGRAPHY

600 0 600 1200
APPROXIMATE SCALE: 1" = 1200'

FIGURE 2–2



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TOWN OF BEDFORD
SEWER DISTRICT FORMATION REPORT

PLANNING AREA ZONING

FIGURE 2-3

2.6 EXISTING WATER AND WASTEWATER SYSTEMS

As has been noted, the Bedford Public Water System supplies potable water throughout most of Bedford Hills and Katonah. The source of supply for this system is a number of wells located in the highly permeable sand and gravel deposits along the valley floor. The Town has experienced pollution of some of the wells by chemical contaminates which move rapidly through the aquifer. One well, located on Jay Street near the Muscoot Reservoir, was taken out of service in the late 1970s after dry cleaning chemicals were found in the water and it remains out of service to this day. In addition, a Village of Mount Kisco well, located on Green Street in Bedford Hills, has been removed from service due to gasoline contamination.

The Town's water distribution system covers all of Katonah and most of Bedford Hills. A limited number of properties in Bedford Hills along the boundary between Bedford and Mount Kisco are served by the Mount Kisco Water System. Although potable water is available to all properties in the Bedford Hills and Katonah, not all property owners are connected to the system. Some properties still operate private wells. All properties connected to either the Bedford or Mount Kisco systems are metered.

The Planning Area contains four, on-site wastewater disposal systems that consist of septic tanks followed by subsurface sand filters with surface water discharges and a wastewater treatment plant owned by the DCS and operated by a private sector contract service provider. The privately owned septic systems are located at the Bedford Park Apartments, St. Mary of the Assumption School, the Katonah Elementary School, and Bedford Lake. Each of these systems discharges to a local drainage course under a SPDES Permit, and each has been targeted for improvements to the degree of treatment provided to the wastewaters. The DCS wastewater treatment plant discharges to a small tributary of the Muscoot Reservoir. A listing of the maximum daily flows permitted from these facilities under their existing SPDES Permits is shown in Table 2-1.

TABLE 2-1 EXISTING WASTEWATER DISCHARGES AND SPDES FLOW LIMITS		
Facility Name	**Service Area**	**Permitted Flow (gpd*)**
Bedford Park Apartments	Apartments off Rome Avenue.	19,500
Bedford Lake	Bedford Diversified Housing and Bedford Elderly Housing Complexes	20,000
Katonah Elementary School	Elementary School	13,000
St. Mary of the Assumption School	Parochial School (now closed)	63,000
Department of Correctional Services Wastewater Treatment Plant	Bedford Hills and Taconic Correctional Facilities & Regional Medical Unit; I-684 Rest Area	500,000

*Gallons per day.

The DCS wastewater treatment plant has recently been upgraded to provide tertiary treatment to wastewaters generated by the prison complex and the I-684 rest area. The design of microfilters to improve the degree of treatment provided at the Bedford Lake system has been completed but construction has been delayed pending the possibility that this system might be eliminated if sewers are installed in the area. The design of an upgrade to the facilities at St. Mary of the Assumption School has been delayed inasmuch as the school has been closed. Reopening this facility, either as a school or for some other use, will require improvements in the subsurface disposal system or a sewer connection if sewers are installed.

3.0 PROPOSED SEWER DISTRICT BOUNDARIES

3.1 NEED FOR SEWERS

It is very difficult to construct and maintain adequate, subsurface, wastewater disposal systems in many of the heavily populated areas of Bedford Hills and Katonah. Small lot sizes, shallow bedrock, unsuitable soils, a seasonal high groundwater table, the presence of a primary aquifer, and the proximity to portions of New York City's water supply reservoirs all contribute to the difficulty of constructing adequate systems at reasonable costs. The problem of failing septic systems will only worsen over time, as small homes on small lots are replaced with larger homes and some of the larger, older homes are converted into apartments, where permitted by the existing zoning codes. Older septic systems and leaching fields, designed and constructed at a time when homeowners depended on private wells for water and automatic dishwashers and clothes washer were uncommon, coupled with the trend to expand modest homes on small lots into larger homes with more bedrooms and multiples bathrooms, cannot cope with the increased volume of wastewater produced. A continued deterioration of the wastewater disposal situation can be expected. The obvious solution to this problem is to provide a municipal wastewater collection and treatment system to serve the area.

3.1.1 Previous Studies and Reports

A number of studies and reports on wastewater disposal in Bedford Hills and Katonah have been prepared over the last several decades. All of these reports have acknowledged that a serious wastewater disposal problem exists. A brief summary of these reports is presented below.

- ***208 Northern Westchester Study, September 1977***
  Water Quality Management Plan was developed for Northern Westchester County under the framework of Section 208 of the Clean Water Act. This plan and report proposed that a part-county sewer district be created in northern Westchester County to collect and treat wastewater from the heavily developed corridor running from Croton Falls in the north to Mount Kisco in

the south and included Bedford Hills and Katonah. This plan was never implemented.

- ***Velsy Report, 1979***
  When it became apparent that the recommendations of the 208 Water Quality Management Plan for northern Westchester County would not be implemented in the near future, the Westchester County Department of Environmental Facilities retained Charles R. Velzy Associates to develop an interim solution, within the framework of the 208 Water Quality Management Plan, to collect and treat sewage from the heavily developed Bedford Hills and Katonah areas where wastewater disposal problems were considered far worse than in some of the surrounding communities. This plan proposed a system to collect and pump wastewater from the two hamlets to an existing pumping station in Mount Kisco. From this point, the wastewater was to be pumped to the Saw Mill Valley Trunk Sewer for treatment at the Yonkers Wastewater Treatment Plant. The cost of this solution was considered relatively high at the time, and the plan was not implemented.

- ***Velsy Report, 1987***
  By 1987, it became obvious that implementation of the recommendations contained in the 1977 Water Quality Management Plan for Northern Westchester County would be delayed indefinitely. The Town of Bedford retained Charles R. Velsey Associates to re-evaluate wastewater collection and disposal options for Bedford Hills and Katonah and consider the construction of a treatment plant within or near these hamlets in lieu of conveying the wastewater to the south for treatment at the Yonkers treatment plant. The study report, entitled Sanitary Sewerage Study of the Katonah – Bedford Hills Area, dated July 1987 (Revised May, 1988) estimated the cost for sewers and an advanced wastewater treatment plant (WWTP) at approximately $14 million, and a first year charge to a typical residential user of around $825. Once again, the estimated cost of this solution was considered too high, and the project was not implemented.

- ***Hudson Engineering Reports, 1989 and 1990***
  In 1988, in another attempt to develop an economically feasible solution to the wastewater disposal problems, the Town of Bedford retained Hudson Engineering Associates to conduct a study of Bedford Hills, Katonah and Bedford Village.

  The engineering report, entitled Town of Bedford Sewerage Facilities, Environmental Narrative, was published in 1989 and proposed the creation of a town sewer district encompassing the hamlets of Bedford Hills, Katonah and Bedford Village to construct sewers and wastewater treatment plants to serve these areas. The proposed WWTP to serve Bedford Hills and Katonah was to be located at or near the existing treatment plant serving the Bedford Hills and Taconic Correctional Facilities. The proposed sewage collection system in Bedford Hills and Katonah was generally limited to the commercial and business districts in the two hamlets, but the proposed sewer district would also take responsibility for periodically pumping out septic tanks and disposing of the sludge from homes within the district that would not be served by sewers.

In 1990, Hudson Engineering Associates produced a second report, entitled Town of Bedford Map, Plan and Report, Part-Town Sewer District No. 1, as the basis for the formation of a town sewer district. Unfortunately, this plan was voted down in a referendum on the formation of the sewer district.

- ***Croton Watershed Wastewater Diversion Study, Savin Engineers, P.C.***
  In 1998, the Westchester County Department of Public Works and Department of Planning sponsored a study on the feasibility of diverting wastewaters collected in the Croton Watershed to existing WWTPs in Peekskill and Yonkers. This study was financed by a grant from the New York City Department of Environmental Protection (DEP) and concentrated on existing WWTP discharges to local water courses and areas with known septic system problems. The hamlets of Bedford Hills and Katonah were included in the "focus area" for this study and sewers were proposed to serve approximately 771 properties, primarily located in the densely developed, downtown areas of these hamlets but also including properties served by privately owned wastewater treatment plants with SPDES permits. Implementation of this plan has been complicated by environmental justice issues, and it is unlikely that it will be implemented in the foreseeable future.

3.1.2 Sanitary Surveys

The Westchester County Department of Health issues permits for the construction of new septic systems and the repair or replacement of existing systems. A review of the Department's records identified 142 documented complaints of failing septic systems in the Bedford Hills – Katonah area that required some form of corrective action since 1975. A partial listing of the locations of these problems is presented in Table 3-1 and shows that the problem is widespread in both hamlets. A full list would include at least one problem on nearly every street in the two communities.

TABLE 3-1

PARTIAL LISTING OF SEPTIC SYSTEM COMPLAINTS IN KATONAH AND BEDFORD HILLS
(Source: Westchester County Department of Health files, 1975 to Spring, 2003)

Location	Street	Number of Complaints
Bedford Hills	Adams Street	4
Bedford Hills	Babbit Street	13
Bedford Hills	Rome Avenue	10
Bedford Hills	Bedford Road	14
Bedford Hills	Turrin Avenue	4
Bedford Hills	Milan Avenue	2
Katonah	Katonah Avenue	10
Katonah	Greenville Road	8
Katonah	Sunrise Avenue	5
Katonah	High Street	3
Katonah	Meadow Lane	2
Katonah	Valley Road	4
Katonah	Pleasant Street	3

Discussions with the Department of Health's engineers indicate that the complaints documented in the Department's files probably represent only a fraction of the total number of septic system problems in the area. The cost of rebuilding a failing leach field can run into the tens of thousands of dollars, and many property owners will only report a failing system when the failure is so severe as to be objectionable to neighbors or is readily noticeable by inspectors from the Department of Health who may happen to pass through the area. In addition, some systems, particularly along the valley walls, are constructed over fractured bedrock and do not provide adequate treatment to the septic tank effluent. Failures of these systems are usually not evident unless the partially treated wastewater re-emerges on the surface at rock faces or in ditches and causes odors. The presence of shallow bedrock, as evidenced by the numerous bedrock outcrops along the steep hillsides in Bedford Hills and Katonah, make it likely that many systems are not operating properly even though there is no immediate evidence of failure such as ponded sewage on the ground surface over the leach field. Finally, the excessively well drained soils along the valley floor provide poor treatment of the septic tank effluent. A septic system failure in these soils generally does not result in a readily visible problem, such as ponded sewage on the ground surface, but threatens groundwater quality as the liquid percolates rapidly though the soil to the groundwater table.

3.1.3 New York City Watershed Memorandum of Agreement

The Town of Bedford is a signatory to the January, 1997 New York City Watershed Memorandum of Agreement (Agreement) that strengthened the rules and regulations that protect the City's water supply. Under Article V, Section 140 of this historic Agreement, New York City agreed to provide $68,000,000 for a water quality investment program in the watershed east of the Hudson River. These funds are to be used for planning, design and construction of water pollution reduction projects including, among other items, a potential sewage diversion project, rehabilitation or replacement of certain subsurface sewage treatment systems in areas where failing systems are prevalent, community septic systems, and "sewage collection systems or extensions to sewage collection systems to the extent necessary to serve areas with concentrations of failing or soon to be failing subsurface sewage treatment systems constructed on inappropriate sites from a water quality perspective (e.g. undersized lots in lakefront communities adjacent to lakes or reservoirs) or to combine sewage flows currently treated at two or more WWTPs and expansion of existing WWTPs or construction of new WWTPs necessary to accommodate the additional flow resulting from such sewering".

In addition to the above, the Agreement provides funds for upgrading existing WWTPs to provide advanced levels of treatment and for operating the additional facilities at each plant. The Department of Correction's WWTP at the Bedford Hills and Taconic Correctional Facilities has recently been upgraded under this program, and designs have been prepared to add additional treatment processes at the treatment plant serving the elderly housing and diversified housing complexes at Bedford Lake. Other existing treatment plants that must be upgraded or abandoned under this Agreement are the facilities at the Katonah Elementary School, Bedford Park Apartments and St. Mary of the Assumption Parochial School.

One aspect of the Memorandum of Agreement that must be taken into account in planning for the installation of new sewers is the fact that the Watershed Rules and Regulations (WR&R) established by the Agreement place tight restrictions on any such projects that might promote increases in population growth with its attendant pollution. New York City's goal is to protect the watershed and reduce existing pollution of its reservoirs, not to foster new growth in the area. As a result, the City has review and approval powers over the design and plans and specifications for new or expanded wastewater treatment plants in the watershed. Bedford Hills has a surface discharge and falls within the 60-day travel time for the Croton intake. Typically excursions within 60-day travel time have not been allowed. While the WR&R provide for variances from this requirement, DEP has not yet issued any at this point in time. This is a significant issue for DEP as other projects besides Bedford's, which are necessary to correct water quality problems, are impacted. If DEP doesn't modify its interpretation the expansion of the WWTP would be limited to its current SPDES permit limit of 500,000 gpd plus the total of 115,500 gpd included in the SPDES permits for the four other facilities shown in Table 3-1, above.

3.2 PROPOSED SEWER DISTRICT BOUNDARIES

Previous studies, considered sewer service areas that varied from only the downtown commercial and business districts of the two hamlets to more extensive areas including most properties situated over the primary drinking water aquifer and residential areas along the sides of the valley. Proposed wastewater treatment facilities varied from an expanded, Yonkers treatment plant to a new treatment plant located in the vicinity of the Taconic and Bedford Hills Correctional Facilities sites. The sewer district proposed in the Hudson Engineering Report would have installed sewers in the densely developed, downtown portions of the area and provided septic system pump-out services for the outlying properties.

Inasmuch as failing septic systems have been documented in essentially all areas of the two hamlets, and soil and other site conditions make it extremely difficult, if not impossible, to design and construct septic systems that meet modern design and operating standards for most of the smaller lots in the area, sewers should be provided for as much of the densely developed sections of the hamlets as is economically feasible. In addition, sewers should be provided to serve St. Mary of the Assumption School, Katonah Elementary School, the Bedford Park Apartments, and the Bedford Lake Elderly and Diversified Housing complexes so that the need to construct and operate advanced wastewater treatment plants in these residential areas can be eliminated.

The boundaries of the proposed sewer district are shown on Plate 1. The proposed boundaries have been selected to follow the boundaries of zoning districts in some instances, minor drainage basin boundaries in other locations, and existing property lines in still other areas as judged appropriate to the goal of providing service to properties in areas with numerous reports of septic system failures. As noted in Section 2 and shown on Figure 2-3, the existing zoning in Bedford Hills and Katonah results in abrupt changes in lot sizes from relatively small, e.g., 1/4- or 1/2-acre lots, to large lots of 2 or more acres in some areas. Where these abrupt changes in lot sizes occur, the proposed district boundaries encompass the zoning districts with small lot sizes and excludes those districts with 1-, 2- and 4-acre zoning where a modern subsurface disposal system can more easily be constructed. Some exceptions to this rule occur where a boundary between zoning districts follows the centerline of a street and the construction of a sewer along that street to serve small lots on one side would also make sewer service available to the properties along the other side of the street where lot sizes are bigger.

As shown on Plate 1, the proposed district boundaries encompass the four properties with existing wastewater treatment plants with SPDES permits and essentially all areas in the two hamlets zoned for 1/4-acre residential lots, Two Family Residential, Village Apartments, Central Business, and Light Industrial uses. Some areas zoned for 1/2-acre residential development are also included, particularly along the westerly side of

Katonah, because these areas are almost completely built out and numerous septic system failures have been documented.

The proposed district boundaries encompass 1,520 individual properties, as recorded in the Town's tax roles. Of these, 1,428, or approximately 94 percent, are developed and 92 are listed as vacant parcels. Some properties listed as single parcels contain apartment complexes with multiple rental units, while in a very limited number of instances a developed parcel may contain only a garage or other outbuilding that is considered a taxable improvement. On the other hand, some vacant parcels cannot be built on due to topography or other physical constraints while others are owned by the adjacent property owner who purchased two adjoining lots at the time he or she moved to the area and is not likely to construct another home on the vacant parcel.

3.3 ASSESSED VALUE OF PROPERTIES WITHIN PROPOSED DISTRICT

The Town of Bedford real property tax roles indicate that the total assessed value of all properties within the boundaries of the proposed sewer district is currently $901,416,281. Tax exempt properties account for $88,662,850, or 9.8 percent of this figure, while the remainder is taxable.

4.0 PROPOSED SEWERAGE FACILITIES

4.1 GENERAL

The proposed sewage collection system for the Bedford Hills – Katonah area consists of gravity collection sewers with pumping stations and forcemains as necessary, and a limited number of grinder pumps to serve individual properties, which are located at an elevation too low to be served by the nearest gravity sewer. To treat the wastewaters collected in the new sewer system, it is proposed that the Town of Bedford acquire and expand the capacity of the New York State Department of Correctional Services' (DCS's) existing WWTP at the Bedford Hills Correctional Facility.

The sewage collection system and treatment plant expansion will be designed in accordance with the Recommended Standards for Wastewater Facilities, published by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers and adopted by New York State as a policy guideline, and applicable portions of the New York City Watershed Rules and Regulations.

4.2 ESTIMATED WASTEWATER FLOWS

4.2.1 Existing Flows

An estimate of the wastewater flow from the proposed district during its initial year of operation has been made using water meter records for the area. Public water is available to all developed properties within the proposed district. The Town of Bedford Public Water System supplies all of these properties with the exception of 11 properties along the border with Mount Kisco, which are served by the Village of Mount Kisco system, and a few properties that have never connected to the Town's water mains and still rely on private wells for potable water.

The quarterly water meter records from the Town water system and semi-annual records for the properties served by the Mount Kisco system in 2002 were reviewed to obtain water use data, and an allowance of 280 gallons per day (gpd) per house was added to account for water used in homes within the proposed sewer district that are still using private wells. These data show that water use in the proposed sewer district averaged approximately 512,500 gpd in 2003.

Not all of the water distributed to customers will be collected in a sewer system. A portion is used for watering lawns, washing cars, and similar purposes. Typically, from 80 to 90 percent of the water used returns as sewage. To this amount must be added an allowance for infiltration of from 100 to 200 gallons per day per inch of pipe diameter per mile of pipe, or from 16,000 to 32,000 gallons per day for the approximately 20 miles of sewers needed to serve the area. Accordingly, the wastewater flow during the initial year of operation of the system is estimated to range as follows:

Low Estimate:	Water use: 80% X 512,500 gpd =	409,600
	Infiltration at 100 gpd/inch diam./mile =	16,000
	Total	425,600 gpd
High Estimate:	Water use: 90% X 480,500 gpd =	461,250
	Infiltration at 200 gpd/inch diam./mile =	32,000
	Total	493,250 gpd

4.2.2 Future Flows

Over time, it is anticipated that many of the vacant lots within the proposed sewer district will be developed. If all of the 92 vacant lots are developed and produce an average of 275 gallons of wastewater per day per lot, an additional flow of 25,000 gpd will result.

Other sources of potential wastewater flows are from the four entities with existing SPDES permits. A comparison of the current wastewater flow, estimated based on water use without discounting this number for water that does not return to the sewers, to the amount of flow that these entities are permitted to discharge under their current SPDES permits, is shown in Table 4-1.

TABLE 4-1 COMPARISON OF ESTIMATED PRESENT FLOW TO PERMITTED DISCHARGES FOR FACILITIES WITH EXISTING SPDES PERMITS		
Facility Name	**Estimated Wastewater Flow (gpd)**	**Permitted Discharge (gpd)**
Katonah Elementary School	7,650	13,000
Bedford Park Apartments	10,000	19,500
St. Mary's of the Assumption	0 (School has been closed)	63,000
Bedford Lake	14,400	20,000
Totals	**32,050**	**115,000**

Although the total permitted wastewater flow from the facilities shown in Table 4-1 amounts to 115,000 gpd, the present water use at these properties is estimated to total only about 32,000 gpd and only from 80 to 90 percent of that water would be expected to return as sewage. If all of these facilities were to expand to utilize all of their wastewater capacity, the flow would increase by at least 83,000 gpd.

In summary, the average daily future flow from the proposed sewer district will consist of the current average daily flow of from approximately 425,000 to 493,000 gpd plus up to about 25,000 gpd from currently vacant lots, assuming some are developed, and up to about 83,000 gpd from the facilities with existing SPDES permits for a total estimated flow of from 533,000 to 601,000 gpd. Since it is unlikely that all existing lots will ever be developed or that all of the currently permitted discharges will reach the maximum discharge limits stated in their SPDES permits, the high end of the range of estimates is judged too conservative. Alternately, the low end of the estimate may be too low, given the current trend of expanding existing houses and adding new water using devices. Therefore, an estimate of 550,000 gpd will be used for the future average daily flow from the proposed sewer district.

4.3 PROPOSED SEWER LAYOUT

A preliminary sewer layout for the proposed district is shown on Plate 2. As shown on this Plate, the system will consist primarily of gravity sewers to collect and convey wastewaters from the homes and businesses. In some areas, the homes along one side of a street are much lower in elevation than those on the opposite side. Two options are available to serve the low-lying homes in these and a limited number of other areas: install the gravity sewer at sufficient depth to permit serving the low-lying home by gravity, or install a grinder pump close to the existing home's septic tank and pump the wastewater to the gravity sewer in the street. In either event, the existing septic tanks and subsurface disposal fields currently used for wastewater disposal should be removed from service when the property owner connects to the new sewers.

Because the topography within the proposed district is so variable, six pumping stations are needed to pump the wastewater to the proposed treatment plant site at the Bedford Hills Correctional Facility's existing wastewater treatment plant. Each of these pumping stations will be designed for a maximum daily flow equal to from 2.5 to 3.0 times the estimated future average daily flow from its tributary area and will contain a minimum of two pumps, one of which will be on stand-by at all times in the event of a failure of the lead pump. Table 4-2 provides preliminary sizing data for each of these pumping stations.

An emergency power generating unit will be installed at each pumping station so that no sewage overflow will occur during power outages. These generators will be self-contained in exterior, weatherproof housings and will be driven by engines operating on either diesel fuel or natural gas, whichever is more economical.

TABLE 4-2 PROPOSED PRELIMINARY DESIGN DATA WASTEWATER PUMPING STATIONS			
Pumping Station Designation	**Future Average Daily Flow (gpd)**	**Proposed Design Capacity (gpd)**	**Proposed Design Capacity (gpm*)**
A	35,250	100,800	70
B	54,350	158,400	110
C	253,000	648,000	450
D	255,600	648,000	450
E	166,650	450,000	312
F	55,400	144,000	100

*Gallons per minute.

4.4 PROPOSED WASTEWATER TREATMENT SYSTEM

The Town proposes to acquire the DCS's existing WWTP at the Bedford Hills Correctional Facility and expand this plant to provide the additional capacity needed to serve the proposed town sewer district. This treatment plant currently serves both the Bedford Hills and Taconic Correctional Facilities plus a limited amount of flow from a rest area along I-684. Preliminary discussions with DCS indicate that the Department would be willing to turn this plant over to the Town, provided that the Town is willing to operate it to treat the flow from the correctional facilities. The treatment plant is currently operated by U.S. Filter, Inc., under an operating contract with DCS.

An evaluation of the existing treatment plant was undertaken prior to recommending that it be expanded for use in treating wastewaters collected in the proposed sewer district. A complete report on this evaluation is included in Part 2 while a summary of its findings and recommendations is presented in this report.

In 2002, the Bedford Hills and Taconic Correctional Facilities' treatment plant was upgraded to the meet the *Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and its*

Sources. This upgrade included the installation of membrane microfiltration, ultraviolet disinfection, cascade aeration, a new grit chamber, and influent and trickling filter feed pumps. DCS is currently upgrading the remote fine screens with the addition of grinders and microstrainers. The plant currently consists of the following:

- Parshall Flume Metering System.
- Vortex Grit Chamber.
- Equalization Basins (2 tanks, 87,400 gal. total capacity).
- Influent Pumps (3 at 350 gpm each).
- Static Screens (2 at 360 gpm each).
- Primary Clarifiers (2, rectangular basins).
- Trickling Filter Feed Pumps (2 at 700 gpm).
- Trickling Filters (2 each, 16 ft. depth of plastic media).
- Secondary Clarifiers (2, rectangular tanks).
- Rapid Sand Filters (3 high rate cells at 500 gpm each).
- Microfilter Feed Pumps (2 at 700 gpm each).
- Membrane Filters (3 filter units, at 500 gpm each).
- Ultraviolet Disinfection.
- Cascade Aeration.
- Sludge Holding Tanks (2 each, Sludge is trucked to off-site disposal).

Phosphorous removal at the plant is accomplished by chemical precipitation in the primary and secondary settling tanks through the addition of alum. Soda ash is added for pH control.

Emergency electrical power generators are available to run the plant in the event of a power outage. Two generators supply emergency power to different parts of the plant.

The treatment plant discharges to Broad Brook, a tributary to the Muscoot Reservoir. Broad Brook is currently classified as a New York State Class D stream. Its SPDES permit limits its average daily discharge to 500,000 gpd. Its estimated present discharge is approximately 316,000 gpd, based on the operational period between

January 2001 and December 2002. The peak influent hydraulic loading to the plant is unknown, as the Parshall flume flow metering device is not operating correctly.

The influent wastewater characteristics, based on two years of operational data, are as presented in Table 4-3.

TABLE 4-3

BEDFORD HILLS CORRECTIONAL FACILITY WWTF
EXISTING INFLUENT WASTEWATER CHARACTERISTICS

Parameter	Average Concentration (mg/l)*	Minimum Concentration (mg/l)	Maximum Concentration (mg/l)	Average Loading (lbs/day)	Maximum Loading (lbs/day)
BOD_5	129	104	189	329	486
TSS	146	112	290	374	744
Phosphorous	2.4	1.3	4.6	6.3	11.1
Ammonia	11.0	6.4	19.5	28.7	44.7

*Milligram per liter.

The anticipated future average daily flow from Bedford's proposed sewer district is 550,000 gpd. Assuming that DCS will wish to keep most of its present 500,000 gpd wastewater discharge allocation, the total future average daily flow to the plant, including flow from the proposed sewer district, will be 1,050,000 gpd, or approximately 1.0 million gallons per day (mgd). Based on a peaking factor of 2.5, the peak hourly flow to the plant is anticipated to be approximately 2.50 mgd.

As reported in *Wastewater Engineering Treatment, Disposal and Reuse, Third Edition*, typical municipal wastewater has the following characteristics presented in Table 4-4:

TABLE 4-4 TYPICAL CHARACTERISTICS OF MUNICIPAL WASTEWATER			
Parameter	**Weak Concentration (mg/l)***	**Medium Concentration (mg/l)**	**Strong Concentration (mg/l)**
BOD_5*	110	220	400
TSS**	100	220	350
Phosphorous	4	8	15
Ammonia	12	25	50

*Biochemical Oxygen Demand over a 5-day period.

**Total Suspended Solids

Assuming that the wastewater component from the Town of Bedford has medium strength characteristics, as the majority of flow will be residential and commercial, the average future influent wastewater characteristics can be determined by combining the current DCS flows and concentrations with future Town flows and concentrations. The estimated design characteristics are presented in the Table 4-5.

TABLE 4-5 DESIGN INFLUENT WASTEWATER CHARACTERISTICS		
Parameter	**Average Concentration (mg/l)**	**Average Loading (lbs/day)**
BOD_5	200	1,670
TSS	200	1,670
Phosphorous	5	45
Ammonia	20	170

The current SPDES Permit for the DCS treatment plant became enforceable in February, 2003. The permit has been issued for the present wastewaters treated at the facility and would have to be revised if the Town builds sewers and expands the plant. Based on an understanding of the New York City Watershed Regulations as applied to the Croton Watershed, it is assumed that the revised effluent discharge limitations for the plant would be approximately as described in Table 4-6.

TABLE 4-6

PROJECTED EFFLUENT LIMITATIONS

Parameter	**Effluent Limit**	**Comment**
Flow	1.02 mgd	30 Day arithmetic mean
CBOD5	15 mg/l	30 Day arithmetic mean
CBOD5		30 Day arithmetic mean
TSS	10 mg/l	30 Day arithmetic mean
TSS		30 Day arithmetic mean
Settleable Solids	0.1 ml/l	Daily Maximum
PH	6.5 – 8.5	Range
Fecal Coliform	200/100 ml	30 day geometric mean
Fecal Coliform	400/100 ml	7 day geometric mean
Fecal Coliform	750/100 ml	Daily maximum
Dissolved Oxygen	4.0 mg/l	Daily minimum
Total Phosphorous	0.18 mg/l as P	30 Day arithmetic mean
Ammonia (as NH_4)	1.5 mg/l	30 Day arithmetic mean
Turbidity	0.5 NTU	For 95 percent of samples
Turbidity	5.0 NTU	Instantaneous maximum

4.4.1 Expansion Alternatives

In order to accept the municipal wastewater from the Town of Bedford, the DCS wastewater treatment facility will have to be expanded from an average daily flow capacity of 0.5 mgd to approximately 1.0 mgd and a peak hydraulic capacity of about 1 mgd to 2.5 mgd. Expansion of the facility is feasible, and several alternatives have been considered. Each alternative expansion plan is very similar with differences only in the biological and microfiltration processes. Work items common to all alternatives are summarized in Table 4-7 and described more fully.

TABLE 4-7 WASTEWATER TREATMENT FACILITY EXPANSION ALTERNATIVES COMMON UNIT OPERATION IMPROVEMENTS	
Unit Operation	**Description**
Influent Flow Monitoring	Existing facilities are inadequate for future flows and should be replaced with a Parshall flume capable of monitoring up to 2.5 mgd.
Mechanical Screens	Existing facilities do not include screens prior to the equalization basins and mechanical screens capable of flows to 2.5 should be installed.
Vortex Grit Chamber	The existing vortex grit chamber maximum hydraulic loading is 1 mgd and should be replaced with a vortex grit chamber capable of 2.5 mgd.
Equalization	In order to adequately equalize future flows, an additional 120,000 gallons of storage should be added to the facility, which is equivalent to 20 percent of the future average daily flow. Future peak discharge should be limited to 1.5 mgd.
Influent Pump Station	The influent pump motors and impellers should be replaced to increase their output.
Fine Screens	The existing fine screens should be demolished and the primary clarifier influent piping replaced to balance the flows between the clarifiers.
Primary Clarification	A third primary clarifier should be constructed to meet Ten States Standards for future flows.
Secondary Clarification	A third secondary clarifier should be constructed to meet Ten States Standards for future flows.
Rapid Sand Filtration	Two more filtration cells and new control systems should be installed to meet Ten States Standards for future flows.
Control Building	The Control Building should be rehabilitated to meet NFPA 820, and the main electrical service should be upgraded.

Headworks

The existing headworks facility is sized for a hydraulic capacity of 1 mgd (or 700 gpm) and does not include screening facilities. The influent Parshall flume is not operational and should be replaced. A Parshall flume with a 9-inch throat should be installed to monitor influent flows. Mechanical screens with a hydraulic capacity of

2.5 mgd should be installed to remove large inorganic material and rags that will plug the influent pumps and fill the equalization basins. The existing vortex grit chamber should be replaced with a unit capable of treating hydraulic loads to 2.5 mgd. The proposed Parshall flume, mechanical screens and vortex grit chamber should be installed in an expanded headworks building.

A preliminary analysis indicates that expanding the wastewater treatment facility can be accomplished in a more cost effective manner if the existing flow equalization facilities are expanded to reduce the peak flow through the remainder of the facility to 1.5 mgd. Therefore all alternatives include 120,000 gallons of additional equalization storage volume (assuming 20 percent of the average daily flow will be sufficient to equalizes the flows) and assume that the peak hourly flow through the wastewater treatment is reduced to a rate of 1.5 mgd (or 1,050 gpm). The blowers that provide air to the existing equalization basin will have to be replaced to provide sufficient mixing and prevent the wastewater from becoming septic. The existing influent pumps are 1 year old and in good condition. Their motors and impellers can be replaced to pump 575 gpm against a TDH of 55 feet to meet the future conditions. Assuming that both the rapid sand filters and the membranes each reject approximately 5 percent of the flow to them.

Primary Clarification

The existing fine screens should be removed and screening performed as discussed previously. The influent piping to the primary clarifiers should be revised to hydraulically balance the flow to the primary clarifiers, which are currently experiencing flow balancing problems. A third primary clarifier should be constructed next to the existing primaries. At an average flow of 1.1 mgd, with one unit out of service, the surface overflow rate will be 980 gpd/ft^2. New scum troughs should be installed on both existing clarifiers.

Secondary Clarification

A third secondary clarifier should be installed with the approximate dimensions of 60 feet by 12 feet. At the peak flow of 1.5 mgd, the surface overflow rate will be approximately 720 gpd and the weir loading rate will be approximately 8,125 gpd per linear foot, assuming the same weir configuration is utilized. The sludge collection equipment in the two existing secondary clarifiers should be replaced to include surface skimmers and scum collectors.

Rapid Sand Filtration

Ten State Standards recommends a maximum wastewater application rate of 5.0 gpm per square foot. However, with the stringent wastewater discharge limitations and phosphorous removal, a wastewater application rate of 4 gpm per square foot was utilized in the original design. Expansion of the plant will require two additional, 87 square foot cells and replacement of the control systems and compressed air system. The proposed improvements will result in a wastewater application rate of 3.3 gpm per square foot at the peak flow of 1.65 mgd with one cell out of service.

Control Building

The existing control building does not meet the building code for NFPA 820 and the main electrical distribution equipment should be moved into a structure. A new, main electrical distribution building should be constructed and the existing structure should be rehabilitated to meet NFPA 820 requirements.

Three alternatives have been considered for increasing the capacity of the biological treatment processes at the plant. Each of these alternatives includes the provision of nitrification, as the current permit implies that it will be required in the near future. The three alternatives are described and compared in a separate report prepared as part of this project and are as follows:

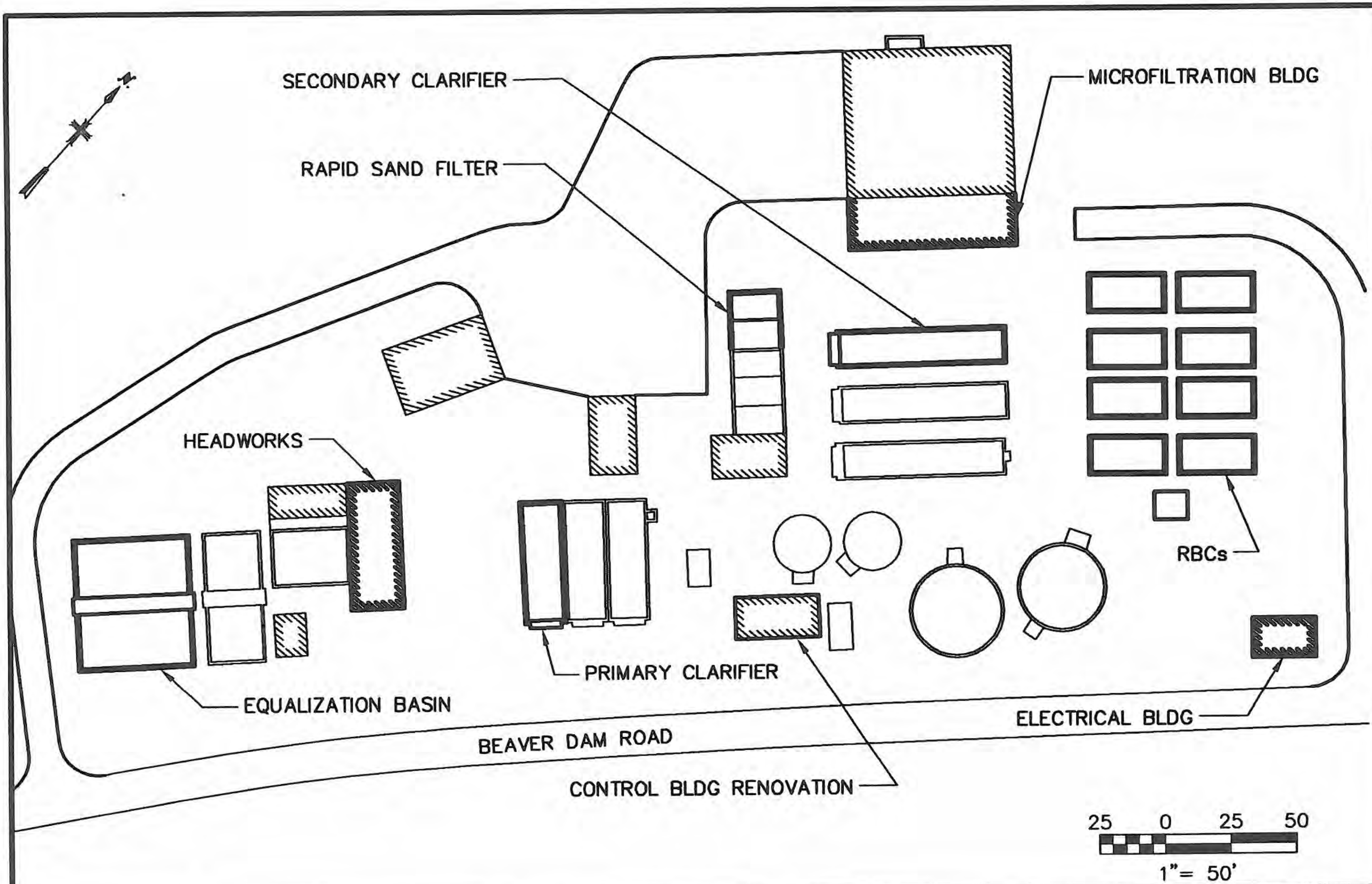
- Single stage nitrification with trickling filters.
- Rotating Biological Contactors with second stage nitrification.
- Contact Stabilization.

In addition to the increase in biological treatment capacity, an increase in the capacity of the microfiltration system will be required to achieve a firm capacity of

1.5 mgd with one unit out of service. This increase in capacity may be achieved by adding additional microfiltration units or, if acceptable to DEP, by conducting a pilot study to demonstrate that the existing filters are capable of operating at the higher rate required.

4.4.2 Recommended Expansion Alternative

The installation of rotation biological contactors with second stage nitrification is recommended as the most cost effective long-term solution to meet the wastewater treatment needs of the Town of Bedford. It is further recommended that the Town pursue pilot testing and re-rating the membrane microfiltration system with the DEP with the understanding that, should the pilot testing fail, new microfiltration units would be installed. A preliminary site plan for the expanded plant is shown on Figure 4-1 while a Process Flow Diagram for the recommended improvements is presented on Figure 4-2.

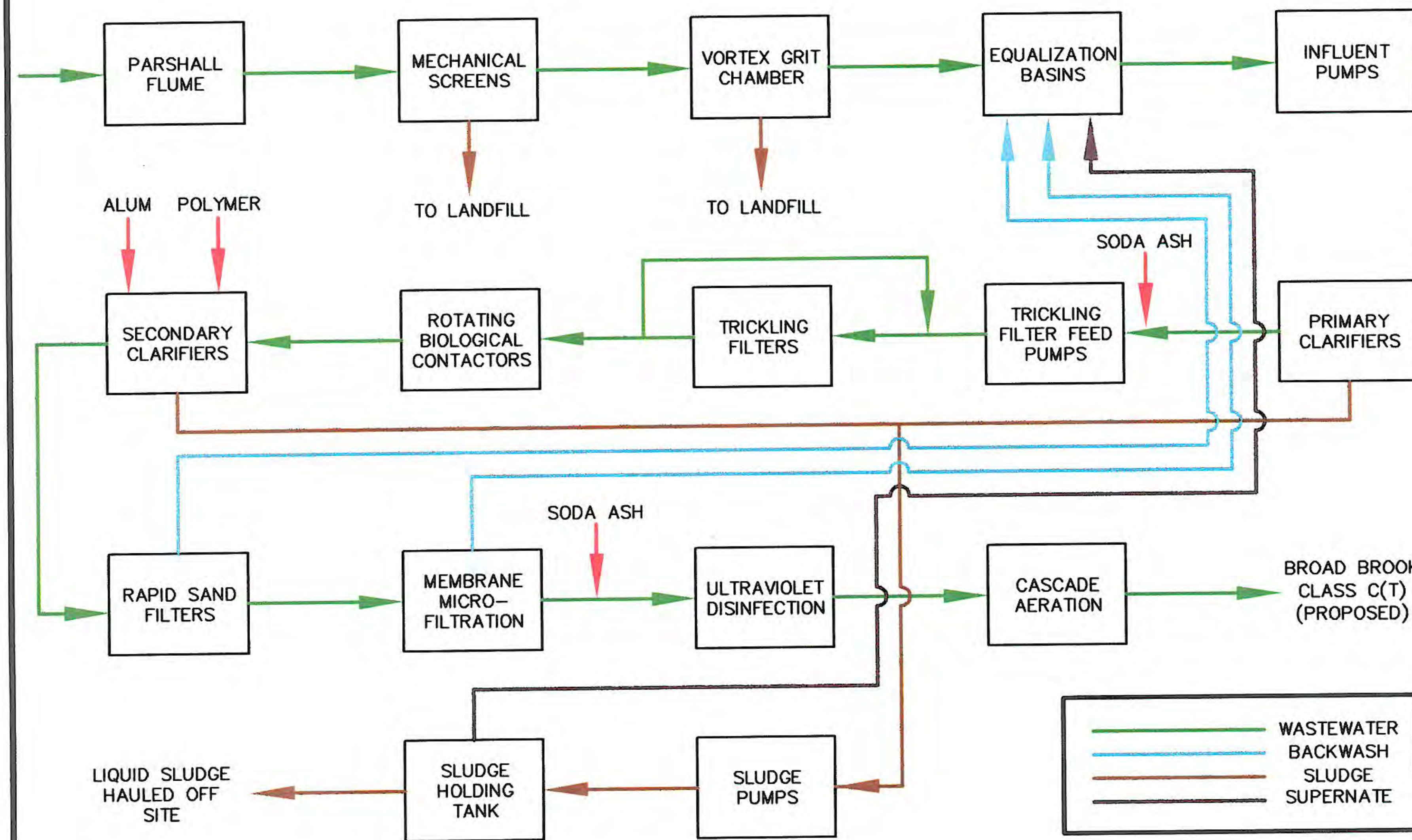


MALCOLM PIRNIE

TOWN OF BEDFORD
SEWER DISTRICT FORMATION REPORT

EXPANDED WWTF PROPOSED SCHEMATIC SITE PLAN

FIGURE 4–1



MALCOLM PIRNIE

TOWN OF BEDFORD
SEWER DISTRICT FORMATION REPORT

PROPOSED WASTEWATER TREATMENT FACILITY FLOW DIAGRAM

FIGURE 4-2

5.0 COST INFORMATION

5.1 GENERAL

One of the first questions raised when considering the establishment of a town sewer district is the cost of constructing the new sewerage system. In fact, concerns about cost were one of the major reasons that a sewer district was not formed following the publication of the Hudson Engineering report in 1990. Since 1990, construction and engineering costs have increased in pace with the cost of living, and costs are as valid a concern today as they were in the past. To address this issue, the Town has taken a number of important steps. These include expanding the area to be served to spread the cost over more property owners and aggressively pursuing negotiations for financial assistance from Westchester County, the DEP and the DCS to reduce the local share of costs. In addition, by expanding the existing DCS WWTP and agreeing to provide wastewater treatment service for the prisons as a town sewer district function, some of the fixed costs associated with operating a wastewater treatment plant will be shared by the State.

As noted in Section 1 of this document, Town Law requires that a map, plan and report be prepared and filed with the Town Clerk for public inspection before a town sewer district is established. The law also requires that the maximum amount to be expended by the sewer district be stated, together with an estimate of the annual cost to a typical property owner in the district. Capital and operating cost data are provided in this section, while financing and an opinion of the annual cost to a typical property owner are addressed in Section 6.

5.2 CONSTRUCTION COSTS

An opinion of the probable costs for constructing the proposed sewage collection system and expanding the existing DCS WWTF are presented in Tables 5-1 and 5-2, respectively. All costs shown in these tables are estimated on the basis of the conceptual designs discussed in Section 4 and historic prices for similar projects in the area. They are presented as current (Summer 2003) costs and can be expected to increase in line with the consumer price index until such time as the project is bid.

As noted in Table 5-1, the probable cost for constructing the sewage collection system is estimated at $19,250,000. Of this amount, approximately $17,534,000 is for the construction of the gravity sewers, force mains and pumping stations. The remaining $1,716,000 is for grinder pumping systems to serve properties too low to drain by gravity to the sewers and service laterals from the sewers or grinder pumping units to the property line. The cost does not include construction of the connections from homes or other buildings to the ends of the service laterals at grinder pumping units or the property line or of abandoning existing septic systems. These costs are typically borne directly by the property owner, who must arrange with a local contractor for his connection to the service lateral and for having his septic tank pumped out and removed or filled with sand and gravel.

TABLE 5-1

OPINION OF PROBABLE CONSTRUCTION COSTS
WASTEWATER COLLECTION SYSTEM

Description	Quantity	Unit Cost	Total
8 and 10 inch PVC Sewer	107,400 l.f.	$98.80	$10,611,200
48-inch Precast Manholes	447 ea	2,500 ea.	1,117,500
6-inch Service Laterals	1500 ea.	$1000 ea.	1,500,000
Pump Sta. A	1 ea	L.S.	280,000
Pump Sta. A, 4-inch Forcemain	1,400 l.f.	$80/l.f.	112,000
Pump Sta. B	1 ea.	L.S.	300,000
Pump Sta. B, 4-inch Forcemain	920 l.f.	$80/l.f.	73,600
Pump Sta. C	1 ea	L.S.	400,000
Pump Sta. C, 8-inch Forcemain	8,700 l.f.	$132.75/l.f.	1,155,000
Pump Sta. D	I ea.	L.S.	375,000
Pump Sta. D, 10-inch Forcemain	1,300 l.f.	$130/l.f.	169,000
Pump Sta. E	1 ea.	L.S.	275,000
Pump Sta. E, 8-inch Forcemain	2,450 l.f.	$110/l.f.	269,500
Pump Sta. F	1 ea.	L.S.	225,000
Pump Sta. F, 5-inch Forcemain	2,600 l.f.	$90/l.f.	234,000
RR and Major Highway Crossings	1,300 l.f.	$500/l.f.	650,000
Grinder Pump Units	20 ea.	$9,000 ea.	180,000
1-1/4 inch Pressure Sewer	1200 l.f.	$30/l.f.	36,000
Air Relief Structures and Valves	6 ea	$3,000 ea.	18,000
Valve Boxes and Valves	6 ea	$3,200 ea.	19,200

TABLE 5-1 (Cont'd) OPINION OF PROBABLE CONSTRUCTION COSTS WASTEWATER COLLECTION SYSTEM			
Description	**Quantity**	**Unit Cost**	**Total**
Rock Excavation	20,000 C.Y.	$50/C.Y.	1,000,000
Allowance for Utility Relocation		L.S.	250,000
Total Construction Cost			**19,250,000**

The probable cost of expanding the existing WWTP at the Department of Correctional Services facilities is shown in Table 5-2 to be approximately $7,000,000. The total construction cost for the sewage collection system and plant expansion is estimated at approximately $26,250,000.

TABLE 5-2 OPINION OF PROBABLE CONSTRUCTION COSTS EXPANSION OF WASTEWATER TREATMENT FACILITY			
Item	**Quantity**	**Unit Cost**	**Total**
Influent Flow Meter	L.S.		$81,000
Influent Screens	L.S.		136,000
Vortex Grit Chamber	L.S.		168,000
Equalization Basins	L.S.		600,000
Influent Pumps	L.S.		83,000
Primary Clarifiers	L.S.		326,000
Rotating Biological Contactors	L.S.		1,890,000
Secondary Clarifiers	L.S.		361,000
Rapid Sand Filters	L.S.		435,000
Microfiltration	L.S.		895,000
Headworks Building	1,800 SF	$250/ SF	450,000
Microfiltration Building	1,800 SF	$250/ SF	450,000
Electrical Building	500 SF	$250/ SF	125,000
Demolition Work	L.S.		500,000
Electrical Upgrade	L.S.		200,000
SCADA Upgrade	L.S.		100,000
Control Building Renovation	L.S.		100,000
Maintenance of Flow	L.S.		100,000
Total Construction Cost*			**$7,000,000**

Exclusive of grants and financial contributions from the Department of Corrections Services, New York State Environmental Facilities Corporation, and New York City Department of Environmental Protection.

5.3 PROJECT COSTS

Construction costs are only a part of the total capital expenditures incurred in establishing a new sewer district and building a sewerage system. Other necessary capital expenditures include, but are not limited to the following;

- Engineering design costs, including surveying and mapping, conducting a soil boring program, facilities planning, design and permitting, assistance in obtaining bids, administering the construction contracts, conducting field oversight of the work, and preparation of record documents and operation and maintenance manuals.
- Land acquisition costs including purchase costs for pumping station sites and for easements for sewers that cross privately owned property.
- Legal and financing costs including legal fees for assisting in the establishment of the sewer district, preparing and filing deeds and easement descriptions, underwriting bonds issued for long term financing, and interest incurred on bond anticipation notes issued to pay for construction.
- Administrative costs incurred by the town in attending meetings, reviewing State Environmental Review Act documents, negotiating with state agencies, and similar, time consuming activities.

The total capital cost for a project includes all of the above items plus an allowance for construction contingencies and is traditionally referred to as the "Total Project Cost". An opinion of the Total Project Cost for the proposed Bedford Project is presented in Table 5-3. As shown in this table, the probable total project cost of the project is estimated at $39,150,000. This figure does not take into account any grants or other available financial assistance. It is presented to show the maximum amount of money that is anticipated to be expended on the project by the time it is completed and ready to be placed in service.

TABLE 5-3 OPINION OF PROBABLE PROJECT COST	
Item	**Probable Cost**
Construction of Sewage Collection System	$19,250,000
Expansion of WWTP	7,000,000
Subtotal, Construction Cost	**$26,250,000**
Construction Contingencies @ 20%	5,250,000
Land Acquisition	1,200,000
Engineering	5,000,000
Legal and Administrative	400,000
Interest During Construction	790,000
Bonding and Other Financing Costs	260,000
Total Estimated Project Cost*	**39,150,000**

Exclusive of grants and financial contributions from the Department of Corrections Services, New York State Environmental Facilities Corporation, and New York City Department of Environmental Protection.

5.4 OPERATION AND MAINTENANCE COSTS

Once the new sewerage system is placed in operation, the Town Sewer District will be responsible for operating and maintaining it. Operation and maintenance (O&M) costs include labor, electrical power, treatment chemicals, spare parts, the cost of contractual services such as telephone lines and alarm system monitoring services, consumable supplies and similar expenses. Typically, the cost of operating and maintaining a gravity sewer system is relatively low, especially when the system is new, and averages less than $600 per year per mile of pipe. O&M costs for sewers and grinder pumps are usually limited to replacing occasional broken manhole covers and responding to alarms at grinder pumping units and to homeowners complaints about clogged or plugged service laterals, and similar work.

Estimated O & M costs for the six wastewater pumping stations are shown in Table 5-4. This estimate is based on the assumption that each of the pumping stations will be visited by an operator 5 times per week, and that routine work such as mowing the lawn around the stations, recording flows from the flow meters, checking pumps, controls and the standby electrical generating system and cleaning the bar screen of rags and other debris can be done by one, full time operator. Non-routine work such as replacing pump seals or malfunctioning equipment is assumed to require ten man-days per year. Spare parts and consumable supplies are estimated at $10,000 per year for all six stations.

TABLE 5-4

ESTIMATED SEWAGE COLLECTION SYSTEM O&M COST
FOR INITIAL YEAR OF OPERATION

Description	Quantity	Unit Cost	Total
Sewer Maintenance	20 miles	$600/mile	$12,000
Pumping Station Power Costs	240,000 kw-hr/yr	$0.10	24,000
Pumping Sta. Labor Cost	2000 man-hours/yr	$32.00/hr	64,000
Spare Parts and Consumables	.	L.S.	10,000
Misc. Tools, Truck, etc.		L.S.	2,000
Total Estimated Annual Cost			**$112,000**

The estimated O&M cost for the wastewater treatment plant is shown in Table 5-5. As shown in this table, the first year cost of operating and maintaining the treatment plant is estimated to be approximately $775,000. However, this cost will be shared by the Town and the DCS, and some of the costs attributable to micro-filtration, required by the WR&R, will be reimbursed by the DEP. DCS's current operating costs are in the range of $400,000 to $500,000 per year.

The total O&M costs for the first year of operation of the new system is estimated at approximately $887,000.

TABLE 5-5
Opinion of Probable Annual Operation & Maintenance Costs

Electrical Costs	Flow (mgd)	Electrical Consumption (1000 kwh/yr)	Unit Cost ($/kwh)	Annual Cost ($/yr)
Influent Pumps	1	50	$0.10	$5,000
Trickling Filter Feed Pumps	1	60	$0.10	$6,000
Membrane Header Pumps	1	30	$0.10	$3,000
Membrane Feed Pumps	1	130	$0.10	$13,000
RBCs	1	261	$0.10	$26,100
Misc. Plant Process	1	300	$0.10	$30,000
			Subtotal	**$83,100**

Chemical Costs	Average Dosage (mg/l)	Average Flow (mgd)	Percent Solution (%)	Unit	Average Usage (unit/day)	Unit Cost ($/unit)	Annual Cost ($/yr)
Alum	206	1	na	lbs.	1,720	$0.12	$75,336
Polymer	5	1	na	lbs.	42	$3.00	$45,990
Sodium Carbonate	10	1	na	lbs.	85	$0.15	$4,654
CIP							
Sodium Hydroxide	na	1	na	lbs.	12	$0.15	$657
Sodium Hypochlorite	na	1	12.0%	gal.	1.2	$1.25	$548
Citric Acid	na	1	na	lbs.	10	$0.80	$2,920
					Subtotal		**$130,100**

Personnel Costs	No.	Personnel Salary ($/yr)	Benefits ($/yr)	Annual Cost ($/yr)
Chief Operator	1	$65,000	$27,300.00	$92,300
Shift Operator	1	$50,000	$21,000.00	$71,000
Maintenance	1	$45,000	$18,900.00	$63,900
Laborer	1	$40,000	$16,800.00	$56,800
			Subtotal	**$284,000**

Miscellaneous Costs	Basis of Cost	Annual Cost ($/yr)
Equipment Parts	2.5% of Total Equipment Value of $2,000,000	$50,000
Service Contracts	10% of Electrical, Chemical and Personnel Costs	$50,000
Vehicles	2 Vehilces @ 20,000 mi./yr. and $0.40/mi.	$16,000
Administration Supplies	1% of Electrical, Chemical and Personnel Costs	$5,000
Sludge Hauling	110,000 gallons per month @ $0.1 per gallon	$132,000
Miscellaneous	5% of Electrical, Chemical and Personnel Costs	$24,900
	Subtotal	**$277,900**

Summary		
	Annual O&M Budget	**$775,000**

6.0 ADMINISTRATION AND FINANCING

6.1 ADMINISTRATION

Administration of the new sewer district will be the responsibility of the Town Board. The actual day-to-day work may be assigned to the Department of Public Works or to a special department established solely to administer the district's activities. The important issue is not which Department in the Town is charged with the task of administering, operating and maintaining the sewerage system, but that separate financial accounts are maintained for district activities. Under State law, once the sewer district is created, all expenses must be met with sewer district funds. The Town's general fund cannot be used for this purpose.

The Town may hire staff to administer, operate and maintain the sewerage system or may retain a firm that specializes in wastewater systems operation and maintenance. The existing WWTP is currently operated by a private firm under contract to DCS.

6.2 FINANCING

6.2.1 Debt Service

As noted in Section 5, the total project cost for the proposed sewer system and treatment plant is estimated at $39,150,000. This figure does not take into account any financial aid that may be available from the DEP, Westchester County, DCS, the New York State Environmental Bond Act, or other sources. As noted in Section 3 of this report, the Memorandum of Agreement between DEP and the municipalities in the New York City Watershed provides funds for certain water quality improvement projects. Specifically, the DEP has set aside funds for adding advanced treatment processes to the four WWTPs with existing SPDES permits in the proposed district: Katonah Elementary School, Bedford Hills Apartments, Bedford Lake Housing Project and St. Mary of the Assumption parochial school. In addition, the DEP provided funds to Westchester County for water quality improvement projects in areas with failing septic tanks. Funding should be available from these programs to reduce the local share of project costs, but the actual amount that may be obtained is under negotiation and is not, as yet, known.

Inasmuch as the amount of financial aid available to Bedford will not be known until negotiations with DEP, DCS and Westchester County are completed, the local share of total project costs to be financed and the debt service costs that must be met through charges to sewer district property owners cannot be calculated. The maximum amount can be estimated, however, on the assumption that no aid is received. Under this assumption, the entire estimated project cost of $39,150,000 would have to be financed by the sewer district. Estimates of the annual charges to property owners within the proposed sewer district have also been made on the basis of different levels of financial assistance.

Municipal bonds backed by the taxing authority of the municipality, or ad valorem bonds, are usually issued to finance public works projects such as the sewerage system proposed for Katonah and Bedford Hills. The term of the bonded indebtedness can be up to 30 years and, given the very low potential for any significant population growth in the proposed district, a 30-year bonding period has been assumed herein. Although Town Finance Law allows flexibility in the selection of a debt retirement schedule, equal annual payments have been assumed for the purpose of estimating the annual debt service on the bonds.

The interest paid to municipal bond holders is tax free and, as a result, the interest rate paid by the municipality is generally low. For estimating purposes, an interest rate of 4 percent has been selected.

Under the assumption that the total estimated project cost of $39,150,000 will be financed by the issuance of 30 year, ad valorem serial bonds with an interest rate of 4 percent and equal annual payments, the debt service would be $2,264,000 per year. This amount would have to be raised each year by the property owners within the proposed sewer district through sewer rents or some other form of assessment.

It is anticipated that grants totaling at least $20,000,000 will ultimately be obtained to assist in financing the cost of the project. If this amount is obtained, the local share of the project costs would be reduced to $19,150,000 and the annual debt service would be $1,107,500.

6.2.2 O&M Costs

In addition to the revenues needed to pay debt service, the sewer district must raise enough money to cover the cost of operation and maintenance of the system. As noted in Section 5-4 of this report, the estimated O&M cost during the initial year of operation of the proposed system consists of $112,000 for the sewage collection system and $775,000 for the expanded WWTP for a total of $887,000.

The Memorandum of Agreement requires DEP to pay for any added annual expenses related to operating and maintaining advanced treatment processes at those plants that must install them to comply with the WR&R. Thus, the costs associated with operating the microfiltration units at the recently upgraded WWTP serving the Taconic and Bedford Hills Correctional Facilities will be paid for by DEP, and it is expected that DEP will reimburse the Town sewer district for the cost of operating and maintaining the advanced treatment processes necessary to serve the Town as part of the proposed plant expansion. This, plus payments from DCS for treating the wastewaters from the two correctional facilities and from New York State for treating the wastewaters from the I-684 rest area will result in a reduction in the annual O&M costs born by the property owners in the proposed sewer district.

In order to estimate the share of the O&M cost that will be borne by sewer users in the proposed new district, it has been assumed that DCS will contribute at least as much toward the O&M costs as it is currently paying to operate the plant. The DCS budget for 2003 shows that the current cost is approximately $430,000. Annual payments of $100,000 by DEP for operating the advanced treatment processes at the expanded plant and a payment of $20,000 from New York State for treating the I-684 rest area wastewater have also been assumed. Thus, the amount of the estimated, $887,000 O&M cost which must be raised from charges to properties in the sewer district is estimated at $337,000 during the first year of operation.

6.2.3 Typical Homeowner Cost

The proposed sewer district will serve approximately 1520 individual lots, some of which contain two family homes, apartment complexes, schools, commercial establishments and similar facilities which produce more sewage than an average, single family home. To account for this difference in wastewater flows from various categories of sewer users and to achieve a degree of fairness in issuing bills for sewer use, municipal governments have developed the concept of an "equivalent dwelling unit." Under this concept, a large water user is considered to be equal to a number of single family homes based on the amount of flow it produces. For example, if a single family home produces, on average, 250 gallons of wastewater per day, a commercial establishment that produces four times that amount would be considered equivalent to four, single family homes for billing purposes. Similarly, a two-family home would be considered as two equivalent dwelling units, and an apartment complex containing 25 apartments would be considered as 25 equivalent dwelling units. The minimum of one equivalent dwelling units is usually assigned to any property connected to the sewer system, although in some cases sewer districts have considered a single bedroom apartment unit as equivalent to 0.9 single family homes where a number of such units are located at one apartment complex and water use records indicate that the average water use per unit is significantly less than that used by the typical home.

In Bedford Hills and Katonah, water use records indicate that, on average, a single family home uses about 275 gallons of water per day. If from 80 to 90 percent of this water is discharged to the sewers, the sewage produced by this average home will range from 220 gallons per day to 247.5 gallons per day. Traditionally, a figure of 225 to 250 gallons per day is used to calculate the number of equivalent dwelling units assigned to a large water user where a count of dwelling units is not possible. To estimate the number of equivalent dwelling units in the proposed Bedford sewer district, a figure of 250 gallons per day has been used. Using this figure, it is estimated that approximately 2,000 equivalent dwelling units will be served by the new sewerage system, excluding the correctional facilities and the I-684 Rest Area, which are outside the proposed district limits and would be served by contract.

In order to estimate the initial year's cost for the sewerage system to a typical, single family home owner, an estimate of the total annual cost must be made. The total annual cost to the sewer district for the initial year of operation, referred to as the "first year total annual cost," is made up of debt service on the ad valorem bonds plus the first year cost for O&M. Table 6-1 summarizes these costs and shows the estimated breakdown of O&M costs between the proposed sewer district, DCS and DEP. Two different levels of debt service are shown in this Table, based on different assumptions regarding the amount of financial aid received, and the effect on the first year cost to a typical homeowner is also shown.

TABLE 6-1

ESTIMATED COST TO TYPICAL SEWER USER

Description	**Total**
Case 1: No Agency Contribution	
Total Project Cost	$39,150,000
Local Share of Total Project Cost	$39,150,000
Annual Debt Service*	*$2,264,000
First Year O&M Cost	$887,000
O&M Cost Paid by DCS and NYS	-$450,000
O&M Cost Paid DEP	-$100,000
O&M Cost Raised from District Property Owners	$337,000
Total First Year Cost to District Property Owners (Annual Debt Service + O&M Raised from District)	$2,601,000
Estimated EDUs in Sewer District	2000
First Year Cost per EDU	**$1,301**
Case 2: $20,000,000 in Agency Contribution	
Total Project Cost	$39,150,000
Financial Aid Received	$20,000,000
Local Share of Total Project Cost	$19,150,000
Annual Debt Service	$1,107,500

TABLE 6-1 (Cont'd) ESTIMATED COST TO TYPICAL SEWER USER	
Description	**Total**
O&M Cost Raised from District Property Owners	**$337,000
Total First Year Cost to District Property Owners	$1,444,500
Estimate EDU's in Sewer District	2,000
First Year Cost per EDU	**$722**

*** Based on 30 year bonds at 4% interest**

**** See Case 1 for breakdown of total O&M cost.**

APPENDIX A

Wastewater Treatment Plant Capacity Analysis

MALCOLM PIRNIE

DRAFT

WASTEWATER TREATMENT PLANT CAPACITY ANALYSIS

Town of Bedford, New York

2

Prepared by:

Malcolm Pirnie, Inc.
104 Corporate Park Drive
White Plains, New York 10602

July 2003
4711001

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LIST OF ATTACHMENTS

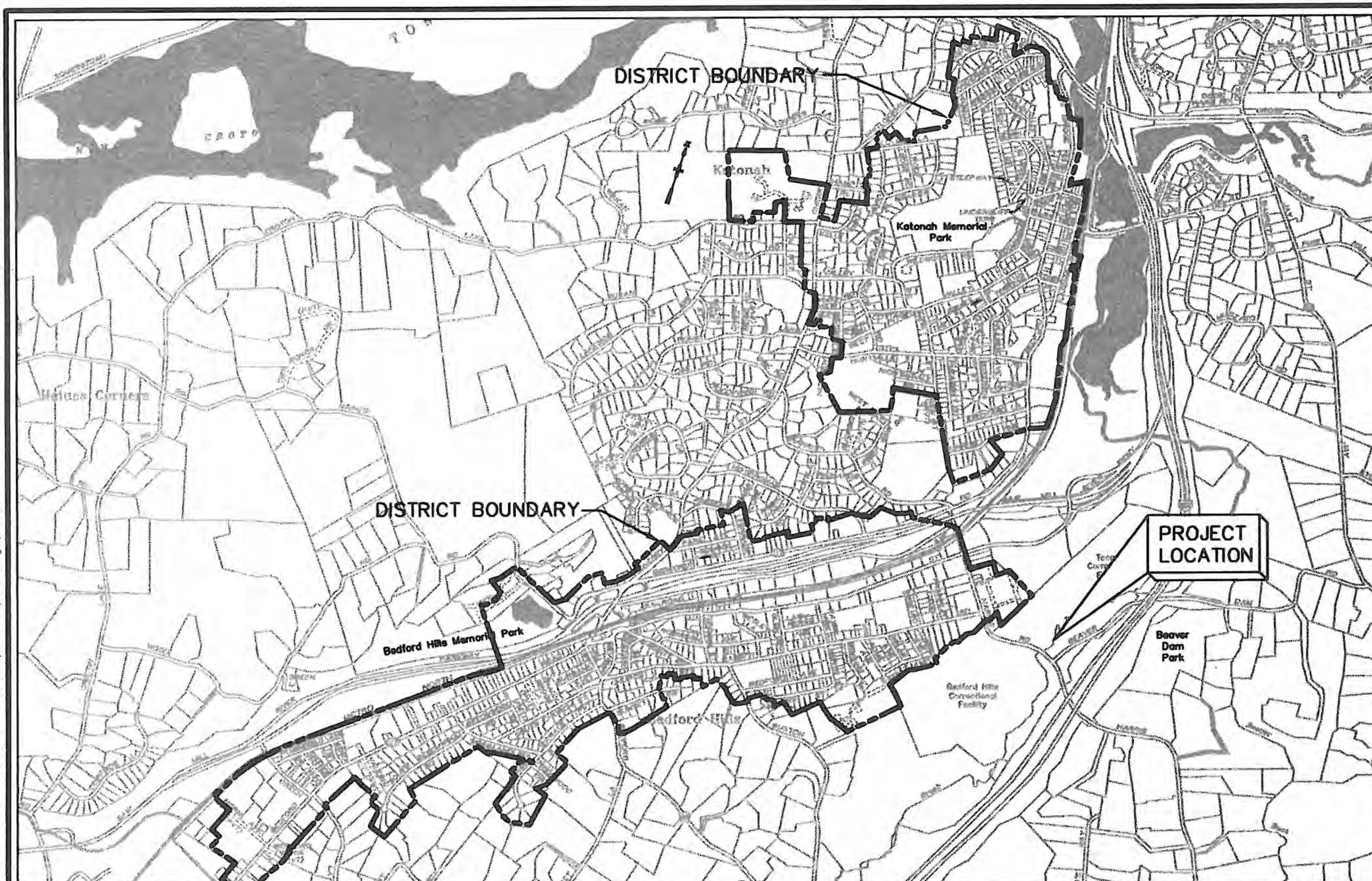
1.0 INTRODUCTION

The Town of Bedford (Town) has retained the services of Malcolm Pirnie, Inc. (Malcolm Pirnie) to prepare a Sewer District Formation Report for the potential formation of a sewer district to serve the higher-density, developed areas and areas susceptible to frequent failures of on-site subsurface disposal systems in the hamlets of Bedford Hills and Katonah. Pursuant to the recommendations of the Sewer District Formation Report, expansion and upgrade of the existing Bedford Hills wastewater treatment facility (WWTF), owned by the New York State Department of Correctional Services (DCS), is being considered to treat the proposed flows. This Capacity Analysis (Analysis) is a summary of the assessment of the existing DCS WWTF and the evaluation of alternative options for upgrading and expanding the WWTF to accept the municipal wastewater from the proposed Town of Bedford Sewer District.

The DCS WWTF currently serves the Bedford Hills and Taconic Correctional Facilities, a DCS Regional Medical Unit and a rest area along Interstate 684. The operators have reported the average daily flow to the WWTF to be approximately 320,000 gallons per day (gpd). The facility has a New York State Pollution Discharge Elimination System (SPDES) permitted capacity of 500,000 gpd as governed by SPDES Permit No. NY0101885. See Figure 1-1 for a location map of the Bedford Hills WWTF and the proposed Bedford Sewer District boundaries.

1.1 HISTORY AND BACKGROUND

The DCS WWTF was originally constructed around the turn of the century for the Westfield State Farms, prior to the construction of the Bedford Hills and Taconic Correctional Facilities. At that time the facility consisted of a screening chamber, 3 Imhoff tanks, 8 sand filters, a chlorine contact chamber and a sludge drying bed. In 1953 the WWTF was upgraded to include primary and secondary clarifiers, and a high rate trickling filter. In 1986 the headworks were upgraded to include a comminutor, bar screen, grit chamber and two equalization tanks. In addition, a sludge belt filter press



MALCOLM PIRNIE

TOWN OF BEDFORD
WASTEWATER TREATMENT PLANT CAPACITY ANALYSIS

PLANNING AREA AND WWTF LOCATION PLAN

FIGURE 1–1

was installed to replace the sludge drying beds and improve solids handling systems at the WWTF.

In 1988, the Hudson River Fisherman's Association filed a compliant against DCS for violation of the facility's SPDES Permit and the Clean Water Act. In order to settle this complaint, DCS upgraded the facility, in 1995, by installing: remote fine screens at each correctional facility, influent parshall flumes, a new grit chamber, new primary and secondary clarifiers, new high rate trickling filters, rapid sand filters, new chlorination and dechorination facilities and a new sludge belt filter press. In addition, one Imhoff tank was decommissioned, one Imhoff tank was converted to a sludge holding tank and one Imhoff tank was converted to an anaerobic digester. Phosphorous removal was achieved by the addition of alum in the primary and secondary clarifiers, and polymer was added to the secondary clarifiers to facilitate settling of chemically precipitated of phosphorous.

In 2001, the facility was upgraded once again to meet the *Rules and Regulations for the Protection from Contamination, Degradation and Pollution of the New York City Water Supply and its Sources* (NYC WR&R), as enforced by the New York City Department of Environmental Protection (NYC DEP). This upgrade included the installation of membrane microfiltration, ultraviolet disinfection, cascade aeration, a new grit chamber, new influent pumps and new trickling filter feed pumps. The upgrade is substantially complete, however, several punch list items need to be addressed. DCS is currently replacing the remote fine screens, located at each Correctional Facility, with grinders and microstrainers, in order to remove inorganic material and protect the siphons that cross the Broad Brook from solids deposition and prevent sanitary sewer overflows (SSOs).

The receiving stream is the Broad Brook, which is a tributary to the Muscoot Reservoir, a water supply reservoir for New York City within the Croton Watershed. Broad Brook is currently classified as a Class D stream by the New York State Department of Environmental Conservation (NYS DEC), however, it is proposed as a Class C stream. A Class C stream is defined as having water quality suitable for primary and secondary contact recreation (i.e., fishing) and fish propagation and survival, whereas, a Class D stream does not have to support fish propagation and typically does not have as stringent effluent discharge limitations. It is highly probable that the stream classification of Broad Brook will be upgraded in the near-term.

2.0 WASTEWATER CHARACTERISTICS

Malcolm Pirnie reviewed the monthly average data, as reported in the Daily Monitoring Reports (DMRs) prepared by U.S. Filter, Inc. for operating years 2001 and 2003 in order to determine current wastewater characteristics.

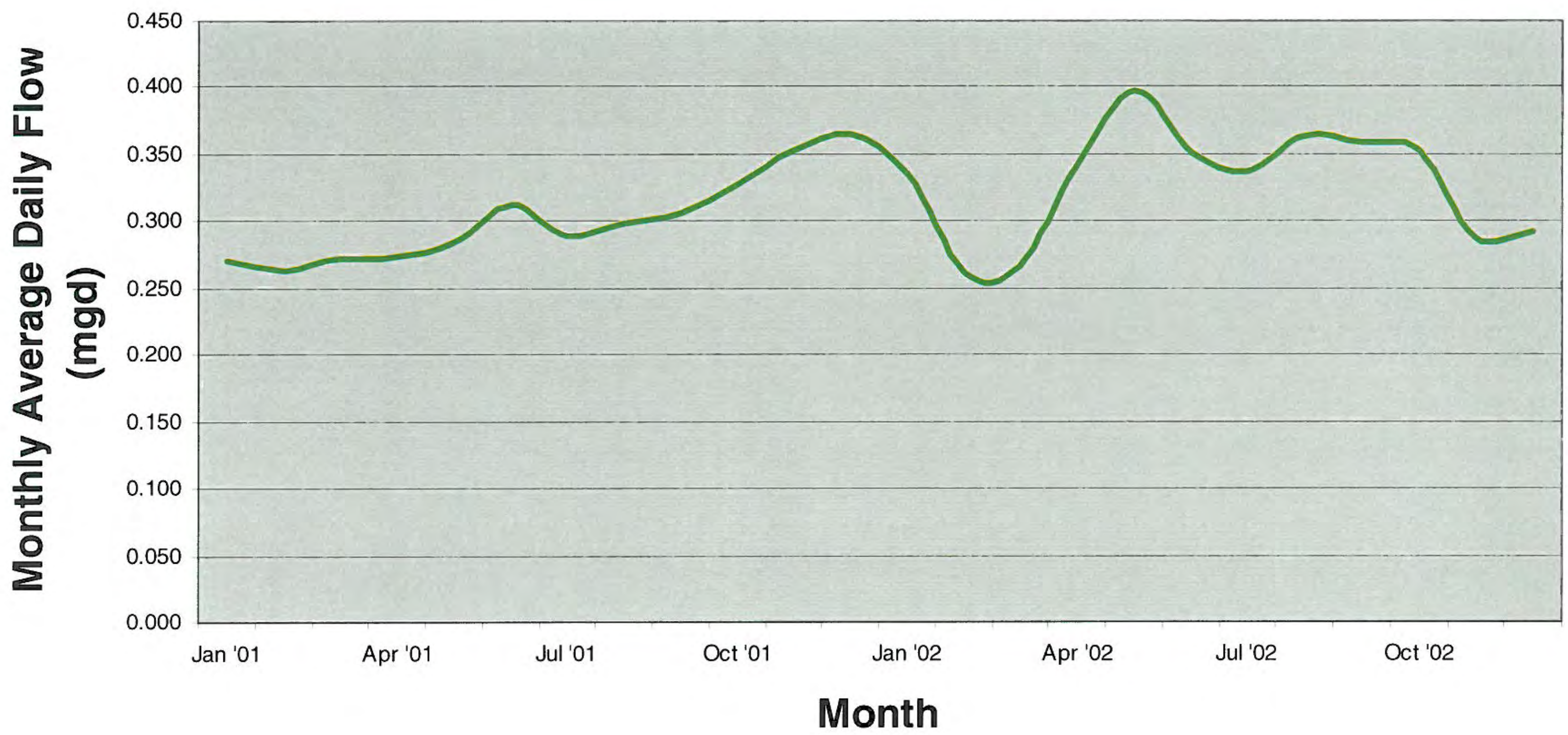
2.1 CURRENT WASTEWATER FLOWS AND LOADS

Based on the operational period between January 2001 and December 2002, the average daily flow through the DCS facility was reported as 316,000 gpd. The peak flows entering the facility are unknown, as flow monitoring for permit compliance is performed on the effluent and the only operational influent flow meter is located downstream of the equalization basins. The wastewater facility plan prepared in support of the most recent upgrade reported a peaking factor of 2,[1] which indicates a current peak hourly flow of 632,000. Based on the *Recommended Standards for Wastewater Facilities* (Ten States Standards) and a permitted average flow of 500,000 gpd, the corresponding design peak hourly influent flow to the DCS WWTF is approximately 1 million gallons per day (mgd).

The operators report that, under normal precipitation events, the influent flows do not typically increase as a result of inflow and infiltration. On occasion, during unusually large precipitation events, surface water has been reported to run down Beaver Dam Road and flow into the primary clarifiers. See Figure 2-1 for historical flows. The minimum and maximum reported monthly average daily flows are 262,000 gpd and 398,000 gpd, respectively.

Table 2-1 presents the influent wastewater characteristics as currently reported in the monthly DMRs.

[1] *Wastewater Facilities Plan for the New York State Department of Corrections Bedford Hills Correctional Facility*, Earth Tech of New York, Inc., August 2000.



MALCOLM PIRNIE	TOWN OF BEDFORD	WASTEWATER TREATMENT PLANT CAPACITY ANALYSIS	DCS WASTEWATER TREATMENT FACILITY 2001 AND 2002 MONTHLY AVERAGE DAILY FLOWS	FIGURE 2-1

TABLE 2-1 DCS WWTF INFLUENT WASTEWATER CHARACTERISTICS					
Parameter	**Minimum Concentration (mg/l)**	**Average Concentration (mg/l)**	**Maximum Concentration (mg/l)**	**Average Loading (lbs/day)**	**Maximum Loading (lbs/day)**
BOD_5	104	129	189	340	486
TSS	112	146	290	384	744
Phosphorous	1.3	2.4	4.6	6.3	11.1
Ammonia	6.4	11.0	19.5	29	44.7

The influent concentrations for the parameters listed in Table 2-1 are lower than typical municipal wastewater in systems with little infiltration and inflow. This can be attributed to the amount of water utilized for washdown practices, laundry services and bathing at the correctional facilities. There are approximately 1,400 inmates and 400 support staff in the two correctional facilities and the regional medical unit combined. Assuming that the support staff contributes approximately 35 gpd per person, the flow per capita for inmates is approximately 215 gpd per person. In municipal systems, a per capita flow of 100 gpd per person is typically utilized for planning purposes. The higher per capita flow at the correctional facilities results in lower concentrations of biological oxygen demand (BOD_5), total suspended solids (TSS), phosphorous and nitrogen (as ammonia, NH_3). See Attachment A for a summary of monthly data from the DMRs.

2.2 FUTURE WASTEWATER FLOWS AND LOADS

In order to accurately evaluate the ability of the DCS WWTF to accept municipal flows, an estimate was made of the future flows and loads anticipated from both the DCS facilities and the planning area proposed for the Town of Bedford Sewer District.

2.2.1 Department of Correctional Services Facilities

The current permitted capacity of the WWTF is 500,000 gpd, and it is assumed that DCS, although currently generating 316,000 gpd, will request an allocation for a total future capacity of approximately 450,000 gpd. The Town has requested that DCS provide an estimate of capacity the Department will require in the future, but no response has been received to date. Therefore, for evaluation and preliminary design purposes, an average daily flow of 450,000 gpd and a peak hourly flow of 900,000 gpd, will be allocated to DCS.

Future loads to the facility have been estimated utilizing current average concentrations and future allocated flows of 450,000 gpd. Using this approach, future wastewater characteristics can be attributed to the DCS facilities and are presented in Table 2-2.

TABLE 2-2

FUTURE DCS FACILITIES WASTEWATER CHARACTERISTICS

Parameter	Average Concentration (mg/l)	Average Loading (lbs/day)
BOD_5	129	485
TSS	146	550
Phosphorous	2.4	9
Ammonia	11.0	41

2.2.2 Town of Bedford Sewer District

Based on existing zoning and development, the anticipated total average daily flow anticipated from the proposed sewer district is approximately 550,000 gpd (see Sewer District Formation Report). Estimates for total average daily flow include 115,500 gpd from other existing permitted wastewater treatment facilities proposed to be incorporated into the Town of Bedford Sewer District.

A total of six pump stations will service the sewer district municipal flows. Two of these pump stations, two will discharge directly into the force main that leads to the WWTF. Therefore, peak hourly flows from the proposed Sewer District will be equal to the proposed discharge rates from these two pump stations combined. The combined peak discharge rate of the pump stations is estimated to be 900 gallons per minute (gpm) or approximately 1.30 mgd, which is equivalent to a peaking factor of 2.4.

The primary pollutants of concern in municipal wastewater are BOD_5, TSS, phosphorous and ammonia. Typical concentrations that can be expected for these conditions are shown in Table 2-3.

TABLE 2-3

TYPICAL CHARACTERISTICS FOR MUNICIPAL WASTEWATER[2]

Parameter	Weak Concentration (mg/l)	Medium Concentration (mg/l)	Strong Concentration (mg/l)
BOD_5	110	220	400
TSS	100	220	350
Phosphorous	4	8	15
Ammonia	12	25	50

[2] *Wastewater Engineering, Treatment, Disposal and Reuse, Third Edition*, Metcalf & Eddy, Inc., 1991.

Malcolm Pirnie has assumed that municipal wastewater from the Town of Bedford Sewer District will have medium strength wastewater characteristics, as the majority of flow will be from residential and commercial sources. As a result, estimated loads to the WWTF are presented in Table 2-4.

TABLE 2-4

FUTURE TOWN OF BEDFORD SEWER DISTRICT WASTEWATER CHARACTERISTICS

Parameter	Average Concentration (mg/l)	Average Loading (lbs/day)
BOD_5	220	1,010
TSS	220	1,010
Phosphorous	8	40
Ammonia	25	115

2.2.3 Combined Flows and Loads

By combining the waste streams from the correctional facilities and the proposed sewer district, the design average daily flow to the WWTF is estimated to be 1 mgd. The peak hourly flow is projected to be 2.25 mgd, assuming the peak hourly flows from the correctional facilities and the Sewer District coincide.

The average organic and solids loads to the facility were estimated from the summation of both the individual estimated loads from the DCS facilities and the proposed sewer district. Future estimated average influent wastewater characteristics, based on a total average daily flow of 1 mgd, are shown in Table 2-5.

TABLE 2-5

FUTURE WWTF INFLUENT WASTEWATER CHARACTERISTICS

Parameter	Average Concentration (mg/l)	Average Loading (lbs/day)
BOD_5	180	1,500
TSS	190	1,560
Phosphorous	6	50
Ammonia	20	160

For preliminary design purposes, a safety factor of approximately 10 percent has been added since the actual influent characteristics can vary. As a result, the WWTF influent wastewater characteristics used to assess expansion and upgrade alternatives are presented in Table 2-6.

TABLE 2-6

DESIGN WWTF INFLUENT WASTEWATER CHARACTERISTICS

Parameter	Average Concentration (mg/l)	Average Loading (lbs/day)
BOD_5	200	1,670
TSS	200	1,670
Phosphorous	10	80
Ammonia	25	210

3.0 EVALUATION OF THE EXISTING WASTEWATER TREATMENT FACILITY

Malcolm Pirnie evaluated the existing DCS WWTF by reviewing: the August 2000 Facility Plan from the most recent upgrade[1]; the 2001 Construction Drawings[2], the 1995 As Built Drawings[3], and conducting a field evaluation of the existing equipment. Refer to Figure 3-1 for a process flow diagram and Figure 3-2 for site plan of the existing treatment system layout.

3.1 WASTEWATER TREATMENT FACILITY PERFORMANCE

Malcolm Pirnie evaluated the performance of the DCS WWTF based on the DMR average monthly data provided by the operators, for the period of January 2001 through December 2002. These data are summarized in Table 3-1.

TABLE 3-1

DCS WWTF AVERAGE ANNUAL PERFORMANCE

Parameter	Avg. Annual Influent Concentration (mg/l)	Avg. Annual Influent Mass Load (lbs/day)	Avg. Annual Effluent Concentration (mg/l)	Avg. Annual Effluent Mass Load (lbs/day)	Average Percent Removal (%)
BOD_5	129	340	<4[1]	10	97
TSS	146	384	<2[1]	4	99
Phosphorous	2.4	6.3	0.17	0.46	93
Ammonia	11	29	<0.2[1]	0.53	98

[1] Results reported below the detection limit are assumed to be half the detection limit reported.

The DCS WWTF achieved its effluent discharge limits (see Attachment B) specified in the SPDES Permit for the past 2 years. Actual monthly DMR data and individual monthly average removal rates are presented in Attachment A.

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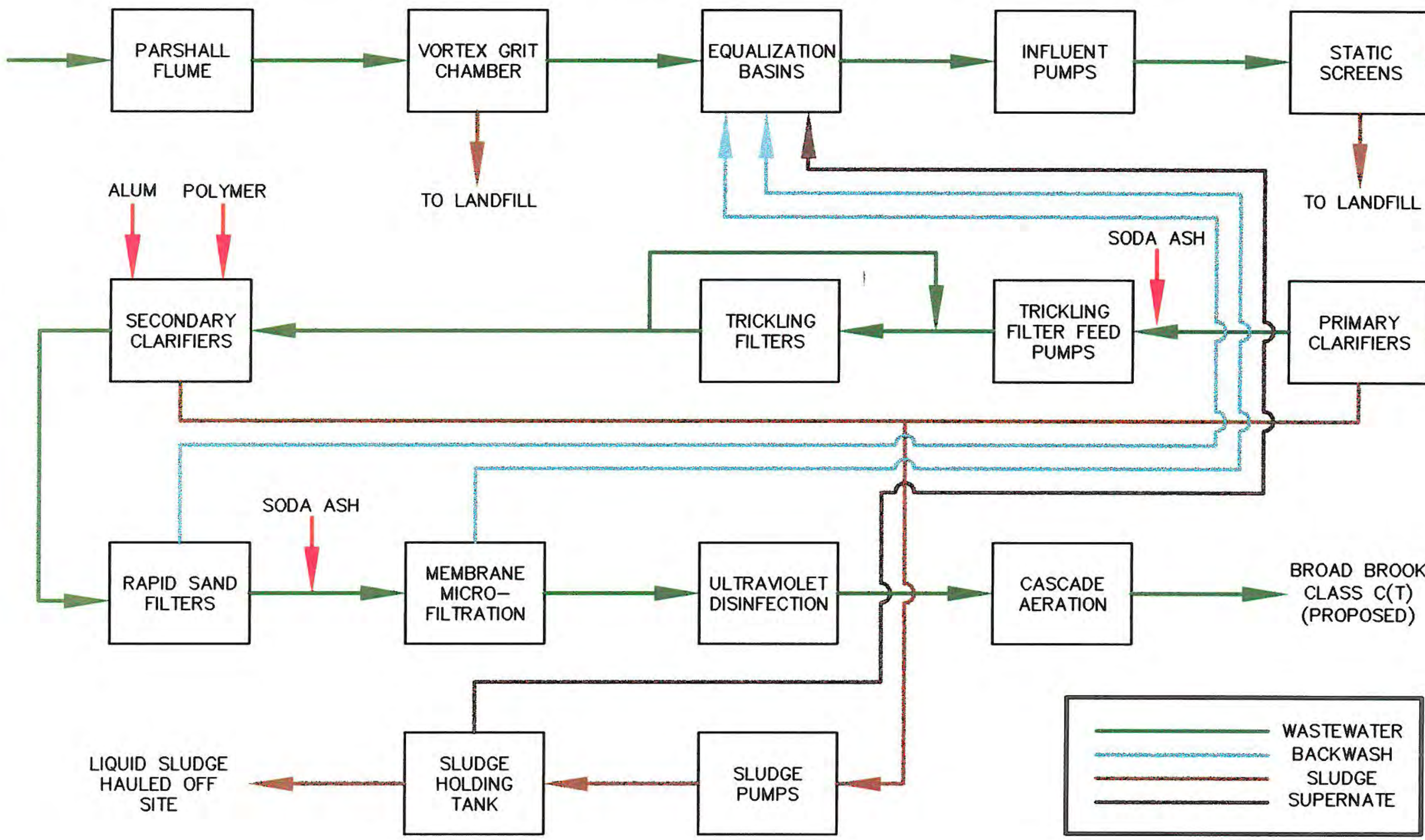
[1] *Wastewater Facilities Plan for the New York State Department of Correctional Services Bedford Hills Correctional Facility*, Earth Tech of New York, Inc., August 2000

[2] Upgrade Wastewater Treatment Facility, Contracts C, H, P, E, - Earth Tech of New York, Inc., September 2001

[3] Upgrade Wastewater Treatment Facilities Contracts G, E, Hudson Engineering Associates, P.C., March 1992



MALCOLM PIRNIE

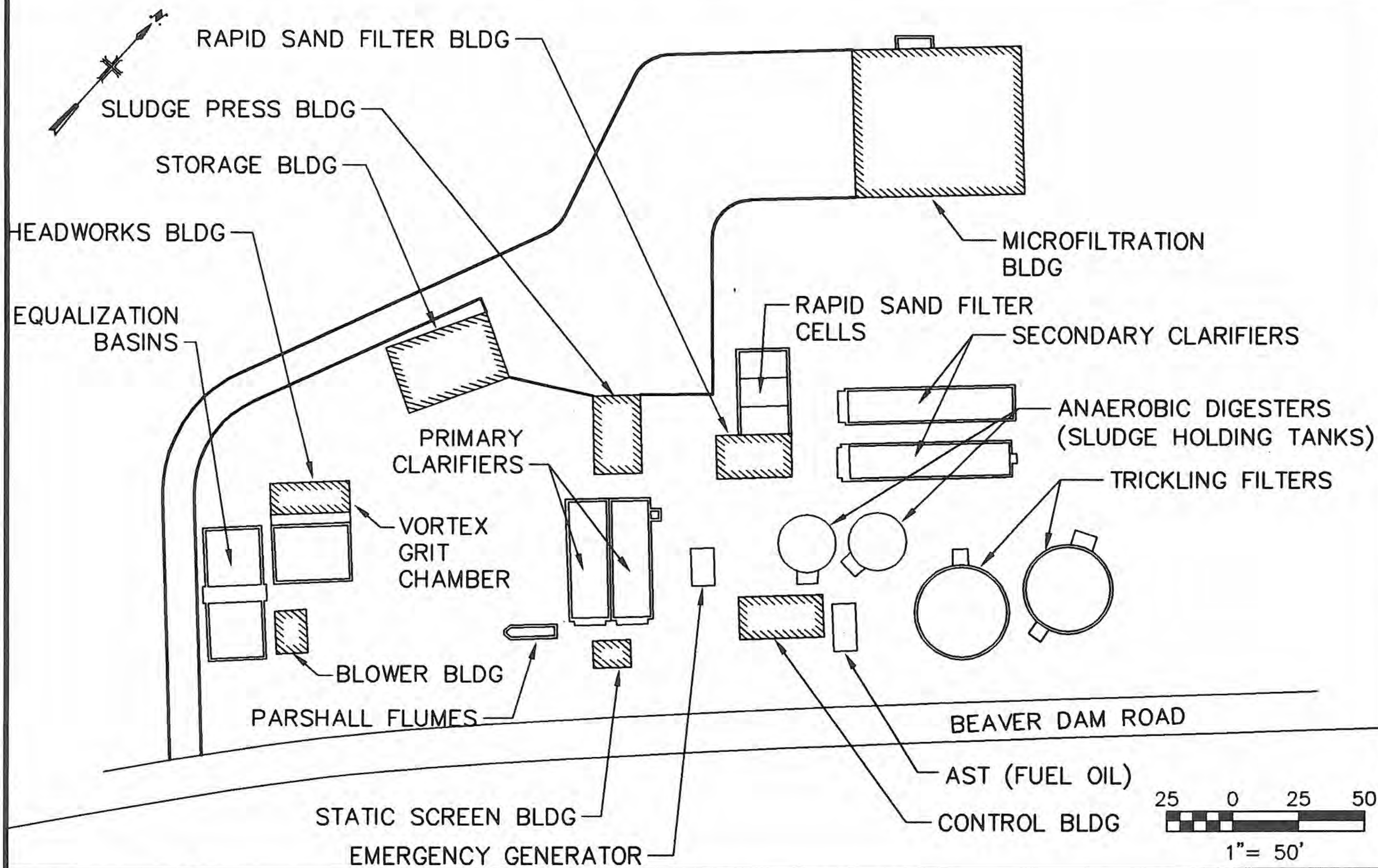
TOWN OF BEDFORD

WASTEWATER TREATMENT PLANT CAPACITY ANALYSIS

EXISTING PROCESS FLOW DIAGRAM

FIGURE 3-1

User: janeo Spec: PIRNIE STANDARD File: C:\TEMP\holding\FIG_3-2.DWG Scale: 1:1 Date: 08/15/2003 Time: 13:20 Layout: FIGURE 3-2



MALCOLM PIRNIE

TOWN OF BEDFORD
WASTEWATER TREATMENT PLANT CAPACITY ANALYSIS

EXISTING BEDFORD HIILLS WWTF SCHEMATIC SITE PLAN

FIGURE 3-2

Current performance of the DCS WWTF has been excellent, except for recent violations of the phosphorous discharge limitation. After the start up of the membrane microfiltration process on April 23, 2002, the WWTF had three reported discharges that contained phosphorous levels greater than 0.2 mg/l. It should be noted that these discharges were within the timeframe for the NYC DEP Regulatory Upgrade Program start-up phase and no violations were issued. In February 2003, the final effluent limits became enforceable. Since then, operators have increased the dosage of alum in order to chemically precipitate more phosphorous. However, the WWTF sporadically does not meet the permitted effluent limit of 0.2 mg/l for phosphorous. All other parameters are well within the limitations set forth in the current SPDES permit.

3.2 OPERATION AND MAINTENANCE

The DCS WWTF is operated by a private contract operations firm, U.S. Filter, Inc (U.S. Filter). DCS originally operated the WWTF with facility personnel, however, following the settlement with the Hudson River Fisherman's Association, DCS hired U.S. Filter to operate and maintain the wastewater treatment facility. In addition, DCS is required to staff the WWTF a minimum of 14 hours per day and respond to all alarm conditions within 1 hour when no staff is present.

The WWTF is well operated and maintained. U.S. Filter utilizes a computerized maintenance work order system to ensure that all required preventative maintenance is performed, prior to equipment failure, and that degenerative equipment conditions are detected as early as possible. The facilities are kept neat and clean.

Typically a WWTF of this size and complexity can be operated and maintained on a shorter daily schedule with 2 to 3 operators and/or maintenance personnel rotating on shifts 7 days a week. After hours response can be handled on a rotating call basis. Furthermore, if operations staff is required to maintain the collection system and pump stations, additional staff may be required as well

3.3 PHYSICAL INFRASTRUCTURE

The existing unit operations were evaluated against typical design parameters and applicable Ten States Standards recommended process parameters. The evaluation of the existing DCS WWTF as is follows:

3.3.1 Headworks

The headworks generally consists of the influent flow monitoring system, grit chamber, equalization facilities and influent pumps. There are two Parshall flumes located at the wastewater treatment facility, designed to provide influent flow monitoring for the Bedford Hills and Taconic Correctional Facilities, respectively. The liquid depth is monitored by 2 Sparling Echopac ultrasonic transducers and Echopac level transmitters, which are designed to provide continuous flow monitoring and flow totalization. A reported construction error resulted in the Parshall flumes not working correctly due to a surcharged condition, and influent flows are not monitored as a result. Several years ago, U.S. Filter relocated one of the ultrasonic transducers to monitor the liquid level in the rapid sand filter clearwell and provide flow pacing to the chlorinators for disinfection.

Since the installation of the UV disinfection system, flow pacing is no longer required. However, the ultrasonic transducer has not been relocated back to the influent parshall flume. The Parshall flumes each have a 9-inch throat and can measure flows between 0.6 and 5.7 mgd, with head conditions of 0.1 and 2 feet, respectively[4].

Grit is removed via a vortex grit separator, manufactured by Waste-Tech, Inc. The grit chamber is sized for a maximum flow of 1 mgd and a headloss of 1 inch. Conversations with the manufacturer indicate that the maximum flow through the system cannot be increased greatly without negatively impacting the grit removal rate.

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[4] *Isco Open Channel Flow Measurement Handbook*, 5th Edition, Douglas M. Grant et al., Lincoln, NE, 1997

The two equalization tanks have effective volumes of 56,200 gallons and 31,200 gallons. The larger equalization tank was constructed during the 1986 upgrade and the smaller equalization tank was constructed during the most recent upgrade, along with a 6,500-gallon wet well. The equalization tanks are utilized to reduce influent flow variations to the WWTF from the correctional facilities and provide wastewater storage for steady state processing. There are coarse bubble diffusers in the tanks that provide mixing air and prevent solids deposition. The blowers that supply air to the diffusers are housed in the Blower Building.

There are three influent, dry pit, submersible pumps, Model No. KRT K 100-251, as manufactured by KSB, Inc. that are designed to operate at 350 gpm and 26 feet of total dynamic head, assuming that two pumps are in operation. Each pump is equipped with a 10 horsepower (hp) explosion-proof, duty rated motor and variable frequency drive.

The influent pump control system employs a programmable logic controller (PLC) and utilizes proportional control to increase the flow through the WWTF as the liquid level in the equalization tanks rise. The influent pump control panel is equipped with an uninterruptible power system (UPS), to maintain PLC settings prior to the emergency generator being activated during a power outage. All control panels for the influent pump station are located in the Blower Building. Influent flows are monitored through a magnetic flow meter located downstream of the influent pumps. The magnetic flow meter is not connected to a flow recording or totalizing device and only provides instantaneous readings at the influent pump control panel.

3.3.2 Static Screens

Upstream of primary clarification, the wastewater passes through two Vulcan Stato-Screens, as manufactured by Vulcan Industries, Inc. Each screen has a capacity of 360 gpm at a suspended solids loading rate of 300 mg/l. The static screens are utilized to prevent material greater than 1.5 millimeters (mm) from passing into the primary clarifiers. The operators are currently bypassing the screens. The static screen building is very small and promotes unsanitary conditions when the screens are in use. Untreated wastewater splashes off the screens and virtually covers the inside of the building.

head of 55 feet. The pumps are controlled by a PLC based control system and variable frequency drives. The control panel has a UPS backup and the pump speed is directly proportional to the liquid level in the wet well.

There are two high rate trickling filters that achieve secondary treatment using plastic cross flow media, manufactured by Surfpac Corp. The trickling filters have diameters of 34 feet and 32.5 feet, respectively, and have a depth of 16 feet each. The trickling filters employ a rotary distributor that utilizes the dynamic reaction of wastewater discharging from the nozzles to drive the distributor arm.

Utilizing the Germain Equation to evaluate the trickling filters at a total flow of 1 mgd (assuming an equal split of flow of 500,000 gpd each unit) the overall BOD_5 removal efficiency of the trickling filters is approximately 80 percent, with an effluent concentration of 24 mg/l, or 203 lbs per day. This evaluation assumes a treatability constant of 0.088 and a wastewater temperature of 10 degrees Celsius (C). However at a total wastewater feed rate of 1 mgd, the recirculation capability of the process is reduced to a ratio of 1 to 1.

During the 1986 upgrade of the WWTF, an original, shallow rock media trickling filter was modified to the present higher rate deep bed configuration and a second new high rate trickling filter was constructed. The base of the smaller trickling filter was the original shallow rock media trickling filter with a metal structure added to increase the overall depth of the filter. At the same time, the original rock media was replaced with the current plastic cross flow media. Water leaks from both filters where the metal tank and the concrete base interface. The problem is much more prevalent at the original trickling filter. Plant operators have repeatedly attempted to correct the exfiltration problem by filling the joint with oakum, but this solution has only worked for short durations. At present, the trickling filters are still leaking.

3.3.5 Secondary Clarifiers

Trickling filter effluent flows by gravity to the secondary clarifiers. The two rectangular clarifiers have a 60-foot length, a 12-foot width and a side water depth of 7.5 feet each. It is noted that Ten States Standards recommends a minimum side water depth of 10 feet. The clarifiers are equipped with non-metallic collector mechanisms (collector chains, sprockets and flights) driven by 1/2 hp motors. There are no surface skimmers for collecting floating materials, so the operators must skim the clarifiers with nets from time to time.

The secondary clarifiers have a surface area of 670 square feet and a weir length of 32 linear feet each. Based on Ten States Standards recommendations, the maximum average daily flow through the secondary clarifiers is 640,000 gpd, based on a weir-loading rate of 20,000 gpd per linear foot of weir, assuming one clarifier is out of service. However, with a side water depth of 7.5 feet, the maximum recommended weir-loading rate may not be realized at these clarifiers.

Operators have noticed an increase in turbidity in the secondary clarifiers since the installation of the membrane microfiltration system.

3.3.6 Rapid Sand Filters

A prefabricated, rapid sand filter manufactured by U.S. Filter, Inc. provides tertiary treatment for suspended solids and phosphorous polishing. Secondary clarifier effluent flows by gravity to the rapid sand filter. The filter has 3 cells, each with a surface area of 87 square feet. Based on a hydraulic application rate of 4 gpm per square foot, with one cell out of service, the rapid sand filter can hydraulically treat a maximum flow of 1 mgd.

The rapid sand filter cells are backwashed at a rate of 1,040 gpm for a period of 3.5 minutes each. Each cell backwashes approximately 3 times per day, resulting in a total return flow of 32,760 gpd or approximately 10 percent of the average daily flow. The mudwell pumps are each rated at 103 gpm, with a total dynamic head of 20 feet, so backwash water is returned to the headworks over a period of 35 minutes. During the 2001 upgrade, each cell was retrofitted with a pneumatic butterfly valve on the influent feed to reduce the amount of backwash water that is returned to the equalization basins. Operators report that some of the pneumatic butterfly valves have frozen during the winter months. There is 100 percent redundancy for the low-pressure blowers, backwash pumps and mudwell pumps.

3.3.7 Membrane Microfilters

In order to comply with the NYC Watershed Regulations, membrane microfiltration was installed during the 2001 upgrade. There are 3 membrane microfiltration units, manufactured by Pall Corporation. Each membrane system has a module rack which holds 44 modules. At a design flux rate of 23.3 gpd per square foot specified by the watershed upgrade program, each unit can treat a peak flow of 500,000 gpd. Assuming one unit is out of service, the total flow at the design flux rate is 1 mgd.

The two membrane microfiltration feed pumps are vertical sump pumps, Model No. 3171, as manufactured by Goulds Pumps, Inc. Each pump is capable of lifting 700 gpm against a total dynamic head of 44 feet. Each is equipped with a variable frequency drive. The membrane microfiltration feed well is 7 feet by 15 feet with an operating depth of 4 feet and an effective volume of 3,200 gallons.

Support systems for the membrane micofiltration system include: two air compressors with integral dryers, a 1,000 gallon receiving tank to supply air scour for membrane cleaning, a 1,400 gallon waste sump with 2 grinder pumps capable of 33 gpm at a total dynamic head of 48 feet, a 2 million BTU per hour instantaneous hot water heater, and sodium hypochlorite and sodium hydroxide chemical feed systems. Both sodium hypochlorite and sodium hydroxide are stored in 55-gallon drums in a drum containment area. Granular citric acid is used during the monthly clean-in-place (CIP) procedure to remove residue that accumulates on the microfilter fibers over time.

Each microfiltration system skid is controlled by a local control panel (LCP) with a PLC. Overall system control is performed by a supervisory PLC mounted in the electrical room. The membrane system has a mini-supervisory control and data acquisition (SCADA) system that is routed through a local Ethernet. The operators are able to remotely dial into the mini-SCADA system to check the status of the membranes and make process control changes.

3.3.8 Ultraviolet Disinfection

Disinfection of the wastewater is accomplished by ultraviolet (UV) disinfection. Ultraviolet light within the range of 200 to 300 nanometers (nm) is known to be germicidal by disrupting the reproductive mechanism of bacteria, viruses and protozoa. There are three, In-Line 1,000 UV disinfection chambers, manufactured by Aquionics, Inc. This equipment is located in the Microfiltration Building and was installed as part of the 2001 upgrade.

Each chamber has a total of four, high intensity, medium pressure lamps that are protected from the effluent by high purity quartz sleeves. The lamps are situated perpendicular to the flow and can be removed from one end of the chamber without draining the unit. The reported headloss through the chamber is 1 inch at a flow of 1 mgd. The UV disinfection system was designed very conservatively with a UV transmittance of 60 percent and an influent TSS concentration of 20 mg/l. At a UV transmittance of 66 percent, the system is capable of treating 1 mgd. A recirculation system provides the necessary cooling flow to allow one UV unit to remain in operation during low flow periods. This addresses concerns over lamp start time and on-off cycles that shorten lamp life.

The UV disinfection control system is comprised of a LCP for each UV disinfection chamber and a supervisory control panel that coordinates the operation of all three chambers. The supervisory control panel controls the influent and effluent valves and the recirculation system.

3.3.9 Post Aeration

Post aeration is required to raise the dissolved oxygen content of the effluent prior to discharge into Broad Brook. A cascade aeration system attached to the Microfiltration Building accomplishes this. Cascade aeration is the least costly method to raise dissolved oxygen levels in the effluent as no aeration equipment or electrical power is required.

The cascade aeration system has a total fall of 5.25 feet, a 3-foot width and eight steps. The current dissolved oxygen of the effluent has been reported to be about 7 to 8 mg/l on average. The permit requires a minimum of 4 mg/l.

3.3.10 Chlorination and Dechlorination Facilities

The gas chlorination station, chlorine contact chamber and gas sulfur dioxide systems are still in place at the WWTF. These facilities were left in place, as a preventative measure, to provide additional disinfection in the event of a catastrophic failure of the membrane microfiltration system and the UV system. A lockable valve controls the bypass.

The chlorine contact chamber, at the current peak flow of 1.0 mgd, has a contact time of 15 minutes. The chlorinator is a Series V-100 Mini-Chlorination Center, as manufactured by Wallace & Tiernan. The system consists of a controller, two 100 lbs cylinders, two cylinder scales and an automatic switchover, cylinder-mounted, vacuum regulating valve. The sulfur dioxide dechlorination system consists of similar equipment to that of the chlorinator. There is no automation associated with the chlorination or dechloriation systems since this system is a back up disinfection system.

3.3.11 Phosphorous Removal

Phosphorous removal is achieved through chemical precipitation with alum in the primary and secondary clarifiers. Alum addition causes the pH of the primary effluent to be acidic. As a result, a sodium carbonate feed system was installed to raise the pH prior to biological treatment in the trickling filters. Polymer can be added, for additional coagulation in the secondary clarifiers, prior to the rapid sand filter.

Alum is stored in a 6,000-gallon, double walled, underground storage tank (UST). Two chemical feed pumps, as manufactured by Wallace & Tiernan, are located in the basement of the rapid sand filter building. The chemical feed systems were installed during the 1995 upgrade. The existing 6,000-gallon storage tank provides 66 days of storage at a feed rate of 352 lbs per day (assuming 22 lbs of alum per 1 lbs of phosphorous) at the current average daily flow of 316,000 gpd. Problems can exist with alum plugging chemical feed lines and alum sludge accumulating in the bottom of the storage tank. Alum was previously delivered every 3 to 4 months. However, without proper mixing, alum tends to settle out of suspension. To address this problem, operators reduced the quantity of alum that is delivered to the site, and increased the delivery frequency. However, the main alum chemical feed lines are plugged and need to be replaced. This was supposed to have been completed during the last upgrade but has yet to be done. Temporary, above ground chemical feed lines have been installed between the alum tank and the chemical feed pumps. The UST does not have a leak detection system as required by 6 NYCRR 599.

Sodium carbonate (soda ash) is delivered to the site in 50 pound (lb) bags and is fed into a volumetric feeder manufactured by Wallace & Tiernan. Soda ash is mixed in a 35-gallon tank prior to storage in two 350-gallon solution storage tanks located in the basement of the rapid sand filter building. Soda ash can be added to the primary clarifier effluent or the effluent of the rapid sand filters as needed for pH control. Soda ash is not typically used by the operators as the existing wastewater buffering capacity is sufficient.

The operators have not added polymer in several years. The feed system is comprised of a Semblex Polymax polymer blending and feeding unit. Polymer can be added to the secondary clarifier. The system is reported to be in working condition and appears to be maintained.

3.3.12 Solids Handling

Both rapid sand filter backwash and membrane microfiltration reject water are returned to the influent equalization basin. Secondary sludge is withdrawn from the secondary clarifiers and returned to the primary clarifiers for co-settling and removal. Primary and secondary sludge is then withdrawn from the primary clarifiers and pumped to the anaerobic digesters.

The sludge pumps are located in the basement of the control building adjacent to the anaerobic digesters. There are three sludge pumps and one simplex controller. Each pump is a Model No. PE61-A dual plunger type pump, as manufactured by ITT Marlow, Inc., and has a rated capacity of 57 gpm at 62 strokes per minute and 60 feet head. Each motor is 1.5 hp. The suction and discharge piping is configured such that Sludge Pump 1 has the capability to discharge primary and secondary sludge to Digester 1. Sludge

Pumps 2 and 3 can discharge secondary sludge to the primary clarifiers or primary and secondary sludge to Digester 1. The sludge pumps are activated on a timed operation controller.

The two anaerobic digesters each have a diameter of 20 feet and an effective depth of 23.5 feet, resulting in an internal volume of 55,000 gallons. Digester 1 has a fixed, cast in place concrete roof since it was converted from an existing Imhoff tank on-site. Digester 2, also a converted Imhoff Tank, has a fixed Type F Digester Cover, as manufactured by EIMCO Process Equipment, Inc. Digester 1 has heating coils, which feed hot water from a boiler located on the first floor of the old process control building.

Operators utilize the digesters as sludge holding tanks; supernate is returned to the equalization basins, and liquid sludge is withdrawn from the tanks and hauled to a separate site for processing. If current operations change and the tanks are operated as anaerobic digesters, the load would exceed the recommendations of ten states standards. The recommended loading rate for a completely mixed system is 40 lbs of volatile solids per day per 1,000 cubic feet of volume. Based on the total volume of 110,000 gallons, a total of approximately 370 lbs per day of volatile suspended solids can be wasted from the process each day. Assuming the combined primary and secondary sludge has a volatile solids content of 60 percent, a total of 610 lbs per day of sludge can be withdrawn from the primary clarifiers. Typical percent solids for the combined sludge is approximately 5 percent, indicating a flow of 1,460 gallons of combined sludge per day. Currently, at an average daily flow of 316,000 gpd, the operators are hauling, on average, 22,750 gallons per month, which is equivalent to 760 gpd of combined sludge.

There is a sludge press building which houses a one meter belt filter press, manufactured by Envirex (Model No. 3500). A polymer feed system has been installed to increase the solids content of the sludge cake. A sludge filtrate return pump station returns filtrate to the headworks. The one meter belt filter press is capable of sludge cake production between 0.75 and 1.25 yards per day. The belt filter press has not been operated for the full time production of sludge cake in several years. However, the operators have reported exercising the system occasionally. The manufacturer has indicated that there may be a market for the equipment, if the facility does not plan to utilize the system in the future.

3.3.13 Emergency Generators

There are two emergency generators on-site. The older diesel generator was installed as part as the 1995 upgrade and the new, natural gas generator was installed during the 2001 upgrade. Each generator supplies power to a different electrical service on-site.

The older generator, is rated for 180 kilowatts (kW) at 120/208 volt (V), 3 phase standby service. The diesel generator is a Model 180PROZJ81, as manufactured by Kohler Power Systems. The generator has an automatic exercise system. However, the current operators manually exercise the generator weekly. There is an automatic transfer switch dedicated to the generator and this electrical service, in the event of a power failure. The diesel fuel tank is buried underground next to the generator and the tank is reported to be comprised of double wall construction and includes a leak detection system.

The new generator was installed during the 2001 upgrade and is rated for 275 kW at 277/480 V, 3 phase standby service. This propane fired generator is a Model SD275, as manufactured by Generac Power Systems, Inc. The generator has an automatic exercise system, which exercises the generator once per week and an automatic transfer switch.

3.3.14 Buildings and Building Systems

Malcolm Pirnie performed a preliminary code investigation of the existing buildings and the building systems on-site. Materials of existing construction (i.e., asbestos or lead paint) were sampled and analyzed. The results were as follows:

3.3.14.1 Blower Building

The Blower Building was constructed during the 1986 upgrade. It houses the blowers for the equalization basin mixing system and the control systems for the vortex grit system and the influent pumping system. Overall, the building is in good condition. However, the following deficiencies were noted:

- Abandoned field devices and electrical equipment are located in the blower room.
- There is no ventilation system or air conditioning system located in the control room.
- Steel windows and doors are rusting and require painting or replacement.

3.3.14.2 Headworks Building

The Headworks Building was constructed during the 2001 upgrade. Overall the building is in good condition, but the following deficiencies were noted:

- Not ADA complaint.
- Stairs not enclosed in fire rated walls and contain open treads and risers.
- Pattern cracking of the surface of the foundation mat.
- Rock pockets and aggregate consolidation of the slab at grade.
- Minor "bugholes" (approximately 1/8 to 1/4 of an inch) through concrete.

3.3.14.3 Static Screen Building

The Static Screen Building was constructed during the 1986 upgrade. Overall the building is in good condition. However, the following deficiencies were noted:

- Not ADA compliant.
- Unsanitary conditions were observed due to the lack of space in the building.

3.3.14.4 Control Building

The Control Building was constructed during the 1953 upgrade. Overall the building is in poor condition and the following deficiencies were noted:

- Not NFPA 820 compliant.
- Not ADA compliant.
- Windows and doors need to be replaced.

- Main electrical services are mounted on the exterior of the building.
- The stairs are not enclosed in fire rated walls and contain open treads and risers.

3.3.14.5 Rapid Sand Filter Building

The rapid sand filter building was constructed during the 1995 upgrade. Overall, the building is in good condition. However, the following deficiencies were noted:

- The stairs are not enclosed in fire rated walls and contain open treads and risers.
- Not ADA compliant.
- Paint is peeling in the basement due to harsh and damp environment.
- No ventilation system has been included in the basement.

3.3.14.6 Membrane Micofiltration Building

The membrane microfiltration building was constructed during the 2001 upgrade. Overall the building is in good condition. However, the following deficiencies were noted:

- The chemical storage area and the emergency shower and eyewash station are not located adjacent to each other and the path of egress is less than 36-inches wide.
- Concrete cracking has occurred near corners of the building.

3.3.14.7 Chlorine/Dechlorination Buildings

The Chlorine Building was constructed during the 1953 upgrade and the dechlorination building (fiberglass reinforced plastic (FRP) enclosure) was installed during the 1995 upgrade. Overall the buildings are in good condition. However, since the UV disinfection system has 100 percent redundancy, chlorination and dechlorination are no longer needed and the building can be removed.

3.3.14.8 Sludge Press Building

The sludge press building was constructed during the 1985 upgrade. Overall the building is in good condition, but some deficiencies were noted.

- Not ADA compliant.
- No odor control available.

3.3.14.9 Storage Building

The storage building was constructed during the in the 1990s and is a preengineered metal building. Overall, the building is in good condition, but could be improved. The following deficiencies were noted:

- No electrical service was installed in the building. An electrical service was run from the membrane microfiltration building to the storage building during the 2001 upgrade, but no lighting or electrical outlets have been installed. There is no secondary containment for the storage of liquid chemicals.

4.0 EFFLUENT CRITERIA AND TREATMENT ALTERNATIVES

Malcolm Pirnie evaluated several alternatives for the expansion of the existing DCS WWTF to be able to accept flows and loads from the proposed Town of Bedford Sewer District. The projected discharge limitations used in this evaluation are presented and discussed below.

4.1 REGULATORY REQUIREMENTS

Based on our understanding of the New York City WR&R and the Croton Watershed, Malcolm Pirnie is anticipating that the effluent discharge limitations of the WWTF will probably be revised as follows:

TABLE 4-1

ANTICIPATED WWTF EFFLUENT LIMITATIONS[1]

Parameter	Effluent Limit	Comment
Flow	1.0 mgd	30 Day arithmetic mean
CBOD5	15 mg/l	30 Day arithmetic mean
CBOD5	125 lbs/day	30 Day arithmetic mean
TSS	10 mg/l	30 Day arithmetic mean
TSS	83 lbs/day	30 Day arithmetic mean
Settleable Solids	0.1 ml/l	Daily Maximum
PH	6.5 – 8.5	Range
Fecal Coliform	200/100 ml	30 day geometric mean
Fecal Coliform	400/100 ml	7 day geometric mean
Total Coliform	750/100 ml	Daily maximum
Dissolved Oxygen	4.0 mg/l	Daily minimum
Total Phosphorous	0.18 mg/l as P[2]	30 Day arithmetic mean
Ammonia (as NH_3)	1.5 mg/l[3]	30 Day arithmetic mean
Turbidity	0.5 NTU	For 95 percent of samples
Turbidity	5.0 NTU	Instantaneous maximum

1 Note that these limitations are anticipated based on Malcolm Pirnie's experience. A waste assimilative capacity (WAC) analysis has not been performed on the receiving stream. NYC DEP and/or NYS DEC may require additional analysis or propose more stringent discharge limitations.

2 Total phosphorous concentration was calculated based on the sum of the existing SPDES permitted mass loading of phosphorous within the Town of Bedford Sewer District and the DCS WWTF and an average daily flow of 1 mgd.

3 Ammonia limit is based on past WWTF performance.

4.2 ALTERNATIVE PROCESS CONFIGURATIONS FOR WWTF EXPANSION

In order to accept municipal wastewater from the proposed Town of Bedford Sewer District, the DCS WWTF needs to be expanded to treat a total average daily flow of 1 mgd. The facility must also be designed to pass the peak hydraulic flow of 2.25 mgd. Expansion of the facility is feasible. Malcolm Pirnie evaluated several alternatives based on capital construction costs, operation and maintenance costs, and constructability. Expansion alternatives are similar, with major differences only at the secondary treatment processes. Table 4-2 lists recommended improvements that are common to all three alternatives.

TABLE 4-2

WWTF EXPANSION ALTERNATIVES
PROPOSED COMMON UNIT OPERATION IMPROVEMENTS

Unit Operation	Description
Influent Flow Monitoring	Existing facilities are inadequate for future flows and should be replaced with a 9-inch parshall flume, which has a hydraulic capacity of 5 mgd.
Mechanical Screens	Existing facilities do not include screens prior to the equalization basins. Install mechanical screens capable of treating flows to a minimum of 2.55 mgd.
Vortex Grit Chamber	Install vortex grit chamber capable of treating flows to a minimum of 2.55 mgd.
Equalization	Construct 120,000 gallons of additional equalization capacity to expand storage capacity to 20 percent of the future average daily flow. Limit WWTF peak discharge to 1.5 mgd.
Influent Pump Station	Replace the influent pump motors and impellers to increase the output to 575 gpm against a total dynamic head of 55 feet.
Static Screens	Demolish existing static screens and building. Construct an influent weir box to balance the flows to the primary clarifiers.
Primary Clarification	Construct a third primary clarifier to meet Ten States Standards.
Secondary Clarification	Construct a third secondary clarifier to meet Ten States Standards.

TABLE 4-2 WWTF EXPANSION ALTERNATIVES PROPOSED COMMON UNIT OPERATION IMPROVEMENTS	
Unit Operation	**Description**
Rapid Sand Filtration	Install two additional filter cells to meet Ten States Standards and install new local control system.
Membrane Microfiltration	Construct an addition to the Microfiltration Building and install an additional membrane microfiltration system to meet NYC Watershed R&R's.
Control Building	Rehabilitate the Control Building to meet NFPA 820.
SCADA System	Install a plant wide SCADA system to improve the operation of the WWTF.
Electrical Service	Construct a new 400 amp electrical service to replace the older service located at the Control Building.

The WWTF SPDES permit currently does not contain an ammonia limitation. It is anticipated that an ammonia limit will be included in the next SPDES permit, based on a statistical analysis performed on the existing facility. For the purpose of this evaluation, Malcolm Pirnie has assumed an ammonia limit of 1.5 mg/l (as NH_3) in the development of all of the biological treatment alternatives discussed in this section.

The three alternatives evaluated for the expansion of the WWTF are presented in Table 4-3, with the respective opinion of probable construction costs. The following sections describe each alternative in further detail. Detailed construction cost estimates are presented in Attachment C.

TABLE 4-3 WWTF EXPANSION ALTERNATIVE SUMMARY TABLE		
Alternative	**Description**	**Opinion of Probable Construction Costs**
1	Single Stage Nitrification with Trickling Filters	$14,800,000
2	Single Stage Nitrification with Rotating Biological Contactors	$10,300,000
3	Roughing Trickling Filters with Contact Stabilization for Nitrification	$10,100,000

4.2.1 Alternative 1 – Single Stage Nitrification with Trickling Filters

This alternative includes the construction of six new trickling filters identical in size to the existing larger unit. Together, this would provide single stage BOD removal and nitrification. This is consistent to the current facility operations and biological processes and eliminates the need for additional pumping to second stage trickling filters. However this alternative does require the installation of a lower density media that results in more trickling filter volume and high capital costs.

Based on published single stage nitrification trickling filter design criteria[1] of 0.07 lbs of BOD per day per 1,000 square feet of media and 0.012 lbs per day of total Kjeldahl nitrogen (TKN) per cubic foot of media, a total of six additional trickling filters would be required to effectively reduce both BOD and ammonia loads. This is counterintuitive due to the fact that two trickling filters are treating an average daily flow of 316,000 gpd, and they are completely nitrifying the ammonia loads most of the time. However, these trickling filters were designed for a large hydraulic and BOD loading, so the additional surface area is sufficient to provide nitrification.

The largest advantage to this proposed alternative is that there are no additional processes for the operations staff to maintain. Attached growth systems, such as trickling filters, are not as susceptible to upset as suspended growth systems due to variable hydraulic, organic or toxic loads. However, this alternative requires substantial pumps for both influent and recirculation flows. The alternative also requires a significant capital investment and substantial land requirement.

4.2.2 Alternative 2 – Second Stage Nitrification with Rotating Biological Contactors

This alternative includes the utilization of the existing trickling filters for BOD removal and the construction of two rotating biological contactor (RBC) trains with 4 shafts each for BOD polishing and nitrification.

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[1] Design of Municipal Wastewater Treatment Plants Volume I, WEF MOP 8, Water Environment Federation and American Society of Civil Engineers, 1991

The existing trickling filters are sized to reduce BOD loads by approximately 80 percent at a flow of 1 mgd. By utilizing the trickling filters for BOD reduction and constructing RBCs for nitrification purposes, effluent discharge limitations can be achieved. The basis of design for the RBCs includes an influent wastewater temperature of 50 degrees Fahrenheit (F), a solulable BOD_5 concentration of approximately 30 mg/l in the trickling filter effluent and an ammonia concentration of 25 mg/l. A total of 1 million square feet of media is required per train, with high-density media installed on the last 2 shafts of each train. The system is conservatively designed to effectively reduce the ammonia to 1.5 mg/l during cold weather operation, with one RBC out of service, at the average daily flow of 1 mgd.

RBCs are similar to trickling filters in that both support attached growth microorganisms and are more resilient to variable hydraulic, organic and toxic loads than suspended growth systems. In addition, since the existing secondary clarifiers are only 7.5 feet deep, this approach should settle attached growth solids more readily than suspended growth solids. The second stage nitrification process outlined in this alternative does not require additional pumps; however each shaft will require a 5 hp motor.

4.2.3 Alternative 3 – Roughing Trickling Filters with Contact Stabilization for Nitrification

This alternative includes the utilization of the existing trickling filters for BOD removal and the construction of an aeration basin and activated sludge process for nitrification purposes.

The existing trickling filters are sized to reduce BOD loads by approximately 80 percent at a flow of 1 mgd. The remaining BOD and ammonia load will flow by gravity into a 420,000-gallon aeration basin for polishing and nitrification. The aeration basin will provide a hydraulic residence time of approximately 8 hours at a flow of 1.25 mgd. The mixing requirements exceed the oxygen requirement for complete nitrification of the mixed liquor. Therefore an air flow rate of 525 standard cubic feet per minute (scfm) is required to completely mix the aeration basin. This air requirement can be met with the installation of two, 30 hp blowers, which includes 100 percent redundancy.

A return activated sludge (RAS) pump station would also be required under this alternative. RAS will be withdrawn from the secondary clarifiers and returned to the aeration basin in order to maintain adequate mixed liquor suspended solids (MLSS) concentrations. It is anticipated that the MLSS will be in the 500 mg/l to 1,000 mg/l range, which is atypically low for a contact stabilization process. However, it would be sufficient to provide adequate nitrification.

This alternative proposes a process that is completely different than the current trickling filter operation at the DCS WWTF. The operation of a contact stabilization activated sludge process requires much more operator attention and process control to ensure that discharge limitations are achieved. The suspended growth process is much more susceptible to process upsets due to variations in hydraulic, organic and/or toxic loads. Lastly, the existing secondary clarifiers have only a 7.5-foot side water depth, and the shallow clarifiers may not be adequate for settling an activated sludge floc.

4.3 RECOMMENDED PROCESS CONFIGURATIONS

The preliminary opinion of construction costs, for expanding the existing DCS WWTF to treat an average daily flow of 1 mgd, indicates that Alternatives 2 and 3 would be equally cost effective regarding the capital upgrade. However, Malcolm Pirnie recommends expanding the facility by implementing Alternative 2.

At this facility, RBCs have several distinct operational advantages over activated sludge or single stage nitrification processes. These advantages are as follows:

- The existing secondary clarifiers are only 7.5 feet deep and the depth may contribute to problems associated with settling the low concentration MLSS from an activated sludge process. Conversely, biological growth on an attached growth process, such as a trickling filter or RBC, tends to settle more readily as the solids slough off the media in large flocs.
- The activated sludge process is completely different from the current unit operations at the DCS WWTF and requires a high degree of operational oversight. The existing WWTF currently employs attached growth secondary treatment with the trickling filters and, therefore, the construction of second

stage RBCs for nitrification is consistent with current operations. In addition, maintenance would be required on blowers, RAS pumps and aeration control equipment at an activated sludge system, while only motors and shaft bearings must be maintained on an RBC system.

- The process control required to operate RBCs is minimal as compared to an activated sludge process. Additional laboratory equipment and sampling protocols would be required to effectively operate an activated sludge process.
- The capital costs for an RBC alternative are much less than for single stage nitrification.

The process flow diagram for the recommended alternative is shown on Figure 4-1. Based on the effectiveness of treatment, probable cost of construction, and operational difficulty, Malcolm Pirnie recommends utilizing RBCs for nitrification.

4.4 IDENTIFED POTENTIAL SAVINGS

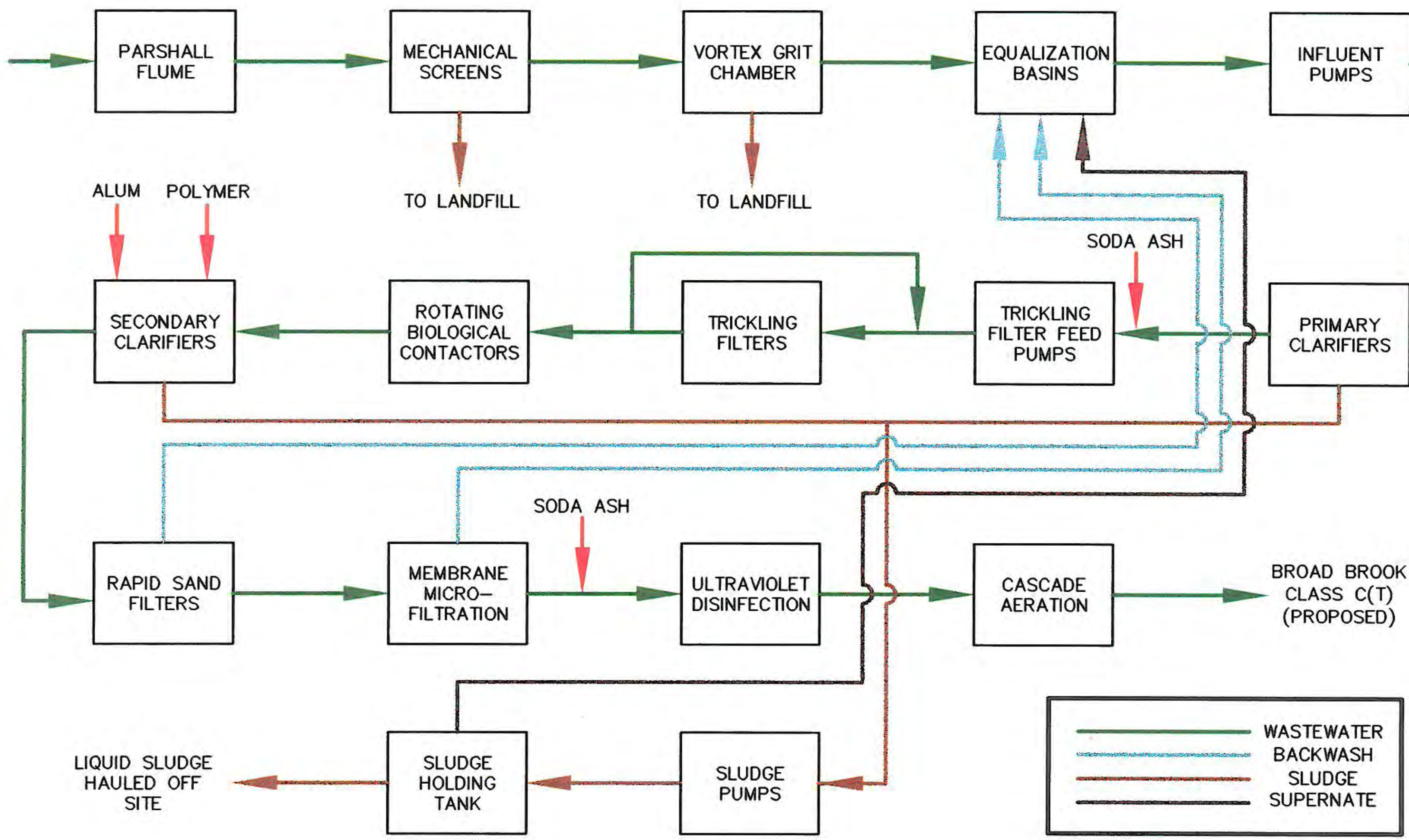
A detailed description of the recommended alternative is presented in Section 5. At this time a preliminary budget of $10,300,000 should be utilized for planning the expansion of the DCS WWTF. However, there may be savings that can be realized with additional investigation and NYC DEP approval.

4.4.1 Re-rating Membrane Microfiltration System

The basis of design for the existing membrane microfiltration system is driven by the NYC WR&R's. These regulations require that the design of membrane microfiltration systems be based on a flux rate of 23.3 gfd. However, industry experience demonstrates that higher flux rates can be achieved and maintained at similar facilities. In consideration of the rapid sand filtration system upstream of the microfiltration system, it is highly likely that higher flux rates may be achieved and maintained at the DCS WWTF without compromising the effluent discharge quality.

Malcolm Pirnie recommends that the Town formally approach the NYC DEP regarding conducting a pilot test on the membrane microfiltration system to determine if a flux rate of 35 gfd can be achieved and maintained without compromising the effluent discharge quality.

User: janeo Spec: PIRNIE STANDARD File: C:\TEMP\holding\FIG_4-1.DWG Scale: 1:1 Date: 08/15/2003 Time: 13:19 Layout: Fiogure 4-1



MALCOLM PIRNIE

TOWN OF BEDFORD
WASTEWATER TREATMENT PLANT CAPACITY ANALYSIS

PROCESS FLOW DIAGRAM

FIGURE 4-1

By re-rating the existing membrane microfiltration system, expansion of the Microfiltration Building and installing additional equipment can be avoided. The apparent savings in construction capital is estimated to be approximately $2,200,000. This includes a conservative estimate for pilot testing the existing microfiltration system of $200,000. Please note that matching funding may be available through existing agencies. However, the award of these funds is on a competitive basis and was not included in the analysis.

An example of a pilot test may be to pump rapid sand filter effluent from the microfiltration feed well to a skid mounted, single module microfiltration system and return both the filtrate and permeate to the waste sump. This allows the pilot test to be conducted without interfering with the existing operations or impacting the effluent discharge. Turbidity measurements and challenge spike testing with inert enteric viruses and spores can be performed to verify the flux rate. A full-scale pilot test can then be performed on the standby microfiltration skid by removing modules to achieve a flux rate of 35 gfd.

4.4.2 Unit Process Sampling and Analysis

It is recommended that the existing unit operations' performance be verified through a sampling and analysis effort. The preliminary basis of design parameters can be verified or modified prior to proceeding to final design. This effort should be conducted as part of the Facility Plan and the results can be utilized to supplement the information presented to the NYC DEP for support of re-rating the existing microfiltration system.

5.0 RECOMMENDED FACILITY EXPANSION

Malcolm Pirnie recommends upgrading and expanding the DCS WWTF to treat an average daily flow of 1 mgd and a hydraulic peak hourly discharge flow of 1.5 mgd by installing RBCs for nitrification, as described in Alternative 2 in Section 4. See Figure 5-1 for a schematic site plan of the recommended improvements to the WWTF.

5.1 UNIT OPERATION DESCRIPTIONS AND BASIS OF DESIGN

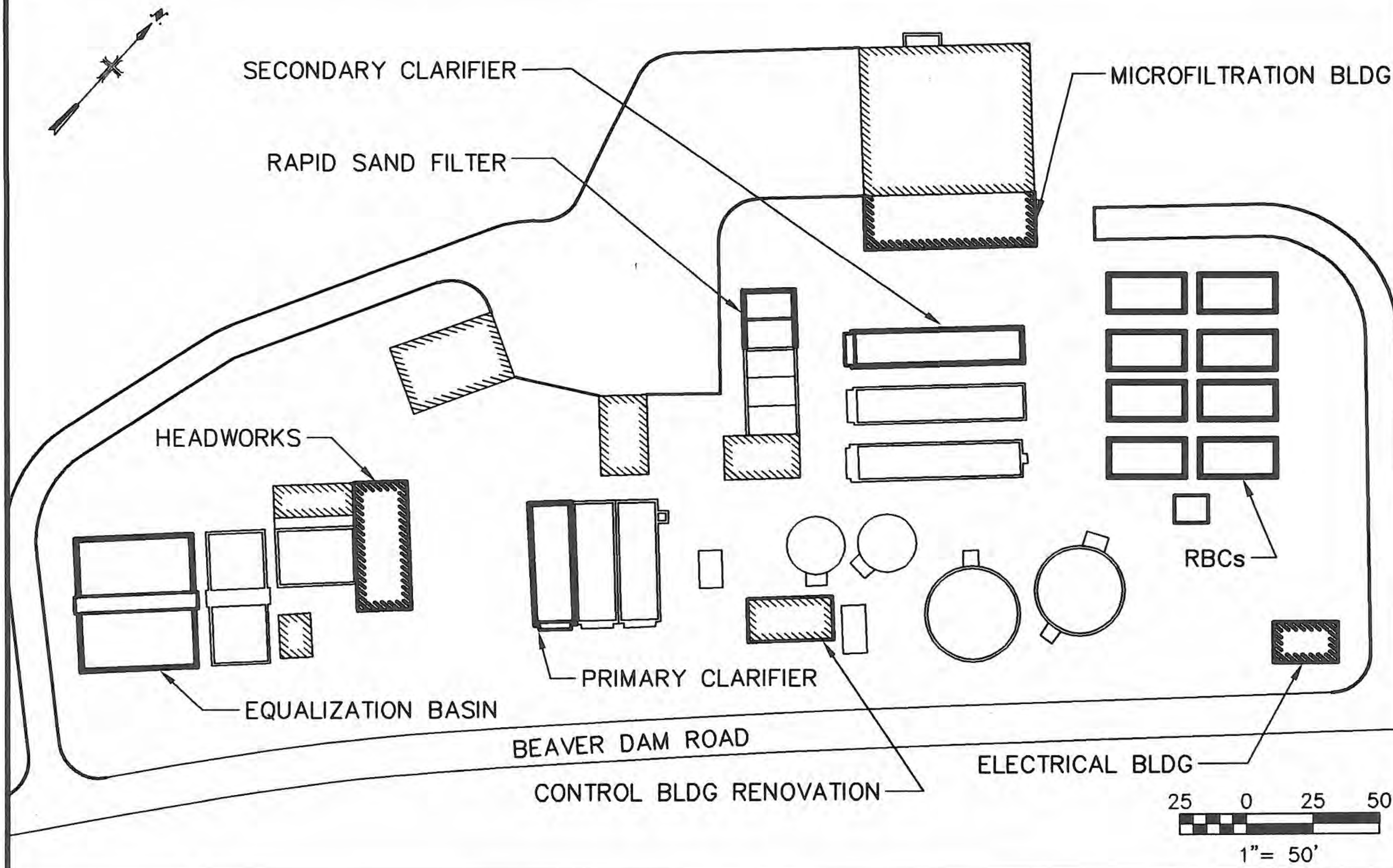
The proposed improvements and modifications to the WWTF are as follows:

5.1.1 Headworks

The existing headworks facility is sized for a hydraulic capacity of 1 mgd (or 700 gpm) and does not include screening facilities. The influent parshall flume is not operational. Install a parshall flume with a 9-inch throat to monitor influent flows, which would accurately measure the flow range. Install mechanical screens with a hydraulic capacity of 2.55 mgd to remove large inorganic material and rags that will plug the influent pumps and fill the equalization basins. Replace the existing vortex grit chamber with a unit capable of treating hydraulic loads to 2.55 mgd. Expand the existing Headworks Building to enclose the proposed parshall flume, mechanical screens and vortex grit chamber.

It was determined that the most cost effective scenario to expand the WWTF includes modifications to the equalization facilities to reduce the peak discharge to 1.5 mgd. Construct 120,000 gallons of additional equalization storage volume to equalizes the flows and to reduce the peak hourly flow through the plant to a rate of 1.5 mgd (or 1,050 gpm). The equalization tank aeration blowers will have to be replaced in order to provide sufficient mixing and prevent the wastewater from becoming septic as a result of the proposed additional basins. The existing influent pumps are 1 year old and in good condition. Their motors and impellers can be replaced to pump 575 gpm against a TDH of 55 feet to meet the future conditions.

User: janeo Spec: PIRNIE STANDARD File: C:\TEMP\holding\FIG_5-1.DWG Scale: 1:1 Date: 08/15/2003 Time: 13:17 Layout: FIGURE 5-1



MALCOLM PIRNIE

TOWN OF BEDFORD
WASTEWATER TREATMENT PLANT CAPACITY ANALYSIS

EXPANDED WWTF PROPOSED SCHEMATIC SITE PLAN

FIGURE 5-1

5.1.2 Primary Clarification

Remove the existing static screens. Screening will be performed as discussed above. Upon removing the static screen, there will be enough available space to construct a flow splitter box to hydraulically balance the primary clarifiers. Construct a third primary clarifier that is 41 feet in length, 14 feet wide and has a side water depth of 10 feet. At the average flow of 1.1 mgd, including recycle streams and with one unit out of service, the surface overflow rate will be 980 gpd/ft^2. The scum troughs should be replaced on both existing clarifiers.

5.1.3 Trickling Filters

Correct the leaks in the existing basins by pressure grouting the interface between the concrete base and the metal shell. The effluent weir may have to be raised in order to flow by gravity to the proposed RBCs.

5.1.4 Rotating Biological Contactors (RBCs)

Install two, 4 shaft RBC trains to reduce the ammonia effluent concentration to 1.5 mg/l during cold weather operation with one RBC out of service. A total of approximately 1 million square feet of media is required with high-density media installed on the last two shafts of each train.

This design is based on an ammonia loading rate of 0.19 lbs per day of ammonia per 1,000 square feet of media and a soluble BOD_5 concentration of less than 20 mg/l. At average flow, with both units in operation, the last stage may not support growth due to an insufficient organic loading. However, adequate treatment should still be provided in the first three stages.

5.1.5 Secondary Clarifiers

Install a third secondary clarifier with a length of 60 feet, a width of 12 feet and a side water depth of 7.5 feet. At the peak flow of 1.65 mgd, the surface overflow rate will be approximately 720 gpd and the weir-loading rate will be approximately 8,125 gpd per linear foot (assuming the same weir configuration is utilized). The sludge collection equipment in the existing two secondary clarifiers should be replaced to include surface skimmers and scum collectors.

5.1.6 Rapid Sand Filters

Ten State Standards recommends a maximum wastewater application rate of 5.0 gpm per square foot. However, with the stringent wastewater discharge limitations and phosphorous removal, a wastewater application rate of 4 gpm per square foot was utilized in the original design. Install two additional 87 square foot cells and replace the control systems and compressed air system. The proposed improvements will result in a wastewater application rate of 3.3 gpm per square foot at a peak flow of 1.65 mgd with one cell out of service.

5.1.7 Membrane Microfilters

Expand the existing Microfiltration Building and install a fourth membrane microfiltration skid-mounted system as manufactured by Pall Corporation to maintain a flux rate of 23.3 gfd. Additional chemical feed systems will be required. Note that it is recommended that the Town pursue pilot testing and re-rating the existing microfiltration system to achieve and maintain a flux of 35 gfd, in order to avoid costly upgrades. See Section 4 for further details.

5.1.8 Chlorination/Dechlorination Facilities

Remove the existing chlorination and dechlorination facilities. The ultraviolet disinfection system has been effectively utilized at the DCS WWTF for a year and is adequately sized for a flow of 1.5 mgd with one unit out service.

5.1.9 Handling

Continue hauling liquid sludge for processing and disposal off-site. The existing anaerobic digesters can be utilized as sludge holding tanks and the existing 1-meter belt filter press may be sold to recover some capital. Construct a more permanent solids transfer facility with secondary containment. Operators currently haul an average of 22,750 gallons per month of liquid sludge. The two existing anaerobic digesters have an effective volume of approximately 55,000 gallons each for a total of 110,000 gallons, which is equivalent to approximately one month of storage at the future average solids loading rate. This will result in 3 to 4 sludge loads per week.

5.1.10 Electrical Service Upgrade

Construct a new main electrical distribution building and replace the older main electrical service that is associated with the existing Control Building. Rehabilitate the Control Building to meet NFPA 820 requirements and replace the windows and doors.

5.1.11 SCADA System Upgrade

The WWTF would benefit from an upgrade of a SCADA system to operate the entire WWTF. Currently the WWTF has a mini SCADA system that is dedicated to the membrane microfiltration process. Additional improvements would allow all monitoring points to be telemetered back to the SCADA system and included in the programming.

5.2 OPINION OF PROBABLE CONSTRUCTION COST

Malcolm Pirnie has developed an opinion of probable capital cost for the expansion and upgrade of the DCS WWTF in order to accept wastewater from the proposed Town of Bedford Sewer District.

The estimated capital cost is $10,300,000 in terms of 2003 dollars. See Table 5-1 for a detailed breakdown of construction and non-construction costs. A 20 percent contingency has been included in the WWTF expansion project budget as the process concept and WWTF layout are preliminary. More detailed cost estimates will be performed during the design phase.

TABLE 5-1 OPINION OF PROBABLE CAPITAL COSTS[1]				
Item	**Quantity**	**Units**	**Unit Cost**	**Cost**
Influent Flow Monitoring	1	LS	$81,000	$81,000
Influent Screens	1	LS	$136,000	$136,000
Vortex Grit Chamber	1	LS	$168,000	$168,000
Equalization Basins	1	LS	$600,000	$600,000
Influent Pump Upgrade	1	LS	$83,000	$83,000
Primary Clarifiers	1	LS	$326,000	$326,000
Rotating Biological Contactors	1	LS	$1,890,000	$1,890,000
Secondary Clarifiers	1	LS	$451,000	$361,000
Rapid Sand Filters	1	LS	$435,000	$435,000
Membrane Microfilters	1	LS	$895,000	$895,000
Microfiltration Building	1,800	SF	$250	$450,000
Headworks Building	1,800	SF	$250	$450,000
Electrical Building	500	SF	$250	$125,000
Demolitions	1	LS	$500,000	$500,000
Electrical Service Upgrade	1	LS	$200,000	$200,000
SCADA Upgrade	1	LS	$100,000	$100,000
Control Building Renovation	1	LS	$100,000	$100,000
Maintenance of Flows	1	LS	$100,000	$100,000
SUBTOTAL CONSTRUCTION				$7,000,000
Contingency (20 %)				$1,400,000
Bonding (3 %)				$210,000
Insurance (2.5 %)				$175,000
Administration/Legal (2 %)				$140,000
Engineering, CA/RE Services (20 %)				$1,400,000
TOTAL WWTF EXPANSION BUDGET				**$10,300,000**

[1] All costs are presented in 2003 (U.S.) dollars.

5.3 OPINION OF PROBABLE OPERATION AND MAINTENANCE COST

The DCS WWTF is currently operated by a private contract operations firm, U.S. Filter, Inc., and current operation and maintenance costs are not available. Malcolm Pirnie has estimated that the annual operation and maintenance budget for the expanded WWTF will be approximately $775,000. See Table 5-2 for a detailed breakdown of the anticipated operation and maintenance staff.

ATTACHMENT A

DCS Wastewater Treatment Facility
Monthly Operating Data

Attachment A

DCS Wastewater Treatment Facility Influent Wastewater Characterisics

Month	Flow (mgd)	BOD5 (mg/l)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs/day)	Phosphourou (mg/l)	Phosphourou (lbs/day)	Ammonia (mg/l)	Ammonia (lbs/day)
Jan '01	0.272	135	338	131	329	1.8	4	19.5	44
Feb '01	0.264	138	323	158	375	4.0	9	12.3	27
Mar '01	0.272	128	297	142	328	2.7	6	11.6	26
Apr '01	0.275	129	295	117	267	1.5	4	9.3	21
May '01	0.285	116	278	148	354	2.4	6	13.4	32
Jun '01	0.313	104	286	113	314	2.1	6	8.4	22
Jul '01	0.290	176	390	157	348	1.5	4	12.0	29
Aug '01	0.299	129	285	173	376	3.3	8	12.6	31
Sep '01	0.307	105	285	140	384	2.2	6	10.7	27
Oct '01	0.328	119	326	148	405	2.0	5	11.4	31
Nov '01	0.353	110	278	113	285	1.3	4	8.8	26
Dec '01	0.365	106	309	112	325	2.3	7	6.4	19
Jan '02	0.337	137	344	143	358	2.0	6	7.7	22
Feb '02	0.262	127	266	128	268	1.9	4	8.9	19
Mar '02	0.266	130	299	148	339	2.4	5	8.3	18
Apr '02	0.342	104	259	122	311	1.9	6	9.3	27
May '02	0.398	146	471	121	400	2.3	7	10.7	35
Jun '02	0.352	105	274	155	406	2.2	6	10.1	30
Jul '02	0.338	189	486	290	744	4.0	11	15.9	45
Aug '02	0.364	126	421	132	440	3.1	10	10.8	33
Sep '02	0.360	140	412	126	371	2.4	7	12.2	37
Oct '02	0.353	136	399	165	479	2.5	7	10.0	29
Nov '02	0.288	120	282	207	486	4.6	11	12.7	31
Dec '02	0.293	139	303	127	273	1.6	4	11.0	27
Average	**0.316**	**129**	**329**	**146**	**374**	**2.4**	**6.3**	**11.0**	**28.7**
Minimum	0.262	104	259	112	267	1.3	3.5	6.4	18.4
Maximum	0.398	189	486	290	744	4.6	11.1	19.5	44.7

Attachment A

DCS Wastewater Treatment Facility Effluent Wastewater Characterisics

Month	Flow (mgd)	BOD5 (mg/l)	BOD5 (lbs/day)	TSS (mg/l)	TSS (lbs/day)	Phosphourou (mg/l)	Phosphourou (lbs/day)	Ammonia (mg/l)	Ammonia (lbs/day)
Jan '01	0.272	4	11	2	4	0.18	0.4	1.34	3.0
Feb '01	0.264	<4	9	<1	2	0.14	0.3	0.10	0.26
Mar '01	0.272	<4	9	<1	2	0.32	0.7	<0.05	0.07
Apr '01	0.275	<4	9	4	8	0.30	0.7	<0.05	0.07
May '01	0.285	<4	9	2	4	0.20	0.5	<0.05	0.07
Jun '01	0.313	<4	11	4	11	0.17	0.4	0.12	0.31
Jul '01	0.290	<4	9	2	4	0.17	0.4	<0.05	0.07
Aug '01	0.299	<4	9	2	3	0.13	0.3	<0.05	0.07
Sep '01	0.307	<4	11	2	6	0.09	0.2	<0.05	0.07
Oct '01	0.328	<4	11	<1	3	0.17	0.5	<0.05	0.07
Nov '01	0.353	<4	10	3	6	0.39	1.1	<0.05	0.07
Dec '01	0.365	<4	11	<1	3	0.13	0.4	<0.05	0.07
Jan '02	0.337	<4	10	2	5	0.18	0.5	<0.05	0.07
Feb '02	0.262	<4	8	2	4	0.17	0.4	<0.05	0.07
Mar '02	0.266	<4	9	3	6	0.21	0.5	<0.05	0.07
Apr '02	0.342	<4	10	<1	2	0.12	0.3	<0.05	0.07
May '02	0.398	<4	13	2	8	0.09	0.3	<0.05	0.07
Jun '02	0.352	<4	10	<1	2	0.34	1.0	0.36	1.1
Jul '02	0.338	<4	10	<1	2	0.06	0.2	<0.05	0.07
Aug '02	0.364	<4	13	<1	3	0.22	0.7	<0.05	0.07
Sep '02	0.360	<4	12	1	4	0.05	0.1	<0.05	0.07
Oct '02	0.353	<4	11	1	4	0.11	0.3	<0.05	0.07
Nov '02	0.288	<4	9	<1	2	0.21	0.5	1.22	2.9
Dec '02	0.293	5	10	1	3	0.10	0.2	<0.05	0.07
Average	**0.316**	**4**	**10**	**2**	**4**	**0.17**	**0.46**	**0.15**	**0.368**
Minimum	0.262	<4	8	<1	2	0.06	0.15	<0.05	0.065
Maximum	0.398	5	13	4	11	0.39	1.15	1.34	3.039

ATTACHMENT B

New York SPDES Permit No. 0101885

New York State Department of Environmental Conservation
Division of Water, 4th FLOOR
625 Broadway, Albany, New York 12233-3500
Phone: (518) 402-8177 • FAX: (518) 402-9029
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

August 14, 2002

Mr. Frank Sheridan
Director of Facilities Planning
New York State Department of Corrections OGS
Building 2, State Office Campus Building
1220 Washington Avenue
Albany, NY 12226

2/1/03

Dear Mr. Sheridan:

Re: Beford Hills Correctional Facility Wastewater Treatment Plant
New York City Department of Environmental Protection
WWTP Regulatory Upgrade Program

We have been informed that on August 6, 2002 the New York City Department of Environmental Protection (NYCDEP) authorized Bedford Hills Correctional Facility to commence Startup and Performance Testing of its recently upgraded wastewater treatment plant. This action by NYCDEP, under its WWTP Regulatory Upgrade Program, constitutes NYCDEP's acknowledgment of "functional completion" of the facility upgrade and begins the six (6) month period allowed the Bedford Hills Correctional Facility to achieve compliance with the Final Effluent Limitations in its SPDES permit (NY0101885).

Consistent with the requirements in the SPDES permit, this Department will be closely monitoring the Bedford Hills Correctional Facility's compliance with Final Effluent Limitations beginning on February 13, 2003. In the interim, the Bedford Hills Correctional Facility will continue to be required to comply with the Interim Effluent Limitations contained in its SPDES permit and all other conditions of the permit.

If you have any questions regarding the Bedford Hills Correctional Facility's compliance with its SPDES permit, feel free to contact this office or our Region 3 Water Engineer, Thomas Rudolph at (914) 332-1835 (ext. 355).

Very truly yours,

Robert R. Cronin, P.E.
Director
Bureau of Water Compliance Programs

cc: R. Ravallo, NYCDEP
B. Sammons, EFC
Tom Rudolph
K. Markussen
S. Vogler

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT
Special Conditions (Part 1)

Industrial Code: 8999	SPDES Number: NY - 01018
Discharge Class (CL): 09	DEC Number: 3-5520
Toxic Class (TX): N	Effective Date (EDP): 09/01/97
Major Drainage Basin: 13	Expiration Date (ExDP): 09/01/02
Sub Drainage Basin: 02	Modification Date(s): 07/21/99 (WES)
Water Index Number: H-31-P44-36-2	Attachment(s): General Conditions (Part II) Date: 11/90
Compact Area: Croton	

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act as amended, (33 U.S.C. Section 1251 et. seq.)(hereafter referred to as "the Act").

NYC

PERMITTEE NAME AND ADDRESS Attention: Warden

Name: NYS Dept. of Corrections
Street: 247 Harris Road
City: Bedford Hills State: NY Zip Code: 10507

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name: Bedford Hills Correctional Facility
Location (C,T,V): Bedford (T) County: Westchester
Facility Address: 247 Harris Rd.
City: Bedford Hills State: NY Zip Code: 10507
NYTM - E: NYTM - N: 4
From Outfall No.: 001 at Latitude: 41° 14' 36" & Longitude: 73° 40' 39"
into receiving waters known as: Broad Brook Class: D

and; (list other Outfalls, Receiving Waters & Water Classifications)

(Proposed as Class C)

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in Special Conditions (Part I) and General Conditions (Part II) of this permit.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: NYS Dept. of Corrections
Street: 247 Harris Road
City: Bedford Hills State: NY Zip Code: 10507
Responsible Official or Agent: Elaine Lord Phone: (914)241-3100

This permit and the authorization to discharge shall expire on midnight of the expiration date shown and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for a permit renewal no less than 180 days prior to the expiration date shown above.

DISTRIBUTION:
J. Marcogliese/E. Zicca
R. Hannaford/E. Reilly
USEPA, Region II
NYCDEP (Valhalla)
Westchester Co. Health Dept.

Permit Administrator:	William E. Steidle NYSDEC
Address:	21 South Putt Corners Road, New Paltz, NY 12561-1696
Signature: [signature]	Date: 7/21/99

DISCHARGE NOTIFICATION REQUIREMENTS

a) Within ninety days after the effective date of this permit modification, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have minimum dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY________

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: ____________________

Permittee Contact: ____________________

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Phone: ( ) - ### -####

b) If upon the effective date of this modification, the permittee has installed signs that include the information required by § 17-0815-a(2)(a), but do not meet the specifications listed above, the permittee may continue to use the existing signs for a period of up to five years, after which the signs shall comply with the specifications listed above.

c) The permittee shall periodically inspect the outfall identification signs in order to insure that they are maintained, are still visible and contain information that is current and factually correct.

d) Within ninety days after the effective date of this permit modification, the permittee shall provide for public review at a repository accessible to the public, copies of the Discharge Monitoring Reports (DMRs) as required by the RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS page of this permit. This repository shall be open to the public at a minimum of normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS page of your permit, each DMR shall be maintained on record for a period of three years.

91-20-2b (1/99)

SPDES No.: NY 0101885

Part 1, Page 3 of 6

INTERIM EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning 07/21/99 the discharges from the permitted facility shall be limited and monitored by the permittee as specified below:

LIMITATIONS APPLY: [X] All Year [ ] Seasonal from ________ to ________

Outfall Number 001

EFFLUENT LIMITATIONS

[X] Flow	30 day arithmetic mean 0.5	[X] MGD [ ] GPD	
[X] BOD, 5 - Day	30 day arithmetic mean 15	mg/l and 63	lbs/day[1]
[X] BOD, 5 - Day	7 day arithmetic mean 25	mg/l and 104	lbs/day
[ ] UOD[2]		mg/l and	lbs/day
[X] Solids, Suspended	30 day arithmetic mean 15	mg/l and 63	lbs/day[1]
[X] Solids, Suspended	7 day arithmetic mean 25	mg/l and 104	lbs/day

[ ] Effluent disinfection required: [ ] All Year [ ] Seasonal from ________ to ________

[X] Coliform, Fecal	30 day geometric mean shall not exceed 200/100 ml		
[X] Coliform, Fecal	7 day geometric mean shall not exceed 400/100 ml		
[X] Chlorine, Total Residual	Daily Maximum	0.1	mg/l
[X] pH	Range	6.5-8.5	SU
[X] Solids, Settleable	Daily Maximum	0.1	ml/l
[ ]		mg/l as	
[X] Chlorine Residual	Range in contact tank	0.5-2.0 mg/l [4]	
[X] Phosphorus, Total	30 day arith. mean	0.5 mg/l	
[X] Coliform, Total	Daily Maximum	750/100 ml	
[ ]			
[ ]			

MONITORING REQUIREMENTS

Parameter	Frequency	Sample Type	Sample Location Influent	Sample Location Effluent
[X] Flow, [X] MGD [ ] GPD	Continuous	N/A		X
[X] BOD, 5 - Day, mg/l	1/month	6 hr. comp.	X	X
[X] Solids, Suspended, mg/l	1/month	6 hr. comp.	X	X
[X] Coliform, Fecal, No./100 ml[3]	1/month	Grab		X
[ ] Nitrogen, TKN (as N), mg/l				
[X] Ammonia (as NH_3), mg/l	1/month	6 hr. comp.		X
[X] pH, SU (standard units)	1/day	Grab	X	X
[X] Solids, Settleable, ml/l	1/day	Grab	X	X
[X] Chlorine, Total Residual, mg/l[3]	1/day	Grab		X
[X] Phosphorus, Total (as P), mg/l	1/month	6 hr. comp.		X
[X] Temperature, Deg. F	1/day	Grab	X	X
[X] Chlorine Residual in	1/day	Grab		
[X] Coliform, Total	1/month	Grab		X

NOTES:
(1) and effluent value shall not exceed ______ % of influent values.
(2) Ultimate Oxygen Demand shall be computed as follows: $UOD = 1\frac{1}{2} \times CBOD_5 + 4\frac{1}{2} \times TKN$ (Total Kjeldahl Nitrogen)
(3) Monitoring of these parameters is only required during the period when disinfection is required. The operator/permittee shall physically inspect the disinfection equipment daily to insure it is operating properly and must maintain a written log of the inspections.
(4) If chlorine is used for disinfection.

91-20-2b (1/89)

SPDES No.: NY 0101885

FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning on the date set forth in the NYCDEP approved upgrade schedule the discharges from the permitted facility shall be limited and monitored by the permittee as specified below:

LIMITATIONS APPLY: [X] All Year [ ] Seasonal from ____________ to ____________

Outfall Number 001

EFFLUENT LIMITATIONS

Parameter	Basis	Limit	Units	Limit (lbs)	Units
[X] Flow	30 day arithmetic mean	0.5	[X] MGD [ ] GPD		
[X] CBOD, 5 - Day	30 day arithmetic mean	15	mg/l and	63	lbs/day(1)
[ ] BOD, 5 - Day	7 day arithmetic mean		mg/l and		lbs/day
[ ] UOD(2)			mg/l and		lbs/day
[X] Solids, Suspended	30 day arithmetic mean	10	mg/l and	42	lbs/day(1)
[ ] Solids, Suspended	7 day arithmetic mean		mg/l and		lbs/day

[X] Effluent disinfection required: [X] All Year [ ] Seasonal from ____________ to ____________

Parameter	Basis	Limit
[X] Coliform, Fecal	30 day geometric mean shall not exceed 200/100 ml	
[X] Coliform, Fecal	7 day geometric mean shall not exceed 400/100 ml	
[X] Chlorine, Total Residual	Daily Maximum	0.1 mg/l
[X] pH	Range	6.5-8.5 SU
[X] Solids, Settleable	Daily Maximum	0.1 ml/l
[X] Ammonia	30 Day Arith. Mean	(5) mg/l as NH_3
[X] Dissolved Oxygen	Daily Minimum	4.0 mg/l
[X] Phosphorus, Total	30 Day Arith. Mean	0.2 mg/l as P
[X] Coliform, ~~Fecal~~ Total	Daily Maximum	750/100 ml

MONITORING REQUIREMENTS

Parameter	Frequency	Sample Type	Sample Location Influent	Sample Location Effluent
[X] Flow, [X] MGD [ ] GPD	Continuous	Recorder		X
[X] CBOD, 5 - Day, mg/l	2/month	6 hr. comp.		X
[X] Solids, Suspended, mg/l	2/month	6 hr. comp.		X
[X] Coliform, Fecal, No./100 ml(3)	2/month	Grab		X
[ ] Nitrogen, TKN (as N), mg/l				
[X] Ammonia (as NH_3), mg/l	2/month	6 hr. comp.		X
[X] pH, SU (standard units)	1/day	Grab		X
[X] Solids, Settleable, ml/l	1/day	Grab		X
[X] Chlorine, Total Residual, mg/l(3,4)	1/day	Grab		X
[X] Phosphorus, Total (as P), mg/l	2/month	6 hr. comp.		X
[X] Temperature, Deg. F	1/day	Grab		X
[X] Dissolved Oxygen, mg/l	2/month	Grab		X
[ ]				

NOTES:
(1) and effluent value shall not exceed ____ % and ___ % of influent values for $CBOD_5$ & TSS respectively.
(2) Ultimate Oxygen Demand shall be computed as follows:
UOD = 1 ½ x $CBOD_5$ + 4 ½ x TKN (Total Kjeldahl Nitrogen)
(3) Monitoring of these parameters is only required during the period when disinfection is required. The operator/permittee shall physically inspect the disinfection equipment daily to insure it is operating properly and must maintain a written log of the inspections.
(4) If chlorine is used for disinfection
(5) The final Ammonia limit will be based on an analysis of the data generated during the interim monitoring period.

91-20-2a (1.89)

SPDES No.: NY 0101885

FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS FOR PATHOGEN REDUCTION

During the period beginning six months from the date of NYCDEP certification of "functional completion" of the facility's upgrade, as required in the facility's Final Upgrade Plan the discharges from the permitted facility shall be limited and monitored by the permittee as specified below:

Outfall Number & Effluent Parameter	Discharge Limitations Daily Avg.	Discharge Limitations Daily Max.	Units	Minimum Monitoring Requirements Measurement Frequency	Minimum Monitoring Requirements Sample Type
001					
Giardia Lamblia, Cysts	(Note 1)		NA	NA	NA
Enteric Viruses	(Note 2)		NA	NA	NA
Turbidity	(Note 3)		NTU	Continuous	Recorder (After microfiltration/equivalent)
Chlorine Residual	(Note 4)		Mg/l	1/Day	Grab (Chlorine contact tank prior to dechlorination)

Note 1 - Facility must be capable of achieving a 99.9% removal and/or inactivation of giardia lamblia cysts. Capability shall be demonstrated by maintaining the turbidity and chlorine levels specified and operating the microfiltration unit and the disinfection system on a continuous basis, in accordance with the provisions set forth in the WWTP's Operation and Maintenance Manual.

Note 2 - Facility must be capable of achieving 99.99% removal/inactivation of enteric viruses. Capability shall be demonstrated as stated above in Note 1.

Note 3 - The turbidity levels shall be maintained at less than or equal to 0.5 NTU in 95% of the measurements taken each month and an instantaneous maximum of 5.0 NTU.

Note 4 - When chlorine is used for disinfection, a minimum residual of 0.2 mg/l shall be maintained in the chlorine contact tank prior to dechlorination.

91-20-2f (5/94)

SPDES No.: NY 0101885

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to the General Conditions (Part II) of this permit for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of three years from the date of the sampling for subsequent inspection by the Department or its designated agent. Also;

[X] (if box is checked) monitoring information required by this permit shall be summarized and reported by submitting completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

Send the original (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water
Bureau of Watershed Compliance Programs
50 Wolf Road
Albany, New York 12233-3506

Phone: (518) 457-3790

Westchester Co. Health Dept.
145 Huguenot Street
New Rochelle, New York 10801

Send the first copy (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer
Region 3
200 White Plains Road - 5th Floor
Tarrytown, NY 10591

c) A monthly "Wastewater Facility Operation Report..." (form 92-15-7) shall be submitted (if box is checked) to the [X] Regional Water Engineer and/or [X] County Health Department or Environmental Control Agency listed above.

d) Noncompliance with the provisions of this permit shall be reported to the Department as prescribed in the attached General Conditions (Part II).

e) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

f) If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording on the Discharge Monitoring Reports.

g) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

h) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based upon measurements and sampling carried out during the most recently completed reporting period.

i) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences, The Nelson A. Rockefeller State Plaza, Albany, New York 12201.

ATTACHMENT C

Detailed Breakdown of Construction Costs
For All Alternatives

Town of Bedford
Wastewater Treatment Capacity Analysis
Preliminary Opinion of Probable Costs
Wastewater Treatment Facility Expansion Alternative No. 1

Item	Quantity	Unit	Unit Cost	Item Cost
Influent Flow Meter	1	LS	$81,000	$81,000
Influent Screens	1	LS	$136,000	$136,000
Vortex Grit Chamber	1	LS	$168,000	$168,000
Equalization Basins	1	LS	$600,000	$600,000
Influent Pump Upgrade	1	LS	$83,000	$83,000
Primary Clarifiers	1	LS	$326,000	$326,000
Single Stage Trickling Filters	1	LS	$4,600,000	$4,600,000
Secondary Clarifiers	1	LS	$574,000	$574,000
Rapid Sand Filter	1	LS	$435,000	$435,000
Microfiltration	1	LS	$895,000	$895,000
Headworks Building	1,800	SF	$250	$450,000
Headworks Building	1,800	SF	$250	$450,000
Electrical Building	500	SF	$250	$125,000
Demolitions	1	LS	$500,000	$500,000
Electrical Upgrade	1	LS	$200,000	$200,000
SCADA Upgrade	1	LS	$100,000	$100,000
Control Building Renovation	1	LS	$100,000	$100,000
Maintenance of Flows	1	LS	$100,000	$100,000
		Construction Subtotal		**$9,920,000**
		Contingency (20%)		$1,984,000
		Bonding (3%)		$298,000
		Insurance (2.5%)		$248,000
		Adminstration/Legal (2%)		$198,000
		Engineering, CA/RE (20%)		$1,984,000
		Pilot Test		$200,000
		Total Project Budget		**$14,800,000**

MALCOLM PIRNIE

Town of Bedford
Wastewater Treatment Capacity Analysis
Preliminary Opinion of Probable Costs
Wastewater Treatment Facility Expansion Alternative No. 2

Item	Quantity	Unit	Unit Cost	Item Cost
Influent Flow Meter	1	LS	$81,000	$81,000
Influent Screens	1	LS	$136,000	$136,000
Vortex Grit Chamber	1	LS	$168,000	$168,000
Equalization Basins	1	LS	$600,000	$600,000
Influent Pumps	1	LS	$83,000	$83,000
Primary Clarifiers	1	LS	$326,000	$326,000
RBCs	1	LS	$1,885,000	$1,885,000
Secondary Clarifiers	1	LS	$361,000	$361,000
Rapid Sand Filter	1	LS	$435,000	$435,000
Microfiltration	1	LS	$895,000	$895,000
Headworks Building	1,800	SF	$250	$450,000
Microfiltration Building	1,800	SF	$250	$450,000
Electrical Building	500	SF	$250	$125,000
Demolitions	1	LS	$500,000	$500,000
Electrical Upgrade	1	LS	$200,000	$200,000
SCADA Upgrade	1	LS	$100,000	$100,000
Control Building Renovation	1	LS	$100,000	$100,000
Maintenance of Flows	1	LS	$100,000	$100,000
		Construction Subtotal		**$7,000,000**
		Contingency (20%)		$1,400,000
		Bonding (3%)		$210,000
		Insurance (2.5%)		$175,000
		Adminstration/Legal (2%)		$140,000
		Engineering, CA/RE (20%)		$1,400,000
		Total Project Budget		**$10,300,000**

MALCOLM PIRNIE

Town of Bedford
Wastewater Treatment Capacity Analysis
Preliminary Opinion of Probable Costs
Wastewater Treatment Facility Expansion Alternative No. 3

Item	Quantity	Unit	Unit Cost	Item Cost
Influent Flow Meter	1	LS	$81,000	$81,000
Influent Screens	1	LS	$136,000	$136,000
Vortex Grit Chamber	1	LS	$168,000	$168,000
Equalization Basins	1	LS	$600,000	$600,000
Influent Pump Upgrade	1	LS	$83,000	$83,000
Primary Clarifiers	1	LS	$326,000	$326,000
Aeration Basin	1	LS	$1,309,000	$1,309,000
Secondary Clarifiers	1	LS	$587,000	$587,000
Rapid Sand Filter	1	LS	$435,000	$435,000
Microfiltration	1	LS	$895,000	$895,000
Headworks Building	1,800	SF	$250	$450,000
Headworks Building	1,800	SF	$250	$450,000
Electrical Building	500	SF	$250	$125,000
Aeration Building	200	SF	$250	$50,000
Demolitions	1	LS	$500,000	$500,000
Electrical Upgrade	1	LS	$200,000	$200,000
SCADA Upgrade	1	LS	$100,000	$100,000
Control Building Renovation	1	LS	$100,000	$100,000
Maintenance of Flows	1	LS	$100,000	$100,000
		Construction Subtotal		**$6,700,000**
		Contingency (20%)		$1,340,000
		Bonding (3%)		$201,000
		Insurance (2.5%)		$168,000
		Adminstration/Legal (2%)		$134,000
		Engineering, CA/RE (20%)		$1,340,000
		Pilot Test		$200,000
		Total Project Budget		**$10,100,000**

MALCOLM PIRNIE