PUBLIC REVIEW COPY

ACT 537 PLAN REVISION

CENTRE REGION ACT 537 PLAN

CENTRE COUNTY, PENNSYLVANIA

PREPARED FOR
CENTRE REGIONAL PLANNING COMMISSION

MARCH 2000

PROJECT NO. 3-1178.064

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TABLE OF CONTENTS

CENTRE REGION ACT 537 PLAN REVISION

TABLE OF CONTENTS (CONTINUED)

CENTRE REGION ACT 537 PLAN UPDATE

CHAPTER 4 – THE BENEFICIAL REUSE ALTERNATIVE

CHAPTER 5 – PROJECT IMPLEMENTATION

LIST OF APPENDICES

CENTRE REGION ACT 537 PLAN REVISION

A. Resolutions

B. PNDI Notification

C. PHMC Notification

D. Correspondence

E. Public Comments

F. 1990 Centre Region Act 537 Sewage Facilities Plan

G. 1996 Centre Regional Planning Commission Wastewater Treatment and Disposal Alternatives Study

H. 1997 Centre Regional Planning Agency Wastewater Treatment and Disposal Alternatives Study, Addendum # 1

I. 1997 Centre Regional Planning Agency Wastewater Treatment and Disposal Alternatives Study, Supplement – Beneficial Reuse

J. 1999 Act 537 Sewage Facilities Plan Update

K. 316(a) Study and Edinger Report

L. 1999 Transmission Corridor Report

M. 2000 Wetlands Delineation Report

N. Municipal Comments

LIST OF MAPS AND FIGURES

CENTRE REGION ACT 537 PLAN REVISION

LIST OF ACRONYMS

CENTRE REGION ACT 537 PLAN REVISION

Acronym	Description
AWWA	American Water Works Association
A/O	Anaerobic-Oxic Process
A2/O	Anaerobic-Anoxic-Oxic Process
BNR	Biological Nutrient Removal
BOD	Biological Oxygen Demand
CHJA	College-Harris Joint Authority
COG	Centre Region Council of Governments
CRPC	Centre Region Planning Commission
CTWA	College Township Water Authority
DCA	Department of Community Affairs
DEP	Department of Environmental Protection
EDU	Equivalent Dwelling Unit
ENR	Engineering News Record
EPA	Environmental Protection Agency
FTWSA	Ferguson Township Water & Sewer Authority
HRG	Herbert, Rowland, & Grubic, Inc.
HVAC	Heating, Ventilation, and Air-Conditioning
M&E	Meiser & Earl
MF	Microfiltration
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetlands Inventory
O&M	Operations & Maintenance
PFJA	Patton-Ferguson Joint Authority
PHMC	Pennsylvania Historical & Museum Commission
PMT	Project Management Team
PNDI	Pennsylvania Natural Diversity Inventory
PSU	The Pennsylvania State University
RBC	Rotating Biological Contactor
RO	Reverse Osmosis
S.R.	State Route
SBR	Sequencing Batch Reactor
SBWJA	Spring-Benner-Walker Joint Authority
SCADA	Supervisory Control and Data Acquisition
SCBWA	State College Borough Water Authority
SCI	Rockview State Correctional Institution
SCSA	State College Sewer Authority
SDWA	Safe Drinking Water Act
TFC HR	Thin-Film Composite High Rejection
UAJA	The University Area Joint Authority
UV	Ultraviolet
WEF	Water Environment Federation

LIST OF UNITS OF MEASURE

CENTRE REGION ACT 537 PLAN REVISION

Units of Measurement	Description
MGD	Million Gallons per Day
gpd	Gallons per Day
gpd/EDU	Gallons per Day per Equivalent Dwelling Unit
gpm	Gallons per Minute
lbs. BOD/day	Pounds of BOD per Day
lbs/day	Pounds per Day
mg/l	Milligrams per Liter

GLOSSARY

CENTRE REGION ACT 537 PLAN REVISION

A/O Process	A process of carbon oxidation and phosphorus removal from wastewater
Belt-Filter Press	A press which removes water from thickened sludge
Biological Nutrient Removal	The use of microorganisms for removing nitrogen and phosphorus from wastewater
BOD	The amount of oxygen required by microorganisms in the wastewater
Comminution	The grinding of solids in wastewater as it enters the treatment plant
Microfiltration	The removal of microscopic particles through a filter
Reverse Osmosis	The advanced filtration and removal of salts, colloids and organics on a microscopic level; produces ultra-pure water
Rotating Biological Contactor	Type of treatment system which provides biological treatment of wastewater
Sequencing Batch Reactor	Type of treatment system which provides biological treatment of wastewater
Ultraviolet Light Disinfection	Process of enabling microorganisms in wastewater
316(a) Study	Detailed analysis of impact of temperature upon stream conditions

EXECUTIVE SUMMARY

This document has been prepared by the University Area Joint Authority (UAJA), in cooperation with the Centre Regional Planning Commission (CRPC), to serve as a revision to the 1990 Centre Region Act 537 Plan. The purpose of the revision is to provide a comprehensive, detailed summary of the extensive wastewater planning and technological based evaluation that has been completed in accordance with the long-range planning goals of the 1990 Act 537 Plan. This revision has been assembled from numerous reports, studies, and pilot tests which have been completed by the UAJA since the 1990 Plan was adopted.

Started in the mid-1990's, the project has evolved from a classic wastewater needs based planning solution to an integrated and innovative Watershed Management Program. The planning for this document has been intensive and detailed due to the complex issues associated with the unique environmental characteristics of the Centre Region, most notably the Spring Creek watershed. A total of fourteen wastewater treatment alternatives were developed and analyzed for technical merit, economic feasibility, and overall benefit to the environment. As the planning work has progressed, some of these alternatives have been eliminated as viable solutions due to one major issue – a conventional expansion of the existing UAJA plant with a stream discharge in excess of 6.0 Million Gallons Per Day (MGD) has been ruled out due to negative thermal impacts upon Spring Creek determined by the 316(a) demonstration.

The 316(a) demonstration conducted by UAJA lasted for more than four years and concluded that the temperature effects of discharges from the UAJA plant up to 6.0 MGD had no adverse impacts to Spring Creeks indigenous populations. However, an extrapolation of modeling completed as part of the 316(a) demonstration indicated that any discharge above 6.0 MGD on an annual average basis will have an adverse impact upon the indigenous populations of Spring Creek and will not be permitted.

The recommended alternative, known as Beneficial Reuse, has been developed by the UAJA as a method to allow managed growth to continue within the Centre Region, while maintaining a high quality of life for the residents of the Region and protecting the natural environment. The Beneficial Reuse alternative incorporates improvements to the existing UAJA wastewater treatment plant; transmission, distribution, and storage system components to convey water to reuse customers and stream augmentation points; and constructed wetlands to act as natural buffers.

The recommended alternative has an estimated cost of approximately $55 Million to implement in total with three phases proposed for 2002, 2008 and 2013 respectively. The proposed phases are as follows:

- Phase I will consist of nutrient removal modifications to the UAJA treatment facility for the entire projected 9.0 MGD wastewater flow and construction of 0.75 MGD of Microfiltration, reverse osmosis and advanced disinfection capacity for production of reuse water. Additionally, a reuse water transmission main will be constructed to the commercial and industrial customers of the Dale Summit Industrial Park. Finally, a detailed hydrogeological study of the Slab Cabin Run sub-basin will be conducted.

- Phase II will consist of the construction of an additional 0.75 MGD (1.50 MGD total) of Microfiltration and advanced disinfection, as well as 0.75 MGD of reverse osmosis if deemed necessary. Additionally, UAJA will extend the transmission main to the intersection of Branch Road and Route 45 with stream augmentation sites on Slab Cabin Run.

- Phase III will consist of the construction of an additional 1.50 MGD (3.00 MGD total) of Microfiltration and advanced disinfection, as well as 1.50 MGD of reverse osmosis.

User rates for customers of the UAJA system are anticipated to increase from $60.00 to $62.40 per quarter initially, with planned modest rate increases over the next 20 years. The connection fee will increase to $2,500 per Equivalent Dwelling Unit (EDU) in 2001 and will also increase marginally over the next 20 years.

CHAPTER 1

INTRODUCTION

1.1.0 1990 Centre Region Act 537 Plan

In 1990, the Centre Region municipalities adopted the Centre Region Act 537 Sewage Facilities Plan that was prepared by the Center Regional Planning Commission. The plan studied the entire Centre Region, which includes College, Ferguson, Halfmoon, Harris, and Patton Townships and the Borough of State College.

1.1.1 Previous Growth Areas Identified by the Plan

The 1990 Act 537 Plan identified College, Ferguson, and Patton Townships as areas with significant development pressures. The Plan included population and housing studies, as well as economic trends and employment projections.

Growth areas identified in College Township include industrial areas along State Route (S.R.) 26 near the Nittany Mall, a convention center to the east of the Mt. Nittany Expressway and Beaver Stadium, commercial and industrial areas along South Atherton Street, as well as growth of several residential developments throughout the Township. These areas have since been developed with the inclusion of commercial and industrial facilities surrounding the Nittany Mall, the construction of Research Park and the Penn Stater Hotel and Conference Center, and the Scenery Drive industrial/commercial area on South Atherton Street. Residential development continues in College Township, particularly in the vicinity of the villages of Lemont and Houserville.

Ferguson Township was also anticipated to see growth in several residential areas as well as commercial/industrial facilities along Science Park Road. within the Bristol Corporate Center, and within the CATO Industrial Park. Residential development was expected to continue west of Science Park Road. To date, these areas have been developed and continue to expand. The expansion includes several residential areas along Whitehall Road and Blue Course Drive. Of relevance to the increase in sewage flow to the University Area Joint Authority is the connection of the Ferguson Township Water and Sewer Authority (FTWSA) service area to the UAJA collection system. The FTWSA system, which served primarily the Village of Pine Grove Mills,

was briefly mentioned in the 1990 Plan but was not included in future flow projections. This area had already been addressed by a separate Act 537 Plan which was completed outside of the Centre Region's Plan.

Patton Township was projected to have future growth in areas including Toftrees, the University Park Airport area, the Park Forest area, and expansion into the Buffalo Run Valley. Growth has progressed in these areas and includes a major commercial development under construction in the Woodycrest area and the development of the initial phases of the Grays Woods development near Scotia Road. Residential development continues to the north of Valley Vista Drive with the construction of manufactured housing developments.

Harris Township has seen residential development in the Bear Meadows Village and Aspen Heights areas.

1.1.2 Flow Projections & Needs Analysis

The 1990 Act 537 plan projected future flows to the University Area Joint Authority treatment plant. These projections accounted for a possible 0.5 to 1.2 MGD diversion to the UAJA plant from the Penn State University (PSU) treatment plant from the State College Sewer Authority (SCSA) and continued growth within the UAJA service area. This diverted flow is necessary due to an increase in flow generated by PSU. In order to reduce the load to the PSU treatment facility, flow from State College Borough will be diverted.

At the time of the 1990 Plan, the UAJA treatment plant was permitted at 3.84 MGD. The Phase I expansion of the UAJA plant, which would increase the capacity to 6.0 MGD, was anticipated to be completed in April of 1992. However, the results of the projected needs analysis showed that by 1992, the UAJA plant would reach 80% of the 6.0 MGD rated capacity, prompting the need for additional planning for a long-term treatment alternative for the Centre Region. Long-term projections using the 3-month averages for the UAJA treatment plant indicated that by 2003, flow to the plant would exceed the 6.0 MGD rated capacity. By 2010, the plant would receive approximately 6.60 MGD.

1.1.3. Recommended Course of Action By the 1990 Act 537 Plan

A potential course of action to achieve long-term sewage treatment needs of the Centre Region was the proposed Phase II Expansion of the UAJA facility to 8.0 MGD. It was anticipated that a facility of this capacity would be adequate for the expected growth in the Centre Region. Before this expansion could be implemented, it was determined that an analysis of the impact of increasing the amount of flow discharged to Spring Creek must be completed.

Flow reduction and flow management were other alternatives mentioned in the 1990 Plan for the former Patton-Ferguson Joint Authority (PFJA) and College-Harris Joint Authority (CHJA) collection systems. It was discussed that efforts to reduce inflow and infiltration to the collection system would assist the Region in meeting its long-term sewage needs. A significant reduction in flow would ultimately benefit the Region by reducing the hydraulic loads conveyed to the UAJA treatment facility.

The 1990 Plan selected a 5-year plan for the Centre Region that included the Phase I Expansion of the UAJA treatment facility to 6.0 MGD, as well as a detailed evaluation of long-term wastewater alternatives. It was also recommended that the Centre Region Council of Governments (COG) prepare a 5-year update of the Centre Region Act 537 plan.

The selected 10-year plan recommended the coordination of ongoing wastewater planning and administration between the COG, UAJA, and DEP.

1.1.4 Planning Results

The result of the planning efforts recommended by the 1990 Act 537 plan include a study of the impacts on Spring Creek and an analysis of 14 treatment alternatives. The wastewater treatment and disposal alternatives were published in the following documents prepared by Herbert, Rowland, & Grubic, Inc.:

- Centre Regional Planning Commission Wastewater Treatment and Disposal Alternatives Study. (January 1996)

- Centre Regional Planning Agency Wastewater Treatment and Disposal Alternatives Study, Addendum #1. (May 1997)
- Centre Regional Planning Agency Wastewater Treatment and Disposal Alternatives Study, Supplement - Beneficial Reuse Alternative. (October 1997)

The 14 alternatives from these three studies were presented to the Centre Region Council of Governments in the Wastewater Treatment and Disposal Alternatives Study. Of the 14 alternatives, the Beneficial Reuse Alternative was endorsed by the COG as the alternative of choice, however, it was requested that further study and analysis be completed prior to an official adoption of the alternative under a revised Centre Region Act 537 Plan. This responsibility for further study was delegated to UAJA.

To facilitate this analysis, UAJA formed a Project Management Team (PMT). The PMT was to decide what facets of the project needed further analysis and to recommend to UAJA, and ultimately the elected officials, specific project concepts for implementation. The organizations that participated in the PMT were:

- University Area Joint Authority
- State College Borough Water Authority (SCBWA)
- College Township Water Authority (CTWA)
- Pennsylvania State University
- COG Administrative Staff
- Centre Region Planning Agency
- Pennsylvania Department of Environmental Protection
- Senator Corman's Office
- Herbert, Rowland & Grubic, Inc. (HRG)
- Black & Veatch (HRG's project subconsultant)
- Sear-Brown Group (PSU's consultant)
- Gwin Dobson & Forman (SCBWA's consultant)
- Meiser & Earl (M&E)

The analysis of the Beneficial Reuse Alternative is detailed in the following chapters of this plan. The analysis includes detailed preliminary engineering and cost estimates for the implementation of the Beneficial Reuse Project.

CHAPTER 2

CAPACITY NEEDS ANALYSIS

2.1.0 Current Service Areas of the Centre Region

The Centre Region Municipalities, as shown on Map 1, consist of College, Ferguson, Halfmoon, Harris, and Patton Townships, and State College Borough. Public sewer service in the Centre Region is currently available in College, Ferguson, Harris and Patton Townships, the Borough of State College, and the Pennsylvania State University campus. Halfmoon Township, a member of the COG does not presently have public sewer service. Sewer service in the Region is provided by the University Area Joint Authority, Penn State University and the State College Sewer Authority.

2.1.1 The UAJA Service Area

In 1998, the former Patton-Ferguson Joint Authority and College-Harris Joint Authority were incorporated into the University Area Joint Authority. The collection systems of these authorities are now owned, operated, and maintained by UAJA.

The sewer service area for UAJA includes most of the existing developed areas of Patton, Ferguson, College, and Harris Townships. The collection system also receives flow from State College Borough and PSU. The flow from Penn State is from direct flow to the collection system and by-pass flow from its treatment facility. The current service area of UAJA is shown on Map-2.

The current UAJA service area includes portions of the Centre Region previously identified as 5-year and 10-year service areas by the 1990 Act 537 Plan. These areas include residential subdivisions such as Aspen Heights and Bear Meadows Village in Harris Township, industrial and residential areas along S.R. 26 and the Benner Pike in College Township, Graysdale and the Fox Hill Road area in Patton Township, the Village of Pine Grove Mills (by mid-2000) and a portion of Whitehall Road and S.R. 26 in Ferguson Township.

2.1.2 The State College Sewer Authority Service Area

The SCSA authority collects wastewater from the Borough of State College. The Borough of State College maintains the SCSA sewers under a lease agreement. Wastewater from the Borough is treated at a plant owned and operated by the Pennsylvania State University. Under an agreement between UAJA and SCSA, flows up to 1.0 MGD are also by-passed and discharged into the UAJA collection system. The current service areas of the SCSA are shown on Map 2.

2.1.3 Ferguson Township Water and Sewer Authority Service Area

Upon completion of the Pine Grove Mills sanitary sewer extension, scheduled for substantial completion in April 2000, the Ferguson Township Water and Sewer Authority service area will be totally incorporated into the UAJA service area. The existing Ferguson Township Wastewater Treatment Plant had been experiencing numerous operational problems and had been cited with several violations by the DEP. Those problems and violations were summarized in a letter dated June 8, 1999 from the DEP to the FTWSA. The UAJA initiated an Act 537 Plan Update at the request of the Ferguson Township Supervisors and the FTWSA in July of 1999. The Planning Area was limited to the existing FTWSA service area, which included the Village of Pine Grove Mills and areas immediately adjacent to the Village along S.R. 26 and 45. UAJA retained the services of Herbert, Rowland & Grubic, Inc. to complete the necessary technical evaluation and planning for public sewage facilities in accordance with Act 537. The Scope of Work for the Plan was approved by the DEP by letter dated July 16, 1999. The Plan was adopted by the Centre Region municipalities and approved by the DEP by letter dated October 21, 1999 to the Ferguson Township Supervisors.

UAJA developed an aggressive schedule to implement the alternative recommended by the Plan Update. The schedule called for concurrent planning and permitting approval followed by a short duration construction project. The existing FTWSA plant will be abandoned upon completion of the project.

As identified by Map 2, the UAJA service area includes the Village of Pine Grove Mills and surrounding portions of Ferguson Township. The area is approximately four miles southwest of the Borough of State College. The service area includes residential, agricultural, and commercial land uses.

2.2.0 Current Treatment Facilities of the Centre Region

In order to adequately plan for the future methods of wastewater treatment and disposal in the Centre Region, it is necessary to evaluate the conditions of the existing nearby treatment facilities. The existing facilities within the Planning Area are the UAJA Spring Creek Pollution Control Facility and the Penn State University Wastewater Treatment Facility. As discussed under section 2.1.3, the existing FTSWA plant will be abandoned upon completion of a sewer extension by the UAJA. The Bellefonte Wastewater Treatment Facility, which is located outside of the Centre Region, provides sewage treatment to municipalities which are located immediately adjacent to the Planning Area.

2.2.1 The UAJA Spring Creek Pollution Control Facility

The Spring Creek Pollution Control Facility was originally constructed in 1969 with a design hydraulic capacity of 3.84 MGD. In 1992, the Stage IV Additions Project was completed. This project increased the treatment hydraulic capacity to 6.0 MGD and organic capacity to 10,000 pounds of Biological Oxygen Demand (BOD) per day. In 1998, the plant was organically re-rated to a capacity of 15,012 pounds of BOD per day. An additional Organic Rerate was submitted in December of 1999 and was approved by permit issued March 7, 2000. This rerate increased the influent organic loading to 20,516 pounds of BOD per day. Major treatment processes include the following:

- flow metering and comminution
- primary clarification
- A/O^{TM} activated sludge biological treatment system
- final clarification
- supplemental alum addition for phosphorus removal
- tertiary dual media filtration
- chlorination-dechlorination

The effluent is discharged to Spring Creek. Primary sludge and thickened waste activated sludge are blended, dewatered by belt filter press and then composted. The finished compost is distributed using several DEP approved methods. UAJA compost meets DEP exceptional quality standards.

The Spring Creek Pollution Control Facility also provides sewage treatment to the SCSA. Flows of up to 1.0 MGD may be diverted to the UAJA system for treatment. All portions of the UAJA collection system are tributary to the Spring Creek Pollution Control Facility, while the flows from the SCSA service area are divided between the PSU plant and the UAJA plant.

According to the 1999 Chapter 94 Wasteload Management Report for the UAJA facility, the average flow to the plant was 4.59 MGD during the period from 1995 through 1999. The report projects an average of 5.36 MGD to the facility by 2004. The organic loading data included in the Chapter 94 report indicates that the facility is projected to below its design organic loading of 20,516 lbs/day of BOD over the next five years. Table 2.1 shows the projected hydraulic and organic loading for the facility.

Table 2.1 Projected Loading for the UAJA Treatment Plant

		Hydraulic		Organic
Year	Number of Additional EDUs	Average (MGD)	3-Month Maximum (MGD)	BOD (lbs BOD/Day)
2000	650	4.74	5.21	12,244
2001	650	4.89	5.38	12,688
2002	650	5.05	5.55	13,133
2003	650	5.20	5.72	13,578
2004	650	5.36	5.89	14,023

2.2.2 The Penn State University Wastewater Treatment Facility

The PSU plant treats wastewater from the PSU campus and the Borough of State College. The plant is located on University property near the intersection of University Drive and College Avenue. Treated wastewater is pumped from the facility to a spray irrigation system located on State Gamelands and University property for ultimate disposal. Wastewater from the Borough of State College is also by-passed and discharged into the UAJA collection system.

Table 2.2 Projected Loading for the PSU Treatment Plant				
		Hydraulic		Organic
Year	Number of Additional EDUs	Average (MGD)	3-Month Maximum (MGD)	BOD (lbs BOD/Day)
2000		2.50	2.95	3,807
2001		2.56	3.02	3,898
2002		2.62	3.09	3,990
2003		2.68	3.16	4,081
2004		2.74	3.23	4,172

2.2.3 The Bellefonte Wastewater Treatment Facility

Although the Bellefonte Wastewater Treatment Facility is not located within the Centre Region, it is located close enough to be considered as an alternate location for the treatment and disposal of under regional concepts. The Bellefonte plant provides treatment of wastewater collected from the Borough of Bellefonte and Spring, Benner, and Walker Townships.

According to the 1999 Wasteload Management Report, the Bellefonte Wastewater Treatment Facility is permitted for an annual average flow of 3.22 MGD with a maximum allowable organic load of 5,640 pounds of BOD per day, based upon an influent concentration of 210 mg/l. The plant was recently upgraded to include a raw sewage pump station and pretreatment facility, bar screen, comminutor and grit removal facility that are sized for 12.0 MGD. The remaining components (activated sludge units, Rotating Biological Contactor (RBC) units, final clarifiers, dual media filters, and chlorine contact tanks) are permitted for 3.22 MGD.

In 1999 the average daily flow was 1.87 MGD with an average organic load of 3,564 pounds of BOD. Projections for the year 2004 are for an average daily flow of 1.97 MGD and an average daily organic load of 4,848 pounds of BOD. These projections are based on an assumption of an additional 100 EDUs per year at an average flow of 160 gpd/EDU from the Spring-Benner-Walker Joint Authority (SBWJA) collection system. The 1999 Wasteload Management Report states that no hydraulic or organic overloading will occur by the year 2004. Table 2.3 shows the projected hydraulic and organic loading of the facility as taken from the 1999 Chapter 94 Report.

Table 2.3 Projected Loading for the Bellefonte Treatment Plant				
		Hydraulic		Organic
Year	Number of Additional EDUs	Average (MGD)	3-Month Maximum (MGD)	BOD (lbs BOD/Day)
2000	273	1.91	2.00	4,636
2001	100	1.93	2.03	4,690
2002	100	1.94	2.04	4,742
2003	100	1.96	2.06	4,795
2004	100	1.97	2.07	4,848

2.3.0 Expected Growth Predictions and Capacity Requirements

To evaluate the wastewater needs of the Centre Region, the CRPC has identified areas of future growth and development, and population projections have been developed. These areas represent new and existing communities within the Centre Region that could expand, thereby producing a greater quantity of wastewater flow.

In order to estimate the quantity of flows several important values were projected. First, utilizing the Centre Region's recorded water usage, the CRPC was able to evaluate the average daily water use per dwelling and per capita. Secondly, in order to use the water usage data to accurately predict an expected quantity of wastewater flow, an estimate of the number of new dwellings was necessary. Using the identified areas of growth and considering current and future zoning, an estimate of the number of dwellings to be built was determined. Current State College Area School District's census data provided an average number of persons per dwelling, which let to an estimated population increase of the Centre Region. Utilizing CRPC values for gallons of wastewater produced per person per day and the 20-year projected population increase estimate, a 2.0 MGD increase in wastewater flow was originally expected from a population increase of 23,000 people.

One of the first tasks of the Project Management Team was to determine the size of the next wastewater treatment capacity upgrade. Based upon updated growth figures from the CRPC, the originally proposed increment of 2.0 MGD would be insufficient to handle the growth of the Centre Region for the next 20 years. The growth trends for the Centre Region, determined by the CRPC are shown in Table 2.4.

TABLE 2.4 - POPULATION PROJECTIONS 1990-2020 (includes Penn State Students)					
	1990	1998	2000	2010	2020
College Township	7,677	8,564	8,868	10,129	11,391
Ferguson Township	9,368	12,237	12,843	15,473	17,851
Halfmoon Township	1,469	2,249	2,350	3,250	4,150
Harris Township	4,167	4,639	4,852	5,485	6,104
Patton Township	9,971	10,888	11,245	12,734	13,891
State College Borough	38,981	41,074	42,748	45,142	46,929
Centre Region	71,633	79,558	82,906	91,751	100,316

Source: CRPC, 1998

After a thorough evaluation of the growth trends of the Centre Region, the PMT and CRPC agreed that an increase of 3.0 MGD of wastewater treatment and disposal capacity would be necessary to handle the expected growth. Assuming the project is adopted during 2000 and implemented by 2003, the added increase in wastewater treatment capacity needed per year is shown in Table 2.5.

Table 2.5 Expected Growth		
Year	**Equivalent EDU Increase**	**Flow Increase (MGD)**
2003	-	0.00
2008	2,855	0.75
2013	5,710	1.50
2018	8,565	2.25
2023	11,420	3.00

The 1996 Wastewater Treatment and Disposal Alternatives Study was based upon an expected required capacity of 8.0 MGD. With recent growth projections, it is apparent that the Centre Region should instead plan for 9.0 MGD in order to meet long-term demands. Therefore, it was necessary to update the originally proposed alternatives detailed in the 1996 study to account for a 3.0 MGD increase in flow.

2.3.1 5-Year Future Sewer Service Areas

The future 5-Year Sewer Service Areas are located in Patton Township (See Map 2). The first area is a portion of land along Circleville Road to the west of Valley Vista Drive. The second is a

portion of land located between Buffalo Run and Fox Hill Road near the border of Patton and Benner Townships. These areas were also included in the 1990 Act 537 Plan 5-year service areas, but have yet to be fully developed.

2.3.2 10-Year Future Sewer Service Areas

The future 10-Year Sewer Service Areas are predominantly located in Patton Township, Ferguson and Harris Townships (See Map 2). These areas were included in the 1990 Act 537 Plan.

CHAPTER 3

WASTEWATER TREATMENT AND DISPOSAL ALTERNATIVES

3.1.0 The Wastewater Treatment and Disposal Alternatives Study

To find solutions for the increasing demand in wastewater treatment and disposal capacity, the Centre Regional Planning Commission authorized the completion of a wastewater alternatives study that would evaluate potential options for addressing the Region's future wastewater treatment and disposal needs. While it was clear that the UAJA facility would continue to be the Region's primary wastewater treatment facility, it was necessary to identify treatment and disposal options to supplement the future capacity of the plant.

The original Wastewater Treatment and Disposal Alternative Study, completed by HRG in 1996, contained 12 alternatives. This document was revised by Addendum in May 1997, in which a 13th alternative was proposed. In October 1997 a final alternative was analyzed which was the Beneficial Reuse Alternative. A total of 14 alternatives were analyzed and each alternative's technical feasibility for implementation was ranked based upon a weighted point scale and eight criteria. The eight criteria and the point scale for evaluating the alternatives in the original 1996 Wastewater Treatment and Disposal Alternatives Study were as follows:

• Reliability	5 pts
• Land Required for Treatment	2 pts
• Lack of Unknown Conditions	5 pts
• Reduced Pollutant Loading to High Quality Section of Spring Creek	2 pts
• Reduced Temperature Increase to High Quality Section of Spring Creek	2 pts
• Lessened Stream Impacts of Temporary Failure at Treatment Facility(s)	4 pts
• Operability	3 pts
• Permitee and Regulatory Control	2 pts
Total Possible Points	25

The weight of each decisive factor was then multiplied by the score a particular alternative received. The score range for each criteria was as follows:

4 = Good 3 = Fair 2 = Poor 1 = Deficient

These subjective grades were used in a manner that compared the relative grade of one alternative to the remaining group. For example, reliability has a weighting factor of 5. If an alternative receives a score of Good (4) in this category, its total score for reliability would be 20. The total scores for all categories were totaled, resulting in the final subjective score for each alternative, with a maximum of 100.

The original 1996 Wastewater Treatment and Disposal Alternatives Study developed alternatives for an additional 2.0 MGD of treatment capacity. Subsequent planning efforts by the PMT and the CRPC have increased the additional capacity need of the Centre Region to 3.0 MGD (see section 2.3.0). Therefore, all alternatives discussed in the following sections have been expanded to provide a total wastewater treatment capacity of 9.0 MGD. Under Chapter 93 Regulations, special protection requirements for a High Quality Watershed eliminate stream discharge alternatives if a feasible non-stream discharge alternative is identified. In addition, the results of the 316(a) Thermal Impact study showed that a direct discharge from the UAJA plant to Spring Creek of greater than 6.0 MGD can no longer be considered as a viable technical option. The Spring Creek Watershed is shown on Map 3.

The following sections present the original 14 alternatives developed by the Wastewater Treatment and Disposal Alternatives Study to document the historical analyses which has been completed. Several of these alternatives are no longer viable due to the 316(a) demonstration. These alternatives have been clearly identified so as not to confuse the reader. Table 3.1, which follows the discussion of the 14 alternatives, provides the original ranking based upon the scoring system described above.

3.1.1 Alternative 1 - UAJA Upgrade with Discharge at the Current Outfall (Not Implementable)

This alternative consisted of upgrading the existing UAJA wastewater treatment plant to 9.0 MGD. This upgrade would include an expansion to the existing preliminary treatment, primary

clarification, the aeration system, final clarification, chlorine disinfection system, and chlorine feed system.

The advantage of this alternative was a low potential for unknown problems associated with expanding the existing plant. The existing, highly-trained staff and professionals of the UAJA are capable of ensuring that the new facilities would be constructed and operated to applicable standards. The use of existing land, laboratories, and composting facilities would minimize construction costs and the need for construction of redundant systems. Monitoring of a single existing discharge point would simplify the regulatory agency's role.

The disadvantage to this option is the obvious negative impact to Spring Creek with the additional discharge. The results of the 316(a) Thermal Impacts Study concluded that discharge above 6.0 MGD would have an adverse impact upon the indigenous populations of Spring Creek. The additional discharge to Spring Creek would also negatively impact the amount of dissolved oxygen in the stream near the outfall.

At the time of the original study, this alternative was a technically viable option and a favorable choice for the Centre Region, however, it is no longer an implementable alternative. This alternative originally received a total technical score of 69.5 out of a possible 100.

3.1.2 Alternative 2 – Transfer of Treated Effluent from UAJA to Bald Eagle Creek (Not Implementable)

This alternative includes all the required UAJA treatment plant upgrades described in Alternative 1, with the addition of a new splitter box beyond the chlorine contact chamber. This splitter box would divert an average daily flow of 3.0 MGD from the current discharge to an outfall on Bald Eagle Creek near Milesburg. This outfall will discharge flow transferred from the UAJA plant via a pumping station and gravity main system. The treated effluent would be pumped from UAJA to S.R. 150 behind the Rockview State Correctional Institution (SCI). From there, the flow would be conveyed by gravity along S.R. 150 to Bellefonte. At Bellefonte, the flow would follow S.R. 144 and then proceed to the planned outfall. The outfall would have ultraviolet light disinfection of the effluent to eliminate the possibility of biological reactivation and to comply with the DEP disinfection requirements.

This alternative had the advantage of being a conventional alternative. The problems associated with construction of the conveyance system and the plant upgrade are minimal. This alternative would also meet the 316(a) requirements by discharging outside the High Quality section of Spring Creek. This alternative also allows for the continued use of the existing high quality facilities at UAJA.

The disadvantages of this alternative were the high cost of purchasing the right-of-way for the conveyance system, and additional remote maintenance and power requirements of the ultraviolet (UV) disinfection system. The potential also exists for loss of the treated effluent into a populated area in the event of a failure of the conveyance system. Lastly, the construction of this alternative may cause the interruption of treatment at the UAJA plant.

This alternative was originally believed to be one of the more technically viable options evaluated, however, it is no longer an implementable alternative due to the existence of a viable non-discharge alternative. This alternative originally received a total technical score of 72.5 out of a possible 100.

3.1.3 Alternative 3 - Transfer Treated Effluent from UAJA to Spring Creek below S.R. 550 Bridge
(Not Implementable)

This alternative also includes the UAJA plant upgrades and splitter box arrangement described in Alternative 2. The major difference is the transfer of an average daily flow of 3 MGD from the current discharge to an outfall at the S.R. 550 bridge on Spring Creek. This outfall will discharge flow transferred from UAJA via a pumping station and gravity line system. The treated effluent would be pumped from UAJA to S.R. 150 behind the Rockview SCI. From there, the flow would proceed by gravity along S.R. 150 until it reaches the S.R. 550 bridge. Similar to Alternative 2, the outfall would also have ultraviolet light disinfection of the effluent to remove the possibility of biological reactivation and to comply with the DEP disinfection requirements.

This alternative also had the advantage of being a conventional alternative. The problems associated with construction of the conveyance system and the plant upgrade are minimal. The land requirements are less than Alternative 2. This alternative would also meet the 316(a)

requirements by discharging outside the High Quality section of Spring Creek allow for the continued use of the existing facilities at UAJA.

The disadvantages of this alternative were the cost of purchasing the right-of-way for the conveyance system, and additional maintenance and power requirements of the ultraviolet disinfection system. The potential also exists for loss of the treated effluent into a populated area during failure of the conveyance system. Lastly, the construction of this alternative may cause the interruption of treatment at the UAJA plant.

This alternative was originally believed to be one of the more technically viable options evaluated, however, it is no longer an implementable alternative due to the existence of a viable non-discharge alternative. This alternative received a total technical score of 73.5 out of a possible 100.

3.1.4 Alternative 4 – Transfer Treated Effluent from UAJA to Benner Spring Fish Research Station
(Not Implementable)

This alternative also includes the UAJA plant upgrades and splitter box arrangement described in Alternative 2 and 3. The difference is the transfer of an average daily flow of 3.0 MGD from the current discharge to an outfall at the Benner Spring Fish Research Station on Spring Creek. This outfall will discharge flow transferred from UAJA via a pumping station and gravity line system. The treated effluent would be pumped from UAJA to Shiloh road, then proceed by gravity to the planned outfall. The outfall would also have ultraviolet light disinfection of the effluent to remove the possibility of biological reactivation and to comply with the DEP disinfection requirements.

This alternative proposes a conventional stream discharge solution. The problems associated with construction of the conveyance system and the plant upgrade are minimal. The land requirements and distance covered are much lower than Alternatives 2 and 3. This alternative also allows for the continued use of the existing facilities at UAJA.

The primary disadvantage of this alternative is the discharge of effluent into a High Quality section of Spring Creek. This would increase the average water temperatures and place more

pollutants into the stream. Another disadvantage is the cost of purchasing the right-of-way for the conveyance system, and additional maintenance and power requirements of the ultraviolet disinfection system. The potential also exists for loss of the treated effluent into a populated area during failure of the conveyance system. Lastly, the construction of this alternative may cause the interruption of treatment at the UAJA plant.

Due to the thermal impacts on Spring Creek, this alternative is no longer an implementable option for the Centre Region. This alternative originally received a total technical score of 61.5 out of a possible 100.

3.1.5 Alternative 5 – Transfer Raw Sewage to Existing Bellefonte Treatment Facility (Not Implementable)

This alternative involves the conveyance of untreated sewage to an upgraded Bellefonte Wastewater Treatment Facility for treatment and disposal. The facility would need to be upgraded and expanded to handle an additional 3.0 MGD and will continue to utilize the existing outfall. A splitter box would be installed at the UAJA Main Pumphouse on Trout Road. The untreated sewage would be pumped from UAJA to S.R. 150 behind the Rockview SCI. From there, the flow would proceed by gravity along S.R. 150 to the Bellefonte Treatment Facility. The Bellefonte facility's RBC system would need to be expanded to handle the additional flow, along with the chlorine contact chamber and secondary clarifiers. Additionally, the sludge handling and processing facilities would require increased capacity to handle the volume of waste.

The advantage of this alternative was that it removes untreated flow from the UAJA facility, eliminating the need for an upgrade. This alternative also eliminates negative discharge impacts to the High Quality section of Spring Creek.

This alternative had many disadvantages. The first is the need to expand the Bellefonte Treatment Facility to handle the additional 3.0 MGD. The second is the length of the conveyance system and the significant cost incurred by the purchase of right-of-way. Lastly, the transfer of raw sewage would pose an odor and health problem if a failure occurred in the conveyance system.

This alternative was originally believed to be technically viable, however, it is no longer an implementable alternative. This alternative originally received a total technical score of 64.5 out of a possible 100.

3.1.6 Alternative 6 – Transfer Raw Sewage to a New Bald Eagle Treatment Facility (Not Implementable)

This alternative involves the conveyance of untreated sewage to a new satellite treatment plant on Bald Eagle Creek for treatment and disposal. The facility would consist of a new sequencing batch reactor (SBR) process designed to handle 3.0 MGD and will require a new outfall. A splitter box would be installed at the UAJA Main Pumphouse on Trout Road. The untreated sewage would be pumped from UAJA to S.R. 150 behind the Rockview SCI. From there, the flow would proceed by gravity along S.R. 150, through Bellefonte, along S.R. 144 and eventually to the satellite facility located just beyond Milesburg on S.R. 220. The treated effluent would be discharged into Bald Eagle Creek and the sludge would be treated on site.

The advantage of this alternative was that it removes untreated flow from the UAJA facility, eliminating the need for an upgrade. This alternative also eliminates negative discharge impacts to the High Quality section of Spring Creek. Another advantage is that the new facility could provide state-of-the-art treatment. This technology was selected for evaluation because, in general, an SBR plant requires less land area than a conventional aeration or an oxidation ditch facility.

The disadvantages are similar to those of transferring raw sewage to the Bellefonte Treatment Plant. The construction of the conveyance system would be difficult and would require a large amount of right-of-way to be purchased. Also, the satellite plant would require additional staff and present remote operation issues. Lastly, the transfer of raw sewage would pose an odor and health problem if a failure occurred in the conveyance system. This alternative also had a high capital cost with the potential for unforeseen permitting and construction issues.

This alternative was originally believed to be technically viable, however, it is no longer an implementable alternative. This alternative originally received a total technical score of 61.5 out of a possible 100.

3.1.7 Alternative 7 – Overland Raw Sewage Transfer to Bellefonte Treatment Facility (Not Implementable)

This alternative is similar to Alternative 5 and involves the overland conveyance of untreated sewage to an upgraded Bellefonte Wastewater Treatment Facility for treatment and disposal. The Bellefonte facility would need to be upgraded and expanded to handle an additional 3.0 MGD and will continue to utilize the existing outfall. A splitter box would be installed at the UAJA Main Pumphouse on Trout Road. The untreated sewage would be pumped via a direct overland route from UAJA through the Rockview SCI property, crossing S.R. 150. The raw sewage then proceeds by gravity along S.R. 150 to S.R. 144, and then proceeds by gravity along S.R. 144 to the Bellefonte Treatment Facility. The Bellefonte facility's RBC system would be expanded to handle the additional flow, along with improvements to the chlorine contact chamber and secondary clarifiers. Additionally, the sludge handling and processing facilities would be upgraded to handle the volume of waste.

The advantage of this alternative was that it removes untreated flow from the UAJA facility, eliminating the need for an upgrade. This alternative also eliminates additional discharge impacts to the High Quality section of Spring Creek. The overland route requires less new construction than Alternative 5.

Similar to Alternative 5, this alternative had many disadvantages. The first was the need to expand the Bellefonte Treatment Facility to handle the additional 3.0 MGD. The second is the length of the conveyance system and the significant cost incurred by the purchase of right-of-way. The approval of Rockview SCI would also have to be obtained, which may prove to be an arduous task. Lastly, the conveyance of raw sewage would pose an odor and public health problem if a failure occurred in the conveyance system.

This alternative was originally believed to be technically viable, however, it is no longer an implementable alternative. This alternative originally received a total technical score of 57.0 out of a possible 100.

3.1.8 Alternative 8 – Overland Raw Sewage Transfer to a New Bald Eagle Creek Treatment Facility
(Not Implementable)

This alternative is similar to Alternative 6 and involves the overland conveyance of untreated sewage to a newly constructed SBR satellite treatment facility, for treatment and disposal. A splitter box would be installed at the UAJA Main Pumphouse on Trout Road. The untreated sewage would be pumped via a direct overland route from UAJA through the Rockview SCI property, crossing S.R. 150. The raw sewage then proceeds by gravity along S.R. 150 to S.R. 144, and then proceeds along S.R. 144 until it reaches the Bald Eagle Creek Treatment Facility.

The advantage of this alternative was that it removes untreated flow from the UAJA facility, eliminating the need for an upgrade. This alternative also eliminates negative discharge impacts to the High Quality section of Spring Creek. As previously described, the new facility could provide state-of-the-art treatment and an SBR typically plant requires less land than a conventional aeration or an oxidation ditch facility.

The disadvantages are similar to those of transferring raw sewage to the Bellefonte Treatment Plant. The construction of the conveyance system would be difficult and would require a large amount of right-of-way to be purchased. Approval from Rockview SCI would be necessary. The second plant would require additional staff and increase operation costs. Lastly, the transfer of raw sewage would pose an odor and health problem if a failure occurred in the conveyance system.

This alternative was originally believed to be technically viable, however, it is no longer an implementable alternative. Originally, this alternative received a relatively low ranking. It received a total technical score of 54.0 out of a possible 100.

3.1.9 Alternative 9 – Raw Sewage Transfer to Buffalo Run Treatment Facility
(Not Implementable)

This alternative involves the diversion of raw sewage flow from UAJA's Big Hollow Trunk Sewer to a new satellite treatment facility along Buffalo Run, near the Village of Filmore in Patton Township. A pump station would be constructed on the Big Hollow Trunk Sewer that

would pump sewage along Fox Hollow Road to Fox Hill Road. From there the sewage would flow via gravity along Benner Road to S.R. 550 to the new treatment facility. As with Alternative 6, the plant would consist of an SBR system. Sludge would be treated on site or taken to UAJA's composting facility.

The advantages of this alternative were the diversion of flow from the UAJA treatment facility, eliminating additional flow to the High Quality section of Spring Creek, and less conveyance system construction.

The disadvantages were the need for the acquisition of right-of-way along S.R. 550, the additional staff, maintenance, and operation costs of the new treatment facility, and impacts associated with discharge to Buffalo Run. Buffalo Run is considered a High Quality Cold Water Fishery and is a hydrogeologically losing stream, which means discharge requirements would be more stringent to avoid groundwater contamination. Also, there are the health, safety, and odor problems associated with the transfer of raw sewage.

This alternative was originally believed to be technically viable, however, it is no longer an implementable alternative. This alternative received a total technical score of 65.0 out of a possible 100.

3.1.10 Alternative 10 -Spray Irrigation at Rockview State Correctional Institution

This alternative incorporates the upgrade of the UAJA plant to 9.0 MGD, with the disposal of 3.0 MGD of treated effluent by spray irrigation at Rockview SCI. A splitter box installed at the UAJA plant chlorine contact chamber would divert flow to a new pump station. The effluent would be pumped along Shiloh Road and S.R. 150 to a storage lagoon near the Rockview SCI facility. From this lagoon, the treated effluent would be pumped into irrigation lines for spraying and disposal on the Rockview SCI property. The lagoon would also serve as flow storage facility and a holding facility during winter months, when spraying would be limited.

The advantage of this alternative was the non-discharge treatment of an additional 3.0 MGD. This results in less impact to the High Quality section of Spring Creek. Also, in the event of a failure, the effects of spray irrigation are less detrimental than a large stream discharge.

The disadvantages are the amount of land that would have to be acquired from Rockview SCI. Early indications from Rockview SCI suggest that it is unlikely that they would approve this alternative. This system would also be difficult to operate efficiently, and monitoring wells and sampling would further complicate operations.

This alternative ranks as one of the most difficult to implement, however, it is technically viable. This alternative received a total technical score of 54.5 out of a possible 100.

3.1.11 Alternative 11 – Seasonal Spray Irrigation – Discharge at Benner Spring Fish Research Station
(Not Implementable)

This alternative incorporates the upgrade of the UAJA plant to 9.0, with the disposal of an additional 3.0 MGD of treated effluent at the Fish Research Station via spray irrigation during summer and stream discharge during winter. A splitter box installed at the chlorine contact chamber would divert flow to a pump station. The effluent would be pumped along Shiloh Road until it reaches the Benner Spring Fish Research Station. It was originally assumed that during warm months, the effluent would be disposed of in surrounding spray irrigation fields and that during colder months, when the thermal impacts and the ability to successfully spray irrigate are reduced, the effluent could be discharged into Spring Creek. This assumption has since been found to be inaccurate and the alternative is no longer technically viable.

This alternative is no longer implementable due to the proposed seasonal stream discharge. This alternative originally received a total technical score of 54.0 out of a possible 100.

3.1.12 Alternative 12 – Combination Treatment at Satellite Facility, Spray Irrigation at Gray's Woods, and UAJA Upgrade
(Not Implementable)

This alternative consists of a combination of five individual components to reduce flow to the UAJA facility. The first component is the upgrade of the current UAJA plant. The second is a satellite treatment facility at Sunnyside in Benner Township near Spring Creek and Buffalo Run. The third is conveyance of a portion of the Centre Region's flow to the Bellefonte Wastewater

Treatment Facility. The fourth is a spray irrigation system in Gray's Woods and other planned communities. And the fifth component consists of small community on-lot systems.

The Sunnyside satellite treatment facility would receive flow diverted from the Big Hollow Trunk Sewer and an existing Spring-Benner-Walker Joint Authority interceptor sewer along Buffalo Run. The Sunnyside plant would be sized for 0.7 MGD and would be owned and operated by SBWJA. The Bellefonte option also utilizes the SBWJA gravity line, but conveys the flow to the existing Bellefonte Wastewater Treatment Facility. With the possible re-rating of the Bellefonte plant, the Centre Region could divert an estimated 0.5 to 1.0 MGD of flow to Bellefonte.

The spray irrigation would be done by the Gray's Woods development and would utilize a proposed golf course and green space for spray fields and water storage. Storage lagoons will be present on site to store the treatment effluent during winter months. This facility would provide a capacity of 0.3 MGD.

Finally, the remainder of the additional flow would be treated by the construction of community on-lot systems such as sand mounds and absorption fields. These systems treat approximately 0.05 and 0.1 MGD each. These facilities would be considered for installation in existing developments such as Ridgemont, Matternville and Bear Meadows, or be included in new residential developments.

This alternative is no longer fully implementable due to the proposed stream discharge above 6.0 MGD at the UAJA plant. This alternative originally received a total technical score of 67.5 out of a possible 100.

3.1.13 Alternative 13 – UAJA Upgrade with Temperature Mitigation at Current Outfall (Not Implementable)

This alternative involves the upgrade of the existing UAJA plant to 9.0 MGD as described in Alternative 1, with the addition of specialized refrigeration units to cool the effluent by 4 to 5 degrees Fahrenheit. This temperature drop would minimize or eliminate the temperature effects of UAJA's discharge on Spring Creek. Two refrigeration options were explored for the effluent, based on the required temperature drop and an average daily flow of 9.0 MGD.

The first option is an ammonia-water absorption cycle. This system uses ammonia as the refrigerant, with a dilute aqueous solution of ammonia for absorbent. For a flow of 9.0 MGD, the unit would require approximately 2000 horsepower and specialized training for operations staff. A new building would also be required to house the system.

The second option is a multi-stage centrifugal refrigeration system. Reciprocating compressors and cooling towers reduce the temperature of the selected refrigerant. These units are very high in maintenance and typically have system lives of less than 15 years. The increased maintenance and reduced system life resulted in the selection of an ammonia system for further evaluation.

The advantages of the alternative are the same as Alternative 1, with the addition of minimizing the impact on Spring Creek. If there was not an implementable non-discharge alternative, temperature mitigation could be used to allow for discharge to Spring Creek under revised permit conditions.

The disadvantages are associated with the capital, maintenance, and operational cost of the system. Specialized training of operations staff would be required for operation of the units. Maintenance of treatment being provided at UAJA may prove to be difficult during the actual construction project.

This is a viable alternative for treating and disposing of wastewater in the Centre Region; however, the existence of an implementable non-discharge alternative eliminates it from further consideration. This alternative received a total technical score of 75.0 out of a possible 100.

3.1.14 Alternative 14 – Beneficial Reuse

The last alternative analyzed was the Beneficial Reuse alternative. The alternative includes the upgrades to the current facility described in Alternative 1. Several improvements are included to achieve the effluent quality necessary to implement the Beneficial Reuse Alternative. The alternative proposes additional plant improvements to provide a Biological Nutrient Removal (BNR) process that will reduce nitrogen to a level below Safe Drinking Water Act (SDWA) criteria. It is also anticipated that future regulations will require BNR technology for stream discharge.

The final step to reduce effluent concentrations below SDWA standards is the installation of advanced filtration and reverse osmosis systems. High quality water will be conveyed to storage tanks located on the UAJA plant site. Day storage would be provided at industrial use sites in the water distribution system. As the flow from one day's treatment is transferred, the previous day's flow is discharged. This allows for a 24-hour residency time within the tanks to accommodate laboratory testing. The effluent would be disinfected with ultraviolet light prior to discharge to the rest of the Beneficial Reuse system.

The finished water is released from the storage tanks into a seven-mile transmission main that travels through Lemont along an existing electric power line. Stream augmentation opportunities would be provided as the transmission main crosses the watershed. The remainder of the water would be used in a number of Beneficial Reuse applications, including industrial, commercial, or agricultural uses.

The Beneficial Reuse alternative provides many advantageous impacts to the Centre Region. The first alternative is that it is a non-stream discharge alternative. This eliminates concerns of thermal impacts on Spring Creek and compliance under Chapter 93 regulations. Groundwater recharge of high quality effluent extends the life of water supplies and enhances regional baseflow. The enhanced baseflow and decreased stream discharge creates a watershed management plan that is long term and sustainable. This was the only alternative proposed which provided a long-term, sustainable watershed plan, regardless of wastewater flow.

The Beneficial Reuse alternative has no technical disadvantages, but there are challenges that must be addressed for successful implementation. These challenges are primarily public perception and safeguarding. An ongoing public education providing has been implemented by the UAJA to provide the public with information on the Beneficial Reuse alternative and its benefits to the Spring Creek Watershed.

Of all the alternatives analyzed, the Beneficial Reuse Alternative provides the best solution to the Region's wastewater disposal needs. This alternative has been endorsed by the COG and will be discussed in further detail in Chapter 4 of this report. This alternative received a total technical score of 79.5 out of a possible 100.

Table 3.1 Original Wastewater Treatment and Disposal Alternatives Ranking				
Alternative	Description	Technical Points	Rank	Can Alternative Be Implemented
*1	UAJA Upgrade with Discharge at Current Outfall	69.5	5	No
*2	Transfer Treated Effluent to Bald Eagle Creek	72.5	4	No
*3	Transfer Treated Effluent to Spring Creek below SR 550 Bridge	73.5	3	No
*4	Transfer Treated Effluent to Fish Research Station	61.5	9	No
*5	Transfer Raw Sewage to Bellefonte Treatment Facility	64.5	8	No
*6	Transfer Raw Sewage to Bald Eagle Treatment Facility	61.5	10	No
*7	Overland Transfer Raw Sewage to Bellefonte Treatment Plant	57.0	11	No
*8	Overland Transfer Raw Sewage to Bald Eagle Treatment Plant	54.0	13	No
*9	Raw Sewage Transfer to Buffalo Run Treatment Plant	65.0	7	No
10	Spray Irrigation at Rockview State Correctional Institution	54.5	12	Yes
*11	Seasonal Spray Irrigation-Discharge at Fish Research Station	54.0	14	No
*12	Combination Treatment	67.5	6	No
*13	UAJA Upgrade with Temperature Mitigation at Current Outfall	75.0	2	No
14	Beneficial Reuse	79.5	1	Yes

* No longer a viable alternative due to Thermal Impact upon Spring Creek and Chapter 93 regulations.

3.2.0 Cost Analysis of the 14 Alternatives

Technical merit alone does not determine the best solution for future wastewater treatment and disposal within the Centre Region. In order to find the best alternatives a cost analysis must be completed. The alternatives were evaluated on an economic basis to determine which would be the most cost effective. The alternatives were developed, along with estimates of probable construction costs, using current market values based upon HRG's conceptual design. All capital and operation and maintenance (O&M) costs were adjusted to present worth and were ranked lowest to highest.

As the Centre Region continues to grow, the pressure on the wastewater treatment and disposal system will increase. The CRPC has prepared growth projections for the next 20 years. Based upon updated growth figures from the CRPC, the originally proposed increase of 2.0 MGD, necessary for the period from 1990 to 2010 would be insufficient to handle the growth of the Centre Region for the period from 2000 to 2020. After a thorough evaluation of the growth trends of the Centre Region, the PMT determined that an increase of 3.0 MGD of wastewater treatment and disposal capacity would be required to handle the expected growth in the Region.

Cost estimates for all of the 14 alternatives were developed and are presented in the original Wastewater Treatment and Disposal Alternatives Study and the two amendments to that report. Of these 14 alternatives, only alternatives 10 and 14 remain as fully implementable alternatives for the long-term sewage needs of the Region. The ability to implement the alternatives was limited by the thermal impacts upon Spring Creek and High Quality Watershed restrictions. Table 3.2 presents a summary of the estimated project and present worth costs for the three remaining implementable alternatives. The costs have been updated from the earlier studies based upon the availability of new design criteria, modifications to proposed alternatives, incorporation of additional treatment facility upgrades, and inflation. Present worth costs have been developed based upon interest rate of 5% for 20 years.

Table 3.2 - Wastewater Treatment Alternatives Cost Summary

Alternative	Description	Project Cost	Present Worth Cost	Rank
10	Spray Irrigation at Rockview State Correctional Institution	$ 71,409,524	$ 85,159,524	2
14	Beneficial Reuse	$ 54,583,534	$ 68,333,534	1

Detailed cost estimates for each of these alternatives are presented at the end of this Chapter.

3.2.1 Future Upgrade Costs

In the future, it may be necessary to upgrade the facilities again in order to account for the growth in the region. As the primary facility for sewage treatment, the future expansion capabilities of the selected alternative is of great interest to the Centre Region. Of the remaining implementable alternatives, only Beneficial Reuse provides for ease of expansion and sustainable long-term watershed management.

3.3.0 Conclusions Regarding the 14 Alternatives

The largest factor affecting the selection of an alternative for UAJA is the fact that with a technically and economically implementable non-stream discharge alternative and the High Quality designation of Spring Creek, UAJA must implement a non-discharge Therefore, only alternatives 10 and 14 are viable.

The selection of the best method for long-term wastewater treatment and disposal must also be based upon a combination of technical feasibility and cost. It is imperative that the alternative selected not only meets the immediate needs of the region, but also has the ability to be easily upgraded to meet the long-term needs of the region. The Beneficial Reuse Alternative, while having a high initial cost, is the only alternative which provides the capability for sustainable long-term watershed management.

The DEP has begun to consider the implementation of biological nitrogen removal requirements for many of the wastewater treatment facilities within Pennsylvania. The Spring Creek Pollution Control Facility already removes phosphorous and the Beneficial Reuse Alternative contains a BNR process modification to allow the effluent to meet SDWA standards.

DETAILED COST ESTIMATE

ALTERNATIVE 10 - UAJA PLANT UPGRADE WITH SPRAY IRRIGATION AT ROCKVIEW SCI

DESCRIPTION	QUANTITY	UNIT PRICE	UNIT	TOTAL
Excavation				
Grit Building	338	$ 20	CY	$ 6,760
Solids Handling	58	$ 20	CY	$ 1,160
Primary Splitter Box	163	$ 20	CY	$ 3,263
Primary Clarifiers	2985	$ 20	CY	$ 59,704
Aeration Splitter Box	86	$ 20	CY	$ 1,726
Blower Building	156	$ 20	CY	$ 3,120
Aeration Tanks	24782	$ 20	CY	$ 495,640
RAS Splitter Box	86	$ 20	CY	$ 1,726
Final Clarifier	3872	$ 20	CY	$ 77,446
RAS Pumping Station Expansion	717	$ 20	CY	$ 14,340
WAS Tank 2	772	$ 20	CY	$ 15,440
Thick Feed/WAS Trans./Blower Bldg.	63	$ 20	CY	$ 1,260
Dewatering Building	95	$ 20	CY	$ 1,900
Compost Building	1877	$ 20	CY	$ 37,540
Septage Receiving Thickener	3676	$ 20	CY	$ 73,513
Septage Receiving Station	57	$ 20	CY	$ 1,140
Generator Building	101	$ 20	CY	$ 2,022
		Total		**$ 797,699**
Yard Piping				
Grit Bldg. to Primary Split	180	$ 157	LF	$ 28,260
Primary Scum for New Clarifiers	170	$ 20	LF	$ 3,400
Primary Sludge for New Clarifiers	40	$ 20	LF	$ 800
Primaries to New Aeration Split	175	$ 157	LF	$ 27,475
RAS Piping-Main	120	$ 70	LF	$ 8,400
RAS Piping-Unit	840	$ 59	LF	$ 49,560
New Aeration Air Line	730	$ 59	LF	$ 43,070
Aeration Influent	731	$ 130	LF	$ 95,030
Aeration Effluent	220	$ 157	LF	$ 34,540
Aeration Effluent	120	$ 150	LF	$ 18,000
Aeration Effluent	40	$ 130	LF	$ 5,200
Final Clarifier Influent	125	$ 93	LF	$ 11,625
Final Clarifier Effluent	75	$ 70	LF	$ 5,250
Final Clarifier Sludge	65	$ 28	LF	$ 1,820
Final Clarifier Scum	100	$ 25	LF	$ 2,500
Relocated Backwash Return	440	$ 20	LF	$ 8,800
PC Scum	150	$ 15	LF	$ 2,250
PC Sludge	150	$ 20	LF	$ 3,000
Sludge Transfer to Dewatering Building	200	$ 20	LF	$ 4,000
Plant Drain Piping	1	$ 50,000	LS	$ 50,000
Gates and Appurtenances	1	$ 100,000	LS	$ 100,000
Valves and Appurtenances	1	$ 100,000	LS	$ 100,000
Non-Potable Water Pipe	1	$ 20,000	LS	$ 20,000
		Total		**$ 402,980**
Upgrade Headworks Building				
Filter Screens	1	$ 249,750	LS	$ 249,750
Screenings Washer	1	$ 32,400	LS	$ 32,400
Grating	160	$ 20	SF	$ 3,200
Railing	36	$ 2	LF	$ 54
Modification of Headworks Bldg.	1	$ 100,000	LS	$ 100,000
		Total		**$ 385,404**

DETAILED COST ESTIMATE

ALTERNATIVE 10 - UAJA PLANT UPGRADE WITH SPRAY IRRIGATION AT ROCKVIEW SCI

Grit & Screenings Storage Building				
Solids Building and Installation	1225	$ 125	SF	$ 153,125
		Total		**$ 153,125**
New Grit Chamber				
Concrete	38	$ 210	CY	$ 8,027
Grit Removal Equipment	1	$ 110,214	LS	$ 110,214
Dumpsters	2	$ 10,000	EA	$ 20,000
Grit Dewatering Screw	2	$ 17,250	EA	$ 34,500
Grit Building	1760	$ 125	SF	$ 220,000
Influent and Effluent Boxes	2	$ 3,500	EA	$ 7,000
New Bypass Valve	2	$ 20,700	EA	$ 41,400
		Total		**$ 441,141**
Additional Primary Clarifiers				
PC Weir Equipment	1	$ 7,500	LS	$ 7,500
PC Splitter Box Concrete	26	$ 252	CY	$ 6,526
Primary Sludge Pumps	4	$ 11,475	EA	$ 45,900
Primary Scum Pumps	2	$ 3,500	EA	$ 7,000
Primary Clarifier Concrete	532	$ 240	CY	$ 127,680
Grating	250	$ 20	SF	$ 5,000
Railing	510	$ 2	LF	$ 765
Compressor and Housing	1	$ 20,000	LS	$ 20,000
Temporary Pumping	1	$ 50,000	LS	$ 50,000
Primary Influent Modifications	1	$ 150,000	LS	$ 150,000
Splitter Box to PC Piping	390	$ 75	LF	$ 29,250
Additional Primary Clarifiers	2	$ 62,100	EA	$ 124,200
		Total		**$ 573,821**
Aeration Process				
Demolition of Existing Tankage	1	$ 275,000	LS	$ 275,000
RAS Splitter Box	11	$ 315	CY	$ 3,454
RAS Weir Equipment	1	$ 5,000	LS	$ 5,000
Aeration Splitter Box	11	$ 314	CY	$ 3,454
Aeration Split Weir Equipment	1	$ 5,000	LS	$ 5,000
Aeration Process Equipment	1	$ 2,070,000	LS	$ 2,070,000
Blowers (5) and Installation	1	$ 345,575	LS	$ 345,575
Blower Building	1620	$ 125	SF	$ 202,500
36"- 48" Recycle Piping	1	$ 50,000	LS	$ 50,000
Temporary Pumping	1	$ 75,000	LS	$ 75,000
Concrete	5282	$ 245	CY	$ 1,294,090
Grating	3700	$ 20	SF	$ 74,000
Railing	1221	$ 2	LF	$ 2,442
		Total		**$ 4,405,515**
Additional Final Clarifiers & RAS Pump Station				
Final Clarifier Concrete	513	$ 228	CY	$ 116,964
Clarifier Mechanism	1	$ 128,250	LS	$ 128,250
Grating	138	$ 20	SF	$ 2,760
Railing	122	$ 2	LF	$ 183
RAS Pump Station Modifications	1	$ 125,000	LS	$ 125,000
RAS Pumps	1	$ 20,250	LS	$ 20,250
WAS Pumps	1	$ 10,125	LS	$ 10,125
Piping	1	$ 25,000	LS	$ 25,000
		Total		**$ 428,532**
Chlorine Contact Tank				
Modifications to Contact Tank	1	$ 25,000	LS	$ 25,000
Trojan UV Disinfection Unit	1	$ 697,952	LS	$ 697,952
		Total		**$ 722,952**

DETAILED COST ESTIMATE

ALTERNATIVE 10 - UAJA PLANT UPGRADE WITH SPRAY IRRIGATION AT ROCKVIEW SCI

Additional Chemical Treatment				
Misc. Chem. Equip., Feed, and Install.	1	$ 20,000	LS	$ 20,000
		Total		**$ 20,000**
Sludge Processing				
WAS Holding Tank Concrete	407	$ 247	CY	$ 100,529
Thickener Feed/WAS Trans./Blower Bldg.	129	$ 265	CY	$ 34,185
Aeration Equipment	1	$ 35,000	LS	$ 35,000
Sieve Drum Thickeners	2	$ 143,750	EA	$ 287,500
Blowers (2)	1	$ 21,000	LS	$ 21,000
Thickener Feed Pumps	3	$ 12,500	EA	$ 37,500
WAS Transfer Pump	1	$ 17,250	EA	$ 17,250
Modify Piping in Dewatering Bldg.	1	$ 35,000	LS	$ 35,000
		Total		**$ 567,964**
Septage Receiving Station				
Septage Receiving Building	1200	$ 125	SF	$ 150,000
Grating	80	$ 20	SF	$ 1,600
Lime Storage	1	$ 275,000	LS	$ 275,000
Thickener Mechanism	1	$ 65,000	LS	$ 65,000
Thickener Concrete	285	$ 226	CY	$ 64,410
Thickener Feed Pumps	2	$ 10,000	EA	$ 20,000
Thickened Transfer Pumps	2	$ 10,000	EA	$ 20,000
Receiving Station Piping	1	$ 12,500	LS	$ 12,500
Screen	1	$ 200,000	LS	$ 200,000
Dumpster	1	$ 3,000	LS	$ 3,000
		Total		**$ 811,510**
New Dewatering Building				
Dewatering Building	1984	$ 125	SF	$ 248,000
Conveyor System	1	$ 100,000	LS	$ 100,000
Belt Filter Presses	1	$ 312,500	EA	$ 312,500
Piping	1	$ 50,000	LS	$ 50,000
Odor Control	1	$ 150,000	LS	$ 150,000
		Total		**$ 860,500**
New Compost Facility				
New Compost Building and Installation	39000	$ 200	SF	$ 7,800,000
Odor Control	1	$ 300,000	LS	$ 300,000
Automation Controls	1	$ 100,000	LS	$ 100,000
		Total		**$ 8,200,000**
Laboratory				
Building	2400	$ 300	SF	$ 720,000
Analytical Equipment	1	$ 370,000	LS	$ 370,000
		Total		**$ 1,090,000**
Effluent Conveyance System				
Mobil./Demobil	1	L.S.	$ 21,930	$ 21,930
E&S Control	1	L.S.	$ 21,930	$ 21,930
Diversion Structure	1	L.S.	$ 49,350	$ 49,350
24" PVC Gravity Line	3300	L.S.	$ 84	$ 277,200
10" PVC Force Main	11500	L.F.	$ 60	$ 690,000
Pumping House & Wet Well	1	E.A.	$ 355,300	$ 355,300
Manholes	22	E.A.	$ 2,470	$ 54,340
Cleanouts	4	E.A.	$ 1,975	$ 7,900
Air Release Valves	4	E.A.	$ 2,300	$ 9,200
		Total		**$ 1,487,150**
Spray Irrigation				
Mobil./Demobil	1	L.S.	$ 21,930	$ 21,930
E&S Control	1	L.S.	$ 21,930	$ 21,930
6" PVC Force Main (Dist.)	7200	L.F.	$ 49	$ 355,300
Sprinklers	2188	E.A.	$ 95	$ 208,750
4" PVC (Lateral)	298410	L.F.	$ 18	$ 5,235,780
Valves (4")	105	E.A.	$ 143	$ 14,970
Valves (10")	5	E.A.	$ 439	$ 2,190
Fittings (Misc)	120	E.A.	$ 16	$ 1,975

DETAILED COST ESTIMATE

ALTERNATIVE 10 - UAJA PLANT UPGRADE WITH SPRAY IRRIGATION AT ROCKVIEW SCI

Land Acquisition	906	Ac.	$ 2,193	$ 1,987,000
Monitoring Wells	12	E.A.	$ 1,645	$ 19,740
Groundwater Sampling	9	E.A.	$ 8,225	$ 74,000
		Total		**$ 7,943,565**
Storage Lagoon				
Mobil/Demobil	1	L.S.	$ 32,900	$ 32,900
E&S Control	1	L.S.	$ 32,900	$ 32,900
Earthwork	1488000	C.Y.	$ 5	$ 8,158,700
Rock Excavation	74400	C.Y.	$ 55	$ 4,079,350
Liner	2625000	S.F.	$ 2	$ 5,757,150
Geotextile	2625000	S.F.	$ 1	$ 2,878,575
Pumping Facility	1	E.A.	$ 477,021	$ 477,000
Piping and Fittings	1	L.S.	$ 49,347	$ 49,350
Monitoring Wells	6	E.A.	$ 1,645	$ 9,870
Groundwater Sampling	6	E.A.	$ 8,225	$ 49,350
Land Acquisition (at Rockview SCI)	135	Ac.	$ 2,193	$ 296,100
		Total		**$ 21,821,245**
Road Work				
Highway Boring (18")	140	L.F.	$ 219	$ 30,705
Maint. & Prot. Of Traffic	1	L.S.	$ 25,200	$ 25,200
		Total		**$ 55,905**
Road Restoration				
Restore R/W of State Roads	200	L.F.	$ 4	$ 875
Restore R/W of Twp. Roads	3000	L.F.	$ 7	$ 19,740
		Total		**$ 20,615**
Subtotal				**$ 51,189,623**
Electrical/SCADA (12%)				**$ 6,142,755**
HVAC & Plumbing(5%)				**$ 2,559,481**
Contingency		**7.5%**		**$ 3,839,222**
Engineering, Legal & Admin.		**15%**		**7,678,443.48**

Estimated Project Total		**$ 71,409,524**
O&M Cost (at 5% Interest annually for 20 years)	$1,100,000	**$ 13,750,000**
Total Present Worth Cost		**$ 85,159,524**

DETAILED COST ESTIMATE

ALTERNATIVE 14 - BENEFICIAL REUSE

DESCRIPTION	QUANTITY	UNIT PRICE	UNIT	TOTAL
Excavation				
Grit Building	338	$ 20	CY	$ 6,760
Solids Handling	58	$ 20	CY	$ 1,160
Primary Splitter Box	163	$ 20	CY	$ 3,260
Primary Clarifiers	2985	$ 20	CY	$ 59,700
Aeration Splitter Box	86	$ 20	CY	$ 1,720
Blower Building	156	$ 20	CY	$ 3,120
Aeration Tanks	24782	$ 20	CY	$ 495,640
RAS Splitter Box	86	$ 20	CY	$ 1,720
Final Clarifier	3872	$ 20	CY	$ 77,440
RAS Pumping Station Expansion	717	$ 20	CY	$ 14,340
Beneficial Reuse Pump Station	7	$ 20	CY	$ 140
WAS Tank 2	722	$ 20	CY	$ 14,440
Thick Feed/WAS Trans./Blower Bldg.	63	$ 20	CY	$ 1,260
Dewatering Building	95	$ 20	CY	$ 1,900
Compost Building	1877	$ 20	CY	$ 37,540
Septage Receiving Thickener	3675	$ 20	CY	$ 73,500
Septage Receiving Station	57	$ 20	CY	$ 1,140
Generator Building	101	$ 20	CY	$ 2,020
		Total		**$ 796,800**
Yard Piping				
Grit Bldg. to Primary Split	180	$ 157	LF	$ 28,260
Primary Scum for New Clarifiers	170	$ 20	LF	$ 3,400
Primary Sludge for New Clarifiers	40	$ 20	LF	$ 800
Primaries to New Aeration Split	175	$ 157	LF	$ 27,475
RAS Piping-Main	120	$ 70	LF	$ 8,400
RAS Piping-Unit	840	$ 59	LF	$ 49,560
New Aeration Air Line	730	$ 59	LF	$ 43,070
Aeration Influent	731	$ 130	LF	$ 95,030
Aeration Effluent	220	$ 157	LF	$ 34,540
Aeration Effluent	120	$ 150	LF	$ 18,000
Aeration Effluent	40	$ 130	LF	$ 5,200
Final Clarifier Influent	125	$ 93	LF	$ 11,625
Final Clarifier Effluent	75	$ 70	LF	$ 5,250
Final Clarifier Sludge	65	$ 28	LF	$ 1,820
Final Clarifier Scum	100	$ 25	LF	$ 2,500
Relocated Backwash Return	440	$ 20	LF	$ 8,800
Micro Filtration Influent	770	$ 70	LF	$ 53,900
Micro Filtration Reject	740	$ 32	LF	$ 23,680
New WAS Piping	395	$ 20	LF	$ 7,900
PC Scum	150	$ 15	LF	$ 2,250
PC Sludge	150	$ 20	LF	$ 3,000
Sludge Transfer to Dewatering Building	200	$ 20	LF	$ 4,000
Plant Drain Piping	1	$ 50,000	LS	$ 50,000
Gates and Appurtenances	1	$ 100,000	LS	$ 100,000
Valves and Appurtenances	1	$ 100,000	LS	$ 100,000
Non-Potable Water Pipe	1	$ 20,000	LS	$ 20,000
		Total		**$ 488,460**
Upgrade Headworks Building				
Filter Screens	1	$ 249,750	LS	$ 249,750
Screenings Washer	1	$ 32,400	LS	$ 32,400
Grating	160	$ 20	SF	$ 3,200
Railing	36	$ 2	LF	$ 54
Modification of Headworks Bldg.	1	$ 100,000	LS	$ 100,000
		Total		**$ 385,404**

DETAILED COST ESTIMATE

ALTERNATIVE 14 - BENEFICIAL REUSE

Grit & Screenings Storage Building				
Solids Building and Installation	1225	$ 125	SF	$ 153,125
		Total		**$ 153,125**
New Grit Chamber				
Concrete	38	$ 210	CY	$ 7,980
Grit Removal Equipment	1	$ 110,214	LS	$ 110,214
Dumpsters	2	$ 10,000	EA	$ 20,000
Grit Dewatering Screw	2	$ 17,250	EA	$ 34,500
Grit Building	1760	$ 125	SF	$ 220,000
Influent and Effluent Boxes	2	$ 3,500	EA	$ 7,000
New Bypass Valve	2	$ 20,700	EA	$ 41,400
		Total		**$ 441,094**
Additional Primary Clarifiers				
PC Weir Equipment	1	$ 7,500	LS	$ 7,500
PC Splitter Box Concrete	26	$ 251	CY	$ 6,526
Primary Sludge Pumps	4	$ 11,475	EA	$ 45,900
Primary Scum Pumps	2	$ 3,500	EA	$ 7,000
Primary Clarifier Concrete	532	$ 240	CY	$ 127,680
Grating	250	$ 20	SF	$ 5,000
Railing	510	$ 2	LF	$ 765
Compressor and Housing	1	$ 20,000	LS	$ 20,000
Temporary Pumping	1	$ 50,000	LS	$ 50,000
Primary Influent Modifications	1	$ 150,000	LS	$ 150,000
Splitter Box to PC Piping	390	$ 75	LF	$ 29,250
Additional Primary Clarifiers	2	$ 62,100	EA	$ 124,200
		Total		**$ 573,821**
Aeration Process				
Demolition of Existing Tankage	1	$ 275,000	LS	$ 275,000
RAS Splitter Box	11	$ 314	CY	$ 3,454
RAS Weir Equipment	1	$ 5,000	LS	$ 5,000
Aeration Splitter Box	11	$ 314	CY	$ 3,454
Aeration Split Weir Equipment	1	$ 5,000	LS	$ 5,000
Aeration Process Equipment	1	$ 2,070,000	LS	$ 2,070,000
Blowers (5) and Installation	1	$ 345,575	LS	$ 345,575
Blower Building	1620	$ 125	SF	$ 202,500
36"- 48" Recycle Piping	1	$ 50,000	LS	$ 50,000
Temporary Pumping	1	$ 75,000	LS	$ 75,000
Concrete	5282	$ 245	CY	$ 1,294,090
Grating	3700	$ 20	SF	$ 74,000
Railing	1221	$ 2	LF	$ 2,442
		Total		**$ 4,405,515**
Additional Final Clarifiers & RAS Pump Station				
Final Clarifier Concrete	513	$ 228	CY	$ 116,964
Clarifier Mechanism	1	$ 128,250	LS	$ 128,250
Grating	138	$ 20	SF	$ 2,760
Railing	122	$ 2	LF	$ 183
RAS Pump Station Modifications	1	$ 125,000	LS	$ 125,000
RAS Pumps	1	$ 20,250	LS	$ 20,250
WAS Pumps	1	$ 10,125	LS	$ 10,125
Piping	1	$ 25,000	LS	$ 25,000
		Total		**$ 428,532**
Tertiary Filtration				
Modifications to Filters	1	$ 50,000	LS	$ 50,000
		Total		**$ 50,000**

DETAILED COST ESTIMATE

ALTERNATIVE 14 - BENEFICIAL REUSE

Chlorine Contact Tank				
Modifications to Contact Tank	1	$ 25,000	LS	$ 25,000
Trojan UV Disinfection Unit	1	$ 697,952	LS	$ 697,952
		Total		**$ 722,952**
Beneficial Reuse Pump Station				
Reuse Pumps	1	$ 225,000	LS	$ 225,000
Wet Tap Filter Influent Line	1	$ 7,500	LS	$ 7,500
Pump Station Concrete	5	$ 331	CY	$ 1,655
		Total		**$ 234,155**
Additional Chemical Treatment				
Misc. Chem. Equip., Feed, and Install.	1	$ 20,000	LS	$ 20,000
		Total		**$ 20,000**
Advanced Water Treatment Building				
MF Units	1	$ 2,100,000	LS	$ 2,100,000
RO Units	1	$ 5,400,000	LS	$ 5,400,000
New AWT Building	1	$ 1,500,000	LS	$ 1,500,000
Installation of New Equipment	1	$ 1,750,000	LS	$ 1,750,000
Chemical Feed	1	$ 400,000	LS	$ 400,000
Piping	1	$ 200,000	LS	$ 200,000
		Total		**$ 11,350,000**
Sludge Processing				
WAS Holding Tank Concrete	407	$ 247	CY	$ 100,529
Thickener Feed/WAS Trans./Blower Bldg.	129	$ 265	CY	$ 34,185
Aeration Equipment	1	$ 35,000	LS	$ 35,000
Sieve Drum Thickeners	2	$ 143,750	EA	$ 287,500
Blowers (2)	1	$ 21,000	LS	$ 21,000
Thickener Feed Pumps	3	$ 12,500	EA	$ 37,500
WAS Transfer Pump	1	$ 17,250	EA	$ 17,250
Modify Piping in Dewatering Bldg.	1	$ 35,000	LS	$ 35,000
		Total		**$ 567,964**
Recycled Water Distribution System				
Clearing and Grubbing	1	$ 250,000	LS	$ 250,000
16 Inch Ductile Iron Force Main	52300	$ 34	LF	$ 1,778,200
Cleanouts	50	$ 3,500	EA	$ 175,000
Waterline Trench (Suit. Backfill)	19030	$ 35	LF	$ 666,050
Waterline Trench (Agg. Backfill)	2120	$ 50	LF	$ 106,000
Stream Crossing	185	$ 375	LF	$ 69,375
Road Crossings	800	$ 400	LF	$ 320,000
3 MGAL Precast Reservoir	2	$ 1,085,000	EA	$ 2,170,000
0.5 MGAL Precast Reservoir	1	$ 320,000	E.A.	$ 320,000
Tank/Reservoir Instrumentation	1	$ 50,000	LS	$ 50,000
Process Piping	1	$ 125,000	LS	$ 125,000
Traffic Control	1	$ 150,000	LS	$ 150,000
Temporary Paving	2120	$ 11	LF	$ 23,320
Right of Way	19030	$ 10	LF	$ 190,300
Lawns	1300	$ 4	LF	$ 4,550
Open Fields	17730	$ 2	LF	$ 35,460
Paved Township Streets	2070	$ 15	LF	$ 31,050
Paved State Streets	50	$ 35	LF	$ 1,750
Paved State Base	50	$ 41	LF	$ 2,050
Main Station Building	1	$ 550,000	LS	$ 550,000
Main Station Pumps	4	$ 125,000	EA	$ 500,000
Main Station Process Piping	1	$ 75,000	LS	$ 75,000
Main Station Electrical	1	$ 300,000	LS	$ 300,000
Main Station I&C	1	$ 50,000	LS	$ 50,000
Remote UV Disinfection Facilities	1	$ 450,000	LS	$ 450,000
Transmission Main I&C	1	$ 15,000	LS	$ 15,000
		Total		**$ 8,408,105**

DETAILED COST ESTIMATE

ALTERNATIVE 14 - BENEFICIAL REUSE

Septage Receiving Station				
Septage Receiving Building	1200	$ 125	SF	$ 150,000
Grating	80	$ 20	SF	$ 1,600
Lime Storage	1	$ 275,000	LS	$ 275,000
Thickener Mechanism	1	$ 65,000	LS	$ 65,000
Thickener Concrete	285	$ 226	CY	$ 64,410
Thickener Feed Pumps	2	$ 10,000	EA	$ 20,000
Thickened Transfer Pumps	2	$ 10,000	EA	$ 20,000
Receiving Station Piping	1	$ 12,500	LS	$ 12,500
Screen	1	$ 200,000	LS	$ 200,000
Dumpster	1	$ 3,000	LS	$ 3,000
		Total		**$ 811,510**
New Dewatering Building				
Dewatering Building	1984	$ 125	SF	$ 248,000
Conveyor System	1	$ 100,000	LS	$ 100,000
Belt Filter Presses	1	$ 312,500	EA	$ 312,500
Piping	1	$ 50,000	LS	$ 50,000
Odor Control	1	$ 150,000	LS	$ 150,000
		Total		**$ 860,500**
New Compost Facility				
New Compost Building and Installation	39000	$ 200	SF	$ 7,800,000
Odor Control	1	$ 300,000	LS	$ 300,000
Automation Controls	1	$ 100,000	LS	$ 100,000
		Total		**$ 8,200,000**
Laboratory				
Building	2400	$ 300	SF	$ 720,000
Analytical Equipment	1	$ 370,000	LS	$ 370,000
		Total		**$ 1,090,000**
Subtotal				**$ 39,987,937**
Electrical/SCADA (12%)				**$ 4,798,552**
HVAC & Plumbing(5%)				**$ 1,999,397**
Contingency		**7.5%**		**$ 2,999,095**
Engineering, Legal & Admin.		**15%**		**$ 4,798,552**

Estimated Project Total			**$ 54,583,534**
O&M Cost (at 5% interest annually for 20 years)	$ 1,100,000		**$ 13,750,000**
Total Present Worth Cost			**$ 68,333,534**

CHAPTER 4

THE BENEFICIAL REUSE ALTERNATIVE

4.1.0 The Beneficial Reuse Alternative - Summary

The Beneficial Reuse Alternative was developed to address comments by the Department of Environmental Protection and local municipalities regarding the evaluation of non-discharge alternatives and water reuse as a means for wastewater treatment and disposal in the Centre Region. Spring Creek is designated as a High-Quality, Cold Water Fishery. The State Special Water Protection Guidance requires all wastewater-planning documents to evaluate alternatives that do not involve increased or new discharges to the receiving stream.

Spray irrigation had been evaluated in the original Wastewater Treatment and Disposal Alternatives Study and had been eliminated from consideration due to cost and the amount of land area needed to adequately treat the expected increase of wastewater flow. Although alternatives such as cluster treatment facilities and community on-lot disposal systems were considered, Beneficial Reuse was determined to be the only fully implementable non-discharge alternative which addresses the projected sewer needs of the existing service areas. Given the DEP priority placed on High-Quality, Cold-Water Fisheries, UAJA is required to implement any "non-discharge" alternative considered feasible.

The Environmental Protection Agency (EPA) and other organizations have created water reuse categories for the differentiation of water reuse options. These options have multiple applications, however, they all share similar water quality demands. Options that may be utilized in the Beneficial Reuse Project are listed below:

- Urban Reuse
- Agricultural Irrigation
- Environmental Enhancement
- Industrial Reuse

Urban reuse is the broadest of the reuse categories and includes such things as landscape irrigation, vehicle washing, toilet flushing, fire protection, and heating and cooling supplements. Many of the reuse projects throughout the United States are using some form of urban reuse, and all of the options listed are being considered for UAJA's Beneficial Reuse Project.

Agricultural Irrigation includes both crops for human consumption and traditional forage crops. Agricultural irrigation reuse projects are very common in Florida and California, especially for orchards and fruit crops. Depending upon the ultimate reuse zone, several large tracts would be available for agricultural irrigation in this project.

Environmental Enhancement is the use of recycled water to promote aesthetic and environmentally sound improvements within the reuse zone. Examples of environmental enhancement include stream augmentation, wetlands and wildlife rehabilitation and creation, and the development of recreational impoundments. Due to limitations on property and the unique geological characteristics of the Centre Region, each of these alternatives should be closely evaluated for possible hydrogeological impacts. The Geologic Map of the Centre Region is shown on Map 4.

Industrial Reuse is specific to the reuser; however, it is comprised of options such as make-up water, heating and cooling, and process water. Several large industrial reuse projects are located in the Northeast United States and this type of reuse is common throughout the United States.

One of the difficulties the Beneficial Reuse project needs to address is the availability of reuse options during specific time periods. The Spring Creek Pollution Control Facility will be producing approximately 3.0 MGD of high quality water, and all of the water must be used daily. Reuse such as urban reuse and agricultural irrigation is seasonal in nature and does not provide a stable flow demand. Even if the intermittent reuse options can provide 3.0 MGD of consumption, there will be inevitable swings in use throughout the day. For UAJA to be able to manage their facilities, a continuous reuse option needs to be included in the project. Therefore, to prevent an excess of water from forming at the Spring Creek Pollution Control Facility and to ensure a constant discharge point for the reuse water, one or several of the environmental enhancement options must be implemented. These enhancements include stream augmentation of Slab Cabin Run, as a method of watershed management.

Stream Flow Augmentation of Slab Cabin Run

The Beneficial Reuse concept is to return pure water from the UAJA Spring Creek Pollution Control Facility to the headwaters of the Spring Creek Watershed in the Slab Cabin Run basin. Portions of Slab Cabin Run routinely dry up in the late summer and many segments of the stream

are hydrogeologically categorized as losing streams. With the State College Borough Water Authority removing approximately 2.4 MGD of drinking water from the basin, it was determined that recharging the groundwater aquifer with high quality treated water would greatly benefit the overall water budget of the Spring Creek Watershed. Additionally, the recent drought periods have heightened public awareness about Slab Cabin Run and its occasional loss of baseflow.

The Project Management Team determined that streamflow augmentation would provide several advantages to the Beneficial Reuse Project. The recharge to Slab Cabin Run would provide much needed water in times of reduced baseflow, however, Slab Cabin Run is losing and much of the water can be expected to enter the aquifer. The recharge of 3.0 MGD will not be enough to prevent the stream from drying up, however it will reduce the frequency and duration of those events. Based upon preliminary stage-flow curves developed by the Spring Creek Watershed Community Water Monitoring Committee, a recharge of 3.0 MGD would be expected to raise the water level in Slab Cabin Run between 1.10 inches and 1.70 inches.

4.1.1 316(a) Thermal Impact Study

On February 20, 1991, the DEP issued a National Pollutant Discharge Elimination System (NPDES) permit to UAJA that, among other conditions, contained specific water quality based effluent limitations for temperature. The UAJA plant was unable to meet these temperature limits much of the time. After a number of appeals spanning several years, the DEP issued a new NPDES on May 18, 1994 that contained essentially the same parameters as the 1991 permit with respect to discharge temperature limits. The exception was that the 1994 permit included a provision that made the temperature limits enforceable only when effluent discharge exceeded the UAJA average flow values during certain times of the year. In addition, the permit required the UAJA to conduct a 316(a) demonstration. Section 316(a) of the Clean Water Act allows alternative, site specific temperature limits if it can be demonstrated that the limits are more stringent than necessary to protect indigenous populations. The flow averaging provision allowed UAJA to remain in compliance with the temperature limitations during the 316(a) demonstration.

The 316(a) demonstration conducted by UAJA lasted for more than four years and concluded that the temperature effects of discharges from the UAJA plant up to 6.0 MGD had no adverse impacts to Spring Creeks indigenous populations. However, an extrapolation of modeling

completed as part of the 316(a) demonstration indicated that any discharge above 6.0 MGD on an annual average basis will have an adverse impact upon the indigenous populations of Spring Creek and will not be permitted.

The Beneficial Reuse Alternative proposes to discharge no more than 6.0 MGD on an annual average basis to Spring Creek at the present outfall location. Therefore, no adverse impact to Spring Creek will occur. As a result of the additional modeling completed during the 316(a) demonstration, it has also been determined that environmental enhancement of Slab Cabin Run by stream augmentation can occur because the addition of 3.0 MGD entering Spring Creek from Slab Cabin Run increases baseflow and decreases stream temperatures slightly, providing a positive impact upon Spring Creek.

4.1.2 Preliminary Report on the Wastewater Treatment Plant

A draft report entitled "Preliminary Report on the Wastewater Treatment Plant" has been prepared for UAJA by HRG in 2000 and is intended to review and select various conventional wastewater treatment plant systems to be implemented at the Spring Creek Pollution Control Facility. The facility will be expanded to treat 9.0 MGD of raw wastewater. Additionally, the upgrade will include a regional compost facility that will have a nominal capacity to treat the biosolids produced from 12.0 MGD of wastewater. The excess compost capacity will allow UAJA to accept biosolids from other sources in the Spring Creek Watershed and the surrounding area. Finally the expanded facility will be designed to incorporate a septage receiving station with the ability to receive septage from Centre Region homes located outside of the sewer service area. Process Flow Diagrams for both the liquid side and the solid side are shown in Figure 1 and Figure 2. In general the proposed expansion and upgrade to the UAJA facility will incorporate the following major components:

Liquid Treatment

- Screening
- Grit Removal
- Influent Flow Metering/Sampling
- Primary Clarification
- A^2/O Process (BNR)

- Chemical Addition
- Final Clarification
- Tertiary Filters
- UV Disinfection
- Effluent Metering/Sampling

Solids Treatment

- Septage Receiving/Screening
- Liquid Sludge Holding
- Thickening
- Dewatering
- Odor Control
- Compost

Advanced Water Treatment

- Straining
- Microfiltration (MF)
- pH Adjustment/Antiscalent
- Reverse Osmosis (RO)
- Decarbonation
- Chlorine Disinfection
- UV Disinfection
- Wetland Barrier

Biological Treatment System

There are several options available to UAJA for the treatment of effluent to be discharged to Spring Creek. Limits currently imposed require the treatment of the wastewater to remove a majority of the BOD, Phosphorus, and Nitrogen Compounds. Currently, UAJA has discharge limits on BOD, Phosphorus and Ammonia. It is anticipated that the DEP will impose additional limits on the total nitrogen in the effluent. Also, a portion of the treated effluent from the conventional wastewater treatment plant will receive advanced treatment and be beneficially reused. The limits on this beneficial reuse water will be consistent with drinking water standards.

So, there is a benefit to the overall system operation if the Biological Treatment System removes as much of the named pollutants as possible.

Advanced Water Treatment

Based upon a streamflow augmentation regime, along with commercial, agricultural and industrial reuse, UAJA will be returning approximately 3.0 MGD of reclaimed wastewater to Slab Cabin Run. To protect public health and safety, the highest levels of water treatment technology will be utilized.

Beginning in October of 1999, UAJA began the pilot testing of Microfiltration and Reverse Osmosis systems to augment the existing wastewater treatment process at its Spring Creek Water Pollution Control Facility. Phase I of the testing lasted from October 1999 through December 1999 and evaluated the water quality performance and operating characteristics of US Filter/MEMCOR, Pall Corporation, and Koch Membrane Systems. Behind the 15 gallons per minute (gpm) MF Pilot Units, Waterlink RO units were installed with Fluid Systems TFC HR membranes. All three pilot units were identical to measure the scaling effects and operational impacts that the various MF manufacturers had on a RO system.

Phase II of the pilot testing will begin in May 2000 and is expected to last through the end of 2000. During the Phase II testing, various RO membranes will be tested to find ideal operating conditions and document removal of water quality constituents, including endocrine disrupters and similar pharmaceutically active compounds.

Pilot Testing of the BioGuide System

The University Area Joint Authority, in partnership with the Department of Environmental Protection, implemented a full-scale pilot application of the BioGuide wastewater control technology. The full-scale project was initiated on September 3, 1998 and was completed in September 1999.

In an effort to add nitrogen reduction to effluent treatment, wastewater reuse, and recycling for the next treatment facility upgrade, UAJA conducted a pilot project with BioChem Technology. This technology allows for real-time, on-line monitoring of wastewater treatment facilities to

optimize treatment efficiency. This project demonstrated that use of the technology might allow treatment facilities to recover actual treatment volume through optimization of existing capacity. This recovered capacity could then be applied toward plan modifications to achieve denitrification. The denitrification associate with the BioChem Technology can be applied to the production of water that meets drinking water standards for the Beneficial Reuse Project.

A secondary objective of the project is the analysis of possible energy savings realized by optimization of aeration blower output associated with process optimization. The pilot testing of the BioChem technology concluded that the system allows the plant to operate at its most efficient capability without changing the over-riding biological reactions. The result is cost savings associated with operating the treatment facility. The system is also a cost-effective solution for expanding the plant capacity without building additional tanks.

4.1.3 Transmission Corridor Report - Beneficial Reuse Project

The Transmission Corridor Report, which was prepared for UAJA by HRG in 1999, identified potential industrial and agricultural users of Beneficial Reuse water. A total commitment of 147,000 gallons per day (GPD) was received for intermittent uses of the recycled water. Since this was below the expected allotment of 3.0 MGD, a need for additional reuse points was apparent. With the industrial and agricultural users being seasonal in nature, the additional reuse points would need to be a continuous option.

Environmental enhancement, through stream augmentation was identified as an additional method for evaluation as a continuous reuse operation. Several stream augmentation points were reviewed along the Slab Cabin Run Basin. As part of the criteria for determining the best locations to augment the base flow of Slab Cabin, Miser & Earl (M&E) reviewed several existing hydrogeologic studies and did a survey of the stream bottom. As a result of this effort, M&E concluded that additional detailed studies are required to determine the interaction between the surface water and the groundwater used by public and private water providers in the Centre Region. The Beneficial Reuse Alternative proposes a plan to produce drinking water quality through MF and RO treatment. Until more detailed studies are conducted, the selected augmentation zone has been determined based upon cost and stream enhancement factors. In the future, the discharge points may change to better reflect the interactions between Slab Cabin Run and the underground aquifer, but the current Beneficial Reuse plan calls for future stream

augmentation on Slab Cabin Run at the Atherton Street intersection and at the intersection of Branch Road and SR 45 into Slab Cabin Run.

Based upon the preliminary hydrogeologic evaluation by Meiser and Earl, the Transmission Corridor Report identified five Stream Augmentation Zones and three Reuse Districts. All five Stream Augmentation Zones, shown on Figure 3, are located along Slab Cabin Run. Zone A is located along the Mt. Nittany Expressway near Lemont. Zone B is located between the Mt. Nittany Expressway and South Atherton Street. Zone C is located just south of South Atherton Street. Zones D and E are located along Shingletown Road. The three Reuse Districts, shown in Figure 4, consist of the Struble Road District along S.R. 26 near the Nittany Mall, the CATO Park District in north of Whitehall Road, and the Whitehall Road District. Map 5 presents the Centre Region Corridor.

4.1.4 Wetland Delineation

The DEP requested that UAJA complete a field wetland delineation to accompany the Transmission Corridor Report. In October 1999, a field investigation was conducted by HRG to determine the presence and extent of any freshwater wetlands along the proposed transmission corridor for the Beneficial Reuse Alternative. This study focused on areas of concern along the corridor, including the electric powerline and areas adjacent to Slab Cabin Run. Areas where the corridor follows existing roadways were excluded in this study and will be investigated at a later date. The study corridor covered approximately 19,000 linear feet. Field limits were the right of way of an existing overhead powerline and the area between Slab Cabin Run and Branch Road.

According to the National Wetlands Inventory (NWI) Map, wetlands within the study area are confined to the top of the banks of Spring Creek and Slab Cabin Run. The wetland delineation was conducted in accordance with the 1987 Army Corp of Engineers Wetland Delineation Manual. To identify a wetland using the Corp procedures an area must exhibit hydric soils, wetland hydrology and a predominance of hydrophytic vegetation. It should be noted that the plant surveys that were conducted in the field to identify the presence of the hydrophytic vegetation reflect the species that were identifiable when the delineation was conducted. Additional species may have been present on the site but were not included in the survey when the remnants of the plant material could not be identified with confidence. Vegetation, in most areas outside of the stream channel, was severely distressed due to the drought experienced in the

area. Many species were stunted and/or dead. Identification was additionally hindered due to frost activity. During the field delineation four wetland areas, and one possible wetland area, were identified outside of the top of bank of the Slab Cabin Creek or Spring Creek. These areas are shown in Figure 5.

Wetland A

Wetland A is located along the south bank of Spring Creek south of Old Boalsburg Road. The site is situated within the electric powerline right-of way, and is associated with overflow from Spring Creek. It is considered to be a wet meadow wetland and is indicated on the NWI map. The wetland is bounded by Spring Creek on the north and is confined to a small depression area. This area most likely accepts overflow from Spring Creek and runoff from the surrounding area. This area is unable to completely drain to the creek due to its topography. The vegetation was dominated by Reed Canary Grass (Phalaris arundinacea), Swamp Thistle (Cirsium muticum), and False Solomon Seal (Smilacina racemosa) most of which are hydrophytes. One Black Walnut (Juglans nigra) was observed to be dead on the site. The soils were a dark grayish brown color and had a matrix chroma of two (10YR/4/2). Yellowish brown mottles were observed (10YR/5/8). The channel of the wetland was not inundated or saturated on the day of the study, however due to the area's proximity to the creek and topography, wetland hydrology is presumed.

Wetland B

Wetland B is located between Slab Cabin Run and Branch Road south of South Atherton Street. The area is situated within the electric powerline right-of way, and is associated with overflow from Slab Cabin Run and drainage of the land. It is considered to be a wet meadow wetland. The wetland is bounded by Slab Cabin Run at the north and south ends. The area is confined to a small depression area that adjoins what appears to be a drainage swale. This swale area approximately follows the electric powerline. The area most likely accepts overflow from Slab Cabin and runoff from the surrounding area. The vegetation was dominated by Pasture Grass, Reed Canary Grass (Phalaris arundinacea), Pennsylvania Smartweed (Polygonum pennsylvanicum), Hispid Buttercup (Ranunculus hispidus), Spearmint (Mentha spicata), Beggar's Ticks (Bidens frondosa), and Spanish needles (Bidens bipinnatta), most of which are hydrophytes. The soils were black and very dark gray in color and had a matrix chroma of one (5YR/2.5/1 and 10YR/3/1). Yellowish brown mottles were observed in the gray soil (10YR/5/6). The channel of the wetland was saturated to the surface and inundated in spots. The area also had clumpy soil.

Wetland C

Wetland C is located between Slab Cabin Run and Branch Road south of South Atherton Street. The area is associated with overflow from Slab Cabin Run and outfalls of drainage pipes. It is considered to be a wet meadow wetland. The wetland is bounded by Slab Cabin Run on the east and has a tiered topography. The lower two tiers are wetland and the third is upland. The area is most likely floodplain for the stream and has a depth to bedrock of approximately 10 inches. The vegetation was dominated by Reed Canary Grass (Phalaris arundinacea), Pennsylvania Smartweed (Polygonum pennsylvanicum) and Bittersweet Nightshade (Solanum dulcamara) most of which are hydrophytes. The soils were dark grayish brown in color and had a matrix chroma of two (10YR/4/2). Prominent black, red and orange mottles were observed. The area of the wetland was saturated to the surface the soil was clumpy.

Possible Wetland D

Possible Wetland D is located within the electric powerline right-of-way adjacent to the Hanson Quarry north of Route 322. The area appears to have been stripped due to powerline construction and/or quarry activities. The area is depressed and is completely dominated by Reed Canary Grass (Phalaris arundinacea) which is a hydrophyte. The soils were brown in color and had a matrix chroma of three (10YR/4/3). Orange mottles were observed. The area was not saturated or inundated at the time of the study. It is possible that water could pond in this area, as the distance to bedrock is approximately six inches.

Wetland E

Wetland E is located north of Slab Cabin Run and extends north to the reaches of the study area. The area is associated with overflow from Slab Cabin Run and drainage of the land. It is considered to be a wet meadow wetland. The wetland is bounded by the top of bank of Slab Cabin Run at the south and the edge of the study area to the north. The area most likely accepts overflow from Slab Cabin and runoff from the surrounding area. The vegetation was dominated by Reed Canary Grass (Phalaris arundinacea) which is a hydrophyte and pasture grass. The soils were dark grayish brown in color and had a matrix chroma of two (10YR/4/2). Numerous light orange mottles were observed in the soil. The wetland soil was soft and moist. The wetland encompasses a large area of pasture/crop land.

4.2.0 Consistency with Previous Planning

As part of the Act 537 Planning process, alternatives must be reviewed for consistency with County, Regional, State, and Federal objectives, planning, and statute. Therefore, the Centre Region Act 537 Plan Update was reviewed for consistency with the following policies and plans.

4.2.1 1990 Centre Region Act 537 Plan

The selected 10-year plan recommended the completion of the Wastewater Alternatives Study. The plan recommended that this study select an alternative that would address sewage capacity needs at the UAJA treatment plant beyond 6.0 MGD. This study was required by the DEP as part of the adopted 1990 Plan. This Act 537 Plan Revision is a result of those efforts. Therefore, the 2000 Centre Region Act 537 Plan Revision is consistent with the 1990 Centre Region Act 537 Plan.

4.2.2 Centre County Comprehensive Plan

The latest Centre County Comprehensive Plan was completed in 1979. The County Plan is relatively old and out of print and has not been recently updated to reflect the current planning needs of the Centre Region.

4.2.3 Centre Region Comprehensive Plan

The 1990 Centre Region Comprehensive Plan was completed for the Centre Region Council of Governments by the Centre Regional Planning Commission in June of 1991. The overall purpose of the Plan was to provide a framework for regional coordination in all aspects of comprehensive planning and community decision making. The plan was financed in part by a State Planning Assistance Grant from the Pennsylvania Department of Community Affairs (DCA). The document was developed as a framework for the future based upon existing conditions, problems, and potential for future growth. The Comprehensive Plan addresses land use, transportation, economic development, housing, historic preservation, environmental protection, and other regional issues within the Centre Region.

The Centre Region Comprehensive Plan discusses the 1992 upgrade of the UAJA treatment facility. It mentioned that anticipated growth and diversion of flow from the PSU treatment plant to the UAJA treatment plant would ultimately require capacity beyond 6.0 MGD. Also stated in the document is that the capacity of the plant may be limited by the wastewater carrying capacity of Spring Creek. It recommended that various non-discharge alternatives to provide additional capacity be analyzed. The Beneficial Reuse Alternative is consistent with the Comprehensive Plan's goal of providing additional treatment beyond 6.0 MGD, without a detrimental impact to Spring Creek.

The Beneficial Reuse Alternative is also consistent with the water management goals and policies contained in the Comprehensive plan. The Region's municipalities are currently in the process of approving an update to the Comprehensive Plan. This document includes a future land use plan, a recommended growth boundary and a variety of policies pertaining to water resources management. The Plan Revision is also consistent with the provisions of the updated Centre Region Comprehensive Plan.

Maps of regional growth boundaries, future land uses, and protected open space areas from the updated Centre Region Comprehensive Plan are included at the end of this chapter.

4.2.4 Subdivision and Land Development Ordinances

The participating municipalities in the Centre Region have all adopted subdivision and land development ordinances. The ordinances set forth the requirements which prospective sub-dividers must follow for approval of plans. The ordinances require that adequate sewage disposal be provided to every lot of the subdivision. All lots located within designated sewer service areas of the Centre County Comprehensive Plan will install sewers and connect to the public sanitary sewer system. The Beneficial Reuse Alternative is consistent with the local municipalities Subdivision and Land Development Ordinances.

4.2.5 Zoning Ordinances

The participating municipalities have adopted zoning ordinances. The zoning ordinance is designed to promote public health, safety, and to provide for coordinated and practical community development, proper density of population, etc. The zoning ordinance establishes and

identifies the allowable land usage in each of the different districts. The ordinance also establishes the nature and types of facilities that may be constructed along with lot requirements, such as building setback, building heights, lot coverage, and other parameters. The Beneficial Reuse Alternative is consistent with the local municipalities zoning ordinances.

4.2.6 Stormwater Management

The participating municipalities have developed stormwater management ordinances, and a County Act 167 study is in progress. The Spring Creek Corridor Management Plan is currently being produced by the CRPC. The plan provides detailed policy direction to guide community actions for the protection of the Spring Creek Corridor.

The Spring Creek Corridor Management Plan discusses the conditions of Slab Cabin Run and the effects of further development in the area. Of interest is the State College Borough Water Authority's impact on the stream. Two additional wells were proposed in the wellfields located within the watershed of Slab Cabin. The Susquehanna River Basin Commission concluded that if the wells were pumped at their maximum capacity they would impact stream flow in Slab Cabin. During summer months, the upstream portion of Slab Cabin near South Atherton Street is typically dry.

Plans to augment the Slab Cabin Watershed with the Beneficial Reuse Alternative will help alleviate the impact of development on Slab Cabin. The Beneficial Reuse Alternative is consistent with protecting the Spring Creek Corridor and may ultimately enhance the area. In fact the Beneficial Reuse actually provides an enhanced watershed management plan for the Region.

4.2.7 Other Special Protection Considerations

The Centre Region Act 537 Plan Update was reviewed for consistency with other policies and plans relating to special protection considerations. The Beneficial Reuse Alternative appears to be consistent with other special protection considerations.

4.2.8 Plans Approved under the Clean Streams Law or Clean Water Act

The Beneficial Reuse Alternative is consistent with previous wastewater planning and has been endorsed by the Centre Region Council of Governments.

4.2.9 Consistency with Applicable Water Quality Standards, Effluent Limitations, or Other Legal or Technical Requirements

Of primary concern is the quality of the water to be reused within the Centre Region and its possible benefits to the environment and any customers that use it. The final water quality standards that the reuse water must meet depend upon the reuse application and are affected by the level of exposure that the public has to the reuse water. Since the water can come into contact with people or become mixed with the drinking water supply the water should meet the standards of the Safe Drinking Water Act. In addition, it has been recommended that the reuse water meet the additional requirements recommended in the following sources: (Guidelines for Water Reuse, EPA, 1992; Water Reclamation and Reuse Standards, Washington State Department of Health, 1997; Using Reclaimed Water to Augment Potable Water Resources, WEF/AWWA, 1998). The applicable standards for Reuse Water are shown on Table 4.2.

In general, the DEP has supported a preliminary determination that reuse water receiving reverse osmosis treatment will be considered as finished water; where as reuse water receiving only micro-filtration will continue to be handled as a sewage planning issue.

The implementation of the Beneficial Reuse Alternative will not result in conflicts with Chapter 93 (water quality criteria), Chapter 95 (wastewater treatment requirements), or Chapter 102 (erosion and sedimentation control).

4.2.10 Protection of Wetlands, Endangered Species, and Historical or Archaeological Resources

The Pennsylvania Natural Diversity Inventory (PNDI) search form was transmitted to the Centre County Conservation District on February 24, 1999. The purpose of this submission is to identify the potential effect of plan alternatives on plant and animal species of special concern. The PNDI information is included.

TABLE 4.2
SUMMARY OF WATER QUALITY REQUIREMENTS FOR VARIOUS REUSE APPLICATIONS

Urban Reuse	Agricultural Irrigation	Environmental Enhancement	Industrial Reuse	Indirect Potable Reuse	Direct Injection
< 10 mg/l BOD5	< 10 mg/l BOD5	< 20 mg/l BOD5	< 30 mg/l BOD5	Meet all SDWA requirements	Meet all SDWA requirements
< 2 NTU Turbidity	< 2 NTU Turbidity	< 20 mg/l TSS	< 30 mg/l TSS	< 1 TOC	< 1 TOC
< Non Detectable Fecal Coliform	< Non Detectable Fecal Coliform	< 200 Fecal Coliform	< 200 Fecal Coliform	Reverse Osmosis Treatment	Reverse Osmosis Treatment
< 2.2 Total Coliform	< 2.2 Total Coliform	< 3 TKN	1 mg/l Cl2 Residual		
1 mg/l Cl2 Residual	1 mg/l Cl2 Residual	< 1 Total P			
50 ft setback from potable water wells	50 ft setback from potable water wells			2000 ft setback from potable water wells Minimum of 1 yr underground retainage until withdrawal from wells 50% Maximum Allowable reclaimed water in withdrawal well	2000 ft setback from potable water wells Minimum of 1 yr underground retainage until withdrawal from wells 50% Maximum Allowable reclaimed water in withdrawal well

SDWA Requirements

1,1,1-Trichloroethane	0.200 mg/l	Benzene	0.005 mg/l	Dibromochloropropane	0.0002 mg/l
1,1,2-Trichloroethane	0.005 mg/l	Benzo(a)pyrene	0.0002 mg/l	Dichloromethane	0.005 mg/l
1,1-Dichloroethylene	0.007 mg/l	Beryllium	0.004 mg/l	Dinoseb	0.007 mg/l
1,2,4-Trichlorobenzene	0.070 mg/l	Cadmium	0.005 mg/l	Diquat	0.020 mg/l
1,2-Dichloroethane	0.005 mg/l	Carbofuran	0.040 mg/l	Endothall	0.100 mg/l
1,2-Dichloropropane	0.005 mg/l	Carbon Tetrachloride	0.005 mg/l	Endrin	0.002 mg/l
2,3,7,8-TCDD	0.0003 ppt	Chlordane	0.002 mg/l	Ethylbenzene	0.700 mg/l
2,4,5-TP	0.050 mg/l	Chloride	250.0 mg/l	Ethylene Dibromide (EDB)	0.00005 mg/l
2,4-D	0.070 mg/l	Chromium	0.100 mg/l	Fecal Coliform	Ndetect
Alachlor	0.002 mg/l	cis-1,2-Dichloroethylene	0.070 mg/l	Flouride	2.000 mg/l
Aluminum	0.200 mg/l	Color	15 CU	Glyphosate	0.700 mg/l
Antimony	0.006 mg/l	Copper	1.000 mg/l	Gross Alpha's	Ndetect
Arsenic	0.050 mg/l	Cyanide	0.200 mg/l	Heptachlor	0.0004 mg/l
Asbestos	7.000 MFL	Dalapon	0.200 mg/l	Heptachlor Epoxide	0.0002 mg/l
Atrazine	0.003 mg/l	DI (2-Ethylhexyl) Adipate	0.400 mg/l	Hexachlorobenzene	0.001 mg/l
Barium	2.000 mg/l	DI (2-Ethylhexyl) Phthalate	0.006 mg/l	Hexachlorocyclopentadiene	0.050 mg/l
Iron	0.300 mg/l	Selenium	0.050 mg/l	Zinc	5.000 mg/l
Lead	95% Percentile	Silver	0.100 mg/l		
Lindane	0.0002 mg/l	Simazine	0.004 mg/l		
Manganese	0.050 mg/l	Styrene	0.100 mg/l		
Mercury	0.002 mg/l	Sulfate	250.0 mg/l		
Methoxychlor	0.040 mg/l	Tetrachloroethylene	0.005 mg/l		
Monochlorobenzene	0.100 mg/l	Thallium	0.002 mg/l		
Nickel	0.100 mg/l	Toluene	1.000 mg/l		
Nitrate	10.00 mg/l	Total Coliform	Ndetect		
o-Dichlorobenzene	0.600 mg/l	Total Dissolved Solids	500.0 mg/l		
Odor	3 TON	Total Organic Carbon	1.000 mg/l		
Oxamyl	0.200 mg/l	Toxaphene	0.003 mg/l		
para-dichlorobenzene	0.075 mg/l	trans-1,2-Dichloroethylene	0.100 mg/l		
PCB's	0.0005 mg/l	Trichlorethylene	0.005 mg/l		
Pentachlorophenol	0.001 mg/l	Vinyl Chloride	0.002 mg/l		
Picloram	0.500 mg/l	Xylenes	10.00 mg/l		

A Cultural Resource Notice was forwarded to the Pennsylvania Historical and Museum Commission (PHMC) on February 23, 2000. The purpose of this submission is to identify the potential effect of plan alternatives on both historic and archaeological resources. Prior to the project design stage, provisions should be made to identify resources eligible or listed on the National Register of Historic Places within the project area. The Cultural Resource Notice and correspondence from the PHMC is included.

Implementation of the alternative recommended by this Plan should not have an impact upon mapped wetlands. A detailed investigation of wetlands has been completed and will be used in the design process. Wetland impacts will be minimized to the extent possible, but should encroachment be necessary, a General Permit for these and other stream crossings will be necessary to complete construction. National Wetlands Inventory mapped wetlands for the Centre Region are shown on Map 6.

4.2.11 Pennsylvania Prime Agricultural Land

The areas along the Transmission Corridor are mapped with some areas of Prime Agricultural Soils (See Map 7). However, since the proposed transmission line will follow an overhead electric right-of-way, it is likely that these soils will not be further impacted by the construction of the line, nor are they currently in agricultural production.

4.3.0 Socio-Economic Justification

The Department of Environmental Protection has determined through the PMT process that a Socio-Economic Justification will not be required if a non-stream discharge alternative is implemented.

CHAPTER 5

PROJECT IMPLEMENTATION

5.1.0 Institutional Requirements for Implementation

In order for the Beneficial Reuse Project to be implemented, several institutional requirements will have to be addressed. These requirements are identified throughout this Chapter. From the outset, as identified by the 1990 Plan, the designated agency responsible for the ultimate implementation of the recommended alternative has been the University Area Joint Authority. This Plan revision recommends that the UAJA continue as the lead agency for implementation. The UAJA has the ability to secure project funding through a number of methods including municipal bonds, State and Federal grant and loan programs, and other methods. The Authority has the ability to adopt rates and connection fees and to adjust these rates and fees as necessary.

5.1.1 Local Government Review

The Act 537 Plan is the last step in the planning process for the local municipalities. After the plan has been adopted by resolution of each Centre Region municipality, the next step will be the design phase of the project. The municipalities will have the opportunity to provide additional input as the Beneficial Reuse project is advanced and implemented. The preliminary indication from the DEP was that micro-filtered water might be subject to future local planning as sewage, but that water receiving RO will be considered as water. It is not anticipated that Regional approval will be required beyond this Plan Revision.

5.1.2 Agreements Between UAJA and Local Water Authorities

The UAJA and the local water suppliers, including the SCBWA, College Township Water Authority and the Pennsylvania State University will enter into agreements relative to the Beneficial Reuse Alternative. It is anticipated that two types of agreements will be required. The first type of agreement will be safeguard agreements relative to the conveyance of the water from the advanced water treatment facility to the Beneficial Reuse sites. The second type will be water supply agreements relative to the provision of water to different Reuse customers and areas of the Centre Region.

5.2.0 Beneficial Reuse Project – Phased Approach

The Project Management Team recommended that the Beneficial Reuse Project be implemented in phases as follows:

- Phase I will consist of nutrient removal modifications to the UAJA treatment facility for the entire projected 9.0 MGD wastewater flow and construction of 0.75 MGD of Microfiltration, reverse osmosis and advanced disinfection capacity for production of reuse water. Additionally, a water transmission main will be constructed to the commercial and industrial customers of the Dale Summit Industrial Park. Finally, a detailed hydrogeological study of the Slab Cabin Run sub-basin will be conducted.

- Phase II will consist of the construction of an additional 0.75 MGD (1.50 MGD total) of Microfiltration and advanced disinfection, as well as 0.75 MGD of reverse osmosis if deemed necessary. Additionally, UAJA will extend the transmission main to the intersection of Branch Road and S.R. 45 with stream augmentation sites on Slab Cabin Run.

- Phase III will consist of the construction of an additional 1.50 MGD (3.00 MGD total) of Microfiltration and advanced disinfection, as well as 1.50 MGD of reverse osmosis.

5.3.0 Technical Requirements for Implementation

UAJA will be the lead agency to complete the technical requirements necessary to implement the Beneficial Reuse Alternative. The Authority has a highly skilled staff and is in the position to be able to enter into agreements with consultants, municipal organizations, state agencies, or other individuals as required to implement the alternative.

One technical design issue that must be resolved is the balance of flows between the stream discharge at the UAJA plant, Beneficial Reuse customers, and stream augmentation. A practical, balanced approach for the management of the watershed must be fully developed so that UAJA can meet the daily demand required by the Beneficial Reuse customers, maintain some level of discharge to Spring Creek, and maintain a baseflow in Slab Cabin Run once that flow has been established. The local municipalities will be given the opportunity to provide input to the formulation of this watershed management program.

5.3.1 Permitting

The project will require a major permitting process to proceed to the construction phase. The following major permits have been identified as likely being required to implement the alternative:

- Part I – National Pollutant Discharge Elimination System (NPDES) Permit
- Part II - Water Quality Management Permit
- Stream Encroachment Permits
- Erosion and Sedimentation Control Plan Approval
- NPDES Permit for Discharge Associated with Construction Activities
- State and Local Highway Occupancy Permits

5.3.2 Detailed Design

Upon receipt of permits for various components of the Beneficial Reuse Project, the UAJA will complete a detailed design to implement the Alternative in three phases. This design will incorporate the final detailed design of unit processes, mechanical, electrical, control, and other systems to allow the UAJA to competitively bid the project. The design of Phase I improvements is anticipated to take approximately 12 months.

5.4.0 Cost Analysis with User Fees

UAJA has completed a detailed analysis of the economic impact of the Beneficial Reuse Alternative upon the current and future customers of the Authority. The analysis is based upon a phased implementation of various components of the Beneficial Reuse Alternative over the next 20 years. The projected impact on connection fees would be an increase to $2,500 per EDU effective in January 2001. The connection fee would increase as necessary over the course of the 20 year project life as additional Beneficial Reuse components are completed. Quarterly user fees would be increased gradually over the next 20 years with a 4% increase in 2001, raising the quarterly user rate to $62.40 per EDU. The rates would be adjusted every two years at a range of 2 to 4% increases, dependant upon the particular capital expenditure scheduled for that period.

The projected user rate in the 2020 would be $76.04. As a comparison, the increase in cost due to inflation at a rate of 1.5% per year over the same 20 year period would result in a rate of $80.81.

A complete analysis of the user rates is shown on Table 5-1.

5.5.0 Implementation Schedule

Enter into Safe Guard Agreements	May 2000
Act 537 Plan Adopted by Centre Region	June 2000
Permit Design Activities – All Phases	July 2000 – December 2000
Act 537 Plan Approved by DEP	August 31, 2000
Part II Permit Submission	December 1, 2000
Detailed Construction Design – Phase I	December 2000 – July 2001
Project Funding	June 2001 – September 2001
Advertise for Construction Bids - Phase I	October 2001
Award Construction Contracts – Phase I	December 2001
Begin Construction	Spring 2002
Enter into Water Supply Agreements	Spring 2002
Construction	Spring 2002- Fall 2003
Initial Start-Up	Fall 2003
Completion of the Project	January 2004
Phase II Improvements	2008
Phase III Improvements	2013

Table 5.1 Financial Projections for UAJA Beneficial Reuse Project

	1997	1998	1999	2000	2001
Quarterly Sewer Rate (per EDU)		60.00	60.00	60.00	62.40
Total Sewer Customers (EDU's)	16,600	17,022	18,101	18,626	19,076
Sewage Flow (Million Gallons)	1,633	1,642	1,649	1,655	1,656
Total Revenues	8,074,823	7,676,541	7,491,714	7,825,666	8,434,988
Total Operating Expenses	2,569,514	2,630,872	2,817,969	2,916,029	2,974,350
Gross Operating Margin	5,505,309	5,045,669	4,673,745	4,909,637	5,460,638
General Authority Expenses	269,710	404,725	516,238	766,870	782,207
Interest Earned On Investments	583,021	772,636	750,936	747,510	757,993
Net Cash from Operating	5,028,028	5,751,195	4,908,443	4,890,277	5,436,424
Prior Year's Ending Balance	8,847,445	11,251,302	13,653,384	13,822,802	13,781,693
Extraordinary Item	0	3,001,875	0	0	0
Loans	135,000	0	0	(102,586)	0
Tapping Fees	0	252,288	195,000	289,900	1,170,000
Developer Contributions	0	0	0	0	0
Grants	0	(2,510,000)	0	0	0
Special Service Area Fees	0	0	0		
Bond Proceeds	0	0	0	0	34,067,803
TOTAL AVAILABLE FUNDS	**14,010,473**	**17,746,660**	**18,756,827**	**18,900,393**	**54,455,920**
USE OF FUNDS					
BOND DEBT SERVICE					
Principal & Premium Paid Or Retired	515,000	535,000	555,000	580,000	905,000
Interest	1,947,284	1,926,612	1,906,015	1,883,260	4,072,727
Bond Issuance Expenses	0	0	0	0	681,356
TOTAL DEBT SERVICE EXPENSES	2,462,284	2,461,612	2,461,015	2,463,260	5,659,083
NET FUNDS AVAILABLE	11,548,189	15,285,048	16,295,812	16,437,133	48,796,836
RESERVES					
Operating Expense Reserve Fund	300,000	300,000	300,000	300,000	300,000
Debt Service Reserve Fund	2,633,000	2,766,000	3,000,000	3,000,000	3,000,000
TOTAL RESERVES	2,933,000	3,066,000	3,300,000	3,300,000	3,300,000
ANNUAL CAPITAL EXPENSES					
Fleet Replacement	0			0	50,000
Plant Equipment Replacement	0			0	0
Inflow and Infiltration Removal	0		300,000	0	300,000
Additions and Improvements	0			0	0
TOTAL ANNUAL CAPITAL EXPENSES	0	0	300,000	0	350,000
NET FUNDS FOR CAPITAL	**8,615,189**	**12,219,048**	**12,695,812**	**13,137,133**	**45,146,836**
CAPITAL PROJECTS	**296,887**	**1,631,664**	**2,173,010**	**2,655,440**	**43,141,040**
Ending balance	8,318,302	10,587,384	10,522,802	10,481,693	2,005,796
Reserves	2,933,000	3,066,000	3,300,000	3,300,000	3,300,000
	11,251,303				
CURRENT YEAR ENDING BALANCE	**11,251,302**	**13,653,384**	**13,822,802**	**13,781,693**	**5,305,796**
Debt Service Coverage	2.3364	2.0970	2.0644	1.1504	1.3612

Table 5.1 Financial Projections for UAJA Beneficial Reuse Project

	2002	2003	2004	2005	2006
Quarterly Sewer Rate (per EDU)	62.40	64.90	64.90	66.19	66.19
Total Sewer Customers (EDU's)	19,356	19,639	19,925	20,214	20,507
Sewage Flow (Million Gallons)	1,674	1,692	1,710	1,729	1,748
Total Revenues	9,145,804	9,413,856	9,489,462	9,670,820	9,749,820
Total Operating Expenses	3,033,837	3,094,513	3,156,404	3,219,532	3,283,922
Gross Operating Margin	6,111,967	6,319,342	6,333,059	6,451,288	6,465,898
General Authority Expenses	797,852	813,809	830,085	846,686	863,620
Interest Earned On Investments	291,819	326,642	366,463	409,015	465,712
Net Cash from Operating	5,605,935	5,832,176	5,869,437	6,013,617	6,067,990
Prior Year's Ending Balance	5,305,796	5,938,944	6,662,971	7,436,645	8,467,492
Extraordinary Item	0	0	0	0	0
Loans	0	0	0	0	0
Tapping Fees	757,120	795,841	836,449	879,032	926,846
Developer Contributions	0	0	0	0	0
Grants	0	0	0	0	0
Special Service Area Fees					
Bond Proceeds	0	0	0	0	0
TOTAL AVAILABLE FUNDS	**11,668,851**	**12,566,961**	**13,368,858**	**14,329,294**	**15,462,328**
USE OF FUNDS					
BOND DEBT SERVICE					
Principal & Premium Paid Or Retired	945,000	1,160,000	1,240,000	1,325,000	1,410,000
Interest	4,032,907	3,989,909	3,935,969	3,878,309	3,814,709
Bond Issuance Expenses	0	0	0	0	0
TOTAL DEBT SERVICE EXPENSES	4,977,907	5,149,909	5,175,969	5,203,309	5,224,709
NET FUNDS AVAILABLE	6,690,944	7,417,051	8,192,889	9,125,985	10,237,619
RESERVES					
Operating Expense Reserve Fund	300,000	300,000	300,000	300,000	300,000
Debt Service Reserve Fund	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
TOTAL RESERVES	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
ANNUAL CAPITAL EXPENSES					
Fleet Replacement	52,000	54,080	56,243	58,493	60,833
Plant Equipment Replacement	0	0	0	0	0
Inflow and Infiltration Removal	200,000	200,000	200,000	100,000	100,000
Additions and Improvements	0	0	0	0	0
TOTAL ANNUAL CAPITAL EXPENSES	252,000	254,080	256,243	158,493	160,833
NET FUNDS FOR CAPITAL	**3,138,944**	**3,862,971**	**4,636,645**	**5,667,492**	**6,776,786**
CAPITAL PROJECTS	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**
Ending balance	2,638,944	3,362,971	4,136,645	5,167,492	6,276,786
Reserves	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
CURRENT YEAR ENDING BALANCE	**5,938,944**	**6,662,971**	**7,436,645**	**8,467,492**	**9,576,786**
Debt Service Coverage	1.2795	1.2877	1.3165	1.3296	1.3642

Table 5.1 Financial Projections for UAJA Beneficial Reuse Project

	2007	2008	2009	2010	2011
Quarterly Sewer Rate (per EDU)	67.52	67.52	68.87	68.87	70.25
Total Sewer Customers (EDU's)	20,803	21,102	21,405	21,711	22,020
Sewage Flow (Million Gallons)	1,767	1,786	1,805	1,825	1,844
Total Revenues	9,939,806	10,022,035	10,462,572	10,548,405	10,756,413
Total Operating Expenses	3,349,601	3,416,593	3,484,925	3,554,623	3,625,716
Gross Operating Margin	6,590,205	6,605,442	6,977,647	6,993,782	7,130,697
General Authority Expenses	880,893	898,510	916,481	934,810	953,506
Interest Earned On Investments	526,723	598,000	213,846	259,827	314,559
Net Cash from Operating	6,236,036	6,304,932	6,275,013	6,318,799	6,491,750
Prior Year's Ending Balance	9,576,786	10,872,726	3,888,109	4,724,130	5,719,251
Extraordinary Item	0	0	0	0	0
Loans	0	0	0	0	0
Tapping Fees	973,790	1,023,005	1,078,159	1,224,000	1,285,440
Developer Contributions	0	0	0	0	0
Grants	0	0	0	0	0
Special Service Area Fees					
Bond Proceeds	0	8,452,385	0	0	0
TOTAL AVAILABLE FUNDS	**16,786,611**	**26,653,048**	**11,241,281**	**12,266,928**	**13,496,440**
USE OF FUNDS					
BOND DEBT SERVICE					
Principal & Premium Paid Or Retired	1,505,000	1,605,000	1,710,000	1,825,000	2,045,000
Interest	3,745,619	4,219,774	4,138,722	4,051,512	3,955,699
Bond Issuance Expenses	0	169,048	0	0	0
TOTAL DEBT SERVICE EXPENSES	5,250,619	5,993,822	5,848,722	5,876,512	6,000,699
NET FUNDS AVAILABLE	11,535,992	20,659,226	5,392,558	6,390,416	7,495,741
RESERVES					
Operating Expense Reserve Fund	300,000	300,000	300,000	300,000	300,000
Debt Service Reserve Fund	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
TOTAL RESERVES	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
ANNUAL CAPITAL EXPENSES					
Fleet Replacement	63,266	65,797	68,428	71,166	74,012
Plant Equipment Replacement	0	0	0	0	0
Inflow and Infiltration Removal	100,000	100,000	100,000	100,000	100,000
Additions and Improvements	0	0	0	0	0
TOTAL ANNUAL CAPITAL EXPENSES	163,266	165,797	168,428	171,166	174,012
NET FUNDS FOR CAPITAL	**8,072,726**	**17,193,430**	**1,924,130**	**2,919,251**	**4,021,729**
CAPITAL PROJECTS	**500,000**	**16,605,321**	**500,000**	**500,000**	**500,000**
Ending balance	7,572,726	588,109	1,424,130	2,419,251	3,521,729
Reserves	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
CURRENT YEAR ENDING BALANCE	**10,872,726**	**3,888,109**	**4,724,130**	**5,719,251**	**6,821,729**
Debt Service Coverage	1.2496	1.2478	1.2587	1.2858	1.3009

Table 5.1 Financial Projections for UAJA Beneficial Reuse Project

	2012	2013	2014	2015	2016
Quarterly Sewer Rate (per EDU)	70.25	71.65	71.65	73.08	73.08
Total Sewer Customers (EDU's)	22,333	22,649	22,969	23,292	23,619
Sewage Flow (Million Gallons)	1,864	1,884	1,905	1,926	1,946
Total Revenues	10,845,960	11,063,662	11,284,514	11,512,295	11,609,620
Total Operating Expenses	3,698,230	3,772,194	3,847,638	3,924,591	4,003,083
Gross Operating Margin	7,147,730	7,291,468	7,436,876	7,587,704	7,606,537
General Authority Expenses	972,577	992,028	1,011,869	1,032,106	1,052,748
Interest Earned On Investments	375,195	441,426	204,650	269,009	346,597
Net Cash from Operating	6,550,349	6,740,866	6,629,657	6,824,607	6,900,386
Prior Year's Ending Balance	6,821,729	8,025,931	3,720,917	4,891,076	6,301,765
Extraordinary Item	0	0	0	0	0
Loans	0	0	0	0	0
Tapping Fees	1,354,163	1,421,828	1,497,419	1,571,916	1,655,037
Developer Contributions	0	0	0	0	0
Grants	0	0	0	0	0
Special Service Area Fees					
Bond Proceeds	0	3,016,167	0	0	0
TOTAL AVAILABLE FUNDS	**14,726,241**	**19,204,792**	**11,847,993**	**13,287,599**	**14,857,189**
USE OF FUNDS					
BOND DEBT SERVICE					
Principal & Premium Paid Or Retired	2,175,000	2,315,000	2,465,000	2,620,000	2,765,000
Interest	3,848,337	3,930,200	3,808,663	3,679,250	3,554,800
Bond Issuance Expenses	0	60,323	0	0	0
TOTAL DEBT SERVICE EXPENSES	6,023,337	6,305,523	6,273,663	6,299,250	6,319,800
NET FUNDS AVAILABLE	8,702,904	12,899,268	5,574,330	6,988,349	8,537,389
RESERVES					
Operating Expense Reserve Fund	300,000	300,000	300,000	300,000	300,000
Debt Service Reserve Fund	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
TOTAL RESERVES	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
ANNUAL CAPITAL EXPENSES					
Fleet Replacement	76,973	80,052	83,254	86,584	90,047
Plant Equipment Replacement	0	0	0	0	0
Inflow and Infiltration Removal	100,000	100,000	100,000	100,000	100,000
Additions and Improvements	0	0	0	0	0
TOTAL ANNUAL CAPITAL EXPENSES	176,973	180,052	183,254	186,584	190,047
NET FUNDS FOR CAPITAL	**5,225,931**	**9,419,217**	**2,091,076**	**3,501,765**	**5,047,342**
CAPITAL PROJECTS	**500,000**	**8,998,300**	**500,000**	**500,000**	**500,000**
Ending balance	4,725,931	420,917	1,591,076	3,001,765	4,547,342
Reserves	3,300,000	3,300,000	3,300,000	3,300,000	3,300,000
CURRENT YEAR ENDING BALANCE	**8,025,931**	**3,720,917**	**4,891,076**	**6,301,765**	**7,847,342**
Debt Service Coverage	1.2962	1.2834	1.3211	1.3406	1.3827