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Date:  
April 22, 2016

Arcadis Project No.:  
04711005.0000

Subject:  
**Town of Bedford Sewer District Feasibility Study Update  
Preliminary Engineering Assessment**

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## Purpose

Arcadis was retained by the Town of Bedford to prepare a feasibility study for the development of a new sewer district comprised of a subset of the areas zoned central business (CB) districts, based on previous evaluations completed in 2003 and 2011. This technical memorandum preliminarily evaluates three possible sewer district scenarios and updates the opinion of probable costs for construction and operation and maintenance (O&M) for both the collection system and the Bedford Hills Correctional Facility wastewater treatment plant (WWTP).

## Background

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

The presence of failing septic systems in Bedford Hills and Katonah could constitute a threat to New York City's Croton Reservoir System, which is immediately adjacent to Katonah. Excessively well drained soils underlying the central commercial districts of the hamlets provide poor treatment to the wastewater and

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allow it to percolate rapidly to the groundwater table, while shallow bedrock in the higher elevations of the hamlets provides numerous fissures and other pathways for the septic tank effluent wastewaters to reappear on the ground surface as seeps and enter the surrounding reservoirs and streams.

In addition to the subsurface disposal systems that serve most residential, commercial and light industrial properties, there are four, on-site wastewater disposal systems. These systems are located at the Bedford Park Apartments, St. Mary’s of the Assumption School, the Katonah Elementary School, and Bedford Lake. Each of these systems have an existing State Pollution Discharge Elimination System (SPDES) Permit. All four WWTPs have plans to be upgraded by the NYC DEP. The construction of public sewers and a single WWTP to serve Bedford Hills and Katonah would eliminate the need for individual treatment systems at these locations, as well as protect and enhance water quality.

Besides the four on-site wastewater disposal systems, there is a WWTP, owned by the New York State Department of Corrections and operated by a private sector contract service provider, which discharges to a small tributary of the Muscoot Reservoir. Arcadis was previously retained to evaluate the WWTP at the Bedford Hills Correctional Facility and develop a map, plan, and report for a proposed sewer district to serve critical areas of the hamlets of Bedford Hills and Katonah. The results of the WWTP evaluation and the development of the proposed sewer district were presented in the report: *Sanitary Sewer Expansion and Plant Capacity Analysis*, dated July 2003. This plan included the transfer of the WWTP from the State of New York to the Town of Bedford. The WWTP SPDES permitted flow limit is 500,000 gallons per day (gpd) and the WWTP discharges an average daily flow of approximately 200,000 to 300,000 gpd (based on three years of discharge monitoring reports from 2007 to 2009). This report estimated that approximately 550,000 gallons per day (gpd) of sanitary sewage would be generated by the previously proposed sewer district, requiring an upgrade for the existing WWTP. In 2011, Arcadis further evaluated the WWTP, estimating the condition and value of the wastewater assets at the WWTP. Our findings were presented in the report: *Wastewater Asset Condition Assessment and Valuation*, dated June 2011.

A listing of the maximum daily flows permitted from these facilities under their existing SPDES Permits is shown in Table 1 below.

**Table 1 - Existing Wastewater Discharges and State Pollution Discharge Elimination System Flow Limits**

<b>Facility Name</b>	<b>Service Area</b>	<b>Permitted Flow (gpd)</b>
<b>Bedford Park Apartments</b>	Apartments off Rome Avenue	19,500
<b>Katonah Elementary School</b>	Elementary School	13,000
<b>St. Mary of the Assumption School</b>	Parochial School	10,000
<b>Bedford Hills Correctional Facility Wastewater Treatment Plant</b>	Bedford Hills and Taconic Correctional Facilities and Regional Medical Unit; I-684 Rest Area	500,000

**Estimated Flows and Loads**

The Town of Bedford provided Arcadis with current water usage data for individual parcels that comprise the CB districts and local facilities evaluated under the three new sewer district scenarios. These properties are identified in Figure 1 (attached). This data shows that the parcels that make up the CB

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districts and the three local facilities used on average approximately 45,000 gallons of water per day in total.

Based on the water usage data provided, an estimate of the wastewater flow for these areas was calculated. Not all of the water distributed to customers will be collected in the sanitary sewer system. A portion of the water used goes to watering lawns, washing cars, and similar purposes. Typically, an average of 80 to 90 percent of the water used by customers' returns to sewage. In addition to this amount is water entering the sewer system from infiltration. The estimated flows take into account an allowance of 100 to 200 gpd per inch of pipe diameter per mile of pipe for infiltration. The estimated wastewater flows projected for the initial year of operation of the system are presented in Table 2.

**Table 2 - Estimated Wastewater Flows**

Sewer District Area	Low Estimate			High Estimate		
	80% Water Usage	Infiltration (100 gpd/inch-diam/mile)	Total	90% Water Usage	Infiltration (200 gpd/inch-diam/mile)	Total
<b>CB - Area 1</b>	560	140	700	6,30	270	900
<b>CB - Area 2</b>	24,800	730	25,530	27,900	1,450	29,350
<b>CB - Area 3</b>	6,800	180	6,980	7,650	350	8,000
<b>Schools*</b>	1,440	720	2,160			23,000
<b>Apartments*</b>	2,160	490	2,650			19,500
<b>WWTP</b>			200,000			300,000
<b>Total</b>			238,020			380,750

\*The high estimate for the schools and the apartments reflects their permitted flows under their current SPDES permit.

If all three local facilities were to expand to utilize all of their wastewater capacity, the flow would increase by at least 38,500 gpd. In the event that all of these areas are combined to create a new sewer district an estimated flow of 80,750 gpd should be used for future average daily flow from the proposed sewer district. This would result in a total flow of 380,750 gpd at the WWTP.

**Alternatives Evaluated**

As mentioned previously, three different sewer district scenarios or alternatives were evaluated as part of this technical memorandum. This section details each of these alternatives and provides the estimated construction cost for the alternative. The different sewer district scenarios are:

- Alternative No. 1 – form a new sewer district comprised of three of the six areas zoned central business (CB) within the Town, as shown in Figure 2.
- Alternative No. 2- form a new sewer district comprised of the CB areas and one or both of the two local schools with existing SPDES permits: St. Mary’s School and Katonah Elementary School, as shown in Figure 3.

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- Alternative No. 3- form a new sewer district comprised of the CB areas and all, or a combination, of the three local facilities with existing SPDES permits: St. Mary's School, Katonah Elementary School and Bedford Park Apartments, as shown in Figure 4.

For each alternative, a revised preliminary collection system layout has been prepared, based on the sewer routing developed in 2003. Arcadis previously prepared an opinion of probable costs for constructing the originally proposed sewage collection system (*Sanitary Sewer Extension and Plant Capacity Analysis, July 2003*). These costs were updated in the *Wastewater Asset Condition Assessment and Valuation Report* (June 2011). The estimated costs in this technical memorandum have been updated to reflect the current bidding environment as well as the updated quantities required, as a result of the revised preliminary collection system layouts. Costs were primarily adjusted based on the Engineering News Record (ENR) Construction Cost Index (CCI) and now reflect 2016 costs.

#### *Alternative No. 1 – Central Business Districts*

The first alternative forms a new sewer district comprised of three of the six CB Districts (shown in Figure 2) via a combination of gravity sewers, pump stations, and force mains. The three CB districts have a combined estimated flow of approximately 33,000 to 39,000 gpd. To be conservative, for the purpose of this technical memorandum, the high estimate of 39,000 gpd was used in the evaluation. This is an addition to the 300,000 gpd already flowing to the WWTP, making the total flow at the plant 339,000 gpd. To convey the flow from the CB districts, a total of 5,050 linear feet (ft) of 8-inch PVC sewer pipe is estimated with 57 manholes. As shown in Figure 2, there are four different pump stations that are required to convey this flow from the different CB districts to the wastewater treatment plant. The opinion of probable construction costs for this alternative is \$9,380,000 and the annual O&M costs associated with this collection system is approximately \$123,000. A detailed breakdown of these costs is found in Tables A and B in the appendix.

#### *Alternative No. 2 – Central Business Districts and Schools*

The second alternative adds the Katonah Elementary School and St. Mary's School to the sewer district described in the first alternative. For the purpose of this technical memorandum, the flows from these schools were estimated based on the permitted flows from the individual SPDES permits, resulting in an additional 23,000 gpd, or a total collection system flow of approximately 62,000 gpd between the CB districts and the schools. The WWTP would see an average daily flow 362,000 gpd. This alternative does not require the addition of another pump station; the flow is conveyed from the two schools to pump station C. This requires approximately 4,200 ft of additional gravity sewer and 16 manholes. The preliminary layout for the collection system is shown in Figure 3. As can be seen, only one additional gravity sewer trunk line would be required to collect flows from both schools. The opinion of probable construction costs for this alternative is \$10,418,000 and the annual O&M costs associated with this collection system is approximately \$127,000. A detailed breakdown of construction and O&M costs is found in Tables C and D in the appendix.

#### *Alternative No. 3 – Central Business Districts, Schools, and Apartments*

The third alternative adds the Bedford Park Apartments to the sewer district described in the second alternative. The Bedford Park Apartments is made up of 144 units and is permitted by their SPDES permit to discharge 19,500 gpd. This flow, in addition to the CB districts and the schools, results in a total flow of approximately 81,500 gpd. Adding the apartments to Alternative No. 2 does not add another pump station; flow is conveyed to pump station D, which is included in Alternative No. 1. In order to convey the

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flow from the apartments to pump station D, approximately 2,850 lft of gravity sewer is required and 13 manholes. The preliminary collection system layout is presented in Figure 4. The opinion of probable construction costs for this alternative is \$11,081,000 and the annual O&M costs associated with this collection system is approximately \$130,000. Tables E and F (attached) provide a detailed breakdown of construction and O&M costs.

### Wastewater Treatment Plant Upgrades

The *Wastewater Asset Condition Assessment and Valuation* report (2011) stated that the WWTP had an average daily flow range from 200,000 to 300,000 gpd. The WWTP has a permitted flow of 500,000 gpd, leaving approximately 200,000 gpd that is unused. Based on the 80,750 gpd estimated flow for the CB's, the schools and the apartments, presented in the Estimated Flows and Loads section, the WWTP would still have excess capacity. Since the WWTP can handle the flows from all three alternatives, it is not necessary to do a complete upgrade to the plant. As was identified in the 2003 and 2011 reports prepared by Arcadis, the influent Parshall flume was not operational due to hydraulic problems and needed to be upgraded. The Town of Bedford may wish to make other improvements to the WWTP to increase efficiency and improve operation of the plant, or because of safety or code reasons. It should be noted that without further evaluating the current condition of the WWTP and assessing what improvements should be completed, any estimate of cost is highly variable. However, based on work recommended by Arcadis in the previous two reports, it is estimated that upgrades to the WWTP will amount to approximately \$2,400,000 with annual O&M costs estimated at \$905,000. A detailed breakdown of these costs is attached at the end of this technical memorandum.

### Project Costs

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

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

The total cost for a project includes all of the above items plus an allowance for construction contingencies and is traditionally referred to as the "Total Project Cost". A comparison of the opinion of the Total Project Costs for each of the proposed alternatives is presented in Table 3.

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Table 3 - Comparison of Opinion of Probable Project Costs

Item	Probable Cost		
	Alternative 1	Alternative 2	Alternative 3
<b>Construction of Sewage Collection System</b>	\$9,380,000	\$10,420,000	\$11,090,000
<b>Wastewater Treatment Plant Upgrade</b>	\$2,400,000	\$2,400,000	\$2,400,000
<b>Subtotal Construction Costs</b>	<b>\$11,780,000</b>	<b>\$12,818,000</b>	<b>\$13,481,000</b>
<b>Construction Contingencies @ 25%</b>	\$2,950,000	\$3,210,000	\$3,380,000
<b>Land Acquisition</b>	\$530,000	\$580,000	\$610,000
<b>Engineering Design</b>	\$1,180,000	\$1,290,000	\$1,350,000
<b>Engineering Construction Administration</b>	\$1,770,000	\$1,930,000	\$2,030,000
<b>Legal and Administrative</b>	\$180,000	\$200,000	\$210,000
<b>Interest During Construction</b>	\$360,000	\$390,000	\$410,000
<b>Bonding and other Financial Costs</b>	\$120,000	\$130,000	\$140,000
<b>Total Opinion of Probable Project Costs* (Point Estimate)</b>	<b>\$18,880,000</b>	<b>\$20,550,000</b>	<b>\$21,620,000</b>
<b>Total Opinion of Probable Project Costs* (Low Range Estimate -25%)</b>	<b>\$14,160,000</b>	<b>\$15,412,500</b>	<b>\$16,215,000</b>
<b>Total Opinion of Probable Project Costs* (High Range Estimate +50%)</b>	<b>\$28,320,000</b>	<b>\$30,825,000</b>	<b>\$32,430,000</b>

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

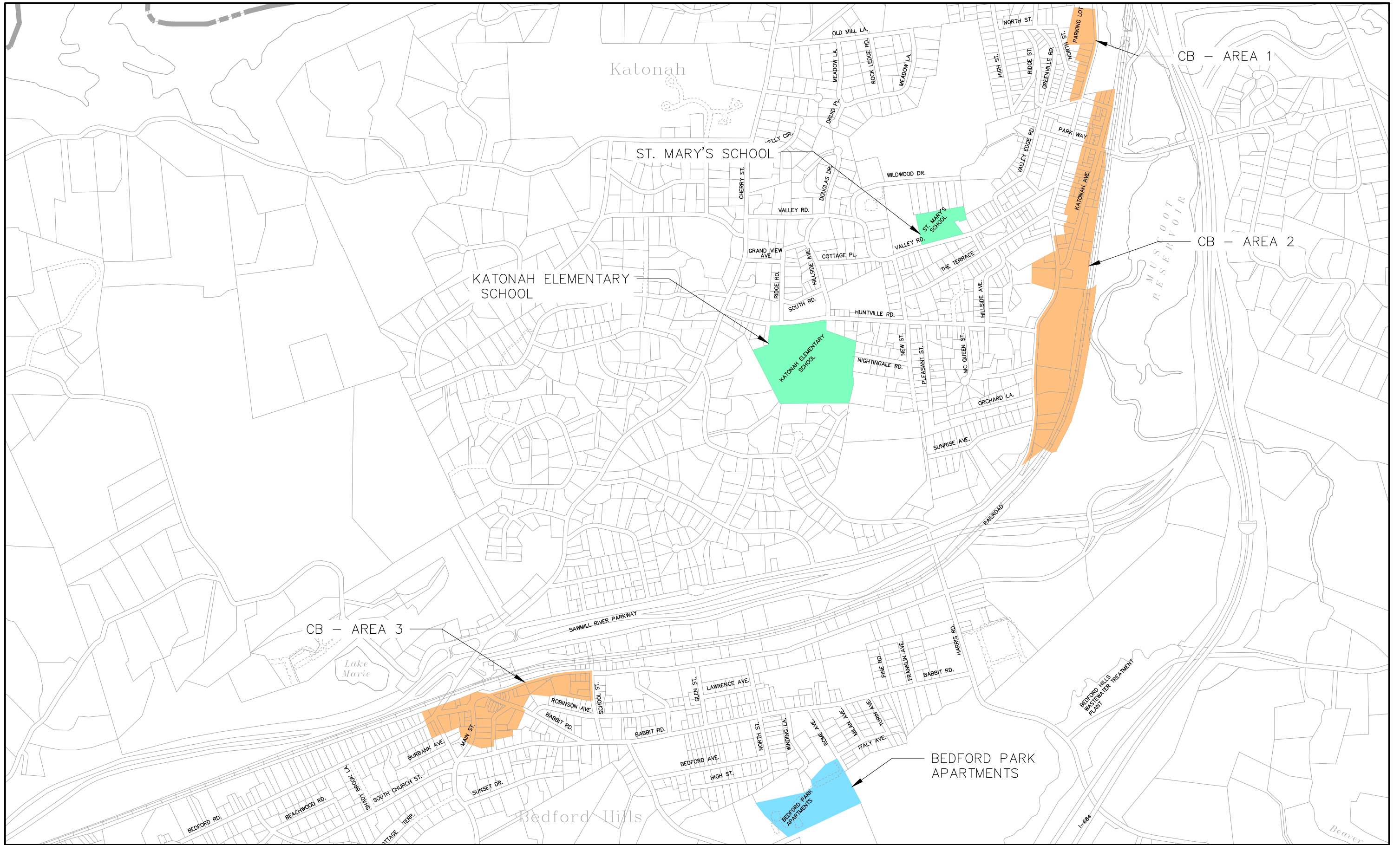
As shown in this table, the probable total project cost for each of the three alternatives. These figures do not take into account any grants or other financial assistance which may be available. The opinion of probable cost is consistent with an Association for the Advancement of Cost Engineering (AACE) Class 5 estimate where project definition and engineering is in the initial concept phases. AACE states that Class 5 estimates have typical accuracy range of -20 to -50 percent on the low side to +30 to +100 percent on the high side. Therefore, the table also presents a low and high range estimate to account for the typical accuracy of the point estimate at the current stage of project definition. These range estimates assume a potential project cost for 20 percent below the point estimate to 50 percent above the point estimate. It is recommended that the Town consider these ranges when developing capital program budgets. As future estimates are developed based on higher levels of project definition and reduced time between estimate development and the likely bid date, the accuracy of the estimate is anticipated to improve and the percentage of the ranges will be reduced. This opinion of probable costs also assumes that there is no cost to the Town to obtain the Bedford Hills Correctional Facility from New York State Department of Corrections.



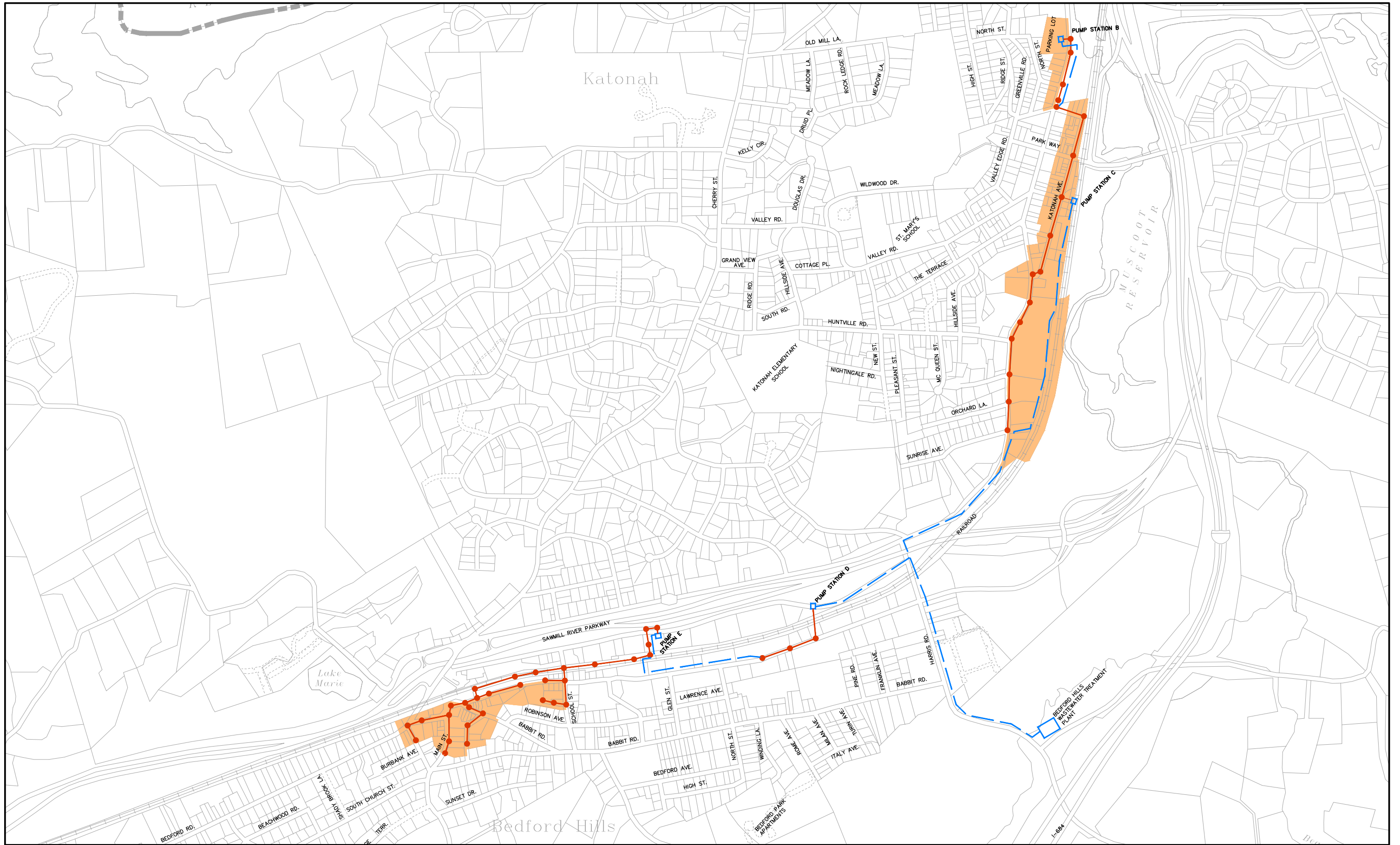
## FIGURES

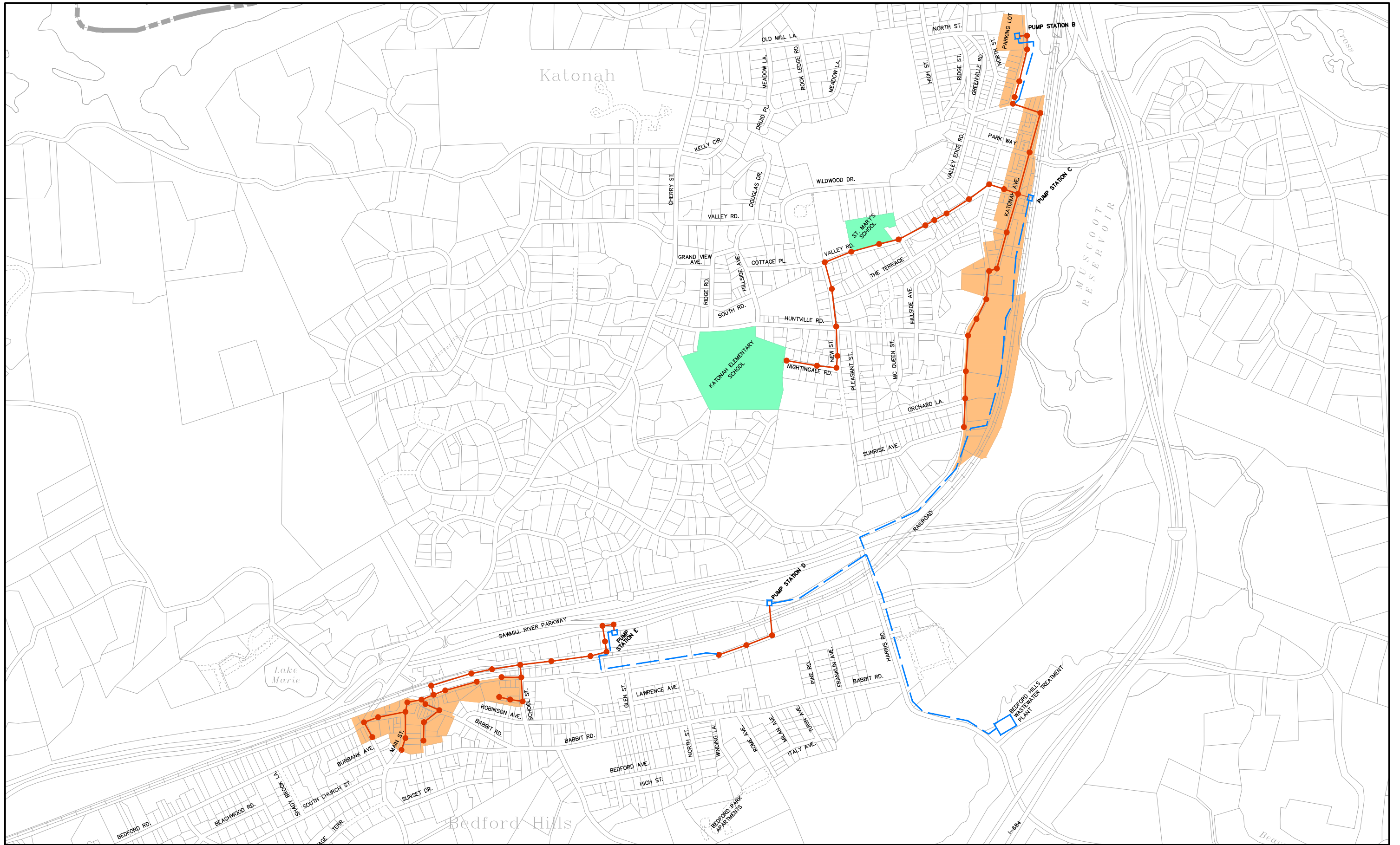


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Plot Date: Brooks, A.J.; 4/25/2016; 12:33 ; Layout: FIG. 1

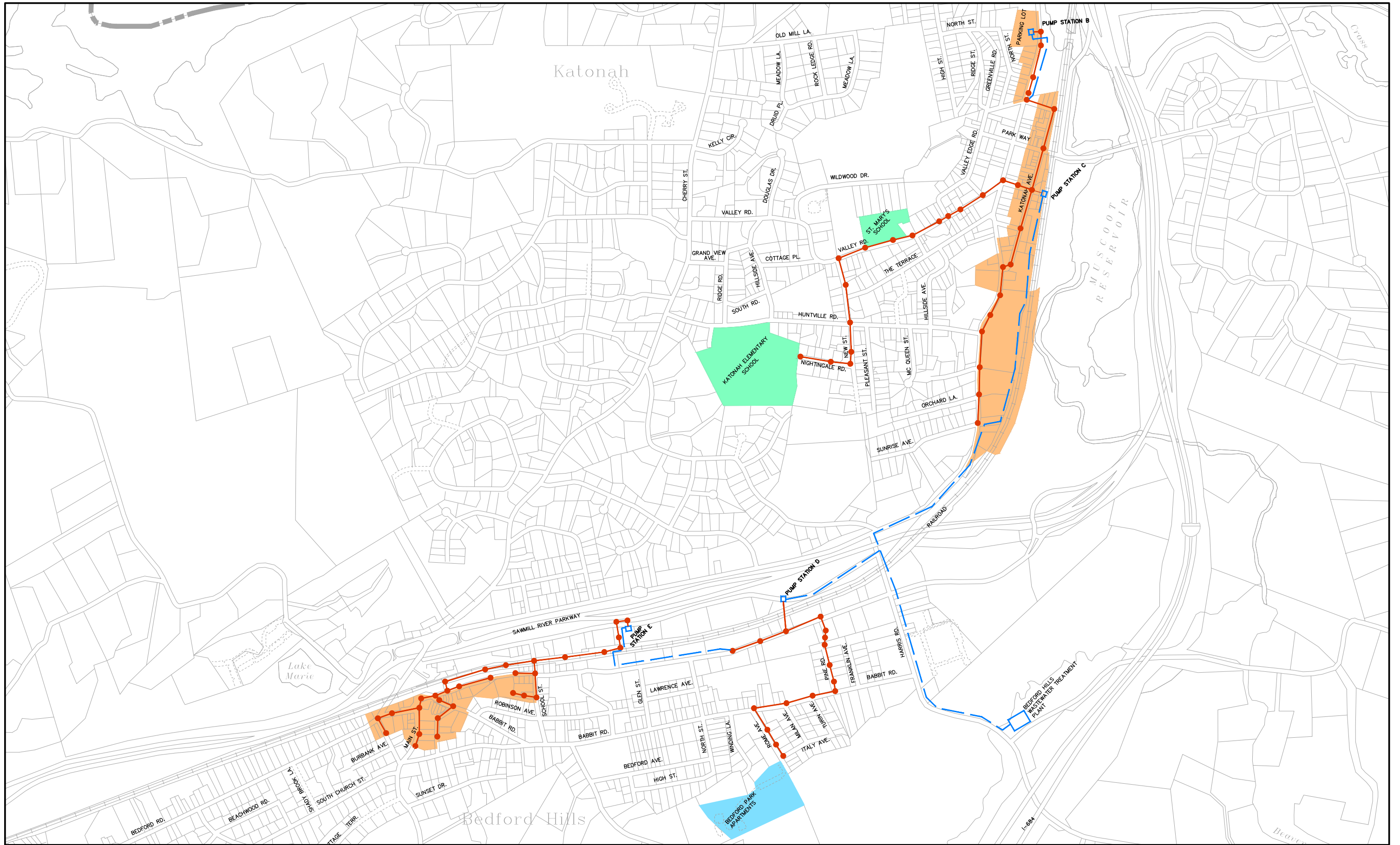












# TABLES

Table A - Sewer District Alternative No. 1 – Opinion of Probable Construction Cost

Description	Quantity	Unit Cost	Total
8 and 10 inch PVC Sewer	5,050 lf	\$153 / lf	\$774,000
48-inch Precast Manholes	57	\$3,873 ea.	\$221,000
6-inch Service Laterals	150	\$1,549 ea.	\$233,000
Pump Sta. B	1	Lump Sum	\$465,000
Pump Sta. B, 4-inch Forcemain	920 lf	\$124 / lf	\$115,000
Pump Sta. C	36	Lump Sum	\$620,000
Pump Sta. C, 8-inch Forcemain	8,700 lf	\$206 / lf	\$1,790,000
Pump Sta. D	1	Lump Sum	\$582,000
Pump Sta. D, 10-inch Forcemain	1,300 lf	\$201 / lf	\$262,000
Pump Sta. E	1	Lump Sum	\$427,000
Pump Sta. E, 8-inch Forcemain	2,450 lf	\$170 / lf	\$418,000
RR and Major Highway Crossings	1,000 lf	\$775 / lf	\$775,000
Grinder Pump Units	20	\$13,944 ea.	\$279,000
1-1/4 inch Pressure Sewer	1,200 lf	\$46 / lf	\$56,000
Air Relief Structures and Valves	4	\$4,648 ea.	\$19,000
Valve Boxes and Valves	4	\$49,579 ea.	\$199,000
Rock Excavation	10,000 cy	\$175 /cy	\$1,750,000
Allowance for Utility Relocation		Lump Sum	\$388,000
<b>Probable Construction Cost</b>			<b>\$9,373,000.00</b>

Table B – Sewer District Alternative No. 1 - Estimated Collection System O&M Cost for Initial Year of Operation

Description	Quantity	Unit Cost	Total
Sewer Maintenance	1 Miles	\$930 /mile	\$1,000
Pumping Station Power Costs	150,000 kw-hr/yr	\$0.19 /kw-hr	\$35,000
Pumping Station Labor	1,400 man-hr/yr	\$50 /hr	\$70,000
Spare Parts and Consumables		Lump Sum	\$13,000
Misc. Tools , Truck, etc.		Lump Sum	\$4,000
<b>Total Estimated O&amp;M Cost</b>			<b>\$123,000</b>

Table C - Sewer District Alternative No. 2 – Opinion of Probable Construction Cost

Description	Quantity	Unit Cost	Total
8 and 10 inch PVC Sewer	9,190 Lf	\$153 / lf	\$1,407,000
48-inch Precast Manholes	73	\$3,873 ea.	\$283,000
6-inch Service Laterals	150	\$1,549 ea.	\$233,000
Pump Sta. B	1	Lump Sum	\$465,000
Pump Sta. B, 4-inch Forcemain	920 lf	\$124 / lf	\$115,000
Pump Sta. C	36	Lump Sum	\$620,000
Pump Sta. C, 8-inch Forcemain	8,700 lf	\$206 / lf	\$1,790,000
Pump Sta. D	1	Lump Sum	\$582,000
Pump Sta. D, 10-inch Forcemain	1,300 lf	\$201 / lf	\$262,000
Pump Sta. E	1	Lump Sum	\$427,000
Pump Sta. E, 8-inch Forcemain	2,450 lf	\$170 / lf	\$418,000
RR and Major Highway Crossings	1,000 lf	\$775 / lf	\$775,000
Grinder Pump Units	20	\$13,944 ea.	\$279,000
1-1/4 inch Pressure Sewer	1,200 lf	\$46 / lf	\$56,000
Air Relief Structures and Valves	4	\$4,648 ea.	\$19,000
Valve Boxes and Valves	4	\$49,579 ea.	\$199,000
Rock Excavation	12,000 cy	\$175 /cy	\$2,100,000
Allowance for Utility Relocation		Lump Sum	\$388,000
<b>Probable Construction Cost</b>			<b>\$10,418,000</b>

Table D – Sewer District Alternative No. 2 - Estimated Collection System O&M Cost for Initial Year of Operation

Description	Quantity	Unit Cost	Total
Sewer Maintenance	2 miles	\$930 /mile	\$2,000
Pumping Station Power Costs	150,000 kw-hr/yr	\$0.19 /kw-hr	\$38,000
Pumping Station Labor	1,400 man-hr/yr	\$50 /hr	\$70,000
Spare Parts and Consumables		Lump Sum	\$13,000
Misc. Tools , Truck, etc.		Lump Sum	\$4,000
<b>Total Estimated O&amp;M Cost</b>			<b>\$127,000</b>



Table E: Sewer District Alternative No. 3 – Opinion of Probable Construction Cost

Description	Quantity	Unit Cost	Total
8 and 10 inch PVC Sewer	12,040 lf	\$153 / lf	\$1,844,000
48-inch Precast Manholes	86	\$3,873 ea.	\$334,000
6-inch Service Laterals	150	\$1,549 ea.	\$233,000
Pump Sta. B	1	Lump Sum	\$465,000
Pump Sta. B, 4-inch Forcemain	920 lf	\$124 / lf	\$115,000
Pump Sta. C	36	Lump Sum	\$620,000
Pump Sta. C, 8-inch Forcemain	8,700 lf	\$206 / lf	\$1,790,000
Pump Sta. D	1	Lump Sum	\$582,000
Pump Sta. D, 10-inch Forcemain	1,300 lf	\$201 / lf	\$262,000
Pump Sta. E	1	Lump Sum	\$427,000
Pump Sta. E, 8-inch Forcemain	2,450 lf	\$170 / lf	\$418,000
RR and Major Highway Crossings	1,000 lf	\$775 / lf	\$775,000
Grinder Pump Units	20	\$13,944 ea.	\$279,000
1-1/4 inch Pressure Sewer	1,200 lf	\$46 / lf	\$56,000
Air Relief Structures and Valves	4	\$4,648 ea.	\$19,000
Valve Boxes and Valves	4	\$49,579 ea.	\$199,000
Rock Excavation	13,000 cy	\$175 / cy	\$2,275,000
Allowance for Utility Relocation		Lump Sum	\$388,000
<b>Total Construction Cost</b>			<b>\$11,081,000</b>

Table F – Sewer District Alternative No. 3 - Estimated Collection System O&M Cost for Initial Year of Operation

Description	Quantity	Unit Cost	Total
Sewer Maintenance	2.5 miles	\$930 /mile	\$3,000
Pumping Station Power Costs	170,000 kw-hr/yr	\$0.19 /kw-hr	\$40,000
Pumping Station Labor	1,400 man-hr/yr	\$50 /hr	\$70,000
Spare Parts and Consumables		Lump Sum	\$13,000
Misc. Tools , Truck, etc.		Lump Sum	\$4,000
		<b>Total Estimated O&amp;M Cost</b>	<b>\$130,000</b>

Table G - Wastewater Treatment Plant Upgrade – Opinion of Probable Construction Cost

Description	Quantity	Unit Cost	Total
General Conditions	Lump Sum		\$218,000
Influent Flow Meter	Lump Sum		\$86,000
Influent Screens	Lump Sum		\$137,000
Primary Clarifiers	Lump Sum		\$171,000
Electrical Building	500 sqft	\$360 /sqft	\$180,000
Demolition Work	Lump Sum		\$284,000
Electrical Upgrade	Lump Sum		\$852,000
SCADA Upgrade	Lump Sum		\$284,000
Control Building Renovation	Lump Sum		\$142,000
Maintenance of Flow	Lump Sum		\$46,000
<b>Total Probable Construction Cost</b>			<b>\$2,400,000.00</b>

Table H - Opinion of Probable Annual Operation and Maintenance Costs for the WWTP

Electrical Costs	Flow (MGD)	Electrical Consumption (1000 kWh/yr)		Unit Cost (\$/kWh)	Annual Cost (\$/yr)		
Influent Pumps	0.38	20		\$0.19	\$3,800		
Trickling Filter Feed	0.38	20		\$0.19	\$3,800		
Membrane Header	0.38	10		\$0.19	\$1,900		
Membrane Feed	0.38	50		\$0.19	\$9,500		
RBCs	0.38	261		\$0.19	\$49,600		
Misc. Plant Process	0.38	300		\$0.19	\$57,000		
<b>Subtotal</b>						<b>\$125,600</b>	
Chemical Costs	Average Dosage (mg/l)	Average Flow (MGD)	Percent Solution (%)	Unit	Average Usage (unit/day)	Unit Cost (\$/unit)	Annual Cost (\$/yr)
Alum	206	0.38	N/A	lbs.	640	\$0.19	\$45,800
Polymer	5	0.38	N/A	lbs.	16	\$4.84	\$27,700
Sodium Carbonate	10	0.38	N/A	lbs.	31	\$0.25	\$2,900
CIP							
Sodium Hydroxide	N/A	0.38	N/A	lbs.	4	\$0.25	\$400
Sodium	N/A	0.38	12.0%	gal.	0.4	\$2.02	\$320
Citric Acid	N/A	0.38	N/A	lbs.	3	\$1.29	\$1,420
<b>Subtotal</b>						<b>\$78,500</b>	
Personnel Costs	No.	Personnel Salary (\$/yr)		Benefits (\$/yr)		Annual Cost (\$/yr)	
Chief Operator	1	\$75,000		\$37,500		\$112,500	
Shift Operator	1	\$60,000		\$30,000		\$90,000	
Maintenance	1	\$50,000		\$25,000		\$75,000	
Laborer	1	\$45,000		\$22,500		\$67,500	
<b>Subtotal</b>						<b>\$345,000</b>	
Miscellaneous Costs	Basis of Cost					Annual Cost (\$/yr)	
Equipment Parts	2.5% of Total Equipment Value of \$2,000,000					\$50,000	
Service Contracts	10% of Electrical, Chemical and Personnel Costs					\$55,000	
Vehicles	2 Vehicles @ 20,000 miles/yr and \$0.50/mile					\$20,000	
Administration	1% of Electrical, Chemical and Personnel Costs					\$5,000	
Sludge Hauling	110,000 gallons per month @ \$0.12 per gallon					\$198,000	
Miscellaneous	5% of Electrical, Chemical and Personnel Costs					\$27,000	
<b>Subtotal</b>						<b>\$356,000</b>	
<b>Summary</b>							
<b>Annual O&amp;M Budget</b>						<b>\$905,000</b>	