



Hatch Mott
MacDonald



**Phase II: Joint Base Regional Wastewater & Growth
Management Plan – Northwestern Municipalities Adjacent to
Joint Base's McGuire and Dix Sections
Final Report**

March 2013 | County of Ocean



County Of Ocean

Report Upon

Phase II: Joint Base Regional Wastewater & Growth Management Plan - Northwestern Municipalities Adjacent to Joint Base's McGuire and Dix Sections

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Studies funded through the support of OEA financial assistance are not intended to incentivize or induce incompatible growth. Rather, outcomes resulting from OEA-funded studies presume existent urban and spatial development conditions and attempt to control and harmonize those conditions through a spatial and urban planning process that is compatible with installation requirements for the sustainment of mission.

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Hatch Mott MacDonald wishes to express our sincere gratitude for the assistance, insight and guidance of all members of the Joint Base Technical Advisory Committee. We appreciated each member's candor and efficient responses to facilitate the preparation of the Phase II: Joint Base Regional Wastewater & Growth Management Plan Study. We also wish to express our thanks to David McKeon and Mark Remsa who were instrumental in coordinating all the local, state and federal agencies and Joint Base/DoD communications. We look forward to working with everybody as you develop your final vision for regional wastewater and growth management for the area.

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1.0 Executive Summary

The Phase II Study provides the framework for cost-effective and sustainable integration of land use and wastewater management for the Joint Base and the surrounding municipalities. A Regional Wastewater System approach is presented that effectively serves the surrounding communities utilizing the existing infrastructure of the Joint Base. It is estimated that the annual user fees per EDU for the regional wastewater system could be between \$475 to \$577 per year in year one and \$553 to \$679 per year in year ten. The user fees represent less than one percent of household income and thus, the East Side Project is considered affordable and cost-effective.

In short, the **Conclusions** of the Phase II study report are as follows:

East Side Project

- Buildout flow has been determined to be 4.40 MGD
- The Existing Joint Base WWTP has a capacity of 4.6 MGD
- Treatment Capacity is greater than buildout demand
- An existing or new regional authority is required
- Joint Base transfers wastewater responsibilities to new regional authority
- Joint Base benefits from controlled growth in the surrounding communities
- Communities benefit from using existing Joint Base wastewater facilities
- EUL is mechanism for a new authority to have immediate customers and bonding capacity
- Regional Conveyance System repurposes the Mount Road Pump Station
- Regional Conveyance System only requires two Regional Pump Stations
- Septic System relief is available within 2-3 years from formation of new Authority for “New Egypt” and “Cookstown”
- East Side Project user fees are less than 1% the median household annual income
- Basis of new municipal wastewater management plan chapters have been prepared

West Side Project

- North Wrightstown buildout flow has been determined to be 0.198 MGD
- Wrightstown buildout flow has been determined to be 0.142 MGD
- Wrightstown MUA treatment plant capacity is 0.337 MGD compared to buildout of 0.340 MGD
- Treatment Capacity is sufficient for the West Side project
- WMUA’s customers base increases by connection of North Wrightstown

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The key **Recommendations** from the Phase II Study report include:

- Technical Advisory Committee needs to spearhead the creation of a new regional authority
- The TAC needs to foster political interest in the project
- The TAC needs to work with the DOD to further the EUL concept
- The TAC needs to continue to seek funding sources to reduce debt service and user fees
- Conduct testing of existing wastewater treatment and disposal facilities within the first 5 years of Authority Operation
- Finalize and submit municipal chapters of the Wastewater Management Plan

Support from the Joint Base is essential to the success of the East Side Project. It is therefore important that the following issues be understood:

- *Out of a tradition, the Joint Base may feel that it is better for them to have full control over vital infrastructure. Nevertheless, the Joint Base Wastewater Treatment Plant (WWTP) is currently being operated and maintained under a contract with a private operating company. The move to turning over full responsibility of base wastewater infrastructure to a Regional Authority is the next logical step in that transition.*
- *As noted in the Report, Joint Base Engineering voiced a concern that they must plan for the unexpected and they therefore need to be conservative in their estimating of future wastewater flows to assure that their wastewater facilities have adequate capacity for their mission. The transfer of Joint Base wastewater infrastructure to a Regional Sewerage Authority by the Enhanced Use Lease process will not restrict the volume of wastewater flow coming to the WWTP from Joint Base. Wastewater facilities are closed systems. That is, all wastewater flows coming into the sewer system must be conveyed, transported, treated, and disposed of in accordance with State laws and regulations. The Regional Authority will have a responsibility to the State of New Jersey to assure proper operation of the WWTP and compliance with its NJPDES Permit. This includes evaluating and planning for additional flow capacity when the plant nears 80% of its permitted capacity. The Enhanced Use Lease of these facilities takes these concerns away from the Joint Base and transfers them to the Regional Authority. Whatever wastewater flows come into the WWTP will need to be treated and disposed of in accordance with law.*
- *It is anticipated that the Joint Base may feel that it can operate and maintain its system at a lower cost. While the Joint Base uses a private operating company to operate and maintain the WWTP, it appears through our site visits that military personnel operate the collection facilities, including the pump stations. It is therefore difficult to determine the actual cost of current operation and maintenance for the entire Joint Base wastewater infrastructure. It has been identified that often, military personnel are operating key components of the system. Typically, military personnel rotate duty stations every two to three years. Accordingly, the institutional knowledge of the system that comes from the day to day operation is also being*

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lost. An intrinsic value of a Regional Sewerage Authority is that that knowledge will not be lost and therefore system operations should improve. In addition, in lieu of cost, another intrinsic value is the Joint Base gaining some control of the development and growth within the adjacent municipalities thereby, providing assurance that their mission will be not impacted by uncontrolled regional growth.

2.0 Introduction and Background

2.1.1. Background

The development of the Joint Base Regional Wastewater and Growth Management Plan was recommended by the Joint Land Use Study (JLUS) that was completed in April 2009. The JLUS identified that individual subsurface disposal methods in most of the surrounding civilian communities promoted residential growth (suburban sprawl) that is incompatible with Base Operations. The JLUS also recognized that the lack of readily available wastewater facilities was a limiting factor in stimulating growth where it could support the base mission as well as invigorate the surrounding communities. Methods were recommended in the JLUS to address these issues. Specifically:

- Incorporate JLUS Municipal Transfer of Development Right (TDR) Program and other growth management techniques such as easement acquisitions for open space and farmland preservation;
- Evaluate the potential of providing sanitary sewer service to existing development areas with municipalities seeking to preserve lands through a TDR program;
- Evaluate wastewater solutions for JLUS communities with failing septic systems and health hazards, such as New Egypt in Plumsted Township, Cookstown in New Hanover Township, and North Cookstown in North Hanover Township; and
- Evaluate wastewater financing solutions for JLUS communities experiencing economic decline.
- Minimize future encroachment by clustering future residential and commercial development within smart growth areas such as the existing towns and villages

The Joint Base Regional Wastewater and Growth Management Plan as recommended under the JLUS seeks to minimize future encroachment by clustering future residential and commercial development within smart growth areas such as the existing towns and villages, and to use the TDR process within the northwestern municipalities adjacent to Joint Base's McGuire and Dix Sections. The purpose of this study is to:

- Promote Smart Growth Planning and development in civilian areas that also promotes sustainability and benefits to continued base operations;
- Correct existing health and environmental concerns due to failed septic systems in adjoining municipalities;

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- Promote economic development resources in existing civilian area town centers;
- Promote farmland and open space preservation through TDR and other growth management programs;
- Provide an option for the Joint Base to no longer be involved in the operation and maintenance of wastewater facilities through Department of Defense Enhanced Use Lease Program.

The study includes the Borough of Wrightstown and the Townships of New Hanover and North Hanover in Burlington County and the Township of Plumsted in Ocean County, and was separated into three phases. The Phase I Study was completed and recommendations made in a Report published in September 2011. The Phase I study provided a general description of Joint Base McGuire-Dix-Lakehurst and the four adjacent municipalities. It identified existing and planned growth management, infrastructure needs, and recommended either working with the Joint Base to convey municipal wastewater to the existing Joint Base sewage treatment plant (WWTP), or to build a new WWTP near Cookstown.

This Phase II Study builds upon the foundation established in Phase I to confirm capacity needs, the status of existing wastewater facilities, the extent and conceptual sizing of new infrastructure and costs associated with implementation of the WMP. The Joint Base needs to be aware of growth in the surrounding municipalities, and thereby allow them to plan their missions in a more sustainable manner. At the same time, these municipalities need a viable and cost-effective means of wastewater treatment to protect the health and safety of its citizens and to allow for economic development and smart growth within their borders. This report can be utilized to move towards accomplishing these needs. Phase II was authorized in May 2012.

It is anticipated that Phase III consisting of Preliminary and Final design documents, permitting and a Regional Wastewater Management Plan will occur sometime in the future.

2.2. Study Area

The following provides very general information on the Joint Base and the adjacent communities, wherein referred to as the East Side or West Side Project:

2.2.1. Joint Base McGuire-Dix-Lakehurst

The Joint Base was officially established on October 1, 2009 and was the result of a realignment of these facilities under the 2005 Base Realignment and Closure Commission (BRAC). All property rights for Fort Dix and Lakehurst Naval Aviation Engineering Station were transferred to the Air Force under the realignment. This study evaluated wastewater management planning (WMP) for areas immediately adjacent to the Dix-McGuire segments of the Joint Base.

2.2.2. Plumsted Township (East Side Project)

The Township is part of Ocean County and is located north of Dix. It is bordered by North Hanover and New Hanover Townships in Burlington County to the west and Jackson Township to the east. Approximately 50% of the total land area within the Township is part of the Dix section of Joint Base. The New Egypt section of the Township is designated as a town center and includes most of the civilian population and building density within the Township. There is no public sewer system and existing wastewater disposal is accomplished by individual subsurface disposal systems using cesspools and septic system, which in many cases are failing. New growth is anticipated, but cannot be completed without the appropriate wastewater infrastructure.

2.2.3. New Hanover Township (East Side Project)

The Township is part of Burlington County and approximately ninety percent (90%) of the Township is part of the Dix section of Joint Base. Most of the Township's civilian population resides within Cookstown, which is a village center. New Hanover Township states in its Master Plan that it must be responsive to the needs of the military, which includes farmland preservation to buffer the military installation from development. Like Plumsted, Cookstown does not have a public sewer system and many of the individual subsurface disposal systems are failing. Growth within the Township will be limited to large parcel housing unless a public sewer system is provided.

2.2.4. North Hanover Township (East and West Side Projects)

The Township is part of Burlington County is located directly north of the McGuire section of Joint Base. With the exception of base housing, the Township is primarily an active farming community. Except for those segments of the Township that include base housing, the Township is primarily serviced by individual subsurface wastewater disposal systems. Existing commercial development is concentrated near Wrightstown along the Route 545 corridor. The planning goal for the Township is to utilize existing water and sewer capacity within the Wrightstown Municipal Utilities Authority (WMUA) for the western section and to create a new growth center north of New Hanover Township Cookstown section. The Township has implemented a non-contiguous clustering ordinance and is exploring a TDR program. The TDR cannot be implemented without adequate public wastewater facilities.

2.2.5. Wrightstown Borough (West Side Project)

Wrightstown is the only community located entirely within the JLUS study area (Joint Base 2 mile buffer) and is locate to the north and west of the Dix segment. The Borough is currently serviced by public water and a wastewater collection and treatment facilities owned and operated by the Wrightstown Municipal Utilities Authority (WMUA). The WMUA currently has excess water and wastewater treatment capacity that could be shared with the western segment of North Hanover

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Township. Businesses in the Borough have served the commuters and residents of Joint Base for decades and the Borough is seeking to achieve redevelopment growth that continues to offer services to Joint Base in the form of multi-use residential and commercial development.

3.0 Project Scope

The project scope was initially detailed in the Request for Proposals from Ocean County and essentially consisted of the following:

- To evaluate existing facilities and equipment at the Joint Base in regards to their condition and useful life;
- To identify all existing wastewater infrastructure and facility rehabilitation/improvements for the East Side and West Side projects;
- To identify all new wastewater infrastructure to be designed and constructed, including collection, conveyance, treatment, and disposal facilities for the East Side and West Side Projects;
- Prepare conceptual layout plans identifying the location and extent of all existing wastewater facilities requiring expansion and new facilities needed for the phased construction of the East Side and West Side Projects;
- The preparation of a real estate/route selection analysis for the East Side and West Side Projects;
- To identify all permits required to complete the East Side and West Side Projects;
- To develop estimated costs to design, construct, own, operate, maintain, and manage the East Side and West Side Projects, together with a proposed financing and management structure;
- The review and report upon the financial feasibility of the East and West Side Projects;
- To undertake Public Agency Coordination in conjunction with Public Participation; and
- To prepare a draft Joint Base Regional Wastewater Management Plan (WMP)

As noted above there are numerous tasks that were undertaken, many of which required input from the counties, local municipalities, or Joint Base. The project goal was to provide input to the various public and governmental agencies on a continuous and timely basis. Early in the process a Technical Advisory Committee (TAC) was established consisting of members from each county, the Joint Base, OEA, and regulatory agencies including the NJ Department of Environmental Protection and the Pinelands Commission. Monthly meetings were held with the TAC as well as periodic conference calls to discuss the project, any difficulties encountered in obtaining data, and alternative plan development and recommendations. The project was separated into main logical segments, which were then developed into separate Technical Memorandum Reports (TM) that provided the basis for, logic use, and recommendations for key segments of the project. Draft TMs were issued throughout the project and comments incorporated into the secondary drafts and final versions of each report. The Final Technical Memorandums are included in Appendix A of this report and form the basis for this Final Report.

4.0 Engineering Evaluation of Existing Infrastructure

Early in the project, development site visits and document reviews were conducted of those existing Joint Base McGuire - Dix wastewater facilities that would be needed to provide wastewater service to the East Side Project. The major infrastructure evaluated included the Texas Road Sewage Treatment Plant (WWTP), the WWTP Effluent Percolation/Infiltration Lagoons located off Juliustown Road, and the Mount Road Sewage Pump Station. Major Joint Base wastewater facilities required to service the East Side Project were evaluated to be rehabilitated, abandoned or re-purposed based upon the size, location and costing of the proposed regional facilities as part of the East Side Project. Technical Memorandum 3 in Appendix A provides a detailed assessment of the existing infrastructure and is briefly summarized below.

4.1. Mount Road (“McGuire”) Pump Station

The MRPS is located at the site of the former “McGuire” sewage treatment plant that was converted to a sewage pump station in 1994. The pump station is located to the rear of the runway system and is a three story wet well/dry well triplex pumping configuration with one floor above grade and two below grade. Flows from the station are pumped to the WWTP by means of the existing 16” force main. The flows discharged from the Mount Road Pump Station are measured by means of a flume and level detector separately at the head end of the Joint Base WWTP. The MRPS essentially serves all of the McGuire section of the Joint Base.

Flow data consisting of daily totalizer readings for this meter were obtained from the Base for the period of 2007–2011. Analysis of the flow data is summarized below:

- Average Daily Flows (ADF) on an annual basis ranged from a high of 0.818 MGD in 2007 to a low of 0.475 MGD in 2009. The five year ADF was 0.587 MGD.
- Average Daily Flows (ADF) on monthly basis ranged from a high of 1.00 MGD in January 2007 to a low of 0.411 MGD in September 2009.

The design report for the Mount Road Pump Station could not be located. Information obtained during the site visit from the pump nameplates indicate that each of the three pumps have a design rating of 1500 GPM at a Total Dynamic Head (TDH) of 195 feet. While the design report was not located, Operation and Maintenance Manuals for the pumps within the station, including a pump curve, and construction plans for the force main were located and obtained. This information was used to develop system and pump curves to obtain a better understanding of the hydraulic capacity of the pump station and to determine whether the pump station in its present arrangement has adequate capacity to transport the additional flow from the East Side Project.

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The detailed hydraulic analysis of the Mount Road Pump Station is presented in Technical Memorandum 2 and concludes that the pump station has a firm capacity of 3,200 gpm or 4.60 MGD. The existing Mount Road “McGuire” Pump Station (MRPS) is reportedly scheduled to be rehabilitated by the Joint Base, however, confirmation that the improvements have been completed has not been received. Accordingly, in the financial analysis of Phase II study we have provided an allowance of \$1,200,000 for future rehabilitation improvements which may include building, electrical, instrumentation and emergency bypass and influent wet well upgrades.

Finally, the existing 16” Discharge Force Main that runs from the MRPS to the Texas Road WWTP has been operating at flows that do not scour solids and may therefore require cleaning. It is recommended that the force main be cleaned, internally inspected and air-release valve exercised and maintained. The rehabilitation will ensure that the force main is free from settled material that may have developed due to low flows since its construction. It is estimated that the proposed rehabilitation improvements would cost \$150,000.

4.2. Texas Road Wastewater Treatment Plant

The Texas Road Wastewater Treatment Plant has a NJPDES permitted flow of 4.6 MGD with an average daily flow (ADF) in 2011 of 2.43 MGD. Site visits were conducted on May 21st, 2012 and May 30th, 2012 to review the current facilities.

The existing Plant was constructed in 1995 and overall appears to be in very good condition. The existing wastewater treatment facility was designed to meet the very stringent Total Nitrogen Limit of 2 mg/L. The major treatment units of this advanced wastewater treatment facility include preliminary treatment with grit removal, primary clarifiers, 5-stage Bardenpho activated sludge treatment with secondary clarifiers, conventional sand filtration and UV light disinfection. The two primary clarifiers are designed with overflow rate of approximately 600 gpd/sq ft, which is adequate for this type of application. The primary clarifiers are covered for odor control.

The key treatment unit, which is activated sludge in a 5-stage Bardenpho configuration, is designed with ample capacity, consistent with the requirement for almost complete nitrification and denitrification. Each of the two available trains consists of multiple aerated and non-aerated zones allowing almost complete removal of nitrogen. A schematic of the existing plant activated sludge train is provided in TM-5, Figure TM 5.1. All zones of the activated sludge train are equipped with mechanical mixers, and with an air supply in the form of spargers provided for the oxic zones. There are a total of 54 mechanical mixers installed in both trains of the Bardenpho process.

Four (4) final clarifiers exist which provide the required process redundancy. The overflow rate with all clarifiers on line at the average design flow conditions is just under 300gpd/sf, which is a very conservative design.

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Effluent polishing for TSS, which is a desired feature for percolation lagoon disposal, is accomplished by conventional, travelling bridge sand filters (3 cells). The overflow rate of the filters is 1.39gpm/sf with all cells on-line, which is within the normal range for this type of application.

Upon inspection of the treatment plant, seven (7) recommendations for upgrade at the Plant were presented on Table TM 3.5. In general, the upgrades are minor in nature and estimated to cost approximately \$350,000.

4.3. Wastewater Treatment Plant Effluent Percolation/Infiltration Ponds

The condition of the effluent percolation/infiltration ponds was noted on the day of the inspection on May 30, 2012. Access to the basins is fair because of poor road conditions in wet weather. It is recommended that the access roads and entrance be improved to keep accessibility during wet weather. The plant operator was mowing the basins to control vegetative growth and was tilling the basin bottom. There are 12 existing basins. The operator has advised that 2 basins are not used due to poor percolation in those basins. The draft NJPDES permit issued in March 1992 indicates that the ponds have a maximum permitted discharge rate of 4.6 MGD however it appears that the ponds have never been operated at flows much above 3.3 MGD. The final design report for these basins could not be located.

A detailed evaluation of the Ponds is presented in TM 3. In general, more field evaluation and stress testing is recommended to confirm the performance of these Ponds.

The following are recommendations for further consideration:

1. Clarification will need to be obtained from the NJDEP of the regulatory significance of the amount of induced rise in the water table and to determine at what distance from the ponds does induced seeps (water leakage through up-welling) constitute a hydraulic failure;
2. Hydraulic testing of the percolation ponds should be conducted using monitoring piezometers through multiple dosing/drying cycles at each of the active lagoon trains to evaluate capacity and seepage potential;
3. Depending upon discussions with NJDEP a finite-difference model should be developed that would be calibrated to site-specific conditions, as measured in Item 2. The model could then be used to predict the maximum application rate that can be sustained by the current system, with the current dosing schedule, without inducing unacceptable hydraulic failures; and
4. Use the model as developed in Item 3 as a predictive tool to test alternative dosing schedules to increase the capacity of the existing system while avoiding the conditions that would constitute hydraulic failure, as defined in Item 1.

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The design report was not available for the existing Joint Base Effluent Infiltration/Percolation Lagoons and hydraulic data was extremely limited. While it appears that there is adequate disposal capacity for the projected 3.245 MGD during the initial 4 year period for the East Side Project there is inadequate hydraulic data to verify hydraulic loading to the ultimate design rate of 4.6 MGD. Accordingly, monitoring of the ponds through piezometers should be conducted so that a computer model could be developed and used to verify capacity.

5.0 Conceptual Local Wastewater Infrastructure

The first step needed to develop and size local infrastructure is to have a better understanding of the wastewater flows to be generated in each municipality and the distribution of that flow. Accordingly projections for both the East and West Side Project were developed and summarized in TM2. The memorandum was intended to present to the local municipalities and the Joint Base the estimated wastewater flows which will become the basis for sizing conveyance and treatment facilities. The draft technical memorandum had been submitted for review, comment and acceptance by the municipalities, the Joint Base, and Technical Advisory Committee (TAC). Relatively minor comments were obtained from the municipalities and the Technical Advisory Committee.

The results of the Sewer Service Area Flow Projections for the East Side Project (Plumsted, Cookstown, West Cookstown, and North Cookstown) sewer service areas tributary to the Joint Base is presented below. The Phase II analysis detailed the projections by Initial Term Flows (0-4 years), Short Term Flows (5-10 years), and Long Term Flows (greater than 10 years). As indicated in the table, the East Side Project has a projected total municipal wastewater flow of approximately 531,000gpd (0.53 MGD) during the first 10 years of operation, and an ultimate build out sewage flow of approximately 1,100,000gpd (1.1 MGD).

Summary of Municipal Wastewater Flow Projections East Side Project						
Description	Phase II Municipal Wastewater Flow Estimates					
	Initial Term Sewer Projects (0 - 4 Yrs)	Short Term Sewer Projects (5 - 10 Yrs)	Subtotal Initial and Short Term Sewer Projects	Long Term Sewer Projects (10+ Yrs)	Total Ultimate Buildout Sewer Projects	% Total
Municipality / Service Area	(gpd)	(gpd)	(gpd)	(gpd)	(gpd)	(%)
Plumsted	153,000	154,000	307,000	282,000	589,000	53.4%
Cookstown	57,000	0	57,000	10,000	67,000	6.1%
West Cookstown	48,000	0	48,000	67,000	115,000	10.4%
New Hanover (Total)	105,000	0	105,000	77,000	182,000	16.5%
North Hanover	119,000	0	119,000	214,000	333,000	30.2%
Total Flows	377,000	154,000	531,000	573,000	1,104,000	100%

For the West Side Project, the projected sewage need is restricted to Wrightstown and the western section of New Hanover. It is projected that new wastewater flows during the first 10 years of operation will be 159,000gpd (0.159 MGD), and an ultimate buildout projected sewage flow of 340,000gpd (0.340 MGD).

Concept Sanitary Sewer Collection System Maps have been developed for the East Side and West Side Project areas. The Phase I Study did not contain sufficient data for review and comment on local wastewater conveyance systems. Hence, conceptual sanitary sewer system layouts were developed wherever previous layout information did not exist. Sanitary sewer system layout maps have been prepared for Plumsted, New Hanover, North Hanover, and Wrightstown.

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The prepared conceptual plans depict the proposed sewer service area within each municipality and show topography, roadways and tax map lots. A conceptual sanitary sewer system layout has been prepared based on available topography so that each town could view and comment on the anticipated means to collect wastewater within their respective municipalities and sewer service areas. In general the conceptual plans as presented have been approved with few, if any, changes. The sanitary sewer system concept layouts were then used to develop construction and project costs for Regional Sewerage Authority conveyance (pump station and force mains) and ultimately estimated user charges and rates.

The Plumsted sewer system map reflects the PMUA's proposed sanitary sewer collection system layout while the Wrightstown map essentially shows the existing collection system within the Borough. Conceptual sewer layout plans for New Hanover and North Hanover, which focus on Cookstown, West Cookstown, North Cookstown and North Wrightstown, were never developed by the municipalities and thus the conceptual plans as developed are new.

Overall it was determined that Cookstown, West Cookstown, and North Cookstown could all be serviced primarily by gravity to one regional sewage pump station. Sanitary sewers would be primarily constructed as 8" diameter pipes, although some larger diameter sewers segments will be required in key location near the Regional Pump Station. The conceptual sanitary sewer system layouts are provided in Appendix C of the report, and are based on plans that were reviewed and approved by the technical advisory committee and/or local municipalities as follows:

- Map TM4.1A Plumsted Sewer System (North) (East Side Project)
- Map TM4.1B Plumsted Sewer System (South) (East Side Project)
- Map TM4.2A North Cookstown Sewer System (East Side Project)
- Map TM4.2B North Wrightstown Sewer System (West Side Project)
- Map TM4.3 West Cookstown & Cookstown Sewer System (East Side Project)
- Map TM4.4 Wrightstown Existing Sewer System (West Side Project)

6.0 Conceptual Regional Conveyance Infrastructure

The Phase I Study did not evaluate any alternatives that involved treating the Joint Base wastewater off-base nor the construction of a new relocated Joint Base WWTP. As such a new regional conveyance system concept based on delivering the municipal wastewater to the JB treatment plant was developed under Phase II.

Early in the Phase II study the exact role of the Regional Sewerage Authority was undetermined and thus the initial basic premise of the Regional Conveyance System was that each municipality would construct an independent sewer collection system (see TM-4) that will eventually convey all local sewage to a central pump station for conveyance to the wastewater treatment plant. Since then it has been recognized that it would be more cost effective and efficient for the Regional Sewerage Authority to construct, operate, and maintain all wastewater facilities associated with the project. Accordingly, while the local and regional wastewater facilities have been separated and accounted for in separate Technical Memorandums, it is recommended that all wastewater facilities be constructed, owned, and operated by the Regional Authority.

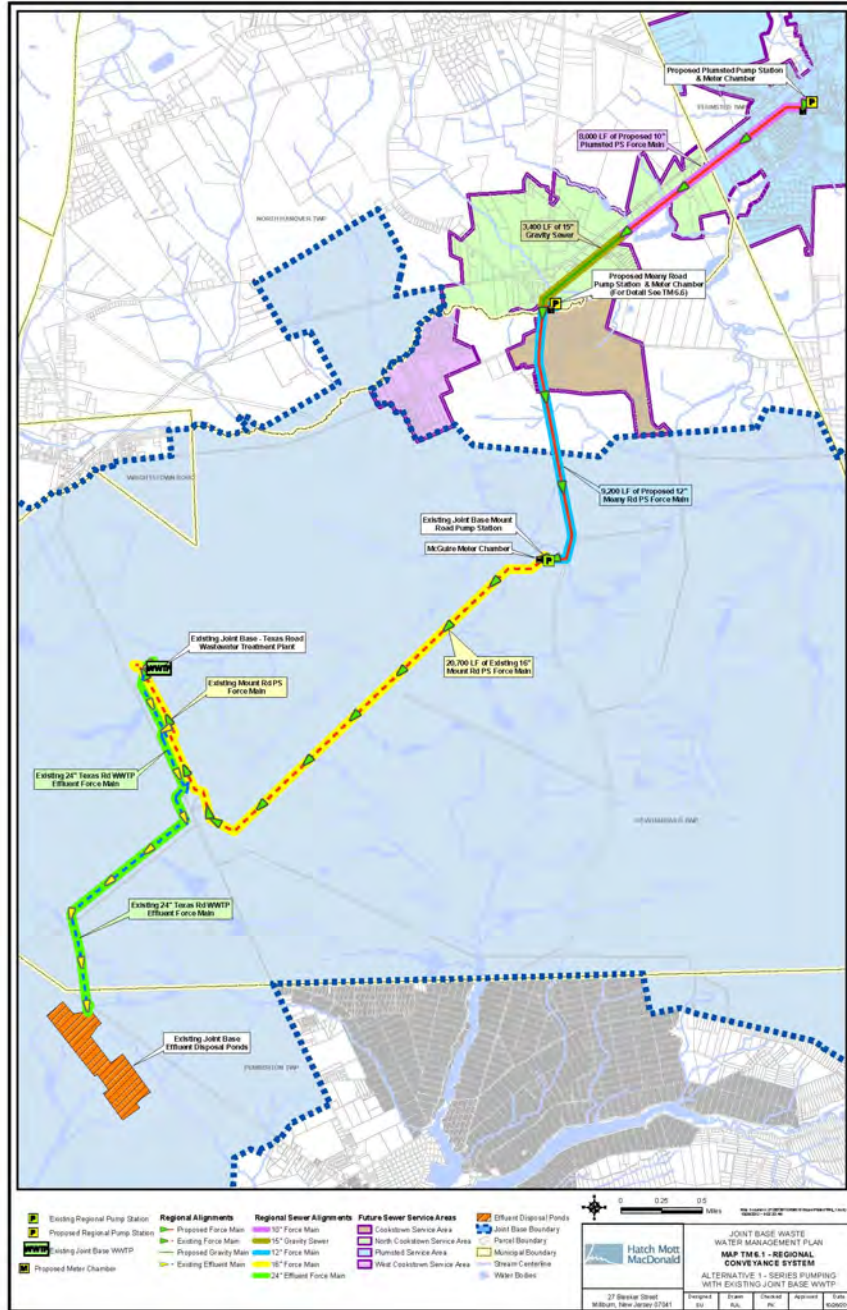
Several conceptual layouts of regional conveyance system to serve the municipalities and the Joint Base were prepared and submitted to the TAC for review. In each case regional pump stations from the East Side municipalities transported flow to the Mount Road Pump Station and ultimately to the existing Joint Base WWTP located on Texas Road. Conceptual regional wastewater facilities were laid out based on the local conveyance system mapping as previously described. It was noted that the East Side municipalities could be serviced by two regional pump stations that would then transport flow to the Mount Road Pump Station located in the McGuire section of the Joint Base.

Two alternative configurations, series and parallel pumping have been evaluated for the Regional Conveyance System to serve the surrounding communities. In the parallel pumping scenario there is a single common force main and each pump station is independent. That is, flow from Plumsted would not be tributary to the New Hanover Pump Station (hereafter referred to as Meany Road). In the series pumping scenario, the flow from Plumsted would be tributary to the Meany Road Pump station. While there are advantages to each, the ‘Series Pumping’ alternative offers significant advantages over the “Parallel Pumping” alternative and is therefore recommended as the Final Regional Conveyance System configuration.

One advantage of the series pumping system is that it includes a gravity sewer segment within New Hanover Township that will act as the backbone for the gravity sewer collection system in the area and avoids having a regional force main and local gravity sewer along the same alignment. Another and perhaps more important factor, is that the series system provides better control of velocities within the force main to Mount Road PS during the early years in that both pump stations will build up tributary flows simultaneously and early in the process. This will simplify the overall design and reduce the period of possible pump station odors during the initial years of operation.

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Plate 1 (following page) illustrates the recommended regional wastewater facilities as needed to provide wastewater service to the East Side Project. The plate depicts a regional conveyance system that includes one regional pump station to service Plumsted Township together with 8,000lf (linear feet) of 10-inch diameter force main tributary to a 3,400lf segment of 15-inch gravity sewer in North Cookstown. The wastewater flows from all three municipalities are then tributary to a second regional pump station in North Cookstown, hereafter referred to as the Meany Road PS. Wastewater flows are then transported through 9,200lf of 12-inch diameter force main that transports wastewater to the Mount Road Pump Station and ultimately to the existing Joint Base Texas Road WWTP. It has been determined that the existing Mount Road Pump Station, the Joint Base WWTP, and Effluent Percolation/Infiltration ponds all have design capacities greater than or equal to the ultimate flow projections for the Joint Base and East Side Projects. Nevertheless Maps TM 6.2 and 6.4, as included in Technical Memorandum 6, illustrate a regional conveyance system assuming a new WWTP were to be built on Pointville Road and has been provided for general information should the Joint Base determine that the existing WWTP needs to be moved from its present location.

Phase II Joint Base Regional Wastewater & Growth Management Plan
Plate 1


The use of the Mount Road Pump Station and the Texas Road WWTW as regional facilities requires that they have the excess capacity to receive these flows. Technical Memorandum 2 was provided to the Joint Base for review and comment in June 2012. Review comments from the Engineering Group of Joint Base were received at the end of October and in general indicated that all future flows from the Joint Base were not considered and thus the flow analysis showing that the existing Joint Base

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Wastewater Treatment Plant (WWTP) had adequate capacity to service the adjoining municipalities was flawed.

The Joint Base Engineering eventually provided the TAC with a detailed breakdown of potential future base wastewater flows totaling 3.860 MGD in January 2013 (see Appendix B). The breakdown was subsequently reviewed and compared to other documents, including the Unified Facilities Criteria (UFC) for Domestic Wastewater Treatment (UFC 3-240-02, dated 1 November 2012) and existing Joint Base project numbers. The review found that the flow analysis as presented by the Joint Base Engineering Group was inconsistent with the UFC, and in some cases doubled counted future development. A follow up analysis of the Joint Base table was conducted to correct for these issues. The modified table (Appendix B) resulted in a revised potential future wastewater flow of 3.298 MGD, which was subsequently used to develop projected total wastewater flows for the Study. The breakdown of flows between Dix and McGuire using the same general time periods as noted above is provided below.

**Projected Wastewater Flows for
Joint Base Dix/McGuire to Year 2036**

<u>Location</u>	<u>0-5 yr. Flows (MGD)</u>	<u>0-10 yr. Flows (MGD)</u>	<u>10 Plus yrs. Flows (MGD)</u>
Fort Dix	2.314	2.412	2.638
McGuire	0.554	0.562	0.660
Total Dix McGuire	2.868	2.973	3.298

These flows were subsequently added to the municipal flows as show in Section 5 to develop the overall theoretical wastewater flow needs for the East Side Project together with the projected 20 year build out wastewater flows for the Joint Base as presented below:

Summary of Wastewater Flow Projections East Side Project & Joint Base						
Description	Phase II Wastewater Flow Estimates					
Service Area	Initial Term Sewer Projects (0 - 4 Yrs) (gpd)	Short Term Sewer Projects (5 - 10 Yrs) (gpd)	Subtotal Initial and Short Term Sewer Projects (gpd)	Long Term Sewer Projects (10+ Yrs) (gpd)	Total Ultimate Buildout Sewer Projects (gpd)	% Total (%)
Plumsted	153,000	154,000	307,000	282,000	589,000	13.4%
Cookstown	57,000	0	57,000	10,000	67,000	1.5%
West Cookstown	48,000	0	48,000	67,000	115,000	2.6%
New Hanover (Total)	105,000	0	105,000	77,000	182,000	4.1%
North Hanover	119,000	0	119,000	214,000	333,000	7.6%
Joint Base	2,868,000	105,000	2,973,000	325,000	3,298,000	74.9%
Total Flows	3,245,000	259,000	3,504,000	898,000	4,402,000	100%

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Through the analysis conducted under Technical Memorandum No. 3, the existing Mount Road pump station has been rated with a pumping capacity of approximately 3,200gpm (4.6 MGD). This pump Station will receive all of the wastewater from the three municipalities, in addition to the flow from the McGuire section of the Joint Base. Wastewater Flow projections for the entire service area were presented above. The ‘Short Term’ design flow for the East Side Project, using 0.555 MGD from McGuire, is 1.093 MGD and the ‘Ultimate’ design flow for the East Side Project tributary to the Mount Road Pump Station assuming 0.660 MGD from McGuire is 1.76 MGD (say 1.80 MGD). Required wastewater pumping rates and capacity needs were based applying a peaking factor of 2.5 in accordance with NJDEP Standards. To meet the capacity need of the East Side Project the required pumping rates for the Mount Road “McGuire” PS are estimated as:

- Short Term - 1,900gpm or 2.73 MGD
- Ultimate Buildout – 3,065gpm or 4.40 MGD

Based on the ultimate flow projections for the East Side Project municipalities and the build out of the McGuire section of the base, the existing Mount Road pump station has adequate capacity to meet all future flow needs (4.40 MGD vs 4.60 MGD).

The existing Texas Road WWTP and Effluent Disposal Percolation/Infiltration Ponds has NJPDES permitted design capacities of 4.60 MGD each and thus also have adequate design capacity to treat all projected wastewater flows from the Joint Base and the wastewater from the municipalities.

7.0 Real Estate/Routing Analysis

Task 4 of the project scope requires that a Real Estate/Route Selection Analysis be performed on all regional facilities under the recommended Wastewater Management Plan. A preliminary analysis was conducted under this project, however, a more detailed analysis will need to be completed once more detailed information is obtained and developed during the formal design process. Regional wastewater facilities required to implement the recommended plan include locations of the new sewage pump stations that are to be located in Plumsted, and North Cookstown (“Meany Road Pump Station”), and their associated force mains. The existing pump station located on the Joint Base (Mount Road Pump Station), the existing Joint Base Wastewater Treatment Plant (“Fort Dix WWTP”), and the twelve (12) existing percolation ponds near Juliustown Road will not, based on existing data, require expansion for capacity and thus the location of existing Joint Base wastewater facilities do not require any routing analysis.

7.1. Municipal Facilities

7.1.1. Plumsted Pump Station (New Egypt - Plumsted Township)

The proposed Plumsted Pump Station is shown on Map TM 4.1A and on Maps TM 6.1 through 6.4. This parcel is identified as Block 19, Lot 8 on Sheet 10.03 of the Plumsted Tax Map and is currently being used as a municipal parking lot. The land is currently owned by Plumsted Township. The intent is to locate the sewage pump station to the rear of the property to minimize loss of parking. It is recommended that the pump station consist of a wet well with submersible pumps, a meter/valve chamber, and a control building to house the pump controls and a standby generator. The parcel is currently in a flood hazard area and thus the facilities will need to be constructed at an elevation one foot above the 100 year flood elevation. It is estimated that a 50' x 40' permanent easement area would be necessary to establish the pump station site and that approximately six to eight parking spaces would be lost. During construction it would be anticipated that the entire lot would be disturbed and utilized for construction and a temporary easement would need to be established. The pump station site is illustrated below.



Source: Van Cleef Engineering

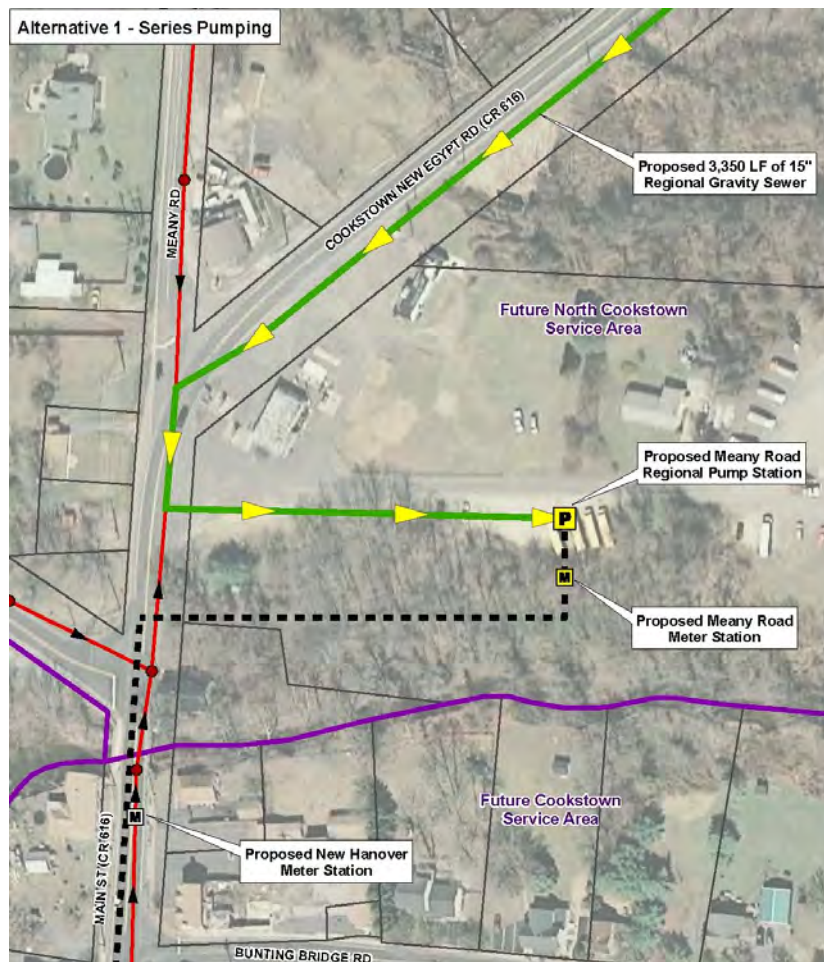
The primary influence of the station location on this parcel is related to previous work conducted by Plumsted that established this location as ideal. The site is already disturbed, however when construction occurs, NJDEP Land Use Regulation Permitting (Flood Hazard Area and Wetlands Permitting) would need to be obtained. HMM has prepared environmental mapping (Map Series 5 of the Wastewater Management Plan Maps) which identify the environmental features of the site. The site is adjacent to the Crosswicks Creek. The zoning map is shown in Map Series 4 of the WMP. The site is in the Township's C-4 (Downtown Core Redevelopment Area).

7.1.2. Meany Road Pump Station (North Hanover Township)

The proposed Meany Road Pump Station is shown on Map TM 4.2A, TM 4.3A and on Maps TM 6.1 through 6.4 and is illustrated as follows. This parcel is identified as Block 905, Lot 32 on the North Hanover Tax Map. The current use of the parcel is private, owned by Belasco Petroleum. There is an abandoned diner building in the foreground along with a currently open gas station. To the rear is parking for school buses, an above ground petroleum storage tank and a private residence. The land is privately owned. The intent is to place a pump station to the rear of the gas station building but the exact location has not been determined. It is recommended that the pump station again consist of a wet well with submersible pumps, a meter/valve chamber, and a control building to house the pump controls and a standby generator.

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It is estimated that a 50' x 50' (2,500sf) permanent easement area would be necessary to establish the pump station site. An access road / sewer easement (containing the gravity influent interceptor line and outgoing force main) from Meany Road would need to be established on a permanent basis.



It is anticipated that a construction staging area will need to be established for the Contractor which would be disturbed and utilized for construction. It is anticipated that a temporary easement of approximately 7,500sf would need to be established.

The primary influence of the station location on this parcel is related to the layout of the local collection systems that is recommended under the current study. HMM's evaluation identified that wastewater from North Hanover's North Cookstown and New Hanover's Cookstown and West Cookstown sections could all flow to this location by gravity thereby eliminating the need for two regional pump stations that were proposed under the Phase I Study. HMM was able to review topographic mapping through the LiDAR system of Burlington County as well as County Road topographic mapping provided by the County which established this location. The site is already disturbed, however when construction occurs, NJDEP Land Use Regulation Permitting (Flood Hazard

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Area and Wetlands Permitting) would need to be obtained. HMM has prepared environmental mapping (Map Series 5 of the Wastewater Management Plan Maps) which identify the environmental features of the site. The site is adjacent to the North Run. The zoning map is shown in Map Series 4 of the WMP mapping. The site is in the Township's C-1 Commercial Zone.

7.1.3. Proposed Regional Piping (Force Main and Gravity Interceptor)

These facilities are described and mapped in Technical Memorandum No. 6. Plate 1 shows a preliminary plan that illustrates the pipeline alignment routing. Almost all of the proposed regional piping is to be located in existing municipal or county right of way and thus easements acquisition for most of the alignment is not anticipated. Nevertheless there will be some minimal land acquisition for segments of the force main that enter or exit the pump station site. In Plumsted, a minimum 20ft wide easement may need to be established near the proposed station site on Block 19, Lot 8 on the adjacent Block 19, Lot 16 to allow the force main piping to run from Lot 18 to Main Street. An alternative approach would be to construct the force main along the parking lot and then into the municipal road. This however would increase the length of pipe required and disturbance to roadway. A minimum 50' wide construction easement (temporary) would also be necessary during construction.

As discussed above, an easement on Block 905, Lot 32 in North Hanover is necessary to bring gravity and force main piping in and out of the Meany Road Pump Station site.

7.2. Military Facilities

7.2.1. Mount Road Pump Station

This pump station is currently located on the site of the old McGuire Wastewater Treatment Plant located on the Joint Base property just west and south of the intersection of Mt. Road and Browns Mills-Cookstown Road. The existing facility is described in detail in Technical Memorandum No.3. The existing site is currently owned and operated by the Joint Base McGuire-Dix-Lakehurst and under control of the Air Force. This report makes an assumption that the entire Joint Base wastewater sewerage facilities will be transferred to the Regional Authority through the Department of Defense Enhanced Use Lease Program (EUL) and "leased" for a 50 or 99 year period. The area would need to be defined similar to an easement description. Based upon the site visit and aerial photography, it would be estimated that a 200' x 200' area would need to be established for the Mount Road Pump Station to include the existing structure, electrical and parking area. An additional component to the EUL for this site will be required for the regional force main (about 1,000 LF) from the Meany Road Pump Station. The alignment of easement is flexible, however it is anticipated that it will extend from Browns Mills-Cookstown Road west into the Base Property. A 30ft minimum "permanent" area would need to remain accessible and a temporary 50ft wide area would need to be established for construction. In addition, access to the site would need to be established with the Joint Base through its security policies.

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7.2.2. Joint Base Wastewater Treatment Plant (“Fort Dix WWTP”)

The arrangement for the EUL would be similar as the Mount Road Pump Station Facility. The existing facility is described in detail in Technical Memorandum No. 3 and 5. The existing site is currently owned and operated by the Joint Base McGuire-Dix-Lakehurst and under the control of the Air Force. The area would need to be defined similar to an easement description. Based upon the site visit and aerial photography, it would be estimated that the existing plant area represents about 12 acres of land that would need to be utilized by the proposed Regional Authority (operational entity) for the facility. In addition, access to the site would need to be established with the Joint Base through its security policies.

Similar to the Plant, the ponds represent 75 acres of land requiring lease under the DOD EUL. In addition, access to the site would need to be established with the Joint Base through its security policies.

7.2.3. Existing Regional Piping on Base

As previously indicated, the benefits to an Enhanced Use Lease to the Department of Defense would be greatly expanded if the Department were able to would like to get completely out of the wastewater business. It is therefore anticipated that the entire Joint Base sanitary sewer collection system piping will need to be quantified by the Joint Base to determine the length and extent of EUL. Mapping and connections would need to be identified. It is not known what area this represents. This will need to be studied in a future evaluation. The larger force main sections between the Mount Road Pump Station and existing Wastewater Treatment Plant represents approximately 20,700lf and those to the Ponds represent about 7 miles of piping that will require inclusion in the EUL program. A 30ft wide access “easement” should be considered for all piping facilities.

7.3. Cost

While a precise cost for the acquisition of easements has not been established for those regional wastewater facilities within the municipalities, the number and size of easements are limited and should therefore represent a very small percentage of the overall project costs. Project cost estimates include an allowance for other costs beyond construction, such as easement acquisition, legal, engineering, permitting, etc... An Enhanced Use Lease may typically involve payments to the Department of Defense (DOD) for the use of the leased facilities. However, these costs would need to be negotiated and cannot be estimated at this time. However, it is suggested that during the EUL negotiations there should be some consideration given to the intrinsic values that the project provides including the transfer of operation and maintenance responsibility of the Joint Base wastewater facilities to a Regional Sewerage Authority, and perhaps more importantly the Transfer of Development Rights from the adjacent municipalities in return for providing the means and method of providing cost effective wastewater facilities and service. In addition, as a majority flow contributor of the Regional Authority, any monetary payments for the Enhanced Use Lease will be

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passed on through user fees and thus would be paid to a great extent by the DOD anyway. Hence, due to the EUL's uncertainty, the cost analysis presented in TM-7 did not include any monetary value for EUL costs.

8.0 Ownership, Operations, Management & Maintenance

The scope of work for this study required that the consultant prepare “an Ownership, Operations, Management and Maintenance Report” identifying a preferred approach and structure to suit the needs of the East Side Project. For the West Side Project, it should be assumed that the Wrightstown MUA will continue its current role and will work directly with North Hanover Township regarding the assessment of user/connection fees for the proposed North Wrightstown sewer area.

Technical Advisory Committee representatives from the Joint Base have indicated that water and wastewater treatment is not a primary mission of the Department of Defense (DOD) and would potentially welcome an Enhanced Use Lease option with an independent authority to assume the operation and maintenance of the existing on-base wastewater conveyance and treatment facilities. These representatives have also indicated that the development of a regional authority or other public agency to operate and maintain these facilities would be the first step in the pursuit of an Enhanced Use Lease agreement, and that it would be unlikely that the DOD would accept wastewater flows from the surrounding municipalities without this type of agreement. In essence, the DOD does not have the means or desire to develop the administrative functions that would allow them to serve non-military residential or commercial customers.

The wastewater facilities required to implement wastewater conveyance and treatment facilities for the surrounding municipalities as developed in Technical Memorandum No. 6 would include at a minimum two new regional pump stations, new regional force main piping, a new regional gravity interceptor sewer, the existing Joint Base Mount Road Pump Station and discharge force main, the existing Joint Base wastewater treatment plant on Texas Road and Plant effluent force main, and the existing Joint Base Infiltration/Percolation Ponds on Juliustown Road. The Joint Base sanitary sewer system also currently contains approximately 475,000 lf of sanitary sewer and twenty (20) additional sewage pump stations located on both Dix and McGuire.

It is preferred to identify a Regional Authority that would assume operational and maintenance responsibilities for all existing and future Joint Base sewerage facilities. This could also be the entity that owns and operates the proposed regional facilities located off-base. Each municipality within the East Side Project will have local sanitary sewer collection systems, and possibly some smaller local pump stations. While Plumsted Township, in Ocean County has a local Municipal Utilities Authority, the municipalities of New Hanover and North Hanover have stated that they are not interested in developing their own authorities or in maintaining their systems by the department of public works. Accordingly, it is anticipated that this project would move in one of two ways: A local Regional Sewerage Authority that owned, maintained, and operated all local and regional facilities servicing the East Side; or one that owned, maintained and operated all local and regional facilities with the exception of Plumsted, who would own, maintain and operate their own local sewage collection system, with the former being preferred due to total cost.

9.0 Financial Feasibility (East Side Project)

Assuming that a new regional authority would be responsible for all local collection systems and regional conveyance systems and all maintenance and upgrades of the existing Joint Base sewerage facilities, the East Side Project consists of the following construction projects in the first ten years:

- Plumsted Local Collection System
- Plumsted Regional Pump Station and Force Main
- Regional Gravity Trunk Sewer (New Hanover)
- Cookstown and West Cookstown Local Collection System
- Meany Road Regional Pump Station and Force Main
- Mount Road (“McGuire”) Pump Station Improvements
- Mount Road (“McGuire”) Force Main Maintenance
- Texas Road Wastewater Treatment Plant Upgrade

The Local Collection Sewer Systems project costs are estimated as \$20,390,000 and the Regional Conveyance System is estimated to cost \$12,040,000 (refer to Table TM 7.1 and TM 7.2). These project costs, along with approximately \$500,000 of maintenance costs within the Joint Base, are basis for a financial analysis to determine the affordability of the overall project; specifically, the debt service component of the Authority revenue requirement.

The financial feasibility of the East Side Project was conducted by Bowman & Company LLC (certified public accountants & consultants) based upon the estimated construction costs and projected flows and customers presented in this report. The financial analysis was performed under two (2) hypothetical assumptions: 1) that an existing utility authority assumed operation of the Joint Bases’ wastewater treatment plant and facilities; and 2) that a new public authority is formed and assumes the operation of the Joint Bases’ operations. The main difference being that a new authority has certain start up costs that an existing authority does not have. The financial analysis was performed using standards established by the American Institute of Certified Public Accountants with certain assumptions made as part of the analysis projection for the annual operations, management and maintenance costs of the Plant. These assumptions are detailed in TM 7 but generally involve:

- Project Scope and Cost
- Additional Potential Funding Sources
- Administration Expenses
- Cost of Operation, Maintenance and Capital Improvements
- Major Repairs and Upgrades
- Equivalent Dwelling Units
- Civilian Service Fees and Joint Base User Fees
- Startup Costs
- Connection Fees

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- Interest Income
- Finance Charges and Other Operating
- Net Position

These assumptions are based upon typical annual financial statements prepared for Authorities to present a realistic assessment of the revenue requirement of the Regional Authority. However, it is stressed that this is a preliminary financial analysis with many variables that are subject to change and in the end may lead to material differences with regard to the financial conclusions. A full copy of the Bowman financial analysis is presented in Appendix D.

Using various assumptions, sample financial statements were prepared to compute the estimated user charges and connection fees. These were prepared for both a new and existing authority for a 10 year period assuming no debt forgiveness or grants for construction of the regional and local wastewater facilities, and then again assuming that the new or existing authority would be capable of obtaining debt forgiveness or grants for 25% of the estimated project costs. These detailed tables (Tables TM7.3 -7.6) are summarized below.

Table TM7.3 Existing Sewerage Authority with no debt forgiveness – estimated user fees per EDU start at \$500 in year 1 and increase to an estimated user fee of \$595 in year 10.

Table TM7.4 New Sewerage Authority with no debt forgiveness – estimated user fees per EDU start at \$577 in year 1 and increase to an estimated user fee of \$679 in year 10.

Table TM7.5 Existing Sewerage Authority with 25% debt forgiveness – estimated user fees per EDU start at \$475 in year 1 and increase to an estimated user fee of \$553 in year 10.

Table TM7.6 New Sewerage Authority with 25% debt forgiveness – estimated user fees per EDU start at \$550 in year 1 and increase to an estimated user fee of \$620 in year 10.

In summary, based on the financial models performed it is estimated that the annual user fee per equivalent dwelling unit (EDU) could range between approximately \$475-\$577 per year in “year one” to approximately \$553 -\$679 per year in “year ten.”

Based upon 2012 American Community Survey data, the median household income in the adjacent municipalities reportedly range from \$58,488 - \$73,790 annually. The current US EPA guideline for projects funded by the Clean Water State Revolving Fund which is a NJEIT funding component states that the user fee shall not exceed 1.75% of the annual median household income. For this project the user fee would therefore need to range between \$1,024 and \$1,291 in “year one”. As stated above, for each of the four scenarios the user fees represent one percent or less of household income and is thus considered affordable.

10.0 Wastewater Management Plan

A key element of the project scope of work requires the preparation of a draft Regional Wastewater Management Plan (WMP) in conformance with the requirements under NJAC 7:15 Water Quality Management Planning Rules (WQMP Rules). An environmental build out analysis is required to be performed based upon the methodology prescribed in NJAC 7:15-5.18 and 7:15-5.25 for sewer service areas in order to analyze existing and future wastewater flows (“buildout flows”) relative to treatment facilities capacities. This analysis is the basis to support the results as presented in Technical Memorandum 2 (TM2) and summarized in Table TM2.1A and 2.1B.

The detailed tables in TM2 supporting the summary tables noted above for the municipalities, identifies by zone, each Block and Lot in the proposed sewer service areas. Under the WQMP Rules at N.J.A.C. 7:15-5.24, large contiguous environmentally sensitive areas of 25 acres or greater in size are to be excluded from sewer service areas. Available GIS data was utilized to list lot areas, areas constrained by environmentally sensitive lands, and net developable lands after deduction of those environmentally constrained lands. An additional deduction of developable land (20% reduction factor) was made after environmentally constrained lands were removed. This deduction accounts for area taken by roads, rights-of-ways, drainage improvements, etc. and is consistent with buildout methodology utilized by the NJ Office of Smart Growth.

In areas where information was not available and provided by Plumsted or Burlington County directly, the number of residential units or non-residential square feet was determined by applying the municipal zoning (lot density for residential lots and Floor Area Ratio for non-residential lots) to the net developable lands. Where non-residential square feet represented warehouse or light industrial flow, the projected square feet was converted to an employee count using a factor of one employee for every 500 square feet of space. NJDEP Design Flow Criteria was then applied to the determined units to developed wastewater flow estimates. The one exception is where existing NJPDES flow could be measured it was used in lieu of NJDEP unit flow criteria. Accordingly, a sewage flow was determined for each block and lot and then tallied. These flow numbers are considered the future flows and are added to existing wastewater demands to generate the ultimate buildout. The Joint Base methodology and flow projections for Joint Base are provided in Appendix B.

In sewer service areas, the purpose is to determine whether existing infrastructure capacity or zoning is the constraining factor. Where zoning is more restrictive than wastewater and water supply capacity and does not conflict with the environmentally sensitive areas, no change in zoning is needed. Where the demand projections exceed available wastewater treatment or water supply capacity, either the projections must be reduced (for instance by reducing the extent of sewer service areas or development permitted thorough zoning) or a plan set forth which will be implemented to enable the increased public water supply or wastewater treatment capacity necessary to match the build-out projections.

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The flow projections developed under this project suggest an ultimate buildout wastewater flow of 4.40 MGD for the East Side project. The existing Joint Base sewage treatment plant (WWTP) and effluent percolation ponds both have a NJPDES permitted flow capacities of 4.6 MGD. Accordingly, the existing Joint Base Wastewater Facilities have available design capacity for all development as envisioned by both the local municipalities and the Joint Base. The flow projections presented herein indicate that ultimate buildout of the West Side Project could generate wastewater flows of 0.340 MGD which slightly exceeds the Wrightstown MUA Sewage Treatment Plant capacity of 0.337 MGD. Nevertheless it is anticipated that all of the proposed development can be accomplished with significant changes to the WWTP. The buildout confirms that the proposed zoning and TDR overlays are not restrictive for the existing available sewer capacity.

The mapping that supports the buildout analysis is presented in Appendix C. This mapping is consistent with the requirements of NJAC 7:15, where existing and proposed sewer service areas are identified along with significant existing and proposed wastewater facilities. Municipal Zoning and environmental features are also mapped along with water purveyor service areas. All mapping is GIS based, based upon the NJ State Plane Coordinates and criteria required by NJDEP. The data in its form of GIS shape files has also been submitted to each county for their use in finalizing the final wastewater management plan submission.

Based upon the work conducted in this current study, a subsequent phase of this project will involve the preparation of individual municipal WMP chapters by each County for submission to NJDEP. The buildout and mapping prepared in this report can be inserted into NJDEP's municipal chapter template for WMP's. The NJDEP WMP facility table template for each existing and proposed NJDPES permitted facility can be populated with the buildout data presented in this report. The municipalities will also be required to adopt ordinances for riparian buffer protection, septic system management, steep slopes, dry conveyance in sewer service areas and septic development in sewer areas which are satisfactory to NJDEP.

Once these chapters are compiled by the Counties, submittal to the New Jersey Department of Environmental Protection (Department) occurs. Upon approval by the New Jersey Legislature, these chapters will be incorporated into the County Water Quality Management Plan (Burlington and Ocean) and via the plan amendment procedure at N.J.A.C. 7:15-3. The plans will be current six years from adoption under the current rules. Subsequent changes to the plans once they are adopted will require revisions or amendments under procedure in the rules.

With the municipal WMP chapters approved, endorsement of the Transfer of Development Rights (TDR) Program by the State Planning Commission can proceed. Under the TDR program, the required Utility Services Plan can be completed based upon the information compiled in this study.

11.0 Conclusions

The best information available to date indicates that the existing Texas Road WWTP and the Effluent Percolation / Infiltration Ponds have adequate capacity for all existing and projected future flow from the Joint Base and the East Side Project as detailed in TM 2.

Implementation of the East Side Project allows the Joint Base to transfer the responsibilities, operation, and maintenance associated with its current wastewater conveyance, treatment, and disposal facilities to an Authority whose sole purpose is the management of wastewater.

The creation of a Wastewater Management Plan for the northwestern municipalities adjacent to the McGuire and Fort Dix (Wrightstown, New Hanover, North Hanover and Plumsted) minimizes future encroachment of surrounding towns through growth management by clustering future housing and economic development around a new regional sewer system.

The development of smart growth areas will assist the military to predict the location of future development and thereby allow them to plan their missions in a more sustainable manner.

A review of the various means for constructing new facilities while operating, and maintaining the existing Joint Base wastewater facilities led to the conclusion that the controlling entity should be either an existing or new Regional Sewerage Authority. Once the controlling entity is selected or formed, the first task of the Regional Sewerage Authority will be to meet with and to apply to the Department of Defense for an Enhanced Use Lease of the existing Joint Base wastewater facilities.

Notwithstanding the above, additional work is required to implement the plan to extend sewer service to the local towns in a relatively short term. It is estimated, based on the analyses conducted, that the short term (0-4 Year) wastewater flow tributary to the existing Joint Base WWTP will be approximately 3.25 MGD, while the ultimate long-term wastewater flows are projected at 4.40 MGD. These flow projections are less than the reported NJPDES permit capacity of 4.6 MGD. However, while the WWTP has successfully processed wastewater flows in the range of 3.25 MGD (short term capacity needs) in the past, the WWTP and effluent disposal ponds have never processed flows near their permit capacity. In addition, the capacity of the plant could not be independently verified and a search for the design reports, detailing the parameters and assumptions made during the design of these facilities, was unsuccessful. In the absence of the reports and historical data showing the performance of the facilities at flows near 4.60 MGD, the only means of verifying the capacity of the WWTP and effluent disposal ponds is through additional monitoring and stress testing of key individual treatment components. As such, it is recommended that additional engineering studies be undertaken at the existing WWTP as soon as possible.

There is additional work that must be undertaken to implement this Wastewater and Growth Management Plan, but the framework has been carefully developed within this project identifying cost-effective engineering, organizational and financial solutions.

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The timely implementation of these solutions ensures cost effectiveness and prevent the uncoordinated civilian growth that might impact vital military mission requirements. Furthermore, this will eliminate wastewater infrastructure from being the limiting factor that inhibits the vitality of the surrounding municipalities.