WRIGHT-PIERCE
Engineering a Better Environment

MEMORANDUM

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| TO: | Pete Clark | DATE: | May 22, 2013 |
| FROM: | Paul Birkel and Chris Dwinal | PROJECT: | 12395F |
| SUBJECT: | Wastewater Treatment Plant Capacity Assessment and Impacts on Future Development/Growth in Falmouth and Cumberland | | |

**General Objectives**

The town of Falmouth retained Wright-Pierce to develop this document to:

- provide an overview of existing wastewater collection, pumping and treatment systems;
- estimate the remaining capacity at the wastewater treatment facility (WWTF);
- discuss the impacts on future sewered growth; and to
- provide recommendations moving forward to allow the Town to improve its sewered growth potential from a wastewater management perspective.

**Overview of Existing Wastewater Collection, Pumping and Treatment Systems**

The town of Falmouth's sewer system currently serves approximately 2,000 properties in Falmouth and 1,200 properties in Cumberland. The wastewater treatment facility (WWTF) and 7 pump stations that were originally constructed in the early 1970's has expanded since the early 1980's to serve portions of Cumberland and West Falmouth. In general, the Falmouth system is now comprised of the following physical assets:

- Approximately 41 miles of underground gravity sewer pipes and pressure pipes (force mains) that convey wastewater from existing sewer system users to the WWTF;
- 28 remote wastewater pump stations that aid in directing locally collected wastewater toward the WWTF; and the
- 1.56 million gallon per day (mgd) Richard B. Goodenow WWTF located at 96 Clearwater Drive which discharges secondary treated wastewater to the Presumpscot River.

The sewer collection system in Cumberland includes just over 21 miles of collector sewers, 4 miles of force main, and 13 pump stations that primarily service Cumberland Center, the Tuttle Road corridor, and Cumberland Foreside.

In 2005-2007, after over 10 years of study and dispute with the regulatory agencies about the dilution afforded by the plant outfall (an issue that would be revisited to accommodate increased license allowance for additional flow), the wastewater treatment facility underwent a major upgrade to replace antiquated equipment, improve process control and energy efficiency, and position the Town to meet more stringent discharge standards in the future. Based on discharge license parameters in place and a desire not to overbuild capacity, the capacity of the facility was not increased at that time. Reasonable future upgrades were factored into the design to allow expandability as growth needs dictate.

Since 1981, portions of the Falmouth collection system and the treatment facility have also served the needs of Cumberland under a joint use agreement between Falmouth and Portland Water District (PWD),

which manages the Cumberland portion of the system for the Town. In general, the agreement, which was made in 1981 and amended in 2002, affords the town of Cumberland the following capacities:

- 30% of monthly average daily flow or 0.468 mgd at the WWTF;
- 35% the peak capacity or 1.076 mgd at the Mill Creek Pumping Station and force main;
- 64% (1.79 mgd) capacity in the Route 88 sewer;
- 56% (2.03 mgd) capacity in the Mill Creek interceptor;
- 100 gpm of the peak capacity of the Johnson Road Pump Station;
- 22.7% (0.144 mgd peak flow value) of the capacity of the gravity sewer line from the Falmouth-Cumberland line on Route 1 to the Johnson Road Pump Station; and
- 40% (0.144 mgd peak flow value) of the capacity of the gravity sewer and force mains from the Johnson Road Pump Station to the Mill Creek Interceptor (located on Route 1).

Consistent with the original Agreement, the towns share the cost of capital upgrades and operational and maintenance costs of facilities in joint ownership. Thus, it is critically important to understand that when looking at how much capacity is available at the WWTF to accommodate future growth, that the remaining capacity is a shared capacity with the town of Cumberland. In other words, the two towns are joined at the hip with regard to the sewer system. As such the towns should work in a coordinated fashion to their mutual benefit.

**How much treatment capacity is available?**

**General**

The Falmouth WWTF is a state of the art, advanced treatment facility capable of treating to typical secondary treatment standards as well as significantly reducing nutrients of concern (nitrogen and phosphorus) in the receiving waters. The upgrade design was prepared in 2005 and the upgraded facility went online in March 2007. It has since reduced energy use by over 40% and improved treatment efficiency by the same amount reducing the amount of pollutants entering Casco Bay.

When the WWTF was originally designed in the 1960's, the Federal government's EPA construction grants program provided about 90 cents on the dollar in funding. As such, the initial cost of facilities was not of great local concern, and many facilities were designed to accommodate substantial future sewered growth. This served many communities well in that capacity needs were often satisfied for many years beyond the typical 20-year planning period. With the disappearance of the grants program and the realization that future expansions would be funded solely through locally collected sewer user fees, communities approach the sizing question carefully when upgrading facilities.

The town of Falmouth is no different. Reasonable growth projections from Falmouth and Cumberland were used to establish the design criteria in 2005. While the preliminary design report recommended three aeration basins to treat the anticipated waste load for the projected 20-year planning period, it was decided to segregate the growth projections into two phases due to uncertainty associated with growth: an interim design period through 2015; and the twenty year

design period through 2025. Thus, two aeration basins were initially constructed to meet projections through 2015, while allowing for a third aeration basin to be constructed in the future providing for additional sewered growth.

Design of treatment facilities is based on two parameters: (1) flow and (2) organic waste load that requires treatment. Flow is represented in million gallons per day (mgd) and the load is represented by the strength of the waste defined as Biochemical Oxygen Demand ($BOD_5$). The following paragraphs will assess the capacity of the WWTF from a waste load and flow perspective, individually, and then bring the two together to comment on actual treatment capacity as they are interlinked.

**Waste Load Capacity**

*Existing Condition Assessment*

To establish existing plant capacity, we began by reviewing existing data for the treatment facility over the past three years from January 2010 to November 2012 to establish "current conditions." Existing data was analyzed to establish current average and maximum month loading conditions. The current annual average load received at the WWTF is currently 17% lower than the interim design for year 2015. From an average loading perspective, significant growth is available to both communities. However, the critical parameter for assessing capacity comes from the maximum month condition, defined as the highest 30-day running average of load that must be treated without exceeding discharge license limitations. For the time period reviewed, the maximum monthly average (MMA) $BOD_5$ load was 2,399 pounds per day (ppd) which occurred in June 2012. A further review of the June 2012 data indicates that a $BOD_5$ load of 5,764 ppd was received on June 5, 2012 which is nearly 75% greater than the next largest day over the 35-month review period. While the reasons for this high load are not fully known, we do not believe that it is indicative of a sustained loading that was received, rather it is the combination of high $BOD_5$ concentrations from septage that was being received at the WWTF during this period coupled with high flows as a result of heavy rains the two previous days. If the 5,764 ppd value received is normalized to the next largest loading day (3,309 ppd), the MMA for $BOD_5$ drops to 2,153 ppd. Thus, in our opinion, the current MMA $BOD_5$ load is approximately 2,150 ppd. The interim design MMA for $BOD_5$ is 2,410 ppd, so during periods of maximum monthly loading, the plant is theorectically operating at 89% of the interim MMA design load capacity.

*Actual Plant Capacity and Available Growth Potential*

While the plant appears to be at 89% of its capacity during maximum month conditions, updated computerized process modeling of the current operating parameters suggests that additional capacity beyond the 2,410 ppd $BOD_5$ exists. Design values incorporated in sizing are generally conservative to ensure reliable, long term compliance with discharge permit parameters. The Falmouth plant is extremely well run and managed, and has consistently exhibited operational parameters that are near optimum for treatment performance. Using these actual values in lieu of textbook values indicate additional capacity within the plant without the need for plant expansion. At historical operating levels of various process parameters and temperatures, we believe the

plant can successfully treat a maximum month condition of 2,650 ppd of $BOD_{5,}$ suggesting the plant is actually operating at about 80% of the MMA design load condition.

Based upon the above assessment, the plant can treat another 500 ppd of waste load during maximum monthly loading conditions before plant expansion would be needed. If additional capacity beyond the 500 ppd is desired, Falmouth could construct the third aeration tank and other ancillary improvements (as anticipated in 2005) to handle the increased loads. Utilizing historical wastewater temperatures and process parameters, the process capacity of the expanded facility would be approximately 3,850 ppd of $BOD_{5.}$ This would increase the plant's ability to treat waste by nearly 80% over current conditions. This is based on treating total nitrogen to no less than 8 mg/L.

It is important to note that the Legislature has directed the Maine DEP to establish nutrient criteria for Casco Bay. These criteria will essentially target an allowable concentration of total nitrogen in the bay and then extend back to discharge license holders with specific limits on the discharge of total nitrogen. These draft criteria are expected to be released by the end of 2015. We believe that 8 mg/L is a reasonable target to expect for a licensing constraint at this time. However, should Maine DEP require a reduction to 3 to 4 mg/L as is occurring in the Great Bay in New Hampshire, plant capacity would be reduced and/or additional tankage and processes would be required to further remove nitrogen to these lower levels while maintaining sufficient $BOD_5$ capacity.

**Flows**

In reviewing the data from January 2010 through November 2012, the WWTF is currently receiving average flows that are approximately 5% higher than the 2015 interim design basis. Not only is the average flow higher, but the current peak daily flow of 4.25 mgd (total gallons treated in 24-hour period) exceeds the interim anticipated value by 58%. As with the waste load assessment, peak values are of critical concern when assessing overall capacity and ability to meet the discharge license provisions under all conditions. In contrast, average and maximum month waste loading values are 17% and 10% *under* the interim design projections underscoring the effects of increased extraneous flows to the plant since the 2005 design basis was developed.

The higher than expected increase in peak daily flow is likely due to a number of factors including, but not limited to:

- 2006 upgrade to the Lunt Road Pump Station which increased the potential peak flow to the WWTF by an additional 400 gpm or approximately 0.6 mgd. Prior to the upgrade, during periods of high flows, staff arranged for septage haulers to line up at the pump station to pump and store flow beyond the capacity of the station to prevent sanitary sewer overflows. With larger size pumps now in place, localized overflows have been eliminated and more flow is reaching the treatment facility increasing the peak flow contribution from this station.
- Wet weather events with increased rainfall intensity; and
- Aging infrastructure.

As collection systems age, clean water enters through leaking or broken pipes and/or leaking manholes (commonly known as infiltration). In older systems, it is not uncommon to find roof leaders, foundation drains and even sump pumps connected to the sewer system to reduce localized surface or ground water problems on private property (commonly known as inflow). These sources are commonly referred to as I/I. Every town with treatment facilities has sewer ordinance language, including Falmouth, making the introduction of extraneous water illegal. Allowing extraneous water into sewer collection systems increases the cost of transport to the treatment plant through increased energy use at pump stations, as well as increased cost for processing at the treatment plant. It can also, in some circumstances, cause sanitary sewer overflows during peak flow conditions or reduce the capacity of wastewater treatment facilities limiting sewered growth potential, as is the case in Falmouth. Further, weather patterns of late suggest that climate change may result in more intense storms which will result in additional infiltration and inflow which may not have been historically observed or recorded.

The Falmouth WWTF currently has a peak daily flow to average daily flow ratio of 4.5 to 1 and peak instantaneous flow (peak flow received during a 15-minute time period) to average daily flow ratio of 5.2 to 1. Compared to communities with similar size sanitary collection systems, Falmouth's peaking ratios are quite high and are far higher than anticipated in previous studies. The peak instantaneous flows to the plant are currently near the predicted maximum hydraulic capacity of the WWTF and the hydraulic capacity of pipes, channels and tanks. *Regardless of the reasons for increased wet weather flows to the WWTF, peak flows need to be reduced to reduce the risk of overtopping channels and tanks as flows increase, and to ensure treatment effectiveness is not reduced during sustained peak flow periods.*

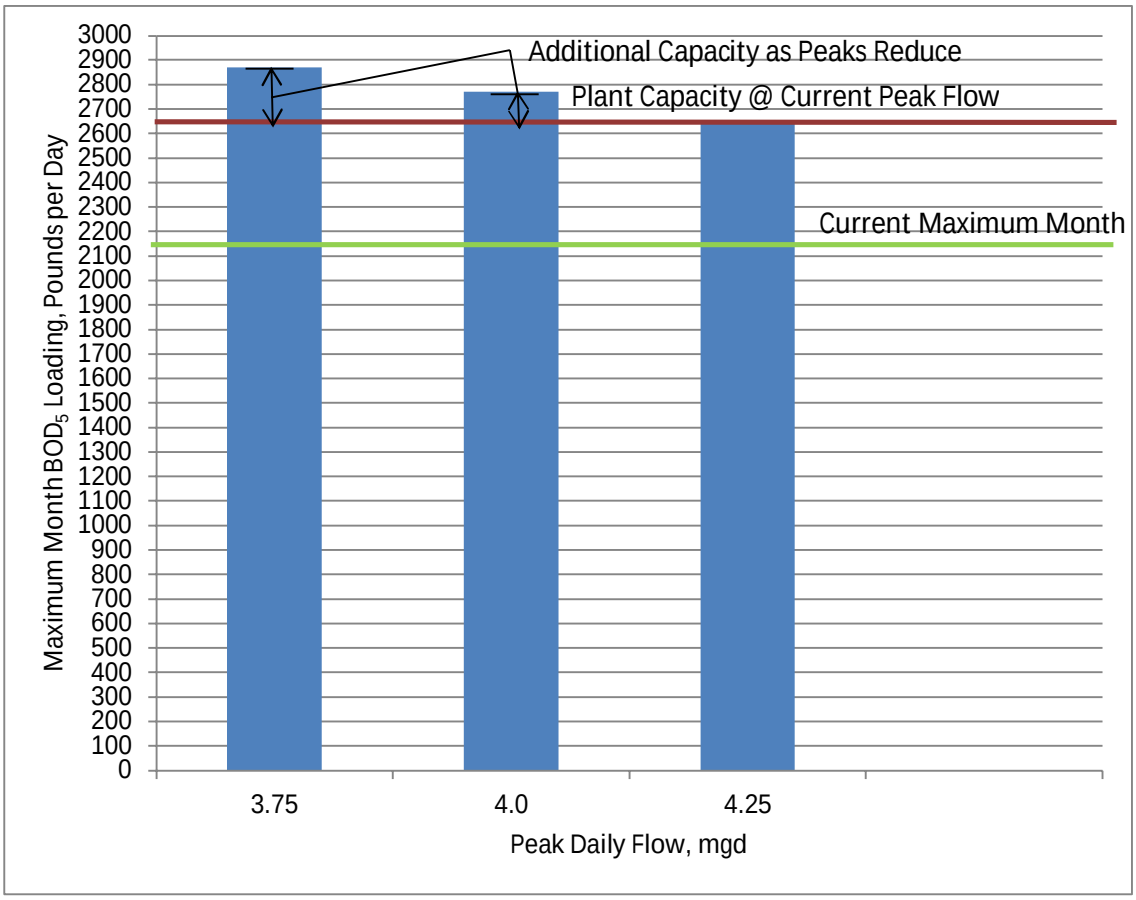
**Overall Growth Capacity**

On an average flow and loading basis, the facility has significant capacity to handle sewered growth in both communities in the near term. The plant can treat an additional 500 ppd of waste load under current maximum month and permit conditions without the need to construct the third aeration basin. However, peak flow conditions which occur during extreme wet weather events have the plant operating near its hydraulic capacity. While each community can continue to grow its sewered base, it will be imperative for each to identify and remove extraneous flows to maintain the current level of treatment and exceptional plant performance. It will also be essential to monitor plant performance for potential degradation under high flows and to share this information between the towns to allow mitigation measures to be developed and implemented. Based on the current peak flow conditions, we suggest that communities target Inflow and infiltration (I/I) removals that are equivalent to the new flows added. The greater the flow reduction, the greater the load the treatment facility can handle. Unfortunately the inverse situation is also true. As flows increase beyond current levels, waste load capacity is reduced. The following graph articulates the impacts on peak flow on the plant and how it affects capacity.

**What does the available waste load capacity at the WWTF translate to in the form of additional sewered growth?**

Before discussing the desired or potential growth scenarios for each town, having a general understanding of how the estimated available waste load capacity at the WWTF translates into amount of new development is valuable. Assuming no plant expansion, the predicted additional peak day capacity of 500 ppd of $BOD_5$ is equivalent to adding the wastewater from 2,411 people (~0.21 ppd per person maximum month $BOD_5$ load) to the sewer system. Using the previously developed analysis of the sewered population during the 2002 facilities plan update of 2.61 capita per home in Falmouth, this would translate into approximately 924 new homes or an increase in average daily flow of 145,000 gpd and a peak daily flow of 435,000 gpd.

On the commercial side, for comparison purposes, the development in West Falmouth near the Turnpike/I95 interchange that drains to the Leighton Road Pump Station discharges an average wastewater flow of 13,000 gpd, a peak daily flow of 39,000 gpd, and approximately 45 ppd $BOD_5$. Based upon the remaining capacity of the WWTF, 11 similar sized developments could be constructed and treated at the existing WWTF.



It is important to underscore that the above examples are exclusive of one another. The addition of 924 new homes OR the addition of 11 commercial developments comparable to the development at West Falmouth, or some reduced combination of the two. This is the gross capacity available amongst both communities.

As shown earlier, one of the keys to promote additional sewered growth potential is to remove extraneous water from the sewer system. Ideally, in either scenario, an equivalent amount of peak flow added by new development should be removed from the sewer system to accommodate the desired sewered growth. To realize a waste load increase for 500 ppd (and associated flow increases of approximately 435,000 gallons/day), the daily peak flow should be reduced with an equal amount. A reasonable target to set is to reduce daily peak flow by 500,000 gallons/day.

**Which town needs to reduce flows?**

With respect to which town owns what remaining capacity or which one needs to reduce flows, not enough data exists to precisely answer the question. With respect to the town of Cumberland, the original joint use agreement with PWD only stipulates flow limits at the treatment plant and maximum flow capacities within pump stations, interceptors and force mains. There are no contractual limits defining waste load allocations. With respect to flow, the available data reviewed indicates that Cumberland's flow to the WWTF is within in contractual limits, however, peak flows from Cumberland have exceeded limits at the Mill Creek pump station and force main, and the Route 88 interceptor on occasion where the vast majority of the flow entering the Falmouth system comes in. Whereas the town of Falmouth represents more than 70% of the flow the majority of the time, the town of Falmouth is also contributing excessive extraneous flows to the treatment facility. Thus, like the agreement that exists between the two communities forming joint ownership in the facilities, this appears to be a joint issue as well. I/I related flows are impacting the sewered growth potential of the facility for both municipalities.

Both the towns of Falmouth and Cumberland should target infiltration and inflow removal to maximize the expansion of sewered growth in each community without the need to upgrade the treatment facility, extend the outfall pipe or attempt to license increased flows and loads.

**How do we assess where I/I is coming from and if it is practical to remove it?**

I/I removal is used successfully by many communities to reduce peak flows to WWTFs to allow for sewered growth, to eliminate sanitary sewer overflows, and to minimize discharges from combined sewer overflows. In order to fully understand where the most "bang for your buck" can be achieved, sewer system evaluation studies (SSESs) are required. These studies might involve the following steps:

1. Evaluate existing data available on flows within the system (normally flow is metered at pump stations) and discuss with plant staff areas that are known, or suspected, of having high incidences of I/I.
2. Install flow meters in select manholes in suspect drainage areas during dry and wet weather to better understand baseline wastewater, groundwater infiltration and rainfall derived infiltration

and inflow, if the drainage area has a high incidence of I/I, and to prioritize the areas exhibiting the highest levels of I/I for further study and abatement.

3. In areas with high incidences of I/I, conduct additional evaluations, including, but not limited to:
    - Instantaneous flow monitoring in manholes during wet weather events (this helps to isolate areas of concern);
    - Smoke testing during dry weather to find sources of inflow such as catch basins, foundation drains, roof drains, cracked pipes, etc.;
    - Dye testing to confirm if suspected sources are connected to the sewer;
    - TV inspection of sewer lines and laterals for condition assessment; and
    - Manhole inspections for condition assessment.

Once sources of infiltration and inflow are found and confirmed, the cost and technical feasibility of removing the I/I needs to be considered, along with the impacts on system users. A large source such as a cracked pipe under a brook might be relatively easy to remove and result in significantly reduced flows. However, removal and replacement of leaky sewers and manholes or the removal of a significant number of foundation drains/sump pumps can prove to be expensive, intrusive on homeowners, and may require ordinance enforcement actions. In general, the cost for I/I removal can start at $3 per gallon per day removed and go up from there. Until an SSES is conducted to identify the type of sources that exist and the probable remediation approach, we simply won't know how economical the cost per gallon removed will be to reduce peak flows. Only then can one compare the cost of flow removal to other potential scenarios, including plant expansion, outfall extension, flow equalization (temporary storage of peak flows), and/or potential relicensing for discharge of greater flows and loads. An increase in the permitted plant design flow above 1.56 mgd would reduce the existing dilution factors which may result in permit limits for toxics that are difficult or impossible to achieve with conventional treatment. Prior to requesting an increase of the permitted plant design flow from Maine DEP, an evaluation of the technical, financial and permitting considerations surrounding a major outfall extension should be conducted.

Both of the communities are currently conducting SSES work within their respective collection systems and will be targeting I/I removal projects that are both economically, technically and politically feasible.

**What type of growth might occur in each community and how much capacity would each utilize?**

**Falmouth – Commercial Development**

There are several prime areas that could promote sewered growth within the town. On the commercial side, the two prime areas for development are the Route 1 corridor (currently zoned SB1 Route 1 Business District and BP Business and Professional District) from Route 88 to the Cumberland town line; and Route 100 north of the existing TD complex in West Falmouth to the CMP utility line easement (currently zoned VMU Village Mixed Used District and CO Route 100 Corridor Overlay District).

The area of Route 1 that has undeveloped commercial real estate available is north from the Turnpike Spur to the Cumberland town line. All wastewater flows from this area currently flow by gravity through the Mill Creek interceptor to the Mill Creek Pump Station. The Northbrook

Drive and Johnson Road Pump Stations, along with smaller gravity sewer lines, collect flows from this area and deliver them to the Mill Creek interceptor. Both the Northbrook Drive and Johnson Road Pump Stations have available capacity, although the pumps at the Johnson Road Pump Station are prone to clogging and additional investigations and improvements to remedy this issue are recommended prior to taking additional flows. Currently, the Mill Creek Pumping Station is at capacity and has had sanitary sewer overflows at existing peak flows. Considering these capacity limitations at the Mill Creek Pumping Station, a preliminary design for this area is recommended at this time. The purpose of the preliminary design would:

- Establish the necessary pumping capacity of the pumping station based on an evaluation of the anticipated sewered growth within the Mill Creek Pumping Station drainage area and the potential for I/I removal within the drainage area;
- Establish the design concept for the pump station, whether it be an upgrade to the existing station or a completely new pump station; and
- Establish the required upstream I/I removal required to offset the increase in flow capacity at the Mill Creek Pumping Station as to not increase peak daily and peak instantaneous flows to the WWTF.

The upgrade of the Mill Creek Pumping Station is of utmost importance, but the pumping capacity of the pump station may need to be flow-limited (through pump station controls) until such a time that sufficient infiltration and inflow can be removed downstream. As such, a preliminary design leading to an upgrade to the Mill Creek Pumping Station, in concert with downstream I/I removal, is recommended in conjunction with additional commercial development on Route 1 north of the Falmouth Spur in either Falmouth or Cumberland.

Additional infill development along Route 1 south of the Turnpike Spur may also occur. A portion of this area drains to the Mill Creek interceptor and Mill Creek Pumping Station, while a portion drains to the Clearwater Pumping Station. During wet weather, the Clearwater Pumping Station currently operates at maximum capacity for long periods of time, suggesting that it is at or near its capacity. Successful infiltration and inflow removal within the area tributary to the Clearwater Pumping Station (including the Brown Street Pumping Station drainage area which flows to the Clearwater Pumping Station) is needed and might additionally provide the capacity necessary for infill development in this area.

Portions of Route 100 north of the existing TD Bank complex are currently served by gravity sewers that drain to either the Leighton Road Pump Station or Mill Road Pump Station. Additional gravity sewers and possibly one or more additional pump stations would be required to serve this area. While both existing pump stations have excess capacity for future flows, flows from both of these pump stations flow through the Pinehurst Drive Pump Station and Woodlands Clubhouse Pump Station, both of which will likely require capacity upgrades. Further, capacity concerns exist in the interceptor that crosses the Turnpike Spur that serves all of West Falmouth, to which this extension would discharge to. A master plan for sewered development of West Falmouth should be initiated to detail the extent of infrastructure upgrade needed before sewer is extended to serve any new development in this area.

**Falmouth - Residential Development**

On the residential development side, there is the potential for additional homes to be constructed within areas currently served by sewer as well as existing neighborhoods that lie outside the current sewer service area that may desire sewer in the future. Prior to extending sewer to currently unsewered areas in Falmouth, the potential for these areas to be served by sewers that flow to adjoining communities (e.g. Portland and Westbrook) should be considered.

There are several existing approved residential developments that are not completely built out at this time. These developments will utilize a portion of the remaining WWTF capacity. Based upon information provided by the Town, the remaining residential units to be constructed within currently approved residential developments will result in approximately 145 new housing units. These units will utilize approximately 16% of the projected remaining wet weather capacity at the WWTF, assuming peak daily flows remain at 4.25 mgd.

In addition, it is likely that infill development will continue to take place. The draft Comprehensive Plan for the Town identified a growth area in which sewer connections by new developments are preferred over on-site wastewater disposal.

**Cumberland – Commercial & Residential Development**

As part of the development of this document, Wright-Pierce met with the town of Cumberland about its plans for development that may impact wastewater flows to the WWTF. Cumberland currently has approximately 1,200 users. While Cumberland does not currently have any firm projections for increases in wastewater, it is anticipating additional development that would increase sewer flows into the Falmouth collection system as follows:

- Full build-out of developable properties along Route 1 within 5 years. Possible uses might include biotechnology, office park, and the Friends School of Portland, comprising 120,000-200,000 SF of potential development.
- 58 units of residential development off Tuttle Road (Drowne Road) in the near future, with another 58 units in a Phase 2 development within 3 years.
- Infill development within the existing sewer service area.

The town of Cumberland has also expressed interest in the available capacity within the town of Falmouth's collection system and WWTF to take additional flows should Cumberland be interested in growing its sewered area. Cumberland's sewer system is currently limited to the following major corridors: Main Street between Tuttle Road and the town line to the north at Greely Road, Tuttle Road, Route 1 and Route 88. Extension of sewer down Middle Road, Longwoods Road (Route 9) or west of Main Street to Route 100 may be of interest to Cumberland in the future.

As noted above, Cumberland has not made any specific estimates of the potential flows and loads from development planned within the next 5 to 7 years, but Cumberland expects to utilize between 25 and 50% of its remaining contractual flow limit. On the commercial side of

development, assuming the office space added along Route 1 is a development comparable to the West Falmouth development near the Turnpike interchange, the additional peak day load to the treatment facility is approximated 45 ppd of BOD and a peak day flow of 39,000 gallons per day. Only a portion of this development is expected to flow to the Johnson Road Pump Station so it appears that Cumberland had adequate capacity in Johnson Road Pump Station and force main and the gravity sewers both upstream and downstream of the Johnson Road Pump Station main. However, all of Cumberland's flow would travel to the Mill Creek Pump Station which is currently at capacity based upon previous studies. Development to this level should require the removal of at least 39,000 gallons per day of peak daily flow through I/I removal.

On the proposed residential development listed, assuming 116 units of residential development off Tuttle are added, this translates to an average daily flow of approximately 18,165 gallons, a peak day flow of 54,495 gallons per day, and 63 ppd of BOD. This flow would travel through the Route 88 interceptor and to the Mill Creek Pump Station, both of which currently have no additional capacity during extreme wet weather conditions based upon previous studies. Further, on occasion, the town of Cumberland has exceeded their capacity limits in the Route 88 interceptor and Mill Creek Pump Station so the removal of a minimum of 54,495 gpd of flow through I/I removal would be necessary to offset just the increased flows from the development.

In addition to the impacts on the collection system, the addition of growth along Route 1 and the residential development along Drowne Road (without commensurate removal in wet weather flow) might push Cumberland close to the 0.468 mgd limit at the WWTF, during certain days and months.

**Summary and Conclusions**

The following items summarize the findings of this study as they pertain to the capacity of the treatment facility and the available sewered growth in Falmouth and Cumberland.

- The upgrade to the Falmouth wastewater treatment facility in 2005 contemplated a 20-year planning period. Due to uncertainty in growth scenarios it was agreed to phase in additional capacity as growth demanded due to the initial cost of the project and not to "overbuild" capacity.

- From a waste load perspective, the existing plant could add another 500 pounds per day (ppd) of $BOD_5$ during maximum month loading conditions before considering the need for a third aeration basin. This waste load allocation, when viewed exclusively, provides for considerable sewered growth over the near term.

- The available waste load capacity translates into allowing the addition of 2,411 population equivalents, 924 new residential homes OR 11 commercial developments comparable to the size of the West Falmouth Crossing/TD Bank complex, or some lesser combination of all the above. Note that current approved developments at Oceanview and Ridgewood will reduce the above growth estimates by 145 residential units.

- Current peak flows under extreme wet weather conditions have the plant near its hydraulic capacity.

- Cumberland has contractual limits defined in an agreement between the town of Falmouth and the Portland Water District which covers flow to the treatment plant as well as in select interceptors and pump stations. In certain cases and for certain limits, there have been flows that exceed the prescribed flow limits.

- From the limited data available to review, both communities contribute high peak flows for their corresponding system.

- Both communities can continue to grow their sewered capacity but should focus on the removal of extraneous flow (I/I) from their systems to insure reliable, consistent compliance with the facility's discharge license.

- Reviewing peak flows including, both daily and instantaneous, and the current peaking factors, it seems feasible to target peak flow reduction of 10% of the peak or 500,000 gallons/day. This level of flow reduction would allow the communities to recognize the existing waste load capacity of 500 ppd within the treatment facility.

- Construction of a third aeration basin, originally contemplated and accommodated for in the 2005design, could increase the plants' waste load capacity by 80% over existing conditions if sufficient growth existed. This tank could also serve as an equalization tank during extreme wet weather flows, mitigating peaks through the plant, while I/I removals are identified and implemented.

- Mill Creek pump station is presently at capacity and has experienced sanitary sewer overflows under extreme wet weather flows. This station serves the downtown area of Route 1 in Falmouth, slated for commercial revitalization, as well as 100% of Cumberland's flows. Its upgrade is essential to meet the sewered growth needs of both communities and should be considered a high priority.

- As directed by the Legislature, the Maine DEP is developing nutrient criteria for Casco Bay. The nutrient of concern is nitrogen. Release of draft criteria is targeted for December 2015. Should the nutrient criteria be more aggressive than expected (8 mg/L), further upgrades to the treatment facility may be needed to meet criteria beyond current capabilities reducing treatment capacity.

- Select sections of the existing collection system, including gravity sewers and pump stations, are currently at capacity and further study is required, particularly in West Falmouth, to determine the best options to address these limitations to accommodate desired growth. The Route 100 corridor in West Falmouth has been identified as a desired commercial growth area in Falmouth and thus should be a priority for assessment.

- Regardless of whether or not the community experiences sewered growth, the Town must reinvest in its underground infrastructure as it ages. Buried pipe, while out of sight and out of

mind, has a finite life and must be renewed or replaced. Peak flows will continue to grow in an aging sewer system regardless of sewered growth requiring attention to this vital community asset.

- An increase in the permitted plant design flow above 1.56 mgd would reduce the existing dilution factors which may result in permit limits for toxics that are difficult or impossible to achieve with conventional treatment. Prior to requesting an increase the permitted plant design flow from Maine DEP, an evaluation of the technical, financial and permitting considerations surrounding a major outfall extension should be conducted.

**Recommendations**

Our recommendations are divided into three stages of implementation - immediate, short term and long.

Immediate

1. Meet with the town of Cumberland and the Portland Water District to review this report and the current state of capacity and limitations at the wastewater treatment facility. Develop an understanding of what each community is doing with regards to the identification and remediation of extraneous flows and the importance of continued communications on sewered development and treatment plant performance. *(Completed, meeting held on May 3, 2013)*

2. Conduct a Sewer System Evaluation Study (SSES) to assess the condition of the collection system and define problematic areas exhibiting high levels of I/I and develop remediation plans for reducing peak extraneous flows in the system. The Town has begun this phase with the incorporation of 10 flow meters within the sewer system to prioritize areas exhibiting higher flows for further study. We estimate the capital need for first part of the study (flow metering, smoke testing) to cost approximately $100,000 (Spring 2013).

3. Initiate the planning, preliminary and final design of a major upgrade to the Mill Creek pump station to increase capacity to serve the growth needs of each community.

Short Term – Next 6-8 months

1. Develop a capital improvement plan for the upgrade of the collection system prioritizing low cost, high flow removal projects that yield a significant return on investment from an allowable growth perspective (To be completed following Task 2 above and in time for CIP budgeting in 2014). Cumberland and Falmouth to fund work within each respective collection system.

2. Complete a thorough review of potential sewered growth anticipated over the next several years. Define the corresponding wastewater flows and loads associated with this growth (by end of 2013).

Mid-Term – 2014

1. Complete final design and start construction of a new or upgraded Mill Creek Pump Station to provide for increased capacity to allow for development along Route 1 in Falmouth and in Cumberland (Design and start of construction in 2014)

2. Further evaluate options for construction of the third aeration basin, to potentially serve as storage in the mid-term, and as a treatment tank in the longer term.

3. Develop a West Falmouth Sewer System master plan which defines the likely areas of future sewered growth and outlines the necessary infrastructure upgrades necessary to realize this potential. We estimate the capital need for this study to cost approximately $100,000. (2014).

4. Initiate a more comprehensive sewer system evaluation study to define the condition of all underground assets and to rank, define priorities for the removal of extraneous water from the collection system, and assign costs. This will serve as the basis for a comprehensive Asset Management program for the sewer collection system (Start in 2014).