CITY OF PORTSMOUTH

LEGAL DEPARTMENT

Robert P. Sullivan, City Attorney – 603-610-7204 (Direct Dial)
Suzanne M. Woodland, Deputy City Attorney – 603-610-7240 (Direct Dial)
Kathleen M. Dwyer, Assistant City Attorney – 603-427-1338 (Phone/Fax)

September 16, 2015

VIA E-MAIL – *CONFIDENTIAL SETTLEMENT COMMUNICATION*

Michael Wagner, Esq.
US Environmental Protection Agency
Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912

RE: Consent Decree Second Modification

Dear Mike,

In preparation for a telephone conference, or meeting if you prefer, I summarize below City staff's effort to craft a path forward following the City's receipt of correspondence dated July 29, 2015 from EPA relative to future nitrogen limits. As we have reported, EPA's position that it would soon issue a draft permit to include an 8 mg/L monthly average Total Nitrogen (TN) limit for April through October came as a surprise given the City's quarterly report filings since April of 2013 that reflect the City's design criteria of an 8 mg/L TN seasonal rolling average. As explained, City Council votes over the past two years to proceed at Peirce Island have been based on meeting an 8mg/L TN limit on a seasonal rolling average basis.

As discussed very briefly with you, one avenue to advance the discussion and bridge the gap is to consider a *Second Modification of Consent Decree* that would include additional components with a new schedule. As you know, the Consent Decree requires only that the City meet secondary treatment standards. The City has however, in spite of its disagreement with EPA over the need for restrictive nitrogen limits, been designing with nitrogen removal capability as part of the effort. Consequently, it may it may be those additional components of a Modification would include the following:

- The City will agree to construct an upgraded wastewater treatment facility at Peirce Island using Biological Aerated Filter (BAF) technology. The design basis for the biological treatment component will be for treating an annual average flow of up to 6.1 million gallons per day (6.4 MGD influent annual average flow) and will include 6 BAF Stage 1 carbon/nitrification cells and 6 Stage 2 denitrification cells. This is consistent with the City's 90% design submittal (to be delivered shortly to NH DES and EPA). This design will provide nitrogen removal according to the bulleted paragraph below.

Municipal Complex 1 Junkins Avenue Portsmouth, NH 03801

- The City will operate its upgraded facility to achieve voluntarily an action level/goal of a seasonal average TN of 8 mg/L at a flow of up to 6.4 MGD between May 1 and October 31; and a monthly average TN of 8 mg/L between June 1 and October 31. The City will report only the results for the month of May in order to better understand the influence of wet weather events on the performance of the upgraded WWTF. If the action level is not met for any month between June and October, the City will investigate the cause and endeavor to timely correct.

The City has had discussions with Dan Arsenault and Ellen Weitzler and they are evaluating the City's request to exclude the month of April in the reporting season. The City's approach is consistent with other recently issued nutrient permits for Massachusetts estuaries and in the City's situation we discharge to the lower segments of the Piscataqua River which have a far shorter detention time and less contribution to the system. Such requirements in the recent permits have not included April.

I have intentionally used the words action level/goal above. The City believes it is premature for EPA to set a restrictive Total Nitrogen permit limit for the Peirce Island Wastewater Treatment Facility based on the current state of the science given the peer review report dated February 13, 2014 and subsequent discussions with experts. That stated, the City is, like Dover and Rochester, willing to provide a level of additional nitrogen removal beyond what typically is achieved by secondary treatment as an adaptive management course. This agreed upon action level/goal should provide some level of confidence for all parties that the City's investment is wise and that EPA can give the scientific effort the time it needs for good regulatory decision-making.

As you know, the original driver for the proposed Consent Decree Modification was the need to adjust the compliance schedule as a result of the increased size of the facility and the addition of nitrogen removal capability. We had tentative agreement with NH DES and EPA to extend the schedule by 18 months and be complete and operational by November 2018. The City and EPA held off on finalizing that schedule once the discussion regarding a possible regional solution at the Pease Tradeport began to have momentum. As you know, the Pease regional option is "off the table", and we are at 90% design completion at the Peirce Island WWTF. Therefore, it would be appropriate now to update the compliance schedule.

What we have learned from the design effort is that the scope and complexity of the project has increased since the 10% design level. By way of example, attached are the proposed site plans associated with the 10% effort and the 90% effort. Those plans are illustrative of the changes. We also attached the 90% effort yard piping plan to demonstrate the complexity of the work.

Included with this communication is a memorandum from AECOM describing in detail the changes in the scope and complexity. See the firm's attached memorandum. AECOM is currently projecting a 47-month construction schedule to achieve substantial completion. This schedule already includes some second shift work as described in the memorandum. At this point, City staff cannot recommend a schedule that includes additional second shifts, let alone third (overnight) shifts to shorten the anticipated construction schedule.

As you will recall from our initial discussions on the topic, there is the impact on the residential neighborhoods from evening, night and overnight work. In addition, there impact on public events and recreational activities as well as the decrease in the margin of safety associated with second and third shift work (safety concerns both to pedestrians and bicyclists who visit Prescott Park and other South End areas along the truck route as well as to the construction workers and WWTF operators). Also of concern is the greater likelihood of construction errors from overnight work. City staff also has difficulty recommending anything less than a 47-month construction schedule because of the complexity of the project. There is a need within the schedule to have the ability to add 2nd shift work in the event that there are coordination interferences, delays, incidents or accidents on the site.

Of more recent concern is that the limitations of the bridge access to Peirce Island may result in more second shift work than presently accounted for in the 47-month schedule. Hoyle, Tanner & Associates performed a detailed evaluation of the Peirce Island Bridge this summer. A report is being generated. In summary, what we have been told is that the bridge will withstand the construction effort, but the traffic over the bridge will have to be limited to one vehicle at a time. It is impossible to replace the bridge prior to the construction effort; it will have to be replaced at the end of the project. We have not yet analyzed what impact this may have on the ability of construction traffic to get to and from the site. I think this is a matter of putting this project out to bid with all the limitations and see what is proposed to accomplish the work. We may find out from the low bidder that additional second shift work will be required due to the bridge limitations to meet a 47-month construction schedule.

The City assumes that this project can be underway by July 1, 2016. AECOM has been authorized to continue its work past the 90% submission. Between now and July 1, 2016, the City expects to finish the design (if there is confidence at the municipal level that we can operate the BAF within anticipated permit levels), obtain all permits and approvals from local, state and federal agencies, bid the project, and authorize the bonding of the project (which requires three City council meetings to accomplish). Given the 47-month construction schedule for substantial completion, we assume that by September 30, 2020, the upgraded facility will be operational and compliant with the action level/goal.

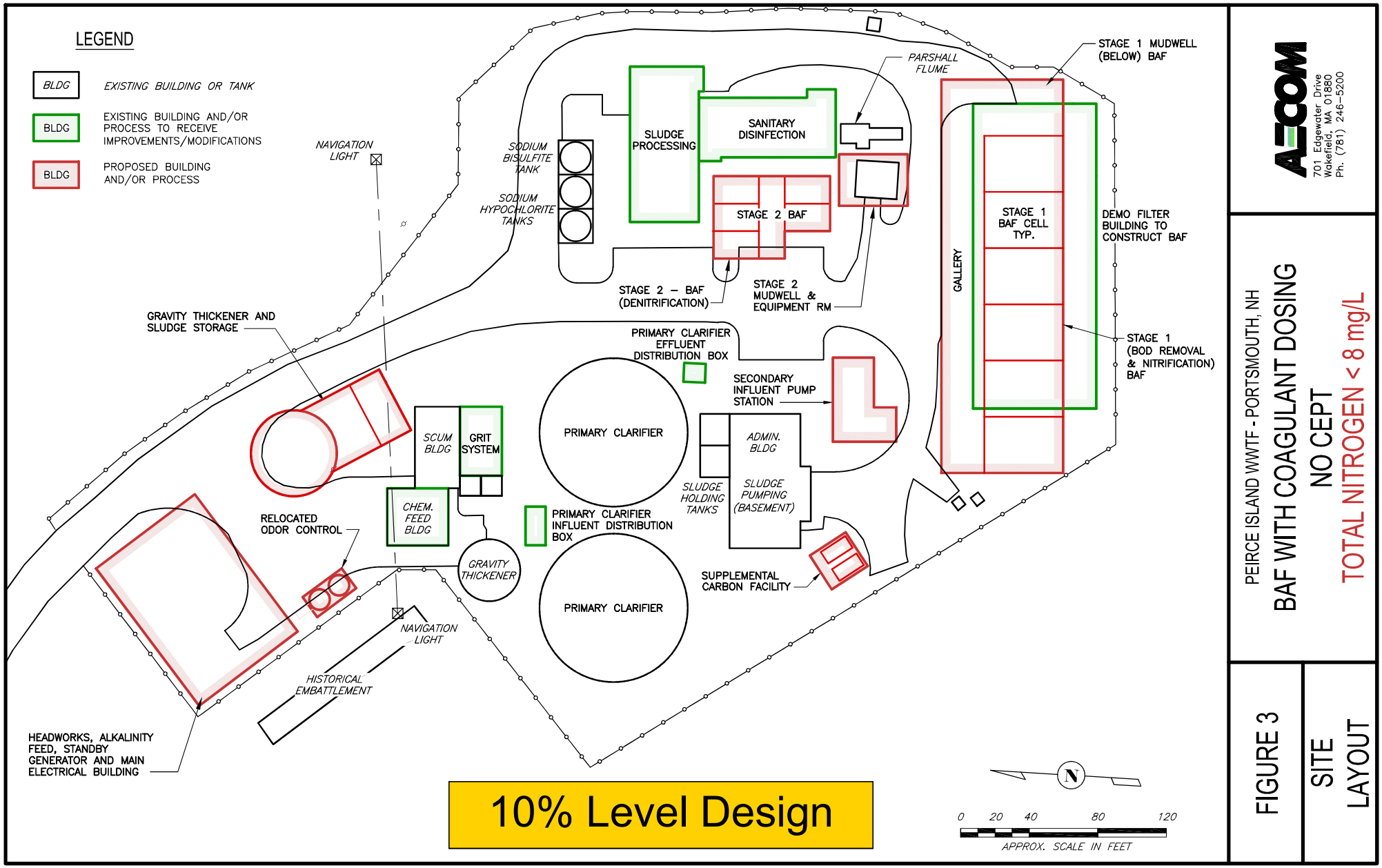
We look forward to wrapping up all these issues in one consent decree modification document, but we are open to another approach after you review this material.

Sincerely,

Suzanne M. Woodland
Deputy City Attorney

cc: Terry Desmarais, P.E. City Engineer, Water and Sewer Division
Jon Pearson, AECOM

h\smw\public works\sewer and water\wastewater – consent decree\mod 2015\ltr to wagner with proposed modification



AECOM
701 Edgewater Drive
Wakefield, MA 01880
Ph. (781) 246-5200

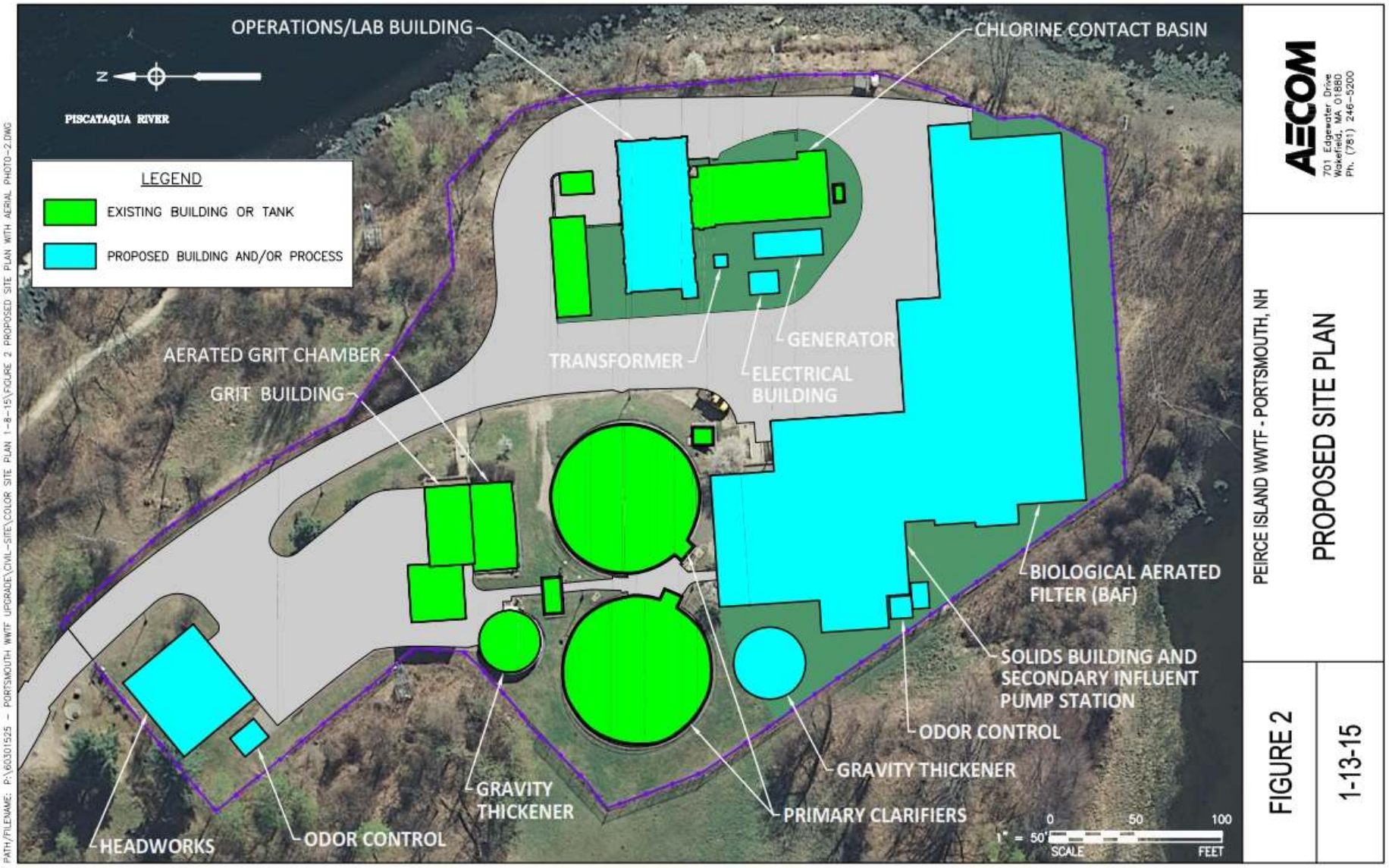
PEIRCE ISLAND WWTF - PORTSMOUTH, NH

BAF WITH COAGULANT DOSING NO CEPT

TOTAL NITROGEN < 8 mg/L

FIGURE 3

SITE LAYOUT



90% Level Design

PATH/FILENAME: P:\60301525 – PORTSMOUTH WWTF UPGRADE\SHEETS\BP-2\C\SK C-002.DWG

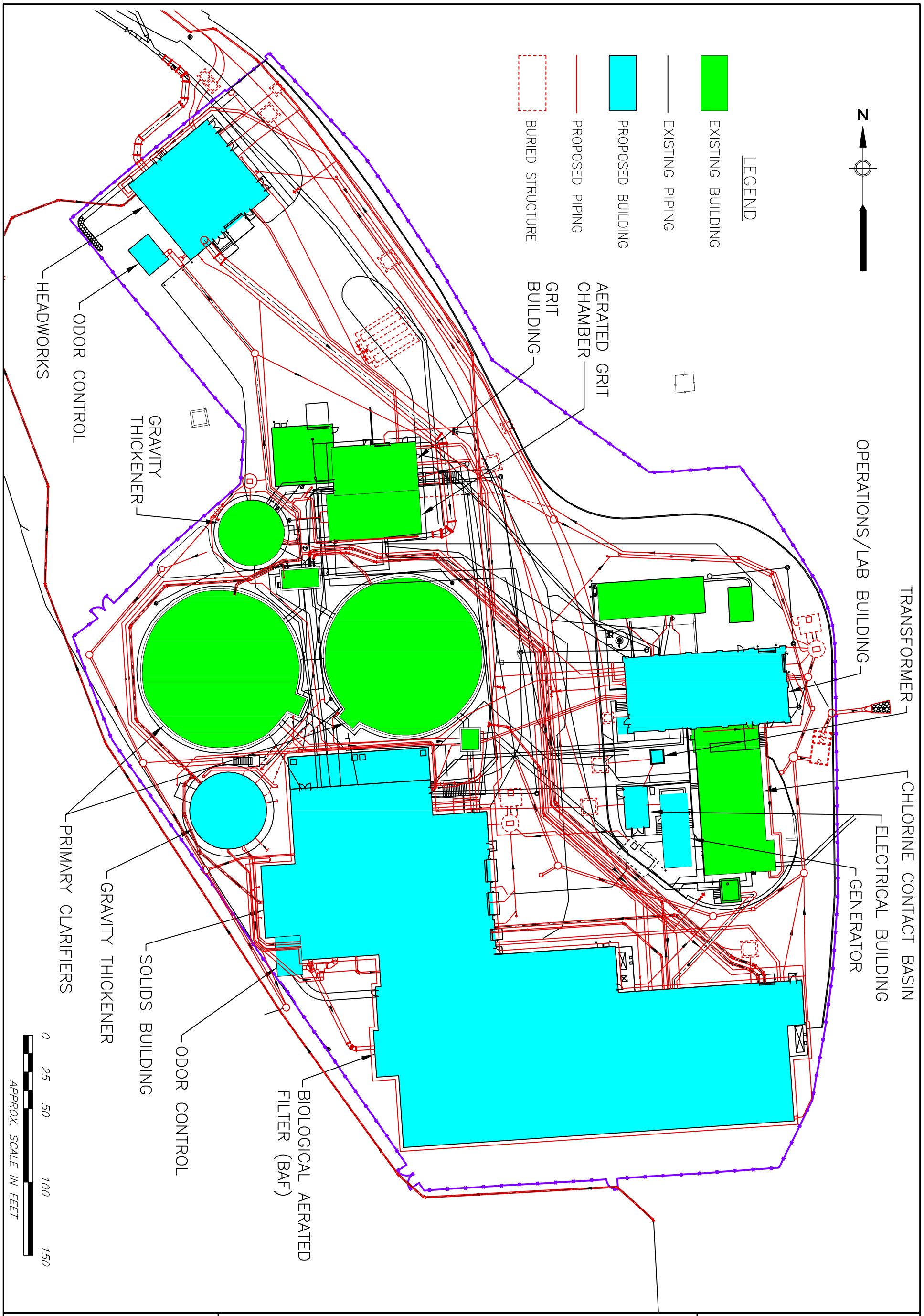


FIGURE 1

9-10-15

PEIRCE ISLAND WWTF - PORTSMOUTH, NH

PROPOSED YARD PIPING AND ELECTRICAL DUCTS PLAN

AECOM
701 Edgewater Drive
Wakefield, MA 01880
Ph. (781) 246-5200

AECOM
250 Apollo Drive
Chelmsford, MA 01824
www.aecom.com

978.905.2100 tel
978.905.2101 fax

Memorandum

To	Terry Desmarais, City Engineer	Page 1 of 4
CC	Peter Rice, Director; Brian Goetz, Deputy Director; and Paula Anania, Chief Operator	
Subject	Updated Construction Schedule Peirce Island WWTF Upgrade Design	
From	Erik Meserve and Jon Pearson	
Date	September 16, 2015	

In the fall of 2013, AECOM prepared several memoranda which outlined the reasons why the change from construction of a secondary WWTF upgrade with an estimated construction cost of $25 million (proposed in the 2010 Wastewater Master Plan) to a larger facility providing nitrogen removal with an estimated construction cost of $45 million (proposed in the 2012 Initial Piloting Report) would require more time and effort to construct than the 24 months allowed for construction (excluding startup and compliance) in the Consent Decree at that time. Since that document was prepared, the scope and cost of the WWTF Upgrade project has grown in scope, complexity and cost and this memorandum outlines the changes in the project and addresses the need for a further extension in the Consent Decree schedule.

Changes in the WWTF Upgrade Scope and Cost Since 2013

AECOM's memoranda from October 2013 are included in Attachment A for reference. At the time that these memoranda were prepared the design was in the concept design stage with the design less than 10 percent complete. Figure 2 in the October 28, 2013 memorandum illustrates the site elements of the WWTF upgrade as it existed at that time. Since then, the WWTF upgrade design has progressed to the 90 percent complete stage and evolved to reflect new information. Figure 1 in Attachment B to this memorandum illustrates the current site plan. Major changes from 2013 to the present include:

1. In 2013, the two stages of the biological aerated filter (BAF) were separate structures. To reduce the footprint of these structures, to optimize the use of the constricted WWTF site, and to take advantage of common wall construction, the two stages were combined into a single BAF structure. This revision reduced the footprint of the BAFs on the site, but increased the required construction sequencing and complexity of construction. This revision also triggered the need for construction of revetment on the Piscataqua River bank along the eastern end of the BAF to stabilize the area that will be disturbed for the construction of the BAF, and increased the complexity of permitting the project.

2. In 2013, the second stage BAF consisted of 5 filter cells. Based on refined mass balances prepared during the design, the current design includes 6 cells for the second stage BAF. This revision was based in large part on the peak instantaneous BAF backwash which temporarily contributes a large amount of recycle flow the overall flow of the plant. This revision increased the extent of construction required.

3. In 2013, the supplemental carbon facility was proposed as a standalone structure and methanol was initially planned to be used as the carbon source for denitrification. To eliminate the need to truck highly flammable methanol through downtown Portsmouth, the City elected to base the design on the use of a sustainable carbon source, Micro-C. With this

change, and to reduce the footprint, the supplemental carbon facility was combined with the BAF structure in the current design. This revision increased the complexity of construction as the standalone structure included outdoor above ground storage tanks, and the current design has indoor storage tanks.

4. In 2013, the upgrade involved the addition of secondary treatment to the existing WWTF facilities, but did not include upgrading much of the existing process, electrical, and heating, ventilating and air conditioning equipment at the WWTF. Subsequent evaluation of the existing facilities during design identified a need to upgrade much of the existing equipment at the WWTF that has reached or exceeded its useful life. The scope of the WWTF upgrade was revised to include these needed upgrades in the WWTF upgrade as much of this equipment is necessary to support the new facilities at the WWTF. This effort will require careful sequencing of the equipment upgrade work in order to maintain the existing WWTF in operation while replacing nearly all of the process, electrical, and heating, ventilating and air conditioning equipment at the WWTF.

5. In 2013, the existing Sludge Processing Building was to be demolished entirely and a new Administration Building constructed in its place. During the assessment of existing facilities, PCBs were identified in the paint and caulk in certain areas of the building, and were determined to have migrated into the adjacent concrete and brick. This increased the cost to accommodate removal and disposal of both PCB Bulk Product waste as well as contaminated building materials. In light of this information, to reduce the cost for the new Administration Building as a result of the Value Engineering review of the project, only the upper level of the existing Sludge Processing Building will now be demolished. PCB Bulk Product waste in the lower level will be removed, the PCB contaminated concrete will be encapsulated, and new second level superstructure will be constructed to house the WWTF administrative functions. The discovery of PCBs will affect the required construction sequencing and duration related to implementing PCB remediation and encapsulation required by EPA regulations during construction of the WWTF upgrade.

6. In 2013, the WWTF electrical switchgear and standby generator were to be located in the new Headworks Building. As a result of the Value Engineering review of the project, the switchgear will be housed in a precast Electrical Building and the standby generator will be housed in a prefabricated walk-in enclosure near the Chlorine Contact Tanks in the current design. This revision will affect the necessary construction sequencing and complexity as the Electrical Building and Generator are now located in an area currently occupied by existing structures that will need to be relocated along with underground piping and conduits.

7. In 2013, an addition to the existing Administration Building was proposed to house the solids processing equipment, with the first floor superstructure of the existing Administration Building being demolished and rebuilt. Subsequent evaluation of the existing structure revealed major renovations to the building would be required in order to meet current seismic codes. As a result of these considerations, and the desire to improve efficiency of operations by keeping the solids handling and dewatering functions in a single building, the decision was made to demolish the existing Administration Building and construct a new Solids Building that would meet current code requirements. In addition, the Secondary Influent Pump Station, which was an independent structure in 2013, was incorporated into the Solids Building. These revisions increased the complexity of the construction of the Solids Building.

The net effect of the revisions in the scope of the WWTF is an improved design that better fits the City's needs within the constricted plant site.

Project Costs

In early 2015, the WWTF upgrade design was advanced to 60 percent complete. An updated opinion of project cost was then prepared based on the 60 percent complete design. As a result of the revisions to the project, the previously estimated construction cost of $45 million in 2013 increased by 45 percent to an estimated construction cost of $65 million.

Schedule Evaluation

With the revisions to the project scope and project cost, and the advancement of the design, the City requested that AECOM assess the effects of these revisions on the construction schedule. AECOM, in concert with its construction specialist subconsultant Carlin Contracting, reviewed the construction schedule in light of the revised scope of the project. As a result of this review, AECOM now recommends a 47 month construction schedule (excluding startup and compliance activities) for the WWTF upgrade. In the October 28, 2013 memorandum, AECOM had previously proposed a 33 month schedule which initiated the City's request for an extension of time for construction in the Consent Decree. As outlined above, the progression of the design from 10 percent to 90 percent completion is the driver for this revised recommended schedule.

Normal construction practice for upgrade construction at an operational WWTF is typically single shift during the workday, except for time sensitive activities which would include efforts such as large concrete placements which may require an extended duration to complete or interconnections with existing tanks and piping which are typically accomplished during the early morning, low flow periods of the day. The 47 month construction schedule assumes some second shift work to complete time sensitive activities during the WWTF upgrade construction period. AECOM's October 2013 memorandum noted the increased risks for the City and the construction contractor with extensive second and third shift work given the constricted site and the need to maintain ongoing WWTF operations. Based on our experience on other WWTF upgrade projects, one of the significant construction challenges on this project will be simultaneously constructing the upgrade of the WWTF while maintaining the existing facilities in operation. With the close proximity of the new structures to the existing WWTF facilities, the depth of many of the new structures requiring excavation in the bedrock that underlies the site, the extensive yard piping and electrical ductbank system that need to be constructed, and the constricted WWTF site, maintenance of existing operations will require significant planning and sequencing. This is also a factor in considering the construction schedule.

Assuming the project is bid and in the winter and spring of 2016 so that the construction contract can be executed, and a Notice to Proceed issued to the construction contractor by July 1, 2016, the following schedule milestones are recommended:

- Notice to Proceed – July 1, 2016
- Overall Construction Substantial Completion (47 months) – May 31, 2020
- Overall Construction Final Completion / Achieve Startup and Compliance (51 months) – September 30, 2020

Conclusion

After review of the increased scope of work and project cost, a 47 month construction period, exclusive of startup and compliance, is recommended.

ATTACHMENT A
AECOM October 2013 MEMORANDA

AECOM
701 Edgewater Drive
Wakefield, MA 01880
www.aecom.com

781.246.5200 tel
781.245.6293 fax

Memorandum

To	Terry Desmarais, City Engineer	Page 1 of 2
CC	Peter Rice, Director; Brian Goetz, Deputy Director; and Paula Anania, Chief Operator	
Subject	Electrical Feed Justification Peirce Island WWTF Upgrade Design	
From	Erik Meserve and Jon Pearson	
Date	October 28, 2013	

This memorandum summarizes the reasons why the change from construction of a secondary WWTF upgrade to a larger facility providing nitrogen removal significantly impacts the work required on the plant electrical feed, distribution, and standby power systems. AECOM, in concert with its subconsultant Carlin Contracting, has prepared this memorandum in support of the City's request for an extension of the current Consent Decree schedule. The impacts of the change from construction of a secondary WWTF to a larger facility designed for nitrogen removal are described below:

- When designed for secondary treatment only, the BAF was small enough to fit inside the existing Filter Building. Under this situation, the Filter Building would be retrofit for the BAF and the existing electrical switchgear and generator would have remained in service.

- When the flows and loads increased and the treatment objective changed to include total nitrogen, the BAF grew significantly larger and exceeded the footprint of the existing Filter Building. Additionally, the electrical load increased to greater than the capacity of the existing electrical service. The increase in flows and loads and change in treatment objective requires that the Filter Building be completely demolished and thus the main electrical switchgear and generator be moved and replaced.

- However, the main electrical switchgear and generator must remain operational until the new switchgear and generator are completed in order to maintain the operation of the existing treatment process. Therefore, demolition of the existing Filter Building and construction of the BAF would not begin until this work is completed.

- The timeline for installing a new electrical service and generator is extended because this equipment is large enough and of custom sizing and configuration that manufacturers only fabricate it on an as-needed basis. The typical timeline for obtaining this type of equipment is shown below. The subsequent bullet point summarizes why this timeline is difficult to accelerate.

    - Contractor submittal preparation, Engineer review and approval: 4 months

- Vendor fabrication and delivery: 6 months
- Contractor installation: 2 months
- Contractor transfer facility to new electrical: 2 months

- The potential for acceleration of this schedule is limited. Because of the size and complexity of the equipment, the several hundred page submittals are lengthy to prepare and take time to review. The fabrication period is determined by the manufacturers and offers limited opportunities for acceleration. Installation and transferring the facility to the new electrical service is also difficult to accelerate because the existing facilities must be closely coordinated with plant operations, transferred one at a time, and tested before the next facility is transferred. As an example of how long this process takes, the Warwick Sewer Authority's treatment facility in Warwick, RI was flooded on March 30, 2010. The existing switchgear and generator were destroyed during the flood. Despite having only to replace these two pieces of equipment in kind and an expedited shop drawing review and approval process, the new switchgear and generator did not arrive on-site until November 17, 2010. Following installation and testing, the new components were put into service in March 2011.

- Relocation of the electrical switchgear and generator will necessitate reconfiguration of the underground electrical distribution system to re-feed existing facilities from the new switchgear and generator. Temporary wiring and careful sequencing will be needed to maintain the plant in operation.

- Because of the time required for the relocation and replacement of the switchgear and generator, which was not needed when the plant was to be upgraded only for secondary treatment, demolition of the Filter Building and construction of the BAF would not begin until approximately 14 months after the construction contract is executed.

AECOM
701 Edgewater Drive
Wakefield, MA 01880
www.aecom.com

781.246.5200 tel
781.245.6293 fax

Memorandum

To	Terry Desmarais, City Engineer	Page 1 of 3
CC	Peter Rice, Director; Brian Goetz, Deputy Director; and Paula Anania, Chief Operator	
Subject	Design Extension Justification Peirce Island WWTF Upgrade Design	
From	Erik Meserve and Jon Pearson	
Date	October 28, 2013	

This memorandum briefly outlines the reasons why AECOM believes that the change from construction of a secondary WWTF upgrade with an estimated construction cost of $25 million to a larger facility providing nitrogen removal with an estimated construction cost of $45 million will require more time and effort to design. The original Consent Decree schedule allowed 14 months for design and 6 months between design completion and the startup of construction. The proposed schedule includes an additional 6 months for design and maintains 6 months between design completion and construction. This memorandum has been prepared in support of the City's request for an extension of the current Consent Decree schedule. AECOM believes that an extension of the design schedule is warranted for the following reasons:

- The design process is a linear, iterative, sequential process in which subsequent steps build on the results of the previous steps. The following is a simplistic summary of the design process. First, the treatment process sizing and flow diagram is determined by process engineers, followed by preliminary equipment selections, conceptual building and structure layouts and a preliminary site plan. The process engineers then work with the architects to refine the building and structure layouts, which typically revises the initial concepts. After the building layouts are further advanced, the structural engineers begin work to define the building envelopes. Once the structure and building envelopes are sufficiently defined, the HVAC, plumbing and fire protection engineers can begin their work. As work by the different disciplines progresses, revisions to the initial layouts and concepts are made. When equipment layouts and selections are finalized at approximately 60% complete, the electrical and instrumentation engineers can begin their work in earnest. Typically 70% of the electrical design budget is expended after the 60% design point. Because information developed by one discipline is relied upon by another discipline, it is not possible to have the entire design team begin at the same time. As a result, to design the significantly larger and more complex upgrade project, more time is needed.

- The design of the larger upgrade will require significant changes to the plant electrical system that were not required with the smaller project (see separate explanation).

- The constricted site of the treatment facility will increase the design effort when more facilities are required within the same site area. There is little available room on the existing site to

locate the new facilities required as part of the upgrade. In many cases, relocation and reconstruction of existing facilities will be required to accommodate the new structures, with additional design effort and careful coordination needed. For example, the second stage BAF is to be located where the existing recycle pump station is located, requiring that this pump station be relocated. Not only does this result in additional design effort for reconstructed facilities such as the recycle pump station, but it also requires careful thought during the design process as to how current plant operations will be maintained during construction. For example, thought must be given as to when processes can be taken off line for rehabilitation or replacement at the same time and what time of year they can be taken off line so that the plant operators have the best chance of continuing to meet their discharge limits during construction.

- Attempting to complete the design of the larger upgrade project within the current Consent Decree schedule for design will unacceptably compromise the City's and NHDES's ability to comment and have input into the design process. Typically, the design team will pause after a progress submittal while the City reviews and comments on the design. If the current schedule is maintained, the design team will need to continue moving during the City's review time and large aspects of the design will need to be "frozen" much earlier than normal. Similar to the City, NHDES would typically have several chances to review and comment on a project of this magnitude during the design process. The current schedule allows for only one review at the conclusion of design activities.

- In Portsmouth's case, the design process is reliant upon the equipment vendors to a larger degree than normal because the BAF process is proprietary. Detailed elements of the design cannot be determined until information is received from the process vendor, Kruger. Just as the design process within AECOM is iterative, AECOM's interaction with Kruger is also iterative to customize their process to the site specific situation. For example, Kruger's preferred layout places the mudwell in an attached structure to the BAF cells. There is not enough space on the Peirce Island site for this to occur so AECOM and Kruger have had to iterate to develop a way in which the mudwell can be located underneath the BAF cells. With two BAF stages required for the larger project, additional time is needed to complete the design effort.

- The proposed schedule includes two Value Engineering reviews, which are recommended by EPA's *Value Engineering For Wastewater Treatment Works* (EPA 430/9-84-009) for large, complex projects as these reviews typically result in an excellent ratio of capital savings to cost. Value engineering is also required by the NH DES for projects with an estimated construction cost of over $10 million (Env.-wq 508.01). However, the typical time period for each of these exercises is 3 to 4 months (EPA 430/9-84-009, p.2-5). Maintaining the current Consent Decree schedule will result in the elimination of one, if not both, VE reviews. This is unacceptable to the City, as the use of value engineering on past projects has yielded significant cost savings.

- Maintaining the current Consent Decree design schedule results in less design time than is typically required for projects of this size. The following list of recent AECOM projects is shown as an example:

    - Cheshire, CT WPCP Upgrade - $30M construction - design period: 24 months
    - Meriden, CT WPCP Upgrade - $35M construction - design period: 21 months
    - Westborough, MA WWTF Upgrade - $46M construction – design period: 20 months

- Proposed Peirce Island WWTF Upgrade – approx. $45M construction – design period: 20 months

The proposed design schedule of 20 months for the Peirce Island WWTF Upgrade is aggressive given the complexities of this project.

AECOM
701 Edgewater Drive
Wakefield, MA 01880
www.aecom.com

781.246.5200 tel
781.245.6293 fax

Memorandum

To	Terry Desmarais, City Engineer	Page 1 of 4
CC	Peter Rice, Director; Brian Goetz, Deputy Director; and Paula Anania, Chief Operator	
Subject	Construction Extension Justification Peirce Island WWTF Upgrade Design	
From	Erik Meserve and Jon Pearson	
Date	October 28, 2013	

This memorandum briefly outlines the reasons why AECOM believes that the change from construction of a secondary WWTF upgrade with an estimated construction cost of $25 million to a larger facility providing nitrogen removal with an estimated construction cost of $45 million will require more time and effort to construct. AECOM, in concert with its subconsultant Carlin Contracting, has prepared this memorandum in support of the City's request for an extension of the current Consent Decree schedule.

The attached three schedules were prepared to support this evaluation. The schedules were developed with the current Consent Decree construction time frame of 24 months and the proposed construction timeframe of 33 months (excludes startup and compliance). The schedules have been prepared by Carlin Contracting and represent one contractor's opinion of how these projects would be constructed. Each contractor will approach the job slightly differently so the schedules should be interpreted as conceptual rather than final. The schedules show the following three scenarios:

- Schedule 1 – Secondary, 4.3 MGD, 24 months - Upgrading the current WWTF to meet secondary treatment standards with a BAF within the current Consent Decree schedule. The design average daily flow is 4.3 mgd and the estimated construction cost was approximately $25 million. Figure 1 shows the site layout for the work proposed under this schedule.

- Schedule 2 – TN8, 6.13 MGD, 33 months - Upgrading the current WWTF to meet a total nitrogen of 8 mg/L with a two-stage BAF process within the proposed Consent Decree schedule. The design average daily flow is 6.13 mgd and the estimated construction cost is approximately $45 million. Figure 2 shows the site layout for the work proposed under this schedule

- Schedule 3 – TN8, 6.13 MGD, 24 months - Upgrading the current WWTF to meet a total nitrogen of 8 mg/L with a two-stage BAF process within the current Consent Decree schedule. The design average daily flow is 6.13 mgd and the estimated construction cost is approximately $45 million. Figure 2 shows the site layout for the work proposed under this schedule

Each schedule has been annotated with the estimated average number of construction employees and estimated average number of heavy construction vehicle one-way trips per month. Using these

estimates, the average number of one-way trips per day, the peak number of one-way trips per day, and the peak trip frequency has been estimated in the following manner:

- In order to take into account weekends, holidays, and days lost to weather, the average number of one-way trips per day has been estimated based on 18 working days per month between November and April and 20 working days between May and October.
- The peak number of one way trips on any given day within the month has been estimated by assuming that the peak day is roughly 40% greater than the average.
- The peak trip frequency displays the frequency in minutes of a truck either entering or exiting the site on the peak day of the month. It was calculated assuming that trucks entered and exited the site throughout 7 hours of an 8 hour shift in recognition that work does not commence promptly at the beginning of the shift nor continue right up to the end. When double shifts are required, the peak truck frequency was calculated assuming that 67% of the truck traffic occurred during the day.

It is important to note that the manpower estimates do not include staff that are not on-site for the entire shift, such as delivery truck drivers, but does include full-time construction labor force. Additionally, the estimates of one-way trips does not include pick-ups and vans that many subcontractors will have for tools, deliveries to the contractor and City, City staff vehicles, engineering staff vehicles, and other visitors. Lastly, the vehicular weight limit of 80,000 lbs on the Peirce Island Road bridge has been taken into account in estimating the truck traffic.

Based on these assumptions and estimates, the tables below display comparisons of manpower and truck traffic between the schedules prepared.

Table 1. Estimated Construction Manpower Comparisons

Schedule Number	Average Manpower Per Day	Peak Manpower Per Day	Sum of Average Monthly Manpower
Schedule 1 – 4.3 mgd, Secondary Treatment BAF, current CD schedule	44	65	1,060
Schedule 2 – 6.13 mgd, TN8 BAF, proposed CD schedule	51	76	1,699
Schedule 3 – 6.13 mgd, TN8 BAF, current CD schedule	77	119	1,857

Table 2. Estimated Truck Traffic Comparisons

Schedule Number	Total One-Way Trips	Average Trips per Day	Peak Trips per Day	Peak Trip Frequency Range (minutes)
Schedule 1 – 4.3 mgd, Secondary Treatment BAF, current CD schedule				
7:00 AM – 3:30 PM	9,869	11 – 39	15 – 55	8 - 28
3:30 PM – 12:00 AM	-	-	-	-
Schedule 2 – 6.13 mgd, TN8 BAF, proposed CD schedule				
7:00 AM – 3:30 PM	21,392	18 – 56	26 – 79	5 - 16
3:30 PM – 12:00 AM	-	-	-	-
Schedule 3 – 6.13 mgd, TN8 BAF, current CD schedule				
7:00 AM – 3:30 PM	20,261	19 – 51	27 – 71	6 – 15
3:30 PM – 12:00 AM		10 - 25	14 - 35	12 - 30

Table 1 shows that there is a roughly 15% increase in the average number of construction workers on-site per day between Schedule 1 – Secondary, 4.3 MGD, 24 months and Schedule 2 – TN8, 6.13 MGD, 33 months. On the constricted site of the WWTF, this level of staffing may, at times, make effective operation and maintenance of the existing plant challenging. Under Schedule 3 – TN8, 6.13 MGD, 24 months, the levels of staffing are similar, except that instead of the negative impacts of construction such as noise, light, traffic and dust are being spread over the 8 hour workday, they are spread over 16 hours of the day.

Table 1 also shows a significant increase in the number of construction workers between Schedules 2 – TN8, 6.13 MGD, 33 months and 3 – TN8, 6.13 MGD, 24 months, although the scope of work between Schedules 2 – TN8, 6.13 MGD, 33 months and 3 – TN8, 6.13 MGD, 24 months is the same. This increase is due to the fact that the shortened schedule results in double shifts being required for approximately 21 of the 24 months of construction, as shown in red on the attached Schedule 3 – TN8, 6.13 MGD, 24 months. Multiple shift operation results in a loss of production efficiency, which results in an increase in the overall number of construction workers and will increase the cost of the project to the City. Loss in construction efficiency is well documented in publications from RS Means and the American Society of Civil Engineers. Under this scenario, construction would take place daily from 7 AM until midnight, 5 days a week. This will result in extensive site lighting during the night hours to allow work to be conducted. Nighttime construction work is inherently less safe than daytime construction work because of the limited lighting and the fact that people are naturally tired. Additionally, preliminary conversations with the United Stated Coast Guard and Harbormaster have indicated that site lighting at night will need to be turned off or turned away from the adjacent Piscataqua River shipping channel while the Harbor Pilots are guiding a large deep draft vessel into or out of the harbor.

The estimated truck traffic in Table 2 shows that the proposed project to remove nitrogen to 8 mg/L more than doubles the amount of truck traffic associated with the project as compared to the traffic associated with the secondary treatment upgrade. The frequency of trucks entering or exiting the site may be as frequent as every 5 minutes. Total truck traffic decreases slightly in Schedule 3 – TN8, 6.13 MGD, 24 months as compared to Schedule 2 – TN8, 6.13 MGD, 33 months because many trucks, such as the fuel trucks and dumpster trucks, are regularly scheduled and will not change significantly if construction takes place over one shift or two. However, under Schedule 3 – TN8, 6.13 MGD, 24 months, trucks will continue to enter and exit the site after 3:30 PM extending to midnight five days per week. On the peak days, it is estimated that a truck will enter or exit the site as frequently as every 12 minutes during that period.

Based on the information contained in these schedules, AECOM believes that an extension of the construction schedule is warranted for the following reasons:

- Completing the upgrade for total nitrogen of 8 mg/L within the current Consent Decree schedule will result in nearly two continuous years of double-shift construction which will degrade the quality of life in the City. Double shift construction will result in extensive heavy construction during the evening and night hours adjacent to the heart of downtown Portsmouth for nearly two years. The noise, traffic, light and dust impacts will significantly impact the residential, recreational and commercial activities that surround the project site and are the foundation of daily life in the City.

- Completing the upgrade for total nitrogen of 8 mg/L within the current Consent Decree schedule with double shift work will require the City to maintain a skeleton operations staff at Peirce Island for an extra shift, adding cost to the project and risk that if construction activities mistakenly cause a malfunction in the plant the skeleton crew may not be large enough to avoid affecting treatment performance.

- Completing the upgrade for total nitrogen of 8 mg/L within the current Consent Decree schedule with double shift work will increase the risk of a construction accident because it will require nearly two years of nighttime construction, which is inherently less safe than daytime construction.

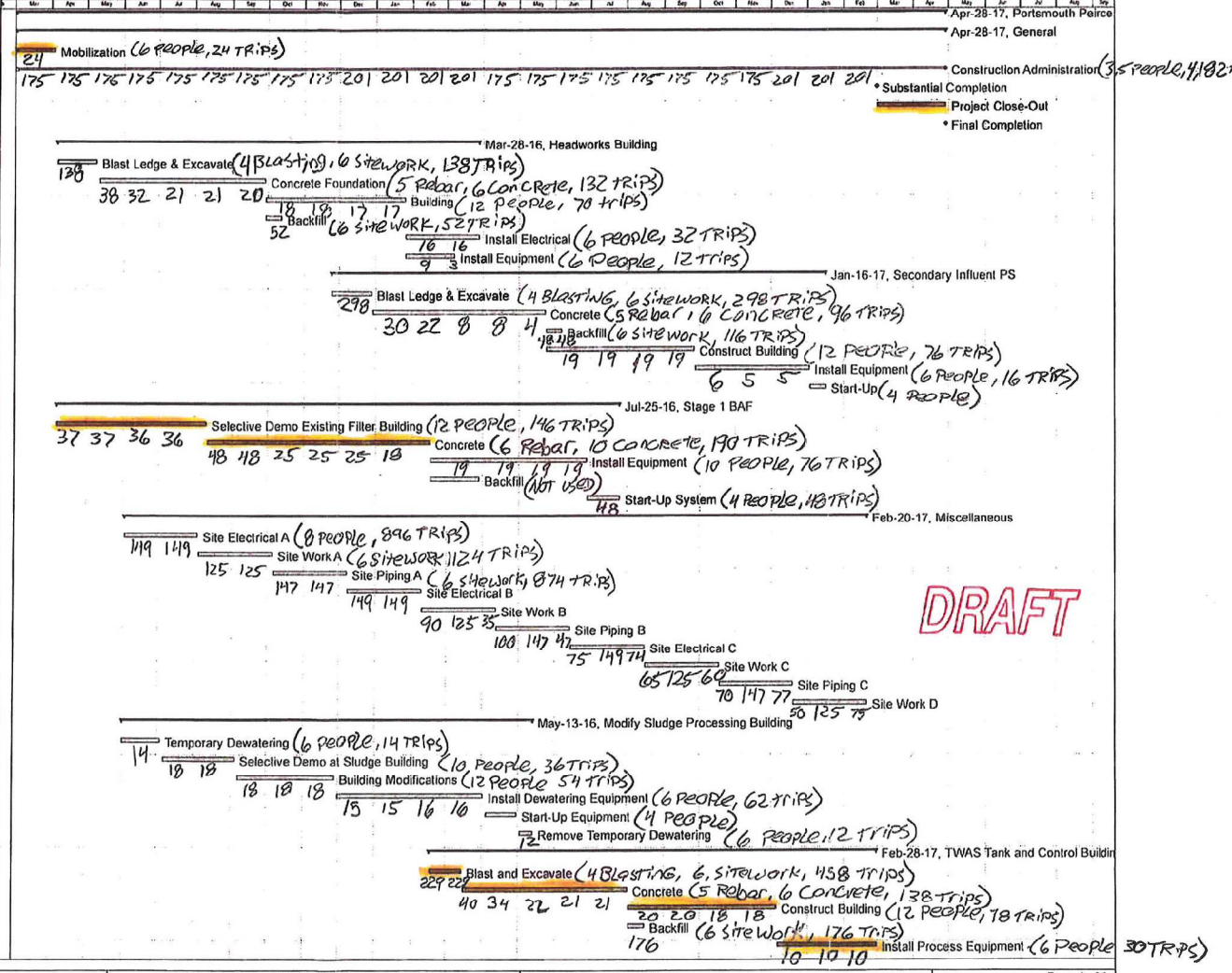
- Completing the upgrade for total nitrogen of 8 mg/L within the current Consent Decree schedule with double shift work may cause delays and increased costs due to the added need to coordinate nighttime work with the USCG and Harbormaster in order to maintain a safe shipping channel.

- Completing the upgrade for total nitrogen of 8 mg/L within the current Consent Decree schedule with double shift work will result in a loss of production which translates into an increase in cost to the City. In addition, the expedited schedule increases the potential for construction coordination and execution errors which would also increase the project cost.

SCHEDULE 1 4.3 mgd; Secondary BAF upgrade

Portsmouth Peirce Island WWTF - Original Plant 24 Months | Carlin Contracting Co., Inc. | Sep-27-13

Activity ID	Activity Name	Original Duration	Start	Finish
	PORTSMOUTH PEIRCE ISLAND WWTF - ORIGINAL PLAN	564	Mar-02-15	Apr-28-17
	GENERAL	564	Mar-02-15	Apr-28-17
PF1010	Mobilization	25	Mar-02-15	Apr-03-15
PF1580	Construction Administration	564	Mar-02-15	Apr-28-17
PF1550	Substantial Completion	0		Feb-28-17
PF1560	Project Close-Out	43	Mar-01-17	Apr-28-17
PF1570	Final Completion	0		Apr-28-17
	HEADWORKS BUILDING	255	Apr-06-15	Mar-28-16
PF1060	Blast Ledge & Excavate	25	Apr-06-15	May-08-15
PF1070	Concrete Foundation	100	May-11-15	Sep-28-15
PF1080	Building	85	Sep-29-15	Jan-25-16
PF1075	Backfill	10	Sep-29-15	Oct-12-15
PF1040	Install Electrical	45	Jan-26-16	Mar-28-16
PF1085	Install Equipment	30	Jan-26-16	Mar-07-16
	SECONDARY INFLUENT PS	300	Nov-24-15	Jan-16-17
PF1130	Blast Ledge & Excavate	25	Nov-24-15	Dec-28-15
PF1140	Concrete	105	Dec-29-15	May-23-16
PF1145	Backfill	10	May-24-16	Jun-06-16
PF1670	Construct Building	90	May-24-16	Sep-26-16
PF1150	Install Equipment	70	Sep-27-16	Jan-02-17
PF1160	Start-Up	10	Jan-03-17	Jan-16-17
	STAGE 1 BAF	340	Apr-06-15	Jul-25-16
PF1190	Selective Demo Existing Filter Building	90	Apr-06-15	Aug-10-15
PF1210	Concrete	135	Aug-11-15	Feb-15-16
PF1220	Install Equipment	95	Feb-16-16	Jun-27-16
PF1215	Backfill	30	Feb-16-16	Mar-28-16
PF1230	Start-Up System	20	Jun-28-16	Jul-25-16
	MISCELLANEOUS	450	Jun-02-15	Feb-20-17
PF1500	Site Electrical A	45	Jun-02-15	Aug-03-15
PF1520	Site Work A	45	Aug-04-15	Oct-05-15
PF1480	Site Piping A	45	Oct-06-15	Dec-07-15
PF1510	Site Electrical B	45	Dec-08-15	Feb-08-16
PF1530	Site Work B	45	Feb-09-16	Apr-11-16
PF1490	Site Piping B	45	Apr-12-16	Jun-13-16
PF1250	Site Electrical C	45	Jun-14-16	Aug-15-16
PF1540	Site Work C	45	Aug-16-16	Oct-17-16
PF1240	Site Piping C	45	Oct-18-16	Dec-19-16
PF1260	Site Work D	45	Dec-20-16	Feb-20-17
	MODIFY SLUDGE PROCESSING BUILDING	250	Jun-01-15	May-13-16
PF1280	Temporary Dewatering	25	Jun-01-15*	Jul-03-15
PF1270	Selective Demo at Sludge Building	45	Jul-06-15	Sep-04-15
PF1290	Building Modifications	60	Sep-07-15	Nov-27-15
PF1300	Install Dewatering Equipment	90	Nov-30-15	Apr-01-16
PF1310	Start-Up Equipment	20	Apr-04-16	Apr-29-16
PF1680	Remove Temporary Dewatering	10	May-02-16	May-13-16
	TWAS TANK AND CONTROL BUILDING	271	Feb-16-16	Feb-28-17
PF1320	Blast and Excavate	20	Feb-16-16*	Mar-14-16
PF1340	Concrete	100	Mar-15-16	Aug-01-16
PF1350	Construct Building	90	Aug-02-16	Dec-05-16
PF1345	Backfill	10	Aug-02-16	Aug-15-16
PF1360	Install Process Equipment	61	Dec-06-16	Feb-28-17



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Remaining Level of Effort | Remaining Work | Mil... | Actual Work | Critical Remaining Work | Su...

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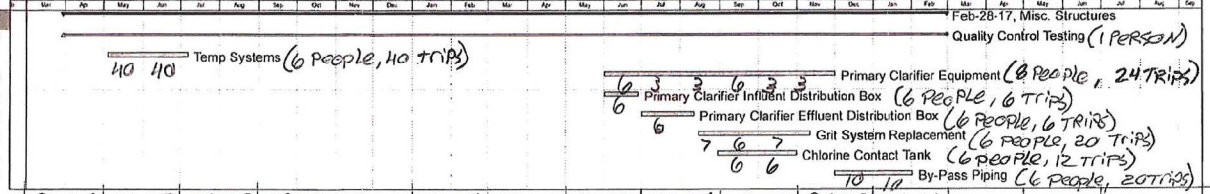
INDICATES CRITICAL PATH

SCHEDULE 1

Portsmouth Peirce Island WWTF - Original Plant 24 Months | Carlin Contracting Co., Inc. | Sep-27-13

		Original Duration	Start	Finish
MISC. STRUCTURES		501	Mar-30-15	Feb-28-17
PF1660	Quality Control Testing	501	Mar-30-15	Feb-28-17
PF1640	Temp Systems	45	May-04-15	Jul-08-15
PF1610	Primary Clarifier Equipment	132	Jun-01-16	Dec-01-16
PF1620	Primary Clarifier Influent Distribution Box	20	Jun-01-16	Jun-28-16
PF1630	Primary Clarifier Effluent Distribution Box	30	Jul-01-16	Aug-11-16
PF1590	Grit System Replacement	65	Aug-15-16	Nov-11-16
PF1690	Chlorine Contact Tank	45	Aug-30-16	Oct-31-16
PF1650	By-Pass Piping	45	Dec-01-16	Feb-01-17



																TOTALS
MAN POWER	9 26	33 47	45 47	49 56	50 56	52 54	59 41	54 65	53 56	54 48	36 28	26 16				1060
Misc ADmin.	195 175	175 189	175 175	175 175	175 201	201 201	201 175	187 175	175 175	175 175	175 201	201 201				4428
Site & Demo	175	37 185	203 143	125 199	147 447	149 319	354 135	195 170	149 315	125 130	147 127	125 75				4176
Concrete		38 32	21 69	68 25	25 25	48 22	48 42	26 21	21							531
ARCHitectURAL				18 36	36 17	17		19	19 39	39 18	18					276
Process/mech/ELECT		40 54			15	15 41	54 19	19 31	57 10	18 22	8 25	20 10				458
TOTAL TRIPS.	195 350	290 460	399 387	386 435	383 705	430 583	657 371	427 416	421 539	357 345	348 353	346 286				9869
AVE TRIPS/Day	11 19	15 23	20 19	19 22	21 39	24 32	36 21	21 21	21 27	18 17	19 20	19 16				
PEAK TRIPS/DAY	15 27	20 32	28 27	27 30	30 55	33 45	51 30	30 30	30 38	25 24	27 28	27 22				
Peak TRIP Frequency (min)	28 16	21 13	15 15	15 14	14 8	13 9	8 14	14 14	14 11	17 17	15 15	15 19				

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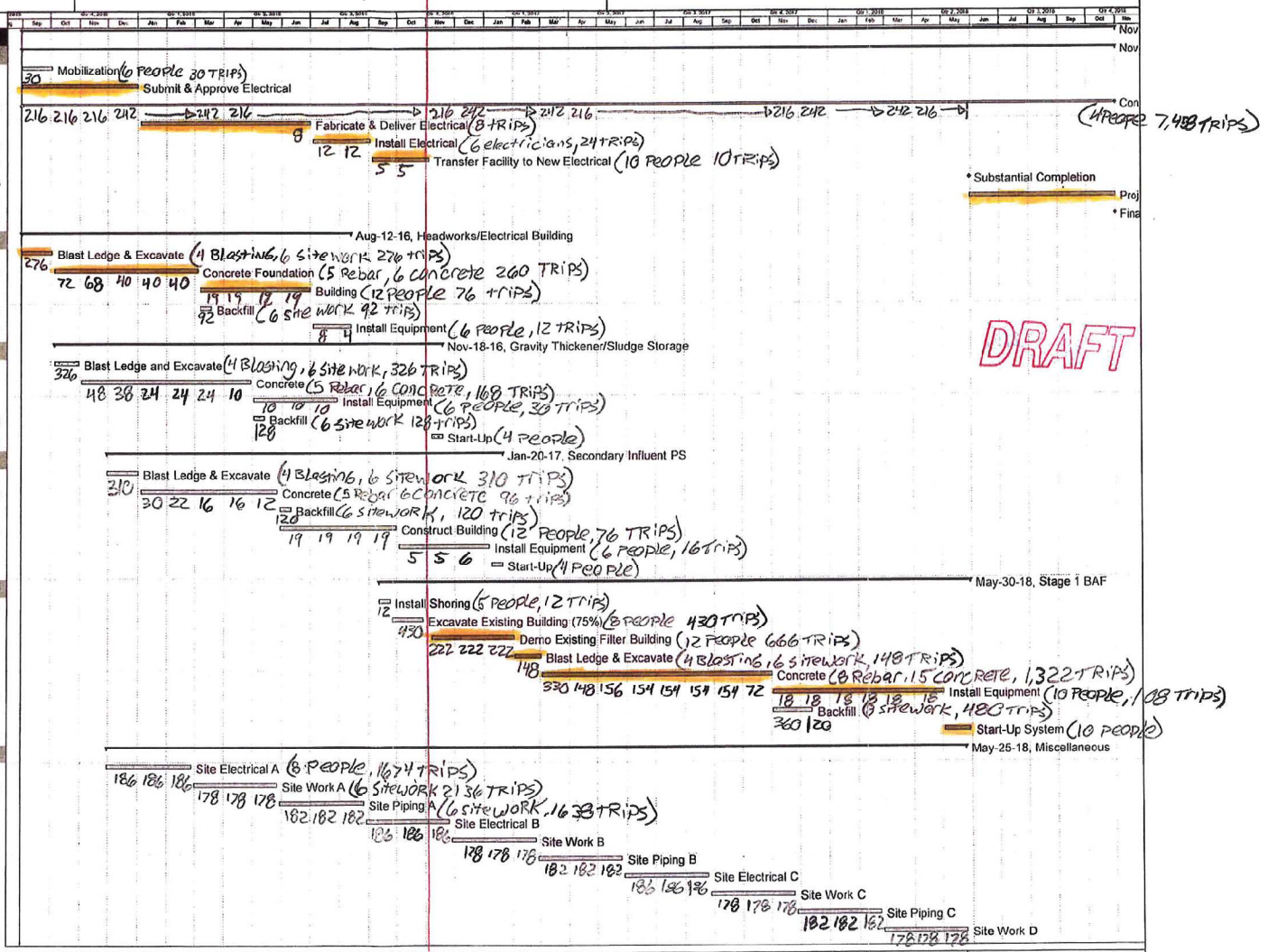
SCHEDULE 2 — 6.1 mgd; TN8 BAF UPGRADE

111.45

Portsmouth Peirce Island WWTF - Full Plant Upgrade 33 Months — Carlin Contracting Co., Inc. — Sep-27-13

PORTSMOUTH PEIRCE ISLAND WWTF - FULL P	829	Aug-31-15	Nov-01-18
GENERAL	829	Aug-31-15	Nov-01-18
PF1010 Mobilization	25	Aug-31-15	Oct-02-15
PF1020 Submit & Approve Electrical	90	Aug-31-15	Jan-01-16
PF1580 Construction Administration	829	Aug-31-15	Nov-01-18
PF1030 Fabricate & Deliver Electrical	130	Jan-04-16	Jul-01-16
PF1040 Install Electrical	45	Jul-04-16	Sep-02-16
PF1050 Transfer Facility to New Electrical	45	Sep-05-16	Nov-04-16
PF1550 Substantial Completion	0		May-30-18
PF1560 Project Close-Out	111	May-31-18	Nov-01-18
PF1570 Final Completion	0		Nov-01-18
HEADWORKS/ELECTRICAL BUILDING	260	Aug-31-15	Aug-12-16
PF1060 Blast Ledge & Excavate	25	Aug-31-15	Oct-02-15
PF1070 Concrete Foundation	110	Oct-05-15	Mar-04-16
PF1080 Building	85	Mar-07-16	Jul-01-16
PF1075 Backfill	10	Mar-07-16	Mar-18-16
PF1085 Install Equipment	30	Jul-04-16	Aug-12-16
GRAVITY THICKENER/SLUDGE STORAGE	295	Oct-05-15	Nov-18-16
PF1090 Blast Ledge and Excavate	20	Oct-05-15	Oct-30-15
PF1100 Concrete	130	Nov-02-15	Apr-29-16
PF1110 Install Equipment	65	May-02-16	Jul-29-16
PF1105 Backfill	10	May-02-16	May-13-16
PF1120 Start-Up	10	Nov-07-16	Nov-18-16
SECONDARY INFLUENT PS	300	Nov-30-15	Jan-20-17
PF1130 Blast Ledge & Excavate	25	Nov-30-15	Jan-01-16
PF1140 Concrete	105	Jan-04-16	May-27-16
PF1145 Backfill	10	May-30-16	Jun-10-16
PF1147 Construct Building	90	May-30-16	Sep-30-16
PF1150 Install Equipment	70	Oct-03-16	Jan-06-17
PF1160 Start-Up	10	Jan-09-17	Jan-20-17
STAGE 1 BAF	448	Sep-12-16	May-30-18
PF1170 Install Shoring	10	Sep-12-16	Sep-23-16
PF1180 Excavate Existing Building (75%)	25	Sep-26-16	Oct-28-16
PF1190 Demo Existing Filter Building	63	Nov-07-16	Feb-01-17
PF1200 Blast Ledge & Excavate	20	Feb-02-17	Mar-01-17
PF1210 Concrete	175	Mar-02-17	Nov-01-17
PF1220 Install Equipment	130	Nov-02-17	May-02-18
PF1215 Backfill	30	Nov-02-17	Dec-13-17
PF1230 Start-Up System	20	May-03-18	May-30-18
MISCELLANEOUS	650	Nov-30-15	May-25-18
PF1500 Site Electrical A	65	Nov-30-15	Feb-26-16
PF1520 Site Work A	65	Feb-29-16	May-27-16
PF1480 Site Piping A	65	May-30-16	Aug-26-16
PF1510 Site Electrical B	65	Aug-29-16	Nov-25-16
PF1530 Site Work B	65	Nov-28-16	Feb-24-17
PF1490 Site Piping B	65	Feb-27-17	May-26-17
PF1250 Site Electrical C	65	May-29-17	Aug-25-17
PF1540 Site Work C	65	Aug-28-17	Nov-24-17
PF1240 Site Piping C	65	Nov-27-17	Feb-23-18
PF1260 Site Work D	65	Feb-26-18	May-25-18



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INDICATES CRITICAL PATH

SCHEDULE 2

Portsmouth Peirce Island WWTF - Full Plant Upgrade 33 Months | Carlin Contracting Co., Inc. | Sep-27-13

Activity ID	Activity Name	Original Duration	Start	Finish
	NEW SLUDGE PROCESSING BUILDING	330	Dec-01-15	Mar-06-17
PF1280	Temporary Administration Trailer	25	Dec-01-15*	Jan-04-16
PF1270	Selective Demo at Administration Building	110	Jan-05-16	Jun-06-16
PF1290	Construct Second Floor	85	Jun-07-16	Oct-03-16
PF1300	Install Dewatering Equipment	90	Oct-04-16	Feb-06-17
PF1310	Start-Up Equipment	20	Feb-07-17	Mar-06-17
	ADMINISTRATION BUILDING	320	Mar-07-17	May-28-18
PF1320	Selective Demo at Sludge Building	20	Mar-07-17	Apr-03-17
PF1330	Demo Sludge Building & Excavate	65	Apr-04-17	Jul-03-17
PF1340	Concrete	110	Jul-04-17	Dec-04-17
PF1350	Construct Building	125	Dec-05-17	May-28-18
PF1345	Backfill	10	Dec-05-17	Dec-18-17
PF1360	Install Process Equipment	60	Mar-06-18	May-28-18
	STAGE 2 BAF	350	Aug-01-16	Dec-01-17
PF1370	Blast Ledge and Excavate	45	Aug-01-16*	Sep-30-16
PF1380	Concrete	130	Oct-03-16	Mar-31-17
PF1385	Backfill	10	Apr-03-17	Apr-14-17
PF1390	Install Equipment	90	Jul-31-17	Dec-01-17
	STAGE 2 MUDWELL	242	Feb-01-17	Jan-04-18
PF1400	Blast Ledge and Excavate	20	Feb-01-17*	Feb-28-17
PF1410	Concrete	90	Mar-31-17	Aug-03-17
PF1415	Backfill	10	Aug-04-17	Aug-17-17
PF1420	Install Equipment	45	Nov-03-17	Jan-04-18
	SUPPLEMENTAL CARBON FACILITY	110	Jan-01-18	Jun-01-18
PF1430	Excavate	20	Jan-01-18*	Jan-26-18
PF1440	Concrete	45	Jan-29-18	Mar-30-18
PF1450	Install Equipment	45	Apr-02-18	Jun-01-18
	RELOCATE ODOR CONTROL	65	Dec-01-16	Mar-01-17
PF1460	Excavation and Concrete	20	Dec-01-16*	Dec-28-16
PF1470	Install Equipment and Piping	45	Dec-29-16	Mar-01-17
	MISC. STRUCTURES	698	Sep-28-15	May-30-18
PF1660	Quality Control Testing	698	Sep-28-15	May-30-18
PF1640	Temp Systems	45	Feb-01-16	Apr-01-16
PF1610	Primary Clarifier Equipment	132	Jun-01-16	Dec-01-16
PF1620	Primary Clarifier Influent Distribution Box	20	Jun-01-16	Jun-28-16
PF1630	Primary Clarifier Effluent Distribution Box	30	Jul-01-16	Aug-11-16
PF1670	Chlorine Contact Tank	45	Aug-30-16	Oct-31-16
PF1650	By-Pass Piping	45	Dec-01-16	Feb-01-17
PF1600	Chemical Feed System	45	Apr-03-17	Jun-02-17
PF1590	Grit System Replacement	65	Jun-01-17	Aug-30-17

Mar-06-17, New Sludge Processing Building
Temporary Administration Trailer (4 people, 20 trips)
Selective Demo at Administration Building (12 people, 86 trips)
Construct Second Floor (12 people 72 trips)
Install Dewatering Equipment (6 people, 62 trips)
Start-Up Equipment (4 people)
May-28-18, Administration Build
Selective Demo at Sludge Building (12 people, 32 trips)
Demo Sludge Building & Excavate (12 people, 360 trips)
Concrete (5 Rebar, 8 Concrete 486 trips)
Construct Building (12 people 78 trips)
Backfill (6 people 78 trips)
Install Process Equipment (12 people, 24 trips)
Dec-01-17, Stage 2 BAF
Blast Ledge and Excavate (4 Blasting, 6 sitework 436 trips)
Concrete (5 Rebar 6 Concrete, 238 trips)
Backfill (6 sitework, 164 trips)
Install Equipment (6 people 64 trips)
Jan-04-18, Stage 2 Mudwell
Blast Ledge and Excavate (4 Blasting, 6 sitework, 398 trips)
Concrete (5 Rebar, 8 concrete 238 trips)
Backfill (6 sitework 154 trips)
Install Equipment (6 people, 14 trips)
Jun-01-18, Supplemental Carbo
Excavate (6 sitework 8 trips)
Concrete (2 Rebar 4 conc 18 trips)
Install Equipment (6 people 14 trips)
Mar-01-17, Relocate Odor Control
Excavation and Concrete (6 sitework, 12 trips)
Install Equipment and Piping (6 people, 14 trips)
May-30-18, Misc. Structures
Quality Control Testing (1 person)
Temp Systems (6 people, 60 trips)
Primary Clarifier Equipment (8 People, 24 trips)
Primary Clarifier Influent Distribution Box (6 people, 6 trips)
Primary Clarifier Effluent Distribution Box 6 people 6 trips)
Chlorine Contact Tank (6 people, 12 trips)
By-Pass Piping (6 people 20 trips)
Chemical Feed System (4 people 16 trips)
Grit System Replacement (6 people 20 trips)

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MANPOWER	21	26	27	41	58	58	69	57	58	73	67	71	76	68	60	58	56	52	50	54	48	52	53	52	38	38	46	45	39	39	51	49	49								1,699
MISC. ADMIN.	216	216	216	262	242	242	242	216	216	216	216	216	216	216	216	242	242	242	242	216	216	216	216	216	216	216	216	242	242	242	242	216	216								7,2190
SITE & DEMO	276	326	–	496	208	203	287	195	324	302	182	400	416	616	408	412	400	724	214	466	302	306	186	340	178	178	536	350	190	182	178	178	178								10,164
CONCRETE	–	92	116	78	94	86	118	26	22	–	–	–	–	–	60	32	32	34	34	24	26	20	34	28	24	16	3	50	–	–	9	9	–	–								2,502
ARCHITECTURAL	–	–	–	–	–	–	19	19	19	56	37	37	37	64	–	–	–	–	–	–	–	–	–	–	–	–	–	13	15	13	13	13	13								366
PROC / MECH / ELEC	–	–	–	–	–	30	30	–	–	30	39	19	17	34	23	32	33	13	–	8	8	7	6	23	16	16	41	25	18	18	26	33	25								590
TOTAL TRIPS	522	614	342	536	529	561	618	456	581	601	1174	672	686	930	707	719	708	1013	920	904	752	749	758	859	635	573	545	660	463	464	468	496	432								21,392

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AVE. TRIPS/DAY	26	31	18	46	30	31	34	25	29	30	24	34	34	47	39	40	39	66	44	50	38	37	38	43	33	29	47	37	26	26	26	24	22							
PEAK TRIPS/DAY	36	43	26	65	42	43	48	35	41	42	34	48	48	65	55	56	55	79	62	70	53	52	53	60	46	41	66	51	36	36	36	34	30							
PEAK TRIP FREQUENCY (min)	12	10	16	7	10	10	9	12	10	10	12	9	9	7	8	8	8	5	7	6	8	8	8	7	9	10	6	8	12	12	12	12	14							

SCHEDULE 3

6.1 mgd; TN8 BAF Upgrade;

Portsmouth Peirce Island WWTF - Full Plant Upgrade 24 Months — Carlin Contracting Co., Inc. — Sep-27-13

	Activity ID	Activity Name	Original Duration	Start	Finish
		PORTSMOUTH PEIRCE ISLAND WWTF - FULL P	564	Mar-02-15	Apr-30-17
		GENERAL	564	Mar-02-15	Apr-30-17
	PF1010	Mobilization	25	Mar-02-15	Apr-03-15
	PF1020	Submit & Approve Electrical	90	Mar-02-15	Jul-06-15
	PF1580	Construction Administration	564	Mar-02-15	Apr-28-17
	PF1030	Fabricate & Deliver Electrical	130	Jul-07-15	Jan-04-16
*	PF1040	Install Electrical	45	22 Jan-05-16	Feb-03-16
*	PF1050	Transfer Facility to New Electrical	45	22 Feb-04-16	Mar-04-16
	PF1550	Substantial Completion	0		Feb-28-17
	PF1560	Project Close-Out	61	Mar-01-17	Apr-30-17
	PF1570	Final Completion	0		Apr-30-17
		HEADWORKS/ELECTRICAL BUILDING	250	Mar-02-15	Feb-15-16
	PF1060	Blast Ledge & Excavate	25	Mar-02-15	Apr-03-15
	PF1070	Concrete Foundation	110	Apr-06-15	Sep-07-15
	PF1080	Building	85	Sep-08-15	Jan-04-16
	PF1075	Backfill	10	Sep-08-15	Sep-21-15
	PF1085	Install Equipment	30	Jan-05-16	Feb-15-16
		GRAVITY THICKENER/SLUDGE STORAGE	249	Apr-06-15	Mar-18-16
	PF1090	Blast Ledge and Excavate	20	Apr-06-15	May-01-15
	PF1100	Concrete	130	May-04-15	Nov-02-15
	PF1110	Install Equipment	65	Nov-03-15	Feb-01-16
	PF1105	Backfill	10	Nov-03-15	Nov-16-15
	PF1120	Start-Up	10	Mar-07-16	Mar-18-16
		SECONDARY INFLUENT PS	300	Jun-02-15	Jul-25-16
	PF1130	Blast Ledge & Excavate	25	Jun-02-15	Jul-06-15
	PF1140	Concrete	105	Jul-07-15	Nov-30-15
	PF1145	Backfill	10	Dec-01-15	Dec-14-15
	PF1147	Construct Building	90	Dec-01-15	Apr-04-16
	PF1150	Install Equipment	70	Apr-05-16	Jul-11-16
	PF1160	Start-Up	10	Jul-12-16	Jul-25-16
		STAGE 1 BAF	296	Jan-12-16	Feb-28-17
	PF1170	Install Shoring	10	Jan-12-16	Jan-25-16
*	PF1180	Excavate Existing Building (75%)	25	20 Jan-26-16	Feb-22-16
*	PF1190	Demo Existing Filter Building	63	30 Mar-07-16	Apr-15-16
	PF1200	Blast Ledge & Excavate		20 Apr-18-16	May-13-16
*	PF1210	Concrete	175	110 May-16-16	Oct-14-16
*	PF1220	Install Equipment	120	80 Oct-17-16	Feb-03-17
	PF1215	Backfill		30 Oct-17-16	Nov-25-16
	PF1230	Start-Up System	20	17 Feb-06-17	Feb-28-17
		MISCELLANEOUS	470	May-04-15	Feb-20-17
	PF1500	Site Electrical A		45 May-04-15	Jul-06-15
	PF1520	Site Work A		45 Jul-07-15	Sep-07-15
	PF1480	Site Piping A		50 Sep-08-15	Nov-16-15
	PF1510	Site Electrical B		45 Nov-17-15	Jan-18-16
	PF1530	Site Work B		50 Jan-19-16	Mar-28-16
	PF1490	Site Piping B		50 Mar-29-16	Jun-06-16
	PF1250	Site Electrical C		45 Jun-07-16	Aug-08-16
	PF1540	Site Work C		45 Aug-09-16	Oct-10-16
	PF1240	Site Piping C		50 Oct-11-16	Dec-19-16
	PF1260	Site Work D		45 Dec-20-16	Feb-20-17

Apr-30-17, Portsmouth Peirce I
Apr-30-17, General
Mobilization (6 People, 30 TRIPS)
Submit & Approve Electrical
Construction Administration (5 PEOPLE, 6696 TRIPS)
Fabricate & Deliver Electrical (8 TRIPS)
Install Electrical (12 Electricians, 16 TRIPS)
Transfer Facility to New Electrical (20 people, 10 TRIPS)
Substantial Completion
Project Close-Out
Final Completion
Feb-15-16, Headworks/Electrical Building
Blast Ledge & Excavate (4 BLASTING, 6 SITEWORK, 276 TRIPS)
Concrete Foundation (5 Rebar, 6 Concrete, 260 TRIPS)
Building (12 people, 76 TRIPS)
Backfill (6 SITEWORK, 92 TRIPS)
Install Equipment (6 people, 12 TRIPS)
Mar-18-16, Gravity Thickener/Sludge Storage
Blast Ledge and Excavate (4 BLASTING, 6 SITEWORK, 326 TRIPS)
Concrete (5 Rebar, 6 Concrete, 168 TRIPS)
Install Equipment (6 people, 30 TRIPS)
Backfill (6 SITEWORK, 128 TRIPS)
Start-Up (4 people)
Jul-25-16, Secondary Influent PS
Blast Ledge & Excavate (4 BLASTING, 6 SITEWORK, 310 TRIPS)
Concrete (5 Rebar, 6 SITEWORK, 96 TRIPS)
Backfill (6 SITEWORK, 120 TRIPS)
Construct Building (12 people 76 TRIPS)
Install Equipment (6 people, 16 TRIPS)
Start-Up (4 people)
Feb-28-17, Stage 1 BAF
Install Shoring (5 people, 12 TRIPS)
Excavate Existing Building (75%) (10 people, 426 TRIPS)
Demo Existing Filter Building (24 people, 634 TRIPS)
Blast Ledge & Excavate (4 BLASTING, 6 SITEWORK, 148 TRIPS)
Concrete (13 Rebar, 24 Concrete, 1310 TRIPS)
Install Equipment (10 people, 96 TRIPS)
Backfill (6 SITEWORK, 480 TRIPS)
Start-Up System (10 people)
Feb-20-17, Miscellaneous
Site Electrical A (11 people, 1662 TRIPS)
Site Work A (9 SITEWORK, 2082 TRIPS)
Site Piping A (9 SITEWORK, 1566 TRIPS)
Site Electrical B
Site Work B
Site Piping B
Site Electrical C
Site Work C
Site Piping C
Site Work D

DRAFT

Remaining Level of Effort | Remaining Work | Mil...
Actual Work | Critical Remaining Work | Su...

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Page 1 of 2

* INDICATES SECOND SHIFT (CRITICAL PATH)
INDICATES CRITICAL PATH

SCHEDULE 3

DRAFT

Activity ID	Activity Name	Original Duration	Start	Finish	
New Sludge Processing Building		230	May-01-15	Mar-18-16	Mar-18-16, New Sludge Processing Building
PF1280	Temporary Administration Trailer	25 15	May-01-15*	May-21-15	(7 people, 20 trips) 20
PF1270	Selective Demo at Administration Building	110 75	May-22-15	Sep-04-15	(18 people, 78 trips) 26 26 26
PF1290	Construct Second Floor	85 65	Sep-07-15	Dec-04-15	(17 people, 72 trips) 24 24 24
PF1300	Install Dewatering Equipment	90 65	Dec-07-15	Mar-04-16	(8 people, 58 trips) 19 19 19
PF1310	Start-Up Equipment	20 10	Mar-07-16	Mar-18-16	(4 people)
Administration Building		205	Mar-21-16	Dec-30-16	Dec-30-16, Administration Building
PF1320	Selective Demo at Sludge Building	20 10	Mar-21-16	Apr-01-16	(24 people, 32 trips) 32
PF1330	Demo Sludge Building & Excavate	65 35	Apr-04-16	May-20-16	(22 people, 350 trips) 175 175
PF1340	Concrete	110 60	May-23-16	Aug-12-16	(9 Rebar, 15 Concrete, 478 trips) 194 192 92
PF1350	Construct Building	125 75	Aug-15-16	Nov-25-16	(20 people, 78 trips) 26 26 26
PF1345	Backfill	10	Aug-15-16	Aug-26-16	(6 people, 78 trips) 78
PF1360	Install Process Equipment	60 35	Nov-14-16	Dec-30-16	(21 people, 20 trips) 10 10
Stage 2 BAF		275	Nov-02-15	Nov-18-16	Nov-18-16, Stage 2 BAF
PF1370	Blast Ledge and Excavate	45	Nov-02-15*	Jan-01-16	(4 Blasting, 6 sitework, 436 trips) 218 218
PF1380	Concrete	130	Jan-04-16	Jul-01-16	(5 Rebar, 6 concrete, 238 trips) 64 60 33 33 34 14
PF1385	Backfill	10	Jul-04-16	Jul-15-16	(6 sitework, 164 trips) 164
PF1390	Install Equipment	90	Jul-18-16	Nov-18-16	(6 people, 64 trips) 16 16 16 16
Stage 2 Mudwell		165	Apr-01-16	Nov-17-16	Nov-17-16, Stage 2 Mudwell
PF1400	Blast Ledge and Excavate	20	Apr-01-16*	Apr-28-16	(4 Blasting, 6 sitework, 398 trips) 398
PF1410	Concrete	90	Apr-29-16	Sep-01-16	(5 Rebar, 6 concrete, 238 trips) 66 70 66 36
PF1415	Backfill	10	Sep-02-16	Sep-15-16	(6 sitework 154 trips) 154
PF1420	Install Equipment	45	Sep-16-16	Nov-17-16	(6 people, 14 trips) 7 7
Supplemental Carbon Facility		110	Oct-03-16	Mar-03-17	Mar-03-17, Supplemental Carbon Facility
PF1430	Excavate	20	Oct-03-16*	Oct-28-16	(6 sitework, 8 trips) 8
PF1440	Concrete	45	Oct-31-16	Dec-30-16	(2 Rebar, 4 concrete, 18 trips) 9 9
PF1450	Install Equipment	45	Jan-02-17	Mar-03-17	(6 people, 14 trips) 7 7
Relocate Odor Control		65	Jun-01-15	Aug-28-15	Aug-28-15, Relocate Odor Control
PF1460	Excavation and Concrete	20	Jun-01-15*	Jun-26-15	(6 sitework, 12 trips) 12
PF1470	Install Equipment and Piping	45	Jun-29-15	Aug-28-15	(6 people 14 trips) 7 7
Misc. Structures		501	Mar-30-15	Feb-28-17	Feb-28-17, Misc. Structures
PF1660	Quality Control Testing	501	Mar-30-15	Feb-28-17	(1 person)
PF1590	Grit System Replacement	65	Aug-03-15	Oct-30-15	(6 people, 20 trips) 7 6 7
PF1600	Chemical Feed System	45	Nov-02-15	Jan-01-16	(4 people, 16 trips) 8 8
PF1640	Temp Systems	45	Nov-02-15	Jan-01-16	(6 people 60 trips) 30 30
PF1610	Primary Clarifier Equipment	132	Jun-01-16	Dec-01-16	(8 people, 24 trips) 6 3 3 6 3 3
PF1620	Primary Clarifier Influent Distribution Box	20	Jun-01-16	Jun-28-16	(6 people, 6 trips) 6
PF1630	Primary Clarifier Effluent Distribution Box	30	Jul-01-16	Aug-11-16	(6 people, 6 trips) 6
PF1670	Chlorine Contact Tank	45	Aug-30-16	Oct-31-16	(6 people, 12 trips) 6 6
PF1650	By-Pass Piping	45	Dec-01-16	Feb-01-17	(6 people, 20 trips) 10 10

																									TOTAL
MANPOWER	21	26	45	62	71	77	77	70	88	81	76	81	93	97	113	119	118	112	97	105	99	59	38	32	1857
MISC ADMIN	300	270	290	270	270	270	270	270	270	300	300	300	300	270	270	270	270	270	270	270	270	300	299	299	6738
SITEWORK/DEMO	276	326	277	625	258	258	316	224	570	615	289	658	644	1051	473	277	441	310	386	352	584	232	232	232	9906
CONCRETE		72	116	78	94	86	40	26			64	60	33	33	430	606	518	388	132		9	9			2794
ARCHITCHURAL							43	43	43	38	19	19	19						26	26	26				302
PROCESS/MECH/ELECT					7	14	6	7	38	67	67	23		5	5	18	9	19	28	44	64	48	45	7	521
TOTAL	576	668	683	973	629	628	675	570	921	1020	739	1060	996	1359	1178	1171	1238	987	842	692	953	589	576	538	20,261
AVE. TRIPS/DAY	32	37	34	49	31	31	34	29	51	57	41	59	55	76	59	59	62	49	42	35	53	33	32	30	
PEAK TRIPS/DAY	45	52	48	69	43	43	49	41	71	80	57	83	82	106	83	83	87	69	59	50	74	46	45	42	
PEAK TRIP FREQUENCY (MIN)	14	12	13	9	15	15	13	12	9	8	11	8	8	6	8	8	7	9	11	12	8	14	14	15	

Remaining Level of Effort | Remaining Work | Milestone
Actual Work | Critical Remaining Work | Summary

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LEGEND
BLDG
EXISTING BUILDING OR TANK
BLDG
EXISTING BUILDING AND/OR PROCESS TO RECEIVE IMPROVEMENTS/MODIFICATIONS
BLDG
PROPOSED BUILDING AND/OR PROCESS
NAVIGATION LIGHT
SODIUM BISULFITE TANK
SODIUM HYPOCHLORITE TANKS
SLUDGE PROCESSING
SANITARY DISINFECTION
MUDWELL
CLEARWELL
BAF
RETROFIT FILTER BUILDING TO BAF
PARSHALL FLUME
PRIMARY CLARIFIER EFFLUENT DISTRIBUTION BOX
SECONDARY INFLUENT PUMP STA. AND SCREEN BLDG.
SCUM BLDG
GRIT SYSTEM
PRIMARY CLARIFIER
ADMIN. BLDG
SLUDGE HOLDING TANKS
SLUDGE PUMPING (BASEMENT)
CHEM. FEED BLDG
PRIMARY CLARIFIER INFLUENT DISTRIBUTION BOX
HEADWORKS
GRAVITY THICKENER
PRIMARY CLARIFIER
TWAS STORAGE TANK AND CONTROL BUILDING
NAVIGATION LIGHT
HISTORICAL EMBATTLEMENT
DRAFT
N
0 20 40 80 120
APPROX. SCALE IN FEET
FIGURE 1
AECOM
701 Edgewater Drive
Wakefield, MA 01880
Ph. (781) 246-5200
WWMP PILOTING - PHASE 1 ENGINEERING EVALUATION
PEIRCE ISLAND WWTF - PORTSMOUTH, NH
BAF
CONVENTIONAL SECONDARY TREATMENT
SITE LAYOUT

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PEIRCE ISLAND WWTF - PORTSMOUTH, NH

BAF WITH COAGULANT DOSING NO CEPT TOTAL NITROGEN < 8 mg/L

FIGURE 2

SITE LAYOUT

ATTACHMENT B
CURRENT (September 2015) SITE PLAN

PATH/FILENAME: P:\60301525 - PORTSMOUTH WWTF UPGRADE\CIVIL-SITE\COLOR SITE PLAN 1-8-15\FIGURE 2 PROPOSED SITE PLAN WITH AERIAL PHOTO-2.DWG

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PEIRCE ISLAND WWTF - PORTSMOUTH, NH

PROPOSED SITE PLAN

FIGURE 1

1-13-15