Hopewell Regional Wastewater Treatment Facility
Alternative 4A-1 Light, Phase 2

Preliminary Engineering Report
Volume 1 of 2

September 2012

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION

1.1 Background and Project Objectives 1-1
1.2 Existing Facilities 1-1
1.3 Alternative 4A-1 Light, Phase 2 Project 1-7
1.4 Organization of the Preliminary Engineering Report 1-8

2.0 WASTEWATER CHARACTERISTICS, PROCESS DESIGN CRITERIA, AND SEGREGATED TREATMENT APPROACH

2.1 Introduction 2-1
2.2 Current Influent Flows and Loads 2-1
2.3 Design Basis Flows and Loads 2-2
2.4 Segregated Treatment Concept 2-2
2.5 Segregated Treatment System Design Criteria and Performance 2-3
2.6 Design Basis Effluent Quality 2-5

3.0 GRAVELLY RUN PUMP STATION AND FORCEMAIN

3.1 Introduction 3-1
3.2 Existing Gravelly Run Pump Station and North Interceptor 3-1
3.3 Gravelly Run Pump Station and Forcemain Improvements 3-1
3.4 Bypass Pumping During Construction 3-3
3.5 Impact on Existing Gravelly Run Pumps 1 and 2 3-4

4.0 MBBR INFLUENT PUMP STATION

4.1 Introduction 4-1
4.2 Pump Station Influent 4-1
4.3 MBBR Influent Pump Station 4-1

5.0 MBBR SCREENING FACILITY

5.1 Introduction 5-1
5.2 Screens 5-1

6.0 BIOLOGICAL TREATMENT FACILITIES

6.1 Introduction 6-1
6.2 MBBR Treatment System 6-1
6.3 Dissolved Air Flotation Units 6-4

7.0 PHASE 2 IMPROVEMENTS FOR EXISTING PROCESS UNITS

7.1 Introduction 7-1
7.2 Process Design Approach 7-1
7.3 Preliminary Treatment Facilities 7-2
7.4 Primary Clarifiers 7-2
7.5 Denitrification Basin 7-2

7.6 UNOX Aeration Tanks 7-3
7.7 Secondary Clarifiers 7-4
7.8 Re-aeration 7-6

8.0 PLANT HYDRAULICS

8.1 Existing Plant Hydraulics 8-1
8.2 Modifications and Hydraulic Profile 8-1

9.0 SOLIDS HANDLING

9.1 Introduction 9-1
9.2 Gravity Thickeners 9-1
9.3 Dissolved Air Flotation Thickeners 9-1
9.4 Centrifuges 9-1
9.5 Incineration 9-3

10.0 SCAT COMPLIANCE

10.1 Introduction 10-1
10.2 Design Flows 10-1
10.3 Comparison Sizing and Design Criteria 10-1
10.4 Conclusions 10-2

11.0 PLANT SUPPORT SYSTEMS

11.1 Introduction 11-1
11.2 Non-Potable Water (NPW) System 11-1
11.3 Potable Water 11-2
11.4 Process Drains 11-2
11.5 Major Yard Piping 11-2
11.6 Stormwater Management 11-3

12.0 FACILITIES DESIGN CRITERIA

12.1 Introduction 12-1
12.2 Structural Design Criteria 12-1
12.3 Architectural Design Criteria 12-3
12.4 Heating Ventilation and Air Conditioning 12-4
12.5 Plumbing Design Criteria 12-6
12.6 Fire Protection Systems 12-6

13.0 ELECTRICAL DISTRIBUTION SYSTEM DESIGN CONSIDERATIONS

13.1 Introduction 13-1
13.2 Hopewell Regional Wastewater Treatment Facility (HRWTF) 13-1
13.3 Gravelly Run Pump Station 13-4
13.4 Design Approach 13-5

14.0 PLANT CONTROL SYSTEM IMPROVEMENTS

14.1 Introduction 14-1
14.2 HRWTF Control Equipment Additions 14-1
14.3 Gravelly Run Pump Station 14-1

15.0 PERMIT AND APPROVAL REQUIREMENTS

15.1 Permitting Requirements 15-1
15.2 Grant and Loan Funding Provisions 15-2

16.0 PROJECT IMPLEMENTATION, SCHEDULE AND COST

16.1 Construction Contracts and Project Schedule 16-1
16.2 Maintenance of Plant Operation 16-1
16.3 Contractor Laydown/Storage Area and Plant Access 16-3
16.4 Engineer's Opinion of Probable Project Costs 16-3

LIST OF FIGURES

Figure 1-1 Site Location 1-2
Figure 1-2 Existing Force Main System 1-3
Figure 3-1 North Interceptor Existing Aerial Crossing 1 3-2
Figure 3-2 North Interceptor Existing Aerial Crossing 2 3-3
Figure 3-3 Bypass Pumping Discharge Connection Point 3-4
Figure 5-1 Typical Screenings Discharge Chute 5-2
Figure 7-1 Secondary Clarifier Structural Supports and Solids Scraper Mechanisms 7-5
Figure 7-2 Secondary Clarifer No. 9 RAS Pump Header Connection Point 7-6
Figure 9-1 Existing Centrifuges 9-2
Figure 9-2 Existing Centrifuge Feed Pumps 9-2
Figure 11-1 Existing NPW Pumps 11-2
Figure 11-2 Existing Rain Garden 11-3
Figure 16-1 Project Schedule 16-5

LIST OF TABLES

Table 1-1 HRWTF Current Effluent Characteristics By Year (2005-2011) Compared to Waste Load Values 1-1
Table 1-2 Existing HRWTF Unit Process Data 1-6
Table 2-1 Current Total Influent Flows and Loads, 2005-2011 2-1
Table 2-2 Current Discharger Loadings, Annual Average, 2005-2011 2-1
Table 2-3 Design Basis Total Influent Flows and Loads, Design Average 2-2
Table 2-4 Design Basis Flow to Segregated System 2-3
Table 2-5 Design Basis Flow to Combined System 2-4
Table 2-6 Design Basis Influent Loads to MBBR System 2-4
Table 3-1 Gravelly Run Pump Station and Forcemain Design Criteria 3-1
Table 4-1 MBBR Influent Pump Station Design Criteria 4-2
Table 5-1 MBBR Wastewater Influent Screening Design Criteria 5-1
Table 6-1 MBBR System Design Criteria 6-1
Table 6-2 DAF System Design Criteria 6-5
Table 7-1 Typical Design Parameters 7-1
Table 7-2 Denitrification System Design Parameters 7-3
Table 7-3 UNOX Conversion Design Criteria 7-4
Table 7-4 Secondary Clarifier Design Criteria 7-6
Table 9-1 Gravity Thickener Design Criteria 9-1
Table 9-2 Centrifuge Design Criteria 9-1
Table 10-1 Comparison Sizing and Design Criteria 10-1
Table 11-1 NPW Pump Design Criteria 11-1

Table 11-2 Additional NPW Demands 11-1
Table 12-1 NFPA Area Classifications 12-4
Table 13-1 Utility Billing Data 13-2
Table 13-2 Electrical Load Summary 13-3
Table 16-1 Engineer's Opinion of Probable Project Costs 16-4

VOLUME 2 0F 2 - DRAWINGS

Drawing No. 0-0 Cover Sheet
Drawing No. 0-1 General Abbreviations-1
Drawing No. 0-2 General Abbreviations-2
Drawing No. 0-3 General Legend and Drawing Index
Drawing No. 0-4 Proposed Hydraulic Profile
Drawing No. 1-1 Process Flow Diagram Existing Facilities
Drawing No. 1-2 Existing Site Plan
Drawing No. 1-4 Proposed Process Flow Diagram
Drawing No. 1-5 Proposed Site Plan
Drawing No. 3-1 Gravelly Run Force Main Plan
Drawing No. 3-2 Gravelly Run Pump Station Site Plan and Force Main Partial Plan
Drawing No. 3-3 Gravelly Run Pump Station Plan
Drawing No. 3-4 Gravelly Run Pump Station Section
Drawing No. 4-1 MBBR Influent Pump Station Plans and Section
Drawing No. 6-1 Segregated MBBR System Upper Plan
Drawing No. 6-2 Segregated MBBR System Lower Plan
Drawing No. 6-3 Segregated MBBR System Sections
Drawing No. 6-4 Dissolved Air Flotation Building Plan
Drawing No. 6-5 Blower Building Plan
Drawing No. 6-6 Primary Clarifier Modifications Plan
Drawing No. 6-7 Mass Balance
Drawing No. 6-8 UNOX Conversion Plan
Drawing No. 7-1 Secondary Clarifier No. 9 Plan and Section
Drawing No. 8-1 Yard Piping Plan
Drawing No. 8-2 Partial Yard Piping Plan
Drawing No. 13-1 Proposed Electrical Site Plan
Drawing No. 13-2 Existing Overall One-Line Diagram
Drawing No. 13-3 Proposed Overall One-Line Diagram
Drawing No. 13-4 Gravelly Run Pump Station Proposed One-Line Diagram
Drawing No. 14-1 Plant Control System Site Location Plan
Drawing No. 14-2 Plant Control System Proposed Block Diagram
Drawing No. 15-1 Flood Hazard Zone
Drawing No. 15-2 Chesapeake Bay Preservation Areas
Drawing No. 15-3 Wetland Delineation Site Plan
Drawing No. 16-1 Contractor Laydown and Storage Area

EXECUTIVE SUMMARY

Background and Project Objectives

The Hopewell Regional Wastewater Treatment Facility (HRWTF) is a 50 million gallon per day (mgd) secondary wastewater treatment plant that currently treats an annual average flow of approximately 27 mgd of combined wastewater from local industries and domestic sources. Industrial loading comprises approximately 85 percent of the total flow and 90 percent of the organic loading to the HRWTF and is generated primarily by five local industries: Honeywell, Hopewell, Virginia Plant (Honeywell), Ashland Aqualon (Ashland), Evonik Goldschmidt (Evonik), RockTenn, and the Virginia American Water Company (VAWCO). Other industrial sources include leachate haulers and Fort Lee.

The HRWTF discharges effluent into Gravelly Run, a receiving stream of the James River, and a tributary of the Chesapeake Bay Watershed. As a Significant Discharger to the Chesapeake Bay, the HRWTF's allowable nutrient discharge loading is capped based on the Chesapeake Bay and its tributaries nutrient control regulations adopted by the Virginia Department of Environmental Quality (Virginia's Water Quality Management Planning Regulation 9 VAC 25-720). The current waste load allocations established for HRWTF are 1.83 million lbs/year (Mlbs/yr) of total nitrogen (TN) and 0.075 Mlbs/year of total phosphorus (TP). The HRWTF is currently below its phosphorus waste load allocations, but exceeded its TN waste load allocation in 2009 and 2010. HRWTF purchases nitrogen credits under the Nutrient Credit Exchange Program (via a private agreement with Honeywell) in order to comply with its TN waste load allocation.

Because the future market for nitrogen credit purchases is uncertain (cost for credits is not established past 2017, and future credit availability may be limited), HRWTF must implement nitrogen reduction improvements. These improvements expand on the Alternative 4A-1 Light, Phase 1 improvements completed in May 2012, which achieved segregation of the domestic flow from the industrial flow at the HRWTF. The Phase 2 improvements will reduce effluent TN to meet the current waste load allocation, and address industry requests to add capacity for increased industrial flow and load. In addition, the Phase 2 improvements will reduce HRWTF's effluent ammonia concentration.

The Phase 2 improvements are based on a segregated treatment concept, in which biological nutrient removal is achieved on only a portion of the influent flow. Achieving biological nutrient removal to comply with low effluent nutrient limits presents a challenge for HRWTF because of the industrial nature of its influent wastewater. The industrial component results in high influent temperatures that exceed 37°C (the upper limit for stable nitrification), variable influent wastewater characteristics and frequent spike loadings, potential sources of chemical inhibition of nitrification, and high concentrations of volatile organic compounds. All of these factors impact the application of biological nutrient removal at HRWTF.

Segregated treatment addresses the temperature issue associated with the main influent stream by achieving biological nutrient removal on only a portion of the influent flow. Two streams that contain a substantial nitrogen load, domestic and Honeywell, are segregated from the stream that contains the majority of the heat load, Rock Tenn. Honeywell flow to the segregated stream is capped at 40% of the design average Honeywell flow to avoid excessive nitrification inhibition. The Honeywell flow is inhibitory to nitrification, and the process stability depends on the dilution of the Honeywell flow by the domestic flow. The segregated treatment approach eliminates the need for cooling prior to biological nutrient removal. It also balances the need for biological nutrient removal on the Honeywell stream with its potential for nitrifier inhibition.

Because of Honeywell's potential for nitrifier inhibition, segregated treatment will be achieved in a moving bed biofilm reactor (MBBR) system designed for biological nutrient removal. The MBBR system was selected because of its resistance to spike loads of inhibitory compounds due both to the biofilm structure as

well as the separate BOD oxidation and nitrification fixed film compartments. It is expected that these advantages afford more protection to the nitrifying biomass from slug loads of inhibitory compounds as compared to a suspended growth system.

The Phase 2 improvements will allow HRWTF to continue to meet their TN and TP waste load allocations The segregated treatment approach sets the Limit of Technology (LOT) effluent quality for HRWTF because only a portion of the flow passes through nutrient removal. The effluent quality is determined by the dilution of the segregated flow into the remaining industrial streams. The segregated treatment system is designed to fully nitrify and partially denitrify. Combining the treated segregated system effluent with the remaining influent flow results in a final effluent total nitrogen concentration of 15.8 mg/L on an annual average basis. The Phase 2 improvements are not expected to affect effluent total phosphorus.

Phase 2 Improvements

The purpose of the Phase 2 project is to implement nitrogen removal capacity at HRWTF with:

- Year-round nitrification and partial denitrification of the domestic wastewater and a portion of the Honeywell wastewater in a segregated treatment process, and
- Anoxic capacity in the existing UNOX reactor to achieve additional denitrification of the combined nitrified segregated waste stream effluent and industrial flows.

Phase 2 project improvements will have a design average capacity of 46.4 MGD and will include the following components:

- Gravelly Run Pump Station and Forcemain Improvements: To treat the segregated stream in the MBBR treatment system, a maximum of 40% of the design Honeywell flow and all of the domestic primary effluent will be directed to the MBBR treatment system. A firm pumping capacity of 3.9 MGD will be provided for the Honeywell flow. Three new self-priming centrifugal pumps located in a new building adjacent to the Gravelly Run Pump Station and a new Gravelly Run forcemain, paralleling the existing North Interceptor, will convey this portion of the Honeywell flow to the segregated treatment system. The new forcemain will be 18-inch diameter ductile iron and will be located in the existing HRWTF easement except for a short section where it crosses Hummel Ross Road. This section will require a new easement.

- MBBR Influent Pump Station: Disinfected domestic wastewater will be conveyed to the MBBR treatment system by a new MBBR Influent Pump Station. The pump station will have a firm capacity of 33.3 MGD and will consist of four vertical turbine solids handling pumps (three operating, one standby). A new MBBR Influent Weir Box will be constructed north of the existing chlorine contact tank effluent channel. This box will have a long weir that will stabilize the water level in the chlorine contact tanks. Disinfected domestic wastewater will flow by gravity through the weir box and a new 42-inch pipe to the MBBR Influent Pump Station wetwell. The wetwell also receives flow from the MBBR tanks during tank draining through a 14-inch MBBR tank drain line.

- MBBR Screenings Facility: The industrial (Honeywell) flow must be screened before entering the MBBR to avoid plugging the media retention screens. The MBBR Screenings Facility will be attached to the the MBBR tanks. The MBBR Screenings Facility includes the MBBR screen influent chamber, two flow-through mechanical screens and the Gravelly Run/Domestic mixing chamber. Two new flow-through, perforated plate mechanical screens with 4-mm diameter openings will be provided. The new screens will be installed in the two new screen channels. Each screen is sized for the peak industrial wastewater flow to allow one screen to serve as standby unit. Screened material will be conveyed hydraulically via a water flume to screw-type washer and

compactor units installed at the top of the MBBR tank. Dewatered screenings will fall through a discharge chute and into a dumpster to be hauled off-site for landfill disposal.

- MBBR Tanks: The new MBBR system includes a combined anoxic and aerobic reactor volume of 7.66 million gallons. The treatment volume is divided into six tanks. Each tank is provided with four treatment cells. The first cell is an anoxic cell, provided with four 12-hp submersible mixers per tank. The second cell is for BOD removal and is provided with a diffused aeration grid. The third and fourth cells are for nitrification and are also provided with aeration grids. Each MBBR tank can be drained through a 14-inch drain line with screened opening for media retention located in cell 2 of each tank.

  MBBR effluent is recycled to the head of the tank using three axial flow pumps (2 operating, 1 standby). A firm capacity of 19.5 MGD, which is 1Q, is provided. This recycle flow will increase denitrification and reduce, but not eliminate, alkalinity addition requirements. Facilities to store and feed caustic (sodium hydroxide) as a source of supplemental alkalinity will be provided.

- Blower Building: To provide air and mixing in the MBBR process, new blowers will be installed with a firm capacity of 39,100 scfm. To span the range of flows anticipated, four blowers are provided, two 800 hp single-stage blowers and two 900 hp multi-stage stage blowers. Each blower will have a capacity of 13,100 scfm. The blowers will be located in the Blower Building adjacent to the MBBR tanks.

- Dissolved Air Flotation (DAF) Building: Excess biological solids discharged from the MBBR tanks must be captured and sent to the solids handling system. To accomplish this, four DAF units, each with a capacity of 6,500 gpm, will be provided. MBBR effluent will be equally split and will flow by gravity through dedicated lines to the DAF units. The DAF includes an influent flowmeter on each unit, which is used to control polymer dosing. Air bubbles are introduced into the unit using three, 40-horsepower aspirating pumps per DAF. DAF effluent will flow through combined 42-inch DAF effluent header and return to the denitrification basin influent channel. Solids are drawn from a 6-inch connection below each unit and returned to the Solids Holding Tanks using progressing cavity pumps.

  The DAF Building will house a polymer system used to feed polymer to the DAF units. This system will use dry polymer from super sacks and wet, mix and age the polymer for feed into the DAF units. The caustic storage and feed system for the MBBR tanks will also be located in the DAF Building.

- UNOX Aeration Tanks: The existing denitrification basin does not have sufficient capacity to treat the nitrate load expected under the Phase 2 design basis. The first stage of the UNOX aeration tanks will be converted to an anoxic zone to increase denitrification capacity and meet these expected loads. This will entail installation of mixers and baffle walls. Relocation of the existing aerators will be evaluated.

- Secondary Clarifier No. 9: One additional secondary clarifier is needed to meet the Phase 2 design basis flows and loads. Secondary Clarifier No. 9 will be installed north of the existing clarifiers, adjacent to Secondary Clarifier No. 1 and will be configured similar to the existing units. The new clarifier will be constructed with a new wall against the north wall of Secondary Clarifier No. 1. The existing influent channel will be extended north to convey flow into the new clarifier.

- Effluent Re-aeration: The facility currently has four OxyCharger units installed to provide re-aeration for the final effluent. The re-aeration structure includes space for a fifth unit. To meet the increase flows under the Phase 2 design basis, the fifth OxyCharger unit will be installed.

- Solids Handling Improvements: Solids loads will increase under the Phase 2 design basis. To meet these increased loads, a third dewatering centrifuge and additional solids handling capacity are needed. The additional centrifuge will be installed adjacent to the existing centrifuges in the Solids Handling Building. Additional solids disposal capacity will be needed to process the design basis solids production. It is recommended that a solids management plan be initiated within the next two years to evaluate solids reuse and disposal technologies to identify the most cost-effective and sustainable approach to providing additional capacity.

Project Schedule and Cost

Following completion of the PER, the proposed treatment process will be pilot-tested at the HRWTF site for approximately six months to demonstrate that MBBR system treating the proposed blend of Honeywell and domestic flow will achieve the target effluent goals. Following the pilot work, detailed design will begin on the Phase 2 improvements. The completed design will be advertised for bids under a single contract. Prior to initiating detailed design, alternative project delivery methods, such as design-build, will be considered for this project.

The proposed schedule for the Phase 2 project is based on a construction start in the fall of 2014. The Phase 2 facilities will be substantially complete by mid-2017. Final completion is planned for fall of 2017.

The Engineer's preliminary opinion of probable construction cost (OPCC) for the Phase 2 improvements as described in this Preliminary Engineering Report is $60,287,000. This OPCC does not include escalation to the midpoint of construction and does not include the cost of additional solids disposal capacity. Escalation will depend on market conditions at the time of bidding. When engineering services, legal and administrative costs and construction phase changes are included, the total project cost is estimated to be $74,153,000.

Use of excess high purity oxygen from the existing Oxygen Generation Plant for process aeration in the MBBR tanks may result in substantial cost savings. This is currently being evaluated by the MBBR vendor and will be considered during the design phase.

1.0 INTRODUCTION

1.1 Background and Project Objectives

The Hopewell Regional Wastewater Treatment Facility (HRWTF) is a 50 million gallon per day (mgd) secondary wastewater treatment plant that currently treats an annual average flow of approximately 27 mgd of combined wastewater from local industries and domestic sources. Industrial loading comprises approximately 85 percent of the total flow and 90 percent of the organic loading to the HRWTF and is generated primarily by five local industries: Honeywell, Hopewell, Virginia Plant (Honeywell), Ashland Aqualon (Ashland), Evonik Goldschmidt (Evonik), RockTenn, and the Virginia American Water Company (VAWCO). Other industrial sources include leachate haulers and Fort Lee.

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Table 1-1 HRWTF Current Effluent Characteristics by Year (2005-2011) Compared to Waste Load Values

	Total By Year (Mlb/yr)							Waste Load Allocation
Parameter	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**(Mlb/yr)**
Phosphorus-P	ND	ND	ND	0.048	0.013	0.028	0.020	0.075
TN-N	1.27	1.55	4.14	1.57	1.88	2.02	1.77	1.83

ND – no data available

Because the future market for nitrogen credit purchases is uncertain (cost for credits is not established past 2017, and future credit availability may be limited), HRWTF must implement the Phase 2 improvements. The Phase 2 improvements expand on the Alternative 4A-1 Light, Phase 1 improvements completed in May 2012. The Phase 2 improvements are designed to reduce effluent TN to meet the waste load allocation, and address industry requests to add capacity for increased industrial flow and load.

The purpose of this Preliminary Engineering Report is to present the basis of preliminary design and sizing for the Phase 2 improvements.

1.2 Existing Facilities

The HRWTF was constructed in the 1970's as a 50-mgd secondary wastewater treatment facility to treat a combination of partially treated domestic wastewater and industrial wastewater. The original facility was designed for solids and organics removal and includes liquid stream treatment units and solids handling facilities. Liquid treatment processes include primary and secondary treatment. Solids generated from primary and secondary treatment are thickened, dewatered, and incinerated. The facility was upgraded in 1997 to replace the original heat treatment and solids dewatering treatment system with a centrifuge dewatering facility. Another facility upgrade was completed in 2002 to achieve partial nitrogen removal by incorporation of a denitrification basin in the existing biological treatment process for denitrification of

nitrates present in the influent wastewater. In 2012, the Alternative 4A-1 Light Phase 1 project was completed, which relocated domestic primary treatment from the satellite Primary Plant to the Regional facility.

Figure 1-1 shows the site location of the HRWTF. Drawing 1-1 presents a process flow diagram for the existing treatment processes. Drawing 1-2 illustrates a site plan of the existing facilities. Note that all drawings are contained in Volume 2 of the PER.

Influent Flow

Domestic wastewater from the City of Hopewell is conveyed via dedicated force main to the HRWTF for preliminary treatment, primary treatment, and disinfection. Industrial wastewater is conveyed to the HRWTF separately from the domestic wastewater. A simplified flow diagram of the existing force main system is shown in Figure 1-2. One segregated industrial waste stream is discharged directly to the biological treatment process at the HRWTF. This waste stream, referred to hereafter as the Hazardous Air Pollutant (HAP) waste stream, consists of foul condensate collected from the pulping process at the RockTenn facility. In early 2001, RockTenn (formerly Smurfit-Stone) completed construction of a foul condensate pipeline and feed system that conveys foul condensate collected from the pulping process and discharges it directly to biological treatment process at the HRWTF. The purpose of the pipeline is to minimize the emission of HAPs by discharging the methanol-rich foul condensate stream directly to a closed biological treatment system where the HAPs can be biologically degraded.

Figure 1-1 Site Location

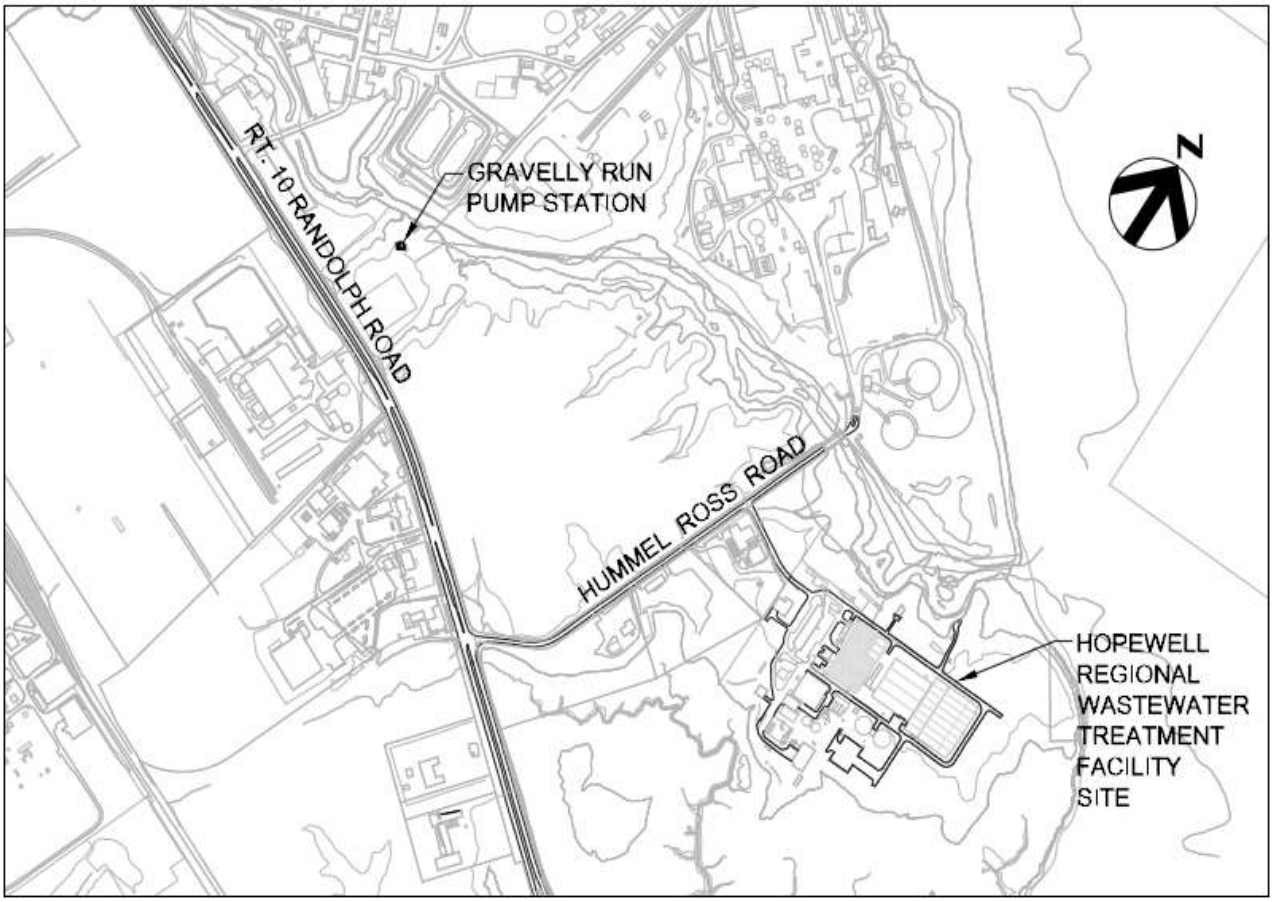
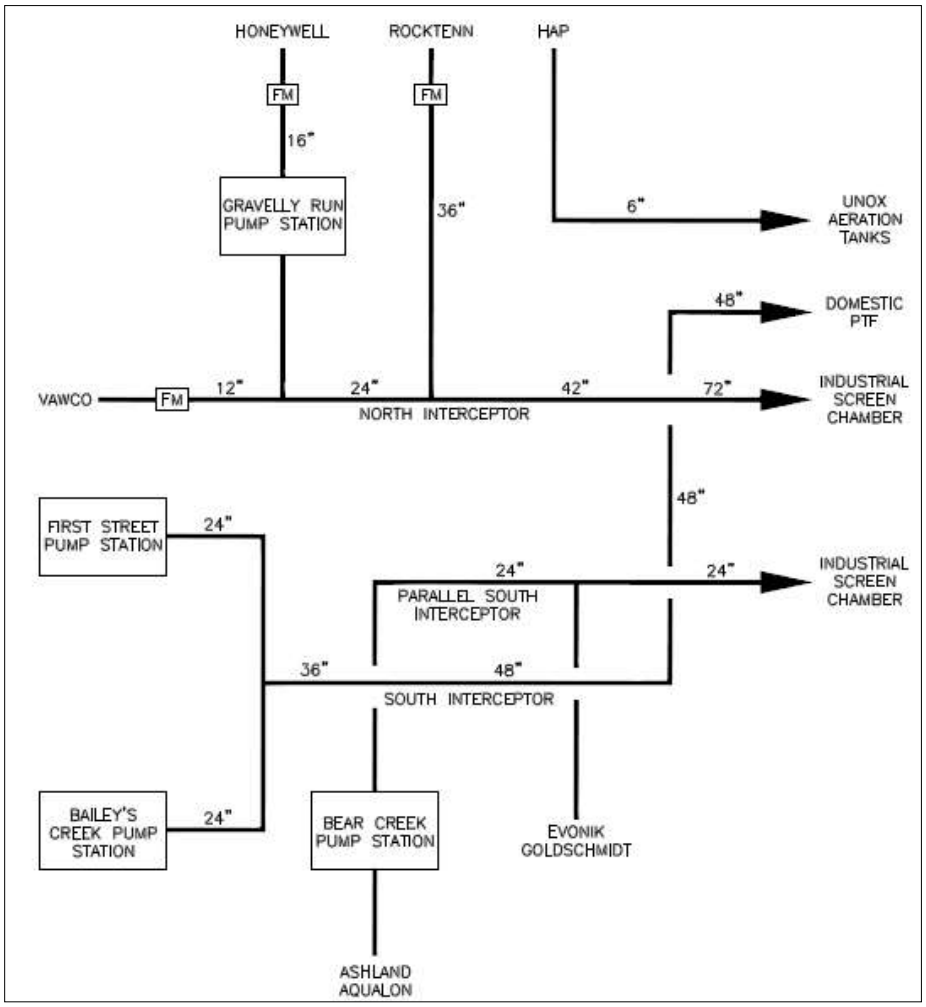


Figure 1-2 Existing Force Main System



HRWTF Liquid Treatment Processes

The HRWTF liquid treatment process includes preliminary, primary, and secondary treatment. Separate preliminary treatment facilities are provided for domestic and industrial flows. Preliminary treatment includes screening, grit removal, and flow measurement in a Parshall flume. Separate primary treatment systems are also provided. The primary treatment system includes seven common wall rectangular clarifiers for removal of influent solids. Three of the primary clarifiers are dedicated to primary treatment of domestic wastewater; four of the primary clarifiers are dedicated to treatment of industrial wastewater. Recycle streams from the solids handling system (centrifuge centrate and gravity thickener overflow are combined with the domestic wastewater at the head of the dedicated domestic primary clarifiers. Scrubber blowdown is combined with the industrial wastewater at the head of the dedicated industrial primary clarifiers. Domestic flow is disinfected with sodium hypochlorite in chlorine contact tanks after primary clarification, then the disinfected domestic flow combines with the industrial primary clarifier effluent in the denitrification influent channel. After primary treatment, the wastewater undergoes secondary treatment.

The secondary, biological treatment system includes a denitrification basin for denitrification of influent nitrates and nitrites, and a high purity oxygen (HPO) activated sludge system in a Union Carbide (UNOX) process. The denitrification basin consists of a single basin, which was originally Primary Clarifier No. 8, for biological conversion of influent nitrates and nitrites to nitrogen gas. A concrete and FRP dividing wall

is installed in the middle of the denitrification basin to create two 20-foot wide passes in the basin. Eight submersible mixers are installed in the basin to maintain the mixed liquor in suspension. The denitrification basin effluent is conveyed to a UNOX distribution chamber located between the primary clarifiers and the UNOX aeration tanks for flow distribution to the four UNOX treatment trains. The UNOX treatment system consists of four common wall covered basins. Each basin has four stages to allow tapered aeration. In the past, HRWTF has operated with the mixers turned off in the first stage of the UNOX treatment system so that this stage can be used as an anoxic selector. At this time, the first stage is not being operated as an anoxic selector, and the surface aerators in this stage are online. As the wastewater passes through the anoxic and aerobic zones, degradable organics are metabolized by the activated sludge in the basins.

Secondary clarification is accomplished in eight common wall rectangular clarifiers. A portion of the activated sludge settled in the secondary clarifiers is recycled to the front of the denitrification basin as return activated sludge (RAS). A total of eight variable speed drive RAS pumps provide a 24-mgd RAS capacity (approximately 50% of the influent design flow). The remaining settled biomass in the secondary clarifiers is wasted to maintain the solids retention time (SRT) in the biological treatment system. The SRT of the biological treatment system (denitrification basin and UNOX system combined) is typically between 5 and 6 days. Because the solids inventory in the secondary clarifiers is larger than the solids inventory in the UNOX basins, the total SRT is significantly higher than the biological treatment system SRT. The total SRT typically averages 14 to 15 days.

Secondary clarifier effluent passes through a re-aeration system prior to discharge to Gravelly Run, a tributary of the James River. The re-aeration system consists of four OxyCharger units. Each unit consists of a stainless steel weir and column structure, designed to encourage atmospheric oxygen transfer to increase the effluent dissolved oxygen concentration. Disinfection of the secondary effluent is not required due to prior disinfection of the domestic flow in the chlorine contact tanks upstream of the denitrification basin.

HRWTF Solids Treatment Processes

Solids generated from primary and secondary clarification are thickened, dewatered, and incinerated. The solids handling facilities included gravity thickeners, dissolved air flotation thickeners (DAFTs), centrifuges, and a multiple hearth incinerator.

Primary solids are thickened in two gravity thickeners. The gravity thickeners can also receive DAFT flow equalization overflow and effluent (when in service) and centrifuge centrate. Gravity thickener overflow is pumped to the head of the domestic primary clarifiers.

WAS can be thickened in the DAFTs, recycled to the industrial primary clarifiers for co-thickening, or routed to a solids holding tank for dewatering. Prior to 2006, HRWTF routed the WAS to the primary clarifiers for co-thickening. During this time, the DAFT units were not in service. In mid-2006, HRWTF rerouted WAS to the DAFTs to reduce ammonification of particulate TKN in the primary clarifiers. In 2007, HRWTF resumed co-thickening of WAS in the primary clarifiers. The DAFTs are not currently in service.

Thickened solids from the gravity thickeners and the DAFT units are conveyed to the solids holding tanks prior to dewatering by centrifugation. The HRWTF is equipped with two centrifuges for dewatering of thickened solids (3,850 lb/hr at 50% primary solids and 50% WAS solids blend). Thickened solids are pumped from the solids holding tanks to the centrifuges using progressing cavity pumps. Dewatered solids are pumped to a multiple hearth incinerator for incineration using high-pressure piston pumps. Centrate is pumped to the domestic preliminary treatment facility via the SNR line.

Centrifuge cake is incinerated in a single 22'-3" diameter, eight-hearth furnace. HRWTF also can accept foreign dewatered solids for incineration. The incinerator off-gas system includes an afterburner, pre-cooler, venturi scrubber, impingement scrubber, and mist eliminator. Scrubber blowdown is conveyed to the head of the industrial primary clarifiers. An independent contractor hauls the incinerator ash to an off-site landfill for disposal.

HRWTF Current Mode of Operation

HRWTF currently operates to achieve organics, solids, nitrate, and nitrite removal. The facility does not currently achieve nitrification. A previous study[1] indicated nitrification cannot be achieved in the existing activated sludge treatment system.

With a few exceptions, the current mode of operation is in accordance with the treatment system design. Influent wastewater undergoes preliminary, primary, and secondary treatment, as described above. The plant typically operates with all primary clarifiers, biological reactors, and secondary clarifiers in service, unless a tank needs to be taken out of service for routine or other maintenance.

Although the facility was designed based on a very low operating SRT of less than 2 days in the biological reactors, HRWTF typically operates at an SRT of between 5 and 6 days in the biological reactors. HRWTF operational staff has noted that is it difficult to maintain a lower SRT with potential solids wash-out conditions occurring during high flow and upset events. To protect against washout conditions, the system is operated at a higher SRT in comparison to original design conditions.

Since actual oxygen demands are typically well below the oxygen transfer capacity, HRWTF operational staff sometimes keep the first stage of the UNOX mixers off to provide a temporary anoxic / anaerobic selector in the UNOX reactor. Operation of the temporary selector achieves energy savings and assists with filamentous bacteria control. The first stage mixers in the UNOX reactor are operated when oxygen demands are high and oxygen transfer capacity of Stage 2 through 4 mixers cannot accommodate the oxygen demand. At this time, the first stage mixers are online.

Solids handling operations are also modified slightly from the original design intent. HRWTF does not typically operate the DAFTs. WAS solids are directed to the industrial primary clarifiers for co-thickening of primary and secondary solids. All of the solids captured in the primary clarifiers are routed to the gravity thickeners and then dewatered.

Sizing and capacity data for major unit process facilities and equipment for the existing facility are summarized in Table 1-2.

[1] Treatment Plant Process Enhancement and Enrichment Investigation, Hopewell Regional Wastewater Treatment Facility. Malcolm Pirnie, 1998-1999.

Table 1-2 Existing HRWTF Unit Process Data

Facility and Equipment	Units	Value
Domestic Influent Screening		
Type	-	Mechanically-cleaned perforated plate
Number	No.	2
Perforation Size	mm	6
Industrial Influent Screening		
Type	-	Mechanically-cleaned perforated plate
Number	No.	2
Perforation Size	mm	6
Domestic Grit Tanks		
Type	-	Stirred vortex
Number	No.	2
Diameter	ft	24
Industrial Grit Tanks		
Type	-	Trapezoidal grit channel
Number	No.	3
Width	ft	1.75 (floor), 8 (surface)
Length	ft	65
Domestic Primary Clarifiers		
Number	No.	3
Dimensions	ft	40 W x 135.75 L x 11.4 D
Total surface area	ft^2	15,915
Total volume	MG	1.35
Industrial Primary Clarifiers		
Number	No.	4
Dimensions	ft	40 W x 200 L x 10.5 D
Total surface area	ft^2	32,000
Total volume	MG	2.52
Domestic Chlorine Contact Tanks		
Number	No.	3
Total volume	MG	0.6
Denitrification Basin		
Number	No.	1
Number of passes	No.	2
Total volume	MG	0.63
UNOX AerationTanks		
Number	No.	4
Trains per tank	No.	4
Aeration System	-	Mechanical surface aerator
Aerator HP (Zone 1 / 2 / 3 / 4)	HP	150 / 125 / 100 / 75
Dimensions, each	ft	60 W x 240 L x 13.5 D
Total volume	MG	5.8
Oxygen Generation Plant		
Maximum capacity	tons/day	100
Turndown (minimum capacity)	tons/day	70
No. Compressors	No.	2 (one original, one replacement)
Compressor horsepower	HP	2250 (original), 1500 (replacement)

Table 1-2 Existing HRWTF Unit Process Data (continued)

Facility and Equipment	Units	Value
Secondary Clarifiers		
Number	No.	8
Dimensions, each	ft	40 W x 285 L x 13.5 D
Total volume	MG	9.2
RAS Pumps – number	No.	8
RAS Pumps – total capacity	mgd	24
Re-aeration System		
Type	-	Oxycharger
Number	No.	4
Gravity Thickeners		
Number	No.	2
Diameter	ft	95
Side Water Depth	ft	10
DAF Thickeners		
Number	No.	3
Dimensions	ft	20 W x 49 L x 12.8 D
Solids Holding Tanks		
Number	No.	2
Dimensions	ft	45 W x 45 L
Side Water Depth	ft	24
Centrifuges		
Number	No.	2
Capacity, each	lb/hr	3,850
Incinerator		
Type	-	Multiple hearth furnace
No. hearths	No.	8
Diameter	ft	22'-3"

1.3 Alternative 4A-1 Light, Phase 2 Project

The purpose of the Phase 2 project is to upgrade the existing HRWTF nutrient removal capacity to include a segregated treatment process to provide year-round nitrification and partial denitrification of the domestic wastewater and a portion the Honeywell wastewater in a segregated treatment process and add denitrification capacity in the existing UNOX reactor to achieve additional denitrification of the combined segregated waste stream effluent and industrial flows. The recommended process improvements consist of a new moving bed biofilm reactor (MBBR) to treat combined domestic and a portion of Honeywell flow in a segregated treatment system. The MBBR system was selected because it is believed to be more resilient than a suspended growth system to potential spike loadings of inhibitory compounds due to its biofilm structure combined with its multiple treatment zones.

Phase 2 project improvements include the following components:

- Gravelly Run Pump Station and Forcemain Improvements
- MBBR Influent Pump Station
- MBBR Screening Structure
- MBBR Biological Treatment System
- Dissolved Air Flotation units
- Secondary Clarifier No. 9
- Additional Re-aeration Unit
- Solids Handling Improvements

Drawing 1-4 shows a process flow diagram for the proposed improvements. A site plan for the proposed improvements is shown in Drawing 1-5.

1.4 Organization of the Preliminary Engineering Report

The Preliminary Engineering Report is organized in two volumes. Volume 1 includes the body of the Report, including all referenced tables and figures. Drawings referenced in Volume 1 are provided in 11-inch by 17-inch format in the separately-bound Volume 2.

The remaining sections of Volume 1 of this PER describe the design criteria and configuration for the Phase 2 improvements, as well as key permitting, construction, and project implementation considerations. A summary of design flows and loads and other key design criteria is followed by process-by-process descriptions of the recommended improvements. Construction sequencing and maintenance of plant operations considerations are discussed. The preliminary opinion of probable construction cost and a preliminary design and construction schedule are also presented.

2.0 WASTEWATER CHARACTERISTICS, PROCESS DESIGN CRITERIA, AND SEGREGATED TREATMENT APPROACH

2.1 Introduction

This chapter summarizes current and design basis wastewater influent flows and loads for HRWTF and presents the segregated treatment approach for the Phase 2 improvements at the design average flow of 46.4 mgd.

2.2 Current Influent Flows and Loads

Current HRWTF influent flows and loads were analyzed using daily flow and load data as reported in the monthly performance reports for the seven year period from 2005 through 2011. HRWTF influent is referred to as Total Influent and consists of influent measured at the industrial and domestic mechanical screens combined with HAP influent (fed directly to UNOX aeration tanks). Total influent flows and loads for 2005 through 2011 are summarized in Table 2-1. Table 2-2 shows the individual industrial and domestic contributions to this Total Influent.

Table 2-1 Current Total Influent Flows and Loads, 2005-2011

Parameter	Lowest Yearly Average	2005-2011 Average	Highest Yearly Average	Maximum 30-Day Average
Flow, mgd	26.8	28.0	29.0	32.4
BOD, lb/day	73,200	76,830	81,980	107,600
TSS, lb/day	41,240	46,340	52,880	70,550
TKN, lb/day	6,670	7,340	7,950	10,180
NH_4-N, lb/day	3,180	3,530	4,000	5,620
NO_X-N, lb/day[1]	910	1,146	1,340	3,440
Temperature, deg C	33.5	33.8	34.6	42.2
Heat Load, MBtu/day	14,090	14,390	15,330	19,560

1. NO_x based on 2007-2011 data to reflect shutdown of adipic acid stream at Honeywell in 2006.

Table 2-2 Current Discharger Loadings, Annual Average, 2005-2011

Contributor	Flow mgd	BOD ld/d	TSS[1] lb/d	TKN-N lb/d	NH_4-N lb/d	NO_X-N[2,3] lb/d	Heat Load Mbtu/d
Primary Plant Influent	4.8	7,530	8,130	1,366	723	12	1,651
Ashland	2.0	19,641	2,220	253	34	2,390	1,166
Honeywell	6.4	20,131	1,750	4,411	2,150	98	3,925
RockTenn	12.3	14,153	40,450	275	89	29	6,696
RockTenn HAP	0.4	12,390	26	641	527	3	256
VAWCO	2.0	-	7,824	75	6	5	660
Evonik	0.1	2,985	292	319	2	0	37
Total	28.0	76,830	60,692	7,340	3,530	2,537	14,390

Notes:
1. Total individual TSS load is higher than measured Total Influent TSS load due to HRWTF sampler inaccurately reporting TSS.
2. NO_x is based on 2007-2011 data to reflect shutdown of adipic acid stream at Honeywell in 2006.
3. Total individual NO_x-N load is higher than measured Total Influent NO_x-N load due to denitrification in the collection system.

Influent nitrates (NO_x-N) are a result of contributions primarily from Ashland Aqualon (Ashland). Until May 2012, Ashland industrial flows were conveyed in a combined system with disinfected domestic flow from the Primary Plant. Starting in May 2012, flow from Ashland is conveyed in a dedicated forcemain. It is anticipated that the influent nitrate load at the head of the plant will increase due to reduced denitrification in the collection system since the domestic flow and Ashland flow are no longer combined.

Due to the heat load from the industrial dischargers, the influent wastewater temperature routinely exceeds 37ºC, the upper temperature limit for stable nitrification. The maximum day influent temperature can reach 45°C and typically exceeds 37°C for three months during the summer.

2.3 Design Basis Flows and Loads

The proposed Phase 2 improvements design average flow is 46.4 mgd. The plant's existing hydraulic capacity of 73 mgd will not be changed. Projected flow and load increases from contributing industries were combined with domestic growth projections to generate Phase 2 design flows and loads. The Total Influent flows and loads are shown in Table 2-3.

Table 2-3 Design Basis Total Influent Flows and Loads, Design Average

Contributor	Flow mgd	BOD lb/d	TSS lb/d	TKN-N lb/d	Ammonia -N lb/d	NOX lb/d	Heat Load Mbtu/day
City Domestic	7.3	11,160	12,720	1,792	916	40	2,592
Ashland	3.2	38,510	4,732	492	75	7,370	2,259
Honeywell	9.3	35,545	2,751	8,064	4,593	512	6,975
RockTenn	17.0	28,457	92,945	464	201	61	10,472
RockTenn HAP	0.7	26,414	35	1,392	1,259	51	406
VAWCO	1.3	0	14,503	74	7	13	482
Evonik	0.1	3,690	304	351	3	1	71
Future City Domestic	7.4	12,416	13,108	2,198	1,062	41	2,639
Total	46.4	156,193	141,135	14,830	8,120	8,090	25,898

2.4 Segregated Treatment Concept

Achieving biological nutrient removal presents a challenge for HRWTF because of the industrial nature of its influent wastewater. The industrial component results in high influent temperatures that exceed 37°C (the upper limit for stable nitrification), variable influent wastewater characteristics and frequent spike loadings, potential sources of chemical inhibition of nitrification, and high concentrations of volatile organic compounds. All of these factors impact the application of biological nutrient removal at HRWTF. To compensate for high influent temperatures, influent cooling would be required to achieve biological nutrient removal on the entire influent flow. As described in an earlier report[1], cooling is not recommended because of the potential for VOC stripping due to the industrial nature of the influent and because of extreme biological growth that would occur on the cooling tower media. To avoid cooling and still meet effluent nutrient goals, the process design is based on segregated treatment of a portion of the influent flow through biological nutrient removal, followed by mixing with the remaining influent streams for additional treatment.

[1] Basis of Design Report, Hopewell Regional Wastewater Treatment Facility. HDR, July 2007.

Segregated treatment addresses the temperature issue associated with the main influent stream by achieving biological nutrient removal on only a portion of the influent flow. Two streams that contain a substantial nitrogen load, domestic and Honeywell, are segregated from the stream that contains the majority of the heat load, Rock Tenn. Honeywell flow to the segregated stream is capped at 40% of the design average Honeywell flow to avoid excessive nitrification inhibition. The Honeywell flow is inhibitory to nitrification, and the process stability depends on the dilution of the Honeywell flow by the domestic flow. The segregated treatment approach eliminates the need for cooling prior to biological nutrient removal. It also balances the need for biological nutrient removal on the Honeywell stream with its potential for nitrifier inhibition.

Treatment will be achieved in a segregated treatment system designed for biological nutrient removal using a moving bed biofilm reactor (MBBR) system. The MBBR system was selected as more resistant to spike loads of inhibitory compounds due both to the biofilm structure as well as the separate BOD oxidation and nitrification fixed film compartments. These advantages afford more protection to the nitrifying biomass from slug loads of inhibitory compounds as compared to a suspended growth system. All of the domestic primary effluent (14.7 mgd design average flow plus solids handling recycle stream flow), and up to 40% of the Honeywell waste flow (3.7 mgd design average flow) would be directed to a new MBBR treatment system. The maximum Honeywell flow to the segregated stream is capped to reduce the likelihood of known inhibitory compounds in the Honeywell stream impacting nitrification in the MBBR system. The estimated maximum temperature for this waste stream is below 37 ºC, which eliminates the need for cooling. Denitrification in the segregated treatment system is achieved by an internal recycle that returns high nitrate effluent to the anoxic tank in Cell 1 of the MBBR. Solids separation after the MBBRs is performed using dissolved air flotation units. Additional denitrification of the combined flow is achieved in the denitrification basin and the first stage of the UNOX aeration tanks, which will be converted to an anoxic cell. The nitrified effluent from the segregated MBBR system will be mixed with the other industrial primary effluent flows prior to the denitrification basin. There is no return activated sludge with the MBBR system.

2.5 Segregated Treatment System Design Criteria and Performance

The design basis influent flows to the segregated system are shown in Table 2-4. The treated segregated effluent is returned upstream of the denitrification basin. After combining the treated segregated effluent with the remaining flows, the flow stream is referred to as combined flow. The combined flow passes through denitrification, UNOX aeration tanks, secondary clarifiers, re-aeration, and is discharged to Gravelly Run. The flows to the combined treatment system are shown in Table 2-5.

Table 2-4 Design Basis Flow to Segregated System

	Honeywell Flow (mgd)	Domestic Flow (mgd)	Recycles (mgd)	Total Flow to Segregated System (mgd)
Minimum Day	1.1	2.78	0.9	4.8
Minimum 7-Day	1.6	2.94	0.9	5.4
Design Average	3.7	14.7	1.25	19.7
Peak Day	3.9	28.4	1.25	33.6
Peak Hydraulic	3.9	32.0	1.25	37.2

Table 2-5 Design Basis Flow to Combined System

	Combined Influent Flow (mgd)	Recycles (mgd)	Total Flow to Combined System (mgd)
Minimum Day	27.0	0.9	27.9
Design Average	46.4	1.25	47.7
Peak Day	68.8	1.25	70.0
Peak Hydraulic	71.8	1.25	73.0

Table 2-6 lists the design basis influent loads to the MBBR system. The MBBR segregated treatment system is designed to fully nitrify.

Table 2-6 Design Basis Influent Loads to MBBR System

Parameter	Design Average (lbs/day)	Peak Day (lbs/day)
BOD	37,821	78,528
CBOD	34,039	70,675
TSS	19,431	36,840
COD	75,641	157,057
TKN	9,215	11,680
NOx-N	285	474
Alkalinity	28,978	

Honeywell Flow and Load Control

The MBBR system is designed to treat a maximum of 40% of the design basis Honeywell flow. The Honeywell flow to the MBBR system is controlled by both the total Honeywell flow and the domestic flow. Because the Honeywell flow is inhibitory to nitrification, the domestic flow is needed to dilute the Honeywell flow and limit the concentration of inhibitory compounds in the MBBR system. Chapter 3 discusses the Gravelly Run Pump Station pump controls that determine the amount of Honeywell flow to send to the MBBR system.

Because the nitrifying population is fixed based on the average influent TKN load, peak day influent TKN spikes can result in breakthrough of ammonia from the MBBR system and failure to meet effluent targets, particularly peak-day effluent ammonia-N LOT. Development of a Honeywell TKN local limit for peak loads is recommended. Based on BioWin dynamic modeling, it is recommended that the Honeywell peak day TKN load be capped at two times the Honeywell annual average TKN load for that respective year. The caps will increase as the Honeywell load increases. Such a local limit will protect the MBBR system from ammonia breakthrough due to spike influent TKN loads.

Temperature

Results from the TPPEE investigation[2] showed that nitrification could be sustained up to 42 ºC; however because substantially lower nitrification rates occur at temperatures above 37 ºC, larger basin volumes are required to nitrify above 37 ºC. A heat load balance was performed to estimate MBBR influent temperatures. Based on the heat load balance results, the MBBR system will operate below 37 ºC. The process design is based on maintaining the maximum 7-day temperature below 37 ºC and the maximum day temperature below 38 ºC.

[2] Treatment Plant Process Enhancement and Enrichment Investigation, Hopewell Regional Wastewater Treatment Facility. Malcolm Pirnie, 1998-1999.

2.6 Design Basis Effluent Quality

The Phase 2 improvements design basis will allow HRWTF to meet their TN and TP waste load allocations. The segregated treatment approach sets the Limit of Technology (LOT) effluent quality for HRWTF because only a portion of the flow passes through nutrient removal. The effluent quality is determined by the dilution of the segregated flow into the remaining industrial streams. The segregated treatment system is designed to fully nitrify and partially denitrify.

With the implementation of the Phase 2 improvements, the final effluent TN concentration is anticipated to be 15.8 mg/l on an annual average basis. The Phase 2 improvements are not expected to affect effluent total phosphorus.

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3.0 GRAVELLY RUN PUMP STATION AND FORCEMAIN

3.1 Introduction

This chapter describes the modifications and configuration of the Gravelly Run Pump Station and new Gravelly Run Force Main required to direct a portion of the Honeywell flow to the segregated treatment system.

3.2 Existing Gravelly Run Pump Station and North Interceptor

Two 150-horsepower dry pit submersible pumps, located in Gravelly Run Pump Station, direct screened Honeywell flow to the HRWTF industrial screen chamber via the North Interceptor force main located within the 30-foot wide HRWTF easement. Chapters 13 and 14 describe the existing electrical and SCADA systems at Gravelly Run Pump Station.

3.3 Gravelly Run Pump Station and Forcemain Improvements

To treat the segregated stream in the MBBR treatment system, a maximum of 40% of the design Honeywell flow and all of the domestic primary effluent will be directed to the MBBR treatment system. Honeywell flows to the MBBR system are listed in Table 2-4. A firm pumping capacity of 3.9 MGD will be provided for the Honeywell flow, with the ability to turn down flow to meet the 1.1 MGD minimum.

New self-priming centrifugal pumps located at Gravelly Run Pump Station and a new Gravelly Run Force Main, paralleling the existing North Interceptor, will convey this portion of the Honeywell flow to the segregated treatment system. Three new, 50-horsepower self-priming centrifugal electrical pumps with variable speed drives (VFDs) will be installed inside a new building located east of the Gravelly Run Pump Station wet well. The pumps will draw suction directly from the wet well and discharge into a new, 18-inch ductile iron Gravelly Run force main installed parallel to the existing North Interceptor in the existing HRWTF easement as shown on Drawing 3-1. Table 3-1 shows the design criteria for the Gravelly Run Pump Station and Force Main. Electrical equipment related to new pumps including the VFDs will be housed in the new building. Drawing 8-1 shows the Gravelly Run Force Main routing within the HRWTF site.

Table 3-1 Gravelly Run Pump Station and Forcemain Design Criteria

Process Equipment	Units	Quantity or Description
Pumps		
Number of Pumps	No.	3 (2 operating, 1 standby)
Type	----	Self-Prime Centrifugal Pumps
Rated Capacity		
Flow, each	gal/min	1,355
Total discharge head	Ft	49
Firm capacity	Mgd	3.9
Motor Size	Hp	50
Drive Type	----	Variable Frequency
Suction Size	In	8
Discharge Size	In	8
Force Main		
Length	Linear Feet	4,500
Nominal Diameter	Inch	18
Pipe Material	----	Ductile Iron

The new pumps will have a firm capacity with one pump out of service of 3.9 mgd and total discharge head of 49 feet. The variable frequency drives will be provided with manual local control and SCADA automatic control. In manual mode, the pump speed can be controlled locally at the pump. In automatic mode, the pump speed will be controlled by the SCADA system at HRWTF based on the flow signal from the Domestic Preliminary Treatment Facility Parshall flume. SCADA will control Honeywell flow to the segregated treatment system as an adjustable percentage of the domestic influent flow. Total Honeywell flow will also be monitored to ensure that a sufficient amount of Honeywell flow is diverted to the segregated treatment system to meet effluent quality requirements.

Drawings 3-2, 3-3 and 3-4 show the arrangement of three new and two existing pumps, suction and discharge piping and building footprint. Three 8-inch discharge pipes will manifold into an 18-inch diameter discharge header. A swing check valve and isolation valve will be provided on each pump discharge pipe prior to the discharge header. The 18-inch Gravelly Run Force Main will be routed parallel to the existing force main. The total length of the Gravelly Run force main will be approximately 4,500 linear feet. Based on a field investigation, areas of the existing easement will require regrading to rebuild and repair eroded areas and provide sufficient width for installation of the new Gravelly Run force main. In addition to the easement regrading work, a plan for paralleling the existing aerial crossings will need to be developed. The existing force main has two locations of aerial crossings, shown in Figures 3-1 and 3-2. The Gravelly Run force main will be installed on new piers adjacent to the existing piers. A wetlands delineation will be needed within the easement, and a wetlands disturbance permit will likely be required. At Hummel Ross Road, an area of new easement will be needed to route the Gravelly Run force main around the existing 48-inch domestic influent line, as shown on Drawing 3-2. The location of the HAP line is unknown in this area, and the HAP line will need to be field located during the design phase.

Figure 3-1 North Interceptor Existing Aerial Crossing 1

Figure 3-2 North Interceptor Existing Aerial Crossing 2

3.4 Bypass Pumping During Construction

The Gravelly Run Pump Station wetwell will need to be shut down, dewatered, and cleaned for access to install the new pump suction lines. Discussions with HRWTF indicate that the longest duration the station can be offline is approximately six hours. There is an existing bypass line around Gravelly Run Pump Station, but the gravity flow from Honeywell does not have enough pressure to bypass the pump station and reach HRWTF. Bypass pumping will be required to shutdown the wetwell for installation of the suction lines. Actual installation will require approximately two days, assuming all components are on site before the work begins. To allow time for dewatering and cleaning the wetwell, a shutdown duration of five days is recommended. This will also allow time for electrical connection work inside the station while it is offline.

Bypass pumps will be installed west of the existing gravity line, as shown on Drawing 3-2. Total firm capacity of 10 MGD with 100% redundant capacity will be required. Current design average Honeywell flow is 8.5 MGD, and peak flow is 9.2 MGD. The bypass pump configuration will be finalized during the design phase. Bypass pump suction will be piped to the wetwell influent screen chamber, shown on Drawing 3-3. A temporary bulkhead will be installed over the screen opening to shutoff flow into the pump station wetwell. Depending on the bypass pumps selected, the available suction volume in this chamber may not be adequate. In that case, a new manhole will be installed on the gravity line upstream of the pump station for use as a pump suction wetwell. The bypass pump discharge will be connected to an existing blind flange and shutoff valve used during previous station bypasses, shown in Figure 3-3, located east of the station along HRWTF's easement, and shown on Drawing 3-2.

Figure 3-3 Bypass Pumping Discharge Connection Point

3.5 Impact on Existing Gravelly Run Pumps 1 and 2

Because the new pumps will be drawing suction from the same wetwell, the existing Gravelly Run Pumps 1 and 2 will operate at lower capacity when the new pumps come online. During peak flow conditions, Pumps 1 and 2 will operate at 7.0 MGD, which is approximately 64% lower than their current peak of 10.9 MGD. This will shift their operating point left on the curve. At minimum flow, it is expected that Pumps 1 and 2 will operate intermittently, because the existing pump efficiencies drop off significantly below 2.9 MGD. The impact of reduced flows and intermittent operation on pump efficiency should be evaluated during design.

4.0 MBBR INFLUENT PUMP STATION

4.1 Introduction

This chapter describes the MBBR Influent Pump Station, which conveys disinfected domestic flow to the MBBR system. Chlorine contact tank effluent will be diverted to the MBBR and dissolved air flotation units before returning to Denitrification Basin. Plant hydraulics, described in Chapter 8, require domestic wastewater to be pumped from the chlorine contact tanks to the MBBR Influent Channel.

4.2 Pump Station Influent

Disinfected domestic wastewater will be conveyed by a 42-inch gravity pipe to the MBBR Influent Pump Station wet well as shown on Drawing 8-1. Domestic flows to the MBBR system are listed in Table 2-4. Pump station influent will be drawn from the chlorine contact tank effluent channel. As shown in Drawing 6-6, a new slide gate will be installed in the chlorine contact tank effluent channel to separate the disinfected domestic flow from the industrial flow. The slide gate will provide process flexibility during construction to facilitate process startup sequencing. The disinfected domestic flow will flow north through the chlorine contact tank effluent channel, through a gated 4-foot by 4-foot wall opening and into the new MBBR Influent Weir Box, as shown on Drawing 6-6. A new weir box is required to hydraulically separate the MBBR Influent Pump Station wetwell from the chlorine contact tanks.

The pump station must be sized to include recycle flows, so it will have a firm pumping capacity of 33.3 MGD and the ability to the turndown to match the minimum flow of 3.7 MGD. The recycle flows include the internal recycle flows that combine with the domestic flow upstream of the domestic primary clarifiers. The wetwell also receives flow from the MBBR tanks during tank draining through the 14-inch MBBR tank drain line. Influent pipes and a pump station layout are shown on Drawing 4-1.

4.3 MBBR Influent Pump Station

Gravity flow from the chlorine contact tank effluent channel enters the MBBR Influent Pump Station wet well as shown in Drawing 4-1. Four vertical turbine solids handling pumps (three operating and one standby) with variable frequency drives maintain wetwell level between El. 24.0 and El. 27.0. The high level alarm will be set at El. 28.0. The wetwell top of wall elevation is set to match the chlorine contact tank effluent channel top of wall elevation at El. 32.50. The wet well invert will slope towards the pump bowl assembly to maximize the flow efficiency and eliminate dead zones in the wet well. The pump motors will be located inside the pump room. An access hatch will be provided in the pump room for confined space entry into the wet well. Roof hatches will be provided in the pump room to allow for pump removal using a crane. An electrical room and mechanical room will be provided. The electrical room will be positively pressurized. All electrical equipment including variable frequency drives and instrumentation equipment will be located in the electrical room. Electrical and instrumentation equipment are described in Chapters 13 and 14.

Pump station firm capacity with one pump out of service will be 33.3 mgd at a total maximum discharge head of 65 feet. Table 4-1 shows the design criteria for the new MBBR Influent Pump Station. The 18-inch pump discharge lines will manifold into a 30-inch discharge header. A swing check valve and isolation valve are provided on each pump discharge line prior to the discharge header. See Drawing 4-1 for pipe and equipment arrangement. The MBBR Influent Pump Station will discharge into a 30-inch line that is approximately 725 feet in length and terminates at the MBBR influent channel. A magnetic flowmeter is located on the exposed vertical portion of the forcemain at the MBBR influent channel.

Table 4-1 MBBR Influent Pump Station Design Criteria

Process Equipment	Units	Quantity or Description
Pumps		
Number of Pumps	No.	4 (3 operating, 1 standby)
Type	----	Vertical Turbine Solids Handling
Rated Capacity		
Flow, each	gal/min	7,700
Total discharge head	ft	65
Firm capacity	mgd	33.3
Motor Size	hp	200
Drive Type	----	Variable Frequency
Suction Size	in	N/A
Discharge Size	in	18
Discharge Line		
Length	Linear Feet	725
Nominal Diameter	Inch	30
Pipe Material	----	Ductile Iron

Manual local control and SCADA automatic control will be provided for the pump VFDs. In automatic mode, SCADA will control pump operation to maintain the wetwell level in the target range. As flows increase, SCADA will ramp up each pump's speed sequentially, adding an additional pump as each previous pump in series nears its capacity. As flows decrease, SCADA will ramp down pump speed and shut off pumps. SCADA will be programmed to optimize pump operation by running as few pumps as possible to meet demand. SCADA will monitor pump flow at the magnetic flow meter located in the vertical portion of the MBBR Influent forcemain where it connects to the MBBR tanks upstream of the mixing chamber (refer to Drawing 6-1).

5.0 MBBR SCREENING FACILITY

5.1 Introduction

This chapter describes the MBBR Screening Facility located adjacent to the MBBR influent channel. To reduce the potential for MBBR media retention screen plugging, MBBR influent must be screened to 6 millimeter (mm) if the flow has passed through primary clarification, and 4 mm if it has not. The domestic flow passes through 6 mm screens and primary clarifiers, so no additional screening is needed for the domestic flow. The Honeywell flow is not clarified, so new 4 mm screens must be installed for this flow stream.

5.2 Screens

The MBBR Screening Facility will be attached to new Gravelly Run/Domestic mixing chamber as part of the MBBR tank. The MBBR Screening Facility includes the MBBR screen influent chamber, two flow-through mechanical screens and the Gravelly Run/Domestic mixing chamber. Drawings 6-1 and 6-3 show the screen facility arrangement in plan and section. Two new flow-through, perforated plate mechanical screens with 4-mm diameter openings will be provided. The new screens will be installed in the two new screen channels. Each screen is sized for the peak industrial wastewater flow to allow one screen to serve as standby unit. Screened material will be conveyed hydraulically via a water flume to screw-type washer and compactor units installed at the top of the MBBR tank. Dewatered screenings will fall through a discharge chute, similar to that shown in Figure 5-1, and into a dumpster to be hauled off-site for landfill disposal. Table 5-1 summarizes the design criteria for the MBBR influent screening.

Table 5-1 MBBR Wastewater Influent Screening Design Criteria

Process Equipment	Units	Quantity or Description
Number of Units	No.	2 (1 operating, 1 standby)
Type	----	Perforated plate, Mechanically cleaned
Perforation size	mm	4
Channel and screen width	feet	3
Peak hydraulic capacity, ea.	mgd	3.9

Flow to each screen channel will be controlled by automatic slide gates. Each screen channel is equipped with one influent automatic slide gate and one effluent automatic slide gate. The gates can be operated locally in manual mode, or controlled through SCADA in automatic mode. In automatic mode, SCADA will open the standby screen's influent and effluent gates in the case of high water level upstream of the operating gate due to screen blinding or mechanical failure.

Figure 5-1 Typical Screenings Discharge Chute

6.0 BIOLOGICAL TREATMENT FACILITIES

6.1 Introduction

This chapter describes the process design criteria and configuration of the MBBR system that is required for biological nutrient removal at HRWTF. Additions and improvements to the biological treatment facilities include the following:

- Combined MBBR anoxic/oxic reactor volume of 7.66 million gallons.
- New blower facility with a capacity of 39,100 scfm.
- Four new Dissolved Air Flotation (DAF) units.
- New storage and feed facility for caustic, to provide alkalinity addition in the MBBR system.
- New polymer storage and feed for the DAF units.

6.2 MBBR Treatment System

The MBBR treatment system design criteria are listed in Table 6-1. The new MBBR facility includes a combined anoxic and aerobic reactor volume of 7.66 million gallons. The reactor volume is based on a 10% reduction in typical nitrification rates due to Honeywell inhibition. Drawings 6-1, 6-2, and 6-3 show the MBBR tanks. The treatment volume is divided into six tanks. Each tank is provided with four treatment cells. The first cell is an anoxic cell, provided with four 12-hp submersible mixers per tank. The second cell is for BOD removal, provided with a diffused aeration grid. The third and fourth cells are for nitrification, also provided with aeration grids.

Table 6-1 MBBR System Design Criteria

Facility and Equipment	Units	Value
MBBR Tanks		
Number	No.	6
Width per tank	ft	46
Side water depth	ft	18
Length	ft	Cell 1 (anoxic): 65 Cell 2 (BOD oxidation): 39 Cell 3 (nitrification): 51 Cell 4 (nitrification): 51
Volume per train/total volume	Mgal	1.28 / 7.66
Anoxic Volume per train/total volume	Mgal	0.40 / 2.42
BOD oxidation volume per train/total volume	Mgal	0.24 / 1.45
Nitrification volume per train/total volume	Mgal	0.63 / 3.79
Media		
Type	-	High density polyethylene
Specific Gravity	g/cm^3	0.96
Length	mm	12
Effective Surface Area	m^2/m^3	650
Media Fill by Volume	%	Cell 1: 50% Cells 2-4: 65%
Liquid Volume Displacement	%	8

Table 6-1 MBBR System Design Criteria (continued)

Facility and Equipment	Units	Value
Anoxic Cell Screens (Cell 1)		
Screen Opening Size (all screens)	mm	5
Media Retention Screen Type	-	Flat panel
No. of Media Retention Screen	No.	3
Maximum Screen Headloss	in	4
Foam Opening Screen Type	-	Flat panel
No. of Foam Opening Screens	No.	4
Drain Opening Screen Type	-	Flat panel
No. of Drain Opening Screen	No.	1
Aerobic Cell Screens (Cells 2-4)		
Media Retention Screen Type	-	Cylindrical
No. of Media Retention Screens per cell/tank	No.	12 / 72
Maximum Screen Headloss	in	4
Foam Opening Screen Type	-	Flat panel
No. of Foam Opening Screens per cell/tank	No.	3 / 9
Drain Opening Screen Type	-	Flat panel
No. of Drain Opening Screens per cell/tank	No.	1 / 3
Drain Cover Screen Type	-	Flat panel
No. of Drain Cover Screens per tank/total	No.	1 / 6
Anoxic Cell Mixing System		
Mixer Type	-	Submersible
No. of Mixers per cell / total	No.	4 / 24
Mixer HP, each	HP	12
Mixing Energy per train	W/m^3	23
Aeration System		
Type	-	Coarse Bubble
No. of Diffuser Grids per cell / total	No.	Cell 2: 3 / 18 Cell 3: 4 / 24 Cell 4: 4 / 24
No. Air Flow Control Valves per cell / total	No.	Cell 2: 3 / 18 Cell 3: 4 / 24 Cell 4: 4 / 24
Grid Pipe Diameter	in	1
Manifold Pipe Diameter	in	6
Air Pipe Material	-	304 Stainless Steel
Diffuser Type	-	Circular orifice in 1-in SST pipe
DO concentration	mg/L	2, minimum
SOTE	%/ft	1.1
Alpha factor	-	Cell 2: 0.9 Cells 3-4: 0.8
Air Sparge Air Flow Requirements	scfm	100
Process Air Flow Requirements		
Minimum	scfm	17,100
Design Average	scfm	30,000
Peak Day	scfm	39,000
Total Air Flow Requirements		
Minimum	scfm	17,200
Design Average	scfm	30,100
Peak Day	scfm	39,100

Table 6-1 MBBR System Design Criteria (continued)

Facility and Equipment	Units	Value
MBBR Recycle Pumps		
Number	No.	3 (2 operating, 1 standby)
Type	-	Axial flow, end suction
Rated Capacity, each		
Design Flow	gpm	6,770
Minimum Flow	gpm	3,330
Discharge Head Range	ft	13-18
Firm capacity, 2 pumps running	mgd	19.5
Motor size	hp	75
Drive Type	-	Variable frequency
Suction size	in	14
Discharge size	in	14
Alkalinity Addition		
Type	-	Sodium hydroxide, 50% solution
Maximum Day	gal/day	6,120
Design Average	gal/day	2,690
No. of Storage Tanks	No.	3
Storage Tank Material	-	FRP
Storage Tank Volume Each / Total	gal	12,000 / 36,000
Days of Storage at Average flow / Max flow	day	13 / 6
No. Metering Pumps	No.	2 (1 operating, 1 standby)
Metering Pump Design Flow, each	gph	255

From the influent channel, flow enters the first treatment cell by flowing over a downward opening gate functioning as a weir to prevent backflow of media out of the tanks and allowing for tank isolation. Flow passes from the first cell to the second cell through a flat screen fixed one foot from the divider wall. Foam passage openings are provided at the water surface, and a drain opening is provided in the center of the divider wall at floor level. All openings are screened to prevent media from travelling between cells. Flow passes through the rest of the cells through cylindrical screens 16 inches in diameter and 10 feet long. Foam passage openings and drain openings are provided on all divider walls. NPW spray water is provided at foam openings to push foam through the tanks to the effluent end. Effluent flows into a divided channel, then through a gated opening into a combined effluent channel. This arrangement is needed to allow for individual tank isolation. Each MBBR tank can be drained through a 14-inch drain line with screened opening for media retention located in Cell 2 of each tank. Screened wall openings to drain Cells 1, 3, and 4 to Cell 2 are provided at floor level. The drain line is controlled by a manual valve located north of MBBR Tank No. 1. The drain line returns flow to the MBBR Influent Pump Station for treatment through the remaining MBBR tanks in service.

A caustic feed point is provided for alkalinity addition at the influent channel. Alkalinity requirements are listed in Table 6-1. Caustic will be stored in FRP tanks located in the caustic area in the DAF Building. One operating and one standby metering pump will be provided in the caustic room. Pumps will be controlled automatically to maintain a preset effluent pH setpoint. Permanent pH probe mounts are provided at the MBBR tank influent and effluents channels for caustic metering pump control.

To reduce caustic requirements, an internal recycle is provided using three, 75-horsepower, end-suction centrifugal pumps located at grade adjacent to the effluent channel. Flow from the recycle pump suction well is returned to the influent end of the MBBR tanks. The pumps are provided with variable frequency drives. Flow will be controlled to match MBBR influent flow, measured as the sum of the MBBR Influent Pump Station discharge line flowmeter plus the Gravelly Run forcemain flow meter. These two flowmeters

are located at the influent end of the MBBR tanks. The MBBR Recycle magnetic flowmeter is located outside the north wall of MBBR Tank No. 1. Because increasing recycle flow above design average flow provides limited additional caustic savings, the maximum recycle capacity is capped at 19.5 MGD. The minimum flow is anticipated to be approximately 4.8 MGD.

Each MBBR cell is filled with media to provide the required amount of surface area for treatment. Cell 1 is provided with 50% media fill by volume. Cells 2, 3, and 4 are provided with 65% fill by volume. In the event that the aeration grid needs to be accessed for maintenance, the media must be removed. Based on typical vendor experience, it is acceptable to temporarily relocate media between cells in a single train. The media can be moved using a recessed impeller pump or vacuum truck.

Process Aeration and Blower Requirements

To provide air and mixing in the MBBR process, a new blower facility is needed with a firm capacity of 39,100 scfm. The firm capacity is based on applying a standard oxygen transfer efficiency of 1.1 percent per foot to maintain a 2 mg/L DO under peak day BOD_5 and TKN load conditions. Table 6-1 lists MBBR system air flow requirements. To span the range of flows anticipated, four blowers are provided, two single stage and two multiple-stage. Each blower can supply 13,100 scfm. Three operating blowers will provide a firm capacity of 39,100 scfm, with one blower serving as a standby. The single-stage blowers will have 800-horsepower motors and the multi-stage blowers will have 900-horsepower motors. The blowers will be located in the Blower Building adjacent to the MBBR tanks. The more efficient single-stage blowers will operate to meet average and minimum demands. The multi-stage blower will be brought on-line to meet peak demands. Drawing 6-5 shows a layout of the Blower Building. The blowers will have inlet filters that will draw air from outside. The blowers will discharge into a common header, which is routed to the MBBR tanks to provide air to the aeration grid and the flat screen air sparge (cleaning) systems. Blower output will be automatically controlled by the blower master control panel to maintain a constant setpoint pressure in the common discharge header.

The air sparge system requires 100 scfm in addition to the process requirements. The total air flow requirements including the air sparging are listed in Table 6-1. The automatic valves on the air sparge header automatically open for a few minutes every hour to clean the flat screen. The cleaning process cycles through the MBBR trains, so that only one flat screen is cleaned at any time.

Each MBBR treatment cell has multiple aeration grids, and each grid is supplied with a separate air header connection and manual air flow control valve. During process startup, the manual valves on each air header connection will be set to the correct percent open to provide the rolling aeration pattern that is required to keep the media distributed throughout the cell. A master throttling valve will be installed on the 42-inch air supply header to control air flow to each cell. The throttling valve will be controlled automatically to maintain dissolved oxygen level in the MBBR tanks at a preset level. Control will be based on a dissolved oxygen sensor signal. The sensor will be located in MBBR Tank No. 1, Cell 2. If Tank No. 1 is offline, the sensor can be moved to Tank No. 2, Cell 2.

6.3 Dissolved Air Flotation Units

To handle the peak day flows, four operating DAFs are required. Each DAF unit has a capacity of 6,500 gpm. DAF design criteria are listed in Table 6-2. The DAFs are installed as left/right pairs, with a shared elevated platform and stairs for each pair. Drawing 6-4 shows this arrangement. Influent flows into each DAF through a dedicated line from a splitter box at the MBBR effluent channel. The DAF package includes an influent flowmeter on each unit, which is used to control polymer dosing. Air bubbles are introduced into the unit using three, 40-horsepower aspirating pumps per DAF. DAF effluent overflows a weir 14 feet above finished floor elevation and drops into an effluent box, then flows to the combined 42-inch DAF effluent header and returns to the denitrification basin influent channel. Solids are drawn from a 6-inch connection below each unit and returned to the solids holding tanks using a progressing cavity pump.

Table 6-2 DAF System Design Criteria

Facility and Equipment	Units	Value
DAF Units		
No. Units	No.	4
Frame Material	-	Polypropylene
Capacity per unit / total	gpm	6,500 / 26,000
Total Firm Capacity	mgd	37.4
Inlet Connection Size	in	36
Outlet Connection Size	in	48
Solids Connection Size	in	6
No. of Air Pumps	-	3 per DAF, 12 total
Air Pump HP	hp	40 each, 480 total
No. of Rake Drive Motors	No.	1 per DAF, 4 total
Rake Drive Motor HP	hp	5 each, 20 total
Polymer Feed System		
Polymer Type	-	Dry
Polymer Storage	-	Super Sack
Polymer Makeup/Feed Firm Capacity	lb/hr	130
Mix/Age Tanks Volume	gal	4,000 each
Mix/Age Tanks Diameter	ft	8.5
Polymer Metering Pumps	No.	5 (4 operating, 1 standby)
Solids Pumps		
Number	No.	2 (1 operating, 1 standby)
Type	-	Progressing cavity
Design Solids Concentration	%	2
Design capacity	gpm	250
Discharge Pressure	psi	20
Motor Horsepower	hp	15
Compressor		
Number	No.	2 (1 operating, 1 standby)
Horsepower, each	hp	3
Design Flowrate	scfm	10
Design Pressure	psi	80

Polymer Feed

A polymer feed system will be provided to serve the DAF units. To minimize operational cost, dry polymer was selected over liquid polymer because of its lower unit purchase cost. Polymer demand is expected to be in the range of 5-10 mg/L for the first few months of operation, then decrease to 1-2 mg/L after the MBBR system has acclimated to the influent wastewater and a nitrifying population is well established. The selected polymer feed system provides 130 lb/hr dry polymer makeup. Potable water will be used for polymer makeup. The polymer system includes a bulk bag frame and hoist for lifting the polymer storage sacks, a polymer wetting system, two mix/age tanks, and five polymer metering pumps. Polymer feed to the DAFs will be controlled based on flow to each DAF unit. One polymer metering pump will be dedicated to each DAF unit, with one pump provided as a spare. The pumps will be provided with variable frequency drives. Polymer feed to each DAF will be controlled automatically to supply an adjustable dosage of polymer based on influent flow to each DAF. A flowmeter will be installed on each DAF unit on the influent line in the DAF building for metering control.

Solids Pumps

Two solids pumps will be provided to transfer solids from the DAF units to the solids holding tanks located in the southwest corner of the site. The solids line will connect to the solids holding tanks influent valve

vault. The solids pumps will be constant speed progressing cavity pumps, one operating and one standby. The pump suction line will be connected to a manifold, and the pumps will draw suction from all four DAF units. The pump operation will be automatically controlled by the DAF control panel. When the rake motor starts, an automatic valve on the solids discharge line for the respective DAF unit will open and the solids pump will run. The DAF control panel will sequence operations so that only one rake motor can operate at a time. In the event of automatic valve failure, the solids level will build up in the DAF solids collection chamber, and a level alarm will be sent to SCADA. Pump design criteria are listed in Table 6-2.

Other Requirements

Two 3-horsepower compressors (one operating and one spare) will be provided in the DAF room to provide compressed air for pneumatic valve operation.

NPW hose bibbs will be provided in the DAF building for washdown and cleaning.

7.0 PHASE 2 IMPROVEMENTS FOR EXISTING PROCESS UNITS

7.1 Introduction

The purpose of this chapter is to present the Phase 2 improvements required for existing process units, and to describe the impact of the Phase 2 improvements on facilities not modified under this project.

The existing process units to be modified under Phase 2 include the following:

- Primary Clarifier Effluent Channel
- UNOX Aeration Tanks
- Secondary Clarifiers
- Re-aeration

The existing process units not modified under Phase 2 include the following:

- Domestic Preliminary Treatment Facility
- Industrial Preliminary Treatment Facility
- Domestic Primary Clarifiers
- Industrial Primary Clarifiers
- Domestic Chlorine Contact Tanks
- Denitrification Basin

7.2 Process Design Approach

The biological treatment system was designed to meet the effluent criteria presented in Chapter 2 for the range of influent flows and loads also listed in Chapter 2. Process sizing was checked against HRWTF-specific suspended growth design criteria established using bench, pilot-scale, and full-scale testing results from the Treatment Plant Process Enhancement and Enrichment (TPPEE) investigation and follow-up bench-scale nitrification tests completed between 2006 and 2008 as part of the Nutrient Reduction Alternatives Evaluation of the anticipated range of domestic and Honeywell waste streams that would be treated in the segregated treatment system. Minimum SRTs, nitrifier growth rates, minimum nitrification rates, minimum denitrification rates, and observed yields were typically established based on findings from the TPPEE investigation and the Nutrient Reduction Alternatives Evaluation. Standard design criteria and equations were used to assist with sizing of the nutrient removal systems. Some examples of standard design criteria used to support sizing of the biological nitrogen removal systems include alkalinity and oxygen requirements for nitrification, oxygen requirements for oxidation of organics, and required internal mixed liquor recycle rates. Design of other unit processes, including the secondary clarifiers, was based on standard engineering practice and the ability to meet the Virginia SCAT Regulations. Typical design parameters are listed in Table 7-1.

Table 7-1 Typical Design Parameters

Parameter	Units	Value
Minimum SRTs, total	day	12
Nitrifier growth rates	mg/L-hr/g/L MLVSS -hr	1.25
Minimum denitrification rates	lb NOx-N / lb MLVSS-d	0.2
Observed yields	lb MLVSS / lb BOD consumed	0.5
Oxygen requirements for nitrification	lb oxygen / lb TKN nitrified	4.57
Oxygen savings with denitrification	lb oxygen / lb NOx-N removed	2.86
Required internal mixed liquor recycle rates	-	1Q

Historical plant operating data were used to estimate a solids mass balance within the existing treatment system. This mass balance was used to estimate typical primary clarifier and solids handling capture rates achieved at HRWTF. These capture rates were used in estimating recycle streams. The existing biological treatment process yield was also estimated and used as the basis for estimating MLSS and WAS rates for waste streams directed to the UNOX treatment system. An ENVision mass balance was set-up for the existing treatment process to assist with development of the mass balance. ENVision is a steady-state mass balance modeling process simulation software program developed by HDR Engineering, Inc. which uses the standard McKinney complete mixing activated sludge mathematical model. Due to the industrial nature of the wastewater and the high operating temperatures, it was found that the McKinney activated sludge model vastly underestimated MLSS and yield rates at the average operating temperature of 35 ^{o}C unless the synthetic rate constant was greatly increased to 170 days (default value is 120 days).

The historical plant operating data were also used to establish historical TKN uptake rates achieved in the existing biological treatment system through oxidation of organics and assimilation. These historical rates were used to estimate TKN removal that would be achieved via biological assimilation and resulting WAS production rates.

As a check on segregated treatment performance under dynamic load conditions, process modeling of a segregated suspended growth biological treatment was completed using BioWin Version 3.1 process simulation software to evaluate ammonia removal performance under worst-case conditions (minimum temperature, maximum month and peak day loads). Due to the industrial nature of the influent wastewater, the wastewater fractions estimated varied significantly from default values. The maximum specific nitrifier growth rates were reduced to reflect estimated inhibition associated with the Honeywell wastewater. Complete COD fractionization data were not available to accurately estimate COD fractions. The process model was therefore used as a check of estimated ammonia removal performance under variable influent loads but was not used to estimate sludge production rates.

A mass balance diagram at design average conditions is shown on Drawing 6-7.

7.3 Preliminary Treatment Facilities

The proposed Phase 2 improvements will have no impact on the domestic preliminary treatment facilities, including the mechanical screens and grit tanks. The proposed Phase 2 improvements will have no impact on the design average flows to the industrial preliminary treatment facilities.

7.4 Primary Clarifiers

The proposed Phase 2 improvements will have no impact on the domestic primary clarifiers or chlorine contact tanks. The proposed Phase 2 improvements will have no impact on the design average flows to the industrial primary clarifiers. The primary clarifier effluent channel will be modified to separate the domestic and industrial flows and a new weir box will be installed at the north end of the channel to convey domestic flows to the new MBBR Influent Pump Station.

7.5 Denitrification Basin

The proposed Phase 2 improvements will not increase design average nitrate loading to the denitrification basin because the segregated flow is returned to the process upstream of the denitrification basin. The RAS flow is returned upstream of the denitrification basin, and will increase by 3.0 MGD due to the addition of Secondary Clarifier No. 9. The RAS nitrate concentration is low, so the flow increase will not impact the denitrification basin performance.

7.6 UNOX Aeration Tanks

In order to meet effluent TN goals, additional denitrification volume is required. The existing denitrification basin provides 0.57 million gallons of denitrification volume. An additional 1.12 million gallons is required. This anoxic volume was determined based on the volume required to reduce both the design influent nitrate and nitrite loading and the oxidized design TKN loading directed to the anoxic zone at the minimum denitrification rate. Table 7-2 lists the denitrification design requirements. To provide this additional volume, the first stage of the UNOX reactor will be converted to an anoxic zone to achieve additional removal of NOx-N loading in the existing treatment process above the NOx-N removal capacity of the existing denitrification basin.

Table 7-2 Denitrification System Design Parameters

Parameter	Units	Value
NOx-N Loading to Denitrification Basin	lb/day	11,300
Anoxic Volume Required	Mgal	1.7
Existing Denitrification Volume	Mgal	0.57
Additional Anoxic Volume Required	Mgal	1.12
Anoxic Volume provided by first stage of the UNOX tanks	Mgal	1.45

To provide additional anoxic volume, the first stage of the UNOX tanks will be converted to an anoxic cell through the addition of mixers and baffling. Four, 10-hp each vertical mixers will be installed in the first stage of each tank, and baffles will be located as shown in Drawing 6-8. Table 7-3 lists the mixing requirements. The oxygen transfer capacity of the remaining three surface aerators will need to be evaluated during the design phase to confirm that they are able to supply the peak oxygen required. Consideration will be given to relocating the 150-hp aerator from Stage 1 to Stage 2 if additional capacity is needed.

On the oxygen supply side, the Oxygen Generation Plant can supply from 140,000 to 200,000 lb/d. The minimum that can be produced is 140,000 lb/d. The average oxygen requirement is below the minimum turndown, and the excess 69,600 lb/d may have to be wasted. Table 7-3 lists the UNOX system oxygen requirements. Using the excess oxygen in the MBBR aeration system may be feasible. Application of pure oxygen in an MBBR system is currently in the experimental phase. If design parameters for use of pure oxygen with an MBBR system become available during the design phase, an analysis should be completed to determine whether it would be cost-effective to use pure oxygen for the MBBR aeration system.

Table 7-3 UNOX Conversion Design Criteria

Facility and Equipment	Units	Value
Oxygen Requirements		
Average Oxygen Required	lb/day	70,400
Peak Oxygen Required	lb/day	161,600
Impact on Oxygen Generation Plant		
Oxygen Plant Production Range (min/max)	lb/day	140,000 – 200,000
Oxygen Blowoff at Average Flow	lb/day	69,600
Oxygen Blowoff at Peak Flow	lb/day	None
Mixing Requirements		
Stage 1 Volume, total	Mgal	1.45
Minimum Mixing Requirements	hp/Mgal	30
No. Mixers per stage	No.	4
HP per Mixer / Total hp per stage	hp	2.5 / 10
Total Mixer HP	hp	40
Design Mixing Energy Supplied	hp/Mgal	40

7.7 Secondary Clarifiers

Secondary clarification is accomplished in eight common wall rectangular clarifiers. Each clarifier is 40 feet wide and 285 feet long, with a side water depth of 13.5 feet. To provide structural support for the clarifier walls, steel pipes have been installed across each basin above the water level (see Figure 7-1). Solids scraper mechanisms, also shown in Figure 7-1, convey solids to the Return Activated Solids (RAS) pump suction. A total of eight variable speed drive RAS pumps provide a 24-mgd RAS capacity. Each RAS pump discharges to a common, overhead header.

The capacity of the existing secondary clarifiers was determined in the Secondary Clarifier Analysis report[1] for both the maximum allowable hydraulic loading rate and solids loading rate. The recommended maximum hydraulic loading rate was 500 gpd/sf. The recommended maximum solids loading rate is 23 lb/d/sf in summer and 32 lb/d/sf in winter. The seasonal variability accounts for poor settling during high summer temperatures.

One additional secondary clarifier is needed to meet the Phase 2 designs basis as listed in Table 7-4. Secondary clarifier No. 9 will be installed north of the existing clarifiers, adjacent to Secondary Clarifier No. 1. The new clarifier will be constructed with a new wall against the north wall of Secondary Clarifier No. 1. The existing influent channel will be extended north to convey flow into the new clarifier. It is recommended that the flow distribution from the UNOX tanks to the clarifiers be evaluated during design.

Based on field inspection, it appears that flow is not split evenly between the clarifiers. Poor flow split results in unbalanced solids loading and the potential for reduced TSS removal. Improving the flow split may improve TSS removal. For solids collection, the new clarifier will be provided with new chain and flight solids collectors similar to those in the existing clarifiers. An additional RAS pump will be provided to serve the ninth clarifier. The ninth RAS pump will discharge into the combined RAS header at the north end. Figure 7-2 shows the 24-inch blind flange that will be the connection point into the existing header. Effluent weirs and troughs similar to the ones installed in the existing clarifiers will be provided to convey effluent from the new clarifier into a dedicated effluent channel. From this channel, effluent will drop into a

[1] Hopewell Regional Wastewater Treatment Facility, Hopewell, Virginia. Nitrogen Reduction Project Basis of Design Memorandum, Appendix B, Draft Technical Memorandum No. 1: Secondary Clarifier Analysis. Malcolm Pirnie, Newport News, Virginia, April 1999.

box constructed around the existing 48-inch final effluent line. The top of the existing line will be removed (see Drawing 7-1).

Figure 7-1 Secondary Clarifier Structural Supports and Solids Scraper Mechanisms

Figure 7-2 Secondary Clarifier No. 9 RAS Pump Header Connection Point

Table 7-4 Secondary Clarifier Design Criteria

Process Equipment	Units	Quantity or Description
Number of Units	No.	9 (8 existing, 1 new)
Dimensions, each	ft	40 x 285
Side Water Depth	ft	13.5
Design RAS Rate	-	0.58Q at design average
Design RAS Capacity	MGD	27.0
Existing RAS Capacity	MGD	24.0
Additional RAS Capacity Required	MGD	3.0
Hydraulic Loading Rate, design average	gpd/ft2	470
Solids Loading Rate, design average	lbs/d-ft2	30 (winter)

7.8 Re-aeration

The facility currently has four OxyCharger units installed to provide re-aeration for the final effluent. Space was provided in the re-aeration structure for the addition of a fifth OxyCharger unit. It has been assumed that this one additional unit will be installed and will provide adequate re-aeration capacity. The hydraulic and re-aeration capacity of the system will be verified during the design phase.

8.0 PLANT HYDRAULICS

8.1 Existing Plant Hydraulics

The capacity of the existing plant is 73 MGD peak hydraulic flow. The Phase 2 improvements will not impact the peak hydraulic capacity.

Industrial wastewater is screened and degritted, then flows through dedicated industrial primary clarifiers and to the denitrification influent channel. Raw domestic wastewater enters separately from the industrial flow. Domestic wastewater is screened and degritted, then flows through dedicated domestic primary clarifiers and chlorine contact tanks to the denitrification influent channel. The two flow streams combine in the denitrification influent channel and continue through the plant. Effluent is discharged through re-aeration units (OxyChargers) to Gravelly Run.

8.2 Modifications and Hydraulic Profile

A portion of the Honeywell flow will be intercepted at the Gravelly Run Pump Station by three new pumps and conveyed to the MBBR treatment system. The domestic flow will be intercepted downstream of the chlorine contact tanks and conveyed through the MBBR Influent Pump Station to the MBBR treatment system. Following MBBR treatment, the segregated stream flows by gravity to DAF units, then returns by gravity to the denitrification basin influent channel.

Drawing 0-4 shows the flow path and water surface elevations for design average and hydraulic peak flows through the segregated treatment system.

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9.0 SOLIDS HANDLING

9.1 Introduction

This section summarizes the proposed solids handling improvements for the Phase 2 project, including an additional centrifuge, conveyors, and incinerator feed pump.

9.2 Gravity Thickeners

The existing gravity thickeners have sufficient capacity to handle the increased solids load under the Phase 2 improvements. Design criteria for the gravity thickeners are shown in Table 9-1.

Table 9-1 Gravity Thickener Design Criteria

Parameter	Units	Value
No. of Units	No.	2
Surface Area, each	sf	7,090
Rated Capacity	lb/day/sf	13.0
Solids Loading, design average	lb/day	181,400
Design Average Loading Rate	lb/day/sf	12.8

9.3 Dissolved Air Flotation Thickeners

The existing Dissolved Air Flotation Thickeners are not currently in service, and their capacity was not evaluated as part of the Phase 2 improvements.

9.4 Centrifuges

Because the influent solids loads have increased, an additional centrifuge is needed, since the solids loading rate will exceed the capacity of the existing units. The Centrifuge Building was designed for the addition of a third unit. The additional centrifuge will be installed adjacent to the existing centrifuges, shown in Figure 9-1. Centrifuge design criteria are shown in Table 9-2.

Table 9-2 Centrifuge Design Criteria

Process Equipment	Units	Quantity or Description
Centrifuges		
Number	No.	2 existing, 1 proposed
Capacity, each	lb/hr	3,850
Solids Feed Rate, design average	lb/day	156,000
Solids Feed Rate, design average	lb/hr	6,500
Solids Feed Rate, each	lb/hr	3,250
Centrifuge Feed Pumps		
Number	No.	4 existing
Capacity, each	gpm	200
Incinerator Feed Pumps		
No. of Units	No.	2 existing, 1 proposed
Capacity, each	gpm	49

Four centrifuge feed pumps are currently installed downstairs of the centrifuges in the Solids Handling Building as shown in Figure 9-2. These pumps provide adequate feed capacity with the addition of the third centrifuge.

The centrifuge cake is discharged onto an inclined screw conveyor located below each centrifuge. One new inclined screw conveyor will be needed to serve the new centrifuge. The inclined screw conveyors discharge cake onto cross screw conveyors. The two existing cross screw conveyors will be extended by

approximately 20 feet to accommodate the new centrifuge. One new high pressure piston incinerator feed pump will be needed to pump cake to the incinerator.

Figure 9-1 Existing Centrifuges

Figure 9-2 Existing Centrifuge Feed Pumps

9.5 Incineration

Dewatered solids (centrifuge cake) are currently incinerated in a single multiple-hearth furnace (MHF). The MHF has eight hearths and is 22'-3" in diameter. When operating, the MHF has a stable throughput capacity of 4,800 dry pounds per hour or 57.6 dry tons per day (dtpd) based on 24 hour per day operation. Periodic outages are necessary to perform routine maintenance. Typically, outage periods are three to four weeks in duration due to the long shutdown and startup time and complex equipment associated with this technology. During these outages, the centrifuge cake is stored on-site in a covered pad. The centrifuge cake is not stabilized and, therefore, is not suitable for landfilling or land application. With outages for routine maintenance, the existing MHF can be in service about 80% of the time on average. This provides a continuous average throughput capacity of 46.1 dry tons per day (dtpd). The current (Year 2010–2011) dewatered solids production is 40.3 dtpd annual average and 49.9 dtpd maximum monthly average. This demonstrates that the existing single MHF is near capacity.

The increased design basis influent loads used for the Phase 2 design will result in increased loads to the incineration process. Solids production will increase from current levels to the design average dewatered solids production of 70 dtpd. The existing MHF does not have sufficient capacity and reliability to meet this increased solids production. Therefore, additional solids disposal capacity will be needed.

Solids management alternatives that could be implemented to increase capacity include:

- Fluid bed incineration
- Land application
- Composting
- Heat drying and distribution
- Landfilling
- Thermal hydrolysis and digestion

Use of private contractors to implement these alternatives could be considered. It is recommended that a solids management plan be initiated within the next two years to evaluate solids reuse and disposal technologies to identify the most cost-effective and sustainable approach to providing additional capacity.

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10.0 SCAT COMPLIANCE

10.1 Introduction

This chapter presents a comparison of the Phase 2 process sizing and design criteria to the Virginia Sewerage Collection and Treatment (SCAT) regulations.

10.2 Design Flows

Flow-based criteria in the Virginia SCAT regulations apply to design average, peak day, and peak hour flows. Phase 2 project design flows for each of these conditions were listed in Tables 2-4 and 2-5. Combined influent peak hydraulic flow is equivalent to peak hour flow.

10.3 Comparison Sizing and Design Criteria

Sizing and design criteria for Phase 2 improvements and Virginia SCAT regulations are compared in Table 10-1.

Table 10-1 Comparison Sizing and Design Criteria

Process and Parameter	SCAT Criteria	Phase 2 Criteria	Phase 2 Basis	SCAT Compliance
Sewage Pumping – Firm Capacity – Gravelly Run Pumps 3, 4, 5	Capacity with any one unit out of service to handle maximum sewage flow or a minimum of 2-1/2 times average design flow, whichever is greater. *(9VAC25-790-380,A.2,A.3)*	Firm pumping capacity of 3.9 mgd (peak flow)	3 Gravelly Run Pumps 2 operating, 1 standby Each at 1,355 gpm Total firm capacity of 3.9 mgd	Yes – See Note 1
Influent Screening, Mechanically-Cleaned MBBR Screens	Provide for taking any unit out of service without sacrificing capability to handle peak design flow. *(9VAC25-790-500, C.2)*	3.9 mgd screening capacity with one unit out of service	2 MBBR Screens 1 operating, 1 standby Each at 3.9 mgd	Yes – See Note 1
Denitrification Basin – design parameters	If pilot plant data cannot be obtained for the specific wastewater involved, denitrification reactors should be sized using kinetic models. *(12 VAC 5-581-960, D)*	Pilot data used for sizing of denitrification basin	Design denitrification rate: 0.2 lb NOx-N / lb MLVSS-d	Yes
UNOX Aeration Tanks	Recirculation Flow Regime Ratio: 0.25-0.5 MCRT: 5-15 days F/M Ratio: 0.15-1.0 Loading: 100-250 lb BOD/1000 cf Target MLSS: 4,000-8,000 mg/L *(12 VAC 5-581-750, D)*	Existing UNOX tanks	Recirculation Flow Regime Ratio: 0.58 MCRT: 10 days F/M Ratio: 0.51 Loading: 125 lb sBOD/1,000 cf MLSS: 5,000 mg/L	Yes
Secondary Clarifiers – Surface Overflow Rate	Shall not exceed 1,200 gpd/ft^2 at peak hour settling rate for conventional process. *(9VAC25-790-530,C.1)*	1,200 gpd/ft^2 maximum at 70 mgd	9 Secondary Clarifiers 682 gpd/ft^2 at 70 mgd	Yes

Table 10-1 Comparison Sizing and Design Criteria (continued)

Process and Parameter	SCAT Criteria	Phase 2 Criteria	Phase 2 Basis	SCAT Compliance
Secondary Clarifiers – Solids Loading Rate	Between 0.6-1.25 lb/ft^2-hr at design average, maximum of 1.8 lb/ft^2-hr at peak hour. *(9VAC25-790-530,C.6)*	0.6-1.25 lb/ft^2-hr at 49 mgd design average. 1.8 lb/ft^2-hr at 70 mgd	9 Secondary Clarifiers 1.27 lb/ft^2-hr at 49 mgd design average 1.8 lb/ft^2-hr at 70 mgd	See note 2
Re-aeration	Provide means of maintaining an adequate level of dissolved oxygen in the effluent (12 VAC 5-581-880)	Existing reaeration units, plus one new unit	Design dissolved oxygen concentration: 3 mg/L	Yes

Notes:
1. Existing Gravelly Run Pumps 1 and 2 have sufficient capacity to send 100% of Honeywell flow to HRWTF through the North Interceptor forcemain. While the new pumps 3, 4, and 5 comply with SCAT requirements, compliance with standby requirements is not mandatory for the new pumps because backup capacity is existing.
2. The capacity of the existing secondary clarifiers was determined in the Secondary Clarifier Analysis report[1]. The site-specific allowable maximum solids loading rate is 1.33 lb/ft^2-hr.

10.4 Conclusions

With the exception of the secondary clarifier loading rates, the Phase 2 project complies with applicable SCAT criteria. The secondary clarifier loading rates are within operating tolerances developed during a site-specific clarifier performance analysis. SCAT criteria are not established for the MBBR or DAF processes. For these processes, standard design practice was used to set design parameters. Based on this analysis, sizing and design criteria for the Phase 2 improvements are consistent with Virginia SCAT regulations, with the exception of minor deviations in operating criteria for the secondary clarifiers that were shown to have no detrimental impact on process performance.

[1] Hopewell Regional Wastewater Treatment Facility, Hopewell, Virginia. Nitrogen Reduction Project Basis of Design Memorandum, Appendix B, Draft Technical Memorandum No. 1: Secondary Clarifier Analysis. Malcolm Pirnie, Newport News, Virginia, April 1999.

11.0 PLANT SUPPORT SYTEMS

11.1 Introduction

This section contains information on key plant support systems that will be impacted by the Phase 2 project.

11.2 Non-Potable Water (NPW) System

NPW is provided by the existing NPW Pump Station, which located in the Solids Handling Building and receives flow from the secondary clarifier effluent channel. The three, 150 hp vertical turbine NPW pumps were installed in 2011 as part of the Phase 1 improvements. The pumps are shown in Figure 11-1. NPW pump design criteria are shown in Table 11-1. The major user of NPW is the incinerator emission control system, requiring 1,819 gpm. The existing pumps were selected to meet current NPW demands, including the Phase 1 improvements:

- Minimum – 2,600 gpm
- Average – 3,060 gpm
- Peak – 3,580 gpm

These demands are met with two pumps operating and one standby. The NPW system is not designed to meet a fire demand, since the PW system is used for fire fighting.

Table 11-1 NPW Pump Design Criteria

Process Equipment	Units	Value
Existing Design Basis Demands		
Minimum	gpm	2,600
Average	gpm	3,060
Peak	gpm	3,580
Pump Design Basis		
Number of Units	No.	3 (2 operating, 1 standby)
Type	----	Vertical Turbine
Horsepower, each	HP	150
Capacity, each	gpm	1,790
Firm Capacity	gpm	3,580

Additional NPW demands from the Phase 2 improvements are listed in Table 11-2. The Phase 2 demands are relatively minor. The existing NPW pumps should have sufficient capacity to provide for these additional demands. During design, the NPW pump and distribution system will be modeled to confirm that the existing pumps can provide adequate flow and pressure at all demand points. Consideration will be given to installing booster pumps at the MBBR tanks to meet pressure requirements.

Table 11-2 Additional NPW Demands

Facility	NPW Usage
MBBR Influent Pump Station	Hose bibbs
MBBR Screens	Screen spray water Washer/compactor supply water
MBBR Tanks	Foam suppression spray Hose bibbs
DAF Building	Hose bibbs
General	Yard hydrants

Figure 11-1 Existing NPW Pumps

11.3 Potable Water

Potable water (PW) is supplied to the site through an 8-inch Virginia American Water Company water main that enters the site at the main entrance road. Under the Phase 2 project, a new 3-inch PW line will connect to the existing 3-inch line north of the UNOX tanks and be routed to the DAF Building. PW at the DAF Building will be provided for polymer makeup and to supply to emergency shower and eyewash facilities in the chemical handling areas. PW will be required for the automatic fire suppression system at the DAF Building. No other PW uses are expected under the Phase 2 project.

11.4 Process Drains

Due to plant hydraulics, HRWTF does not have a central process drain pump station. HRWTF currently uses portable pumps to empty tanks such as the primary clarifiers and UNOX tanks. Secondary clarifiers are emptied using the RAS pumps. Portable pumps are not practical for draining the MBBR tanks, because a screened intake would be needed to avoid draining the media along with the process fluid. For draining, each MBBR tank is provided with a screened 14-inch drain. The tank floor is sloped to the drain point, and screened wall openings are provided to allow drain flow between MBBR zones. The drain lines run north below the tanks, and shutoff valves are provided where the lines manifold together beyond the tank wall. The drain line returns to the MBBR Influent Pump Station.

11.5 Major Yard Piping

Drawings 8-1 and 8-2 show the major yard piping required for the Phase 2 facilities. All liquid process piping will be ductile iron. Air supply piping will be 304 stainless steel. PW piping will be copper, Type L for exposed and Type K for buried.

11.6 Stormwater Management

Facilities constructed under the Phase 2 improvements will add impervious area to the existing site. The new impervious areas include the following:

- MBBR Influent Pump Station
- DAF Building
- Blower Building
- Roadways/sidewalks

Because the total impervious area will increase under Phase 2, the addition of stormwater management facilities for the new areas will be required. Possible stormwater management facilities that will be considered during design include bioretention basins, similar to the existing rain garden shown in Figure 11-2, and water quality manholes. Consideration will be given to treating the entire new impervious area or a combination of existing, untreated areas and a portion of the new areas.

Figure 11-2 Existing Rain Garden

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12.0 FACILITIES DESIGN CRITERIA

12.1 Introduction

This section summarizes the general design criteria for the project design specialties including structural, architectural, heating, ventilating and air conditions (HVAC), plumbing, and fire protection system.

12.2 Structural Design Criteria

Structural design will be in accordance with the following documents and standards:

- Building Code: 2009 Virginia Uniform Statewide Building Code
- ASCE 7-05 Minimum Design Loads for Building and Other Structures
- ACI 318-05 Building Code Requirements for Structural Concrete
- ACI 350-01 Code Requirements for Environmental Engineering Concrete Structures
- ACI 350.3-01 Seismic Design of Liquid-Containing Concrete Structures
- AISC Steel Construction Manual - Thirteenth Edition
- Other codes as referenced by the Building Code

Where conflicts exist between the Building Code and this document, the most stringent requirements shall apply. All structures for this project will be classified as Category III, per IBC Table 1604.5.

The structural calculations for each structure will contain structure-specific design criteria calculations that further clarify the loads listed below. Design loads will be noted on the drawings as required by the Building Code. Loads listed below are based on preliminary information and will be reviewed in final design.

Dead Load

The weight of materials of construction incorporated into the structure, including but not limited to walls, floors, ceilings, stairways, built-in partitions, finishes, cladding and other similarly incorporated architectural and structural items.

Live Loads

- Floor: Floor live loads will be in accordance with the building code but typically not less than 100 psf. Live loads will be increased where necessary for the use of the structure. Such considerations will include equipment lay-down areas, storage areas, wheel loads and future use.

  All stairs and walkways will be designed for 100 psf.

- Piping: Smaller pipes (less than 12 inches in diameter) will be accounted for in a uniform piping load. The uniform load will be evaluated after preliminary piping layouts are completed. A minimum allowance of 5 psf will be used, except where fire protection piping is also present, in which case the minimum allowance will be 10 psf. Allowance for smaller piping, including fire protection piping, will be included in the design loads for each area.

  Pipes 12 inches and larger, pipe racks, corridors of piping and piping valves produce heavier concentrated loads on pipe supports. Pipe racks will include an allowance for future pipes as recommended by the Process Engineer. Pipe support reactions for larger pipes will be calculated and structural members will be designed for the appropriate loads.

  Thrust loads from piping at anchor points may be present and will be incorporated in the design.

- Equipment: Approximate size and weight of equipment will be incorporated in the structural design. The weights of smaller equipment may be included as part of the design live load if the equipment plus equipment pad weight is less than the design live load. Localized areas of the structure will be designed to provide support for larger pieces of equipment in addition to the other uniform loads when the average distributed equipment load is greater than the design live load. Equipment pad weights will be included with the equipment weight.

  Dynamic loads will be included when appropriate.

- Monorails and Cranes: The size and capacity of the monorail or crane will be integrated into the structural design.

Fluid Loads

Lateral and vertical loads from fluid-applied loads will be considered in design of tanks, channels and basins. The specific gravity of the fluid will be verified during the design process. Preliminary material densities are:

- Liquid Stream: 62.4 lbs per cubic foot
- Solids Stream: 65 lbs per cubic foot
- Dewatered Solids: 70 lbs per cubic foot

The maximum possible fluid level elevation will be considered in design.

Structures will be checked for buoyancy if the water table could be above the base slab of the structure. The minimum factor of safety against uplift is 1.25. Loads used to resist uplift included the permanent weights of the structure and soil on the structures. Soil resting directly above the footing projection may be included in the resisting weights. However, the volume of displaced fluid must include the volume of soil on the footing lip below the water level.

The design water elevations will be used for checking lateral loads on structures and for checking buoyancy. The published 100-year flood elevation is El 7 ft (FEMA Zones A and AE).

Snow

Ground Snow Load, Pg = 10psf
Exposure Factor, Ce = 1.0
Thermal Factor, Ct = 1.0 (Unless otherwise required by the structure)
Importance Factor, Is = 1.1

Other additional snow load conditions will be applied as required as required by the Building Code. These may include ponding instability, partial loading, unbalanced snow loading, drifting snow, roof projections, sliding snow and ice dams along eaves. In no case will the design roof load be less than the required roof live load.

Roof Live Load

A minimum roof live load of 20 psf will be used. No reductions will be used for tributary area or roof slope.

Wind Load

Basic Wind Speed (3-Second Gust), V3s = 110 mph.
Exposure Category C.
Importance Factor, Iw = 1.15

Seismic Load

Seismic Occupancy Category: III
Spectral response acceleration at short periods, Ss = 0.119
Spectral response acceleration at 1-section period, S1 = 0.048
Site Class E (to be confirmed by Geotechnical Report)
Design spectral response acceleration at short periods, Sds = 0.197
Design spectral response acceleration at 1-section period, Sd1 = 0.112
Seismic design category B
Importance Factor, Ie = 1.25

Soil Load

Geotechnical investigations will be conducted during final design to confirm foundation requirements and establish foundation design criteria.

Specific Structure Considerations

All required construction and control (contraction) joints will be indicated on the design drawings, and will be required for any structure with a dimension of 50 feet or more in any direction. The joint spacing is also used to determine the amount of shrinkage and temperature reinforcement required, in accordance with ACI 350. In general, construction joints will be located at points of minimal flexural stress. Expansion joints will be used only where required and, where required, will be located to minimize out-of-plane shear forces.

Cast-in-place concrete structural framing with precast concrete roof planks will be used in buildings with wet or corrosive environments such as the DAF Building, Gravelly Run Pump Station, and MBBR Influent Pump Station. For dry areas, such as the Blower Building, structural steel framing will be evaluated.

12.3 Architectural Design Criteria

The project will be designed to comply with HRWTF preferences and the 2009 Virginia Uniform Statewide Building Code. The following paragraphs summarize the proposed architectural components.

Roofing

A standing seam pre-finished metal type roof will be used for new buildings. Standing seam metal systems have lower maintenance requirements than built-up roofs. In consideration of personnel access, placing equipment or roof penetrations that require maintenance on the sloped metal roofs will be avoided.

Exterior Wall System

In general, the architectural treatment for new buildings will be compatible with existing buildings. Masonry block walls, pre-cast concrete panels, and metal siding will be considered for exterior walls on the new buildings.

Doors, Window, and Hardware

All doors and frames in corrosive areas will be fiberglass reinforced polymer (FRP). Where fire rated doors are required in corrosive areas, the doors will be FRP fire rated with steel door frames coated with a factory applied gel coating to protect against corrosion. Stainless steel door frames will also be evaluated for fire rated openings. Doors and frames in non-corrosive areas will be specified as insulated aluminum with anodized finish. Hollow metal doors are not recommended because of higher corrosion potential in wastewater treatment plants.

Door hardware will be specified as stainless steel base metal for all hardware where available. Where stainless steel is not an option, chrome plated brass will be used.

Windows will be aluminum or FRP frames depending upon exposure to corrosive atmosphere. Laminated glass is recommended for all exterior insulated glass installations.

Painting and Protective Coatings

Standard coating systems as specified on the Alternatives 4A-1 Light, Phase 1 Contracts 1, 2, and 3 will be specified for this project. In addition:

- All metal-based process piping (except stainless steel) will be coated with high performance epoxy or urethane paint systems. All piping will be identified with service and flow direction.
- Heat tracing and insulation will be provided on exposed exterior piping that must stay in continuous service during cold weather.
- Exposed PVC pipe will be painted for UV protection. CPVC will be used where heat tracing is required.
- All exposed ferrous metal surfaces will be painted with high performance epoxy paint systems.
- All aluminum in contact with dissimilar materials or concrete will be coated to prevent corrosive action.
- Cast-in-place floors will be provided with a penetrating sealer/hardener/dustproofer.

12.4 Heating Ventilation and Air Conditioning

Ventilation requirements of the various process areas will be governed and designed in accordance with the following codes and regulations:

- National Fire Protection Association (NFPA) 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities (2012 Edition)
- ASHRAE Handbook, Fundamentals
- International Mechanical Code

NFPA 820 identifies process areas within a wastewater treatment plant and lists the NEC Classification, minimum ventilation requirements, and required materials of construction and fire protection measures that must be incorporated into the construction. Table 12-1 summarizes the proposed project areas and identifies the NFPA 820 ventilation requirements for each of those areas.

Table 12-1 NFPA Area Classifications

Area	Extent of Classification	NEC Classification	Required Ventilation	Required Materials of Construction	Required Fire Protection Measures	NFPA Reference
Gravelly Run Pump Station Addition						
Entire structure	Not applicable	Unclassified	No requirement	Non-combustible, limited-combustible or low flame spread materials.	Not applicable	NFPA 820 Table 4.2, Row 18
MBBR Influent Pump Station						
Pump Room	Entire area	Division 2	Continuously ventilated at 12 air changes per hour	Non-combustible, limited-combustible or low flame spread materials.	Portable fire extinguishers	NFPA 820 Table 4.2, Row 19

Table 12-1 NFPA Area Classifications (continued)

Area	Extent of Classification	NEC Classification	Required Ventilation	Required Materials of Construction	Required Fire Protection Measures	NFPA Reference
MBBR Influent Pump Station						
Electrical Room	Not applicable	Unclassified	No requirement	Non-combustible, limited-combustible or low flame spread materials.	Not applicable	NFPA 820 Table 4.2, Row 18
MBBR Influent Pump Station						
Mechanical Room	Not applicable	Unclassified	No requirement	Non-combustible, limited-combustible or low flame spread materials.	Not applicable	NFPA 820 Table 4.2, Row 18
MBBR Tanks						
Entire Structure	Not applicable	Unclassified	Open to atmosphere	No requirement	Hydrants	NFPA 820 Table 5.2, Row 7
DAF Building						
DAF Room (includes polymer area)	Entire area	Unclassified	No requirement	No requirement	Hydrants	NFPA 820 Table 5.2, Row 14.
Electrical Room	Entire area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Mechanical Room	Entire area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Caustic Storage and Feed Room	Entire area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Blower Building						
Blower Room	Entire area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Electric Room	Entire area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Secondary Clarifier Areas						
Entire structure	Entire area	Unclassified	No requirement	No requirement	Hydrants	NFPA 820 Table 5.2, Row 14.

Outdoor air design conditions will be in accordance with the following:

- 92 F Dry Bulb/77 F Wet Bulb (summer)
- 22 F Dry Bulb (winter)

Indoor air design conditions will generally be as follows:

- General Process Areas: 65 F winter/10 F above ambient summer
- Control/Electrical Rooms: 75 F winter/75 F summer

Heating in the DAF Building, Blower Building, Gravelly Run Pump Station, and MBBR Influent Pump Station will be provided by either electric or natural gas-fired air handling units. Cooling of electrical and control rooms will be provided using condensing units mounted outside the building. Positive pressurization units will be provided for the electrical and control rooms.

12.5 Plumbing Design Criteria

The plumbing design will be completed in accordance with the 2009 International Plumbing Code. In general, plant process water demands will be met by the plant NPW system. Details of the plant NPW systems are provided in Chapter 12.

New potable water connections will include polymer makeup service at the DAF Building and emergency eyewash stations and showers. On-demand water heaters will be included to provide tepid water to the emergency eyewash stations and showers. There will be no new sanitary facilities (lavatory or shower) constructed under this project, so new sanitary drains will not be required. Backflow prevention devices will be provided at each facility where the potable water system is connected into a treatment process.

12.6 Fire Protection Systems

The fire protection system will be designed in accordance with National Fire Protection Association (NFPA) 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities (2012 edition). The anticipated fire protection facilities as required by NFPA are limited to PW hydrants and portable fire extinguishers with the exception of the DAF Building as described in the next paragraph. The extent of the fire protection facilities required by NFPA is provided in Table 12-1.

The caustic storage and feed facility serving the MBBR tanks is located in the DAF Building. The International Building Code (IBC) considers the storage of caustic above 500 gallons to be a hazardous condition, and results in a hazardous (H-4) classification for the DAF Building. The H-4 classification requires automatic fire detection system and an automatic sprinkler system throughout the building. The entire DAF Building will be provided with an automatic water sprinkler system, with the exception of the caustic room, because caustic is reactive with water. An automatic foam fire suppression system will be provided in the caustic room.

13.0 ELECTRICAL DISTRIBUTION SYSTEM DESIGN CONSIDERATIONS

13.1 Introduction

The new processes and equipment planned for the Phase 2 project at HRWTF will increase the electrical demand. In addition, new pumps will be added at the Gravelly Run Pump Station. A review of the existing electrical distribution systems was performed to determine the adequacy of the capacities and overall reliability. The results were used to determine proposed additions.

13.2 Hopewell Regional Wastewater Treatment Facility (HRWTF)

Existing Plant Service and Distribution

Two 34.5 kV distribution circuits are brought to a Dominion Virginia Power (DVP) owned outdoor substation located in the southeast area of the plant. Each circuit originates from a different DVP distribution substation. The utility substation consists of two 34.5/19.9 kV – 4160/2400V solidly-grounded transformers rated 10 MVA and 7.5 MVA. In the original facility construction, the service consisted of a 4160V grounded service from each transformer to City-owned main switchgear located in the Solids Handling Building. During the Centrifuge Dewatering Modifications project, dated 1995, a second set of service conductors was installed from the 7.5 MVA transformer to City-owned outdoor pad-mounted switchgear located on the east side of the Centrifuge Building. Refer to Drawing 13-2 for an overall plant one-line diagram.

Even though two utility services are provided, only one service is distributed throughout the facility. This service originates from the 10 MVA transformer which is tagged as the "primary utility source". The other service serves as a backup. It is a manual operation to switch the plant distribution from one service to the other which is done at the main 4,160V switchgear in the Solids Handling Building.

The distribution system is predominantly a radial system with one source of power to the major distribution equipment. This is due to the facility being powered from only one of the two utility services at a time. However, some redundancy was added to the Solids Handling Building in the original design by providing two 4,160V feeders from the switchgear to two transformers, each of which is capable of powering the entire building. That arrangement has been modified as indicated in Drawing 13-2 where the building is powered by only one of the two transformers. The one exception is the Centrifuge Building which has redundant, fully rated transformers and where each transformer can be powered by a different utility service.

Existing HRWTF Utility Service Demand

Billing data were provided by HRWTF for several months and are shown in Table 13-1. Demand values for kW and kVAR are recorded by DVP. From these the kVA and power factor values can be calculated.

Table 13-1 Utility Billing Data[1]

Date	kW Demand[2]	kVAR Demand[2]	Calculated kVA[2]	Calculated Power Factor (PF)
May 2012	3,205	1,828	3,690	0.87
April 2012	3,477	1,818	3,924	0.89
March 2012	3,080	1,713	3,524	0.87
February 2012	3,170	1656	3,576	0.89
January 2012	3,170	1581	3,542	0.89
December 2011	3,067	1504	3,416	0.90
September 2011	3,257	1880	3,761	0.87
August 2011	3,265	1860	3,758	0.87
July 2011	3,265	1890	3,773	0.87
June 2011	3,408	1830	3,868	0.88
May 2011	3,296	1805	3,758	0.88
April 2011	3,223	1701	3,644	0.88
March 2011	3,520	1910	4,005	0.88
February 2011	3,620	1875	4,077	0.89
January 2011	3,659	2010	4,175	0.88
December 2010	3,650	1883	4,107	0.89
November 2010	3,369	1738	3,791	0.89

Notes:
1. New processes at the new Domestic Preliminary Treatment Facility and Sodium Hypochlorite Facility started in May 2012. The utility billings data does not reflect the increased electrical loads.
2. Assumed the kW and kVAR demand values occurred at the same time. The kVA values were calculated based on the demand values.

The calculated kVA values provide an indication of the used capacity of the service transformers. From the table the peak value of 4,175 kVA occurred in January 2011, but it fell off to less than 4000 kVA in the later months. Additional loads were brought on-line in May 2012 with the startup of the Phase 1 facilities. Therefore, for the purpose of this analysis, the peak value of 4,175 kVA will be used as the existing plant demand.

The percentage of used transformer capacity: 4,175 / 10,000 x 100 = 42 percent.

Projected Plant Demand

Table 13-2 provides an estimated plant electrical load based on the existing demand, any reduction of operating equipment, and the anticipated new equipment. This load projection is conservative by using the assumption that horsepower equals kVA. Many of the new motor loads are controlled by variable frequency drives (VFD) which further reduces the kVA values.

Table 13-2 Electrical Load Summary

Parameter	Connected (kVA)	Demand Factor	Demand (kVA)
Existing plant demand (utility metering)			**4,175**
Phase 2 Project			
Existing UNOX Mixers (removed), 4 @ 150hp	(600)	0.8	(480)
UNOX mixers, 16 @ 2.5hp	40	0.8	32
MBBR Influent pumps, 4 @ 200hp (1 standby)	600	0.8	480
MBBR Influent Pump Station – Building services	60	0.6	36
MBBR – Process equipment	150	0.6	90
MBBR – Recycle pumps, 3 @ 75hp (1 standby)	150	0.8	120
Blower Building – Blowers, 2 @ 900hp (1 standby)	900	0.8	720
Blower Building – Blowers, 2 @ 800hp	1600	0.8	1280
Blower Building – Building services	100	0.6	60
DAF – DAF Systems, 4 @ 125hp	500	0.8	400
DAF – Building services	60	0.6	36
Centrifuge, 1 @ 300hp main drive, 100hp back drive	400	0.8	320
Centrifuge Building – Process equipment	50	0.6	30
Solids Processing Facility (Future)	1,500	0.8	1,200
Phase 2 Project Subtotal			**4,324**
Plant Diversity 80%			x 0.8
Phase 2 Project Subtotal			**3,460**
Approximate Plant Total after Phase 2 Project			**7,635**

The loads in Table 13-2 are also based on a gradual increase in flow to the HRWTF. As a result the projected plant demand may not develop for several years.

The plant demand in the Phase 2 expansion is not expected to grow larger than the two DVP service transformers.

Recommended Improvements

Most of the new process equipment and structures are located along the northern plant road as indicated in Drawing 13-1. New transformers will be located at both the MBBR Influent Pump Station and in the DAF/Blower Building/MBBR area for 480V services. In addition, a new transformer will be required at the future Solids Processing Facility. The existing main 4160V switchgear in the Solids Handling Building has all feeder circuit breakers in use. There are no spare breakers and there are no equipped spaces in the existing line-up. The building around this equipment would require expansion and modification if this switchgear was to expand.

Drawing 13-3 shows the recommended method for expansion of the plant distribution system. Service taps within the DVP outdoor substation would be made and routed to pad-mounted, outdoor switchgear. This switchgear would then distribute separate 4,160V feeders to each new transformer and a 4160V feeder to the blower motor control equipment. These service taps would be coordinated and approved by DVP prior to finalizing this approach. Specific improvements by each area include:

- UNOX Aeration Tanks
  - New motor starters would be added to the two existing MCC's. Some space becomes available with the removal of the four 150 hp starters. Abandoned power factor correction capacitors will be removed to make room for any additional MCC sections.

- MBBR Influent Pump Station
  - A 4,160V – 480/277V outdoor transformer will be placed near the pump station. A 480V MCC will be provided in the electrical room of this building. The room will be air conditioned and will contain a positive pressure filter unit.

- DAF/Blower Building/MBBR Area
  - A 4,160V motor control line-up (MCLU) will be provided in the Blower Building electrical room for the new blowers. Starters will be the solid-state reduced voltage type.
  - A 4,160V-480/277V outdoor transformer will be placed near the Blower Building electrical room which will feed an MCC in the electrical room. This MCC will serve as power distribution and control equipment for 480V equipment. It will also subfeed the DAF Building.
  - An arc flash reduction switch and associated breaker trip units will be provided on the MCC main circuit breaker.
  - The electrical rooms in the DAF and the Blower Buildings will be air conditioned and will contain positive pressure filter units.

- Centrifuge Building
  - A third centrifuge will be installed with all associated pumps, conveyors, etc. The electrical service and equipment installed in the late 1990's was sized for the addition of this equipment. Motor starters, feeder circuit breakers, etc., will be added to the existing equipment.

- Solids Processing Facility (Future)
  - A 4,160V-480/277V outdoor transformer will be provided. A 480V MCC will be provided for motor control and power distribution.

13.3 Gravelly Run Pump Station

Existing Utility Service, Generator, and Service Equipment

The DVP service to the pump station consists of three 50 kVA, single phase, pole-mounted transformers near the pump station. The service voltage is 480/277V. The service conductors are routed underground to the service equipment located within the building. The service equipment consists of a switchboard containing two service circuit breakers within switchboard construction. The switchboard was built with one internally mounted automatic transfer switch (ATS) and is also coupled to an MCC. A second ATS is separately mounted. A 300kW, 480/277V generator is located adjacent to the pump station and is connected to both automatic transfer switches (ATS). The arrangement of the equipment was to provide completely redundant normal and standby services to each of the two pumps. Drawing 13-4 shows both the existing electrical system arrangement and the proposed improvements.

Recommended Improvements

The new pump station will house three 50 hp pumps and a new DVP service will be needed. The pumps will be controlled by VFDs. The existing DVP service transformers will be upgraded to power both pump stations. The new service will be coordinated with DVP but it is anticipated that the transformers will be replaced with larger units. The service conductors to the existing pump station should be able to be reconnected without replacement. A second service drop to the new pump station will be added. The new pump station will contain an ATS and a third set of cables will be routed from the existing generator to this ATS.

13.4 Design Approach

The electrical design approach will incorporate the following manufacturers, equipment types, and basic materials based on past projects:

- Wire and cable.
  - 600V THHN-THWN-2 building wire.
  - 5/8 kV medium voltage cable with EPR insulation.
  - VFD Cable: 3 conductor shielded cable with fully rated ground conductor, 1000V, suitable for installation in conduit. This cable shall only be installed from the VFD's to the motors.
- Conduit.
  - In general conduit shall be surface mounted in new and existing buildings.
  - Indoor and outdoor areas where exposed: Rigid aluminum conduit (RAC) and fittings.
  - Where embedded in poured concrete walls and floors:
    - Non-hazardous locations: PVC Schedule 40 and fittings.
    - Hazardous locations: PVC coated RAC (PVC-RAC) and fittings.
  - Where emerging from concrete: PVC-RAC.
  - Ductbanks: PVC Schedule 40.
  - Flexible non-metallic, liquid-tight conduit (FLEX-NM): Thomas & Betts "Shureflex" extra flexible grade nylon conduit and fittings.
- Raceway system support.
  - Strut support systems: Stainless steel.
  - Stainless steel anchors, hardware, straps.
- Pull and Junction Boxes.
  - Indoor non-hazardous areas: Stainless steel or aluminum.
  - Outdoor non-hazardous areas: Stainless steel.
  - Outlet boxes:
    - Indoor, non-corrosive areas: Aluminum.
    - Indoor corrosive, or outdoor: PVC coated aluminum.
- Motor control equipment.
  - Manufacturers: Eaton, Siemens, Allen-Bradley.
- VFD's.
  - Manufacturers: ABB or Allen-Bradley.
  - Drive type: Active front end. Six, twelve or eighteen pulse type PWM drives will not be permitted.
  - Bypass starters (constant speed) will not be provided.
- Arc Flash reduction methods.
  - For the 480V MCC's connected to the new transformers th main circuit breakers the Eaton Arc Flash Reduction Maintenance Switch (Eaton ARMS) or similar product will be specified for the main circuit breakers.

- Low voltage circuit breakers with 400 amp frames and larger will be solid state breakers furnished with adjustable trip units including the instantaneous setting. Trip units will be provided if available with the Eaton ARMS feature (or equivalent device).

- Power monitoring will be provided for all main circuit breakers in the low voltage switchgear and MCC's. The data collected can be connected to the plant control system.
- Lighting.
  - Indoor lighting for process areas can be metal halide, LED or fluorescent type and will require further discussion. Equipment rooms will utilize fluorescent lighting.
  - Street lighting will be provided for new roadways and will match the existing fixture type.
- Lightning protection systems will be provided for the following structures:
  - MBBR Influent Pump Station.
  - DAF Building.
  - Blower Building.
  - Gravelly Run Pump Stations (new and existing buildings).

14.0 PLANT CONTROL SYSTEM IMPROVEMENTS

14.1 Introduction

HRWTF has standardized its control system with Modicon PLC's and Siemens WinCC software for all human-machine interfaces (HMI's). Both Modbus Plus and fiber optic cabling are used in underground installations tying the equipment together. Fiber optic cable is the preferred means of cabling between the new programmable logic controllers (PLC's). Modifications to the PLC programming and HMI configuration development will be performed by qualified integration contractors. This work will be included in the construction contract.

Drawing 14-1 is a site plan showing the location of the existing and proposed control system elements. A block diagram of the existing and proposed improvements is shown in Drawing 14-2.

14.2 HRWTF Control Equipment Additions

New PLC's are recommended to be placed in the MBBR Influent Pump Station and the Blower Building electrical rooms where air conditioning and air filtering will be provided. Because the DAF Building is in close proximity to the Blower Building, a remote terminal unit (RTU) will be placed in the DAF Building and connected to the PLC in the Blower Building. An HMI will be included at all new PLC and RTU locations.

14.3 Gravelly Run Pump Station

A new pump station will be constructed adjacent to the existing pump station. Due to the short distance all new I/O will be hardwired to the existing PLC. Any modifications to the PLC will be closely coordinated with the City.

Presently the pump station PLC enclosure includes a spread spectrum radio which communicates with the radio master located in the Solids Handling Building at the HRWTF. The radio communication will be replaced with cellular communication.

Honeywell also has a spread spectrum radio mounted in a separate enclosure. This radio also communicates with the City's repeater so the same information is transmitted back to the radio master at the HRWTF. As a result the existing radios may need to be retained.

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15.0 PERMIT AND APPROVAL REQUIREMENTS

15.1 Permitting Requirements

City of Hopewell

Completed plans and specifications must be submitted to the City of Hopewell for site plan review and review for compliance with building codes. The Engineer must prepare and complete the Statement of Special Inspections and submit this document to the City with the site plan submittal.

The general contractor will obtain all land disturbing and building permits directly from the City of Hopewell.

Structure limits will not encroach on the 100-year flood hazard zone, shown in Drawing 15-1. The effluent channel on the west side of the MBBR tanks extends beyond the 100-year flood line. Because this is an elevated channel above grade level, it will not impact the local flood elevation. Construction limits will not encroach on the Chesapeake Bay Resource Protection and Resource Management Areas, shown in Drawing 15-2.

Virginia Department of Environmental Quality

The HRWTF operates under the requirements of VPDES Permit No. VA0066630 which includes an annual average 2.0 mg/L total phosphorus effluent limit. Annual mass loads for effluent nitrogen and phosphorus are regulated by Virginia's Water Quality Management Planning Regulation 9 VAC 25-720, which establish the current waste load allocations of 1.83 million lbs/year of total nitrogen and 0.075 million lbs/year of total phosphorus.

For the Hazardous Air Pollutants (HAP) stream from RockTenn, HRWTF must comply with the Maximum Achievable Control Technology (MACT) regulations introduced by Title III of the 1990 Clean Air Act Amendments. The HAP stream discharges directly to the first stage of the UNOX aeration tanks. HRWTF passed its MACT performance test with the first and last stage mixers off and with one train out of service. Converting the first zone to additional denitrification volume will not impact MACT compliance. Relocation of the HAP from its current feed point will not be required.

For HRWTF's other air pollutants, HRWTF holds a Title V air permit (administered under the Code of Federal Regulations at 40 CFR part 70). The existing air permit may need to be modified in the future depending on the solids management improvements selected. No additional standby generators are planned. All air permit modifications will be managed by HRWTF.

Virginia Department of Conservation and Recreation

The general contractor will be required to prepare a stormwater pollution prevention plan that is compatible with the VPDES stormwater permit for the HRWTF and obtain a Stormwater Management Permit for construction activities from the Virginia Department of Conservation and Recreation.

Wetlands Delineation

Construction of new facilities will not encroach into wetlands areas. HDR performed a wetlands delineation in February 2012. The delineation was submitted to the Army Corps of Engineers, Norfolk District, for confirmation. The delineated wetlands areas are shown in Drawing 15-3.

15.2 Grant and Loan Funding Provisions

HRWTF intends to apply for grant funding through the Water Quality Improvement Fund (WQIF) administered by Virginia DEQ. The Preliminary Engineering Report will be submitted to VDEQ and used by VDEQ to determine eligibility of costs. To secure WQIF funding, HRWTF will enter into a grant agreement with VDEQ that will establish treatment performance standards, design and construction milestones and other project requirements. Additionally, because the project is more than $10 million in construction cost, VDEQ will require a Value Engineering (VE) Study. The VE study will be performed at the 30 to 60 percent stage of design. The bidding documents must be structured so that the cost of grant eligible components can be readily determined.

VDEQ will issue the Certificate to Construct and Certificate to Operate following their review and approval of the required documents.

16.0 PROJECT IMPLEMENTATION, SCHEDULE AND COST

16.1 Construction Contracts and Project Schedule

Following completion of the PER, the proposed treatment process will be pilot-tested at the HRWTF site for approximately six months to demonstrate that MBBR system treating the proposed blend of Honeywell and domestic flow will achieve the target effluent goals. Following the pilot work, detailed design will begin on the Phase 2 improvements. The completed design will be advertised for bids under a single contract. The project schedule, showing the PER phase, piloting, design, bidding, and construction is shown in Figure 16-1. Prior to initiating detailed design, alternative project delivery methods, such as design-build, will be considered for this project.

The proposed schedule for the Phase 2 project is based on a construction start in the fall of 2014. The Phase 2 facilities will be substantially complete by mid-2017. Final completion is planned for fall of 2017.

16.2 Maintenance of Plant Operation

Construction, testing, and placing the Phase 2 facilities into service will require coordination between existing facility operations and the contractor's construction activities. Support system tie-ins will occur throughout the construction period. Key connections into existing facilities and the majority of the Phase 2 startup activities will occur toward the end of the construction period. Some connections will require temporary interruption of existing operations. A Maintenance of Plant Operations (MOPO) specification section will be prepared as part of the design effort and will be included in the Contract Documents. The specification section will provide detailed requirements and instructions that the contractor must follow during each shutdown or connection task. The MOPO specification section will also define which processes can be taken out of service and the allowable shutdown duration.

The MOPO schedule has been divided into the following work areas:

Work Area I: Includes the Gravelly Run Pump Station expansion, Gravelly Run forcemain, MBBR Influent Pump Station, MBBR Screenings Facility, MBBR Tanks, Blower Building, and DAF Building.
Work Area II: Includes construction and startup activities related to Secondary Clarifier No. 9.
Work Area III: Includes conversion of the first stage of the UNOX aeration tanks for anoxic treatment using mixers and baffle walls.
Work Area IV: Includes solids handling system modifications.
Work Area V: Includes re-aeration improvements.

Work Area I

The major Work Area I construction and startup activities include the Gravelly Run Pump Station expansion, Gravelly Run force main, MBBR Influent Pump Station, MBBR Screenings Facility, MBBR Tanks, Blower Building, and DAF Building. These facilities will be placed into service as follows:

Major Construction:

1. Construction the Gravelly Run Pump Station addition.
2. Construct the MBBR tanks and MBBR Screenings Facility.
3. Construct the DAF Building and Blower Building.
4. Construct the MBBR Influent Pump Station.
5. Construct MBBR Influent Weir Box.
6. Install yard piping from MBBR Influent Weir Box to MBBR Influent Pump Station. Install yard piping from MBBR Influent Pump Station to MBBR tanks.
7. Install yard piping from MBBR tanks to DAF units. Install yard piping from DAF units to the Denitrification Influent Channel.

8. Complete all piping pressure tests and equipment clean water startup and acceptance testing.

Gravelly Run Tie-In:

1. Install bypass pumping system. Install suction piping in screen chamber. Route discharge piping to an existing blind flange and shutoff valve used during previous station bypasses, located east of the station along HRWTF's easement.
2. Bring bypass pumping system online. Shut off flow to Gravelly Run Pump Station by installing temporary bulkhead in screen chamber. Dewater the wetwell.
3. Install Gravelly Run Pump Nos. 3, 4, and 5 suction piping and associated equipment such as level sensors in the wetwell.
4. Complete clean water testing on Gravelly Run Pump Nos. 3, 4, and 5.
5. Reintroduce flow to wetwell by removing temporary bulkhead in the screen chamber. Turn off and remove bypass system.

Chlorine Contact Tank Effluent Channel Tie-In and Separation of Domestic and Industrial Flows:

1. Shutdown Chlorine Contact Tank No. 1. Install temporary bulkhead between the effluent gates of CCT No. 1 and No. 2. Dewater CCT Effluent Channel north of bulkhead.
2. Cut wall opening for flow to MBBR Influent Weir box. Install slide gate.
3. Remove bulkhead fitting. Bring CCT No. 1 back online.
4. Install bypass pumping system at the MBBR Influent Weir Box. Route discharge piping to Denitrification Influent Channel.
5. Shutdown flow to CCT No. 3 and Industrial Primary Clarifier No. 4.
6. Install temporary bulkhead in the Chlorine Contact Tank Effluent Channel south of the CCT No. 2 effluent gate. Install temporary bulkhead in the Denitrification Influent Channel south of the Industrial Clarifier No. 4 effluent gate. Dewater this section of channel.
7. Bring bypass pumps online to convey effluent flow from MBBR Influent Weir Box to the Denitrification Influent Channel.
8. Install Denitrification Influent slide gate between effluent gates of Tanks 3 and 4. Install wall fitting for DAF effluent piping connection to Denitrification Influent Channel.
9. Remove temporary bulkheads.
10. Close MBBR Influent Weir Box gate. Open Denitrification Influent gate. Turn off bypass pumping.

Startup:

1. When the above work tasks are complete and all components are ready for startup, the MBBR Influent Pump Station will be brought online to convey disinfected domestic flow to the MBBR tanks. The Gravelly Run Pumps 3, 4, and 5 will be brought online to convey a portion of the Honeywell flow to the MBBR Screenings Facility at the MBBR tanks. The Blower Building will go into service to supply process air for the MBBR tanks. The DAFs will be brought online.

Work Area II

The Work Area II construction and startup activities relate to Secondary Clarifier No. 9. This clarifier will be placed into service as follows:

1. Relocate existing yard piping in the construction area.
2. Construct Secondary Clarifier No. 9, influent channel extension, and effluent box.
3. Install solids collector mechanisms and RAS Pump No. 9.
4. Shutdown and drain overhead RAS line. Remove 24-inch blind flange at RAS Pump No. 1 connection. Tie in RAS Pump No. 9 to overhead RAS line. Bring overhead RAS line back into service.
5. Perform clean water acceptance testing on Secondary Clarifier No. 9.

6. Install temporary bulkhead at north end of influent channel. Dewater channel north of bulkhead. Demolish existing influent channel wall to connect channel extension with existing channel. Remove bulkhead.
7. Remove section of effluent piping to connect effluent box with effluent line.

Additional MOPO will be needed if the clarifier study shows that work is needed to improve the flow distribution between the clarifiers.

Work Area III

The Work Area III construction and startup activities relate to conversion of the first stage of the UNOX aeration tanks for anoxic treatment using mixers and baffles. The modifications will be accomplished as follows:

1. Sequentially shutdown, dewater, and clean for personnel entry each UNOX aeration tank.
2. Remove existing surface aerator from Stage 1. Install baffle wall and mixers.
3. Bring tank back online.

Work Area IV

The Work Area IV construction and startup activities relate to the solids handling improvements. Details of the shutdown and tie-in activities required for the solids handling facilities will be developed during design.

Work Area V

The Work Area V construction and startup activities relate to the addition of one re-aeration unit. The modifications will be completed as follows:

1. Shutoff flow to re-aeration units and route effluent flow through existing bypass piping.
2. Install new re-aeration unit.
3. Route flow back through re-aeration units. Close effluent bypass.

16.3 Contractor Laydown/Storage Area and Plant Access

Plant access will be through the main plant gate. The main gate is open during regular business hours. Coordination needed for contractor access on holidays and afterhours will be described in the Contract Documents.

Drawing 16-1 shows the area the contractor may use for staging, laydown and storage. The Contract Documents will show this staging, laydown and storage area, and will list the limitations and coordination needed to minimize impact on facility operations.

16.4 Engineer's Opinion of Probable Project Costs

The Engineer's preliminary opinion of probable construction cost (OPCC) for the Phase 2 improvements as described in this Preliminary Engineering Report is $60,287,000. This OPCC does not include escalation to the midpoint of construction and does not include the cost of solids disposal capacity improvements. Escalation will depend on market conditions at the time of bidding. When engineering services, legal and administrative costs and construction phase changes are included, the total project cost is estimated to be $74,153,000. A breakdown of the opinion of probable project costs is provided in Table 16-1.

Table 16-1 Engineer's Opinion of Probable Project Costs

Item	Est. Cost
Sitework and Yard Piping	$1,796,000
Gravelly Run Pump Station Additions and Force Main	$1,282,000
Primary Clarifier Modifications	$100,000
MBBR Influent Pump Station	$1,227,000
MBBR Screening Facility	$620,000
MBBR Treatment Tanks	$9,203,000
MBBR System Equipment (inc. DAF equipment)	$21,060,000
DAF Building	$1,195,000
Blower Building	$1,674,000
UNOX Tank Modifications	$528,000
Secondary Clarifier No. 9	$1,304,000
Re-Aeration Addition	$435,000
Centrifuge Addition	$917,000
Instrumentation & Controls	$1,950,000
Electrical	$5,750,000
Contractor Field General Conditions	$3,187,000
Subtotal	$52,228,000
Contractor's Fee	$2,493,000
Contractor's Bonds and Insurance	$891,000
Undefined Scope of Work	$4,675,000
Subtotal	$8,059,000
Construction Cost Total[1]	**$60,287,000**
Engineering Services (15%)	$9,043,000
Legal & Administrative (3%)	$1,809,000
Construction Phase Changes (5%)	$3,014,000
Subtotal	$13,866,000
Project Cost Total	**$74,153,000**

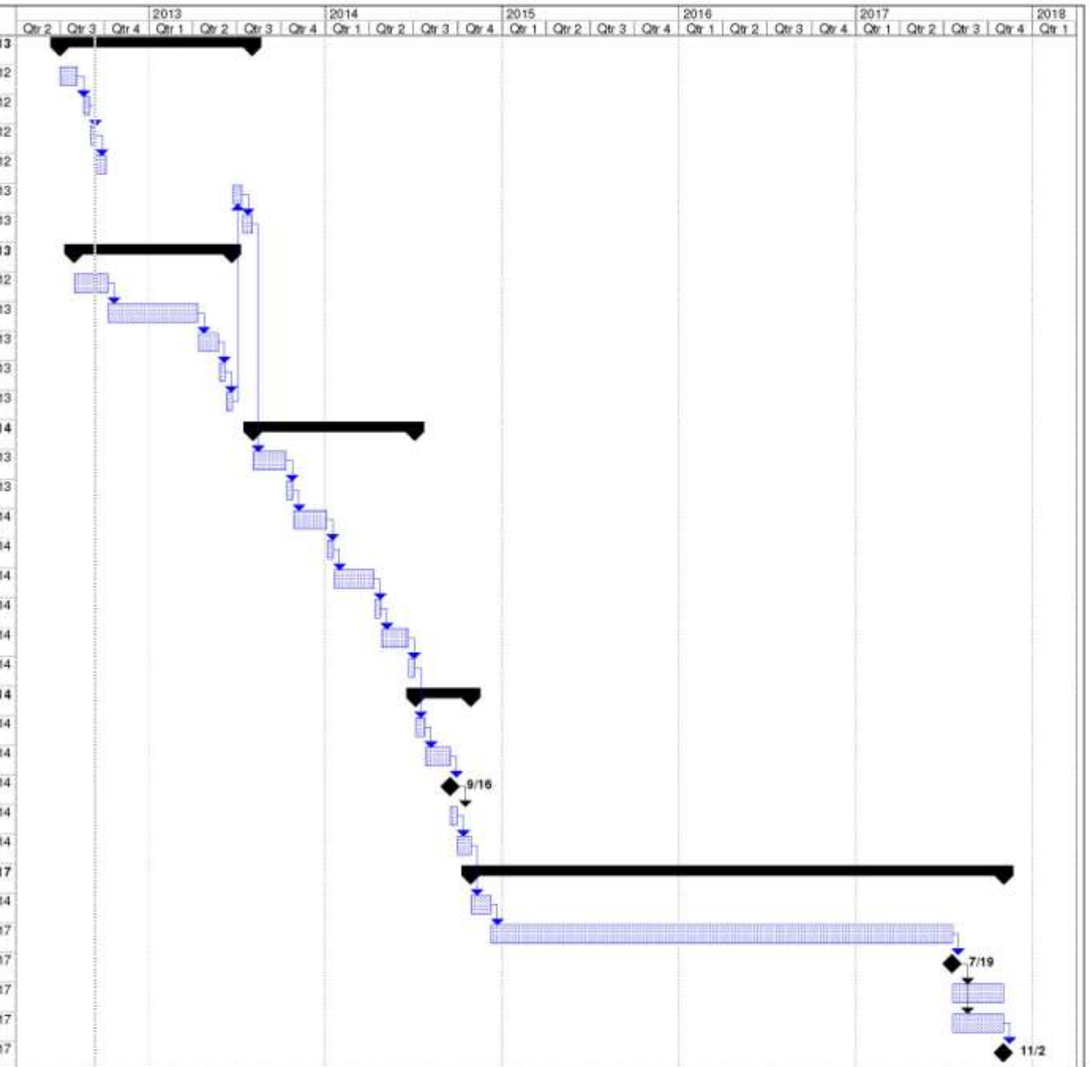
[1] – Does not include cost of solids disposal capacity improvements or escalation to the mid-point of construction.

The Engineer's OPCC was prepared as a Class 4 level estimate as defined by the Associated for the Advancement of Cost Engineering (AACE) with an expected accuracy of -20 percent to +40 percent. AACE Class 4 estimates are appropriate for projects in the 1 to 15 percent completion range. Davis-Bacon wage rates for Petersburg, Virginia were used and it was assumed that the project is exempt from sales taxes.

As described in Chapter 7, use of excess high purity oxygen for process aeration in the MBBR tanks would result in substantial cost savings. This is currently being evaluated by the MBBR vendor and will be considered during the design phase.

Figure 16-1 Project Schedule

ID	Task Name	Duration	Start	Finish
1	**Preliminary Engineering Report**	**285 days**	**Mon 7/2/12**	**Fri 8/2/13**
2	Draft PER	26 days	Mon 7/2/12	Mon 8/6/12
3	HRWTF Review	10 days	Mon 8/20/12	Fri 8/31/12
4	Final PER	9 days	Mon 9/3/12	Thu 9/13/12
5	DEQ Review	15 days	Fri 9/14/12	Thu 10/4/12
6	Prepare PER Addendum (if req'd based on pilot testing)	15 days	Mon 6/24/13	Fri 7/12/13
7	DEQ Review	15 days	Mon 7/15/13	Fri 8/2/13
8	**Bench/Pilot Testing**	**234 days**	**Tue 7/31/12**	**Fri 6/21/13**
9	Construct Pilot System	50 days	Tue 7/31/12	Mon 10/8/12
10	Conduct Pilot Testing	134 days	Tue 10/9/12	Fri 4/12/13
11	Evaluate Results & Draft TM	30 days	Mon 4/15/13	Fri 5/24/13
12	HRWTF Review	10 days	Mon 5/27/13	Fri 6/7/13
13	Final TM	10 days	Mon 6/10/13	Fri 6/21/13
14	**Design**	**240 days**	**Mon 8/5/13**	**Fri 7/4/14**
15	30% Design	50 days	Mon 8/5/13	Fri 10/11/13
16	HRWTF Review	10 days	Mon 10/14/13	Fri 10/25/13
17	60% Design	50 days	Mon 10/28/13	Fri 1/3/14
18	HRWTF Review	10 days	Mon 1/6/14	Fri 1/17/14
19	90% Design	60 days	Mon 1/20/14	Fri 4/11/14
20	HRWTF Review	10 days	Mon 4/14/14	Fri 4/25/14
21	100% Design	40 days	Mon 4/28/14	Fri 6/20/14
22	HRWTF Review	10 days	Mon 6/23/14	Fri 7/4/14
23	**Bidding**	**82 days**	**Mon 7/7/14**	**Tue 10/28/14**
24	Bidding Documents	15 days	Mon 7/7/14	Fri 7/25/14
25	Advertise	36 days	Mon 7/28/14	Mon 9/15/14
26	Receive Bids	1 day	Tue 9/16/14	Tue 9/16/14
27	Evaluatate Bids	10 days	Wed 9/17/14	Tue 9/30/14
28	Award	20 days	Wed 10/1/14	Tue 10/28/14
29	**Construction**	**787 days**	**Wed 10/29/14**	**Thu 11/2/17**
30	Mobilize	30 days	Wed 10/29/14	Tue 12/9/14
31	Construct Project	680 days	Wed 12/10/14	Tue 7/18/17
32	Substantial Completion	1 day	Wed 7/19/17	Wed 7/19/17
33	Startup & Initial Operation	75 days	Thu 7/20/17	Wed 11/1/17
34	Punch List	75 days	Thu 7/20/17	Wed 11/1/17
35	Final Completion	1 day	Thu 11/2/17	Thu 11/2/17



Project: hrwtf phase 2 project schedul
Date: Tue 9/11/12

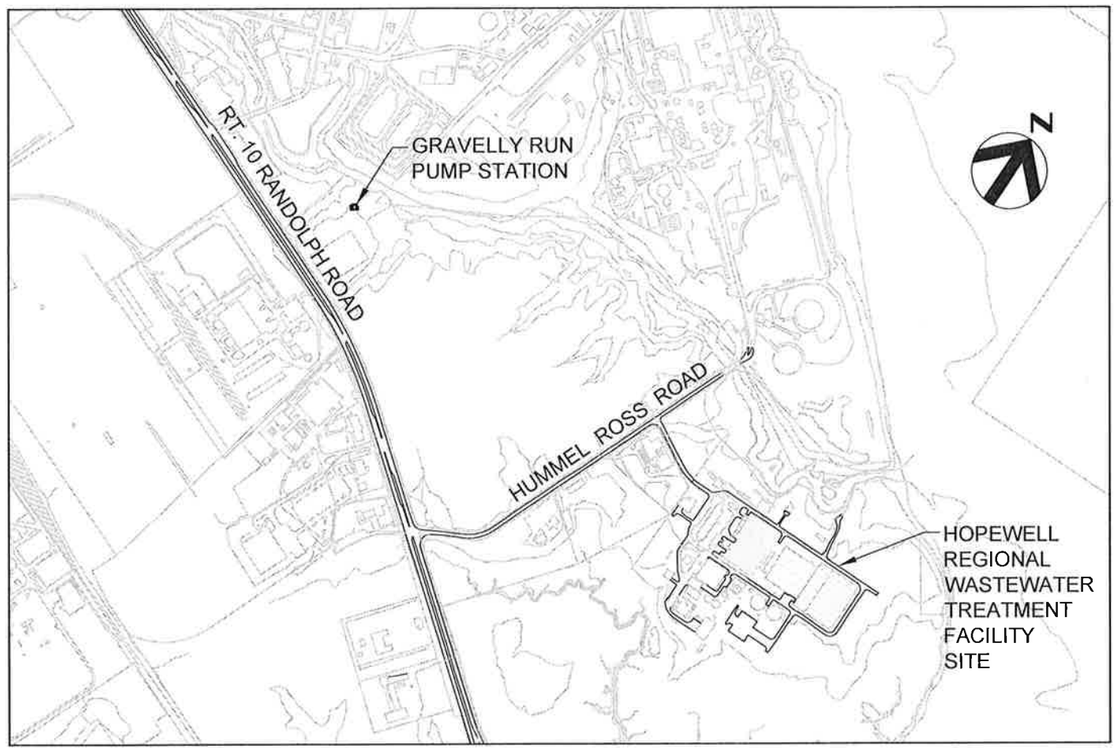
Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

Page 1

CITY OF HOPEWELL, VIRGINIA

HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY
ALTERNATIVE 4A-1 LIGHT, PHASE 2
PRELIMINARY ENGINEERING REPORT

VOLUME 2 OF 2
DRAWINGS



LOCATION PLAN

500 0 500 1000 2000'

GRAPHIC SCALE
1" = 500'

AUGUST 2012

HDR

HDR Engineering, Inc.
5700 Lake Wright Drive
Twin Oaks 1 - Suite 300
Norfolk, VA 23502
Phone: (757) 222-1500

NOTES:

1. HORIZONTAL DATUM AS SHOWN HEREON IS BASED ON VIRGINIA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE (NAD1983) U.S. SURVEY FEET.
2. ELEVATIONS AS SHOWN HEREON ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

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A	ARCHITECTURAL (DWG DISCIPLINE), AMP, AMPERE, ALARM, AMBER
A/C	AIR CONDITIONING
A/E	ARCHITECT/ENGINEER
AB	ANCHOR BOLT
ABAN	ABANDON
AC	ALTERNATING CURRENT, ACID CLEANING
AC/H	AIR CHANGES PER HOUR
ACCU	AIR-COOLED CONDENSING UNIT
ACK	ACKNOWLEDGE
ACT	ACOUSTIC CEILING TILE
AD	ADDENDUM, AREA DRAIN
ADDL	ADDITIONAL
ADH	ADHESIVE
ADJ	ADJUSTABLE, ADJACENT
AF	AMP FRAME, AMP FUSE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AHU	AIR HANDLING UNIT
AI	AREA INLET, ANALOG INPUT
AIC	AMPS INTERRUPTING CAPACITY
AIT	ANALYZER INDICATING TRANSMITTER
ALIG	ALIGNMENT
ALUM	ALUMINUM
ALT	ALTERNATE, ALTITUDE
AMB	AMBIENT
AMPS	AMPERES
ANC	ANCHOR
AO	ANALOG OUTPUT
AP	ACCESS PANEL
APPROX	APPROXIMATELY
APVD	APPROVED
AR	ALARM RELAY
ARCH	ARCHITECTURAL
AS	AIR SUPPLY (LOW PRESSURE PROCESS AIR), AIR SEPARATOR
ASSY	ASSEMBLY
AT	AMP TRIP, AERATION TANKS
ATM	ATMOSPHERE
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
B/	BOTTOM OF
B/B	BACK TO BACK
B/D	BOTTOM OF DITCH
BAL	BALANCE
BC	BASE CABINET, BOTTOM CHORD, BOLT CENTER BOLT CIRCLE
BD	BOARD
BDD	BACKDRAFT DAMPER
BDM	BOTTOM
BE	BOTH ENDS, BELL END
BF	BOTH FACES, BOTTOM FACE, BLIND FLANGE BOARD FEET
BFP	BACKFLOW PREVENTER
BFV	BUTTERFLY VALVE
BKG	BACKING
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BLR	BOILER
BLWR	BLOWER
BM	BENCHMARK, BEAM
BO	BLOW-OFF, BOTTOM OF
BOC	BACK OF CURB, BOTTOM OF CONCRETE
BOD	BIOLOGICAL OXYGEN DEMAND, BOTTOM OF DUCT
BOG	BOTTOM OF GRILLE
BOL	BOTTOM OF LOUVER
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BOT	BOTTOM
BOU	BOTTOM OF UNIT
BP	BASE PLATE
BRG	BEARING
BRGP	BEARING PLATE
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BTWLD	BUTT WELD
BU	BELL UP
BW	BOTH WAYS
BYP	BYPASS

C	CHANNEL SHAPE, CENTIGRADE, CLOSE, CONDUIT, CIVIL (DRAWING DISCIPLINE), COMMUNICATION, CONTRACTOR, COUNTER
C-C	CENTER TO CENTER
C TO C	CENTER TO CENTER
C&G	CURB & GUTTER
CAB	CABINET
CAP	CAPACITY
CAT	CATALOG
CAV	CAVITY
CB	CATCH BASIN
CCB	CONCRETE BLOCK
CCT	CHLORINE CONTACT TANK
CCTE	CHLORINE CONTACT TANK EFFLUENT
CCW	COUNTER CLOCKWISE
CE	CONCRETE EDGE
CENT	CENTRIFUGAL, CENTRIFUGE
CF	CUBIC FEET (FOOT)
CFH	CUBIC FEET PER HOUR
CFL	COUNTER FLASHING
CFM	CUBIC FEET PER MINUTE
CHFR	CHAMFER
CHD	CHORD
CHH	COMMUNICATION HANDHOLE
CI	CURB INLET
CIP	CAST-IN-PLACE
CIRC	CIRCULATION, CIRCULAR
CJ	CONSTRUCTION JOINT
CKT	CIRCUIT
CL	CENTERLINE, CLASS, CLOSE
CLG	CEILING
CLKG	CAULKING
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT, CONCRETE OPENING
COL	COLUMN
COM	COMMON
COMB	COMBINATION
COMM	COMMUNICATION
COMP	COMPOSITION, COMPRESSIBLE, COMPOSITE,
COMPR	COMPRESSOR
CONC	CONCENTRIC, CONCRETE
COND	CONDENSATE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUED, CONTINUOUS
COOR	COORDINATE
CORR	CORROSIVE, CORRUGATED
CP	CHECKER PLATE, CONTROL POINT, CONTROL PANEL
CPLG	COUPLING
CPT	CONE PENETRATION TEST, CONTROL POWER TRANSFORMER
CR	CURRENT, CONTROL RELAY
CRL	CORROSION RESISTANT LINING
CS	CONTROL STATION
CSC	COMPRESSION SLEEVE COUPLING
CSK	COUNTERSINK
CT	CERAMIC TILE, CYCLE TIMER, CURRENT TRANSFORMER
CTJ	CONTRACTION JOINT
CTR	CENTER
CTRD	CENTERED
CTRS	CENTERS
CTRL	CONTROL
CVT	CULVERT
CU	COPPER, CUBIC
CU FT	CUBIC FEET
CW	CLOCKWISE, COLD WATER
CY	CUBIC YARD

D	DEEP, DEPTH
DAF	DISSOLVED AIR FLOTATION
DAFI	DAF INFLUENT
DAFE	DAF EFFLUENT
DB	DUCT BANK, DECIBEL, DRY BULB, DEED BOOK
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DC	DIRECT CURRENT
DCP	DIGITAL CONTROL PANEL
DCS	DIGITAL CONTROL SYSTEM
DCU	DIGITAL CONTROL UNIT
DDC	DIGITAL DEMAND CONTROLLER
DEG	DEGREE
DEG C	DEGREE CENTIGRADE
DEG F	DEGREE FAHRENHEIT
DEMO	DEMOLITION
DEP	DEPRESSED
DET	DETAIL
DETCTR	DETECTOR
DI	DROP INLET, DUCTILE IRON, DIGITAL (DISCREET) INPUT
DIA	DIAMETER
DIAG	DIAGONAL, DIAGRAM
DIFF	DIFFERENTIAL, DIFFERENCE
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DISCH	DISCHARGE
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DMJ	DOUBLE MECHANICAL JOINT
DN	DOWN
DO	DISSOLVED OXYGEN, DITTO, DIGITAL (DISCREET) OUTPUT
DP	DEPTH
DPDT	DOUBLE POLE, DOUBLE THROW
DPOLY	DRY POLYMER
DPS	DIFFERENTIAL PRESSURE SWITCH
DPST	DOUBLE POLE, SINGLE THROW
DPTF	DOMESTIC PRELIMINARY TREATMENT FACILITY
DPTFPP	DOMESTIC PRELIMINARY TREATMENT FACILITY POWER PANEL
DR	DRAIN
DS	DOWN SPOUT, DISCONNECT SWITCH
DT	DOUBLE TEE, DRIP TRAP ASSEMBLY
DUP	DUPLICATE
DW	DILUTION WATER
DWG	DRAWING
DWL	DOWEL
DWR	DRAWER
E	EAST, ELECTRICAL (DWG DISCIPLINE), ELECTRIC
EA	EACH, EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EC	EMPTY CONDUIT
ECC	ECCENTRIC
ED	EQUIPMENT DRAIN
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE, EXHAUST FAN
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLE
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW, ELEVATION
ELEC	ELECTRICAL
EMBD	EMBEDDED
EMERG	EMERGENCY
EMH	ELECTRICAL MANHOLE
EMH-HV	ELECTRICAL MANHOLE - HIGH VOLTAGE
EMH-LV	ELECTRICAL MANHOLE - LOW VOLTAGE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EO	EMERGENCY OVERFLOW
EOP	EDGE OF PAVEMENT
EOS	EDGE OF SLAB
EP	EXPLOSION PROOF
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ES	EACH SIDE, EQUAL SPACE, END SWITCH
ESEW	EMERGENCY SHOWER AND EYE WASH
ESMT	EASEMENT
EST	ESTIMATE
E-STOP	EMERGENCY STOP
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
EW	EACH WAY
E/W	EACH WAY
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY, EACH FACE
EWH	ELECTRIC WATER HEATER

EWTB	EACH WAY, TOP AND BOTTOM
EXC	EXCAVATION
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION, EXPOSED
EXT	EXTERIOR, EXTERNAL, EXTENSION
F	FIBER, DEGREES FAHRENHEIT
F/FOR	FORWARD
F&B	FACE & BYPASS
F TO F	FACE TO FACE
FAB	FABRICATE
FB	FLOOR BEAM
FBD	FIBERBOARD
FBG	FIBERGLASS
FBM	BOARD FOOT MEASURE
FC	FLUSHING CONNECTION, FAN COIL
FCA	FLANGED COUPLING ADAPTER
FCU	FAN COIL UNIT
FD	FIRE DAMPER, FLOOR DRAIN
FDC	FLEXIBLE DUCT CONNECTION
FDN	FOUNDATION
FDTN	FOUNDATION
FDR	FEEDER
FE	FLANGED END, FLOW ELEMENT
FEC	FIRE EXTINGUISHER CABINET
FES	FLARED END SECTION
FEXT	FIRE EXTINGUISHER
FF	FAR FACE, FACTORY FINISH, FLAT FACE
FG	FINISHED GRADE
FI	FILTER
FIG	FIGURE
FH	FIRE HYDRANT
FIN	FINISH
FIT	FLOW INDICATING TRANSMITTER
FJT	FLUSH JOINT
FL	FLOW, FLOW LINE
FLA	FULL LOAD AMPERES
FLEX	FLEXIBLE
FLG	FLANGE
FLOR	FLUORESCENT
FLR	FLOOR
FLS	FLASHING, FLUSH
FM	FLOW METER, FORCE MAIN
FN	FENCE
FNE	FINAL EFFLUENT
FO	FINISHED OPENING
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE, FACE OF CURB, FUEL OIL COOLER
FOF	FACE OF FINISH
FOM	FACE OF MASONRY, FIBER OPTIC MODEM
FOP	FUEL OIL PUMP
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY, FACE OF STUDS
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPP	FIBER PATCH PANEL
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FRTM	FIRE RETARDANT TREATED MATERIAL
FS	FLOOR SINK, FAR SIDE, FLOW SWITCH
FSB	FLOTATION THICKENER SUBNATANT
FT	FEET, FOOT
FT^3	CUBIC FEET
FTG	FOOTING, FITTING
FTS	FLOTATION THICKENER BIOSOLIDS
FUR	FURRED, FURRING
FURN	FURNITURE, FURNISH
FUT	FUTURE
FV	FACE VELOCITY, FIELD VERIFY
FW	FIELD WELD, FIRE WALL
FWD	FORWARD
FWE	FURNISHED WITH EQUIPMENT
FXTR	FIXTURE

G	GRILLE, GROUND, GENERAL (DWG DISCIPLINE), GREEN
GA	GAGE (METAL THICKNESS)
GAL	GALLON
GALV	GALVANIZED
GAM	GAS ANALYSIS MODULE
GB	GRAB BAR, GRADE BREAK
GC	GROOVED COUPLING, GRIT CHANNEL
GD	GUARD, GROUND DETECTOR
GDR	GRADING
GEN	GENERAL, GENERATOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFI	GROUND FAULT INTERRUPTER
GFMU	GROUND FACE MASONRY UNIT
GFR	GROUND FAULT RELAY
GG	GUTTER GRADE
GJ	GROOVED JOINT
GND	GROUND
GP	GUY POLE
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GR	GRADE
GRFM	GRAVELLY RUN FORCE MAIN
GRIT	GRIT
GRTC	GRAVELLY RUN TRAINING CENTER
GRTG	GRATING
GSP	GALVANIZED STEEL PIPE
GT	GREASE TRAP, GRIT TANK
GTE	GRIT TANK EFFLUENT
GVL	GRAVEL
GW	GUY WIRE
H	HIGH, HVAC (DWG DISCIPLINE), HAZARDOUS, HOT
HAP	HAZARDOUS AIR POLLUTANTS
HB	HOSE BIBB
HC	HOLLOW CORE, HORIZONTAL CURVE, HORIZONTAL CENTERLINE
HCA	HEADED CONCRETE ANCHOR, HARNESSED COUPLING ADAPTER
HD	HEAD, HOT DIP
HDR	HEADER
HDW	HARDWARE
HE	EXISTING PANEL DESIGNATION
HEX	HEXAGONAL
HGR	HANGER
HH	HANDHOLE
HID	HIGH INTENSITY DISCHARGE
HM	HOLLOW METAL
HMI	HUMAN MACHINE INTERFACE
HMW	HIGH MOLECULAR WEIGHT
HOA	HAND/OFF/AUTO
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER, HEAT PUMP
HPC	HORIZONTAL POINT OF CURVATURE
HPO	HIGH PURITY OXYGEN
HPS	HIGH PRESSURE SODIUM
HPT	HORIZONTAL POINT OF TANGENCY
HR	HOSE REEL, HOUR
HRS	HOURS
HRT	HYDRAULIC RETENTION TIME
HS	HEADED STUD, HIGH STRENGTH
H_2S	HYDROGEN SULFIDE
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HW	HEADWORKS
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HWP	HOT WATER PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HX	HEAT EXCHANGER
HYD	HYDRAULIC, HYDRANT
HZ	HERTZ, CYCLES PER SECOND

I	INSTRUMENTATION (DWG DISCIPLINE), INCLINOMETER
I&C	INSTRUMENTATION & CONTROLS
I/O	INPUT/OUTPUT
ID	INSIDE DIAMETER, INTERIOR DIMENSION
IE	INVERT ELEVATION
IF	INSIDE FACE
IH	INTAKE HOOD
IMP	IMPACT
IN	INCH
INC	INCLUDE
INCAND	INCANDESCENT
INF	INFLUENT
INS WC	INCHES WATER COLUMN
INSTR	INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR, INTERSECTION
INTR	INTERMEDIATE, INTERIOR
INV	INVERT
IP	INLET PROTECTION, INSTRUMENT PANEL
IPS	IRON PIPE SIZE
IPT	INTERNAL PIPE THREAD
IR	INSIDE RADIUS
IS	INDUSTRIAL SCREENING
ISO	ISOMETRIC
J/JB	JUNCTION BOX
JCT	JUNCTION
JF	JOINT FILLER
JST	JOIST
JT	JOINT
K	KIP, KEY INTERLOCK
K-CUFT	1,000 CUBIC FEET
KB	KNEE BRACE
KCJ	KEYED CONSTRUCTION JOINT
KCMIL	THOUSAND CIRCULAR MILS
KD	KNOCK DOWN
KO	KNOCK OUT
KSI	KIPS PER SQUARE INCH
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATT (1000 WATTS)
KWH	KILOWATT HOUR
L	ANGLE, LENGTH, LAVATORY, LINTEL, LOW LEVEL, LATCH
LAD	LADDER
LAM	LAMINATE
LATL	LATERAL
LB	LAG BOLT, POUND
LB/D	POUNDS PER DAY
LB/HR/M	POUNDS PER HOUR PER MINUTE
LBVS	POUND OF VOLATILE SOLIDS
LCP	LOCAL CONTROL PANEL
LDG	LANDING
LDR	LEADER
LE	LIFTING EYE, LEVEL ELEMENT, EXISTING PANEL DESIGNATION
LEA	LEACHATE
LF	LINEAR FOOT
LG	LONG
LH	LEFT HAND
LIN	LINEAR
LIQ	LIQUID
LIT	LEVEL INDICATING TRANSMITTER
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LNG	LONGITUDINAL
LOC	LOCATION
LP	LOW POINT, LIGHTING PANEL, LIGHT POLE
LPOLY	LIQUID POLYMER
LPS	LOW PRESSURE SODIUM
LR	LONG RADIUS, LATCH RELAY
LS	LEVEL SWITCH, LIMIT SWITCH
LSH	LEVEL SWITCH HIGH
LSL	LEVEL SWITCH LOW
LT	LEFT
LTD	LIMITED
LTG	LIGHTING
LTL	LINTEL
LTNG	LIGHTNING
LV	LOW VOLTAGE
LVL	LEVEL
LVR	LOUVER
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL

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ISSUE	DATE	DESCRIPTION
A	08/2012	DRAFT PER - NOT FOR CONSTRUCTION

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CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

GENERAL ABBREVIATIONS 1

0 1" 2"

FILENAME	0-1.dwg
SCALE	NONE
DRAWING NUMBER	0-1
SHEET	OF -

C:\pwworking\pittd06119470-1.dwg, 8/10/2012 9:15:57 AM, epagsanj, 1:2

M	METER, MECHANICAL (DWG DISCIPLINE) MAGNETIC MOTOR STARTER
mA	MILLIAMPERE
MA	MIXED AIR
MACH	MACHINED
MAINT	MAINTENANCE
MAN	MANUAL
MATL	MATERIAL
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MB	MACHINE BOLT
MBBR	MOVING BED BIOFILM REACTOR
MBBRD	MBBR DRAIN
MBBRI	MBBR INFLUENT
MBBRR	MBBR RECYCLE
MBH	THOUSAND BTU PER HOUR
MBR	MEMBER
MC	MECHANICAL COUPLING, MOMENT CONNECTION
MCA	MINIMUM CIRCUIT AMPS
MCB	METAL CORNER BEAD
MCC	MOTOR CONTROL CENTER
MCJ	MASONRY CONTROL JOINT
MCLU	MOTOR CONTROLLER LINE-UP
MCP	MOTOR CIRCUIT PROTECTOR
MD	MOISTURE DETECTOR
MDMJ	MODIFIED DOUBLE MECHANICAL JOINT
MECH	MECHANICAL
MED	MEDIUM
MFM	MAGNETIC FLOW METER
MFR	MANUFACTURER
MG	MILLION GALLONS
mg/l	MILLIGRAMS PER LITER
MGD	MILLION GALLONS PER DAY
MH	MANHOLE, METAL HALIDE, MOUNTING HEIGHT
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MLO	MAIN LUGS ONLY
MLSS	MIXED LIQUOR SUSPENDED SOLIDS
mm	MILLIMETER
MO	MASONRY OPENING, MONTH
MOCP	MAXIMUM OVERCURRENT CIRCUIT PROTECTION
MOD	MODULAR, MODIFY, MOTOR OPERATED DAMPER
MOV	MOTOR OPERATED VALVE
MPR	MOTOR PROTECTION RELAY
MPT	MALE PIPE THREAD
MS	MOP SINK, MAGNETIC MOTOR STARTER
MSL	MEAN SEA LEVEL
MT	MOUNT
MTD	MOUNTED
MTR	METER
MV	MEDIUM VOLTAGE
MW	MONITORING WELL
N	NORTH, NEUTRAL
NA	NOT APPLICABLE
NAT	NATURAL
NC	NORMALLY CLOSED, NOISE CRITERIA
NEC	NATIONAL ELECTRICAL CODE
NEG	NEGATIVE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NF	NEAR FACE, NON-FUSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NG	NATURAL GAS
NGM	NATURAL GAS METER
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NI	NORTH INTERCEPTOR
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NOMIN	NOMINAL
NOS	NUMBERS
NPS	NOMINAL PIPE SIZE
NPT	NATIONAL PIPE THREAD
NPW	NON-POTABLE WATER
NS	NEAR SIDE
N/S	NORTH/SOUTH; NON-SHRINK
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL

O_2	OXYGEN
O	OPEN
O TO O	OUT-TO-OUT
OA	OUTDOOR AIR, OVERALL
OC	ON CENTER
OCPD	OVER CURRENT PROTECTION DEVICE
OD	OUTSIDE DIAMETER
OED	OPEN-ENDED DUCT
OF	OUTSIDE FACE, OVERFLOW
OFR	OVERFLOW RATE
OG	ORIGINAL GROUND
OH	OVERHEAD, OPPOSITE HAND
OL	OVERLOAD
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
OR	OUTSIDE RADIUS
ORD	OVERFLOW ROOF DRAIN
ORIG	ORIGINAL
ORP	OXIDATION REDUCTION POTENTIAL
OSHA	OCCUPATIONAL SAFETY AND HEALTH ACT
OVFL	OVERFLOW
OVHG	OVERHANG
OZ	OUNCE
P	PAINT, PROCESS (DWG DISCIPLINE), PUMP, POLE
PAR	PARALLEL, PARAPET
PB	PANIC BAR, PULL BOX, PUSH BUTTON, PLAT BOOK
PC	POINT OF CURVE, PIECE, PRECAST, PRIMARY CLARIFIER, PHOTO CONTROL
PCA	PLANT COMPRESSED AIR
PCC	POINT OF COMPOUND CURVATURE
PCCP	PRESTRESSED CONCRETE CYLINDER PIPE
PCE	PRIMARY CLARIFIER EFFLUENT
PCF	POUNDS PER CUBIC FOOT
PCI	PRIMARY CLARIFIER INFLUENT
PCS	PRIMARY CLARIFIER SOLIDS
PCT	PERCENT
PD	PROCESS DRAIN
PDS	DIFFERENTIAL PRESSURE SWITCH
PDSH	DIFFERENTIAL PRESSURE SWITCH HIGH
PDSL	DIFFERENTIAL PRESSURE SWITCH LOW
PE	PLAIN END, POLYETHYLENE, PHOTOELECTRIC CELL
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT, PERIMETER
PERP	PERPENDICULAR
PF	POWER FACTOR
PG	PAGE
PH	PHASE
PI	POINT OF INTERSECTION
PIT	PRESSURE INDICATING TRANSMITTER
PKG	PACKAGE
PL	PLATE, PROPERTY LINE
PLAS	PLASTIC
PLAT	PLATFORM
PLBG	PLUMBING
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLF	POUNDS PER LINEAR FOOT
PNEU	PNEUMATIC
PNL	PANEL
PNLBD	PANELBOARD
POL	POLISH
POLYS	POLYMER SOLUTION
POS	POSITIVE, POSITION
PP	POLYPROPYLENE, POWER POLE
PPM	PARTS PER MILLION
PPU	POSITIVE PRESSURIZATION UNIT
PRC	POINT OF REVERSE CURVATURE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PREP	PREPARE
PRES	PRESSURE
PRESS	PRESSURE
PRGS	PVC-COATED RIGID GALVANIZED STEEL
PRI	PRIMARY
PROJ	PROJECTION
PROP	PROPERTY

PRV	PRESSURE REDUCING VALVE
PS	PIPE SUPPORT, PRESSURE SWITCH, PUMP STATION, PRIMARY SOLIDS
PSF	POUNDS PER SQUARE FOOT
PSH	PRESSURE SWITCH HIGH
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PSL	PRESSURE SWITCH LOW
PST	PRESTRESSED
PT	POINT, POINT OF TANGENCY POTENTIAL TRANSFORMER, PROGRAM TIMER
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PW	POTABLE WATER
PWC	POTABLE WATER, COLD
PWD	PLYWOOD
PWH	POTABLE WATER, HOT
PWJ	PLYWOOD WEB JOIST
PWR	POWER
PZ	PIEZOMETER
Q	RATE OF FLOW
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R	RADIUS, RAISE, RED, REGISTER, RELAY, REVERSE, RISER
R&R	REMOVE AND REPLACE
R&S	REMOVE AND SALVAGE
RA	RETURN AIR
RAD	RADIUS
RAS	RETURN ACTIVATED SOLIDS
RB	RESILIENT BASE, ROCK BERM
RC	REINFORCED CONCRETE
RCP	RECIRCULATION PUMP, REINFORCED CONCRETE PIPE
RCPT	RECEPTACLE
RCR	RADIATOR COOLING RETURN
RCS	RADIATOR COOLING SUPPLY
RD	ROOF DRAIN
REC	RECESS
RECD	RECEIVED
RECP	RECEPTACLE
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REFRIG	REFRIGERANT
REG	REGISTER
REINF	REINFORCING
REM	REMOVE
REQD	REQUIRED
RES	RESISTOR
RESIL	RESILIENT
RET	RETAINING, RETURN
REV	REVISION, REVERSE
RFG	ROOFING
RFL	REFLECTED, REFLECTOR
RGH	ROUGH
RGS	RIGID GALVANIZED STEEL
RGS-PVC	PVC COATED RGS
RH	RELIEF HOOD, RIGHT HAND, RELATIVE HUMIDITY
RIO	REMOTE INPUT/OUTPUT
RL	REQUIRED LAP
RLA	ROTOR LOCKED AMPS
RLFA	RELIEF AIR
RM	ROOM
RMS	ROOT-MEAN-SQUARE
RND	ROUND
RNG	RUNNING
RO	ROUGH OPENING
ROW	RIGHT OF WAY
RP	REFERENCE ELEVATION POINT
RPM	REVOLUTIONS PER MINUTE
RS	RAPID START
RSP	ROCK SLOPE PROTECTION
RT	RIGHT
RTD	RESISTANCE TYPE THERMAL DETECTOR
RWI	RAW WASTEWATER INFLUENT
RY	READY

S	SOUTH, SINK, STRUCTURAL (DWG DISCIPLINE)
SA	SUPPLY AIR, SERVICE AIR (HIGH PRESSURE)
SAMP	SAMPLE
SAMU	SOUND ABSORBING MASONRY UNIT
SAN	SANITARY
SB	SPLASH BLOCK
SBD	SCRUBBER BLOWDOWN
SC	SECONDARY CLARIFIER, SOIL CORE, SCREEN CHANNEL
SCE	SECONDARY CLARIFIER EFFLUENT
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SCHEM	SCHEMATIC
SCI	SECONDARY CLARIFIER INFLUENT
SCN	SCREEN
SCUM	SCUM (PRIMARY)
SD	STORM DRAIN
SDFM	STORM DRAIN FORCE MAIN
SE	SCREENED EFFLUENT, STEEL/ALUMINUM EDGE
SEC	SECONDARY, SECONDS, SECTION
SECT	SECTION
SEIS	SEISMIC
SEP	SEPARATE
SEPT	SEPTAGE
SEWER	PLANT SEWER
SF	SILT FENCE, SQUARE FOOT, SUPPLY FAN
SFM	SANITARY FORCE MAIN
SFTD	SUBNATANT FLOTATION THICKENER DISCHARGE
SG	SLIDE GATE, SEALANT GROOVE
SH	SPACE HEATER
SHC	SODIUM HYPOCHLORITE
SHCT	SODIUM HYPOCHLORITE TRANSFER
SHT	SHEET
SHTG	SHEATHING
SI	SOUTH INTERCEPTOR
SID	SHUT-OFF ISOLATION DAMPER
SIL	SILENCE
SIM	SIMILAR
SIT	SPEED INDICATING TRANSMITTER
SJ	SAWED JOINT
SL	SLOPE, STEEL LINTEL, SNOW LOAD
SLR	SOLIDS LOADING RATE
SLTD	SLOTTED
SLV	SLEEVE
SMLS	SEAMLESS
SNR	SUPERNATANT RETURN
SOG	SLAB ON GRADE
SOTE	STANDARD OXYGEN TRANSFER EFFICIENCY
SP	SINGLE POLE, SOUNDPROOF, STATIC PRESSURE, STANDPIPE, SUMP PUMP
SPA	SPACING
SPCG	SPACING
SPCS	SPACES
SPD	SUMP PUMP DISCHARGE, SURGE PROTECTIVE DEVICE
SPEC	SPECIFICATION
SPLY	SUPPLY
SPRAY	SPRAY WATER
SPST	SINGLE POLE SINGLE THROW
SPT	SET POINT
SQ	SQUARE
SR	SHORT RADIUS
SS	SERVICE SINK, STAINLESS STEEL, SELECTOR SWITCH
SSFM	SANITARY SEWER FORCE MAIN
SSMR	STANDING SEAM METAL ROOF
SSR	SCUM SUBNATANT RETURN
SSRV	SOFT START REDUCED VOLTAGE
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STN	STAINLESS
STOR	STORAGE
STR	STRUCTURAL, STRAIGHT
SUB	SUBSTITUTE
SUC	SUCTION
SUSP	SUSPENDED
SV	SOLENOID VALVE
SW	SEAL WATER, SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SY	SQUARE YARD
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
SYS	SYSTEM

T	TELEPHONE, THERMOSTAT, THICKNESS, TIMER, TRANSFORMER, TREAD
T/	TOP OF
T/SST	TOP OF STAINLESS STEEL
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
TAN	TANGENT
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCHMARK
TC	TIME CLOCK, TIMER CLUTCH
TCE	TEMPORARY CONSTRUCTION EASEMENT
TD	TIME DELAY RELAY
TDH	THREAD
TEK	SELF-SEALING ROOFING FASTENER
TEMP	TEMPORARY, TEMPERATURE
THD	THREAD
THK	THICK
THRESH	THRESHOLD
THRU	THROUGH
TK	TANK
TKN	TOTAL KJELDAHL NITROGEN
TM	TIMER MOTOR
TO	TOP OF
TOA	TOP OF ALUMINUM
TOB	TOP OF BOLT, TOP OF BANK, TOP OF BEAM
TOC	TOP OF CURB, TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL
TOW	TOP OF WALL
TP	TOILET PARTITION, TOE PLATE, TRAP PRIMER, TELEPHONE POLE
TPG	TOPPING
TQ/TQS	TORQUE
TR	TRANSOM, TIMER RELAY
TRANS	TRANSITION
TRD	TRENCH DRAIN
TS	THICKENED SOLIDS, TEMPERATURE SWITCH
TSH	TEMPERATURE SWITCH HIGH
TSL	TEMPERATURE SWITCH LOW
TSP	TWISTED SHIELDED PAIR
TSS	TOTAL SUSPENDED SOLIDS
TSTAT	THERMOSTAT
T-TREAD	TOP OF TREAD
TYP	TYPICAL
U	UNLATCH
UG	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES
ULT	ULTIMATE
UNFN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTIL	UTILITY
UV	UTILITY VAULT
V	VENT, VELOCITY, VOLT, VALVE
VA	VOLT AMPERE
VAC	VACUUM, VOLTS ALTERNATING CURRENT
VAR	VARNISH, VARIABLE, VOLT AMPERES REACTIVE
VB	VAPOR BARRIER, VINYL BASE, VALVE BOX
VC	VERTICAL CURVE
VCT	VERTICAL CENTERLINE
VD	VOLUME DAMPER
VDC	VOLTS DIRECT CURRENT
VDOT	VIRGINIA DEPARTMENT OF TRANSPORTATION
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VERTS	VERTICAL REINFORCING
VFD	VARIABLE FREQUENCY DRIVE
VG	VERTICAL GRAIN
VIF	VERIFY IN FIELD
VLS	VALVE LIMIT SWITCH
VLTDR	VAULT DOOR
VLVS	VALVES
VM	VOLTMETER
VOL	VOLUME
VPC	VERTICAL POINT OF CURVATURE
VPI	VERTICAL POINT OF INTERSECTION, VALVE POSITION INDICATOR
VPT	VERTICAL POINT OF TANGENCY

VR	VENT RETURN
VS	VERSES, VAPOR SEAL, VOLATILE SOLIDS, VOLTMETER SWITCH
VSC	VARIABLE SPEED CONTROLLER
VSD	VARIABLE SPEED DRIVE
VSS	VOLATILE SUSPENDED SOLIDS
VT	VENT, PLUMBING VENT
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W	WATT, WEST, WIDE, WINDOW, WIRE, WATER, WIDE FLANGE BEAM, WHITE
W/	WITH
W/O	WITHOUT
WAS	WASTE ACTIVATED SOLIDS
WB	WOOD BASE, WET-BULB
WC	WATER COLUMN
WD	WOOD, WIDTH
WF	WIDE FLANGE
WG	WIRE GLASS, WATER GAUGE
WH	WALL HYDRANT, WEEP HOLE, WATTHOUR METER
WI	WROUGHT IRON
WL	WATER LEVEL, WIND LOAD
WLD	WELDED
WM	WIRE MESH
WP	WATERPROOF, WORKING POINT, WITNESS POST
WTHP	WEATHERPROOF
WS	WATERSTOP, WATER SURFACE
WSCT	WAINSCOT
WSE	WATER SURFACE ELEVATION
WST	WASTE
WT	WEIGHT, WATER TIGHT
WWF	WELDED WIRE FABRIC
XFER	TRANSFER
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
XS	EXTRA STRONG
XSECT	CROSS SECTION
XTMR	TRANSFORMER
XXS	DOUBLE EXTRA STRONG
Y	YELLOW
YH	YARD HYDRANT
YS	YIELD STRENGTH
ZS	POSITION SWITCH
ZSS	ZERO SPEED SWITCH
Φ	PHASE

ABBREVIATION NOTES:

1. THESE ABBREVIATIONS APPLY TO THE ENTIRE SET OF CONTRACT DRAWINGS.
2. LISTING OF ABBREVIATIONS DOES NOT IMPLY THAT ALL ABBREVIATIONS ARE USED IN THE CONTRACT DRAWINGS.
3. ABBREVIATIONS SHOWN ON THIS SHEET INCLUDE VARIATIONS OF A WORD. FOR EXAMPLE, "MOD" MAY MEAN MODIFY OR MODIFICATION; "INC" MAY MEAN INCLUDED OR INCLUDING AND "REINF" MAY MEAN EITHER REINFORCE OR REINFORCING.

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PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

GENERAL ABBREVIATIONS-2

0 1" 2"

FILENAME	0-2.dwg
SCALE	NONE
DRAWING NUMBER	0-2
SHEET	OF -

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SITE PLAN SYMBOLOGY

- EMBANKMENT SLOPE
- 50.5 — CONTOUR
- VEGETATION (SIZE)
- CO — CLEANOUT
- MH — MANHOLE
- MW — MONITORING WELL
- PZ — PIEZOMETER
- CB — STORM DRAIN CATCH BASIN
- UV — UTILITY VAULT
- PP — POWER POLE
- TP — TELEPHONE POLE
- FH — FIRE HYDRANT
- YH–X — YARD HYDRANT
- 75.5 — EXISTING SPOT ELEVATION
- 75.8 — FINISHED SPOT ELEVATION
- CP–X — HORIZONTAL CONTROL POINT
- BENCHMARK
- TH–"X" — IDENTIFICATION AND APPROXIMATE LOCATION OF SOIL TEST HOLE
- DOWNGUY
- EXTERIOR PAD MOUNTED TRANSFORMER
- POLE – MOUNTED TRANSFORMER
- Y — ELECTRICAL HANDHOLE OR MANHOLE Y – MHX OR HHX, WHERE X INDICATES SEQUENCE NUMBER
- T — TELEPHONE LINE
- E — ELECTRIC LINE
- F — FIBER OPTIC
- C — COMMUNICATION
- HANDRAIL AND GUARDRAIL
- PIPELINE
- LARGE PIPELINE
- UTILITY BENEATH STRUCTURE
- RAILROAD
- DRAINAGE FLOW
- NATURAL WATERWAY
- X — CHAIN LINK FENCE
- X — FIELD FENCE
- PROPERTY LINE
- CENTERLINE
- RB — ROCK BERM
- SF — SILT FENCE
- EASEMENT
- LIMITS OF CONSTRUCTION
- ROW

NOTES:

1. UTILITIES THAT ARE SUSPENDED ABOVE GRADE ARE DESIGNATED BY THE PREFIX "OH" (OVERHEAD).

MATERIALS IN PLAN/SECTION

- ABANDON IN PLACE
- ASPHALT (PLAN OR SMALL–SCALE SECTION)
- ASPHALT (LARGE–SCALE SECTION)
- BATT INSULATION (SECTION)
- BRICK MASONRY (PLAN AND/OR SECTION)
- CHECKERED PLATE (PLAN)
- CONCRETE (PLAN AND/OR SECTION)
- CONCRETE MASONRY (PLAN AND/OR SECTION)
- DEMOLITION (PLAN AND/OR SECTION)
- EARTH (SECTION)
- FINISHED WOOD (SECTION)
- GRANULAR FILL (SECTION)
- GRATING (SECTION)
- GRATING (PLAN)
- GROUT (SECTION)
- GYPSUM BOARD (SECTION)
- METAL (SECTION)
- ORIENTED STRAND BOARD (SECTION)
- PARTICLE BOARD (SECTION)
- PLYWOOD (LARGE–SCALE SECTION)
- PLYWOOD (SMALL–SCALE SECTION)
- PRECAST CONCRETE (PLAN AND/OR SECTION)
- RIGID INSULATION (SECTION)
- RIPRAP (PLAN AND/OR SECTION)
- SAND (SECTION)
- SOD (SECTION)
- WEEP JOINT MORTAR PROTECTION SYSTEM (SECTION)
- WOOD – CONTINUOUS (SECTION)
- WOOD BLOCKING (SECTION)

GENERAL SYMBOLOGY

ARROW INDICATES DIRECTION OF PLAN NORTH — N

PLAN
SCALE: 1/4" = 1'–0"
PLAN TITLE

SECTION LETTER
FLAG INDICATES DIRECTION OF SECTION CUT
SHEET WHERE SECTION IS LOCATED *
SECTION CUT MARKER

SECTION
SCALE: 3/8" = 1'–0"
SECTION LETTER
SHEET WHERE SECTION VIEW IS FIRST CUT *
SECTION TITLE

DETAIL NUMBER
SHEET WHERE DETAIL IS LOCATED *
DETAIL MARKER
FOR REFERENCING DETAILS INCLUDED IN DRAWING SET.

XXXXXXXXX
DETAIL MARKER
FOR REFERENCING DETAILS BOUND IN SPECIFICATIONS OR SEPARATE VOLUME.

DETAIL
SCALE: 1" = 20'
DETAIL NUMBER
SHEET WHERE DETAIL WAS CALLED OUT
DETAIL TITLE

* FOR COMMON DETAILS AND SECTIONS OR DETAILS THAT ARE CUT OR CALLED OUT ON MULTIPLE SHEETS, THE SHEET NUMBER IS REPLACED BY A DASH (–).

ELEVATION NUMBER
ARROW INDICATES POINT OF VIEW
SHEET WHERE ELEVATION IS LOCATED *
SINGLE ELEVATION OR PHOTO MARKER

A B C D
ELEVATION NUMBER
ARROW INDICATES POINT OF VIEW ELEVATION
INDICATES SHEET WHERE ELEVATION IS LOCATED
MULTIPLE ELEVATION OR PHOTO MARKER

ELEVATION
SCALE: 1/4" = 1'–0"
ELEVATION IDENTIFICATION NUMBER
SHEET WHERE POINT OF VIEW MARKER CAN BE FOUND *
ELEVATION TITLE

TARGET ELEVATION
IP — INLET PROTECTION

ARCHITECTURAL

- ROOM NAME / XX–XX — ROOM NUMBER
- XXX/X — DOOR NUMBER
- A — COLUMN GRID LINE
- X — WALL TYPE
- X — WINDOW TYPE
- X — LOUVER
- X — ACCESSORY, FURNITURE, AND MISCELLANEOUS EQUIPMENT IDENTIFIER

KEY NOTE DESIGNATION
KEY NOTE NUMBER

GENERAL LINE SYMBOLOGY

COLUMN GRID LINE / CENTERLINE

DRAWING INDEX

DRAWING	DESCRIPTION
0–0	COVER SHEET
0–1	GENERAL ABBREVIATIONS 1
0–2	GENERAL ABBREVIATIONS 2
0–3	GENERAL LEGEND AND DRAWING INDEX
0–4	PROPOSED HYDRAULIC PROFILE
1–1	PROCESS FLOW DIAGRAM–EXISTING FACILITIES
1–2	EXISTING SITE PLAN
1–4	PROPOSED PROCESS FLOW DIAGRAM
1–5	PROPOSED SITE PLAN
3–1	GRAVELLY RUN FORCE MAIN PLAN
3–2	GRAVELLY RUN PUMP STATION SITE PLAN AND FORCE MAIN PARTIAL PLAN
3–3	GRAVELLY RUN PUMP STATION PLAN
3–4	GRAVELLY RUN PUMP STATION SECTION
4–1	MBBR INFLUENT PUMP STATION PLANS AND SECTION
6–1	SEGREGATED MBBR SYSTEM–UPPER PLAN
6–2	SEGREGATED MBBR SYSTEM–LOWER PLAN
6–3	SEGREGATED MBBR SYSTEM–SECTIONS
6–4	DISSOLVED AIR FLOTATION BUILDING–PLAN
6–5	BLOWER BUILDING–PLAN
6–6	PRIMARY CLARIFIER MODIFICATIONS–PLAN
6–7	MASS BALANCE
6–8	UNOX CONVERSION PLAN
7–1	SECONDARY CLARIFIER NO. 9 PLAN AND SECTION
8–1	YARD PIPING PLAN
8–2	PARTIAL YARD PIPING PLAN
13–1	PROPOSED ELECTRICAL SITE PLAN
13–2	EXISTING OVERALL ONE–LINE DIAGRAM
13–3	PROPOSED OVERALL ONE–LINE DIAGRAM
13–4	GRAVELLY RUN PUMP STATION PROPOSED ONE–LINE DIAGRAM
14–1	PLANT CONTROL SYSTEM SITE LOCATION PLAN
14–2	PLANT CONTROL SYSTEM PROPOSED BLOCK DIAGRAM
15–1	FLOOD HAZARD ZONE
15–2	CHESAPEAKE BAY PRESERVATION AREAS
15–3	WETLAND DELINEATION SITE PLAN
16–1	CONTRACTOR LAYDOWN AND STORAGE AREA

GENERAL NOTES:

1. THIS IS A STANDARD SHEET SHOWING COMMON SYMBOLOGY. ALL SYMBOLS ARE NOT NECESSARILY USED ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE–EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.

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DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

GENERAL LEGEND AND DRAWING INDEX

0 1" 2"

FILENAME	0–3.dwg
SCALE	NONE
DRAWING NUMBER	0-3
SHEET	OF –

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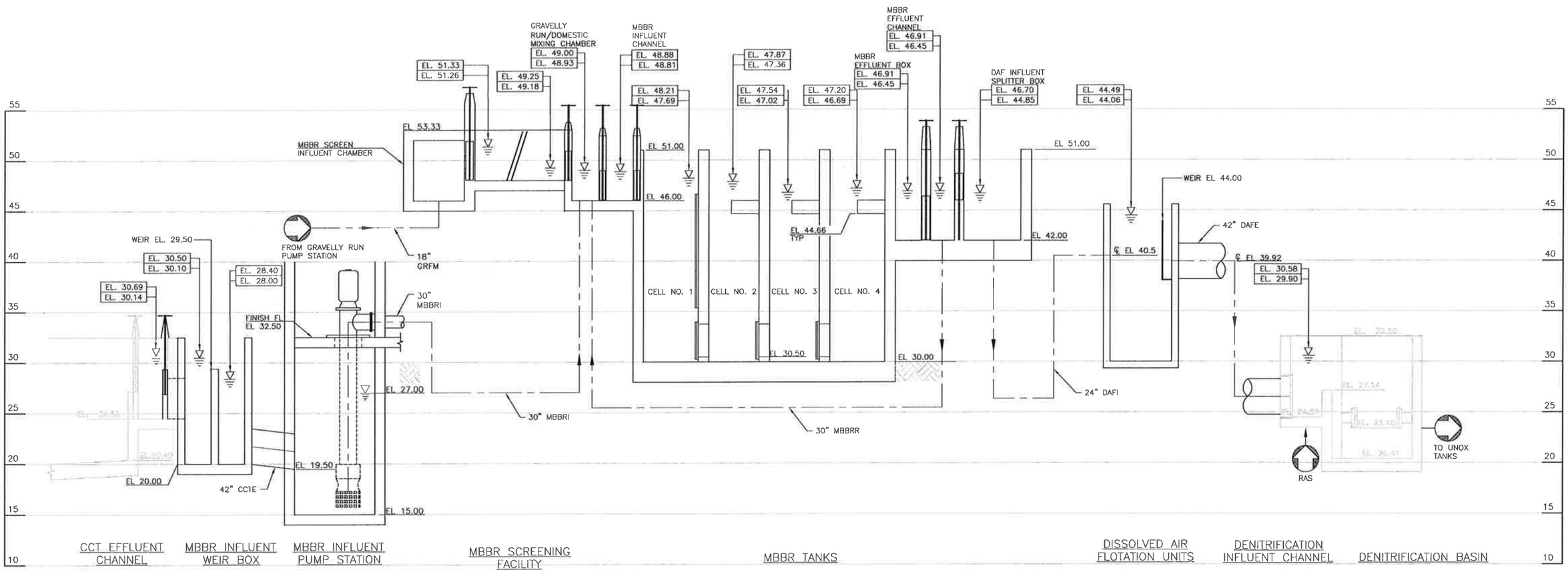

FLOW TABLE			
CONDITION	INFLUENT FLOW (MGD)		
	DOMESTIC (INCLUDES RECYCLES)	COMBINED INFLUENT (INCLUDES RECYCLES)	HONEYWELL TO MBBR (FROM GRPS)
HYDRAULIC PEAK	33.3	73.0	3.9
DESIGN AVERAGE	16.0	47.7	3.7

RETURN FLOW TABLE		
CONDITION	RAS	MBBR RECYCLE
HYDRAULIC PEAK	27.0	19.5
DESIGN AVERAGE	23.75	19.5

LEGEND

EL. XX.XX HYDRAULIC PEAK FLOW
EL. XX.XX DESIGN AVERAGE FLOW

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PROPOSED HYDRAULIC PROFILE

0 1" 2"

FILENAME 0-4.dwg
SCALE NOT TO SCALE
DRAWING NUMBER 0-4
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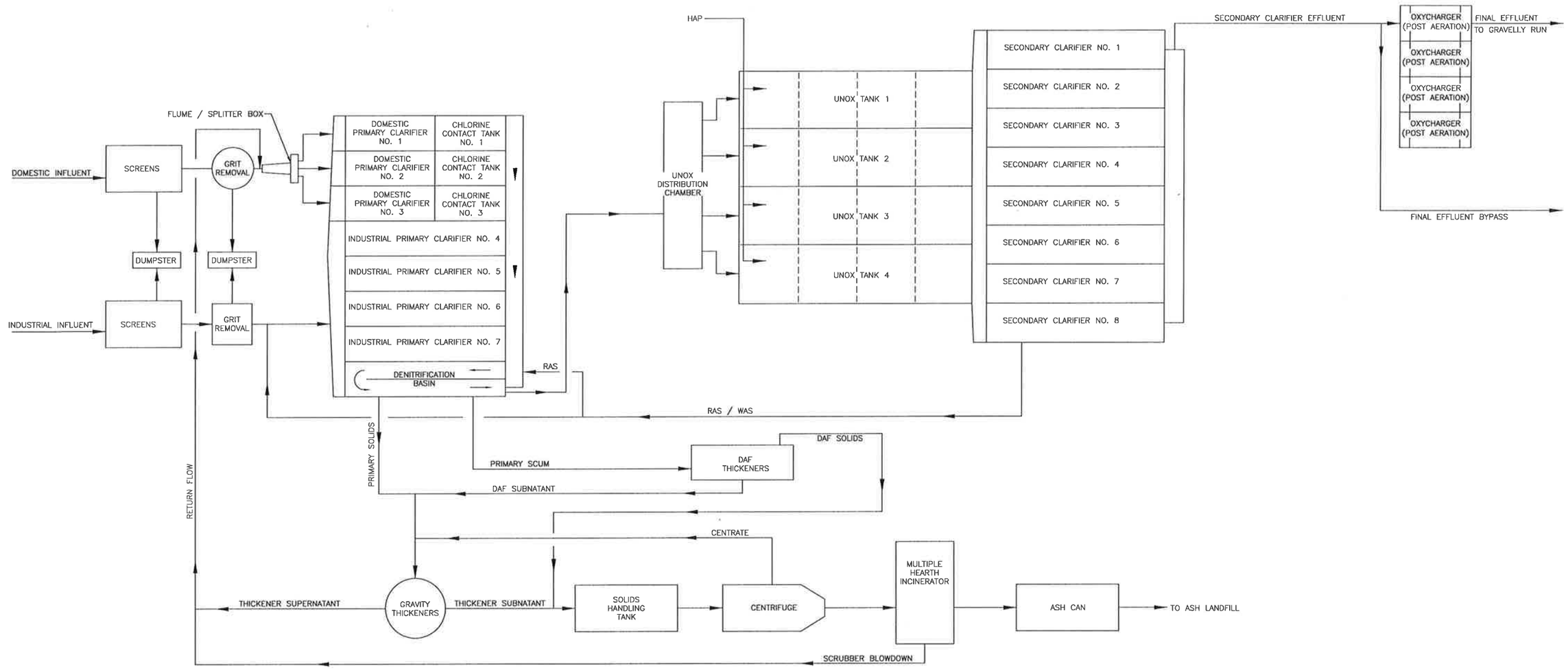

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
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ALTERNATIVE 4A-1 LIGHT, PHASE 2

PROCESS FLOW DIAGRAM
EXISTING FACILITIES

0 1" 2"

FILENAME	1-1.dwg
SCALE	NOT TO SCALE
DRAWING NUMBER	1-1
SHEET	OF -

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ALTERNATIVE 4A-1 LIGHT, PHASE 2

EXISTING SITE PLAN

0 1" 2"

FILENAME 1–2.dwg
SCALE 1" = 60'

DRAWING NUMBER **1-2**

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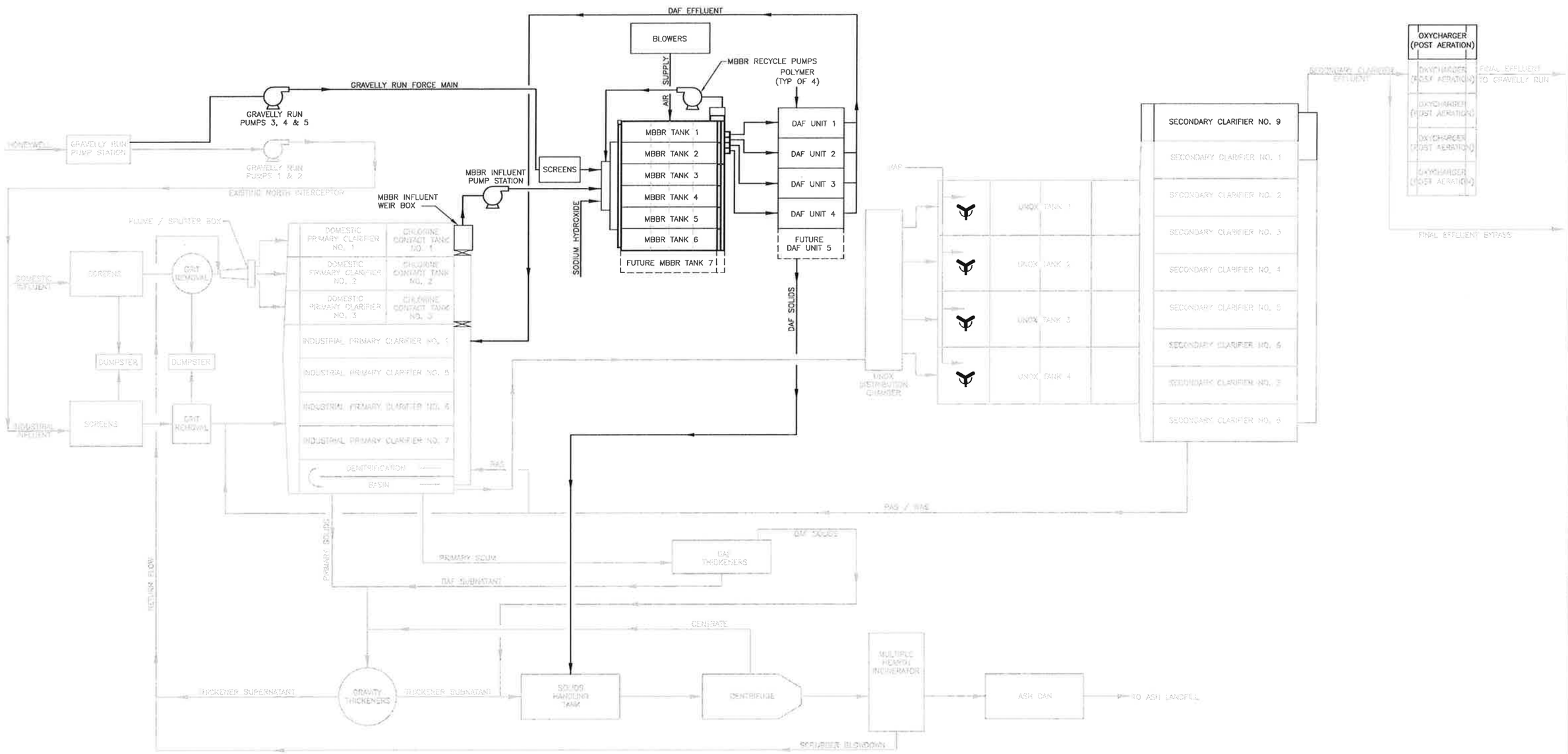

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PROPOSED
PROCESS FLOW DIAGRAM

0 1" 2"

FILENAME	1-4.dwg	DRAWING NUMBER	SHEET OF -
SCALE	NOT TO SCALE	1-4	

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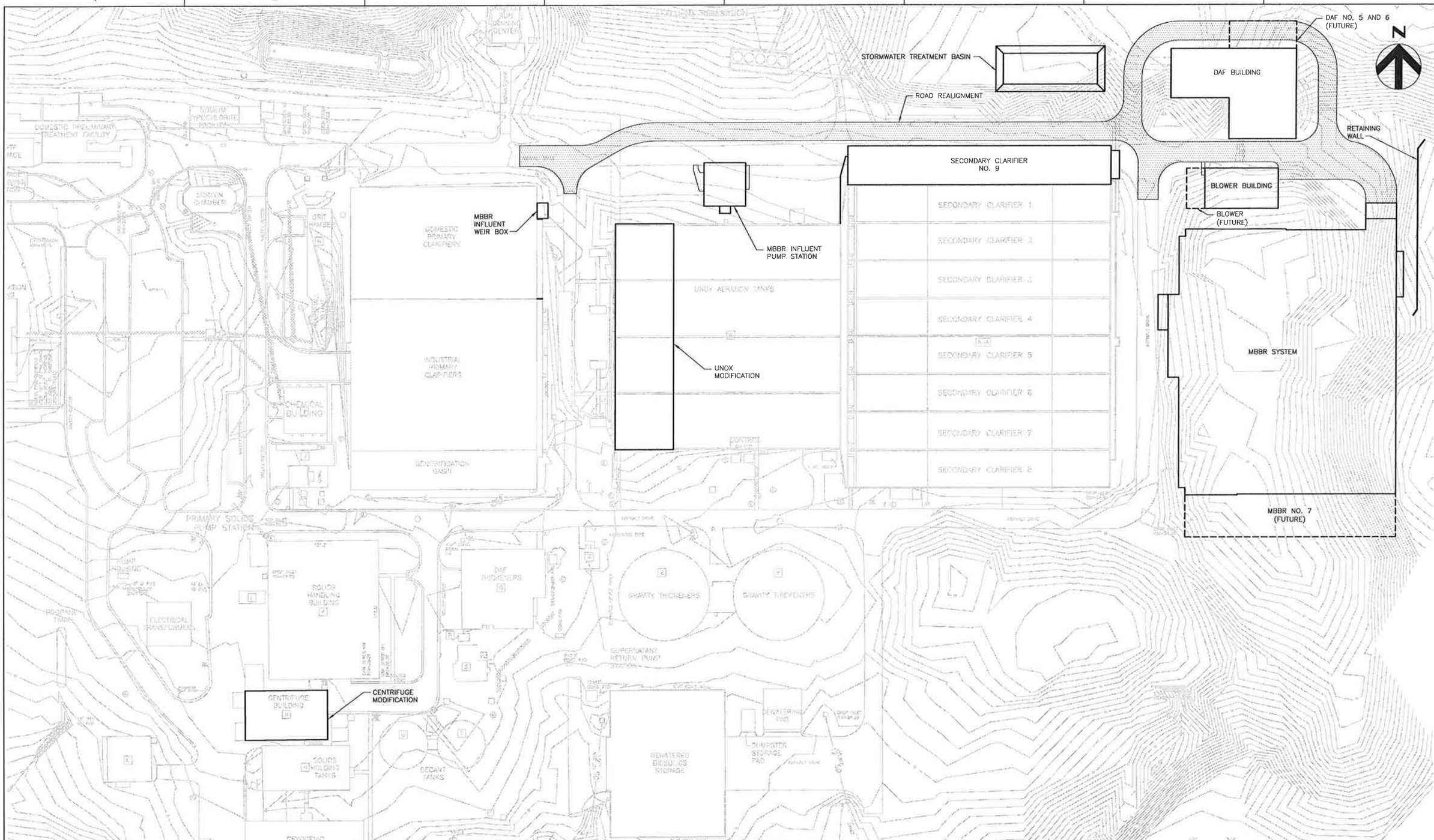

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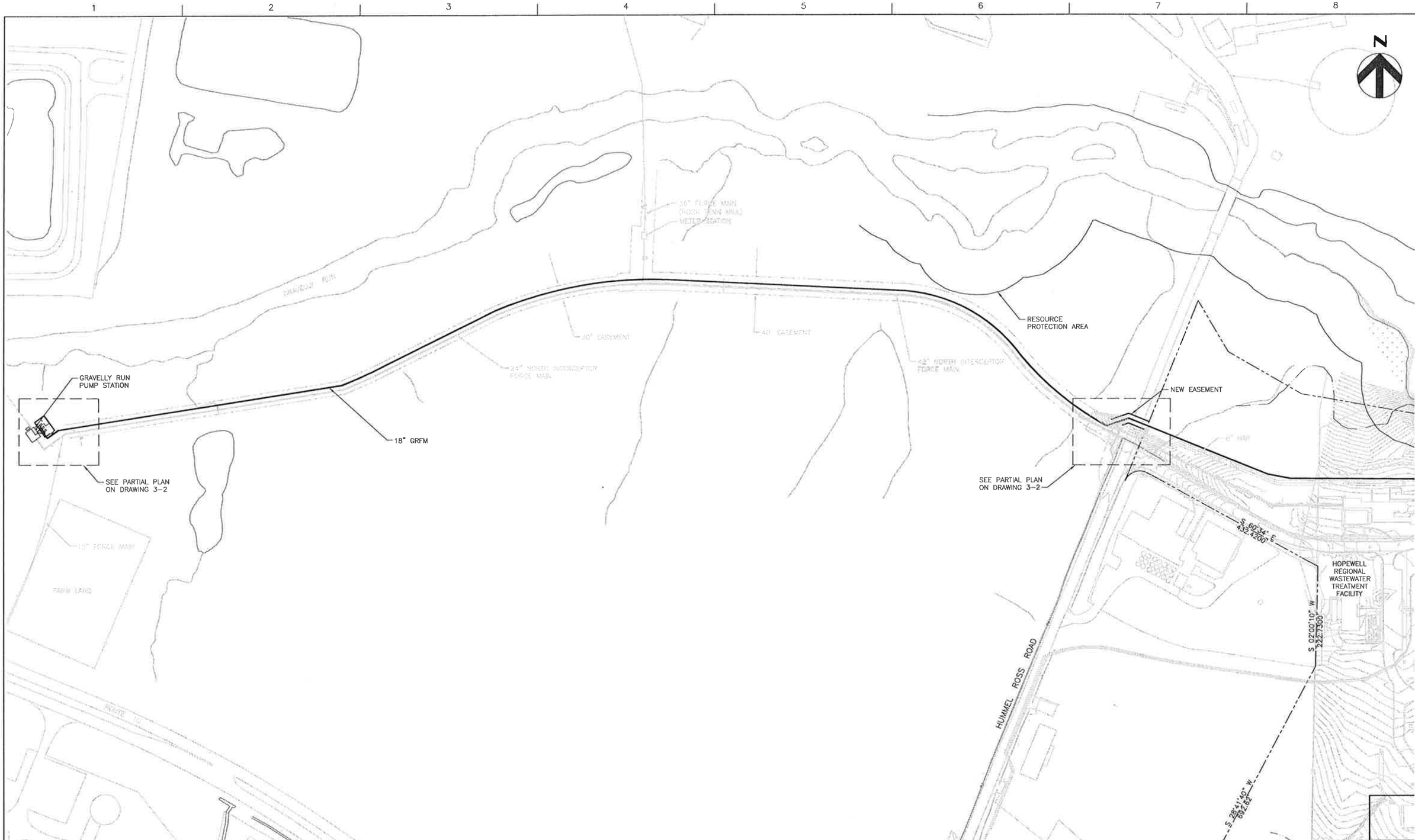
ALTERNATIVE 4A-1 LIGHT, PHASE 2

PROPOSED SITE PLAN

0 1" 2"

FILENAME	1-5.dwg
SCALE	1" = 50'
DRAWING NUMBER	1-5
SHEET	OF -



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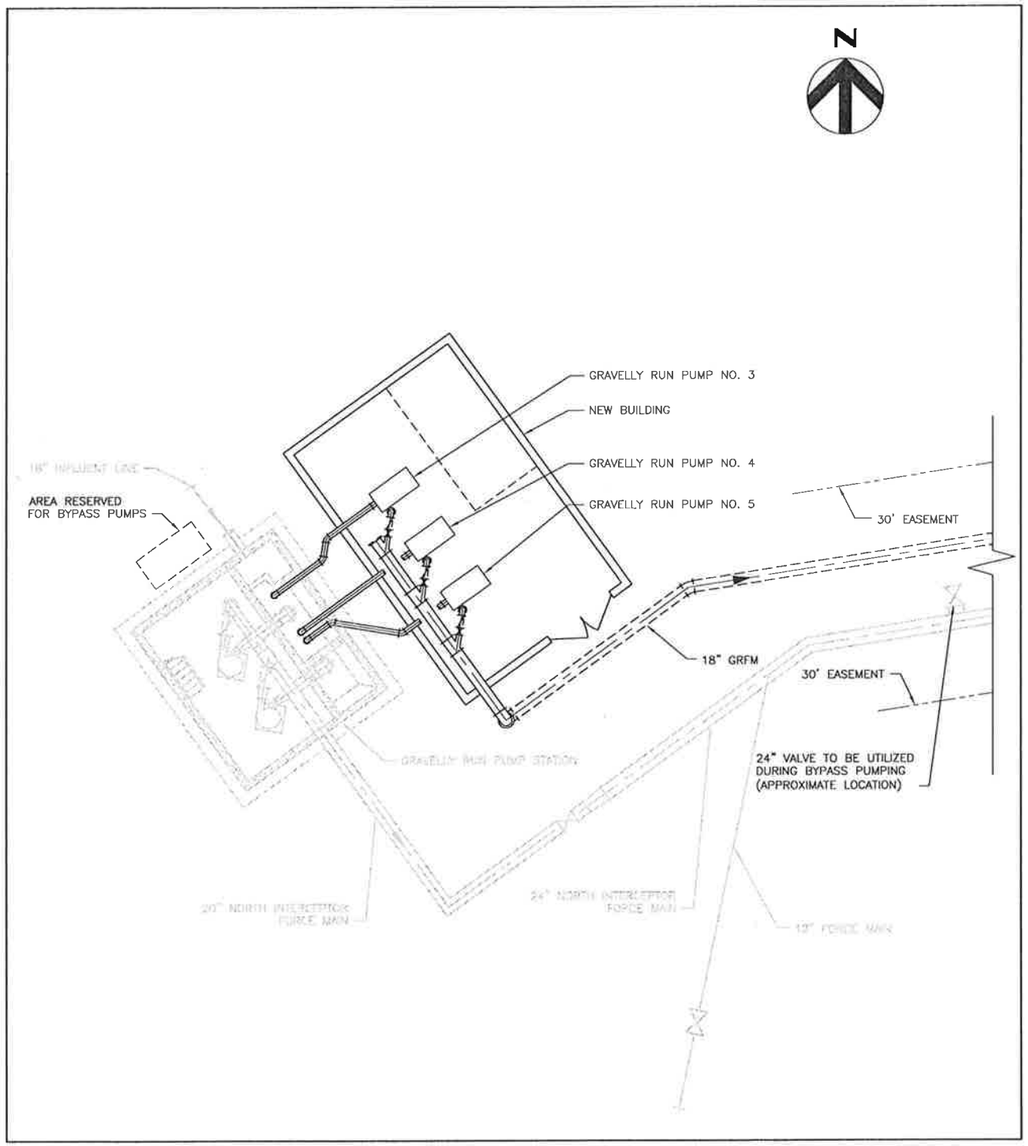
ALTERNATIVE 4A-1 LIGHT, PHASE 2

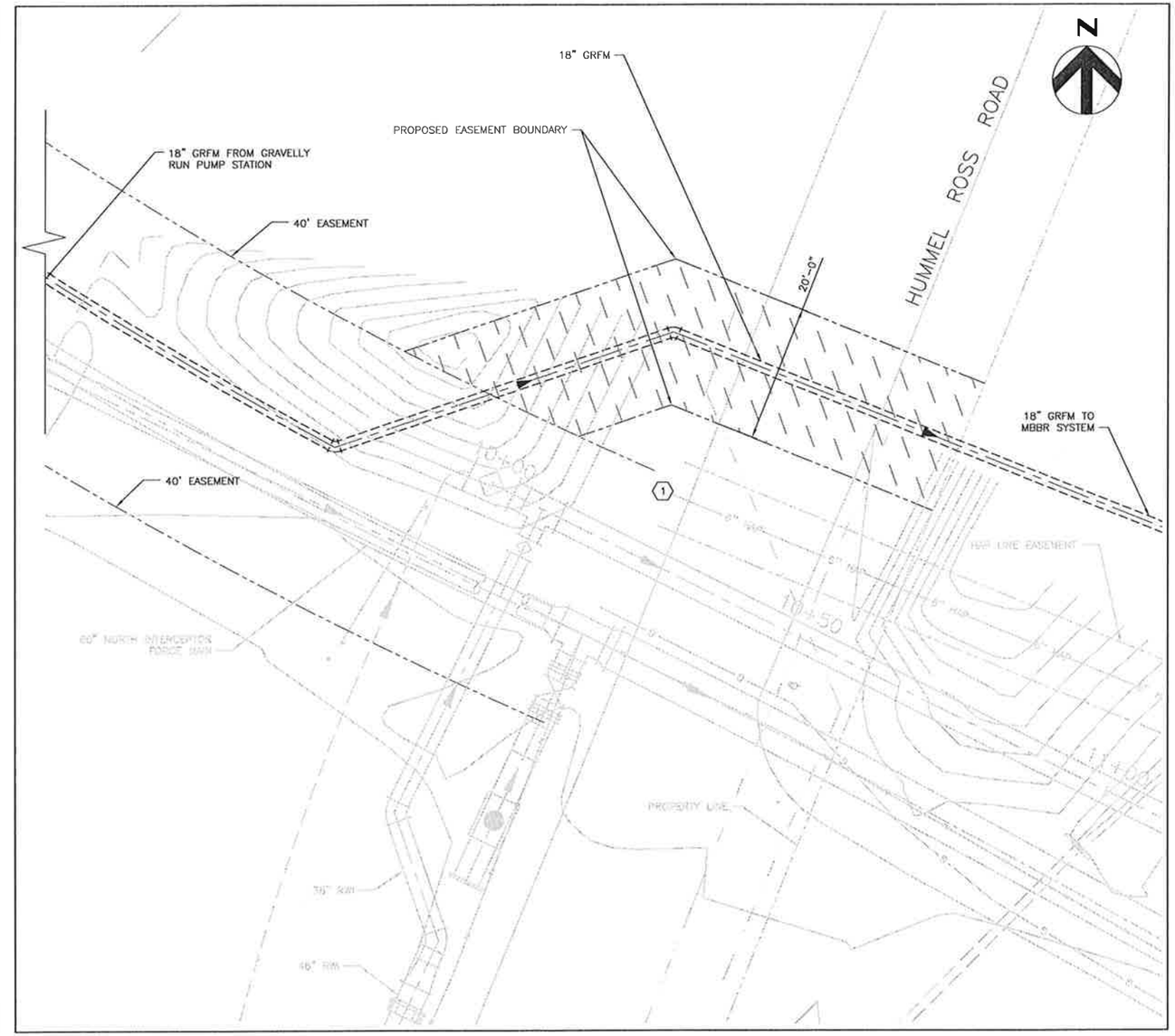
GRAVELLY RUN FORCE MAIN PLAN

0 1" 2"

FILENAME	3–1.dwg
SCALE	1" = 100'
DRAWING NUMBER	3-1
SHEET	OF -



GRAVELLY RUN PUMP STATION
PARTIAL PLAN



GRAVELLY RUN FORCE MAIN
HUMMEL ROSS CROSSING
PARTIAL PLAN

(1) LOCATION OF HAP LINE TO BE CONFIRMED DURING DETAIL DESIGN.

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
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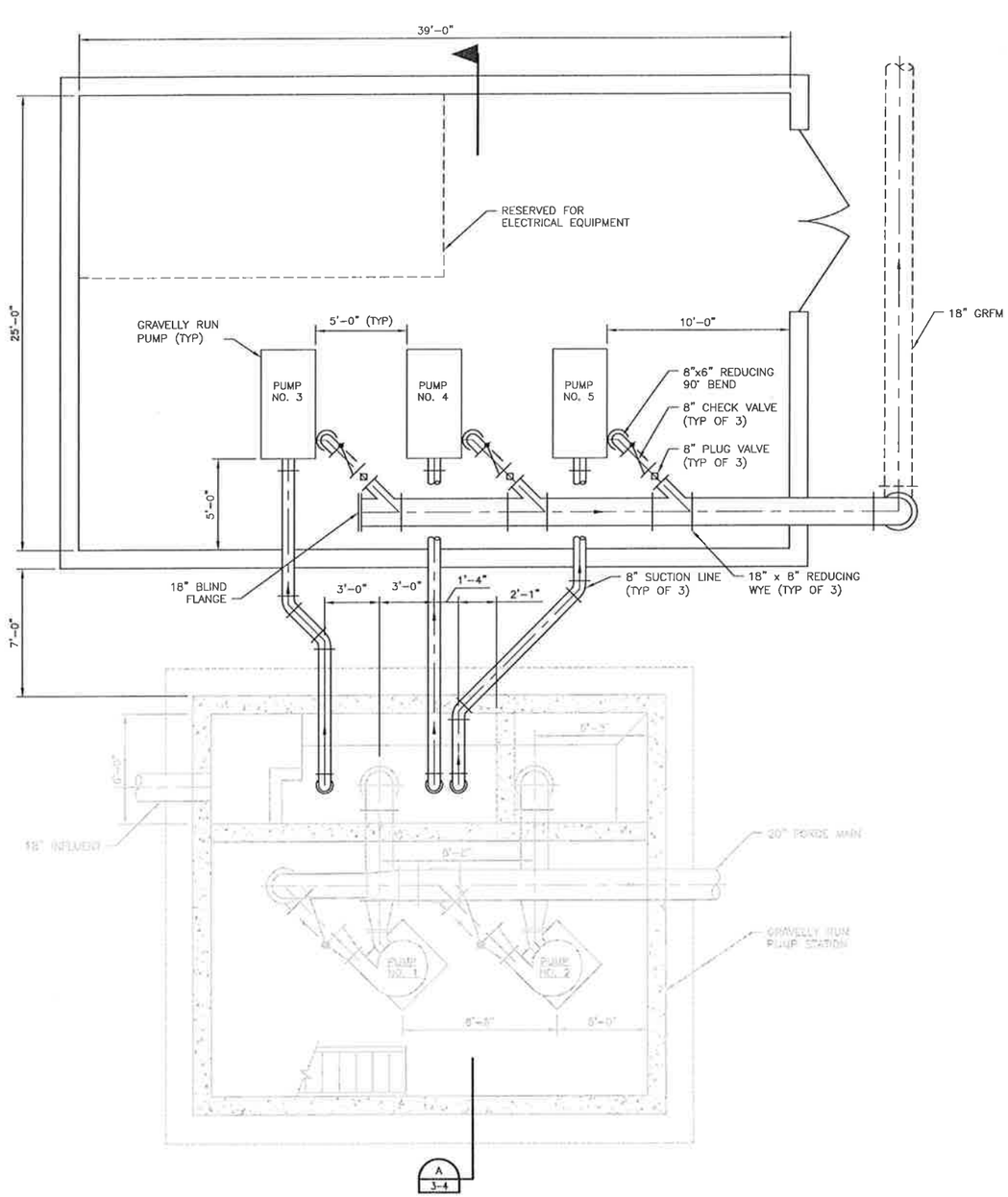
ALTERNATIVE 4A-1 LIGHT, PHASE 2

GRAVELLY RUN PUMP STATION SITE PLAN AND FORCE MAIN PARTIAL PLAN

0 1" 2"

FILENAME	3-2.dwg
SCALE	1" = 10'
DRAWING NUMBER	3-2
SHEET	OF -



PLAN

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
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ALTERNATIVE 4A-1 LIGHT, PHASE 2

GRAVELLY RUN PUMP STATION
PLAN

0 1" 2"

FILENAME	3-3.dwg
SCALE	1/4"=1'-0"
DRAWING NUMBER	3-3
SHEET	OF -

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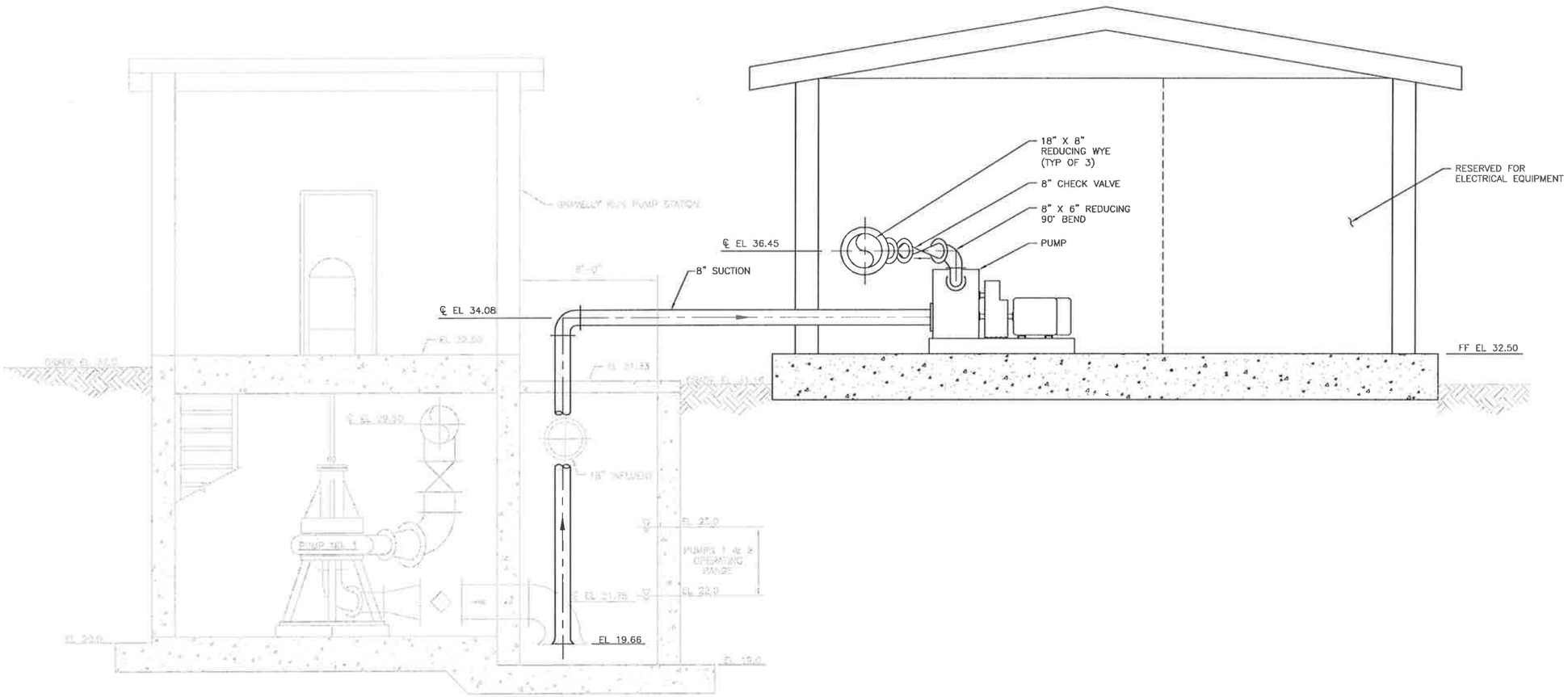

SECTION A 3-4

A	08/2012	DRAFT PER – NOT FOR CONSTRUCTION	
ISSUE	DATE	DESCRIPTION	

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DESIGNED BY: N. DESAI
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PROJECT NUMBER 177722

HDR Engineering, Inc.
5700 Lake Wright Dr.
Suite 300
Norfolk, VA 23502

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

GRAVELLY RUN PUMP STATION
SECTION

0 1" 2"

FILENAME 3-4.dwg
SCALE 3/8"=1'-0"
DRAWING NUMBER 3-4
SHEET OF -

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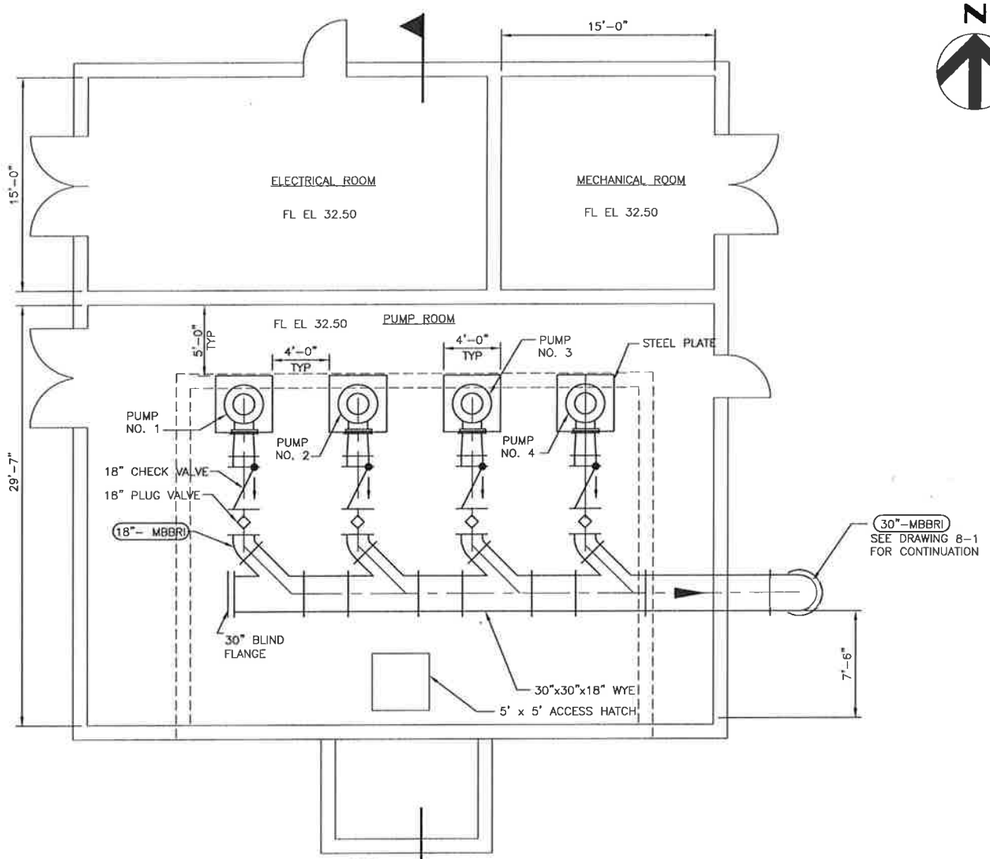
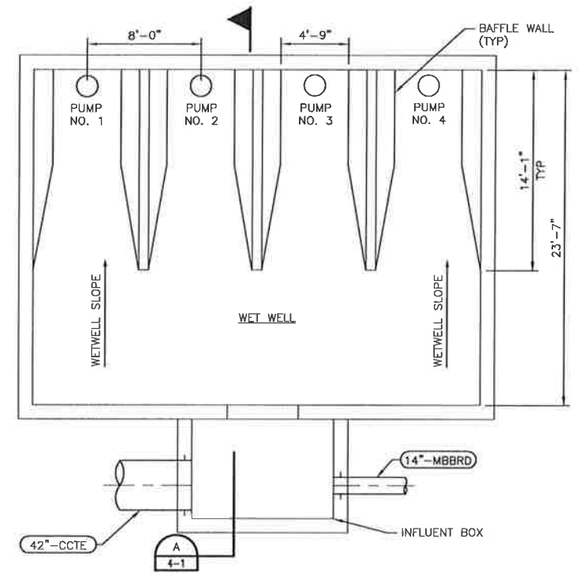


A 4-1

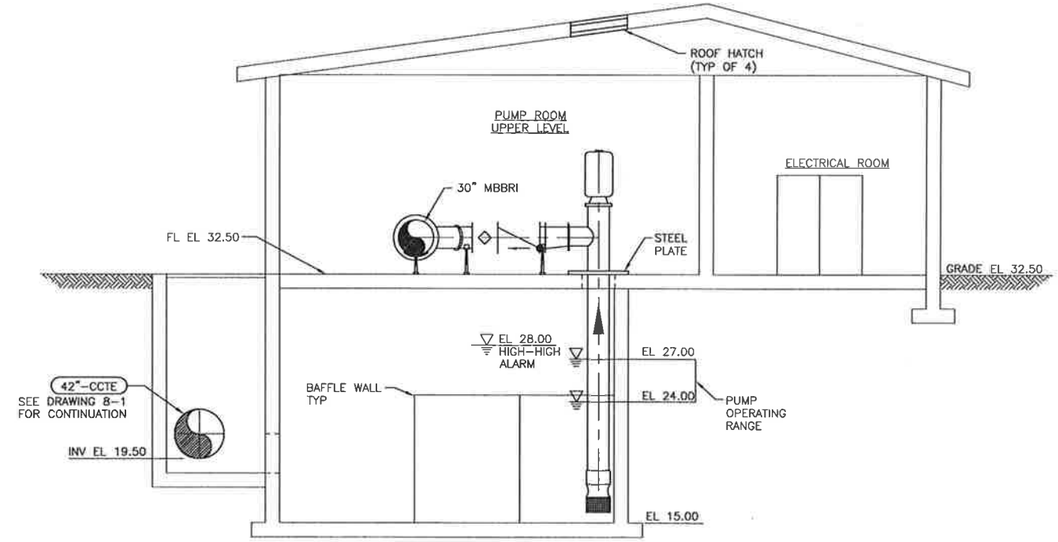
UPPER PLAN

SCALE: 3/16" =1'-0"



LOWER PLAN

SCALE: 3/16" =1'-0"



SECTION A 4-1

SCALE: 3/16" =1'-0"

HDR

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5700 Lake Wright Dr.
Suite 300
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ISSUE	DATE	DESCRIPTION
A	08/2012	DRAFT PER – NOT FOR CONSTRUCTION

PROJECT MANAGER:	KATHERINE L MOHAMMED-JONES
DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

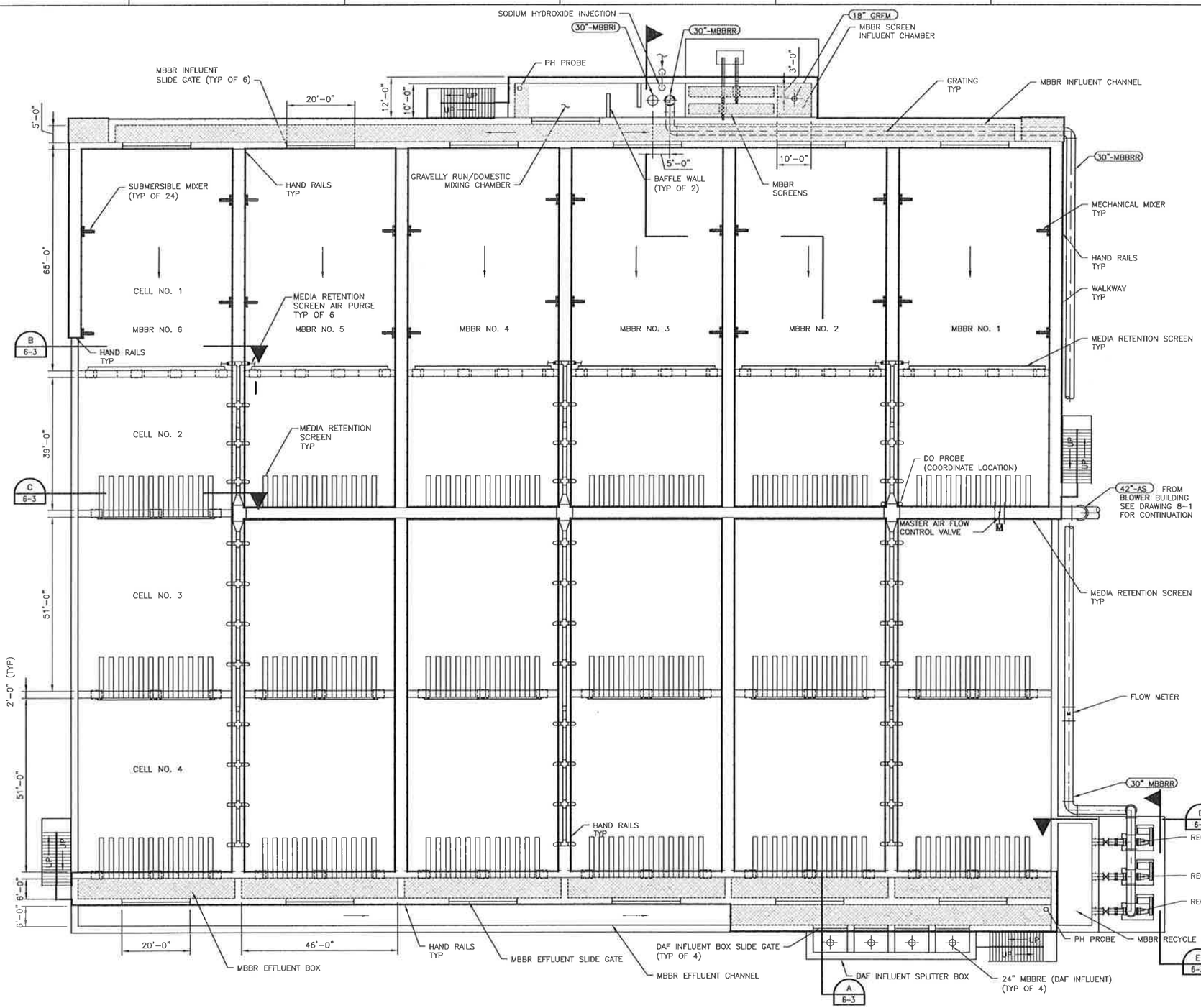
CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

MBBR INFLUENT PUMP STATION PLANS AND SECTION

0 1" 2"

FILENAME	4-1.dwg
SCALE	3/16" = 1'-0"
DRAWING NUMBER	4-1
SHEET	OF -



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CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

SEGREGATED MBBR SYSTEM
UPPER PLAN

0 1" 2"

FILENAME	6-1.dwg
SCALE	1/16" = 1'-0"
DRAWING NUMBER	6-1
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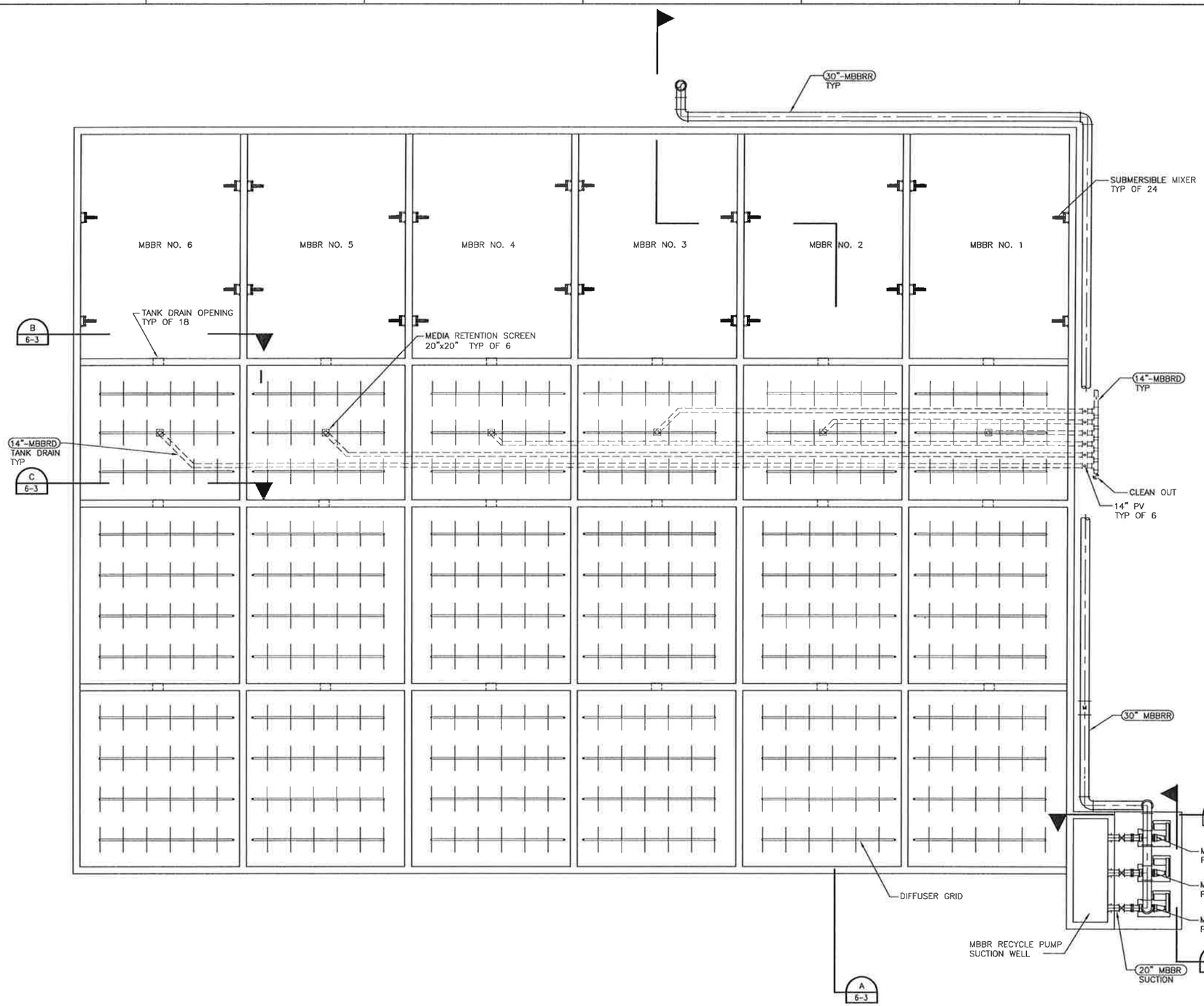

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CHECKED BY:	
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PRELIMINARY ENGINEERING REPORT

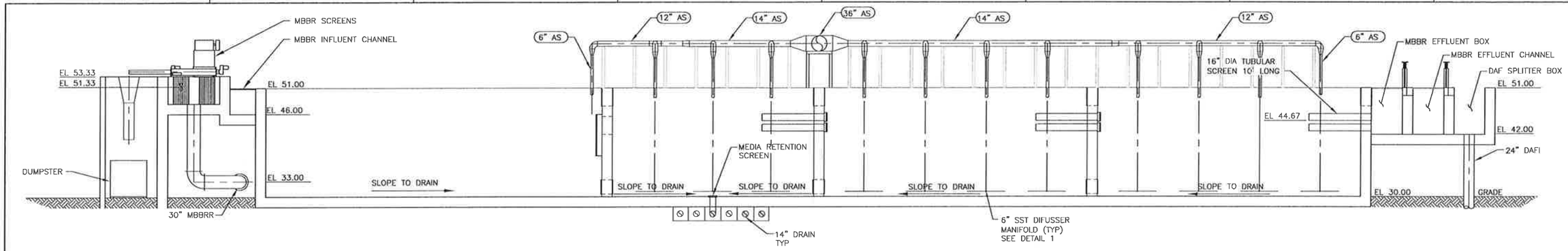
CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

SEGREGATED MBBR SYSTEM
LOWER PLAN

0 1" 2"

FILENAME	6-2.dwg
SCALE	1/16" = 1'-0"
DRAWING NUMBER	6-2
SHEET	OF -



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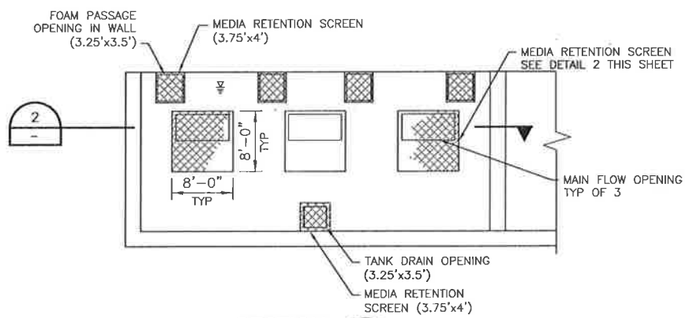
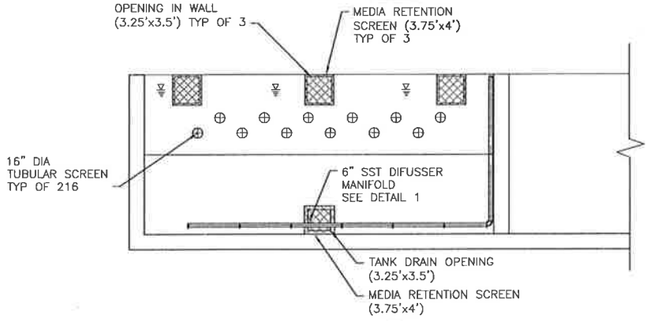
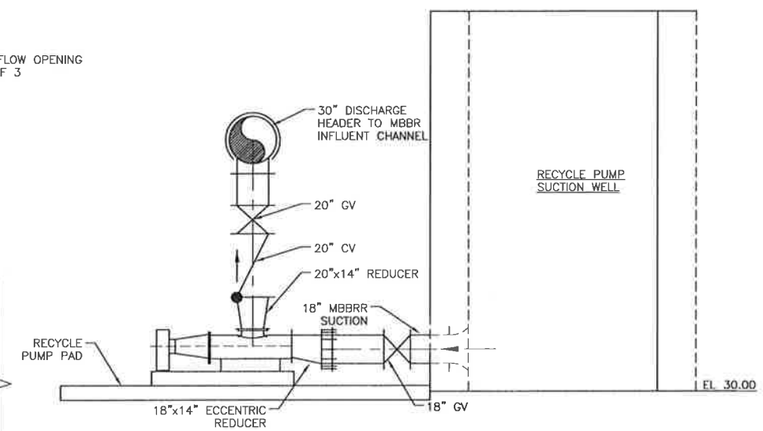


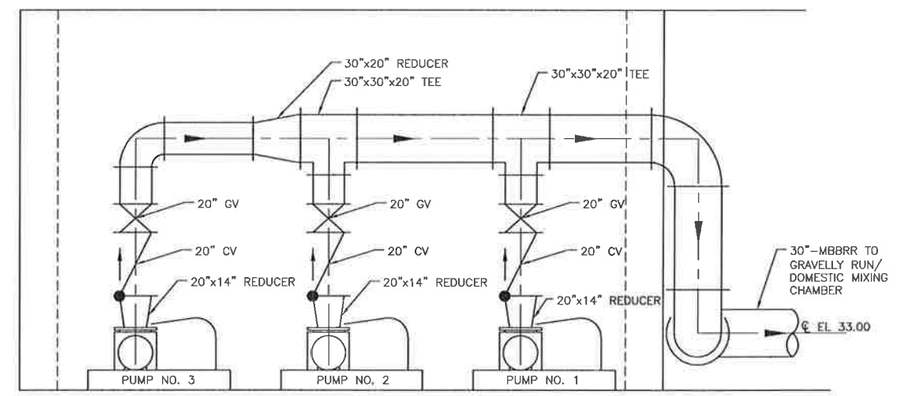
SECTION B 6-1
SCALE: 1"=10'



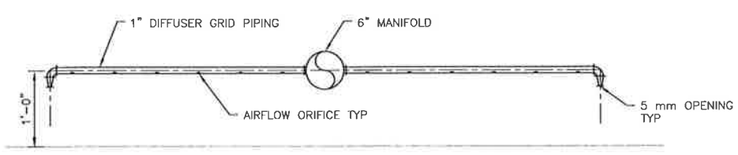
SECTION C 6-1
SCALE: 1"=10'



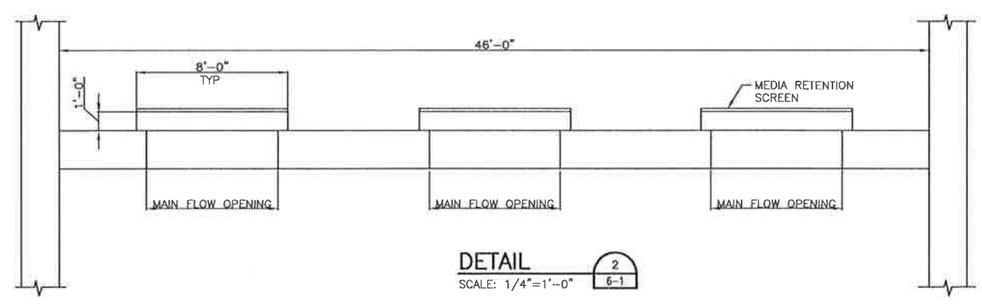
SECTION D 6-1
SCALE: 1/4"=1'-0"



SECTION E 6-1
SCALE: 1/4"=1'-0"



DETAIL 1 –
SCALE: 1"=1'-0"



DETAIL 2 6-1
SCALE: 1/4"=1'-0"

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

SEGREGATED MBBR SYSTEM SECTIONS

0 1" 2"

FILENAME	6-3.dwg
SCALE	AS SHOWN
DRAWING NUMBER	6-3
SHEET	OF -

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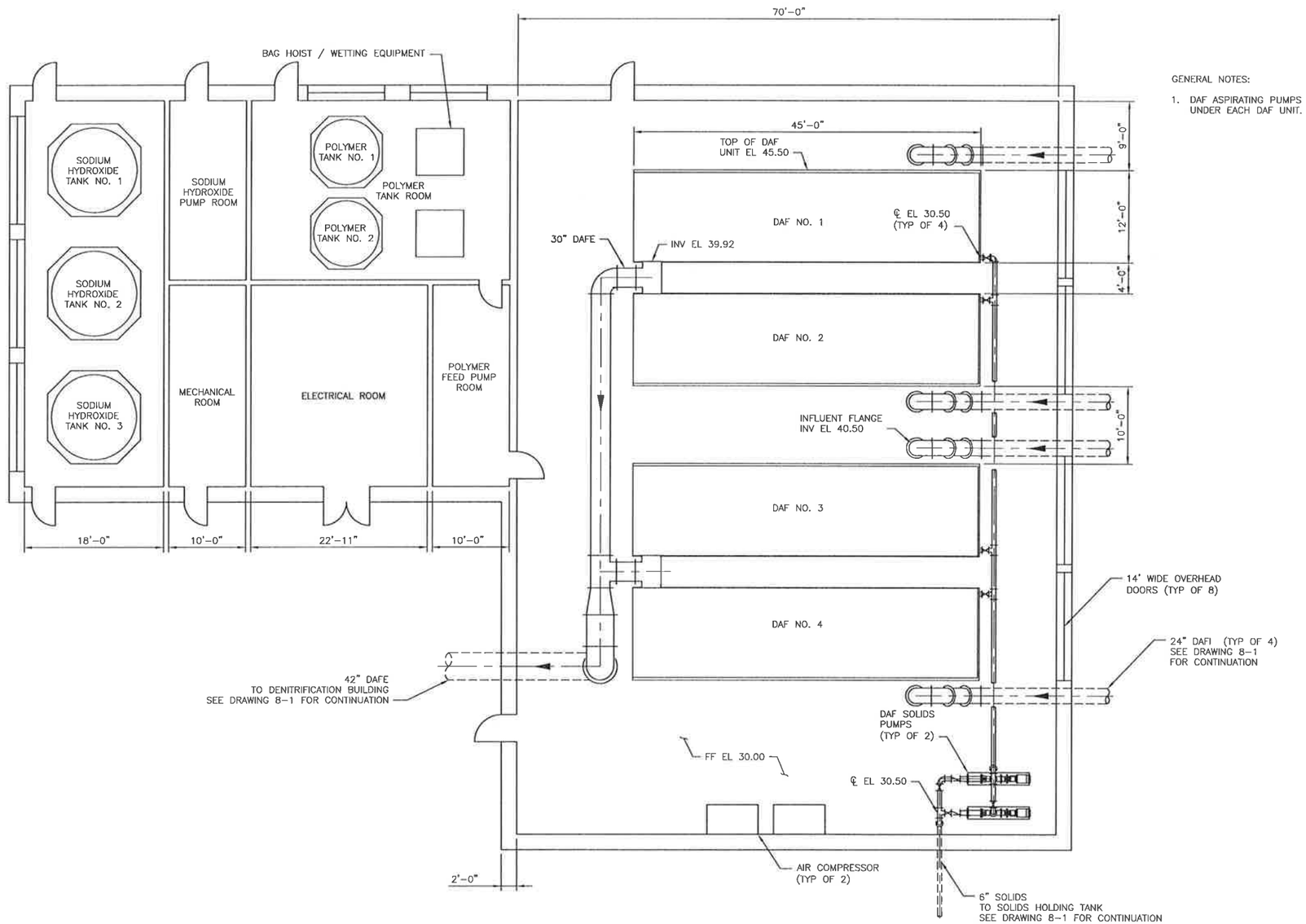

GENERAL NOTES:

1. DAF ASPIRATING PUMPS LOCATED UNDER EACH DAF UNIT.

A	08/2012	DRAFT PER – NOT FOR CONSTRUCTION		
ISSUE	DATE	DESCRIPTION		

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Norfolk, VA 23502

PROJECT MANAGER: KATHERINE L. MOHAMMED-JONES
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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

DISSOLVED AIR FLOTATION BUILDING PLAN

0 1" 2"

FILENAME 6-4.dwg
SCALE 1-1/2" = 1'-0"
DRAWING NUMBER 6-4
SHEET OF -

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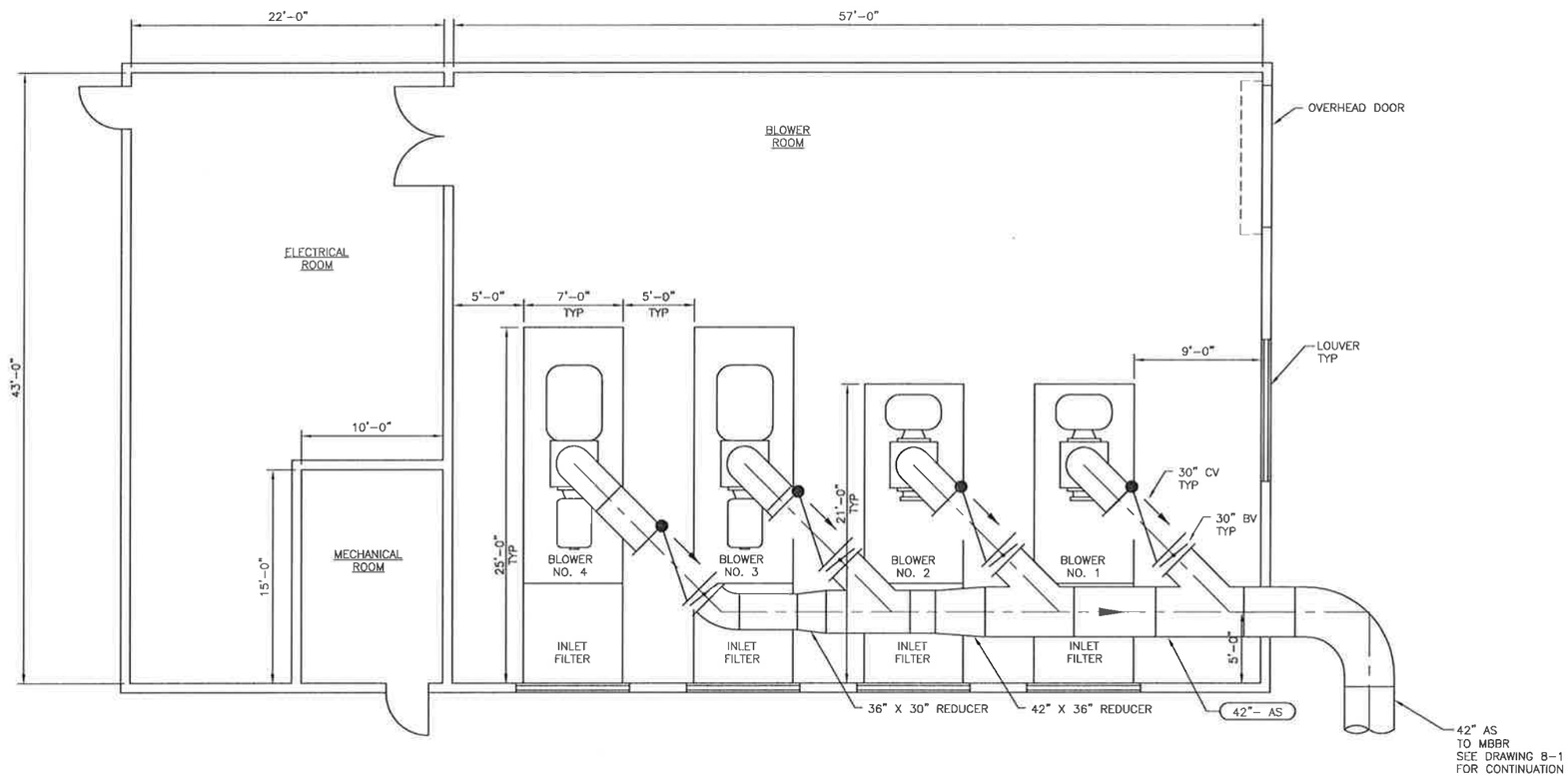

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

BLOWER BUILDING PLAN

0 1" 2"

FILENAME	6-5.dwg
SCALE	3/16" = 1'-0"

DRAWING NUMBER **6-5**

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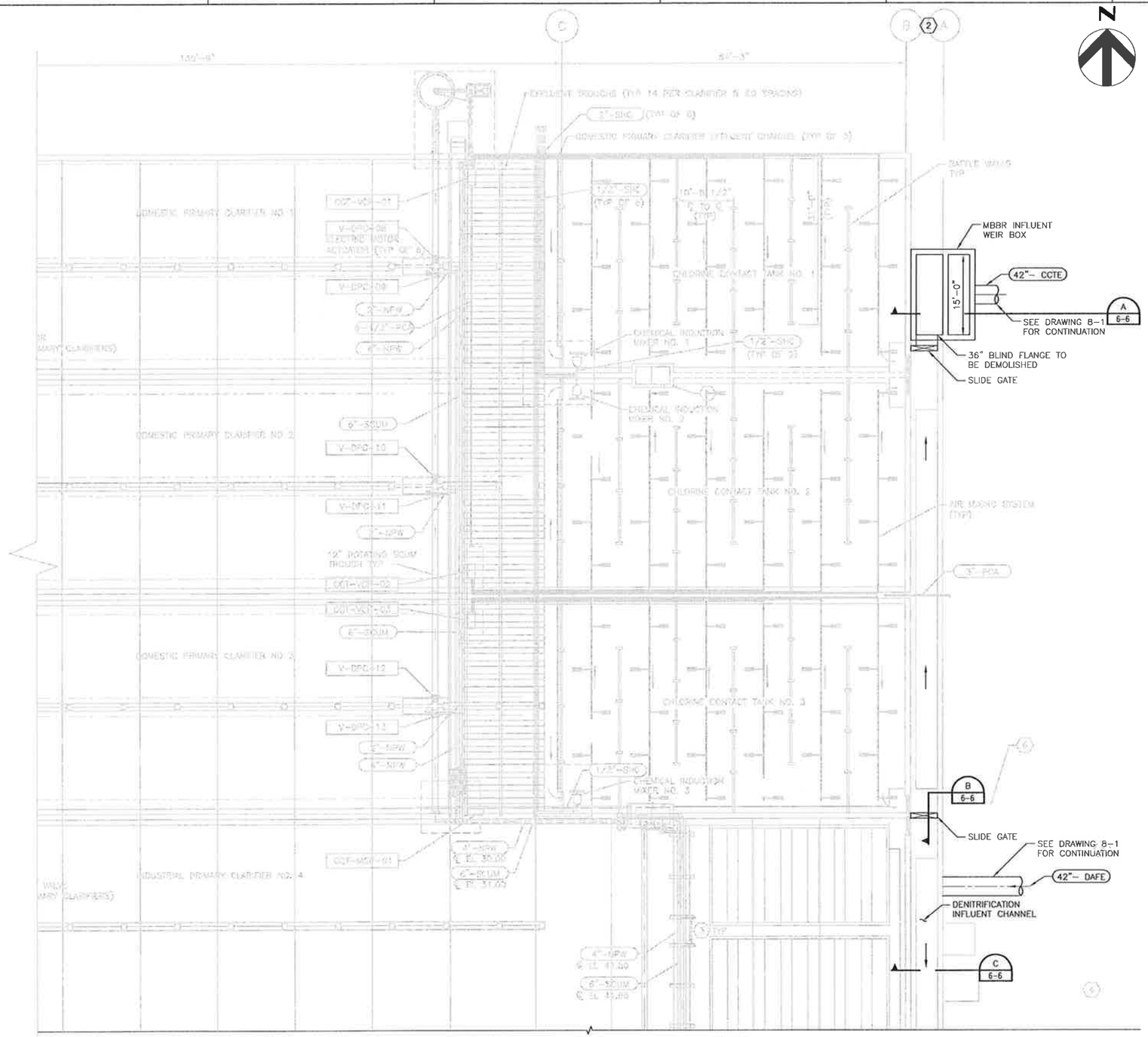
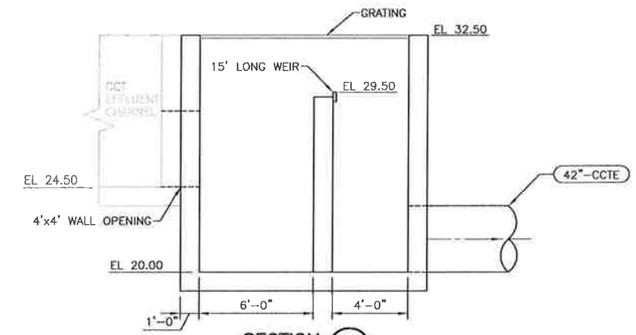
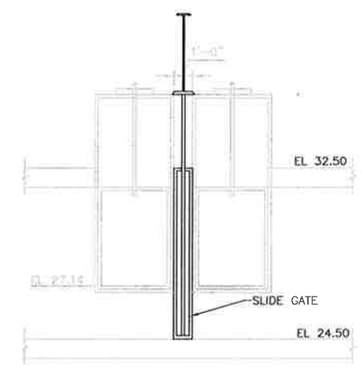


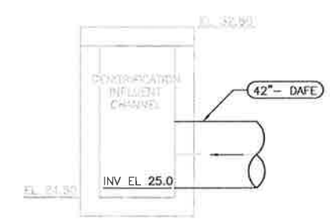
PLAN
3/32"=1'–0"



SECTION A 6-6
1/4"=1'–0"



SECTION B 6-6
1/4"=1'–0"



SECTION C 6-6
1/4"=1'–0"

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PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

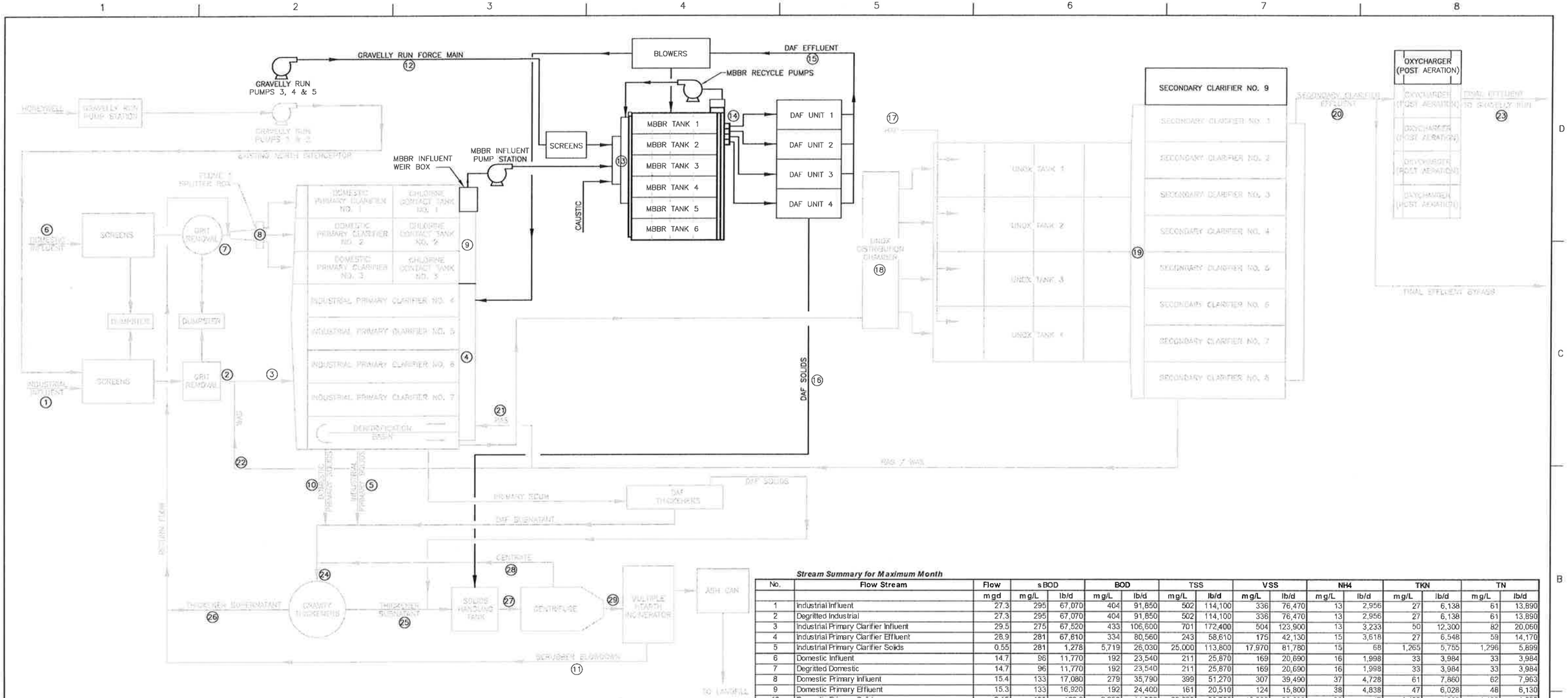
CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PRIMARY CLARIFIER MODIFICATIONS PLAN

0 1" 2"

FILENAME	6–6.dwg
SCALE	AS NOTED
DRAWING NUMBER	6-6
SHEET	OF -



Stream Summary for Maximum Month

No.	Flow Stream	Flow	sBOD		BOD		TSS		VSS		NH4		TKN		TN	
		mgd	mg/L	lb/d	mg/L	lb/d	mg/L	lb/d	mg/L	lb/d	mg/L	lb/d	mg/L	lb/d	mg/L	lb/d
1	Industrial Influent	27.3	295	67,070	404	91,850	502	114,100	336	76,470	13	2,956	27	6,138	61	13,890
2	Degritted Industrial	27.3	295	67,070	404	91,850	502	114,100	336	76,470	13	2,956	27	6,138	61	13,890
3	Industrial Primary Clarifier Influent	29.5	275	67,520	433	106,600	701	172,400	504	123,900	13	3,233	50	12,300	82	20,060
4	Industrial Primary Clarifier Effluent	28.9	281	67,810	334	80,560	243	58,610	175	42,130	15	3,618	27	6,548	59	14,170
5	Industrial Primary Clarifier Solids	0.55	281	1,278	5,719	26,030	25,000	113,800	17,970	81,780	15	68	1,265	5,755	1,296	5,899
6	Domestic Influent	14.7	96	11,770	192	23,540	211	25,870	169	20,690	16	1,998	33	3,984	33	3,984
7	Degritted Domestic	14.7	96	11,770	192	23,540	211	25,870	169	20,690	16	1,998	33	3,984	33	3,984
8	Domestic Primary Influent	15.4	133	17,080	279	35,790	399	51,270	307	39,490	37	4,728	61	7,860	62	7,963
9	Domestic Primary Effluent	15.3	133	16,920	192	24,400	161	20,510	124	15,800	38	4,838	47	6,028	48	6,130
10	Domestic Primary Solids	0.15	133	163.6	9,256	11,390	25,000	30,760	19,260	23,690	38	47	1,489	1,832	1,489	1,832
11	Scrubber Blowdown	1.8	0	0	0	0	0	0	0	0	16	234	30	437.9	30	437.9
12	Honeywell to MBBR	3.7	333	10,280	459	14,160	36	1,111	29	888.7	57	1,759	104	3,209	111	3,413
13	MBBR Influent	19.0	172	27,200	244	38,570	137	21,620	106	16,690	42	6,597	58	9,237	60	9,543
14	MBBR Effluent / DAF Influent	19.0	12	1,904	84	13,270	164	25,960	133	21,020	0.2	33	17	2,673	38	6,039
15	DAF Effluent	18.9	10	1,574	23	3,621	30	4,672	24	3,784	0.2	33	3	508.1	25	3,859
16	DAF Solids	0.085	10	7,094	13,150	9,331	30,000	21,280	24,300	17,240	0.2	0.1	3,052	2,165	3,072	2,180
17	HAP	0.71	4,227	25,030	4,450	26,350	6	35.53	5	28.42	212	1,255	235	1,392	244	1,445
18	UNOX Influent	74.7	156	96,930	1,431	892,000	5,214	3,250,000	4,239	2,642,000	12	7,311	517	322,400	536	333,900
19	UNOX Effluent / Secondary Clarifier Influent	74.7	12	7,190	1,289	803,300	5,225	3,257,000	4,257	2,654,000	11	6,857	522	325,300	524	326,500
20	Secondary Clarifier Effluent	48.1	12	4,623	19	7,561	30	12,020	24	9,795	11	4,408	14	5,584	16	6,391
21	RAS	26.2	12	2,522	3,575	781,500	14,580	3,187,000	11,880	2,596,000	11	2,405	1,436	314,000	1,438	314,400
22	WAS	0.48	12	45.99	3,575	14,250	14,580	58,120	11,880	47,350	11	44	1,436	5,726	1,438	5,734
23	Final Effluent	48.1	12	4,623	19	7,561	30	12,020	24	9,795	11	4,408	14	5,584	16	6,391
24	Gravity Thickener Influent	1.3	139	1,541	4,601	51,100	16,330	181,400	12,090	134,300	414	4,596	1,335	14,820	1,352	15,020
25	Gravity Thickener Effluent	0.71	900	5,315	2,075	12,250	4,301	25,400	3,183	18,800	462	2,730	656	3,875	674	3,979
26	Gravity Thickener Solids	0.62	900	4,680	9,096	47,300	30,000	156,000	22,200	115,500	972	5,054	2,105	10,950	2,114	10,990
27	Centrifuge Feed	0.62	900	4,680	9,096	47,300	30,000	156,000	22,200	115,500	972	5,054	2,105	10,950	2,114	10,990
28	Centrate	0.55	20	92.31	944	4,354	3,380	15,600	2,502	11,550	971	4,481	1,099	5,070	1,106	5,106
29	Centrifuge Cake to Incinerator	0.070	20	11.7	65,590	38,370	240,000	140,400	177,600	103,900	971	568	10,040	5,871	10,040	5,876

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

MASS BALANCE

0 1" 2"

FILENAME	6–7.dwg
SCALE	NOT TO SCALE

DRAWING NUMBER **6-7**

SHEET OF -

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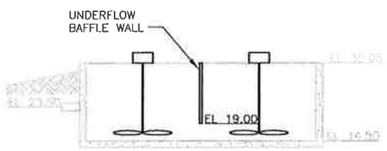
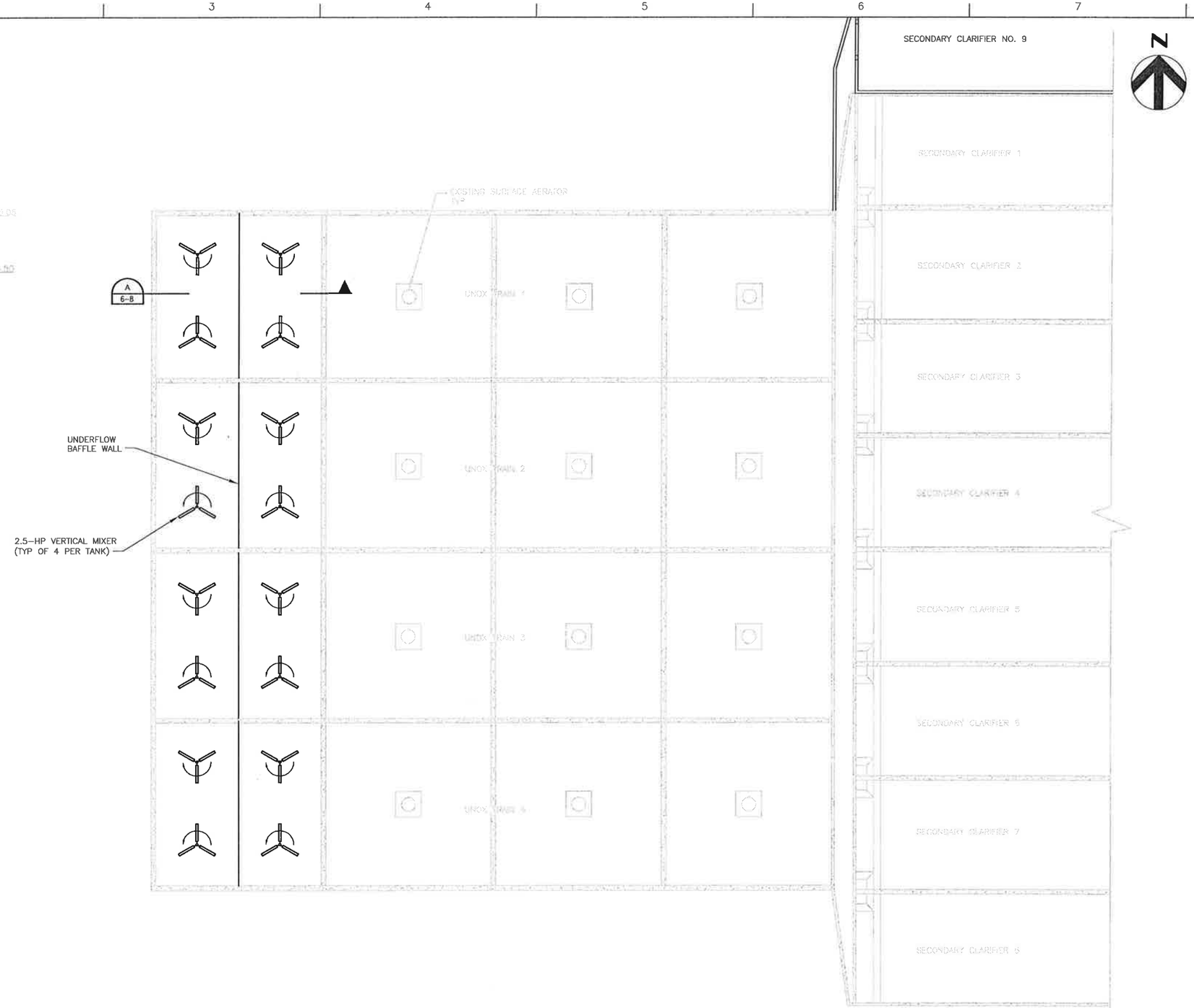


SECTION A 6-8
SCALE: 1"=20'



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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

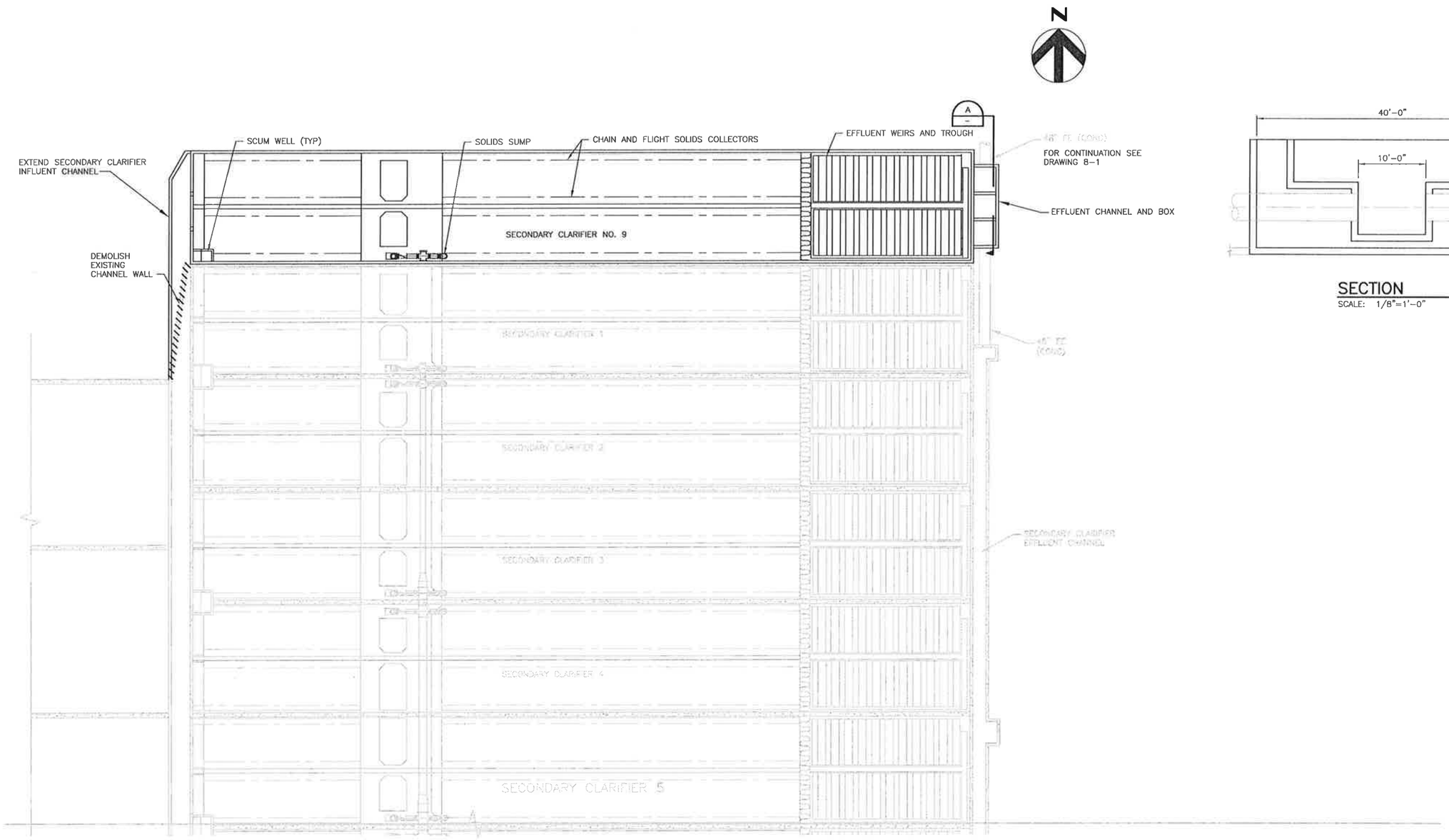
UNOX CONVERSION PLAN

0 1" 2"

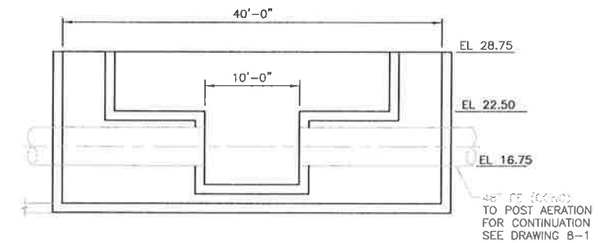
FILENAME	6-8.dwg
SCALE	1" = 20'

DRAWING NUMBER **6-8**

SHEET OF -



PLAN
SCALE: 1"=20'



SECTION A
SCALE: 1/8"=1'-0"

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CHECKED BY:	
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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

SECONDARY CLARIFIER NO. 9
PLAN AND SECTION

0 1" 2"

FILENAME	7-1.dwg
SCALE	AS SHOWN

DRAWING NUMBER **7-1**

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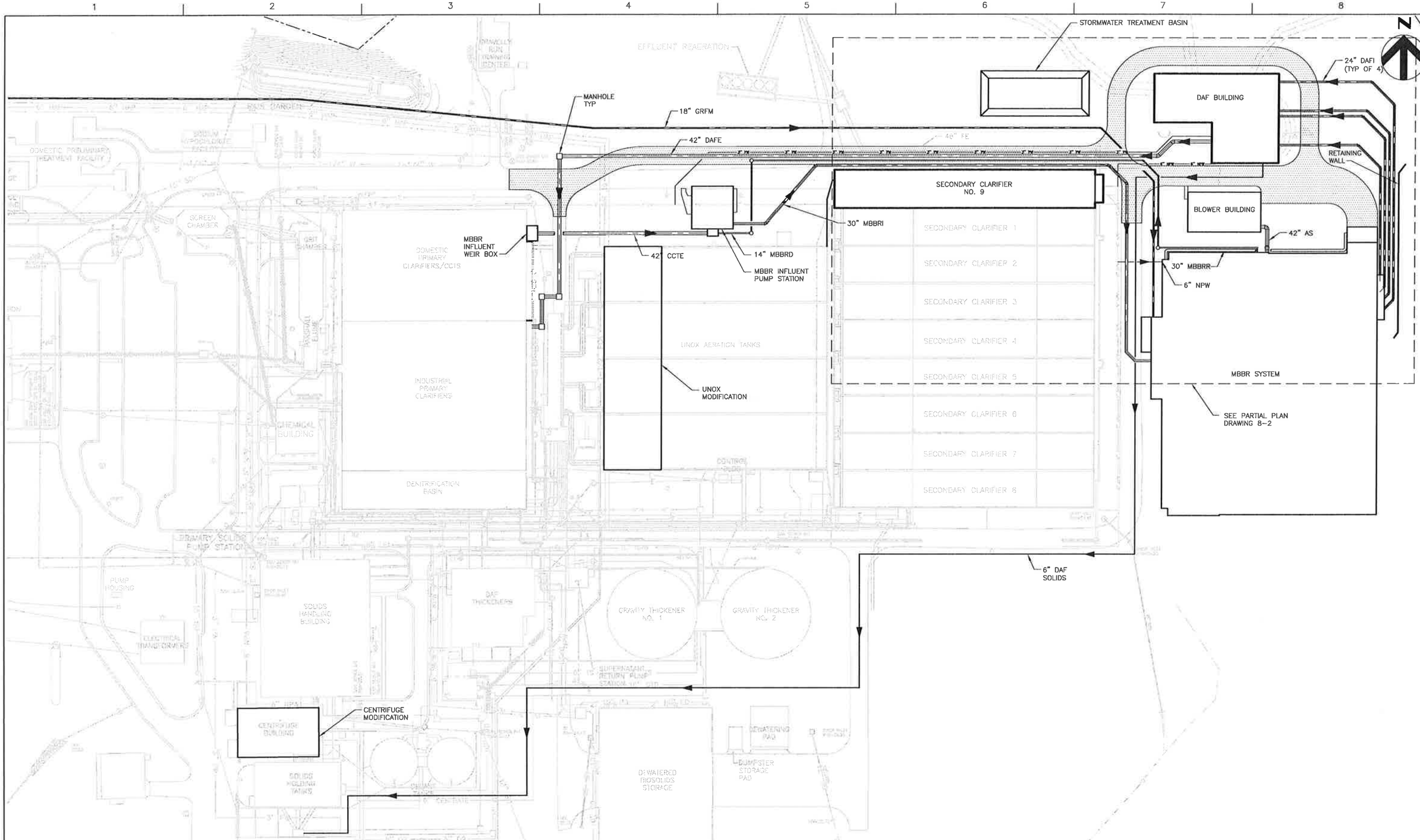

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PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

YARD PIPING PLAN

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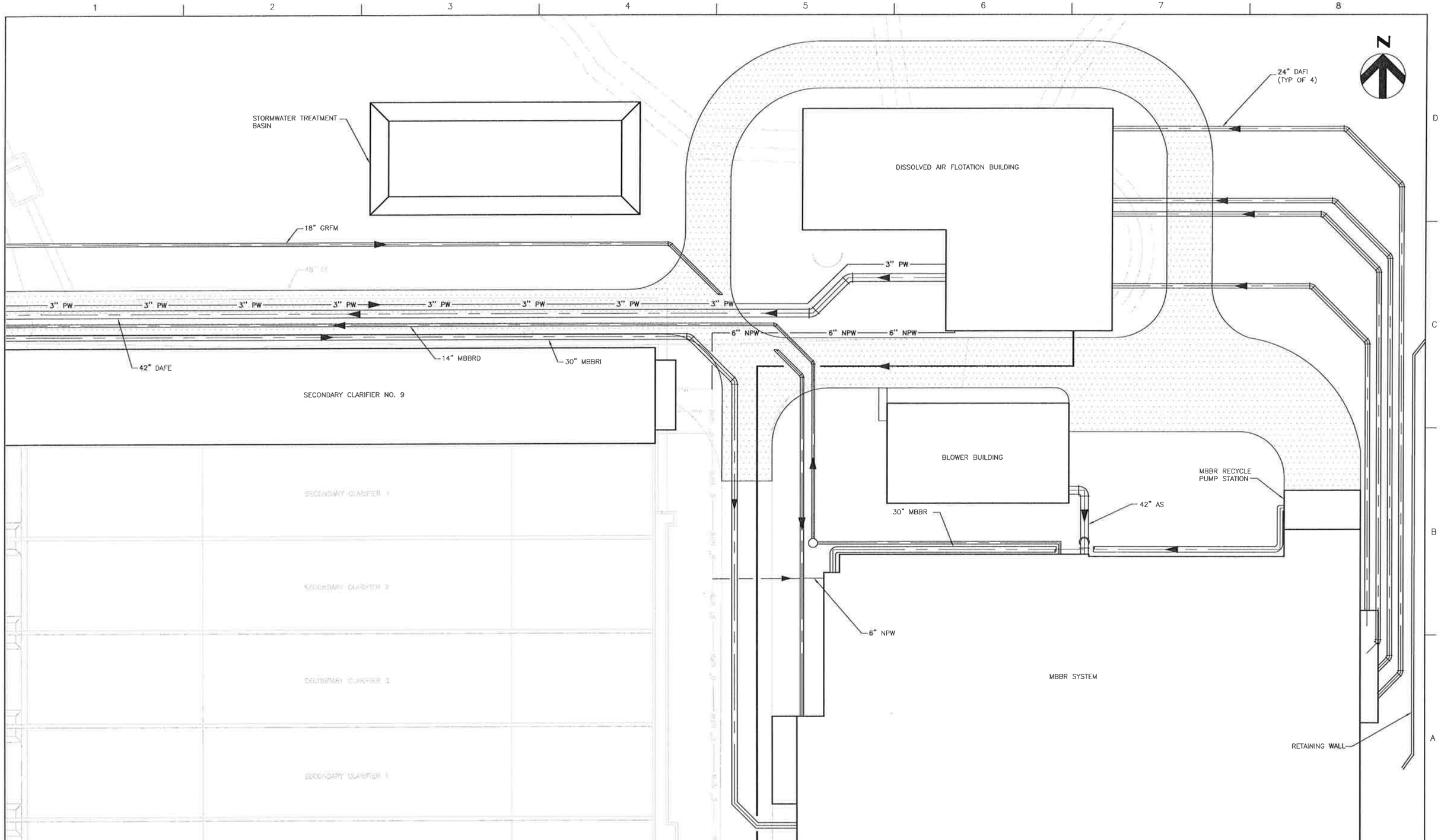

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PARTIAL YARD PIPING PLAN

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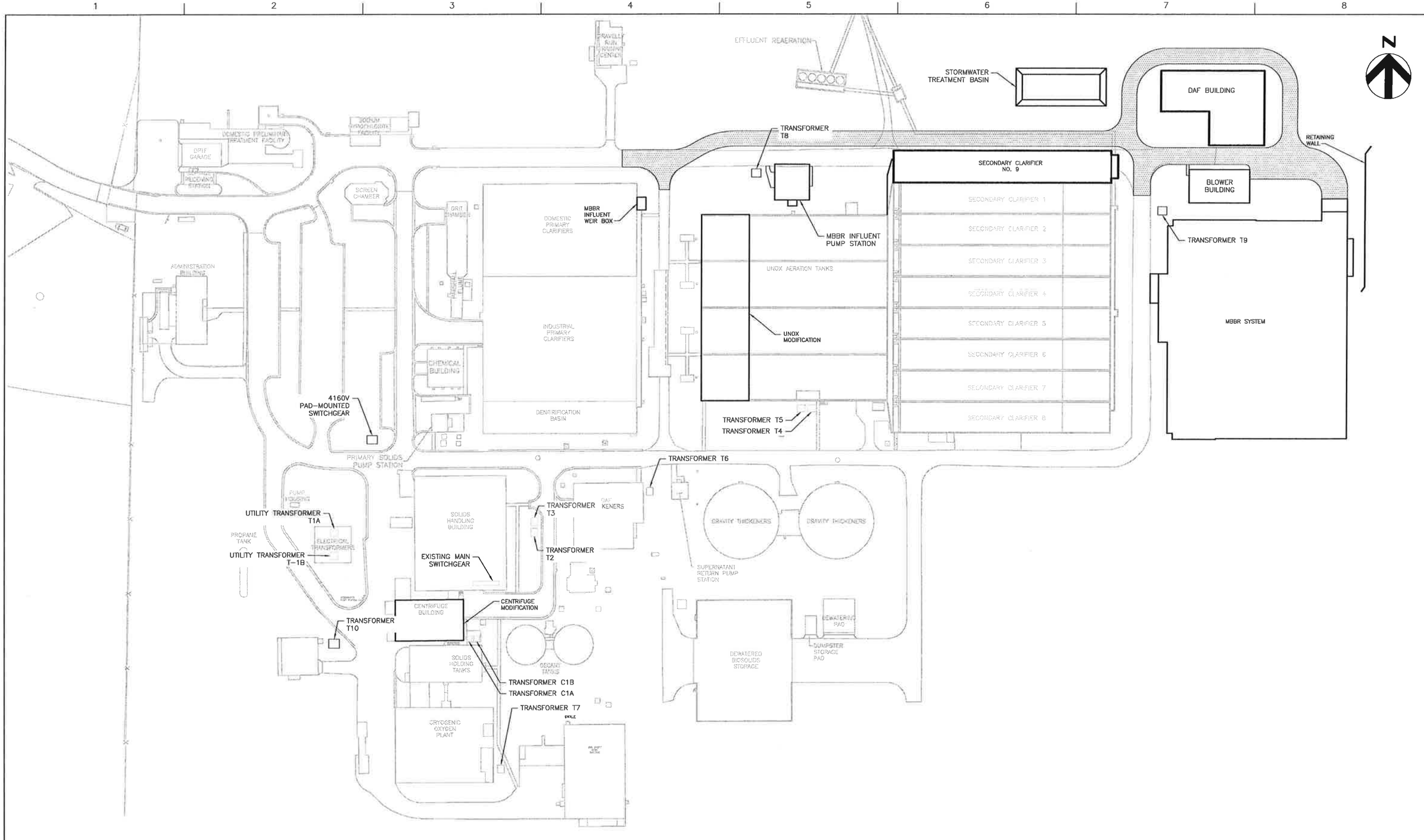

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	ISSUE	DATE	DESCRIPTION	

PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PROPOSED ELECTRICAL SITE PLAN

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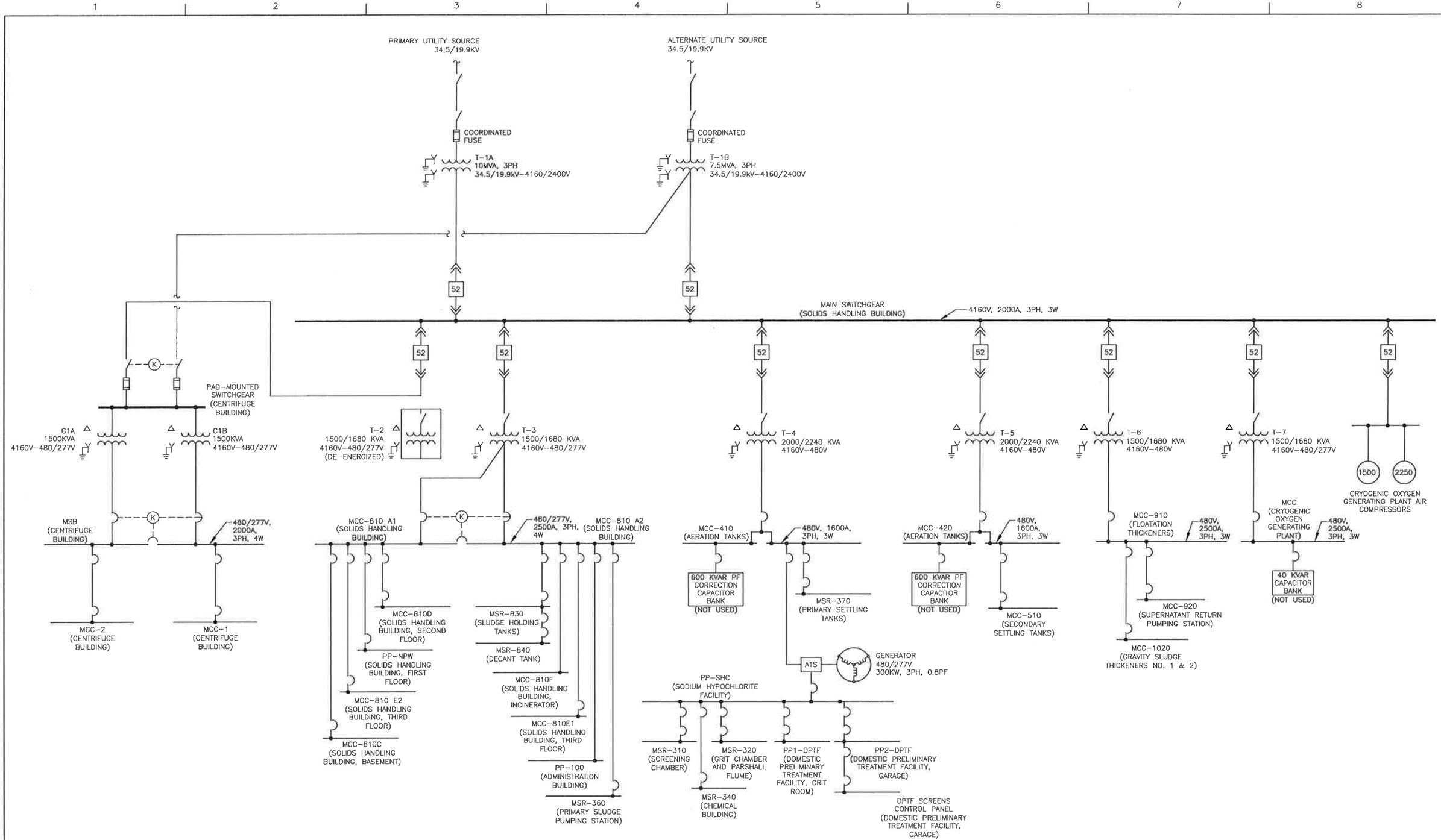

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

EXISTING
OVERALL ONE-LINE DIAGRAM

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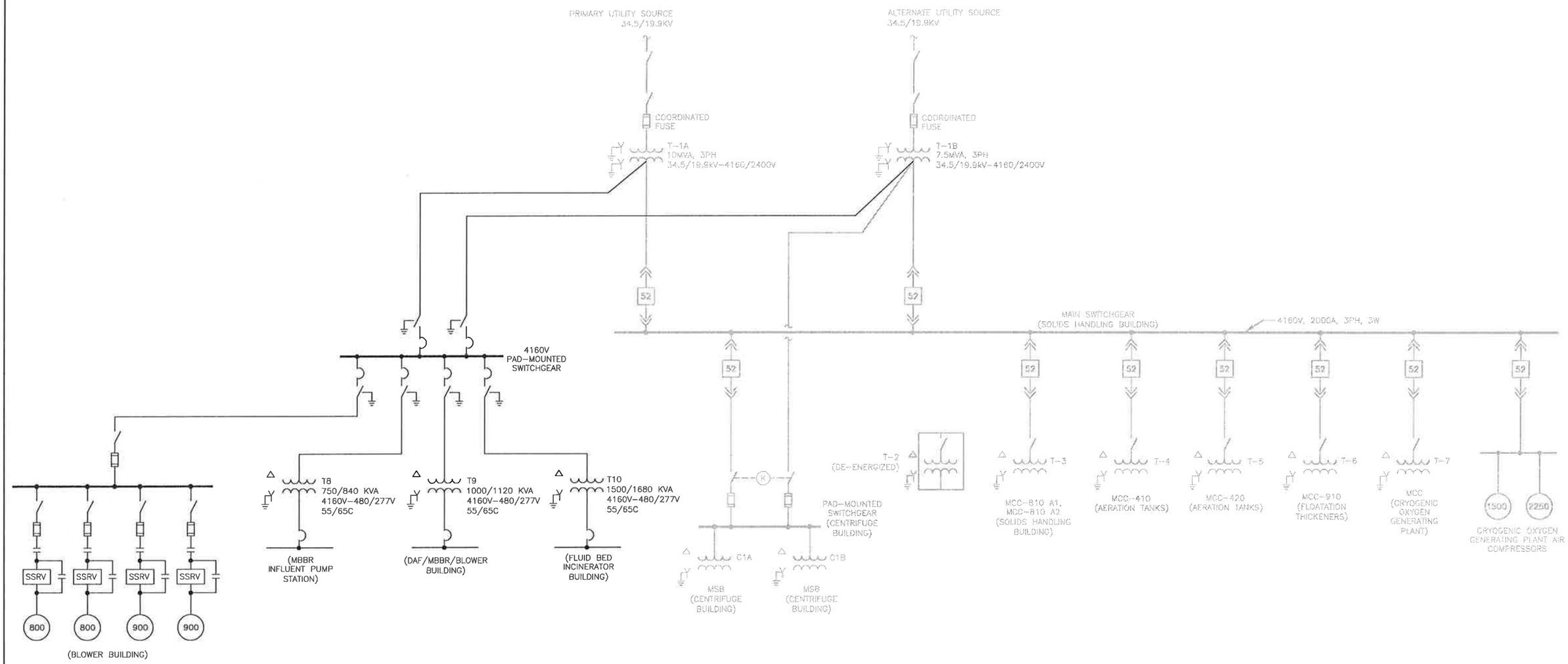

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CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PROPOSED
OVERALL ONE-LINE DIAGRAM

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DRAWING NUMBER **13-3**

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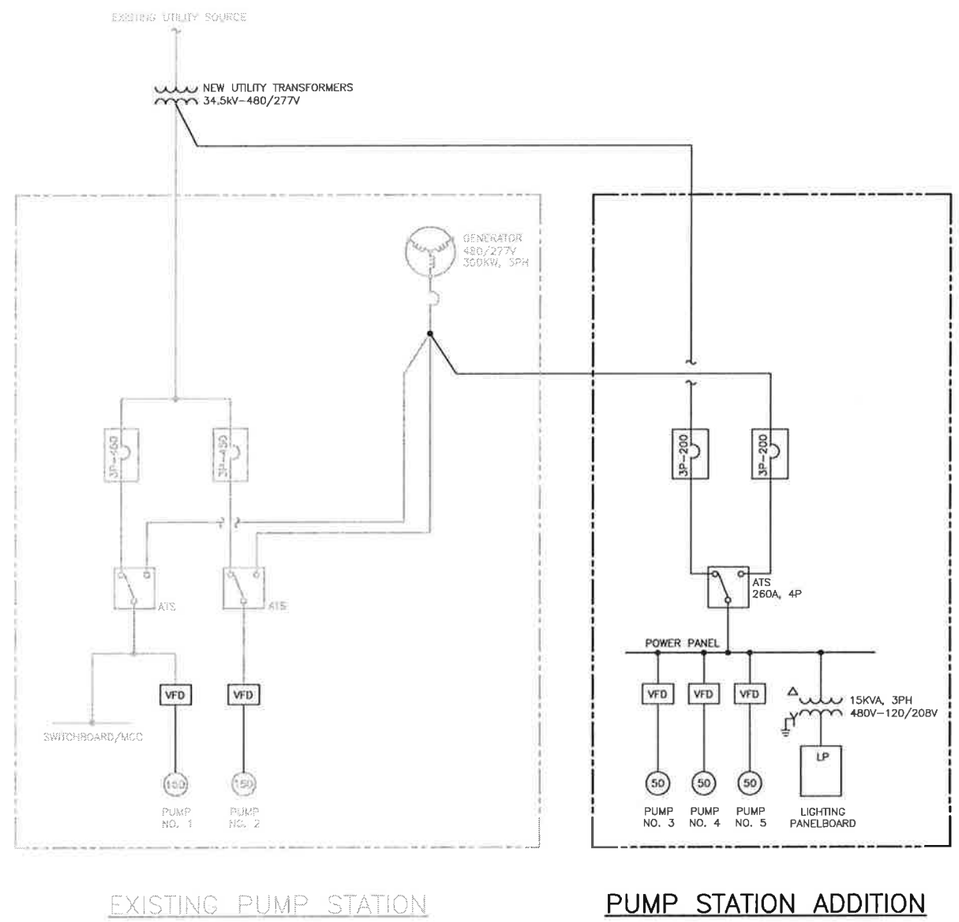

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

GRAVELLY RUN PUMP STATION
PROPOSED ONE-LINE DIAGRAM

0 1" 2"

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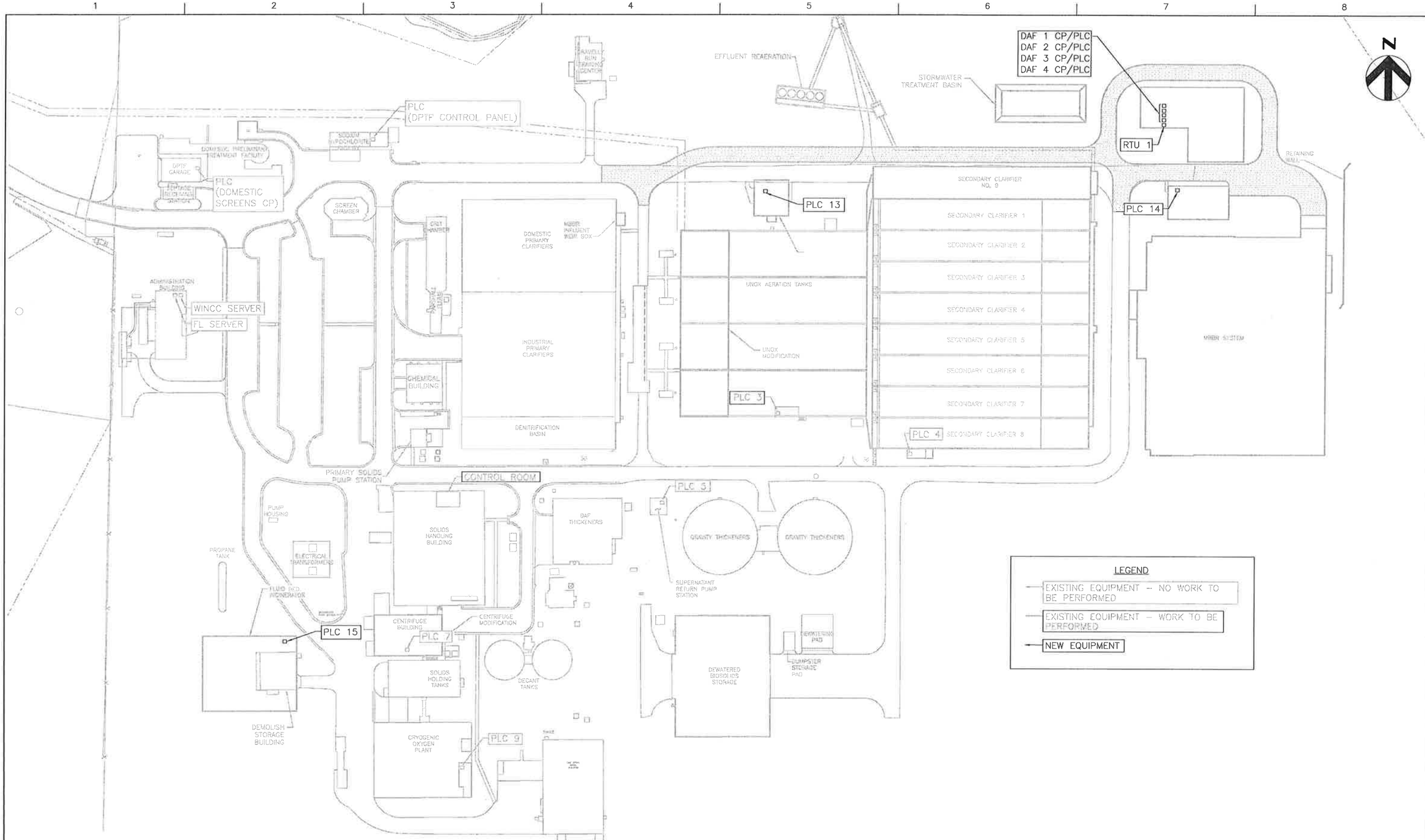

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DESIGNED BY:	G. USELDINGER
DRAWN BY:	N. WIESZEK
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PLANT CONTROL SYSTEM
SITE LOCATION PLAN

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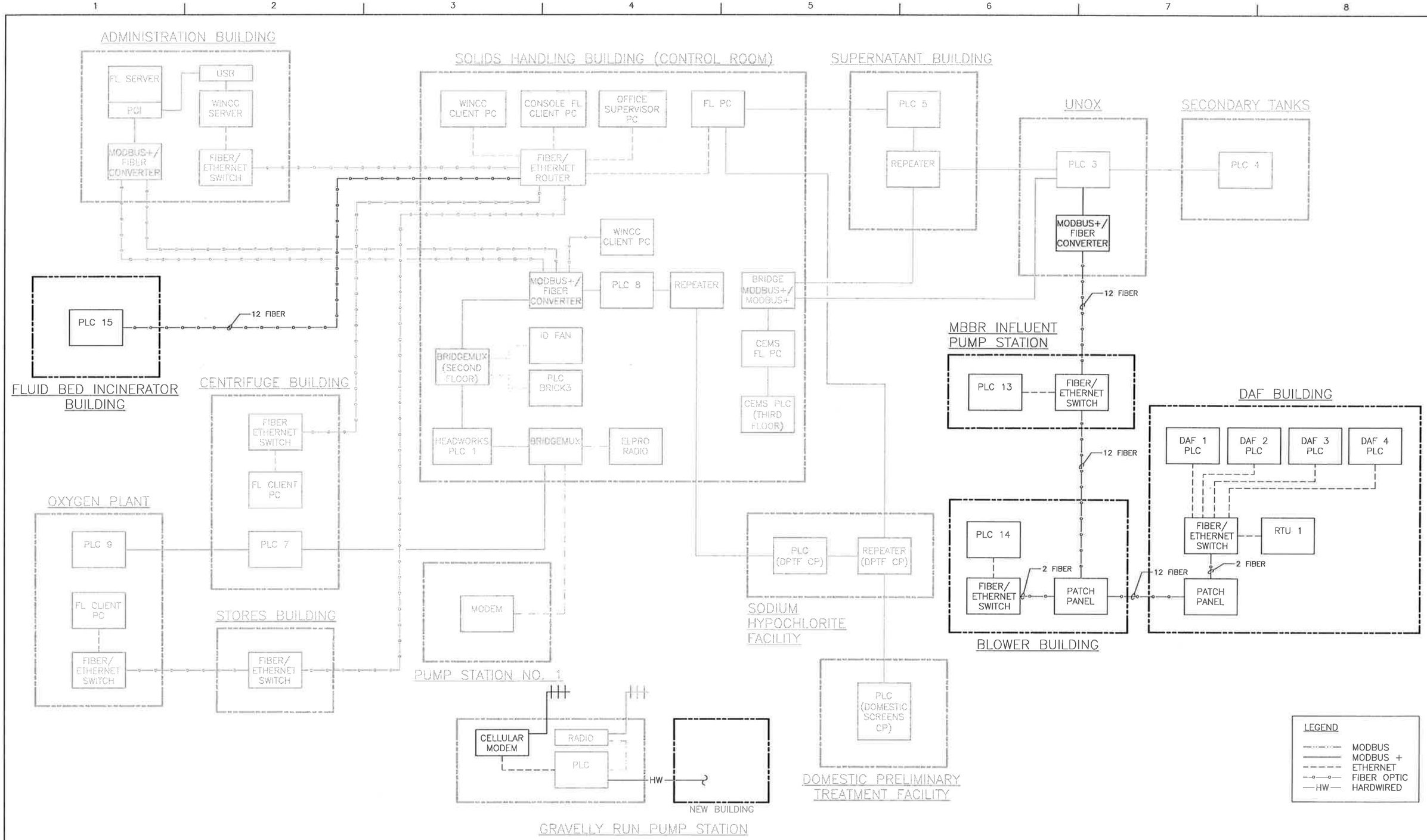

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PLANT CONTROL SYSTEM
PROPOSED BLOCK DIAGRAM

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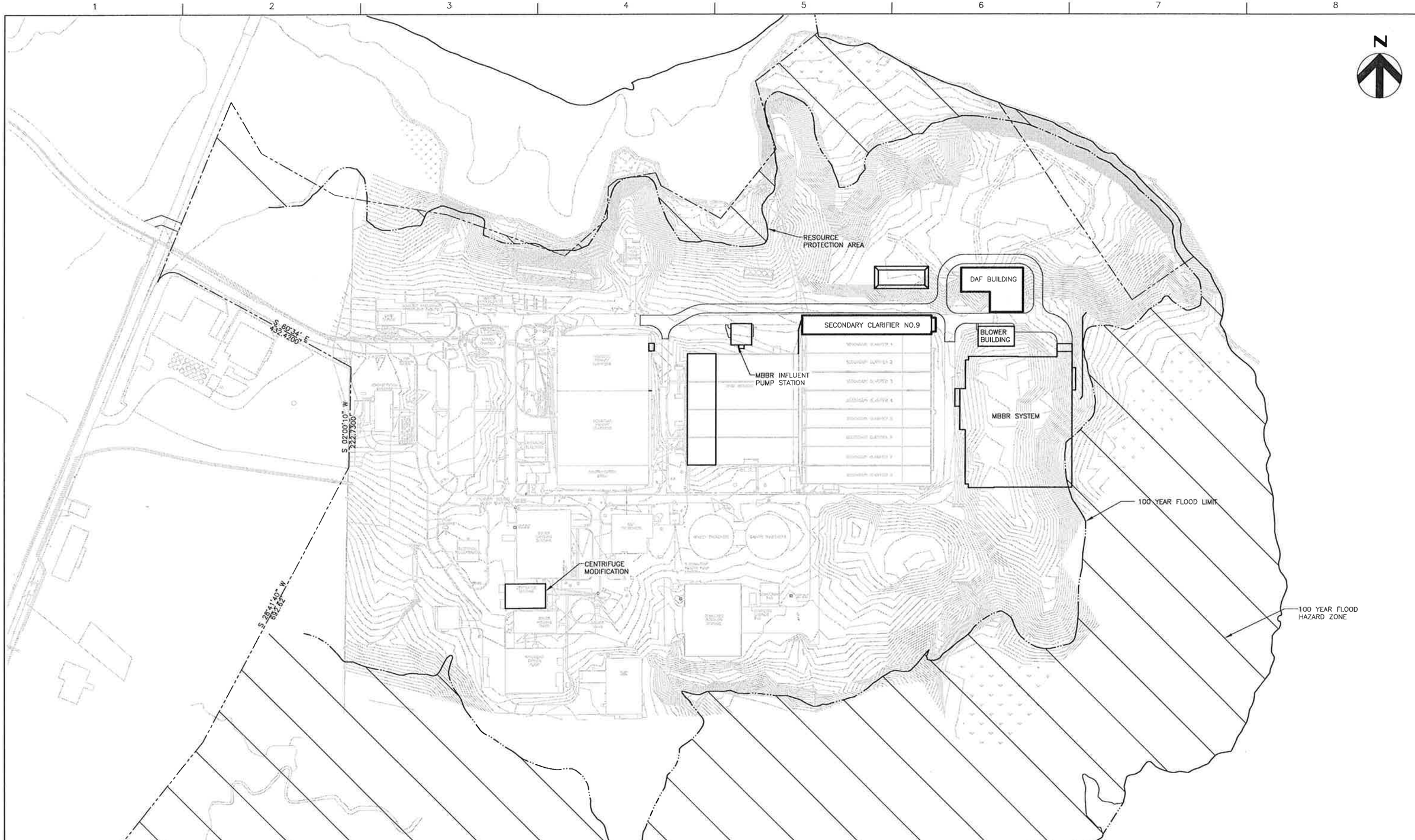

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CHECKED BY:	
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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

FLOOD HAZARD ZONE

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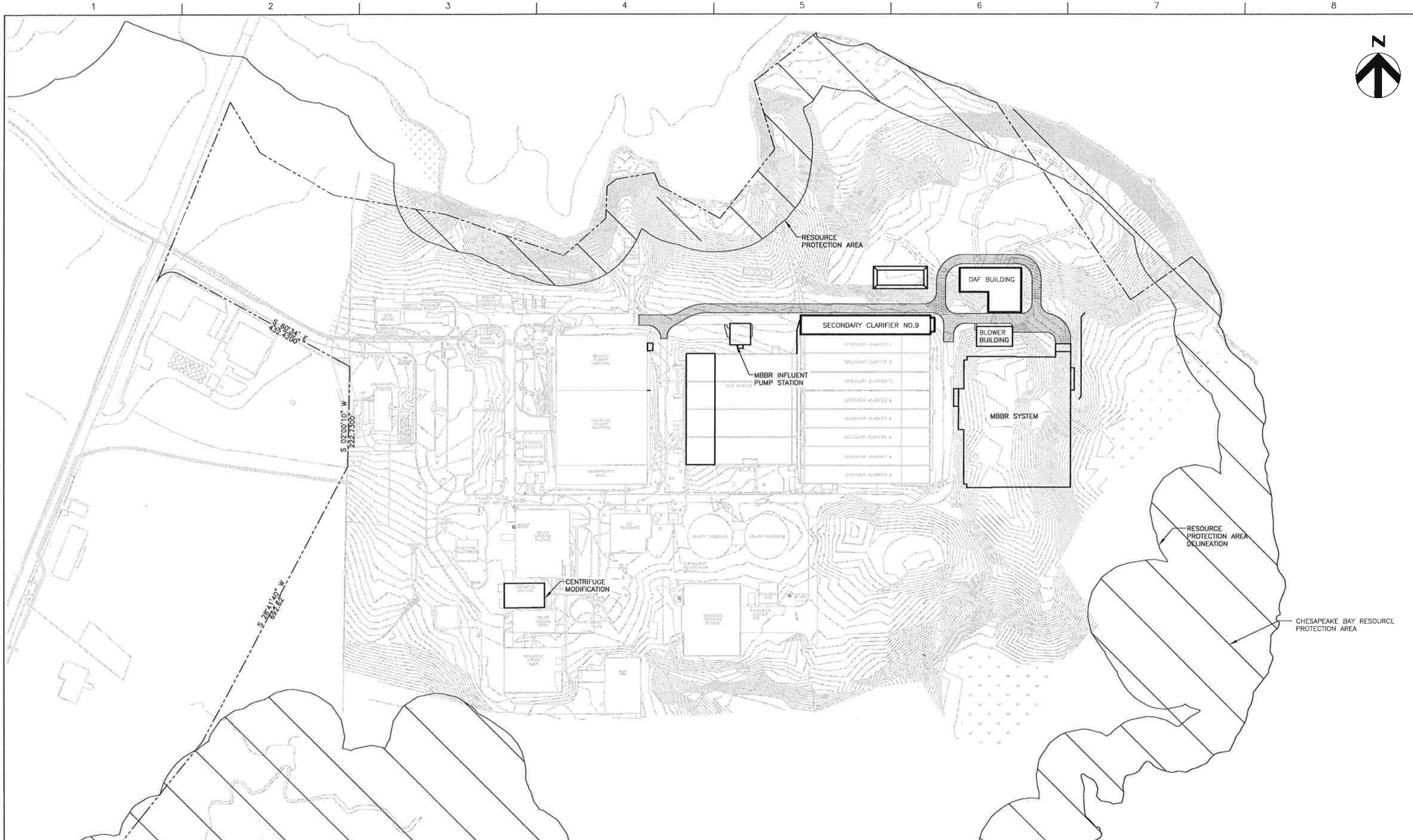

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PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

CHESAPEAKE BAY PRESERVATION AREAS

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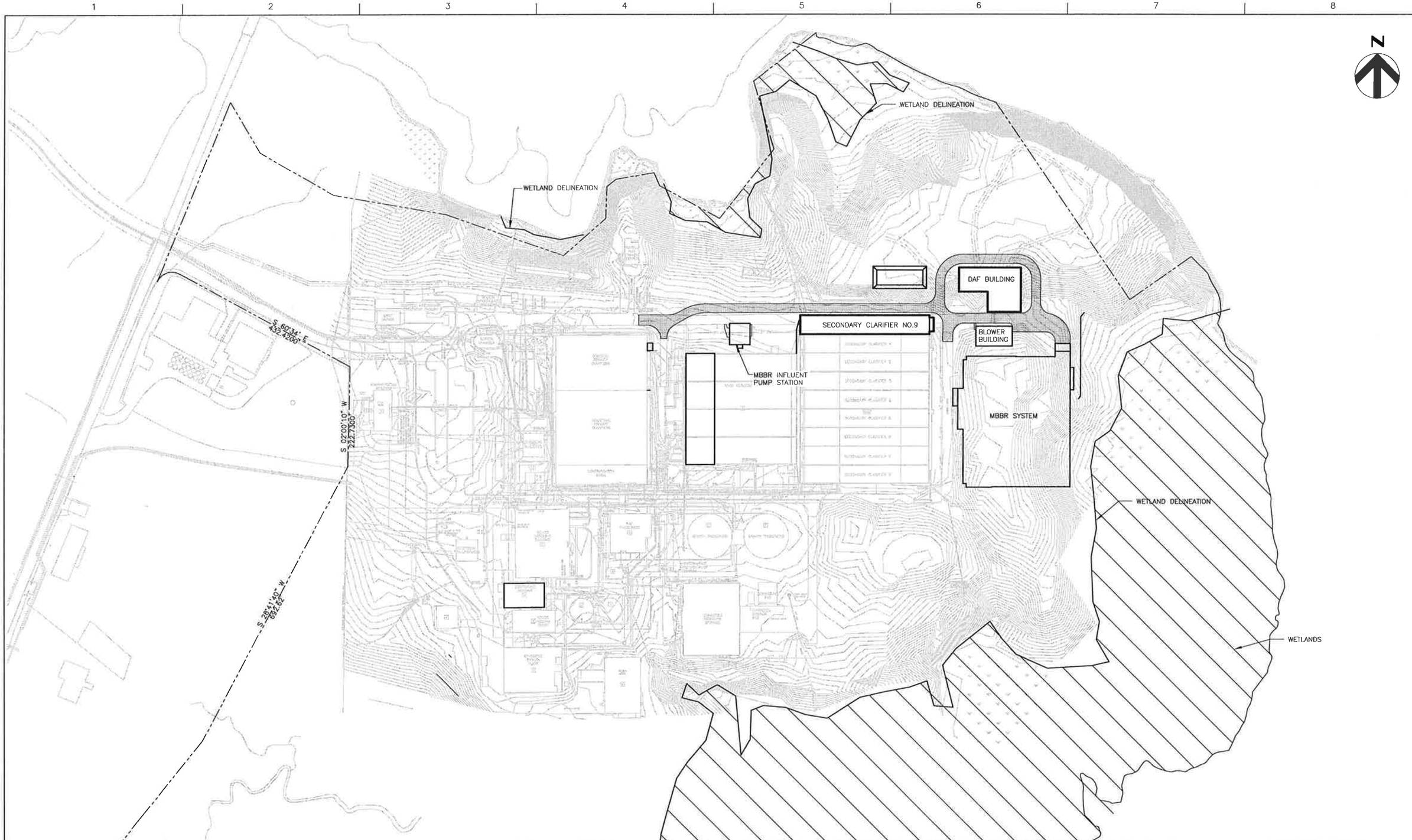

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PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

WETLAND DELINEATION SITE PLAN

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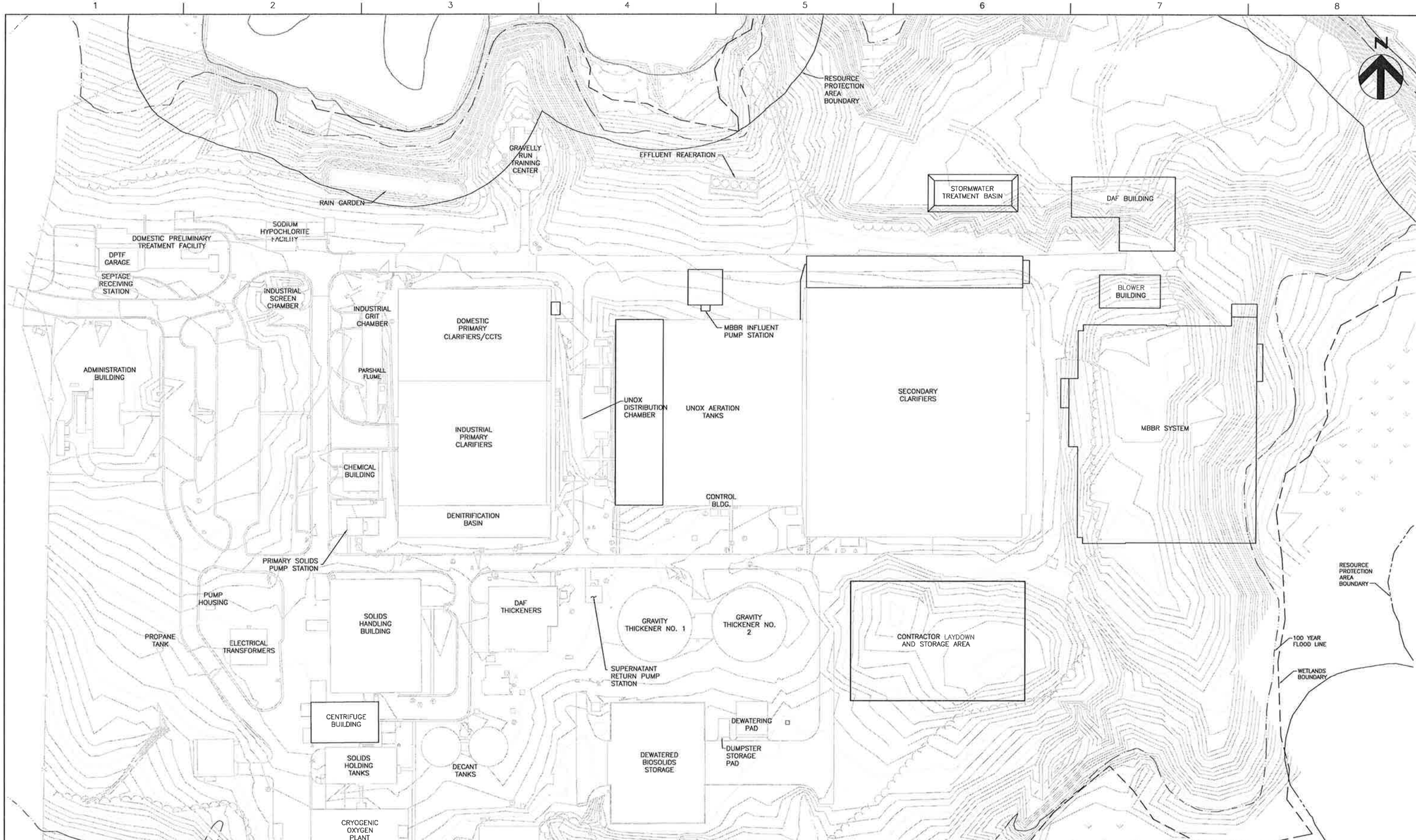

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PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
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DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

CONTRACTOR LAYDOWN AND STORAGE AREA

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FILENAME	16–1.dwg
SCALE	1" = 60'

DRAWING NUMBER **16-1**

SHEET OF -

To:	Hopewell Regional Wastewater Treatment Facility		
From:	HDR Engineering, Inc.	Project:	Alternative 4A-1 Light Phase 2 PER
cc:	File		
Date:	September 2013	Job No:	177722

1.0 INTRODUCTION AND PURPOSE

1.1 Background

The Hopewell Regional Wastewater Treatment Facility (HRWTF) must implement nitrogen reduction improvements to reduce its nitrogen discharge load below its current nitrogen waste load allocation established under the Chesapeake Bay and its tributaries nutrient control regulations. The nutrient reduction improvements expand on the Alternative 4A-1 Light, Phase 1 improvements completed in May 2012, which achieved segregation of the domestic flow from the industrial flow at the HRWTF. The Phase 2 improvements will reduce effluent total nitrogen (TN) to meet the current nitrogen waste load allocation, and address industry requests to add capacity for increased industrial loads. The design flow capacity of this 50-mgd treatment facility will not be increased.

In 2012, preliminary engineering was completed for the HRWTF Phase 2 improvements to establish the basis of design, evaluate alternatives to meet anticipated nutrient reduction requirements, and prepare a Preliminary Engineering Report (PER) for recommended improvements. The Alternative 4A-1 Light, Phase 2 PER presents the basis of design and recommended nutrient reduction improvements (September 2012 PER). The Phase 2 improvements include a segregated treatment process to provide year-round nitrification and partial denitrification of the domestic wastewater and a portion of the Honeywell wastewater in a segregated treatment process and add denitrification capacity in the existing UNOX reactor to achieve additional denitrification of the combined segregated waste stream effluent and industrial flows.

A Moving Bed Biofilm Reactor (MBBR) treatment system designed for biological nutrient removal was recommended for the Phase 2 improvements. The MBBR system was selected because of its resistance to spike loads of inhibitory compounds due both to the biofilm structure as well as the separate BOD oxidation and nitrification fixed film compartments. Pilot testing was recommended to confirm that the MBBR segregated treatment system can consistently meet nitrogen removal goals and to quantify the benefits of the MBBR system to HRWTF. A parallel suspended growth system was also recommended for pilot testing to compare performance with the MBBR system. A pilot study was conducted from October 2012 through June 2013 to compare performance of MBBR and suspended growth segregated treatment systems. Findings from the segregated treatment system pilot testing are summarized in the "HRWTF Segregated Treatment System Pilot Testing Summary Report" (September 2013).

Results from the pilot testing illustrated that an MBBR treatment system was more stable and achieved higher removal efficiencies of nitrogen and COD in comparison to the suspended growth treatment system. In addition, results from the pilot testing confirm that the segregated treatment system design basis should be maintained at treating 40% of the total Honeywell flow stream.

1.2 Purpose of PER Addendum

Additional wastewater characterization data and MBBR operational performance data collected during the pilot study were used to confirm and make recommended adjustments to the design basis for the Phase 2 improvements. The purpose of this PER Addendum is to document changes to the basis of preliminary design and recommended nutrient reduction improvements presented in the September 2012 PER. The Addendum presents only design items that have been adjusted from the design basis presented in the September 2012 PER.

1.3 Phase 2 Design Items Covered Under the PER Addendum

Table 1 summarizes proposed changes to Phase 2 design that are covered under this PER Addendum.

Table 1: Summary of Phase 2 Preliminary Design Changes Covered Under the PER Addendum

Unit Process / Design Item	Changes to Basis of Preliminary Design and Recommended Improvements
Influent Design Flows and Loads	Segregated treatment system design flow and load updates based on additional wastewater characterization data collected since September 2012 PER.
Segregated Treatment System Design Criteria Modifications	Changes to segregated treatment system design criteria based on pilot study results.
Design Basis Effluent Quality	Revisions to predicted effluent TN performance based on 40% of total Honeywell flow to segregated treatment system. Discussion of challenges of influent load variability and impacts on daily effluent performance.
Gravelly Run Pump Station and Forcemain Design Modifications	Modifications to pump station design to provide flexibility to treat additional Honeywell flow in segregated treatment system if allowed by actual process performance.
Modifications to MBBR Screening Facility	Modifications to MBBR Screening Facility to provide flexibility to treat additional Honeywell flow in segregated treatment system if allowed by actual process performance.
Modifications to MBBR Treatment Facility	Modifications to aeration blower sizing. Modifications to internal recycle flow capacity. Modifications to alkalinity feed system. Addition of supplemental phosphorus feed system.
Segregated Treatment System Dechlorination System	Addition of sodium bisulfite storage and feed facility to dechlorinate disinfected domestic primary effluent upstream of segregated treatment system.
Modifications to Phase 2 Improvements for Existing Process Units	Revisions to UNOX aeration tank modifications to reflect replacement of existing aerators.
SCAT Compliance for Amended Design Items	Revisions to Table 10-1 to compare amended design items to VA SCAT regulations.
Facility Design Criteria for Amended Design Items	Revisions to Table 12-1 for amended design items.

The 2012 PER design is based on treating a maximum of 40% of the Honeywell flow at Design Average conditions. Based on the results from the pilot study, the design basis will remain at the 40% Honeywell condition at design minimum temperature of 14 °C. However, the influent conveyance system improvements will be modified to provide the capability to divert up to 100% of the Honeywell flow to the

segregated treatment system if actual performance proves that additional Honeywell flow can be treated in the segregated system.

2.0 UPDATES TO INFLUENT DESIGN FLOWS AND LOADS

Wastewater characterization data collected during the pilot study were used to estimate wastewater fractionation for the segregated influent and to estimate domestic primary effluent and Honeywell waste stream characteristics for constituents not typically measured, such as alkalinity and total phosphorus (TP). No changes were made to the total influent flows and loads presented in Table 2-3 of the September 2012 PER. It is noted that HRWTF has recognized some of the projected future City domestic growth; however, total domestic loads projection (current plus future) do not change and are maintained at the total of the City Domestic flows and loads presented in Table 2-3 of the September 2012 PER. In addition, the total design flow to the MBBR treatment system is maintained at design flows presented in Table 2-4 of the September 2012 PER. Note that the design flow for the Phase 2 improvements does not represent a capacity expansion of the current design flow of this 50-mgd treatment facility.

Although the design basis total influent flows and loads are not being changed, several adjustments to additional wastewater characteristics were recommended based on the characterization data collected during the pilot study. The following adjustments are incorporated into the PER design basis.

- Domestic primary effluent COD/BOD ratios measured during the pilot study were considerably higher than those assumed in the PER phase and attributed to high COD/BOD ratio of solids handling recycle streams. Domestic COD concentrations are not routinely monitored at HRWTF and a typical domestic COD/BOD ratio of 2:1 was assumed for domestic primary effluent. The domestic primary effluent COD loads were adjusted to account for the higher domestic primary effluent COD/BOD ratio.

- Alkalinity concentrations were considerably different than assumed values used in the September 2012 PER. The previous alkalinity loads were assumed based on limited alkalinity data collected during the Treatment Plant Process Enhancement and Enrichment (TPPEE) study conducted in the late 1990's. During this pilot study, the domestic primary effluent had a higher alkalinity concentration, while the Honeywell waste stream had a significantly lower alkalinity concentration than what was assumed for the September 2012 PER. The design alkalinity loads were adjusted based on pilot data and these adjustments result in a combined influent alkalinity load to the segregated treatment system that is similar to that used for the September 2012 PER.

- Pilot plant domestic primary effluent BOD, TSS, and TKN concentrations were lower than mass balance projections presented in the September 2012 PER. The lower domestic primary effluent constituent concentrations are attributed to higher primary clarifier removal rates achieved at current flow and load conditions, and the high removal rates for the solids handling stream recycle loads directed to the Domestic Primary Clarifiers. Lower Domestic Primary Clarifier removal rates are anticipated at design flow and load conditions. The Domestic Primary Clarifier removal rates were adjusted to account for different removal rates anticipated for the solids handling recycle streams and the domestic influent wastewater.

Updated influent design loads for the segregated treatment system were developed based on load adjustments presented above and include estimates of additional wastewater characterization data. The anticipated loads from domestic primary effluent, the total Honeywell waste stream, and the combined influent to the segregated treatment system are summarized in Tables 2, 3, and 4, respectively. The combined influent to the segregated treatment system (Table 4) represents the revised Design Basis Influent to the MBBR system (i.e., replaces Table 2-6 of the September 2012 PER). Peak day TKN loads presented in Tables 3 and 4 reflect the recommended Honeywell peak day TKN load cap at two times the Honeywell annual average TKN load.

Table 2: Updated Domestic Primary Effluent Flows and Loads

Parameter	Design Average (lbs/day)	Peak Day (lbs/day)
Flow (mgd)	16.0	29.7
BOD	24,539	35,864
CBOD	22,085	32,278
TSS	19,531	33,990
COD	63,001	92,077
TKN	6,290	6,863
NO_x-N	81	144
Alkalinity	23,907	
Estimated Additional Wastewater Characteristics[1]		
TVSS	*17,084*	*29,732*
scBOD	*17,993*	*26,297*
gfCOD	*41,203*	*60,219*
ffCOD	*35,494*	*51,876*
TP	*572*	*1,061*
Ortho-P	*358*	*665*
STKN	*5,288*	*5,769*
NH_3-N	*4,802*	*5,239*

[1]Additional wastewater characteristics are estimated by assuming pilot domestic primary effluent ratios are constant. Ratios are multiplied by design loads to estimate corresponding loads at each condition.

Table 3: Updated Total Honeywell Flows and Loads to HRWTF

Parameter	Design Average (lbs/day)	Peak Day (lbs/day)
Flow (mgd)	9.3	11.2
BOD	35,545	109,137
COD	74,645	232,461
TSS	2,751	11,021
TKN	8,064	11,629
NO_x-N	512	825
Alkalinity	12,371	
Estimated Additional Wastewater Characteristics[1]		
TVSS	*1,939*	*7,769*
sBOD	*31,716*	*97,381*
gfCOD	*65,397*	*203,660*
ffCOD	*42,055*	*130,967*
TP	*40*	*48*
Ortho-P	*6*	*7*
STKN	*7,452*	*10,746*
NH_3-N	*5,308*	*7,654*

[1] Additional wastewater characteristics are estimated by assuming pilot Honeywell ratios are constant. Ratios are multiplied by design loads to estimate corresponding loads at each condition.

Table 4: Updated Combined Influent Flows and Loads to Segregated Treatment System at 40% Honeywell Condition

Parameter	Design Average (lbs/day)	Peak Day (lbs/day)
Total Flow (mgd)	19.7	33.6
Domestic Primary Effluent Flow (mgd)	16.0	29.7
Honeywell Flow (mgd)	3.7	3.9[2]
BOD	38,757	79,722
CBOD	34,881	71,750
TSS	20,631	38,548
COD	92,859	185,584
TKN	9,516	11,515
NO_x-N	285	474
Alkalinity	28,855	
Estimated Additional Wastewater Characteristics[1]		
TVSS	*17,856*	*32,971*
sCBOD	*30,611*	*65,398*
gfCOD	*67,221*	*142,024*
ffCOD	*52,226*	*104,557*
TP	*588*	*1,080*
Ortho-P	*361*	*668*
STKN	*8,252*	*10,068*
NH_3-N	*6,913*	*8,301*

[1] Additional wastewater characteristics are estimated by assuming pilot domestic primary effluent and Honeywell ratios are constant. Total domestic primary effluent loads from Table 2 are added to percentage of total Honeywell load from Table 3 directed to segregated treatment system.
[2] Maximum Honeywell flow at peak day is capped to keep maximum Combined Influent at 33.6 mgd.

3.0 SEGREGATED TREATMENT SYSTEM DESIGN CRITERIA MODIFICATIONS

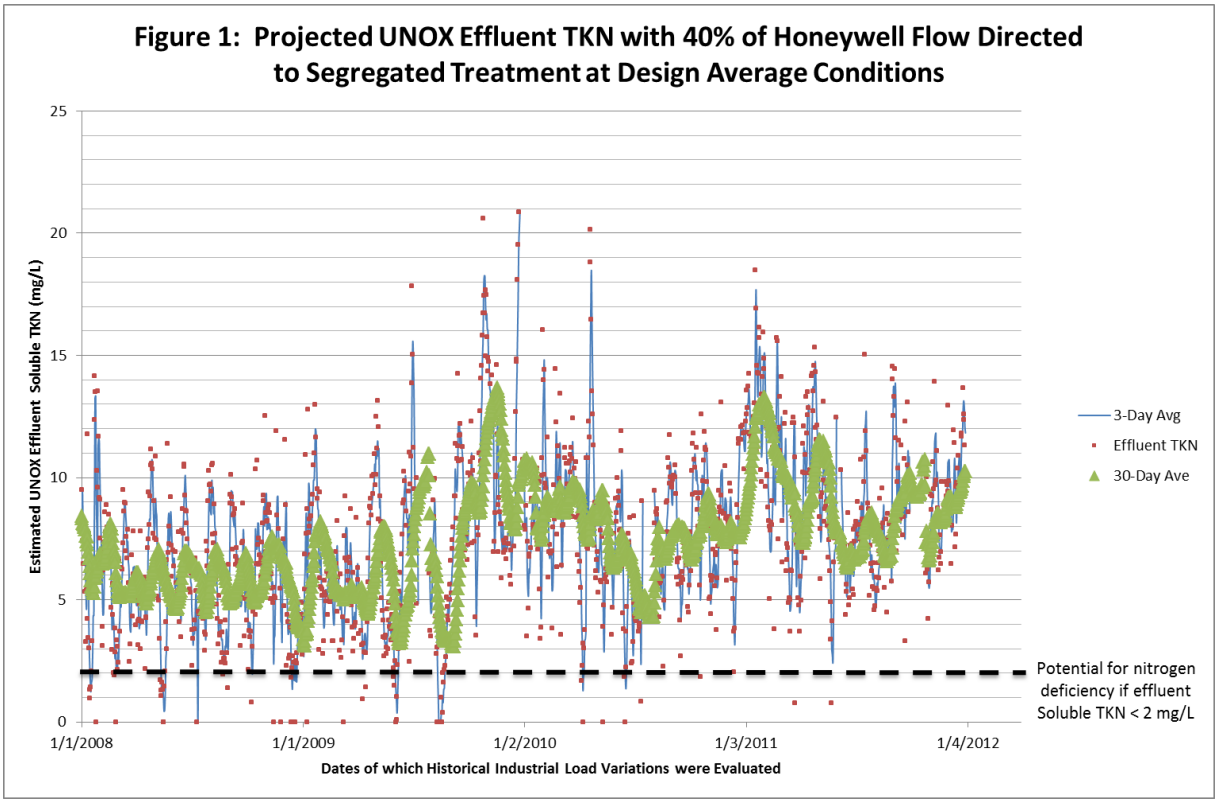
3.1 Maximum Treatable Fraction of Honeywell Flow

The September 2012 PER design was based on treating a maximum of 40% Honeywell flow at Design Average conditions (equivalent to 19% Honeywell as a fraction of the total combined influent flow). This was determined based on previous testing which concluded the resulting level of continuous nitrification inhibition associated with higher Honeywell flow percentages resulted in significant increases to basin sizing. Furthermore, the potential for sporadic nitrification inhibition events increased with higher percentages of Honeywell in the combined influent. An objective of the pilot study was to either confirm the September 2012 PER design assumption that Honeywell flow diversion to segregated treatment should be limited to 40% of the total Honeywell flow at Design Average conditions, or establish a revised maximum treatable fraction of the Honeywell flow. The advantage of treating a larger portion of the Honeywell flow would be greater TN removal at the HRWTF.

Based on the results of the pilot work, the potential for sporadic upsets to nitrification was experienced at all operation conditions, even at the September 2012 PER design basis of 40% of the total Honeywell flow at Design Average conditions. Overall, the systems performed well at the 70% and 100% Honeywell conditions. However, it is important to note that the pilot systems were operating well above minimum design temperatures under higher Honeywell conditions. Nitrification performance of the systems at 70% and 100% Honeywell conditions was not demonstrated at design minimum temperature (14 °C). Because nitrification rates are sensitive to operating temperatures, there are concerns that the systems would be susceptible to ammonia breakthrough and nitrification loss at higher percentages of Honeywell

at lower operating temperatures. For these reasons, it is not recommended that the segregated treatment system design basis be revised around treating a larger percentage of the total Honeywell flow stream at design temperature conditions.

In addition to nitrification performance concerns in the segregated treatment system above 40% Honeywell design condition, the UNOX treatment system would potentially experience process challenges if a higher percentage of Honeywell were treated in the segregated treatment system. Many of the industrial waste streams discharged to HRWTF are nitrogen deficient; in other words, the BOD/TKN ratios of several of the industrial waste streams are not sufficient to support biological growth in a biological treatment system. A nitrogen balance was completed to evaluate the potential for nitrogen limiting conditions to occur in the UNOX with all of the domestic flow and 40% of the Honeywell flow directed to the segregated treatment system. The design average UNOX influent BOD/TKN ratio (13:1) is sufficient to accommodate biological growth. However, the historical daily fluctuations in influent BOD and TKN presents challenges. Figure 1 illustrates estimated projected UNOX effluent TKN at design conditions with 40% of the Honeywell flow and all of the domestic primary effluent treated in the segregated treatment system. Figure 2 illustrates estimated projected UNOX effluent TKN at start-up conditions. The start-up estimates are based on current flow and load conditions with Honeywell flows to the Segregated Treatment System maintained at the design average of 3.7 mgd. It is assumed that there is potential for nitrogen deficiency when the UNOX soluble effluent TKN concentration is projected to be less than 2 mg/L. The soluble effluent TKN target was selected assuming that at least 1 mg/L of dissolved organic nitrogen would be recalcitrant and assuming a target effluent ammonia-nitrogen concentration of 1 mg/L. As illustrated in Figures 1 and 2, there is a potential for transient nutrient deficient conditions to occur periodically in UNOX influent with a design average of 3.7 mgd of Honeywell directed to the segregated treatment system. The potential for sustained nutrient deficient conditions in the UNOX treatment system increases as the percentage of Honeywell increases above the design average of 3.7 mgd. Treating less than the design average of 3.7 mgd Honeywell in the segregated treatment system impacts the ability to meet the TN waste load allocation, but treating more than 3.7 mgd of Honeywell increases the risk of nutrient deficiency in the UNOX reactor.



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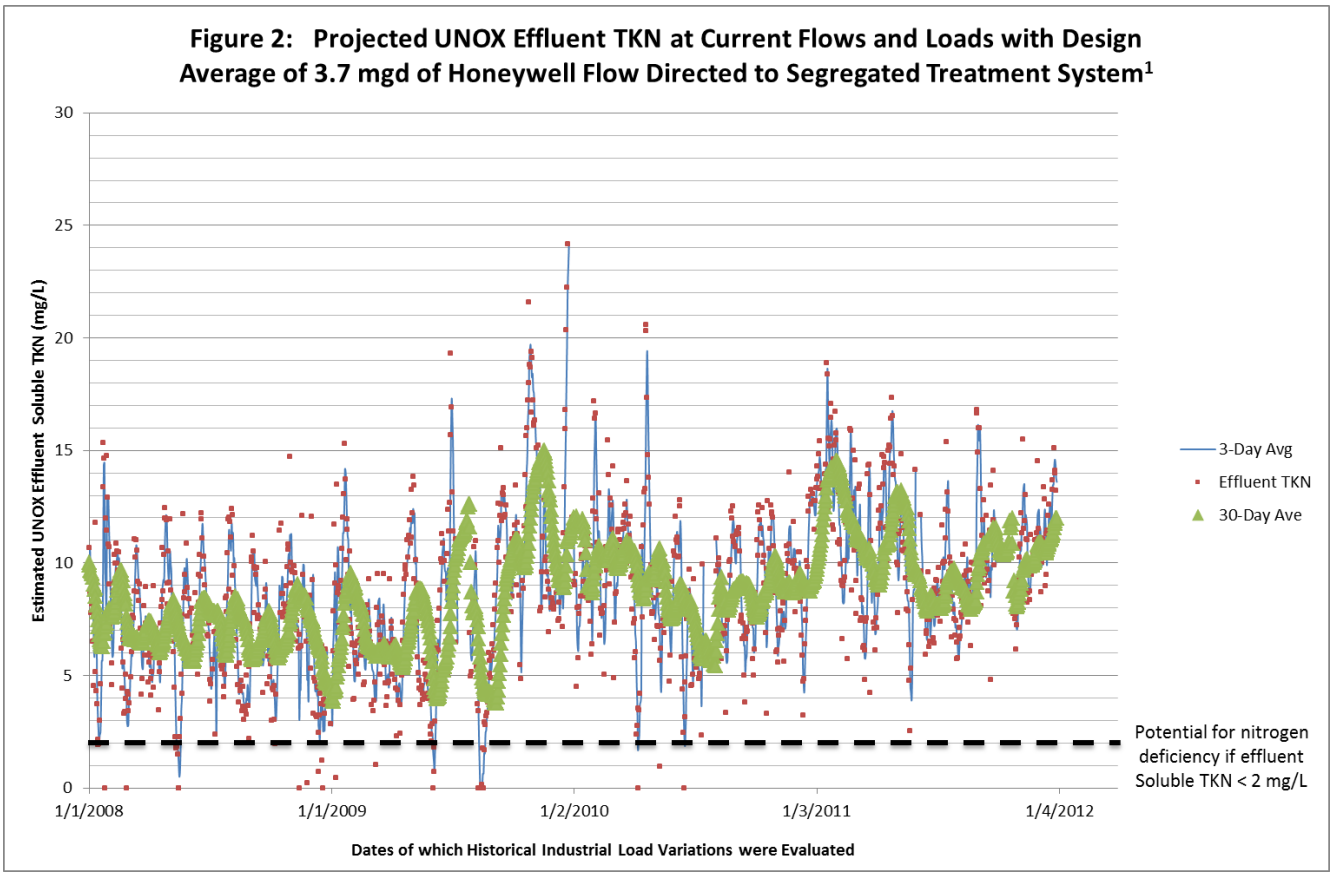

[1]At current flow and load conditions, the Honeywell design average flow of 3.7 mgd directed to the Segregated Treatment System represents 50% of the total current Honeywell flow. Honeywell flows to the Segregated Treatment System must be maintained at design flows to meet the effluent TN target at current conditions because domestic flows and loads are lower than design conditions.

To accommodate fluctuations in industrial BOD and TKN influent loads, it is recommended that on-line analyzers be installed to monitor UNOX influent TOC and ammonia as well UNOX effluent inorganic nitrogen concentrations (ammonia-N + NO_x-N concentrations) with capabilities to direct additional Honeywell flow to UNOX in the event that nutrient deficient conditions are encountered.

Based on the pilot testing and detailed evaluation of the potential for nutrient limiting conditions, the design basis for the segregated treatment system is maintained at 40% of the Honeywell flow (3.7 mgd design flow Honeywell flow).

3.2 Modifications to MBBR System Design Criteria

Results from the pilot testing generally supported the MBBR design criteria presented in the September 2012 PER. The following modifications to the MBBR design criteria are recommended based on pilot test findings:

- A phosphorus uptake rate of 0.02 lbs P / lb MLVSS produced was assumed in the September 2012 PER. While pilot averages were similar to this assumed uptake rate, a slightly higher uptake rate of 0.03 lbs P / lb MLVSS was observed during portions of the pilot testing. This higher uptake rate should be considered in estimating supplemental phosphorus requirements.

- The pilot data illustrated that influent phosphorus concentrations to the segregated treatment system will be variable and create a risk for phosphorus limiting conditions. Minimum combined influent phosphorus concentrations varied from 1 to 2 mg/L during the pilot testing scenarios and CBOD/TP ratios exceeded 100:1 during some of these periods. Provisions for supplemental phosphorus addition are recommended for the full-scale segregated treatment system to accommodate periods of phosphorus limiting conditions.

- The Honeywell wastewater exhibits a high fraction of readily biodegradable soluble organics in the influent wastewater, which may result in more favorable denitrification rates. Higher denitrification rates could not be confirmed in the MBBR treatment system based on pilot data due to nitrate limiting conditions in the pilot dentirifcation reactor. The PER basis of design for sizing of the anoxic zone for the MBBR system is based on the NOx-N load associated with a 100% internal recycle at design conditions; no changes are recommended to the sizing of the anoxic reactor. However, it is recommended that the size of the internal recycle pumps be increased to allow operation of the recycle pump up to 200% of influent flow to provide flexibility to achieve additional alkalinity recovery should more favorable denitrification rates be achieved.

- Design supplemental alkalinity dosages need to updated to reflect revised segregated treatment system influent alkalinity loads established based on pilot data.

- The September 2012 PER established target effluent criteria for the segregated treatment system. The system was sized to completely nitrify and partially denitrify. Findings from the pilot study support that the MBBR system can achieve complete nitrification under normal operating conditions but that the system will experience variability in daily nitrification performance. The variability in daily nitrification performance during pilot testing was attributed to transient fluctuations in influent TKN loads and transient inhibition events. Effluent TN performance should take into account that there will be variability in daily nitrification performance in the segregated treatment system in addition to highly variable industrial influent loads to the UNOX treatment system. This variability makes it difficult to accurately predict achievable daily performance and demonstrate the challenge of compliance with a daily limit. HRWTF's nitrogen waste load allocation is based on an annual average load limit, which allows for some short-term nitrification performance variability.

3.3 Design Basis Effluent TN Quality

In 2007, HRWTF concluded an extensive evaluation of nutrient reduction alternatives. This study was documented in the Nutrient Reduction Alternatives Basis of Design Report, dated July 2007, and was determined to be technically adequate by VDEQ on September 26, 2007. This study determined that segregated treatment for nutrient reduction of the high TKN waste streams was the best approach for HRWTF.

The segregated treatment approach sets the Limit of Technology (LOT) effluent quality for HRWTF because only a portion of the flow passes through the nutrient removal treatment process. The effluent TN quality is dependent upon the effluent TN and TKN of the segregated treatment system, the dilution of the segregated flow into the remaining industrial streams, and additional denitrification achieved in the UNOX treatment system. The proposed modifications to the existing system include converting the first stage of the UNOX reactor to an anoxic zone to achieve additional removal of NOx-N loading in the existing treatment process above the NOx-N removal capacity of the existing dentrification basin. The total anoxic volume is greater than the estimated volume required to completely denitrify the NOx-N load from the segregated treatment system effluent and the industrial primary effluent. The average effluent NOx-N concentration is expected to be less than 1 mg/L. Therefore, effluent TN quality is primarily affected by the segregated effluent TKN and the industrial influent loads to the UNOX treatment process.

As part of the PER addendum, the design basis effluent TN quality was revisited to take into account the following items:

- Variability in daily nitrification performance in the segregated treatment system based on pilot testing findings. The segregated treatment system is expected to achieve complete nitrification on a monthly average basis. However, it is anticipated that there will be daily periods in which complete nitrification will not be achievable due to transient inhibition or a significant spike in influent TKN loads. The variability in daily nitrification performance does not significantly impact annual average effluent TN projections, but will present challenges for HRWTF to comply with a daily nutrient limit.

- Daily fluctuations in industrial influent BOD and TKN loads. Previous estimates considered design average load conditions and did not considered daily fluctuations.

- Maintaining Honeywell flow directed to segregated treatment system at a constant 40% of the total Honeywell flow. In the September 2012 PER, it was assumed that Honeywell flow would be set at a maximum of 40% of the total flow at design average conditions and that the flow would fluctuate based on historical peaking flow factors, which would result in a lower percentage of Honeywell being directed to the segregated treatment system at annual average flows. To increase overall TN removal achieved in the segregated treatment system, the PER addendum takes into account that the segregated treatment system will be operated with 40% of the total Honeywell flow directed to the segregated treatment system.

A nitrogen balance was completed taking into account the items noted above. Historical industrial data from 2007 through 2011 were used to estimate the effluent TN performance under variable industrial influent BOD and nitrogen loads. The nitrogen balance was completed assuming all of the domestic flow and 40% of the Honeywell flow being directed to the segregated treatment system. The segregated treatment system is assumed to achieve an average effluent soluble TKN of between 3 and 4 mg/L, which is consistent with pilot performance. The impact of daily nitrification performance was considered, but does not significantly impact annual average TN performance. Effluent NOx-N is assumed to average 1 mg/L, since the anoxic zones are sized to dentrify the total NOx-N load directed to the UNOX treatment system.

As discussed in Section 3.2, daily effluent TN performance will vary significantly largely due to fluctuations in industrial influent BOD and TKN loads. Evaluation of annual average historical industrial load data from 2007 to 2011 also illustrates that there will be fluctuations in annual average effluent TN performance from year to year due to fluctuations in influent industrial BOD and TKN loads. To account for such yearly fluctuations, the 80th percentile of daily average estimated effluent TN quality was used to establish achievable annual average effluent TN performance over the 5-year data period (80th percentile represents the highest annual average out of 5 years). The approach of using probability statistics to estimate achievable nutrient removal performance is documented in several papers developed as part of the Water Environment Research's Nutrient Removal Challenge (Bott and Parker, 2011, Neethling and Stensel, 2013, Neethling et al, 2009). With implementation of the Phase 2 improvements, the revised final effluent TN concentration is anticipated to be 15 mg/L on an annual average basis. The Phase 2 improvements are not expected to affect effluent total phosphorus.

4.0 GRAVELLY RUN PUMP STATION AND FORCEMAIN DESIGN MODIFICATIONS

The influent conveyance system improvements described in Chapter 3.0 of the September 2012 PER have been revised to provide the capability to divert up to 9.3 mgd of Honeywell flow (100% of design average flow) to the segregated treatment system if actual performance proves that more than 40% of Honeywell flow can be treated in the segregated system. The existing Gravelly Run Pump Station is designed with a firm capacity of 7,500 gpm (10.8 mgd) at 51 feet total discharge head (TDH). Conveyance of Honeywell flow to the segregated treatment system will increase the pump TDH significantly due to the higher water surface elevation of the MBBR system and the head consumed in

controlling a flow split between the segregated system and the industrial system. Therefore, new submersible pumps will be installed in a new wet well with influent grinders to meet the increased TDH requirements. The pumps will discharge through the existing 24-inch forcemain up to the RockTenn connection at which point a new 24-inch forcemain will be installed and routed parallel to the North Interceptor to the HRWTF site. A new 12-inch forcemain will be installed parallel to the existing 24-inch section of the North Interceptor to carry VAWCO flows and discharge them into the North Interceptor at the RockTenn connection. Table 5 lists the design criteria for the pump station and forcemain.

The number of pumps operating and the pump speed will be controlled automatically based on wet well level. The flow split between the segregated treatment system and the industrial headworks will be controlled by motor-operated valves located at the HRWTF plant site that are connected to the SCADA system. Honeywell flow routed to the segregated system will discharge into fine screens located at the head of the MBBR tanks. Honeywell flow routed to the industrial system will discharge into the Industrial Screening Chamber. Revised Drawings 3-1, 3-2, 3-3 and 3-4 are attached showing the proposed pump station and forcemain arrangements.

Table 5: Revised Gravelly Run Pump Station and Forcemain Design Criteria

Parameter	Units	Quantity or Description
Pumps		
Number of Pumps	No.	3 (2 operating, 1 standby)
Type	---	Submersible
Rated Capacity		
Flow, each	gal/min	3,750
TDH	feet	72
Firm capacity	mgd	10.8
Motor size	hp	150
Drive Type	---	Variable Frequency
Discharge Diameter	inches	10
Forcemain		
Existing Serving Honeywell		
Length	linear feet	1,400
Nominal Inside Diameter	inches	24
Pipe Material	---	PCCP
New Serving Honeywell		
Length	linear feet	3,100
Nominal Inside Diameter	inches	24
Pipe Material	---	DI or HDPE
New Serving VAWCO		
Length	linear feet	1,400
Nominal Inside Diameter	inches	12
Pipe Material	---	DI or HDPE

Since a new wet well is required, Sections 3.4 and 3.5 of the September 2012 PER are no longer applicable. The new pump station can be constructed while the existing pump station is operating. There will need to be temporary shutdowns and/or bypass pumping to transition influent flow to the new wet well.

5.0 MODIFICATIONS TO MBBR SCREENING FACILITIES

The MBBR Screening Facility described in Chapter 5.0 of the September 2012 PER will remain unchanged with the exception that the peak hydraulic capacity of the screens will be 9.3 mgd so that up to 100% of the Honeywell design average flow can be treated in the segregated system. The channel and screen width of 3 feet are adequate for this higher design flow.

6.0 MODIFICATIONS TO MBBR BIOLOGICAL TREATMENT FACILITIES

This section documents modifications to the MBBR biological treatment facilities design to reflect revised influent flows and loads presented in Section 2.0 and recommended design criteria changes presented in Section 3.0. Design modifications include:

- Modifications to the aeration blower sizing to reflect updated loads.
- Modifications to internal recycle flow capacity.
- Modifications to alkalinity feed system.
- Supplemental phosphorus feed system.

6.1 Modifications to Aeration System and Blower Sizing

The aeration requirements for the MBBR system were modified to reflect updated flows and loads presented in Table 4. The aeration system is sized to accommodate peak organic and TKN loads presented in table 4. The peak day Honeywell organic loads are based on a historical peak day / annual average BOD peaking factor of 4.3, which is a significantly higher peaking factor in comparison typical domestic wastewater. In addition, domestic wastewater diurnal flow variations measured at HRWTF are considerably flat in comparison to typical domestic flow patterns. Based on the industrial contribution to peak demands and the relatively flat flow pattern of domestic wastewater, the aeration system was sized to accommodate peak day loads with one blower out of service. Table 6 summarizes the modified aeration system demands. These values replace those listed in Table 6-1 of the September 2012 PER.

Table 6: Revised MBBR Air Requirements

Facility and Equipment	Units	Value
Air Sparge Air Flow Requirements	scfm	100
Process Air Flow Requirements		
Minimum for Media Mixing	scfm	17,000
Minimum for Biological Requirement	scfm	20,100
Design Average	scfm	29,200
Peak Day	scfm	40,300
Total Air Flow Requirements		
Minimum	scfm	20,200
Design Average	scfm	29,300
Peak Day	scfm	40,400

The blower facility must accommodate a slightly higher firm capacity of 40,400 scfm compared to 39,100 scfm. Because the additional requirements are small, the blower size will increase slightly from the 13,100 scfm capacity listed on page 6-4 of the September 2012 PER to a capacity of 13,433 scfm.

6.2 Modifications to Alkalinity Feed System

The alkalinity feed requirements for the segregated treatment system were modified to reflect updated flows and loads. Table 7 summarizes revisions to the alkalinity addition requirements listed in Table 6-1

of the September 2012 PER. The number of metering pumps and their capacities are also modified to accommodate a higher maximum instantaneous feed rate. The maximum instantaneous feed rate presented in Table 7 is projected at design average flow at 100% internal recycle, minimum day influent alkalinity of 100 mg/L as $CaCO_3$, and peak day influent TKN loads. The September 2012 PER reported the maximum day feed rate, but did not include maximum instantaneous feed rate.

Table 7: Revised Alkalinity Addition Design Criteria

Facility and Equipment	Units	Value
Type	-	Sodium hydroxide, 50% solution
Maximum Feed Rate	gal/day	8,700
Design Average	gal/day	3,040
Minimum Feed Rate	gal/day	625
No. of Storage Tanks	No.	3
Storage Tank Material	-	FRP
Storage Tank Volume Each / Total	gal	13,650 / 40,950
Days of Storage at Average flow / Max flow	day	13 / 5
No. Metering Pumps	No.	4 (3 operating, 1 standby)
Maximum Metering Pump Flow, each	gph	130

6.3 Supplemental Phosphorus Feed System

The HRWTF has a phosphorus storage and feed system that feeds either a phosphate solution or phosphoric acid to the existing UNOX aeration tanks. This system will be modified under the Phase 2 improvements to also feed phosphorus to the segregated treatment system as recommended in Section 3.2. Since overall phosphorus needs will not change, the existing storage tank capacities are adequate. These improvements will only consist of installation of additional metering pumps within the existing Chemical Building and small diameter chemical piping from the Chemical Building to the MBBR influent.

6.4 Modifications to Internal Recycle Flow Range

The MBBR pump design is modified to provide flexibility to operate up to 200% internal recycle rate with all units operating. Table 7 summarizes modifications to the MBBR recycle pump design criteria that were listed in Table 6-1 of the September 2012 PER.

Table 8: Revised MBBR Recycle Pump Design Criteria

Facility and Equipment	Units	Value
Number	No.	3 (3 operating, 0 standby)
Type	-	Axial flow, end suction
Rated Capacity, each		
Design Flow	gpm	9,120
Discharge Head Range	ft	6-20
System Capacity, 3 pumps running	mgd	39.4
Motor size	hp	75
Drive Type	-	Variable frequency
Suction size	in	16
Discharge size	in	16

The MBBR recycle line size will increase to 36-inch diameter (30-inch diameter shown on Drawings 6-1, 6-2 and 6-3 of the September 2012 PER.

7.0 SEGREGATED TREATMENT DECHLORINATION FACILITIES

The Phase 1 improvements completed in May 2012 achieved segregation of the domestic flow from the industrial flow at the HRWTF and included sodium hypochlorite facilities for disinfection of domestic primary effluent. The HRWTF permit requires a 1.0 mg/L total residual chlorine concentration in the domestic primary effluent. Due to variability in recycle loads and septage loads directed to the Domestic Primary Clarifiers, the Domestic Primary Effluent experiences significant variations in chlorine demands, which makes it challenging to maintain a low chlorine residual in the domestic primary effluent. It was assumed in the September 2012 PER that the chlorine concentration in the domestic primary effluent would be low enough that dechlorination would not be required ahead of the MBBR system. The monthly average residual chlorine has ranged between 8 and 24 mg/L after start-up of the Phase 1 facilities and with optimization of the chlorine dosage controls. As a result, the Phase 2 improvements must include dechlorination of the disinfected domestic primary effluent to reduce the residual prior to entering the segregated treatment system.

Dechlorination will be achieved with sodium bisulfite addition. A 40% sodium bisulfite solution will be added to disinfected domestic primary effluent at the MBBR Influent Pump Station wet well. Sodium bisulfite storage and feed facilities will be adjacent to the MBBR Influent Pump Station. A layout of this proposed facility is shown in Drawing No. 4-1 and the location of this facility on the plant site is shown on revised Drawing No. 1-5, both of which are attached.

Table 9 summarizes design criteria for the dechlorination facilities.

Table 9: Dechlorination Facilities Design Criteria

Facility and Equipment	Units	Value
Type	-	Sodium Bisulfite, 40% solution
Design Average TRC	mg/L	24
Maximum Day TRC	mg/L	50
Min Day TRC	mg/L	1
Maximum Day Feed Rate	gal/day	2,300
Design Average	gal/day	1,100
Minimum Feed Rate	gal/day	30
No. of Storage Tanks	No.	3
Storage Tank Material	-	XLPE
Storage Tank Volume Each / Total	gal	5,400/16,200
Days of Storage at Design Average flow / Max Day flow	day	15 / 7
No. Metering Pumps	No.	4
Maximum Metering Pump Flow, each	gph	Two at 13.2, Two at 71.6 gph

8.0 MODIFICATIONS TO PHASE 2 IMPROVEMENTS FOR EXISTING PROCESS UNITS

The updated segregated treatment system influent flows and loads and the preliminary design modifications do not change Phase 2 improvements for existing process units presented in the September 2012 PER.

8.1 Clarification Regarding Existing Denitrification Basin

Section 7.5 of the September 2012 PER needs to be revised to read as follows:

It is noted that the proposed Phase 2 improvements will increase design average nitrate loading to the existing Denitrification Basin because the segregated flow is returned to the process upstream of the Denitrification Basin. Because the additional nitrate load from the segregated treatment system exceeds the denitrification capacity of the existing Denitrification Basin, the first stage of the UNOX reactor will be converted to an anoxic zone.

8.2 UNOX Aeration Tanks

The proposed modifications to the UNOX aeration tanks presented in Section 7.6 of the September 2012 PER have been further evaluated to confirm if the existing aerators are sufficient to accommodate projected oxygen demands.

On the oxygen supply side, the existing Oxygen Generation Plant has a minimum generation capacity of 140,000 lbs O_2/day. The average oxygen requirement of 70,400 lbs/day is below the minimum turndown of 140,000 lbs/day. If the minimum oxygen capacity of 140,000 lbs/day is fed through the dissolution system, the dissolution system oxygen utilization efficiency drops but results in significantly higher oxygen purities in each of the stages which results in lower aerator horsepower demand to meet the biological oxygen demand. If the UNOX system is operated in this manner, then the existing Stage 2 through 4 aerators are sufficient to accommodate design average oxygen demands but marginal for accommodating peak oxygen demands.

The existing aerators are original equipment installed in the 1970s, and are nearing the end of their useful service life. The gear boxes are obsolete and parts are increasingly difficult to obtain. In addition, technology advances since the existing aerators were installed 30 years ago offer improved oxygen transfer efficiency over a range of operating speeds. It is recommended that Stage 2 through 4 aerator mixers be replaced with new mechanical surface aerators. The improved oxygen transfer efficiency of the aerators would allow the new mixers to better meet peak oxygen demands.

9.0 MODIFICATIONS TO SOLIDS HANDLING LOADING RATES

The updated segregated treatment system influent flows and loads and the preliminary design modifications do not change proposed solids handling improvements for the Phase 2 project presented in the September 2012 PER. The updated segregated treatment system influent flow and loads result in minor changes to design average domestic primary clarifier solids and MBBR effluent solids loads. The total solids loads from the segregated treatment system do not change significantly.

10.0 SCAT COMPLIANCE FOR AMENDED DESIGN ITEMS

Table 10 lists all required revisions to Table 10-1 of the September 2012 PER:

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Table 10: Comparison Sizing and Design Criteria

Process and Parameter	SCAT Criteria	Phase 2 Criteria	Phase 2 Basis	SCAT Compliance
Sewage Pumping – Firm Capacity – Gravelly Run Pump Station	Capacity with any one unit out of service to handle maximum sewage flow or a minimum of 2-1/2 times average design flow, whichever is greater. *(9VAC25-790-380,A.2,A.3)*	Firm pumping capacity of 7,500 gpm (peak flow)	3 Gravelly Run Pumps 2 operating, 1 standby Each at 3,750 gpm	Yes
Influent Screening, Mechanically-Cleaned MBBR Influent Screens	Provide for taking any unit out of service without sacrificing capability to handle peak design flow. *(9VAC25-790-500, C.2)*	9.3 mgd screening capacity with one unit out of service	2 MBBR Screens 1 operating, 1 standby Each at 9.3 mgd	Yes

Note 1 in Table 10-1 should be deleted.

11.0 FACILITY DESIGN CRITERIA FOR AMENDED DESIGN ITEMS

Table 11 lists all required revisions to Table 12-1 of the September 2012 PER:

Table 11: NFPA Area Classifications

Area	Extent of Classification	NEC Classification	Required Ventilation	Required Materials of Construction	Required Fire Protection Measures	NFPA Reference
Gravelly Run Pump Station						
Wet Well	Entire space	Division 1	No requirement	Noncombustible material	Combustible gas detection system	NFPA 820 Table 4.2, Row 16, Line a

12.0 MODIFICATIONS TO PROJECT SCHEDULE AND COST

An updated project schedule is attached as Figure 3. This schedule replaces the schedule shown in Figure 16-1 of the September 2012 PER and has been revised based on actual completion dates for the PER and pilot testing. Also, the startup period has been lengthened to account for the longer process startup time required for the MBBR for biological mass buildup and the value engineering study activity has been added to the schedule.

The Engineer's preliminary opinion of probable construction cost (OPCC) has been updated to include the following changes in the basis of design since the September 2012 PER was issued:

1. The construction costs were escalated by 3.5% to account for the one-year time delay since the issuance of the PER. This represented an increase in the construction cost of $2,110,000.
2. The new Gravelly Run Pump Station increased the construction cost by $2,907,000.
3. The supplemental phosphorus feed system modifications increased the construction cost by $52,000.
4. The increase in the capacity of the MBBR Recyle flow from 100% to 200% increased the construction cost by $104,000.
5. The new sodium bisulfite storage and feed system for dechlorination of the MBBR influent increased the construction cost by $208,000.
6. The UNOX aerator replacement for Stages 2, 3 and 4 increased the construction cost by $2,769,000.

Table 12 is the updated preliminary opinion of probable project cost and replaces Table 16-1 of the September 2012 PER.

Table 12: Engineer's Opinion of Probable Project Cost

Item	Est. Cost
Sitework and Yard Piping	$1,859,000
Gravelly Run Pump Station Additions and Force Main	$2,727,000
Primary Clarifier Modifications	$104,000
MBBR Influent Pump Station	$1,370,000
MBBR Screening Facility	$642,000
MBBR Treatment Tanks	$9,600,000
MBBR System Equipment (inc. DAF equipment)	$21,797,000
DAF Building	$1,237,000
Blower Building	$1,732,000
UNOX 1st Stage Modifications	$546,000
UNOX Aerator Replacement	$1,600,000
Secondary Clarifier No. 9	$1,350,000
Re-Aeration Addition	$450,000
Centrifuge Addition	$949,000
Instrumentation & Controls	$2,336,000
Electrical	$6,904,000
Contractor Field General Conditions	$3,775,000
Subtotal	$58,978,000
Contractor's Fee	$3,072,000
Contractor's Bonds and Insurance	$1,011,000
Undefined Scope of Work	$5,376,000
Subtotal	$9,459,000
Construction Cost Total1	**$68,437,000**
Engineering Services (15%)	$10,266,000
Legal & Administrative (3%)	$2,053,000
Construction Phase Changes (5%)	$3,422,000
Subtotal	$15,741,000
Project Cost Total	**$84,178,000**

1 – Does not include cost of solids disposal capacity improvements or escalation to the mid-point of construction.

13.0 ATTACHMENTS

Figure 3: Project Schedule
Drawing No. 1-5: Proposed Site Plan
Drawing No. 3-1: Gravelly Run Forcemain Plan
Drawing No. 3-2: Gravelly Run Pump Station Site Plan and Forcemain Partial Plan
Drawing No. 3-3: Gravelly Run Pump Station Plan
Drawing No. 3-4: Gravelly Run Pump Station Section
Drawing No. 4-1: MBBR Influent Pump Station Plans and Section

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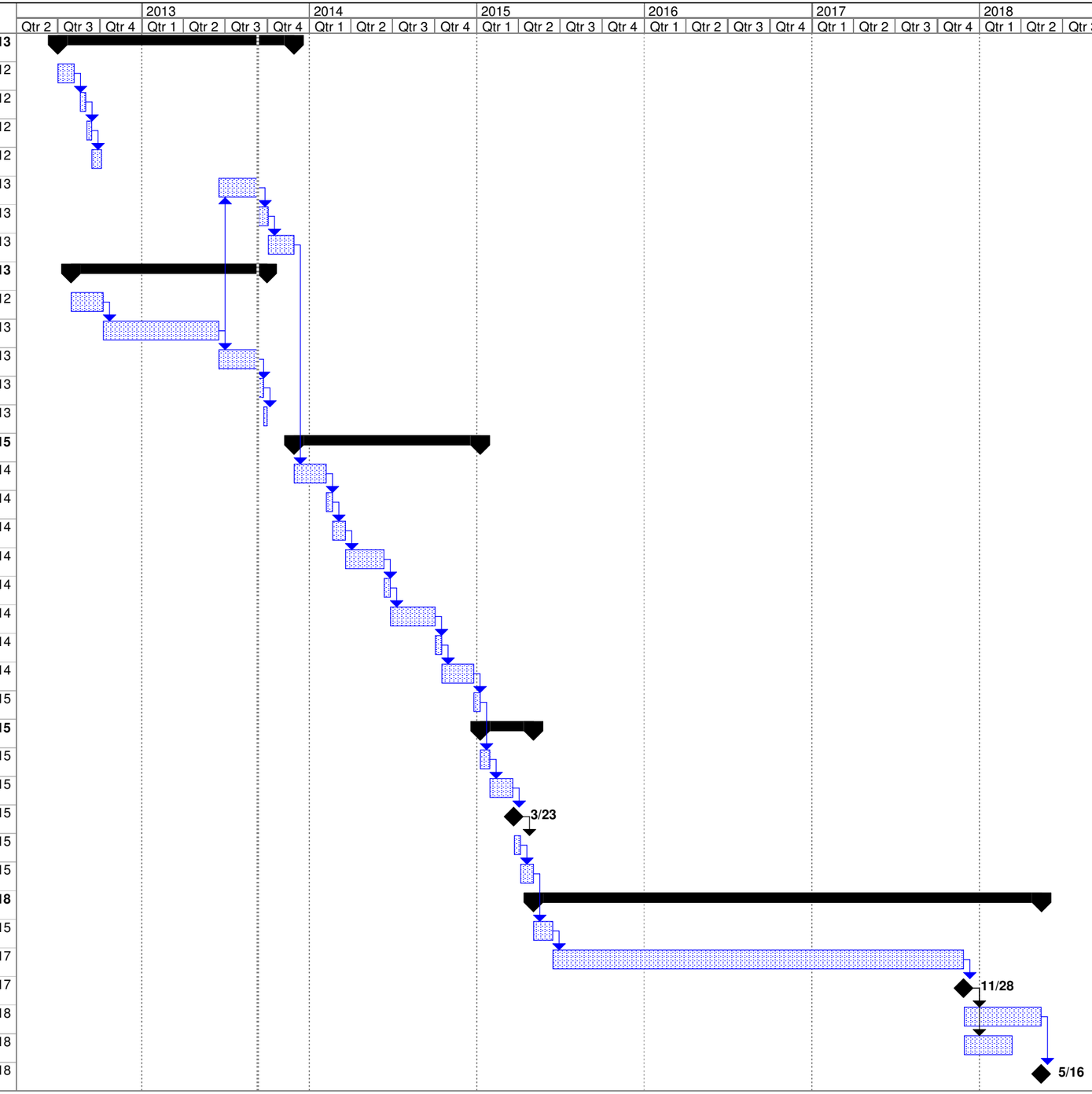
Figure 3: Project Schedule

ID	Task Name	Duration	Start	Finish
1	**Preliminary Engineering Report**	**369 days**	**Mon 7/2/12**	**Thu 11/28/13**
2	Draft PER	26 days	Mon 7/2/12	Mon 8/6/12
3	HRWTF Review	10 days	Mon 8/20/12	Fri 8/31/12
4	Final PER	9 days	Mon 9/3/12	Thu 9/13/12
5	DEQ Review	15 days	Fri 9/14/12	Thu 10/4/12
6	Prepare PER Addendum	63 days	Tue 6/18/13	Thu 9/12/13
7	DEQ Review	15 days	Fri 9/13/13	Thu 10/3/13
8	WQIF Grant Agreement	40 days	Fri 10/4/13	Thu 11/28/13
9	**Bench/Pilot Testing**	**305 days**	**Tue 7/31/12**	**Mon 9/30/13**
10	Construct Pilot System	50 days	Tue 7/31/12	Mon 10/8/12
11	Conduct Pilot Testing	180 days	Tue 10/9/12	Mon 6/17/13
12	Evaluate Results & Draft TM	60 days	Tue 6/18/13	Mon 9/9/13
13	HRWTF Review	10 days	Tue 9/10/13	Mon 9/23/13
14	Final TM	5 days	Tue 9/24/13	Mon 9/30/13
15	**Design**	**290 days**	**Fri 11/29/13**	**Thu 1/8/15**
16	30% Design	50 days	Fri 11/29/13	Thu 2/6/14
17	HRWTF Review	10 days	Fri 2/7/14	Thu 2/20/14
18	Value Engineering Study	20 days	Fri 2/21/14	Thu 3/20/14
19	60% Design	60 days	Fri 3/21/14	Thu 6/12/14
20	HRWTF Review	10 days	Fri 6/13/14	Thu 6/26/14
21	90% Design	70 days	Fri 6/27/14	Thu 10/2/14
22	HRWTF Review	10 days	Fri 10/3/14	Thu 10/16/14
23	100% Design	50 days	Fri 10/17/14	Thu 12/25/14
24	HRWTF Review	10 days	Fri 12/26/14	Thu 1/8/15
25	**Bidding**	**82 days**	**Fri 1/9/15**	**Mon 5/4/15**
26	Bidding Documents	15 days	Fri 1/9/15	Thu 1/29/15
27	Advertise	36 days	Fri 1/30/15	Fri 3/20/15
28	Receive Bids	1 day	Mon 3/23/15	Mon 3/23/15
29	Evaluatate Bids	10 days	Tue 3/24/15	Mon 4/6/15
30	Award	20 days	Tue 4/7/15	Mon 5/4/15
31	**Construction**	**792 days**	**Tue 5/5/15**	**Wed 5/16/18**
32	Mobilize	30 days	Tue 5/5/15	Mon 6/15/15
33	Construct Project	640 days	Tue 6/16/15	Mon 11/27/17
34	Substantial Completion	1 day	Tue 11/28/17	Tue 11/28/17
35	Startup & Initial Operation	120 days	Wed 11/29/17	Tue 5/15/18
36	Punch List	75 days	Wed 11/29/17	Tue 3/13/18
37	Final Completion	1 day	Wed 5/16/18	Wed 5/16/18



Project: hrwtf phase 2 project schedul
Date: Mon 9/9/13

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

HDR Engineering, Inc.
5700 Lake Wright Dr.
Suite 300
Norfolk, VA 23502

ISSUE	DATE	DESCRIPTION
C	09/2013	PER ADDENDUM–NOT FOR CONSTRUCTION
B	09/2012	PER – NOT FOR CONSTRUCTION
A	08/2012	DRAFT PER – NOT FOR CONSTRUCTION

PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

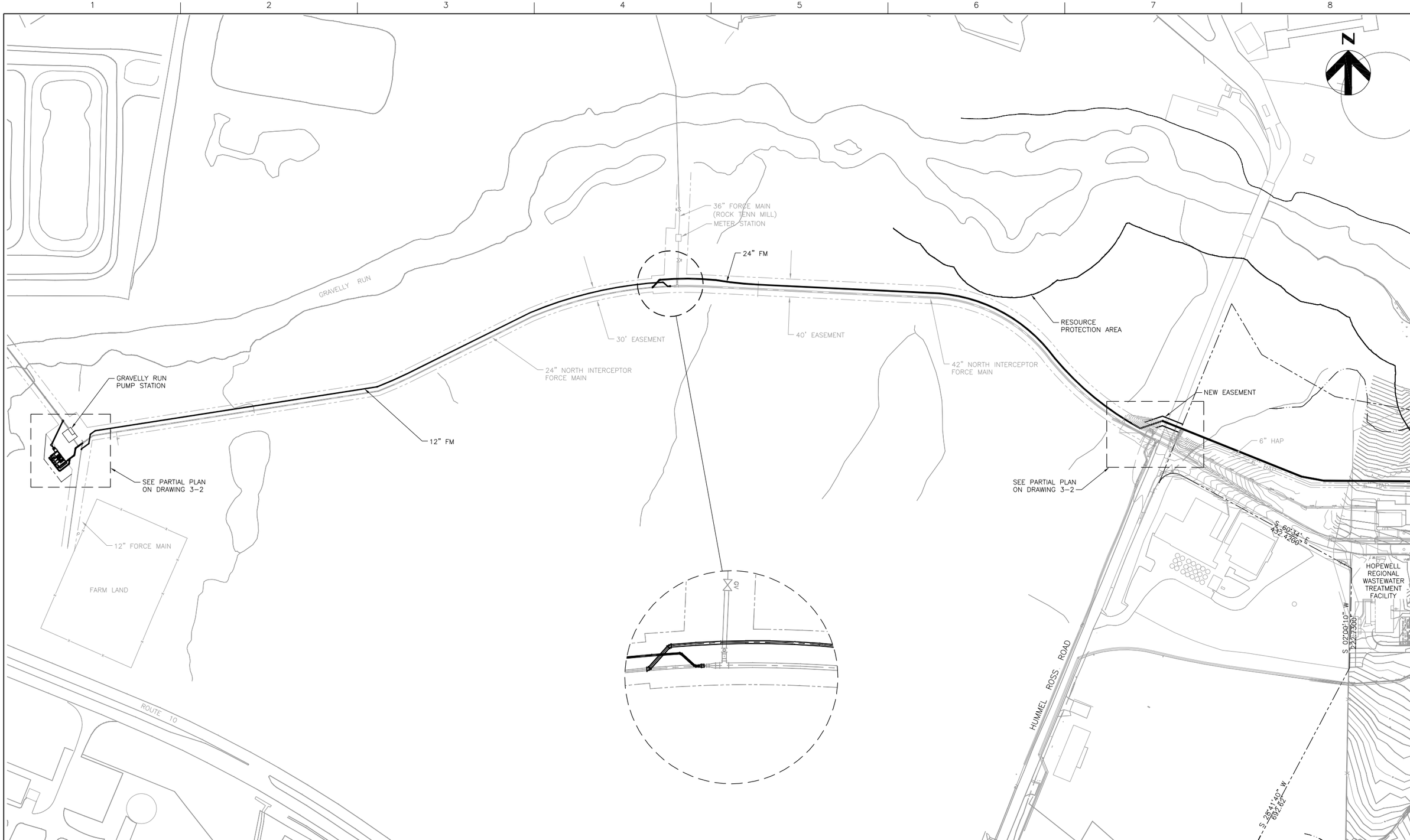
CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

PROPOSED SITE PLAN

0 1" 2"

FILENAME	1–5.dwg
SCALE	1" = 50'
DRAWING NUMBER	1-5
SHEET	OF -



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PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

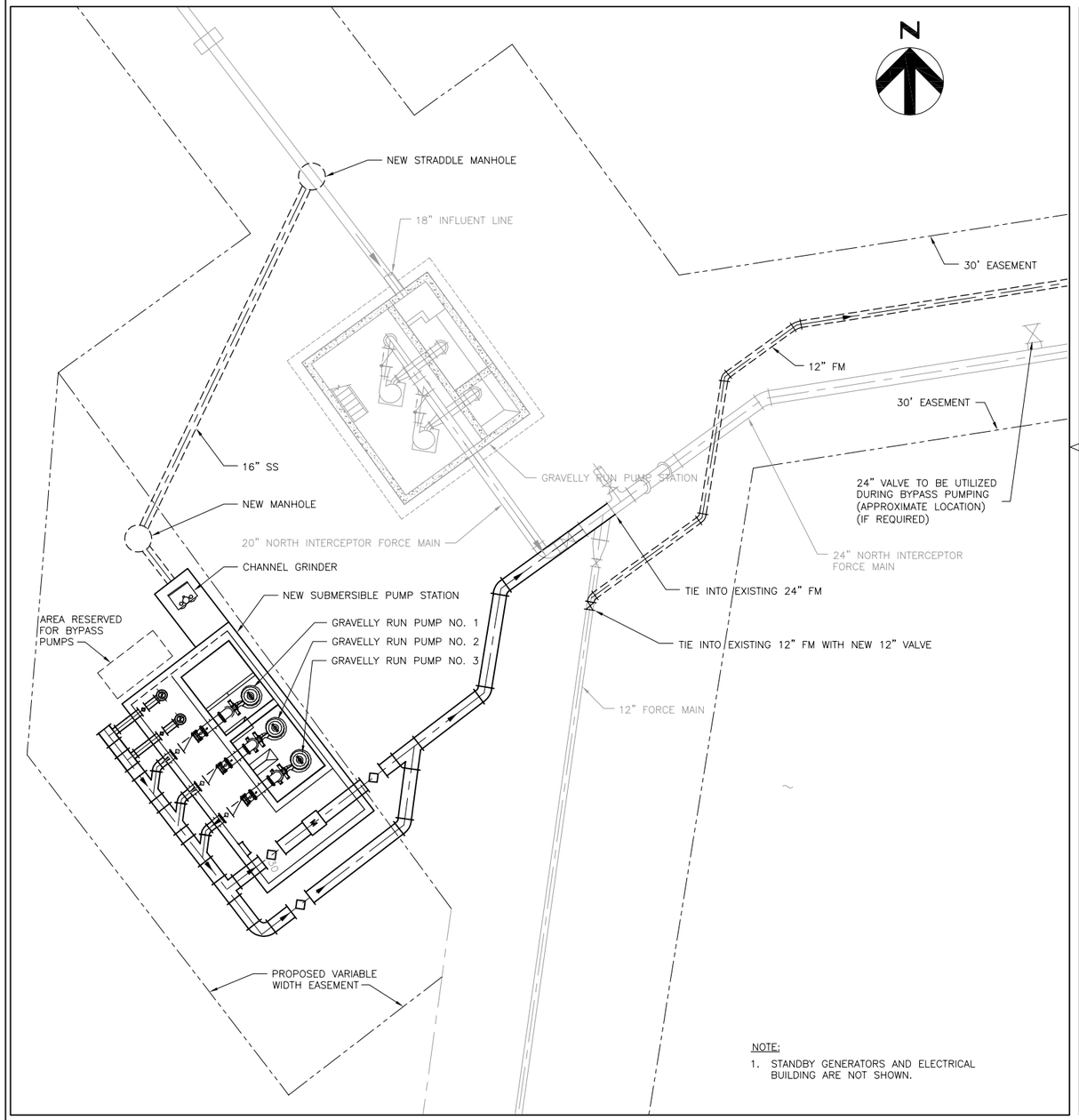
GRAVELLY RUN FORCE MAIN PLAN

0 1" 2"

FILENAME 3–1.dwg
SCALE 1" = 100'

DRAWING NUMBER **3-1**

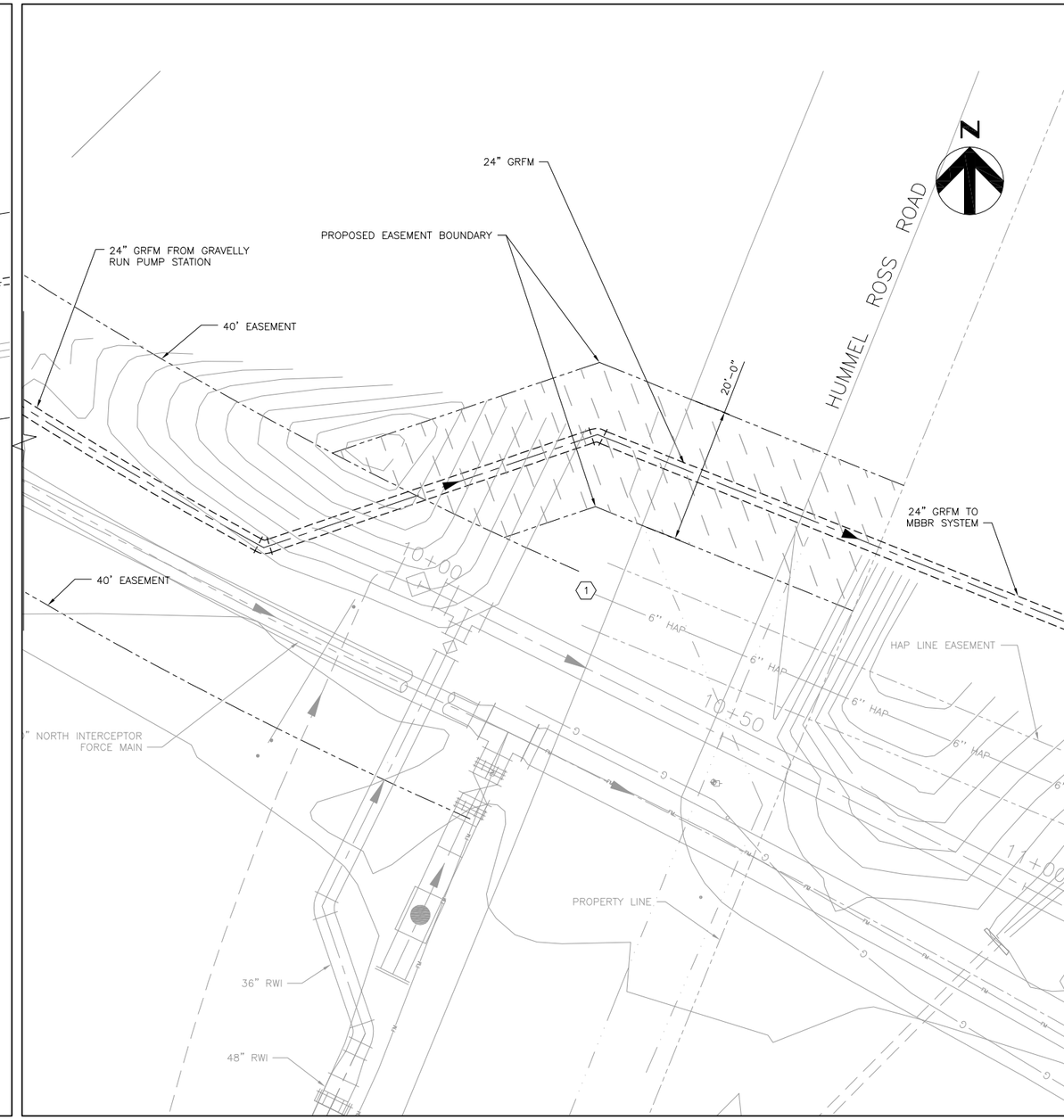
SHEET OF -



NOTE:

1. STANDBY GENERATORS AND ELECTRICAL BUILDING ARE NOT SHOWN.

GRAVELLY RUN PUMP STATION
PARTIAL PLAN



GRAVELLY RUN FORCE MAIN
HUMMEL ROSS CROSSING
PARTIAL PLAN

(1) LOCATION OF HAP LINE TO BE CONFIRMED DURING DETAIL DESIGN.

HDR

HDR Engineering, Inc.
5700 Lake Wright Dr.
Suite 300
Norfolk, VA 23502

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DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

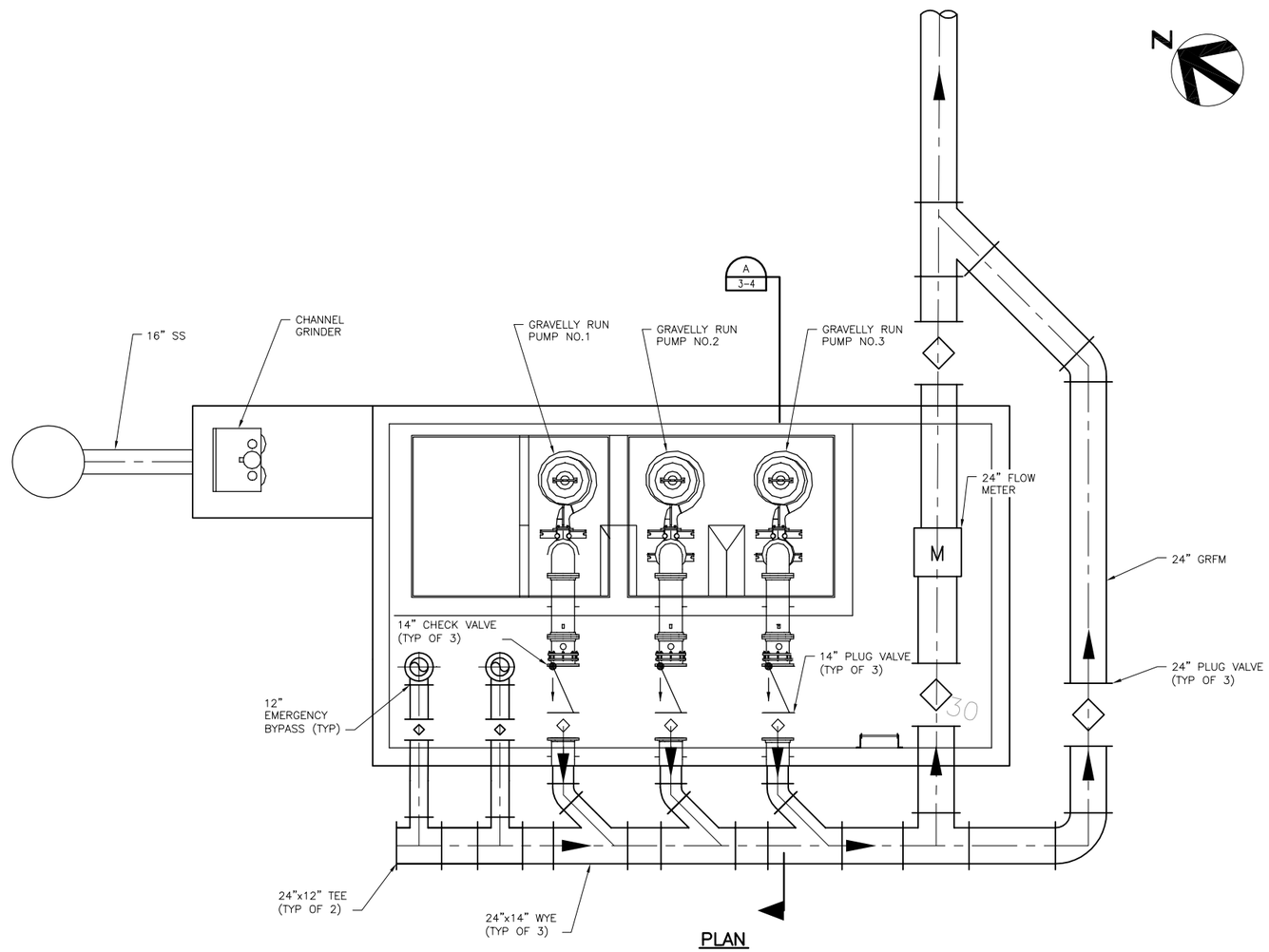
GRAVELLY RUN PUMP STATION SITE PLAN AND FORCE MAIN PARTIAL PLAN

0 1" 2"

FILENAME	3–2.dwg
SCALE	1" = 10'

DRAWING NUMBER **3-2**

SHEET OF -



PLAN

HDR Engineering, Inc.
5700 Lake Wright Dr.
Suite 300
Norfolk, VA 23502

ISSUE	DATE	DESCRIPTION
C	09/2013	PER ADDENDUM–NOT FOR CONSTRUCTION
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PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

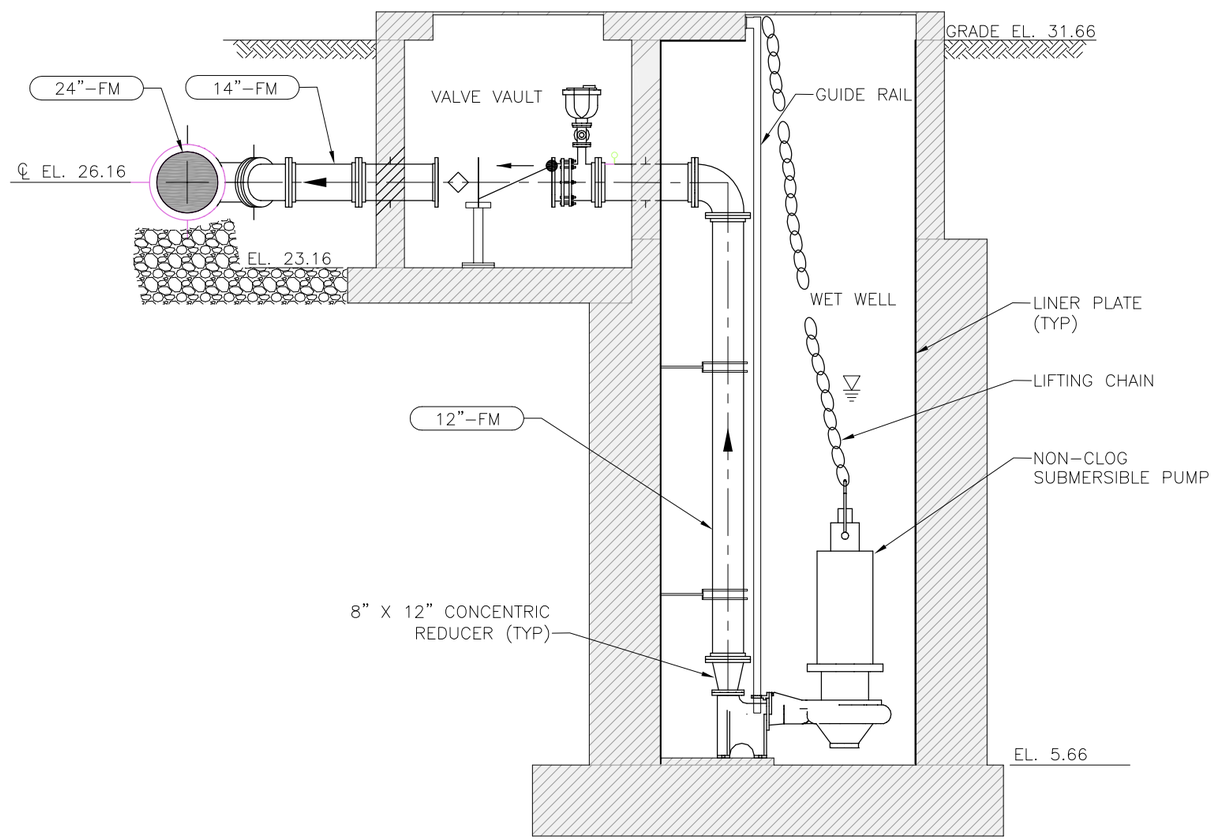
CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

GRAVELLY RUN PUMP STATION
PLAN

0 1" 2"

FILENAME	3–3.dwg
SCALE	1/4"=1'–0"
DRAWING NUMBER	3-3
SHEET	OF -



SECTION A 3-3

C	09/2013	PER ADDENDUM-NOT FOR CONSTRUCTION	
B	09/2012	PER - NOT FOR CONSTRUCTION	
A	08/2012	DRAFT PER - NOT FOR CONSTRUCTION	
ISSUE	DATE	DESCRIPTION	

HDR Engineering, Inc.
5700 Lake Wright Dr.
Suite 300
Norfolk, VA 23502

PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

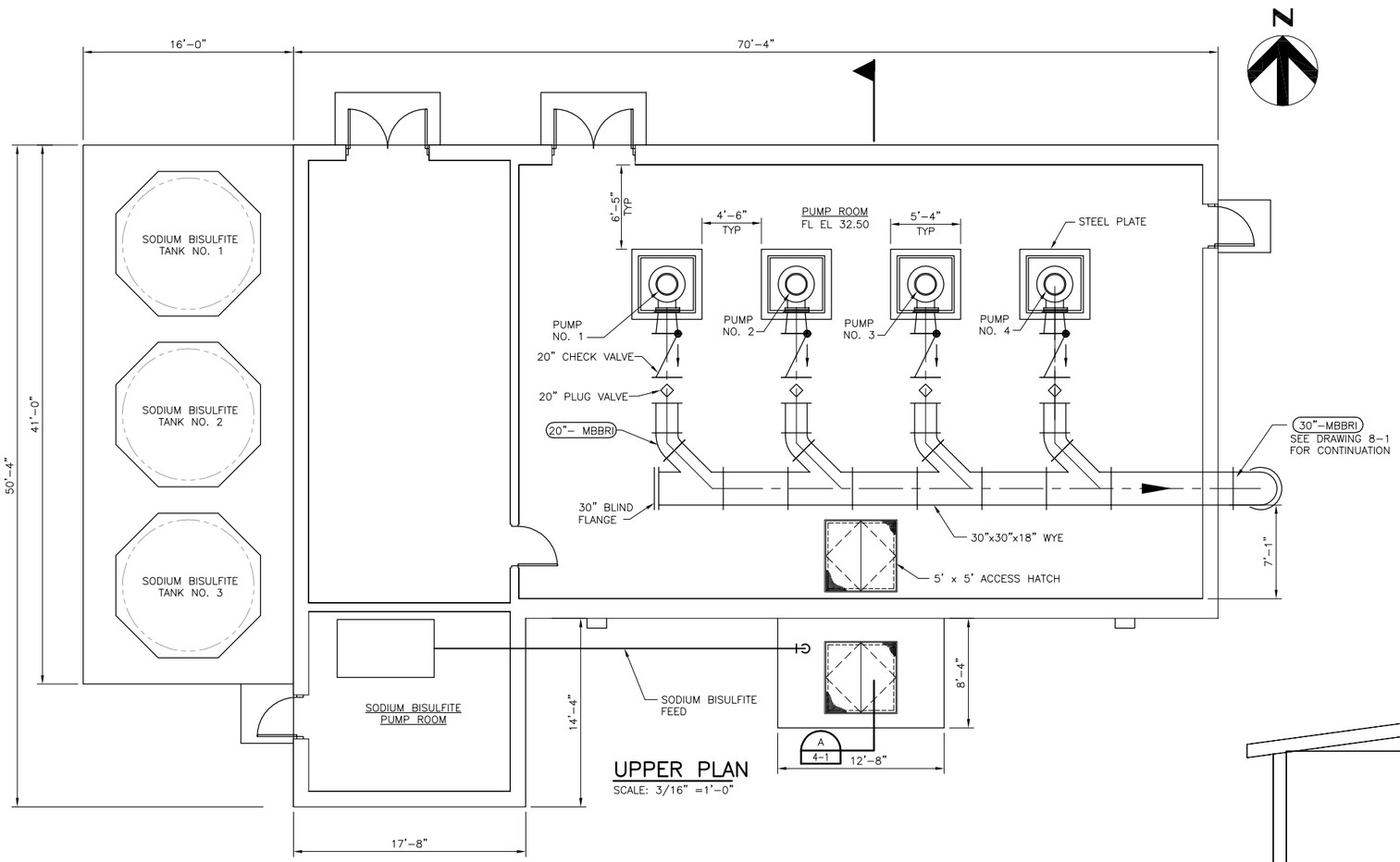
GRAVELLY RUN PUMP STATION
SECTION

0 1" 2"

FILENAME	3-4.dwg
SCALE	3/8"=1'-0"

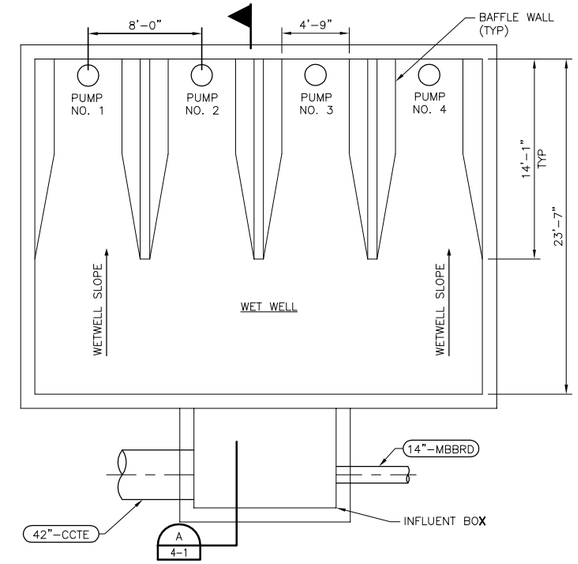
DRAWING NUMBER **3-4**

SHEET OF -



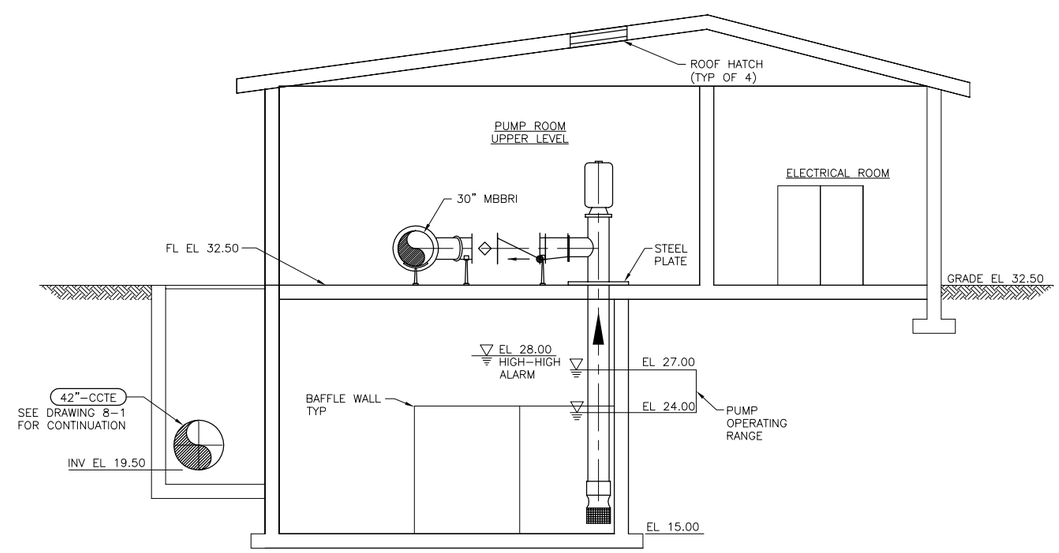
UPPER PLAN

SCALE: 3/16" =1'-0"



LOWER PLAN

SCALE: 3/16" =1'-0"



SECTION A 4-1

SCALE: 3/16" =1'-0"

HDR

HDR Engineering, Inc.
5700 Lake Wright Dr.
Suite 300
Norfolk, VA 23502

ISSUE	DATE	DESCRIPTION
C	09/2013	PER ADDENDUM-NOT FOR CONSTRUCTION
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PROJECT MANAGER:	KATHERINE L. MOHAMMED-JONES
DESIGNED BY:	N. DESAI
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	177722

PRELIMINARY ENGINEERING REPORT

CITY OF HOPEWELL, VIRGINIA
HOPEWELL REGIONAL WASTEWATER TREATMENT FACILITY

ALTERNATIVE 4A-1 LIGHT, PHASE 2

MBBR INFLUENT PUMP STATION PLANS AND SECTION

0 1" 2"

FILENAME	4-1.dwg
SCALE	3/16" = 1'-0"

DRAWING NUMBER **4-1**

SHEET OF -

Unsolicited Conceptual Phase Proposal
Public-Private Education Facilities and
Infrastructure Act of 2002, As Adopted by the City in 2010

Hopewell Regional Wastewater Treatment Facility

Alternative 4A-1 Light, Phase 2 Improvements

Volume I

November 2013

Hopewell Nutrient Partners

Hopewell Nutrient Partners

November 8, 2013

Mr. Mark Haley, Acting City Manager
City of Hopewell
300 North Main Street, Room 218
Hopewell, Virginia 23860

Re: Proposal for the Hopewell Regional Wastewater Treatment Facility
Alternative 4A-1 Light, Phase 2 Improvements Project

Mr. Haley,

Hopewell Nutrient Partners, A Joint Venture (HNP), a joint venture of HDR Constructors and PC Construction, appreciates the opportunity to submit an unsolicited proposal to the City of Hopewell (City) for the design and construction of the Hopewell Regional Wastewater Treatment Facility (HRWTF) Alternative 4A-1 Light, Phase 2 Improvements (Phase 2 Improvements or project). We are presenting our unsolicited proposal under the Public-Private Education Facilities and Infrastructure Act of 2002, as adopted by the City on February 9, 2010 (PPEA).

HNP is respectfully requesting that information located in Volume II of our conceptual proposal be withheld from public disclosure under the Freedom of Information Act because it contains confidential, proprietary information regarding our conceptual plan and the release of such information would materially and adversely impact the negotiating positions of HNP and the City of Hopewell. We have worked hard to restrict the amount of withheld information to permit a transparent review of our proposal. Please provide us with your written acceptance of this request and any conditions that may be imposed upon it.

HNP is a joint venture Design-Build organization comprised of HDR Constructors, Inc. (HDR) and PC Construction Company (PC), two organizations nationally recognized for our experience with the design and construction of major wastewater treatment facility projects. Our decision to form this joint venture organization was simple. Together, HDR and PC were responsible for the successful design and construction of the Phase 1 Improvements at the HRWTF. With this prior experience, we are confident we can and will meet the City's goals and expectations for the Phase 2 Improvements project. Under the leadership of HDR's Bill M'Coy, we have worked closely with the City to develop the Preliminary Engineering Report (PER) for the Phase 2 Improvements. Bill's intimate knowledge of the HRWTF combined with his prior working experience with PC means there will be no "learning curve" for HNP to overcome in developing and executing this project. Finally, HDR and PC share a corporate culture which is committed to meeting the expectations of our clients. This makes it easy for HNP to ensure this project is successful for the City.

HNP has included World Water Works (WWW) and Heyward, Inc. as exclusive key technology providers for the project. Together, we represent an integrated team able to provide turnkey design and construction for the Phase 2 Improvements. The project will provide your community a long term, reliable and regulatory compliant upgraded wastewater treatment facility. In our proposal we have suggested a procurement process which has proven successful on numerous other projects, reducing project delivery schedules and costs while producing innovative results.

HNP appreciates your consideration of our proposal and we remain eager to discuss our approach to this important project with your selection committee. Our proposed Design-Build Project Manager and primary point of contact is Bob Huie (802-922-6535 or RHuie@pcconstruction.com). You may also contact Tony Snead (602-723-8296 or Tony.Snead@hdrinc.com) or Jeff Garner (802-598-6818 or JGarner@pcconstruction.com) if you have any questions.

Sincerely,
Hopewell Nutrient Partners, A Joint Venture

Anthony J. Snead
Vice President, HDR Constructors, Inc.

Jeffrey A. Garner
Senior Vice President, PC Construction Company

EXECUTIVE SUMMARY

Introduction

Hopewell Nutrient Partners (HNP) is excited about the opportunity to be your Design-Builder for the HRWTF Phase 2 Improvements Project. HNP is a joint venture organization formed by HDR Constructors, Inc., (HDR) and PC Construction Company (PC). HDR will be the managing partner and in this role will be responsible for day-to-day management and decisions of the project delivery team. Both organizations maintain a 50 percent equity position within the joint venture. With this equity relationship, financial responsibility of the joint venture is shared in equal proportion by both organizations.

HNP has selected Bob Huie to be our overall Design-Build Project Manager. Bob is very skilled with both design-bid-build and integrated project delivery methods. With more than 30 years of progressive responsible experience, Bob understands how to develop and lead multi-disciplined teams consisting of engineering and construction talent in the execution of complex infrastructure projects. While Bob is a results oriented individual, he is able to balance the multiple competing interests which are an inherent part of wastewater treatment projects.

Bill M'Coy will serve two roles on the HNP joint venture. As the Design Manager, Bill will be responsible for advancing the design for the Phase 2 Improvements project so it can be permitted and constructed with ease. HNP believes Bill is the best person for this role because he is intimately familiar with the regulatory environment and operating challenges of the HRWTF and the work that needs to be performed to implement the Phase 2 Improvements Project. Bill will also serve as Client Service Manager to the City of Hopewell, as he has a long relationship with the City of Hopewell and has become not only your trusted engineer, but also your trusted advisor. Bill will be in regular contact with the City of Hopewell during execution of the project and will be your contact for any performance concerns.

World Water Works and Heyward, Inc., are key technology providers to the HNP joint venture. Both organizations are exclusive teaming firms to HNP and have worked closely with us during the development of our proposal for the Phase 2 Improvements Project. Together, we will provide the planning, engineering, construction and commissioning services necessary to meet the requirements of the Phase 2 Project, to the City of Hopewell's satisfaction. The benefits offered by HNP and our proposal are summarized below.

Unmatched Experience and Leadership

HNP brings unmatched HRWTF experience and project leadership. PC has successfully constructed the two largest capital improvement projects at the HRWTF since it was started up in the mid-1970s. PC constructed the Centrifuge Dewatering Facility in the mid-1990s and the HDR-designed Phase 1 Improvements in 2012. Since 2003, HDR has brought trusted leadership and expertise to generate collaborative solutions for the City of Hopewell. HDR and PC's reputation with HRWTF staff illustrates the level of commitment and ability to deliver all of your project goals. Our established project team allows Hopewell to leverage the investment already made in our staff's knowledge of your facilities, personnel, and preferences. Additionally, HNP brings extensive experience working on large wastewater treatment plants across the region with construction budgets over $50 million, including several design-build projects.

Proven Process Equipment

WWW is a global leader in MBBR Technology for industrial applications, and their MBBR and DAF Pilot Plant has proven to reliably meet the HRWTF process treatment objectives under varying loads and conditions over a rigorous one-year testing period. Utilizing WWW's MBBR and DAF equipment provides HRWTF staff a high level of comfort and reliability. WWW's team of process experts have successfully installed MBBR and DAF treatment systems in a wide range of applications including: pulp and paper, chemical, food and beverage, pharmaceutical, oil and gas, and others. These applications range in treatment from achieving only high rates of BOD removal to achieving effluent total nitrogen limits <6 mg TN/L. WWW also has more MBBR-DAF combination installations in the municipal marketplace than any other vendor. Combining their

tremendous experience and knowledge and their unique experience of both industrial and municipal applications achieving similar goals to this project makes the selection of WWW assured success.

Integrated Design-Build Team

This technically complex project benefits from a well-rounded team of engineers and constructors providing the City of Hopewell a single of point of contractual responsibility. HDR and PC team members have worked together on complex wastewater treatment plant projects including HRWTF Phase 1 Improvements and HRSD's Atlantic Treatment Plant Expansion Phase 1. Our team's established working relationships, coupled with our HRWTF knowledge, better allows us to help you identify, plan for, and solve this project's challenges.

Schedule Acceleration

Due to permitting issues and availability of grant funding, it is our understanding that the City of Hopewell is motivated to move this project forward as efficiently as possible. Using the PPEA proposal process allows the City of Hopewell to implement the project on a faster schedule. Moving forward with Phase 2 Improvements now is the City of Hopewell's best assurance to locking into achievable permit limits, receiving significant WQIF grant funding and keeping construction costs to a minimum. HNP is uniquely qualified to best accelerate the schedule due to our familiarity with the project requirements gained from HDR's work on the preliminary engineering report (PER) and WWW pilot testing.

HNP and Our Proposed Project

Our proposal provides for the implementation of the recommendations and requirements provided in the Preliminary Engineering Report prepared by HDR. The Phase 2 Improvements with optional enhancements will provide for a design average capacity of 46 million gallons per day and will include the following components: Gravelly Run Pump Station and Forcemain Improvements, Moving Bed Biofilm Reactor (MBBR) Influent Pump Station, MBBR Screenings Facility, MBBR Tanks, Blower Building, Dissolved Air Flotation (DAF) Building, UNOX Aeration Tank Modifications, Secondary Clarifier No. 9, Effluent Re-aeration and Centrifuge Addition.

Our proposal is based on the PER and we are confident this completed project will provide the City of Hopewell the ability to meet your permitted discharge requirements. Our design will also provide flexibility in facility operations as well as ease in maintaining your facility for many years into the future

Our Commitment to the City of Hopewell

HNP believes that the attached proposal will best serve the City of Hopewell and it's HRWTF industrial partners to meet the anticipated new Virginia Department of Environmental Quality (VDEQ) permit requirements for nitrogen reduction in the most cost-effective and timely manner as compared to other available alternatives. Our proposal provides the City of Hopewell both a lump sum price and schedule commitment for delivering the completed Phase 2 Project. In order to stand behind this commitment, HNP has advanced the PER to a 30 percent level of design. For a qualified Design-Builder, the 30 percent design provides adequate detail for estimating, procurement and construction operations to understand the project and how it needs to be priced, built and commissioned. The confidence in our proposal is the result of HNP investing our financial resources and time to pursue this important project. HNP recognizes our investment in this proposal effort will yield results only if we are truly providing fair value and innovation to the City of Hopewell.

World Water Works and Heyward, Inc., have worked collaboratively with HNP during the development of the PER and pilot testing of the MBBR equipment. HNP is confident in the application of this technology to the Phase 2 Improvements project.

Many of the contracts executed by HDR and PC are awarded on the basis of our qualifications and outstanding references provided by our clients. These references are earned through delivering their projects on time, within budget, with high quality and with absolute transparency. We begin every project with the goal of earning a client reference which distinguishes our performance from that of our competitors. HNP is committed to earning an outstanding project reference from the City of Hopewell and we will do what is necessary to ensure this goal is achieved.

Table of Contents

SECTION 1 | QUALIFICATIONS AND EXPERIENCE..... page 1

1a. Team & Management Approach ..... page 1
1b. Experience..... page 43
1c. Prior Projects & References ..... page 59
1d. Team Contact Information..... page 67
1e. Audited Financial Statements ..... page 67
1f. Disqualifications..... page 68
1g. Proposed Plan for Obtaining Sufficient Number of Qualified Workers..... page 68
1h. Legal Information ..... page 69
1i. Worker Safety Programs ..... page 71

SECTION 2 | PROJECT CHARACTERISTICS..... page 73

2a. Proposed Project Description ..... page 73
2b. Identification of Work to be Performed by the City of Hopewell..... page 78
2c. Required Permit Approvals..... page 79
2d. Identification of Adverse Social, Economic, and Environmental Impacts..... page 80
2e. Identification of Positive Social, Economic, and Environmental Impacts..... page 81
2f. Proposed Schedule ..... page 82
2g. Contingency Plan..... page 85
2h. Allocation of Risk and Liability ..... page 85
2i. Assumptions..... page 86
2j. Phased or Partial Openings..... page 86

SECTION 3 | PROJECT FINANCING ..... page 87

3a. Preliminary Estimate ..... page 87
3b. Project Development, Financing and Operation Plan..... page 87
3c. Assumptions..... page 87
3d. Risk Factors and Risk Mitigation..... page 87
3e. Identification of Local, State or Federal Resources ..... page 87
3f. Identification of Revenue Sources..... page 88
3g. Identification of Potential Tax-exempt Financing Disqualification ..... page 88

SECTION 4 | PROJECT BENEFIT AND COMPATIBILITY..... page 89

4a. Community Impacts ..... page 89
4b. Public and Government Support/Opposition..... page 90
4c. Strategy and Plan to Inform General Public ..... page 90
4d. Compatibility with Economic Development Efforts..... page 90
4e. Compatibility with City Plans..... page 90

SECTION 1 - QUALIFICATIONS AND EXPERIENCE

SECTION 1 - QUALIFICATIONS AND EXPERIENCE

SECTION 1 | QUALIFICATIONS AND EXPERIENCE

1a. Team & Management Approach

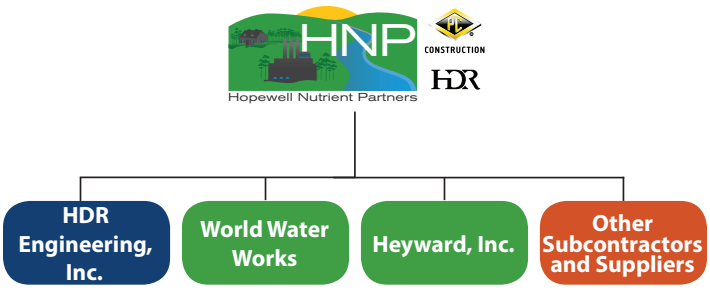
Identify the legal structure or type of private entity making the proposal. Identify the organizational structure for the project, the management approach and how each partner and major subcontractor ($1 million or more) in the structure fits into the overall team. All members of the operator/offeror's team, including major subcontractors known to the proposer, must be identified at the time a proposal is submitted for the conceptual stage. Identified team members, including major subcontractors (over $1 million), may not be substituted or replaced once a project is approved and comprehensive agreement entered into, without the written approval of the City. Include the status of the Virginia license of each partner, proposer, contractor, and major subcontractor.

Legal Structure

The form of organization to be used is a joint venture, which is named the Hopewell Nutrient Partners, A Joint Venture.

Organizational Structure for the Project

The Hopewell Nutrient Partners, A Joint Venture (HNP) will be a partner-managed joint venture. HNP shall be comprised of two primary joint venture partners: HDR Constructors, Inc., and PC Construction Company. HNP will have primary subconsultants, subcontractors, and technology providers as shown below.



HNP Firm Members and Responsibilities

Firm Member	Responsibilities
HDR Constructors, Inc.	Managing Partner of HNP
PC Construction Company	Partner of HNP
HDR Engineering, Inc.	Design Engineer
World Water Works, Inc.	MBBR Technology Provider
Heyward, Inc.	Technology Provider

Table of Contents for Section 1a

Legal Structure ..... page 1
Organizational Structure for the Project .... page 1
HNP Firm Members and Responsibilities.... page 1
Virginia License ..... page 1
Identified Firm Member Descriptions ..... page 3
Project Team Organizational Chart ..... page 6
Resumes..... page 8
Management Approach ..... page 35

Virginia License

On the following page are copies of each major partner or major subcontractor's Virginia license.

Firm	License Type	Status of Virginia License
HDR Constructors, Inc.	Contractor	2705081516, Class A, Expires 1/31/2014
PC Construction Company	Contractor	2701015900, Class A, Expires 4/30/2015
HDR Engineering, Inc.	Professional Engineer	0411000028, Board For Architects, Professional Engineers, Land Surveyors, Certified Interior Designers Expires 2/28/2014

HNP Partners' Licenses

DEPARTMENT OF PROFESSIONAL AND OCCUPATIONAL REGULATION
COMMONWEALTH OF VIRGINIA
9960 Mayland Dr., Suite 400, Richmond, VA 23233
Telephone: (804) 367-8500

EXPIRES ON 01-31-2014

NUMBER 2705081516

BOARD FOR CONTRACTORS
CLASS A CONTRACTOR
CLASSIFICATIONS BLD H/H SDS

HDR CONSTRUCTORS, INC
4435 MAIN ST SUITE 1000
ATTN DAVE LUTZ
KANSAS CITY, MO 64111

Gordon N. Dixon, Director

ALTERATION OF THIS DOCUMENT, USE AFTER EXPIRATION, OR USE BY PERSONS OR FIRMS OTHER THAN THOSE NAMED MAY RESULT IN CRIMINAL PROSECUTION UNDER THE CODE OF VIRGINIA.

DEPARTMENT OF PROFESSIONAL AND OCCUPATIONAL REGULATION
COMMONWEALTH OF VIRGINIA
9960 Mayland Dr., Suite 400, Richmond, VA 23233
Telephone: (804) 367-8500

EXPIRES ON 04-30-2015

NUMBER 2701015900

BOARD FOR CONTRACTORS
CLASS A CONTRACTOR
CLASSIFICATIONS BLD ELE H/H HVA PLB

PCEO INC
PC CONSTRUCTION COMPANY
193 TILLEY DRIVE
SOUTH BURLINGTON, VT 05403

Gordon N. Dixon, Director

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Major Subcontractor: HDR Engineering, Inc. License

DEPARTMENT OF PROFESSIONAL AND OCCUPATIONAL REGULATION
COMMONWEALTH OF VIRGINIA
9960 Mayland Dr., Suite 400, Richmond, VA 23233
Telephone: (804) 367-8500

EXPIRES ON 02-28-2014

NUMBER 0411000028

BOARD FOR ARCHITECTS, PROFESSIONAL ENGINEERS, LAND SURVEYORS, CERTIFIED INTERIOR DESIGNERS AND LANDSCAPE ARCHITECTS
BUSINESS ENTITY BRANCH OFFICE REGISTRATION

PROFESSIONS: ENG

HDR ENGINEERING INC
5700 LAKE WRIGHT DRIVE
SUITE 300
NORFOLK, VA 23502

Gordon N. Dixon, Director

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Identified Firm Member Descriptions

HNP Partners

HDR, Inc. (HDR) is an employee-owned architecture, engineering, consulting, and construction firm with more than 8,600 professionals in 200 offices worldwide. Founded in 1917, HDR has a long and successful history of helping our clients make sound decisions and manage complex projects. HDR's operating philosophy is to be an expertise-driven national firm that delivers tailored solutions through a strong local presence. HDR's ability to draw upon company-wide resources and expertise is a great strength in meeting and exceeding your expectations.

HDR offers integrated design and construction services to clients through HDR Constructors, Inc. (HDRC), a wholly owned subsidiary of HDR. Headquartered in Kansas City, Missouri, HDRC is a fully-bonded and insured general contractor, capable of working throughout the United States and guarantees all or part of the price, schedule, quality, and/or performance of the project. Integrating construction with traditional design services provides HDR clients with a single source of project responsibility and serves to promote an atmosphere of collaboration and integration with clients, maintaining our position as your advocate.

HDR Engineering, Inc. (HDRE) is a leader in advanced wastewater treatment and nutrient removal engineering. HDR is leading the Water Environment Research Foundation (WERF) Nutrient Removal Challenge program, a multi-year program that helps communities, like the City of Hopewell, navigate the challenges associated with stringent discharge limits. HDR is involved with on-going collaborative research to assess the reliability of ammonia removal, nutrient removal, nonbiodegradable nitrogen and phosphorus, phosphorus removal technologies, denitrification kinetics, sustainability, design and operations of nutrient removal facilities. HDR brings our advanced wastewater treatment capabilities, Norfolk-based team, and practical, reliable and cost-effective solutions to the HRWTF Phase 2 Improvements project.

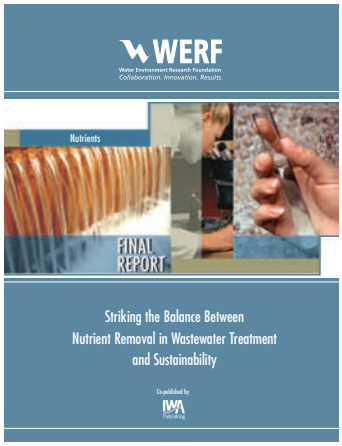
For the remainder of this submittal, all references to HDR are inclusive of HDR Constructors, Inc., and HDR Engineering, Inc., unless otherwise noted with "HDRC" and "HDRE" designations.

HNP Provides:

- Unmatched Experience and Leadership
- Proven Process Equipment
- Integrated Design-Build Team
- Schedule Acceleration
- Large Wastewater Treatment Plant Experience

HDR 2013 Engineering News-Record (ENR) Rankings

- No. 11 - Top 500 Design Firms
- No. 6 - Top 20 in Water
- No. 6 - Top 20 in Sewer & Waste



HDR and J.B. Neethling are the principal investigators leading the Water Environmental Research Foundation's 5-year nutrient removal challenge.

CONSTRUCTION

PC Construction Company (PC) is a 100 percent employee-owned construction company providing professional client-focused construction solutions through proven general contracting, construction management, design-build and preconstruction planning services. With a corporate office in South Burlington, Vermont, and regional offices in North Carolina and Maine, PC's staff of 900 professionals manages and supports project sites along the east coast.

Specializing in water and wastewater treatment construction, PC teams understand the unique challenges associated with completing complex construction operations within an actively functioning plant and have the expertise to overcome them. PC's 55 year history has allowed PC to work on a wide variety of projects ranging from pump stations to major expansions and new plants with construction budgets over $50 million – resulting in nearly $4 billion of completed water and wastewater projects in the past 10 years alone. Backed by innovative design phase estimating services, PC demonstrates self-performance capabilities and a proven history of high quality, safe projects. PC ensures successful project completion while creating greater control and avoiding impacts to plant operations.

PC's extensive experience with integrated delivery construction models provides clients with a collaborative approach which leads to the achievement of project goals. With PC's input during the early stages of design, constructability and value engineering solutions are generated, providing substantial opportunity for lower costs and higher project quality. When focus shifts from preconstruction to construction, our water and wastewater treatment plant construction experience elevates the project to a new level with teams who possess the knowledge, skills and industry understanding to bring blueprints and drawings to reality. PC boasts over $1 billion worth of successfully completed integrated delivery projects and a portfolio of design-build work dating back nearly 30 years. PC is ready to put their specialized team and long history of industry execution to work to deliver a successful HRWTF Phase 2 Improvements project.

PC Engineering News-Record (ENR) Rankings

- No. 13 - Wastewater
- No. 45 overall - Top 200 Environmental Firms
- No. 154 - Top 400 Contractors
- No. 94 – Top 100 Green Contractors

The collaborative approach embraced by Bob Huie and members of an integrated delivery project ensures greater flexibility for field and design changes.

Extensive logistical coordination for this 3,400 cubic yard concrete placement set the stage for success.

HNP Exclusive Technology Providers

World Water Works, Inc. (WWW) is a U.S. Employee-owned manufacturer of specialized advanced wastewater treatment solutions with design focus on performance, flexibility and longevity yielding the best water quality at the lowest life cycle costs. The company was incorporated in 1998 recognizing the need for ethical product commitment and continual innovation in technology. Executing these goals has enabled WWW to establish strong meaningful ongoing relationships with our customers.

WWW has successfully delivered advanced wastewater treatment technologies to every major continent in the world. WWW is a global leader in Moving Bed Biofilm Reactor (MBBR) and Dissolved Air Flotation (DAF) technology, recently delivering the largest municipal complete treatment MBBR in the U.S. (10.3 mgd in Midwest City, OK) and having delivered more MBBR/DAF combined solutions globally than any other company.

WWW has assembled and continues to attract a team of globally recognized technical experts. To provide the most effective and dynamic solutions, WWW's approach is to tackle problems with a diverse team consisting of engineers, scientists, operators, mechanics, electricians, accountants and other specialists. We believe this approach achieves a more creative and more encompassing solution. Further fueling innovation, WWW uniquely combines a strong Research and Development (R&D) program with In-House Manufacturing.

Staying true to these core values throughout WWW's history has translated into tremendous growth and success. In both 2012 and 2013, INC Magazine recognized WWW as one of the fastest growing companies in America. WWW's technologies have won numerous awards for delivering the highest water quality and maximum resource recovery. One recent award was the AAEES Sustainability Award for a project completed at Hampton Roads Sanitation District (HRSD).

Heyward Incorporated (Heyward) is a manufacturer's representative firm serving customers in Virginia, Maryland, Delaware and the District of Columbia, with a local office located in the Richmond area.

Heyward represents leading manufacturers of process equipment for the municipal and industrial water and wastewater treatment fields, and is a technology resource partner for the HRWTF Phase 2 Improvements project. Heyward represents WWW, the MBBR/DAF technology provider, and several other manufacturers of key process equipment proposed for this project.

Having been in business for over 100 years, Heyward is known for the quality of its service, and the knowledge and expertise of its staff to provide cost-effective solutions with high quality state-of-the-art process equipment to its customers. Heyward has experienced engineers and wastewater treatment operators on staff with technical expertise in the application of the latest technologies and equipment to best meet the customer's needs. Heyward is actively engaged with WEF, VWEA, VRWA, Virginia Tech/VA DEQ Operator Short School, and other professional organizations to advance the knowledge and use of new technologies to meet more stringent environmental regulations.

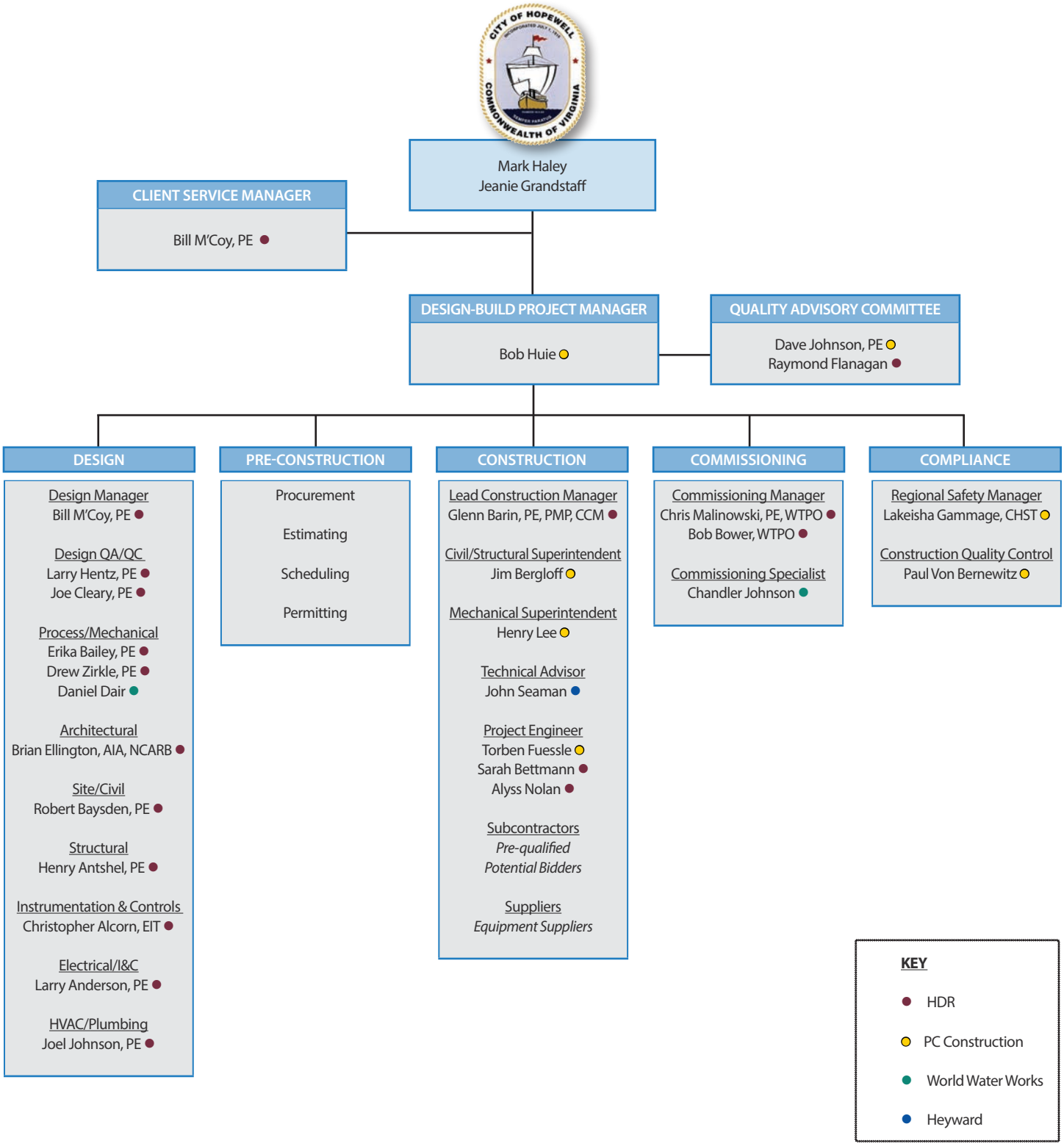
Heyward has provided local equipment sales, service and technical support to HRWTF since the plant was built in 1977, and is committed and staffed to provide a continued high level of service and support to the plant well into the future.

Local Subcontractor Participation

HNP realizes the importance of participation of local subcontractors and suppliers for this project to provide a positive impact within the local economy. We have worked with many local subcontractors on other projects in the area and will solicit pricing from qualified firms during the preconstruction phase of the project. At this stage of the process it is too early to make any firm commitments due to the level of design detail and the amount of time required for the procurement process; however, the HNP will involve the City of Hopewell and other stakeholders during the process to ensure you receive the best value and highest quality.

Project Team Organizational Chart

HNP has assembled an outstanding team that combines the strengths of our two organizations to design and construct this important project for the City of Hopewell. The organizational chart provided herein is offered not only to identify key members of our team, but also to illustrate the reporting structure of our team and how we intend to communicate with the City of Hopewell during the project.



Design-Build Project Manager Bob Huie will serve as HNP's main point of contact for the City of Hopewell and will provide overall senior leadership for the project and manage the design-build process from inception to completion. Mr. Huie will be the City of Hopewell's "go-to" person for the project and HNP.

Client Service Manger/Design Manager Bill M'Coy will also serve as a key point of contact for HNP. Mr. M'Coy will be available to the City of Hopewell and will lead the design team as well as assisting Mr. Huie to ensure the design and construction teams are integrated. During the design phase, Mr. M'Coy will be HNP's point of contact for design feedback, and will facilitate design phase meetings and workshops. Mr. M'Coy will also be leading engineering support during construction.

Key Team Members' Roles and Responsibilities

Role	Responsibilities
Design-Build Project Manager **Bob Huie**	• Main point of contact for City of Hopewell (along with Bill M'Coy) • Lead the HNP team throughout project design, preconstruction, construction, and start-up • Engage stakeholders throughout the process • Monitor relationships with the City of Hopewell and the integrated design and construction team • Provide personnel resources to support project • Ensure timely resolution of conflicts should they arise • Liaison between the HNP, engineer, and the City of Hopewell
Design and Client Service Manager **Bill M'Coy**	• Main point of contact for City of Hopewell (along with Bob Huie) • Lead the HNP design team through design and construction • Monitor relationships with the City of Hopewell and the integrated design and construction team • Provide a collaborative decision making process during design • Facilitate design phase meetings and workshops • Lead engineering support during construction
Lead Construction Manager **Glenn Barin**	• Provide overall construction management leadership • Lead preconstruction services • Lead vendor/subcontractor negotiations • Lead procurement efforts • Direct project superintendents and project engineers • Ensure progress reporting
Civil/Structural Superintendent **Jim Bergloff**	• Supervise and coordinate the day-to-day construction activities • Develop site logistics, phasing plan, and site specific safety plan • Maintain control of quality, schedule, and safety for the project • Provide oversight for start-up of plant systems and processes
Mechanical Superintendent **Henry Lee**	• Supervise installation of piping, process equipment and underground utilities • Schedule and formulate plans for shut-downs, tie-ins and startup and commissioning of equipment and process systems
Regional Safety Manager **Lakeisha Gammage**	• Implement HNP's "Zero Accidents-No Excuses" safety philosophy • Assists the project team in the development and administration of a site-specific safety plan • Coordinates safety-related training and education initiatives
Construction Quality Control **Paul Von Bernewitz**	• Coordinates procurement activities, in particular for the MBBR unit • Supervises contract/subcontract documentation • Reviews, expedites, and coordinates submittals • Communicates with field management on scheduling activities • Expedites equipment deliveries to ensure continual workflow on the project site • Manage RFI process • Updates project schedules
Quality Advisory Committee **Dave Johnson** **Ray Flanagan**	• Develop and implement Project Quality Plan (PQP) • Continuous review PQP and process • Conduct regular QC Audits across all project phases
Commissioning Manager **Chris Malinowski**	• Develop start-up, commissioning, and operations and maintenance (O&M) plans • Coordinate with plant staff for training requirements • Ensure commissioning process is begun early in the project • Coordinate with technology providers, suppliers, manufacturers and subcontractors to formulate processes and procedures for equipment start-up

Bob Huie

Design-Build Project Manager

Firm
PC Construction

Industry Tenure
32 years

Education
BS, Civil Engineering

Registration/ Certifications and Training
General Contractors License

- GA

Relevant Experience & Benefits

- Extensive wastewater alternative delivery experience
- Expertise in managing solutions to complex construction issues

As a senior project manager with PC, Mr. Huie has managed more than $400 million worth of upgrades and expansions on water and wastewater treatment plants throughout the Southeast. He is responsible for overall project administration and management, scheduling and cost reporting and displays a talent for discovering solutions to complex construction issues.

Mr. Huie managed teams of engineers and construction personnel on two of the largest alternative delivery water and wastewater treatment plant projects in the country. His mastery of orchestrating project teams to form cohesive units with a common goal ensures projects are completed safely and the highest quality.

Select Project Experience

Ground Water Reduction Program Surface Water Treatment Facility, San Jacinto River Authority, Conroe, TX. Senior Project Director. CM-at-Risk. Project Value: $191 million.

Yellow River Water Reclamation Facility Improvements, Gwinnett County Department of Public Utilities, Lilburn, GA. Senior Project Director. CM-at-Risk. Project Value: $238.3 million.

South River Water Reclamation Center Upgrades, City of Atlanta, Atlanta, GA. Senior Project Manager. Project Value: $3.5 million.

Big Creek UV System Improvements, Fulton County Department of Public Works, Rosewell, GA. Senior Project Manager. Design-Build. Project Value: $4.1 million.

Fort Wayne Hill Water Resources Center Upgrade and Expansion, Gwinnett County Department of Public Utilities, Buford, GA. Senior Project Manager. Joint Venture. Project Value: $113 million.

Flat Creek Water Reclamation Facility, City of Gainesville, Gainesville, GA. Senior Project Manager. Project Value: $21.5 million.

South River Water Reclamation Center Improvements, City of Atlanta, Atlanta, GA. Senior Project Manager. Project Value: $63.5 million.

Monterey Wastewater Treatment Facility Renovation, United Water Florida, Jacksonville, FL. Project Manager. Project Value: $9.1 million.

H.L. Mooney Wastewater Treatment Plant (WWTP) Expansion and Upgrade, Prince William County Service Authority, Woodbridge, VA. Project Manager. Project Value: $33 million.

Olney Pump Station, Washington Suburban Sanitary Commission, Laurel, MD. Project Manager. Project Value: $3 million.

Wastewater Treatment Facility, City of Dover, Dover, NH. Assistant Project Manager. Project Value: $17.3 million.

Chlorination/Dechlorination Facility, Portland Water District, Portland, ME. Project Manager. Project Value: $5.2 million.

Bill M'Coy, PE

Client Service Manager; Design Manager

Firm
HDR

Industry Tenure
33 years

Education
MS, Environmental Engineering
BS, Civil Engineering

Registration/ Certifications and Training
Professional Engineer
- VA, MD, DC

Relevant Experience & Benefits
- Project Manager for large, complex treatment plant projects including Hopewell's Alternative 4A-1 Light Phase I and HRWTF Solids Building Phase 1a Denit Basin
- Performing a wide variety of engineering services to the HRWTF since 1994

Mr. M'Coy has a broad range of experience in the planning and design of municipal and industrial water and wastewater treatment facilities. He has extensive knowledge of Hopewell Regional Wastewater Treatment Facility's (HRWTF) facilities, processes and staff based on his work with HRWTF dating back to the early 1990s. Under HDR's HRWTF BOA contract, he has been responsible for numerous assignments including the Nitrogen Cost Allocations, Hopewell Plant Upset Analysis, Nitrogen Reduction Evaluation and Nitrogen Confirmation Testing, and alternatives for the municipal/industrial WWTP.

Select Project Experience

HRWTF Phase 1, City of Hopewell, VA. Project Manager. Provided segregated preliminary treatment, primary treatment, and disinfection of domestic wastewater. Responsible for facility planning, and preliminary design of upgrades for biological nitrogen removal - the segregation of domestic wastewater from industrial wastewater was required for nutrient removal within the Phase 2 Improvements. In addition, the domestic treatment facilities were upgraded to include new fine screening and vortex grit removal facilities. Three of the existing rectangular primary clarifiers were retrofitted to serve as combined primary clarifiers followed by chlorine contact tanks. This project improved influent screening, activated sludge aeration, mixing, and secondary clarification.

Basic Ordering Agreement, City of Hopewell, VA. Contract and Project Manager. General engineering services to the City's 50 mgd HRWTF since 1994. To date, HDR has served Hopewell with over 40 task orders under this contract. Mr. M'Coy served as project manager for the Nutrient Reduction Alternatives task order where he developed a facility plan for the upgrade of plant facilities to meet new nitrogen and phosphorus limits required by the Chesapeake Bay program.

Army Base Treatment Plant Improvements Phase III, Hampton Roads Sanitation District (HRSD), Norfolk, VA. Project Manager. Designed new preliminary treatment facility (PTF), raw waste influent pump station, grit removal facilities, biological treatment basins, blower facility, secondary clarifier and RAS pump station modifications, new gravity belt filter facility, incinerator modifications, numerous solids treatment system upgrades and modifications, conversion of the plant to a distributed control system and various support facilities. Project Value: $80 million.

Virginia Initiative Plant Nutrient (VIP) Reduction Improvements (NRI), HRSD, Norfolk, VA. Project Manager. HDR is designing NRI and hydraulic upgrades to the 40 mgd VIP. The design includes a new PTF with pump station that is capable of discharging a portion of the peak flow to a new equalization tank, biological process tank and chlorine contact channel while operating in parallel with the existing treatment processes. Phased project delivery approach using BIM, allowed HRSD to better visualize design solutions, minimized risks, and expedited decision making. Site preparation and foundation piling for the NRI facilities were separated into an early release contract to fast-track the construction schedule which allows HRSD to be in compliance with the near-term and future requirements of the Virginia Watershed Implementation Plan. Project Value: $100 million.

Atlantic Treatment Plant (ATP) Expansion Phase I, HRSD, Virginia Beach, VA. Project Manager. The project expanded the plant from 36 mgd to 54 mgd, with provisions for future 72 mgd expansion. The design included a new PTF, two additional primary clarifiers, 12.3 million-gallon two-pass biological treatment aeration basin, new secondary clarifiers, chlorine contact tanks, dewatering building, acid phase digestion facilities, cake storage facility, digester modifications, blower facility, and distributed control system. Project Value: $164 million.

Dave Johnson, PE

Quality Advisory Committee

Firm
PC Construction

Industry Tenure
24 years

Education
BS, Construction Engineering

Registration/ Certifications and Training
Professional Engineer

- CO, VT

Class A Construction Supervisor

- CO

Relevant Experience & Benefits

- Solid integrated delivery experience, both CM-at-Risk and Design-Build
- Extensive experience with preconstruction process and value engineering

Mr. Johnson brings two decades construction and management experience with particular expertise in project management, cost control, scheduling and execution of projects involving the expansion, upgrade and construction of complex water and wastewater treatment plants. His strong understanding of the preconstruction process provides a seamless transition between the planning and value engineering efforts straight through the final construction product.

Select Project Experience

HRWTF Expansion Contract 1, City of Hopewell, Hopewell, VA. Project Manager. Project Value: $9.1 million

Hopewell Water Treatment Plant Improvements, Virginia American Water Company, Hopewell, VA. Project Manager. Design-Build. Project Value: $22 million.

H.L. Mooney Water Reclamation Facility Expansion and Upgrade Stage 2 Phase 1, Prince William County Service Authority, Woodbridge, VA. Project Manager. Design-Build. Project Value: $118.8 million.

McMillan Sand Filter Site Stormwater Storage, DC Water, Washington, DC. Senior Project Manager. Design-Build. Project Value: $12 million.

Enhanced Nutrient Removal (ENR) Facilities First Contract Slurry Wall and Tankage, DC Water, Washington, DC. Senior Project Manager. Project Value: $71 million.

Cox Creek Water Reclamation Facility ENR Upgrade PI, Anne Arundel County, Curtis Bay, MD. Project Manager. Project Value: $11.4 million.

Linton Hall Lift Station, Prince William County Service Authority, Manassas, VA. Project Manager. Project Value: $9.7 million.

Fuller Heights Lift Station B, Prince William County Service Authority, Triangle, VA. Project Manager. Project Value: $2.6 million.

H.L. Mooney Phase IV UV Disinfection Facility, Prince William County Service Authority, Woodbridge, VA. Project Manager. Project Value: $6.7 million.

Marston Water Treatment Plant (WTP) Improvements, Denver Water Board, Denver, CO. Project Manager. CM-at-Risk. Project Value: $38.1 million.

Wemlinger WTP Renovation and Upgrade, City of Aurora, Aurora, CO. Project Manager. Design-Build. Project Value: $5.4 million.

Raymond Flanagan

Quality Advisory Committee

Firm
HDR

Industry Tenure
46 years

Education
BS, Civil Engineering

Registration/ Certifications and Training
N/A

Relevant Experience & Benefits
- Providing assistance in developing project specific Quality Management Plans
- Performing Zero percent reviews and Quality Assurance Audits
- Insuring project controls procedures have been instituted and are being followed

Mr. Flanagan has 46 years of construction experience in the water/wastewater, industrial, power, and commercial industries. Throughout his career he has managed more than 150 projects with an in-place construction value of $750 million. In addition, he has been responsible for developing and implementing project and corporate procedures for project control systems, estimating systems, management control systems and QA/QC programs. Mr. Flanagan provides project management oversight on specific design-build projects while providing support and auditing functions for the implementation of corporate and project procedures, policies, standards, and best practices. In his current role with HDR, Mr. Flanagan is responsible for implementing a consistent quality management program for HDR Constructors which integrates both design and construction procedures, policies and best practices.

Select Project Experience

ATP Expansion Phase I, HRSD, Virginia Beach, VA. Construction Review and Estimating Services. HDR evaluated alternative expansion concepts that would provide lowest life-cycle costs and improved service to HRSD. Project consisted of the design and construction services for ten different new building structures as well as renovation of some existing buildings for the expansion of the 36 mgd ATP to 54 mgd, with provisions for a future expansion to 72 mgd. Treated effluent is discharged through a 1.5 mile outfall and diffuser to the Atlantic Ocean. Project Value: $164 million.

West Basin, Edward C. Little Water Recycling Facility Phase IV Expansion Design-Build, El Segundo, CA. Operations Manager. HDR is providing design services which include expansion of the barrier water injection from 7.5 to 12.5 mgd, expansion of the Title 22 and solids handling facilities, and new chemical feed and storage systems. The existing Title 22 lime clarifiers will be replaced by solids contact clarifiers, and the barrier water treatment facility will be expanded using microfiltration, reverse osmosis, and UV irradiation. HDR's schedule and work plan addressed the need for detailed sequencing, pre-planning of startup activities, and testing of individual components, requiring weekly planning and coordination meetings with operations staff, the design-build team, and vendors to ensure no interruptions to plant operations.

West Palm Beach Biosolids Processing Facility Design-Build, New England Fertilizer Co., West Palm Beach, FL. Operations Manager/Client Manager. The design and construction of a Biosolids Processing Facility using an integrated, 50-50 joint venture (JV) between HDR Constructors and Turner Industries. HDR's responsibilities included overall management of the JV, permitting assistance, design, engineering, procurement of engineered equipment, and provided supplemental field staff during construction.

Water and Sewer Design-Build Criteria, Okaloosa County, FL. Construction Review and Estimating Services. HDR was responsible for the development of the Design Criteria as well as developing the Design-Build contract documents for use by the client for the design and construction of a new 10 mgd WWTP Design-Build project.

EnerTech Rialto Biosolids Facilities Design-Build, EnerTech Environmental, Inc., Rialto, CA. Operations Manager. HDR and Filanc Construction provided design-build services for a $83 million, 750 wet tons per day facility that produces a renewable fuel from biosolids for EnerTech Environmental, Inc. This project involves taking biosolids from five municipalities through EnerTech's patented SlurryCarb process and converting the biosolids into a low-grade fuel (E-FuelTM). Initial facility operations commenced in summer of 2008 with full facility operation by end of 2009.

Larry Hentz, PE

Design QA/QC

Firm
HDR

Industry Tenure
34 years

Education
MS, Sanitary Engineering

Registration/ Certifications and Training
Professional Engineer

- VA, MD, DC, VT, SC, PA, GA

Relevant Experience & Benefits

- Extensive enhanced nutrient removal project experience in Mid-Atlantic region
- Led the delivery of several large treatment projects by alternative project delivery methods

Mr. Hentz has over 34 years of experience as a process engineer and project manager for biosolids, water, wastewater, sludge, leachate, and air emission control facilities. His responsibilities range from preliminary process selection studies to final design and construction of facility improvements. Mr. Hentz has developed a national reputation for enhanced nutrient removal and technological advances in biosolids treatment and odor control.

Select Project Experience

VIP NRI, HRSD, Norfolk, VA. Technical Director and Odor Control Specialist. HDR is designing nutrient reduction improvements to the 40 mgd VIP. Performed evaluation and design of new influent equalization tank, new odor control systems, and new chemical feed systems. Preliminary treatment odor control includes a two-stage system, with a biotower as the first stage to remove 99%+ of the inlet hydrogen sulfide with no chemicals, and a chemical scrubber second stage for polishing and redundancy. Equalization tank improvements will be used to allow for higher wet weather flows at the plant, with two million gallons of equalization storage. Project Value: $100 million.

Fort Meade Water and Wastewater Improvements, Fort Meade, MD. Process Engineer. This design-build project included water and sewer pipeline replacement, design of new water storage tanks, design of new enhanced nutrient removal facilities, design of a sludge dryer, and sewer system evaluation survey of the collection system at Fort Meade.

Army Base Treatment Plant Improvements Phase III, HRSD, Norfolk, VA. Technical Advisor. The project included a new preliminary treatment facility, raw waste influent pump station, grit removal facilities, ENR facilities, blowers, and RAS pump station modifications. Mr. Hentz was responsible for odor control improvements and design of associated odor control facilities. An innovative cyanide removal system was designed by Mr. Hentz. Project Value: $80 million.

ATP Expansion Phase I, HRSD, Virginia Beach, VA. QA/QC. Optimized the performance of the odor control facilities during expansion. Five two-stage packed tower scrubbers were designed to treat 170,000 cfm of air from headworks, biosolids, and biological treatment processes. Innovative controls were developed to remove organic sulfides with acidified bleach. Project Value: $164 million.

Seneca WWTP Expansion, Laurel, MD. Project Manager/ Process Engineer. Responsible for the design and construction of a 20 mgd advanced WWTP expansion that incorporates anoxic selectors, biological nutrient removal facilities, high speed centrifuges, and denitrification filters. The project also included improvements to the 60 mgd influent pumping station and new grit and screening, secondary clarifiers, chlorine disinfection, centrifuge dewatering, lime stabilization and many other facilities. Mr. Hentz later led the design of the ENR and expansion improvements.

Little Patuxent Water Reclamation Plant, Savage, MD. Project Manager, Managing Principal and Process Engineer. Mr. Hentz was responsible for the design and construction of a comprehensive plant expansion to 29 mgd. The project also included the incorporation of enhanced nutrient removal facilities. Improvements were made to the existing headworks, primary clarifiers, aeration systems, secondary clarifiers, RAS systems, internal recycle systems, and comprehensive biosolids facilities. The plant was also designed to accommodate a large industrial load, which was fermented and used to improve enhanced biological phosphorus removal. The project was delivered by design-build and construction management at risk (CMAR) contracts.

Joe Cleary, PE

Design QA/QC

Firm
HDR

Industry Tenure
43 years

Education
ME, Environmental Engineering
BE, Civil Engineering

Registration/ Certifications and Training
Professional Engineer
- NY, NJ, PA, Puerto Rico

Relevant Experience & Benefits
- Provided environmental engineering consulting services to both private and public-sector clients in the United States, Puerto Rico, Mexico, Columbia, Brazil and Ireland
- Designed a new biological SBR treatment plant for pharmaceutical wastewater

Mr. Cleary has served as a consultant to industrial clients in the pharmaceutical, chemical, food and beverage, refinery, petrochemical, utilities, textile, pulp and paper and microelectronics industries. He specializes in industrial wastewater treatment and groundwater remediation. He has recently focused on food and biosolids to energy projects and removal of microconstitutents in wastewater and water treatment plants. Mr. Cleary's technical and project management expertise covers alternatives evaluation, bench- and pilot-scale treatability studies, process engineering design, construction, design-build, start-up and operation and maintenance services. He has designed and started-up aerobic and anaerobic biological treatment systems, membrane processes, advanced oxidation and water recycle/reuse facilities.

Select Project Experience

Alternative 4A-1 Light Phase 2 PER, City of Hopewell, VA. QA/QC Reviewer. Preliminary engineering to evaluate alternatives to meet anticipated nutrient reduction requirements. The Alternative 4A-1 Light, Phase 2 PER presents the basis of design and recommended nutrient reduction improvements. The Phase 2 Improvements include a segregated treatment process to provide year-round nitrification and partial denitrification of the domestic wastewater and a portion of the Honeywell wastewater in a segregated treatment process and add denitrification capacity in the existing UNOX reactor to achieve additional denitrification of the combined segregated waste stream effluent and industrial flows.

WWTP Design and Troubleshooting Performance, Eli Lilly, Carolina, Puerto Rico. Project Director. Designed BNR WWTP. Conducted troubleshooting of nitrification performance issues for this high strength pharmaceutical wastewater nitrification/denitrification treatment plant. Developed sampling program to investigate root cause of loss of nitrification. Analyzed sampling data and performed BIOWIN process modeling to develop root cause and recommendations. Evaluated alternatives for upgrading capacity and converting to MBR or MBBR technology. Performed BIOWIN model analysis and developed upgrade of MLE process.

Food to Energy Facility, Confidential Client, New York, NY. Project Director for the design of a food to energy facility that will use anaerobic digestion of food waste to produce biogas for combined heat and power production. The design includes material receiving and handling processes, a wet anaerobic digestion process, aerobic composting, biofilters for odor control and treatment of a high ammonia bearing (1,000 to 3,000 mg/L) wastewater stream. Wastewater treatment considered biological and physical/chemical alternatives. Physical/chemical (vacuum distillation) was selected during preliminary energy design as the cost effective alternative.

Feasibility Study and Engineering Design of New Wastewater Treatment Plant, Kingwood LLC, Sullivan County, NY. Project Director. Performed feasibility study of alternatives, engineering design, waste assimilation capacity (WAC) analysis of stream and water quality modeling of stream for South Brook Creek and SPDES permit application for a 0.5 mgd wastewater plant for a new housing development biological treatment alternatives was evaluated as an SBR system was designed for testing treatment to meet intermitted stream standards for BOD, ammonia and phosphorus.

NYSOGS, Summit CF Upgrade WWTP. Project Director. Design of a new 30,000 gpd rotating biological contactor (RBC) treatment plant. Developed design basis and coordinated review with NYSDEC of all permitting requirements to meet SPDES discharge limits. Design included use of existing screens and equalization tanks, new RBC package treatment system in a fiberglass enclosure, pH adjustment system, new pressure filters, ultraviolet disinfection unit and post aeration.

Erika Bailey, PE

Process/Mechanical

Firm
HDR

Industry Tenure
17 years

Education
ME, Civil Engineering

Registration/ Certifications and Training
Professional Engineer, Environmental

- VA, NC

Relevant Experience & Benefits

- Lead process engineer for most of the major process studies performed at HRWTF for the past 16 years and is extremely familiar with HRWTF and HRWTF staff
- HDR process expert for Southeast region industrial wastewater projects

Ms. Bailey has 17 years of experience in water/wastewater treatment process evaluation, design, and environmental permitting. Her specialties include municipal and industrial wastewater treatment and reuse, biological nutrient removal (BNR), treatability testing, conceptual evaluations, master planning, environmental permitting, design, and plant operations. Ms. Bailey has provided process technical support for municipal and industrial water and wastewater projects throughout the Southeast. She also served as the Practice Leader for HDR's Wastewater Treatment Facility Planning and Water Quality Practice Group.

Select Project Experience

HRWTF Nutrient Reduction Alternatives, Hopewell, VA. Process Lead. Developed process sizing for upgrade alternatives to meet new nitrogen and phosphorus limits required by the Chesapeake Bay program and assisted with development of Basis of Design Report. Developed and evaluated a number of innovative and unusual process alternatives.

Alternative 4A-1 Light Phase 2 PER, City of Hopewell, VA. Process Lead. Preliminary engineering to evaluate alternatives to meet anticipated nutrient reduction requirements. The Alternative 4A-1 Light, Phase 2 PER presents the basis of design and recommended nutrient reduction improvements. The Phase 2 Improvements include a segregated treatment process to provide year-round nitrification and partial denitrification of the domestic wastewater and a portion of the Honeywell wastewater in a segregated treatment process and add denitrification capacity in the existing UNOX reactor to achieve additional denitrification of the combined segregated waste stream effluent and industrial flows.

Segregated Treatment System Pilot Study, City of Hopewell, VA. Senior Process Engineer. Provided technical oversight for pilot-scale operation of two parallel BNR processes at HRWTF. The study compared performance of an MBBR treatment system and suspended growth treatment system. HDR ensured that testing, sampling, data, and reporting methods met the study objectives by developing a pilot testing plan. A summary report was written documenting the results from the pilot testing.

HRWTF Ammonia Analysis, City of Hopewell, VA. Project Engineer. This study included completion of a data evaluation to benchmark TKN uptake performance during 2009 and early 2010 as compared to historical performance at the HRWTF. Results were summarized in a technical memorandum that identifies factors that may have contributed to elevated effluent ammonia concentrations during this time period.

Nitrogen Confirmation Testing, City of Hopewell, VA. Project Engineer. Performed bench-scale treatability testing to confirm assumed nitrifier growth rates of the BNR process associated with a mixture of domestic and industrial wastewaters to be treated in a segregated BNR treatment system at the HRWTF.

Hopewell Regional Wastewater Treatment Facility, City of Hopewell, VA. Project Engineer. Oversaw and assisted with the following treatability studies, process evaluations, designs, and plans for a 50 mgd, highly industrial WWTP that anticipates a future nitrogen permit limit: Treatment Plant Process Enhancement and Enrichment (TPPEE) Investigation, a 2 year biological nitrogen-reduction evaluation that included bench, pilot, and full-scale testing to identify cost-effective nitrogen-removal solutions that addressed inhibition and high-temperature issues. Preliminary design of phased nitrogen-reduction upgrades identified from biological nitrogen reduction evaluation.

Drew Zirkle, PE

Process/Mechanical

Firm
HDR

Industry Tenure
6 years

Education
ME, Environmental Engineering
BS, Civil Engineering

Registration/ Certifications and Training
Professional Engineer

- VA

Relevant Experience & Benefits

- Extremely familiar with HRWTF and HRWTF staff
- Design and field experience with process mechanical work
- Experienced as a field engineer for the construction of large WWTP projects

Mr. Zirkle's experience consists of planning, detail design, and construction administration services in water and wastewater treatment facilities and collection systems. As a project engineer, he has worked on the design of wastewater treatment facilities, large diameter raw water transmission mains, wastewater force mains, and collection systems. His roles have ranged from detailed design and cost estimating to construction administration and startup support. During the last year and a half, he managed the construction of the ATP Digester Gas Combined Heat and Power Project. His responsibilities were communication, planning, construction management, design support and inspection.

Select Project Experience

HRWTF Phase 1, City of Hopewell, VA. Design Engineer. Provided design support for the 50 mgd industrial wastewater treatment facility. Work included civil site and yard piping modifications for the design of high solids centrifuges, centrifuge feed pumps, cake handling and conveying equipment, polymer system, incinerator modifications, odor control facilities, and instrumentation and control modifications. Prepared a preliminary engineering report for the upgrade, including the relocation of the Primary Plant and TSS removal improvements.

Sanitary Sewer System Evaluation Surveys and Sewer Rehabilitation, City of Hopewell, VA. Assistant Project Engineer. Mr. Zirkle analyzed rainfall data to identify sewers with high infiltration/inflow. Using this information, sewer mapping was developed and deteriorated sewers were evaluated via closed-circuit television videos. Work under this project consisted of sewer rehabilitation using cured in-place pipe and manhole rehabilitation.

Basic Ordering Agreement, City of Hopewell, VA. Engineer. Provided services under task order contract. Representative task orders that Mr. Zirkle worked on Phase 2 Flow Monitoring and Pilot Area Sewer Rehab.

ATP Digester Gas Combined Heat and Power System, HRSD, Virginia Beach, VA. Project Field Engineer. Provided on-site construction services for installing two 1.1 megawatt methane gas generators and a 550 scfm rated digester gas cleaning system that provides renewable electric power for the plant. The gas cleaning system included the installation of a biological primary H_2S removal system, secondary H_2S removal system, gas blower and glycol chiller system, and siloxane removal system. Responsible for managing the construction of the project and provided design support, inspection and startup services. Management roles included overseeing the construction administration, shop drawing reviews, inspections, weekly construction meetings and monthly progress meetings. Worked closely with Plant Operations and the Contractor during design changes and coordinating startup and testing.

Northwest River WTP, Miscellaneous Modifications: Tasks 1A, 1D, and 1F, Chesapeake, VA. Design Engineer. Replaced centrifuges, flocculators, chemical feed pumps, and instrumentation and control upgrades at the plant. Work also included evaluating and designing a 2 million gallon reservoir replacement which included piping modifications to the 36-inch clearwell influent and 42-inch clearwell effluent.

Normandy Lane and City Farm Interceptor Force Main Replacements, HRSD, Newport News, VA. Lead Project Engineer. The design consists of multiple HRSD Interceptor Force Mains (IFM) and City force main relocations. Work includes relocating two 36-inch ductile iron IFM's (3,076 linear feet [LF] and 8,924 LF) and one 18-inch ductile iron IFM (3,242 LF) within City right-of-way. Design includes bypass piping and line stops, bore and jacks of major roadways and hydraulic evaluations of affected pump stations.

Daniel Dair

Process/Mechanical

Firm
WWW

Industry Tenure
9 years

Education
BS, Biology

BS, Chemical Engineering

Registration/ Certifications and Training
N/A

Relevant Experience & Benefits
- Process Design Engineer for both municipal and industrial MBBR + DAF projects.
- Technical expert with biological wastewater treatment processes

Mr. Dair started his career as a pilot engineer for the Moving Bed Biofilm Reactors (MBBR) process with the company that originally developed the patented technology, AnoxKaldnes (now Veolia). The hands on nature of the position facilitated knowledge gained through operational experience. With a concrete understanding of the technology and established design philosophy, the jump to process design engineer was straightforward. Currently, Mr. Dair leads World Water Works' intellectual property efforts and supports all client opportunities and projects in the Northeastern corridor. He has particular expertise in biological nutrient removal processes and is intimately familiarized with the DEMON® side stream process.

Select Project Experience

Ken's Foods, Inc., McDonough, GA. Process Design Engineer. Upgraded industrial WWTP treating wastewater generated in the production process of edible oils and sauces. The production capacity of the facility experiences tremendous growth leading to regular overloading of the existing conventional activated sludge (CAS) plant. In order to meet the site specific constraints, an MBBR system was design upstream of the CAS system to alleviate 60 percent of the organic load. In addition to the biological process design, responsibilities included coordination with the client and contractor regarding system mechanical requirement, maintaining plant operation throughout the construction phases, producing Process Flow Diagrams (PFD) and training the plant operation staff on the new MBBR process. Other process improvements included pumping system, blower design with after coolers, chemical feed, and process monitoring and control.

Mountaire Farms, Selbyville, DE. Process Design Engineer. Services for the addition of a biological wastewater treatment system for the wastewater generated in chicken processing activities. The facility, prior to the addition of the MBBR and DAF system, was only required to pretreat using a DAF system. When the facilities local discharge limits changed, the addition of a biological treatment was required. The client selected the MBBR process for its compact footprint and ease of operation. In addition to the biological design activities, responsibilities included coordination with the client and contractor regarding system mechanical requirement, producing PFD and startup/training the plant operation staff on the new MBBR process. The design and installation of a clarification DAF system was also required to remove the biological sludge generated in the treatment process and meet the new TSS pretreatment regulations. The current system is capable of meeting the new BOD, TKN, and TSS required by the new permit.

Water Renewal, City of Plainwell, MI. Process Design Engineer. Upgraded a municipal Rotating Biological Contactor (RBC) facility. Due to the age of the RBC system and the need for increased capacity, the city opted to decommission the existing system and install a more flexible biological treatment technology (MBBR) with additional room for expansion. The system was design for the treatment of BOD and Ammonia biologically with Phosphorous removal through metal salt addition to the secondary clarifiers. Others responsibilities: MBBR mechanical equipment layout, equipment installation inspection, operator training and startup oversight.

Noman M. Cole, Jr. Pollution Control Plant, Lorton, VA. Junior Process Design Engineer. This is the largest denitrifying MBBR system in the U.S. In order to meet new regulations (stringent total nitrogen limits), the facility selected the MBBR technology for is flexibility and proven track record as a top post-denitrification technology. Responsibilities included supporting the main process designer, performing detailed calculations regarding mixing requirements, post aeration requirements, sieve loading, etc. During the design process, alternative mixing technologies were evaluated along with the addition of "heavy" type carries.

Brian Ellington, AIA, NCARB

Architectural

Firm
HDR

Industry Tenure
14 years

Education
BA, Architecture

Registration/ Certifications and Training
National Council of Architectural Registration Boards

American Institute of Architects

- VA, WV, SC, NC, PA, GA, FL, DC

Relevant Experience & Benefits

- Over 9 years of architectural design experience exclusively on water and wastewater treatment facilities, understands special design needs for these projects
- Extensive understanding of building codes and how they apply to water and wastewater buildings

Mr. Ellington has 14 years of experience in architectural design of buildings, including water and wastewater treatment, office, laboratory, administration, and maintenance buildings; along with renovations and additions to existing buildings. Architectural design responsibilities include schematic building design, 3D modeling and rendering for presentations; preparation of construction drawings and specifications; architectural cost estimating; building material research; construction administration; shop drawing review; and construction observation.

Select Project Experience

VIP NRI, HRSD, Norfolk, VA. Architect. HDR is working to upgrade the 40 mgd Virginia Initiative Plant. Nutrient reduction improvements are necessary for compliance with near-term and future requirements specified in the Virginia Watershed Implementation Plan. Challenges include tight site conditions, an aggressive schedule, and the need for an operator-friendly design that minimizes chemical and energy use to achieve a low life cycle cost. HDR is responsible for preliminary engineering, final design, bidding, contract administration, field engineering and inspection, startup and testing, operations and training, and post-startup and certification services. Project Value: $100 million.

Town of Cary, Cary/Apex WTF Phase III Expansion, Cary, NC. Architect. Currently providing final design services for plant process facility buildings and an expansion to the existing administration building. The administration building renovation and expansion includes a two-story addition with a new laboratory, offices, conference room, electronics shop, locker rooms, and storage.

City of Winston-Salem, Reedy Fork Pump Station, Winston-Salem, NC. Architect. Design of a new 2,200 gpm triplex wastewater pump station, 40,000 LF of 16-inch force main, 2,000 LF of gravity sewer, and the decommissioning of the existing Reedy Fork Pump Station.

Crowder Construction Company, CMU - McAlpine Creek WWMF Filters, Charlotte, NC. Architect. Design of four new filter enclosure structures used for the operation and maintenance of the existing and new filters.

HRSD General Engineering Services (GES) Contract 2010-2013, VA. Architect. Currently providing engineering services to all of HRSD's facilities, including treatment plants, pump stations, and interceptors. Services include analysis, design, construction administration, inspection, and specialty studies.

City of Dallas, Texas, Central WWTP Grit and Headworks Improvements. Architect. Providing architectural design support for the HDR office in San Antonio, TX. Addition and renovation for the White Rock grit facility. The design includes code compliance review, plans, elevations, sections, and specifications for the grit facility renovation.

Robert Baysden, PE

Site/Civil

Firm
HDR

Industry Tenure
18 years

Education
MBA, Business Administration

BS, Civil Engineering

Registration/ Certifications and Training
Professional Engineer

- VA, NC, SC, WV, GA

ISI Envision Sustainability Professional

LEED Accredited Professional for Building Design + Construction

Relevant Experience & Benefits

- Resourceful with erosion control, site layout and storm water conveyance
- Technical design experience of drainage systems within water and wastewater treatment plants

Mr. Baysden has 18 years of civil engineering experience in the land development industry covering most business sectors private and public. He has significant experience in site planning, grading and earthwork analysis, storm water conveyance and management, sediment and erosion control, as well as sanitary sewer and water distribution systems. His experience in both design and management fosters clear communication between clients and regulatory agencies, developing clear engineering solutions to site civil challenges.

Select Project Experience

Sugar Creek WWTP Expansion, CMU, Charlotte, NC. Senior Civil Engineer. Providing engineering direction for a new fuel station, storm drainage improvements and turning movements. Provided erosion control and site layout information.

Cary/Apex WTP Phase III Expansion, Apex, NC. Site Civil Quality Control Reviewer and Engineer of Record. Design included stormwater quality, erosion control, site layout, storm water conveyance, and associated raw water pump station improvements.

NW Campus Water & Sewer Extensions, City of Greensboro, Greensboro, NC. Civil Engineer. Utility project to serve the future Guilford Technical Community College Northwest Campus and development in the associated drainage basin. Utilities included 2,713 linear feet (lf) of 6" water main, 2,320 lf of 8" water main, 11,385 lf of 12" forcemain, 2,790 lf of 12" gravity sewer, 2,829 lf of 16" gravity sewer, 10,422 lf of 16" water main and regional pump station. Project entailed easement evaluation, erosion control and NCDOT right-of-way encroachment agreements for the entire project working closely with the city, county and school.

Simons Solar, Phoenix Solar, Inc., Social Circle, GA. Civil Engineer. Provided Erosion Control and Storm Water Management in support of a 169 Acre Solar Farm in Social Circle, Georgia. Due to sensitive stream buffers and wetlands, along with challenging terrain, the site required twelve erosion control basins with six of them being converted to permanent wet-ponds. Worked closely with Georgia Environmental Protection to develop a phased erosion control plan that would allow the contractor to grade more than 50 Acres at one time to remain on schedule.

Various Stormwater Projects, City of Charlotte, Charlotte, NC. Project Manager for M-Team Contract. Projects included Hydrologic and Hydraulic Analysis of existing watersheds and existing storm systems in addition to developing proposed solutions, modeling those solutions and producing construction documents to complete. Projects included improvements to Euclid Avenue, Broadview Drive and Sunnymede Lane.

Design-Build Queens University Residence Hall & Parking Deck, Stormwater Management, & Utility Improvements, InterCon Building Corporation, Charlotte, NC. Land Development Site Civil Engineer. Work included the demolition of tennis courts, roadways and existing utilities while providing new utility routing in support of a new, combined, residence hall and parking deck. Storm water management was provided in two vaults, with erosion control being designed in a multiple phase sequencing to facilitate construction in dense and active University campus. Project also consisted of a new private sewer system, water distribution system, parking, truck turning analysis, and hardscape.

Henry Antshel, PE

Structural

Firm
HDR

Industry Tenure
44 years

Education
BS, Civil Engineering

Registration/ Certifications and Training
Professional Engineer

- VA, SC, NC, PA, MD, GA, OH, NY, MI, OR

Relevant Experience & Benefits

- Long, successful career in design of significant water and wastewater facilities
- Practical, logical approach to problem solving

Mr. Antshel has extensive structural engineering design and analyses experience concentrated in the water, environmental, industrial, and municipal facilities; power and energy; waste; and metals sectors. He has special skills in construction, rehabilitation and repair, vessel design, and protective coatings. Mr. Antshel has diverse experience in the heavy industrial process arena, including experience in managing and coordinating large projects and multi-disciplined principal and staff activities.

Select Project Experience

HRWTF Phase 1, City of Hopewell, VA. Structural Engineer. Responsible for design of upgrades for improvements at this municipal/industrial WWTP. New domestic treatment facilities were constructed to include fine screening and vortex grit removal facilities. Three of the existing rectangular primary clarifiers were retrofitted to serve as combined primary clarifiers and chlorine contact tanks.

ATP Expansion Phase I, HRSD, Virginia Beach, VA. Structural Engineer of Record. Improvements included expansion of headworks with fine screening and vortex grit removal tanks, 12.3 million-gallon two-pass biological treatment aeration basin, relocation of the centrifuges adjacent to the cake storage pad to eliminate cake hauling operation (saving $250,000+ in annual O&M costs), new centrifuge dewatering building, four new gravity belt thickeners for waste activated sludge thickening, converting the biosolids holding tanks to acid-phase digester to increase volatile solids reduction by 10 percent (saving $200,000+ annually in land application and dewatering chemical costs), conversion of six existing primary and secondary digesters to gas-phase digesters, blower facility, addition of two primary clarifiers, addition of two 160 feet diameter secondary clarifiers and rehabilitation of four existing secondary clarifiers, two chlorine contact tanks, addition of one effluent pump, primary scum handling and concentration facility, plant drain pumping station, and distributed control system. Project Value: $164 million.

Army Base Treatment Plant Improvements Phase III, HRSD, Norfolk, VA. Structural Engineer. HDR provided engineering and construction services for the modifications and enhancements to the waterfront facility. Designed and currently constructing a new preliminary treatment facility, raw waste influent pump station, grit removal facilities, enhanced nutrient removal facilities, blowers, secondary clarifiers and RAS pump station modifications. New gravity belt filter facilities, incinerator modifications, numerous biosolids treatment system upgrades and modifications, and chemical facilities. Project overall cost is $88 million and included rehabilitation of older structures and numerous new facilities, all on piled foundations. Project Value: $80 million.

VIP NRI, HRSD, Norfolk, VA. Senior Structural. Upgrading the 40 mgd VIP. Nutrient reduction improvements are necessary for compliance with near-term and future requirements specified in the Virginia Watershed Implementation Plan. Challenges include tight site conditions, an aggressive schedule, and the need for an operator-friendly design that minimizes chemical and energy use to achieve a low life cycle cost. HDR is responsible for preliminary engineering, final design, bidding, contract administration, field engineering and inspection, startup and testing, operations and training, and post-startup and certification services. Project Value: $100 million.

York River Treatment Plant Composting Facility Design-Build, HRSD and Crowder Construction, Seaford, VA. Senior Structural Engineer. The $44 million project included the complete design of a fully enclosed and odor controlled composting facility to process 23 dtpd of biosolids into a "Class A" compost/soil conditioning product. The project included a new control building and a 209,000 scfm synthetic media biofilter for odor control.

Christopher Alcorn, EIT

Instrumentation and Controls

Firm
HDR

Industry Tenure
5 years

Education
BSE, Chemical Engineering

Registration/ Certifications and Training
Engineer in Training

- NC

Relevant Experience & Benefits

- Process Engineer Experience
- Instrumentation & Controls Experience

Mr. Alcorn is a chemical engineer with experience in the water/wastewater treatment industry which includes general system design tasks with a current focus on Human Machine Interface (HMI) Design and PLC programming. He is also experienced as a process engineer for multiple design-build projects. As a process engineer, Mr. Alcorn has created design-build documents including specifications, P&IDs, PFDs and cost estimation documents.

Select Project Experience

Interceptor SCADA System Upgrade Preliminary Engineering, HRSD, Virginia Beach, VA. Process Engineer. Responsible for development of database of remote pump station sites and existing equipment inventory. Developed overall system architecture diagrams for SCADA systems.

Regional Municipality of Durham SCADA Upgrade, NC. Process Engineer. Responsible for development of HMI graphics, database integration, and system testing of new control elements to be integrated into the existing SCADA System. System utilizes the GE iFIX HMI/SCADA Software. Duties also included participation in the development of PLC programming using Proficy ME and GE PACS.

SCADA HMI Upgrade, Charles County Department of Utilities, MD. Process Engineer. Responsible for development of database for a HMI database from existing documentation for a Wonderware Intouch/System Platform HMI/SCADA system. Duties also included collation and review of HMI standards.

Adhesive Plant Preliminary Design/Price Estimate. Process Engineer. Development of P&IDs. Creating an overall equipment list for the proposed project as well as price estimation for each piece of equipment. Equipment specification used to obtain budgetary price information.

Adhesive Plant Detailed Design. Process Engineer. Development of P&IDs. Equipment specification for Pumps, Stainless Steel Tanks, FRP Tanks and Heat Exchangers. Equipment specification bid reviews. Development of Equipment Arrangement drawings. Pipe sizing. Multidiscipline coordination from the kickoff meeting until the end of the project. The discipline coordination involved Process, Piping, Electrical, Structural as well as the Mechanical Contractor.

Glass Manufacturing Plant – Plant Design. Process Engineer. Multidiscipline coordination from the kickoff meeting until the end of the project. The discipline coordination involved process, piping, electrical and structural as well as the mechanical contractor. Development of Utility Flow Diagrams and P&IDs for the RO System, compressed air, wastewater, and natural gas. Equipment specifications including boilers, air compressors, centrifugal pumps and air diaphragm pumps. Pipe sizing. Equipment specification bid reviews.

Tower Replacement Project at Carbon/Graphite Plant. Process Engineer. P&ID development. Developing a pipe specification document. Equipment specification for the cooling tower, pumps and valves. Equipment specification bid reviews. Multidiscipline coordination between the Process, Piping and the Instrumentation and Controls departments.

Larry Anderson, PE

Electrical/I&C

Firm
HDR

Industry Tenure
34 years

Education
BS, Electrical Engineering

Registration/ Certifications and Training
Professional Engineer

- VA, MD, SC, NC, PA, DC, OH, WV, VT, MA, NJ, TX, TN, GA, FL, DC, NY, AL, AZ, CA, HA, IL, KY, LA, NV, NM

Relevant Experience & Benefits

- Design Engineer for several WWTP design-build projects
- Familiarity with environmental and code issues with respect to WWTPs

Mr. Anderson's responsibilities include instrumentation and control (I&C) and electrical distribution design. His experience primarily has been focused on WWTP/WTP and pump station design utilizing design/bid/build and design-build delivery systems. His I&C experience includes supervisory control and data acquisition (SCADA) for system monitoring and control utilizing programmable logic controllers (PLC), computer-based networks, human-machine interface (HMI), relay logic controls, data communications utilizing copper and/or fiber optics, wireless communications utilizing radio, cellular or satellite. Mr. Anderson's more specific electrical experience includes back-up electrical power system design, indoor/outdoor lighting design, energy calculations, estimating electrical construction costs, electrical design for hazardous locations, overhead and underground distribution of high voltage circuits, fire alarm and signal systems, lightning protection, security systems, access control, closed-circuit TV design and layout, circuit breaker and relay coordination, load studies, fault current and voltage drop calculations and studies, and energy audits.

Select Project Experience

VIP NRI, HRSD, Norfolk, VA. Electrical Engineer. HDR is working to upgrade the 40 mgd Virginia Initiative Plant. Nutrient reduction improvements are necessary for compliance with near-term and future requirements specified in the Virginia Watershed Implementation Plan. Challenges include tight site conditions, an aggressive schedule, and the need for an operator-friendly design that minimizes chemical and energy use to achieve a low life cycle cost. HDR is responsible for preliminary engineering, final design, bidding, contract administration, field engineering and inspection, startup and testing, operations and training, and post-startup and certification services. Project Value: $100 million.

Cedar Creek WWTP (CCWWTP) Design-Build Project, Louisville MSD. Electrical/I&C Engineer. CCWWTP was a design-build project for an average daily flow at 7.5 MGD and a peak hydraulic capacity of 32.5 MGD. Unit processes include influent pump station, grit collector, biological treatment/ oxidation ditches, biological phosphorus removal, clarifiers, filters, UV disinfection, post aeration, RAS/WAS pump station and sludge holding tanks. Total project cost is $12,043,636. The electrical/I&C design included power distribution, lighting, hazardous location requirements, lightning protection, motor controls, MCCs, VFD controllers, PLC based SCADA system, instrumentation and controls.

Fort Meade Water and Wastewater Improvements, Fort Meade, MD. Electrical/I&C Engineer. This design-build project included water and sewer pipeline replacement, design of new water storage tanks, design of new ENR facilities, design of a sludge dryer, and Sewer System Evaluation Survey of the collection system. Mr. Anderson performed the following WTP plant improvements: new filters, high service pump station upgrade, new chemical facilities, new filters, high service pump upgrade, backwash pump upgrade, new chemical facilities, new generators and automatic transfer switches, well pump upgrades, and radio telemetry system. The WWTP expansion included screening upgrade, UV disinfection, aeration upgrade, chemical facilities, remote pump station upgrade and new SCADA and control system.

Floyds Fork WWTP Design-Build, Louisville MSD. Electrical/I&C Engineer. This was the first design-build municipal WWTP project in Kentucky. Unit processes include influent pump station, grit collector, biological treatment/ oxidation ditches, biological phosphorus removal, clarifiers, filters, UV disinfection, post aeration, RAS/WAS pump station and sludge holding tanks. The electrical/I&C design included power distribution, lighting, hazardous location requirements, lightning protection, motor controls, MCCs, VFD controllers, PLC based SCADA system, instrumentation and controls.

Joel Johnson, PE

HVAC/Plumbing

Firm
HDR

Industry Tenure
25 years

Education
BS, Mechanical Engineering

Registration/ Certifications and Training
Professional Engineer

- VA, SC, NC, TN, MO, OH, NY, LA, IN, FL, AL, GA

Relevant Experience & Benefits

- 15+ years of WWTP HVAC and plumbing design using energy efficient technologies

Mr. Johnson has more than 25 years experience as a mechanical systems design engineer and project manager concentrating in fluids and heat transfer applications. His experience includes building HVAC and plumbing systems focusing on energy savings, thermal comfort and water use reduction. Representative project experience is provided below.

Select Project Experience

ATP Expansion Phase I, HRSD, Virginia Beach, VA. Senior Mechanical Engineer. Provided site and building water distribution (plumbing) modifications for multiple buildings. Project Value: $164 million.

Design-Build Mine WTP, Buchanan, VA. Senior Mechanical Engineer. As part of a design-build consortium for a major coal mining company, HDR was the facility engineer for a 2 MGD Zero Liquid Discharge (ZLD) water treatment system based on membrane and thermal processes. Objectives were to simultaneously dewater a flooded inoperable mine seam and to treat the water for subsequent reuse in nearby coal washing operations. HDR's scope included civil, structural, and electrical design as well as unit process integration, piping, conveyance, and chemical systems. As Senior Mechanical Engineer, designed elements of the HVAC, plumbing and fire protection standpipe system for the main facility.

York River Treatment Plant Composting Facility Design-Build, HRSD and Crowder Construction, Seaford, VA. Senior Mechanical Engineer. Provided fire protection sprinkler and compressed air systems design.

WWTP Master Plan and Modeling, Greenville Utilities Commission, Greenville, NC. Senior Mechanical Engineer. Evaluated all HVAC and plumbing systems on site and made recommendations for replacement and improved operation. HDR created a master plan to develop a comprehensive strategic plan which integrates wastewater treatment and operations. Key elements included asset management study/plan; future regulatory scenarios analysis; wastewater quality improvement analysis; and energy efficiency analysis.

Sugar Creek WWTP Expansion, CMU, Charlotte, NC. Mechanical Engineer. HDR provided design for expansion from a permitted capacity of 20 mgd to 28 mgd, with provisions to expand to 32 mgd or more in the near future. As Senior Mechanical Engineer designed HVAC and plumbing systems for multiple buildings on the site.

WWTP Upgrade, Thomasville, NC. Senior Mechanical Engineer. Designed laboratory building HVAC and lab hood exhaust systems, lab gas, vacuum, hot and cold water plumbing distribution and waste/soil systems. Added LPG farm and gas distribution system for facility. Designed aeration system centrifugal and rotary blowers, and distribution and basin piping. Added anaerobic digester covers, sludge heaters, chopper pump mixers, and transfer rotary/recessed impeller pumps and controls.

WWTP Upgrade, Lexington, NC. Senior Mechanical Engineer. Designed upgrade to plant chemical treatment system, adding chemical tanks, retention system, pipes/metering pumps and control. Designed complete replacement for aeration system by adding blowers, piping, controls and basin distribution manifolds.

WWTP Upgrade, Lincolnton, NC. Senior Mechanical Engineer. Designed anaerobic digester upgrades, covers, vertical mixers, sludge transfer piping/pumps, gas collection and flaring, boiler/sludge HX, dissolved air floatation thickener, solids contact reactor, contact basin pumps, flushing water system, chemical storage tanks and plant distribution piping.

Glenn Barin PE, PMP, CCM

Lead Construction Manager

Firm
HDR

Industry Tenure
30 years

Education
BS, Construction Engineering

Registration/Certifications
Professional Engineer
- CA, TX

Licensed Contractor
- ID, SC, LA

Certified Construction Manager (CCM)
Project Management Professional (PMP)
Construction Quality Manager (CQM)

Relevant Experience & Benefits
- 10+ years of relevant experience in responsible charge of large and complex municipal and industrial water and wastewater utility projects.
- Led multiple infrastructure project delivery teams recognized nationally by the DBIA and the CMAA.

Mr. Barin has 30 years of experience performing multiple roles on water and wastewater construction projects throughout the country. As an expert in Alternative Delivery, Mr. Barin has led projects and teams recognized nationally by the Construction Management Association of America (CMAA) and Design-Build Institute of America (DBIA). He brings practical and diverse expertise to complex water and wastewater projects and is skilled at handling demanding schedules and tight budgets. Mr. Barin has exemplary skills in partnering, project management, construction engineering, team development, and safety, including hands-on experience in multiple construction trades. He consistently delivers high-quality projects and high client satisfaction while minimizing risks.

Select Project Experience

North RO WTP Progressive Design-Build, City of Cape Coral, FL. Construction Manager. Mr. Barin joined this project at month 10 of a three-year project constructing a new RO WTP facility, including well field, clearwell, pump station, AST, RO treatment system, a two-story administration-laboratory building, and radio SCADA system. The project schedule had dramatically slipped and client relations were deteriorated. Mr. Barin developed a strategy to construct the project within the required time and budget, and assumed operational control of the project. He prioritized the goals of the project into achievable targets and focused the delivery team to effectively execute construction fundamentals and control risks. The efforts of the new construction team resulted in a successful turnaround, client appreciation and a Corporate President's Award for Most Improved Project. Over 700,000 work hours were logged with Zero Lost Time Accidents. This $111 million project received a national "Water Projects over $50M, Merit Award" from the DBIA.

Corona Del Mar WTP Phase II Upgrades Progressive Design-Build, Goleta Water District, Goleta, CA. Construction Manager. Mr. Barin led this project from start to finish, achieved high customer satisfaction, maintained budget, and retrofit multiple processes without any disruption to the plant's 35 years of operation. His delivery team turned over the completed facility within the required time frame and with Zero LTA. This $23M project included a Laboratory and Operations building that received LEED Gold. The Construction Management Association of America selected this project as the "Best Infrastructure Project, under $50 million" in 2008. It was also recognized by the DBIA for "Excellence in Water Infrastructure" in 2009.

Napa River Flood Control Program Phase 2 Design-Build, U.S. Army Corps of Engineers (USACE), CA. Construction Manager. Mr. Barin planned and supervised construction to move over 400,000 tons of soil, transport and disposal of 145,000 tons of TPH-contaminated soils off site within a 10 week period. The work required extensive excavation, ½-mile of sheet piles, a dewatering and treatment system to manage 50 million gallons of contaminated water, and grading to re-sculpt the east riverbank immediately adjacent to downtown Napa. The project had Zero Lost Time Accidents. $12.1 million.

300 kW, 2.9 Million BTU Cogeneration Pilot Station for WWTP Design-Build, Escondido, CA. Construction Manager. Mr. Barin oversaw the pre-project planning, design, preconstruction, construction, and commissioning of this pilot station. The station is integrated with the existing WWTP anaerobic digesters to recover methane that powers microturbine generators that produce electricity for peak shaving and capturing generator exhaust for heating digester tank recirculation water – an 85 percent efficient process. He also presented the project at technical conference in 2001. $1.4 million.

Jim Bergloff

Civil/Structural Superintendent

Firm
PC Construction

Industry Tenure
26 years

Education
N/A

Registration/ Certifications and Training
First Aid/CPR and AED

OSHA 10-hour

Field training: confined space, injury management, scaffold, fall protection, excavation, steel erection, lockout/tagout, crane awareness, rigging

Relevant Experience & Benefits

- Extensive WTP and WWTP experience
- Thorough understanding of the scheduling requirements for tie-ins to existing systems without disruption of flows

Mr. Bergloff's extensive experience constructing, expanding and upgrading water and wastewater treatment plants comes from a lengthy history of field exposure, beginning as a carpenter and progressing to project superintendent. As a project superintendent with PC, Mr. Bergloff manages all field operations and subcontractor activities. He maintains responsibility for all work activities in accordance with the schedule while ensuring the project requirements and goals are met and work is performed to the highest quality.

Select Project Experience

Tupelo Bayou WWTP Improvements, Conway Corporation, Conway, AR. Project Superintendent. Project Value: $66.3 million.

Triangle WWTP Expansion Phase 3, City of Durham, Durham, NC. Project Superintendent. Project Value: $10.7 million.

R. A. Thomas WTP Improvements, Winston-Salem/Forsyth County Utility Commission, Winston-Salem, NC. Project Superintendent. Project Value: $56.3 million.

Durbin Creek WWTP Expansion, Renewable Water Resources, Fountain Inn, SC. Project Superintendent. Project Value: $39.2 million.

Northwest WTP Improvements, Winston-Salem/Forsyth County Utility Commission, Lewisville, NC. Project Superintendent. Project Value: $51.7 million.

South River Water Reclamation Center Upgrades, City of Atlanta, Atlanta, GA. Project Superintendent. Project Value: $4 million.

McAlpine Creek Residuals Management Facility, Charlotte-Mecklenburg Utilities, Pineville, NC. Project Superintendent. Project Value: $13.7 million.

Davis WWTP Expansion, North Charleston Sewer District, Charleston, SC. Project Superintendent. Project Value: $22.6 million.

Mauldin Road WWTP Expansion, Renewable Water Resources, Charleston, SC. Project Superintendent. Project Value: $28.1 million.

USACE, Dos Rios Solids Handling Facility, San Antonio, TX. Project Superintendent. Project Value: $8.7 million.

USACE, NISE East Engineering Center Naval Weapons Station, Charleston, SC. Project Superintendent. Project Value: $32 million.

Henry Lee

Mechanical Superintendent

Firm
PC Construction

Industry Tenure
30 years

Education
N/A

Registration/ Certifications and Training
OSHA 10-Hour

First Aid/CPR and AED

Field training: confined space, excavation, fall protection, scaffold awareness, lockout/tagout, signaling, crane awareness, steel erection

Relevant Experience & Benefits

- Extensive experience with large mechanical and electrical systems, building instrumentation and controls systems
- Effective at fully implementing commissioning processes

Mr. Lee has extensive experience with the installation and coordination of multiple disciplines, ensuring project costs and schedule goals are met. He is adept at logistics, scheduling, materials planning and purchasing, submittal reviews, subcontractor coordination and field quality control. As a trade superintendent, Mr. Lee provides direction to all subcontractors on the layout and installation of pipe and utilities throughout the site. He resolves conflicts through early coordination meetings and detailed drawings review, and is intimately involved with project commissioning and is responsible for start-up inspections.

Select Project Experience

H.L. Mooney Water Reclamation Facility Expansion and Upgrade Stage 2 Phase 1, Prince William County Service Authority, Woodbridge, VA. Trade Superintendent. Design-Build. Project Value: $118.8 million.

H.L. Mooney Water Reclamation Facility Phase 1B Odor Control System, Prince William County Service Authority, Woodbridge, VA. Trade Superintendent. Project Value: $5.1 million.

Corbalis WTP Phase III, Fairfax County Water Authority, Herndon, VA. Trade Superintendent. Project Value: $159.1 million.

Linton Hall Lift Station, Prince William County Service Authority, Manassas, VA. Mechanical Foreman. Project Value: $9.8 million.

Fuller Heights Lift Station B, Prince William County Service Authority, Triangle, VA. Mechanical Foreman. Project Value: $2.6 million.

H.L. Mooney WWTP Expansion and Upgrade, Prince William County Service Authority, Woodbridge, VA. Mechanical Foreman. Project Value: $33 million.

South River Water Reclamation Center Improvements City of Atlanta, Atlanta, GA. Mechanical Foreman. Project Value: $63.5 million.

Lake Blalock WTP, Spartanburg Water Commission, Spartanburg, SC. Mechanical Foreman. Project Value: $30.4 million.

Abingdon WTP, Harford County Department of Public Works, Abingdon, MD. Mechanical Foreman. Project Value: $13.4 million.

John Seaman

Technical Advisor

Firm
Heyward

Industry Tenure
36 years

Education
BS, Biology

Registration/Certifications
Wastewater Works Operator License (WWWOOSSP #1965003158)

- VA

Relevant Experience & Benefits

- Licensed Class 1 Wastewater Plant Operator
- Virginia Tech/DEQ Operator Short School Instructor
- WWW MBBR Pilot Plant Operations Team Member

Mr. Seaman is Vice President at Heyward and has been with the company for 23 years. Prior to joining Heyward, Mr. Seaman was Director of Utilities for the City of Franklin, Virginia, and was responsible for the operation of the City's WTPs and WWTPs, and utility systems. He is a licensed Class 1 WWTP Operator, and has been an instructor at the Virginia Tech/ Virginia DEQ Annual Operator's Short School for 34 years, teaching wastewater treatment biology and biological treatment processes to plant operators seeking State certification. He has wide-ranging practical experience with wastewater plant operations and biological treatment processes, and in the design and operation of process treatment equipment and systems. He was directly involved as a WWW team member with the Hopewell MBBR Pilot Plant program, including pilot unit set-up and commissioning, process controls, troubleshooting, test program protocol, and provided continuous oversight of the testing program. He will provide invaluable on-site technical support to HDR and PC during equipment installation and commissioning to ensure the equipment is installed, started-up and operated correctly, and achieves the specified performance for the system. He will also assist in training the HRWTF Operators in proper operation of the new MBBR equipment, and will provide local technical support to the plant on a long-term basis after the equipment is placed into operation.

Select Project Experience

James River Treatment Plant (TP) Nutrient Upgrades, HRSD, Newport News, VA. Technical Support. Provided support to HRSD plant operating staff, the engineer, and contractor for installation of full-scale pilot demonstration of Integrated Fixed-Film Activated Sludge (IFAS) treatment system in one of eight process trains, and after successful demonstration testing, provided technical support for procurement, installation and commissioning of IFAS treatment system equipment for the entire 20 mgd TP.

York River TP Demon Demonstration Plant, HRSD, Seaford, VA. Technical Support. Provided support to HRSD plant operating staff, the engineer, and contractor for installation of full-scale Demon demonstration plant for anammox side-stream treatment for ammonia reduction in centrifuge centrate at this 15 mgd TP.

HRWTF, Hopewell, VA. Technical Support. For over 20 years, John has provided personalized technical support to the HRWTF staff including consultation for equipment upgrades or replacements, spare parts and service support, troubleshooting, and warranty repairs and replacements, for numerous process equipment installed at the plant furnished over the years by manufacturers that Heyward represents. The various projects where Mr. Seaman and Heyward have provided equipment and service support to HRWTF include: Centrifuge Dewatering Facility, Domestic WWTP Pump Station, Rehabilitation of the Primary and Secondary Clarifiers, Installation of Post-Aeration Static Aerators, and most recently the Segregated Domestic Headworks and Primary Clarifier Modifications. Mr. Seaman is very familiar with the design and operation of the HRWTF, and personally knows and works well with the plant operating and maintenance staff, which will be beneficial to Hopewell for the successful installation and commissioning of the new proposed MBBR treatment process.

Technical Support, Various Clients. Technical Support. Provided support and process equipment sales and service for plant upgrades at the following municipalities: HRSD Atlantic TP (Virginia Beach); HRSD Nansemond TP (Suffolk); HRSD Boat Harbor TP (Newport News); HRSD Williamsburg TP; Henrico County Regional WRF; Emporia WWTP; Chesterfield County Proctor's Creek and Falling Creek WWTPs; City of Richmond WWTP; DC Water Blue Plains WWTP; City of Baltimore Back River and Potapsco WWTPs.

Torben Fuessle

Project Engineer

Firm
PC Construction

Industry Tenure
9 years

Education
BS, Construction/ Mathematics

Registration/ Certifications and Training
PC Leadership Development Program

OSHA 10-hour

First Aid/CPR and AED

Field training: fall protection, scaffold awareness, excavation, rigging level 1, injury management

Relevant Experience & Benefits
- Experience with buyout, procurement and coordination of bid packages
- Adept at monitoring and overseeing multiple subcontractor activities

Mr. Fuessle brings demonstrated leadership capabilities and technical construction skills with a focus on water and wastewater treatment projects. Having held positions in field engineering, project engineering, estimating, scheduling, submittal coordination and site supervision, Mr. Fuessle's well-rounded experience aids in the successful execution of the construction project. Mr. Fuessle is responsible for overall project administration and management, scheduling and cost reporting. He plans, monitors and manages construction activities to ensure compliance with all requirements and project goals.

Select Project Experience

Tupelo Bayou WWTP Improvements, Conway Corporation, Conway, AR. Project Controls. Project Value: $66.3 million.

HRWTF Expansion, City of Hopewell, Hopewell, VA. Project Engineer. Project Value: $9.1 million.

Virginia American Water Company, City of Hopewell, Hopewell, VA. Project Engineer. Design-Build. Project Value: $22 million

R.A. Thomas WTP Improvements, Winston-Salem/Forsyth County Utility Commission, Winston-Salem, NC. Project Engineer. $56.3 million.

Sugar Creek WWTP Pump Station, Charlotte-Mecklenburg Utilities, Chapel Hill, NC. Project Engineer. Project Value: $45.9 million.

Mason Farm WWTP Upgrade and Improvements, Orange Water and Sewer Authority, Chapel Hill, NC. Project Engineer. Project Value: $40.5 million.

Sarah Bettmann

Project Engineer

Firm
HDR

Industry Tenure
10 years

Education
BS, Construction Management

Registration/ Certifications and Training
OSHA 10-Hour Construction Safety,

Construction Industry Technician

Relevant Experience & Benefits

- Experience with buyout, procurement and coordination of bid packages
- Adept at monitoring and overseeing multiple subcontractor activities

Ms. Bettmann has 10 years project controls experience working on wide range of design-build projects including water and wastewater facilities for industrial and municipal clients. Ms. Bettmann's responsibilities include managing multiple prime contracts, and their associated subcontracts and purchase orders, maintenance of contractual agreements, certificates of insurance, payment & performance bonds, RFIs, submittals, invoicing, and managing project costs. She is involved with the closeout of projects obtaining final lien waivers, and preparing project documents for archiving. She also assists with daily field construction operations, scheduling, and safety. Ms. Bettmann's other duties involve the pursuit of new work from estimating, bidding, proposal development and submission, through prime contract execution.

Select Project Experience

Los Alamos National Security LLC, Los Alamos National Laboratory (LANL), Sanitary Effluent Reclamation Facility (SERF), Los Alamos, NM. Project Controller. HDR provided integrated design-build services to perform all work necessary to design and construct the expanded SERF and infrastructure. Working closely with LANL construction management personnel, HDR completed the project within the 14 month contract time frame. HDR successfully managed 18 subcontractor companies through LANL's stringent safety program without a single first-aid incident or serious injury.

Perchlorate Treatment Design-Build AEP-3 Project, City of Pomona, Pomona, CA. Project Controller. HDR was contracted to design, construct, start up, complete acceptance testing and provide permitting assistance for a 16.6 mgd perchlorate anion exchange treatment plant. Design included providing intermediate pumping to deliver the finished water to Reservoir 6, redundancy of process equipment, security for the facility, and incorporation of the system operation into the City's SCADA network and with the existing AEP processes.

Design-Build Groundwater Treatment System, Henderson, NV. Project Coordinator. HDR completed an integrated design-build contract to modify and expand a groundwater treatment system using a fluidized bed reactor (FBR) system. The owner operates a groundwater treatment system to remove perchlorate. The FBR system is sized to reduce up to 230 parts per million (ppm) of perchlorate (up from 130 ppm) in the groundwater to non-detect levels (per EPA Method 314.0), as well as the oxygen, chlorate and nitrate in a flow of up to 800 gallons per minute (gpm).

Aquifer Storage and Recovery (ASR) System, Boise White Paper LLC, Wallula, WA. Project Controller. Under an integrated design-build delivery contract, HDR designed and constructed the ASR project. The ASR is designed to supply the plant with 3 MGD of cool stored water during the summer months, which will displace the use of 5 MGD of warmer river water. HDR professional services for this project included: water quality testing; ASR feasibility study; regulatory coordination and permitting; design; construction; and startup.

Far West 4 mgd Water Treatment Plant, Far West Water & Sewer Inc., Yuma, AZ. Design-Build Project Engineer. HDR was contracted to design and construct a new 4 mgd water treatment facility to support its existing plant #1. The project involved a two-phased design-build approach, with Phase 1 being broken into a Membrane Filtration Pilot Study and Program Development. Upon completion of the Membrane Filtration Pilot Study, and consistent with its findings, HDR secured a Notice to Proceed for project Program Development and Design.

Alyss Nolan

Project Engineer

Firm
HDR

Industry Tenure
3 years

Education
BS, Construction Engineering

Registration/ Certifications and Training
OSHA 10-Hour Construction Safety

Relevant Experience & Benefits
- Experience with buyout, procurement and coordination of bid packages
- Adept at monitoring and overseeing multiple subcontractor activities

As a construction project engineer, Ms. Nolan's responsibilities include managing multiple prime contracts, and their associated subcontracts and purchase orders, maintenance of contractual agreements, certificates of insurance, payment & performance bonds, Requests for Information (RFI), submittals, invoicing, and managing project costs. She is involved with the closeout of projects, obtaining final lien waivers, and preparing project documents for archiving.

Select Project Experience

Anaerobic Digester Facility EPC, EDF Renewable Energy, Heartland Biogas, LLC, LaSalle, CO. Construction Project Engineer. HDR is contracted for the design, construction and startup of the $33.7 million Heartland Biogas anaerobic digester facility near Greely, Colorado. HDR's scope of services includes engineering design for Phases 1A and 1B, and construction, including subcontracting, procurement and commissioning of operations. The Heartland digester facility is expected to be fully operational in 2015 and capable of exporting up to 1.5 million British Thermal Units annually, making it the largest anaerobic digester facility in North America.

Arthur H. Bridge Water Treatment Plant, Cucamonga Valley Water District (CVWD), Rancho Cucamonga, CA. Construction Project Engineer. Design-Build contract to upgrade the Arthur H. Bridge Water Treatment Plant to an optimized design capacity of 2.0 MGD plus provide an additional 1.0 MGD of standby capacity. HDR is working with the District to restore the intake to its original condition and its consultants and permitting agencies to upgrade the intake to a more reliable and self-sustaining design.

ASR System, Boise White Paper LLC, Wallula, WA. Construction Project Engineer. Under an integrated design-build delivery contract, HDR designed and constructed the ASR project. The ASR is designed to supply the plant with 3 MGD of cool stored water during the summer months, which will displace the use of 5 MGD of warmer river water. HDR professional services for this project included: water quality testing; ASR feasibility study; regulatory coordination and permitting; design; construction; and startup.

Design-Build Oil and Gas Exploration and Production Waste Processing Facilities, Multiple Sites – TX, OK, and WY. Construction Project Engineer. HDR provided integrated design-build services for multiple oil/water processing and separation facilities in various locations throughout the southern, southwestern, and Rocky Mountain regions of the United States. These facilities receive and treat liquid and solid oil field Exploration and Production (E&P) wastes.

Salt River Pima Maricopa Indian Community Zone 2 Water System Improvements, Scottsdale, AZ. Construction Project Engineer. HDR completed the design and construction of a 4 million gallon buried reservoir, 21 mgd pump station, 13 mgd arsenic treatment system, demolition of the existing facility, building of a new well and approximately three miles of potable water lines ranging in size from 12 to 48 inches. Construction cost of the project was $28 million.

Facility Expansion and Upgrades, Valmont Industries Inc., Brenham, TX. Construction Project Engineer. HDR provided design-build services to expand Valmont Industries' manufacturing facility in Brenham, Texas. This project involved the modification of existing structures to allow the addition of approximately 32,000 square feet of pre-engineered metal building, which Valmont intends to use for increasing its production of large-diameter metal utility poles.

Christopher Malinowski, PE, WTPO

Commissioning Manager

Firm
HDR

Industry Tenure
27 years

Education
BS, Civil Engineering

Registration/ Certifications and Training
Wastewater Treatment Plant Operator

- TX

Professional Engineer

- OK, TX

Relevant Experience & Benefits

- Operations experience at a wide variety of facilities.
- Startup and commissioning experience of large facilities

Mr. Malinowski is responsible for the development of HDR's operations and maintenance business line in both the municipal and industrial sectors. Services provided include operations and maintenance contracts, startup and commissioning services, asset management, plant decommissioning, operability reviews, operations troubleshooting, and operational efficiency studies. His experience includes the management, design, operation and maintenance, and project development of water and wastewater systems. His experience also includes developing project strategies, pricing, developing teaming arrangements, running and interpreting financial models and preparing project pro formas. Mr. Malinowski has extensive experience operating municipal utilities, and a wide variety of industrial sites in the refining, chemical, auto, paper, and food & beverage industries.

Select Project Experience

Sheldon Road Municipal Utility District, Houston, TX. Chief Operator. The system serves approximately 500 connections. Responsible for two wastewater treatment plants and two groundwater plants.

Southwest Water Company, Sugar Land, TX. Vice President of Operations. Mr. Malinowski had overall responsibility for over 300 water and wastewater systems and 400 employees, including environmental and safety performance, client relations, contract compliance, and staff management.

Southeast Water Treatment Plant, City of Houston, TX. Start-up Lead. Mr. Malinowski managed the staff that successfully started up and commissioned a plant expansion that increased the capacity from 120 mgd to 200 mgd. Working for the project's contractor, all systems went through a detailed commissioning process. In addition, the expansion was operated for 14 days without shutdown during a "proving phase" prior to putting the expansion into service.

North Fort Bend Water Authority, Houston, TX. Vice President of Operations. Mr. Malinowski managed the staff that operates and maintains this regional surface water supply system. Water is received from the City of Houston and is distributed to dozens of water districts within Fort Bend County. This system includes a 10 mgd pump station and over 25 miles of transmission lines.

Bexar Metropolitan Water District, San Antonio, TX. Project Developer. Oversaw the first Design, Build, Operate project for a water treatment plant in Texas municipal water market for a 9 mgd ultra filtration membrane plant. This facility has now been in service for over 15 years.

Midland Freshwater Supply District Number One, Midland, TX. Managing Director. While at Southwest Water Company, Mr. Malinowski managed the team that is performing the startup and commissioning of the T-Bar Ranch project, a new water supply system for the City of Midland. This involves approximately 40 wells, 60 miles of transmission lines, a ground storage tank, and booster pump station.

Fort Bend County Levee Improvement District Number 2, Sugar Land, TX. Vice President of Operations. Managed the staff that operated and maintained this project. This system of levees and pump stations protects much of Sugar Land from the Brazos River. The staff operated and maintained two high flow pump stations and inspected all of its levees.

Wastewater System Operations, Stonegate Village Metropolitan District, Englewood, CO. Vice President of Operations. Mr. Malinowski managed the staff that operated and maintained this district's wastewater treatment facility. It was taken over from the previous operator, and significant improvements were made to bring the facility into compliance.

Bob Bower, WTPO

Commissioning Manager

Firm
HDR

Industry Tenure
35 years

Education
BS, Environmental Science

Registration/ Certifications and Training
Wastewater Treatment Plant Operator

- CO, WA

Construction Documents Technologist

Relevant Experience & Benefits

- Served as a municipal wastewater systems operator and manager for 14 years
- Highly empathetic to O&M staff needs and continually strives to scrutinize designs from the perspective of long-term ownership and operational flexibility

Mr. Bower has 35 years of experience in the commissioning, operation, maintenance, and management of municipal wastewater pumping and treatment distribution facilities. His experience includes preparing O&M manuals, providing operations assistance, evaluating and optimizing treatment processes, troubleshooting equipment, commissioning pumping and treatment facilities, delivering operator training, devising automated control strategies, and designing plant process laboratories. Mr. Bower is the recipient of the WEF 2006 Gascoigne medal award for plant operations improvements. He also served on the WEF task force that prepared manual of practice MOP 29: Biological Nutrient Removal (BNR) Operation in Wastewater Treatment Plants.

Select Project Experience

Engineering and Inspection Services, City of Hopewell, VA. Start-up Manager. HDR serves as the City of Hopewell's consultant to its 50 mgd Regional Wastewater Treatment Facility under a long-term Basic Ordering Agreement. HDR evaluated and designed facility upgrades to meet the new more stringent requirements mandated under the Chesapeake Bay Program, as well as performed other miscellaneous asset management projects.

ATP Expansion Phase I, HRSD, Virginia Beach, VA. Start-up Manager. The project expanded the plant from 36 mgd to 54 mgd, with provisions for future 72 mgd expansion. The design included a new PTF, two additional primary clarifiers, 12.3 million-gallon two-pass biological treatment aeration basin, new secondary clarifiers, chlorine contact tanks, dewatering building, acid phase digestion facilities, cake storage facility, digester modifications, blower facility, and distributed control system.

Clean Water Services, Durham Wastewater Treatment Plant Expansions, Tigard, OR. Operations Specialist. Provided numerous improvements and expansions at the plant for over 10 years. Responsible for preparing O&M manuals, preparing startup plans, assisting with startup and commissioning of new equipment and systems, preparing training operator materials, providing operator training, providing operational assistance after startup, and performing constructability reviews.

West Brunswick Water Reclamation Facility, Brunswick County, NC. Commissioning Manager. Prepared startup and commissioning plan, including component testing as well as instrumentation and control (I&C) system testing for new wastewater system consisting of five pump stations, 3 mgd wastewater treatment plant, reclaimed water distribution system, and 700 acre drip irrigation system. Prepared and presented operator training and participated in startup and. Treatment plant equipment included influent screens, flow equalization basin, two oxidation ditches, two clarifiers, two effluent disc filters, chlorine contact basin, hypochlorite storage and metering, effluent pumps, return activated sludge (RAS) and waste activated sludge (WAS) pumps, gravity belt thickening, and ATAD solids digestion.

McAlpine Creek WWTP, City of Charlotte, NC. Operations Specialist. Provided equipment and instrumentation and control (I&C) system commissioning for 140 mgd screening and grit facility, as well as prepared and presented operator training, and participated in startup and commissioning.

Chandler Johnson

Commissioning Specialist

Firm
World Water Works

Industry Tenure
18 years

Education
MS, Environmental Engineering

BS, Civil/Environmental Engineering

Registration/ Certifications and Training
N/A

Relevant Experience & Benefits
- Process Design Manager for both municipal and industrial MBBR + DAF projects.
- Technical expert with biological wastewater treatment processes

Mr. Johnson is recognized globally for his knowledge and experience in MBBR and IFAS systems. He has at least played a role in over 80% of the MBBR/IFAS systems in the US to date. Before joining World Water Works in 2010, Mr. Johnson gained experience working on MBBR/IFAS projects at Purac Engineering, as the MBBR product manager for Waterlink Biological Solutions Division, and as director of sales and later US division President for AnoxKaldnes (now Veolia), where he trained all the business units in his territory on the MBBR and IFAS technology. Chandler is focused on building the company's biological division, leading the company's initiative to be the leader in cutting edge BNR technologies which currently highlights the innovative DEMON® process. Mr. Johnson has presented and published numerous technical papers and continues to be active in such industry organizations as WEF and Water Environment Research Foundation (WERF).

Select Project Experience

Midwest City WWTP, Midwest City, OK. Process Design Engineer. With impending nutrient regulations on the WWTP, the existing RBC's would not meet the requirement. Additionally, mechanical upgrades were needed at the plant. The MBBR technology was selected as the process to upgrade as was previously done at the South Adams County WWTP and Cheyenne Crow Creek WWTP which both had existing fixed film treatment processes and made it a simple transition to upgrading to the MBBR process. The system is designed at a maximum month flow rate of 10.5 mgd to meet < 10 mg/L TN year round. Mr. Johnson was the lead process design engineer on the project as World Water Works was selected as the technology supplier for the project.

Field Point WWTP, Providence, RI. Lead Process Design and Mechanical Engineer. This was the largest IFAS project in the world (77 mgd) . The IFAS concept allowed the facility to take their existing tankage (which was designed only for BOD and TSS removal) and convert it into a Nitrogen Removal system using the IFAS treatment technology.

Blue Plains WWTP, DC Water, Washington DC. Process Design Engineer. Mr. Johnson assisted in the design and procurement of the Filtrate Treatment Facility using the Demon® process along with Dr. Bernhard Wett and Dr. Geert Nyhuis. The 18 month long design process required teaming with client, design engineer and review engineer on all aspects of the technology and incorporation of all the necessary equipment components required for the entire treatment system.

James River TP, HRSD, Newport News, VA. Process Design Engineer. Mr. Johnson was the lead process and mechanical design engineer for the IFAS demonstration upgrade at the James River WWTP in 2007. The successful implementation of the IFAS concept at the James River WWTP showcased the ability of the plant to utilize the existing treatment volume while treating more volume and meet new nutrient limits. The facility ultimately upgraded the entire facility with the IFAS process based on the successful demonstration project.

South Adams County WWTP, Commerce City, CO and Crow Creek WWTP, Cheyenne, WY. Process Design Engineer. Mr. Johnson was the lead process and mechanical design engineer for these two (2) MBBR projects where were installed in 2003 and 2005. Both systems meet nitrogen removal requirements and have operated to their design requirements as well as having very little to no maintenance requirements on the components (aeration system, sieve assemblies, media). These projects will allow for minimal operator attention and maintenance during the life of the process.

Lakeisha Gammage, CHST

Regional Safety Manager

Firm
PC Construction

Industry Tenure
7 years

Education
MS, Occupational Safety Management

BS, Criminal Justice

Registration/ Certifications and Training
Construction Safety and Health Technician

Relevant Experience & Benefits
- Thorough knowledge of construction techniques, methods and safety
- Demonstrated ability to communicate effectively with laborers and craftworkers

As regional safety manager, Ms. Gammage is responsible for project implementation of PC's "Zero Accidents—No Excuses" philosophy in the Southeast United States. Working with the project team, she promotes and creates a safe working environment and ensures associated public safety protocols are met.

Ms. Gammage is an integral part of safety-related training and education initiatives. She applies her extensive experience by assisting the project team in the development and administration of a site-specific safety program as well as pre-task planning for upcoming work. Her proactive approach and active involvement is invaluable to a safe and successful project.

Select Project Experience

Main Process Train, DC Water, Washington, DC. Regional Safety Engineer. Design-Build Joint Venture. Project Value: $210.3 million.

Northeast WWTP Improvements, City of Hickory, Hickory, NC. Safety Engineer. Project Value: $22.2 million.

Yellow River Water Reclamation Facility Improvements, Gwinnett County Department of Public Utilities, Lilburn, GA. Safety Engineer. CM-at-Risk. Project Value: $238.3 million.

Abingdon WTP Expansion, Harford County Department of Public Works, Abingdon, MD. Regional Safety Engineer. Project Value: $62.8 million.

R.A. Thomas WTP Improvements, Winston-Salem/Forsyth County Utility Commission, Winston-Salem, NC. Safety Engineer. Project Value: $56.3 million.

Rocky River WWTP Phase I Expansion, Mooresville, NC. Safety Engineer. Project Value: $10.7 million.

H.L. Mooney Water Reclamation Facility Expansion and Upgrade Stage 2 Phase 1, Woodbridge, VA. Safety Engineer. Design-Build. Project Value: $118.8 million.

ATP Expansion Phase 1 Contract C, Hampton Roads Sanitation District, Virginia Beach, VA. Safety Engineer. Project Value: $164 million.

Neuse Regional WTP, Neuse Regional Water and Sewer Authority, LaGrange, NC. Safety Engineer. Project Value: $61.4 million.

Paul Von Bernewitz

Construction Quality Control

Firm
PC Construction

Industry Tenure
43 years

Education
Lynchburg College

SUNY at Farmingdale

Registration/ Certifications and Training
GSWCC Level 1A Erosion Control Certified

OSHA 10-hour

First Aid/CPR and AED

Field training: confined space

Relevant Experience & Benefits

- Experience in environmental and general civil engineering
- Extensive project management and contractor quality control programs experience

Mr. Von Bernewitz has extensive experience in environmental and general civil engineering and construction, with a focus on project management and contractor quality control programs. His background in engineering analysis and design, and his ability to impact system improvements and quality control strategy results in a high quality construction project. With a thorough understanding of the water and wastewater treatment market and hands-on experience with project administration, Mr. Von Bernewitz adds insight to the quality control process to ensure project goals are achieved. As a quality control representative, he is responsible for the development and implementation of quality assurance and control programs and tracking construction quality from inception to final completion.

Select Project Experience

Tupelo Bayou WWTP Improvements, Conway Corporation, Conway, AR. Quality Control Representative. Project Value: $66.3 million.

Yellow River Water Reclamation Facility Improvements, Gwinnett County Department of Public Utilities, Lilburn, GA. Quality Control Representative. CM-at-Risk. Project Value: $238.3 million.

Linwood Water Reclamation Facility Upgrade and Expansion, City of Gainesville, Gainesville, GA. Chief Field Engineer. Project Value: $46.7 million.

Shoal Creek Filter Plant, Gwinnett County Department of Public Utilities, Buford, GA. Chief Field Engineer. Joint Venture. Project Value: $102 million.

RM Clayton Water Reclamation Center Expansion, City of Atlanta, Atlanta, GA. Chief Field Engineer. Joint Venture. Project Value: $115.4 million.

Forsyth County WTP, Forsyth County Water and Sewer Department, Cumming, GA. Field Engineer. Design-Build. Project Value: $11.5 million.

Management Approach

Organization and Structure

Project Leadership

HNP will provide for the design and construction of the Hopewell Regional Wastewater Treatment Facility Alternative 4A-1 Light, Phase 2 Improvements (Phase 2 Improvements or project). HNP is an integrated design-build team that will provide turn-key design and construction for the Phase 2 Improvements.

Bob Huie | Design-Build Project Manager

Mr. Huie will be responsible to lead the design and construction team for the successful design-build delivery of the project, including:

- Development of the work plan
- Risk Management
- Schedule development and milestones
- Procurement strategy
- Staff performance
- Meeting or exceeding quality expectations

Bill M'Coy | Design and Client Service Manager

Mr. M'Coy will assist Mr. Huie to ensure the design and construction teams are integrated. His responsibilities include:

- Lead the HNP design team through design and construction
- Cultivate a collaborative decision making process during design
- Facilitate design phase meetings and workshops
- Provide continuity from pilot testing/PER to design and construction
- Ensure the Client's expectations for the project are continually being met

Design Team

This technically complex project benefits from a well-rounded team of engineers and constructors with HRWTF experience. Our design team has worked together on complex wastewater treatment plant projects including HRWTF Phase 1 Improvements, HRSD's Atlantic Treatment Plant Expansion Phase I, HRSD's Army Base Treatment Plant Phase III Improvements, and HRSD's Virginia Initiative Plant Nutrient Reduction Improvements. Based in Norfolk, our design team's established working relationships coupled with our HRWTF knowledge allows us to help you identify, plan for, and solve this project's challenges.

Management Approach Table of Contents

Organization and Structure.....page 35
- Project Leadership
- Design Team
- Key Technology Providers
- Other Subcontractors

Project Delivery Process .....page 37
- Collaboration Communication and Integration
- Project Controls
- Maintenance of Plant Operations (MOPO)
- Proposed Schedule

Quality Assurance and Quality Control .....page 41

Key Technology Providers

Key participants and technology providers for the Phase 2 project are WWW and Heyward. WWW is a leading manufacturer and developer of wastewater treatment equipment and technology. As an integral part of the project, WWW will provide the MBBR equipment, media and ancillary devices required to make this a successful project. WWW will be an integrated HNP team member and will provide specialized technical support for the systems and process they will be furnishing for the project. Heyward will also provide support and technical expertise to the project. They are a local equipment representative that is familiar with the plant and plant staff and thus will be an important member in supporting the team with their experience and knowledge.

Other Subcontractors

HNP realizes the importance of participation of local subcontractors and suppliers for this project to provide a positive impact within the local economy. We have worked with many local subcontractors on other projects in the area and will solicit pricing from qualified firms during the preconstruction phase of the project. It is too early at this stage to make any firm commitments due to the level of design detail and the amount of time required for the procurement process; however the HNP will involve the City of Hopewell and other stakeholders during the process to ensure you receive the best value and highest quality for your project.

Hopewell Nutrient Partners

HNP PROJECT LEADERSHIP (HDR AND PC)

Bob Huie, Design-Build Project Manager
Bill M'Coy, Design/Client Service Manager

Responsibilities

- Lead the HNP team throughout project design, construction, and start-up
- Engage stakeholders throughout the process
- Provide a collaborative decision making process

Benefits to the City of Hopewell

- Clear project leadership team with a single-point of contact Design-Build Project Manager for design and construction
- Demonstrated experience with large wastewater projects requiring careful scheduling of construction activities to minimize impact to ongoing operations
- Allows Hopewell to leverage the specific knowledge the HNP team has from previous work at the HRWTF

Tony Snead, Project Executive
Jeff Garner, Project Executive

Responsibilities

- Execute comprehensive agreement on behalf of HNP
- Ensure proper resources are in place to execute project

Benefits to the City of Hopewell

- Project Manager is given broad autonomy to make project decisions by Project Executives
- HNP has ample resources to complete the project within an accelerated schedule

HDR Engineering, Inc.

DESIGN

Bill M'Coy

Responsibilities

- Deliver overall design
- HRWTF point of contact during the design development
- Facilitate design workshops
- Along with Bob Huie, integrate the design and construction teams

Benefits to the City of Hopewell

- HNP's design lead and established project team allows Hopewell to leverage the investment already made in HNP staff's knowledge of your facilities, personnel, and preferences
- Trusted design leadership necessary to communicate, lead large teams, and generate collaborative solutions

World Water Works

KEY TECHNOLOGY PROVIDER

Dan Dair

Responsibilities

- Provide input into the process/mechanical design
- Supply MBBR equipment, media, and ancillary devices
- Provide technical and commissioning support
- Provide MBBR process performance guarantee

Benefits to the City of Hopewell

- Utilizing WWW MBBR equipment provides HRWTF staff a high level of comfort and reliability
- Proven process through pilot testing
- Pre-imminent industry knowledge and experience in successful application of MBBR technology for industrial and municipal wastewater

Heyward, Inc.

KEY TECHNOLOGY PROVIDER

John Seaman

Responsibilities

- Technical advisor for installation, startup and training for the MBBR System and ancillary process equipment
- Facilitate procurement of MBBR screens, secondary clarifier collectors, chemical feed system, and static aerators to match existing equipment

Benefits to the City of Hopewell

- Worked with HRWTF since 1977
- Knowledge of HRWTF treatment process and plant equipment
- Experience with MBBR equipment installations
- Keeps capital dollars in the local community
- Expands local firm experience with design-build delivery

Other Subcontractors and Suppliers

SUB/SUPPLIER COORDINATION

Bob Huie and Glenn Barin

Responsibilities

- Prequalify local and specialty subcontractors
- Identify meaningful opportunities for local subcontractors to participate in the project

Benefits to the City of Hopewell

- Best value and highest quality subcontractors are selected
- Keeps payroll dollars local, supports the local economy

Project Delivery Process

Upon selection for the Phase 2 Improvements, HNP pledges to implement the same procedures and collaboration that we have successfully used for our other large wastewater treatment nutrient removal projects. Our delivery process and structure are based on selecting the most qualified team members who will collaboratively perform the work and maintain engagement of all stakeholders throughout the delivery process.

HNP Project Delivery Benefits to the City of Hopewell:

- Increased collaboration between Hopewell and the design-build team
- Single point of contractual responsibility
- Integration of a design and construction team who know HRWTF
- Early knowledge of total cost and budget control
- Cost certainty through concurrent design and estimating
- Schedule acceleration

Collaboration, Communication, and Integration

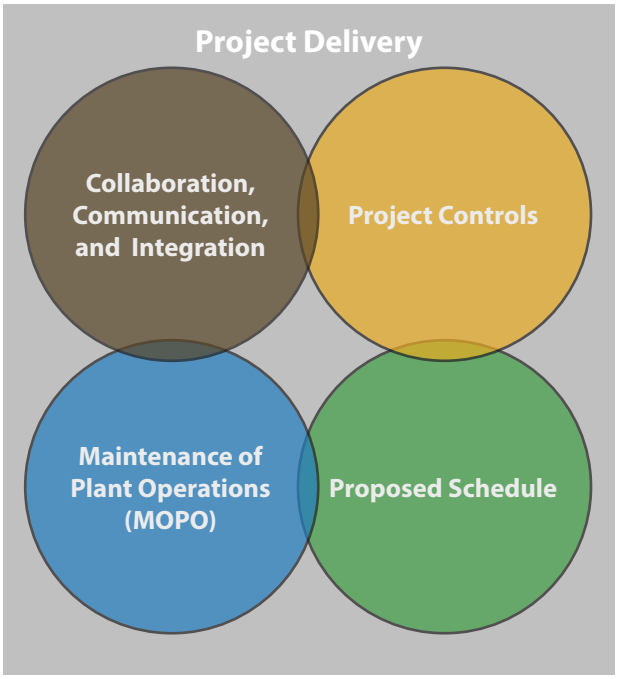
The design-build delivery method offers the best opportunity to integrate the talents of a world class constructor with a world class designer along with the owner's team. HNP will begin the project by confirming our understanding of the project goals and objectives. During the design phase of the project, HNP will identify the procedures to assure that all stakeholders are included in all critical design, value engineering, and constructability decisions that evolve during project execution.

Using the work completed during the PER process, HNP will prepare a detailed design strategy that fully defines the scope of the project, the design effort, and will conduct further design workshops with stakeholders, as appropriate, to confirm the effectiveness of our approach and understanding of your project goals. In consultation with the stakeholders, design will proceed through close collaboration with engineering, construction and operations professionals. This assures cost control, constructability, scheduling, and safety considerations are incorporated into the design as it is progressed.

During the development of the design submittals, the team will consult regularly with HRWTF staff and other project stakeholders. HNP will provide all essential information to allow effective participation in key decisions and understanding of work sequence and integration with operations staff required during construction.

Simultaneous to the design submittals, the HNP team will consult with regulatory authorities to affirm a clear understanding of the regulatory permitting process while defining clear responsibilities for HNP and the City of Hopewell.

Collaboration, communication, and decision making will be accomplished through regularly scheduled meetings, focused meetings, and formal workshops. Table 1-1 on the following page summarizes HNP's proposed meetings and workshops.



Our Project Delivery Process involves four major elements

Table 1-1 Proposed Meetings and Workshops

	Meeting/Workshop Title	Expected Outcome
Design / Preconstruction	**Design / Preconstruction Kick-off**	• Confirmed project goals and objectives • Defined work plan • Clear communication plan • Completed review of PPEA design and cost estimate • Confirmed design criteria and assumptions • Clear understanding of design boundaries • Plan to mitigate risk for priority items
	Monthly Progress	• Completed schedule review • Updated schedule • Updated progress report • Identification and progress of action items
	30% Design Review	• Team agreement on design concepts
	Value Engineering*	• Team agreement on implementing value engineering concepts and ideas
	30% Functional Description Review	• Team agreement on process control approaches
	60% Design Review	• Team agreement on design and total project costs
	60% Functional Description Review	• Final functional descriptions and P&IDs
	Maintenance of Plant Operations (MOPO)/Startup/ Conversion Requirements	• Agreement on specific project requirements for MOPO and process conversion
Construction	**Construction Kick-off**	• Updated defined work plan • Updated clear communication plan
	95% Design	• Team agreement on design and total project cost
	"What if" Modeling	• Identify impact of alternative approaches to work
	Weekly Coordination and Scheduling Meetings with Design Team and Subcontractors	• Completed schedule review • Updated schedule • Updated progress report • Coordination of issue resolution • Distribution of expediting logs that tract the manufacturer and delivery of critical materials
	Weekly Superintendent Meeting	• Completed review of superintendent's three-week look-ahead schedules
	Maintenance of Plant Operations (MOPO)	• Clearly defined restrictions and plan
	Electrical Instrumentation and Controls Integration	• Clearly defined integration plan
	Startup/Testing/Training	• Detailed startup and process conversion plan
	Project Closeout	• Identify early punchlist items • Establish schedule for weekly close-out coordination meetings

* *Value Engineering per VDEQ grant and loan funding requirements*

Project Controls

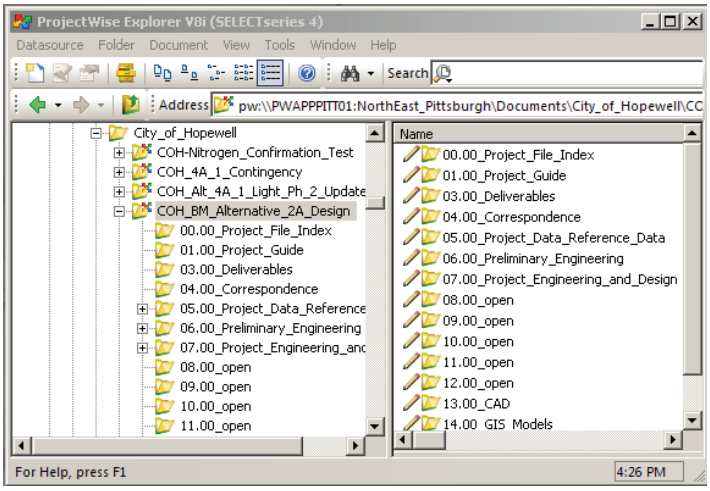
A project guide and work plan will be developed at the start of the project to establish the guidelines and controls for executing the project. The Project Guide communicates essential information about the project to all involved, including project requirements and objectives, personnel responsibilities, communication information and protocols, and electronic filing structures. It provides marching orders for the team and paves the way to successful project completion and accountability.

We will use ProjectWise as the document management system for all working and final design documents. The City of Hopewell will be provided access to ProjectWise if desired; however, a web-based SharePoint site will also be developed to post milestone documents of interest. Milestone folders will be set up for the final deliverable documents so that each phase of the project documents will be clear to the reviewer.

A design comment spreadsheet will be used to document design review comments, concerns, alternatives to be explored, and the responses and decisions made for each of these items. The spreadsheet will provide a record of all comments received and their resolution so that all stakeholders will be able to confirm their concerns were addressed.

ProjectWise

- ProjectWise will be used as the document management system for the project with access provided to the City of Hopewell



Maintenance of Plant Operations (MOPO)

Working on an existing, operational wastewater treatment plant requires extensive planning by the team to prepare for the work ahead. Early in the design phase the HNP team will access HRWTF's plant operations, determine where underground utilities are located and share this information with the design team. This will allow design and construction efforts to properly plan and execute the work required to incorporate the new facilities into the overall plant.

Our team also understands the importance of properly maintaining plant operations in the midst of completing complex shut-downs, bypasses and hot-taps within a scheduled time frame with no permit violations. We will achieve this by employing our comprehensive understanding of the treatment plant processes to develop a detailed maintenance of plant operations plan which provides a descriptive methodology for maintaining plant operations. This plan will be reviewed with the entire team and plant operators to ensure we have the resources in place to complete the work as planned. We will also develop contingency plans outlining equipment and resource needs to mitigate any potential risk associated with performing the work. When it comes to constructing, upgrading and expanding water and wastewater treatment plants – we get it and we get it done.

HNP MOPO Benefits to the City of Hopewell:

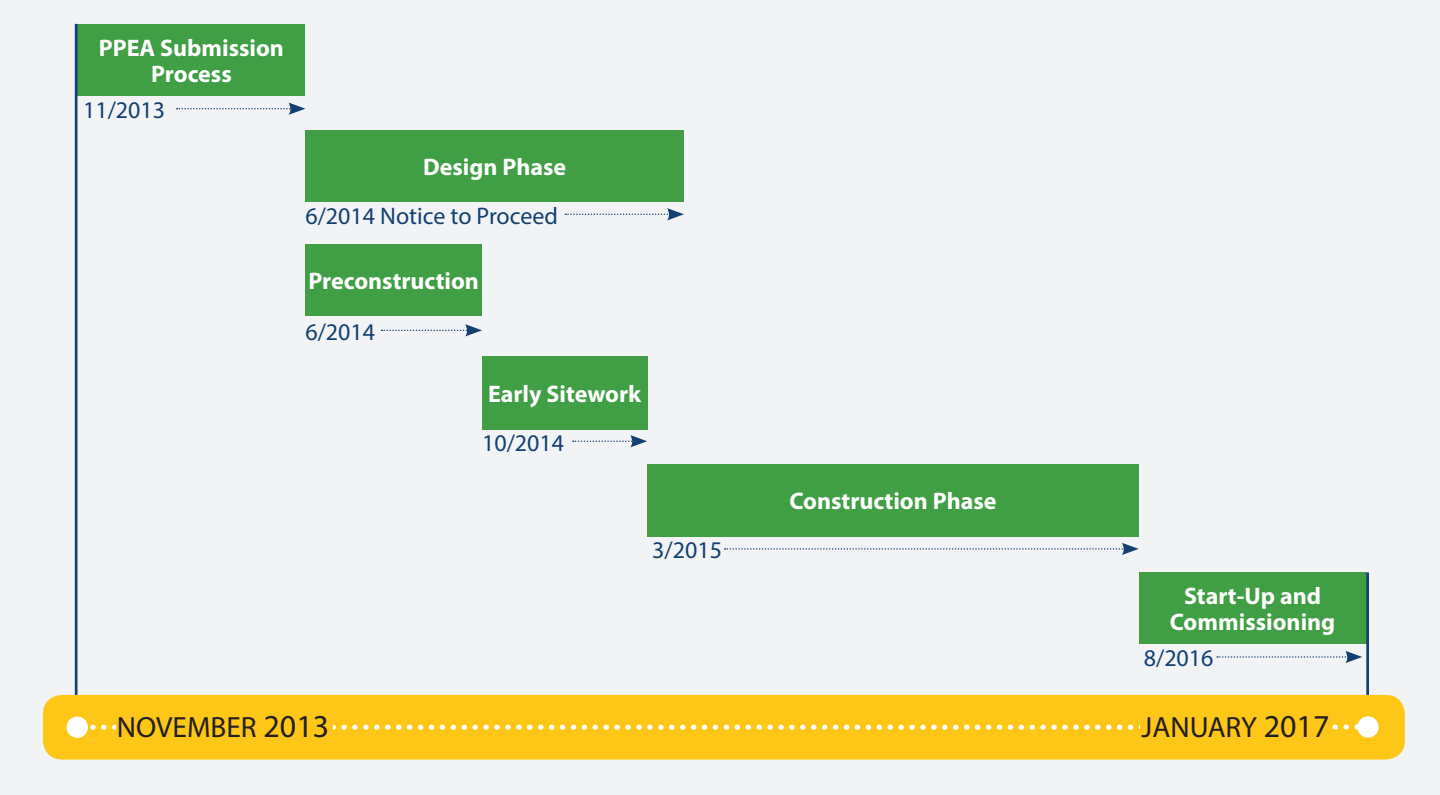
- No unplanned interruptions to HRWTF operations
- Continued, consistent permit compliance

Proposed Schedule

HNP has developed a schedule to design and construct this project in 31 months from the Notice to Proceed. Our schedule outlines the plan to execute the major and sub tasks required to construct the project. We have identified the work activities and tasks we believe are critical to the success of the project: This plan provides a starting point for the team to plan and execute the design, permitting and construction of the project. HNP will utilize the work completed during the PER process and overlap design and construction in an efficient manner thereby completing the project as presented in the schedule. We propose that the City of Hopewell consider starting early procurement and site development construction activities as the design of the project progresses. This will allow the project to integrate the best efforts of the design and the construction team for the benefit of the overall project. Once the approval of the design is complete and the permitting is in place we will proceed immediately with construction.

A schedule summary outlining all major schedule milestones can be found in Volume I, Section 2f; however, to view a more detailed schedule, please reference Volume II, Section 2f.

Proposed Schedule



Quality Assurance and Quality Control

HNP services will be based on sound principles meeting the standards of professional practice and satisfying quality requirements. We will distribute the project quality plan (PQP) at each of the kick-off meetings to all team members including field inspection staff, subcontractors, and subconsultants. All project team members will be required to use the QC production and review procedures described in the PQP. Our Quality Advisory Committee will perform QC audits at key project milestones to ensure the PQP is being followed.

Design Phase Controls

The design portion of our PQP is practiced in three phases:

Phase I, Project Initiation
our team's project initiation phase begins with the preparation of a project guide. The project guide is a communication tool used to inform the team of pertinent information.

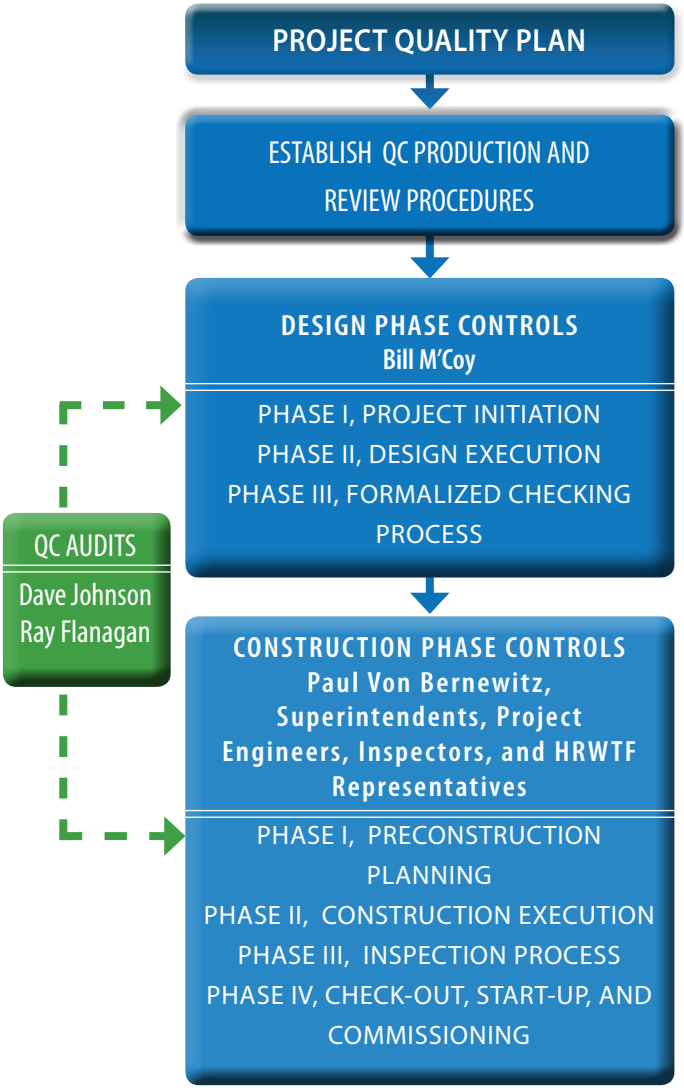
Phase II, Design Execution
our team's design execution phase begins with a team kick-off meeting. Our Design Manager, Bill M'Coy, oversees the execution and development of the deliverables, communicates with Hopewell and the team and documents the progress and decisions made during the design development.

Phase III, Formalized Checking Process
our team's formalized checking process begins when the plans or documents are production ready.

All deliverables including plans, calculations, reports, studies, quantities and cost estimates undergo a detailed QC review prior to submittal to Hopewell. Bill M'Coy will oversee the formalized checking process to ensure the procedures defined in the PQP are implemented.

Quality Is "Built In, Not Inspected In"

- HNP believes quality work is achieved through a combination of quality design, an effective work plan, having all the tools and equipment necessary to perform the work, communicating the quality standards to every member of the team, and establishing the appropriate criteria against which to measure the quality of the work.



Our PQP will integrate all elements of the design-build process by including both design and construction professionals in the quality process throughout the entire project.

Construction Phase Controls

The construction portion of our PQP is also practiced in three phases. We will implement the phases listed below on each task assigned under this contract:

Phase I, Preconstruction Planning

Prior to starting construction in a new work area, a preconstruction planning meeting will be held. Included in this meeting will be Paul Von Bernewitz, the appropriate superintendent(s), project engineer(s), inspector(s), and HRWTF representative(s). The team will discuss items such as safety, schedule, required outages, material delivery, and MOPO. Required submittal drawings and "For Construction" drawings will be compared with the field and production drawings to confirm completeness and accuracy.

Phase II, Construction Execution

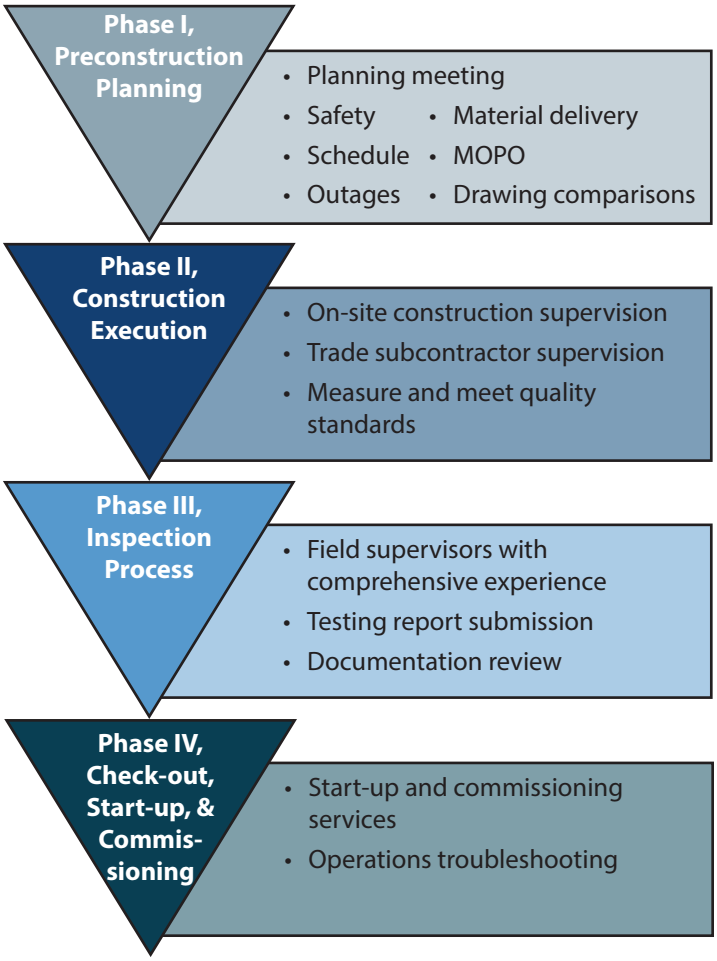
Construction Quality Control lead Paul Von Bernewitz and our other on-site construction supervision will meet the quality standards developed as part of the design documents and will ensure the performance of our trade subcontractors meet the same standards.

Phase III, Inspection Process

HNP's unique strength is the ability to provide field supervisors who offer comprehensive construction experience, as opposed to mere "inspection services." As key members of the Project Management team, these field supervisors provide in-depth knowledge of construction means, methods, and QC procedures. The QC Plan will require the submission of inspection and testing reports and documentation as needed to satisfy the project criteria. Our construction team will review the documentation with the HRWTF staff and design team as applicable to confirm that the quality requirements are being met as expected. Where work does not meet quality requirements, procedures will dictate documentation of re-work and re-testing until the work is acceptable and approved. HNP will carefully audit the documentation of all re-testing to be sure that the work meets all standards prior to the official final inspection.

Phase IV, Check-out, Start-up, and Commissioning

For Phase IV, Chris Malinowski and Bob Bower will oversee the execution of check-out, start-up, and commissioning.



HNP's Construction Phase Controls are applied in four phases.

1b. Experience

Describe the experience of the private entity making the proposal and the key principals involved in the proposed project including experience with projects of comparable size and complexity, including prior experience bringing similar projects to completion on budget and in compliance with design, land use, service and other standards. Describe the length of time in business, business experience, public sector experience and other engagements of the private entity. Describe the past safety performance record and current safety capabilities of the private entity. Describe the past technical performance history on recent projects of comparable size and complexity, including disclosure of any legal claims by or against the private entity. Include the identity of any private entity that will provide design, construction and completion guarantees and warranties and a description of such guarantees and warranties.

Project Team Experience

HNP is a single purpose entity that has been formed specifically for the Phase 2 Improvements project. As such, HNP cannot claim any past experience; however, its two partners, HDR and PC, do have significant, shared experience between its personnel and relevant projects. Because of our partner companies' shared history of successfully completing multiple projects similar to the City of Hopewell's project, we believe HNP is the most qualified team to design and construct this highly complex project in the most expeditious and economical manner. In addition, HNP's exclusive technology providers, WWW and Heyward, add strong wastewater treatment expertise to our team.

HDR

Managing partner, HDRC, is a wholly owned subsidiary of HDR, Inc. HDR, Inc. was founded in 1917 and is a global employee-owned firm providing architecture, engineering, consulting, construction and related services through various operating companies. Our professionals are committed to helping clients manage complex projects and make sound decisions. HDR has six offices in Virginia and has been part of the Virginia business landscape since 1969 when it opened its Alexandria office. Today, more than 300 Virginia-based HDR professionals offer a full range of architecture, engineering and construction services to government, institutional and private sector clients.

HDR's integrated design-build approach is focused on making projects simpler, faster and more efficient for our clients by assembling the right team and the right plan for the project. Our experts in design-build project management, construction, procurement, estimating, accounting, financing, and project controls assist clients in selecting the most effective path forward to ensure that their project is done on-time and within budget. This collaborative approach offers clients the ability to design, manage and construct projects in the most efficient, effective manner.

Key Principal/Executive

Anthony Snead, Vice President: Mr. Snead has nearly 40 years of industry experience and specializes in design-build project delivery for water and wastewater facilities. Over the last 20 years, he has managed diverse and complex projects with a combined value of more than $500 million for both private and public sector clients. Mr. Snead's extensive design-build project management background includes multiple WWTP projects involving upgrades to primary and secondary (nitrification/denitrification) systems, tertiary upgrades to Title 22 standards, control system upgrades, equalization/emergency storage, solids handling improvements, pump stations, and cogeneration. He has diverse experience overseeing an integrated multi-disciplinary team of design engineers, construction managers/schedulers, contractors, and construction subcontractors.

Comparable Projects

HDR has included project descriptions on page 46.

Safety Performance Record/Current Safety Capabilities

Please refer to Volume II, Section 1h for this information.

Legal Claims

For the aforementioned comparable projects, no known legal claims have been made at the time of this submission. Please refer to Volume II, Section 1h for additional information regarding legal claims.

PC Construction

PC provides professional, client-focused construction solutions. As an employee-owned company, PC goes above and beyond on every project and delivers on promises with integrity.

PC shares more than a half of a century of industry-leading excellence with every client they meet. PC offers general contracting, construction management, design-build, and preconstruction planning services for projects of all sizes.

Founded in 1958, PC is one of the nation's largest employee-owned contractors with corporate offices in Vermont, regional offices in Maine and North Carolina, and construction projects spanning the east coast. PC's five-year average annual volume of over $450 million includes extensive work in each of our primary markets of water treatment, commercial, education and campus, health care, hospitality and resort and manufacturing and industrial.

PC is a 100 percent employee-owned company whose daily actions are guided by core values. Our commitment to outstanding job completion, exceptional customer service and superior safety performance has made us a partner of choice in the construction industry.

PC's 900 employees come from every craft and expertise in the field, allowing us to combine innovative construction methods and accountable project management to get the job done, and to get it done right.

Key Principal/Executive

Jeffrey Garner, PE, LEED AP, Senior Vice President: Mr. Garner has more than 26 years of engineering and construction industry experience, the past 14 years of which with PC Construction. He has held a number of positions with increasing levels of responsibility throughout his career progressing from engineering, design, and field supervision, to overall management of projects for energy, advanced manufacturing, heavy industrial and municipal clients. Mr. Garner has successfully managed multiple large-scale projects across the United States including design-build projects and multi-site programs requiring careful coordination and sequencing of all construction activities, many of which involved highly complex mechanical systems.

While in operations at PC, Mr. Garner managed work totaling more than $520 million for both public and private clients spanning all project delivery methods. He has managed several departments within PC including the company's overall estimating and preconstruction efforts. Mr. Garner is adept at developing innovative solutions, guiding vendor and subcontractor negotiations, owner relations and safety. His experience on both sides of construction – preconstruction and project management – brings the highest level of construction expertise and management skill to his teams.

As senior vice president, Mr. Garner provides executive leadership for PC's Water/Wastewater Treatment business segment including business development, estimating, and all field operations activities as well as applicable components of PC's business and strategic planning. As a member of the company's Executive Committee, he fulfills an important role in the development and implementation of our strategic plan.

Comparable Projects

PC has included project descriptions starting on page 55.

Safety Performance Record/Current Safety Capabilities

Please refer to Volume II, Section 1h for this information.

Legal Claims

For the aforementioned comparable projects, no known legal claims have been made at the time of this submission. Please refer to Volume II, Section 1h for additional information regarding legal claims.

Guarantees/Warranties

Please refer to Volume II, Section 1b for this information.

Comparable Projects

The highlighted projects on the following pages were selected based on similar characteristics to the Phase 2 Improvements project. Similarities may include delivery method, project complexity, dollar value, and/or comparable technologies or equipment. Please refer to the project sheets included in this section for further details.

HRWTF Alt. 4A-1 Light Phase 1, Contract No. 1, 2, and 3

Hopewell, VA

Project Owner
City of Hopewell (HRWTF)

HNP Firm Member(s) Involved
- HDR (design: All contracts)
- PC (construction: Contract 1 only)
- Heyward (equipment supplier: Contract 1 only)

Size of Facility
50 mgd

Total Project Value
$19 million

Completion Date
2012

Technical Elements/Relevance
- Segregated treatment system set the stage for Phase 2 Improvements, which will allow the plant to efficiently send wastewater through a nutrient removal process, meeting nutrient reduction objectives

Project Description

The key objective of Contract 1 (Relocation of Domestic Treatment) was to provide segregated preliminary treatment, primary treatment, and disinfection of domestic wastewater at the Regional plant at the projected 2015 flows and loads. Two key factors drove the need for this work. First, the projected domestic loads exceed the available capacity of the Primary Plant, and due to its condition and satellite location, the City of Hopewell can streamline operations and reduce costs by combining treatment at the Regional Plant. Second, because the combined industrial stream is inhibitory to nitrification, separation of the streams is required so that the facility can ultimately nitrify (planned under Phase 2 Improvements to comply with new VPDES permit requirements).

Specific elements within Contract 1 include the following:

- Domestic Preliminary Treatment Facility including mechanical screens, grit removal, and grit washing and compacting units
- Septage receiving facility
- Sodium hypochlorite storage and feed facility
- Conversion of existing rectangular primary clarifiers to combination clarifier/chlorine contact tanks
- Dewatering pad and dumpster storage area
- Replacement of non-potable water pumps
- Mechanical screens for industrial influent

In Contract 2, HDR designed new First Street Pump Station to 15 mgd and Bailey's Creek Pump Station to 17 mgd. Replacements included constructing two new submersible, self-cleaning pump stations with influent channel grinders, valve vaults and magnetic flow meter vaults.

In Contract 3, HDR designed a new industrial wastewater force main to allow segregation of the domestic and industrial wastewaters.

New Preliminary Treatment Facility (PTF)

Close-up of the new PTF

Three primary clarifiers were converted

Atlantic Treatment Plant Expansion Phase I, Contract C

Virginia Beach, VA

Project Owner
Hampton Roads Sanitation District (HRSD)

HNP Firm Member(s) Involved
- HDR (design)
- PC (construction)

Size of Facility
54 mgd

Total Project Value
$164 million

Completion Date
2013

Technical Elements/Relevance
- HDR and PC worked together for all construction phase services included under this extended contract
- Innovative site preparation plan saved HRSD $25 million
- Helped HRSD obtain state funding for CHP system

Project Description

HRSD's Atlantic Treatment Plant

CHP system generators

HRSD needed to expand the 36 mgd Atlantic Treatment Plant (ATP) to 54 mgd capacity. As part of the preliminary design phase, HDR evaluated concepts that would provide lowest life-cycle costs and improved service. Increasing the efficiency of the solids handling system was a priority. Further, HDR developed design plans to convert the existing digesters into a two-stage acid-phase digestion system. The digestion process increases volatile solids reduction by 10 percent, saving more than $150,000 annually in land application and dewatering chemical costs. Working with HRSD, HDR relocated the centrifuges to a new building adjacent to the cake storage pad. A labor-intensive dewatered cake handling system was eliminated saving HRSD more than $350,000 in annual O&M costs.

Part of the planning process included applying for funding from the Virginia Wastewater Revolving Loan Fund. As part of the application process, an environmental assessment of the proposed project area was required. HDR coordinated the wetland delineations and cultural resource surveys needed and prepared a final report detailing the potential impacts of the project.

As part of the preliminary engineering phase, HDR evaluated alternative expansion concepts that would provide lowest life-cycle costs and improved service to HRSD. PC construction work included:

- A blower and electrical building, dewatering building, digested solids storage tank pump station, acid phase digester, odor control station, plant drain pump station, primary treatment facility, solids handling building and cake storage pad
- Multiple aeration tanks, chlorine contact tanks, primary clarifiers, secondary clarifiers
- Miscellaneous distribution boxes and ancillary facilities
- Self-performance of 70 percent of contract value by PC
- Modifications and upgrades to existing chlorine contact tanks, effluent pump station, primary clarifiers, digesters, solids handling and generator room
- Extensive odor control system with over 7,600 linear feet of fiberglass reinforced plastic pipe ranging in size from 6 inches to 96 inches in diameter
- Rehabilitation of the plant's four existing secondary clarifiers; each 160 feet in diameter with Siemens clarifier equipment and Warminster fiberglass weirs, baffles and troughs

Construction of a new combined heat and power (CHP) system to capture and clean the digester biogas was completed in 2013. The biogas fuels new internal combustion engine generators for power production and heat recovery for digester and building heating. Unconventional anaerobic digestion has positioned ATP for more cost-effective and efficient solids handling, renewable energy production, energy efficiency, and reduced environmental impacts. Based on design flow and estimated gas production, the installation includes 2.2 MW of generation capacity with two digester gas-rated 1,100 kW generators.

Army Base Treatment Plant Improvements Phase III

Norfolk, VA

Project Owner
HRSD

HNP Firm Member(s) Involved
- HDR (design)

Size of Facility
18 mgd

Total Project Value
$106 million

Completion Date
Estimated 2014

Technical Elements/Relevance
- Design Limits: TN 3.0 mg/L, TP 0.3 mg/L
- ENR upgrade of an existing WWTP
- Preliminary treatment upgrades
- Retrofit of aeration tanks
- Stringent MOPO requirements

Project Description

HDR was selected by the Hampton Roads Sanitation District (HRSD) to provide planning, design and construction phase services for the upgrade of the 18 mgd Army Base Treatment Plant in Norfolk, VA. The Army Base Treatment Plant Phase III upgrade includes enhanced nutrient removal and ancillary plant improvements at a construction cost of $85 million. The project is complicated by a congested site that must accommodate additional treatment processes, while maintaining plant operations and providing adequate construction space.

Fine bubble aeration diffusers

The Army Base Treatment Plant is a secondary treatment facility that was last expanded in the late 1970s. As part of HRSD's plan to meet a new waste load allocation for nitrogen and phosphorus, the Army Base Treatment Plant will be upgraded to meet an annual average effluent limit of 5 mg/L total nitrogen and 1 mg/L total phosphorus. The upgrade has been designed for the addition of methanol and/or effluent filters in the future to meet a possible limit of 3 mg/L total nitrogen and 0.3 mg/L total phosphorus.

Nitrified Recycle (NRCY) Pump

HDR has completed the detailed design phase for the project and construction is ongoing. The plant improvements include the following key facilities:

- A new preliminary treatment facility that will house fine screens, screening handling and dewatering equipment, raw waste influent pumps and grit removal equipment
- Six million gallons of new biological process tanks for operation of a five-stage nitrification/denitrification process with biological phosphorus removal
- Conversion of the existing aeration tanks to operate in a post-anoxic and re-aeration mode in series with the new biological process tanks
- A new methanol storage and feed facility
- Rehabilitation of the existing four secondary clarifiers and RAS pump station
- Provisions for future construction of effluent filters and pumping
- Rehabilitation of the existing biosolids receiving facility
- Rehabilitation of an existing biosolids holding tank and the construction of a new gravity thickener facility to process primary and waste activated solids.
- A new 25,500 scfm odor control station to serve the preliminary treatment facility
- A new electric generator building and major upgrades to the electrical system
- Installation of a plant-wide Distributed Control System

Virginia Initiative Plant Nutrient Reduction Improvements

Norfolk, VA

Project Owner
HRSD

HNP Firm Member(s) Involved
- HDR (design)
- PC (construction: Contract A)

Size of Facility
40 mgd

Total Project Value
$120 million

Completion Date
Estimated 2017

Technical Elements/Relevance
- Design Limits: TN 5.0 mg/L, TP 1.0 mg/L
- Nutrient removal process: 5-stage enhanced biological nutrient removal
- Informed decision making is facilitated through the use of building information modeling and workshops

Project Description

Interactive workshop utilizing BIM

BIM modeling

HDR is working with the Hampton Roads Sanitation District (HRSD) to upgrade its 40 mgd Virginia Initiative Plant (VIP). Nutrient reduction improvements are necessary for compliance with near-term and future requirements specified in the Virginia Watershed Implementation Plan (WIP) as part of the Chesapeake Bay TMDL. Challenges include tight site conditions, an aggressive schedule and the need for an operator-friendly design that minimizes chemical and energy use to achieve a low life cycle cost.

HDR is responsible for preliminary engineering, final design, bidding, contract administration, field engineering and inspection, startup and testing, operations and training, and post-startup and certification services. PC is performing early site preparation, installation of pile foundations and replacement of NRCY pumping system.

HDR's innovative design concept treats peak flows by using a new equalization tank, biological process tank and chlorine contact channel in a "parallel" mode. This concept provides for significant peak flow treatment capacity on the constrained site at an economical cost.

Key design criteria for the nutrient reduction improvements – plant design capacity, effluent nutrient targets and peak hydraulic capacity – were studied in parallel tracks, with integration at key points to provide HRSD with a clear understanding of the marginal cost impacts and trade-offs between each step of increased nutrient reduction and peak hydraulic capacity. Informed decision making is facilitated through the use of building information modeling (BIM) so HRSD staff can better visualize and understand design solutions. A series of interactive workshops further foster HRSD staff involvement in developing and evaluating solutions.

Project Highlights

- Improvements include a preliminary treatment facility (influent screening and pump station), flow equalization tanks, a methanol storage and feed facility, secondary clarifier and a chlorine contact channel.
- The project also includes anoxic recycle (ARCY) and nitrified recycle (NRCY) pump station improvements, biological process tank upgrades for nitrification/denitrification, retrofit of the existing digester for primary solids storage and fermentation, expansion of the plant-wide distributed control system, upgrades to the electrical system, and planning for future effluent denitrification filters and an ultraviolet disinfection facility.
- An innovative, fast-track project delivery approach is being used to resolve issues and minimize risks in order to develop the most effective and efficient solutions while meeting the tight schedule.

Fort Meade Water and Wastewater Improvements

Fort Meade, MD

Project Owner
American Water Military Services

HNP Firm Member(s) Involved
- HDR (design)

Size of Facility
12.3 mgd (WWTP)
3.3 (WTP)

Total Project Value
$57.9 million

Completion Date
Estimated 2014

Technical Elements/Relevance
- Integrated design-build project delivery
- Design Limits: TN 4.0 mg/L and TP 0.3 mg/L
- ENR upgrade of an existing WWTP

Project Description

Fort George G. Meade is a permanent U.S. Army installation located 24 miles northeast of Washington, D.C. The installation encompasses approximately 5,415 acres and includes both water treatment/distribution and wastewater collection/treatment facilities.

Ft. Meade water treatment facility

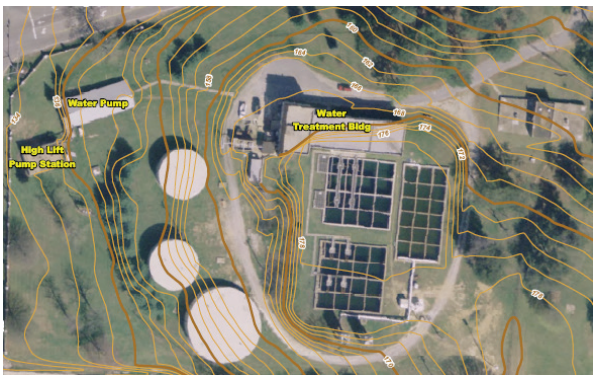
The American Water/Bowen Engineering/HDR team was selected to provide design/build/own/operate services for the water and wastewater systems. HDR's work includes 52 defined projects and services related to capital improvements. The capital improvements are on-going and are being constructed over a three-year period and include:

Wastewater Treatment Plant and Collection System

- New fine screens system to improve debris removal upstream of other plant processes
- Retrofit/upgrade the existing activated sludge system by converting to 5-stage Bardenpho ENR system. This system will significantly lower chemical use while meeting the low 4 mg/L total nitrogen and 0.3 mg/L total phosphorus limits
- Added tankage to restore treatment capacity to 4.5 mgd
- Rehabilitation/upgrade of the existing effluent polishing filters to denitrification filters
- Installation of new ultraviolet disinfection facility to replace gaseous chlorine and sulfur dioxide
- A new solids processing system including screw press dewatering and drying for Class A biosolids production
- Rehabilitation of an existing biosolids holding tank and the construction of a new gravity thickener facility to process primary and waste activated solids
- Installation of a plant-wide Distributed Control System
- Pump station upgrades
- Significant sewer and manhole rehabilitation and replacement work throughout the collection system (replacement of over 1,000 building sewer laterals)
- Sewer system extensions to previously unsewered areas

Water Treatment Plant and Distribution System

- Aerator replacement
- Piping improvements (replacing over 60,000 LF of aged water piping, hydrant, valves and services to buildings)
- Filter upgrades
- Hypochlorite system
- High service pump replacement at booster station
- Water line extensions and upgrades (upsizing transmission main)
- New supervisory control and data acquisition (SCADA) system



Ft. Meade Water Treatment Plant

Sanitary Effluent Reclamation Facility (SERF) Expansion

Los Alamos, NM

Project Owner
U.S. Department of Energy, Los Alamos National Laboratory (LANL), & Los Alamos National Security (LANS)

HNP Firm Member(s) Involved
- HDR (design and construction)

Size of Facility
0.4 mgd

Total Project Value
$11.4 million

Completion Date
2012

Technical Elements/Relevance
- Integrated design-build project delivery
- Fast-track schedule completed on-time
- Outstanding Safety Performance

Project Description

LANL and LANS discharges more than 175 million gallons of treated wastewater each year through 15 permitted outfalls under its National Pollution Discharge Elimination System (NPDES) permit. In order to meet the NPDES permit's increasingly strict effluent limitations, LANL contracted with HDR to design and construct upgrades to the existing Sanitary Effluent Reclamation Facility (SERF).

Following project completion in September 2012, HDR's performance on this project received the highest rating possible, Level 5 – Excellent, in all nine review categories of the LANS Subcontractor Assessment Report.

New treatment building

Chris Quartieri, LANL Project Manager, said, "HDR has been very responsive on the SERF project. They have worked diligently to meet our expectations."

Under an integrated design-build delivery contract with LANL, HDRC furnished qualified personnel, equipment, materials and all design services necessary to design and construct the expansion of the SERF. This expansion allows LANL to reuse treated wastewater from the Sanitary Wastewater System (SWWS) at an expanded SERF and reusing it at various locations throughout the facility. Cooling towers at the Strategic Computing Complex (SCC) and Laboratory Data Communications Center (LDCC) receive treated effluent from the SERF facility. The SERF facility modifications included design and construction of a new building to house three micro filters and three reverse osmosis (RO) filters to clean up the SWWS effluent to a level that it can be reused. Facility modifications include associated site work and utility upgrades. HDR's scope of work included the following tasks:

- Expanding SERF to deliver 300 gpm for net processing capacity
- Expanding the treatment capacity of the existing SERF to allow treatment of the cooling tower blow down from the SCC, LDCC and Power Plant
- Installing or modifying piping, lift stations, and/or other appurtenances necessary to convey SERF treated water to the SCC, LDCC and Power Plant and SERF RO reject to the evaporation ponds
- Installing or modifying evaporation ponds to accept SERF RO reject
- Installing necessary influent, effluent, and blow down storage tanks

The facility design began in May 2011 and by working closely with the LANL construction management personnel, HDR completed the project within the 14 month contract time frame. Key to the successful execution of this project was the single-point of responsibility that the integrated HDR team provided. The HDR design and construction team worked closely with the LANL engineers to assure that the project met all of LANL's rigid requirements for both water treatment standards and construction standards.

Using behavioral-based safety concepts and employing a full-time safety professional on-site, HDR was able to manage 18 subcontractor companies through LANL's stringent safety program. In the short time-period at LANL, a positive safety culture was developed, which was a major reason the project was completed without a single first-aid incident or serious injury. In March 2012, DOE conducted an in-depth safety audit of construction projects at performed at LANL. Of the 12 projects audited, the HDR LANL SERF project was given a first-place ranking on the audit, which reviewed all LANL contractor safety programs currently in place. Additionally, by attending and participating in LANL's monthly safety meetings, HDR was able to assist in improving some of the LANL safety systems.

Following project completion in September 2012, HDRC's performance on this project received the highest rating possible, Level 5 – Excellent, in all nine review categories of the LANS Subcontractor Assessment Report, listed below:

1. Safety Requirements
2. Security Requirements
3. Quality Assurance Requirements
4. Adherence to Schedule
5. Delivery Performance
6. Technical Related Items
7. Cost Management
8. Subcontractor Management/Project Controls
9. Business Related Activities

Edward C. Little Water Recycling Facility, Phase IV Expansion

El Segundo, CA

Project Owner
West Basin Municipal Water District

HNP Firm Member(s) Involved
- HDR (design and construction as JV partner)

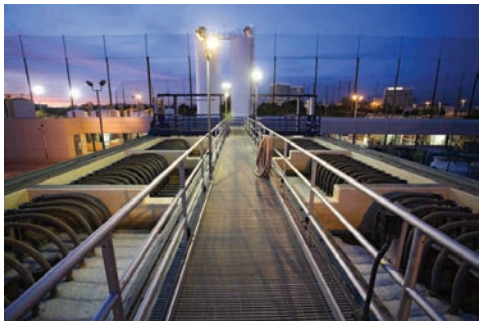
Size of Facility
40 mgd

Total Project Value
$51.7 million

Completion Date
2007

Technical Elements/Relevance
- Integrated design-build project delivery
- Highly complex facility employing advanced treatment technologies to create ultrapure water from poor quality secondary effluent
- Stringent MOPO requirements

Project Description



HDR served also as the Owner's Representative for the Phase V project, which will expand the tertiary system from 40- to 50 mgd and expand the barrier from 12.5- to 17.5 mgd.

The Edward C. Little Water Recycling Facility was built in 1992 and is one of only six national centers recognized by the National Water Research Institute for Water Treatment Technologies. This facility is now the largest water recycling facility of its kind in the U.S.

HDR partnered through a joint-venture to meet the owner's design and construction needs. Utilizing the design-build alternative method of delivery, the West Basin Water Recycling Facility Phase IV Expansion received multiple awards for its technical accomplishments and construction approach, which consisted of expanding two treatment systems: the Barrier Water system and the Title 22 system. The upgrades to the Barrier Water Treatment included cartridge filters, chemical addition, microfiltration, reverse osmosis, decarbonation, ultraviolet (UV) irradiation, product water pump station, and conversion of the water chlorine contact tank to a product water pump station. The Barrier Water produced from the system is distributed and injected into a potable water aquifer. The capacity of the associated Title 22 water system was increased from 30 mgd to 40 mgd. This expansion included conversion of an existing clarifier, recarbonation basin, and existing filters, an addition of a 5 mg product water storage tank and backwash water pump station, and modifications to the existing disinfection system.

This complex facility was been constructed in phases on a small parcel of land. With space at a premium, our design and construction team addressed the need to install a new product water pump station by converting an existing chlorine contact basin that was no longer needed. This approach not only succeeded in meeting the space limitations of the site but satisfied Owner goals to complete the expansion as sustainably as possible.

During the design phase of the project the Owner concluded that additional treatment was needed to address the highly variably secondary effluent quality entering the facility for treatment. The HDR design team evaluated all alternatives and the limitations space limitations of the site and designed a 20 mgd high-rate clarifier to stabilize incoming water quality. The clarifier was integrated into the original design-build scope with minimal interruption to the overall project.

- Microfiltration system – 12 mgd expandable to 18 mgd
- Reverse osmosis system – 3.5 mgd
- Ultraviolet (UV) disinfection/NDMA reduction – 12.5 mgd
- Pretreatment system for Title 22 system – 22 mgd
- New solids handling thickeners – 8 mgd total hydraulic capacity
- Partially buried Clearwell – 5 Mgal
- Filter conversion/addition – 10 mgd
- Solids dewatering expansion – 27,000 lb/day solids dewatering capacity

AWARDS
- DBIA 2007, Western Pacific Region Award of Excellence
- Best in '07 Award by California Construction
- 2005 Water Reuse Association Project of the Year

Project Coordination. As the water treatment plant operated 24 hours a day, 7 days a week, there were many challenges for the HDR team to resolve with the operations staff during construction of this project. The facilitated collaboration between the project team and operations staff resulted in successfully coordinated teams overcoming each of the hurdles. HDR prepared a CPM Schedule to address scheduling challenges, including the need for detailed sequencing and pre-planning of startup phase activities. HDR's project schedule and start-up work plan included testing of each individual component, which required weekly planning and coordination meetings with the operations staff, the design-build team, and applicable vendors to ensure there were no interruptions to the plant. The HDR team was able to manage challenges with subcontractors and vendors resulting in timely completion and smooth start up of the expanded treatment facilities.

Separate tie-ins for hydraulic flows and process treatment systems were of concern because of the treatment plant's limited space and the need for continuous operation. Well-planned meetings with the plant operations staff countered these challenges by creating hour-by-hour schedules (marching charts) showing the sequence and designating responsibilities for different tasks, thereby eliminating any confusion during the tie-ins. There were more than fifty various tie-ins to process water and chemical systems. The mutual project goals included "no impact" to the delivery capabilities of the plant and combining as many tie-ins at one time to minimize overall disruptions. With the collaborative processes implemented between HDR's team and operations staff, these challenges had no effect on the project's schedule or plant operations.

Title 22 Treatment System improvements included demolishing the existing (currently mothballed) flocculation basins, constructing one 20 mgd high rate clarifier to expand pretreatment capacity to 46 mgd (average) and 52 mgd (peak), extending the Title 22 treatment train No. 1 conventional gravity filter gallery by four conventional gravity filters to provide an additional 10 mgd of filter capacity to provide a total of 50 mgd filter capacity, providing an additional 10 mgd of disinfection capacity by adding two chlorine contact basins to provide a total of 50 mgd disinfection capacity, and adding two medium voltage variable frequency drives on the Title 22 product water pumps.

Solids Handling System improvements included adding two mechanical thickening units operated 24 hours per day; constructing a building to house the mechanical thickeners, adding two new 24,000 gallon conditioning tanks, providing a dewatered solids conveyance system/a hopper storage system/odor control system, relocating the dewatering holding equalization basin backwash waste pumps, and installing wall-mounted submersible mixers in each of the equalization basins to better manage, continuously mix, and to mitigate solids accumulation in the equalization basins.

Reverse osmosis treatment process improvements included installation of two new reverse osmosis trains, each producing 2.5 mgd reverse osmosis permeate for the barrier (5 mgd total), as well as enhancing the existing reverse osmosis trains 4 and 5 to produce an additional 0.47 mgd of reverse osmosis permeate for NRG Power.

UV disinfection improvements included adding one UV train to provide 17.5 mgd of disinfection and advanced oxidation process treatment capacity for the barrier feed water.

Site Upgrades And Modification included modifying the reverse osmosis clean-in-place equipment, installing a sump for the reverse osmosis system, installing a reverse osmosis waste stream metering vault, enhancing and relocating the sulfuric acid distribution system, providing a building for equipment storage, providing bulk caustic storage, modifying the Saturator blowdown sump, and including provisions for on-site chemical spill containment, including two detention tanks and localized spill containment, including burms and a detention tank for the solids handling process.

Permitting was overseen by HDR. Key to HDR's approach was a company-wide regulatory and permitting action plan used in hundreds of HDR offices across the country and customized for each local area. The plan identified the agencies, their requirements, and a permitting schedule for each phase of the project. It became a living document to spark key tasks including: preparing applications and obtaining and maintaining necessary documentation, approvals, certifications, and permits. Finally, our permitting process was subject to HDR's QA/QC review, providing West Basin with another layer of accountability and assurance.

Funding - HDR assisted West Basin in securing funding for their recycled water programs by developing a master database of potential funding sources and providing technical assistance in the preparation of compelling grant application packages with value-added elements.

Blue Plains Advanced WWTP Main Process Train Improvements

Washington, DC

Project Owner
DC Water

HNP Firm Member(s) Involved
- PC (construction)

Size of Facility
370 mgd

Total Project Value
$210.3 million

Completion Date
January 2015 (estimated)

Technical Elements/Relevance
- Integrated design-build project delivery
- New technology implemented in an existing plant
- Intense startup, commissioning and training plans

Project Description

Located at the world's largest advanced wastewater treatment plant (370 mgd), this project is part of the facility's biosolids management plan to incorporate Cambi's Thermal Hydrolysis Process (THP) into the operating facility. This design-build joint venture project includes:

- Four Cambi Thermal Hydrolysis process trains, expandable to six process trains
- Four, four-million-gallon anaerobic digesters, solids screening, centrifuges, solids handling and pumping facilities
- Improvements that will reduce solids from 1,270 wet tons per day of Class B sludge to 450 dry tons of Class A biosolids
- Self-consolidating concrete in conjunction with post tensioned cable walls
- On-site fabrication and installation of four fixed steel digester covers which were then floated to the top of the digesters and secured in place
- 70 percent of contract value self-performed by PC Construction workforce, including concrete placement, mechanical process equipment and site work
- Design began June 2011 with construction beginning January 2012
- Mechanical completion scheduled for August 2014 with final completion by March 2015

At the completion of this project, the Blue Plains Advanced Wastewater Treatment Plant will be the largest thermal hydrolysis process plant in the world.

DC Water's Main Process Train Improvements under construction

Yellow River Water Reclamation Facility Improvements

Lilburn, GA

Project Owner
Gwinnett County Department of Public Utilities

HNP Firm Member(s) Involved
- PC (construction)

Size of Facility
22 mgd

Total Project Value
$238.3 million

Completion Date
2012

Technical Elements/Relevance
- New treatment technology integrated into existing plant
- Extensive plant shutdowns, bypasses and tie-in's

Project Description

This five-year expansion of the existing 12.5 mgd facility to 22 mgd included:

- Complete replacement of the wastewater treatment process while the existing plant remained operational
- Dramatic improvements to effluent quality
- Phased decommissioning followed by new construction
- Multiple construction phase packages
- New preliminary treatment/primary clarifier structure, two, 20 million gallon storage/equalization tanks, fine screen/lime facility, biological reactor basins, UV disinfection facility and post aeration facility
- Influent pump station
- GE Zenon membrane filtration facility
- LEED Gold operations center
- Self-performance of 70 percent of the contract value by PC Construction's workforce

Awards

- 2012 Best Project Award, Best Civil Works/Infrastructure, ENR Southeast Region
- 2012 Project Achievement Award, Construction Management Association of America
- 2012 Best of the Best Civil Works/Infrastructure, ENR National Award
- 2011 Top Water and Wastewater Project, Water and Wastes Digest
- 2011 Georgia Outstanding Civil Engineering Achievement Award, American Society of Civil Engineers

Yellow River Water Reclamation Facility

Airport Parkway Wastewater Treatment Facility Upgrade

South Burlington, VT

Project Owner
City of South Burlington

HNP Firm Member(s) Involved
- PC (construction)

Size of Facility
Upgrade and expansion from 2.3 mgd facility to 3.3 mgd

Total Project Value
$22.5 million

Completion Date
2011

Technical Elements/Relevance
- Upgrade to existing treatment plant
- Added new treatment processes to an existing plant
- Stringent MOPO requirements

Project Description

The Airport Parkway Wastewater Treatment Facility Upgrade included an upgrade and expansion of an existing facility from 2.3 to 3.3 mgd, including:

- Headworks, primary and secondary clarifiers, aeration tanks, digester complex, secondary treatment complex, administration building and maintenance garage
- Solids handling facility producing Class A sludge
- Filtration and UV building to replace the existing chlorine disinfection system
- Expansion of the lab building to accommodate future needs
- Improvements allow for the utilization of biogas from the digestion process to fuel a cogeneration system for the plant's boiler and a micro-turbine generator

Airport Parkway Wastewater Treatment Facility

H.L. Mooney Water Reclamation Facility Expansion and Upgrade

Woodbridge, VA

Project Owner
Prince William County Service Authority

HNP Firm Member(s) Involved
- PC (construction)

Size of Facility
24 mgd

Total Project Value
$118.8 million

Completion Date
2011

Technical Elements/Relevance
- Integrated design-build project delivery
- Nutrient removal upgrade of a large plant
- Extensive MOPO requirements and full plant bypasses requirements

Project Description

This design-build expansion and upgrade touched every aspect of the existing, fully-operational facility. The entire process flow from the primary clarifier effluent to the UV facility influent was intercepted and routed incrementally with no permit violations and zero impact to the discharge effluent quality. The expansion included:

- Increased plant capacity from 18 mgd to 24 mgd
- New screening and grit facilities, primary clarifier, aeration basin and secondary clarifiers
- Reconfiguration of existing aeration basins and installation of new aeration basins
- A new RAS pump station (influent and RAS), thickener sludge pump station, denitrification facilities, gravity thickeners, centrifuge dewatering system including sludge feed pump and cake pump
- Modification and/or construction of a new six-chemical feed system
- A new plant-wide SCADA system

Awards

- 2011 Design-Build Institute of America (DBIA) National Design-Build Excellence Award

H.L. Mooney Water Reclamation Facility

c. Prior Projects &
References

1c. Prior Projects & References

For each private entity or major subcontractor ($1 million or more) that will be utilized in the project, provide a statement listing all of the private entity's prior projects and clients for the past five years and contact information for same (names/addresses/telephone numbers). If a private entity has worked on more than ten (10) projects during this period, it may limit its prior project list to ten (10), but shall first include all projects similar in scope and size to the proposed project and, second, it shall include as many of its most recent projects as possible. Each private entity or major subcontractor shall be required to submit all performance evaluation reports or other documents which are in its possession evaluating the private entity's performance during the preceding three years in terms of cost, quality, schedule maintenance, safety and other matters relevant to the successful project development, operation, and completion.

HDR References

HRWTF Alt. 4A-1 Light Phase 1, Contract No. 1, 2, and 3	
Client	City of Hopewell
Address	PO Box 969, Hopewell, VA 23860
Name & Phone	Mark Haley, 804-541-2210
Dates	2008-2012
Capacity	50 mgd
Wastewater (WW) Type:	Predominately Industrial
Project Cost	$19,000,000

1

HRSD ATP Expansion I, Contract C	
Client	Hampton Roads Sanitation District (HRSD)
Address	1434 Air Rail Ave., Virginia Beach, VA 23455
Name & Phone	Bruce Husselbee, 757- 460-7012
Dates	2004-2013
Capacity	54 mgd
WW Type:	Predominately Municipal
Project Cost	$164,000,000

2

HRSD Army Base Treatment Plant Improvements Phase III	
Client	HRSD
Address	1434 Air Rail Ave., Virginia Beach, VA 23455
Name & Phone	Bruce Husselbee, 757- 460-7012
Dates	2006-Est. 2014
Capacity	18 mgd
WW Type:	Predominately Municipal
Project Cost	$106,000,000

3

HRSD Virginia Initiative Plant Nutrient Removal Improvements	
Client	HRSD
Address	1434 Air Rail Ave., Virginia Beach, VA 23455
Name & Phone	Bruce Husselbee, 757- 460-7012
Dates	2011-Est. 2017
Capacity	40 mgd
WW Type:	Predominately Municipal
Project Cost	$120,000,000

4

Fort Meade Water and Wastewater Improvements	
Client	American Water (Design-Build Project Delivery, HDR as a subconsultant to the Contractor – Bowen Engineering Corporation)
Address	3210 Laurel Ft. Meade Road Route 198, Laurel, MD 20724
Name & Phone	Jameson Pearson, 410-294-4756
Dates	2010-Est. 2014
Capacity	12.3 mgd (WWTP) and 3.3 mgd (WTP)
WW Type:	Predominately Municipal
Project Cost	$57,900,000

5

McAlpine WWTF Effluent Filter Upgrades	
Client	Charlotte-Mecklenburg Utilities (Design-Build Project Delivery, HDR as a subconsultant to Contractor – Crowder Construction Co.
Address	15100 Brookshire Blvd., Charlotte, NC 28216
Name & Phone	Kit Eller, 704-391-4708
Dates	2012 – Est. 2014
Capacity	64 mgd
WW Type:	Predominately Municipal
Project Cost	$25,000,000

6

Advanced Wastewater Treatment Program Management	
Client	Sacramento Regional County Sanitation District
Address	8521 Laguna Station Road Elk Grove, CA 95758
Name & Phone	Vick Kyotani, 916-875-9001
Dates	2012 - 2021
Capacity	150 mgd (average)
WW Type:	Predominately Municipal
Project Cost	$2,100,000, 000

7

South County Wastewater Treatment Plant Expansion	
Client	Hillsborough County Public Utilities Department
Address	925 E. Twiggs Street Tampa, FL 33602
Name & Phone	Lisa Murrin, 813-272-5977 ext. 43303
Dates	2008 - Est. 2014
Capacity	10 mgd
WW Type:	Predominately Municipal
Project Cost	$79,000,000

8

Sanitary Effluent Reclamation Facility (SERF) Expansion	
Client	U.S. Dept. of Energy, Los Alamos National Laboratory (LANL) & Los Alamos National Security (LANS)
Address	Bikini Atoll Rd., SM 30, Los Alamos, NM 87545
Name & Phone	Chris Quartieri, 550-665-6074
Dates	2011-2012
Capacity	0.4 mgd
WW Type:	Predominately Municipal
Project Cost	$11,413,000

9

Shale Gas Water and Wastewater System	
Client	Heckmann Water Resources Corp. (currently Nuverra Environmental Solutions)
Address	300 Cherrington Parkway, Suite 200 Coraopolis, PA 15108
Name & Phone	John Lucey, 412-329-7275 x118
Dates	2012
Capacity	12.6 mgd
WW Type:	Predominately Industrial
Project Cost	$30,000,000

10

PC References

Blue Plains Advanced WWTP Main Process Train Improvements	
Client	DC Water
Address	5000 Overlook Ave. SW, Washington, DC 20032
Name & Phone	Gus Bass, 202-787-2355
Dates	2012 – present
Capacity	370 mgd
WW Type:	Municipal
Project Cost	$210,300,000

1

H.L. Mooney Water Reclamation Facility Expansion and Upgrade	
Client	Prince William County Service Authority
Address	4 County Complex Court, Woodbridge, VA 22192
Name & Phone	Steve Bennett, 703-393-2062
Dates	2008 – 2012
Capacity	24 mgd
WW Type:	Municipal
Project Cost	$118,800,000

4

Yellow River Water Reclamation Facility Improvements	
Client	Gwinnett County Department of Water Resources
Address	684 Winder Hwy., Lawrenceville, GA 30045
Name & Phone	Richard Schoeck, 678-376-6953
Dates	2007 – 2012
Capacity	23 mgd
WW Type:	Municipal
Project Cost	$238,300,000

2

HRSD ATP Expansion Phase I	
Client	HRSD
Address	1434 Air Rail Ave., Virginia Beach, VA 23455
Name & Phone	Bruce Husselbee, 757- 460-7012
Dates	2007 – 2010
Capacity	54 mgd
WW Type:	Predominately Municipal
Project Cost	$164,000,000

5

Airport Parkway Wastewater Treatment Facility Upgrade	
Client	South Burlington Department of Public Works
Address	104 Landfill Road, S. Burlington, VT 05403
Name & Phone	Justin Rabidoux, 802-658-7961
Dates	2010 – 2012
Capacity	3.3 mgd
WW Type:	Municipal
Project Cost	$23,500,000

3

Tupelo Bayou Wastewater Treatment Plant Improvements	
Client	Conway Corporation
Address	800 South Harkrider, P.O. Box 99, Conway, AR 72033
Name & Phone	David Bradley, 501-548-3026
Dates	2012 – present
Capacity	16 mgd; expandable to 32 mgd
WW Type:	Municipal
Project Cost	$66,300,000

6

Basham Simms Wastewater Facility Expansion	
Client	Town of Purcellville
Address	130 E. Main St., Purcellville, VA 20132
Name & Phone	Samer Beidas, 703-335-7929 (currently with Prince William County)
Dates	2008 – 2010
Capacity	1.5 mgd
WW Type:	Municipal
Project Cost	$23,600,000

7

Broad Run Water Reclamation Facility, Contracts 2 and 3	
Client	Loudoun Water
Address	44865 Loudoun Water Way, Ashburn, VA 20146
Name & Phone	Tom Broderick, 571-291-7825
Dates	2006 – 2008
Capacity	10 mgd
WW Type:	Municipal
Project Cost	$75,700,000

8

Percy D. Miller Water Treatment Plant Upgrade	
Client	City of Winchester
Address	165 North Cameron Street Rousse City Hall, Winchester, VA 22601
Name & Phone	Steven Corbit, 540-667-1815
Dates	2010-2012
Capacity	10 mgd
WW Type:	Municipal
Project Cost	$20,700,000

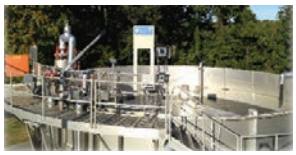
9

Durbin Creek Wastewater Treatment Plant	
Client	Renewable Water Resources (ReWa)
Address	561 Mauldin Rd., Greenville, SC 29607
Name & Phone	Charles Vaskula, 864-299-4000
Dates	2006-2009
Capacity	5.2 mgd
WW Type:	Municipal
Project Cost	$39,200,000

10

Technology Provider Prior Experience

World Water Works, Inc.


York River Treatment Plant

WWW, incorporated in 1998, is a U.S. employee-owned manufacturer of specialized advanced wastewater treatment solutions with design focus on performance, flexibility and longevity yielding the best water quality at the lowest life cycle costs.

WWW is a global leader in MBBR and DAF technology. WWW recently delivered the largest municipal complete treatment MBBR. WWW has assembled a team of diverse technical experts including engineers, scientists, operators, mechanics, and electricians. WWW uniquely combines a strong research and development program with in-house manufacturing. WWW technologies have won numerous awards for delivering the highest water quality and maximum resource recovery. One recent award was the American Academy of Environmental Engineers and Scientists (AAEES) Sustainability Award for an HRSD York River Treatment Plant DEMON® project. The projects below demonstrate WWW proven track record.

Midwest City WWTP: Complete Treatment MBBR, Midwest City, OK

Completion Date: Ongoing
Size of Facility: 10.3 mgd
Equipment Value: $4.4 M

Technical Elements/Relevance
- MBBR for BOD, Ammonia and nitrate removal
- New construction with specific design features required for the MBBR due to approach velocity
- Municipal Facility upgrading from RBC's to meet new effluent permit limit for BOD and Total Nitrogen

Mountaire Farms: MBBR + DAF, Selbyville, DE

Completion Date: 2011
Size of Facility: 1.3 mgd
Equipment Value: $1.4 M

Technical Elements/Relevance
- Industrial Facility – Fluctuating Loads
- MBBR for BOD & Ammonia Removal
- DAF for Final Clarification of Biological Solids

Moark, LLC: Complete Treatment DAF + MBBR + DAF, Bozrah, CT

Completion Date: 2010
Size of Facility: 0.02 mgd
Equipment Value: $1.4 M

Technical Elements/Relevance
- Industrial Facility – Direct Discharge Permit
- MBBR for BOD & Total Nitrogen Removal
- DAF for Final Clarification of Biological Solids

DC Water: DEMON®, Washington, DC

Completion Date: Ongoing
Size of Facility: 352 mgd; 2.7 mgd (filtrate system)
Equipment Value: $6.3 M

Technical Elements/Relevance
- New construction/specific design features required.
- Filtrate from system exhibited toxicity to the AOB. Pilot testing allowed for better knowledge of wastewater to show treatability and a full scale design.
- Close collaboration between vendor, engineer and municipal client for a more cost-effective system.

Hillshire Farms (formerly Sara Lee): DAF + MBBR + DAF, Storm Lake, IA

Completion Date: 2012
Size of Facility: **1.2 mgd; 4,507 lb/day BOD; 1,000** lb/day TSS; 1,102 lb/day TKN to MBBR treatment system
Equipment Value: $4 M

Technical Elements/Relevance
- DAF – MBBR – DAF configuration for treatment of wastewater prior to discharge to local WWTP
- Single stage MBBR provides BOD removal as partial nitrification to reduce loading on city WWTP
- Variable / seasonable loading to DAF + MBBR + DAF system

Heyward, Inc.

Heyward has provided service and equipment to HRWTF for many years, and is very knowledgeable about the plant operations and installed process equipment, and the new matching equipment that is proposed as part of the Phase 2 Improvements project. Heyward also has direct experience with MBBR and fixed film process technologies that are relevant to the City of Hopewell's project as evidenced by the following project experience.

MBBR Pilot Plant at Hopewell

Noman Cole WWTP: MBBR, Lorton, VA

Completion Date: 2013
Size of Facility: 67 mgd
Equipment Value: $10 M

Technical Elements/Relevance

- Furnished MBBR Process Equipment for treated effluent polishing to remove Nitrates
- New construction with specific design features required to meet effluent TN=2 mg/l
- Municipal Facility upgrading to meet new effluent permit limit for BOD, Total Nitrogen and Total Phosphorous

HRSD James River WWTP: IFAS, Newport News, VA

Completion Date: 2013
Size of Facility: 20 mgd
Equipment Value: $8 M

Technical Elements/Relevance

- Furnished IFAS Process Equipment for BOD, Nitrogen and Phosphorous Removal
- Modification of the existing biological reactors to an MLE configuration with integrated fixed film activated sludge (IFAS) in the aerobic sections
- Municipal Facility upgrading to meet new effluent permit limit for BOD, Total Nitrogen and Total Phosphorous

Hopewell Regional WTF: Alt. 4A-1 Phase 1, Contract 1

Completion Date: 2012
Size of Facility: 50 mgd
Equipment Value: $2 M

Technical Elements/Relevance

- Furnished Process Equipment for New Headworks Facility and Primary Clarifier Modifications
- New Domestic Influent Fine Screens and Screenings Washer/Compactors with Controls
- Retrofit/Modification of Primary Clarifiers Nos 1-3, Chain & Flight Sludge Collectors
- Large-Bubble Mixing System for Chlorine Contact Tanks
- Sodium Hypochlorite Chemical Feed Systems and Controls

Hopewell Regional WTF: Post Aeration Facility, Design-Build Project

Completion Date: 2001
Size of Facility: 50 mgd
Equipment Value: $1.8 M

Technical Elements/Relevance

- Furnished Process Equipment for New Post Aeration Facility
- Teamed with Local Contractor and Engineer to provide turn-key solution
- Furnished Facility Design and Oxycharger Static Aerator Equipment

Hopewell Regional WTF: Centrifuge Solids Dewatering Facility

Completion Date: 1998
Size of Facility: 50 mgd
Equipment Value: $3 M

Technical Elements/Relevance

- Furnished Process Equipment for Centrifuge Solids Dewatering Facility
- New Horizontal Decanter High-Solids Centrifuges with Controls
- New Foreign Sludge Hopper, Incinerator Feed Pumps, and Sludge Transport System with Controls

Performance Evaluation Reports

Most client performance evaluation reports are of a confidential nature and as such cannot be included with this submission. However in the interest of transparency, reviewers are encouraged to contact any or all references provided on pages 59-62. These clients can attest to our qualifications and commitment to safety, schedule, cost and quality. Additionally, the table below lists example projects where our team met schedule and cost goals.

Demonstrated Ability to Meet Schedule

Project	Milestone	Scheduled	Actual
HDR: **HRSD Atlantic Treatment Plant Expansion Phase I**	Issue Final PER	2/28/05	2/25/05
	Initiate Final Design	2/1/05	1/7/05
	Advertisement - Contract C	12/1/06	11/12/06
	Bid Opening – Contract C	2/28/07	2/15/07
	Construction NTP – Contract C	5/29/07	5/1/07
	Substantial Completion – Contract C	5/28/10	4/12/10
HDR: **HRSD York River Treatment Plant Expansion Phase I Contract B**	Notice to Proceed	11/1/10	11/1/10
	30% Design	2/1/10	2/1/10
	60% Design (95% Site & Foundations)	6/28/11	6/10/11
	Submit Guaranteed Maximum Price	6/29/11	6/29/11
HDR: **HRWTF Alt. 4A-1 Light Phase 1, Contract No. 1, 2, and 3**	Contract 1: Advertise	2/3/10	2/3/10
	Contract 1: Notice to Proceed	8/2/10	8/2/10
	Contract 1: Substantial Completion	4/23/12	4/18/12
	Contract 2: Advertise	8/9/10	8/9/10
	Contract 2: Notice to Proceed	1/10/11	1/10/11
	Contract 2: Substantial Completion	1/15/12	3/3/12
	Contract 3: Advertise	9/14/10	9/14/10
	Contract 3: Notice to Proceed	2/14/11	2/14/11
	Contract 3: Substantial Completion	9/11/11	10/26/12
PC: **Percy Miller WTP Upgrade**	Notice to Proceed	1/04/10	1/04/10
	Substantial Completion	5/13/12	3/21/12
	Final Completion	8/11/12	4/30/12
PC: **Basham Simms Wastewater Facility Expansion**	Notice to Proceed	3/24/08	3/24/08
	Contract 1, Milestone 1	6/22/08	3/31/08
	Contract 1, Milestone 2	7/21/09	7/17/09
	Contract 1, Milestone 3	10/19/09	8/07/09
	Contract 1, Milestone 4	4/11/10	6/08/10
	Contract 1, Milestone 5	6/10/10	4/21/10
	Contract 1, Milestone 6	8/9/10	8/2/10
	Contract 2, Milestone 1	2/17/09	2/12/09
	Contract 2, Milestone 2	4/18/09	4/07/09
PC: **H.L. Mooney WRF Expansion and Upgrade Stage 2, Phase 1**	Notice to proceed	10/04/07	10/04/07
	Substantial Completion	9/30/10	9/30/10
	Final Completion	5/30/11	4/30/11

Demonstrated Ability to Stay Within Budget

Project	Milestone	Estimated/Actual
HDR: **HRSD Atlantic Treatment Plant Expansion Phase I**	PER Estimate	$100,000,000
	Engineer's Estimate at Bid	$149,139,000
	Accepted Bid Price	$148,506,000
	Change Orders – Owner-Generated	$12,292,433 (8.3%)
	Change Orders – Transfer Work Between Contracts	$1,080,743 (0.7%)
	Change Orders – Other	$2,706,991 (1.8%)
	Final Contract Price	$164,586,167
HDR: **HRSD York River Treatment Plant Expansion Phase I Contract B**	Initial Proposal	$49,883,000
	Contract Cost Limit	$41,992,000
	Guaranteed Maximum Price Proposal	$40,323,000
	Guaranteed Maximum Price Accepted	$40,550,000
HDR: **HRWTF Alt. 4A-1 Light Phase 1, Contract No. 1, 2, and 3**	Contract 1 Change Orders	$302,340
	Contract 2 Change Orders	$47,690
	Contract 3 Change Orders	($1,158)
	Total Change Orders	$348,872
	PER Estimate	$29,920,000
	Engineer's Estimate at Bid	$20,410,000
	Accepted Bid Price	$16,086,000
PC: **HRWTF Alt. 4A-1 Light Phase 1, Contract No. 1 (Competitive Bid)**	Bid price	$8,700,000
	Change Orders	$302,340
	Final cost	$9,002,340
PC: **H.L. Mooney WRF Expansion and Upgrade Stage 2 Phase 1 (Design-Build)**	Bid price (GMP)	$108,750,000
	Change Orders (owner initiated)	$10,050,000
	Final Contract Price	$118,800,000
PC: **Yellow River Advanced Water Reclamation Facility (CM-at-Risk)**	GMP price	$250,000,000
	Change Orders (Value Engineering savings)	($11,700,000)
	Final Contract Price	$238,300,000

1d. Team Contact Information

Provide the names, addresses, and telephone numbers of persons within the private entity who may be contacted for further information.

HNP Main Point of Contact for City of Hopewell

Bob Huie, Design-Build Project Manager
Hopewell Nutrient Partners, A Joint Venture
802-922-6535
RHuie@pcconstruction.com
5700 Lake Wright Drive, Suite #300
Norfolk, VA 23503

Other Points of Contact

Bill M'Coy, Design Manager
HDR Engineering, Inc.
757-222-1517
William.Mcoy@hdrinc.com
5700 Lake Wright Drive, Suite #300
Norfolk, VA 23503

Tony Snead, Vice President
HDR Constructors, Inc.
602-723-8296
Tony.Snead@hdrinc.com
3200 East Camelback Rd., Suite 350
Phoenix, AZ 85018

Jeff Garner, Senior Vice President
PC Construction Company
802-598-6818
JGarner@pcconstruction.com
193 Tilley Drive
South Burlington, VT 05403

1e. Audited Financial Statements

Provide a current or most recently audited financial statement of the private entity and each partner with an equity interest of ten percent or greater.

Due to the confidential nature of our audited financial statements, please refer to Volume II, Section 1e.

1f. Disqualifications

Identify any persons known to the proposer who would be obligated to disqualify themselves from participation in any transaction arising from or in connection to the project pursuant to the Virginia State and Local Government Conflict of Interests Act, Chapter 31 (§ 2.2-3100 et seq.) of Title 2.2.

Statement

The Hopewell Nutrient Partners, A Joint Venture, its component partners, nor its major team member firms have anyone on staff who would be disqualified from participating in any transaction arising from or in connection to this proposed PPEA project pursuant to the Virginia State and Local Government Conflict of Interest Act. Additionally, HNP knows of no one affiliated with this project that would have a conflict of interest.

1g. Proposed Plan for Obtaining Sufficient Number of Qualified Workers

Identify the proposed plan for obtaining sufficient numbers of qualified workers in all trades or crafts required for the project.

Regional Resources

HNP's two component partners (HDR and PC) have constructed projects in 32 states over the past 55 years and have a labor force of nearly 9,500 professionals and craft workers. PC has more than a dozen projects with an aggregate value of nearly $450 million within a two-and-a-half hour drive of the HRWTF. PC has the ability to draw experienced craft workers and construction equipment resources, as-needed, to most efficiently construct the Phase 2 Improvements project. These projects have been ongoing and have a large pool of experienced professionals. In addition, HDR has a staff of 300 engineering and construction professionals who live and work in Virginia.

Over the last few decades of performing work in the region, HNP's component partners have established excellent relationships with local and regional key subcontractors and vendors. The subcontractors and vendors appreciate the orderly, well-planned manner in which our projects are constructed, getting paid on time and our commitment to the safety of all workers on the site.

Benefits to the City of Hopewell

- Prequalification and careful structuring of work packages lead to competitive pricing, maximization of the resources of the subcontractor community, and delivery of the level of quality expected by HRWTF

Self-Perform Work

HNP anticipates self-performing approximately 70 percent of the direct craft labor on the Phase 2 Improvements project including:

- Yard Piping
- Structural Excavation
- Structural Concrete
- Process Piping
- Process Equipment
- HVAC Equipment and piping
- Plumbing

The City of Hopewell benefits from this approach because:

- HNP directly controls all construction work on the critical path except electrical, instrumentation, and controls. This allows HNP to shift resources as needed to execute the critical path schedule.
- HNP carefully coordinates all mechanical and structural tie-ins allowing us to plan for and swiftly respond to any changes due to plant operations needs or unexpected conditions. This is particularly important on this project as construction operations and plant operations will be interactive.
- This approach in many instances minimizes double markups for overhead and profit, which lowers overall project cost.

The anticipated self-performed labor by HNP represents approximately 10 percent of the total direct cost of the work. The remainder of the work and all materials and equipment installed with HNP labor will be competitively selected.

1h. Legal Information

For each private entity or major subcontractor that will perform construction or design activities, provide the following information:

(1) A sworn certification by an authorized representative of the private entity attesting to the fact that the private entity is not currently debarred or suspended by any federal, state or local government entity.

(2) A completed qualification statement that reviews all relevant information regarding technical qualifications and capabilities, private entity resources and business integrity of the private entity, including but not limited to, bonding capacities, insurance coverage and private entity equipment. This statement shall also include a mandatory disclosure by the private entity for the past five years any of the following conduct:

- *(A) bankruptcy filings*
- *(B) liquidated damages*
- *(C) fines, assessments or penalties*
- *(D) judgments or awards in contract disputes*
- *(E) contract defaults, contract terminations*
- *(F) license revocations, suspensions, other disciplinary actions*
- *(G) prior debarments or suspensions by a governmental entity*
- *(H) denials of prequalification, findings of non-responsibility*
- *(I) safety past performance data, including fatality incidents, "Experience Modification Rating," "Total Recordable Injury Rate" and "Total Lost Workday Incidence Rate"*
- *(J) violations of any federal, state or local criminal or civil law*
- *(K) criminal indictments or investigations*
- *(L) claims filed by or against the firm*

Sworn Certification Stating Private Entity Is Not Currently Debarred Or Suspended

Our team has provided sworn statements for the HNP component partners on the following pages.

HDR Financial and Legal Information

In Volume II, Section 1h, please find HDR's financial and legal information: Qualification Statement, Bonding, Insurance, Private Entity Equipment, and mandatory disclosure subsections A through L.

PC Financial and Legal Information

In Volume II, Section 1h, please find PC's financial and legal information: Qualification Statement, Bonding, Insurance, Private Entity Equipment, and mandatory disclosure subsections A through L.

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AFFIDAVIT OF NO DEBARMENT OR SUSPENSION

The undersigned hereby certifies it is not currently debarred or suspended by any federal, state or local government entity.

Date: 8/30/13

By: _____
(Signature of Respondent's Authorized Representative)

By: Douglas E. Lisak
(Printed Name of Respondent's Authorized Representative)

Title: President
(Title of Respondent's Authorized Representative)

For: HDR Constructors, Inc.
(Title of Respondent's Authorized Representative)

Shawn P Murphy
(Notary Public)

State of: Missouri

County of: Jackson

On this 30th day of August, 2013, before me appeared Douglas E. Lisak, personally known to me to be the person described in and who executed the document and acknowledged that (she/he) signed the same freely and voluntarily for the uses and purposes therein described.

In witness thereof, I have hereunto set my hand and affixed my official seal the day and year last written above.

Shawn P Murphy
(Signature)

Notary Public in and for the state of: Missouri

Shawn P. Murphy
(Printed Name)

SHAWN P. MURPHY
Notary Public-Notary Seal
STATE OF MISSOURI
Jackson County
My Commission Expires June 27, 2015
ID # 11206722

AFFIDAVIT OF NO DEBARMENT OR SUSPENSION

The undersigned hereby certifies it is not currently debarred or suspended by any federal, state or local government entity.

Date: 9/1/13

By: _____
(Signature of Respondent's Authorized Representative)

By: Jeffrey A. Garner
(Printed Name of Respondent's Authorized Representative)

Title: Senior Vice President
(Title of Respondent's Authorized Representative)

For: PC Construction, Inc.
(Title of Respondent's Authorized Representative)

_____
(Notary Public)

State of: Vermont

County of: Chittenden

On this 1st day of September, 2013, before me appeared Jeffrey A. Garner, personally known to me to be the person described in and who executed the document and acknowledged that (she/he) signed the same freely and voluntarily for the uses and purposes therein described.

In witness thereof, I have hereunto set my hand and affixed my official seal the day and year last written above.

_____
(Signature)

Notary Public in and for the state of: Vermont 2/10/2015

Kathryn Kantorski
(Printed Name)

1i. Worker Safety Programs

Describe worker safety training programs, job-site safety programs, accident prevention programs, written safety and health plans, including incident investigation and reporting procedures.

HNP Worker Safety Program

Safe construction begins with proper planning and a positive attitude towards achieving a stated goal, and continues with the execution of a written plan. HNP has adopted PC's Safety Program for the HRWTF Phase 2 Improvements project. HDR's Safety Program is designed to ensure individual and project safety as well as protect and preserve the health of everyone who enters our project sites. Our primary goal is for all employees to return home in the same healthy condition in which they arrived. To that end, we require all HNP, subcontractor, owner and vendor personnel to strictly adhere to HNP's Safety Program as well as other federal, state and owner safety regulations.

HNP's safety program is built upon the attitude that all incidents are preventable. We will employ a Zero Accidents – No Excuses philosophy for managing project safety. Our nationally-recognized safety program is based upon the fundamentals of prevention, awareness and personal accountability. HNP's proactive approach to safety includes:

- Pre-planning
- Education
- Prevention

HNP recognizes that our most critical safety device on any project is a safety-conscious employee. Our team understands that safety is more than a priority; it is a condition of employment. We are proud of our dedication to safety and our team's resulting safety performance. HDR and PC both offer impressive safety records as demonstrated in our EMR rankings in Volume II, Section 1h. PC is nationally ranked in the top 2 percent of contractors for their safety record.

Project Specific

Overall responsibility for safety on this project will rest with the superintendents who will proactively manage the implementation of the site safety plan for HNP's team, subcontractors and suppliers working on the job site. Reporting to our construction manager will be our full-time safety engineer who is responsible for administering our site safety program.

The first step occurs before the project begins and focuses on a project-specific site safety plan. Working with the owner and regional safety engineer, the project team will develop the plan at the onset of the project. The plan will identify the risks or hazards associated with the work, employee safety training needs and owner safety requirements. The initial plan will be completed prior to the start of any major construction activities and will be updated throughout the course of the project.

Our safety engineer will monitor implementation of the plan which includes:

- Orchestrating pre-employment drug testing and training
- Integrating our plan with Hopewell's safety plan
- Pre-planning of all activities including any special requirements of the project

Every treatment plant is unique and has its own safety procedures and protocols. Our safety engineers will review your safety plan and incorporate any special requirements that may be different from our procedures.

For example, evacuation rally points, severe weather protocols and chemical handling requirements for your plant may require specialized procedures that may differ from our plan or our interpretation of your procedures.

Our safety engineers understand that communication is the key to implementation of our safety plan for adaptation of any special situations that may be unique to the Hopewell plant.

HNP's safety pre-planning worksheet assists project teams with planning safety into activities involving potential high risks such as falls, excavation, confined space, and lock out/tag out as well as activities requiring logistics to complete such as scaffolding, lanyards or lifelines. Activities requiring more in-depth safety planning will be identified at the onset of the project in the site-specific safety plan and the actual plans develop throughout the course of the project.

Safety Audits

As part of HNP's commitment to safety, regular safety audits are conducted using the Predictive Solutions safety technology. Predictive Solutions is a management tool that allows the designated site safety officer and project management team to log safe and unsafe observations relative to OSHA safety categories (i.e., personnel protective equipment, fall protection, scaffolding, etc.). As the site safety engineer or superintendent conducts the safety audit, the observations are logged into a hand-held device. At the end of the audit, the results are tabulated and any unsafe observations are reviewed with the project team. Corrective actions for unsafe observations are then noted in the database and tracked until the issue is resolved. Copies of the audit reports are then generated by the Predictive Solutions system and distributed to the project management team.

Over time, the project data stored in Predictive Solutions is tracked to review project safety performance and identify any potential trends for unsafe acts (i.e., scaffolding hazards). Once a potential trend is identified, the information can be used to proactively address potentially unsafe conditions, eliminating more serious safety issues that could develop in the future.

Safety Awards
Vermont Governor's Award for Outstanding Workplace Safety – Finalist 2010
Best Craft Training Program Associated General Contractors of America (AGC) – Awarded to PC Construction 2009
Outstanding Safety Record Award AGC of Georgia – Honored for supervising over 50,000 hours of work in 2004 without a lost time or recordable injury
National Construction Safety Excellence Award AGC of America – Awarded to PC Construction in the Heavy Contractor Division 2000

SECTION 2 - PROJECT CHARACTERISTICS

SECTION 2 - PROJECT CHARACTERISTICS

SECTION 2 | PROJECT CHARACTERISTICS

2a. Proposed Project Description

Provide a description of the proposed project, including the conceptual design, in sufficient detail so that type and intent of the project, its location, and the communities that may be affected are clearly identified.

Background

The Hopewell Regional Wastewater Treatment Facility (HRWTF) is a 50 million gallon per day (mgd) secondary wastewater treatment plant that currently treats an annual average flow of approximately 27 mgd of combined wastewater from local industries and domestic sources. Industrial loading comprises approximately 85 percent of the total flow and 90 percent of the organic loading to the HRWTF and is generated primarily by five local industries: Honeywell, Hopewell, Virginia Plant (Honeywell), Ashland Aqualon (Ashland), Evonik Goldschmidt (Evonik), RockTenn, and the Virginia American Water Company (VAWCO). Other industrial sources include leachate haulers and Fort Lee.

The HRWTF discharges effluent into Gravelly Run, a tributary of the James River in the Chesapeake Bay Watershed. As a Significant Discharger to the Chesapeake Bay, the HRWTF's allowable nutrient discharge loading is capped by nutrient control regulations adopted by the Virginia Department of Environmental Quality on the Chesapeake Bay and its tributaries (Virginia's Water Quality Management Planning Regulation 9 VAC 25-720). The current waste load allocations established for HRWTF are 1.83 million lbs/year (Mlbs/year) of total nitrogen (TN) and 0.075 Mlbs/year of total phosphorus (TP). The HRWTF is currently below its phosphorus waste load allocation, but exceeded its TN waste load allocation in 2009 and 2010. HRWTF purchases nitrogen credits under the Chesapeake Bay Nutrient Credit Exchange Program (via a private agreement with Honeywell) in order to comply with its TN waste load allocation.

The future market for nitrogen credit purchases is uncertain for two primary reasons. First, the cost for credits is not established past 2017 and future credit availability may be limited. Second, there are current legal challenges to the Clean Water Act's authorization of pollution trading and offset programs in the final rule promulgated by the US Environmental Protection Agency establishing the Total Maximum Daily Loads for nitrogen, phosphorus, and sediment for the Chesapeake Bay and its tributaries. For these (and other) reasons, HRWTF must implement nitrogen-reduction improvements. These improvements (Phase 2 Improvements) expand on the Alternative 4A-1 Light, Phase 1 Improvements completed in May 2012, which achieved partial segregation of the domestic flow from the industrial flow at the HRWTF.

Phase 2 Improvements - Base Improvements

The Phase 2 Improvements will reduce effluent total nitrogen (TN) to meet the current nitrogen waste load allocation, and address industry requests to add capacity for increased industrial loads. The design flow capacity of this 50 mgd treatment facility will not be increased.

The Phase 2 Improvements include a segregated treatment process to provide year-round nitrification and partial denitrification of the domestic wastewater and a portion of the Honeywell wastewater in a segregated treatment process and add denitrification capacity in the existing UNOX reactor to achieve additional denitrification of the combined segregated waste stream effluent and industrial flows.

A Moving Bed Biofilm Reactor (MBBR) treatment system designed for biological nutrient removal is proposed for the Phase 2 Improvements. The MBBR system was selected because of its resistance to spike loads of inhibitory compounds due both to the biofilm structure as well as the separate BOD oxidation and nitrification fixed film compartments.

The Phase 2 Improvements will allow HRWTF to continue to meet their TN and TP waste load allocations. The segregated treatment approach sets the Limit of Technology (LOT) effluent quality for

HRWTF because only a portion of the flow passes through nutrient removal. The effluent quality is determined by the dilution of the segregated flow into the remaining industrial streams. The segregated treatment system is designed to fully nitrify and partially denitrify. Combining the treated segregated system effluent with the remaining influent flow results in a final effluent total nitrogen concentration of 15.0 mg/L on an annual average basis. The Phase 2 Improvements are not expected to affect effluent total phosphorus.

Components of Phase 2 Improvements

The Phase 2 Improvements will include the following components:

- **Gravelly Run Pump Station (GRPS) and Forcemain Improvements:** The existing GRPS will be replaced with a new pump station having a firm pumping capacity of 7,500 gpm and having the capacity to divert Honeywell flow to both the segregated treatment system and the industrial headworks. The new pump station will include submersible pumps and a channel grinder. The Honeywell flow will be segregated from the VAWCO and RockTenn flows by constructing new force mains parallel to the existing North Interceptor. A new force main will be installed between GRPS and the RockTenn connection to convey the VAWCO flow and a new force main will be installed between the RockTenn connection and the plant site to convey the Honeywell flow.
- **Sodium Bisulfite Facility:** Dechlorination is required to reduce the chlorine residual in the primary effluent prior to entering the MBBR tanks. Sodium bisulfite storage and feed facilities will be installed to accomplish this function.
- **MBBR Influent Pump Station:** Disinfected domestic wastewater will be conveyed to the MBBR treatment system by a new MBBR Influent Pump Station. The pump station will have sufficient capacity to handle the peak design flows and will consist of vertical turbine solids handling pumps. A new MBBR Influent Weir Box will be constructed north of the existing chlorine contact tank effluent channel. This box will have a long weir that will stabilize the water level in the chlorine contact tanks. Disinfected domestic wastewater will flow through the weir box to the MBBR Influent Pump Station wetwell. The wetwell also receives flow from the MBBR tanks during tank draining through the MBBR tank drain line.
- **MBBR Screenings Facility:** The industrial (Honeywell) flow must be screened before entering the MBBR to avoid plugging the media retention screens. The MBBR Screenings Facility will be attached to the MBBR tanks. The MBBR Screenings Facility includes the MBBR screen influent chamber, mechanical screens and the Gravelly Run/Domestic mixing chamber. New flow-through, perforated plate mechanical screens will be provided. The new screens will be installed in the two new screen channels. Each screen is sized for the peak industrial wastewater flow to allow one screen to serve as a standby unit. Screened material will be conveyed hydraulically via a water flume to screw-type washer and compactor units installed at the top of the MBBR tank. Dewatered screenings will fall through a discharge chute and into a dumpster to be hauled off-site for landfill disposal.
- **MBBR Tanks:** The new MBBR system includes sufficient capacity to treat the 2040 flows and loads. The treatment volume is divided into five tanks and each tank is provided with four treatment cells. The first cell is an anoxic cell, provided with submersible mixers in each tank. The second cell is for BOD removal and is provided with a diffused aeration grid. The third and fourth cells are for nitrification and are also provided with aeration grids.

  MBBR effluent is recycled to the head of the tank using axial flow pumps of quantity and size to provide a capacity of 2Q. This recycle flow will increase denitrification and reduce, but not eliminate, alkalinity addition requirements. Facilities to store and feed caustic (sodium hydroxide) as a source of supplemental alkalinity will be provided.
- **Blower Building:** To provide air and mixing in the MBBR process, new blowers will be installed. To span the range of flows anticipated, multiple blowers are provided. The blowers will be located in the Blower Building adjacent to the MBBR tanks.

- **Supplemental Phosphorus Feed System:** Pilot testing indicated the need for periodic addition of phosphorus to the MBBR system to provide adequate nutrients for biological growth. The existing phosphorus solution and phosphoric storage tanks can be used for this purpose. Under the Phase 2 Improvements, metering pumps and small diameter piping will be installed to feed phosphorus to the MBBR influent.
- **Dissolved Air Flotation (DAF) Building:** Excess biological solids discharged from the MBBR tanks must be captured and sent to the solids handling system. To accomplish this, three DAF units will be provided. MBBR effluent will be equally split and will flow by gravity through dedicated lines to the DAF units. Air bubbles are introduced into the unit using aspirating pumps per DAF. DAF effluent will flow through a combined effluent header and return to the denitrification basin influent channel. Solids are drawn from a connection below each unit and returned to the Solids Holding Tanks using progressing cavity pumps.

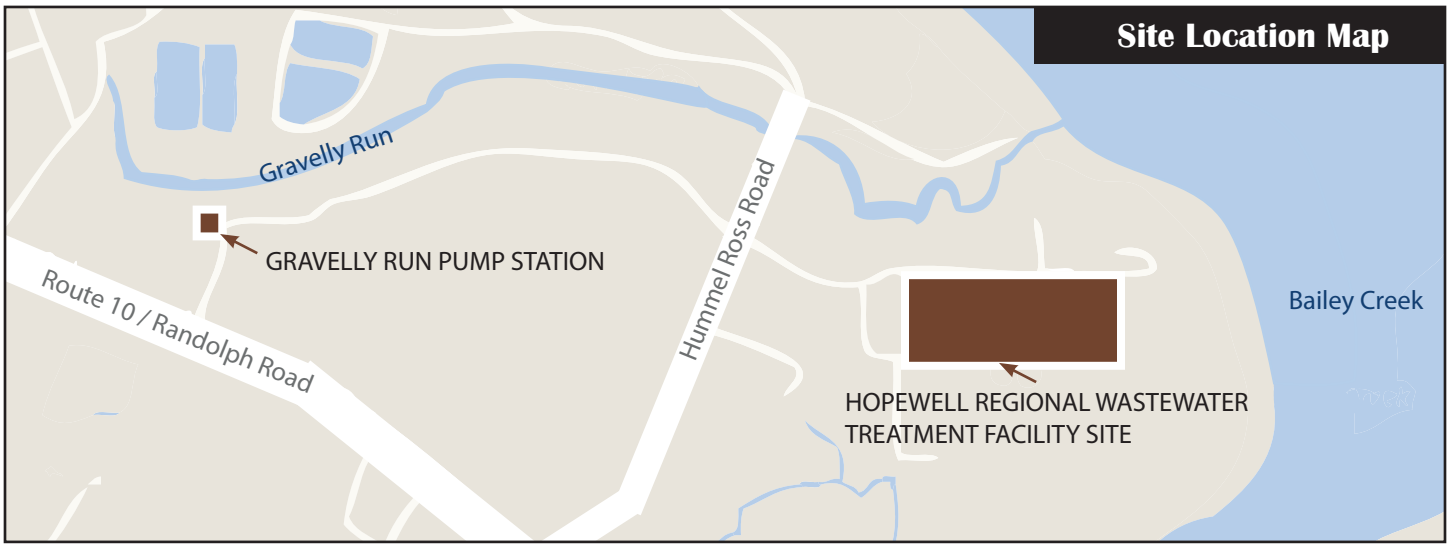
  The DAF Building will house a polymer system used to feed polymer to the DAF units. This system will use dry polymer from super sacks and wet, mix and age the polymer for feed into the DAF units. The caustic storage and feed system for the MBBR tanks will also be located in the DAF Building.
- **UNOX Aeration Tanks:** The existing denitrification basin does not have sufficient capacity to treat the nitrate load expected under the Phase 2 Improvements design basis. The first stage of the UNOX aeration tanks will be converted to an anoxic zone to increase denitrification capacity and meet these expected loads. This will entail installation of mixers.
- **Effluent Re-aeration:** The facility currently has four OxyCharger units installed to provide re-aeration for the final effluent. The re-aeration structure includes space for a fifth unit. To meet the increase flows under the Phase 2 Improvements design basis, the fifth OxyCharger unit will be installed.

For additional project enhancement ideas, please reference Volume II, Section 2a. Some of these project enhancements are required to provide the full design basis 2040 flow and load capacity.

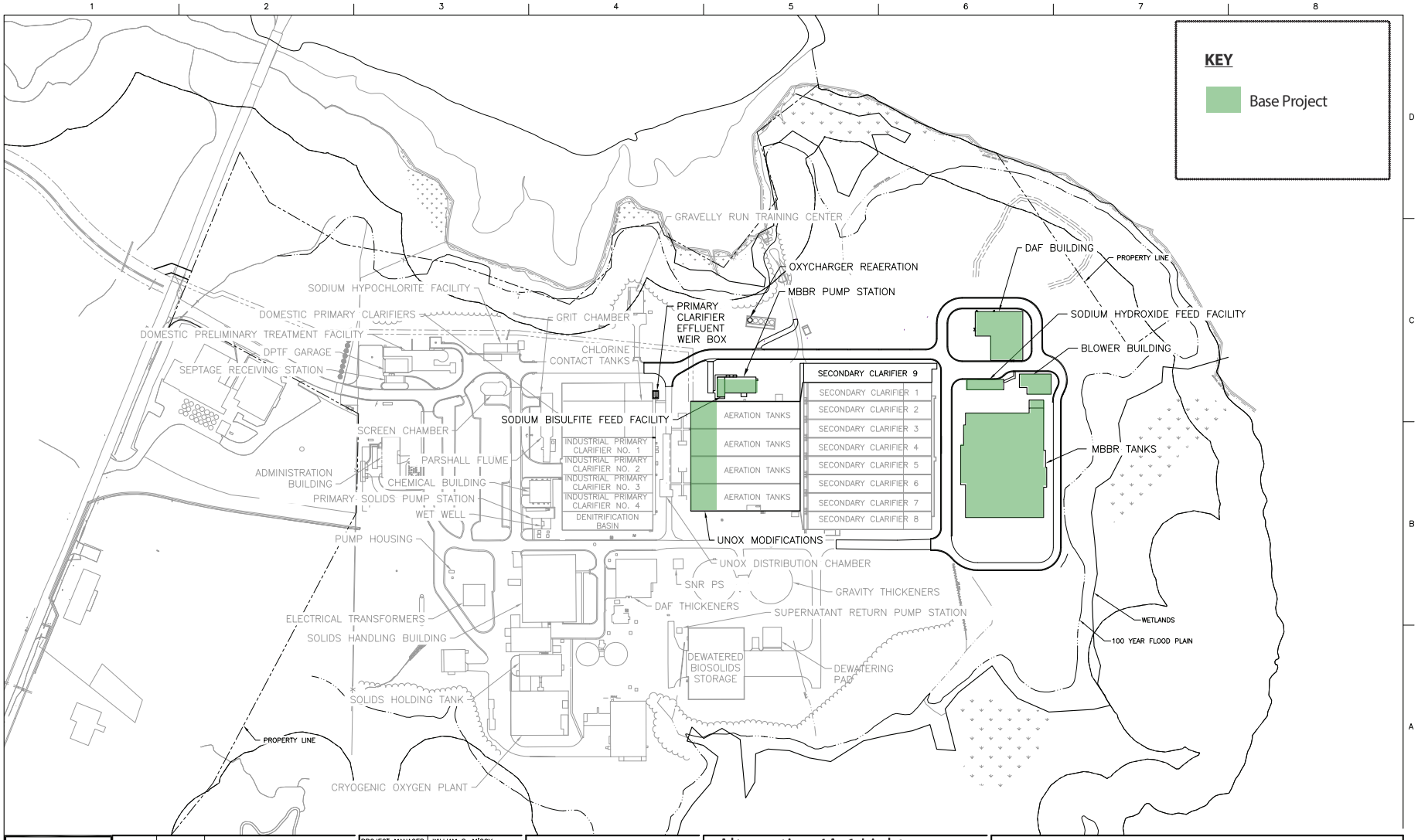
Conceptual Design of Phase 2 Improvements

We have provided the following conceptual design drawings on the following pages:

- Site Location Map
- Overall Site Plan - Base Project
- Proposed Process Flow Diagram - Base Project



Overall Site Plan - Base Project



HDR Engineering, Inc.
5700 Lake Wright Dr.
Suite 300
Norfolk, VA 23502

ISSUE	DATE	DESCRIPTION
A	08/26/2013	30% DESIGN SUBMITTAL

PROJECT MANAGER:	WILLIAM S. M'COY
DESIGNED BY:	D. ZIRKLE
DRAWN BY:	T. LOKEY
CHECKED BY:	
PROJECT NUMBER	

30% DESIGN

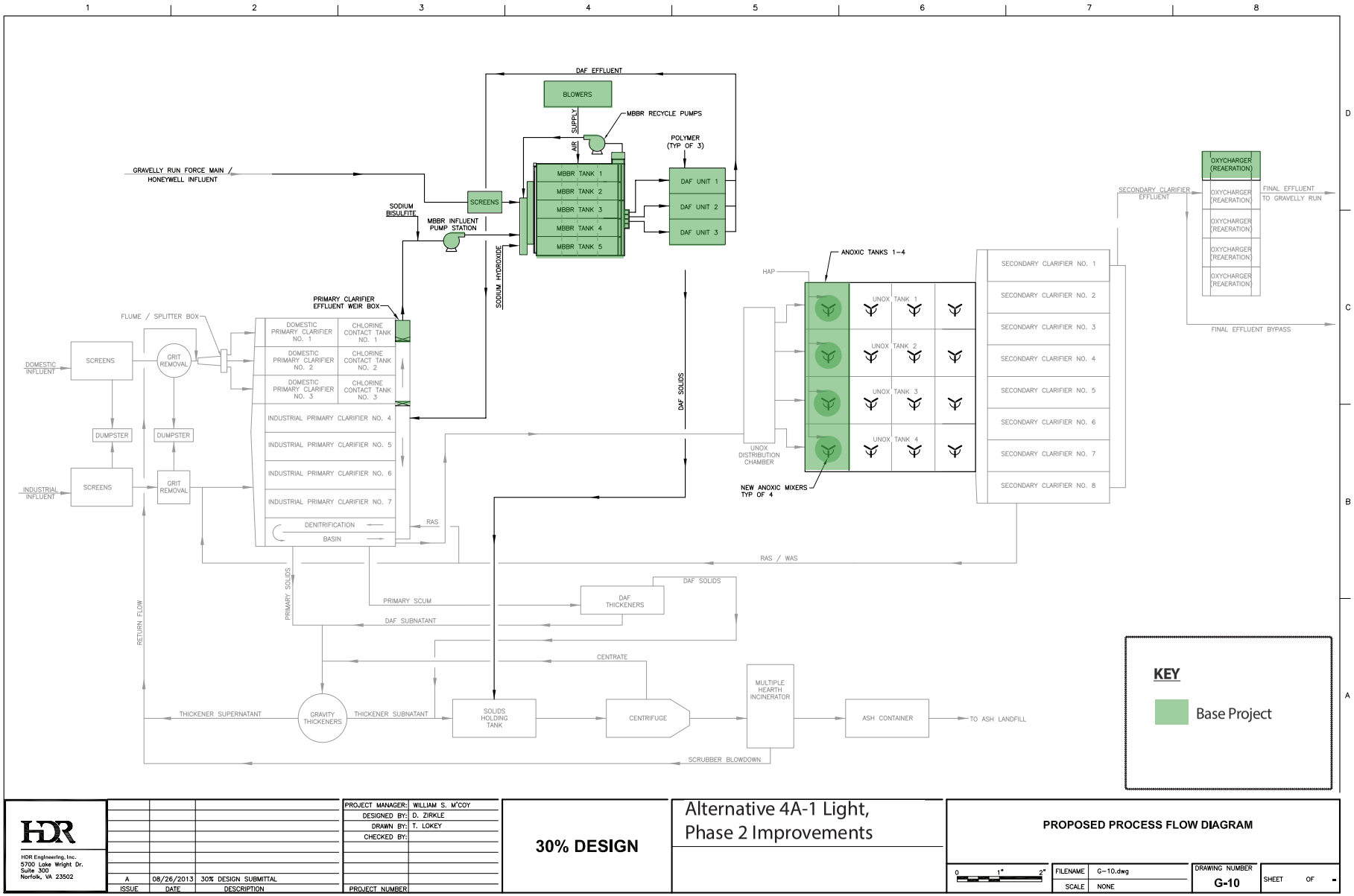
Alternative 4A-1 Light, Phase 2 Improvements

OVERALL SITE PLAN

0 1" 2"

FILENAME	G-07.dwg
SCALE	1"=100'
DRAWING NUMBER	G-07
SHEET	OF -

Proposed Process Flow Diagram



HDR Engineering, Inc. 5700 Lake Wright Dr. Suite 300 Norfolk, VA 23502			PROJECT MANAGER:	WILLIAM S. M'COY
			DESIGNED BY:	D. ZIRKLE
			DRAWN BY:	T. LOKEY
			CHECKED BY:	
A	08/26/2013	30% DESIGN SUBMITTAL		
ISSUE	DATE	DESCRIPTION	PROJECT NUMBER	

30% DESIGN

Alternative 4A-1 Light, Phase 2 Improvements

PROPOSED PROCESS FLOW DIAGRAM

FILENAME	G-10.dwg	DRAWING NUMBER	G-10
SCALE	NONE	SHEET	OF -

2b. Identification of Work to be Performed by the City of Hopewell

Identify and fully describe any work to be performed by the City.

It is the express intent of HNP to clearly define the responsibilities that uniquely belong to the City of Hopewell. It is HNP's further intent to limit HNP involvement as much as possible without sacrificing the collaboration needed to successfully implement this project.

This proposal is based on the City of Hopewell retaining the following responsibilities:

- Review and accept PPEA proposal
- Enter into a Comprehensive Agreement with HNP
- Provide approval of construction drawings and specifications
- Provide owner oversight functions during design and construction
- Review design and construction work progress and issue payments per monthly requests
- Secure funding of the project costs through Water Quality Improvement Fund (WQIF) grants and other sources of funds, which may include financing
- Conduct value engineering study to comply with Virginia Department of Environmental Quality (DEQ) WQIF guidelines
- Apply for and obtain DEQ VPDES permit (permit will be in City of Hopewell's name)
- Conduct public hearings per city, county and state regulations, ordinances and laws

2c. Required Permit Approvals

Include a list of all federal, state and local permits and approvals required for the project and a schedule for obtaining such permits and approvals.

Outlined below is a summary of federal, state and local permits and approvals required for this project. A schedule for obtaining these permits and approvals is detailed within the master schedule in Volume II, Section 2f.

Summary of Permitting Requirements

1. City of Hopewell
   a. Design Phase
      i. Site Plan Review
      ii. Statement of Special Inspections
   b. Construction Phase
      i. Land Disturbing Activity permit
      ii. Building Permits

2. Virginia Department of Environmental Quality
   a. Design Phase
      i. Application for Certificate to Construct (CTC)
      ii. Virginia Water Protection Permit (VWPP) via Joint Permit Application
   b. Construction Phase
      i. Virginia Stormwater Management Permit (including Stormwater Pollution Prevention Plan)
      ii. Application for Certificate to Operate
      iii. Submit updated O&M manual

3. HNP assumes that the Owner will be responsible for all air and VPDES permitting.

4. Early site preparation/foundation package – as indicated in the master schedule, initiation of site preparation work is key to meeting the overall construction schedule. The key steps in obtaining permit approval for this early site preparation work are as described below:
   a. DEQ will issue a CTC for an early construction package on a design-build project based on submittal of a Final Engineering Report (FER). This is essentially an "enhanced" PER. Therefore, plans and specifications do not have to be complete to obtain a CTC for site preparation/foundations.
   b. The City of Hopewell will require a site plan review prior to issuing building permit for the early construction package. That site plan review submittal will need to include site civil drawings (including E&SC).
   c. If a VWPP is required for the project, then that permit would need to be in hand to start any early site preparation work.

2d. Identification of Adverse Social, Economic, and Environmental Impacts

Identify any anticipated adverse social, economic and environmental impacts of the project. Specify the strategies or actions to mitigate known or anticipated impacts of the project. Indicate if any environmental or archaeological assessment has been completed.

Projected Adverse Social Impacts

HNP does not anticipate any significant adverse social impacts. However typical impacts due to construction will be encountered:

Impact	Mitigation Strategy
Increased traffic near job site	• Establish proper site entry signage and routing plan
Increased mud and dust on area roads	• Provide truck wash down system at construction entrance

Projected Adverse Economic Impacts

The only adverse economic impact anticipated is associated with the debt service for any borrowed funds and the increased operations and maintenance cost to the HRWTF Commission members. However, reliable and adequate wastewater treatment capacity is essential to the economic health of the City of Hopewell and the HRWTF Commission members. The Phase 2 Improvements project provides for this reliable and adequate capacity.

Projected Adverse Environmental Impacts

An environmental or archeological assessment have not been conducted for the Phase 2 Improvements project. If the City of Hopewell obtains financing through the state revolving loan fund program, then an environmental assessment may be required. HNP does not anticipate any significant adverse environmental impacts. However typical impacts due to construction will be encountered:

Impact	Mitigation Strategy
Potential site erosion and sediment control issues	• Design and implementation of stormwater control plan
Dust associated with construction activities	• Plan and implementation of a dust control plan
Minor filling of flood plain	• Evaluation to ensure no-rise condition
Minor impacts to wetlands for GRPS force main construction	• Obtain regulatory permits and comply with permit requirements to minimize impacts

2e. Identification of Positive Social, Economic, and Environmental Impacts

Identify the projected positive social, economic and environmental impacts of the project.

Projected Positive Social Impacts

The Phase 2 Improvements project allows the City of Hopewell to continue regional efforts to improve James River and Chesapeake Bay water quality by decreasing the total nitrogen discharged to these water bodies. By contributing to water quality improvement, City of Hopewell residents and guests will continue to enjoy boating, fishing, hiking, and swimming within and around these water bodies.

In addition, this project presents an opportunity for the City of Hopewell and the GREATER Hopewell Coalition [1] to continue their education process about water quality and provide access to world-class educational resources. The Coalition has previously provided water quality text, flashcards and field guides, authored by Dr. Reese Voshell, and published by McDonald & Woodward Publishing, to the Appomattox Regional Library System for circulation in the region.

Projected Positive Economic Impact

Although the population of the City of Hopewell is only 23,000 inhabitants, HRWTF is unique as it is sized at 50 mgd to also serve a large industrial base essential to the local and state economy. By providing reliable, compliant wastewater treatment, the HRWTF provides infrastructure support critical to the local and state economy.

Approximately 80 percent of the wastewater treated at HRWTF is from five industrial companies: Honeywell-Hopewell Plant, Ashland, RockTenn, Evonik Goldschmidt Corporation and Virginia American Water Company. It also treats the domestic wastewater for the City of Hopewell, portions of Prince George County, Fort Lee Post, Petersburg Federal Correctional Complex and Riverside Regional Jail.

The Hopewell-Prince George Chamber of Commerce [2] reported on April 2011 that the five leading manufacturers in the City of Hopewell alone represented $130,193,700 in local annual payroll for 1,434 employees. Approximately 20 percent of those employees live in the City of Hopewell and the rest are broadly distributed around the region. Mangum Economic Consulting reported in October 2011, through a report commissioned by the HRWTF, that:

- Manufacturing is the City of Hopewell's dominant employer, accounting for one out of every four jobs and paying wages that are almost twice the average wage in the city.
- Manufacturing contributes approximately $1.6 billion in total annual economic output to the City of Hopewell and surrounding communities.
- Manufacturing is indirectly responsible for supporting 2,907 jobs within the area. Together, the 1,871 direct manufacturing jobs in the City of Hopewell and the 2,907 other jobs supported in the area produce a total employment impact of 4,778 jobs.
- Manufacturing in the City of Hopewell directly and indirectly generates $127.8 million in federal, state and local tax revenue in the area annually ($87 million in federal tax revenue and $40.8 million in state and local tax revenue).

In addition to meeting essential wastewater treatment needs for the Hopewell area, the Phase 2 Improvements will provide opportunities for local jobs, including those at the project job site and through local business participation in supplying materials, equipment and services.

[1] *Information gathered from the GREATER Hopewell Coalition website: http://greaterhopewellcoalition.org/*

[2] *Information gathered from the Hopewell-Prince George Chamber of Commerce website: http://www.hpgchamber.org/*

Projected Positive Environmental Impact

The HRWTF discharges effluent into Gravelly Run, a receiving stream of the James River, and a tributary of the Chesapeake Bay Watershed. As a Significant Discharger to the Chesapeake Bay, the HRWTF's allowable nutrient discharge loading is capped based on the Chesapeake Bay and its tributaries nutrient control regulations adopted by the Virginia Department of Environmental Quality (Virginia's Water Quality Management Planning Regulation 9 VAC 25-720). This project will contribute to regional efforts to improve James River and Chesapeake Bay water quality by decreasing the total nitrogen discharged.

HRWTF's implementation of Phase 2 Improvements (nitrogen-reduction improvements) will expand on the Alternative 4A-1 Light, Phase 1 Improvements completed in May 2012, which achieved partial segregation of the domestic flow from the industrial flow at the HRWTF. The Phase 2 Improvements will reduce effluent total nitrogen to meet the current waste load allocation, and address industry requests to add capacity for increased industrial flow and load.

2f. Proposed Schedule

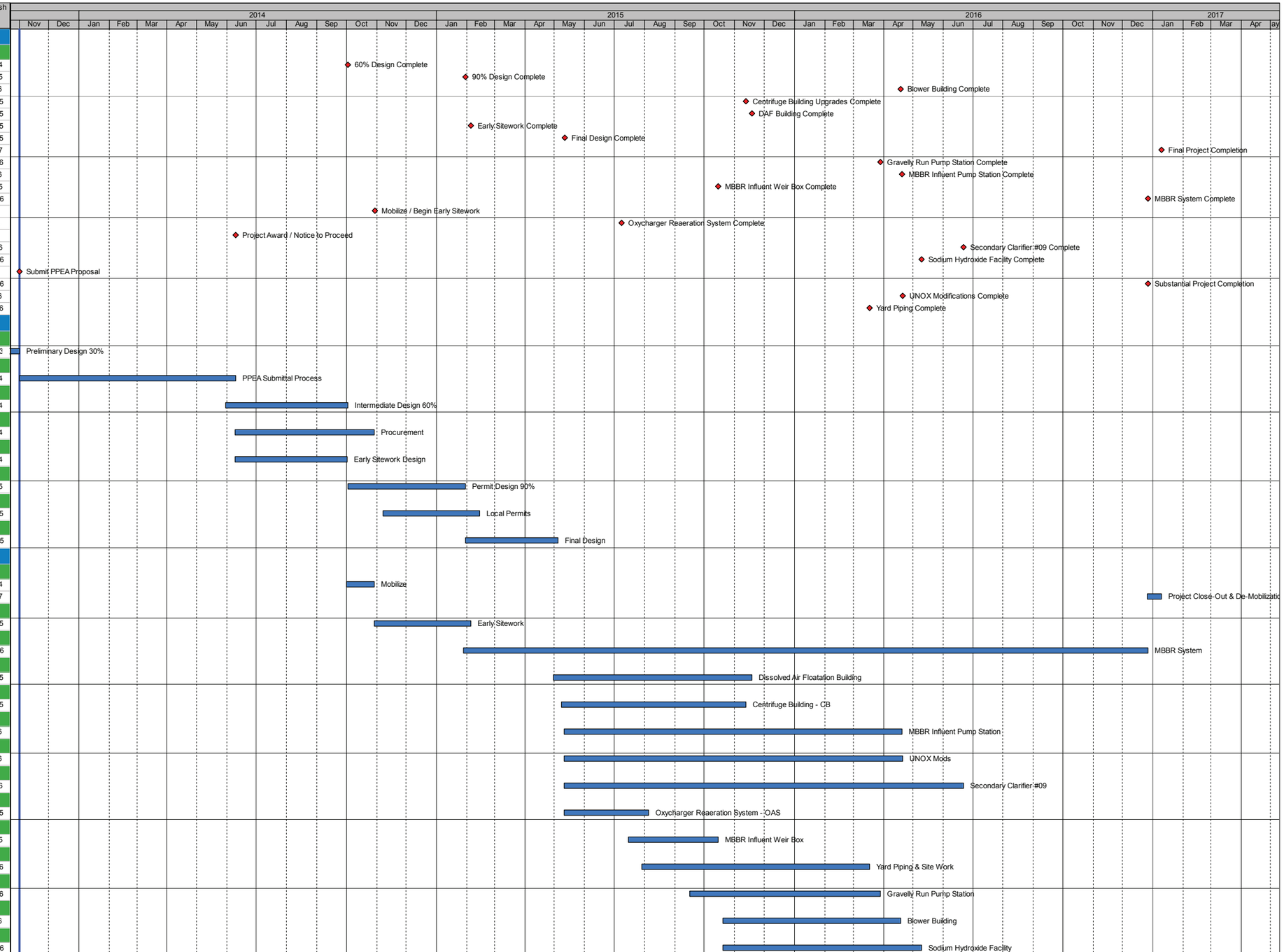
Identify the proposed schedule for the work on the project, including sufficient time for the City to review, and the estimated time for completion.

HNP has developed an integrated project schedule that incorporates the design, permitting, construction and commissioning activities of the HRWTF Phase 2 Improvements project. This schedule was developed with a level of detail to reflect the time required and proposed sequence of work for major elements of the project. The overall execution plan of the project is expected to take 31 months to complete and includes the following assumptions:

- Advancement of the design will begin upon issuance of notice to proceed and will include close collaboration between the HNP and the City of Hopewell.
- HNP will work with the City of Hopewell to start early procurement of major equipment and material to assist in the design process and provide early coordination of design and construction work.
- HNP has assumed that mobilization of the on-site management team will begin early during the design phase of the project.
- The schedule assumes that HNP will perform early project set up activities and sitework to prepare the project for construction activity once the design and permitting has sufficiently progressed.
- HNP early on in the project will work with the City of Hopewell plant staff to identify how plant operations will impact design and construction. This will also include underground surveying and test pitting to locate existing utilities and plant process lines which will help coordinate design and construction.
- The UNOX improvements will be sequenced to complete one tank at a time.
- HNP schedule and sequence of activities assumes the proper allocation of self-performing resources to efficiently complete the work. HNP will move these resources throughout the project to maximize production.
- HNP will utilize local subcontractors to construct various buildings throughout the project.
- Start-up and commissioning will be planned early and coordinated with the City of Hopewell to achieve minimal impact to the existing plant operations.

Included on the following page is a schedule summary outlining all major schedule milestones, to view a more detailed schedule, please reference Volume II, Section 2f.

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Milestones					
MI1030	60% Design Complete	0	0		02-Oct-14
MI1040	90% Design Complete	0	0		30-Jan-15
MI1160	Blower Building Complete	0	0		18-Apr-16
MI1190	Centrifuge Building Upgrades Complete	0	0		12-Nov-15
MI1150	DAF Building Complete	0	0		18-Nov-15
MI1090	Early Sitework Complete	0	0		04-Feb-15
MI1050	Final Design Complete	0	0		11-May-15
MI1070	Final Project Completion	0	0		09-Jan-17
MI1170	Gravelly Run Pump Station Complete	0	0		28-Mar-16
MI1120	MBBR Influent Pump Station Complete	0	0		19-Apr-16
MI1110	MBBR Influent Weir Box Complete	0	0		15-Oct-15
MI1130	MBBR System Complete	0	0		26-Dec-16
MI1020	Mobilize / Begin Early Sitework	0	0	30-Oct-14	
MI1260	Oxycharger Reaeration System Complete	0	0		08-Jul-15
MI1080	Project Award / Notice to Proceed	0	0	10-Jun-14	
MI1180	Secondary Clarifier #09 Complete	0	0		21-Jun-16
MI1210	Sodium Hydroxide Facility Complete	0	0		09-May-16
MI1270	Submit PPEA Proposal	0	0	01-Nov-13*	
MI1060	Substantial Project Completion	0	0		26-Dec-16
MI1140	UNOX Modifications Complete	0	0		20-Apr-16
MI1240	Yard Piping Complete	0	0		17-Mar-16
Preconstruction					
Preliminary Design 30%					
SM1000	Preliminary Design 30%	87	0	01-Aug-13 A	01-Nov-13
PPEA Submittal					
SM1330	PPEA Submittal Process	151	151	01-Nov-13	09-Jun-14
Intermediate Design 60%					
SM1010	Intermediate Design 60%	88	88	30-May-14	02-Oct-14
Procurement					
SM1020	Procurement	101	101	09-Jun-14	29-Oct-14
Early Sitework Design					
SM1030	Early Sitework Design	81	81	09-Jun-14	01-Oct-14
Permit Design 90%					
SM1040	Permit Design 90%	82	82	02-Oct-14	30-Jan-15
Local Permit Deliverables					
SM1060	Local Permits	66	66	07-Nov-14	13-Feb-15
Final Design					
SM1080	Final Design	66	66	30-Jan-15	04-May-15
Construction					
Project General					
SM1050	Mobilize	21	21	01-Oct-14	29-Oct-14
SM1320	Project Close-Out & De-Mobilization	11	11	26-Dec-16	09-Jan-17
Early Site Work					
SM1070	Early Sitework	66	66	29-Oct-14	04-Feb-15
MBBR System					
SM1090	MBBR System	486	486	28-Jan-15	26-Dec-16
Dissolved Air Floatation Building					
SM1340	Dissolved Air Floatation Building	142	142	30-Apr-15	18-Nov-15
Centrifuge Building					
SM1100	Centrifuge Building - CB	132	132	08-May-15	12-Nov-15
MBBR Influent Pump Station					
SM1150	MBBR Influent Pump Station	240	240	11-May-15	19-Apr-16
UNOX Mods					
SM1140	UNOX Mods	241	241	11-May-15	20-Apr-16
Seconary Clarifier #09					
SM1120	Secondary Clarifier #09	284	284	11-May-15	21-Jun-16
Oxycharger Reaeration System					
SM1110	Oxycharger Reaeration System - OAS	61	61	11-May-15	05-Aug-15
MBBR Influent Weir Box					
SM1170	MBBR Influent Weir Box	66	66	15-Jul-15	15-Oct-15
Yard Piping					
SM1190	Yard Piping & Site Work	163	163	29-Jul-15	17-Mar-16
Gravelly Run Pump Station					
SM1210	Gravelly Run Pump Station	135	135	16-Sep-15	28-Mar-16
Blower Building					
SM1250	Blower Building	126	126	20-Oct-15	18-Apr-16
Sodium Hydroxide Facility					
SM1240	Sodium Hydroxide Facility	141	141	20-Oct-15	09-May-16



Start Date	01-Aug-13
Finish Date	09-Jan-17
Data Date	01-Nov-13
Run Date	06-Nov-13

Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone

CIP1 Page 1 of 1

Alternative 4A-1 Light, Phase 2 Improvements

Hopewell Nutrient Partners

PC Construction Company - Proposed CIP Schedule

Date	Revision	Checked	Approved
01-Oct-13	CIP-1	C. Ballard	

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2g. Contingency Plan

Identify contingency plans for addressing public needs in the event that all or some of the project is not completed according to projected schedule.

HNP's proposed project schedule is based on a construction start in the beginning of 2015. The facilities will be ready for startup by summer of 2016. Final completion is planned for January 2017. This will deliver the project 17 months earlier than conventional delivery as outlined in the PER. The HRWTF will remain in operation throughout construction with no service interruptions.

2h. Allocation of Risk and Liability

Propose allocation of risk and liability for work completed beyond the Comprehensive Agreement's completion date, and assurances for timely completion of the project.

HNP is committed to the successful design and construction of this project. HNP will assume full responsibility for the design, permitting, and construction of the project components, as described herein, and will be responsible for the delivery of the completed project with a guaranteed lump sum price and fixed completion date.

Should the City of Hopewell desire to expand the scope of this proposal or the project scope after a Comprehensive Agreement has been executed, HNP is prepared to negotiate with the City of Hopewell at the appropriate time utilizing the Design Build Institute of America (DBIA) contract number 525 – "Standard Form of Agreement Between Owner and Design-Builder – Lump Sum." This contract is a recognized standard within the industry, providing fair and equitable risk allocation.

HNP will provide via its associated design and construction team members the appropriate bonding and insurance coverage through subordination agreements among the team members. Specifically, HDR Constructors, Inc., and PC Construction Company will provide a performance bond for all construction and HDR Engineering, Inc., and subconsultants will provide adequate normal professional liability insurance for errors and omissions.

2i. Assumptions

State assumptions related to ownership, legal liability, law enforcement and operation of the project and the existence of any restrictions on the City's use of the project.

Ownership

The City of Hopewell will retain ownership of the constructed improvements, as described herein and in associated agreements.

Legal Liability

HDR Constructors, Inc., and PC Construction Company, in their roles as HNP joint venture partners, will be liable for their actions.

Law Enforcement

Law Enforcement responsibilities remain unchanged under this proposal.

Operations

Operation of the wastewater treatment facility and collection system will be the City of Hopewell's responsibility throughout and after construction.

2j. Phased or Partial Openings

Provide information relative to phased or partial openings of the proposed project prior to completion of the entire work.

There are no planned phased or partial openings for this project. The HRWTF will remain in operation throughout construction with no service interruptions.

SECTION 3 - PROJECT FINANCING

SECTION 3 - PROJECT FINANCING

SECTION 3 | PROJECT FINANCING

3a. Preliminary Estimate

Provide a preliminary estimate and estimating methodology of the cost of the work by phase, segment, or both.

Estimating Methodology

Due to the confidential nature of our team's estimating methodology, please refer to Volume II, Section 3a.

Project Cost Estimate

Due to the confidential nature of our team's preliminary estimate, please refer to Volume II, Section 3a.

3b. Project Development, Financing and Operation Plan

Submit a plan for the development, financing and operation of the project showing the anticipated schedule on which funds will be required. Describe the anticipated costs of and proposed sources and uses for such funds, including any anticipated debt service costs. The operational plan shall include appropriate staffing levels and associated costs. Include any supporting due diligence studies, analyses or reports.

Please refer to Volume II, Section 3b for this information.

3c. Assumptions

Include a list and discussion of assumptions underlying all major elements of the plan. Assumptions should include all significant fees associated with financing given the recommended financing approach. In addition, complete disclosure of interest rate assumptions should be included. Any ongoing operational fees, if applicable, should also be disclosed, as well as any assumptions with regard to increases in such fees.

Please refer to Volume II, Section 3c for this information.

3d. Risk Factors and Risk Mitigation

Identify the proposed risk factors and methods for dealing with these factors.

Please refer to Volume II, Section 3d for this information.

3e. Identification of Local, State or Federal Resources

Identify any local, state or federal resources that the proposer contemplates requesting for the project. Describe the total commitment, if any, expected from governmental sources and the timing of any anticipated commitment, both one-time and on-going. Such disclosure should include any direct or indirect guarantees or pledges of the City's credit or revenue.

Please refer to Volume II, Section 3e for this information.

3f. Identification of Revenue Sources

Identify the amounts and the terms and conditions for any revenue sources.

Please refer to Volume II, Section 3f for this information.

3g. Identification of Potential Tax-exempt Financing Disqualification

Identify any aspect of the project that could disqualify the project from obtaining tax-exempt financing.

Please refer to Volume II, Section 3g for this information.

SECTION 4 - PROJECT BENEFIT AND COMPATIBILITY

SECTION 4 - PROJECT BENEFIT AND COMPATIBILITY

SECTION 4 | PROJECT BENEFIT AND COMPATIBILITY

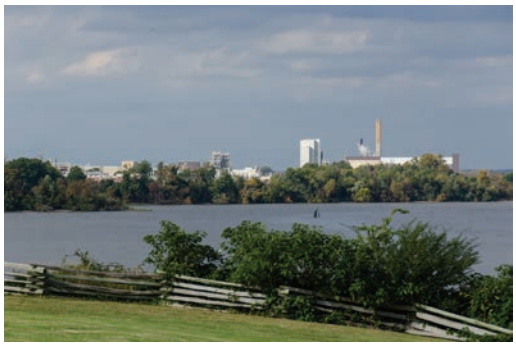
4a. Community Impacts

Identify community benefits, including the economic impact the project will have on the Commonwealth and the City in terms of amount of tax revenue to be generated for the Commonwealth and the City, the number of jobs generated for Virginia residents and level of pay and fringe benefits of such jobs, the training opportunities for apprenticeships and other training programs generated by the project, and the number and value of subcontracts generated for Virginia subcontractors.

Economic, environmental, and educational community impacts from the Phase 2 Improvements have been documented by The GREATER Hopewell Coalition (http://greaterhopewellcoalition.org). In particular, HNP sees the following key community impacts for Phase 2 Improvements:

- Ensure reliable and compliant wastewater treatment for City of Hopewell's residents, industrial manufacturers, and businesses into the foreseeable future. These improvements will allow the industrial manufacturers and businesses to stay and grow in the area. The Hopewell-Prince George Chamber of Commerce reported on April 2011 that the five leading manufacturers in Hopewell alone represented $130,193,700 in local annual payroll for 1,434 employees. Approximately 20 percent of those employees live in the City of Hopewell and the rest are broadly distributed around the region.
- Improve James River and Chesapeake Bay water quality by decreasing the total nitrogen discharged to these water bodies. By contributing to water quality improvement, City of Hopewell residents and visitors will continue to enjoy boating, fishing, hiking, and swimming within and around these water bodies.
- The City of Hopewell qualifies as an "economically distressed" locality since the City's unemployment rate for the preceding year is at least 0.5 percent higher than the average statewide unemployment rate. For 2012, the statewide average unemployment rate was 5.9 percent. As of August 2013, the Hopewell unemployment rate is 8.6 percent. Thus, Hopewell meets the criteria as an "economically distressed" locality. This project will improve the unemployment rate as it provides opportunities for local jobs, including those at the project job site and through local business participation in supplying materials, equipment and services.

Phase 2 Improvements will allow the industrial manufacturers and businesses to stay and grow in the area.



Phase 2 Improvements will Improve James River and Chesapeake Bay water quality

Phase 2 Improvements will provide opportunities for local jobs, including those at the project job site

4b. Public and Government Support/Opposition

Identify any anticipated public support or opposition, as well as any anticipated government support or opposition, for the project.

It is anticipated that generally this project will have positive public support and will be supported by the GREATER Hopewell Coalition and Hopewell-Prince George Chamber of Commerce.

4c. Strategy and Plan to Inform General Public

Explain the strategy and plan that will be carried out to involve and inform the general public, business community, local governments, and governmental agencies in areas affected by the project.

It is anticipated that HNP will provide the City of Hopewell with project updates which can be posted on the City of Hopewell's website. In addition, HNP can assist with press releases throughout the design and construction.

4d. Compatibility with Economic Development Efforts

Describe the compatibility of the project with local, regional, and state economic development efforts.

The Phase 2 Improvements are consistent with local, regional, and state economic development efforts. The table below outlines these economic development efforts and where the Phase 2 Improvements can assist.

Level	Primary Focus Areas [2]	Phase 2 Improvements Will Help
Local/Regional/State	Revitalize declining commercial and industrial areas and obsolete facilities through redevelopment and rehabilitation	
Local/Regional/State	Retain and expand existing businesses and industries	X
Local/Regional/State	Develop adequate infrastructure capacity to support existing and new development, including closer coordination between economic development and capital improvements programming	X
Local/Regional/State	Develop sites for expansion of existing commercial and industrial uses and attraction of new establishments and projects	X
Local/Regional/State	Attract industry that will enhance the local economy and is consistent with structural changes occurring in the national economy	X
Local/Regional/State	Expand visitor and tourism activity	X

[2] *Courtesy of Hopewell's Department of Economic Development*

4e. Compatibility with City Plans

Describe the compatibility with the City's comprehensive plan, infrastructure development plans, and capital improvements plan.

HNP believes the Phase 2 Improvements are compatible with the City of Hopewell's Comprehensive Plan, adopted by the Hopewell City Council, December 11, 2001.

5700 Lake Wright Drive
Twin Oaks 1
Norfolk, VA 23502

HNP
Hopewell Nutrient Partners
PCL CONSTRUCTION
HDR

MINUTES OF THE CITY COUNCIL MEETING HELD FEBRUARY 9, 2010

A Regular meeting of the City Council of the City of Hopewell, Virginia, was held Tuesday, February 9, 2010, at 6:30 PM in the City Council Chambers, Municipal Building, 300 North Main Street, Hopewell, Virginia.

PRESENT:
Brenda S. Pelham, Mayor
N. Gregory Cuffey, Vice Mayor
Christina J. Luman-Bailey, Councilor
Curtis W. Harris, Councilor
Kenneth B. Emerson, Councilor
Gerald S. Stokes, Councilor
K. Wayne Walton, Councilor

Edwin C. Daley, City Manager
Thomas E. Lacheney, City Attorney
Ann M. Romano, City Clerk

Mayor Pelham was detained and Vice Mayor Cuffey opened the meeting at 6:34 PM. Roll call was taken as follows:

Mayor Pelham	-	ABSENT (arrived at 7:15 PM)
Vice Mayor Cuffey	-	present
Councilor Bailey	-	present
Councilor Harris	-	present
Councilor Emerson	-	present
Councilor Stokes	-	present
Councilor Walton	-	present

CLOSED SESSION

Motion was made by Councilor Stokes, and seconded by Councilor Bailey, to convene into Closed Session to discuss Legal Matters, Economic Development, Personnel; and, Boards & Commissions, in accordance with Virginia Code Sec. 2.2-3711 (A)(1) (3) and (7). Upon the roll call, the vote resulted:

Vice Mayor Cuffey	-	yes
Councilor Bailey	-	yes
Councilor Harris	-	yes
Councilor Emerson	-	yes
Councilor Stokes	-	yes
Councilor Walton	-	yes

OPEN SESSION

At 7:30 PM Council convened into Open Session. Councilors responded to the question: "Were the only matters discussed in the Closed Meeting public business matters lawfully exempted from open meeting requirements; and public business matters identified in the motion to convene into Closed Session?" Upon the roll call, the vote resulted:

Mayor Pelham	-	yes
Vice Mayor Cuffey	-	yes
Councilor Bailey	-	yes

Councilor Harris	-	yes
Councilor Emerson	-	yes
Councilor Stokes	-	yes
Councilor Walton	-	yes

REGULAR MEETING

Mayor Pelham opened the regular meeting at 7:30 PM. Roll call was taken as follows:

Mayor Pelham	-	yes
Vice Mayor Cuffey	-	yes
Councilor Bailey	-	yes
Councilor Harris	-	yes
Councilor Emerson	-	yes
Councilor Stokes	-	yes
Councilor Walton	-	yes

Prayer was offered by Vice Mayor Cuffey, followed by the Pledge of Allegiance to the Flag of the United States of America.

CONSENT AGENDA

Motion was made by Councilor Harris, and seconded by Councilor Walton to approve the Consent Agenda: Minutes: City Council Regular Meeting January 12, 2010; and Work Session January 26, 2010; Pending List; Information for Council Review: Recreation Commission agenda 1/13/10 & minutes 12/9/09; HRHA agenda 1/11/10 & minutes of 10/19/09; School Board agenda 1/14/10; TSB minutes 12/1/09; ARLS minutes 1/19/10; HRWTF agenda 1/25/10; HDSS Advisory Board Annual report 2009; Personnel Change Report; Public Hearings Announcements: none; Routine Approval of Work Sessions: February 23, 2010 – 6:30 PM; Ordinances on second and final reading: Ord. No. 2010-01 – PPEA; Routine Grant Approval: None; Proclamations/Resolutions/Presentations: None. Upon the roll call, the vote resulted:

Vice Mayor Cuffey	-	yes
Councilor Bailey	-	yes
Councilor Harris	-	yes
Councilor Emerson	-	yes
Councilor Stokes	-	yes
Councilor Walton	-	yes
Mayor Pelham	-	yes

ORDINANCE NO. 2010-01

An Ordinance amending Ordinance 2009-10 adopting, enacting and implementing local guidelines pursuant to the Public-Private Education Facilities and Infrastructure Act of 2002, as amended, for the City of Hopewell, Virginia.

WHEREAS, the Virginia General Assembly, pursuant to the Public-Private Education Facilities and Infrastructure Act of 2002, Va. Code § 56-575.1 et seq., and all amendments thereto (PPEA), has determined that there is a public need for timely acquisition, design, construction, improvement, renovation, expansion, equipping, maintenance, operation, implementation, or installation of education facilities, technology infrastructure and other public

infrastructure and government facilities within the Commonwealth that serve a public need and purpose; and

WHEREAS, such public need may not be wholly satisfied by existing methods of procurement in which qualifying projects are acquired, designed, constructed, improved, renovated, expanded, equipped, maintained, operated, implemented, or installed; and

WHEREAS, there are inadequate resources to develop new education facilities, technology infrastructure and other public infrastructure and government facilities for the benefit of citizens of the Commonwealth, and there is demonstrated evidence that public-private partnerships can meet these needs by improving the schedule for delivery, lowering the cost, and providing other benefits to the public; and

WHEREAS, financial incentives exist under state and federal tax provisions that promote public entities to enter into partnerships with private entities to develop qualifying projects; and

WHEREAS, authorizing private entities to develop or operate one or more qualifying projects may result in the availability of such projects to the public in a more timely or less costly fashion, thereby serving the public safety, benefit, and welfare; and

WHEREAS, the intent of the PPEA has been declared to, among other things, encourage investment in the Commonwealth by private entities and facilitate the bond financing provisions of the Economic Growth and Tax Relief Reconciliation Act of 2001 or other similar financing mechanisms, private capital and other funding sources that support the development or operation of qualifying projects, to the end that financing for qualifying projects be expanded and accelerated to improve and add to the convenience of the public, and such that public and private entities may have the greatest possible flexibility in contracting with each other for the provision of the public services that are the subject of the PPEA; and

WHEREAS, prior to requesting or considering a proposal for a qualifying project under the PPEA, the City must adopt and make publically available guidelines that are sufficient to enable the City to comply with the PPEA, which guidelines shall be reasonable, encourage competition, and guide the selection of projects under the purview of the City; and

WHEREAS, the following guidelines fulfill the purposes of, and meet the requirements of, the PPEA.

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF HOPEWELL that the following guidelines are hereby adopted, enacted and implemented pursuant to the PPEA:

February 9, 2010

City of Hopewell, Virginia

Guidelines for the Implementation of the Public-Private Education Facilities and Infrastructure Act of 2002

Adopted April 8, 2008, and
Amended February 9, 2010

City of Hopewell, Virginia
Guidelines for the Implementation of the
Public-Private Education Facilities and Infrastructure Act of 2002

Table of Contents

I. Introduction ..... p. 1

II. General Provisions p.2
- A. Proposal Submission ..... p. 3
- B. Proposal Review Fees ..... p. 3
- C. Reservation of Rights ..... p. 4
- D. Virginia Freedom of Information Act ..... p. 6
- E. Use of Public Funds p.6
- F. Applicability of Other Laws p.6

III. Solicited Proposals p.6

IV. Unsolicited Proposals p.6
- A. Decision to Accept and Consider Unsolicited Proposal; Notice p.6
- B. Posting Requirements p.7
- C. Review at Conceptual Stage p.8

V. Proposal Preparation and Submission p.9
- A. Format for Submissions at Conceptual Stage p.9
- B. Format for Submissions at Detailed Stage p.12

VI. Proposal Evaluation and Selection Criteria p.14
- A. Qualifications and Experience p.14
- B. Project Characteristics p.15
- C. Project Financing p.15
- D. Project Benefit and Compatibility p.16
- E. Other Factors p.16

VII. Interim and Comprehensive Agreements p.16
- A. Interim Agreement Terms p.17
- B. Comprehensive Agreement Terms p.17
- C. Notice and Posting Requirements p.19

VIII. Governing Provisions p.20

Terms and Definitions p.20

I. Introduction

The Public-Private Education Facilities and Infrastructure Act of 2002 (the "PPEA") grants the City of Hopewell (the "City"), a responsible public entity as defined in the PPEA, the authority to enter into public-private partnership agreements for the development of a wide range of projects for public use if the City determines that there is a public need for the project and that private involvement may provide the project to the public in a timely or cost-effective fashion. For the purposes of these guidelines, the term "City" includes its School Board in the case of education facilities. Individually negotiated interim and comprehensive agreements between a private entity, as defined in the PPEA, and the City will define the respective rights and obligations of the City and the private entity. Although guidance with regard to the application of the PPEA is provided herein, it will be incumbent upon the City and all private entities to comply with the provisions of the PPEA.

In order for a project to come under the PPEA, it must meet the definition of a "qualifying project." The City may consider utilizing PPEA procedures if:

1. There is a public need for or benefit derived from the qualifying project of the type the private entity proposes;

2. The estimated cost of the project is reasonable in relation to similar facilities; and

3. The private entity's plans will result in the timely development or operation of the project.

The PPEA contains a broad definition of qualifying projects that include public buildings and facilities of all types, for example:

1. An education facility, including, but not limited to, a school building (including any stadium or other facility primarily used for school events), any functionally related and subordinate facility and land to a school building and any depreciable property provided for use in a school facility that is operated as part of the public school system or as an institution of higher education;

2. A building or facility that meets a public purpose and is developed or operated by or for any public entity;

3. Improvements, together with equipment, necessary to enhance public safety and security of buildings to be principally used by a public entity;

4. Utility and telecommunications and other communications infrastructure;

5. A recreational facility;

6. Technology infrastructure and services, including but not limited to telecommunications, automated data processing, word processing and management information systems, and related information, equipment, goods and services;

7. Technology, equipment, or infrastructure designed to deploy wireless broadband services to schools, businesses, or residential areas, or

8. Any improvements necessary or desirable to any unimproved locally- or state-owned real estate.

The PPEA establishes requirements to which the City must adhere when reviewing and approving proposals received pursuant to the PPEA. In addition, the PPEA specifies the criteria that must be used to select a proposal and the contents of the interim or comprehensive agreement detailing the relationship between the City and the private entity.

The Hopewell City Council (the "City Council") adopted these guidelines on April 8, 2008 to implement the PPEA in the City. The City Manager will follow these guidelines in receiving and evaluating any proposal submitted to the City under the provisions of the PPEA. The City Council must adopt any amendments to these guidelines.

These guidelines shall govern all City PPEA projects, including education facilities, and shall be applicable to all City agencies, boards, commissions, and committees. The City Manager may designate a working group (the "Working Group") to assist the City Manager in evaluating proposals and negotiating any interim or comprehensive agreement. The City Manager shall implement these guidelines, receive proposals submitted under the PPEA, and respond to inquiries regarding the PPEA or these guidelines, but the City Manager may specifically designate one or more persons to perform one or more of these duties.

II. General Provisions

A. Proposal Submission

A proposal may be either solicited by the City or delivered by a private entity on an unsolicited basis. In either case, the proposal shall be clearly identified as a "PPEA PROPOSAL." To be considered, one original and eight (8) copies of any unsolicited proposal must be submitted along with the applicable fee to the City Manager, or his designee as set forth above, 300 N. Main Street, Hopewell, Virginia 23860 by certified mail, express delivery or hand delivery. Proposers may be required to follow a two-part proposal submission process consisting of an initial conceptual phase and a detailed phase, as described herein. The City may discontinue its evaluation of any proposal at any time during the conceptual or detailed phase.

The PPEA allows private entities to include innovative financing methods, including the imposition of user fees or service payments, in a proposal. Such financing arrangements may include the issuance of debt instruments, equity or other securities or obligations. Proposals may include, if applicable, the portion of the tax-exempt private activity bond limitation amount to be allocated annually to the Commonwealth of Virginia pursuant to the Economic Growth and Tax Relief Reconciliation Act of 2001 for the development of education facilities using public-private partnerships, and to provide for carryovers of any unused limitation amount.

Proposals should be prepared simply and economically, providing a concise description of the proposer's capabilities to complete the proposed qualifying project and the benefits to be derived from the project by the City. Project benefits to be considered are those occurring during the construction, renovation, expansion or improvement phase and during the life cycle of the project. Proposals also should include a scope of work and a financial plan for the project, containing enough detail to allow an analysis by the City of the financial feasibility of the proposed project. Any facility, building, infrastructure, or improvement included in a proposal shall be identified specifically or conceptually. The cost analysis of a proposal should not be linked solely to any proposed financing plan, as the City may determine to finance the project through other available means. The City Manager or his designee may request, in writing, clarification of the submission.

The PPEA is intended to encourage proposals from the private sector that offer the provision of private financing in support of the proposed public project and the assumption of commensurate risk by the private operator, but also benefits to the private entity through innovative approaches to project financing, development and use. However, while substantial private sector involvement is encouraged, qualifying facilities will still be devoted primarily to public use and typically involve facilities critical to the public health, safety and welfare. Accordingly, the City shall continue to exercise full and proper due diligence in the evaluation and selection of private entities for these projects. Prospective private entities proposing projects shall be held strictly accountable for their representations or other information provided regarding their qualifications, experience, or other contents of their proposals, including all specific aspects of proposed plans to be performed by the private entity.

B. Proposal Review Fees

The PPEA authorizes the City to charge fees to cover the costs of processing, reviewing, and evaluating proposals.

1. A fee in accordance with the fee schedule below, paid with certified funds, shall accompany any initial proposal to cover the cost of determining whether it is a qualifying project with a reasonable expectation of satisfying the criteria of Va. Code § 56-575.4 (C) of the PPEA of public need or benefit, reasonable estimated cost, and timely acquisition of the project. The fee shall be based on the total cost of the proposal.

2. If the proposal is advanced to the detailed stage of review, an additional fee in accordance with the fee schedule below shall be due. The fee, paid in certified funds, shall accompany the proposer's submission at the detailed stage.

Review Stage	Fee	Minimum	Maximum
Conceptual/Initial	1%	$2,500.00	$5,000.00
Detail	1%	$5,000.00	$50,000.00

C. Reservation of Rights

In connection with any proposal or qualifying project, the City shall have all rights available to it by law in administering these guidelines, including without limitation, the right in its sole and unfettered discretion to:

1. Reject any or all proposals at any time, for any reason, solely within the discretion of the City. Proposers shall have no recourse against the City for such rejection. Proposers will be notified in writing of such rejection in accordance with these guidelines.

2. Terminate evaluation of any and all proposals at any time.

3. Suspend, discontinue or terminate interim and comprehensive agreement negotiations with any proposer at any time before the actual authorized execution of an interim or comprehensive agreement by all parties.

4. Negotiate with a proposer without being bound by any provision in its proposal.

5. Request or obtain additional information about any proposal.

6. Issue addenda to or cancel any request for proposals ("RFP") or invitation for bids ("IFB").

7. Revise, supplement or withdraw all or any part of these guidelines at any time and from time to time.

8. Modify any standard fee schedule as stated herein for a specific proposal or for all future proposals.

9. Decline to return any and all fees required to be paid by proposers hereunder.

10. Request revisions to conceptual or detailed proposals.

11. Submit a proposal for review by outside consultants or advisors selected by the City without notice to the proposer. Such consultants or advisors shall be advised of, and required to maintain, the confidentiality of information that has been designated as confidential, and to refer all requests for such information to the City.

Under no circumstances shall the City be liable for, or reimburse, the costs incurred by proposers, whether or not selected for negotiations, in developing proposals or in negotiating agreements. Any and all information the City makes available to proposers shall be as a convenience to the proposer and without representation or

warranty of any kind. Proposers may not rely upon any oral responses to inquiries. If a proposer has a question regarding application of these guidelines, the proposer must submit the question in writing and the City will respond in writing as it determines appropriate.

D. Virginia Freedom of Information Act

1. General applicability of disclosure provisions

Proposal documents submitted by private entities are generally subject to the Virginia Freedom of Information Act ("FOIA") except that Va. Code § 2.2-3705.6 (11) exempts certain documents from public disclosure. FOIA exemptions, however, are discretionary, and the City may elect to release some or all of documents except to the extent the documents are:

a. Trade secrets of the private entity as defined in the Uniform Trade Secrets Act (Va. Code § 59.1-336 et seq.);

b. Financial records of the private entity that are not generally available to the public through regulatory disclosure or otherwise, including but not limited to, balance sheets and financial statements; or

c. Other information submitted by a private entity, where if the record or document were made public prior to the execution of an interim or comprehensive agreement the financial interest or bargaining position of the public or private entity would be adversely affected.

Additionally, to the extent access to proposal documents submitted by private entities are compelled or protected from disclosure by a court order, the City will comply with the provisions of such order.

2. Protection from mandatory disclosure for certain documents submitted by a private entity

Before a document of a private entity may be withheld from disclosure, the private entity must make a written request to the City at the time the documents are submitted, designating with specificity the documents for which the protection is being sought and a clear statement of the reasons for invoking the protection with reference to one or more of three classes of records listed in Section I.D.1.

Upon the receipt of a written request for protection of documents, the City shall determine whether the documents contain (i) trade secrets, (ii) financial records, or (iii) other information that would adversely affect the financial interest or bargaining position of the City or private entity in accordance with Section I.D.1. The City will make a written determination of the nature and scope of the protection to be afforded by the City under this subdivision. If the written determination provides less protection than requested by the private entity, the private entity will be accorded an opportunity to withdraw its proposal. Nothing shall prohibit further negotiations of the documents to be accorded protection from release although what may be protected must be limited to the categories of records identified in Section I.D.1.

Once a written determination has been made by the City, the documents afforded protection under this subdivision shall continue to be protected from disclosure when in the possession of the City or any affected jurisdiction to which such documents are provided.

If a private entity fails to designate trade secrets, financial records, or other confidential or proprietary information for protection from disclosure, such information, records or documents shall be subject to disclosure under FOIA.

3. Protection from mandatory disclosure for certain documents produced by the City

   The City may withhold from disclosure memoranda, staff evaluations, or other records prepared by the City, its staff, outside advisors, or consultants exclusively for the evaluation and negotiation of proposals where (i) if such records were made public prior to or after the execution of an interim or a comprehensive agreement, the financial interest or bargaining position of the City would be adversely affected, and (ii) the basis for the determination required in clause (i) is documented in writing by the City.

   Cost estimates relating to a proposed procurement transaction prepared by or for the City shall not be open to public inspection.

4. The City may not withhold from public access:

   a. Procurement records other than those subject to the written determination of the City;

   b. Information concerning the terms and conditions of any interim or comprehensive agreement, service contract, lease, partnership, or any agreement of any kind entered into by the City and the private entity;

   c. Information concerning the terms and conditions of any financing arrangement that involves the use of any public funds; or

   d. Information concerning the performance of any private entity developing or operating a qualifying transportation facility or a qualifying project.

   However, to the extent that access to any procurement record or other document or information is compelled or protected by a court order, the City will comply with such order.

E. Use of Public Funds

Virginia constitutional and statutory requirements and City ordinances and policies as they apply to appropriation and expenditure of public funds apply to any interim or comprehensive agreement entered into under the PPEA. Accordingly, the processes and procedural requirements associated with the expenditure or obligation of public funds shall be incorporated into planning for any PPEA project or projects.

F. Applicability of Other Laws

Nothing in the PPEA shall affect the duty of the City to comply with all other applicable law not in conflict with the PPEA.

III. Solicited Proposals

The City may issue Request for Proposals (RFPs) or Invitations for Bids (IFBs), inviting proposals from private entities to develop or operate qualifying projects. The City may use a two-part proposal process consisting of an initial conceptual phase and a detailed phase. An RFP shall invite proposers to submit proposals on individual projects identified by the City. The City will set forth in the RFP the format and supporting information that is required to be submitted, consistent with the provisions of the PPEA. The City may establish suggested timelines for selecting proposals for the review and selection of solicited proposals.

The RFP will specify, but not necessarily be limited to, information and documents that must accompany each proposal and the factors that will be used in evaluating the submitted proposals. The RFP will also contain or incorporate by reference other applicable terms and conditions, including any unique capabilities or

qualifications that will be required of the private entities submitting proposals. Public notice of the RFP shall be posted in such public areas as are normally used for posting of the City's notices, including the City's website and published in a newspaper or newspapers of general circulation in the City. In addition, solicited proposals shall be posted pursuant to Section IV. B. Pre-proposal conferences may be held as deemed appropriate by the City.

IV. Unsolicited Proposals

The PPEA permits the City to receive, evaluate and select for negotiations unsolicited proposals from private entities to develop or operate a qualifying project.

The City may publicize its needs and may encourage interested parties to submit proposals subject to the terms and conditions of the PPEA. When such a proposal is received without issuance of an RFP, the proposal shall be treated as an unsolicited proposal. The City may establish suggested timelines for the review and selection of unsolicited proposals.

A. Decision to Accept and Consider Unsolicited Proposal; Notice

1. Upon receipt of any unsolicited proposal or group of proposals and payment of the required fee or fees by the proposer or proposers, the City Council shall, after receiving the recommendation of the City Manager, determine whether to reject the unsolicited proposal or accept the unsolicited proposal for publication and further conceptual-stage consideration. If the proposal is or proposals are for an education facility, the City Manager shall consult with the Superintendent of Schools ("Superintendent"), who may receive the recommendation of the School Board regarding the proposal or proposals.

2. If City Council chooses to accept an unsolicited proposal for publication and conceptual-stage consideration, the City shall post a notice in a public area regularly used by the City for posting of public notices and on the City's website for a period of not less than 45 days. The City may also publish the same notice in one or more newspapers or periodicals of general circulation in the City to notify any parties that may be interested in submitting competing unsolicited proposals. Interested parties shall have adequate time as specified in the notice to submit competing unsolicited proposals. The notice shall state that the City (i) has received an unsolicited proposal under the PPEA, (ii) intends to evaluate the proposal, (iii) may negotiate an interim or comprehensive agreement with the proposer based on the proposal, and (iv) will receive for simultaneous consideration any competing proposals that comply with the guidelines adopted by the City and pursuant to the PPEA. The notice also shall summarize the proposed qualifying project or projects, and identify their proposed locations. If such unsolicited proposal is accepted and is to be evaluated using "competitive negotiation" procedures as described in Section IV. C. 1, the City shall make the written determination described in Section IV. C. 1 prior to such evaluation.

   To ensure that sufficient information is available upon which to base the development of a serious competing proposal, representatives of the City familiar with the unsolicited proposal and the guidelines established by the City shall be made available to respond to inquiries and meet with private entities that are considering the submission of a competing proposal. The City shall conduct an analysis of the information pertaining to the proposal included in the notice to ensure that such information sufficiently encourages competing proposals. Further, the City shall establish criteria, including key decision points and approvals to ensure proper consideration of the extent of competition from available private entities prior to selection.

3. Any proposal not accepted for conceptual-stage consideration will be returned, together with all fees and accompanying documentation, to the proposer.

B. Posting Requirements

1. Conceptual proposals accepted for review and further evaluation, whether solicited or unsolicited, shall be posted by the City within 10 working days after acceptance of such proposals.

   Posting shall be on the City's website or by publication, in a newspaper of general circulation in the area in which the contract is to be performed, of a summary of the proposals and the location where copies of the proposals are available for public inspection.

2. Nothing shall be construed to prohibit the posting of the conceptual proposals by additional means deemed appropriate by the City so as to provide maximum notice to the public of the opportunity to inspect the proposals.

3. In addition to the posting requirements, at least one copy of the proposals shall be made available for public inspection. Trade secrets, financial records, or other records of the private entity excluded from disclosure under the provisions Va. Code § 2.2-3705.6 (11) shall not be required to be posted, except as otherwise agreed to by the City and the private entity. Any inspection of procurement transaction records shall be subject to reasonable restrictions to ensure the security and integrity of the records.

C. Review at Conceptual Stage

1. When one or more proposals are received, the City will determine at this initial stage of review whether it will proceed with the evaluation of the proposals using standard procurement procedures consistent with the Virginia Public Procurement Act or procedures normally used by the City that are consistent with procurement of other than professional services through "competitive negotiation" as the term is defined in Va. Code § 2.2-4301. The City may proceed using such guidelines only if it makes a written determination that doing so is likely to be advantageous to the City and the public based upon either (i) the probable scope, complexity or priority of need; (ii) the risk sharing including guaranteed cost or completion guarantees, added value or debt, or equity investments proposed by the private entity; or (iii) the increase in funding, dedicated revenue or other economic benefit that would otherwise not be available. The City may reject any or all proposals.

2. After reviewing the original proposal and any competing proposals submitted during the notice period, the City may determine:

   a. not to proceed further with any proposal;

   b. to proceed to the detailed stage of review with the original proposal;

   c. to proceed to the detailed stage with a competing proposal;

   d. to proceed to the detailed stage with multiple proposals; or

   e. to request modifications or amendments to any proposal.

   In the event that more than one proposal will be considered in the detailed phase of review, the City shall consider whether the unsuccessful proposer should be reimbursed for costs incurred in the detailed phase of review, and such reasonable costs may be assessed to the successful proposer in the comprehensive agreement.

3. Discussions between the City and private entities about the need for infrastructure improvements shall not limit the ability of the City to later determine to use standard procurement procedures to meet its infrastructure needs. The City retains the right to reject any proposal at any time prior to the execution of an interim or comprehensive agreement.

V. Proposal Preparation and Submission

A. Format for Submissions at Conceptual Stage

At the conceptual stage, all proposals, whether solicited or unsolicited, shall contain information in the following areas: (i) qualifications and experience; (ii) project characteristics; (iii) project financing; (iv) project benefit and compatibility; and (v) any additional information that the City may request to comply with the requirements of the PPEA. Suggestions for formatting information to be included in proposals at this stage include the items listed below, as well as any additional information or documents that the City may request:

1. Qualifications and Experience

   a. Identify the legal structure or type of private entity making the proposal. Identify the organizational structure for the project, the management approach and how each partner and major subcontractor ($1 million or more) in the structure fits into the overall team. All members of the operator/offeror's team, including major subcontractors known to the proposer, must be identified at the time a proposal is submitted for the conceptual stage. Identified team members, including major subcontractors (over $1 million), may not be substituted or replaced once a project is approved and comprehensive agreement entered into, without the written approval of the City. Include the status of the Virginia license of each partner, proposer, contractor, and major subcontractor.

   b. Describe the experience of the private entity making the proposal and the key principals involved in the proposed project including experience with projects of comparable size and complexity, including prior experience bringing similar projects to completion on budget and in compliance with design, land use, service and other standards. Describe the length of time in business, business experience, public sector experience and other engagements of the private entity. Describe the past safety performance record and current safety capabilities of the private entity. Describe the past technical performance history on recent projects of comparable size and complexity, including disclosure of any legal claims by or against the private entity. Include the identity of any private entity that will provide design, construction and completion guarantees and warranties and a description of such guarantees and warranties.

   c. For each private entity or major subcontractor ($1 million or more) that will be utilized in the project, provide a statement listing all of the private entity's prior projects and clients for the past five years and contact information for same (names/addresses/telephone numbers). If a private entity has worked on more than ten (10) projects during this period, it may limit its prior project list to ten (10), but shall first include all projects similar in scope and size to the proposed project and, second, it shall include as many of its most recent projects as possible. Each private entity or major subcontractor shall be required to submit all performance evaluation reports or other documents which are in its possession evaluating the private entity's performance during the preceding three years in terms of cost, quality, schedule maintenance, safety and other matters relevant to the successful project development, operation, and completion.

   d. Provide the names, addresses, and telephone numbers of persons within the private entity who may be contacted for further information.

   e. Provide a current or most recently audited financial statement of the private entity and each partner with an equity interest of ten percent or greater.

f. Identify any persons known to the proposer who would be obligated to disqualify themselves from participation in any transaction arising from or in connection to the project pursuant to the Virginia State and Local Government Conflict of Interests Act, Chapter 31 (§ 2.2-3100 et seq.) of Title 2.2.

g. Identify the proposed plan for obtaining sufficient numbers of qualified workers in all trades or crafts required for the project.

h. For each private entity or major subcontractor that will perform construction or design activities, provide the following information:

(1) A sworn certification by an authorized representative of the private entity attesting to the fact that the private entity is not currently debarred or suspended by any federal, state or local government entity.

(2) A completed qualification statement that reviews all relevant information regarding technical qualifications and capabilities, private entity resources and business integrity of the private entity, including but not limited to, bonding capacities, insurance coverage and private entity equipment. This statement shall also include a mandatory disclosure by the private entity for the past five years any of the following conduct:

(A) bankruptcy filings
(B) liquidated damages
(C) fines, assessments or penalties
(D) judgments or awards in contract disputes
(E) contract defaults, contract terminations
(F) license revocations, suspensions, other disciplinary actions
(G) prior debarments or suspensions by a governmental entity
(H) denials of prequalification, findings of non-responsibility
(I) safety past performance data, including fatality incidents, "Experience Modification Rating," "Total Recordable Injury Rate" and "Total Lost Workday Incidence Rate"
(J) violations of any federal, state or local criminal or civil law
(K) criminal indictments or investigations
(L) claims filed by or against the firm

i. Worker Safety Programs: Describe worker safety training programs, job-site safety programs, accident prevention programs, written safety and health plans, including incident investigation and reporting procedures.

2. Project Characteristics

a. Provide a description of the proposed project, including the conceptual design, in sufficient detail so that type and intent of the project, its location, and the communities that may be affected are clearly identified.

b. Identify and fully describe any work to be performed by the City.

c. Include a list of all federal, state and local permits and approvals required for the project and a schedule for obtaining such permits and approvals.

d. Identify any anticipated adverse social, economic and environmental impacts of the project. Specify the strategies or actions to mitigate known or anticipated impacts of the project. Indicate if any environmental or archaeological assessment has been completed.

e. Identify the projected positive social, economic and environmental impacts of the project.

f. Identify the proposed schedule for the work on the project, including sufficient time for the City to review, and the estimated time for completion.

g. Identify contingency plans for addressing public needs in the event that all or some of the project is not completed according to projected schedule.

h. Propose allocation of risk and liability for work completed beyond the Comprehensive Agreement's completion date, and assurances for timely completion of the project.

i. State assumptions related to ownership, legal liability, law enforcement and operation of the project and the existence of any restrictions on the City's use of the project.

j. Provide information relative to phased or partial openings of the proposed project prior to completion of the entire work.

3. Project Financing

a. Provide a preliminary estimate and estimating methodology of the cost of the work by phase, segment, or both.

b. Submit a plan for the development, financing and operation of the project showing the anticipated schedule on which funds will be required. Describe the anticipated costs of and proposed sources and uses for such funds, including any anticipated debt service costs. The operational plan shall include appropriate staffing levels and associated costs. Include any supporting due diligence studies, analyses or reports.

c. Include a list and discussion of assumptions underlying all major elements of the plan. Assumptions should include all significant fees associated with financing given the recommended financing approach. In addition, complete disclosure of interest rate assumptions should be included. Any ongoing operational fees, if applicable, should also be disclosed, as well as any assumptions with regard to increases in such fees.

d. Identify the proposed risk factors and methods for dealing with these factors.

e. Identify any local, state or federal resources that the proposer contemplates requesting for the project. Describe the total commitment, if any, expected from governmental sources and the timing of any anticipated commitment, both one-time and on-going. Such disclosure should include any direct or indirect guarantees or pledges of the City's credit or revenue.

f. Identify the amounts and the terms and conditions for any revenue sources.

g. Identify any aspect of the project that could disqualify the project from obtaining tax-exempt financing.

4. Project Benefit and Compatibility

a. Identify community benefits, including the economic impact the project will have on the Commonwealth and the City in terms of amount of tax revenue to be generated for the Commonwealth and the City, the number of jobs generated for Virginia residents and level of pay and fringe benefits of such jobs, the training opportunities for apprenticeships and other training programs generated by the project, and the number and value of subcontracts generated for Virginia subcontractors.

b. Identify any anticipated public support or opposition, as well as any anticipated government support or opposition, for the project.

c. Explain the strategy and plan that will be carried out to involve and inform the general public, business community, local governments, and governmental agencies in areas affected by the project.

d. Describe the compatibility of the project with local, regional, and state economic development efforts.

e. Describe the compatibility with the City's comprehensive plan, infrastructure development plans, and capital improvements plan.

B. Format for Submissions at Detailed Stage

If the City decides to proceed to the detailed stage of review with one or more proposals, the following information must be provided by the proposer unless specifically waived in writing by the City:

1. A topographical map (1:2,000 or other appropriate scale) depicting the location of the proposed project.

2. Conceptual site plan indicating proposed location and configuration of the project on the proposed site.

3. Conceptual (single line) plans and elevations depicting the general scope, appearance and configuration of the proposed project.

4. Detailed description of the proposed participation of, use by, and financial involvement of the City.

5. A list of public utility facilities, if any, that will be crossed by the qualifying project and a statement of the plans of the proposer to accommodate such crossings.

6. A list of public facilities or other public improvements that will be required by the City to complete the project.

7. A statement and strategy setting out the plans for securing all necessary property interests required for the project. The statement must include the names and addresses, if known, of the current owners of the subject property interests, as well as a list of any property the proposer intends to request the City to condemn.

8. A detailed listing of all firms that will provide specific design, construction and completion guarantees and warranties, and a brief description of such guarantees and warranties.

9. A total life-cycle cost specifying methodology and assumptions of the project or projects and the proposed project start date. Include anticipated commitment of all parties; equity, debt, and other financing mechanisms; and a schedule of project revenues and project costs. The life-cycle cost analysis should include, but not be limited to, a detailed analysis of the projected return, rate of return, or both, expected useful life of facility and estimated annual operating expenses.

10. A detailed discussion of assumptions about user fees or rates, and usage of the projects.

11. Identification of any known government support or opposition, or general public support or opposition for the project. Government or public support should be demonstrated through resolutions of official bodies, minutes of meetings, letters, or other official communications.

12. Demonstration of consistency with appropriate City comprehensive or infrastructure development plans or indication of the steps required for acceptance into such plans.

13. Explanation of how the proposed project would affect the City's development plans.

14. Description of an ongoing performance evaluation system or database to track key performance criteria, including but not limited to, schedule, cash management, quality, worker safety, change orders, and legal compliance.

15. Identification of the executive management and the officers and directors of the firm or firms submitting the proposal. In addition, identification of any known conflicts of interest or other disabilities that may impact consideration of the proposal, including the identification of any persons known to the proposer who would be obligated to disqualify themselves from participation in any transaction arising from or in connection to the project pursuant to the Virginia State and Local Government Conflict of Interests Act, Chapter 31 (Va. Code § 2.2-3100 et seq.) of Title 2.2 of the Code of Virginia.

16. Additional material and information as the City may request.

VI. Proposal Evaluation and Selection Criteria

In reviewing any PPEA proposal accepted for consideration, the City shall engage the services of qualified professionals, which may include an architect, professional engineer, or certified public accountant, not otherwise employed by the City, to provide independent analysis regarding the specifics, advantages, disadvantages and the long- and short-term costs of any request by a private entity for approval of a qualifying project unless City Council determines that such analysis shall be performed by City employees.

The following items, along with the information that may be required under Sections V.A. and V.B. above, are some of the factors that the City may consider in the evaluation and selection of a PPEA proposal. The City reserves the right at all times to reject any proposal at any time for any reason.

A. Qualifications and Experience

Factors to be considered in either phase of the review to determine whether the proposer possesses the requisite qualifications and experience will include at a minimum:

1. Professional qualifications and experience with similar projects;

2. Demonstration of ability to perform the work;

3. Demonstrated record of successful past performance, including timeliness of project delivery, compliance with plans and specifications, quality of workmanship, cost-control and project safety;

4. Demonstrated conformance with applicable laws, codes, standards, regulations, and agreements on past projects;

5. Leadership structure;

6. Project manager's experience;

7. Management approach;

8. Project staffing plans, the skill levels of the proposed workforce, and the proposed safety plans for the project;

9. Financial condition of the proposer; and

10. Project ownership.

B. Project Characteristics

Factors to be considered in determining the project characteristics include, along with the specified information required under V.A. and V.B. above, the following:

1. Project definition;

2. Proposed project schedule;

3. Operation of the project;

4. Technology and technical feasibility;

5. Conformity to State and City laws, regulations, and standards;

6. Environmental impacts;

7. Condemnation impacts;

8. State and local permits; and

9. Maintenance of the project.

C. Project Financing

Factors considered in determining whether the proposed project financing allows adequate access to the necessary capital to finance the project include the following:

1. Cost and cost benefit to the City;

2. Financing, including debt source, and its impact on the debt or debt burden of the City;

3. Financial plan including overall feasibility and reliability of plan; default implications; the proposer's past performance with similar plans and similar projects; degree to which the proposer has conducted due diligence investigation and analysis of the proposed financial plan and the results of any such inquiries or studies;

4. Life-cycle cost analysis.

5. Opportunity costs assessment;

6. Estimated cost; and

7. The identity, credit history and past performance of any third party that will provide financing for the project, and the nature and timing of their commitment, as applicable.

In the event that any project is financed through the issuance of obligations that are deemed by the City to be tax-supported debt of the City, or if financing such a project may impact the City's debt rating or financial position, the City may select its own finance team, source, and financing vehicle.

D. Project Benefit and Compatibility

Factors considered in determining the proposed project's compatibility with the City's comprehensive or development plans include the following:

1. Community benefits, including the economic impact the project will have on the City in terms of amount of tax revenue generated for the City, the number of jobs generated for area residents, and level of pay and fringe benefits of such jobs, and the number and value of subcontracts generated for area subcontractors;

2. Community support or opposition, or both;

3. Public involvement strategy;

4. Compatibility with existing and planned facilities;

5. Compatibility with City, regional, and state economic development efforts; and

6. Compatibility with the City's land use and transportation plans.

E. Other Factors

Other factors that may be considered by the City in the evaluation and selection of PPEA proposals include:

1. The proposed cost of the qualifying project;

2. The general reputation, industry experience, and financial capacity of the private entity;

3. The proposed design of the qualifying project;

4. The eligibility of the project for accelerated documentation, review, and selection;

5. Local citizen and government comments;

6. Benefits to the public, including financial and nonfinancial;

7. The private entity's compliance with a minority business enterprise participation plan or good faith effort to comply with the goals of such plan;

8. The private entity's plans to employ local contractors and residents; and

9. The recommendation of a committee of representatives of the City which may be established to provide advisory oversight for the project.

VII. Interim and Comprehensive Agreements

Prior to developing or operating the qualifying project, the selected private entity shall enter into a comprehensive agreement with the City. Prior to entering a comprehensive agreement, an interim agreement may be entered into that permits a private entity to perform compensable activities related to the project. Any interim or comprehensive agreement shall define the rights and obligations of the City and the selected proposer with regard to the project.

A. Interim Agreement Terms

The scope of an interim agreement may include but is not limited to:

1. Project planning and development;

2. Design and engineering;

3. Environmental analysis and mitigation;

4. Survey;

5. Availability of financing for the proposed facility through financial and revenue analysis;

6. The process to negotiate, and the timing of the negotiation of, the comprehensive agreement; and

7. Any other provisions related to any aspect of the development or operation of a qualifying project that the parties may deem appropriate prior to the execution of a comprehensive agreement.

B. Comprehensive Agreement Terms

The scope of the comprehensive agreement shall include but not be limited to:

1. The delivery of maintenance, performance and payment bonds or letters of credit in connection with the development or operation of the qualifying project;

2. The review of plans and specifications for the qualifying project by the City;

3. The rights of the City to inspect the qualifying project to ensure compliance with the comprehensive agreement;

4. The maintenance of a policy or policies of liability insurance or self-insurance reasonably sufficient to insure coverage of the project and the tort liability to the public and employees and to enable the continued operation of the qualifying project;

5. The monitoring of the practices of the private entity by the City to ensure proper maintenance of the project;

6. The terms under which the private entity will reimburse the City for services provided;

7. The policy and procedures that will govern the rights and responsibilities of the City and the private entity in the event that the comprehensive agreement is terminated or there is a material default by the private entity including the conditions governing assumption of the duties and responsibilities of the private entity by the City and the transfer or purchase of property or other interests of the private entity by the City;

8. The terms under which the private entity will file appropriate financial statements on a periodic basis;

9. The mechanism by which user fees, lease payments, or service payments, if any, may be established from time to time upon agreement of the parties. Any payments or fees shall be set at a level that is the same for persons using the facility under like conditions and that will not materially discourage use of the qualifying project;

    a. A copy of any service contract shall be filed with the City.

    b. A schedule of the current user fees or lease payments shall be made available by the private entity to any member of the public upon request.

c. Classifications according to reasonable categories for assessment of user fees may be made.

10. The terms and conditions under which the City may contribute financial resources, if any, for the qualifying project;

11. The terms and conditions under which existing site conditions will be assessed and addressed, including identification of the responsible party for conducting the assessment and taking necessary remedial action;

12. The terms and conditions under which the City will be required to pay money to the private entity and the amount of any such payments for the project;

13. Other requirements of the PPEA or other applicable law; and

14. Such other terms and conditions as the City may deem appropriate.

Any changes in the terms of the interim or comprehensive agreement as may be agreed upon by the parties from time to time shall be added to the interim or comprehensive agreement by written amendment.

The comprehensive agreement may provide for the development or operation of phases or segments of a qualifying project.

Parties submitting proposals understand that representations, information and data supplied in support of, or in connection with, proposals play a critical role in the competitive evaluation process and in the ultimate selection of a proposal by the City. Accordingly, as part of the interim or comprehensive agreement, the proposer and its team members shall certify that all material representations, information and data provided in support of, or in connection with, a proposal is true and correct. Such certifications shall be made by authorized individuals who have knowledge of the information provided in the proposal. In the event that material changes occur with respect to any representations, information or data provided for a proposal, the proposer shall immediately notify the City of same. Any violation of this section of the interim or comprehensive agreement shall give the City the right to terminate the agreement, withhold payment or other consideration due, and seek any other remedy available under the law.

C. Notice and Public Hearing Requirements

1. In addition to the posting requirements of Section IV. B, the City shall hold a public hearing on a proposal during the proposal review process, but not later than 30 days prior to entering into an interim or comprehensive agreement.

2. Once the negotiation phase for the development of an interim or a comprehensive agreement is complete and a decision to award has been made by the City, the City shall post the proposed agreement on the City's website or post a summary thereof by publication, in a newspaper of general circulation in the City.

3. In addition to the posting requirements, at least one copy of the proposals shall be made available for public inspection. Trade secrets, financial records, or other records of the private entity excluded from disclosure under the provisions of subdivision Va. Code § 2.2-3705.6 (11) shall not be required to be posted, except as otherwise agreed to by the City and the private entity.

4. Any studies and analyses considered by the City in its review of a proposal shall be disclosed to City Council at some point prior to the execution of an interim or comprehensive agreement.

5. Once an interim agreement or a comprehensive agreement has been entered into, the City shall make procurement records available for public inspection, upon request.

   a. Such procurement records shall include documents protected from disclosure during the negotiation phase on the basis that the release of such documents would have had an adverse affect on the financial interest or bargaining position of the City or private entity in accordance with Section II.D.3.

   b. Such procurement records shall not include (i) trade secrets of the private entity as defined in the Uniform Trade Secrets Act (Va. Code § 59.1-336 et seq.); (ii) financial records, including balance sheets or financial statements of the private entity that are not generally available to the public through regulatory disclosure or otherwise; or (iii) cost estimates prepared by or for the City.

   To the extent access to procurement records is compelled or protected by a court order, the City will comply with such order.

6. A copy of any comprehensive agreement shall be submitted by the City to the Auditor of Public Accounts within 30 days after execution.

VIII. Governing Provisions

In the event of any conflict between these guidelines and the requirements of the PPEA or other applicable law, the terms of the PPEA or other applicable law shall control.

Terms and Definitions

"Comprehensive agreement" means the comprehensive agreement between the private entity and the City that is required prior to the development or operation of a qualifying project.

"Conceptual stage" means the initial phase of project evaluation when the City makes a determination whether the proposed project serves a public purpose and meets the criteria for a qualifying project; assesses the qualifications and experience of a private entity proposer; reviews the project for financial feasibility; and determines whether the project warrants further pursuit.

"Cost-benefit analysis" means an analysis that weighs expected costs against expected benefits in order to choose the best option. For example, the City Manager may compare the costs and benefits of constructing a new office building to those of renovating and maintaining an existing structure in order to select the most financially advantageous option.

"Detailed stage" means the second phase of project evaluation where the public entity has completed the conceptual stage and accepted the proposal and may request additional information regarding a proposed project prior to entering into competitive negotiations with one or more private entities to develop an interim or comprehensive agreement.

"Develop" or **"Development"** means to plan, design, develop, finance, lease, acquire, install, construct, or expand.

"Interim agreement" means an agreement between a private entity and the City that provides for phasing of the development or operation, or both, of a qualifying project. Such phases may include, but are not limited to, design, planning, engineering, environmental analysis and mitigation, financial and revenue analysis, or any other phase of the project that constitutes activity on any part of the qualifying project.

"Lease payment" means any form of payment, including a land lease, by the City to the private entity for the use of a qualifying project.

"Lifecycle cost analysis" means an analysis that calculates cost of an asset over its entire life span and includes the cost of planning, constructing, operating, maintaining, replacing, and when applicable, salvaging the asset. Although one proposal may have a lower initial construction cost, it may not have the lowest lifecycle cost once maintenance, replacement, and salvage value is considered.

"Material default" means any default by the private entity in the performance of its duties that jeopardizes adequate service to the public from a qualifying project.

"Operate" means to finance, maintain, improve, equip, modify, repair, or operate.

"Opportunity cost" means the cost of passing up another choice when making a decision or the increase in costs due to delays in making a decision.

"Private entity" means any natural person, corporation, general partnership, limited liability company, limited partnership, joint venture, business trust, public benefit corporation, nonprofit entity, or other business entity.

"Public entity" means the Commonwealth and any agency or authority thereof, any county, city or town and any other political subdivision of the Commonwealth, any public body politic and corporate, or any regional entity that serves a public purpose.

"Qualifying project" means (i) any education facility, including, but not limited to a school building, any functionally related and subordinate facility and land to a school building (including any stadium or other facility primarily used for school events), and any depreciable property provided for use in a school facility that is operated as part of the public school system or as an institution of higher education; (ii) any building or facility that meets a public purpose and is developed or operated by or for any public entity; (iii) any improvements, together with equipment, necessary to enhance public safety and security of buildings to be principally used by a public entity; (iv) utility and telecommunications and other communications infrastructure; (v) a recreational facility; (vi) technology infrastructure, services, and applications, including, but not limited to, telecommunications, automated data processing, word processing and management information systems, and related information, equipment, goods and services; (vii) any services designed to increase the productivity or efficiency of the responsible public entity through the use of technology or other means; (viii) any technology, equipment, or infrastructure designed to deploy wireless broadband services to schools, businesses, or residential areas; (vix) any improvements necessary or desirable to any unimproved locally- or state-owned real estate; or (x) any solid waste management facility as defined in Code § 10.1-1400 that produces electric energy derived from solid waste.

"Responsible public entity" means a public entity that has the power to develop or operate the applicable qualifying project, including the City.

"Revenues" means all revenues, income, earnings, user fees, lease payments, or other service payments arising out of or in connection with supporting the development or operation of a qualifying project, including without limitation, money received as grants or otherwise from the United States of America, from any public entity, or from any agency or instrumentality of the foregoing in aid of such facility.

"Service contract" means a contract entered into between a public entity and the private entity pursuant to Va. Code § 56-575.5.

"Service payments" means payments to the private entity of a qualifying project pursuant to a service contract.

"State" means the Commonwealth of Virginia

"User fees" means the rates, fees, or other charges imposed by the private entity of a qualifying project for use of all or a portion of such qualifying project pursuant to the comprehensive agreement pursuant to Va. Code § 56-575.9.