Date:

Mr. Gregory A. Tramontozzi Executive Director Passaic Valley Sewerage Commission 600 Wilson Avenue Newark, New Jersey 07105

Dear Mr. Tramontozzi:

The undersigned hereby submits the enclosed proposal for the position of **DESIGN SERVICES AND DESIGN SERVICES DURING CONSTRUCTION FOR A STANDBY POWER PLANT.**

The undersigned hereby undertakes and promises to provide services for **DESIGN SERVICES AND DESIGN SERVICES DURING CONSTRUCTION FOR A STANDBY POWER PLANT** and to do all work requested as appropriate and required herein as well as the contract documents concerning the same, including all written amendments and changes thereto, if any, which are incorporated herein by reference and made a part of this proposal.

MGNATURE

Brent Reuss Type or Print Full Name

204968 1839

Telephone Number

Veatch Corporation SINESS NAME

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Fax-Telephone Number



BLACK & VEATCH CORPORATION 489 FIFTH AVENUE, 14TH FLOOR, NEW YORK, NY 10017 +1 804-426-8356 | TaralloS@bv.com

May 26, 2016

Mr. Gregory A. Tramontozzi, Executive Director Passaic Valley Sewerage Commission Main Training Center 600 Wilson Avenue Newark, New Jersey 07105

Subject: Design Services and Design Services during Construction for a Standby Power Plant

Dear Mr. Tramontozzi,

Please find enclosed one original and five copies of our proposal for the Design Services and Design Services during Construction for a Standby Power Plant.

Black & Veatch and our project partner CDM Smith are committed to Passaic Valley Sewerage Commission (PVSC) and to meeting your objectives for this important resiliency project. We are pleased to present a proposal that is compliant with the Request for Qualifications and Proposals and is responsive to PVSC's desire to install a standby power generation system that is capable of providing sufficient power for all treatment needs during a loss of electrical supply from PSE&G. Our team's industry-leading power and wastewater resources combined with our extensive knowledge of your facility will ensure that PVSC will receive a well-designed and **reliable** standby power plant.

PVSC expects over 300 contractors on-site during the peak construction period of the resiliency program. Successful delivery of the program will require a **trusted partner** with **specialized expertise** to efficiently deliver the standby power plant, the largest of the program's construction projects.

Our team's extensive experience in combustion turbine power plant design, knowledge of wastewater treatment systems, and long history of delivering successful construction projects to PVSC and other municipal clients will ensure that PVSC and the Program Management Joint Venture (JV) will have a clear path from concept design to commissioning and operation of the new power generation facility.

Black & Veatch and CDM Smith have a history of successful collaboration on similar projects. For example, we collaborated with DC Water and the Program Manager to deliver the Combined Heat and Power and Main Process Train projects at the Blue Plains Advanced Wastewater Treatment Plant, the largest thermal hydrolysis and combustion turbine power generation facility ever constructed at a wastewater treatment plant.

We will ensure that PVSC and the Program Management JV meet the goals and objectives of the standby power plant project and strive to achieve the highest return on your FEMA funding. For this purpose, we propose as an option for your consideration the implementation of a civil/site preparation contract in advance of the main construction contract. This approach would minimize risk, lower the construction cost, and allow standby power to be available up to 6 months sooner than would be possible in a single construction contract, providing PVSC with early protection from power outages.

TRUSTED PARTNER. SPECIALIZED EXPERTISE. RELIABLE POWER.

PROFESSIONAL ENGINEERING SERVICES FOR THE DESIGN SERVICES AND DESIGN SERVICES **DURING CONSTRUCTION FOR A STANDBY POWER PLANT**

Passaic Valley Sewerage Commission 26 MAY 2016



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Executive Summary

The Passaic Valley Sewerage Commission (PVSC) wastewater treatment plant (WWTP) was flooded in 2012 by a tidal surge from Newark Bay as a result of Superstorm Sandy. The storm also caused a loss of power supply to the WWTP from Public Service Electric & Gas (PSE&G). This major flooding event and loss of power from the electric grid resulted in PVSC losing control of its treatment processes. In addition, PVSC could not provide biosolids management and liquid waste acceptance services to municipal and industrial entities in New Jersey and New York. In response to this catastrophic event, PVSC is undertaking a multifaceted program to protect the facility against major flooding up to a 500 year storm. As part of the program, a standby power system will be located at the WWTP; the system will be designed to maintain full operation during utility power supply disruptions at the site.

The Black & Veatch/CDM Smith Team Is Your Trusted Partner to Deliver Your Priorities for This Project

- Reliable Standby Power Our team's depth of industry-leading power and wastewater resources, combined with our extensive knowledge of your facility, will ensure PVSC gains a well-designed facility that is capable of providing sufficient power for all treatment plant needs in the event of a loss of supply from PSE&G.
- Efficient Project Delivery Through Specialized Expertise Our team's extensive experience in power plant design, knowledge of wastewater treatment systems, and long history of delivering successful construction projects to municipal clients will ensure that PVSC and AECOM+HDR, the Program Management Joint Venture (JV), will experience an efficient project that is on schedule and on budget. Our team has demonstrated successful collaboration with PVSC, PSE&G, Federal Emergency Management Agency (FEMA), the New Jersey Environmental Infrastructure Trust (NJEIT), New Jersey Department of Environmental Protection (NJDEP), and all three of the combustion turbine generator suppliers to be evaluated for the prepurchase contract.
- Maximized Return on FEMA Funding PVSC and the Program Management JV will benefit from Black & Veatch's integrated, specialized expertise in power and wastewater. Our team is uniquely qualified to deliver innovative, cost- and time-saving solutions, from design through installation and commissioning, to maximize the return on every FEMA dollar.

PVSC and the Program Management JV will have a clear path from concept design to commissioning and operation of a reliable, cost-effective standby power plant.

Providing Reliable Standby Power

The New Jersey Pollutant Discharge Elimination System (NJPDES) rules at N.J.A.C 7:14A-6.12 and 23.13(h) establish a service standard to maintain operations to ensure compliance with the NJPDES permit at all times. The Basis of Design Report (BODR) prepared by the Program Management JV identified the necessary design criteria for the 34 megawatt (MW) power generation facility. The BODR provides a robust plan to ensure that power remains available to operate the WWTP in the event of a loss of electrical supply from PSE&G.

Ensuring Success Through Efficient Project Delivery

PVSC expects more than 300 contractors to be on-site during the peak construction period of the resiliency program. Successful delivery of the program will require seamless coordination of the design, construction,

and commissioning work of the various projects and a trusted partner to deliver services from design through commissioning. The Black & Veatch/CDM Smith team will facilitate this coordination effort through its

GLOBAL EXPERTISE, LOCAL DELIVERY

Clients across the world turn to Black & Veatch for its specialized expertise in combustion turbine systems. We have successfully delivered more than 115,000 MW of combustion turbine power generation in over 600 projects worldwide.

A HISTORY OF COLLABORATION

Black & Veatch and CDM Smith successfully collaborated with DC Water and the Program Manager to deliver the Combined Heat and Power (CHP) and Main Process Train (MPT) projects at the Blue Plains advanced wastewater treatment plant (AWTP), the largest thermal hydrolysis and combustion turbine power generation facility ever constructed at a WWTP.



integrated team structure and proven project management approach—our effective communication, collaboration, and accountability will result in decisions being made early, avoiding rework and redesign.

Ensuring the Highest Return on FEMA Funding

In the Project Approach/Schedule section of this proposal, we outline our innovative approaches to helping PVSC and the Program Management JV meet the goals and objectives of the standby power plant project and ensuring the highest return on FEMA funding. We propose for your consideration the implementation of a civil/site preparation advanced contract. This two construction contract approach would minimize risk, lower construction cost, and allow standby power to be available up to 6 months sooner than would be possible with a single construction contract, providing PVSC with early protection from power outages.

The BODR identified three acceptable combustion turbines that PVSC will procure through a separate bidding process. Each turbine has unique design requirements that will impact the design of the facility. To mitigate PVSC's procurement risk and reduce the construction contract's proportionately high cost of mechanical systems and equipment, our schedule assumes early selection and procurement of the turbines, which will define the design requirements of the auxiliary facilities and allow for a streamlined design and procurement process.

The Black & Veatch/CDM Smith team has procured hundreds of combustion turbine systems. As design engineer or design-build contractor on numerous combustion turbine projects, we are experienced at managing the procurement risk and maximizing the return on investment of big ticket power generation equipment.

Meeting PVSC Requirements

Section IV of the Request for Qualifications and Proposals (RFQ/RFP) lists the selection evaluation criteria. Table 1 provides a cross-reference with the sections of our proposal and the RFQ/RFP criteria (RFQ/RFP pages 7 and 8) and demonstrates that the Black & Veatch/CDM Smith team meets or exceeds PVSC's criteria. The capabilities summarized in Table 1 provide a solid foundation for helping PVSC and the JV make decisions that will result in efficient delivery of a technically sound, cost-effective, and reliable standby power plant.

Table 1. RFQ/RFP Criteria

RFQ/RFP CRITERIA	PAGE
Technical Competence	3
The background, professional qualifications, education and training of the Respondent and its staff to fully understand and deal with the requirements of the project.	3-14
The Respondent's qualifications specifically pertaining to the scope of work outlined in this RFQ/RFP.	3-14
The Respondent's execution of the requirements and procedures as set forth with the RFQ/RFP.	
Geographical location of the Respondent's offices and key personnel.	15
Experience	16
The Respondent's familiarity with the work, requirements, and procedures of PVSC, including if applicable, PVSC's prior experiences with the Respondent.	19
The Respondent's prior experience with Public Entities and/or Governmental Agencies.	19
The ability of the Respondent to demonstrate its experience (and the experience of its staff) with the design of power generation facilities with a minimum capacity of 5 MW.	16-18, 20-26
The Respondent must demonstrate a verifiable history of successful projects, similar in size and scope to that proposed.	20-26
Project Approach/Schedule	27
The Respondent's proposed technical approach to meet the requirements and objectives of the RFQ/RFP.	27
The Respondent's proposed schedules, drawing list, & outline specifications.	42
The Respondent's summary of Total Manday Estimate (Attachment G).	Att. G

Technical Competence

INTRODUCTION

Black & Veatch, as prime consultant, will manage the standby power plant project from its New York City and Raleigh, North Carolina, offices and will have overall responsibility for the successful execution of this project. Our project partner, CDM Smith, is a highly qualified and well-respected firm with significant relevant New Jersey and PVSC experience.

The Black & Veatch/CDM Smith team brings specialized and relevant qualifications to best serve PVSC. In this section of our proposal, we have focused on our team's credentials to provide professional engineering services for the design and construction of large power generation facilities, particularly those using combustion turbine technology. More detailed information on our qualifications can be found in the Experience section of this proposal.

Black & Veatch Qualification

Black & Veatch has served the wastewater and power industries throughout its 101 year history. Our industry rankings in power (No. 2 by Engineering News-Record [ENR]); mechanical, electrical, and plumbing (No. 1 by Consulting -Specifying Engineer); power transmission and distribution (No. 4 by ENR); and wastewater treatment (No. 6 by ENR)



Figure 1. PSE&G's \$600M Sewaren 7 combined cycle gas turbine plant in Woodbridge, NJ will deliver power to the PJM market in time for the summer of 2018.

demonstrate our industry leading expertise. We provide depth of electrical and power delivery expertise and specialty expertise in all the required service areas and have supported medium-voltage and electrical system upgrade projects, including projects for agencies similar to PVSC in treatment capacity and electrical load requirements.

Black & Veatch has delivered more than 115,000 MW of combustion turbine power generation. Our combustion turbine leadership includes consulting, design, construction, and commissioning of 600 turbine installations worldwide. As an example of this experience, we performed engineering and procurement services (and are currently providing construction management services) for PSEG Power's 540 MW Sewaren 7 combined cycle plant in Woodbridge, New Jersey.

Black & Veatch brings PVSC and the Program Management JV unequaled experience and qualifications to perform the electrical system design for the standby power project. We have been at the forefront of responding to our clients' challenges regarding emergency power supply at water and wastewater utilities for decades, providing both design and construction services capabilities for CHP facilities and electrical improvements at operating WWTPs. Our involvement has been so extensive that we literally "wrote the book." Black & Veatch prepared the guidance manual "Emergency Power Source Planning for Water and Wastewater." The Experience section herein contains descriptions of projects performed by Black & Veatch that have elements similar to the services required for the standby power project.

CDM Smith Qualification

Our project partner, CDM Smith, has an in-depth understanding of your plant site, the facility's electrical demand requirements, and the local permitting environment.

Founded in 1947, CDM Smith is an employee-owned global consulting engineering, construction, and operations firm with annual revenues over \$1.3 billion and over 5,000 specialized personnel in 125 offices in the United States and abroad. Such robust resources allow CDM Smith to respond decisively and effectively to our clients and to take on a wide range of projects.

Black & Veatch's experience in power generation, combined with Black & Veatch's and CDM Smith's respective leadership in WWTP design and construction, provides



"Emergency Power Source Planning for Water and Wastewater" was authored by three Black & Veatch engineers and is a primary reference source on standby power for the water and wastewater industry. One of the book's authors, Larry Pittman, is on our proposed project team.



PVSC with the specialized resources, engineering expertise, and familiarity with PVSC and the local permitting environment required to successfully execute this important resiliency project with confidence.

Team Structure

Our team was carefully selected to include New York/New Jersey-based leadership and professionals who are committed to serving PVSC. The Black & Veatch/CDM Smith team is supported by a strong team of specialized technical experts that is fully committed to executing the project under a fast-track, risk-mitigated design, and construction implementation approach.

Strong leadership supported by highly experienced technical staff is required for this important project. The success of the standby power plant will require dedicated, collaborative team members all focused on the timely delivery of the project. The sooner the project is delivered to PVSC, the sooner the facility will be protected from loss of utility power. To achieve these objectives, we selected an experienced leader and technically proficient Project Manager, Domenick Loschiavo, who has worked on fast-track designs involving critical timing and integrating equipment procurement with the design. Domenick will have overall responsibility for the project. He will be supported by highly experienced Design Managers Mike Shafer, Kathryn Robinson, and Tom Laustsen and Construction Manager, Joe Stromwall.

As shown on Figure 2 and the organization chart on Figure 3, we are proposing a streamlined organizational structure designed to ensure effective project delivery through accessibility, collaboration, and accountability. To make this a successful project and to meet the proposed schedule, our dedicated leads will be aligned with the PVSC and Program Management JV lead engineers and permitting specialists. One of the benefits to integrating the Pre-Purchase, Permitting, Design & Constructability, and Commissioning & Startup teams with PVSC and the Program Management JV is to allow design decisions to be made early, "locking in the design." With the design locked in by all stakeholders, rework and redesign is minimized saving time and money by collaborating on ideas, concepts, and preferences whenever they come up. Every level of our team will be available to PVSC and the Program Management JV.

ACCESSIBILITY, COLLABORATION AND ACCOUNTABILITY A TEAM STRUCTURE DESIGNED FOR EFFICIENT PROJECT DELIVERY



Figure 1. A Team Structure Based on Accessibility, Collaboration and Accountability

We have demonstrated our ability to effectively apply our expert resources and provide innovative and high quality engineering services on previous power plant and wastewater projects. The standby power plant project requires up front and detailed coordination with outside stakeholders to be successful. Our team will carefully coordinate with PVSC Operations, PSE&G, and the NJDEP. The Black & Veatch/CDM Smith team will always be responsible to PVSC and will always be accountable in its execution of the professional services we provide. PVSC will be well served by ensuring that the locally accessible, worldwide expertise of Black & Veatch and CDM Smith is available to support its needs.





Figure 2. Organization Chart



Key Staff Qualifications

Our team members bring qualifications that are specific and unique to delivering combustion turbine-based standby power to a large wastewater treatment plant. Our team members' experience with PVSC and execution of other similar projects for local, national, and global clients ensures that our team fully understands the project requirements and has a firm grasp of every facet of the scope of work.

The following pages describe the specific attributes of our key team members. Résumés for all team members are included in Appendix A: Company Information. Our local key team members are backed by world-class resources that have direct experience with electrical distribution and power generation and exhaust gas treatment technologies.

DOMENICK LOSCHIAVO | Project Manager



Office Location New York, New York Benefit to PVSC

Domenick has designed and managed infrastructure projects for large municipalities across the east coast of the United States and Australia. This experience, which includes design of large mechanical and high-pressure equipment systems and construction management services, positions Domenick to successfully manage the multidiscipline and contracting specialties of the standby power plant project. Most recently, he has supported several Department of Environmental Protection (DEP) projects at the North River WWTP and is currently the Deputy Project Manager for the Black & Veatch design team for the North River Cogeneration and Electrification project. His hands-on experience and technical expertise make him the ideal candidate to manage this project.

Domenick Loschiavo is a project manager with experience in civil/mechanical engineering design on a variety of water and wastewater plant upgrade and infrastructure projects. His recent experience is managing and leading the detailed design for a cogeneration and electrification project as part of a large treatment facility upgrade. He was also a lead team member restoring a fire damaged 1,700 horsepower (hp) internal combustion (IC) engine. His design experience includes a range of domestic and international projects including plant expansion, pumping station upgrades, reservoir rehabilitation, and large diameter pipeline design and rehabilitation. He has also executed construction work as part of design-build project teams and supported projects as a Resident Engineer.

KEY STRENGTHS

Hands-on project manager with strong technical skills in multiple areas.

Construction experience with new buildings and facilities.

Emergency response and large construction contract experience in the New York City metro area (North River WWTP electrification and cogeneration project for the New York City DEP).

Relevant Project Experience

 New York City Environmental Protection; North River WWTP Cogeneration and Electrification; New York, New York. Deputy Project

Manager/Engineering Manager. Responsible for managing the Black & Veatch cogeneration and electrification design team as well as leading the upgrade to the 340 million gallons per day (mgd) pumping station and new process air blower facility during detailed design. The program included multiple advanced contracts to streamline the work, which had a total \$225 million construction value.

- New York City Environmental Protection; North River WWTP Emergency Response and Reconstruction; New York, New York. Engineering Manager. Responsible for coordinating multiple work orders and engineering design of reconstruction contracts to return the North River WWTP to a pre-incident condition. One of the 10 direct drive IC engines had caught fire at the plant and damaged critical process components.
- Melbourne Water Corp; EPC Wastewater Project, Eastern Treatment Plant Tertiary Upgrade; Melbourne, Australia. Project Engineer. Developed civil infrastructure components for three 30 percent designs as part of the owner-engineer-constructor alliance on this 200 mgd tertiary treatment upgrade to improve ocean outfall quality and prepare for future water reuse. Responsible for the design of two major pumping stations that, at full plant capacity, meet the required flow conditions for the treatment processes. Responsibilities also



included the civil/structural designs of the ultraviolet light and ultrafiltration membrane systems and ozone cooling system pumping station.

MIKE SHAFER | Turbine Building Design Manager



Office Location Raleigh, North Carolina Benefit to PVSC

Mike will coordinate the technical details between all engineering disciplines to ensure a seamless design that meets all of the project goals. Mike will work closely with Domenick to communicate PVSC design goals and decisions to the design team and effectively implement the detailed design that incorporates the collaborative input from all project partners.

Mike is an engineering manager who has experience with all facets of water and wastewater systems, including treatment plant upgrades and expansions, residuals facilities, pumping station, and pipeline design. For wastewater systems, he has developed collection system master plans, sewer line design, pumping station and force main design, liquid treatment expansions, and biosolids management. For reuse systems, Mike has led some of the most comprehensive master plan efforts in the Mid-Atlantic region. Through all of these projects, Mike has focused on a client-centered approach to finding solutions that meet each individual client's goals for a successful project.

KEY STRENGTHS

Performed the same engineering manager role for the Blue Plains AWTP CHP project.

Relevant Project Experience

DC Water; Blue Plains AWTP Combined Heat and Power Project; Washington, District of Columbia. Engineering Manager. Provided design of new CHP project that produces up to 100,000 pounds per hour (pph) of steam for use in the Cambi process as well as up to 15 MW of electricity for use in the Blue Plains AWTP. Facilities included three Solar Mercury 50 combustion turbines coupled with 11,000 pph heat recovery steam generators (HRSGs) and duct burners for enhanced steam production. Digester gas conditioning included moisture and siloxane removal and 450 hp rotary screw gas compressors.

 Winston-Salem/Forsyth County Utilities Commission; Muddy Creek WWTP Power Generation Upgrade; Winston-Salem, North Carolina. Project Engineer. Assisted in planning and permitting of a CHP facility including a new 1,100 kilowatt (kW) engine generator fueled by digester gas, natural gas, or a blend of both. Hot water from the engine cooling system is utilized for digester and building heating. Sacramento Regional County Sanitation District; Sacramento Regional WWTP Biological Nutrient Removal Project; Sacramento, California. Hydraulics Engineer. Developed the hydraulic profile for the secondary treatment process at the 181 mgd facility, including new biological nutrient removal basins. The basins were configured to allow four different operating schemes at a peak effluent flow of 330 mgd.

City of Kinston; Forrest Street Lift Station and Wastewater Force Main; Kinston, North Carolina. *Project Engineer.* Designed modifications to the existing Forrest Street Lift Station following a major flooding event from Hurricane Floyd. An abandoned drywell was retrofitted into a second wetwell to allow the existing station to remain in continuous operation. Four 300 hp submersible pumps were installed in two wetwells to provide a firm pumping capacity of 17 mgd. A 1,250 kW natural gas fired engine-generator was provided to ensure continuous operation during flooding events that isolated the pump station site.



JOE VEILLEUX | Combustion Turbine Generator Mechanical Systems / Technical Advisor



Office Location Raleigh, North Carolina Benefit to PVSC

Joe will support Domenick and the Black & Veatch/CDM Smith team to ensure that the standby power plant design meets the client's rigorous technical requirements and conforms to Black & Veatch's extensive design procedures and guides for simple cycle power plants. As Black & Veatch's Raleigh Office Power Business Manager of Mechanical Engineering, Joe will ensure that appropriate mechanical staff resources are assigned to support the design phase and construction throughout the duration of the project.

Joe Veilleux has 32 years of professional engineering experience. His project experience with Black & Veatch includes a biofuel fired cogeneration facility at a major metropolitan water and sewer authority WWTP, a lignite coal delivery facility for an integrated gasification combined cycle (IGCC) power plant; a simple cycle gas turbine demonstration power plant fired by syngas generated by air-blown gasification; a 1,000 MW one-unit, supercritical, coal fired power plant; a 5,000 MW six-unit, supercritical, coal fired power plant; a conversion of two simple cycle plants to combined cycle; and a pulverized coal process plant used for steel manufacturing at an existing coal fired power station.

KEY STRENGTHS

Extensive power plant mechanical system and equipment design background based on experience as a nuclear trained navy officer and as a mechanical engineer in a power generating utility and two manufacturing firms.

Extensive experience with combustion turbine generator and CHP system design based on the DC Water CHP Project at the Blue Plains AWTP.

Relevant Project Experience

Power Business; Raleigh Office; Cary, North
 Carolina. Raleigh Office Mechanical Manager of

Engineering. Responsible for managing Mechanical Section engineers and technicians to ensure that professionals with proper expertise and tools are available to support Raleigh Office project and business development proposal execution efforts. Also responsible for maintaining quality, productivity level, and billable rates for the section. Support production project billable work as senior engineering specialist, as required.

Potomac Electric Power Company (PEPCO) Energy Services; DC Water CHP Project; Washington, District of Columbia. Power Engineering Manager and Project Discipline Engineer – Mechanical.

Responsible for managing the multidiscipline engineering effort during construction and commissioning and the detailed mechanical engineering design and procurement support associated with a new state-of-the-art biofuel fired cogeneration facility at the Blue Plains AWTP in Washington, DC.

R,

KATHRYN ROBINSON | Combustion Gas Turbine System Design Manager



Office Location Raleigh, North Carolina Benefit to PVSC Kathryn will coordinate t generator and its associa and with Domenick to er

Kathryn will coordinate the overall design effort surrounding the combustion turbine generator and its associated systems. She will collaborate with the other design managers and with Domenick to ensure that the overall project goals are achieved. She will utilize her extensive background in overall power plant design and construction to bring the standby power plant concept to reality.

Kathryn Robinson is an engineering manager responsible for supervision of the overall engineering design on assigned projects. She is also the Assistant Mechanical Manager of Engineering for the Raleigh office. Kathryn has extensive experience on simple cycle gas turbines, combined cycle gas turbines, biomass boiler, air quality control retrofit, and balance-of-plant design projects. Responsibilities have included mechanical engineering project oversight, engineering design, procurement support, and construction support.

KEY STRENGTHS

Extensive experience in combustion turbine power plant design and construction.

Large plant retrofit project experience, bringing system improvements and power generation upgrades into existing power and industrial plants without interruption of normal facility operations.

Relevant Project Experience

- Exelon; Project Phoenix; Texas. Senior Mechanical Engineer. Provided permitting support and preliminary system definition for combined cycle power plant. Provided engineering data, equipment layout, and performance data in support of obtaining project permitting. Provided preliminary system flow diagrams for inclusion in the EPC project specification.
- LS Power; Dual Fuel Conversion; Illinois. Engineering Manager/Project Mechanical Engineer. Provided a preliminary engineering and cost estimate for project to add fuel oil firing capability to existing simple cycle combustion turbine plants at five sites in two states. Developed plant layout for equipment skids and balance-of-plant equipment.
- Black Hills Simple Cycle Project; Colorado. Senior Mechanical Engineer. Provided preliminary plant design for a simple cycle combustion turbine project. Provided mechanical engineering support for equipment procurement including fuel gas compressors, HRSGs, and selective catalytic reduction (SCR) systems.
- Maui Electric Company (MECO); Waena Simple Cycle; Hawaii. Project Mechanical Engineer. Provided preliminary engineering of a simple cycle combustion turbine power plant. Responsibilities included preliminary system design, equipment layout, permitting support, specification development, bid analysis, and recommendations for procurement of combustion turbines.

LARRY PITTMAN | QA/QC Standby Power



Office Location Kansas City, Missouri Benefit to PVSC

Larry will support Brian and the standby power team with technical expertise concerning all mechanical aspects for the standby power plant. As Black & Veatch's recognized expert concerning on-site reciprocating engine electrical power generation, he will guide the staff throughout the design process.

Larry Pittman specializes in the design of engine driven equipment and fuel storage and distribution systems for water and wastewater treatment facilities and pumping stations. Larry has also provided reliability assessments, payback analysis, and energy usage evaluation studies for many different sizes of engine-generators. His design experience includes design of vehicle service and maintenance facilities.

KEY STRENGTHS

Has been involved with several hundred standby power designs located throughout the United States.

Individual engine-generators have varied in capacity from less than 10 kW to over 3,000 kW each and were located both inside of buildings or outside in their own weatherproof enclosures.

Relevant Project Experience

- City of Santa Monica; Arcadia Water Treatment Plant; Santa Monica, California. Mechanical Engineer. Designed one 2,400 kW diesel fueled engine-generator for the Arcadia facility and one 1,400 kW diesel fueled engine-generator for the Charnock facility. Each engine-generator was designed to provide standby power.
- Water District No. 1 of Johnson County; Wolcott Water Treatment Plant; Johnson County, Kansas. Mechanical Engineer. Designed three 2,000 kW natural gas fueled engine-generators to provide power for standby and load curtailment applications.
- Orange County Sanitation District (OCSD); Energy Master Plan; Orange County, California. Mechanical Engineer. Responsible for the evaluation of OCSD's current and future standby power needs and options to meet those needs, including a diesel fuel storage system.
- New York City Department of Environmental Protection; Construction Management (CM) Services to the 26th Ward Water Pollution Control Plant (WPCP) Emergency Generator Upgrades; New York, New York. Technical Advisor. This \$50 million project was to upgrade the emergency power system at the 26th Ward WPCP. Work included replacing the existing gas turbine generators with diesel generators, replacing the existing diesel black start generator, and completing all modifications required to the substation, switchgear, and control systems. The CM team performed the constructability review of the project.

R,

SAI PEYYETI Resident Project Representative (Turbine Building)



Office Location Sewaren, New Jersey Benefit to PVSC

Sai will be our team's agent at the construction site. He will be responsible for the day-today observation and monitoring of construction activity, observing whether the contractor's work is substantially in conformance with the plans and specifications, and for on-site coordination of PVSC employees and our design team during construction.

Sai is a Certified Construction Contract Administrator (CCCA) by Construction Specifications Institute (CSI). Sai worked as an Assistant Resident Engineer/Structural Engineer/Civil Structural Inspector/Office Engineer and experienced in the structural design, field inspections, contractor payment reviews, field records management (such as submittals, RFIs, RFCs, change orders, O&M Manuals etc.), preparation of partial and substantial occupancy documents, preparation and tracking of punch list items, controlled inspections document management, and permit management.

KEY STRENGTHS

Experience coordinating a large field team for a large municipal client (New York City DEP)

Local large combustion turbine power generation construction experience

Experienced negotiator and adept at claims resolution

Relevant Project Experience

- New York City Department of Environmental Protection; New York City Water Tunnel No. 3; New York City, New York. Assistant Resident Engineer/Office Engineer. Worked as Assistant Resident Engineer/Office Engineer on the Construction Management team for Contracts 538D and 549A. Contract 538D is a \$200 million project, which consists of installation of electrical, mechanical and H&V equipment installation in tunnel shafts & construction of trunk water mains. Mr. Peyyeti is responsible for field records
- management, contractor payment reviews, field inspections, and close out of the projects.
 PSEG; Sewaren 7 CC; Sewaren, New Jersey. Field

Civil/Structural Engineer. Working as a field Civil/Structural Engineer. Sewaren 7 is a dual-fuel (natural gas, and ultra-low-sulfur distillate fuel oil), 540-MW combined cycle power plant of \$600 million investment by PSEG. Equipment included Combustion and Steam Turbine Generators, Heat Recovery Steam Generator, Air Cooled Condensers etc. New York City Department of Environmental Protection; Manhattan Pump Station Upgrade; New York City, New York. Structural Inspector/Assistant Resident Engineer. Worked as Structural Inspector/Assistant Resident Engineer for \$236 Million Manhattan Pump Station Upgrade Project in New York. It was a Wicks Law contract and had 4 Prime Contractors. Upgrade consists of replacing of all 5 Centrifugal pumps with new 100 MGD each Main Sewage Pumps, replacement of Suction, Discharge & Cone Check Valves, Screens and Sluice Gates. Installation of new Throttling Gates, 2-5000kW Gas Turbine Generators with Black Start Diesel Generators and other Electrical, Structural, Mechanical, HVAC and Plumbing systems.

TOM LAUSTSEN | Site Preparation and Permitting Design Manager

Office Location



Edison, New Jersey Benefit to PVSC Tom will coordinate the overall design effort for site preparation. He will collaborate with the other design managers and with Domenick to ensure that the site is ready for construction of the turbine building. In addition, Tom will apply his knowledge of City of Newark, Essex County, and New Jersey regulatory requirements to coordinate the activities related to permit applications and approvals needed for the project to remain on schedule.

Tom Laustsen has 24 years of experience in design and construction of soil and groundwater remediation systems; water and wastewater treatment plants; landfill caps; sitework and mechanical systems; underground and aboveground storage tanks; construction services; storm sewer, water main, and force main design; data collection and analysis; and treatment system installation, operation, and maintenance. He has worked on a variety of environmental and hydrological engineering projects in the areas of hazardous waste, wastewater, water, solid waste, and water resources.

KEY STRENGTHS

Has worked in a leadership role on several PVSC projects

Is very familiar with the site.

Has extensive experience with New Jersey regulatory agencies and permitting requirements

Relevant Project Experience

- PVSC; Pumping Station Design. Project Manager.
 Provided design, bidding, and construction services related to a parallel heat treatment plant supernatant return line (HTPSR).
- PVSC; Sludge Pipeline Improvements. Project Manager. Provided design, bidding, and construction services related to rehabilitation of a gravity HTPSR line. The existing polyethylene liner in the piping was failing and causing hydraulic restrictions.
- PVSC; Waste Activated Sludge (WAS) Pumping Station Upgrade. Project Manager. Tom is managing a project where PVSC is looking to expand the pumping capacity of its WAS pumping station from 10 mgd to 15 mgd. Evaluation includes considering hydraulic issues, pump clogging, and pumping efficiency.
- Westchester County; Construction Oversight Wastewater Treatment Plant Upgrade; New York.
 Project Engineer. For the expansion and upgrade of the 92 mgd Mamaroneck WWTP. Tom provided shop drawing review and on-site construction inspection services, including test monitoring of the fine-bubble aeration system designed for high oxygen transfer efficiency.

Percentage of Time to Be Spent on the Project

Table 2 provides the information requested on page 31 of the RFQ/RFP.

Table 2.Percent of Project Team Members Time to be spent on the Project; Broken down by Task

				% TIME 1	TO BE S	PENT OF	N TASK
NAME	FIRM	PROJECT ROLE	YEARS OF EXPERIENCE ON RELATED WORK	REVIEW, INVESTIGATION BODR VALIDATION, AND PROJECT WORKPLAN	DESIGN SERVICES	DESIGN SERVICES DURING CONSTRUCTION	CONSTRUCTION
Jeff Austin	Black & Veatch	13.8 kV Electrical Lead	12	5	75	20	0
Rebecca Barnes	Black & Veatch	Project Support Specialist	20	5	5	5	5
William Blair	Black & Veatch	SCR and Exhaust Stack Mechanical Engineer Lead	2	0	50	50	0
Alexander Bullers	Black & Veatch	Civil Engineer	6	0	15	10	0
Cameron Bryant	Black & Veatch	Lead Structural Engineer – Turbine Foundation	23	5	50	10	0
Kevin Cahill	Black & Veatch	Lead HVAC Mechanical Engineer	10	5	15	5	0
Wanda Cox	Black & Veatch	Project Support Specialist	26	0	0	0	50
Mike Davis	Black & Veatch	CAD Technician	30+	0	65	2	0
Doug Duncan	Black & Veatch	Structural Engineer	5	0	60	15	0
Randy Fiorucci	Black & Veatch	QA/QC Manager	43	2	2	2	0
Doug Friedel	Black & Veatch	Mechanical Systems QA/QC	37	2	5	0	0
Tim Holmes	Black & Veatch	Instrumentation and Control (I&C) Engineer QC	35+	0	8	0	0
Michael Hums	Black & Veatch	Lead Fuel Supply Mechanical Engineer	8	5	75	20	0
Brian Huska	Black & Veatch	Lead Mechanical Engineer – Black Start Generator	9	10	20	5	0
Jason Johnson	Black & Veatch	Senior CAD Technician	10	0	75	2	0
Michael Johnson	Black & Veatch	Technical Advisor	35+	2	2	0	0
Mark Kleveter	Black & Veatch	QA/QC Electrical Systems	24	2	5	0	0
Dave Long	Black & Veatch	Senior Mechanical Engineer	35+	25	10	2	0
Domenick Loschiavo	Black & Veatch	Project Manager	15	25	25	25	5
James McCaw	Black & Veatch	Commissioning Specialist	40	0	0	0	75
Mallory McGinnis	Black & Veatch	Building Mechanical Engineer	3	0	30	5	0
Dave Modi	Black & Veatch	Combustion Turbine Generators	10	5	75	10	0
Jeff Nickerson	Black & Veatch	Control Systems Engineer	14	5	20	2	0
Lou Nemeth	Black & Veatch	Lead Architect	26	5	10	0	0
Kim Ogle	Black & Veatch	I&C Engineer	35+	0	35	2	0
Sai Peyyeti	Black & Veatch	Resident Project Representative (RPR)	11.5	0	0	0	100
Larry Pittman	Black & Veatch	QA/QC Standby Power	35+	2	5	0	0
Scot Pruett	Black & Veatch	Fire Protection Engineer	19	0	5	5	0

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	1			-	-	-	-
		Combustion Gas Turbine					
Kathryn Robinson	Black & Veatch	Generator System Design Manager	22	15	20	20	0
Elizabeth Rodgers	Black & Veatch	Health and Safety Officer	13	2	2	0	0
Michele Roth	Black & Veatch	Building Mechanical QC	35+	0	5	0	0
Nick Salem	Black & Veatch	Electrical Engineer – Power Distribution	11.5	45	25	8	0
Jason Seck	Black & Veatch	Building Information Modeling (BIM) Manager	20	0	30	1	0
Michael Shafer	Black & Veatch	Turbine Building Design Manager	24	20	50	35	5
Shawn Sparrow	Black & Veatch	Project Manager	20	10	20	0	0
Thomas Strout	Black & Veatch	Control Systems Engineer	22	5	50	20	0
Joe Stromwall	Black & Veatch	Construction Manager	17	2	5	2	5
Stephen Tarallo	Black & Veatch	Project Director	26	10	20	5	5
Earl Tast	Black & Veatch	Lead Structural Engineer – Turbine Building	30+	5	30	2	0
Andrew Truman	Black & Veatch	Power Distribution Electrical Lead	14	45	25	8	0
Dennis Trupka	Black & Veatch	Architect	25	10	40	5	0
Joe Veilleux	Black & Veatch	QA/QC Mechanical Systems/Technical Advisor	32	5	5	2	
Robert Zechmann	Black & Veatch	Structural Engineer QC	14	0	8	0	0
Paul Zink	Black & Veatch	Operations and Maintenance (O&M) Training Specialist	42	0	0	0	75
Eralda Allajbe	CDM Smith	Junior Geologist	5	0	30	0	0
Jessica Beattie	CDM Smith	Environmental Engineer	17	5	0	0	0
Dana Boyadjian	CDM Smith	Licensed Site Remediation Professional	30+	5	0	0	0
Robert Bunting	CDM Smith	Lead Geotechnical Engineer	23	10	30	10	0
Timothy Dupuis	CDM Smith	Project Director	24	2	2	0	0
Marcie Encinas	CDM Smith	Junior Permitting Engineer	11	20	0	0	0
Patti Forgang	CDM Smith	Permitting Lead	30+	10	0	0	0
Melissa Harclerode	CDM Smith	Civil Engineer	12	25	25	10	0
Cynthia Hibbard- Strong	CDM Smith	Title V Specialist	30+	5	0	0	0
Rebecca Jablon	CDM Smith	FEMA Program Specialist	12	10	0	0	0
Robert Klein	CDM Smith	Resident Project Representative	20	0	0	0	25
Tom Laustsen	CDM Smith	Site Preparation and Permitting Design Manager	24	20	20	5	0
Kevin McEvoy	CDM Smith	Constructability Review	30+	2	2	5	5
Kapila Pathridge	CDM Smith	Geotechnical Engineer	23	5	5	5	0
Virginia Roach	CDM Smith	Lead Civil Engineer	30+	5	5	0	0
John Rogers	CDM Smith	Mechanical Engineer	30+	10	10	5	0
Darcy Rosenthal	CDM Smith	Civil Engineer	10	25	25	0	0
Amit Sen	CDM Smith	Title V Specialist	17	25	0	0	0
William Bauer	Nasco	Estimator	20	0	8	2	0
Joseph DeMelis	Nasco	Junior Estimator	5	0	15	2	0
Chris DuPont	Nasco	Senior Estimator	20	0	33	2	0
Ed Hiney	Nasco	Chief Estimator	35+	0	5	0	0

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Project Team Location

With more than 11,000 professionals worldwide, 4,000 in North America, and 150 within 50 miles of the PVSC service area, **Black & Veatch** offers leading experience in the market segments we serve. Our single integrated global workforce allows us to deploy optimal multidisciplinary teams from around the world quickly and efficiently.

Founded in 1947, **CDM Smith** is an employee-owned global consulting engineering, construction, and operations firm with annual revenues over \$1.3 billion. CDM Smith currently employs over 5,000 specialized personnel in 125 offices in the United States and abroad. Such robust resources allow CDM Smith to respond decisively and effectively to its clients and to take on a wide range of projects. As shown in the graphic below, project team leaders are based in New York/New Jersey and Raleigh, North Carolina and are supported by the global and local resources of Black & Veatch and CDM Smith.





LOCAL PRESENCE BOLSTERED BY GLOBAL EXPERTISE AND EXPERIENCE WITH PVSC

BLACK & VEATCH HEADQUARTERS Overland Park, Kansas

Over 110 Offices Globally

Over 60 Offices in the United States

Over 1,300 employees on the East Coast

CDM SMITH HEADQUARTERS Boston, Massachusetts

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Experience

RELEVANT EXPERIENCE

Black & Veatch brings unequaled experience and qualifications to the design, design services during construction, and construction management/RPR services for the PVSC standby power plant project. The following sections illustrate how the Black & Veatch/CDM Smith team will provide the following to PVSC:

- Strong, relevant experience in every aspect of the scope of work.
- Extensive experience designing electrical systems for wastewater treatment facilities.
- Extensive experience with the design of large power generation facilities.
- Extensive experience with combustion turbine systems, both in simple cycle and CHP operations.
- A long, successful history delivering quality designs to PVSC and other municipal agencies.

POWER GENERATION PROJECTS COMPLETED BY THE BLACK & VEATCH TEAM	CAPACITY (MW)	YEAR IMPLEMENTED	TECHNOLOGY/FUEL	DESIGN SERVICES	PROCUREMENT	DESIGN SERVICES DURING CONSTRUCTION	COMMISSIONING	CONSTRUCTION MANAGEMENT/F SERVICES
Sewaren 7 Combined Cycle Project PSEG Power	740	Ongoing (2018)	1 x 1; Combustion Turbine				٠	
Lauderdale Combustion Turbine Project Florida Power & Light Co. (FPL)	1075	Ongoing (2018)	5 x 0; General Electric (GE) 7F.05		•		÷	
Ft. Myers Combustion Turbine Project FPL	430	Ongoing (2018)	2 x 0; General Electric 7F.05					
Ocotillo Modernization Project Arizona Public Service (APS)	530	Ongoing (2018)	5 x 0; General Electric LMS100PA "Plus"					(*)
Kazanskaya CHP Plant 3 GAMA Power Systems, Inc.; Kazan City, Tatarstan, Russia	390	Ongoing (2017)	1 x GE 9H Gas Turbine / Natural Gas	•	•		٠	
North River WWTP Cogeneration and Electrification NYCDEP	10	2015	Dual Fuel (biogas and natural gas)					
Blue Plains AWTP CHP DC Water	25	2015	Combustion Turbine (100% digester gas or up to a 70/30 blend of digester gas to natural gas)	•		•		•
Meridian Cogeneration Plant Husky Energy, Inc.; Lloydminster, Saskatchewan, Canada	220	2015	Natural Gas				÷	
Port Westward Unit 2 Portland General Electric; Clatskanie, Oregon	220	2014	12 x 0; Wärtsilä 18V505G		•		÷	8 4 y
Various Locations in California Coalinga Cogeneration Company / California Partnerships	Various Capacities	2014	Natural Gas	•				
Hamlet Unit 6 North Carolina Electric Membership Corp.	54	2013	1 x 0; FT8 TwinPac	٠			٠	
Spy Hill Peaking Project Northland Power Incorporated; Canada	86	2011	2 x 0; General Electric LM6000		•		•	
Airport Power Plant Black Hills / Colorado Electric Utility Company	181	2011	2 x 0; General Electric LMS100 Gas Turbines			-	٠	

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POWER GENERATION PROJECTS COMPLETED BY THE	CAPACITY	YEAR		ESIGN SERVICES	OCUREMENT	SIGN SERVICES JRING DNSTRUCTION	ONINOISSIMMO	DNSTRUCTION ANAGEMENT/RP RVICES
Greenland Energy Center Units	(MW)	IMPLEMENTED	TECHNOLOGY/FUEL	õ	Ъ	555	ŭ	525
1 and 2 JEA	350	2011	2 x 0; General Electric 7FA			•		-
Rayong, Thailand Glow Energy Public Company Limited	382	2011	Combined Cycle Cogeneration				٠	() .
McIntosh Power Plant PowerSouth	360	2010	2 x 0; Siemens SGT6-5000F					
Clover Bar Energy Centre Capital Power Corperation	200	2010	2 x 0; General Electric LMS100 Gas Turbines					
Michigan State East Lansing, Michigan	99	2010	Cogeneration					
Kahe Unit 3 Hawaiian Electric Company, Inc.	92	2010	100% Crude Palm Oil (first unit of its kind)	•				
Ladysmith Unit 5 Dominion	170	2009	1 x 0; General Electric 7FA				٠	
J.K. Smith Generating Station - Units 9 and 10 East Kentucky Power Cooperative	200	2009	2 x 0; General Electric LMS100 Gas Turbines	•			•	
Emporia Energy Center Westar Energy	665	2009	7 x 0; General Electric LM6000 (4) and 7FA (3)					0.00
Dansby 3 Peaking Plant at Dansby Power Station Bryan Texas Utilities	45	2009	1 x 0; General Electric LM 6000PC-Sprint		•			×
Immingham, United Kingdom SCE	450	2009	Combined Cycle Cogeneration / Natural Gas	ł	•		٠	
Ladysmith Units 3 and 4 Dominion	340	2008	2 x 0; General Electric 7FA	٠			٠	100
Turkey Point 5 FPL	5	2008	Diesel	٠				
Kennedy Generating Station JEA	172	2007	1 x 0; General Electric 7FA				٠	10
Anson and Hamlet North Carolina Electric Membership Corporation	324	2007	6 x 0; Pratt & Whitney FT- 8 TwinPac for Anson 5 x 0; Patt Whitney FT-8 Twin-Pac's for Hamlet site	•			÷	
Combustion Turbine (CT) Removal and Reconstruction Tampa Electric Company	340	2007	2 x 0; General Electric 7FA	•			•	
University of South Carolina Johnson Controls	1.4	2007	Waste Wood Fueled Gasification Cogeneration				٠	
Horizon Oil Sands Project Canadian Natural Resources	100	2007	Combustion Turbine					
Manatee Parrish FPL	5	2007	Diesel					
CNC Module 5 Compania de Nitrogeno Cantarell, S.A. de C.V.	75	2006	1 x 0; General Electric 6FA				٠	1.
Stock Island CT 4 Florida Municipal Power Agency	44	2006	1 x 0; General Electric LM6000PC Sprint					
Shanghai Chemical Industrial Park Cogeneration Company Shanghai, China	1000	2006	Combustion Turbine					
Martin FPL	5	2006	Diesel					

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WATER AND WASTEWATER TREATMENT PLANT ELECTRICAL SYSTEM PROJECTS COMPLETED BY THE BLACK & VEATCH TEAM	DETAILED DESIGN	ELECTRIC SYSTEM SITE INVESTIGATION	POWER SYSTEM CALCULATIONS	ELECTRIC UTIUTY SUPPLY COORDINATION	CONSTRUCTION MANAGEMENT
North River Emergency Response NYCDEP					
North River Electrification and Cogeneration NYCDEP					
Oakwood Beach EO-2022 Electrical Upgrades NYCDEP					
Oakwood Beach Power Distribution Improvements NYCDEP					
Variable Frequency Drive (VFD) Failure Evaluation					
Tallman Island Switch Gear Failure Evaluation NYCDEP					
Wards Island Emergency Generators Constructability Review NYCDEP					
26th Ward Emergency Generators Construction Management Services NYCDEP					
East Side Water Treatment Plant (WTP) Dallas, Texas					1.0
Cedar Creek WWTP Olathe, Kansas					
Cox Creek WWTP Annapolis, Maryland					
Orange County Water District, California			181		
Lake Townsend WTP City of Greensboro, North Carolina					
Mitchell Pump Station City of Greensboro, North Carolina					
SJWD WTP Optimization SJWD Water District – Duncan, South Carolina					
Table Rock/North Saluda WTP Greenville Water System, Greenville, South Carolina					1
Pelham WWTP WCRSA, Greenville, South Carolina			1.		
Northwest WTP Winston Salem Utilities, Winston-Salem, North Carolina					
Lower Reedy WWTP WCRSA, Greenville, South Carolina					
Rocky River Regional WWTP WSACC, Concord, North Carolina					
2400V Switchgear and Motor Controller Replacement - River Intake Pumping Station Kansas City, Missouri	•				
North Mecklenburg WTP CMU, Charlotte, North Carolina					
Northside WWTP Improvements and Expansion City of Kinston, North Carolina					
McDowell & Mallard Creek WWTPs CMU, Charlotte, North Carolina					
Engine Generator Project Bloomington, Indiana					
McCarrons WTP Electrical System Reliability & Optimization PRWS St. Paul, Minnesota					
Electrical Equipment Replacement - Big Blue WWTP Kansas City, Missouri					
2400V Switchgear and Motor Controller Replacement - Cosme WTP City of St. Petersburg, Florida					*
4160V Switchgear and Motor Controller Replacement Johnson County, Kansas					
Standby Power - CAP Water Treatment Plant Mesa, Arizona					
Northwest WWTP Cobb County Water System, Marietta, Georgia					•

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PVSC EXPERIENCE

Since 1981, CDM Smith has provided engineering services to PVSC. CDM Smith has a firm understanding of the PVSC wastewater treatment and collection system through many years of work on PVSC projects. Currently, CDM Smith is working with Greeley and Hansen LLC on preparing an integrated Long-Term Combined Sewer Overflow (CSO) Control Plan for the combined sewer communities of Bayonne, East Newark, Harrison, Jersey City, Kearney, Newark, North Bergen, and Paterson as well as North Bergen (Woodcliff) and Guttenberg permittees pursuant to the final NJPDES permits issued by NJDEP in July 2015. CDM Smith has also provided engineering services to PVSC on many other projects, including the following:

- Long-Term CSO Control Plan (subcontractor to Greeley and Hansen LLC).
- Fast-Track Design and Construction of Sludge Handling Facility.
- Sludge Pipeline Improvements Project.
- Final Design of Parallel Heat Treatment Plant Supernatant Return Line.
- Zimpro Odor Control System Report, Design, and Construction Management.
- Air Quality Services for Sewage Sludge Incinerator.
- Air Permitting Assistance.
- 0&M Training.
- Emergency Disaster Assistance.
- Facility Energy Audit.
- WAS Pumping Station.

OTHER MUNICIPAL/AGENCY EXPERIENCE

With over 11,000 professionals worldwide, Black & Veatch is ranked the 11th largest employee-owned company in the United States. Black & Veatch has been serving municipalities for over 100 years and currently serves over 10,000 clients. Our global project base consists of more than 100 countries on six continents. Black & Veatch is conducting 6,300 active projects globally at any one time.

Regional municipal agency clients include the following (partial list):

- Two Bridges Sewerage Authority.
- New York City DEP.
- Westchester County, New York.
- City of Meriden, Connecticut.
- City of West Haven, Connecticut.

- Suez Environment.
- Boston Water and Sewer Commission.
- City of Danbury, Connecticut.
- Philadelphia Water Department.
- Passaic Valley Water Commission.

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CDM Smith has been instrumental in helping to establish and support regional authorities throughout New Jersey and across the country. It uses its expertise to help authorities better serve the public interest. Since its formation in 1947, CDM Smith has been providing engineering services to the Linden Roselle Sewerage Authority (LRSA). CDM Smith has been awarded authority engineer contracts (general and special) with the Joint Meeting of Union and Essex Counties, the Lambertville Sewerage Authority, and the Joint Meeting of Madison and Chatham, as well as work with the Township of Parsippany-Troy Hills.

EXAMPLE PROJECTS Blue Plains AWTP Combined Heat and Power

Washington, DC.

The Blue Plains AWTP is a 370 mgd facility serving the District of Columbia and surrounding communities. DC Water has recently undertaken a biosolids management program consisting of three main projects: MPT, which consists of pre-dewatering, thermal hydrolysis (Cambi), and anaerobic digestion; CHP, which consists of gas treatment and conditioning, gas turbine power generation, and heat recovery steam generation; and FDP, which consists of final dewatering and disposal. Black & Veatch provided design and construction support services for the CHP project through a Design-Build-Operate Contract with Pepco



3-D Model of Turbine Building Design: Gas Turbines, 1st Floor, Right; Heat Recovery Generators, 2nd Floor, Left

Energy Services, which will operate the facilities for 15 years.

Black & Veatch collaborated with the Cambi process designers, CDM Smith, to coordinate all interfaces with the new anaerobic digester and Cambi thermal hydrolysis process in that all digester gas produced by the digesters will be consumed in the CHP process, and the CHP process will produce all steam necessary for the Cambi thermal hydrolysis process. The CHP facilities include the following:

- Digester Gas Compression Systems. Low-pressure gas blowers to provide medium pressure to duct burners (supplemental steam as necessary). High-pressure gas compressors to provide pressure to the combustion turbines.
- Digester Gas Treatment. First-stage particulate removal through wet scrubbing. Moisture removal and temperature treatment through a series of plant water heat exchangers, chilled water heat exchangers, and reheat heat exchangers. Primary siloxane removal through desiccant media system, and secondary polishing through activated carbon.
- Plant Water Treatment System. Treatment of potable water through reverse osmosis and water softening for boiler makeup water. Cooling water for the heat exchangers and steam dump condenser was supplied by a combination of the existing high-pressure plant service water, a cooling water pumping system utilizing the plant's low-pressure service water, and a potable water backup system.
- Power Generation. Three (plus two future) Solar Mercury 50 gas turbine generators capable of generating 5 MW each on 100 percent digester gas or up to a 70/30 blend of digester gas to natural gas.
- Steam Generation. Primary steam generation through use of combustion turbine waste heat in three (plus two future) HRSGs provided with supplemental energy through digester gas duct burner (as necessary). Backup steam generation through a digester gas/natural gas fired auxiliary boiler.

Project Elements

- Digester Gas Conditioning and Treatment
- Power Generation Gas
- Combustion Turbines
- Heat Recovery through Steam Generator
- Steam Supply to Cambi
- Process
- Design-Build-Operate Contracting

Key Team Members David Modi Mike Shafer Joe Veilleux

Period of Service August 2011 - May 2015 (est)

Client Reference





North River WWTP Cogeneration and Electrification

New York City, New York

The 340 mgd North River WWTP provides wastewater treatment for the west side of Manhattan. New York City DEP selected Black & Veatch to provide engineering and design services to upgrade the facility's CHP system.

Technical Details

The Cogeneration and Electrification Project will provide 10 MW of generating capacity on the site for plant processes. The project was



also undertaken to improve reliability of the plant; reduce operating cost; reduce the plant's greenhouse gas (GHG) emissions; and comply with air permit requirements.

One of the project's key feature is the implementation of five new 3.0 MW dual fuel (biogas and natural gas) IC engine-generators for CHP production. The new generators utilize the energy created by the on-site generated biogas and have the capability to operate solely on utility supplied natural gas. The project also includes electrification of the existing main sewage pumps (MSPs) and blowers by replacing the existing engine prime movers with electric motors. The MSPs will have 1,850 hp, 900 revolutions per minute (rpm) wound-rotor electric motors, and the process air blowers will be 350 hp high-efficiency gearless turbo blowers.

The IC engine-generators are GE Jenbacher, Model 620, which were preselected under a bestvalue solicitation consisting of numerous criteria, without limitation: capital and operating costs, peak load capability, and island mode operation. The IC engine-generators are designed to operate together through an electrical synchronization bus that will parallel with the operation of the utility power feed. This will provide the plant with an "N+1" configuration that can meet the average cogeneration demand of the plant while it is operating at 75 percent load factor.

Electrical improvements are also being made to coordinate the on-site generated 10 MW of power with the existing electrical utility service. Design includes synchronizing the existing four electrical feeds with the cogeneration units within the facility's existing substation, which steps down the 13.2 kV service to 5 kV. New electrical rooms are being furnished to distribute the 5 kV power down to 480V. The electrical distribution design adopts a "no single point" of failure concept, and complete redundancy is provided for critical operation equipment.

The criticality of the project was to maintain facility operation throughout the upgrade without compromising reliability or permit requirements. This was accomplished by executing five advance contracts ahead of the main cogeneration contract to expedite the replacement of critical plant process equipment. Design work also utilized Building Information Management with 3-D modeling linked to the construction schedule for a 4-D presentation.

Project Elements

- Power Generation
- WWTP Upgrade
- Electrical Utility Paralleling.
- Waste to Energy
- Gas Utilization

Black & Veatch Services

Engineering and Design

Key Team Members

Domenick A. Loschiavo, Deputy Project Manager Randy Fiorucci, QA/QC Manager Brian Huska, Mechanical Engineer Mark J. Kleveter, Electrical Engineer Jim McCaw, QA/QC Member Larry Pittman, Mechanical Engineer Nick Salem, Electrical Engineer Earl Tast, Structural Engineer Andrew Truman, Electrical Engineer

Technology

10 MW GE Jenbacher 620 Reciprocating Engine

Schedule June 2013 to July 2016

Client References





Port Westward Unit 2

Clatskanie, Oregon

As JV contractors, Black & Veatch and Harder Mechanical Construction provided turnkey EPC services to Portland General Electric (PGE) for its 220 MW Port Westward Unit 2.

Black & Veatch was responsible for the engineering, procurement, construction management, and startup services.

The flexible capacity power generating station utilizes 12 Wärtsilä natural gas reciprocating engines and provides a versatile source of power at the existing Port Westward site. Its highly efficient and environmentally friendly design helps integrate renewable resources such as wind and solar into the system.

The project comes at a time of increased customer demand and anticipated future power needs. Port Westward Unit 2 provides increased power reliability as a peaking resource during times of high demand and is able to react to power output changes from the renewable energy facilities, as well as provide dynamic load following service.

At construction peak, more than 400 workers were on-site, with about 1,000 total professionals contributing in some capacity over the 18 month project. This power plant was designed to meet the real-time variations that occur in customers' electricity usage and began commercial operation on December 30, 2014.

"With the growing amount of variable renewable power coming on line, a flexible resource like Port Westward Unit 2 is an essential component in helping us continue to provide reliable service to our customers in an increasingly complex environment."

JIM PIRO, PGE'S PRESIDENT AND CEO

Project Elements

Engineering

- Procurement
 Construction
- Construction Management
- Startup Services

Schedule

Feb. 2013 - Dec. 2014

- Technology
- 220 MW
- Wärtsilä 18V50SG
- reciprocating engines
- Significant Aspects Flexible capacity power generation
- Reciprocating engines Completed ahead of
- schedule

Client Reference



Emporia Energy Center Emporia, Kansas



Westar Energy selected Black & Veatch to provide EPC services through Overland Contracting Inc. (OCI), a wholly owned subsidiary of Black & Veatch, for the construction of a 665 MW power project to meet growing customer electricity demand in Kansas.

According to Westar Energy's Vice President and Generation Construction Manager, Greg Greenwood, "We have partnered with Black & Veatch to build high quality, cost-effective generation in the past with great success. We continued that legacy of success with this exciting project near Emporia."

Black & Veatch provided EPC services for

Westar's Emporia Energy Center, which is located 6 miles northeast of Emporia, Kansas. The 665 MW natural gas fired peaking plant will help meet the increasing electric demand of Westar's 669,000 customers in Kansas.

"We were pleased to have had the opportunity to participate in a project that will provide reliable and cost-effective energy supplies for Westar's customers for years to come," said Dan Schmidt, Black & Veatch Project Director. "The project was designed and constructed to provide highly efficient, state-of-the-art electricity production for the benefit of Westar's growing customer demand."

Phase I of the Emporia Energy Center had an initial capacity of 330 MW and became operational in May and June 2008. The second 335 MW addition was installed and began operation March 2009, 2 months ahead of schedule. The capacity installed in 2008 included four GE LM6000 combustion turbines and the first GE 7FA combustion turbine. The capacity installed for 2009 was the second and third GE 7FA combustion turbines.

The project also included a 345 kV switchyard, which is a five-bay conventional breaker and one-half, air-insulated arrangement. The switchyard connects the generating unit power blocks, each through a dedicated generator transformer, to Westar's 345 kV transmission system. The switchyard was provided by Black & Veatch through OCI as part of its EPC services for this project.

Black & Veatch Role

- Engineering
- Procurement
- Construction
- Construction Management

Technology

- **Configuration: Simple** Cycle, four GE LM6000s and three GE 7FA turbines
- Total Output: 665 MW
- 345 kV air-insulated
- switchyard
- Project completed in two phases

Key Team Members David Modi

S. Jeffrey Austin

Period of Services Notice to Proceed: February 2007 Commercial Operation: Initial Capacity: May 2008 Second Addition: March 2009

Significant Aspects

Honorable Mention for Power Engineering 2009 Projects of the Year Awards

Client Reference





Ocotillo Modernization Project

Tempe, Arizona

In June 2015, Black & Veatch was selected by Arizona Public Service (APS) to perform EPC services for the Ocotillo Modernization Project. The project, located in Tempe, Arizona, is on a 125 acre brownfield site adjacent to the Arizona State University (ASU) campus and surrounded by residential and commercial buildings and the ASU golf course.

The Ocotillo Modernization Project includes installation of five GE LMS100PA "Plus" natural gas turbines in simple cycle arrangement. The new turbines will provide the new facility's output of 530 MW.

Black & Veatch will execute the project via its wholly owned open shop construction subsidiary, OCI. The project is scheduled for completion in August 2018.

Major components of Black & Veatch's scope of work include the following:

- Five GE LMS100PA "Plus" gas turbines equipped with high temperature intercoolers.
- Five nominal 2,600 ton mechanical refrigeration gas turbine air inlet chilling systems.
- Five emission control modules (including nitrogen oxides [NO_x] and carbon monoxide (CO) catalysts).
- Three fuel gas compressors.
- Electrical distribution system instrumentation and controls.
- Project cooling system, including a cooling tower and air-cooled heat exchangers.
- New control building, new water treatment buildings and new operations storage building.
- All equipment and electrical gear, up to and including generator step-up unit (GSU) transformers.
- Generation interconnections and terminations at the high-side of the GSU transformer.

Given the project's proximity to the ASU campus and greater Tempe community, Black & Veatch is taking steps to ensure that the project makes a positive local impact.

Black & Veatch Role

- Engineering
- Construction

Schedule

Contract Signing: June 30, 2015 Completion: November 2018

Technology

General Electric LMS100PA "Plus" natural gas turbines 5 X 0 configuration

Significant Aspects 530 MW of new generation Black & Veatch Contact





Airport Power Plant

Pueblo, Colorado

In 2009, Black Hills/Colorado Electric Utility Company selected Black & Veatch to provide engineering and procurement support services for the Black Hills Airport Power Plant, a nominal 181 MW gross simple cycle power plant in Pueblo, Colorado.

The plant utilizes two GE Model LMS100PA combustion turbine generators equipped to burn natural gas, and an inlet air chiller system is provided to maintain output at higher ambient temperatures. Water injection and a post-combustion SCR system are utilized for NO_x reduction, and an oxidation catalyst system is utilized for CO reduction.

Process and potable drinking water are supplied by the city of Pueblo Water District treated water system. An on-site wastewater treatment system and evaporation pond are utilized for wastewater disposal.

Common mechanical and electrical systems were sized and configured to support the two simple cycle GE LMS100 units, as well as two combined cycle generating blocks, each consisting of two GE LM6000 combustion turbines and a single steam turbine. Black & Veatch provided all coordination for the common system interfaces.

The project also included an 115 kV air-insulated switchyard with a five-bay conventional breaker and one-half arrangement. The switchyard connects all the generating unit power blocks, each through a dedicated generator transformer, to the 115 kV transmission system.

The Airport Power Plant, completed in 2011, provides utility clean energy to more than 93,000 customers in the Pueblo, Cañon City, and Rocky Ford area communities in southeastern Colorado.



Black & Veatch Role

Engineering
 Procurement Support

Schedule

Project initiation: September 2009 Commercial Operation: June 2011

Technology

- 2 x 0 GE LMS100PA combustion turbines
- 115 kV air-insulated switchyard

Significant Aspects

First GE LMS100 to use inlet air chillers 90% recovery of wastewater reducing raw water consumption

Key Team Members

David Modi S. Jeffrey Austin Cameron Bryant Kathryn Robinson

Client Reference



PSEG Power

Sewaren 7 Combined Cycle Project

Black & Veatch has been selected to perform engineering, procurement, and construction management services for PSEG Power's Sewaren 7 Combined Cycle Plant, a 740 MW 1 x 1 dual fuel combined cycle plant. The combustion turbine is a GE 7HA.02. The plant will run primarily on clean, efficient natural gas but can also run on ultra-low sulfur distillate fuel oil as a backup fuel.

Construction will begin in early 2016 at PSEG's existing generating station in Sewaren, New Jersey.

Client Goals/Drivers

With more gas generation being developed in the northeast, fuel security and reliability has been a major focus in the PJM Interconnection LLC (PJM) market capacity planning. The new natural gas turbine project is being developed to provide power to the PJM market starting in the summer of 2018.

Black & Veatch Role on Project

Black & Veatch will provide all engineering services and procurement of plant equipment and manage all construction activities.

GE has a contract to provide the following power island equipment:

- Combustion Turbine.
- Steam Turbine.
- HRSG.
- Distributed Control System (DCS).
- Continuous Emissions Monitoring System (CEMS).
- Isophase Bus.
- Steam Bypass Valves.

Innovation

The \$600 million facility will feature GE's high-

H-Class combustion turbines and deliver greater resilience and flexibility through dual fuel capability. Dual fuel capability allows the plant operator to generate power using low sulfur fuel in the event of a gas supply disruption.

Sewaren 7 will meet all applicable federal and state emissions regulations. The new plant will be equipped with state-of-the-art emissions control technology, including the following:

- A combination of low NO_X combustors and an SCR system to reduce NO_X emissions.
- An oxidation catalyst to reduce CO emissions.
- An air-cooled condenser to continuously recycle water for cooling purposes and minimize the need for cooling water.

Black & Veatch Role

- Engineering
- Procurement
- Construction Management
- Commissioning and
- Startup

Project Elements

- Combustion Turbine / Combined Cycle Plants
- 740 MW
- 1 x 1 Configuration
- General Electric

Schedule

Start Date: September 3, 2015

End Date: May 31, 2018

Key Team Members

Sai Peyyeti

Black & Veatch Contact

Project Approach/Schedule

This section describes our complete understanding of the technical issues related to this project, provides our innovative ideas that will ensure successful completion of the work, and details our proposed method for delivering a high quality project that is on schedule and 0within budget. We have identified key project challenges and specifically tailored our approach to ensure that each of those challenges is met effectively. Our team fully understands the project goals and the complexities of incorporating combustion turbine technology within a wastewater treatment environment and will use our expertise to efficiently deliver the design and implementation of this critical standby power plant project.

PROJECT UNDERSTANDING

Superstorm Sandy wreaked devastation throughout New Jersey, including in the PVSC service area. In particular, it created major flooding that incapacitated the PVSC WWTP for several weeks. In response, PVSC is undertaking a multifaceted program to protect t0he facility against major flooding events up to a 500 year storm. This project will provide a standby power system that will allow the facility to maintain full operation for any event that disrupts the utility power supply to the site.

The BODR prepared by the Program Management JV established the necessary facilities and design criteria for the project, including three combustion turbines to produce a minimum of 34 MW. It also provided a preliminary general arrangement and site layout. The Black & Veatch/CDM Smith team reviewed the BODR thoroughly and believes it provides a robust plan to ensure that power remains available to operate the facility in the 500 year storm and other events that would interrupt the utility power supply.

The Black & Veatch team understands that the new standby generation facility shall interconnect with the WWTP's existing electrical distribution system at the 13.8 kV Substation 1 breakers AA9 and AB9. Under a separate electrical contract to be issued by PVSC, the existing feeders connected to breakers AA9 and AB9 will be relocated to new storm water pumping stations switchgear, freeing up these breakers to act as the point of connection to the new standby generation facility. In addition, all existing breakers in Substation 1 will be upgraded to 1,000 MVA class breakers under this separate electrical contract in advance of the standby generation facility coming online, to make the Substation 1 switchgear suitable to PSE&G for it to accommodate the standby generation facility connection. By connecting the new standby generation facility to both the A and B sides of the existing Substation 1 switchgear, PVSC will be provided with a more flexible and reliable solution to accommodate their standby power needs.

Our team has identified a number of critical challenges that must be effectively addressed to ensure a successful project, including the following:

- Accelerated implementation schedule; the sooner the standby power plant is operational, the sooner the plant is protected from a future power outage.
- Early selection of the combustion turbine equipment so that design efforts can be focused on the specific needs of ancillary equipment required for these turbines.
- Building upon previous air permitting activities to obtain the necessary air permits in a timely manner.
- Initiating permit applications and pre-meetings for new permits early in the design process.
 - Consider a separate site preparation contract to remove underground obstacles and provide a detailed location of any existing piles or structures that will remain in place, allowing the design team to resolve any potential conflicts before the new piles are installed. A separate site preparation contract would also provide early installation of the retaining wall for protection of the existing bridge.
- A formal constructability review from construction professionals experienced in construction of similar power generation facilities to identify strategies to construct facilities on the proposed site, which is not only small but is also constrained on all sides.
- A construction and implementation plan to maintain plant operations.
- A traffic plan to allow uninterrupted access for biosolids trucks to the sludge unloading facility.

TECHNICAL APPROACH

Our technical approach was developed to address the key project challenges early in the project so that detailed design and construction of the standby power plant may proceed efficiently and with minimal risk of delay or unforeseen conditions. Three parallel activities will be completed in the early phases of the project. The design phase will start with the validation of the design concept in accordance with Task 1.1 of the RFQ/RFP. After validation, three parallel activities will be conducted: development of procurement specifications and bidding



documents to allow the early procurement of the combustion turbines, detailed geotechnical investigations leading to the development of site preparation contract documents to address the underground obstructions, and the development of the Preliminary Engineering Report. Early selection and procurement of the turbines will define the design requirements of the auxiliary facilities and allow a streamlined design and procurement process. The site preparation contract will identify and quantify the underground obstructions removed to provide a clean site for the main construction contract. The benefit to this approach (as illustrated in our project schedule) can save up to 6 months in the overall project schedule, providing a reliable source of standby power much sooner than would be possible in a single construction contract approach. Each phase of our approach is further defined in the following sections.



Concept Validation

The BODR defines the project including the number and size of the combustion turbines, the site location, and the size of the building. In accordance with the RFQ/RFP, these items are not subject to change. Our initial review indicates that the combustion turbines identified will provide adequate standby power capabilities, and the selected site and building square footage are adequate to house the facilities. During the concept validation phase, we will review the background data of the BODR to understand in detail the project drivers that led to these decisions to allow us to build upon the current concept. Any identified deficiencies or improvements will be documented in a Supplemental Basis of Design Report.

Our initial goal will be to confirm the electrical generation capacity needed to supply power to the entire WWTP, with particular attention to starting



Solar Mercury 50 combustion turbine generators were procured and shipped to the site before buildings were at the Blue Plains AWTP.

the large motors throughout the facility. This is the most important item to allow the early development of the procurement specifications, which will drive the remaining elements of the design, including the design and selection of gas compressors, emissions control equipment, and the blackstart generators.

Combustion Turbine Procurement

The BODR identified three acceptable combustion turbines, which are to be procured in a separate bid package. Although similar, each of these turbines has unique design requirements that will impact the balance of the facilities. Our approach expedites the selection of the combustion turbine to facilitate the design of the balance of the plant.

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Through our extensive experience with all three of the targeted combustion turbine suppliers and specific machines, Black & Veatch understands the differentiators between the turbines. Since each of these manufacturers are constantly looking to improve its design, Black & Veatch will tailor the technical specifications and bid submittal requirements to ensure the evaluation is thorough and is based upon current and accurate information. The technical specifications will include key required design parameters such as power generation capacity at a range of ambient conditions and loads, maximum gas utilization, load change capabilities, minimum required efficiency, maintenance intervals/durations, potential future suitability for cogeneration application, and emissions performance requirements to be achieved with the SCR system and oxidation catalyst technologies. The specifications will also describe the required accessory features such as intake and exhaust hoods, enclosures, fire protection systems, lube oil coolers, turbine wash water systems, and controls requirements.

Evaluation factors will be applied to procurement bids to ensure that the bids are evaluated consistently and that PVSC selects the most cost-effective units after considering all the key factors affecting the project. For instance, the required gas pressure differs by as much as 125 pounds per square inch (psi) among the three prospective combustion turbines; gas pressure will have a significant impact on the compressor and blackstart generator sizing. The cost impacts of these differences will be included in the evaluated bid. Other factors such as efficiency, emissions, and maintenance cost will also be included. In addition, the bidders will be required to submit technical data for further evaluation of the bids; data might include process and instrumentation diagrams (P&IDs) showing all required interconnections, dimensional drawings, fuel gas curves, potential future flexibility to burn low-Btu fuel, and electrical interface requirements. These data will allow a detailed technical review of each unit. Performance guarantees for power production, efficiency, and emissions will also be submitted with the bids. The bid form will be set up to permit the varying data from each manufacturer to be normalized so that each bid can be easily compared to the others. The benefit to this approach will be that PVSC may make a best value selection without any ambiguity or potential for bid protest.

Combustion Turbine Procurement Impact on Schedule and Balance-of-Plant Design

Whenever an owner directly purchases equipment, the risks associated with delivery and performance of that equipment must be closely managed. Combustion turbines of this size can take over a year for fabrication and delivery, which has a major impact on the construction schedule. Delivering the units at the right time in the construction sequence is paramount. Deliveries too early in construction require storage of the units, and space is very limited on the site. Delays in delivery can impact the building erection and, potentially, the startup and commissioning phase of the project. Standard EJCDC (Engineers Joint Contract Document Committee) procurement documents allow for the assignment of these risks to the general construction contractor. Black & Veatch has been directly involved in the procurement of combustion turbine generators on over 600 turbine installations with a total generating capacity of 115,000 MW, and have effectively guided many of our clients through assignment of contracts and/or risks from the owner to the general contractor. Our team is uniquely qualified to assist PVSC in understanding the risks associated with the procurement, and will work with you to find the most effective means to mitigate that risk.

In addition to the combustion turbine generators, several other pieces of equipment will have long lead times. The proposed 2,500 kW gas fired blackstart generator will be another item that could require a year for fabrication. Black & Veatch is currently assisting the New York City DEP to procure a 2,500 kW gas fired generator for its North River WWTP; fabrication, testing, witness testing, and delivery is expected to be 11 months. Therefore, we need to also consider early, direct procurement of the blackstart generators. The delivery times for gas compressors, emissions control equipment, and electrical gear will also be evaluated early in the project to determine whether direct procurement will facilitate the construction schedule.

Permitting

Our team's proactive permitting approach on construction projects includes three key elements: a full understanding of the necessary permits, preparation of complete and thorough permit application submittals to expedite agency reviews, and excellent working relationships with agency review staff. These three elements enable our team to meet the goal of on-time delivery of the necessary permits and approvals so that projects may proceed to the construction phase.

Our team understands that timely and successful permitting of PVSC's on-site standby power system is paramount to staying ahead of or on the desired overall program schedule. Our scope of work includes project permitting services to obtain those permits or approvals for the on-site standby power system that PVSC has not already obtained.

Our team will be responsible for assisting PVSC with obtaining the outstanding permits and approvals that will be necessary to construct the proposed on-site standby power system. The following table lists the remaining permitting and outside agency reviews that our team anticipates.

PERMIT NAME	REGULATORY AGENCY	NOTE
Plan Review	City of Newark	In accordance with BODR
Certificate of Occupancy	City of Newark	In accordance with BODR for office spaces; to be obtained when construction is nearly complete
Fire Safety Plan, Fire Detection Permit, Fire Protection	City of Newark, Fire Department	In accordance with BODR
Essex Regional Health	Essex County	Registration of new air emissions sources
FAA No Hazard to Air Navigation	Federal Aviation Administration (FAA)	In accordance with BODR
Air Permit Title V	NJDEP – Air Quality Permit Program (AQPP)	In accordance with BODR
Electrical Generating Station Construction Review	New Jersey Department of Community Affairs (NJDCA)	Requires review of all electrical generating stations or substations
State Comptroller Review	NJ Comptroller office	Requires pre-advertisement notice (<\$10M); post-award notice (<\$2M); perform pre-notice before NJDEP Authorization to Advertise project; link http://www.nj.gov/comptroller/compliance/index.html

On behalf of PVSC, and with PVSC's concurrence, our team can act as the primary contact with regulatory agencies for this project. We have performed this role for many of our clients on a wide variety of design and design-build projects located throughout New Jersey. We will assist PVSC in addressing the remaining regulatory requirements of the federal, state, and local agencies, with the following subtasks:

- Discussing past regulatory requirements and work known by PVSC staff to be applicable to this project.
- Meeting early in the design process with PVSC and the regulators to understand regulatory requirements.
- Attending PVSC meetings and teleconferences with regulators.
- Assisting PVSC in addressing regulatory requirements by providing calculations and construction drawings and/or by providing analysis and data in applications required by the regulatory agency.
- Preparing regulatory documentation and permit applications for PVSC signature and application fee payment, with the goal of obtaining the outstanding permits or approvals needed for this project in accordance with the project schedule.

In accordance with regulatory requirements, our team will assist PVSC with modifying its Title V Air Operating Permit to include the equipment and air emissions control devices proposed by the standby power plant project before construction commences. The following tasks will be performed:

- Calculations of emissions for criteria and hazardous air pollutants and updating of the emissions inventory for the entire facility.
- State-of-the-art analysis for any pollutant over the regulatory threshold limit.
- Emissions netting analysis and evaluation of whether emissions reduction credits can be taken after decommissioning the existing emergency generators.
- A screening level health risk assessment and evaluation of optimum stack height.
- Preparation of a permit compliance plan.
- Preparation of the air operating permit modification application using NJDEP's RADIUS computer software.
- On the basis of the results of the screening level health risk assessment (if NJDEP determines that an air dispersion model is required) development of an AERMOD dispersion model, analysis of results, and preparation of a report (PVSC has set an allowance for this effort, if required by NJDEP).
- Assistance in the review of pre-draft and draft permits, negotiating with NJDEP the facility-specific permit requirements, and securing preconstruction approval as well as final Title V permit approval.

TITLE V AIR PERMITTING KNOWLEDGE IS KEY TO MEETING SCHEDULE

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Our team includes nationally recognized experts in Title V operating permit assistance, ensuring state-of-the-art knowledge and experience. We have established strong working relationships with the NJDEP and a record of permitting successes on Title V projects throughout New Jersey. On the basis of our team's review of PVSC's RFQ/RFP, BODR, the National Environmental Policy Act (NEPA) Environmental Assessment (EA), NJDEP's October 2013 Federal Consistency Determination, September 2014 permit application to NJDEP Division of Land Use Regulation, and NJDEP's Data Miner, it was determined that the following permits or permit modifications will not be necessary; further explanation follows.

PERMITINAME	REGULATORY AGENCY	NOTE
Land use permits to include wetlands, flood hazard area, waterfront development (modification)	NJDEP – Division of Land Use Regulation (DLUR)	PVSC submitted application on September, 2014; DLUR permit issued December 2014 for the construction of a floodwall and an on- site standby power system at the PVSC WWTP. Modifications to this approval are currently not anticipated.
FEMA NEPA EA, FONSI (modification)	FEMA	FONSI issued July 31, 2014. Modifications to this approval are currently not anticipated.
Federal Consistency Determination (modification)	NJDEP – DLUR	The project Federal Consistency Determination was approved by NJDEP on October 22, 2013. Modifications to this approval are currently not anticipated.
Stormwater Permit/SWPP	NJDEP - DLUR	To be addressed sitewide under a separate contract, as noted in BODR/site walk meeting.

However, as the project design is further developed, if additional permits or permit modifications are needed, our team will inform PVSC.

Preliminary Engineering Report and 30 Percent Design

After selection of the combustion turbine generator, we will focus on confirming the required design criteria for the balance of the facilities. The fuel gas curves supplied in the procurement bids will define the required gas flows and pressures required from the gas compressors. The resulting horsepower requirement will dictate the sizing of the blackstart generators. Preliminary design will also be developed for the SCR and oxidation catalysts, ammonia feed system, electrical interconnections, grounding, and compressed air requirements. The building size and layout will also be confirmed in this phase of the project according to the footprint of the selected combustion turbines.

This preliminary engineering phase will include any alternatives evaluations for the project. The conceptual design presented in the BODR provides a solid plan to move forward, but the following evaluations may provide additional benefits to PVSC:

The conceptual design provides one duty and one standby gas compressor, each with a motor horsepower of 1,550 hp. Using two duty compressors plus one spare would reduce the horsepower to 800 hp. That reduction in horsepower would allow the blackstart generator to be reduced from the proposed 2,500 kW to 1,250 kW. Since only one of the compressors would need to be started in blackstart mode, only one duty and one standby blackstart generator would be required. Preliminary discussions with Caterpillar suggest that the smaller blackstart generators could save as much as \$1,000,000 each. In addition, the original EA included 1,250 kW diesel generators, but the units were changed to gas fired units when the capacity was increased. Converting back to a diesel driven unit could save as much as \$300,000 per unit. These savings are greater than the additional cost of the third compressor. One of the construction challenges facing the project is the presence of abandoned sedimentation basins,



Figure 4: HRSG installed on the mezzanine level with administrative and electrical rooms below at the Blue Plains AWTP Turbine Building.

which complicate the foundation designs and increase risks of construction delays and change orders. The conceptual design shows that the primary interference is under the electrical room. Locating the electrical room above the administrative offices would eliminate that portion of the conflict with the abandoned basins, significantly reducing the complexity and cost of the foundation design as well as reducing the risk of construction impacts. Another approach to reducing the conflict would be to install the emissions control equipment on a mezzanine level and locate the administrative areas, electrical room, and blackstart generators underneath the mezzanine. This arrangement would provide the same usable square footage in a smaller foot print on the site and further reduce the risks of conflicts with the underground structures.



In addition to the abandoned sedimentation basins, the old flow conduits are also shown under the proposed location of the turbines, approximately 25 feet below grade. The combustion turbines require a robust foundation to counteract the rotational forces. To eliminate this direct conflict with the critical turbine foundations, we can mirror the proposed layout, which would locate those foundations in what appears to be an open area of the site. The foundation of the SCR equipment is less critical, and it may be possible to design this portion of the foundation to bridge over those abandoned conduits. That would save demolition cost and maintain the conduits for potential future use as a piping tunnel.

The Preliminary Engineering Report will include calculations for all key process parameters including natural gas pressure, compressor horsepower, blackstart generator capacity, and emissions control equipment to lock in these design elements. P&IDs will be developed for each unit process, along with control descriptions.

Drawings in the 30 percent submittal will include the following:

- A site plan showing the proposed facilities and the existing site features and constraints.
- General arrangement drawings showing the building layout, equipment locations, and major piping systems.
- An electrical power functional diagram.
- A network block diagram and DCS system upgrades.

The 30 percent design phase is the optimum time to solicit

schedule and budget. It is appropriate to have an independent third-party value engineering review as required by the RFQ/RFP,

independent feedback on the design. It is early enough in the design phase to be able to adjust course with minimal impact to the design

In addition, we are proposing a formal constructability review be conducted

at the 30 percent design stage. As a design-build contractor working in both

the power generation and wastewater treatment industries, we have many

documents are coordinated and ready for bid, and potential change orders and claims have been identified and mitigated. Construction personnel will

construction professionals on staff who are familiar with all of the

professionals know the importance of developing a plan in which

construction challenges facing your standby power plant project. Our

Independent Reviews

and our design team will participate.



DESIGN FOR FLEXIBILITY

needs of the WWTP.

While reviewing the options for

Black & Veatch will ensure that adequate space remains to allow for

alternative building arrangements,

flexibility to add heat recovery and

other systems to supply the future

ility reviews typically reduce change orders by 50%.

QUALITY DESIGN DOCUMENTS Advanced contract NR-46 as part of the New York City DEP North River WWTP cogeneration and electrification project received nine bids with a spread of less than 5 percent for the three lowest bids, and an average of only 2 percent greater than Black & Veatch's construction cost estimate of \$20M.

visit the site to gain a better understanding of the constraints that will impact foundations, construction crane placement, laydown, and storage. Minimizing the impacts to the surrounding roads and unloading facility will be key to achieving a successful project installation. The team will review the drawings, specifications, estimate, and schedule and provide input on all aspects of the project that relate to constructability, bidability, permitting, site conditions, and coordination with and among agencies, utilities, and stakeholders. When constructor-oriented input is incorporated into contract documents, the result is a clear, biddable, buildable project.

Detailed Design

Following the value engineering and constructability reviews, the design scope will be set, and we will proceed into detailed design. Two parallel design paths will be taken. The first includes a site preparation contract that will remove all necessary obstructions and prepare the site for the standby power plant construction contract. The site preparation contract design will be a short duration design effort that will allow construction to begin on-site much sconer than it would with a single construction contract will benefit from the removal of many of the underground conflicts; precise locations of any remaining structures will be known before that contract starts.

The detailed design of the standby power plant will progress at a good pace, allowing for ample review time and PVSC and Program



Sen York City Department of Eavingumentel Protection Contractor Request for Qualifications (NIQ) Contract NR.31: Cogeneration & Electrofication

1 INTRODUCTION

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The Green Taris Grey Department of Europeranetic Protocols (* 2017) in a solving quadrature form constrained Protocol workship approximated barrel from (* Protocol Marcon form) approximation of an advery size in a support of addition (* 2017) in a solving quadrature Comparison & Electricitations for Project (* 2016) provided for the solving of approximated for an addition of the provided for the solution of the solving of approximation (* 2016) for the solving solving the solving of approximation (* 10 meV) and the solution of the solution of the solution of the solving of approximation (* 2016) for the form of the solution of the solution of the solving of approximation (* 2016) for the form of the solution of the solution of a solving of the Protocol solution of the solutio

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North River WWTP Cogeneration & Electrification Contractor Pregualification RFQ

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Management JV input into the design process. It will include 60 percent and 90 percent review submittals as well as monthly design progress meetings.

Contractor Prequalification

Contractors will be prequalified for the work associated with the main construction contract. The qualification list will be finalized approximately 1 year before construction Notice to Proceed (NTP) to coordinate with the design and equipment prepurchase. Our team has direct experience prequalifying contractors in the New Jersey-New York metro area; our proposed Project Manager, Domenick Loschiavo, was the primary author and the contractor qualification process for the North River Cogeneration and Electrification project. We envision the contractor Request for Qualifications, at a minimum, to include the following:

- Technical Qualifications and Experience: Contractors will demonstrate qualifications by providing descriptions and owner references for three projects similar in nature, scope, and cost. The referenced projects shall be either completed within the last 7 years or may be ongoing projects that are more than 50 percent complete.
- Firm's Team Qualifications: Contractors must have an organizational structure that evidences the capacity to manage and implement the contract. An organizational chart of the project team, including major subcontractors, should be included.
- References: The decision on prequalification will include a review of references provided by the contractor.
- Environmental Health and Safety: Worker's compensation experience modification rate accident and illness statistics, regulatory violations, resources, and program elements as these relate to the project should be included.
- Quality Assurance and Quality Control: The contractor must demonstrate a culture of quality in the delivery of projects similar in scope and size to the standby power project. To demonstrate this commitment to quality, the Quality Control Manual from at least one of the three reference projects should be provided.
- Financial and Contract Capability: The contractor's financial statements should be obtained and certification obtained from a bonding agency to issue bonding as security for contractor's performance under the standby power project for a construction value of \$110,000,000.

BIM Design

We have successfully delivered design and construction of power plant projects using BIM. Our BIM work facilitates effective general arrangement reviews with the project stakeholders by walking through the "model." This allows a collaborative dialogue between operations and engineering, forcing topics otherwise overlooked to be addressed, for example, equipment maintenance, access, and health and safety/Occupational Safety and Health (OSHA) items. Additionally, BIM permits better constructability review and cost estimating, as the constraints and ease of the work can be visualized.



NEW YORK CITY | NYCDEP North River WWTP – Used 3-D laser scanning with BIM+ to provide as-built information to aid contractors in restoring the facility to pre-fire conditions.

BIM is our standard platform, and our team has extensive project experience executing AutoCAD software as required by Subtask 3.1.2 of the RFQ/RFP. For each of our projects, we utilize Navisworks to showcase the project and perform design reviews. To showcase our BIM capabilities for PVSC on this project, renderings of the new standby power plant facility are included on the following page.



IRVINE RANCH, CALIFORNIA | Biosolids and Energy Recovery Facility – Design in 3-D CADD with Navisworks "virtual walkthrough" views used to convey design concepts.



SANTIAGO, CHILE | 50 mgd Desalination Plant – Using intelligent 3-D model information for quantities and estimating, integrated scheduling, and deliverables.

BLACK & VEATCH | Project Approach/Schedule




Figure 1: Combustion Turbine Building for Configuration per the BODR.



Figure 2: Combustion Turbine Building View from Doremus Avenue.



Figure 3: Combustion Turbine Building View from the intersection of Doremus Avenue and Wilson Avenue.





Site Design

Geotechnical Technical Approach

The project site is partially underlain by abandoned buried structures and conduits that will obstruct new foundations. In addition, the underlying soil is not suitable for supporting shallow foundations. According to available drawings, the abandoned sedimentation basin is supported on timber piles constructed in the early 1900s. Given the age of the existing piles, they will not be suitable for incorporation into the new structures, and removing the piles is not practical. Therefore, the new structures will be designed with deep pile foundations that must be designed to avoid conflict with the existing piles.

The extent of the demolition of the concrete structures must be closely coordinated with the new foundations as well. Deeper portions of those structures may be abandoned in place if there is no impact on the new foundations. In addition to the sedimentation basins, four, 66 inch circular conduits and an 8'-6" by 11'-0" intake conduit and bypass also underlie the site. Since the conduits are as much as 25 feet deep, it is possible to abandon these in place. The proposed layout in the BODR shows the combustion turbine foundations directly above these conduits. If we can adjust the layout so that the critical turbine foundations are not impacted, the foundation for the remainder of the building can be designed to bridge over the conduits, saving significant demolition costs and maintaining the open conduits for routing of future utilities to/from the site east of Doremus Avenue. If bridging the conduits is not cost-effective, an alternative will be evaluated to determine whether the foundation elements could be installed through the conduits.



The site for the new standby power plant has a number of geotechnical design challenges, including buried structures that will obstruct new foundations. To supplement the geotechnical data presented in the BODR and to clearly identify the limits of the abandoned structures, a subsurface investigation will be performed early in the design stage.

To supplement the geotechnical data presented in the BODR and to clearly identify the limits of the abandoned structures, a subsurface investigation will be performed early in the design stage. Approximately four borings will be drilled in accordance with American Society of Testing and Materials (ASTM) D1586 and advanced to bedrock to identify subsurface conditions in areas not covered by the 1974 investigation. Soil and bedrock samples will be collected for physical testing. Soil samples will be tested for select contaminants. In addition to the test boring program, additional test pitting with a large excavator and/or probing/coring with a drill rig is proposed to further assist with defining the limits and depth of the abandoned structures so that foundations for the new structure can be located to minimize conflicts. A geotechnical report will be prepared that will include all relevant information collected from the field and laboratory testing program and will provide detailed foundation recommendations.

High capacity piles driven to bedrock is anticipated to be the most cost-effective pile foundation option for the project, with the understanding that vibrations during pile driving may need to be abated.

So that the new structure can fit into the proposed site, a retaining wall will be required to protect the existing approach embankment at the south side of the site. The proposed retaining wall is directly over the abandoned sedimentation basin. Using a top-down construction method, a soldier pile and lagging wall would be a cost-effective solution. It is anticipated that the soldier piles will be drilled and socketed through the slab and into the ground.

With a clear understanding of the footprint of the slab as established in the subsurface investigation, the new facilities can be oriented to avoid the footprint as much as possible. Discrete pile caps would be used to support the turbines, which will be laid out away from the existing slabs. A pile grid would be used to support the remainder of the structure. This will avoid any pile redesign for the pile caps under the turbines. Once the limits and thicknesses of the existing foundations are established, a site preparation contract will be implemented to remove the existing slab interfering with the proposed work, locate the existing timber piles, locate preliminary pile locations, and install the retaining wall.

Active structures encompass the proposed site and will need to be protected during construction. Wilson Avenue borders the north of the site; Doremus Avenue and a railroad spur border the east. An underground



sludge facility borders the west; a road runs along the south and overflys Doremus Avenue. A monitoring program will be implemented to monitor vibrations, deformations, and settlement; a contingency plan will be implemented if acceptable levels are exceeded.

Site Remediation

According to a review of the PS&S's September 6, 2013, Coastal Zone Management Compliance Statement submitted to NJDEP in connection with the floodwall and standby power system Federal Consistency request, no known discharges have been identified for the standby power system project area. With respect to the presence of historic fill, our team assumes that (according to the information provided in Item 16 of Clarification 1 to the RFQ/RFP, which states that no soil or groundwater sampling should be required for the standby power system project) a deed notice and Classification Exception Area (CEA) covering the site historic fill is already in place and that this fill material has been characterized by previous soil/groundwater laboratory analyses.

Site Layout and Materials

The BODR identified two potential locations for the standby power plant, both adjacent to Doremus Avenue. One potential location is on the western portion of the site and adjacent to the trucked-in waste facility. The other is on the eastern portion next to the effluent control chamber. Regardless of the location, both have buried historical structures that will need to be addressed during the design and construction of the power plant. The preferred location identified in the BODR is on the western portion of the site because of its proximity to the existing plant substation, availability of undeveloped space, and fewer underground structures than the eastern proposed location.

Even with this location, challenges remain with siting the facilities without impacting the trucked-in waste traffic, bridge supports, and the proposed floodwall. These challenges, along with the presence of the abandoned sedimentation basins, will make siting the facilities critical.

Our team proposes that a separate site preparation contract be incorporated into the project plan to mitigate the risks associated with underground conflicts and to expedite the construction of the project.

We have assumed that the survey prepared by Boswell Engineering, dated April 13, 2015, will be used as the basis for all site plans. It will be updated to include additional spot elevations and any existing utilities that are currently not shown.

Day-to-day access to the standby power plant will be from Rutherford Street within the treatment facility. Several parking spaces will be provided adjacent to the building. The location and sequencing of the construction will need to be coordinated so as not to impede the operations of the trucked-in waste facility. Additional emergency access may be necessary from either Doremus Avenue or Wilson Avenue to provide fire truck access during any emergency events. This will be determined and closely coordinated with the Newark Fire Department early on in the design phase of the project.

An erosion and sedimentation control plan developed in accordance with the *Standards for Soil Erosion and Sediment Control in New Jersey* will provide best management practices conforming to state and federal regulations, including designated construction entrances, inlet protections, and sediment fences where appropriate. There will be minimal disturbance to existing vegetation.

Pavements, depending on location, will be constructed of either concrete or asphalt, and all curb will be concrete and match existing where appropriate. Materials and methods of installation will be in accordance with the state of New Jersey Highway Specification, New Jersey Department of Transportation, *Standard Specifications for Road and Bridge Construction*, latest edition, and the United Facilities Guide Specifications, latest edition.

Utilities

New utility connections will be made to support the new standby power plant. Utilities to be installed will include water mains, sanitary sewers, storm drains, electric lines, buried telecommunications lines, and gas mains. All utilities will tie into the existing systems as close to the required connection locations as possible.

A new water service will be brought to the standby power plant. It is assumed that the existing on-site potable water service will have sufficient capacity to provide the water necessary.

Floor drains and any other sanitary service from the standby power plant will be drained by gravity from the facility. With the trucked-in waste facility adjacent to the new facility, we have assumed that the new sanitary service will tie into one of the manholes for the 24 inch line that conveys the trucked-in waste from that facility.

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A new gas service will be provided from PSE&G to the standby power plant. It is our understanding that the service will be brought in from either Wilson Avenue or Doremus Avenue and terminate near the property line by PSE&G. The line will then be brought into the standby power plant. We will coordinate with PSE&G for the logistics on the location of the line.

APPROACH TO MANAGING THE PROJECT DESIGN

Our approach is based on the team working collaboratively with PVSC and the Program Management JV to deliver exceptional value by producing high quality documents and delivering them on schedule. Our management team's guiding principle is to place the highest value on PVSC's and the Program Management JV's time. This section describes our proposed work plan for the standby power plant project that incorporates the requirements of the Program Management Services Project Management Plan (PMP).

Our project management approach begins with recognizing that this project will be a collaboration between multiple stakeholders to ensure that PVSC's best interests are served by a successful project. We will anticipate and proactively

address issues quickly and efficiently to mitigate risk. Our management team will orchestrate the activities needed to accomplish all the objectives of the standby power plant under the Program Management Services program through a collaborative environment while driving consistent, quality deliverables. This section highlights the key points of our project management approach for the standby power plant project.

- Providing a Single Point of Contact for the Program Management JV's Project Manager. We recognize that PVSC expects a dedicated and focused Project Manager to be a single point of contact for the duration of design and construction. Our proposed Project Manager, Domenick Loschiavo, will keep the Program Management JV's Project Manager informed on project status and be fully accountable for resolving any issues related to the management of resources, scope, schedule, and budget.
- Workshop Driven Project Delivery. Collaboration of project stakeholders at design review workshops will engage all parties and provide an effective means of communication for ideas and understanding of PVSC preferences.

The Black & Veatch/CDM Smith team is dedicated to providing quality-focused engineering, construction management, inspection, and testing services. We do this by the following:

- Assigning experienced quality team members for the duration of a project, promoting consistency.
- Communicating with the team and our clients so that our commitment to quality meets expectations on each deliverable.
- Following Black & Veatch's established design and quality procedures.
- Providing independent quality reviews and verifications of project deliverables.
- Performing internal audits to achieve compliance with our Quality Management System (QMS).



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Ensuring Full and Direct Access to All of Our Design Managers. The importance of a collaborative working

environment among the Program Management JV and standby power plant team members cannot be overstated. We will establish a culture of collaboration and provide the communication tools to ensure that our team's and PVSC's technical staff can discuss and resolve technical issues freely and openly. The hierarchy of this structure approach is "flat" and efficient, promoting a results-driven collaboration while following an open communication structure.

- Managing Schedule and Budget with Advanced Project Controls. Good project management practice starts with a comprehensive PMP. PMP execution will be supported by detailed project controls and advanced monitoring tools.
- **Ensuring High Quality Deliverables.** Executing QA/QC procedures ensures that proper staff and methods are employed for each of the specific services provided under the contract and that deliverables are high quality. The Quality Management Plan (QMP) will incorporate Section 07 of the Program Management Services PMP into our standard QMP.

Mitigating Risk. Proactively managing risk avoids costly change orders, delays, and unnecessary burdens on PVSC staff time.

Details on the PMP, project controls, and quality and risk management are provided below.

Preparing a Complete Project Management Plan

Given the specialty work required to execute the standby power plant project (BODR validation, pre-purchase of equipment, and Title V Air Permitting), planning and coordination is critical. Successful projects meet goals for performance, reliability, timeliness, and budget. At Black & Veatch, we have project management procedures in place to consistently and successfully deliver power projects at wastewater treatment plants such as the standby power plant.

Our quick start activities for the standby power plant project include development of a thorough PMP, in addition to the Project Work Plan (as outlined in Task 2.1 of the Scope of Work), which will adapt to the requirements of the PMP, the Program Procedures Manual, and the PVSC Safety Manual. As shown on the adjacent figure, the PMP incorporates the recognized project management elements of schedule management, quality management, and risk management. Communications and document control will be provided through PMWeb collaboration software.

Meeting PMP Schedule and Budget with Advanced Project Management Controls

Underpinning PMP execution will be Black & Veatch's detailed project controls and advanced monitoring tools. Black & Veatch has executed power and wastewater projects for more than 100 years. Through this experience, our team has developed a risk-based approach built on proven, highly refined project management/construction management tools and systems.

The adjacent graphic summarizes the tools we employ on projects. These tools keep our managers informed with current, actionable information on project status.

Managing Risk

We intend to manage a risk register for the project to ensure that PVSC and the Program Management JV understand the project risks. The risk register will go hand-in-hand with the schedule and will be updated and discussed monthly. MS Excel will be used initially for developing the risk register.

Managing Our Engineering Fees

We intend to keep PVSC and AECOM+HDR regularly informed of our project budget. Domenick will report schedule and task status to AECOM's Project Manager monthly, and he will compile the information into the master cost-loaded schedule. He will review and approve the resulting project status report that accompanies each invoice, which includes earned value, prior to submission to PVSC. This process enables Black & Veatch to provide accurate and timely updates for the Program Manager's internal and required FEMA reports and financial



Black & Veatch's Project Management System equips our management team with the tools and controls needed to deliver a successful project to PVSC.

Quality Manager's Scope of Responsibilities during the Design Phase:

- Control and verify the design activities, define technical interfaces, ensure that the design meets the specified requirements and verify that the complete design meets all design input requirements
- Create vehicles for input and review by interdisciplinary teams consisting of discipline leads, permitting specialists, operators, and contractors
- Complete comprehensive discipline reviews and checks for functional and technical adequacy of the design
- Maximize protection against design oversights that may adversely affect quality, scheduling, safety, or efficiency of the completed Project
- Control design revisions and ensure that design documents are updated and issued in a timely manner. Ensure complete and secure management and filing of design documents
- Provide the mechanism for safety, constructability, cost, and operability/ maintainability reviews

forecasting. Project work-arounds will be handled on a case-by-case basis. Should a situation occur that impedes the progress of work, we will evaluate schedule and cost impacts and take action to bring the project back on track.

Commitment to Quality

Our goal is always to provide professional services that meet the quality expectations and requirements of our clients. Achieving this goal is the function of Black & Veatch's QMS.

Our QMS is based on the International Organization for Standardization (ISO) 9001:2008, Quality Management System Requirements, and addresses all elements of the standard as well as any project-specific contract, codes, and standards requirements.

Our professionals show up ready to execute the project, but not before receiving orientation on Black & Veatch's quality expectations. The orientation includes general and project-specific quality requirements.

Our Quality Management team will be led by Randy Fiorucci, Black & Veatch's Quality Manager. Randy manages the quality of the North River emergency response and North River cogeneration and electrification projects, all of which are high-profile projects with tight schedules. As a result of the quality reviews and our experience professionals, we have had zero design-related construction change orders spanning eight construction contracts for the North River WWTP work.

Commitment to Environmental Health and Safety

Black & Veatch's Environmental Health and Safety culture is rooted in its THINK PLAN ACT philosophy and goal for Zero Injuries Today.



Black & Veatch places the highest importance on the safety and health of its professionals and the employees of its contractors during the performance of their work. Incident prevention involves not only personal safety but also many other factors affecting the progress and efficiency of the work. Our goal is to provide an efficient and productive effort incorporating

safe working methods and strong safety consciousness by all of our employees, supervisors, contractors, and suppliers. To demonstrate this commitment, we successfully executed one of the first prevention through design workshops related to construction and operator safety for the New York City DEP at the North River WWTP for the cogeneration and electrification project. As a result of the overwhelming positive feedback from the NYCDEP, we will be implementing this concept at this project's 60 percent design review workshop.

Schedule

This project will integrate with other future projects under the Program Management JV, such as the floodwall and stormwater pumping station. As with any well managed project, the schedule drives the project, and maintaining the schedule is key to project success. An overall design and construction schedule summary for two construction contracting approaches is provided on Page 43. A single construction contract will involve one General Contractor to be responsible for all work, but will push the schedule out an additional 6 months compared to a separate advanced site preparation contract. A single contract will also require a schedule hold (or have excessive float) on the fabrication of the combustion gas turbines because without a hold, the combustion gas turbines would be delivered prior to their foundations being complete.

The two contract approach (Advanced Contract and Main Contract) provides an accelerated, but risk mitigated, implementation. This approach incorporates several specific features that will increase the effectiveness of the project team. Highlights and proposed features include the following:

- Advance Smaller Projects for Early Bidding. This feature involves the identification of specific items of work that can be advanced ahead of the main project to provide immediate benefit to the plant and reduce the scope and schedule of construction on the main project. The scope of work identified as site design is an excellent candidate for one or two smaller projects that could be designed early and bid out to allow construction to proceed ahead of the main project. An advanced site design contract saves approximately 6 months to the overall project schedule.
- Procurement Contracts. Our project team will deliver the procurement contract for PVSC to pre-purchase the combustion gas turbines. Our team concurs with PVSC's approach and fully supports the concept that permits commissioning the new standby power plant sooner than could be expected with contractorprocured equipment. Continuing with PVSC's original concept, we recommend the two gas fired blackstart generators also be pre-purchased. The procurement for the blackstart generators would be slated after the 60 percent design phase after the combustion gas turbine compressor sizing and loads are finalized. We



also allotted a third procurement contract for other auxiliary combustion turbine items that may require long lead times.

Project Permitting. We understand that obtaining required permitting approvals is one of the major risks to completing the project on time. The NJDCA construction review added in Clarification No. 2 will likely present the largest administrative schedule risk, as this permit can involve extensive public input, is not initiated until final design is complete, and can take more than 6 months. In an effort to minimize any potential delay with minimal risk, our project team will submit the Title V permit application, a 9 month

review process, immediately after completing the BODR validation. The application will represent the worst case technical risk for the combustion gas turbine and blackstart generator emissions values – PVSC has already narrowed down the combustion gas turbine models to three.

These features are incorporated into the schedule to provide an efficient and effective project execution as schedule compression provides cost savings.

Workshop Driven Project Delivery

Our project approach is workshop driven and focused on well-defined deliverables that are submitted in a timely manner. The following features, without limitation to the PMP and Program Procedures Manual will serve as a guide for the submittals and the structure of the workshops used to review these submittals as shown on the schedule enclosed in this section.

The completion of the BODR validation will lead into the immediate development of the Preliminary Engineering Report (PER). The acceptance of the final PER is a critical milestone for this project, locking in the project scope and marking the beginning of the design phase. In keeping with the

Black & Veatch has developed a solid approach to the design services during construction that provides the following:

- Construction knowledge and experience as contractors.
- Experience implementing DEP's Project Delivery Manual.
- Knowledge of the DEP's standard operating procedures.
- Effective quality
- management

requirements of the RFQ/RFP, the following discussion is focused on the execution of the base project scope defined by the RFQ/RFP, although we acknowledge that the BODR validation may result in features differing from the project as originally planned. The basic design approach will not change based on the scope of the constructed project.

Our project team will work with PVSC and the Program Management JV to develop the project scope and plan that will culminate in the preparation and delivery of the PER. During this phase, we will initiate discussions with PSEG, NJDEP, NJDCA, authorities having jurisdiction (Newark, New Jersey), FEMA, and the Environmental Protection Agency (EPA) to obtain their input on the requirements of the new standby power plant, outdoor/indoor switchgear, outdoor mechanical equipment, gas metering yard, and National Fire Protection Association (NFPA) 850 compliance, so that the PER will contain the key requirements to satisfy all outside agencies. Early input from PSE&G and the EPA is important to providing a valid baseline scope, schedule, and budget.

The 30 percent deliverable is the next key milestone in the project delivery, and this document will be reviewed by an independent value engineering team; the comments from that team will be incorporated into an updated document. By this time in the project, all technical issues will have been decided and documented in the PER. After approval by all agencies, the design can progress to 60 percent, 90 percent, and then completion.

During detailed design, we will advance the project through the 30 percent, 60 percent, and 90 percent stages in accordance with the PMP. At the 30 percent level, the 3-D model is being utilized for BIM, wherein assets are identified and located in space, and the interior of spaces can be viewed in real-time walk-throughs. This effort will ensure that the 0&M staff can experience the facility layout using an approach that is more user-friendly than reviewing drawings.

Our site preparation and geotechnical project partner CDM Smith, will conduct boring and subsurface investigations to provide PVSC and the project team with an accurate understanding of the existing conditions at the proposed site. In addition, CDM Smith will perform hazard material sampling and testing; it will be crucial to have a hazards inventory conducted early so that appropriate remediation measures can be included in the design documents. Effective partnering and coordination between the project team, PVSC, AECOM+HDR, PSEG, FEMA, and the EPA is important to maintaining the project schedule.

DELIVERY APPROACH OF DESIGN SERVICES DURING CONSTRUCTION

Bid and Construction Phase Services

Our team will provide bid and construction phase services to support PVSC and the Program Management JV until project closeout. The design services during construction are assumed to cover a 24 month span, coordinating with the construction duration. Black & Veatch will provide all personnel necessary for project construction quality control, progress meetings, site representation, risk management, submittal review, shop witness testing, requests for information, startup/commissioning/training, and project closeout activities.

Balance of Standby Power Plant Training

The Black & Veatch Plant System Operation and Training (PSOT) Group is staffed by retired managers/professionals of the electric utility industry; all of their experience is in power generation. The team represents over 250 years of experience in power generation and more than 50 years of experience in training. The Black & Veatch PSOT team has performed training on more than 150 projects over the past 20 years.

The purpose of the balance-of-plant training is to provide PVSC employees with information so they can be better prepared to effectively assist the startup and commissioning team during the startup phase of the project, as required by Subtask 4.12 of the RFQ/RFP. The training sessions will help prepare the employees to make intelligent choices on how to start up, operate, and maintain the new equipment and systems in a safe, reliable, cost-effective, and environmentally sound manner.

The training will be conducted at the site for the operations and maintenance staff. During the training, the plant systems will be studied with an emphasis on understanding the process and the control of the process. The participants will be given P&IDs, arrangement drawings, and electrical oneline diagrams to be reviewed in class. The training is intended to familiarize the participants with the plant systems. The interrelation between systems is covered to tie the plant systems into a cohesive, functional unit. The daily schedule will include class lectures, self-study of the provided materials, and walking tours of the project.

The balance-of-plant training will supplement the training provided by specific equipment suppliers (e.g., combustion turbine, air compressors). An adequate training facility will be provided and reserved exclusively for training for the duration of all classes. Such a facility will specifically support the PSOT and vendor training as described herein.

Training materials provided will include the following three components:

- Training Manual This manual contains text giving a description of the equipment and processes. These are prepared from the design engineer's system descriptions and will not include detailed integrated operating procedures, problem-solving guides, or maintenance overview.
- Drawing Book The drawings include building and site general arrangement drawings, P&IDs, one-line electrical diagrams, and selected vendor drawings.

Basis of Design Report Validation

- Identify performance characteristics that are required.
- Identify deficiencies.
- Document all validation activities.

30 Percent Design Review Milestone Deliverable Quality Reviews

- 30 percent submittal will be checked by disciplines, and the quality review checklists will be completed by each discipline.
- Construction cost estimate representing this stage of the design will be included.
- The 30 percent design review to "lock in the design" will be held 4 weeks following the submission of the complete 30 percent design submittal.
- Participate in value engineering workshops.
 Hold a constructability review workshop.

60 Percent and 90 Percent Design Review Milestone Deliverable Quality Reviews

- The 60 percent and 90 percent submittals will have been subjected to internal quality control within our team, and the appropriate quality control checklists will have been completed.
- Construction cost estimate representing this stage of design will be included.
- The first review workshop will be held after submittal of the document. This workshop will allow our team to present the design to PVSC and the Program Management JV and help focus the review effort on critical areas.
- After the Program Management JV completes its review and submits comments to our team, a second workshop can be held to discuss and resolve the comments submitted.
- Walkdown– This process is key to the continuous learning process. Each day includes a walkdown tour of the systems studied.

After the classroom training sessions are completed, the PVSC staff will have the opportunity to work with the startup and commissioning team to assist in the startup of the plant. This will be the "hands-on" phase of the training and will help prepare the 0&M staff for operating and maintaining the plant after it is turned over.

Each PVSC staff member that participates in the training session will be issued a certificate of completion specific to this facility.



PROJECT SCHEDULE

Single Construction Contract



Two Contracts (Site Preparation Contract + Main Construction Contract)

	2016	2017	2018	2019	2020
PRE-ENGINEERING Project Kick – Off Meeting Pre-Engineering & Investigation BoDR Validation Equipment Pre-Purchase Package 1 (Turbine) Package 2 (Black Start Gen) Package 3 (Other) Equipment Fabrication Package 1 (Turbine) Package 2 (Black Start Gen) Package 3 (Other) Contractor Pre-Qualification	•				
DETAILED DESIGN Site Design 30% Design Effort Value Engineering 60% Design Effort 90% Design Effort Permitting Title V Permit All Other Permits Final Contract Documents	Site P	ep Permits	-		
BIDDING PHASE	54	e Prep Contract	Main Contract		
CONSTRUCTION PHASE Site Prep Construction Turbine Facility Construction Turbine Delivery Black Start Gen Delivery Other Equipment Delivery			•	:	December 2019 Substantial Completion

BLACK & VEATCH | Project Approach/Schedule

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	1	DIVISION OO - BIDDING
1	00020	Invitation to Bid
2	00100	Instructions to Bidders
3	00400	Bid Form
4	00430	Bid Bond — Penal Sum Form
5	00440	List of Subcontractors
6	00450	Equipment Questionnaire
7	00452	Instrumentation and Control System Supplier Questionnaire
8	00455	Owner's Forms
9	00500	Agreement
10	00510	Notice of Award
11	00520	Notice to Proceed
12	00570	Assignment of Procurement Contract
13	00575	Surety's Agreement to Assignment
14	00610	Performance Bond
15	00615	Payment Bond
16	00620	Application for Payment
17	00625	Certificate of Substantial Completion
18	00700	Standard General Conditions of the Construction Contract
19	00800	Supplementary Conditions
20	100801	Federally Hequired Forms
		DIVISION 01 - CONTRACT REQUIREMENTS
21	01015	Project Requirements
22	01016	Work Restrictions
22	01020	Pre-Purchased (Selected) Equipment
23	01025	Measurement and Payment
23	01030	Project Milestones and Liquidated Damages
24	01070	Abbreviations of Terms and Organizations
24	01300	Submittals Procedures
25	01310	Construction Progress Schedule
25	01320	Construction Progress Documentation
26	01380	Construction Photographs
26	01400	Quality Control
27	01450	Code Required Special Inspections and Procedures
27	01500	Temporary Facilities
28	01610	General Equipment Stipulations
28	01611	Meteorological and Seismic Design Criteria
29	01612	Product Delivery Requirements
29	01014	Product Storage and Handling Requirements
30	01615	Equipment and valve identification
30	01620	Pipeling Schedule
37	01630	Pipeline Schedule
31	01650	Stantun Poquisonosta
22	01820	Startup Requirements
22	01020	Demonstration and Vaintenance Manuals
30	10/030	operactor and matricentatice manuals
		DIVISION 02 - SITE WORK
34	02015	Test Borings
35	02050	Demolition
10	02200	Excavation and Fill for Structures
1/	02202	Trenching and Backfilling
30	02304	Drilled Concrete Piers and Shafts
10	02512	Asnhalt Paving
11	02514	Concrete Paving
12	02522	Concrete Sidewalk, Curb. and Gutter
43	02603	Fire Hydrants
13	02605	Sanitary Utility Sewerage Manholes, Frames, and Covers
14	02606	Manhole and Vault Covers and Accessories
15	02628	Polyvinyl Chloride (PVC) Sewer Pipe
16	02630	Polyvinyl Chloride (PVC) Pressure Pipe
47	02634	HDPE Pressure Pipe
48	02675	Cleaning and Disinfection of Water Pipelines
19	02702	Sewer ripe installation and lesting
51	02704	Seeding and Sodding
11	02930	Seenting and Soundling
		DIVISION 03 - CONCRETE
2	03100	Concrete Forming
53	03200	Concrete Reinforcing
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PVSC STANDBY POWER PLANT TECHNICAL SPECIFICATIONS LIS	51
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		FVSC STANDBT FOWER PLANT TECHNICAL SPECIFICATIONS LIST
#	Section	Title
55	03300	Cast-in-Place Concrete
56	03350	Concrete Placing, Finishing, and Curing
57	03430	Precast Structural Concrete
58	03600	Grouting
59	03930	Concrete Crack Repair
		DIVISION 04 - MASONRY
60	04051	Masonry
00	101001	DIVISION 05 - METALS
61	05210	Steel Joist Framing
62	05312	Steel Boof Decking
63	05313	Steel Form Decking
64	05520	Handrailing, Guardrailing, and Ladders
65	05530	Grating
66	05550	Anchorage In Concrete and Masonry
67	05990	Structural and Miscellaneous Metals
		DIVISION 06 - WOOD AND PLASTICS
68	06090	Carpentry
69	06200	Glass Fiber Reinforced Plastic Fabrications
		DIVISION 07 - THERMAL AND MOISTURE PROTECTION
70	07160	Dampproofing
71	07510	Built-Up Bituminous Roofing
72	07525	Modified Bituminous Membrane Roofing
73	07531	EPDM Roofing, Mechanically Fastened
74	07532	EPDM Roofing, Fully Adhered
75	07540	Fluid Applied Deck Coverings
76	07600	Flashing and Sheet Metal
77	07900	Joint Sealants
		DIVISION OB - DOORS AND WINDOWS
78	08110	Steel Doors and Frames
79	08305	Floor Access Doors and Hatches
80	08330	Overhead Coiling Steel and Fire Doors
81	08331	Overhead Coiling Aluminum Doors
82	08410	Aluminum Entrances and Assemblies
83	08510	Steel Windows
84	08520	Aluminum Windows
86	08700	Glezing
00	100000	DIVISION 09 - FINISHES
07	00000	Leth and Blaster
87	09200	Cuppun Poerd
80	09250	Terrazzo Elooring
90	09510	Acoustical Panel Ceilinos
91	09660	Resilient Flooring
92	09725	Resinous Flooring
93	09820	Cementitious Coating
94	09880	Corrosion Protection Lining Systems
95	09886	Elastomeric High-Solids Urethane Lining Systems
96	09920	Painting
97	09940	Protective Coatings
		DIVISION 10 - SPECIALTIES
98	10160	Metal Toilet Compartments
99	10200	Louvers and Vents
00	10400	Identification Devices and Signage
100	10500	Metal LUCKErs
102	10000	Viscellaneous Specialties
00	10330	
	Labor -	DIVISION TI - EQUIPMENT
04	11060	Equipment Installation
05	11185	Submersible Sump and Sewage Pumps
00	11620	Compressed Air Equipment _ Ress Hounted Compressors
108	11727	Liquid Chemical Feed Systems
109	11910	Engine Generators
110	11920	Combustion Gas Turbine
111	11930	Emmission Control Equipment
		DIVISION 12 - FURNISHINGS
12	12310	Metal Casework
13	12625	Laboratory Furniture

0	ontion 1	Title
S	ection	
. 1.22		DIVISION 13 - SPECIAL CONSTRUCTION
4 13	195	Ammonia Storage Tanks
4 13	500	Chemical Storage Tank Installation
5 13	530	Distributed Control System
6 13	550	Software Control Block Descriptions
6 13	561	Panel Mounted Instruments
7 13	562	Flow Instruments
7 13	563	Pressure and Level Instruments
8 13	564	Process Analytical Instruments
8 13	565	Temperature Instruments
9 13	566	Miscellaneous Instruments
9 13	570	Panels, Consoles, and Appurtenances
0 13	580	Uninterruptible Power Supply
1 13	501	Network Systems
1 13	030	Fire Suppression Sprinkler Systems
2 13	960	Clean-Agent Fire Extinguishing Systems
- 110		DTVISION 14 _ CONVEYING SYSTEMS
2 4 4	601	Verenzil Heist Sustem
3 174	021	Monorall Holst System
		DIVISION 15 - MECHANICAL
4 15	010	Valve Installation
5 15	020	Miscellaneous Piping and Accessories Installation
6 15	050	Basic Mechanical Building Systems Materials and Methods
7 150	060	Miscellaneous Piping and Pipe Accessories
0 15	062	Steel Pipe
0 15	065	Viscellaneous Steel Pine Tubing and Accessories
1 15	067	Miscellaneous Plastic Pine. Tubing, and Accessories
2 15	069	Cast Iron Soil Pipe and Accessories
3 15	070	Copper Tubing and Accessories
4 15	091	Miscellaneous Ball Valves
5 15	092	Industrial Butterfly Valves
6 15	093	Check Valves
7 15	094	Backflow Preventers
8 15	095	Solenoid Valves
9 15	096	Globe Valves
0 150	860	Plug Valves
1 15	100	Pressure Heducing Valves
2 15	130	Pressure Gauges
4 15	140	Pipe Supports
5 15	180	Valve and Gate Actuators
6 15	250	Mechanical Insulation
7 15	400	Plumbing
8 15	486	Distilled-Water Equipment
9 15	500	Heating, Ventilating, and Air Conditioning
0 15	550	Heating Systems Equipment
1 150	650	Refrigeration Systems
2 159	955	Building System Controls
3 175	990	resting, Aujusting, and Batancing
_		DIVISION 16 - ELECTRICAL
4 160	050	Electrical
5 16	100	Electrical Equipment Installation
6 16	150	Adjustable Frequency Drives
/ 16	155	Medium-Voltage Adjustable Frequency Drives
8 16	220	General Purpose Induction Motors
0 10	220	Secondary Integral Unit SUDStations
1 10	320	Medium Voltage Metal Clad Switchcoor
2 16	490	600 Volt Class Motor Control Centers
3 164	610	Uninterruntible Power Supply System
4 16	630	DC Power System
5 16	670	Lightning Protection for Structures
6 16	721	Fire Detection and Alarm System
7 16	723	Fire Protection and Signaling System

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1	6310	A326	GI	- General (Symbols, Legends, No.	000	6310-A326-G-0000	COVER SHEET	Y Y	TY	TY	TY
2	6310	A328	6 1	General (Symbols Legends No	001	6210, 4226, 6, 0001		2 3	÷	+	+
	8210	4220	t c t	General (Symbola, Legenda, No	007	0010-4020-0-0007		A A	A	1 2	-
4	0370	AJZO	0 0	- General (Symbols, Legends, No	002	6310-A326-G-0002	SHEEL LISI ~ 2 UF 2	A A	X	A	X
4	6310	A326	6 0	General (Symbols, Legends, No	003	6310-A326-G-0003	GENERATOR BUILDING - APPENDIX E	XX	X	X	X
5	6310	A326	G	General (Symbols, Legends, No	004	6310-A326-G-0004	GENERATOR BUILDING - LIFE SAFETY PLAN	X X	X	X	X
6	6310	A326	GIO	General (Symbols, Legends, No	005	6310-A326-G-0005	GENERAL NOTES	XX	X	X	X
7	6310	A326	G	- General (Symbols Legends No	006	6310-A326-G-0006	ADDEVIATIONS AND GENERAL SYMBOLS	20 M (1) 10 M	Y	Y	TY
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0	6310	AJZD	61 0	- General (symbols, legends, no	001	6310-A326-GI-0001	PEID LEGEND AND ABBREVIATIONS - SHEET 1 OF 2	X X	X	X	X
9	6310	A326	GI) - General (Symbols, Legends, No	002	6310-A326-GI-0002	P&ID LEGEND AND ABBREVIATIONS - SHEET 2 OF 3	XX	X	X	X
10	6310	A326	I	5 - Details	001	6310-A326-I-5001	INSTRUMENT INSTALLATION DETAIL	XX	X	X	X
11	6310	A326	I	5 - Details	002	6310-A326-I-5002	INSTRUMENT INSTALLATION DETAIL GENERAL NOTES	XX	X	X	X
12	6310	A726	TI	Datails	003	6310-A326-1-5002	INSTRUMENT INSTALLATION DETAIL STANDADD INTRUMENT TAL	Y I	Y		Y
12	6310	ATTA	17 1	5 . Details	004	6310 A326 7 6004	TNETDUMENT INSTALLATION DETAIL NEW ATD USEL	2 3	10	1 0	1 0
10	0010	AGOO	1 1	Deterile	004	0010-4020-1-0004	AND THIS TO AND A DETAIL ALL ALL ALL ALL ALL ALL ALL ALL ALL		-	+	+ ^
14	0310	A326	11	· Detalls	005	B310-A326-1-5005	INSTRUMENT INSTALLATION DETAIL TYPICAL AIR SUPPLY INSTALLATION	XX	X	X	X
15	6310	A326	I	5 - Details	006	6310-A326-I-5006	INSTRUMENT INSTALLATION DETAIL INSTRUMENT PIPING TERMINOLOGY	XX	X	X	X
16	6310	A326	I	5 - Details	007	6310-A326-1-5007	INSTRUMENT INSTALLATION DETAIL INSTRUMENT PIPING TERMINOLOGY	XX	X	X	X
17	6310	A326	II	5 - Details	008	6310-A326-1-5008	INSTRUMENT INSTALLATION DETAIL TYPICAL PIPE STAND CONSTRUCTION	X 3	X	X	X
18	6310	A326	111	5 · Details	000	6310-A326-T-5000	INSTRUMENT INSTALLATION DETAIL PROCESS TAP ORIENTATIONS DOESS TEM	Y I	Y	TY	Y
10	6210	Anne	17 1	Ostalla	010	8210 A220 1 5042	INCOMPANY AND A DECEMBER AND A DECEM		- 2	+	+ 0
19	0310	A320	1.	- Detalla	010	0310-A320-1-5010	INSTRUMENT INSTALLATION DETAIL PARCESS TAP UNIENTATIONS FLOT	X X	A	+ *	X
20	6310	A326	1 1	b - Decalls	011	6310-A326-1-5011	INSTHUMENT INSTALLATION DETAIL TUBING SUPPORTS	XX	X	X	X
21	6310	A326	1 1	5 - Details	012	6310-A326-I-5012	INSTRUMENT INSTALLATION DETAIL NATURAL GAS FLOW ORIFICI	XX	X	X	X
22	6310	A326	I	5 - Details	013	6310-A328-I-5013	INSTRUMENT INSTALLATION DETAIL NAT GAS/AIR/GAS STATIC PRES:	XX	X	X	X
23	6310	A326	II	5 - Details	014	6310-A326-T-5014	INSTRUMENT INSTALLATION DETAIL PRESSURE GAUGE LOCAL	X 3	X	X	X
24	6210	4226	TI	. Derails	015	6210 A226 1.5015	TNSTOHNENT INSTALLATION DETAIL THEOMOGYUDLE AND TEST WELL ASSY - NO	Y N	- V	t v	Y
25	8310	4320	1 . 1	Details	015	6010 A008 I 5018	INSTRUMENT INSTALLATION DETAIL TRUMEGGOVE AND LEST WEEK NOT IN			+	+ 2
23	6310	A320	1 1	- Details	016	0310-A320-1-5010	INSTRUMENT INSTRUCTION DETAIL TEMPERATURE INDICATOR - NP.	A A	-	-	
26	6310	A326	1 1	Schedules and Diagrams	001	6310-A326-1-6001	CUNTROL SYSTEM CONCEPTUAL ARCHITECTURE	XX	X	A	X
27	6310	A326	I	S - Schedules and Diagrams	011	6310-A326-I-6011	P&ID FUEL GAS SUPPLY	XX	X	X	X
28	6310	A326	I	S - Schedules and Diagrams	012	6310-A326-J-6012	P&ID COMPRESSOR NO 1	XX	X	X	X
29	6310	A326	I	5 - Schedules and Diagrams	013	6310-A326-I-6013	P&ID COMPRESSOR NO 2	XX	X	X	X
30	6310	A326	II	S - Schedules and Diagrams	014	6310-A326-1-6014	PAID GAS TURBINE GENERATOR 1	XX	X	X	X
21	6210	A726	111	S. Schedules and Diagrams	015	8210 A226 T. 6015	DATO GAS TUDETNE GENERATOR S	Y N	Y	X	Y
	0010	1000	+ : 1	- Schedules and Diagrams	015	0310-74320-1-0015			+ 2	+	+ 0
32	0310	AJZD	1	- Schedules and Diagrams	0/0	0370-A320-1-0070	PGID UNS TUNDING DENEMATION 3		-	-	1 0
33	6310	A326	11	5 - Schedules and Diagrams	017	6310-A326-I-6017	PRID EMISSION CONTROL SYSTEM NO 1	XX	X	X	X
34	6310	A326	I	5 - Schedules and Diagrams	018	6310-A326-I-6018	P&ID EMISSION CONTROL SYSTEM NO 2	XX	X	X	X
35	6310	A326	II	5 - Schedules and Diagrams	019	6310-A326-I-6019	P&ID EMISSION CONTROL SYSTEM NO 2	XX	X	X	X
36	6310	A326	11	5 - Schedules and Diagrams	020	6310-A326-I-6020	P&ID AMMONIA STORAGE SYSTEM	XX	X	X	X
27	6210	4226	TI	S . Schedules and Diagrams	021	6210-4326-1-6021	DATO ANNUMA FEED SYSTEM	XX	Y	Y	X
28	6210	4226	1 7 1	Cohedules and Diagname	027	6210 4226 I 6027	DETO DE ADVESTADT CENEDATOD NO 1		Y	Y	Y
30	0310	A320	1 1	Schedules and Diagrams	022	6310-A320-1-6022	POLD BLACKGART GENERATOR NO 1		-	+	+ -
39	6310	A326	1 1	5 - Schedules and Ulagrams	023	6310-A326-1-6023	PGID BLACKSTART GENERATOR NO 2	-	-	+ -	-
40	6310	A326	I	 Schedules and Diagrams 	024	6310-A326-1-6024	PGID PLANT COMPRESSED AIR SYSTEM	X 2	A	A	X
41	6310	A326	I	5 - Schedules and Diagrams	025	6310-A326-I-6025	P&ID DEMINERALIZED WATER SYSTEM	X X	X	X	X
42	6310	A326	I	8 - Schedules and Diagrams	026	6310-A326-I-6026	PAID MISCELLANEOUS BUILDING SYSTEMS	X X	X	X	X
1							CIVIL				
43	6310	A326	GC U	- General (Symbols, Legends No.	001	6310-A326-GC-0001	CIVIL LEGEND AND GENERAL NOTES	XII	X	X	X
14	6710	A726	C	Plans	001	6310-4326-C-1001	$OVERALL SITE PLAN - 1^* = 200'$	X	X	X	Y
44	6310	4320	0	Dises	007	6310 A336 C 1007		¥ 1	T Y	Y	Y
40	0310	AJ20	10	- F10//3	002	0310-4320-0-1002	EXAMPLE TARTER AND A CONTRACT OF THE CONTRACT.	2 + 3		+	÷
46	0310	A326	G	- FTAUS	003	0310-A326-C-1003	511E 51M1100 FLAN - 1 = 30	2 1	1	+ 2	+ 0
47	6310	A326	C	· Plans	004	6310-A326-C-1004	SITE STAKING PLAN - 1" = 30'		X	×	-
48	6310	A326	C	1 Plans	005	6310-A326-C-1005	SITE GRADING PLAN 1" = 30'	X)	X	X	X
49	6310	A326	C	1 - Plans	006	6310-A326-C-1006	SITE GRADING PLAN - 1" = 30'	X	X	X	X
50	6310	A326	C	1 - Plans	007	6310-A326-C-1007	SITE PIPING PLAN - 1' = 30	X	X	X	X
51	6310	A326	C	I Plans	008	6310 A326 C. 1008	STTE PTOTING PLAN = $1^{+} = 30^{+}$	XII	X	TX	X
50	0310	A320	1-	Place	000	0010-4020-0-1008	NUE FARINE DOCTORES	2 1 3	1 v	TY	Y
52	0310	A320	G	- Flans	009	0310-A326-C-7009	IANU FIFINI FRUFILES	2 + 3	12	+ -	10
53	6310	A326	C	1 - P1802	010	6310-A326-C-1010	TARD DETAILS			+ -	-
54	6310	A326	C	1 - Plans	011	6310-A326-C-1011	YARD DETAILS	X	X	X	X
55	6310	A326	C	1 - Plans	012	6310-A326-C-1012	TRAFFICE MANAGEMENT PLAN	XX	X	X	X
56	6310	A326	C	1 - Plans	013	6310-A326-C-1013	EROSION AND SEDIMENT CONTROL PLAN	XX	X	X	X
57	6310	A306	C	1 - Plana	014	6310-A325-C-1014	FROSION AND SEDIMENT CONTROL - GENERAL NOTES	XII	X	X	X
60	6310	1 4320	10	01200	016	6210 A226 C 1015	EDISTON AND SECTION CONTON DETAILS 1	X X	X	TX	X
50	0310	1320	1-		015	0010-0020-0-1015	Engelsen and Schlieft Control Denator	Y	Y	TY	Y
59	6310	A326	6	1 - Plans	016	0310-A320-C-1016	ERUSIUN AND SEUTRENT CONTROL DETAILS &	A 19 21	-1 A	1	1.
	-		-				ARCHITECTURAL		_		
60	6310	A326	GA	0 - General (Symbols, Legends, No	001	6310-A326-GA-0001	NOTES AND LEGEND	X)	X	X	X
1 01	6210	Anne	1.1	t Dinne	001	6210 A225 A 1001	CENERATOR RULL DING ADDANCEMENT RIAN . 3/32" = 1'.0"	Y I	Y	X	Y
01	0310	A320	A	1 - FTGU2	001	0310-A320-A-1001			1 2	+	10
62	6310	A326	A	1 - Plans	002	6310-A326-A-1002	GENERATOR BUILDING - FLOOR PLAN 3/16" = 1'-0"	A	X	-	-
63	6310	A326	A	1 - Plans	003	6310-A326-A-1003	GENERATOR BUILDING - FLOOR PLAN 3/16" = 1'-0"	XX	X	X	X
64	6310	A326	A	1 - Plans	004	6310-A326-A-1004	GENERATOR BUILDING - ENLARGED FLOOR PLAN 1 OF 2	XI	X	X	X
04	0010	4000	121	f Diana	004	6210 4200 4 1004	CENERATOR BUILDING ENLARGER ELONG BLAN 2 OF 2			Y	Y
05	0010	AJ20	1 4 1	1 - F10/3	005	0010-A320-A-1005	GENERATION DVILVING - ENUMPERATE VE 2				

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86	6210	4336		1 01202	005	6710 4706 A 1005			
67	6310	A320	A	1 - Plans	000	6310-A326-A-1006	GENERATOR BUILDING - REFLECTED CEILING PLAN 3/15 - 1 - 0*	XXX	XX
68	6310	A326	A	1 - Plans	008	6310-A326-A-1007	GENERATOR BUILDING - RECEIVED CELLING FON 3/10 - 1 -0		+ × ×
69	6310	A326	A	1 · Plans	009	6310-A328-A-1009	GENERATOR BUILDING - REFLECTED CEILING PLAN 3/16" = 1'-0"	XXX	XX
70	6310	A326	A	1 - Plans	010	6310-A326-A-1010	GENERATOR BUILDING - ROOF PLAN 3/16* = 1'-0*	x x x	XX
71	6310	A326	A	2 - Arch Elevations	001	6310-A326-A-2001	BUILDING ELEVATIONS - 3/32* = 1'-0*	X X X	X X
72	6310	A326	A	2 Arch Elevations	002	6310-A326-A-2002	BUILDING ELEVATIONS - 3/32* = 1'-0*	X X X	X X
74	6310	A320	A	3 - Sections	003	6310-A326-A-3003	WALL SECTIONS	XXX	XX
75	6310	A326	A	3 - Sections	005	6310-A326-A-3005	WALL SECTIONS	x x x	XX
76	6310	A326	A	3 - Sections	006	6310-A326-A-3006	WALL SECTIONS	X X X	XX
.77	6310	A326	A	5 - Details	001	6310-A326-A-5001	DETAILS	XXX	XX
78	6310	A326	A	5 - Details	002	6310-A326-A-5002	DETAILS	x x x	X X
19	6310	A326	A	5 - Detalls	003	6310-A326-A-5003	DETAILS	XXX	XX
80	6310	AJZO	LA.	6 - Schedules and Diagrams	001	6310-A320-A-6001	DUON, WINDOW, LOUVEN AND NOOM FINISH SCHEDDLES	XXXX	XX
81	8310	A326	GS	0 - General (Symbols, Legends, No	001	6310-A326-GS-0001	STRUCTURAL NOTES AND LEGEN	XXX	XX
82	6310	A326	GS	1 - Plans	001	6310-A326-GS-1001	GENERATOR BUILDING PLAN - 3/32" = 1'-0"	X X X	X X
83	6310	A326	GS	1 - Plans	002	6310-A326-GS-1002	GENERATOR BUILDING - FOUNDATION PLAN 3/18" = 1'-0"	X X X	X X
84	6310	A326	GS	1 - Plans	003	6310-A326-GS-1003	GENERATOR BUILDING - FOUNDATION PLAN 3/16" = 1'-0"	XXX	X X
85	6310	A326	GS	1 - Plans	004	6310-A326-GS-1004	TURBINE GENERATOR - FOUNDATION PLAN 1/8 = 1'-0"	XXX	XX
87	6310	A320	00	1 Plans	005	6310-A320-05-1005	GENERATOR BUILDING - FLOOR PLAN 3/16" = 1^{-0}		+ + + +
88	6310	A320	20	1 - Plans	007	6310-A326-GS-1000	GENERATOR BUILDING - FLOOM FLAN 3/16' = 1 -0'	x x x	+ ÷ ÷
89	6310	A326	GS	1 · Plans	008	6310-A326-GS-1008	GENERATOR BUILDING - ROOF PLAN 3/16" = 1'-0"	XXX	X X
90	6310	A326	5	1 - Plans	009	6310-A326-S-1009	COMPRESSOR FOUNDATION PLAN	X X X	XX
91	6310	A326	S	3 · Sections	001	6310-A326-S-3001	SECTIONS AND DETAILS	x x x	X X
92	6310	A326	S	3 - Sections	002	6310-A326-S-3002	SECTIONS AND DETAILS	x x x	XX
93	6310	A326	S	3 - Sections	003	6310-A326-S-3003	SECTIONS AND DETAILS	X X X	X X
94	6310	A326	S	3 Sections	004	6310-A326-S-3004	SECTIONS AND DETAILS	XXX	XX
95	6310	A326	S	3 Sections	005	6310-A326-S-3005	CUMPHESSUR SECTIONS AND DETAILS		+ ÷ ÷
97	6310	A326	S	5 - Details	007	6310-A326-S-5007	STANDARD CONCRETE JOIN DETAILS	XXX	XX
98	6310	A326	S	5 - Details	003	6310-A326-S-5003	STANDARD MASONINY REINFORCING DETAILS	X X X	XX
99	6310	A326	S	5 - Details	004	6310-A326-S-5004	STANDARD MASONRY JAMB AND LINTEL DETAILS	x x x	X X
100	6310	A326	S	5 - Details	005	6310-A326-S-5005	STANDARD GUARDRAIL ELEVATIONS AND DETAILS	X X X	XX
101	6310	A326	5	5 — Details	006	6310-A326-S-5006	STANDARD LADDER & MISCELLANEOUS STEEL DETAILS	X X X	XX
102	6310	A326	S	5 - Details	007	6310-A326-S-5007	STEEL FRAMING DETAILS	XXX	XX
107	6710	4226	CH	0 Conecal (Sumbols Legende No	001	6210 A228 CH.0001	MECHANICAL	X X X	XX
104	6310	A326	M	1 - Plans	001	6310-A326-M-1001	MATIMAL GAS DELIVERY STATION PLAN	XXX	XX
105	6310	A326	M	1 - Plans	002	6310-A326-M-1002	COMPRESSOR PLAN	X X X	XX
106	6310	A326	M	1 - Plans	003	6310-A326-M-1003	GENERATOR BUILDING OPERATING FLOOR GENERAL ARRANGEMENT DRAWING - 3/32" = 1'-0"	X X X	X X
107	6310	A326	M	1 - Plans	004	6310-A326-M-1004	GENERATOR BUILDING ROOF PLAN GENERAL ARRANGEMENT DRAWING - 3/32" = 1'-0"	XXX	XX
108	6310	A326	M	1 - Plans	005	6310-A326-M-1005	GENERATOR BUILDING COMPOSITE PIPING PLAN - 3/32"=1'-0"	X X X	X X
109	6310	A326	M	1 Plans	006	6310-A326-M-1006	GENERATOR BUILDING ENLARGED PIPING PLAN - 3/8"=1"-0"	XXX	+ + + + +
110	6310	A320	M	1 - Plans	007	6310-A326-M-1007	DENERATOR BUILDING ENLARGED PIPING PLAN + 3/8"=1'-0"	XXXX	x x
112	6310	A326	M	1 - Plans	000	6310-A326-M-1008	GENERATOR BUILDING ENLARGED PIPING PLAN - 3/8"=1"-0"	XXX	XX
113	6310	A326	M	1 - Plans	010	6310-A326-M-1010	GENERATOR BUILDING - HAZARDOUS AREA PLAN OPERATING FLOOR - 3/16*=1'-0*	X X X	XX
114	6310	A326	M	1 - Plans	011	6310-A326-M-1011	GENERATOR BUILDING - HAZARDOUS AREA PLAN OPERATING FLOOR - 3/16"=1'-D"	X X X	X X
115	6310	A326	M	1 - Plans	012	6310-A326 M 1012	GENERATOR BUILDING - HAZARDOUS AREA PLAN ROOF - 3/16"=1'-0"	x x x	X X
116	6310	A326	H	1 - Plans	013	6310-A326-M-1013	GENERATOR BUILDING - HAZARDOUS AREA PLAN ROOF - 3/16"=1'-0"	X X X	XX
117	6310	A326	M	1 - Plans	014	6310-A326-M-1014	AMMONIA STORAGE AND FEED PLAN	X X X	+ ÷ + ÷
118	6310	A326	M	3 Sections	001	6310-A326-M-3001	NATURAL GAS DELIVERY SECTIONS AND DETAILS	XXXX	x x
120	6310	A326	H	3 - Sections	002	6310-A326-M-3002	COMPRESSOR SECTIONS	XXX	XX
121	6310	A326	M	3 - Sections	004	6310-A326-M-3004	COMPRESSOR HAZARDOUS AREA PLAN AND SECTIONS	X X X	X X
122	6310	A326	M	3 - Sections	005	6310-A326-M-3005	GENERATOR BUILDING PIPING SECTIONS AND DETAILS	XXX	XX
123	6310	A326	M	3 - Sections	006	6310-A326-M-3006	GENERATOR BUILDING PIPING SECTIONS AND DETAILS	x x x	XX
124	6310	A326	M	3 - Sections	007	6310-A326-M-3007	GENERATOR BUILDING PIPING SECTIONS AND DETAILS	X X X	X X
125	6310	A326	M	3 - Sections	008	6310-A326-M-3008	GENERATOR BUILDING PIPING SECTIONS AND DETAILS	XXX	× ×
126	6310	A326	M	3 Sections	009	6310-A326-M-3009	GENERATOR BUILDING - HAZARDOUS AREA SECTIONS	A A X	

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107	8910	1000		0 8	1			
128	6310	A326	M	3 - Sections	010	6310-A326-M-3010	GENERATOR BUILDING HAZAROOUS AREA SECTIONS	X X X X X
129	6310	A326	M	3 - Sections	012	6310-A326-M-3012	GENERATOR BUILDING = NAZARDOUS AREA SECTIONS	
130	6310	A326	M	3 - Sections	013	6310-A326-M-3013	ANMONIA STORAGE AND FEED SECTIONS AND DETAILS	x x x x x
131	6310	A326	M	5 - Details	001	6310-A326-M-5001	MECHANICAL DETAILS	x x x x x
132	6310	A326	M	5 - Details	001	6310-A326-M-5001	NECHANICAL DETAILS	x x x x x
133	6310	A326	M	5 - Details	001	6310-A326-M-5001	MECHANICAL DETAILS	X X X X X
134	6310	A326	м	5 - Details	001	6310-A326-M-5001	MECHANICAL DETAILS	X X X X X
135	6310	A326	GH	0 - General (Symbols Legends No	001	6210-A326-CH-0001	HVAG LEGEN ARDEVATION AND GENERAL MOTES	
136	6310	A326	G	1 - Plans	001	6310-A326-G-1001	AVAG - LCORNO, ADDREVIATION AND GENERAL MATEX	
137	6310	A326	G	1 - Plans	002	6310-A326-G-1002	GENERATOR BUILDING - FLOOR PLAN 3/16" = 1'-0'	X X X X X
138	6310	A326	G	1 - Plans	003	6310-A326-G-1003	GENERATOR BUILDING -ROOF PLAN 3/16" = 1'-0"	x x x x x
139	6310	A326	G	1 - Plans	004	6310-A326-G-1004	GENERATOR BUILDING -ROOF PLAN 3/16* = 1'-0*	X X X X X
140	6310	A326	G	2 - Arch Elevations	001	6310-A326-G-2001	COMBUSTION TURBINE DUCTWORK ELEVATIONS	x x x x x
141	6310	A326	H	3 Sections	001	6310-A326-H-3001	COMBUSTION TURBINE SECTIONS AND DETAILS	xxxxx
142	6310	A326	H	5 - Details	001	6310-A326-H-5001	EXISTING SUBSTATION MODIFICATIONS	XXXXX
144	6310	A326	H	6 - Schedules and Diagrams	002	6310-A326-H-5002	HVAC DENERGY SCHOOLE OF OPERATIONS	
145	6310	A326	H	6 - Schedules and Diagrams	002	6310-A326-H-6002	AIRFLOW SCHEMATICS	XXXXXX
-	-				_		PLUMBING	
146	6310	A326	GP	0 - General (Symbols, Legends, No	001	6310-A326-GP-0001	PLUMBGIN - LEGEND, ABBREVIATION AND GENERAL NOTE:	x x x x x x
148	6310	A326	P	1 - Plans	007	6310-A326-P-1001	GENERATOR BUILDING - FLOOR FLAN - 3/16 = 1'-0'	
149	6310	A326	P	1 - Plans	003	6310-A326-P-1003	GENERATOR BUILDING - ROOF PLAN - 3/16"=1'-0'	XXXXXX
150	6310	A326	P	1 - Plans	004	6310-A326-P-1004	GENERATOR BUILDING - ROOF PLAN - 3/16"=1'-0'	X X X X X
151	6310	A326	P	1 - Plans	005	6310-A326-P-1005	AMMONIA STORAGE AREA	xxxxx
152	6310	A326	P	5 - Details 6 - Schedules and Discover	001	6310-A326-P-5001	PLUMBING DETAILS	X X X X X
154	6310	A326	P	6 - Schedules and Diagrams	002	6310-A326-P-6002	PLUMBING SCHEDULES	x x x x x x
					-		ELECTRICAL	
155	6310	A326	GE	0 General (symbols, legends, no	001	6310-A326-GE-0001	LEGEND AND ABBREVIATIONS	x x x x x
150	6310	A326	E	1 Plans	001	6310-A326-E-1001 6310-A326-E-1002	ELECTRICAL STIE PLAN 1 = 50°	
158	6310	A326	E	1 - Plans	002	6310-A326-E-1002	ENLARGED ELECTRICAL SITE PLAN 1° = 30'	x x x x x
159	6310	A326	E	1 - Plans	004	6310-A326-E-1004	GENERATOR BUILDING \ CABLE TRAY LAYOUT	X X X X X
160	6310	A326	E	1 - Plans	005	6310-A326-E-1005	ELECTRICAL ROOM \ CABLE TRAY LAYOUT	x x x x x
161	6310	A326	E	1 Plans	006	6310-A326-E-1006	ELECTRICAL ROOM \ LAYOUT PLAN	X X X X X
163	6310	A326	E	1 - Plans	008	6310-A326-E-1007	GENERATOR BUILDING OFFRATING FLOOR FUNCH FLON	
164	6310	A326	E	1 - Plans	009	6310-A326-E-1009	GENERATOR BUILDING LIGHTING PLAN	x x x x x
165	6310	A326	E	1 - Plans	010	6310-A326-E-1010	GENERATOR BUILDING ENLARGED LIGHTING PLAN	<u>x x x x x</u>
166	6310	A326	E	1 - Plans	011	6310-A326-E-1011	OVERALL SITE GROUNDING GRID PLAN	x x x x x
167	6310	A326	F	1 - Plans	012	6310-A326-E-1012 6310-A326-E-1013	GENERATOR BUILDING - AREA GROUNDING PLAN GENERATOR BUILDING - ENLARGE GROUND BLANS	
169	6310	A326	E	1 - Plans	014	6310-A326-E-1014	GENERATOR BUILDING GROUNDING ROOF PLAN	X X X X X
170	6310	A326	E	1 — Plans	015	6310-A326-E-1015	SITE GROUNDING PLAN	x x x x x
171	6310	A326	E	1 - Plans	016	6310-A326-E-1016	BATTERY ROOM LAYOUT PLAN TURBINE BUILDING 1ST FLOOI	x x x x x
172	6310	A326	E	J - Sections	001	6310-A326-E-3001	DUCTBANK SCHEDULE AND SECTIONS	
174	6310	A326	E	3 - Sections	003	6310-A326-E-3003	4160 SWITCHGEAR ELEVATION	x x x x x
175	6310	A326	E	3 - Sections	004	6310-A326-E-3004	480V SUS ELEVATION	X X X X X
176	6310	A326	E	3 - Sections	005	6310-A326-E-3005	4BOV MCC ELEVATIONS (G1 & G2)	xxxxxx
177	6310	A326	E	3 Sections	006	6310-A326-E-3006	480V MCC ELEVATIONS (H1 & H2)	
179	6310	A326	E	5 - Details	002	6310-A326-E-5002	GROUNDING DETAILS	x x x x x
180	6310	A326	E	5 - Details	003	6310-A326-E-5003	GROUNDING DETAILS	X X X X X
181	6310	A326	E	5 — Details	004	6310-A326-E-5004	MANHOLE AND DUCTBANK DETAILS	xxxxx
182	6310	A326	E	5 - Details	005	6310-A326-E-5005	CONDULT AND CABLE TRAY DETAILS	
184	6310	A326	F	6 - Schedules and Diagrams	000	6310-A326-E-5006	POWER PHASING DIAGRAN	x x x x x
185	6310	A326	E	6 - Schedules and Diagrams	002	6310-A326-E-6002	13,800V PARALLELING SWGR A/B \ MAIN BREAKER (52MNA) \ SCHEMATIC WIRING DIAGRA	X X X X X
186	6310	A326	E	6 - Schedules and Diagrams	003	6310-A326-E-6003	13,800V PARALLELING SWGR A/B \ MAIN BREAKER (52MNA) \ SCHEMATIC WIRING DIAGRA	xxxxx
187	6310	A326	E	6 - Schedules and Diagrams	004	6310-A326-E-6004	13,800V PARALLELING SWGR A/B \ MAIN BREAKER (52MNB) \ SCHEMATIC WIRING DIAGRA	X X X X X
180	6310	A326	F	6 - Schedules and Diagrams	005	6310-A326-E-6005	13.800V PARALLELING SWGR A/B \ GENERATOR 1 BREAKER \ SCHEMATIC WIRING DIAGRAU	
190	6310	A326	E	6 - Schedules and Diagrams	007	6310-A326-E-6007	13, BOOV PARALLELING SWGR A/B \ GENERATOR 1 BREAKER \ SCHEMATIC WIRING DIAGRA	XXXXXX
191	6310	A326	E	6 - Schedules and Diagrams	008	6310-A326-E-6008	13,800V PARALLELING SWGR A/B \ GENERATOR 2 BREAKER \ SCHEMATIC WIRING DIAGRAM	x x x x x
192	6310	A326	E	6 - Schedules and Diagrams	009	6310-A326-E-6009	13,800V PARALLELING SWGR A/B \ GENERATOR 2 BREAKER \ SCHEMATIC WIRING DIAGRA	XXXXXX

Sheel Number	Cast Center	Contract No	Discipline Code	Sheet Type	Sequence No.	Drawing No.	Drawing Tille	at's Solemitral cos - Solemitral etr.s Solemitral 1001. Solemitral Conformed Solemitral
100	0040	1000	-		1			
193	6310	A326	E	6 - Schedules and Diagrams	010	6310-A326-E-6010	13,800V PARALLELING SWGR A/B \ GENERATOR 3 BREAKER \ SCHEMATIC WIRING DIAGRA	xxxxx
194	6310	A320	E	6 - Schedules and Diagrams	011	6310-A326-E-6011	13,800V PARALLELING SWER A/B \ GENERATOR 3 BREAKER \ SCHEMATIC WIRING DIAGRA	X X X X X
195	6310	A326	E	6 Schedules and Diagrams	012	6310-A326-E-6012	13, BOOV PAPALLELING SWEH A/B (A/B 11E BREAKER (52/AB1)) SCHEMATIC WIRING DIAGRA	XXXXX
197	6310	A326	E	6 - Schedules and Diagrams	014	6310-A326-E-6014	13 BOOV PARALLELING SHOP A/S (A/S 112 BREAKEN (STABL) (SCHEMATIC WIDTAG DIAGRA	
198	6310	A326	E	6 - Schedules and Diagrams	015	6310-A326 F-6015	13. BOOV PARALLETING SWGR ATR \ ATR TTE BREAKER (527AB2) \ SCHEMATIC WIRING DIAGRA	
199	6310	A326	E	6 - Schedules and Diagrams	016	6310-A326-E-6016	13. BOOV PARALLELING SWGR V TYP TRANSFORMER FEEDER BREAKER V SCHEMATIC WIRING DIAGRA	2 2 2 2 2 2
200	6310	A326	E	6 Schedules and Diagrams	017	6310-A326-E-6017	13,800V PARALLELING SWGR \ TYP TRANSFORMER FEEDER BREAKER \ SCHEMATIC WIRING DIAGRA	XXXXXX
201	6310	A326	E	6 - Schedules and Diagrams	018	6310-A326-E-6018	CONDUIT AND CABLE SCHEDULES	X X X X X
202	6310	A326	E	6 Schedules and Diagrams	019	6310-A326-E-6019	CONDUIT AND CABLE SCHEDULES	XXXXXX
203	6310	A326	E	6 - Schedules and Diagrams	020	6310-A326-E-6020	CONDUIT AND CABLE SCHEDULES	X X X X X
204	6310	A326	E	6 - Schedules and Diagrams	021	6310-A326-E-6021	CONDUIT AND CABLE SCHEDULES	XXXXXX
205	6310	AJ20	E	6 Schedules and Diagrams	022	6310-A326-E-6022	CONDUTT AND CABLE SCHEDULES	XXXXX
200	6310	A320	E	6 - Schedules and Diagrams	023	6310-A320-E-0023	CONDULT AND CABLE SCHEDULES	
208	6310	A326	F	6 - Schedules and Diagrams	025	6310-A326-E-6024	COMPUTE AND CABLE SCHEDULES	
209	6310	A326	E	6 - Schedules and Diagrams	026	6310-A326-E-6026	CONDUIT AND CABLE SCHEDULES	2 2 2 2 2 2 2
210	6310	A326	E	6 - Schedules and Diagrams	027	6310-A326-E-6027	CONDUIT AND CABLE SCHEDULES	XXXXXX
211	6310	A326	E	6 Schedules and Diagrams	028	6310-A326-E-6028	CONDUIT AND CABLE SCHEDULES	x x x x x
212	6310	A326	E	6 - Schedules and Diagrams	- 029	6310-A326 E-6029	CONDUIT AND CABLE SCHEDULES	XXXXXX
213	6310	A326	E	6 - Schedules and Diagrams	030	6310-A326-E-6030	CONDUIT AND CABLE SCHEDULES	XXXXXX
214	6310	A326	E	6 - Schedules and Diagrams	031	6310-A326-E-6031	CONDUIT AND CABLE SCHEDULES	xxxxxx
215	6310	A326	E	6 - Schedules and Diagrams	032	6310-A326-E-6032	PANEL BOARD SCHEDULES (1 of 2)	X X X X X
210	6210	A320	E	6 Schedules and Diagrams	033	6310-A320-E-6033	PANEL BUARD SCHEDULES (2 0T 2)	
218	6310	A326	E	7 - Schematics (One-Lines Block	004	6310-A320-E-0034	LIURTING FIXIURE SCREDULE	
219	6310	A326	F	7 - Schematics (One-Lines, Block	002	6310-A326-E-7007	ONE I THE NETERING AND BELAVING DIAGRAM \ 13.8 KV PARALLELING SWITCHGEAR BUS A	x x x x
220	6310	A326	E	7 - Schematics (One-Lines, Block	003	6310-A326-E-7003	ONE LINE METERING AND RELAYING DIAGRAM \ 13.8 KV PARALLELING SWITCHGEAR TIE BU	XXXXXX
221	6310	A326	E	7 - Schematics (One-Lines, Block	004	6310-A326-E-7004	ONE LINE METERING AND RELAYING DIAGRAM \ 13.8 KV PARALLELING SWITCHGEAR BUS B	XXXXXX
222	6310	A326	E	7 - Schematics (One-Lines, Block	005	6310-A326-E-7005	ONE LINE METERING AND RELAYING \ GENERATORS -1, -2, -3	XXXXXX
223	6310	A326	E	7 - Schematics (One-Lines, Block	006	6310-A326-E-7006	THREE LINE DIAGRAM \ GENERATOR 1	xxxxx
224	6310	A326	E	7 - Schematics (One-Lines, Block	007	6310-A326-E-7007	THREE LINE DIAGRAM \ GENERATOR 2	X X X X X
225	6310	A320	E	7 - Schematics (One-Lines, Block	008	6310-A326-E-7008	IMMEE LINE DIALGHAM \ GENEMATOR S	
227	6310	A326	F	7 - Schematics (Ope-Lines, Block	010	6310-A326-E-7003	4160 V SINGLE LINE DIAGRAU (2052)	
228	6310	A326	E	7 - Schematics (One-Lines, Block	011	6310-A326-E-7011	HOV SUS SINGLE LINE DIAGRAM	X X X X X
229	6310	A326	E	7 - Schematics (One-Lines, Block	012	6310-A326-E-7012	480V MCC SINGLE LINE DIAGRAM 1	x x x x x
230	6310	A326	E	7 - Schematics (One-Lines, Block	013	6310-A326-E-7013	4BOV MCC SINGLE LINE DIAGRAM 2	X X X X X
231	6310	A326	E	7 - Schematics (One-Lines, Block	014	6310-A326-E-7014	ABOV MCC SINGLE LINE DIAGRAM 3	X X X X X
232	6310	A326	E	7 - Schematics (One-Lines, Block	015	6310-A326-E-7015	480V MCC SINGLE LINE DIAGRAM 4	x x x x x
233	6310	A326	E	7 - Schematics (One-Lines, Block	016	6310-A326-E-7016	MISCELLANEOUS ONE -LINE DIAGRAMS	X X X X X
234	6310	A326	E	7 - Schematics (One-Lines, Block	017	6310 -A326 -E-7017	MISCELLANEOUS UNE-LINE DIAGRAMS	
235	6310	A326	F	7 - Schematics (One-Lines, Block	019	6310-A326-E-7018	MISCELEVERUS UTE-LINE DIADAVAS (180) MISCELEVERUS UTE-LINE DIADAVAS (180)	
237	6310	A326	E	7 - Schematics (One-Lines Block	020	6310-A326-E-7020	MISCELLANFOUS DNE-LINE DIAGRAMS (IBC)	XXXXXX
238	6310	A326	E	7 - Schematics (One-Lines, Block	021	6310-A326-E-7021	MISCELLANEOUS ONE-LINE DIAGRAMS (I&C)	X X X X X
239	6310	A326	E	7 - Schematics (One-Lines, Block	022	6310-A326-E-7022	MISCELLANEOUS ONE-LINE DIAGRAMS (I&C)	X X X X X
240	6310	A326	E	7 - Schematics (One-Lines, Block	023	6310-A326-E-7023	MISCELLANEOUS ONE-LINE DIAGRAMS (IBC)	X X X X X
241	6310	A326	E	7 - Schematics (One-Lines, Block	4 024	6310-A326-E-7024	DC SYSTEM SINGLE LINE DIAGRAM BATTERY ROOM	x x x x x
242	6310	A326	E	7 - Schematics (One-Lines, Block	025	6310-A326-E-7025	SCHEMATICS	X X X X X
243	6310	A326	E	7 - Schematics (One-Lines, Block	026	6310-A326-E-7026	SCHEMATICS	
244	6310	A326	F	7 . Schematics (One-Lines, Block	027	6310-A326-E-7027	SCHEMATICS	
246	6310	A326	E	7 - Schematics (One-Lines, Block	029	6310-A326-E-7029	SCHEMATICS	x x x x x
247	6310	A326	E	7 - Schematics (One-Lines, Block	030	6310-A326-E-7030	SCHEMATICS	X X X X X
248	6310	A326	E	7 - Schematics (One-Lines, Block	031	6310-A326-E-7031	SCHEMATICS	X X X X X
249	6310	A326	E	7 - Schematics (One-Lines, Block	032	6310-A326-E-7032	SCHEMATICS	X X X X X
250	6310	A326	E	7 - Schematics (One-Lines, Block	033	6310-A326-E-7033	SCHEMATICS	x x x x x
251	6310	A326	E	7 - Schematics (One-Lines, Block	034	6310-A326-E-7034	SCHEMATICS	X X X X X 251 251 251 251 251

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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1	6310	A326	G	0 - General	000	6310-A326-G-0000	COVER SHEET	X	X	X	X	X
3 610 A226 6 0 c fameral 002 6310 A236 6.0 0 c fameral (km) x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x	2	6310	A326	6	0 - General	001	6310-A326-G-0001	SHEET LIST - 1 OF 1	X	X	X	X	X
4 6310 A28 6 0 - General (Symbols, Lege 03 8310-A328-G-00.03 A389-KARD CUV 5 6510 A328 GC 0 General (Symbols, Lege 001 6310-A328-GC.0001 GENERAL MOTES X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	3	6310	A326	G	0 - General	002	6310-A326-G-0002	GENERAL NOTES	X	X	X	X	X
6 67:0 A226 67:0 GC 6 67:0 A227 67:0 General (Symbols, Loge 001 6310-A326-GC-0001 GENERAL NOTES 6 6371 A327 GC 0 General (Symbols, Loge 002 6311-A326-GC-0001 GENERAL NOTES X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	4	6310	A326	G	0 - General (Symbols, Lege	003	6310-A326-G-0003	ABBREVIATIONS AND GENERAL SYMBOLS	X	X	X	X	X
5 6370 A326 GC 0 cameral (symbols, Lege) 001 6371-A327 G.0002 GERRAL NOTES X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X<			_					CIVIL					
6 6371 A127 GC 0 - General (Symbols, Log) 002 6371-A327.GC 0002 General (Symbols, Log) X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	5	6310	A326	GC	0 - General (Symbols, Lege	001	6310-A326-GC-0001	GENERAL NOTES	X	X	X	X	X
T 6372 A328 C 1 Plans 001 6512-A328-0-1002 EVESTING FILE LOAN - 1* = 200' B 63714 A330 C 1 Plans 002 6513-A320-0-1002 EVESTING FILE LOAN TON SITE PLAN - 1* = 200' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <th< td=""><td>6</td><td>6311</td><td>A327</td><td>GC</td><td>0 - General (Symbols, Lege</td><td>002</td><td>6311-A327-GC-0002</td><td>GENERAL SYMBOLS, ABOREVIATIONS AND NOTES</td><td>x</td><td>X</td><td>X</td><td>X</td><td>X</td></th<>	6	6311	A327	GC	0 - General (Symbols, Lege	002	6311-A327-GC-0002	GENERAL SYMBOLS, ABOREVIATIONS AND NOTES	x	X	X	X	X
B 65713 A329 C I Plans 002 6517 A320 - C1002 EXISTING SITE PLAN<1*= 50' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <thx< th=""></thx<>	7	6312	A328	C	1 - Plans	001	6312-A328-C-1001	OVERALL SITE PLAN - 1* = 200'	X	X	X	X	X
9 6314 A330 C 1 Plans 003 6314-A330-C103 EXISTING PILE LOCATION OVERALL PLAN - 1" = 20" X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	8	6313	A329	C	1 - Plans	002	6313-A329-C-1002	EXISTING SITE PLAN : 1" = 50'	X	X	X	X	X
10 6375 A331 C 1 Plens 004 6515 + A332 - C1004 EXISTING PLLE LOCATION ENLARGE PLAN 1 OF 3 - 1" = 40" X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	9	6314	A330	C	1 - Plans	003	6314-A330-C-1003	EXISTING PILE LOCATION OVERALL PLAN = 1* = 200'	X	X	X	X	X
11 6316 A332 C 1 - Plans 005 6316 - A32 - C1005 EXISTING PLLE LOCATION - ENLANGED PLAN 2 OF 3 - 1" = 40' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <td>10</td> <td>6315</td> <td>A331</td> <td>C</td> <td>1 - Plans</td> <td>004</td> <td>6315-A331-C-1004</td> <td>EXISTING PILE LOCATION - ENLARGED PLAN 1 OF 3 - 1" = 40'</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td>	10	6315	A331	C	1 - Plans	004	6315-A331-C-1004	EXISTING PILE LOCATION - ENLARGED PLAN 1 OF 3 - 1" = 40'	X	X	X	X	X
12 6317 A333 C 1 Plans 006 6317 A334 C: 010 EXISTING PLLE LOCATION - ENLARGED PLAN 3 OF 3 - 1° = 40° 13 6316 A334 C 1 Plans 007 6318 A334 C: 010 Plans 008 6317 A334 C: 010 DEMOLITION STADING AREA 1 OF 2 - 1° = 40° X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <td>11</td> <td>6316</td> <td>A332</td> <td>C</td> <td>1 - Pians</td> <td>005</td> <td>6316-A332-C-1005</td> <td>EXISTING PILE LOCATION - ENLARGED PLAN 2 OF 3 - 1" = 40'</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td>	11	6316	A332	C	1 - Pians	005	6316-A332-C-1005	EXISTING PILE LOCATION - ENLARGED PLAN 2 OF 3 - 1" = 40'	X	X	X	X	X
13 6318 A334 C 1 Plans 007 6318-A33-(C-1007) DEWOLTTION STAGING AREA 1 OF 2 · 1* = 40' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	12	6317	A333	C	1 · Plans	006	6317-A333-C-1006	EXISTING PILE LOCATION - ENLARGED PLAN 3 OF 3 - 1" = 40'	X	X	X	X	X
14 6379 A335 C 1 Plans 008 6519-A335-C-1008 DEMOLITION STAING ARE 2 OF 2 - 1" = 40' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	13	6318	A334	C	1 - Plans	007	6318-A334-C-1007	DEMOLITION STAGING AREA 1 OF 2 - 1" = 40'	X	X	X	X	X
15 6320 A336 C 1 Plans 009 632(-A336-C-1009 EXISTING SEDIMENTATION BASIN OVERALL PLAN<-1* = 40' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <thx< th=""> X X X<</thx<>	14	6319	A335	C	1 Plans	800	6319-A335-C-1008	DEMOLITION STAGING AREA 2 OF 2 1" = 40'	X	X	X	X	X
16 6321 A337 C 1 - Plans 010 6322 + A33 - C + 1010 EXISTING SEDIMENTATION BASIN ENLARGED PLAN 1 OF 2 - 1° = 40° X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <th< td=""><td>15</td><td>6320</td><td>A336</td><td>C</td><td>1 - Plans</td><td>009</td><td>6320-A336-C-1009</td><td>EXISTING SEDIMENTATION BASIN OVERALL PLAN - 1" = 40'</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></th<>	15	6320	A336	C	1 - Plans	009	6320-A336-C-1009	EXISTING SEDIMENTATION BASIN OVERALL PLAN - 1" = 40'	X	X	X	X	X
17 6322 A338 C 1 6322-A338-C-1011 EXISTING SEDIMENTATION BASIN ENLARGED PLAN 2 OF 2 - 1" = 40' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <t< td=""><td>16</td><td>6321</td><td>A337</td><td>C</td><td>1 - Plans</td><td>010</td><td>6321-A337-C-1010</td><td>EXISTING SEDIMENTATION BASIN = ENLARGED PLAN 1 OF 2 - 1" = 40"</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></t<>	16	6321	A337	C	1 - Plans	010	6321-A337-C-1010	EXISTING SEDIMENTATION BASIN = ENLARGED PLAN 1 OF 2 - 1" = 40"	X	X	X	X	X
23 6323 A339 C 1 - Plans 012 6324-A339-C-1012 EXCAVATION PLAN 1 OF 2 24 6324 A340 C 1 - Plans 013 6324-A330-C-1013 EXCAVATION PLAN 1 OF 2 25 6325 A341 C 1 - Plans 014 6325-A342-C-1013 EXCAVATION PLAN 2 OF 2 X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <td< td=""><td>17</td><td>6322</td><td>A338</td><td>C</td><td>1 - Plans</td><td>011</td><td>6322-A338-C-1011</td><td>EXISTING SEDIMENTATION BASIN - ENLARGED PLAN 2 OF 2 - 1" = 40'</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></td<>	17	6322	A338	C	1 - Plans	011	6322-A338-C-1011	EXISTING SEDIMENTATION BASIN - ENLARGED PLAN 2 OF 2 - 1" = 40'	X	X	X	X	X
24 6324 A340 C 1 - Plans 013 6324 A340-C-1013 EXCAVATION PLAN 2 OF 2 25 6325 A341 C 1 - Plans 014 6325-A341-C-1014 RETAINING WALL PLAN 28 6326 A342 C 1 - Plans 015 6326-A342-C-1015 TRAFFIC MANAGEMENT PLAN X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	23	6323	A339	C	1 - Plans	012	6323-A339-C-1012	EXCAVATION PLAN 1 OF 2	X	X	X	X	X
25 6325 A341 C 1 - Plans 014 6325-A341-C-1014 RETAINING WALL PLAN X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	24	6324	A340	C	1 - Plans	013	6324-A340-C-1013	EXCAVATION PLAN 2 OF 2	X	X	X	X	X
28 6326 A342 C 1 - Plans 015 65226.A342-C-1015 TRAFIC LMANGEMENT PLAN GENERAL NOTES X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	25	6325	A341	C	1 - Plans	014	6325-A341-C-1014	RETAINING WALL PLAN	X	X	X	X	X
30 6327 A343 C 1 - Plans 016 6327.A34.3 - C 1016 EROSION AND SEDIMENT CONTROL PLAN GENERAL NOTES X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <t< td=""><td>28</td><td>6326</td><td>A342</td><td>C</td><td>1 - Plans</td><td>015</td><td>6326-A342-C-1015</td><td>TRAFFIC WANAGEMENT PLAN</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></t<>	28	6326	A342	C	1 - Plans	015	6326-A342-C-1015	TRAFFIC WANAGEMENT PLAN	X	X	X	X	X
29 6328 A344 C 1 - Plans 017 6328 A344-C-1017 EROSION AND SEDIMENT CONTROL PLAN 18 6329 A345 C 3 - Sections 001 6329 A345-C-3001 EXISTING SEDIMENTATION BASIN & COMBUT PROFILE - 1* = 40* X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	30	6327	A343	C	1 - Plans	016	6327-A343-C-1016	EROSION AND SEDIMENT CONTROL PLAN - GENERAL NOTES	X	X	X	X	X
18 6329 A345 C 3 - Sections 001 65329-A345-C-3001 EXISTING SEDIMENTATION BASIN & COMDULT PROFILE - 1* = 40' X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X<	29	6328	A344	C	1 - Plans	017	6328-A344-C-1017	EROSION AND SEDIMENT CONTROL PLAN	X	X	X	X	X
19 6330 A346 C 3 Sections 002 6330-A346-C-3002 EXISTING SEDIMENTATION BASIN SECTIONS 1 OF 2 20 6331 A347 C 3 Sections 003 6331-A347-C-3002 EXISTING SEDIMENTATION BASIN SECTIONS 1 OF 2 X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	18	6329	A345	C	3 - Sections	001	6329-A345-C-3001	EXISTING SEDIMENTATION BASIN & CONDUIT PROFILE - 1" = 40"	X	X	X	X	X
20 0331 A347 C 3 - Sections 003 6331-A347-C-3003 EXISTING SEDIMENTATION BASIN SECTIONS 2 0F2 X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <thx< td=""><td>19</td><td>6330</td><td>A346</td><td>C</td><td>3 - Sections</td><td>002</td><td>6330 · A346 · C - 3002</td><td>EXISTING SEDIMENTATION BASIN SECTIONS 1 OF 2</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></thx<>	19	6330	A346	C	3 - Sections	002	6330 · A346 · C - 3002	EXISTING SEDIMENTATION BASIN SECTIONS 1 OF 2	X	X	X	X	X
Zé 6332 A34b C 3 - Sections 004 6332-A348-C-3004 RETAINING WALL SECTIONS X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	20	6331	A247	C	3 - Sections	003	6331-A347-C-3003	EXISTING SEDIMENTATION BASIN SECTIONS 2 0F2	X	X	X	X	X
21 6333 A349 C S Details 001 6333-A349-C-5001 EXISTING SEDIMENTATION BASIN DETAILS 1 OF 2 22 6334 A350 C S Details 002 6334-A350-C-5002 EXISTING SEDIMENTATION BASIN DETAILS 2 OF 2 X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <td< td=""><td>26</td><td>6332</td><td>A348</td><td>C</td><td>3 - Sections</td><td>004</td><td>6332-A348-C-3004</td><td>RETAINING WALL SECTIONS</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></td<>	26	6332	A348	C	3 - Sections	004	6332-A348-C-3004	RETAINING WALL SECTIONS	X	X	X	X	X
22 6334 A350 C 5 - Details 002 6334 - A350 - C - 5002 EXISTING SEDIMENTATION BASIN DETAILS 2 OF 2 25 6335 A351 C 5 - Details 003 6335 - A351 - C-5003 EXISTING SEDIMENTATION BASIN DETAILS 2 OF 2 X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X <td< td=""><td>21</td><td>6333</td><td>A349</td><td>C</td><td>5 - Details</td><td>001</td><td>6333-A349-C-5001</td><td>EXISTING SEDIMENTATION BASIN DETAILS 1 OF 2</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></td<>	21	6333	A349	C	5 - Details	001	6333-A349-C-5001	EXISTING SEDIMENTATION BASIN DETAILS 1 OF 2	X	X	X	X	X
25 6335 A351 C S Details 003 6335.A351-C-5003 EXCMATION DETAILS 27 6336 A352 C S Details 004 6336.A352-C-5004 RETAINING WALL DETAILS X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	22	6334	A350	C	5 - Details	002	6334-A350-C-5002	EXISTING SEDIMENTATION BASIN DETAILS 2 OF 2	X	X	X	X	X
27 6336 A352 C 5 Details 004 6336-A352-C-5004 RETAINING WALL DETAILS X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X	25	6335	A351	C	5 - Details	003	6335-A351-C-5003	EXCAVATION DETAILS	X	X	X	X	X
31 6337 A353 C 5 - Details 005 6337-A353-C-5005 EROSION AND SEDIMENT CONTROL DETAILS 1 32 6338 A354 C 5 - Details 006 6338-A354-C-5006 EROSION AND SEDIMENT CONTROL DETAILS 1	27	6336	A352	C	5 - Details	004	6336-A352-C-5004	RETAINING WALL DETAILS	X	X	X	X	X
32 6338 A354 C 5 Details 006 6338-A354-C-5006 EROSION AND SEDIMENT CONTROL DETAILS 2	31	6337	A353	C	5 - Details	005	6337-A353-C-5005	EROSION AND SEDIMENT CONTROL DETAILS 1	X	X	X	X	X
	32	6338	A354	C	5 - Details	006	6338-A354-C-5006	EROSION AND SEDIMENT CONTROL DETAILS 2	X	X	X	X	X

PASSAIC VALLEY SEWERAGE COMMISSION STANDBY POWER PLANT PROJECT

BLACK & VEATCH | CDM SMITH SUMMARY OF TOTAL MANDAY ESTIMATE ("ATTACHMENT G")

						Estimate of	f Man Days				
	DESCRIPTION OF WORK	Project Director	Technical Advisor	Project Manager	Project Engineer	Principal Engineer	Engineer	Designer	Technician	Support	Total Man Days
K	Staff Name>	See Staff Category Sheet	See Staff Category Sheet	See Staff Category Sheet	See Staff Category Sheet	See Staff Category Sheet					
H. Shink C.	Hourly Rates>	\$ 256.10	\$ 288.29	\$ 217.13	\$ 177.01	\$ 149.40	\$ 130.15	\$ 128.89	\$ 124.04	\$ 106.17	
Task 1	Review and Compilation of Data		200.200.00								
11 I. J.	I Investigation	1.8	0.8	7.5	65.9	15.0	1.0	3.8	0.0	0.8	96.4
Task 2	Project Work Plan and Reporting										
2.	Project Work Plan	17.0	2.8	120.8	77.0	0.0	232.5	2.5	0.0	41.0	493.5
Task 3	Design Services										
3.	1 Design	14.5	24.5	93.8	639.9	977.9	207.3	370.0	318.4	3.3	2,649.4
3.	2 Meetings	5.0		18.5	77.9	10.0		5.0			116.4
3.	3 Value Engineering	2.0	2.0	4.6	28.0	0.0		1.1.1.1.2.4	1	0.5	37.1
3.	4 Permitting			16.5	77.0	1	÷	-		5.0	98.5
3.	5 Bidding Assistance	0.5		6.3	41.1	26.8	15.0	-	5.0		94.6
Task 4	Design Services During Construction (DSDC								and the second second		
4.	1 Notice to Proceed	14	1.0	5.0	3.0				-		8.0
4.	2 Liaison and Administration	1.0		12.5	10.0	5.0	12.0			0.5	41.0
4.	3 Meetings	5.0		20.0	43.0	17.0	6.0	1			91.0
4.	4 Baselines and Benchmarks	4	1	11 A.	1	100 C		5.0	· · · · ·		5.0
4.	5 Approval of Manufacturers/Vendors				14.3	8.0				-	22.3
4.	6 Shop Drawings		0.4	2.0	92.4	175.1	25.9	34.4		1.0	331.1
4.	7 Contractor Initiated Substitutions	-			18.1	31.4	5.0	3.8	-	-	58.3
4.	8 Testing		0.8		73.3	11.3			*		85.3
4.	9 RFI's & Field Orders		0.4	4.0	33.1	31.6	11.0	5.0		1	85.1
4.1	0 Change Orders	-	1.000	7.8	14.8	5.5	8.0	1			36.0
4.1	Payment Requests		5	4.4	7.5	1.3	6.0	1.6			19.1
4.1	2 Start-Up Services	1.1	1 L	3.8	130.6	18.8		4	211	-21	153.1
4.1	3 Post Construction Assistance			4.3	23.4	26.5	4.5	14.0	26.3	-	98.9
	Subtotal Tasks 1 through 4	46.8	31.5	331.5	1.470.1	1.361.0	534.1	443.4	349.6	52.0	4,620.0
Task 5	Work)	10.0				110.000					
5	1 Resident Project Representative	-	3.0		500.0	-	-		-	áci.	503.00
5	2 Part Time Administrative Assistant		5.0		50070	-				130.0	130.00
5	3 Specialty Inspection Services	-			79.4						79.38
5.	Subtatal Tack S		3.0		579.4		1			130.0	712 38
	Subtoral Task 3		5.0		513.4					150.0	11212/0

Total Man Day Estimate 5,332.38

May 26, 2016

ATTACHMENT A

CERTIFICATION OF INSURANCE

I HEREBY CERTIFY THAT MY OFFICE CARRIES INSURANCE ADEQUATE TO COVER PASSAIC VALLEY SEWERAGE COMMISSION ("PVSC") AND PROTECT PVSC FOR ANY ERROR OR OMISSION BY THE UNDERSIGNED THAT CREATES LIABILITY TO PVSC. THIS INCLUDES ERRORS AND OMISSIONS POLICY AND ANY OTHER TYPE OF POLICY <u>WHATSOEVER</u> THAT CAN BE UTILIZED TO PROTECT THE INTERESTS OF PVSC. I HAVE ATTACHED HERETO COPIES OF THE DECLARATION PAGES OF EACH SUCH POLICY THAT I ASSERT DOES OR CAN PROTECT ANY ERROR, OMISSION OR ACTIVITY IN WHICH I OR ANYONE FROM MY OFFICE MIGHT ENGAGE ON BEHALF OF PVSC.

I FURTHER CERTIFY THAT THE POLICIES OF INSURANCE THAT ARE CARRIED BY MY OFFICE SHALL CONTINUE TO BE CARRIED DURING THE ENTIRE TERM OF MY APPOINTMENT AS <u>DESIGN SERVICES AND DESIGN SERVICES DURING</u> <u>CONSTRUCTION FOR A STANDBY POWER PLANT</u>, IN THE EVENT THAT MY OFFICE IS SELECTED TO SERVE IN THAT CAPACITY. IN THE EVENT THAT THE DECLARATIONS PAGE(S) SUBMITTED HEREWITH SHOWS THE POLICY OR POLICIES OF INSURANCE WILL LAPSE DURING THE COURSE OF THE TERM OF MY APPOINTMENT, I WILL PROVIDE TO PVSC A COPY OF THE RENEWAL POLICY DECLARATION PAGE. I FURTHER CERTIFY THAT THE RENEWED POLICY SHALL HAVE THE SAME OR GREATER LIMITS OF LIABILITY AS THE ONE PROVIDED FOR THE BEGINNING OF MY APPOINTMENT.

CERTIFYING OFFICIAL:

NAME: Brent Reuss, P.E.

TITLE:	Vice President
SIGNAT	URE: ASA
DATE:	5/12/14

ATTACHMENT B

CONFLICT OF INTEREST CERTIFICATION

THE UNDERSIGNED CERTIFIES TO PASSAIC VALLEY SEWERAGE COMMISSION ("PVSC"), COUNTY OF ESSEX, STATE OF NEW JERSEY THAT IN PERFORMING SERVICES TO PVSC HE/SHE IS AWARE OF NO CIRCUMSTANCE THAT WOULD CONSTITUTE A CONFLICT OF INTEREST, FINANCIAL OR OTHERWISE, BETWEEN HIMSELF/HERSELF (OR HIS/HER FIRM) AND THE INTERESTS OF PVSC. THE UNDERSIGNED CERTIFIES THAT HE/SHE HAS MADE A SEARCH OF HIS/HER FIRM'S CLIENT BASE AND HAS EXECUTED THIS CERTIFICATION SUBSEQUENT TO SUCH SEARCH.

THE UNDERSIGNED ACKNOWLEDGES THIS IS A CONTINUING CERTIFICATION, AND SHALL REMAIN IN EFFECT FOR THE TERM OF THE SERVICES CONTAINED IN THE SOLICITED REQUEST FOR PROPOSAL. I CERTIFY THAT THE FOREGOING STATEMENTS MADE BY ME ARE TRUE. I AM AWARE THAT IF ANY OF THE FOREGOING STATEMENTS MADE BY ME ARE FALSE, PVSC IS FREE TO TERMINATE ANY PROFESSIONAL SERVICES AGREEMENT ENTERED INTO WITH THE UNDERSIGNED AND/OR HIS OR HER FIRM.

Applicant

Signature:

Typed: Brent Reuss, P.E.

Firm Name: Black & Veatch Corporation

W/

Title: Vice President

Date: 5/12/16

ATTACHMENT F

P.L.1975.C.127 (N.J.A.C. 17:27) MANDATORY AFFIRMATIVE ACTION LANGUAGE PROCUREMENT, PROFESSIONAL AND SERVICES CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will take affirmative action to ensure that such applicants are recruited and employed, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor, where applicable, will send to each labor union or representative or workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

The contractor or subcontractor agrees to make good faith efforts to employ minority and women workers consistent with the applicable county employment goals established in accordance with N.J.A.C. 17:27-5.2, or a binding determination of the applicable county employment goals determined by the Division, pursuant to N.J.A.C. 17:27-5.2.

The contractor or subcontractor agrees to inform in writing its appropriate recruitment agencies including, but not limited to, employment agencies, placement bureaus, colleges, universities, labor unions, that it does not discriminate on the basis of age, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, and that it will discontinue the use of any recruitment agency which engages in direct or indirect discriminatory practices.

ATTACHMENT F (Cont.)

The contractor or subcontractor agrees to revise any of its testing procedures, if necessary, to assure that all personnel testing conforms with the principles of job-related testing, as established by the statutes and court decisions of the State of New Jersey and as established by applicable Federal law and applicable Federal court decisions.

In conforming with the applicable employment goals, the contractor or subcontractor agrees to review all procedures relating to transfer, upgrading, downgrading and layoff to ensure that all such actions are taken without regard to age, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, consistent with the statutes and court decisions of the State of New Jersey, and applicable Federal law and applicable Federal court decisions.

The contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

Letter of Federal Affirmative Action Plan Approval

Certificate of Employee Information Report

Employee Information Report Form AA302

The contractor and its subcontractors shall furnish such reports or other documents to the Div. of Contract Compliance & EEO as may be requested by the office from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Div. of Contract Compliance & EEO for conducting a compliance investigation pursuant to <u>Subchapter 10 of the Administrative Code</u>

ATTACHMENT I

ACKNOWLEDGEMENT OF RECEIPT OF CLARIFICATIONS

The undersigned Respondent hereby acknowledges receipt of the following clarifications to the Request for Qualifications and Compensation (Fee) Proposal. By indicating date of receipt, Respondent acknowledges the submitted qualifications and proposal takes into account the provisions of the issued clarification(s). Note that the PVSC's record of clarification(s) issued shall take precedence and that failure to include provisions of changes in qualifications and proposal may be submit for rejection of the qualifications and proposal.

PROFESSIONAL SERVICES FOR DESIGN SERVICES AND DESIGN SERVICES DURING CONSTRUCTION FOR A STANDBY POWER PLANT

Directions: Complete Part I or Part II, whichever is applicable

CLARIFICATION RECEIVE RFQ/RFP:	D IN CONNECTION W	ITH THIS
CLARIFICATION #1, DATED	9 <u>May</u>	,2016
CLARIFICATION #2, DATED	13 May	, 2016
CLARIFICATION #3, DATED	18 May	, _2016
CLARIFICATION #4, DATED		

PART II: _____NO CLARIFICATION WAS RECEIVED IN CONNECTION WITH THIS RFQ/RFP.

DATE: 5/25/2016

NAME Stephen Tarallo

SIGNATURE

Resumes

Jeff J. Austin, P.E., P.Eng.	L
William S Blair	3
Cameron L. Bryant, P.E., S.E., P.Eng.	5
Kevin M. Cahill, P.E., LEED AP BD+C	7
Randy W. Fiorucci, P.E	L
Douglas R. Friedel, PE, CEM, DCEP	3
Michael Craig Hums, P.E1	5
Brian C. Huska, P.E	7
Michael S. Johnson, P.E	9
Mark J. Kleveter, P.E	L
Domenick A. Loschiavo, P.E	3
James A. McCaw, Jr., P.E	5
David S. Modi, P.E., P. Eng	7
Louis E. Nemeth, R.A., CSI, LEED AP	9
Sai B Peyyeti, P.E., CCCA	L
Jeffrey V. Nickerson, P.E	3
Larry D. Pittman, P.E	5
Scot E. Pruett, P.E	7
Kathryn H. Robinson	9
John K. Ruhl, P.E	L
Nicholas Salem, PE, LEED® AP	3
Michael B. Shafer, P.E	5
Joseph R. Stromwall, P.E	7
Toby B. Strout, B.S.E.E , M.B.A	9
Jeff D. Szymanski, P.E., INCE Bd. Cert51	L
Stephen Tarallo, ENV SP	3
Siegfried E. Tast, P.E	5
Dennis J. Trupka, R.A., NCARB	7
Andrew J. Truman, P.E	9
Joseph E. Veilleux, P.E	L
Paul M. Zink	3
Robert Bunting, P.E	5
Patricia Forgang, CHMM67	7
Robert J. Klein, P.E	9
Tom Laustsen, P.E., BCEE)
Kevin G. McEvoy	3
Kapila S. Pathirage, PhD, PE, PEng	5
Virginia Roach, P.E., BCEE	7
Amit K. Sen, PE	3
Chris DuPont8	L



Jeff J. Austin, P.E., P.Eng.

Steven Jeffrey (Jeff) Austin is an Electrical Engineer within Black & Veatch's Energy business. Jeff has 7 years of experience as a commercial electrician and 15 years of experience as an electrical engineer. Engineering experience includes generator test witnessing, managing electrical teams, performing design calculations such as Arc-Flash Analysis, Short Circuit Analysis, Load Flow Analysis, Motor Starting Analysis, Relay Coordination, Cable Sizing, Ground Grid Sizing and more. Jeff has also written equipment technical specifications and created one-line diagrams, three-line diagrams, metering and relay diagrams, schematics and wiring diagrams.

PROJECT EXPERIENCE

Duke Energy; Roxboro Dust Mitigation; Roxboro, NC | 2015

Lead Electrical Engineer. Managed team of electrical engineers and electrical designers to make necessary modifications to upgrade electrical devices and equipment in Class II, Hazardous Classified Areas. The project involved replacing and/or repairing condulets, electrical enclosures and panelboards. The project also involved adding carbon monoxide in the coal conveying underground tunnels.

Florida Power and Light (FPL); FP&L Martin Tank Conversion; FL | 2014-2015

Lead Electrical Engineer. Electrical design for converting a purge oil storage tank to a storage tank for Biodiesel fuel. Scope of project involves installing new MCC, new fuel unloading skid, new oil water separator and new instrumentation on tank. Supervised the development of schematics, wiring diagrams, raceway composites, grounding drawings, lighting drawings and design calculations.

Axiall; Hydrogen Boiler Conversion; WV | 2014-2015

Electrical Engineer. Managed small group to perform design calculations such as cable sizing, load flow analysis, ARC flash, and relay setting. Also reviewed vendor drawings and developed one-line diagrams, for the purposes of converting a coal-fire boiler to a hydrogen fire boiler.

Consumers; Campbell 1 & 2 DSI-ACI; MI | 2014-2015

Electrical Engineer. Review vendor drawings and managed small group of engineers to develop schematics, wiring diagrams, one-line diagrams, and raceway drawings for installation of dry sorbent injection and activatied carbon injection systems.

13.8 KV ELECTRICAL SYSTEM

Expertise: Auxiliary Power System Design

Office Location Cary, NC

Education

- Bachelors, Electrical Engineering, Power, Georgia Institute of Technology, 2000
- Associates, Engineering General, Gainesville College, 1997

Professional Registration

- License, Steven J. Austin, Electrical, 199395, Alberta, Canada, 2015
- License, Steven J. Austin, Electrical, 29869, Alabama, United States, 2008
- License, Steven J. Austin, Electrical, 112338, Tennessee, United States,
- 2008 License, Steven J. Austin, Electrical, 44889, Virginia,

United States, 2008

- License, Steven J. Austin, Electrical, 25992, Kentucky,
- United States, 2008

License, Steven J. Austin, Electrical, 17340, West Virginia, United States, 2007

License, Jeff Austin, Electrical, 32645, North Carolina, United States, 2007 License, Engineer In

Training, Electrical, Georgia, United States, 2000

Total Years of Experience 24

Black & Veatch Years of Experience 13



SK E&S; Jangmoon Combined Cycle Power Plant; South Korea | 2014

Electrical Engineer Inspector. Witness the Stator Winding tests for a H-Class Gas Turbine. Tests performed included

- Megger test
- Power Loss Factor
- Partial Discharge Test
- Corona Inspection
- Hipot test of each phase
- Phase rotation test
- RTD test
- Bump test

Black Hills; PAGS Common SWGR Mods; CO | 2014

Lead Electrical Engineer. Electrical design for splitting a 4.16kV Bus. Arc Flash Calculation was performed on all busses to reflect updated incident energy levels at all electrical busses. Relay settings calculation was performed to determine proper settings of protection relays that were affected by scope of project. Design included rerouting existing and installing new 4.16kV feeder cables. Design also included modifying cable tray drawings, raceway composites, breaker schematics and one-line diagrams.

Consumers Energy; DE Karn 1 & 2 AQCS Project; MI | 2011-2014

Lead Electrical Engineer. Electrical design for the addition of two B&W spray dry absorbers, lime slurry preparation system, new by-product handling system and balance-of-plant work. Supervised the development of specifications for medium voltage switchgear, nonseg bus duct, low voltage switchgear, motor control centers, UPS and battery chargers. Supervised the development of oneline diagrams, panelboard schedules, medium voltage switchgear and low voltage switchgear metering and relaying diagrams, schematics and grounding drawings. Supervised the performance of design calculations for short circuit, load flow, motor starting, arc flash, cable sizing, inverter sizing and battery sizing.

NESCO; Klamath Falls; Oregon, United States; 2011-2011

Electrical Engineer. Performed design calculations for underground cable sizing and ground grid sizing.

Northwest Energy Systems Company (NESCO); Oregon Bioenergy Generation Project; OR | 2011-2011

Electrical Engineer. Electrical design for a biomass steam turbine generator and balance-of-plant. Performed GSU transformer sizing calculation.

Black Hills; Airport; CO | 2010-2011

Electrical Engineer. Performed Arc-Flash study to determine incident energy levels at all electrical busses. Performed Relay Coordination Study. Review one-line diagrams and schematics.

William S Blair

William (Sammy) Blair is a Mechanical Engineer within Black & Veatch's global power business. Blair has experience with pipe and equipment sizing, specification generation and management, and drawing review. Blair has experience working with Simple Cycle and Combined Cycle gas fired combustion turbine plants and Biomass powered facilities.

PROJECT EXPERIENCE

Ince Bio Power Limited | Ince Bio Power Resource Recovery Centre; Cheshire, UK | 2015-In-Progress

Mechanical Engineer. Provided system design and equipment management for Biomass Power Plant in the United Kingdom. The scope included the Cooling Water, Rain Water, and Fuel Oil Systems and management of Air Blast Coolers contract. Responsibilities included piping and equipment sizing and specification creation for coolers.

Black Hills | PAGS Unit 6 Expansion Project; CO | 2015

Mechanical Engineer. Performed system design for a LM6000 addition to the existing plant at Black Hills Pueblo Airport site. The scope included ammonia for SCR, fuel gas, compressed air, and water systems. Responsibilities included integrating existing ammonia, fuel gas, and water supplies to be used with Unit 6 and sizing of piping, control valves, and other equipment.

Exelon | Project Phoenix; TX | 2014-2015

Mechanical Engineer. Performed system design reviews in an Owner's Engineer's role for two natural gas fired 2x1 Combined Cycle Plants with SCR. The scope included reviewing drawings, calculations, and system documents for compressed air and various water systems. Also handled document submission and RFI control responsibilities.

Celanese Acetate, LLC | Celanese Narrows Boiler MACT; VA | 2014

Mechanical Engineer. Performed reviews of change documents and drawing mark-ups to assist in creating As-Built Lists and P&IDs. The plant has five 250,000 lb. gas fired package boilers and associated equipment. Provided miscellaneous engineering support.

DTE Energy Co. | Belle River Conversion; MI | 2014

Mechanical Engineer. Modeled piping for natural gas igniters to the main and auxiliary boilers. Project was converting fuel oil and propane fired igniters on the main and auxiliary to natural gas fired components at two coal-fired units.



SCR AND STACK

Expertise: Mechanical Engineering

Office Location Cary, NC

Education Bachelor of Science, Mechanical Engineering, North Carolina State University, 2014

Professional Registration License, E.I.T., North Carolina, 2014

Total Years of Experience

Black & Veatch Years of Experience



Cameron L. Bryant, P.E., S.E., P.Eng.

Cameron Bryant is a Project Civil / Structural Engineer, responsible for structural design and coordination of civil / structural activities on power projects, including the development and release of drawings and specifications. Bryant specializes in structural steel and concrete design, and has a broad base of design experience in combustion turbine and combined cycle; coal-, oil-, and wood-fired boilers; solar-thermal integration; and air quality retrofit projects. Additionally, Bryant provides logistic coordination with clients and field personnel.

PROJECT EXPERIENCE

Florida Power & Light (FPL) | Turkey Point Unit 1 Dismantlement Project; FL | 2016-In-Progress

Lead Structural Engineer. Coordinated structural design and drawing development for the dismantlement of an existing coal-fired power plant unit.

Exelon; Project Steamboat | PA; 2015-In-Progress

Civil/Structural Owner's Engineer. Reviewed design submittals from the EPC contractor to confirm contract and code provisions were met.

Ince Park; IPBRRC | England, UK | 2015-In-Progress

Civil/Structural Engineer. Provided consultation and review for design activities performed in the UK.

Black Hills | PAGS Expansion Project; CO | 2015-2016

Project Civil / Structural Engineer. Managed civil and structural design activities, including production of drawings and specifications for site development, underground utilities, structural steel, foundations and piles, and general construction packages for a GE LM6000 combustion turbine installation.

Exelon | Project Phoenix; TX | 2014-2016

Civil/Structural Owner's Engineer. Reviewed design submittals from the EPC contractor to confirm contract and code provisions were met.

Florida Power & Light (FPL) | Turkey Point Unit 2 Dismantlement Project; FL | 2014-2016

Lead Structural Engineer. Coordinated structural design and drawing development for the dismantlement of an existing coal-fired power plant unit.

Celanese Acetate | Celanese Narrows Boiler MACT Project; VA | 2013-2015

Civil / Structural Engineer of Record. Engineer of Record for the integration of a new power boiler at an existing industrial facility.



STRUCTURAL, TURBINE BUILDING

Expertise: Air Quality Control: Biomass; Combustion Turbine; Thermal Solar

Office Location Cary, NC

Education

- Masters, Civil Engineering, Structures, Virginia Polytechnic Institute & State University (Virginia Tech), 1993
- Bachelors, Civil Engineering, Structures, Virginia Polytechnic Institute & State University (Virginia Tech), 1991

Professional Registration

- License, Professional Engineer, Civil
 - Tennessee,, Alabama, Texas,, Ontario, Canada, Alberta, Canada, Colorado, Florida, Hawaii, Indiana, California

Total Years of Experience 23

Black & Veatch Years of Experience 23

Professional Associations

- Structural Engineers Association of North Carolina (SEA of NC) -
- President Local Chapter Professional Engineers of North Carolina (PENC) -
- Member National Society of Professional Engineers
- (NSPE) Member American Institute of Steel Construction (AISC) -Member





Orlando Utility Commission (OUC) | SEC Unit 1 SCR Addition Project; FL | 2011-2013

Project Civil / Structural Engineer. Managed structural design activities, including production of drawings and specifications for structural steel, ductwork and expansion joints, foundations and piles, and the general construction package for an SCR retrofit at a 460 MW coal-fired power plant. Coordinated civil and site design activities.

Northwest Energy Systems Company (NESCO) | Oregon Bioenergy; OR | 2011-2011

Project Civil / Structural Engineer. Coordinated civil and structural activities for the development of a duplicate 35 MW biomass facility during the preliminary design phase of the project.

NESCO | Klamath Falls Bioenergy; OR | 2010-2011

Project Civil / Structural Engineer. Coordinated civil and structural activities for the development of a 35 MW biomass facility. Developed cost estimates and a detailed engineering schedule. Prepared site specific design information and procurement specifications to assist with procurement of major equipment.

OREC | Hybrid Solar Thermal / Biomass Project Conceptual Design; FL | 2010-2010

Project Structural Engineer. Provided conceptual engineering support for a proposed 6MW facility, including development of a site layout, cost estimate and preliminary level I schedule.

Black Hills | Black Hills Airport Power Project; CO | 2009-2010

Civil / Structural Engineer of Record. Engineer of Record for the installation of a simple cycle facility utilizing two 100 MW GE LMS100 combustion turbines.

Florida Power & Light | Martin Solar Energy Center - Combined Cycle Integration; FL | 2009

Project Civil / Structural Engineer. Managed structural design activities, including production of drawings and specifications for structural steel and foundations, for the integration of a solar thermal energy center into the unit 8 combined cycle plant.

Florida Power & Light | Lauderdale Hurricane Shelters; FL | 2008

Project Structural Engineer. Managed structural design for a hurricane shelter installation, including design modifications of existing structures, for Units #4 & #5.

Kevin M. Cahill, P.E., LEED AP BD+C

Mr. Cahill has experience in the design of various mechanical systems, including heating, ventilating, and air conditioning (HVAC), odor control, dehumidification and plumbing.

Mr. Cahill has designed and overseen the construction phase services of systems for HVAC, odor control, dehumidification and plumbing for water and wastewater infrastructure projects and federal government facilities. His experience covers the application of these systems for administration buildings, laboratories, maintenance facilities, chemical areas, pumping stations, and process related areas. He has been involved in numerous designs and reports for new and existing facilities.

PROJECT EXPERIENCE

New York City Environmental Protection | North River WWTP Cogeneration & Electrification; New York, NY | 2016

Lead Mechanical Engineer. Provided mechanical HVAC and plumbing system design for upgrades to an existing wastewater treatment facility and a new electrical substation.

New York City Environmental Protection | Oakwood Beach WWTP Electrical Upgrades Project; New York, NY | 2016

Lead Mechanical Engineer. Provided mechanical HVAC and plumbing system design for upgrades to an existing wastewater treatment facility and a new electrical substation.

City of Toronto | Humber Treatment Plant Secondary Treatment Upgrades; Toronto, Ontario Canada | 2015

Lead Mechanical Engineer. Provided mechanical HVAC and plumbing system design for a wastewater treatment facility upgrade.

Irvine Ranch Water District | Michelson Water Recycling Plant Biosolids and Energy Recovery Facilities; Irvine, CA | 2014

Mechanical Engineer. Provided mechanical HVAC construction phase support for a biosolids and energy recovery project.

Frederick-Winchester Service Authority | Opequon Water Reclamation Facility Green Energy Project; Winchester, VA | 2014

Lead Mechanical Engineer. Provided mechanical HVAC and odor control system design for an operation, chemical feed and dewatering facility rehabilitation and a new digester control building.

County of Harford | Sod Run Wastewater Treatment Plant ENR Upgrades; Harford County, MD | 2011

Mechanical Engineer. Provided mechanical HVAC and odor control system design for a wastewater treatment facility upgrade.



HVAC, TURBINE BUILDING

Expertise: Heating, Ventilating, and Air Conditioning (HVAC), Odor Control, Dehumidification and Plumbing; Design, Drawings and Specification Development and Cost Estimating

Office Location Kansas City, MO

Certifications

- Professional Engineer
 Licensed in Kansas
- LEED AP BD+C

Education B.S., Mechanical Engineering, University of Nebraska-Lincoln, 2006

Year Career Started

Year Started with B&V 2006



City of Westminster | Reclaimed Water Treatment Facility Phase 2 Expansion; Westminster, CO | 2010

Lead Mechanical Engineer. Provided mechanical HVAC and plumbing system design for a reclaimed water treatment facility expansion. Work included a filter building addition and pump capacity expansion.

City of Pueblo | Wastewater Treatment Plant Ammonia and Nutrient Removal Project; Pueblo, CO | 2010

Lead Mechanical Engineer. Provided mechanical HVAC and plumbing system design for the expansion of an existing wastewater treatment facility. Work included a new UV building and an expansion of an existing blower building.

South Adams County Water and Sanitation District | Wastewater Treatment Plant Modifications; Commerce City, CO | 2008

Mechanical Engineer. Provided mechanical HVAC system design for an upgrade to an existing headworks building that utilized chemical media filters to prevent corrosion of electrical equipment.

ACSA | Fishersville Wastewater Treatment Facility; Fishersville, VA | 2007

Mechanical Engineer. Provided mechanical HVAC system design for an upgrade to an existing wastewater treatment facility. This design included renovations to an existing electrical building and new designs for a dewatering building, chemical building and filter building.

ACSA | Middle River Wastewater Treatment Facility; Verona, VA | 2007

Mechanical Engineer. Provided mechanical HVAC system design for an upgrade to an existing wastewater treatment facility. This design included renovations to an existing blower building, grit removal facility and electrical building and new designs for a dewatering building and filter building.

Winston-Salem / Forsyth County Utility Commission | Muddy Creek Wastewater Treatment Plant Consolidated Influent Pumping Improvements; Winston-Salem, NC | 2013

Lead Mechanical Engineer. Provided mechanical HVAC and odor control system design for a new influent pump station and headworks.

County of San Diego | Rancho San Diego Pump Station Rehabilitation; San Diego, CA | 2015

Lead Mechanical Engineer. Provided mechanical HVAC and plumbing system design for a wastewater pump station rehabilitation.

City of Cary | Kit Creek Odor Control Improvements; Cary, NC | 2011

Lead Mechanical Engineer. Provided mechanical odor control system design for an existing pump station, screenings structure and distribution vault.



Wanda K. Cox

Wanda has a well-rounded background in administration management and project and document controls, having served as the Administrator for numerous major capital projects. She has administered project documentation, change management systems, correspondence files, O&M Manual formulation, and other field duties. She is a coach and supporter for P6 and Contract Manager software by Primvera and has administered several programs with these tools. She is experienced in developing and implementing grants programs with accounting and financial reporting of labor records, T&M logs, and preparing documentation for US/EPA and State Grants programs. Wanda is skilled in establishing field offices including fit outs, file management, and organization of document control procedures and protocols. She has managed administrative offices for major capital projects with values up to \$600 million. Wanda managed all the administration staff and set up technical information libraries for project documentation and future operations for these projects.

Wanda assists in set up of Black & Veatch construction management projects utilizing the Jump Start Toolkit for project startup, enabling project uniformity of delivery and adding to the quality of work. She also administers web based project management tools and implements the field communications, hardware and software tools.

PROJECT EXPERIENCE

NYCDEP | 26th Ward Emergency Generator Project Construction Management; New York City, NY | 2011-In-Progress

Project Administrator. Responsible for setting up document control procedures, training project staff on our project management tools, setting up file management, conducting project audits to ensure compliance with the NYCDEP SOPs.

NYCDEP | Manhattan Tunnel No. 3 Construction Management; New York City, NY | 2010-In-Progress

Project Administrator. Responsible for setting up document control procedures, training project staff on our project management tools, setting up file management, conducting project audits to ensure compliance with the NYCDEP SOPs.

Anne Arundel County | Cox Creek WRF ENR Upgrade and Expansion; Curtis Bay, MD | 2010-In-Progress

Project Controls Administrator. Responsible for setting up document control procedures, establishing and equipping the field offices, training project and County staff on our project management tools, installing the network and web system, file management, processing submittals, requests for information and maintaining an even flow of correspondence for the project.

ADMINISTRATION

Expertise: Construction Management; Onsite Administration Manager; Program Management; Project Administration; Project Controls; Project Documentation; Prolog

Office Location Curtis Bay, MD Total Years of Experience 30.7 Black & Veatch Years of Experience 8.2

Professional Associations Construction Management Association of America – Member

R,

Sewerage and Water Board of New Orleans | Sewer Rehabilitation Project; New Orleans, LA | 2009-In-Progress

Project Controls Assistant. Responsible for setting up and maintaining records. Work includes 10 design contracts and the eventual construction work for the program. P6 and Contractor Manager are used.

Howard County | Little Patuxent Reclaimed Water Pump Station; Howard County, MD | 2008-2010

Project Controls Assistant. Managed the project recordkeeping, files, and documentation for the 5MGD pumping station project.

City of Hagerstown | Hagerstown ENR/UV; Hagerstown, MD | ; 2007-2009

Project Controls and Administrator. Project involved upgrade of a 30 mgd treatment plant. Processed contractor submittals, RFI's and maintained project documentation.

City of Lancaster Bureau of Water | Susquehanna and Conestoga Water Treatment Plants; Lancaster, PA | 2007-2009

Project Controls Assistant. Responsible for the project document controls procedures for the 24 MGD and 12 MGD membrane filtration upgrade project, setting up and maintaining document for the two contracts and training new users on the contract management software. Processed project correspondence, project submittals, managed the flow of RFIs, and O&M manuals utilizing the project's delivery system.

District of Columbia Water | Lead-Pipe Service Replacement Program; DC | 2006-2008

Office Manager - Arcadis. LSR Joint Venture working on the \$450M Lead-Pipe Service Replacement Program. Responsible for organizing and maintaining document control procedures and protocols for the four current contracts. Created survey packages, tracked and input cost estimates into the database for private side replacements. Processed project correspondence, project submittals, contractor's bid proposals and contracts for the District. Managed the flow of RFIs, change orders, and correspondence utilizing the project's delivery system.

Tampa Bay Water Master Water Plan | Tampa Bay Water; Tampa, FL | 2000-2006

Administrative Office Manager - Arcadis (Construction Dynamics Group). Managed the administrative offices of major construction offices in Florida for this \$600M program. Responsible for establishing and equipping field offices, installing network and web systems, file management, organization of document control procedures and protocols, and managing administrative staff. Additionally, managed program and construction management project control systems and documentation.

Randy W. Fiorucci, P.E.

Mr. Fiorucci has over 40 years of experience in the preparation of designs and studies for wastewater treatment plants, pump stations, and collection systems; water treatment plants, pump stations, and distribution systems.

PROJECT EXPERIENCE

San Francisco Public Utilities Commission I Southeast Water Pollution Control Plant (SEP) Biosolids Digestion Facilities Project; San Francisco, CA I 2014-2015

Senior Engineering Manager. Responsible for providing technical oversight, review and guidance for the conceptual and preliminary design of the combined heat and power (CHP) energy recovery facilities and utility tunnels connecting process facilities for the new biosolids treatment system at the SEP. The SEP is a 100 mgd facility treating 64 percent of the total San Francisco combined sewer flows. The CHP facilities will contain two midsized gas turbines (4.6 MW each); heat recovery steam generators to convert exhaust heat into steam to supply a thermal hydrolysis process, gas treatment for hydrogen sulfide and siloxane removal, gas storage, emergency flares, supplemental 200 kW microturbines and supplemental boilers.

Sacramento Regional County Sanitation District | EchoWater Project – Advanced Wastewater Treatment Plant BNR Project; Sacramento, CA |2013-2014

Quality Manager. Responsible for the implementation and management of the Project Quality Management Plan for the design of a secondary treatment process upgrade for a 181 mgd WWTP to meet new NPDES discharge limitations. The design project included over 10 technical memoranda, Preliminary Design Report and over 2500 construction drawings. Estimated at approximately \$500M, the construction includes a new biological nitrogen removal (BNR) complex and associated blower facility and chemical storage/feed facility. Design capacity is 181 mgd average dry day weather flow. The main treatment component includes a complex of 8 basins and associated piping/equipment galleries. The process design and basin layout provides the flexibility to operate in either a 2-stage MLE configuration or a 4-stage Bardenpho configuration. An innovative mixed liquor fermenter (MLF) zone is incorporated into each basin to create biological carbon for driving denitrification. The MLF zones will increase nitrogen removal efficiency and reduce the requirement for chemical carbon supplementation and corresponding operating cost. The process configuration also provides the flexibility to biologically remove phosphorus without any additional construction cost, if required in the future. .

City of Sunnyvale | Program Management Services for Water Pollution Control Plant Expansion; Sunnyvale, CA | 2014-2015

Senior Engineering Manager. Responsible for providing Program Management services for the Water Pollution Control Plant Expansion Program. The work will include overall rehabilitation as well as new processes and facilities for



QA/QC MANAGER

Expertise: Study, Design, & Construction Management of Wastewater Collection & Treatment Facilities; and Water Supply, Distribution, and Treatment Systems

Office Location Walnut Creek, CA

Education

MS, Environmental Health Engineering, University of Kansas, 1979 BS, Civil Engineering,

Kansas State University, 1972

Professional Registration

PE – 1989, CA, C44317 PE – 1977, KS, 7703 PE – 1988, OR, 14119 PE – 1984, WA, 21764

Expertise Certification Board Certified Environmental Engineer

American Academy of Environmental Engineers & Scientists

Professional Associations

- American Society of Civil Engineers
- California Water
- Environment Association Water Environment Federation

Year Career Started 1973

Year Started with B&V 1973 portions of the existing plant. Expected plant capacity will increase to 20 mgd; anticipated program construction costs will exceed \$850,000,000. Services provided included oversight of master planning efforts, coordination of multiple design contracts, document review, managing controls, and consultant oversight.

San Jose – Santa Clara Regional Wastewater Facility | Cogeneration Facility – Project Definition Report; San Jose, CA | 2013

Senior Engineering Manager. Responsible for the project delivery evaluation and development of a Project Definition Report (PDR) for a new 16 MW cogeneration facility for the 167 mgd San Jose-Santa Clara Regional Wastewater Facility. Internal combustion engines and gas turbines were evaluated for the project with 4-4MW engines selected to be housed in a new Cogeneration building. Design Build, Design Build Operate and Progressive Design Build delivery methods were evaluated with Progressive Design Build the selected approach. The PDR established key performance criteria and design requirements which will be used to facilitate the selection of a design build contractor.

NYCDEP | Reconstruction of Manhattan, Bronx Grit Screens at Wards Island WPCP; New York, NY | 2012-2014

Design Manager. Responsible for the preliminary assessment, pre-design, and design of the replacement of eight (8) bar screens at the Bronx and Manhattan Grit Chambers. The Bronx (369 mgd) and Manhattan (182 mgd) grit chambers provide preliminary treatment of CSO flows prior to the Wards Island WPCP. Existing climber screens and recently installed newer climber screens were experiencing operational and mechanical problems which led to flooding and inadequate screenings removal. This fast track project includes the replacement of all bar screens at both facilities. Work included a Facility Assessment Report, Bar Screen and Grit Pumping Technical Memoranda, miscellaneous memoranda, permitting assistance, hydraulic analysis, and a CFD model of both grit chambers. Final bid documents are currently being prepared.

NYCDEP | North River WWTP Cogeneration and Electrification Phase1 Preliminary Design; New York, NY | 2012-2013

Quality Control Manager. Responsible for implementation of the Project Quality Management Plan for the 10 MW Cogeneration and Electrification project. Plan includes quality standards, techniques, procedures, quality control review schedules, and project audits. Phase 1 involves the production and the Facility Plant and the Basis of Design Report to: replace the 5 MSP and 5 Blower engines with electric motors; provide a 10 MW cogeneration facility using treated digester gas and natural gas; recover the engine heat for heating digesters and facility areas; improve digester performance and mixing efficiency; provide new switchgears; treat digester gas; and treat engine exhaust to comply with Title V air permit requirements.



Douglas R. Friedel, PE, CEM, DCEP

Douglas R. Friedel is Project Director for Distributed Generation projects within Black & Veatch's Power business. In his current role he coordinates with Project Managers in the execution of DG projects deploying all technologies. He is a specialist in commercial, industrial and institutional application of multiple DG technologies, particularly CHP systems. Friedel is a career subject matter expert in facilities design, including central utility plants and distributed energy, standby power generation, power distribution, data centers, and manufacturing environments.

Friedel is a Professional Engineer, a Certified Energy Manager and he holds DOE's DCEP certification. He has 37 years of energy consulting and design experience including complex plant retrofit projects as well as new utility plant facilities. Projects have covered a broad area, including central utility plants and utility distribution, energy use and conservation, utility piping systems, heating, ventilating, and air conditioning (HVAC) systems and controls, industrial process systems, and plumbing and fire protection.

PROJECT EXPERIENCE

MillerCoors | Boiler Superheater Replacement BOP Design; WI

Project Director. BOP Piping Design in support of Locke Equipment execution of superheater removal and boiler heater tube installation.

Sprint | High Density Server Cooling at DRDC; TX

Project Director. Mechanical, Electrical and Structural design elements in support of Sprint deployment of High Density DX type server rack cooling system in an existing computer room.

Axiall Corporation; WV

Project Director. Boiler MACT compliance evaluation including installation of back-end air quality control equipment; evaluation of non-coal options including conversion to gas, new auxiliary gas boilers and CT based cogeneration. Coal to gas conversion choice required cost estimate and detailed engineering for construction documentation including P&IDs, specifications, drawings and RFP documents:

- Natural Gas Supply
- Burners procurement specifications and RFP
- NO. 5 Boiler Flue Gas Piping
- No. 5 Boiler Steam Cross- Tie Upgrade
- Electrical Switchgear
- Controls Upgrade Boiler No. 5 Pneumatic to DCS Conversion, Boiler No. 6 upgrade

City of Jasper | Biomass Repowering Study; IN

Project Director. Facility assessment with detailed inspection of boiler, steam turbine generator, and balance-of-plant to determine the plant condition and



DISTRIBUTED GENERATION QA/QC

Expertise:

Cogeneration; Detailed Design; Energy Intensive Industries; Mechanical and Electrical Systems; Mission Critical Facilities; Utilities Master Planning

Education

Bachelors, Mechanical Engineering, Iowa State University, 1978

Professional Registration

- Certification, Data Center Energy Practitioner, 2012
 Certification, Certified Energy Manager, 16446, 2011
- License, Professional
- Engineer, Mechanical,
- 20391, West Virginia, 2013 License, Professional
- Engineer, 12706, Kansas, 1992
- License, Professional Engineer, 16257, Tennessee, 1983

Total Years of Experience 37

Black & Veatch Years of Experience 37

Professional Associations

- Council of Industrial Boiler Owners - Company Representative
- Association of Energy Engineers - Senior Member
- American Society of Heating, Refrigerating, and Air Conditioning Engineers
- Member 7x24 Exchange
- International, Midwest Regional Chapter - Chapter Board Member

Office Location Overland Park, Kansas
methods of repowering. The repowering study addressed plant condition; performance; operating and maintenance costs; fuel supplies (coal, gas, and biomass) with an existing and modified system; environmental review; biomass with combination heat and power opportunities; and plant valuation. The study findings provided solutions and answers to questions.

Lexmark International | Central Chiller Plant Control System Upgrade; KY

Project Manager. Assisted Lexmark with the development of the technical requirements for the specification for the new plant control system addressing the following reduced operating cost goals:

- Effectively and seamlessly interface with existing equipment dedicated controls and instrumentation.
- Optimize existing equipment control strategies based on equipment efficiencies.
- Reduce operator monitoring requirements by increased automation and sequencing.
- Secure remote visibility capability via internet to plant operations and supervisory personnel (alarm status).
- Increase plant operating reliability and reduce maintenance costs.
- Plan for future extension to incorporate the steam plant equipment dedicated controls.
- Technical specifications were developed and delivered to Lexmark for bidding and execution by a controls system contractor.

Lexmark International | Stratified Thermal Storage Tank Renovation; KY

Project Manager. This project included analysis, evaluation, design, and construction cost estimation engineering services for the rebuild of Lexmark's 3 million gallon thermal storage tank. Specific tasks addressed in the project included the following:

- Structural integrity.
- Environmental safety.
- Cathodic protection, internal and external.
- Internal coating.
- New internal distribution piping.
- Outside access ladder.

Conceptual design activities were completed, followed by a detailed review and comment period by Lexmark. Hydraulic calculations and thermal expansion modeling supported the design of internal distribution piping. Construction documents were prepared, including specifications and drawings for bid.

Pilgrim's Pride Corporation | Computer Data Center; TX

Project Manager. Oversaw the planning, conceptual design, and detailed design of a 40,000 square foot data center. Phase 1 included 28,000 square feet of a raised floor data center with N+1 redundant monitoring and evaluation (M&E) systems.



Michael Craig Hums, P.E.

Craig Hums is a mechanical design engineer with project experience that includes air quality control systems, simple and combined cycle combustion turbine plants, coal fired thermal plants, and biomass fired thermal cycle power generation facilities; economic and technical evaluations for engineering studies; and the development of technical specifications and system descriptions.

PROJECT EXPERIENCE

Microsoft | CYS05 Data Center; WY | 2016-In-Progress

Mechanical Project Discipline Engineer. Managed mechanical design efforts for the fuel gas supply system design at the CYS05 Datacenter. The scope included fuel supply system design for natural gas generators at the Datacenter. Responsibilities included managing development of all mechanical engineering deliverables.

Duke Energy | Mayo HCA Mitigation; NC | 2016-In Progress

Mechanical Project Discipline Engineer. Led mechanical design efforts for the HCA mitigation project at the Mayo Steam Station. The scope included piping and support modification for hydrogen and methane vent piping, HVAC system design for an existing building. Responsibilities included managing development of all mechanical engineering deliverables.

Duke Energy | Belews Creek FGB Absorber Overflow Modifications; NC | 2015-2016

Mechanical Project Discipline Engineer. Led mechanical design effort for modifications at the Belews Creek Steam Plant. The scope included modification of reactor overflow piping, an automated overflow spray system, and a design for an injection lance for defoamer injection into the FGD vessel. Responsibilities included managing development of all mechanical deliverables including isometrics, pipe support details, P&IDs, and specialty details.

Tennessee Valley Authority | Bull Run Fossil Plant U1 Chemical Clean Piping Phase 1; TN | 2015-2016

Lead Mechanical Engineer. Lead engineer for the phase 1 Project Plan Development (conceptual design) for the piping and systems to support the chemical clean at Bull Run Fossil Plant. Major elements of the scope include equipment arrangement, site civil design, auxiliary steam supply systems, chemical circulation systems, and chemical drain systems.

Duke Energy | Roxboro Combustible Dust Mitigation; NC | 2015

Mechanical Project Discipline Engineer. HVAC system design for the Unit 1/2 Crusher House positive pressure system Responsibilities included managing all mechanical engineering deliverables, including development of specifications, calculations, D&ID, sequence of operation, and layout drawings.



FUEL SUPPL.Y

Expertise: Air Quality Control; Coal; Combustion Turbine; Consulting Engineering Services; Field Engineering

Education

Masters, Civil Engineering, Construction Engineering, North Carolina State University, 2015, Bachelors, Mechanical Engineering, North Carolina State University, 2008,

Professional Registration

License, Michael Craig Hums, Mechanical, 11644, Rhode Island, , 2015 License, Professional Engineer, Professional to Populate, 38634, North Carolina, , 2012

Total Years of Experience 9.4

Black & Veatch Years of Experience 7.8 Office Location

Cary, NC

FPL | Martin Unit 8 Heat Balance Support; FL | 2015

Mechanical Engineer. Developed complete as-routed fluid system models for Condensate, Boiler Feed, and Solar Steam for the combined cycle and solar power blocks. Supported thermal performance analysis and report development for proposed plant upgrades.

Consumers Energy | Unit 1 & 2 SDA Addition; Essexville, MI | 2015

Warranty Coordinator. Supported warranty services after plant commissioning. Support included warranty contract development and bid evaluation. Warranty contract support. System evaluation and design including control valve sizing, expansion tank design, valve modifications. Commissioning and start-up of new equipment added as warranty scope.

Consumer's Energy | Dan E. Karn Unit 1 & 2 SDA Addition; MI | 2012-2015

Mechanical Field Engineer. Field Engineering and construction contract administration of major construction contracts for the two unit SDA installation project. Construction contracts include SDA Erection, Mechanical Construction, Fire Protection F&E, Field Erected Tanks, and Utility Trestle Construction. Responsible for performing on-site engineering design as required to facilitate ongoing project progress including answering contractor RFIs and field engineering changes. Provided commissioning and start-up support.

Consumer's Energy | Dan E. Karn Unit 1 & 2 SDA Addition; MI | 2012

Mechanical Engineer. Specification development, contract bid review, and technical contract administration for major construction contracts. Contracts included Utility Trestle, Fire Protection, SDA Erection, and Mechanical Construction. Additional responsibilities included review of mechanical design documents and calculation checking.

Orlando Utilities Commission | Igniter Gas Upgrade; FL | 2011-2012

Mechanical Engineer. Detailed system design including piping system modelling, control valve sizing, and technical evaluation of procurement packages for the natural gas system that supplies gas to the upgraded burner igniters on a two unit coal plant.

PowerSouth | Powersouth McIntosh; AL | 2008-2009

Mechanical Engineer. Performed design, calculation, and construction deliverable development for the BOP systems for a green field two-unit simple cycle plant.



Brian C. Huska, P.E.

Mr. Brian Huska is a Mechanical Engineer in Black & Veatch's Systems Engineering department. He specializes in the design of aeration blower and control systems, combined heat and power systems, standby power systems, fuel storage and distribution systems, biogas treatment and distribution systems, compressed air systems, heating water systems and other miscellaneous mechanial systems. Brian has performed the roles of design engineer and lead mechanical engineer on his projects and has experience leading a mechanical design team through detailed design.

PROJECT EXPERIENCE

City of Springfield | Biosolids Improvements; Springfield, MO

Lead Mechanical Engineer. Responsible for the design of an upgraded digestion system and new digester gas treatment and utilization systems. The digestion system is being modified to a two-stage acid-gas phase digester process consisting of two new digesters and modifications to four existing digesters. Modifications include digester mixing, digester heating and digester gas storage. A new digester gas treatment system is being installed for compression and removal of H2S, siloxanes and moisture prior to combustion in two new 1,200 kW cogeneration engine-generators and utilization in two existing heating water boilers. Also responsible for design of modifications to the existing heating water system.

New York City Environmental Protection | North River Wastewater Treatment Plant Cogeneration; New York, NY

Lead Mechanical Engineer. Performed a detailed blower life cycle cost analysis comparing multiple blower technologies and sizes to be implemented as part of the cogeneration project to electrify the aeration blowers currently driven by 1,100 hp 400 rpm engine drives. Analysis compared capital, maintenance, and operational costs between electrifying and renovating the existing multistage blowers with new 4160V motors, installing new integrally geared single stage blowers, and installing new high speed gearless turbo blowers.

Frederick Winchester Service Authority | Opequon WRF Green Energy Project; Winchester, VA

Lead Mechanical Engineer. Responsible for the design of a complete digester and gas utilization system consisting of three new one million gallon digesters and associated sludge heating systems; gas storage, treatment and distribution; 800 kW cogeneration engine-generator for paralleling with the utility; 800 kW standby diesel engine-generator with sub-base fuel storage tank; heating water boiler and heating water system.



BLACKSTART GENERATOR

Expertise: Aeration; Blower System Design; Cogeneration; Compressed Air Systems; Digester Systems; Standby Power Generation; Water and Wastewater Process Mechanical System Design

Education Bachelor of Science, Mechanical Engineering, Kansas State University, 2006,

Professional Registration License, Professional Engineer, Professional to Populate, 22745, Kansas, , 2012

Total Years of Experience 9

Black & Veatch Years of Experience

Office Location Kansas City, Missouri, USA:

New York City Environmental Protection | North River Wastewater Treatment Plant Emergency Response and Reconstruction; New York, NY

Lead Mechanical Engineer . Responsible for the mechanical design after a fouralarm fire on one of five 1,700 hp main sewage pump engine drives. Performed an on-site mechanical assessment shortly after the incident to determine the condition of the existing auxiliary systems servicing the engine, and identify future potential fire safety concerns. Designed and issued multiple Work Orders to Contractors for expedited repair of the mechanical systems in order to bring the engine and associated main sewage pump back online in a timely manner, while at the same time implementing fire safety measures through design. Responsibilities included the assessment, design, and production of Work Orders, specifications, drawings, schematics, and technical memoranda as well as on-site coordination with the client, contractors, construction manager, fire department, and engine repair specialists.

Orange County | Northwest Water Reclamation Facility; Orlando, FL

Mechanical Designer. Designed two 2,500 kW standby diesel enginegenerators to be installed inside a building. Designed a fuel system consisting of day tanks located inside the building and two 12,000 gallon concrete encased diesel fuel storage tanks located outside. Future provisions were made to install one additional engine-generator and fuel storage tank. Design also included the installation of one 500 gallon gasoline concrete encased storage tank. Also designed three different aeration blower systems utilizing high speed gearless turbo blowers.

City of Carlisle | Carlisle Wastewater Treatment Plant; Carlisle, PA

Mechanical Designer. Responsible Designed a 1,500 kW diesel enginegenerator to provide standby power for the facility. Designed new fuel system consisting of day tank and associated pumps to connect to an existing buried storage tank. Also designed a complete BNR aeration blower system consisting of high speed gearless turbo blowers utilizing a most open valve aeration control system.

Yucaipa Valley Water District | Henry N. Wochholz Water Reclamation Facility; Yucaipa, CA

Design Engineer. Designed an engine-generator system, including diesel engine-generator, remote aboveground fuel storage tank, and fuel system.

City of Lakeland | English Oaks Accommodations; Lakeland, FL | 2007

Design Engineer -generators located at separate pumping statio | ns. The engine-generator at Air Park Pump Station is located outdoors in an enclosure with a sub-base fuel tank. The engine-generator at Drane Field Pump Station is located inside the pump station with a remote fuel tank installed outside. Also designed a compressed air system to provide tool air for maintenance within the pump station.

Michael S. Johnson, P.E.

Mr. Johnson has successfully completed numerous assignments in the field of water and wastewater. These assignments have included planning, detailed design and construction phase services for projects using traditional and designbuild delivery methods. He has supervised design crews working out of multiple offices on complex projects with construction costs in excess of \$100 million and has completed individual assignments with a small team of specialists to suit the client's needs. Mr. Johnson's experience includes water treatment facilities, wastewater treatment facilities, pipelines, and pumping station.

PROJECT EXPERIENCE

NYCDEP | North River Wastewater Treatment Plant Cogeneration and Electrification Improvements Facility Plan; New York, NY | 2012-Ongoing

Engineering Manager. Responsible for managing the Black & Veatch design team during the Facility Plan effort which was executed under a subcontract to another firm. This scope included replacement of the existing dual fuel engines with electric motors and associated improvements to the electrical system. New engine generators will be utilized to supply 10 MW of power to the plant burning digester gas and natural gas. Heat will be recovered from these units for use onsite. Responsibilities included evaluation of alternatives, preparation of the Facility Plan and constructability analysis. Worked daily with the project manager of the prime consultant to ensure that the team worked together as a seamless unit.

NYCDEP | North River Wastewater Treatment Plant Emergency Response, Restoration and Reconstruction; New York, NY | 2011-Ongoing

Project Manager. Responsible for managing the design team on site during the condition assessment and emergency response portion of this contract. The North River WWTP is a 170 mgd treatment facility that was significantly damaged during a fire in July 2011. B&V was retained under an emergency contract to perform a condition assessment, provide immediate emergency response to address life safety issues, restore the plant to normal operation, and reconstruct the area damaged by the fire back to full functionality that existed prior to the fire. The project team developed numerous work orders and provided field direction to contractors working onsite during the emergency response portion of the work. During the restoration and reconstruction portion of the work nine separate construction contracts were developed to obtain competitive bids for various portions of the work.

City of Austin | Walnut Creek WWTP Filter Rehabilitation Study; Austin, TX | 2011-2012

Engineering Manager. Responsible for execution of the technical aspects of this study which included a condition assessment of the existing sand filters at the Walnut Creek WWTP and evaluated alternatives for upgrading this process. The Walnut Creek WWTP is a 75 mgd wastewater treatment facility that provides advanced secondary treatment with filtration for discharge to the Colorado



TECHNICAL ADVISOR

Expertise: Water and Wastewater Planning and Design

Office Location Denver, Colorado

Education

BS, Civil Engineering, Kansas State University, 1978

Professional Registration PE – 1982, CO, #19787 PE – 1990, NV, #8691

Professional Associations

American Water Works Association

Water Environment

Federation Year Career Started

1978 Year Started with B&V

1980

R,

River and a reclaimed water system used for municipal irrigation. The work included evaluation of numerous traditional and emerging technologies that could be utilized to provide final solids removal and comply with current and proposed future regulations.

Metro Wastewater Reclamation District | Capital Projects Management Program; Denver, CO | 2007-2011

Engineering Manager for Technical Support. Responsible for the management of a portion of the Capital Projects Management Program. This five-year assignment includes the development of the processes, procedures and tools necessary to assist the owner's staff manage a program of capital improvements valued at one billion dollars. The objectives of this program include: Understand and Control Costs; Make Consensus-Based Decisions; Improve Project Delivery; Support Plant Operations; and Effectively Manage the Capital Expenditure Schedule. Johnson led the project team that developed the cost estimating standards and participated in the development of improved project delivery and the revision of the Capital Expenditure Schedule. As part of this work, Johnson was responsible for managing the development of a plantwide process model, a plant-wide hydraulic model, and a system-wide transmission model. Working in conjunction with this program, Johnson served as project manager for the preliminary design of capital improvement projects at the Robert W. Hite Treatment Facility.

Metro Wastewater Reclamation District | Hot Water System Improvements; Denver, CO | 2011-Ongoing

Project Manager for Preliminary and Final Design. Responsible for the execution of the preliminary and final design of the Hot Water System Improvements at the Robert W. Hite Treatment Facility. This plant 170 mgd wastewater treatment facility utilizes 10 anaerobic digesters arranged for two-phase digestion. Digester gas is utilized to generate electricity using turbine generators, and the waste heat from the turbine exhaust is used as a primary source of heat for the hot water system that is used to heat the digesters and provide building heat for several structures onsite. This system had been experiencing significant issues since the plant went to two-phase operation, with inadequate heat available and the inability to transfer that heat to the first stage (acid phase) digesters. The study phase included modeling of the hot water system, sludge pumping system and the mixing within the digester. Improvements were designed so that the existing equipment could be used to the maximum extent practical and the operators had the maximum flexibility. The project is currently under construction.

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Mark J. Kleveter, P.E.

Mr. Kleveter has been involved in a variety of electrical power system designs of water and wastewater treatment facility projects. His responsibilities include lead electrical design and the supervision of various electrical design teams. His experience includes power and instrumentation design, in-depth power system studies, on-site generation study and design, field investigations, and construction phase field services. He also supervises the development and implementation of electrical design standards and quality control guidelines.

His electrical design experience includes drawing and specification development of power distribution systems, control schematics, wiring diagrams, intercom systems, fire alarm systems, electronic security systems, lightning protection systems, and instrumentation systems. He has experience in the design and implementation of medium and low voltage switchgear, engine-generator synchronizing switchgear, primary and secondary unit substations, medium voltage motor control equipment, medium voltage variable frequency drives, low voltage variable frequency drives, and solid-state motor control equipment. Additionally, Mr. Kleveter has also designed electrical systems for new and existing electrical generation facilities where his responsibilities included generator protection, contract administration and factory test inspections.

Mr. Kleveter has established himself as Black & Veatch's expert in renewable energy for water and wastewater treatment facilities. He has coauthored "Renewable Energy Options for Water and Wastewater Systems", APWA Reporter, February, 2009. His experience also includes green engineering, sustainability assessments, and energy management. His responsibilities have included energy master planning, energy audits and optimization, and equipment and power supply reliability projects.

PROJECT EXPERIENCE

NYCDEP | North River Water Pollution Control Plant Cogeneration Project; New York City, NY | 2011-2015

Electrical Design Manager: Project involved evaluation of improvements to an existing 340 mgd secondary wastewater treatment plant, including replacement of existing diesel engine driven main sewage intake pumps and diesel engine driven aeration blowers with electric motors. Additionally, the project included addition of 15MW of engine-generator units which burn natural and/or digester gas cogenerating in tandem with the electric utility. Initial project scope included evaluation of technical feasibility and operational efficiency of the pump and blower motor options as well as the electrical distribution improvement options to incorporate new motor and co-generator equipment. Detailed design includes supervising, producing and maintaining all project one-lines, schematics, power plans and specifications along with staffing, budgets and schedules.



ELECTRICAL SYSTEMS QA/QC

Expertise: Design of Electrical Systems for Water and Wastewater Facilities

Office Location Kansas City, MO

Education BS, Electrical Engineering, California State University, 1992

Professional Registration

PE - 2004, AZ, 41567 PE - 2005, CA, 17748 PE - 2009, CO, 42984 PE - 1998, KS, 15148 PE - 2005, UT, 5747644-2202 PE - 2008, WV, 17776

Year Career Started 1992

Dallas Water Utilities | Electrical Infrastructure Project; Dallas, TX | 2010-2012

Engineer Manager. Energy Master Plan and Electrical Infrastructure Improvements Design. Responsible for the evaluation of electric power service and distribution system; evaluated substation and distribution system alternatives for reliability, cost, construction sequencing, ownership, and impacts to existing operations; and provided an assessment of alternative energy opportunities, namely solar, wind, and hydroelectric to find the most economical combination of self-generation and purchased power.

City of Pueblo | Pueblo Reclamation Facility Solar Facility; Pueblo, CO | 2009-2010

Lead Electrical Engineer. Solar Photovoltaic Facility. 300 kW peak solar array. Responsible for evaluating various solar technologies including thin film, monocrystalline, and polycrystalline. Evaluation of each technology also included utilizing either fixed or tracking array systems. Provided complete design of the solar array including specifications and interconnection to the electric utility. Evaluated all incentives for solar power including renewable energy credits (RECs), grants, and rebates. Design included the capability to expand solar array to 400 kW peak.

New Jersey American Water | Diamond Hill and Chatham Pumping Station Energy Audits; Berkeley Heights and Chatham, NJ | 2009

Quality Control Engineer. Provided quality control for the energy audit of two distribution pumping station audits.

Orange County Sanitation District | Energy Master Plan; Fountain Valley, CA | 2004-2006

Electrical Workgroup Lead. Energy Master Plan for OCSD plants 1 and 2 through year 2020. Responsible for producing testing methods for electrical system transient stability with various on-site generation alternatives and paralleling alternatives. Transient stability testing included on-site digester gas power generation in parallel with utility power and various combinations of digester gas and natural gas mixes. Evaluated existing on-site standby engine-generators and provide solutions to meet existing and future requirements.

City of Troy | Water Treatment Plant, Standby Power Engine Generators; Troy, OH | 2003-2004

Lead Electrical Design Engineer. Provide a complete electrical design for onsite generation at the Troy, Ohio water treatment plant and well fields. Addition of one 900kW generator to the existing 480V switchgear at the water treatment plant. Addition of one 100kW and 350kW generator at the well fields. Responsible for producing and maintaining all project one-lines, schematics, power plans and specifications. Review of equipment submittals during construction.

Domenick A. Loschiavo, P.E.

Mr. Loschiavo is a Project Manager with experience in civil/mechanical engineering design on a variety of water and wastewater plant upgrade and infrastructure projects. His recent experience is managing and leading the detailed design for a cogeneration & electrification project as part of a large treatment facility upgrade. He was also a lead team member restoring a fire damaged 1700 HP internal combustion engine. His design experience includes a range of domestic & international projects including plant expansion, pump station upgrades, reservoir rehabilitation and large diameter pipeline design & rehabilitation. He has also executed construction work as part of Design-Build project teams and supported projects as a Resident Engineer.

PROJECT EXPERIENCE

New York City Environmental Protection | North River WWTP Cogeneration & Electrification; New York, NY

Deputy Project Manager/Engineering Manager. Responsible for managing the Black & Veatch cogeneration & electrification design team as well as leading the upgrade to the 340 mgd pumping station and new process air blower facility during detailed design. The program included multiple advanced contracts to streamline the work with a total \$225 M construction value. This scope included replacement of the existing dual fuel engines with electric motors, installation of new cogeneration engine generators and associated improvements to the electrical system. New engine generators will be utilized to supply 10 MW of power to the plant burning on site generated digester gas and utility supplied natural gas. Heat will be recovered from these units for plant hot water and digester sludge heating. Main Sewage Pump (MSP) improvements include a new Pump Power Train System consisting of 1,850 HP wound-rotor induction motors, right angle gear speed reducers and intermediate lineshafting for five existing MSPs and one new MSP. MSP power train designed for flood resiliency by utilizing three new 2,000 psig hydraulic power units for pump suction, discharge and control valve actuation and elevating the power train above the base flood design elevation.

New York City Environmental Protection | North River WWTP Emergency Response and Reconstruction; New York, NY

Engineering Manager. Responsible for coordinating multiple work orders and engineering design of reconstruction contracts to return the North River WWTP to pre-incident condition where a fire to one of the 10 direct drive internal combustion engines caught fire and damaged critical process components. The work was broken into Work Orders valued at \$14M and nine Construction Contracts valued at \$18M. Work Orders directed Contractors for immediate repair with an emphasis on personnel safety. Contract work was divided into nine discipline specific contracts to stabilize the critical plant systems with replacement of equipment to return the plant to a fully functional facility. The design was completed under a fast track aggressive schedule with all work to be completed within 18 months of Black & Veatch mobilizing to the site. The design was enhanced with the aid of a Three Dimensional model to avoid interferences



PROJECT MANAGER

Expertise: Cogeneration; Design and Construction of Water Infrastructure; Pipeline Design; Pipeline Rehabilitation; Tunneling; Water Transmission; Water Treatment

Education

Masters, Civil Engineering, Northeastern University, 2009 Bachelors, Civil Engineering, Northeastern University, 2002

Professional Registration

- License, Civil, 24GE05243000, New Jersey, , 2015 License, Professional Engineer, Professional to Populate, 89933, , 2011
- License, Professional Engineer, Civil, 47378, Massachusetts, , 2007

Total Years of Experience 15

Black & Veatch Years of Experience 15

Professional Associations

- New England Water Works Association - Young Professionals Committee
- New England Water Works Association - Distribution & Storage Committee
- American Society of Civil Engineers - M.ASCE

Office Location New York, NY

and assist in the post fire condition assessment. Melbourne Water Corp | Alliance EPC Wastewater Project, Eastern Treatment Plant Tertiary Upgrade; Melbourne, Victoria, Australia

Project Engineer. Developed civil infrastructure components for three 30% designs as part of the Owner-Engineer-Constructor Alliance on this 200mgd tertiary treatment upgrade to improve ocean outfall quality and prepare for future water reuse. Responsible for the design of two major pumping stations, at full plant capacity, that meets required flow conditions for the treatment processes Responsibilities also included the civil-structure designs of the ultraviolet light & ultra-filtration membrane systems and ozone cooling system pump station.

Veolia Water Indianapolis, LLC (VWI) | TW Moses Water Treatment Plant Technical Upgrades; Indianapolis, IN

Project Engineer. Designed new filter backwash treatment consisting of a package plate settler unit housed in a new 2,700 square foot four story building for the 24m upgrade. Responsibilities also included development of five separate residual pumping applications ranging from 2HP to 30HP, yard piping and valve vault structures, and an electric operated three-way eccentric plug valve for the new Sludge Truck Loading Station.

City of West Haven | West Haven Water Pollution Control Facility Upgrade and Expansion; West Haven, CT

Project Engineer. Performed on site special inspection of the deep foundation raw sewage pump station building expansion. Deep foundation consisted of eleven 5 -1/2 inch diameter micro-piles with load capacities of 70,000 lbs (axial), 2,000 lbs (uplift), and 4,000 lbs (lateral). Inspection also included witness testing of one test pile for verification of pile capacity in accordance with contract documents.

Massachusetts Water Resources Authority (MWRA) | Southern Spine Distribution Mains Section 107 – Phases 1 & 2; Boston, MA

Project Engineer. Designed and developed contract documents for 4,500 linear foot 48-inch ductile iron pipeline. To facilitate installation of the 48-inch main, design involved: 60-inch Pipe Jacking, 48-inch 150 psi double linestop, 10-foot diameter sewer crossing utilizing drilled-in mini-piles, development of three 5 mgd water revenue meter stations and replacement of 10,000 linear feet of 12-inch and smaller local town watermain. In addition as project engineer for design, served as Resident Engineer throughout construction.

PRESENTATIONS & PUBLICATIONS

"Installation of 48" Double Linestops on 50 Year Old Steel Water Main." Worcester, MA DCU Center; NEWWA 2009 Spring Conference. April 2009.

"Realizing a Reliable, Resilient and Efficient Source of Energy – CHP" Atlantic City, NJ; The John J. Lagrosa 101st Annual Conference and Exposition of the NJWEA, May 2016.

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James A. McCaw, Jr., P.E.

Jim McCaw is a Startup Support Manager with over 40 years of experience in the power industry. Responsibilities include startup management of power and wastewater facilities, onsite startup support of plant chemistry issues, including chemical cleaning, steam blows, lube oil flushes, cooling water and steam cycle chemistry, and startup of water treatment systems. In addition, provides home office support for projects in the areas of startup planning, staffing, and package development. Prior to coming to Black & Veatch, he designed, engineered, and operated chemical processes for power plants, including water and wastewater treatment systems, cycle chemistry, boiler chemical cleanings, and developed alternative fuels applications for coal fueled power plants using tires, waste solvents, wood products, and contaminated soils.

PROJECT EXPERIENCE

Various Projects and Clients; Overland Park, KS | 2005-Current

Startup Support Manager. Responsible for home office support of startup activities for various Black & Veatch energy and water division projects. Activities included supporting staffing needs, startup planning, development of turnover packages, and proposal estimating. In addition, managed startup cleanliness practices including, chemical cleaning and steam blows, for ongoing projects.

American Electric Power | Clifty Creek Station Project; Madison, IN | 2013

Startup Manager. Responsible for managing the commissioning and startup of the Waste Water Treatment Plant at the Clifty Creek Station of AEP. Project consisted of a lime precipitation system with organosulfide addition to remove suspended solids and mercury from the blowdown stream of a flue gas desulfurization system installed at the facility.

Dansby Station Project, BTU; Overland Park, KS | 2010

Startup Manager. Responsible for managing and directing startup and commissioning activities for Unit 3, a simple cycle combustion turbine. Project was completed on schedule within a two month unit outage window.

Florida Power and Light | Port Everglades Station, Stack Emissions Reduction Project; FL | 2005

Startup Manager. Responsible for planning, managing and directing startup and commissioning activities for Unit 2. Project consisted of the retrofit installation of an electrostatic precipitator, ash transport system and silos, alkali injection system, and associated electrical, service water and air systems. Project was completed on schedule within a two month unit outage window.

Various Projects and Clients; Overland Park, KS | 2001-2005

Chemical Startup Engineer. Managed and coordinated pre-operational cleaning activities and chemistry issues for new power projects. Activities ranged from overseeing subcontracted work, to managing self-performed chemical cleanings, including procurement of chemicals and cleaning

COMMISSIONING

Expertise: Startup Support Plant Chemistry Chemical Cleaning

Office Location Kansas City, MO

Education

BS, Electrical Engineering, California State University, 1992

Professional Registration

PE - 2004, AZ, 41567 PE - 2005, CA, 17748 PE - 2009, CO, 42984 PE - 1998, KS, 15148 PE - 2005, UT, 5747644-2202 PE - 2008, WV, 17776

Year Career Started 1992

Year Started with B&V 1993



equipment; preparation of the cleaning procedure, valve list, precleaning preparations lists; and on site supervision.

Responsible for home office support of startup activities for various projects, which included developing startup manloading and cost budgets for new projects.

Various Training Programs | 1999-2000

Senior Project Manager - Multimedia Development Services. Developed computer based, interactive training programs for water and wastewater treatment processes and other industrial processes.

New York State Electric & Gas Corporation, Binghamton, NY | 1979-1999

Senior Chemical Engineer - New York State Electric & Gas Corporation. Managed the corporate chemistry group to oversee water, wastewater, and cycle chemistry for six power plants. Managed several boiler chemical cleanings. Developed alternative fuels ranging from contaminated soils, tires and wood products, to waste solvents and tars to replace coal at fossil fueled power plants. Managed the remediation of several sites contaminated with coal tars from former manufactured gas plants.

1985-1987

Project Engineer - New York State Electric & Gas Corporation. Responsibilities included design, installation and startup up of water and wastewater treatment and collection systems at several fossil fueled power plants.

1979-1985

Staff Engineer - New York State Electric & Gas Corporation. Responsible for performing design review and overseeing startup of chemical processes for the Somerset Station, including boiler makeup water, condensate polishing, cycle chemical feed and monitoring, and wastewater treatment systems. Managed the preoperational cleaning of the preboiler/boiler cycle. Designed and furnished the chemical lab. Provided technical support for the flue gas desulfurization system, including selection of corrosion-resistant materials, limestone supply evaluation and procurement, and system compliance acceptance testing.



David S. Modi, P.E., P. Eng

David Modi is a Mechanical Engineer who functions in a lead role, providing technical guidance and supervision of engineering staff on projects of low to medium complexity. On larger projects, David prepares designs for assigned systems, including analysis, calcs, research, and equipment selection. David supervises drafters, designers, and subordinate engineers assigned to his projects. David also coordinates design effort with other project personnel. David is the Chief Engineer's representative for the Raleigh Office, assisting with classified area map reviews for Raleigh projects. David has approximately 9+ years of experience in the power industry, including 1 year of field service experience. David also spent 6 years as a Naval nuclear trained mechanical technician, familiar with the operation and maintenance of nuclear power generation equipment and propulsion systems.

PROJECT EXPERIENCE

Black Hills | PAGS LM6000 Expansion; CO

Mechanical PDE. Adding GE LM6000 40MW CT in simple cycle mode to existing facility. Mechanical PDE in overseeing the overall mechanical design of the project. Coordinated activities between the assigned mechanical system engineers and technicians. Responsible for mechanical budget and schedule.

DC Water | DC Water CHP; Washington, DC

Lead Mechanical Engineer. Renewable Energy Biosolids Project. Combined heat and power plant utilizing two Solar Mercury 50 CT's and Rentech HRSG to provide steam to anaerobic digester. Engineering design of mechanical systems (steam and boiler blowdown). Coordinated design activities among junior system engineers and technicians assigned to the project.

Black Hills Power | Colorado Electric Utility LP - Airport Project; CO

Mechanical Engineer. 200 MW Simple Cycle Project with two GE LMS100 combustion turbines. Engineering design of mechanical systems (circulating water, fuel gas, inlet air chilling), including preparation of P&IDs and calculations, purchase specifications (cooling tower, concrete pipe, chiller, vertical pumps, control valves, field erected tanks), equipment evaluations, equipment design coordination, and construction support.

Westar Energy | Emporia Energy Center; KS

Mechanical Engineer. 660 MW Simple Cycle Project w/ 3 GE 7FA's and 4 GE LM6000's. Assisted PDE with calculations, spec writing, procurement management, field construction support.



COMBUSTION TURBINE GENERATORS

Expertise: Engineering Design

Office Location Cary, NC

Education Bachelors, Mechanical Engineering, University of Maryland - Baltimore County, 2005,

Professional Registration

License, David Modi, Mechanical, 40894, Georgia, , 2016 License, Professional Engineer's License, Mechanical, 49750, Colorado, , 2015 License, Professional Engineer's License, Mechanical, 84016, Pennsylvania, , 2015 License, Professional Engineer's License, Mechanical, 21342, West Virginia, , 2015 License, Professional Engineer's License, Mechanical, 194253, Alberta, Canada, 2015 License, Professional Engineer's License, Mechanical, 36265, North Carolina, , 2015

Total Years of Experience 20

Black & Veatch Years of Experience 10



Louis E. Nemeth, R.A., CSI, LEED AP

Mr. Nemeth is well versed in all phases of architectural services; including building design, construction document production, specification writing and constructability reviews. His experience includes work on water and wastewater treatment facilities as well as participating in value engineering studies.

Mr. Nemeth has served as an architect on projects located in Saudi Arabia, Kuwait and the United Arab Emirates. The international and cultural experience, along with a variety of project types, guarantees the client a successful project.

PROJECT EXPERIENCE

NYCDEP | North River Water Pollution Control Plant Cogeneration and Electrification Project; New York, NY | 2013 - Present

Project Architect. Responsibilities include: building code analysis, life safety/egress plans, building design, material selection, and supervising development of the construction documents.

DC Water | Blue Plains AWTF Combined Heat and Power Project; Washington, DC | 2012

Project Architect. Provided building designs for a new combined heat and power project that produces up to 100,000 pph of steam for use in the Cambi process as well as up to 15 MW of electricity for use in the Blue Plains AWTF. Facilities included gas blowers, siloxane removal equipment, gas compressors, combustion turbines, heat recovery steam generators, and other ancillary facilities. The project was delivered thru a Design-Build-Operate contract arrangement.

City of Midwest City | Pollution Control Facility Improvements; Midwest City, OK | 2011

Project Architect. Designed the following buildings: Headworks, MBBR Blower Building, UV Disinfection, and Biosolids Pumping Complex. The building exterior features masonry veneer to match existing plant buildings. Also, "green materials" will be specified including the use of natural daylighting.

City of Westminster | Influent Pump Station; Westminster, CO | 2010

Project Architect. Designed a load bearing masonry pump station. The building exterior features split face masonry to match existing plant buildings along with a clay tile mansard roof system.

Winston-Salem/Forsyth County Utility Commission | R. A. Thomas Water Treatment Plant LEED Evaluation; Winston-Salem, NC | 2008

Architect/LEED Specialist. Collaborated on review of design documents for the new water treatment plant to determine how the 90% complete design compared to the LEED rating system for sustainable/green design and provided recommendations for reasonable additions to the project scope to increase the



ARCHITECTURAL, TURBINE BUILDING

Expertise: All phases of architectural services

Office Location Kansas City, MO

Education

- Master of Regional and Community Planning, Kansas State University, 1986
- Bachelor of Architecture, Kansas State University, 1983
- Associate of General Education (Architectural Technology), Northampton Community College, 1979

Professional Registration

R.A.- Colorado, Connecticut, District of Columbia, Florida, Kansas, Maine, Maryland, Michigan, Missouri, Montana, Nevada, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, Wyoming

NCARB Certified

LEED Accredited Professional Professional Associations USGBC-Central Plains Chapter CSI-Construction Specifications Institute

Year Career Started 1986 Year Started with B&V 1989 level of sustainability. Co-authored report documenting findings in terms of LEED point comparison.

Metro Wastewater Reclamation District | Primary Treatment Improvements; Denver, CO | 2008

Project Architect. Provided architectural design and detailing for gravity thickeners building, pump station, and an electrical building. The building exterior featured brick veneer to match existing plant buildings.

City of West Jordan | Biosolids Thermal Drying Project, South Valley Water Reclamation Facility; West Jordan, UT

Project Architect. Provided architectural design and detailing for a new drying building located adjacent to an existing dewatering building. The building features exterior brick veneer to match existing plant buildings, steel frame structure, and a flat roof system.

Cobb County Water System | Northwest Cobb WRF Expansion; Kennesaw, GA | 2003

Project Architect. Designed an influent pump station, primary sludge pump station, primary screening building, aeration basin blower building, ultra violet disinfection building, switchgear building, and maintenance building. Buildings featured brick veneer with brick accent bands and flat roofs.

Southern Nevada Water Authority | Pilot Plant Building, Alfred Merritt Smith Water Treatment Facility; Las Vegas, NV | 2008

Project Architect. Provide architectural design and detailing for a 6,670 square foot building that will include office area, break room, training room, bench scale laboratory and pilot plant area. The building will feature a combination of a steel frame structure and load bearing masonry walls and flat roof system. Although LEED certification will not be pursued, "green design" elements will be incorporated.

Southern Nevada Water Authority | Mechanic Maintenance Shop, Alfred Merritt Smith Water Treatment Facility; Las Vegas, NV

Project Architect. Provided architectural design and detailing for a 16,000 square foot building that included office area, break room, training room, mechanic and welding shops. The building featured a steel frame structure with precast concrete wall panels and flat roof system.



Sai B Peyyeti, P.E., CCCA

Professional Engineer with a master's degree and 11 years of experience in the Construction Management and Structural Engineering Design of Water and Wastewater Treatment Plants.

Mr. Peyyeti is a Certified Construction Contract Administrator (CCCA) by Construction Specifications Institute (CSI). Mr. Peyyeti worked as an Assistant Resident Engineer/Structural Engineer/Civil Structural Inspector/Office Engineer and experienced in the structural design, field inspections, contractor payment reviews, field records management (such as submittals, RFIs, RFCs, change orders, O&M Manuals etc.), preparation of partial and substantial occupancy documents, preparation and tracking of punch list items, controlled inspections document management, and permit management.

PROJECT EXPERIENCE

PSEG | Sewaren 7 CC; Sewaren, NJ | 2016-In-Progress

Field Civil/Structural Engineer. Working as a field Civil/Structural Engineer. Sewaren 7 is a dual-fuel (natural gas, and ultra-low-sulfur distillate fuel oil), 540-MW combined cycle power plant of \$600 million investment by PSEG. Equipment included Combustion and Steam Turbine Generators, Heat Recovery Steam Generator, Air Cooled Condensers etc. Responsibilities include providing technical support for the project, liaise with design engineering office, monitoring construction for compliance (quality), responding to RFIs, review contractor requisitions, prepare change orders, provide constructability input, maintain red lined conformed to construction record drawings etc.

NYCDEP | New York City Water Tunnel No. 3; New York, NY |2013-2016

Assistant Resident Engineer/Office Engineer. Worked as Assistant Resident Engineer/Office Engineer on the Construction Management team for Contracts 538D and 549A. Contract 538D is a \$200 million project, which consists of installation of electrical, mechanical and H&V equipment installation in tunnel shafts & construction of trunk water mains. Contract 549A consists of the Activation of tunnel and installation of instrumentation, security and telemetry systems, and is a \$26 million project. Mr. Peyyeti is responsible for field records management, contractor payment reviews, field inspections, and close out of the projects. Our team successfully completed activating the City Water Tunnel No. 3, Manhattan Leg.

NYCDEP | Manhattan Pump Station Upgrade; New York, NY | 2008-2013

Structural Inspector/Assistant Resident Engineer - ARCADIS. Worked as Structural Inspector/Assistant Resident Engineer for \$236 Million Manhattan Pump Station Upgrade Project in New York. It was a Wicks Law contract and had 4 Prime Contractors. Upgrade consists of replacing of all 5 Centrifugal pumps with new 100 MGD each Main Sewage Pumps, replacement of Suction, Discharge & Cone Check Valves, Screens and Sluice Gates. Installation of new Throttling Gates, 2- 5000kW Gas Turbine Generators with Black Start Diesel Generators



RESIDENT PROJECT REPRESENTATIVE (TURBINE BUILDING)

Expertise: Construction Management; Design Services During Construction; Structural Design

Office Location Sewaren, NJ

Education

- Master of Science, Civil Engineering, Univ Toledo, 2004,
- Bachelor of Science, Civil Engineering, Andhra University, India, 2001, India

Professional Registration

License, Sai Bhaskar Peyyeti, Civil, 16095601, New York, , 2015

Certifications

- Confined Space Entry
 NYCDOB 4-hour
- scaffolding, OSHA 10 hour,
- Construction Document Technologist (CDT) by CSI, Certified Construction Contract Administrator (CCCA) by CSI

Total Years of Experience 11.5

Black & Veatch Years of Experience and other Electrical, Structural, Mechanical, HVAC and Plumbing systems. Duties include field inspections, contractor payments processing, partial and final acceptance (Article 16s and 44s) documents preparation, punch lists preparation and monitoring, field correspondence preparation, T&M records management, and field records management for controlled inspections and closeout etc. Worked as a part of the team in recovery of pump station after hurricane Sandy and led the effort in preparing hurricane damage assessment for FEMA review.

City of Ann Arbor | Ann Arbor Wastewater Treatment Plant - Aeration Tanks and Primary Building; Ann Arbor, MI | 2008

Structural Engineer – Malcolm Prinie, Inc. Responsible for the structural design of Aeration Tanks and Primary Building, which was part of \$60 million upgrade to the existing plant. Aeration Tanks were 192ft.X205ft.X22ft. deep concrete structure, and Primary Building is 86ft.X30ft. and has basement and first floor. Basement is reinforced concrete with brick and block above grade walls and prestressed concrete roof. Primary Building houses various mechanical and electrical equipment, and chemical systems. Prepared structural drawings, specifications and cost opinion.

City of Marysville | Marysville Wastewater Treatment Plant - Residual Handling Building and Tertiary Filter Building; Marysville, OH | 2006

Structural Engineer - Malcolm Pirnie, Inc. Performed structural design of Residual Handling Building and Tertiary Filter Building for a new \$50 million Wastewater Treatment Plant. Both buildings were designed as masonry structures with wooden roof and concrete foundations. Residual Handling Building was 105ft.X90ft. and Tertiary Filter Building was 100ft.X85ft. Both buildings were designed for the loads specified in the ASCE 7 loadings standard.

Jackson County | Jackson County Water Treatment Plant - Flocculation and Sedimentation Basins; MS | 2005

Structural Engineer - Malcolm Pirnie, Inc. Performed structural design of Flocculation and Sedimentation Basins for a new \$30 million Water Treatment Plant which has an ultimate flow rate of 10MGD. It is a reinforced concrete structure with dimensions of 158ft.X33ft.

Northeast Ohio Regional Sewer District; OH | 2005

Structural Engineer - Malcolm Pirnie, Inc. Worked on the retrofitting of Steel Sludge Handling Building.



Jeffrey V. Nickerson, P.E.

Jeff Nickerson specializes in instrumentation; supervisory control and data acquisition (SCADA) systems; computer networks; and fieldbus networks. His experience includes design, inspection, and startup of SCADA systems comprised of programmable logic controllers (PLCs), distributed control system (DCS) controllers, remote terminal units, computer workstations for human-machine interface (HMI), metallic and fiber optic data highway communication, device and fieldbus networks, and process instrumentation for water and wastewater treatment facilities.

PROJECT EXPERIENCE

U.S. Army Corp of Engineers – Baltimore District, Washington Aqueduct Division | East Shaft Pumping Station Rehabilitation; Washington, District of Columbia | 2015

Lead Controls Engineer. Designed an instrumentation and control system for the rehabilitation of a settled water pump station. Project includes replacement of the existing pump and electrical gear and addition of chemical treatment. Design includes the addition of a new PLCs for process control and fiber optic cable for communications to the main plant.

Sacramento Regional County Sanitation District | Biological Nutrient Removal; Elk Grove, CA | 2013-2015

Controls Project Manager. Led an instrumentation and control team through detailed design for a new biological nutrient removal system. Facility will be designed to remove nitrate and phosphorus from 181 mgd of primary effluent and includes design of basins, aeration blowers, and several pump stations. Design includes the addition of a new area control center with Emerson Ovation supervisory control, Allen Bradley ControlLogix process control, valves and instrumentation networked through Profibus DP/PA, and MCCs and VFDs networked through Ethernet/IP.

NYCDEP | North River Wastewater Treatment Plant Cogeneration and Electrification; New York, NY | 2013-2014

Controls Design Quality Control. Supervised the lead controls designer and performed quality checks of the instrumentation and controls design of multiple contracts associated with the project. Project includes replacement of main sewage pump and blower engines with electric motors; a cogeneration facility using treated digester gas and natural gas; heat recovery; and digester improvements.



CONTROL SYSTEMS

Expertise:

computer networks; fieldbus networks; Instrumentation & Control; SCADA/Automation; Wastewater Process; Water Process

Office Location Kansas City, MO

Education Bachelors, Electrical

Engineering, Digital Design, Kansas State University, 2002, United States

Professional Registration

- License, Electrical, 51935, Minnesota, United States, 2014
- License, Electrical, 20397, Iowa, United States, 2011
- License, Electrical, 87923, New York, United States, 2010
- License, Electrical, 19119, Kansas, United States, 2006

Total Years of Experience 14

Black & Veatch Years of Experience 14

NYCDEP | Wards Island WPCP, Manhattan – Bronx Grit Chambers; New York, NY | 2012-2014

Lead Controls Engineer. Designed an instrumentation and control system for the replacement of bar screens at two combined sewer screening facilities. Upgrades include replacement of existing screens at 369 MGD and 182 MGD facilities with traveling bridge type bar screens. Design included detailed coordination with screen vendors and the modification of the Modicon Quantum PLC-based control system.

District of Columbia Water and Sewer Authority | Combined Heat and Power; Washington, DC | 2012-2014

Controls Engineer. Designed the instrumentation and control system associated with the gas treatment system for the Combined Heat and Power Facility used to generate steam and electrical power using digester gas. Upgrades included the addition of gas blowers, moisture removal, siloxane removal, gas blending, and gas compression for treatment of approximately 5300 scfm of digester gas. Design included the addition of an Allen-Bradley ControlLogix PLC-based control system with Wonderware System Platform HMI and an expansion of the Emerson Ovation DCS system used for monitoring.

Irvine Ranch Water District | Michelson Water Recycling Plant Biosolids and Energy Recovery Facilities; Irvine, CA | 2010-2012

Lead Controls Engineer. Designed an instrumentation and control system for the addition of sludge drying. Upgrades included the addition of thickening centrifuges, acid phase digesters, egg-shaped methane phase digesters, dewatering centrifuges, biogas treatment, odor control, heat dryer system, fats, oils and grease receiving station, and chemical storage and feed systems. Design included the expansion of the Modicon Quantum PLC-based control system and expansion of multimode fiber optic backbone.

Orange County Sanitation District | Sludge Thickening, Dewatering and Odor Control at Plant 1 – P1-101; Fountain Valley, CA | 2010-2011

Controls Engineer. Assisted in the design of an instrumentation and control system for the replacement of sludge dewatering at Plant 1. Upgrades included replacement of belt filter presses with thickening and dewatering centrifuges, replacement of odor control, modifications to truck loading, expansion of chemical storage and feed systems, and miscellaneous pumping stations and plant improvements. Design included the expansion of the Modicon Quantum PLC-based control system and expansion of an air-blown multimode fiber optic backbone.



Larry D. Pittman, P.E.

Mr. Pittman specializes in the design of engine-driven equipment and fuel storage and distribution systems for water and wastewater treatment facilities and pumping stations. He has also provided reliability assessments, payback analysis, and energy usage evaluation studies for many different sizes of engine-generators. He design experience includes the designed vehicle service and maintenance facilities.

PROJECT EXPERIENCE

City of Santa Monica | Arcadia Water Treatment Plant; Santa Monica, CA

Mechanical Engineer. Designed one 2,400 kW diesel fueled engine-generator for Arcadia facility and one 1,400 kW diesel fueled engine-generator for the Charnock facility. Each engine-generator designed to provide standby power.

Water District No. 1 of Johnson County | Wolcott Water Treatment Plant; Johnson County, KS

Mechanical Engineer. Designed three 2,000 kW natural gas fueled enginegenerators to provide power for standby and load curtailment applications.

San Jose | San Jose/Santa Clara Water Pollution Control Plant; San Jose, CA

Mechanical Engineer. Responsible for the evaluation of alternative power supply and cost estimates for comparison of digester gas fueled turbines and reciprocating engines to provide approximately 13,800 kW.

Orange County Sanitation | District Energy Master Plan; Orange County, CA

Mechanical Engineer. Responsible for the evaluation of the District's current and future standby power needs and options to meet those needs including the diesel fuel storage system.

NYCDEP | Wards Island Water Pollution Plant; New York, NY

Mechanical Engineer. Responsible for the evaluation for the On-Site Power Supply Evaluation at the Wards Island Water Pollution Plant in the event utility supplied power is not available. Evaluations were based on capital, maintenance, and operating costs.

 NYCDEP | CM Services to the 26th Ward WPCP Emergency Generator Upgrades; New York, NY

Technical Advisor. \$50 million project to upgrade the emergency power system at the 26th Ward WPCP. Work includes replacing the existing gas turbine generators with diesel generators, replacing the existing diesel black start generator, and all modifications required to the substation, switchgear, and control systems. The CM team performed the constructability review of the project.

City of Mesa | Mesa CAP Water Treatment Plant; Mesa, AZ

Mechanical Engineer. Designed two 1,400 kW natural gas engine-generators and one 50 KW diesel engine-generator for standby power.



STANDBY POWER QA/QC

Expertise: Water and Wastewater

Office Location Kansas City, MO

Education Bachelor of Science, Mech, Wichita State University, 1977,

Professional Registration License, Professional

Engineer, Professional to Populate, 9444, Kansas, , 1983

Total Years of Experience 40

Black & Veatch Years of Experience 40

Professional Associations American Society of Mechanical Engineers -Member



City of Greensboro | Alternative Energy Evaluation; Greensboro, NC

Mechanical Engineer. Responsible for the evaluation of alternative power supply and cost estimates for several locations. Design one 2,000 kW diesel engine-generator at the Lake Townsend location.

Electric Power Reliability Evaluation; Cincinnati, OH

Mechanical Engineer. Responsible for the evaluation of standby power needs and cost estimates for various locations. Design one 600 kW diesel enginegenerator at the Kennedy Avenue location and one 300 kW diesel enginegenerator at the Cherry Grove location.

NYCDEP | North River Water Pollution Control Plant; New York, NY

Senior Mechanical Engineer. After a fire occurred in the engine room an assessment to North River Water Pollution Control Plant was performed. Assessment of the root cause for the fire was performed and recommendations were provided to prevent another similar occurrence to other equipment. Assessment also included reviewing of existing facilities to mitigate other potential future risks of potentially failure scenarios of engines.

PUBLICATIONS

Pittman, L.D. Rowan, J.M., Long. "Digester Gas Utilization: Is the Time Right to On-Site Power Generation? ." WEF Conference. January In-Progress

Ellermeier, Fred; Pittman, Larry; and Stevens, Don. "Emergency Source Power Planning for Water and Wastewater." AWWA. January In-Progress

Scot E. Pruett, P.E.

Scot Pruett is currently the Fire Protection Engineering Manager for Black & Veatch's Energy Division. Responsible for managing the fire group and generating/implementing company fire protection policies. The fire protection group consists of both U.S. based engineers as well as engineers in our international offices.

Responsible for ensuring the companies fire protection standards, processes and procedures are current and maintained as necessary to support changing project workload. He specializes in the design and review of fire protection systems and specifications. He is also responsible for generating fire protection cost estimates, code analysis, correspondence with code officials, generating the fire protection specification and supporting calculations, bid evaluations, and detailed design and installation drawing reviews.

PROJECT EXPERIENCE

Duyen | Duyen HAI; Vietnam | 2014-2016

Fire Protection. Manage fire protection personnel on this project, oversee specifications, and design details for the coal unit addition to the existing power facility.

Therma South Inc. | Therma South; Philippines | 2011-2015

Fire Protection. Oversee fire protection specification, bid reviews and detailed design review for the 2 unit coal power facility.

Black Hills Corporation | Black Hills; WI | 2009

Fire Protection Lead. Responsible for administrative duties with regards to the fire protection section. Designed and reviewed fire protection systems and specification for power plants (Energy Division) and other divisions within Black & Veatch.

Hawaiian Electric Company, Inc. | Substation Expansion; HI | 2005-2007

Fire Protection Section Lead. The project consisted of the expansion of an existing indoor substation. Generated fire protection specification, bid reviews and detailed design review of new and reworked fire protection systems.

ConAgra Foods | Fire Protection Equipment; Nebraska | 2002-2004

Fire Protection, Owners Engineer. Black & Veatch assisted the owner in obtaining consistent and appropriate fire protection equipment in multiple 300,000 square foot rack cold storage warehouses. Black & Veatch also assisted with the review of a new airport hangar.

Deere and Company Facilities Engineering | Deere and Company Corporate Data Center; Illinois | 2003

Fire Protection Lead. Generated fire protection specification, bid reviews and detailed design review. Fire protection systems included sprinkler systems, gas suppression and early warning detection.



FIRE PROTECTION

Expertise: Coal; Combustion Turbine; Consulting Engineering Services; Biomass; Water Industry; Gas; Oil and Chemicals Industry; Renewable Energy

Office Location Overland Park, KS

Education

- Masters, Business, Baker University, 2005
- Bachelors, Electrical Engineering, University of Missouri, Kansas City, 1988

Professional Registration

License, Professional Engineer / Fire Protection, Professional to Populate, 36965, 2001 License, Professional Engineer / Fire Protection, Professional to Populate,

16321, Kansas, , 2001 Total Years of Experience 27

Black & Veatch Years of Experience 19

- Professional Associations Society of Fire Protection Engineers - Member
- National Fire Protection Association (NFPA) - NFPA 853 Committee member -National Fire Protection Association (NFPA) - NFPA 851 Committee member National Fire Protection Association (NFPA) - NFPA 850 Committee member National Fire Protection Association (NFPA) - NFPA 101 Committee member



Mesquite Power LLC | Mesquite Generating Station | 2002-2003

Fire Protection Lead. Generated fire protection specification, bid reviews and detailed design review for two blocks consisting of 1 steam turbine and 2 combustion turbines.

Kiowa Power Partners | Kiamichi Energy Facility; Oklahoma | 2001-2002

Fire Protection Lead. Generated fire protection specification, bid reviews and detailed design review for two blocks consisting of 1 steam turbine and 2 combustion turbines.

Calpine Energy | Aries Power Plant; Missouri | 2000-2001

Fire Protection Lead. Generated fire protection specification, bid reviews and detailed design review for a power facility consisting of 1 steam turbine and 2 combustion turbines.

Pharmacia and Upjohn | Detailed Sprinkler Design; Puerto Rico (U.S.) |1998-2000

Fire Protection Lead. Generated fire protection detailed sprinkler design for high bay rack storage building.

Taiwan Power Company | Lungmen Nuclear Power Plant; Taiwan | 1998-1999

Fire Protection Lead. Responsible for design and layout of controls, initiating and notification systems.



Kathryn H. Robinson

Kathryn Robinson is an Engineering Manager responsible for supervision of the overall engineering design on assigned projects. She is also the Assistant Mechanical Manager of Engineering for the Raleigh office. Ms. Robinson has extensive experience on simple-cycle gas turbines, combined cycle gas turbines, biomass boiler, air quality control retrofit, and balance of plant design projects. Responsibilities have included mechanical engineering project oversight, engineering design, procurement support, and construction support.

PROJECT EXPERIENCE

Exelon | Project Phoenix; TX | 2014-2015

Senior Mechanical Engineer. Permitting support and preliminary system definition for combined cycle power plant. Provided engineering data, equipment layout, and performance data in support of obtaining project permitting. Provided preliminary system flow diagrams for inclusion in EPC project specification.

LS Power | Dual Fuel Conversion; IL | 2014-2015

Engineering Manager / Project Mechanical Engineer. Preliminary engineering and cost estimate for project to add fuel oil firing capability to existing simple cycle combustion turbine plants at five sites in two states. Developed plant layout for equipment skids and balance of plant equipment.

Black Hills Simple Cycle Project; CO | 2009

Senior Mechanical Engineer. Preliminary plant design for simple cycle combustion turbine project. Provided mechanical engineering support for equipment procurement including fuel gas compressors, HRSGs, and SCRs.

Maui Electric Company (MECO) | Waena Simple Cycle | 2008

Project Mechanical Engineer. Preliminary engineering of simple cycle combustion turbine power plant. Responsibilities included preliminary system design, equipment layout, permitting support, specification development, bid analysis and recommendation for procurement of combustion turbines.

Orion Power | Kelson Ridge Project; MD | 2001

Mechanical Engineer. Owner's Engineering services for the selection of an EPC contractor for an 1160 MW simple cycle combustion turbine power plant.

Con Edison Development | West Springfield and Lakewood Simple Cycle Projects; MA and NJ; 2001

Mechanical Engineer. Owner's Engineering services for the selection of EPC contractors for two simple cycle combustion turbine power plants (80 MW and 525 MW).



CGT SYSTEM DESIGN MANAGER

Expertise:

Combined Cycle; Combustion Turbine; Cogeneration; Air Quality Control; Biomass; Coal; Mechanical Engineering

Office Location Cary, NC:

Education

Postgraduate Diploma, Engineering Management, University of Kansas, 2014 Bachelors, Mechanical Engineering, North Carolina State University, 1992

Professional Registration

- License, Professional Engineer, Mechanical, 62067274, Illinois, , 2015 License, Professional Engineer, Mechanical, 199715, Alberta, Canada, 2015
- License, Professional Engineer, Mechanical, 6201059173, Michigan, , 2012
- License, Professional Engineer, Mechanical, 60619, Florida, , 2003 License, Professional Engineer, Mechanical, 10101363, Indiana, , 2001 License, Professional Engineer, Mechanical, 23474, North Carolina, , 1998

Total Years of Experience 22

Black & Veatch Years of Experience 22

Oglethorpe Power Corporation | Talbot County Energy Facility Project; GA | 2000-2001

Mechanical Engineer. Owner's Engineering services for the engineering, procurement, and construction of a 650 MW simple cycle combustion turbine power plant.

GWF Power Systems | Hanford Energy Park Project; CA | 2000

Mechanical Engineer. Preliminary engineering study and cost estimate for a 100 MW combined cycle combustion turbine power plant addition.

Columbia Electric | Columbia ECAR Project; WV | 1999-2000

Project Mechanical Engineer. Mechanical engineering support of plant permitting and combustion turbine equipment purchase for a 500 MW simple cycle combustion turbine power plant. Preliminary engineering for overall facility design.

Dynegy, Inc. | Rockingham Power Station Project | 1999

Mechanical Engineer. Mechanical engineering design, procurement, and construction support for an 800 MW simple cycle combustion turbine project.

Skygen | Androscoggin Cogeneration Center Project; ME | 1998-1999

Project Mechanical Engineer. Mechanical engineering design, procurement, and construction support for a 150 MW CT / HRSG cogeneration facility, including air, steam, fuel, water, chemical, CO and SCR catalyst systems.

Carolina Power & Light Company | Darlington County CT Project | 1996

Mechanical Engineer. Engineering design of a 240 MW simple cycle combustion turbine utility power plant addition.

North Carolina Electric Membership Corporation | Davidson County Project

Mechanical Engineer. Engineering design of a 330 MW combined cycle combustion turbine utility power plant. Engineering design for systems including preparation of P&IDs, system descriptions, equipment specifications, and calculations.



MAY 2015

John K. Ruhl, P.E.

Mr. Ruhl has 27 years of experience in water resources planning and civil engineering design. His experience includes flood control, sediment control, water quality, surface water hydrology and hydraulics, stormwater detention, groundwater quality, hazardous waste management, navigation, levees, channel modification, salinity control, dam inspections, environmental studies, economic analysis, permit requirements, and value engineering. He also has expertise in civil engineering studies and design including roads, stormwater, utilities, pavement, field data collection, community meetings, analysis, design, report preparation, plans and specifications, cost estimates, and construction phase services.

PROJECT EXPERIENCE

USACE, Kansas City District | Soldier Creek Engineering During Construction; Topeka, KS

Project Manager. Mr. Ruhl is performing services in support of the Kansas City District during construction of the Soldier Creek Diversion Unit Repair. The Diversion Unit Repair is a stream stability design to repair damage from a flood in 2005. The services completed to date include participation at the pre-bid meeting, response to bidder questions, participation at the construction kickoff meeting, and response to contractor requests for information. The additional services performed will be review of contractor submittals and periodic construction inspections. Construction is expected to be completed in October 2010.

USACE, Kansas City District | Sherman Army Airfield Upgrade Feasibility Study; Leavenworth, KS

Water Resources Engineer. Mr. Ruhl is leading the water resources component of this airport planning feasibility study. The airfield lies landward of a Missouri River levee which does not provide protection for the 1% probability event. The levee is located within the Missouri River floodway. The first phase of the study has compared the Missouri River effective flood profile to that generated from the data which resulted from the post-1993 flood Upper Mississippi River System Flow Frequency Study. The second phase has calibrated the latter HEC-RAS model to the 1993 and 2007 events. The remaining portions of the work will include models for each alternative associated with levee upgrades and alternatives for flood mitigation measures to satisfy a no-rise requirement.

USACE, Kansas City District | Swope Park Industrial Area Drainage Study; Kansas City, MO

Water Resources Engineer. The project involves design of a levee/floodwall system for an industrial park adjacent to the Blue River in Kansas City. Interior drainage facilities are being designed which include a pipe network and a detention pond. The pond is designed based on the assumption that high river water levels require closure of the detention pond outlet during the rainfall

FEMA PROGRAM SPECIALIST

Expertise:

Water Resources Planning and Design; Civil Engineering Design

Office Location Kansas City, MO

Education M.S., Water Resources Engineering, University of Kansas, 1988 B.S., Civil Engineering, University of Kansas, 1978

Professional Registration 1983, P.E., KS, No. 9622

Professional Associations Society of American Value Engineers

Year Career Began 1978

Year Started with B&V 1978



event in the interior area. The existing site development in the industrial park produces significant constraints on the design of the levee and floodwall.

FEMA Region VII Flood Insurance Studies/Restudies; Waterloo, IA | 2006 Project Manager. Prepared Flood Insurance Study updates for 15 counties in Nebraska and Iowa. Hydrologic methods have included HEC-HMS, flood frequency analyses, and state regression equations. The hydraulic analyses were performed using either HEC-RAS or an approximate zone redelineation tool which was developed by the Nebraska Department of Natural Resources. Work maps were developed using Intergraph InRoads and ArcView. The HEC-HMS model for Dry Run Creek in Waterloo, Iowa included three detention ponds.

FEMA Region V|Flood Insurance Studies/Restudies; Minnesota and Wisconsin | 2006

Project Manager. Prepared Flood Insurance Study updates for six counties in Minnesota and Wisconsin. Hydrologic methods have included HEC-HMS, flood frequency analyses, and state regression equations. The hydraulic analyses were performed using HEC-RAS. Work maps were developed using Intergraph InRoads. GIS data was developed with ArcInfo. One task required development and calibration (to historical data for two rainfall events) of a HEC-HMS model for the Chain of Lakes in Dane County, Wisconsin.

FEMA Region V | Flood Insurance Studies/Restudies; Upper Minnesota River Basin | 2002-2003

Project Manager. Prepared Flood Insurance Study updates for Big Stone, Swift, Lac Qui Parle, and Brown counties in the upper Minnesota River basin. Six streams were studied by detailed methods and an additional twelve streams by limited detailed methods. Hydrologic methods have included HEC-HMS, flood frequency analyses, and state of Minnesota regression equations. The hydraulic analyses were performed using HEC-RAS. Work maps are being prepared using Intergraph InRoads. Database development was performed using ArcInfo.

FEMA Region V|Flood Insurance Studies/Restudies; Waukesha County, WI | 2002-2003

Project Manager. Prepared a Flood Insurance Study update for the Bark River in suburban Milwaukee, Wisconsin. A HEC-HMS model has been developed to compute the stream discharge. The basin includes considerable storage. The hydraulic analyses were performed using HEC-RAS. Work maps are being prepared using Intergraph InRoads. Database development was performed using ArcInfo.



Nicholas Salem, PE, LEED® AP

Professional Engineer with a master's degree in Electrical Engineering. Passionate, goal-oriented, and success-driven, determined to be a recognized leader in the engineering / construction industry. Strong background in electrical design and construction at NYC wastewater treatment plants and NYC schools dealing with low and medium voltage power distribution systems, as well as many low voltage systems such as fire detection and alarm and exterior security lighting in schools. Also possess significant experience with energy performance contracting involving the full spectrum of electrical and mechanical systems.

PROJECT EXPERIENCE

NYCDEP | North River Water Pollution Control Plant Cogeneration and Electrification Project; New York, NY | 2013

Electrical Engineer. Project involved the electrification of the existing diesel engine driven main sewage intake pumps and diesel engine driven aeration blowers with electric motors, as well as the addition of 15MW of enginegenerator units cogenerating in parallel with the electric utility. Personal project responsibilities included coordination with electrical utility (Consolidated Edison) and NYC Electrical Advisory Board, performing site investigations, development of technical specifications for specific electrical equipment, and electrical support for various design tasks.

Engineering Manager. The North River WWTP Cogeneration and Electrification project included the NR-44 Riverbank State Park Feeder Separation project. This advanced contract involved the separation of the primary service feeders serving the Riverbank State Park from the North River WWTP's electrical distribution system to make available the electrical capacity required to meet peak loading conditions of the WWTP. The project design included a new electrical substation dedicated to the Riverbank State park, independent of the North River WWTP. Personal project responsibilities included coordination with electrical utility (Consolidated Edison) for a new primary electrical service for the Riverbank State Park, coordination with the State Parks Commission, performing site investigations, development of technical memoranda evaluating equipment selection, and development of preliminary design criteria and report documentation.

New York City Environmental Protection | Oakwood Beach WWTP Electrical Upgrades Project; Staten Island, NY | 2013

Electrical Engineer. Project involved the design of suitably-sized transformers to replace the existing transformers which are at the end of their useful life and associated 33 kV primary and 5 kV secondary switchgear to upgrade the entire high tension service to meet the requirements of the latest version of Con Edison's EO-2022 High Tension Service Specification. Personal project responsibilities included coordination with electrical utility (Consolidated Edison), performing site investigations, development of technical memoranda



POWER DISTRIBUTION

Expertise: Electrical Engineering

Office Location New York, NY

Education

- MS, Electrical Engineering, Polytechnic Institute of NYU, 2009
- BS, Electrical Engineering, University of Maryland, College Park, 2004

Professional Registration PE – 2010, NY, #087702 PE – 2010, MD, #40874 PE – 2016, NJ (Pending) LEED * AP

Training, Certifications and Professional Organizations

- OSHA 10 Hour Training Manager as Leader
- Training PSMJ Project Management Bootcamp
- IES Lighting Design Course
- LEED Accredited Professional
- New York Water
- Environment Association (NYWEA)

Year Career Started 2005

Year Started with B&V 2013 evaluating equipment selection, and development of preliminary design criteria and report documentation.

New York City Environmental Protection | Oakwood Beach WWTP Power Distribution Improvements Project; Staten Island, NY | 2014

Engineering Manager / Electrical Engineer. Design of replacement motor control centers and switchgear to replace the existing distribution equipment which are at the end of their useful life. Another main project goal is to bring the new and existing electrical rooms into compliance with NFPA 820. Personal project responsibilities included performing site investigations, development of technical memoranda evaluating equipment selection, and development of preliminary design criteria and report documentation.

New York City Environmental Protection | Newtown Creek WWTP Main Sewage Pump Re-Manufacturing; New York, NY | 2013

Lead Electrical Design Engineer. Lead the electrical portion of the design of the Brooklyn/Queens main sewage pump station upgrade. Detailed design included installation of isolation valves on discharge pipe and replacement of main sewage pumps to meet 428 MGD consent decree capacity. Responsibilities included coordinating the design with the existing MSP resistor bank controller manufacturer, site investigations to confirm existing conditions, new equipment and conduit layouts, and the integration of new equipment into existing operational protocol.

New York City Environmental Protection | Ward's Island Grit Chamber Analysis; New York, NY | 2013

Electrical Engineer. Assisted in the mechanical design lead for the mechanical grit pumping system replacement in the Manhattan and Bronx Grit Chambers for the Ward's Island Waste Water Treatment Plant. Responsibilities included performing site investigations, analyzing potential equipment layouts, as well as assisting in the development of proposed near and long-term solutions for the client.

New York City Environmental Protection | Ward's Island Grit Chamber Motor Failure Analysis; New York, NY | 2013

Electrical Engineer. Investigated the motor failures on the US Filter bar screens installed to replace the aged IDI bar screens at the Manhattan and Bronx Grit Chambers for the Ward's Island Waste Water Treatment Plant. Proposed solutions to prolong the functioning life of the motors and keep the facility operating until the permanent traveling bar screens are installed. Responsibilities included performing site investigations to evaluate motor failures, development of proposed near and long-term solutions for the client, communication with bar screen and motor manufacturers, development of report documentation.



MAY 2016

Michael B. Shafer, P.E.

Mike is an engineering manager that has experience with all facets of water and wastewater systems, including treatment plant upgrades and expansions, residuals facilities, pumping station, and pipeline design. For wastewater systems, he has developed collection system master plans, sewer line design, pumping station and force main design, liquid treatment expansions, and biosolids management. For reuse systems, Mike has led some of the most comprehensive master plan efforts in the Mid-Atlantic region. Through all of these projects, Mike has focused on a client-centered approach to find solutions that meet each individual client's goals for a successful project.

PROJECT EXPERIENCE

DC Water; Blue Plains AWTF Combined Heat and Power Project; Washington, DC | 2012-In-Progress

Engineering Manager. Provided design of new combined heat and power project that produces up to 100,000 pph of steam for use in the Cambi process as well as up to 15 MW of electricity for use in the Blue Plains AWTF. Facilities included three Solar Mercury 50 combustion turbines coupled with 11,000 pph heat recovery steam generators (HRSG). Duct burners in each turbine exhaust boosts the HRSG steaming capacity to 34,000 pph. Gas processing facilities include wet scrubber, 250 hp gas blowers, siloxane removal equipment, and 450 hp gas compressors. The project is being delivered thru a Design-Build-Operate contract arrangement.

Winston-Salem/ Forsyth County Utilities Commission; Muddy Creek WWTP Power Generation Upgrade; Winston-Salem, NC | 2014-In-Progress

Project Engineer Assisted in planning and permitting of a combined heat and power facility including a new 1,100 kilowatt engine generator fueled by digester gas, natural gas, or a blend of both. Hot water from the engine cooling system is utilized for digester and building heating. The electricity produced will be exported and sold to the local electric utility, providing approximately \$368,000 of projected annual electricity sales revenue and 66% reduction in net energy usage. The system will also provide additional emergency standby power capacity such that, in the event of loss of utility power, the system controls will automatically parallel with existing diesel generators to power the plant.

Sacramento Regional County Sanitation District; Sacramento Regional WWTP Biological Nutrient Removal Project; Sacramento, CA | 2014

Hydraulics Engineer. Developed the hydraulic profile for the secondary treatment process at the 181 mgd facility, including new biological nutrient removal basins. The basins were configured to allow four different operating schemes at a peak effluent flow of 330 mgd.



TURBINE BUILDING DESIGN MANAGER

Expertise:

Treatment Plant Upgrades; Hydraulics (Plant); Wastewater Pumping; Wastewater Reuse;

Education

- Masters, Environmental Engineering, NC State, 1994,
- Bachelors, Civil Engineering, NC State, 1991,

Professional Registration License, NC Professional

Engineer, Civil, 22008, North Carolina, , 1996 Total Years of Experience

24

Black & Veatch Years of Experience 24

Professional Associations American Water Works Association - Member Office Location

Cary, NC

Winston-Salem/ Forsyth County Utilities Commission; Muddy Creek WWTP Temporary Influent Pump Station; Winston-Salem, NC | 2014-2015

Project Engineer. Designed a 48 mgd temporary influent pump station in response to a collapsed 54-inch influent sewer. The temporary pump station was designed to operate for up to three while the permanent facility was being constructed. The temporary facility included six 6,700 gpm submersible pumps installed in three manholes and two 600 kW generators. The facility was designed in one month.

City of Morganton; Catawba River WPCF Regulatory Improvements; Morganton, NC | 2011-2012

Project Engineer. Provided design of upgrades to the influent screening and pump station structure. Two new climber screens were designed to replace the existing screens. Four new pumps, providing a firm capacity of 30 mgd were provided with VFD controls for improved influent flow control.

City of Durham; Brown and Williams WTP Upgrade and Expansion; Durham, NC | 2008-2016

Engineering Manager. Provided evaluation and design services to upgrade the City's two existing WTPs, including expansion of the Brown WTP from 30 mgd to 42 mgd. The design included two new treatment trains, new chlorine contact basin, new chemical feed facilities, new 2,500 kW generator, and complete retrofit of the plants 4,160 volt electrical distribution system.

City of Kinston; Forrest Street Lift Station and Wastewater Force Main; Kinston, NC | 2002-2004

Project Engineer. Designed modifications to the existing Forrest Street Lift Station following major flooding event from Hurricane Floyd. An abandoned dry-well was retrofitted into a second wetwell to allow the existing station to remain in continuous operation. Four 300 hp submersible pumps were installed in two wetwells to provide a firm pumping capacity of 17 mgd. A 1,250 kilowatt natural-gas fired engine generator was provided to ensure continuous operation during flooding events that isolated the pump station site.



Joseph R. Stromwall, P.E.

Joe Stromwall is an experienced Project Manager and Construction Manager and has successfully led construction management teams in the Mid-west and New York Metro region for more than 16 years. Joe has hands on experience in construction, design, regulatory compliance and permitting of complex and multidisciplinary water, waste-water and industrial construction projects. Having spent the majority of his CM career focused on water and waste water facilities construction, Joe leads the Black & Veatch Program and Construction Management Group supporting water and waste water construction execution.

PROJECT EXPERIENCE

Various Projects, Various Locations; Black & Veatch Construction Management Group; New York, NY | 2014 – Present

PMCM Group Manager. Joe Stromwall provides support to Black & Veatch's National Program and Construction Management (PMCM) group for: PMCM Business Development, CM Staff Management & Development, Schedule and Delay Analysis, QA/QC activities, Claims & Change Order management, Constructability reviews.

NYCDEP | Installation of Water Meters at various locations; NY

Construction Manager. Joe Stromwall leads the Construction management team overseeing the installation of 650 water meters, backflow preventers and AMR's at New York City Housing Authority (NYCHA) facilties in New York City. As the CM for this project, Joe is accountable for field staffing, coordination with City stakeholders & Prime Contractors and development of a project controls & project schedule strategy.

NYCDEP | City Water Tunnel No.3, Stage 2, Manhattan shafts; NY

Resident Engineer. Joe Stromwall was the Resident Engineer for the Construction of major clean water infrastructure providing additional capacity and redundancy for the potable water supply in Manhattan. This project provided for installation and activation of large diameter piping, mechanical, HVAC electrical and process telemetry equipment at ten locations in New York City in the Borough of Manhattan. As the field leader of this Construction Management JV, Joe has driven the \$250 million dollar project to completion.

Engine & Blower Upgrades Project | Oak Creek, WI

Senior Project Manager. Joe Stromwall was the Project Manager and on-site Construction Manager for the \$30 million Engine & Blower Upgrades Project in which included construction of Bio-Gas generators, Digester gas compressors, Digester improvements, electric blowers, black start generators, Numerous VFD's, new 24.9 kV & 14.8 kV switch gear and new 50,000sq ft building.

NYCDEP | Reconstruction of the Port Jervis WWTP – Value Engineering Study | Queens, NY

VE Team Member; Constructability. Provided Innovative and efficient sequencing ideas to compress the construction schedule and Sustainable ideas like



CONSTRUCTION MANAGER

Expertise: Civil Engineering; Construction Management; Heavy Civil Construction; WWTP Construction; Water & Sewer Conveyance System Construction; Cogen Constructions

Education

- Bachelor of Science, Architectural Studies, University of Wisconsin – Milwaukee, 2002
- Master of Science, Civil/Environmental Engineering, Milwaukee School of Engineering – Milwaukee, 2008

Professional Registration

- New York, Professional Engineer, 089254-1
- New Jersey, Professional Engineer, 24GE04910400
- Wisconsin, Professional Engineer, 40091-6

Began Career 1999 Joined Black & Veatch

2014



retrofitting the Chlorine contact tanks for UV disinfection and reusing trickling filter media as backfill material.

Parsippany-Troy Hills Wastewater Treatment Plant (WWTP) 16 MGD Redesign and Upgrade; Morris County, NJ

Resident Engineer. Joe Stromwall was responsible for supervising construction, applications engineering, commissioning and startup activities on this multidisciplinary project in which the Parsippany-Troy Hills WWTP was converted to a step-feed BNR process. The project included complete demo and replacement of the plant process air system, installation of backup generators, install of new motor control centers, extensive excavation, installation of large-diameter process piping and a new plant outfall. Numerous facility outages and in-plant diversions were necessary. The total construction value of this project was \$27 million.

NYCDEP | Tallman Island WPCP Wet Weather Maximization; Queens, NY

Resident Engineer, CM Project Manager. Joe Stromwall served as the Resident Engineer and Project Manager for the installation of major sewer infrastructure feeding the Tallman Island WWTP in College Point. He was directly involved with the issues surrounding the College Point community, underground conditions, and other local construction issues. Construction of the new Whitestone Interceptor includes medium to deep excavations though tidal wetlands on Long Island Sound and construction of new underground structures at the Tallman Island WPCP. Several flow diversions and bypass operations in excess of 100 MGD were completed to maintain constant influent flow to the Tallman Island WPCP during construction.

Milwaukee Metropolitan Sewerage District; Milwaukee, WI

Senior Project Manager, Construction Manager. Joe Stromwall was the lead Resident Engineer for all construction projects at a 300 MGD WWTP in Milwaukee, WI until Decmber 2009. Joe led a team of Resident engineers and Resident inspectors on construction projects ranging from less than \$1 million to \$60 million in construction value.

Wet ESP Upgrade Project; Milwaukee, WI

Assistant Resident Engineer. Mr. Stromwall was responsible for coordinating and supervising construction, commissioning and start-up activities for the Wet Electrostatic Precipitator Upgrade Project.

Silo Dust Control Project; Milwaukee, WI

Assistant Resident Engineer. Mr. Stromwall was responsible for coordinating and supervising construction, applications engineering, commissioning and startup activities for a dust control project at the Milwaukee Metropolitan Sewerage District's 10,000 ton fertilizer storage facility.



MAY UTE

Toby B. Strout, B.S.E.E , M.B.A.

Toby Strout is an Instrumentation and Controls engineer with experience executing EPC / EPCM projects as Instrumentation and Controls discipline lead for combined cycle, simple cycle, biomass, coal, fossil fuel, process waste heat recovery, and municipal solid waste power generation plants. Strout has led efforts in engineering and equipment estimation and creation of technical and performance based specifications used to assist in procurement of major equipment and services contracts. Strout has performed technical bid evaluations to assist in equipment and service selection. Additionally, Strout has reviewed and created scope of work and engineering deliverable documents for installation contracts.

PROJECT EXPERIENCE

Exelon | Phoenix; TX | 2014-2016

Owner's Engineer. Exelon 2x1 Combined Cycle Owners Engineer. Owners Engineer for 2 - 1100MW Plants.

Detroit Edison | DSI / ACI MATS Compliance; MI | 2014-2016

Fly Ash Controls DCS Retrofit. Replaced existing PLC controls for 144 Fly Ash Hoppers and 4 Filter Separators and Mechanical Exhausters. Brought a mix of existing and new Fly Ash field devices into the plant DCS for two 600MW Coal Fired Units. 1600 I / 0 total.

Hawaiian Electric Company (HECO); HECO Waiau 9 Controls Upgrade; HI | 2013-2014

Controls Engineer. Distributed control system retrofit.

Babcock & Wilcox (B&W) | Berlin Station 70MW Biomass; New Hampshire | 2012-2013

I&C Engineer - Stantec. Balance-of-Plant Specifications, Datasheet, Instrument Database, and P&ID support.

Ecomaine | Numerous; ME | 2008-2013

Business Development - Stantec (and Industry Energy Associates). Chief Point of Contact for Customer Requests for Proposal for Owners Engineer, Project Management, and Multi-discipline Engineering Projects.

DCO Energy | Olinda Landfill Gas to Energy and Providence Landfill Gas to Energy Projects two 32 MW 4x1 combined cycle plants | 2011-2012

I&C Engineer - Stantec. Balance of Plant Specifications, Datasheets, Instrument Database, and P&ID support for two 4x1 combined cycle landfill gas to energy projects 32MW each located in Johnston County Rhode Island and Brea California.



CONTROL SYSTEMS

Expertise:

Air Quality Control Retrofit; Biomass; Bulk Material Unloading and Handling Machinery; Combined Cycle Power Plants; Combustion Turbine Projects; Distributed Control Systems; District Heating and Cooling; **Emissions Monitoring; EPC** Project Execution; FGD Systems; Instrumentation & **Controls Engineering; Plant** Conceptual and Detail Design; Proposal Engineering; Simple Cycle, Steam Turbine Repowering

Office Location Cary, NC

Education

 Masters, Business Administration, Management Concentration, University of Southern Maine, 2000, United States

- Bachelor of Science,
- Electrical Engineering, University of Southern

Maine, 1993, United States

Total Years of Experience

Black & Veatch Years of Experience



Florida Power and Light | FPLE Wyman Station Unit 3 - 150MW Controls Upgrade; ME | 2009-2010

I&C Discipline Lead Project Engineer - Industry and Energy Associates. DCS Upgrade from Foxboro I / A to Emerson Ovation. Creation of electrical drawings for Demolition and Construction. Field Verification, commissioning, and construction support.

UGI | Hunlock Creek Power Station 130MW Repower; PA | 2008-2010

I&C Engineer - Industry and Energy Associates. Balance of Plant Specifications, Datasheet, Instrument Database, and P&ID support.

Areva | 30 MW FEED Conceptual Plant Design; Pennsylvania | 2009-2009

I&C Discipline Lead Project Engineer - Industry and Energy Associates. +/-30% Front End Engineering Design and Development of a Biomass Plant for a generic project location. Priced all Major Pieces of Equipment and Developed 30% P&IDs and an EPC Cost Estimate.

L'Energia | L'Energia Cogeneration Facility 80MW Repowering; MA | 2007-2009

I&C Engineer - Industry and Energy Associates. Balance of Plant Specifications, Datasheet, Instrument Database, and P&ID support.

Ecomaine | Grate Drive Controls Upgrade; ME | 2007-2008

I&C Discipline Lead Project Engineer - Industry and Energy Associates. Retrofit of a hardwired / PLC combustion control system into a new Programmable Logic Controller. Added new Screens to existing HMI.

SunCoke | Gateway Energy and Coke Company; IL | 2007-2008

I&C Discipline Lead Project Engineer - Industry and Energy Assocaties. I&C Discipline Lead Engineer for a 60MW Power Project, Waste Heat Recovery from Coking Ovens.

Florida Power and Light | FPLE Wyman Station Unit 4 600MW -Controls Upgrade; ME | 2006-2007

I&C Discipline Lead Project Engineer - Industry and Energy Associates (IEA). DCS Upgrade from Foxboro Spec 200 to Emerson Ovation. Creation of electrical drawings for Demolition and Construction. Field Verification, commissioning, and construction support.

S.D. Warren Company | Consulting Engineer; ME | 1997-2006

Consulting Engineering for Various Projects - I&C Systems Engineering Inc. Paper Machine Controls Retrofits, Material Handling Controls Retrofits, Bulk Chemical Handling Controls Retrofits. PLC / HMI programming. Plant maintenance support.


Jeff D. Szymanski, P.E., INCE Bd. Cert.

Jeff D. Szymanski is the Acoustical Consulting Services Manager and Senior Acoustical Engineer within Black & Veatch's global energy business. Szymanski's team provides design and engineering support for projects across all Black & Veatch divisions and service areas. Projects include power generation facilities, electrical substations, water / wastewater treatment facilities, pump stations, refinery / petrochemical plants, and manufacturing facilities. Szymanski's experience includes projects throughout the as well as China, Mexico, the United Kingdom, Thailand, and Vietnam.

Projects range from small consulting projects to large engineering, procurement, and construction (EPC) projects. Responsibilities include facility noise modeling, noise regulation reviews, community noise evaluations, environmental noise assessments, permitting / site certification studies, room acoustics design, architectural sound isolation design, and building systems noise control.

PROJECT EXPERIENCE

Westar Energy | Emporia Energy Center; KS | 2007-2008

Acoustical Engineer. Black & Veatch was engaged to provide engineering and construction services related to the construction of this 600 MW simple cycle peaking power plant. Specifically, the noise emissions were evaluated to facilitate meeting the regulatory limits. The new installation included seven combustion turbines and ancillary equipment. A sound level survey and facility noise modeling were performed, and the noise emissions were assessed to minimize noise impacts from facility operations. Noise emissions compliance testing for the project included measurement of in-plant, near-field, and far-field sound levels from combustion turbine equipment packages.

Portland General Electric | Port Westward Generating Station; OR | 2007

Acoustical Engineer. Black & Veatch was engaged to design and construct this new combined cycle facility. Noise emissions compliance testing for the project included measurement of in-plant sound levels around all equipment packages, as well as monitoring of ambient sound levels over a 2 day period at nearby Oregon and Washington residences during commissioning of the facility.

National Grid | Wakefield Substation; MS | 2006-2012

Acoustical Engineer. Black & Veatch was engaged to assess the potential noise impacts on nearby residents and to evaluate compliance with the state noise regulations and zoning requirements, as related to the proposed substation. The new installation included four 345 / 115 kV transformers and two geographic information system (GIS) buildings in a residential area. An ambient sound level survey was conducted to establish the existing conditions at the site property. Substation noise modeling and a regulatory evaluation were performed, and the potential acoustical impacts to the surrounding community were assessed. Subsequent to the substation hoise emissions. Sound levels of the operational substation were measured in order to refine the substation acoustical model.



NOISE STUDY & SITE TESTING

Expertise: Consulting Engineering Services

Education

MS, Engineering General, Acoustics, Pennsylvania State University, 2016, BS, Engineering General, Acoustical Engineering, Purdue University, 1995,

Professional Registration

Certification, Board Certification, Not Applicable, N/A, , 2009 License, Professional Engineer, Mechanical,

10200494, Indiana, , 2002 Total Years of Experience

20.3

Black & Veatch Years of Experience 10.3

Professional Associations

Institute of Noise Control Engineering - Board Certified Member Acoustical Society of America - Full Member

Office Location Overland Park, KS



Using the refined acoustical model, noise mitigation measures were proposed, including noise barrier walls.

ConocoPhillips | Immingham Combined Heat and Power Phase 2; UK | 2006-2012

Acoustical Engineer. Black & Veatch was engaged to provide EPC services related to the construction of this 470 MW combined cycle power plant. Specifically, the noise emissions were evaluated to facilitate meeting the contractual noise limits. The new installation included a combustion turbine with a heat recovery steam generator (HRSG) and a steam turbine generator. Facility noise modeling was performed, and the noise emissions were assessed to maintain compliance with the permitted noise limits. Extensive noise emissions tests were completed to verify facility compliance with the contractual limits.

West Amesbury Substation | National Grid; MS | 2011

Acoustical Engineer. Black & Veatch was engaged to assess the noise impacts on nearby residential neighbors and to evaluate substation compliance with state and local noise regulations. The substation includes several transformers, including one 345 / 115 kilovolt (kV) transformer, and is situated near a major highway in a residential / commercial area. A sound level survey was conducted to determine the existing acoustical conditions at the site property. The noise measurements were compared to the applicable regulations to evaluate compliance, and the substation acoustical impacts to the surrounding community were assessed.

Johnson Controls, Inc. | University of South Carolina Biomass Energy Facility; SC | 2010-2011

Acoustical Engineer. Black & Veatch was engaged to assess high sound levels from a steam generator cooling fan. The sound levels from the fan were evaluated and compared to Occupational Safety and Health Administration (OSHA) guidelines. An acoustical mitigation strategy was developed to reduce the noise emissions from the generator cooling fan.

Hawaii Electric Company, Ltd. | Keahole ST7; ; 2006-2011

Acoustical Engineer. Black & Veatch was engaged to design and construct the combined cycle expansion of the Keahole facility. The acoustical design of the facility included measures to support compliance with the maximum allowable sound levels at the property boundary. Extensive sound mitigation design for the combined cycle equipment was necessary to ensure that operation of the completed facility would meet the stringent nighttime sound level limits. Several sound level surveys were conducted throughout the design and construction process to support the development of additional noise mitigation measures for the entire facility. Additional sound level surveys were conducted to verify compliance with the applicable property boundary sound level limits.



Stephen Tarallo, ENV SP

Mr. Tarallo leads the New York City office and serves as Client Services Director and Project Director with the global water business of Black & Veatch Corporation. Mr. Tarallo has over 25 years' experience in municipal water and wastewater treatment R&D, design, and project development. His broad technical background, work experience, business acumen, and leadership capabilities has provided him with the ability to gain deep understanding of clients' operational and financial needs and challenges and to lead multidisciplinary teams for effective and efficient project execution.

PROJECT EXPERIENCE

NYCDEP | Oakwood Beach WPCP Primary Power Distribution Transformers Replacement; New York, NY

Project Director. Overall responsibility to client for delivery of design and construction management services to replace the primary power distribution transformers.

NYCDEP | North River Wastewater Treatment Plant Cogeneration and Electrification Improvements Facility Plan; New York, NY

Project Director. Overall responsibility to client for delivery of project scope including replacement of the existing dual fuel engines with electric motors and associated improvements to the electrical system. New engine generators will be utilized to supply 10 MW of power to the plant burning digester gas and natural gas. Heat will be recovered from these units for use onsite.

Philadelphia Water Department | Utility-wide Energy Plan Implementation; Philadelphia, PA

Task Leader – Innovation Planning. focus on the evaluation of the energy program's progress towards its strategic goals. Assisting the Energy Team in the tracking and assessment of the industry trends, as well as the evaluation, documentation, and presentation of emerging energy technologies.

NYCDEP | North River Waste Water Treatment Plant Cogeneration and Electrification Project; New York, NY

Task Leader for Energy Profile. Responsible for documenting Energy Profiles and conducting energy/GHG performance analysis for the North River WWTP before and after electrification of the main sewage pumps and aeration blowers, installation of engine generators (12 MW total), and various digester and heat recovery improvements. Energy Profile documentation will be maintained and updated throughout the detailed design process. Design alternative evaluations will be summarized to the extent that the alternatives address equipment, systems, methods, or operating procedures that will reduce energy consumption, increase energy efficiency, and decrease GHG emissions.



PROJECT DIRECTOR

Expertise: Business Case Evaluations; Energy Management; Sustainability Assessments; Wastewater Process

Office Location New York, NY

Education

- Bachelor of Science, Mechanical Engineering, Villanova University, 1989,
 MBA,
- College of William & Mary, 1999

Total Years of Experience 26

Black & Veatch Years of Experience 10

Professional Associations

- Water Environment
- Federation

R,

53

- New York Water
- Environment Association New Jersey Water
- Environment Association
- Chesapeake Water
- Environment Association
- Virginia Water
- **Environment Association**

Washington Suburban Sanitary Commission (WSSC) | Strategic Energy Plan; Laurel, MD

Technical Director. Responsible for content development for WSSC's comprehensive 10-year strategic energy plan covering energy efficiency, load management, renewable energy, and energy supply. Project included development of strategic energy goals, key performance indicators, strategic energy objectives, and supporting projects and initiatives. Integration of the energy management program with WSSC's new asset management program was a key part of the project, as well as development of performance measurement and tracking framework and IT support systems.

City of Hollywood Department of Public Services | Energy Efficiency Master Plan; Hollywood, FL

Technical Director. Responsible for identifying and coordinating decision frameworks, tools, models, and professional staff resources to deliver a comprehensive, integrated energy efficiency master plan to help City of Hollywood Department of Public Services achieve significant reductions in the usage and cost of energy at its water and wastewater treatment plants, distribution and collection pumping facilities, and water and wastewater treatment facility buildings.

Water Environment Research Foundation | Project No. ENER1C12 Energy Balance and Reduction Opportunities, Case Studies of Energy-Neutral Wastewater Facilities and TBL Research Planning Support; Alexandria, VA

Co-Principal Investigator. Led multi-disciplinary research team to investigate energy efficiency and production opportunities that achieve energy neutral wastewater treatment. The project develops baseline energy flows for common WWTP process configurations, including opportunities for demand reduction, energy efficiency, and energy recovery; compiles energy neutral (or near neutral) WWTP case studies from throughout the world; and identifies sustainable options for managing biosolids through a triple bottom line assessment of diverse technical and management approaches.

Two Bridges Sewerage Authority | Two Bridges Sewerage Authority (TBSA) Waste Water Treatment Plant Master Plan for Capital Improvements; Lincoln Park, New Jersey

Engineering Manager/Process Lead. Responsible for process analysis, alternatives evaluation, and conceptual plant design, and conceptual level cost estimates for the upgrade and expansion of the 7.5 mgd TBSA WWTP. The Master Plan addresses foreseeable needs and provides flexibility for future alterations to accommodate compliance with new environmental laws, regulations, and policies. TBSA's four driving needs were disinfection improvements to limit the formation of Dichlorobromomethane, improved phosphorus removal to meet a more stringent TMDL limit of <0.4 mg/l, treatment capacity increase to handle growth within the service area, and denitrification upgrades to prepare for an anticipated future nitrate limit of <10 mg/l.



Siegfried E. Tast, P.E.

Mr. Tast has over 25 years of experience as a civil and structural engineer. The majority of his work has been involved with structural design of heavy civil projects focusing primarily on water/wastewater treatment facilities. His experience includes the design of small dams and spillways; transportation related structures, storm water drainage structures; and municipal work such as swimming pools and sports parks. He uses his civil engineering background in traffic design, hydraulics and geotechnical to evaluate and design parking lots, streets and storm sewers, detention facilities and open flow channels. He is competent designing structures utilizing steel, aluminum, concrete, pre-stressed concrete, masonry, fiberglass reinforced plastics and wood/timber. Mr. Tast has written and reviewed spreadsheets for internal use as design aides and has used MathCad during his time in our Federal Services Division.

Mr. Tast's experience prior to joining Black & Veatch in the Water Sector Americas Division has proven beneficial. In addition to being a lead design engineer Mr. Tast provides conceptual and preliminary designs for water/wastewater structures, supervises the work of junior engineers, performs quality reviews, writes project specific specifications and establishes design fee estimates. Mr. Tast has been involved with special designs on retrofit and emergency projects requiring solutions that are readily constructible and cost effective. He spent sixteen months in the Federal Services Division of Black & Veatch prior to joining the Water Division where he worked on missile defense projects and provided quality control.

PROJECT EXPERIENCE

District of Columbia Water; Blue Plains Secondary Treatment Upgrades; Washington, DC | 2012-In-Progress

Structural Engineer. This project includes modifications and new structures to upgrade the facility. Mr. Tast started as staff structural engineer on the project and moved into the lead structural engineer role upon the retirement of his predecessor. With a construction cost of \$130 million, the Blue Plains Advanced Wastewater Treatment Plant in Washington, DC includes the six cell bio-reactor basin with the option to construct three additional cells. The structure includes a pipe gallery between reactor cells, an elevated blower room, and overflow pumping capabilities. A specialized design constraint was the proximity of the water table adjacent to the structure being close to the Potomac River. Monitoring wells combined with a pressure relief system to flood empty cells will be used in conjunction with concrete ballast slabs under the foundation slabs of dry pit structures such as the pipe gallery and pumping room to mitigate the presence of higher than normal groundwater. Construction is expected to begin in 2014.

City of St. Joseph; Disinfection Facilities and Effluent Pump Station Design and Construction Phase Services; St. Joseph, MO | 2013-2014

Special Design. After construction of the pumping station was completed there



STRUCTURAL, TURBINE BUILDING

Expertise: Structural Design and Specifications, Quality Assurance, Pipe Supports, Water/Wastewater Process Structures, Support Buildings and Foundations, Retaining Walls, Value Engineering Studies.

Office Location Kansas City, MO

Education Bachelor of Science, Civil Engineering, Transportation, Structural, Water/Wastewater, University of Nebraska, 1985,

Professional Registration

License, , PE - 093592, New York, 2014 License, PE - 51502, Minnesota, 2011 License, Siegfried Earl Tast, Civil, PE-12325, Kansas, 1991 License, PE - 15859, Oklahoma, 1989

Total Years of Experience 40

Black & Veatch Years of Experience

Professional Associations American Society of Civil Engineers - Member



was unexpected settlement of the effluent piping leading from the building. The deep excavation and resulting backfill did not allow for a simple concrete cradle to be constructed under the piping for support. Mr. Tast participated in the design solution with the Kansas City Divisional Office by providing guidance in the design of a pipe collar and helical pile system to support the sagging pipeline.

PacifiCorp Energy | Merwin Hydropower Plant Upgrades; WA | 2013

Special Design. During construction an overhead pipe support failure required immediate action. After reviewing the existing support bracket a retrofit solution was created to secure the existing lug plate with a heavy angle bracket and undercut anchor bolts. Similar brackets are to be load tested and any failures will be treated in a similar manner. The bracket can be installed without removal of the existing pipe hanger and may be used a retrofit if load testing is not performed on the existing hangers.

Tarrant Regional Water District and City of Dallas Texas | Integrated Pipeline Project; Dallas, TX | 2013

Special Design. Mr. Tast worked on the specialized design to support the pipeline with flexible connections. Due to expected large soil movements the Dallas, TX regional office designed a flexible coupling in the pipes that where not capable of direct support of the pipe on exterior piers. The solution was to place a ring girder on one side of the flexible pipe connection coupled with a steel saddle and clamp on the opposite side of the connection. The spring support was modelled then designed using neoprene bearing pads to provide flexibility. The exterior piers will be placed on a mat foundation set at the level of the buried piping to mitigate settlement. A similar spring and ring girder support will be constructed in the building interior.

NYCDEP (NYC-DEP); North River Waste Water Treatment Plant Effluent Channel Modifications; New York, New York | 2013

Specialized Design. Mr. Tast worked with the New York City regional office of Black & Veatch to find a solution to a failed expansion joint in an effluent channel within the multi-level structure. Work on the three inch wide expansion joints within the 16ft x 16ft channel was limited to short durations which complicated the retrofit design. A temporary solution was created to insert an expansive filler between the joint faces after removing the existing joint and cleaning the debris between the concrete faces. A steel reinforced neoprene Ubulb shaped seal was located on a proprietary website and installed as the permanent seal.

Federal/Special Projects Division; ; 2011-2012

Structural Engineer. As a contingent employee Mr. Tast worked primarily on the AEGIS Missile Defense Project assisting with the design and quality review of support buildings, munitions storage, water and fire suppression storage tanks.



Dennis J. Trupka, R.A., NCARB

Mr. Trupka is a design architect for laboratory, water, and wastewater projects. His experience as a project architect and a design architect includes 35 years of design of municipal and commercial buildings. He has been involved in programming, design, construction drawings, specification writing, finish selections, construction observation, and facility assessments.

PROJECT EXPERIENCE

MWD of Southern California | Greg Ave Pressure Control Structure; Los Angeles, CA | 2015-In-Progress

Project Architect. Mr. Trupka is the lead architect for the New Control Building. The 2,300 square foot building will be built on a very tight site. The masonry building has a low-key appearance with a steel framed flat roof.

Gwinnett County DMR | Sunny Hill Booster Pumping Station; Gwinnett County, GA | 2015-In-Progress

Project Architect . Mr. Trupka is the lead architect for the 6,100 square foot booster pumping station. The building is very similar to a pumping station Mr. Trupka designed for the same client in 2002. The walls are color banded CMU. The building has a steel frame and a steeply sloped standing seam metal roof. The steel frame also supports the bridge crane for the pumps.

City of Lawrence | Wakarusa WWTP; Lawrence, KS | 2014-In-Progress

Project Architect . Mr. Trupka is the lead architect for the five process buildings on this green-field site. The buildings include Headworks, Chemical Feed & Storage, Final Sludge PS, UV Disinfection, and Solids Thickening. All buildings are have a brick and stone exterior. Interior walls are maintenance-free glazed block. The Headworks Building has a concrete frame and the other buildings have load bearing masonry walls.

Irvine Ranch Water District | Michelson Water Recycling Plant Biosolids and Energy Recovery Facility; Irvine, CA | 2013-In-Progress

Project Architect. Mr. Trupka was the lead architect on the design of the solids handling facility and the digester complex estimated to be a \$100 million dollar project. The solids handling is a two story building housing both process areas and personnel areas. The personnel spaces include a laboratory, a control room, restrooms, locker rooms, and a break room. The building houses centrifuges, a dryer, and a truck load-out facility. The digester complex includes a digester building, three egg digesters, a seventy foot tall access tower, and access bridges to the egg digesters. All structures have a high-tech appearance with exteriors of masonry and metal panels. Mr. Trupka is currently the lead architect for the Construction Phase Services.

City of Olathe | Hedge Lane Pump Station & Reservoir; Olathe, KS | 2012-2016

Project Architect . Mr. Trupka was the lead architect on the design of a 12,000 pumping station. The pumping station was designed to meet the growing water



ARCHITECTURAL, TURBINE BUILDING

Expertise: Architect for Facility Assessments; Design Architect for Laboratory Design Architect for Wastewater; Design Architect for Water

Office Location Kansas City, MO

Education Bachelors, Architecture, Kansas State University, 1980,

Professional Registration License, Architect, Not Applicable, 21Al01977000, New Jersey, , 2014

Total Years of Experience 26

Black & Veatch Years of Experience 26

Professional Associations College of Architects and Landscape Architecs of Puerto Rico - Member National Council of Architectural Registration Boards - Member





demands for the District through the year 2050. The masonry and rough cast stone exterior of the building fits well into the rural landscape of the site.

Cape Fear Public Utility Authority | Raw Water Booster Pumping Station; Wilmington, NC | 2011-2011

Project Architect. Mr. Trupka lead the architectural design effort for the new raw water booster pumping station. The load bearing masonry building has a brick veneer with cast stone accent bands. Its appearance is similar to the architecture of the water plant designed by Mr. Trupka for this client three years earlier.

Lancaster County Water and Sewer District | Catawba River Water Treatment Plant Raw Water Reservoir Expansion; Van Wyck, SC | 2011-2011

Project Architect. Designed the reservoir pumping station. The pumping station will sit atop a 90 foot intake tower and will be accessible by a bridge. The building has a steel frame structure and single wythe masonry walls.

City of Leavenworth | Leavenworth WWTP UV Disinfection Improvements; Leavenworth, KS | 2011-2011

Project Architect. Provided architectural design for the addition and reuse of an existing chlorine building. The existing building was converted to storage and an addition was placed over the existing contact basins converting them to UV channels for disinfection. The new structure was load bearing masonry with double tee roof slabs. A project challenge was to use deeper double tees while still matching the height of the existing building.

City of Olathe | Cedar Creek WWTP; Olathe, KS | 2010-2010

Project Architect . Provided architectural design for the Control Building remodel and new headworks, sludge pumping station, blower building, and chemical feed building. The masonry buildings were load bearing structures and had hollow core roof slabs or steel and metal deck roof structure. Design was done on a fast track schedule.

Buncombe County | French Broad River Water Reclamation Facility; Buncombe County, NC | 2009

Project Architect. Designed upgrade of existing building and an expansion of the electrical room for a conversion to cloth disk filters.



Andrew J. Truman, P.E.

Andrew Truman started with Black & Veatch as an electrical engineering college graduate in May 2002. Andrew has performed the roles of design engineer, lead engineer and is currently a senior engineer and department team leader. Roles include managing workload within an assigned department team of engineers and engineering technicians as well as being a mentor for both technical and career decisions of less experienced staff. Andrew has internally recognized expertise in electrical design in corrosive and hazardous areas and has often been called upon to represent the B&V Water Electrical design department in presentations and inter-disciplinary activities. Andrew is also capable of taking on project work of various sizes, developing electrical criteria and detailed design concepts and following the design through the construction phase. Andrew has extensive electrical design experience in all types of water and wastewater projects.

PROJECT EXPERIENCE

NYCDEP; North River WWTP Cogeneration and Electrification; New York, NY | 2012-In-Progress

Electrical Discipline Lead Engineer. Electrical scope of this large plant improvements project involved significant electrical upgrades including ConEd 15kV service feeder upgrades, additional in-plant 5kV distribution, 5kV metalclad switchgear and integration of 15MW worth of engine-generators designed to operate in a cogeneration arrangement as well as provide standby power for the entire plant. Additional project electrical work included replacement of the existing reciprocating engines with electric motors for main sewage pumps which were 1,850 hp wound rotor motor units. Design of a custom resistor bank type motor controller for the purpose of speed control for these units was also included. Low-voltage electrical improvements included a new process air blower facility with nine 350-HP high-speed gearless turbo-blowers which required two new unit substations as well as a new low-voltage service from ConEd to support Riverbank State Park located on top of the facility. Personal project responsibilities included developing technical memoranda on electrical distribution and motor design options, coordination with electric utility, coordination with engine-generator manufacturer via preselection contract process, on-site design investigations during preliminary and detailed design, authoring of electrical calculations including short-circuit coordination study, supervision of electrical design team responsible for production of all electrical design documents.

New York City Environmental Protection; Oakwood Beach WWTP Electrical Upgrades Project; Staten Island, NY | 2013-In-Progress

Engineering Manager. Project involved the design of a new high tension service to replace the existing utility service transformers which are at the end of their useful life. 33 kV primary and 5 kV secondary switchgear as well as a new electrical service building were included to upgrade the entire existing plant service to meet the requirements of the latest version of Con Edison's EO-2022 High Tension Service Specification requirements. Personal project responsibilities included coordination of other disciplines to support the



POWER DISTRIBUTION

Expertise: Electrical distribution; Energy Management; Motors; Motor control; Renewables (Carbon Footprint); Sustainable Solutions

Office Location Kansas City, MO

Education Bachelors, Electrical Engineering, Power, University of Missouri -Columbia, 2002,

Professional Registration

License, Andrew James Truman, Electrical, 85838PE, Oregon, , 2011 License, Andrew J. Truman, Electrical, 21283, Nevada, , 2011 License, Andrew J. Truman, Electrical, 24GE04856600, New Jersey, , 2010 License, Andrew J. Truman, Electrical, 19820, Kansas, , 2007

Total Years of Experience 14

Black & Veatch Years of Experience 14

Professional Associations National Fire Protection Association - Member American Society of Mechanical Engineers - PTC-13 Standards Committee -Associate Member electrical work, development of technical memoranda evaluating design and electrical equipment selection, and development of preliminary design criteria and report documentation.

City of Springfield; Southwest WWTP Biosolids Improvements Project; Springfield, MO | 2011-In-Progress

Senior Electrical Engineer. Project involved solids treatment improvements to an existing 45MGD wastewater treatment plant, including replacement of existing engine driven aeration blowers with high-speed turbo blowers. Additionally, the project included addition of 4MW of engine-generator units which burn natural and/or digester gas cogenerating in tandem with the electric utility. New low-voltage synchronizing electrical gear was required as well as upgrades to the plant's 13.2kV distribution system. Personal project responsibilities included authoring predesign electrical documentation and reports, supervising the work output of an electrical design team, assuring all project deliverables were produced for each project milestone submittal, coordinating with City and local utility staff to determine an acceptable arrangement for the electric cogeneration facilities, Quality Assurance/Quality Control review of electrical design documents, construction phase design support.

City of Olathe; Cedar Creek WWTP Expansion Project; Olathe, KS | 2008-2012

Lead Electrical Engineer & Engineer of Record. Project involved expansion of an existing wastewater treatment plant to 6 mgd with, provisions to expand to 10 mgd, utilizing an activated sludge BNR process. Electrical scope included new 12.47kV utility service, 5kV medium-voltage electrical distribution system, 5kV standby diesel engine-generator, several new buildings and processes with provisions for future expansion, and retrofitting of existing facilities for reuse. Personal project responsibilities included authoring predesign electrical documentation and reports, on-site investigation for NFPA 820 compliance and existing electrical facilities condition assessment, assuring all project deliverables were produced for each project milestone submittal, production of many detailed design documents and calculations, coordinating with City and local utility, construction phase design support throughout construction.



Joseph E. Veilleux, P.E.

Joseph E. Veilleux has 32 years of professional engineering experience and is the Mechanical Manager of Engineering in the Black & Veatch Power Business Raleigh Office.

Veilleux's project experience with Black & Veatch includes a biofuel- fired cogeneration facility at a major metropolitan water and sewer authority wastewater treatment plant, a lignite coal delivery facility for an IGCC power plant, a simple cycle gas turbine demonstration power plant fired by syngas generated by air-blown gasification, a 1000 MW one unit, supercritical, coal-fired power plant, a 5000 MW six unit, supercritical, coal-fired power plant, a 5000 MW six unit, supercritical, coal-fired power plant, a conversion of two simple cycle plants to combined cycle and a pulverized coal process plant used for steel manufacturing at an existing coal-fired power station.

In addition to his fossil power background at Black & Veatch, Veilleux has extensive experience in the commercial nuclear power, pulp and paper, chemical process, water / wastewater treatment and desalination industries. Veilleux served as a nuclear-trained submarine warfare officer in the U.S. Navy and is a retired naval reserve engineering duty officer. Veilleux has ten professional publications and presentations.

PROJECT EXPERIENCE

Power Business | Raleigh Office; Cary, NC | 2013-In-Progress

Raleigh Office Mechanical Manager of Engineering. Responsible for managing Mechanical Section engineers and technicians to ensure that professionals with proper expertise and tools are available to support Raleigh Office project and business development proposal execution efforts. Also responsible for maintaining quality, productivity level and billable rates for the section. Support production project billable work as senior engineering specialist, as required.

Potomac Electric Power Company (PEPCO) Energy Services | DC Water Combined Heat and Power Project; Washington, DC | 2011-2016

Power Engineering Manager and Project Discipline Engineer - Mechanical. Responsible for managing the multi-discipline engineering effort during construction and commissioning and the detailed mechanical engineering design and procurement support associated with a new state-of-the-art biofuel- fired cogeneration facility at the Blue Plains Advanced Wastewater Treatment Plant in Washington, D.C.

Southern Company Services | Kemper County IGCC Lignite Delivery Facility Project; Meridian, MS | 2011-2012

Project Discipline Engineer - Mechanical.



CTG MECHANICAL SYSTEMS AND TECHNICAL ADVISOR

Expertise: Biomass; CHP; Coal; Combustion Turbine; Gasification; IGCC; Nuclear; Renewable Energy

Office Location Cary, NC

Education

- Postgraduate Diploma,
 Engineering Management,
 University of Kansas, 2012,
 Bachelors, Mechanical
- Engineering, Worcester Polytechnic Institute, 1984,
- Professional Registration Professional Engineer (MECHTFS), Mechanical, 906684, District of Columbia, 2012
- Professional Engineer, Mechanical, 20296, Mississippi, 2011
- Professional Engineer, Mechanical, 32814, North Carolina, 2007
- Registered Professional Engineer, Mechanical, 39291, Massachusetts, 1996
- Licensed Professional Engineer (lapsed), Mechanical, 8212, New Hampshire, 1991

Total Years of Experience 32

Black & Veatch Years of Experience 10

Professional Associations Pi Tau Sigma-International Mechanical Engineering Honor Society - Member

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Confidential Client | Large Coal-Fired Power Plant; Perak Darul Ridzuan, Kedah, Malaysia; 2010-2010

EPC Specification Coordinato.

Confidential Client | Six Unit Coal-Fired Power Station Conceptual Design Study Project; Johannesburg, Gauteng, South Africa | 2008-2010 Project Discipline Engineer - Mechanical.

Confidential Client | Air-Blown Gasification 110 MW Open Cycle Demonstration Plant; Johannesburg, Gauteng, South Africa | 2008-2010 Project Discipline Engineer - Mechanical.

Confidential Client | Combined Cycle Conversion Project; Johannesburg, Gauteng, South Africa | 2007-2008 Project Discipline Engineer - Mechanical.

DTE Energy Services | River Rouge PCIE Expansion 2008 Project; River Rouge, MI | 2006-2008

Project Discipline Engineer - Mechanical.

A.W. Chesterton Company | Groveland, MA | 2001-2006

Market Manager / Senior Applications Engineer, ARC Composites Division - A.W. Chesterton Company.

Ionics, Incorporated | Watertown, MA | 1997-2001

Product Mechanical Engineer, Equipment Business Group - Ionics, Incorporated.

North Atlantic Energy Service Corporation- Seabrook Station Nuclear Power Plant; Seabrook, NH | 1989-1997

Senior Engineer, Staff Engineer, Design Engineering Department - North Atlantic Energy Service Corporation.

U.S. Navy | Groton, CT 1984-1989

Lieutenant , Lieutenant (junior grade), Ensign (Nuclear-Trained Submarine Warfare Officer) - U.S. Navy, USS AUGUSTA (SSN-710)



Paul M. Zink

Paul M. Zink is an Operations Consultant within Black & Veatch's energy business. Zink is experienced in managing and executing all phases of power plant issues and is dedicated to providing project solutions that aid clients in meeting their goals. In addition to his project management capabilities, Zink's technical competencies include power plant operations and electrical power design. The list of project experience showcases his ability to manage personnel, as well as his knowledge in these technical areas.

PROJECT EXPERIENCE

- SEC Home Office (Engineer) Training; Saudi Electric Company (SEC); Overland Park, KS | 2015
- Port Westward Unit 2 (RICE); PGE; Clatskanie, OR | 2013-2014
- Power Fundamentals for Entry Level Engineers; Hawaiian Electric Company (HECO); Honolulu, HI | 2013
- Low Nitrogen Oxides (NOx) Burner Upgrade; Nearman Creek Generating Plant; Kansas Board of Public Utilities (BPU); Kansas City, KS | 2012
- Unit 4 Fabric Filter and Air Quality Control System (AQCS) Upgrade Project; Lawrence Energy Center (LEC); Westar Energy; Lawrence, KS | 2012
- Kusile Operations and Maintenance (O&M) Manuals; ESKOM; Johannesburg, South Africa: 2012-2113
- Low NOx Burner Upgrade; Quindaro Unit No. 2; BPU; Kansas City, KS | 2011
- Spy Hill Generating Station; Spy Hill Power, LP; Spy Hill, Saskatchewan, Canada | 2011
- Project Harvest; Quintana Minerals Corporation; Richland, Ohio, : 2011
- Sandy Creek Energy Station, Unit 1; Sandy Creek Energy Associates, LP; Riesel, Texas, : 2010-2011
- Glow Phase 5 Project; Glow Energy Public Co., Ltd; Map Ta Phut Industrial Estate, Rayong, Thailand: 2010
- Tarakhil 105 MW Power Plant; US Agency for International Development (USAID); Kabul, Afghanistan: 2010
- Summary Overview; Glow Phase 5 Project; Black & Veatch Bangkok Office; Bangkok, Thailand | 2010
- Whelan Energy Center Unit 2; Public Power Generation Agency; Hastings, NB | 2009-2010

PREVIOUS EXPERIENCE

Conestoga Energy; Conestoga Energy Partners; Garden City, KS | 2006-2007

Director, Electrical Engineering-ICM, INC. Supervised electrical design and specifications for a 110 million gallons per year (mgy) fuel ethanol plant. Duties included coordinating service and load with the local utility, oversight of major electrical equipment specifications, and purchase.

TRAINING AND O&M

Expertise: Consulting Engineering Services

Education Bachelors, Electrical Engineering

Engineering, Kansas State University, 1974

Professional Registration 1980, Kansas,

Professional Engineer, 8659 2004, Colorado, Professional Engineer, 38339 2004, Illinois, Professional Engineer (Electrical), 062057670 2004, Iowa, Professional Engineer (Electrical), 17008 2005, Michigan, Professional Engineer, 62010-52421 2003, Nebraska, Professional Engineer -Emeritus (Electrical), E-10945 2004, North Dakota, Professional Engineer, 5218 2003, South Dakota, Professional Engineer, 8125

Total Years of Experience

Joined Black & Veatch 2002

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Conestoga Energy; Conestoga Energy Partners; Liberal, KS | 2006-2007

Director, Electrical Engineering--ICM, INC. Supervised the electrical design and specifications for a 110 mgy fuel ethanol plant. Duties included coordinating service and load with the local utility, oversight of major electrical equipment specifications, and purchase.

Motor Control Center (MCC) Upgrade; General Electric (GE) / Malloy Electric; Colwich, KS | 2006

Director, Electrical Engineering--ICM, INC. Instigated and worked with GE personnel to provide design change to GE's Evolution Series E9000 motor control centers, which was implemented for production.

Ethanol Production Plants; Various Clients; Kansas, Nebraska, Colorado, Michigan, South Dakota, and Iowa | 2002-2006

Senior Electrical Engineer--ICM, INC. Created the power design group, including personnel hiring and development. Responsible for complete electrical design for new fuel ethanol production plants from the utility substation (typically 12.4 to 14.2 kV), including distribution, transformers, switchgear, motor control centers, lighting, power and auxiliaries, grounding, and interface requirements for distributed control system (DCS) controls. Prepared specifications and purchase requisitions, and evaluated bids. Coordinated service for new plants with local utilities. Established project design standards. Projects included 30 mgy plants in Oakley, Kansas; Trenton, Nebraska; Garnett, Kansas; and Sterling, Colorado; 55 mgy plant in Albion, Michigan; and 110 mgy plants in Brookings, South Dakota, and Fort Dodge, Iowa. AutoCAD and ETAP proficient. Provided electrical design for the company's office expansions. Designed the entire electrical system for the first 100 mgy dry-grind fuel ethanol plant installed in the .

Integrate Cogeneration Unit into Plant Design; ICM, Inc.; Colwich, KS | 2003-2005

Senior Electrical Engineer--ICM, INC. Contributed to a team effort to specify and integrate a cogeneration unit into the plant steam system for ICM fuel ethanol plant designs. Responsible for the design of electrical interconnections for a 2 MW cogeneration unit, including developing relay specifications, transformer connections, and grounding connections. Selected the engineering firm to provide relay settings and testing to meet various utility interconnection requirements. Coordinated installation and testing with utilities.

Trimble County Simple Cycle Plant; Louisville Gas & Electric (LG&E); KY | 2001-2002

Operations Consultant--SELF-EMPLOYED. Developed training materials and presented BOP training for a new two unit, 160 MW simple cycle plant in Trimble County, Kentucky, to 45 employees of LG&E. (Contracted to Black & Veatch.)



Robert Bunting, P.E.

Mr. Bunting is a senior geotechnical engineer with over 23 years of experience in a broad range of civil engineering, including projects related to highways, mass transit, facilities, marine, environmental, dams and water resources. He has been responsible for subsurface investigations; laboratory testing, assigning, and interpreting; foundation analysis and design; report and specification preparation; and construction monitoring.

Mr. Bunting has extensive experience with the design of shallow and deep foundations (driven piles and drilled shafts), proprietary retaining walls, braced and tied back excavation support systems, and seismic design including evaluation of liquefaction potential. In addition, he has prepared roadway monitoring programs which have included groundwater observation wells, piezometers, surface settlement platforms, vertical extensometers with magnet/reed switch transducers, inclinometers, and survey monitoring points.

PROJECT EXPERIENCE

NYCDEP Office of Green Infrastructure | Right-Of-Way-Bioswales, Flushing Bay BB-008 Contract Area 3; Queens, NY

Senior Geotechnical Engineer. Mr. Bunting coordinated and supervised various aspects of the geotechnical investigation programs for soil borings and in-situ permeability testing for about 1000 preliminary right-of-way bioswales, greenstreet and public property retrofit sites in Queens, New York. The drilling programs included over 900 permeability testing locations and over 600 test borings in total. He reviewed the permeability evaluation and reporting, the geotechnical evaluation, and the design and contract drawing production. Responsibilities included coordinating with 2 boring contractors, preparing a drilling contract and HASP and approving invoices for the work. Mr. Bunting also coordinated with MTA and LIRR agencies to obtain Letters of No Impact and No Objection for subsurface investigations near railroad facilities.

NYCDEP Office of Green Infrastructure | Right-Of-Way-Bioswales, Newtown Creek Project; Brooklyn, NY

Senior Geotechnical Engineer. Mr. Bunting supervised various aspects of the geotechnical investigation programs for soil borings and in-situ permeability testing for about 300 preliminary right-of-way bioswales, greenstreet and public property retrofit sites in Brooklyn, New York. Responsibilities included frequent site visits to oversee field staff quality and review of boring logs and permeability data.

NYCDEP Office of Green Infrastructure | Right-Of-Way-Bioswales, Bowery Bay BB-005 Contract Phase 2; Queens, NY

Senior Geotechnical Engineer. Mr. Bunting's responsibilities include planning, coordinating, and supervising the geotechnical investigation programs for soil borings and in-situ permeability testing for right-of-way bioswales, greenstreet and public property retrofit sites in Queens, New York. The drilling programs include 100's of permeability testing locations and test borings. He coordinates



CDM



Education

- M.S., Geotechnical Engineering, Clarkson University, 1991
- B.S., Civil Engineering, Clarkson University, 1988

Registration

Professional Engineer: NY, NJ, MA, DE, SC, PA (1995), VA

Certifications

80-Hour Project
 Management Training
 Program, PSU, 1999
 16-Hour Quality
 Improvement Meeting
 Workshop in Continuous
 Quality Improvement, GF
 40-Hour Recognizing and
 Identifying Hazardous
 Materials/Hazardous
 Waste Operation and
 Engineering Response

P 65

work plans, Health and Safety Plans and drilling contracts. Mr. Bunting's responsibilities will also include reviewing the geotechnical evaluation, the geotechnical program and data management, and the design and contract drawing production.

NYCDDC | Various Projects; New York, NY

Senior Geotechnical Engineer. Mr. Bunting serves as a senior reviewer for various projects under a 3-year, on-call geotechnical services contract. He oversees staffing, field work, report preparation, project fee proposals, record of boring logs, geotechnical recommendation reports, and coordinates with the field staff and the client's project managers.

PRIOR TO CDM SMITH

US Army Corps of Engineers | Lake Cataouatche Area, Pump Stations 1 and 2, Discharge Tube Access Road; New Orleans, LA

Geotechnical Project Engineer. Mr. Bunting was responsible for reviewing a roadway embankment design adjacent to levees in the New Orleans area. He performed slope stability analysis using normal weight and lightweight fill to reduce possibility of slope failure.

PSE&G | Northeast Grid Reliability Project, 230KV HPFF Pipe-Type Cable, Jersey City; Passaic County and Bergen County, NJ

Geotechnical Project Engineer. Mr. Bunting was responsible for approximately 30 miles of underground 230 kV cable, buried manholes, and trenchless crossings under water, roadway and railroads. The project consisted of coordinating over 350 borings ranging in depth from 25 feet to 125 feet in County roadways, rivers, private property, and utility authority properties along with assigning the corresponding laboratory tests which included thermal resistivity tests. The manholes were 20 to 25 feet long, 8 feet wide and approximately 12 feet deep and were considered compensated foundations or if in very soft areas were placed on driven piles. The trenchless crossings were jack and bores, micro tunnels and HDD. Geotechnical reports were prepared for 4 different circuits.

Ocean Drive (C.R. 619) Scour Damage Repairs; Upper Township, Cape May County, NJ

Senior Geotechnical Engineer. Mr. Bunting was responsible for coordinating the efforts of two geotechnical engineers during a field reconnaissance of Ocean Drive between the Rush Chattin Bridge and the Corsons Inlet Bridge and preparing a conceptual report. The field reconnaissance included the visual documentation of scour damage, the collection of soil samples, and subsequent laboratory testing. Investigated the use of four long-term scour countermeasure alternatives, which included a geotube, geotextile fabric and riprap, gabions, and concrete revetment blocks, to reinforce the berm and protect the roadway. Mr. Bunting prepared a write-up that included the applicability, advantages and disadvantages, cost estimates, and details for each alternative.

Patricia Forgang, CHMM

Patricia has 30+ years of experience in regulatory permitting and compliance for a variety of projects, including water supply, municipal and industrial wastewater, infrastructure (dams and bridges), a recreational park, solid waste and hazardous waste operations, as well as project management of multifaceted and complex contaminated site cleanups, and design-build projects. She has assisted a variety of public and private clients to comply with the Clean Water Act, including the Pollutant Discharge Elimination System; the Resource Conservation and Recovery Act (RCRA); the Toxic Substances Control Act (TSCA); the Clean Air Act; underground storage tanks (USTs); and specific to New Jersey, the Industrial Site Recovery Act (ISRA), as well as all Division of Land Use Regulation permit matters involving freshwater and coastal wetlands, flood hazard areas, coastal areas, stormwater management, threatened and endangered species, cultural resources, and Category One waters. These projects encompass regulated discharges to groundwater, surface water, and air, and hazardous and solid waste landfill design, construction, and operations, and large-scale facility design-build projects.

PROJECT EXPERIENCE

Haworth WTP Design-Build Upgrade; Haworth, NJ

Permitting Specialist. Patricia served as the permitting specialist on this \$85 million water treatment plant upgrade project, located in the Borough of Haworth, Bergen County, New Jersey. The scope of the work included new preozone treatment facilities; followed by new dissolved air flotation facilities; followed by new disinfection facilities, after which the treated water is passed through filters prior to being pumped into the local distribution system that serves approximately 800,000 customers. In addition, it included new residuals processing facilities, which included an equalization basin, residuals pump station, back wash clarifiers, sludge storage tanks, and a building that houses belt filter presses. Environmental constraints on this property included stateregulated freshwater water wetlands, flood hazard areas, and Category One waters due to the water supply reservoir and tributaries to the reservoir, which in turn required an evaluation of the Special Water Resources Protection Area -Functional Value Analysis. Patricia worked with the design team to develop a site plan to minimize potential development impacts to these environmentallysensitive areas. Due to the fact that the proposed plans showed that in-depth thought went into laying out the new dissolved air flotation and ozone generation systems, an upgrade to the residuals area and an upgrade to the sludge dewatering areas, where avoidance of future impacts to the environmentally-sensitive areas was clearly demonstrated, the NJDEP's DLUR staff recognized this effort and instead of imposing all of the DLUR program requirements that include stringent stormwater management rules, the need for DLUR review and permitting of this public-need project were deemed to be minimal.



PERMITTING

CDM Smith

Education B.S. - Chemical Engineering, University of Virginia, 1983

Registration Engineer-in-Training: New

Jersey Certifications

40-hour OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training 8-hour OSHA Hazardous Waste Operations and **Emergency Response** (HAZWOPER) Refresher Training Certified Hazardous Materials Manager (CHMM), Certificate 2006 Awards Alliance of Hazardous Materials Professionals, Champion of Excellence Award Winner, 2009, 2010





Manasquan WTP Ozone System Improvements; Wall Township, NJ

Patricia serves as a regulatory compliance specialist on a water treatment improvement project in Wall Township, for the New Jersey Water Supply Authority. This project involves the replacement of an existing ozone system with a new system to enhance water quality. She assists the Authority with securing no-interest/low-interest funding through the combined NJDEP and NJEIT financing program, as well as several permits including a NJDEP air quality permit and NJDEP-Division of Water Supply water system permit. An evaluation of NJ's TCPA requirements was conducted for the new ozone generation system. Although the federal Risk Management Program does not regulate ozone generation, NJ's TCPA program does regulate this process.

Permitting and Regulatory Manager for Water Supply Pipeline; Middlesex County, NJ

Task Manager. Patricia served as permitting and regulatory manager for a oneand-a-half mile long, 60-inch diameter raw water supply pipeline for a private water company located in Middlesex County (\$10 million capital project), New Jersey. The project entails crossing of New Jersey Highway Route 18, a 600-foot open cut crossing of the Raritan River, and location of the pipeline through county park property and within busy county roadways.

Patricia's role entailed managing the regulatory and permit aspects for this pipeline, which required a multitude of environmental permits including: USACE Nationwide Permit No. 12 – Utility Line Activities; NJDEP – Green Acres Program - Diversion of Use Approvals; NJDEP Land Use Regulation Program (LURP) - Waterfront Development Permit; NJDEP LURP Freshwater Wetlands General Permit (No. 2) Authorization; NJDEP LURP Stream Encroachment Permit; NJDEP Land Use Management and Compliance - Bureau of Tidelands Management, Tidelands License; NJ Department of Transportation - State Highway Jacking and Boring Permit; County and local road opening permits; archaeological and cultural resources evaluation; Freehold Soil Conservation District - SESC Plan certification. Patricia also assisted the client with the New Jersey Environmental Infrastructure Trust financing program application requirements to obtain low interest financing. Patricia coordinated her activities with the design team throughout the process, making sure that the designers met all of the project deadlines and incorporating the necessary information into the contract and permitting documents.

Municipal Water Supply and Stormwater Projects; Gloucester County, NJ

Permit and Regulatory Compliance Specialist. Patricia served as a regulatory permitting and compliance specialist on several water supply projects for a municipality in Gloucester County, and assisted with NJDEP LURP permit support including freshwater and coastal wetlands, stream encroachment, and tidelands/riparian issues, compliance with local soil erosion and sediment control requirements, NJ Division of Fish and Wildlife permits, and Green Acres Program review, and securing funding through the combined NJDEP and NJEIT financing program.

Robert J. Klein, P.E.

Mr. Klein has experience working on major projects. He has been involved in many levels from planning and design to field observation and construction management. He has performed field inspections. As an effective communicator, his duties have included daily client management, coordination with architects, sub-consultants, and contractors. Mr. Klein has also demonstrated his budget management abilities through construction projects for clientele and design projects for larger firms. He is experienced in establishing budgets and writing proposals.

PROJECT EXPERIENCE

Edenwald Houses North and South Green Infrastructure; Bronx, NY

Resident Engineer. Mr. Klein is currently service as the Resident Engineer for the Edenwald Houses North and South Green infrastructure Project. His responsibilities include managing and overseeing the construction of a green infrastructure projects designed by CDM Smith. Mr. Klein is responsible for coordinating observation services, ensuring the project is constructed in accordance with the contract documents and required permits, and ensuring timely responses to project related inquiries to meet the project schedule.

Brookfield Avenue Landfill Remediation Project; Staten Island, NY

Construction Manager. Mr. Klein is currently serving as the Design Liaison. His responsibilities include managing submittal reviews, providing design clarifications and coordinating design changes between the contractor, resident engineer, and the various designers involved with the project. Mr. Klein is also responsible for coordinating and preparing permit documents on behalf of the client. Overall, he is tasked with ensuring timely responses to all project related inquiries to assist in the construction's progress.

T&M Associates; Middletown, NJ

Project Manager. Mr. Klein was a project manager for a variety of private site projects including commercial, office, industrial, warehouse, and pharmaceutical developments. He was involved in the preparation of Preliminary and Final Site plans and required permit documents for various local and state permitting agencies including Municipal, County, NJDEP, and NJDOT. His responsibilities included preparation of concept and design plans, bid and construction document preparation, and construction management.

Hatch Mott MacDonald (formerly Killam Associates); Millburn, NJ

Project Manager. Mr. Klein performed project management for a variety of projects including landfill construction and closure; fuel storage tank projects; solid waste transfer station design and permitting; sanitary and storm sewer systems; site development for recreational facilities such as park and zoo rehabilitation, park development, and athletic facility development. He also managed projects in all stages of development including conceptual design, design, site development, permitting, bid document preparation, cost estimating, construction observation and construction management.



RESIDENT PROJECT REPRESENTATIVE DESIGN CONTRACT



Education

B.S. - Civil Engineering, New Jersey Institute of Technology, 1996

Registration Professional Engineer: New Jersey, New York

Certifications 40-hour OSHA

Certification Hazardous Materials

8-hour Confined space

OSHA training

Hazardous Materials

Refresher Course

Hazardous Waste Operations Supervisor Certification

Tom Laustsen, P.E., BCEE

Mr. Laustsen has 24 years of experience in design and construction of soil and groundwater remediation systems; water and wastewater treatment plants; landfill caps; site work and mechanical systems; underground and aboveground storage tanks; construction services; storm sewer, water main and force main design; data collection and analysis; and treatment system installation, operation, and maintenance. He has worked on a variety of environmental and hydrological engineering projects in the areas of hazardous waste, wastewater, water, solid waste, and water resources.

PVSC | Pumping Station Design

Project Manager. Mr. Laustsen provided design, bidding and construction services related to a parallel heat treatment plant supernatant return line (HTPSR). CDM Smith evaluated two different pumping station options for conveying the supernatant from the sludge decant tanks in a new parallel HTPSR line. CDM Smith recommended using a new wet well and force main.

PVSC | Sludge Pipeline Improvements

Project Manager. Mr. Laustsen provided design, bidding and construction services related to rehabilitation of a gravity HTPSR line. The existing polyethylene liner in the piping was failing and causing hydraulic restrictions. CDM Smith prepared design documents for the cleaning of the line, and the removal of the liner using high pressure jetting.

PVSC | Waste Activated Sludge (WAS) Pumping Station Upgrade

Project Manager. Mr. Laustsen is managing a project where PVSC is looking to expand the pumping capacity of their WAS Pumping Station from 10 MGD to 15 MGD. Evaluation includes considering hydraulic issues, pump clogging, and pumping efficiency. Also as part of the project, CDM Smith is preparing contract documents to rehabilitate the facilities HTPSR line with a coating system.



SITE PREPARATION & PERMITTING DESIGN MANAGER



Office Location Edison, NJ

Education

M.S. - Management Engineering, New Jersey Institute of Technology, 1994 B.S. - Civil Engineering, Texas A&M University, 1989

Registration

Professional Engineer: New Jersey (1994), Pennsylvania, and New York

Certifications

- 40-hour OSHA Health and Safety Training
- Health and Safety Officer Training
- Confined-Space Entry Training

Honors/Awards

Board Certified Environmental Engineer (BCEE), American Academy of Environmental Engineers and Scientists

Westchester County | Construction Oversight Wastewater Treatment Plant Upgrade; NY

Project Engineer. For the expansion and upgrade of the 92-mgd Mamaroneck Wastewater Treatment Plant. Mr. Laustsen provided shop drawing review and onsite construction inspection services, including test monitoring of the finebubble aeration system designed for high oxygen transfer efficiency.

Northwest Bergen County Utilities Authority | Fluidized Bed Incinerator System, Waldwick, NJ

Construction Manager. Mr. Laustsen is the construction manager for the replacement of a fluidized bed incinerator system used to incinerate municipal sludge at a site in Waldwick, New Jersey.

Northeast Monmouth County Regional Sewerage Authority | Upgrade and Expansion of Wastewater Treatment Facility; Monmouth County, NJ

Project Engineer. Mr. Laustsen designed the upgrade and expansion of the existing wastewater treatment facility to handle the average design flow of 13.83 mgd. The project included upgrading two existing aeration basins and providing two new aeration basins equipped with fine bubble aeration.

Linden Roselle Sewerage Authority | Raw Wastewater Pumping Station; Linden Roselle, NJ

Construction Manager. Mr. Laustsen oversaw the modifications of the control system for four 100 HP raw wastewater pumps to include new variable frequency drives (VFDs) and a new bubbler control system. The pumping station was maintained in operation while the work was performed.

Village of Ridgewood | Wastewater Treatment Facility Upgrade; Ridgewood, NJ

Project Engineer. Mr. Laustsen designed the upgrade and expansion of the existing wastewater treatment facility. The project included upgrading four existing aeration basins to provide nitrification equipped with fine bubble aeration. Two existing primary clarifiers were upgraded with new spiral collectors. Two existing secondary clarifiers and one new clarifier are being provided with spiral sludge collection for rapid sludge withdrawal. Mr. Laustsen also designed the odor control system which included covering the primary clarifier launderers, influent channels, grit removal equipment and wet wells and treating the air with regenerative carbon odor control systems.

Kevin G. McEvoy

Mr. McEvoy is a senior project manager with more than 30 years of experience in the planning, design, and construction engineering of water, wastewater, transportation and hazardous waste remediation projects for municipal and private-sector clients. As Group Leader of Construction Services, Mr. McEvoy is responsible for contract administration of both general and resident engineering services on our largest and most complex projects. His responsibilities include interfacing with design engineers, coordinating the shop drawing process, resident engineering services, major claims negotiation, client reporting and business development. He has served as both project manager and chief resident engineer on major water and wastewater treatment facility projects, including water treatment facilities utilizing ozonation, secondary and tertiary wastewater treatment plants including activated sludge, biological nutrient removal, membrane technology and sludge dewatering facilities. Mr. McEvoy has an exemplary record of delivering completed projects on schedule and on budget.

PROJECT EXPERIENCE

PVSC | Sludge Handling Facility; Newark, NJ

Chief Resident Engineer. Mr. McEvoy was the chief resident engineer for the construction of a \$53 million sludge handling facility for the. This complex facility was constructed and placed into operation within 15 months to successfully comply with a ban on ocean disposal of sludge required by the USEPA. Mr. McEvoy was responsible for the supervision of resident engineering and inspection staffs, project reporting, project scheduling reviews, review, negotiation and preparation of field directives and change order documents, and general construction contract administration.

Brightwater Treatment Plant; Seattle, WA

Program Manager. Mr. McEvoy is currently managing the \$550 million construction, utilizing dual contract delivery methods. During pre-construction services, Mr. McEvoy facilitated the implementation of a split contracting approach in order to maintain the client's relationship with a pre-selected General Contractor/Construction Manager (GCCM). Once final design was completed the total cost exceeded the GCCM's bonding capability, so an alternative means of contracting was required. Mr. McEvoy, working closely with client management, developed the approach to bifurcate the project into separate contracts for Liquids and Solids facilities, with the GCCM performing the Liquids and competitively bidding the Solids.

Westchester County | Wastewater Treatment Plant Upgrade and Expansion, Westchester County, NY

Chief Resident Engineer. Mr. McEvoy was the chief resident engineer for the completion of the upgrade and expansion of the Mamaroneck Wastewater Treatment Plant. This 4-year, \$105 million project required the administration of multiple prime contracts, complex maintenance of plant operations during



RPR (SITE PREP)



Education B.S. - Architecture, New York Institute of Technology, 1976 Advanced Wastewater

Treatment I & II - Morris County Community College, 1979



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construction, and close attention to community relations due to its proximity to a Village park and downtown retail shopping. This project incorporated several unique features including the installation of piles through an operating process structure to accommodate the construction of a new building over the existing process; the construction of stacked tray secondary clarifiers which were the first of its kind on wastewater in the USA; and, historical preservation work on the existing facility. Mr. McEvoy was responsible for the supervision of resident engineering and inspection staffs, project reporting, project scheduling reviews, review and negotiation preparation of change order documents, and general construction contract administration.

Orange Count | Harriman Wastewater Treatment Plant Expansion; Orange County, NY

Construction Manager. Mr. McEvoy managed the construction of the \$25 million Harriman wastewater treatment plant. This facility includes the construction of a new activated sludge train, a process building with three tertiary filters, a disinfection system, blowers and electrical equipment, as well as modifications to the existing facility and new odor control systems for the entire plant.

W.H.O. Tri-Area Sewer District | Secondary Wastewater Treatment Plant; South Fallsburg, NY

Resident Engineer and Client Manager. Mr. McEvoy was the resident engineer and client manager for the \$12 million upgrade of the 3.25-mgd secondary wastewater treatment plant in South Fallsburg, New York. In addition, he was resident engineer for the construction of the \$6 million, 0.7-mgd secondary wastewater treatment plant in Loch Sheldrake, New York. Responsibilities at both of these rotating biological contactor (RBC) facilities included coordination of multiple-prime construction contracts, supervision of resident inspection staffs, coordination with existing plant operations personnel, preparation of change-order documents in conformance with State/Federal guidelines, criticalpath-method (CPM) schedule up-dating and monitoring and overall contract monitoring, and overall contract administration.

LRSA | Secondary Wastewater Treatment Plant Expansion; Linden, NJ

Resident Engineer. Mr. McEvoy was resident engineer for closeout of LRSA's \$20-million secondary wastewater treatment plant expansion and for the construction of sludge dewatering facilities. He was responsible for supervising the resident engineering and inspection staffs, project reporting, cost estimating, project scheduling reviews, review and negotiation of cost proposals and claims, progress payment reviews, preparation of field change and change-order documents, and general construction contract administration.



Kapila S. Pathirage, PhD, PE, PEng

Dr. Pathirage has more than 23 years of experience in geotechnical/tunnel, geoenvironmental, and civil engineering projects for private, commercial, and government clients. He has experience in performing geotechnical investigations for tunnels, microtunneling, horizontal directional drilling (HDD), dams, slurry walls, pipe lines, solid waste landfills, water and waste water treatment plants, contaminant projects, subdivision developments, storm water ponds, and soil liners. His responsibilities include developing project scopes, geotechnical proposals, cost proposals, contact documents (plans and specs) and supervising field exploration programs. His field and laboratory responsibilities include selecting boring locations, assigning laboratory tests, classifying soil samples, developing soil logs and profiles, and analyzing subsurface conditions.

Dr. Pathirage's engineering experience includes design and construction of tunnels, microtunneling, horizontal directional drilling, slurry walls, landfills, contaminant clean-ups, and site development projects. Dr. Pathirage also has engineering experience in design and construction of dams (i.e., rockfill/earth and concrete gravity dams). He has also managed operations and maintenance of dams that include rockfill/earth, concrete gravity and concrete arch dams. Dr. Pathirage has carried out formal/regular inspections and safety/performance evaluations; directed geotechnical (field/lab) investigations, and performed dam rehabilitation designs (earthen embankments, spillways, low-level outlets), remedial works and reviewed contracts. He has also been responsible for updating operation and maintenance manuals.

Dr. Pathirage also has extensive experience in computer 3D modeling (FLAC3D) and 2D modeling (PLAXIS); using 2D models for stability and seepage analyses; embankment designs. He also has experience in seismic designs and liquefaction analyses; deep and shallow foundation designs (piles, caissons, geo-piers, spread footings); retaining wall designs; excavation support system designs (soldier piles, cantilevered sheet piling, and sheet piling with tiebacks); rockbolt designs; cut-off wall designs (slurry walls, and jet-grouted column walls); settlement analyses; ground improvement designs (pre loading, vertical drains, and dynamic compaction); construction vibration analyses, instrumentation layout designs, and geophysical surveys.

PROJECT EXPERIENCE

NYCDEP | Green Infrastructure Design Services Contract Area 1; Brooklyn, NY

Lead Geotechnical Engineer. Dr. Pathirage served as the lead geotechnical engineer on the project team as a subconsultant for the right-of-way bioswale project. The current phase of the project consists of performing test borings and in-situ permeability tests at proposed bioswale locations to evaluate the suitability of the proposed locations for the bioswales. Dr. Pathirage is responsible for planning and executing subsurface investigation programs and preparing geotechnical reports.



GEOTECHNICAL

CDM Smith

Education

- M.A.Sc. Geotechnical Engineering, University of British Columbia, Canada, 2000
- Ph.D. Civil/ Hydraulic Structure (Dams)Engineering, Russian People's Friendship University, Moscow, 1992 M.Sc. - Civil/ Hydraulic
- Structure (Dams)Engineering, Russian People's Friendship University,

Moscow, 1986 Registration

Professional Engineer: New Jersey, New York, Ohio (2003), and British Columbia, Canada (2002)

Certifications

40-hour OSHA Hazardous
 Waste Training
 8-hour OSHA Refresher
 Training



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NYCDEP | Catskill Rondout West Branch Bypass Tunnel (RWBBT) Project; NY

Geotechnical/Tunnel Engineer. The RWBBT will be constructed at an offset distance of approximately 1,750 feet north of the existing RWBT. The majority of the Bypass Tunnel will run parallel to the existing RWBT with connections at the new Shaft 5B in the vicinity of existing Shaft 5A in Newburgh, New York and at the new Shaft 6B in the vicinity of existing Shaft 6 in Wappinger, New York. Dr. Pathirage worked with Jacobs Associates Underground (JA Underground) on the supplemental geotechnical investigation program. The supplemental program included three deep, angled exploratory borings (RB-14 through RB-16). These borings were conducted in Newburgh, NY to total proposed drilled depths ranging between 771 and 1,001 feet (668 and 867 vertical feet, respectively) below ground surface (bgs). In addition, an extensive geotechnical field testing program to characterize the bedrock and evaluate engineering properties for design was also included in the supplemental geotechnical program.

Harbor Siphon Replacement Project, Staten Island to Brooklyn, NY

Senior Geotechnical/Tunnel Engineer. The project consists of the construction of a new a 72-inch diameter pipeline within a 12-foot diameter bored tunnel between Brooklyn and Staten Island. The primary purpose of the proposed siphon is to provide a standby pipeline for transmission of water to Staten Island, in the event of an outage of the existing 10-foot diameter Richmond Tunnel, which is the primary transmission facility between Brooklyn and Staten Island. Dr. Pathirage is responsible for evaluating instrumentation readings, overseeing the construction of slurry wall (4-ft wide, 120-ft deep, 220-ft long), the excavation of the starter trench, and preparation for launching the Tunnel Boring Machine (TBM).

Suffolk County Sewer Outfall; New York, NY

Senior Geotechnical/Tunnel Engineer. Dr. Pathirage served as the geotechnical engineer for the explorations and design of this outfall replacement tunnel under South Bay Cove from the Bergin Point Wastewater Treatment Plant (WWTP). The project involves both land and marine borings and the tunnel is anticipated to be 15,000 lf and be 10 to 12 ft in diameter in either sand or clay. The anticipated lining system will be gasketed precast concrete segmental lining.

Horizontal Directional Drilling (HDD) Governors Island; New York, NY

Senior Geotechnical Engineer. Dr. Pathirage was the Geotechnical task leader responsible for planning and executing a subsurface exploration and laboratory testing program. Laboratory testing program included both soil and rock testing. He is also responsible for developing a Geotechnical Data Report (GDR). The proposed HDD works include designing a 2,200 ft long two pass system (i.e., casing pipe and carrier pipe, thee casing pipe is 24-inch diameter steel pipe and the carrier pipe (i.e., forcemain) is 12-inch diameter Ductile Iron pipe), and developing plans and specifications.

Virginia Roach, P.E., BCEE

Ms. Roach has 30 years of civil and environmental engineering experience. Throughout her career, she has been involved in a broad range of stormwater management studies, site designs and construction projects, as well as wastewater, combined sewer overflow (CSO), and water projects throughout the . Ms. Roach was a contributing author to the 2012 WEF Design of Urban Runoff Controls Manual of Practice, and the 2014 WEF Green Infrastructure Implementation manual.

PROJECT EXPERIENCE

NYC DEP Office of Green Infrastructure | Design Services Contract; New York, NY

Project Manager. The New York City Green Infrastructure Plan is to manage the first inch of runoff from 10 percent of impervious surfaces in combined sewer tributary areas in Queens, Brooklyn and the Bronx by 2030. Ms. Roach is managing a green infrastructure project with the NYCDEP Office of Green Infrastructure across a 1,200-acre area of Queens. Over three years, CDM Smith is providing design and engineering services for green infrastructure in Flushing Bay combined sewer tributary area BB-008 through construction. Green infrastructure improvements include approximately 400 right-of-way bioswales, as well as stormwater greenstreets and various types of green infrastructure practices on public properties (porous pavements, vegetated bioretention areas and subsurface storage and infiltration). Ms. Roach is the Project Director for a similar green infrastructure project in the Queens BB-005 combined sewer area tributary to Bowery Bay.

NYC DEP | Edenwald Houses Green Infrastructure Planning and Design, New York, NY

Project Manager. Ms. Roach managed the planning and design of green infrastructure development at Edenwald Houses, the largest New York City Housing Authority (NYCHA) development in the Bronx with 41 buildings on nearly 53 acres. CDM Smith completed a facility plan and design for the Edenwald site incorporating green infrastructure controls to maximize storm flow attenuation to the extent practical, and is providing construction services over the next two years. This project will reduce combined sewer overflows to the Hutchinson River and thereby improve the water quality of the river and harbor.

Stormwater Master Plans; Various Locations

Project Manager and Lead Practitioner. Ms. Roach was the Project Manager for the Northampton, Massachusetts Stormwater and Flood Control System Assessment and Utility Plan. The purpose of this project was to meet specific goals of the city's Sustainable Northampton Comprehensive Plan, as well as consider the implementation of a new Sustainable Stormwater and Flood Control Utility to fund capital projects and maintenance of the city's stormwater and flood control facilities. This project assessed the adequacy of existing



CIVIL SITE ENGINEER



- MS Civil/ Environmental Engineering, Worcester Polytechnic Institute, 1992
- BS Civil Engineering, Worcester Polytechnic Institute, 1985
- BA Mathematics, College of the Holy Cross, 1981

Registration Professional Engineer: Massachusetts, 1990

Certifications

Title 5 Soil Evaluator: Massachusetts, 1995 OSHA 10-hour Occupational Safety and Health Training

Honors/Awards

Board Certified Environmental Engineer (BCEE), American Academy of Environmental Engineers and Scientists

 NEWEA E. Sherman Chase Award, 2015 drainage systems within select areas of the city, and developed and evaluated alternatives for addressing areas where the system needed improvements to meet present and future stormwater management requirements. Alternatives included green design elements as well as large pipe solutions. In addition, the alternatives evaluation addressed ways to cost-effectively maintain the city's flood control facilities. The product of this assessment was a prioritized longterm improvement plan, laying the groundwork for a Stormwater and Flood Control Utility, implemented in 2014.

Various CSO, Drainage, and Sewer Projects

Project Manager/Engineer. Ms. Roach managed numerous other CSO, drainage, and sewer projects. She managed five major CSO conceptual design projects for the Hartford, Connecticut Clean Water Project, including sewer separation, consolidation conduit and tunnel storage designs. She performed a CSO study for the City of Fall River, using the STORM model to determine the feasibility of various CSO control alternatives. Utility and roadway projects include reconstruction of approximately 6,000 feet of Chestnut Hill Road in Rochester, New Hampshire, and the Massachusetts Department of Transportation (MassDOT) Spring Street reconstruction design project in Williamstown, Massachusetts, that included drain, sewer, water main, and roadway improvements. Ms. Roach managed the design of sewer separation and water system improvements in downtown Exeter, New Hampshire, improvements recommended by CDM Smith in a comprehensive infiltration/inflow (I/I) study, sewer system evaluation survey, and CSO study for the town.

Green Capitols Infrastructure Improvements; Hartford, CT

Stormwater Design Lead. Ms. Roach designed a "Green Capitols" project on the grounds of Hartford, Connecticut's capitol building. The Hartford Metropolitan District Commission (MDC) partnered with the Connecticut DEP and State Capitol Office of Legislative Management to design various green infrastructure improvements around the capitol to demonstrate to Connecticut municipal officials and homeowners the potential benefits of green technologies. The improvements include a rainwater harvesting system that captures roof water for use in site irrigation, permeable paver and pervious concrete walkway demonstration areas, porous asphalt parking areas, urban and residential rain garden infiltration areas and a green roof. Construction of the project was completed in 2010.

Cape May Coast Guard Facilities and Atlantic City Federal Air Marshall Training Facility, Atlantic City, NJ

Civil/Site Design Manager. Ms. Roach was the civil/site design manager for a LEED-certified Coast Guard Facilities Design in Cape May, New Jersey, as well as a Federal Air Marshall Training Facility in Atlantic City, New Jersey. Both of these design-build projects included stormwater BMPs (bioretention areas, rain gardens, a particle separator and an infiltration basin) in accordance with strict New Jersey State and Pinelands Commission requirements.



Amit K. Sen, PE

Mr. Sen has 17 years of experience in the engineering consulting and chemical industries with concentration in water and wastewater plant design, air regulatory compliance, pilot plant operations and reporting, construction oversight, and process development. He has extensive experience in air permitting, air emissions reporting, and regulatory compliance for wastewater, solid waste, and industrial clients.

Project Manager and Project Engineer, Air Compliance Program, Newark, New Jersey. Mr. Sen served as the project manager for an air compliance program at a 330-mgd wastewater treatment plant from 2012 to 2015. The air compliance program included preparation of yearly emission statements, Title V operating permit modification to accommodate plant and process modifications, compliance tracking, and operating permit renewal application. Mr. Sen prepared supporting documentation and calculations for the regulatory reports and submittals. He participated in negotiations with the NJDEP to finalize the operating permit renewal.

PROJECT EXPERIENCE

Various Clients | Air Quality Permitting and Regulatory Compliance; NJ

Project Engineer. Mr. Sen served as project engineer for a variety of clients, performing air quality permitting and regulatory compliance work. His responsibility included identifying permit requirements, collecting facility data, performing air emissions calculations utilizing computer models and available data, consolidating the data in New Jersey Department of Environmental Protection's (NJDEP) RADIUS data entry/database program, performing emission offset analysis, and negotiating permit requirements with NJDEP. He performed air quality permitting work for both minor (NJDEP Subchapter 8) facilities and major (Title V) facilities. Mr. Sen was also responsible for identifying potential air quality issues from the regulatory standpoint, assisting clients to comply with regulations and emission limits, and preparing deviation and compliance reports. For industrial clients, he performed site evaluation to determine permitting requirements and compliance issues. He has detailed knowledge and ten years of working experience with New Jersey and Federal air regulations. He has extensive experience in working with the regulators.

Air Compliance Program; Sayreville, NJ

Project Manager and Project Engineer. Mr. Sen served as project manager for an air compliance program at a wastewater treatment plant from 2007 to 2015. The air compliance program included preparation of yearly emission statements, deviation reports (from the monitoring, recordkeeping and submittal requirements of the Title V air operating permit), annual compliance reports, Title V operating permit modification to accommodate plant expansion and upgrade, and operating permit renewal application. Mr. Sen prepared supporting documentation and calculations for the regulatory reports and





Education

- M.S. Environmental Engineering, Drexel University, 2009 B.S. – Chemical
- Engineering, Lehigh University, 1999

Registration Professional Engineer: New Jersey (2007), Pennsylvania submittals. He participated in negotiations with the NJDEP to finalize the operating permit modifications.

Ammonium Hydroxide System Improvements at Water Treatment Plant; Philadelphia, PA

Project Manager of Construction Services and Project Engineer. For a municipal water authority, Mr. Sen served as the project manager for construction services for the construction of an ammonium hydroxide (aqua ammonia) storage and feed system at a 150-mgd water treatment plant, which included two steel tanks, two chemical vaults, chemical feed pumps, pump vault, and associated piping. In addition, he was responsible for shop drawing review of the specified equipment, and provided responses to request for information from the contractor.

Groundwater Treatment Plant; Taneytown, MD

Project Manager and Design Engineer. Mr. Sen served as the project manager for the design of a 200-gpm groundwater treatment plant that included well water pump, air stripper for PCE removal, gross alpha and radium removal with an ion exchange process without regeneration, high-service pumps, and emergency generator. The design of gross alpha and radium removal system involved investing in and soliciting companies that provide a complete equipment and service package including licensing and disposal as part of a long term contract. He performed process-mechanical design calculations; prepared specifications and drawings, as well as coordinated the efforts of structural, architectural, electrical, instrumentation and HVAC engineers. He coordinated permitting and funding deliverables with the regulatory agencies.

Ammonium Hydroxide System Improvements at Water Treatment Plant; Philadelphia, PA

Design Engineer. For a municipal water authority, Mr. Sen assisted in the design of an ammonium hydroxide (aqua ammonia) storage and feed system at a 150-mgd water treatment plant, which included two steel tanks, two chemical vaults, chemical feed pumps, pump vaults, and associated piping. He performed analysis of existing chemical feed system, design calculations for the new system; prepared specifications and drawings.

Ferric Chloride System Improvements at Water Treatment Plant; Philadelphia, PA

Design Engineer. For a municipal water authority, Mr. Sen assisted in the design of a ferric chloride storage and feed system at a 120-mgd water treatment plant, which included two FRP tanks, storage and containment area, chemical transfer and feed pumps, and associated piping. He performed analysis of existing chemical feed system, design calculations for the new system; prepared specifications and drawings.

Chris DuPont

Mr. DuPont has 20 years experience in construction in and around New York City and is completing his tenth year with Nasco. His responsibilities include cost estimating throughout the design life of projects as well as the preparation of bid estimates. Prior to his association with Nasco he owned and operated a general contracting firm for four years.

His experience includes Sewer & Waste Water Treatment Plants, Dams, Reservoirs and Water Treatment projects. He has performed cost estimates at all stages of design and has performed value engineering on many of these projects.

Responsibilities include: Quantity take-off & pricing; Estimating at all stages of project design; Coordination and review; Value Engineering; Analyzing contractor claims.

SELECT PROJECT EXPERIENCE

North River WWTP, (NYCDEP), New York, NY. Provided cost estimating services for the co-generation & electrification facility plan for Contracts NR39, NR42, NR 43, and NR46 estimated at the 30%, 60%, 90%, and 100% CD phases. Estimated Amount: \$250,000,000.

Rikers Island Project, Elmhurst, NY

Provided cost estimating for new co-generation power plant.

26th Ward WPCP-(NYC DEP), Brooklyn, NY

Provided cost estimating services for new emergency generator.

Bay Park STP, (Nassau County DPW), Nassau County, NY

Provided cost estimating services for 3rd engine generator.

Yonkers WWTP, Client: (for Westchester County DPW), Yonkers, NY

Provided detailed cost estimating services for the Sump Pump Replacement/Post Storm Rehabilitation.

Rockaway WWTP- Level 1 BNR Upgrade, (NYC DEP), Queens, NY

Provided cost estimating and scheduling services for plant upgrade.

Flushing Bay WWTP, (NYCDEP), Queens, NY

Provided cost estimating services for the high level Interceptor improvements.

Clearview Pump Station Reconstruction, (NYC DEP), Queens, NY Provided cost estimating services for the reconstruction of pump station.

Croton Falls Pump Station & Facilities, (NYCDEP), Westchester County, NY Provided detailed cost estimating services for reconstruction of new pump station. COST ESTIMATING



Education AAS—Civil Technology Westchester Community College Registration Associate Value Specialist Years of Experience

20 Year Joined Nasco 2000

BLACK & VEATCH | Chris OuFoni

Tallman Island WWTP, Client, (NYC DEP), Queens, NY

Provided cost estimating and value engineering support for the Wet Weather Flow project.

Cedar Creek WPCP Pumps & Tanks, (for Nassau County DPW), Nassau County, NY

Provided cost estimating services for the improvements to protected and domestic water systems.

Hunts Point WWTP, (for NYCDEP), Bronx, NY

Provided cost estimating services for the centrifuge replacement project.

Barnes Avenue Pump Station, (for Nassau County DPW), Nassau County, NY

Provided cost estimating for Flow Diversion Pumping Station and Newman's Court Pumping Station Improvements.

Wards Island WWTP, (for NYC DEP), Bronx/Manhattan, NY

Provided cost estimating services for the plants settling system replacement.

Bay Park WWTP, Sludge Dewatering Facility Improvements, (Nassau County DPW), Nassau County, NY

Provided cost estimating services for the sludge dewatering project.

Bay Park STP Program Management Efforts, (for the Nassau County DPW), Nassau County, NY

Provided cost estimating services for pump station mitigation of effluent pumping facility—pump stations PS2, PS3, PS4, PS5, PS6, PS7, and PS8. Estimated Cost

Bay Park STP Raw Sewage Pump Station, (for the Nassau County DPW), Nassau County, NY.

Cost estimating for the raw sewage pumping system improvements.

Bay Park STP Perimeter Protection, (for the Nassau County DPW) Location, Nassau County, NY.

Provided cost estimating services for storm hardening and remediation.

Yonkers Joint WWTP, CDM Smith, Yonkers, NY.

Provided cost estimating services for the plant rehabilitation after Hurricane Sandy.

New Rochelle WWTP, New Rochelle, NY.

Provided detailed cost estimating services for the wastewater treatment composite performance implementation and plant expansion.

Ocean County Utilities Authority—Northern WPC Facilities Expansion, Ocean County, NJ

Parsippany Troy WPCP—Plant Upgrades (NJDEP), Township of Parsippany/Troy, NJ