

# **An Assessment of PWSA Operations**

**Presented October 20, 2017**



**(this page intentionally left blank)**

# 1 INTRODUCTION

## 1.1 PROJECT APPROACH

The IMG Team used a water industry best practice tool called the Management Assessment Profile (MAP) to assess PWSA's operations and maintenance as part of its Task III work. The Team conducted a high-level assessment of the effectiveness of PWSA's overall management at the utility using five critical performance criteria. These five elements were further divided into twenty-three *achievement standards*. This exercise yielded an objective means of evaluating the utility's performance against standard water industry practices.

In a water utility, "operations" usually refers to raw water intake and water treatment plant activities rather than water transmission, where the work is mostly maintenance and asset management. The operational evaluation of PWSA's water treatment facility included engineering analysis, statistical review, and evaluation of process operational practices. This evaluation was conducted using available PWSA technical reports, memoranda, internal correspondence, operating data and staff interviews.

# PERFORMANCE EVALUATION

## 1.1 METHODOLOGY

A Management Assessment Profile (MAP) matrix was used as an interview guide for meetings with the Crane facility staff. MAP uses a standard rating methodology to provide insightful points of reference for the evaluations. These evaluations yield a performance “report card” that includes focused observations on a utility’s strengths and weaknesses as well as recommendations for improvement.

## 1.2 QUALITY PERFORMANCE ELEMENTS

The Management Assessment Profile is built upon five elements of quality performance including:

- Customer Service
- Leadership
- Technical Management
- Vision
- Community

Each of these elements is further defined into five subcategories, creating a full matrix of achievement standards. The achievement standards include:

- |                          |                            |                                      |
|--------------------------|----------------------------|--------------------------------------|
| • Compliance             | • Protection of Investment | • Technical Management               |
| • Recruitment & Training | • Contract Management      | • Operational Plans                  |
| • Facility Improvements  | • Fiscal Control           | • Standard Operating Procedures      |
| • Response Plans         | • Regulatory Communication | • Laboratory QA/QC                   |
| • Asset Management       | • Management Communication | • Regulatory/Permits Standards       |
| • Department Management  | • Staff Development        | • Environmental Standards Compliance |
| • Facility Management    | • Performance Reporting    | • Professional and Community         |
| • Coordination           | • Professional Integrity   |                                      |

## 1.3 EVALUATION OF ACHIEVEMENT STANDARDS

The Team conducted the operations and maintenance activities through a multi-step approach focused on PWSA’s performance against industry standard practices for a utility of its size. The evaluation is drawn from the following resources:

- facility tours and interviews of plant and management personnel conducted by IMG Team staff in August of 2017
- review of Standard Operating Procedures (SOPs), logs, computer systems, forms, O&M Manual and other documentation
- use of Management Assessment Profile (MAP) template as guidance
- evaluation of treatment process performance based on staff interviews

The results of these evaluations are summarized in the following sections.

# 2 MANAGEMENT ASSESSMENT

## 2.1 VISION – LOOKING TO THE FUTURE

**2.1.1 Standard: Regulatory Compliance (Future)**  
**Requirement: Regulatory**

**Measurement:**

- Conduct an annual review of permits and rules in promulgation process.
- Document the review/conclusions, i.e. potential impact on operations or design planning.

**Observations on PWSA**

PWSA management conducts its regulatory compliance reviews with guidance from its consultants. These reviews are conducted at least annually basis. The findings are communicated to the PWSA board.

The typical large water utility uses a Master Compliance Schedule in which Consent Orders and other regulatory decree deadlines are highlighted along with progress-to-date, performance areas of concern, and the utility’s goals. This schedule should roll up into the overall 5-year or 10-year Capital Improvement Program (CIP) to support deliberations for project prioritization, funding and needs assessment discussions. PWSA does not appear to have this type of well-organized Compliance Schedule, however it recently created a new Environmental Compliance Office and appointed a new director that the PWSA board believes has the confidence of Pennsylvania’s Department of Environmental Protection and the US Environmental Protection Agency.

**Industry Norms**

An effective compliance and regulatory management program, especially for a utility of similar size, complexity and service area to PWSA, assigns a dedicated supervisory staff member to determine the courses of action required to accomplish the following:

- Meet all Consent Order Decree schedules
- Collaborate with other departments in performing cost-benefit analysis for system upgrades, stormwater collection and sewer conveyance.
- Make the utility cognizant of and manage anticipated regulatory regulations affecting your utility.
- Make the utility cognizant of technology upgrades specific to process QA/QC to improve compliance monitoring, residuals management, stormwater and sewer conveyance.

A compliance oversight team should consist of a collaborative effort of department heads, supervisors and outside consultants. It should include Laboratory, Treatment Operations, Engineering, Finance, Distribution and Collection. Finally, the utility’s unique operating philosophy should be reflected in how it conducts its cost/benefit analyses, sets its compliance thresholds and goals, establish capital cost thresholds, and conducts public relations and media communications.

**2.1.2 Standard: Recruitment and Training**  
**Requirement: Employee and Management Staff Development**

**Measurement:**

- Maintain a timely and aggressive recruitment process for unfilled positions.
- Complete an annual training assessment profile, and document training for staff and manager (demonstrating presence of a complete employee training plan).
- Regularly reassess job descriptions and responsibilities to determine minimum training requirements for professional licensure and job classifications.

**Observations on PWSA**

- The HR function at PWSA has typically been performed by just two people: Director of Administration and HR Specialist. This is below the level for utilities of comparable size.
- PWSA's biggest HR challenge appears to be recruitment of new talent and retention of existing talent. Field positions are apparently easier to fill than professional office positions. The barriers to professional hiring are (in order): salary, residency requirements and PWSA stability (perception of sinking ship).
- PWSA has just over 250 employees, 35-40 of which are non-union. Non-union employees follow AESME union annual raises. Prior to 2015, there were no "pay for performance" positions within PWSA; in 2015 & 2016, merit-based pay raises were introduced. In 2017 that policy was apparently modified or eliminated.
- Turnover is primarily a result of aging workforce in the field. This turnover, as well as recruitment difficulties, force PWSA to rely too heavily on contractors: approximately 10 positions in Customer Service and 30 in Engineering are filled by contractors.
- A Request for Information (RFI) was recently issued to outsource most or all of the Customer Service; the majority of Customer Service employees are unionized.
- According to HR staff, PWSA has never invested much in employee training, either in professional staff or "in the field." They would like to see a much greater focus on training; indeed PWSA's Continuing Education hours appear to be well below those of other utilities. This problem is exacerbated by too few staff using the modest amount of training offered, a fact that may be attributable to the lack of career guidance.
- The Safety Manager position has recently been outsourced, a frequent tactic for filling skilled positions in the face of residency and compensation limits. However, HR said they were very satisfied with the new Manager's performance because the new workplace safety processes and procedures implemented have yielded immediate results.
- PWSA appears to be trying to improve its HR programs overall, but its long-prevailing culture of indifference and its lack of resources dedicated to evaluation, training and career advancement make implementing reforms a slow and frustrating process.
- Performance appraisals at PWSA are done during the annual employee review cycle. Several of the staff interviewed complained that these appraisals were largely "pro forma" except when they were negative, and that they typically do not focus on either a professional career path or individual career development recommendations.
- HR staff observed that PWSA's departments operate in a very uncoordinated fashion, adding that efforts to set objectives and metrics have had little traction.

## Industry Norms

A utility the size of PWSA, especially one with its considerable infrastructure and operating needs, requires a well-structured and well-funded Training and Career Advancement Program, one which should be managed through Human Resources and be backed by all levels of management. Among other benefits, this all-inclusive approach helps prevent dissention and misunderstanding about the utility's HR strategy.

A successful utility begins with regular communications at every level and to every member of the staff. For PWSA, each employee of a department needs to have clearly defined goals and responsibilities, both individually and shared with their working unit. This includes regular enforcement of written and implied responsibilities associated with the job classification, including taking advantage of the career development opportunities that are offered.

A thorough review of field personnel job classifications (in conjunction with a review of assigned Collective Bargaining Agreement schedules) would allow for employees to be moved into positions better suited with their skill set (a frequently-observed problem at PWSA). It would also guide a revamping of job descriptions to foster more effective workdays and improved shop-level morale. Finally, this would promote an "ownership" mentality among staff that should lead to the achievement of higher performance standards, about which PWSA needs to be much more explicit.

An immediate area of focus for the Human Resources should be an in-depth evaluation of workplace injuries and worker's compensation claims, one that would seek to determine root causes and costs. A statistical analysis would be particularly helpful in providing PWSA with enough information to analyze the following observed concerns:

- unsafe workplace practices that requiring investment or process modification
- cost/benefit of performing certain tasks in-house versus outsourcing
- the cost of scheduled maintenance versus unscheduled (preventative vs. corrective)
- improper training, design and planning of work tasks
- the need for a Job Safety Analyses (JSA) where a task is reviewed in detail on scope, resources, Health and Safety concerns, emergency response, desired outcome, etc.
- the cost of injury and recovery, including insurance premium increases, workplace accommodations (light duty, restricted duty versus full duty), compensatory department overtime, STD and LTD, and litigation
- the need for pre-employment physical protocols to determine pre-existing conditions of job candidates to help ensure they are able to perform as required
- the need for background checks for candidates of management and supervisory positions (at a minimum)

Most of these analyses will require more information than PWSA has on hand, and so the improvements may have to wait until basic HR information systems are in place.

Another prospective area of focus for the Training Program is professional growth, including a much clearer career path for each employee as well as incentives for continuing education. Providing the resources for employees to improve their technical, communications and personnel

skills is vital to resuscitating PWSA's functional health. Because upgrading employee skills is so essential to meeting PWSA's vast infrastructure, operations and technology needs, any major capital or operations improvement program will struggle – and likely be wasteful -- until these skill gaps are addressed. Moreover, professional licensure and certificates achieved by personnel can only improve the morale and technical ability of the staff, as well as overall utility performance.

**2.1.3 Standard: Facility Improvement**  
**Requirement: Written Improvement Plan with KPIs**

**Measurement:**

- Prepare a summary of process/facility/equipment ideas designed to improve the appearance and function of PWSA's facilities. Document improvements by interdepartmental memos or monthly summaries complete with performance indicators.
- Assign each department a list of low, moderate and high profile tasks to improve the aesthetics of the treatment facility, maintain the integrity of mechanical and electrical components, extend asset useful life, reduce injury risks, etc.

**Observations on PWSA**

The aesthetics (cleanliness, order, proper functioning) of the treatment facilities and related buildings were quite poor. What is needed is a comprehensive improvement plan that is incorporated into PWSA's routine maintenance program. Many of the items in need of attention are inexpensive and are not associated with the larger capital improvement program.

The majority of water and wastewater utilities nationwide are aging, but this should not affect aesthetics as long as the utility is committed to professionalism and pride in the workplace. A comprehensive re-evaluation of building and grounds maintenance programs is warranted. Many of the routine housekeeping tasks can be performed by all levels of staff; this responsibility should be recognized in job descriptions and the CBA. These aesthetic improvements go far beyond janitorial items. Areas of special concern include the following:

- integrity of roof line gutter systems (poplar trees, weeds)
- rodent control to protect electrical wiring of lighting fixtures, prevent equipment and controls damage, reduce the risk of electrical fires with short-circuiting, etc.
- integrity of clearwell structures due to tree root intrusion
- public health due to compromised clearwell integrity, i.e. waterborne disease due to rodents and birds
- compromised security due to lack of doors, door locks, failing doors, roof lines, and cracked and damaged windows
- compromised integrity of critical spare parts inventory, especially those stored outdoors, improper storage techniques, and the lack of a controlled environment
- fire hazards due to improper storage and compatibility of equipment, solvents, aerosols, lubricants
- OSHA's Right to Know guidelines include labeling of individual containers, storage areas, storage cabinets and storage areas, disposal containers, insulation type, etc.

- Health and Safety hazards, dangers due to workplace clutter, trip hazards, security issues, confined spaces, etc.

### **Industry Norms**

At PWSA, each department should have its own operating budget with allocated line items for routine equipment replacement, asset repair and improvements, general housekeeping and janitorial services. This budget should be reviewed and assessed monthly for effectiveness and efficiency. These budgets should be built from the ground up. A Zero-Based Budgeting approach to utility management was pioneered by the Seattle Public Utilities, and it is currently being introduced at PWSA by its CFO.

Each department should schedule routine meetings where assigned budgets are discussed with respect to Year-to-Date (YTD) expenditures versus Budget-to-Date (BTD) allocations, staffing needs / staffing realignment, anticipated out of scope needs based on emergencies due to equipment and component failures, injuries, storm events, and consent orders to name a few.

#### **2.1.4 Standard: Response Plans Requirement: ERP/EAP, RMP/PSM, Disaster Preparedness, SPCC**

#### **Measurement:**

- Document the use of the applicable plans as required by laws or City departments.
- Maintain the plans up-to-date (annual review).
- Meet plan training requirements.
- Conduct and document reviews with local authorities as relevant and/or desirable.

#### **Observations on PWSA**

PWSA has several departments that should be (but are not, according to staff) documenting their training requirements. They should make sure that these requirements are incorporated into emergency plans. These departments include Water Production, Communications, Engineering, Field Services, Finance and Administrations. In addition, the departments should individually and collectively review assigned plans, identify gaps in each plan (needs assessment), and confirm their regular correspondence and cooperation with other City, state and federal departments. PWSA recently tasked an individual with developing a utility-wide Emergency Management Plan.

### **Industry Norms**

A formal review of the plans (once drafted) and their effectiveness should be conducted at regularly intervals. Moreover, a utility of PWSA's size and complexity, geographic location, and service area should have a comprehensive Emergency Preparedness Program. Major components of this plan require extensive planning and reinforced training of personnel, the Fire Department, Police Department, Public Health and City Hall. Large utilities equivalent to the PWSA conduct "mock" drills at least annually to confirm emergency logistics, such as the following:

- reduced capacity of the treatment facility for an extended length of time
- terrorist activity like source water sabotage, compromised pump equipment assets
- pandemic flu

- weather conditions associated with blizzards and floods
- electrical grid supply to the pumping assets
- compromised clearwell
- compromised distribution system due to pressure loss, main breaks, etc.

Regulatory agencies require written programs and plans specific to the following:

- ERP, EAP
- critical inventory control
- Vulnerability Assessment (VA)
- pandemic flu
- power response
- extreme weather
- process control/improvement (response to source water compromise)
- Cross Contamination (CCCP)
- Spill Prevention (SPCC)
- hazard assessment
- arc flash audit (motor control centers and switch gear cabinets).

**2.1.5 Standard: Asset Management**  
**Requirement: Capital Improvement Plan**

**Measurement:**

- Prepare a facility CIP. Review and replace items.
- Document the facility and equipment needs with financial estimates for the PWSA.

**Observations on PWSA**

PWSA’s asset management is mostly reactive, as opposed to proactive. By any measure, PWSA’s maintenance planning is very poor. This is not surprising considering the absence of robust maintenance management tools, such as computerized maintenance management system (“CMMS”). A CMMS is considered the most basic management tool for large water and sewer systems, and PWSA’s lack of one is almost unprecedented among systems its size or larger. Instead, PWSA uses handwritten logs and index cards to record its maintenance activities. This allows almost no analysis or well-informed planning for making repairs, thereby increasing the risk that major system failures will occur as a surprise. The fact that the maintenance department appears short of skilled technicians exacerbates both the inefficiency of the process and the potential hazard to the public.

{See also, Assessment of PWSA’s Asset Management in separate document.}

## Industry Norms

The American Water Works Association (AWWA) recommends four focal points in any effective Asset Management Program. They are People, Practices, Money and Data. From these, there are thirty-seven (37) sub-components to evaluate. Like puzzle pieces, all of the components fit together (with some overlap) to provide for an Asset Management Plan that supports low life-cycle costs and thereby an optimal rate structure. PWSA currently falls short of a true Asset Management Plan that meets long-term compliance needs and protects their investments in infrastructure. When discussing an Asset Management Plan, utilities tend to focus strictly on their Capital Improvement Plan and financial funding. Utilities equivalent in size and complexity of PWSA need to consider the following items when implementing and managing an effective Asset Management Plan:

Organized Labor	Rates	Strategy Development	Metrics
Culture	C.I.P.	Planning	Reports
Public	Billing	Sustainability	Systems
Managers	Service Levels	O&M	Work Orders
Demographics	Mission	SOPs	Tools
Line Workers	Revenue	Workflow	Maintenance Records
Structure	Wants/Needs	Products	Budgets
Supervisors	Public	Value	Loans and Bonds
Other Stake Holders	Assets	SCADA	Performance

See also “Assessment of PWSA’s Capital Improvement Program Development and Planning” elsewhere in this Task III Report.

## 2.2 CUSTOMER SERVICE – MEETING THE EXPECTATIONS

### 2.2.1 Standard: Managing at the Department Level

**Requirement: Meeting preparation, frequency and administrative satisfaction**

#### Measurement:

- Confirm with department administrative supervisors that meetings are conducted in a professional manner and at a satisfactory frequency.
- Prepare Departmental Annual Work/Business Plans.
- Prepare monthly operating report summaries (MORs) for the department.

#### Observations on PWSA

The PWSA has numerous departments with a total proposed head count of 270 personnel (as shown in the updated organizational charts provided to the Team). Customer Service at PWSA includes more functions than in the typical utility: Metering, Billing, Call Center, Collections and Appeals and Dispatch. Dispatch, for example, is normally part of operations and maintenance staff. According to PWSA management, nearly half of the new hires in Customer Service are temps or contractors, a factor attributed to difficulty in finding interested and qualified city residents to fill those positions.

Many of the staff in PWSA's Customer Service fill multiple roles, but their rough allocation among tasks is as follows below.

- Metering: 5 (primarily data collection, not installation and repairs)
- Billing: 6
- Call Center: 21
- Collections and Appeals: 4
- Dispatch: 5

There are also six temps devoted to Cogsdale, PWSA's primary enterprise information management solution (EMS). Call Center staff are supplemented by a basic entry-point phone tree that directs callers to the correct group to resolve their problems.

PWSA's Customer Service structure is not the worst aspect of its day-to-day operations, but it probably seems that way to its customers because of the inadequacy and ineffectiveness of the billing department and maintenance field staff that have to respond to customer needs: bills continue to be riddled with errors (though not as many as several months ago), and work orders for leaks and service repairs are still recorded on log sheets and index cards rather than a Computerized Maintenance Management System. A contemporary large-system CMMS not only issues and records service activities, but it is typically linked to the Call Center's database to track and eventually close the loop on individual service calls. PWSA's follow-up tracking approach, on the other hand, appears to be largely hand written or verbal. This makes measuring customer service performance a lot harder than it should be.

### **Industry Norms**

It is imperative that all employees (and consultants and temps) be cognizant of PWSA's Mission Statement and its particular service quality commitment. Customer Service is not just a department, but rather a service provided by all employees throughout their workday.

To ensure customer service is a priority of each department, routine communications are required to confirm budget expenditures, department priorities, concerns on the ability to deliver on Work/Business Plans, monthly activities of each department, etc. Under its Utility Enterprise Initiative, Tulsa's Metropolitan Utility Authority developed one of the most detailed and measurement-rich business plans in the industry. The plan, which is updated annually, is used to drive the budgeting process, organize maintenance initiatives and capital programming, drive improvements in operating processes, and is incorporated into all manager-level personal performance plans.

AWWA standards and best industry practices require that PWSA adopt systems and standards and enforce business practices that continuously improve their Customer Service, top to bottom. It is vital that there be consistent communications between departments in order to gauge the organization's progress and to maintain consistency with respect to PWSA's mission statement. To ensure success, department work plans or business plans should be developed so that the specific goals of PWSA's managers and supervisors, both office and field alike, are clearly communicated to all staff. By doing so, work can be delegated effectively.

Industry-accepted business plans include measurements of success and benchmarks for failure, as well as areas of focus for improved customer satisfaction. These include the following:

- goals and objectives of each department
- required deliverables both internally to the PWSA and/or the City and public
- communications plans and protocols
- department personnel assessments for professional growth
- job descriptions and skills assessment of staff to achieve desired results and fulfill the respective obligations of each position

The American Water Works Association provides technical training programs and certificates of training. An effective training plan enhances public perception of the utility. Areas of focus include the following:

- communications and customer relations
- diversity & inclusion
- listening skills
- working with challenging customers and situations
- teamwork
- people, processes & technology
- understanding personality types
- understanding the water cycle and articulating water conservation to customers
- social media etiquette
- electronic messaging, information sharing and bill pay
- meter reading and billing cycles.

Many, if not most, utilities of PWSA's size have a Utilities Business Manager or the equivalent to oversee Customer Service, Rate Setting, and Capital Planning. In PWSA's case, this position is particularly important given its lack of internal communication and data-sharing mechanisms. This position would work along side a Human Resources Director, Director of Engineering, Treatment & Water Resource Director and Filed Director (distribution and collection) and an Operations QA/QC Director. All should report the Executive Director's office

**2.2.2 Standard: Facility Management**  
**Requirement: Exterior and Exterior Appearance**

**Measurement:**

- Maintain clean, neat, orderly exterior appearance (i.e. landscaping, painting, etc.).
- Maintain clean, neat and orderly interior appearance (i.e. – walls, floors, labs, offices, etc.)

**Observations on PWSA**

The treatment plant and assigned assets require extensive cleaning, scheduled maintenance and a commitment to quality by assigned staff. The 5S process should begin immediately and be performed by all plant staff – Sort, Straighten, Shine, Standardize and Sustain. This is not just important to appearances and basic sanitation, but also to the morale of the plant staff. The PWSA should implement an internal monthly site audit to make sure that the standards are maintained.

At the time of our visit to PWSA's facilities, the water plant was wrapping up a major capital improvement project for the rehabilitation of filters, pipe gallery and assigned electrical controls. The industry standard and accepted business practices for water and wastewater utilities consist of aesthetically pleasing buildings and grounds. The facility with best appearance was the main office and equipment shed for the Underground Assets department. Their rolling stock were kept in order and stored professionally. The majority of the pipe and valve inventory was organized and in one common storage area for ease of use. Inventory of critical spare parts was in order and well-known by the managers.

In visiting the water treatment facility, it is safe to say its condition was the complete opposite of the vehicles and equipment facilities. Outside of the main lobby, reception area and administrative offices, the water plant requires a thorough evaluation of its facilities and implementation of a revised maintenance plan.

### **Industry Norms**

An industry standard approach to facility management and aesthetics includes the following:

- removing excess clutter housed near electrical cabinets
- critical inventory is classified and stored appropriately
- rodent control measures
- window and door security
- HVAC operations for compliant air quality
- landscaping for aesthetics
- landscaping for storm water management
- fence line security
- roof and gutter systems
- ground level inspection program for storage tanks, remote structures, etc.
- stairways and ramps according to American with Disabilities Act (ADA)
- proper labeling, line marking and identification of parking areas for employees and the general public (these include handicap allocations, expectant mothers, delivery and dropoff vehicles, etc.)
- wind socks and other warning devices installed in highly visible spots (typically roof lines) near chemical storage areas as part of all emergency planning measures
- assessment of exterior lighting to include building façade mounted devices, streetlights, perimeter units, motion sensor devices, etc.

#### **2.2.3 Standard: Organization Requirement: Filing and data management systems**

##### **Measurement:**

- Demonstrate use of document management system – paper files, computer files.
- Maintain a technical reference resource library, serving as a location point for manuals or other operations and maintenance resources.

## **Observations on PWSA**

The PWSA employs several engineering consultants with numerous contractors, construction management firms, a large internal engineering department and, of course, a maintenance department. The document management system stretched among them appeared disconnected and not well organized, and the library (to the extent that it existed) appeared to be missing many of the manuals and procedural documents expected in a well-functioning utility.

## **Industry Norms**

Most water and wastewater utilities of equivalent size and complexity to PWSA have a dedicated Records Management Department. Given the sheer volume of data and files assigned to the assets under the PWSA's command, such a department is probably warranted. Typically, this is an extension of the engineering department working in cooperation with the City's building and zoning department. Industry accepted practices and standards dictate electronic and hard copy management of the following (at a minimum):

- insurance certificates and limits of liability contract language assigned to each vendor and sub-contractor and consultant
- preferred vendors
- equipment Specifications
- life cycle costs and repair records of strategic equipment
- procurement records
- construction documents
- regulatory agency record submittals
- compliance documents
- outside funding applications
- information on Federal and State grant and loan programs
- water quality compliance data and report submittals
- emergency preparedness and training documents
- preliminary/30% design blueprints
- all final design and as-build blueprints
- easements and property line documents;
- pipe infrastructure CCTV (video) inspections files
- water storage tank inspection videos and documents
- rolling stock purchase, lease and rental agreements.

A central library of records should be created where critical manuals, equipment specifications, asset critical analysis documents, etc. can be housed. Ideally, this library should have electronic files assigned in which access could be streamlined and kept uniform by all required parties with a DRA-Document Request Authorization.

A central document library should also house all applicable training documents, H&S programs, skills training programs, reference manuals, equipment warranties, procurement documents, funding applications, etc.

**2.2.4 Standard: Protection of Investment**  
**Requirement: Corrective, Preventative and Predictive Maintenance with Inventory Control**

**Measurement:**

- Document the use of a CMMS: Computerized Maintenance Management Software.
- Document the scheduling and completion of work.
- Document the cost of maintenance efforts.
- Document the use and costs of subcontracted services.
- Confirm the presence of Predictive Maintenance Report and its regular use
- Implement a Vendor Management system.
- Demonstrate the evidence of spare parts & supplies.
- Prepare and provide monthly documentation (MOR) of activities to the department manager.

**Observations on PWSA**

PWSA uses an archaic “reactive” work order system managed through their customer service and maintenance departments. It badly needs a new system. Preventative (“proactive”) maintenance should also be assigned with work orders, ideally through portable tablets for more effective and efficient maintenance management. The CMMS should also be used for critical spare parts inventory at all the Water Production, Communications and Field Services.

**Industry Norms**

Almost all water utilities of equivalent in size and complexity to PWSA use a CMMS for effective asset management. Effective maintenance systems – those found in most large water and wastewater systems -- allow staff to manage the following more efficiently than any hand-recorded system can possibly achieve:

- pump and controls
- underground assets, (valves, services, pipe, fittings)
- above-ground assets, (hydrants, meter boxes, culverts, catch basins, passive stormwater valves, flood control systems, building structures, etc.)
- laboratory precision analytical equipment
- on-line instrumentation for process control integrity
- SCADA system critical spare parts like PLCs, relays, I/O cards, PID loop equipment)
- rolling stock
- emergency generators and other response equipment
- health & safety equipment relevant to confined spaces, personal protective equipment;
- valve exercising programs
- hydrant winterization and replacement
- uniform design of services, culverts, catch basins, etc.
- catch basin cleanings and screenings assessment

In most large utilities, sophisticated software programs assist field staff and engineers identify and manage the following:

- required maintenance of critical components
- cost benefit analyses for equipment replacement / repair
- customer service logs for work orders, meter reads, pressure complaints, dirty water complaints, turn-ons and turn offs, vandalism, etc.
- cross connection (health risk)
- backflow device inspections and service
- assessment of work load by department based on workflow and work order summary reports
- chemical use and automated ordering schedules
- leak detection
- Inflow and infiltration (InI)
- poor maintenance practices
- required outsourcing of high risk maintenance
- loss prevention
- line item budget expenditures
- SOPs and SOGs for uniformity amongst staff and external vendors

**2.2.5 Standard: Contract Integrity**  
**Requirement: Subcontract Reviews**

**Measurement:**

- Review all subcontracts for terms and conditions and for potential annual changes for limits of liability and change orders. Assess contract value, risks presented and document all communications.

**Observations on PWSA**

The Team did not have the Scope to review PWSA's contracts. This was disappointing, because PWSA relies quite a bit more heavily on outside contractors to conduct its routine planning and project management than do other utilities its size. A comprehensive system for review of all contractual activities should be conducted and managed through PWSA's Engineering and/or Finance Department. Given the volume of work performed annually, the complexity of most of the work, the high-risk potential assigned to the projects and PWSA's infrastructure issues, PWSA needs a comprehensive review system, one that will ensure uniformity of contracting processes across the departments. It will also protect PWSA legally and financially.

**Industry Norms**

A well-integrated process for issuing and managing contracts allows for all departments to cooperatively manage their respective risks. This approach integrates all of the information management systems in the utility and assures well-developed Standard Operating Procedures for contracting and oversight. A detailed review of all high-risk contract work needs to be

performed so that the PWSA's stakeholders can be assured that they are protecting the utility's assets and its financial integrity.

Industry accepted practices call for utility departments to complete their contracting assessments through a work review and then assign preferred vendors to their tasks. This helps expedite the work, especially under emergency conditions. Protecting the interests of the utility and its customer base should be at the forefront of all maintenance procurement, capital construction, daily operations and contingency planning.

## **2.3 LEADERSHIP – GUIDING THE WAY**

### **2.3.1 Standard: Fiscal Control**

**Requirement: Budget Management, forecast tools, change order management, subcontract management and fiscal management**

#### **Measurement:**

- Confirm participation in budget process.
- Confirm working relationship with finance group.
- Prepare timely and accurate cost-to-complete forms (quarterly).
- Use monthly financial reports to monitor status of expenditures.
- Confirm implementation of a change order process with the customer.

#### **Observations on PWSA**

PWSA's recent reorganization *should* allow the department heads to work more closely with one another (a notable failing in our initial observation), as well as with the Finance department, to assure fiscal control and adherence to PWSA protocols. Each department should establish annual operating budgets and provide monthly expenditure reports to Finance. They should also participate in regular discussions on capital planning, resource planning, work sharing, emergency management, vendor or sub-contractor performance issues, procurement needs, etc. One model that PWSA should look to – and apparently already is -- is the Seattle SUP, where the zero-based budgeting concept has been used for over 10 years.

Performance information systems (those which monitor operations and maintenance at the department and workshop level and report that information upward through the organization) are virtually non-existent at PWSA. This was the biggest challenge faced by the IMG Team in assessing PWSA's condition, performance and organizational capacity. Few managers have quantified or report-supported understandings of how their departments are performing relative to PWSA's goals or standard industry practices. In fact, few staff seemed to be aware that PWSA even had goals for operations and maintenance (beyond general mission statements and the overall caution against mechanical and compliance failure). This situation is unlikely to change until business planning, performance management and business intelligence tools become part of everyday practices.

PWSA's chief financial officer has begun to develop a roster of KPIs that might be sufficient to satisfy a regulator, if not the basic needs of the utility. However, most of these KPIs are financial rather than operational. That is of necessity, since PWSA has a workable financial management

system but it does not have most of the management information systems required to generate a robust list of measures, let alone a useful Monthly Operating Report. Other KPIs will have to wait until PWSA's organization is modified with new systems and business processes.

### **Industry Norms**

There are many industry-accepted software programs and business practices to ensure fiduciary responsibility and accountability across an entire utility. This responsibility should begin and end with the Finance department, but it should also extend across the other departments (see the discussion on Internal Controls elsewhere in this document). Large utilities similar to PWSA require all managers, supervisors and foreman to be proficient in fiscal management, and often the financial management system's basic functioning as well. Supervisors should be proficient in the following:

- budget planning consistent with the municipal cycle
- cost benefit analyses
- internal financial and overall business practices for run rates, accruals, asset depreciation, amortization schedules
- forecasting of expenditures consistent with labor and consumables;
- debt schedules
- general understanding of workers comp insurance programs and cost to the utility
- costs assigned to hiring and training new hires
- applicable Grant and Loan programs and their impact to their department with respect to labor match requirements (in-kind services)
- investment practices for training programs, technical software systems, compliance software, personnel management and public communications (e.g. social media)

Managing each department as a business is important to PWSA's continuous improvement. Being proficient with these business practices will allow department heads to better carry out and delegate the technical responsibilities. Consistent with industry best practices, financial Key Performance Indicators (KPIs) should be selected, implemented and enforced. Routine timeline reporting between the Utilities Business Manager and the Executive Director needs to be implemented. Typically, these timelines include monthly and quarterly schedules, and can be generated automatically with good information management software systems. They can be used with numerous reporting templates to meet individual department needs and for roll-up reporting to succeeding levels of the organization, including (at the top) the PWSA board of directors. KPIs are usually reported for the following activities:

- assigned budgets
- construction schedules
- municipal business cycles
- loan programs
- Consent Order Return to Compliance Plans
- community relations initiatives

**2.3.2 Standard: Regulatory Communication**  
**Requirement: Knowledge of relevant regulatory oversight agencies**

**Measurement:**

- Develop and maintain a list of relevant regulatory contacts - names/phone numbers.
- Document communications with agencies and keep such documentation accessible.
- Send a copy of all regulatory monitoring reports to the department compliance manager.

**Observations on PWSA**

Good regulatory communication and record keeping are not challenging goals to meet, and in PWSA's case it has plenty of practice. Since its communication with Pennsylvania's Department of Environmental Protection and the U.S. Environmental Protection Agency is relatively frequent compared to most water utilities, PWSA's administrative staff are accustomed to managing the paperwork and contacts with these regulatory agencies.

The PWSA leadership appears to have good working knowledge of the regulatory oversight agencies. The Team found this to be less so at the sub-executive level. This probably reflects the underdeveloped state of PWSA's internal communication systems and protocols.

**Industry Norms**

All regulatory thresholds and compliance concerns should be part of annual planning each department's Annual Work/Business Plan. Engineering consultants should also be involved in departmental meetings and annual planning exercises, as needed.

Similar utilities faced with these challenges have either assigned (temporarily or permanently) a "Compliance Liaison Officer" who reports to the Utilities Business Manager, or equivalent. This position maintains a professional relationship with the various regulatory compliance agencies to ensure the following:

- clear, concise, uniform and timely communication
- confirmation of short and long-term plans of the utility is consistent with compliance schedules and unregulated contaminants on the horizon
- management of any state or federal sponsored loan/grant programs in cooperation with the Engineering Department
- impact statements concern of the Utility are effectively communicated
- public sessions specific to compliance and compliance initiatives are managed effectively (these can include City Council meetings, construction project communications, etc.)

Additionally, this liaison usually attends all relevant informational, technical and regulatory seminars on behalf of the utility. Attendance at lawmaker functions at the state and federal level may also be warranted; e.g., legislative hearings, informative round table discussions, interaction with other utilities regionally and/or nationally. Finally, this position typically interacts with certified laboratories and reports directly to an Operations QA/QC Manager (e.g., how water quality data for process control and regulatory compliance are measured, used, reported and archived is critical to ensure efficient use of labor and technology resources).

**2.3.3 Standard: Management Communication**  
**Requirement: Communication with staff**

**Measurement:**

- Conduct routine staff meetings.
- Participate in departmental team meetings.

**Observations on PWSA**

Based on observations during the Team's site visits and interviews with staff, it appears that there is a low level of communications among PWSA's departments and among the different levels within the organization, at least compared to other large utilities with whom the Team has worked before. Some of this can be attributed to short staffing in almost every department. Some staff believed that the level of communication, at least from the executive to the management level, had improved under the new leadership, although some managers complained that there were several major initiatives that they were not told about until they happened.

**Industry Norms**

Documented departmental team meetings should be held frequently in order to keep everyone apprised of the operational activities, system demands, emergency planning and resource sharing opportunities. This is especially the case for PWSA, where crisis management and alarming system failures have become the norm over the last few years. Human Resources should meet regularly with department heads and other assigned supervisory staff to answer employee questions on benefits, discuss injuries to the workforce, hiring practices, discipline, training needs, reviews, etc. With any organization either private or public, employee relations can provide for many challenges and affect overall productivity.

**2.3.4 Standard: Performance Reporting**  
**Requirement: Setting and monitoring standards of performance**

**Measurement:**

- Develop select treatment system KPIs, measureable goals and related action item lists.
- Select a minimum of three cost standards (KPIs) to track for the Water Production and Field Services departments. For example - \$ per MG treated; power costs per MG treated; \$ main break repair for various pipe diameters; labor costs per MG treated, etc.
- Develop KPIs for other departments. For example - \$-workmans comp claim, \$ - training of new employees, \$ - skill set training, etc.

**Observations on PWSA**

As noted before, PWSA has no material performance management system and no means of routinely reporting both its overall performance (except on some financial measures) and that of individual departments. In the Team's experience, many large utilities have under-developed performance management systems, but they are never as weak as PWSA's. As a result, PWSA would be challenged to participate in industry-wide benchmarking exercises even if it had the time and resources to do so. This lack of readily available and reliable performance data for

PWSA was the main reason that the Team was unable to conduct meaningful benchmarking as part of its work.

PWSA has recently taken at least some initial steps toward developing a performance management program. It has identified a short list of KPIs that can be generated by its financial management system, not unlike smaller utilities. It is hoping to install a simple, short-term computerized maintenance management system at some point in the future, and then progress to a more advanced system over time; this may or may not be the most efficient strategy. It is in the early stages of shifting to an Oracle-based enterprise management solution (EMS) from which it might eventually make use of business intelligence (“BI”) analytics. And it is at least exploring the possibility of outsourcing as a way of obtaining its entire Performance Management Program.

### **Industry Norms**

Water utilities of all sizes use Key Performance Indicators (KPIs) to track and improve their performance, and also to use that data to benchmark their performance against industry medians and best-in-class performers. Among other tools, utilities use their KPI reports to benchmark themselves using the AWWA’s Benchmarking Performance Indicators manual, which is updated annually based upon surveys of hundreds of municipal water and sewer systems. However, the utilities that make the best use of KPIs also have robust information systems for collecting, analyzing and reporting the own performance data.

Larger utilities use advanced business information systems – CMMS, operating systems, financial systems, etc. -- to collect, report and analyze performance data from a variety of proprietary systems. They sometimes aggregate all of that data via a “data warehouse,” where the information can be analyzed and shared among multiple specialized operating systems.

A large part of Tulsa’s Utility Enterprise Initiative (for which IMG was the lead implementation consultant) was the installation of state-of-the-art and upgraded management information systems, ranging from financial management to water operations to maintenance to asset management and capital programming. This was expensive and time-consuming, and it required a lot of staff training, but it was successful in advancing the utility to the “best-in-class” level of self-awareness, CIP development and cost management. These systems are now well-integrated and are already generating rich performance reports to all staff levels, the most important of which is the Monthly Operating Report.

For years, the MOR has been a basic management tool in privately-operated water systems, and in Tulsa it is now used by almost every member of the staff, as well as by its governing board.

Assigning KPIs can also facilitate performance goal-setting for department and shop-level managers, who can then evaluate changes in their performance against changes in their budgets. For example, chemical and power consumption are two of the larger line items within a water utility budget. Monitoring and reporting those costs routinely can help staff balance those costs against changes to water quality, equipment performance, maintenance needs, etc.

KPIs, benchmarking and a collection of new information systems could help solve many of PWSA’s problems in numerous and unexpected ways. For instance, PWSA appears to have relatively high employee turnover (and turnover among contractor employees), so establishing the cost to hire, train and onboard a new employee could be compared against the current pay rate structure for that position, the department and the entire organization. It could also be compared with PWSA’s

total cost of advertising, interviews, overtime to train the personnel, assumed lost productivity, etc. Next, it could be compared to the cost of increasing compensation or providing more incentives to reduce turnover, overtime, sick leave and disability abuse, etc. Finally, the results could be routinely compared to those of its industry peers via the AWWA survey.

## **2.4 TECHNICAL MANAGEMENT – CONTROLLING THE SYSTEMS**

### **2.4.1 Standard: Operational Plans**

**Requirement: Site Specific Management Plan and Process Control Strategies**

#### **Measurement:**

- Document development of systems control strategies.
- Confirm use and understanding of plans by staff.
- Confirm presence and regular use of daily activity log books.

#### **Observations on PWSA**

PWSA's operating systems consist of an aged SCADA system, plus sporadic and sometimes inappropriate (due to lack of alternative tools) use of its Cogsdale information system. A typical large water utility will have seven or eight specialized operations and maintenance control systems. PWSA has three (depending upon how one counts), and those appear to be outdated, underused, misused, and/or lacking the data volume and quality necessary to be reliable tools for their human counterparts.

There are many effective operational control strategies that can be implemented at PWSA's treatment facilities in conjunction with KPIs. Based on the site visit there appear to be plans to adjust the organic removal strategy by altering chemical injection locations and improve reaction/oxidation time (measured in milliseconds). Developing clarifier and filter operation process flow charts based on the Key Performance Indicators will ensure all staff on all shifts operate the facilities uniformly to include process sampling, process analysis, process adjustments, identifying process upsets, etc.

To begin with, utilization of the SCADA system for the tracking and trending of important operational parameters, along with significant upgrades in staff skills, should be prioritized at PWSA. Real-time data collection and trending of performance data is vital for a contemporary utility operator to ensure the highest water quality, but it is equally important for the staff to have enough skills to use the full strengths of their system, however old or outdated the system may be.

PWSA plant staff told the Team that a chemical use strategy is being evaluated by an outside consulting firm in collaboration with internal engineers and operations personnel. The Team was also told that the recent filter and pipe gallery capital rehabilitation project in tandem with a SCADA hardware and software upgrade. Observations of, and interviews with, personnel on shift at the time of visit confirm that a comprehensive Quality Assurance / Quality Control program needs to be implemented along with a Process Control Plan (PCP) for improved and streamline water treatment operations. This extends into the Laboratory operations as well.

## Industry Norms

**Using KPIs in Operations:** A well-run operation – one consistent with AWWA guidelines, as measured against other successful utilities nationwide -- utilize Key Performance Indices (KPIs) as part of their comprehensive Process Control Plan. Technical KPIs for process control and compliance include but are not limited to the following:

- source water quality changes for seasonal operations and alerts (these measurable parameters include pH, turbidity, TOC, DOC, sulfides, total ammonia, VOCs, e-coli, cryptosporidium, giardia cysts, dissolved oxygen)
- treatment-train effectiveness as measured with “before and after” %-efficiency and effectiveness; this helps optimize the following:
  - chemical dose ranges
  - sludge residual management effectiveness
  - water reuse/recycle streams and flow set points
  - filter performance
  - clearwell performance
  - chemical regimen effectiveness
  - energy consumption
  - pump strategies
- operator effectiveness, required skill set, training & development needs, required uniformity amongst operations;
- filter performance, individual and collective:
  - run times (hours)
  - headloss (filtration rates and through put)
  - air wash/ air scour rates (CFM) and duration (minutes)
  - back wash flow rates (GPM), high and low cycles, and duration (minutes)
  - filter-to-waste duration as measured with recovery turbidities (NTUs)
  - media recovery and loss prevention
  - compliance performance
- chemical system performance
  - bulk tank and day tank levels
  - metering pump performance; flow rates with digi-pulse units. This determines cleaning schedules and overall pump repair / replace schedules
  - suction and discharge conveyance piping; pulse dampener units, backflow prevention devices. These all help in delivering consistent and reliable volumes for desired dose
- energy consumption
  - optimization of large pump systems
  - utilizing peak demand rate schedules
  - sub-metering for treatment train and operations optimization
  - power monitoring
  - electrical allocation for pressure zones and assigned program management

- natural gas consumption for heating of chemical storage areas, etc
- power response and emergency planning
- regulatory compliance:
  - permit thresholds
  - Tier I, II & III thresholds
  - chemical storage inventory (SARA Title III or Tier 2 Reporting)
  - spill reporting and spill prevention (level sensors, sump/containment level sensors)
  - chemical Consumption and reporting
  - recycle stream flow for reporting (back wash recycle rule)
  - sludge disposal and discharge permit quality control

**Coordination Among System Components:** Operations staff and supervisors also need to work with -- and under the direction of -- Laboratory QA/QC and Utility Business personnel in order to deploy the most effective KPIs, especially those that align with their detailed PCP. It is especially important to include operations staff when using outside consultants to develop these programs, perform capital repairs and upgrades, and incorporate technological advancements. At a minimum, KPIs should be considered when evaluating and operating the following:

- SCADA systems and Compliance Reporting software programs
- remote analytical equipment for water quality monitoring
- chemical systems for optimized performance
- laboratory analyses
- compliance with TOC removal, Contact Time (CT), filter turbidity (NTU)

A good measure of success is a cost/benefit analysis to compare operating structure versus mission statement, goals and operating philosophy. An example of a common operational and service quality KPI is taste and odor. Many systems *want* to achieve zero (0) taste and odor complaints, but this tends to be cost prohibitive if it is achievable at all. Zero complaints with a large distribution and service like PWSA's simply is not realistic. There are too many variables outside of the direct control of management and operations staff. Similar reluctance is appropriate for other desirable service goals, such as the following:

- Maximum Contaminate Levels (MCLs) for regulatory compliance versus Maximum Contaminant Goals (MCLG)
- TOC %-removal of 35-45 % for compliance versus 100%
- filter effluent turbidity to meet the surface water rule of 95% monthly < 0.30 NTU individually and collectively versus a goal of < 0.10 NTU
- clarifier sludge concentration of 2-4% consistent with most conventional surface water facilities versus >10% (conserves water, reduces chemical waste, reduces energy waste)
- Water storage tank turnover of 15-20% to reduce water age versus a goal of >25%
- disinfection program where chlorine residuals meet minimum compliance thresholds of >0.20 mg/l entering the system versus a goal of >1.0 mg/l to combat water age, algae growth and bacteria

**Distribution and Collection:** Using KPI's and a Process Management Plan (PMP) is standard practice at large utilities. AWWA provides numerous templates for measuring distribution and collection success. For example, an effective maintenance program for large utilities assigns replacement schedules for critical system components. Industry standards typically assign a 10-15% replacement schedule of assets under ideal conditions, although these guidelines are best refined by careful attention to utility-specific and equipment-specific failure modes.

KPIs help utilities determine root causes of infrastructure failure and help predict the need for capital investments, including for the following:

- distribution system pressures and pressure reducing valves
- distribution system blow off valves
- fire hydrant flow testing and inspections
- valve exercising program
- water service replacement
- meter replacement / upgrade (radio reads)
- Cross-Connection Control Plan (CCCP)
- Back Flow Prevention Device Inspection Plan
- pipe replacement schedules
- root causes of main breaks and service disruptions
- leak detection and Unaccounted-for Water (UAW) threshold of 10-15% versus goal of 5%
- strategic inventory for emergency preparedness and response efforts

**Lab Activities:** KPI's can also be used for laboratory programs and system modeling to measure the following:

- water quality sample data (incorporate lab results against flushing programs, storage tank management and pump strategy for acceptable and optimum water age, etc.)
- water age in pipes to manage TTHMs, HAA% and D/DBP programs
- storage tank %-turnover: compare water quality data against system demand and water modeling and hydraulic profiles for fire suppression to determine optimum pump strategy, etc.
- service area pressures (number of complaints or data collected with hydrant flow testing in comparison to with water modeling warrants an evaluation of C-factors, etc.)
- hydrant flushing program
- stormwater flow (number of complaints of \$-amount in property damage relevant to a defined rain event warrants an evaluation of culverts in the area, storm water discharge locations and receiving areas)
- InI of sewer system: >20% flow due to I/I relevant to a defined rain event warrants a CCTV of that service area and ultimate capital schedule for repair

**Staff Metrics:** KPIs and a PMP should also be used to gauge staff efficiency, workload distribution, staff size, resource allocation, and identification of problems and capital investment needs. For example, mapping and managing main breaks in certain areas of the service area would help staff conduct cost/benefit comparisons of continuing to repair sections of a main (in response to

emergencies) or to be proactive in scheduling water main replacement. The same hold true for valve replacement schedules. Performance of field crews can be measured in man-hours on a job, length of service for equipment with construction upgrades and useful life of long term fixed assets. AWWA best practices suggest measuring performance in the following manner:

- response time to emergency events
- time allocation for a service area to be without water or have water <25psi during scheduled and unscheduled repairs of water mains, service lines and general construction assigned with other utility work
- meter reading measured in quantity
- hydrant winterization
- hydrant repair / replace schedules (% of total, type and/or age)
- valve exercising, measured in quantity
- valve replacement schedules (% of total, type and/or age)
- force main replace, slip lining, etc.
- video surveillance (CCTV), linear feet/yr, pipe size, service area, etc.

These are just some of the areas where operations performance measurement using KPI, together with dedicated operations software management systems (e.g., Hach WIMS, Maximo, Lucity, etc.) can allow PWSA to identify its most pressing staff development needs. They also help allocate limited resources to perform jobs more efficiently, to optimize staff size and/or staff allocation, to develop efficient shift schedules, and to evaluate outsourcing of work versus performing work in-house.

**2.4.2 Standard: SOPs**

**Requirement: Safety procedures, Site Specific Operating Procedures, Rounds Sheet**

**Measurement:**

- Develop operating procedures/round sheets.
- Document training and verify SOP usage.

**Observations on PWSA**

One of the most obvious deficiencies of PWSA compared to its peer utilities is the lack of written Standard Operating Procedures for operations, maintenance, customer service, and emergency response. Moreover, those SOPs that are codified appear to be frequently ignored, as one might expect when a workforce lacks the numbers, resources and training to abide by the book (which in any case, is often outdated or incomplete). As its workforce ages and retirements accelerate, these SOPs become even more essential: There may be no substitute for experience, but where experience cannot be retained, there must at least be written procedures for the less experienced successor staff to follow. In fact, PWSA desperately needs detailed SOPs for treatment plant operations and field services, including plain-English Job Safety Analysis (JSA), use of an Electronic Notebook, and SCADA logging system for operational data and alarms.

## Industry Norms

Implementing JSAs are particularly vital for PWSA, as they are for any Health and Safety program where potentially hazardous tasks performed. These JSAs should include a description of the hazards associated with each task and the tools needed to perform them without danger. To ensure uniform operations, SOPs, SOGs and Rounds Sheets should be implemented so that all operators or staff analyze and perform each task uniformly and correctly. The result will be improved efficiency, lower risk of workplace injuries, and shorter equipment downtime.

### 2.4.3 Standard: Lab QA/QC Requirement: Presence and use of an updated QA/QC Manual

#### Measurement:

- Presence, understanding, and use of manual
- Presence and use of chain-of-custody procedures for sampling/analyses activities

#### Observations on PWSA

Under Veolia, PWSA chose to outsource many of its laboratory functions as a cost-saving and quality improvement measure. The Team was not able to fully evaluate the cost and quality of these outsourced services with the Scope available. However, the Team did observe a relatively high level of professionalism and staff expertise at the lab.

A large part of any Lab QA/QC is for an organization to maintain sample integrity so that results can be substantiated and safe drinking water ensured. The importance of a Chain-of-Custody (COC) program and training of all employees affected should be a priority for PWSA, specifically the Water Production and Field Services departments. If all lab services were provided under contract, PWSA will still need to be aware of the contractor's equivalent procedures. In drafting this QA/QC manual, PWSA's compliance needs must be clearly identified to include position skill set, professional training needs for each position, analytical equipment used or needed, etc. If and when broader organizational and management capacity is achieved – perhaps a few years from now -- PWSA may wish to consider bringing all of the laboratory functions back in-house.

## Industry Norms

Utilities equivalent to PWSA typically employ a team of full time professionals to monitor and manage the following environmental requirements:

- drinking water treatment compliance
- sludge residual permits
- recycle / reuse water analyses
- source water protection sampling
- source water sampling, (crypto & giardia)
- storage tank sampling
- lead & copper (Pb & Cu) sampling programs
- coliform bacteria and E-coli analyses
- TTHM & HAA5 sampling

- asbestos
- disinfection program sampling
- storm water sampling
- leak detection efforts

With the responsibility of managing a laboratory, management should be concerned with the following:

- full-time labor with longevity (overhead) costs
- training and development program for staff
- outfitting lab with required precision and analytical equipment
- maintenance and calibration schedule for lab equipment
- program for on line analytical equipment with treatment facility and at remote structures and/or strategic monitoring locations throughout the system
- vehicles for staff to perform their sampling requirements
- cost for 3<sup>rd</sup> party certified lab as a contingency and integrity checks
- indirect costs like Class A glassware and other consumables to perform the work

**2.4.4 Standard: Regulatory/Permit Standards**  
**Requirement: Data Collection and Management**

**Measurement:**

- Development the use of a protocol to manage data for regulatory reporting (bench sheet management, lab service data, and DMR preparation)

**Observations on PWSA**

As note elsewhere, PWSA's peer utilities are usually assisted by multiple environmental reporting systems capable of being routinely audited by regulators. PWSA needs a way to electronically generate most of its regulatory data, water quality results, and other regulatory reports so that they are filed in a timely manner, compliance parameters are highlighted as a KPI, and the integrity of the reports is maintained. Detailed bench sheets for the daily laboratory process control testing should be maintained and kept on file – electronic and/or paper -- for review with staff, management and regulators.

**Industry Norms**

To reach the proficiency level of its peer utilities, PWSA needs to implement – or at least start planning for -- an electronic system with a robust SCADA and remote communications networking (starting with an upgrade to its SCADA system's functionality and training for SCADA staff), including tablet and electronic form technology to ensure efficient data collection, effective interpretation of data and timely submittals to meet regulatory compliance deadlines.

**2.4.5 Standard: Environmental Standards Compliance**  
**Requirement: EPA, OSHA, Local and State statutes**

**Measurement:**

- compliance with all local, state, and federal inspections
- documented plan to address deficiencies
- documented presence and use of site specific safety plans

**Observations on PWSA**

The PWSA has implemented a Health and Safety program (with some success) in which workplace standards and practices are reinforced with staff and contractors, employee safety is at the forefront of every workday and that at a minimum, all OSHA and local and state regulations are considered daily by the various departments.

**Industry Norms**

In order to bring PWSA up to the level of its peer utilities, it needs to establish an internal review program. Any noted deficiencies should be addressed using a Corrective and Preventive Action (CAPA) Management system. CAPA identifies and analyzes root causes and improvements, including those designed to reduce the risk of certain hazardous workplace events from happening again. When determining the possible root causes of treatment process upsets, permit violations, main breaks, CSOs, etc., a comparable utility will typically identify resource allocation needs (equipment and funding), and make changes in operating philosophy.

## **2.5 COMMUNITY – TEAMWORK AND PROFESSIONALISM**

**2.5.1 Standard: Professional and Community Participation**  
**Requirement: Participation, Sponsorship and Education**

**Measurement:**

- Demonstrate participation in a technical association (e.g., host a meeting at the plant or project site; sponsor or moderate a meeting, conference, or symposium; teach at seminars; or perform participate in industry committee work, etc.).
- Demonstrate participation in community events and sponsorships.
- Demonstrate participation in education.
- Support local business associations.

**Observations on PWSA**

While far from critical to its core mission or its immediate priorities, PWSA's many service functions include regular community outreach, education and participation in community activities. PWSA now appears to do this reasonably well through its regular public meetings. It is obvious, however, that a lack of resources hinders its ability to become the kind of community supporter and participant that better-performing utilities are able to provide.

IMG Team members are very active in almost all of the water utility industry associations, and we note that PWSA is virtually invisible in industry activities compared to its peer utilities. While individual staff are members of -- and sometimes participate in -- the AWWA and Water Environment Federation, PWSA's overall name recognition is low relative to other utilities its size, and its reputation among its peers should be concerning to both the PWSA board and the local business community. Moreover, compared to its peers, few PWSA staff partake in industry training seminars and industry association committees.

### **Industry Norms**

To reach the level of its better-performing peers, PWSA should implementing a roster of new public outreach initiatives. Regular plant tours (once the treatment plant completes some basic housekeeping, among other improvements, including repair or replacement of the clearwell. The Water Production department could improve its public image and the morale of its employees. In peer utilities, these tours are an important part of the utility's image-building, including visits from (or to) a wide variety of community groups. Other avenues for public education include routine communication with local school systems and youth organizations.

As with community outreach, industry association participation is not PWSA's highest priority need. However, it should be part of PWSA's organizational rehabilitation program. PWSA need not have the same bragging rights as its peer utilities in order to participate. Participation can be both active (e.g., serving as members or leaders of association committees) or passive (regularly sending staff for advanced training, continuing education, and specialty seminars). Once PWSA is past its most pressing organizational problems (perhaps in two to three years), it should consider hosting training sessions and meeting events for local chapters of state and national organizations. When establishing goals and objectives for supervisors and department heads, such activities could be included their personal plans. Additionally, staff should be encouraged to author professional papers where PWSA's improvement efforts can be highlighted. This encouragement can even go as far as an incentive program where staff are rewarded in part according in part according to their published papers, speaking engagements at conferences, etc.

#### **2.5.2 Standard: Professional Integrity Requirement: Involvement and Teamwork**

##### **Measurement:**

- Confirmation by staff and community that management demonstrates integrity, honesty, and a good work ethic

##### **Observations on PWSA**

In its August 28<sup>th</sup> presentation to the Mayor's Blue Ribbon Panel, the IMG Team highlighted several of PWSA's greatest cultural challenges, as well as the "foxhole valor" of its best staff working with dilapidated systems, insufficient resources and unmotivated colleagues to nevertheless provide Pittsburgh's citizens with the best water and sewer services they can. The Team observed -- and heard from staff -- plenty of examples of both admirable dedication and shocking indifference or inability. These person-to-person contrasts in motivation and professionalism seemed to appear in almost every department or activity the Team observed.

Interestingly, such stark differences are actually common in crisis-ridden utilities, where some skilled and mission-driven staff go to extraordinary lengths to keep the utility from failing (indeed, relatively few of the PWSA deficiencies identified in this report are due to the personal failings of staff), while other staff are sufficiently discouraged or estranged that they ignore the many small things that help others achieve their mission.

### **Industry Norms**

In any public service organization, personal integrity is closely linked to – though not identical to – corporate culture. Even some operationally dysfunctional workplaces are nevertheless able to enforce a high degree of personal integrity among staff, either through careful screening of employees or through regular education and reinforcement of certain positive organization values. This ethic is often furthered by routine performance measurement and operational auditing: well-performing water and sewer utilities tend to have more than their share of both. Key identifiers include whether the utility has a strong mission statement, a robust on-boarding process for new employees, a high-participation training and career advancement program, a detailed and regularly-updated business plan (thereby keeping all employees aligned with the details of the agency’s activities and strategy), and an expansive performance management and reporting system where performance information is widely shared.

#### **2.5.3 Standard: Coordination**

**Requirement: Relationship with relevant local authorities and organizations**

#### **Measurement:**

- presence of a departmental contact list
- a demonstration of participation in meetings with such relevant groups as health agencies, law and fire agencies, and power companies
- preparation and presence of relevant memorandums of understanding, eg., mutual aid agreements

#### **Observations on PWSA**

Most of the PWSA staff interviewed by the Team appeared to demonstrate good working relationships, including a shared dedication to positive communication both within the utility and to important partners outside of it, including ALCOSAN and regulators. They seemed to be aware that internal communication had broken down over time, and that few “hard” systems existed to support routinized performance information and operational instruction. These middle managers, it seemed, had taken upon themselves the duty of more frequent face-to-face communication to substitute for the lack of other protocols and systems. Overall, it appears that information and opinion is valued (when available) and operational improvements are sought (when identified), even if written documentation is lacking.

END OF CHAPTER 2

## 3 TREATMENT PROCESS EVALUATION

The IMG Team reviewed the recent operational practices and treatment system performance of PWSA compared to industry standards (within the limitations of the existing facility configuration). We also reviewed operating data for the treatment plants (at least what was available) to determine if alternative operating practices and technologies would offer improvements in system performance.

### 3.1 METHODOLOGY

The evaluation of process control included a limited review of plant design drawings, O&M manual information and operating data. The Team considered various types of plant data in order to find correlations between operating parameters and effluent performance. The Team focused primarily on operational control strategies and system components that directly impact water quality and permit compliance.

### 3.2 PROCESS AND PERFORMANCE OBSERVATIONS

PWSA's treatment processes seem to be focused on meeting system demands without full consideration of the environmental impacts of high volume waste streams that affect system processes and operating costs. This includes filter waste streams consistent with backwash cycles, clarifier sludge removal and in having <2% sludge solids residuals, energy consumption in keeping the microfiltration plant running simply to keep the membrane cartridges submerged in water, and other less than efficient or optimum operations.

The Team suggests that PWSA consider taking the micro-filtration plant off-line, and that storage modules for the membranes (either purchased directly from PALL or constructed in-house) to preserve the integrity of the units. The cost savings would probably be immediate and measurable with regard to labor (shift operators), energy consumption, chemicals and water. Additionally, an overall pump strategy should be reviewed and confirmed to optimize energy consumption, a proactive management plan for all Pressure Reducing Valves / Zones (PRVs or PRZs) in the system to better manage operating pressures recorded as high as 220 psi.

The management team appears knowledgeable, appears to care deeply about water quality, and appear to want to "do the right thing." Based on the system conditions and accepted industry operating practices, the staff made some otherwise sound decisions at the front end of this event. However, they need to now go back to basics on controls and simplify their observations and control decisions. This approach should include the activities listed below.

1. Process control training, development of Key Performance Indicators, and SCADA system tracking utilizing trending graphs would all be very helpful operational tools. Setting specific process control parameters for treatment trains will be useful. These parameters would include daily monitoring of TOC %-removal, DOC %-removal (UV254 surrogate), pH, alkalinity, turbidity, aluminum, and phosphates.
2. Identifying a range of expected results for each parameter and watching for process monitoring variances.
3. Establish specific response actions to keep parameters within the desired limit.

4. Clarifier performance should be evaluated based upon sludge generation and %-solids or gallons removal, effluent turbidity and aluminum content
5. Pump strategy for large pumps should be based on demand, service conditions and pump characteristics.
6. Lab QA/QC training should emphasize COCs and training of staff to interpret applicable results.
7. Implement a robust maintenance program for effective asset management and inventory control.
8. Enforce an aggressive line-item budget program by department managers to include capital planning, expenditure forecasting, routine operating reports, Annual Business/Work Plans, etc.
9. Institute an employee training and communications program that includes Human Resources for personal well-being, professional growth, Health and Safety expectations, and overall job performance satisfaction. This may entail review of assigned CBAs.

## 4 SUMMARY

1. **TRAINING:** While the pursuit of O&M training appears to be encouraged by PWSA management, the training program itself is skeletal at best. This is a glaring deficiency compared to PWSA's peer group. PWSA does not conduct an annual training program assessment.
2. **HOUSEKEEPING:** The plant, pump stations and some other facilities are cluttered and unkempt. Regardless of PWSA's resource limitations, this condition is entirely unnecessary, demoralizing to staff and probably concerning to any member of the public who might see it. An immediate facility management plan is needed to improve the condition and appearance of grounds, equipment, and structures.
3. **BELOW GROUND FACILITIES:** The "Yard" (below ground) facilities may have environmental requirements that include the development and implementation of response plans for stormwater, hazardous metals inventory, SPCC, chemical releases, inclement weather impacts, etc. Following development of such plans, staff should be instructed on their contents, i.e., their roles and responsibilities during each scenario. An Emergency Response Plan may exist for each department, but has not been updated in quite a while.
4. **HIGH FLOW PLAN:** No High Flow Management Plan (CSO) exists at this time. The current plan should be reviewed and revised to reflect staff changes, contact numbers, procedures, and any other outdated information. A High Flow Management Plan should be developed that details procedures required to meet such conditions.
5. **ASSET MANAGEMENT PROGRAM:** An peer-quality asset management program provides a complete inventory of facilities and equipment, defines a hierarchy of dependence among the assets (including criticality), and provides financial estimates for maintenance, repair, and/or replacement needs for the life of the asset. The plan is used to develop annual maintenance and equipment replacement budgets. No formal plan was observed to be in place at this time. There is a need to immediately consider expenditures for such items as:
  - on-line Instrumentation for monitoring water quality within stages of the treatment trains
  - repair/replacement of underground piping that may be leaking, and associated valves or flow meters
  - bench top precision instruments for the laboratory
  - tank cleanings, inspections and repairs
  - large pump controls and affected pump strategy
  - vendor servicing of critical mechanical and electrical assets
  - distribution system valves and conveyance appurtenances
6. **CMMS:** PWSA's maintenance management approach can best be characterized as a work order system only. Some work orders are generated. A facility mechanic prioritizes maintenance tasks, but it is not clear that a specific logic exists to the entire maintenance effort. It is clear that the staff is conducting work in a reactive mode, and there is evidence

that the mechanic is not able to keep up with the needs. There is no evidence that a formal preventive or predictive equipment maintenance program is in place. A more robust preventive/predictive maintenance program will yield cost savings and better protection of PWSA's future investments. An all-new system needs to be implemented where its full capabilities are being implemented, especially in the areas of preventive/predictive maintenance, asset management, spare parts inventory, etc. The IMG Team's assessment is that facility operations require substantial improvement in order to meet established industry standards and the performance level of its peer utilities. However, we have identified some immediate measures that can be easily implemented to improve operator performance to a level that meets professional standards.

7. **SOPs:** It does not appear that a sufficient number of site or shift-specific Standard Operating Procedures (SOPs) have been developed and implemented. Operator "rounds sheets" should be developed to assure that operators routinely inspect processes and equipment in a consistent manner. All daily sheets should be maintained in a binder in the process lab so that staff can access them at any time. All new staff on-boarding programs should emphasize SOPs, and employee career development programs should reinforce them.
  
8. **PROCESS IMPROVEMENTS:** Technical management of water systems require operating plans, relevant data collection, institutional knowledge, and a basic quality control program. At PWSA, there is a need to update the process control management plan for the treatment facility. Operation & Maintenance manuals for the Water Production and Field Services departments and individual pump stations may exist, but they could not be referenced by staff during our visit. Operators do maintain some data on a whiteboard in their process control area, however a formal control program for the plant is sorely needed. Much of these needs can be addressed through the following steps:
  - Set specific process control parameters for critical treatment and pumping trains.
  - Identify a range of expected results for each parameter and watching for process monitoring variances.
  - Establish specific response actions to keep parameters within the desired limit.

Currently PWSA's water distribution is operated under the lowest form of operational control compared to cities in the same size category, such as Philadelphia, the District of Columbia, San Diego, Tulsa or even Aurora, Colorado. PWSA needs to manage its system to standards established by the following organizations and documents:

- American National Standards Institute
- American Water Works Association
- ANSI/AWWA Operational Guide to Distribution System Operation Management G200
- Homeland Security Safety Act AWWA G430

Standard water distribution operating pressures under these guidelines range from 60-100 PSI. For the PWSA, some service areas are >200 psi. This may be understandable in an old system located in hilly terrain, like Pittsburgh's, but it can cause a lot of stress to the system and steadily degrade its reliability.

9. **REVERSE FLOW:** Another very important concern is that PWSA's system is allowed to operate with reverse flows. While this practice is often acceptable within the industry, few to none of the major cities in the US use this method of operation due to both its unreliability and its extensive wear of the infrastructure. The most troubling aspect of this practice is the potential for contamination of the potable water within the distribution system. It is very clear that the contamination breach starts at the main water treatment plant's clearwell, which is the beginning of the distribution system.
10. **CLEARWELL:** In the clearwell, where treated water is stored before it is pumped out into the distribution system, there are tree roots breaching the sidewalls, holes in the top structure, etc. Management has known about the issue for years but previous management and PWSA boards have been sluggish in responding to this important public safety concern. This should be (and apparently is now) on the list of top priorities for distribution system repairs, along with inspecting the entire system for other potential contamination points.
11. **MASTER PLAN:** PWSA appears to have little in the way of a written master plan or a roster of long-term goals for the operation of the water distribution system, although the Team understands that at least some planning is being undertaken by the new acting director. However, so long as the problem persists, the utility is probably incurring a number of avoidable operational expenses. The AWWA standards for water loss within a distribution system is 10% or less. Currently the PWSA water loss cannot be accurately calculated due to the lack of reliable and accurate information.
12. **WATER LOSS:** The data provided to the Team shows that PWSA's water loss is at or over 50%. This would be unacceptable to any utility: one manager described PWSA transmission network as "one of the largest irrigation systems in the country." Although water loss percentages are higher in Pennsylvania than most other states due to the age of their systems and the prevailing terrain, PWSA's loss is simply unprecedented among utilities its size. Among other reasons for mitigating this problem is that it increases PWSA's expenditures for chemicals, power and maintenance by roughly one-quarter to one-third above the AWWA average of 10%-of-total-budget. Among the low-cost steps that PWSA could take immediately, it should consider training in the basics of standards of maintaining distribution system water quality. These standards are as follows:
  - Understand your distribution system and define the problems.
  - Set water quality goals and establish preliminary performance objectives.
  - Evaluate alternatives and select the best practices.
  - Implement good management practices and monitor effectiveness.
  - Finalize performance standards and develop standard operating procedures.
13. **EXPERTISE:** PWSA should quickly consider replacing some of its current staff with more experienced certified operators so as not to allow further deterioration of the system. The Team realizes that this problem may be difficult considering its overall low compensation and the city residency requirement. However, there appears to be a poor level of understanding of the industry standards of operation and the use of new technology. Proper training should improve the overall operations and condition of the system fairly quickly. The paucity of certified experienced operators and maintenance personnel is especially alarming, and nearly without precedent among PWSA's peer utilities. Moreover,

it will take large amounts of capital to quickly repair the system. Spending that money wisely will be a challenge if PWSA does not improve upon the expertise of its staff.

14. **MAINTENANCE SPENDING BENCHMARK:** AWWA stipulates that the average annual water distribution system maintenance budget should be 1/10<sup>th</sup> of the systems value. Until such time an effective master plan is implemented, a definitive cost estimate to repair the system will be difficult to obtain. However, it is evident that underfunding – a problem exacerbated by chronically misguided resource allocation -- has been a big part of the problem for many years.
15. **MONTHLY OPERATING REPORT:** PWSA should consider immediate development of a Monthly Operations Report or MOR. An MOR report would include summaries of the following: permit compliance; plant operations; flows, maintenance activities; administrative activities; Health and Safety issues; public relations; staffing updates; training activities; and engineering updates. Though mostly technical in nature, it should be shared with all staff, including administration, as well as with the PWSA board of directors. If that report cannot be generated automatically (and it probably can't be), then it should be hand-generated in Excel from whatever information sources PWSA has at the department level.
16. **COMMUNICATIONS:** Internal communication with all staff is an important element in the development of a team culture. While memos and/or new policy SOPs are currently being developed and disseminated more frequently, line staff appear not to be fully engaged in scheduled meetings. Overall communication between plant staff and their supervisors could be greatly improved. PWSA should increase the frequency of staff meetings, with an agenda that should include compliance status, Health and Safety issues, maintenance updates, operational concerns, policy/procedure change, and question/answer discussions.
17. **BENCHMARKING WITH PEER UTILITIES:** Benchmarking is the process of setting and monitoring specific standards of performance that management and staff can track for comparison with peer utilities, fiscal planning purposes and trends of improvement or deterioration in system operation. The IMG Team recommends that each department managers select a minimum of three standards for tracking purposes, along with purchasing regular updates of AWWA's *Benchmarking Performance Indicators for Water and Wastewater*.
18. **F.O.G. MANAGEMENT:** Staff discussions indicated that the city has the foundation of a formal fats, oil, and grease (FOG) inspection, monitoring, and control program. Oil and grease discharge limits ARE specified in the city's Sewer Use Ordinance, but inspections, user self-monitoring, periodic split sample analyses, and enforcement guidelines did not appear to be occurring at the time of this assessment. A FOG management program that addresses all restaurant and industrial discharges should be implemented. Implementation would include such activities as site inspections, sampling, review of FOG disposal records, and documentation of enforcement actions.
19. **PIPELINE CONDITION:** The IMG Team also recommended (consistent with AWWA standards) that one third of the entire collections system is high pressure jetted and CCTV'ed (video inspected) each year. Once the data is collected a detailed plan to repair or replace troubled areas are addressed within the next fiscal year. A typical repair and replacement budget for a collection system is 1/10 the value of the asset annually. This expenditure does not

include growth or critical repairs. This repair budget protocol does not appear to be in place at PSWA. The pipeline system appears to be managed in crisis mode. A 10-year inspection cycle is not nearly enough.

20. **SSOs:** Many well-run large water utilities, such as those in Phoenix and Seattle, operate under a well-developed master plan to address and manage SSOs. They include long-term goals, population and system growth and critical system issues, as well as a day-to-day schedule of maintenance activities. Astonishingly, some of PWSA's failing collection infrastructure was allowed to be installed under large buildings in the downtown area rather than under streets. Consequently, if the critical system issues are not addressed immediately, there is an obvious potential for disaster. Accordingly, PWSA should look to eliminate the SSOs, lest critical system damage under these structures and creeks lead to larger problems. To help expedite its planning for the collection system, PWSA should look to share in the experience, data and management tools of the following organizations:
  - New England Waster Collection System Toolbox,
  - Eastern Pennsylvania Water Pollution Control (EPWPCOA)
  - American Water Works Association Pennsylvania Section (PA-AWWA).
21. **BOTTOM LINE ON COLLECTION SYSTEM:** It will be a large undertaking to get PWSA's collection system even to minimally acceptable utility standards based on the ANSI/AWWA Wastewater Collection System Operations and Management Standards G520. PWSA should consider extensive training for the staff on collection system management. There appears to be insufficient consideration of system efficiencies or use of new technologies, although this may not be surprising considering PWSA's crisis situation. Additional hiring of industry experts is warranted to immediately address these critical issues.
23. **INDUSTRIAL PRE-TREATMENT:** An Industrial Pretreatment Coordinator is needed for the community. Such an individual should also be responsible for overseeing the FOG management program and laboratory QA/QC efforts. This individual would assure that industrial facilities are routinely inspected and sampled. They would also be a commercial contact point for the business community. Recruitment should focus on fundamental chemistry knowledge, familiarity with lab operations, an understanding of regulatory policy, the ability to write clear memos, and strong interpersonal skills.
24. **COMMUNITY OUTREACH:** Commitment to community participation is substantiated through actions. Based on the current physical and operating conditions, establishing plant tours might not be prudent. The City should certainly consider prioritizing other community education efforts.
25. **WORKER SAFETY:** The water service profession has always been a dangerous industry to work in, both for operations and maintenance. Safety must be a prime focus, not only from the viewpoint of worker protection, but as a common point to build teamwork and a professional culture. Even small accidents should be documented and investigated by the supervisors. Employees should be encouraged to identify and report unsafe working conditions at any time. All above ground walking surfaces should be assessed from a physical safety perspective as soon as possible. A Job Safety Analysis (JSA) program should be implemented to assist employees and contractors in reducing accidents. An effective Safety Program includes the following elements:

- designation of an individual safety coordinator to oversee meeting planning, suggestion follow-ups, and program direction
- conducting at least one safety meeting per month for all staff, including development of a standard agenda, fixed date and time (overlap shift changes if necessary), and documentation of attendance and suggestions

26. **ETHICS AND VALUES:** A successful water utility culture promotes environmental values and integrity in all manners of business. These ethics include: (1) that all environmental compliance sampling follows standard procedures, (2) that data is reported and documented properly, (3) that conflicts of interest with service providers are avoided, (4) that gifts from supply vendors are refused, (5) that utility property is respected and protected, (5) that communication with outside agencies and citizens is truthful, (6) and that employees respect each other and their contribution to the utility's success. Based on the IMG Team's observations, it appears that most PWSA staff share these values.

*Overall, the restructuring of PWSA presents the Pittsburgh with an unprecedented opportunity to permanently address the utility's long-standing operational, management and technical performance problems. Based upon its professional experience with other water and sewer utilities in the US and around the world, the IMG Team is confident that the improvements needed at PWSA – many of which have been identified in this report, along with suggested action items -- can be achieved through whichever restructuring option is chosen by the City, some more readily than others. In all cases, however, a successful restructuring agreement will require that the terms of the restructuring are thoughtfully considered and written, and that compliance with them is carefully monitored for years to come. The Team's experience is that when it comes to public utilities, making change durable turns out to be much harder than making the change itself.*

END OF DOCUMENT