Charlotte County, Florida

# Water Quality Sampling and Analysis – Annual Contract



July 21, 2025
RFP20250526

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Port Charlotte, Florida 33948-1094

**RE: RFP No. 20250526 Water Quality Sampling and Analysis - Annual Contract**

Dear Members of the Selection Committee:

Environmental Science Associates (ESA) is pleased to submit our proposal for Charlotte County's RFP No. 20250526, *Water Quality Sampling and Analysis – Annual Contract.* As the incumbent consultant, ESA brings a deep, working knowledge of the County's ambient water quality monitoring program, having led its successful implementation over the past three years. We are intimately familiar with the station network, access logistics, and evolving program needs—and we're eager to build on this momentum.

With no ramp-up required, our team is fully prepared to begin sampling on day one. We have worked collaboratively with County staff to enhance the program by incorporating new sites, responding to major weather events, and refining the Sampling and Analysis Plan in real time. Our strengthened team offers unmatched regional expertise, regulatory fluency, and a responsive field-to-lab logistics model designed to meet the County's high standards for performance, reliability, and environmental stewardship.

**Proven Team. Immediate Start. Seamless Continuity.**

*With three years of successful implementation, ESA is ready to begin sampling on day one. Our integrated team—now including Janicki Environmental—brings unmatched local knowledge, regulatory expertise, and a streamlined field-to-lab operation to support Charlotte County's monitoring goals.*

## A PROVEN, EXPANDED TEAM FOR CHARLOTTE COUNTY

For this contract, ESA will serve as the prime consultant, building on our long and successful partnership with Charlotte County and our direct role in implementing this ambient water quality monitoring program over the past three years. Since the program's inception, ESA has led the development of the sampling design, supported key refinements to improve efficiency and data quality, and provided seamless coordination of fieldwork, laboratory analysis, and regulatory data reporting.

Under the previous contract, Janicki Environmental, Inc. (JEI) served as a trusted subconsultant to ESA. Following our formal merger on December 29, 2023, JEI is now fully integrated into ESA—bringing with it decades of project-specific experience and a strong regional team of water quality and ecological science experts. This merger formalizes a long-standing partnership and enhances ESA's capacity to provide comprehensive monitoring, analysis, and regulatory support. For Charlotte County, this means the institutional knowledge and technical leadership previously delivered by JEI are now embedded within ESA's core team, ensuring continuity of service, a deep understanding of past work, and a seamless transition into the next phase of the program.

Additionally, ESA is joined by our FDOT-certified DBE partner, Benchmark EnviroAnalytical (Benchmark EA)—a locally owned and operated laboratory with facilities in North Port, Palmetto, and Winter Haven. Benchmark EA has been a trusted ESA partner for over 20 years, consistently producing defensible water quality data that support regional Total Maximum Daily Loads (TMDLs), Minimum Flows and Levels (MFLs), and environmental compliance initiatives. *Benchmark EA is the existing certified laboratory for the Charlotte County Ambient Surface Water Monitoring Program and supports other monitoring throughout the County providing standardization across County programs.* Fully accredited under the National Environmental Laboratory Accreditation Program (NELAP) and the Florida Department of Health (DOH) Environmental Laboratory Certification Program, Benchmark EA is qualified to analyze nearly all FDEP- and County-required parameters, ensuring timely, accurate, and regulatory-compliant results.

## TECHNICAL ALIGNMENT WITH THE COUNTY'S RFP GOALS

ESA fully understands the County's objectives to:

- Implement comprehensive ambient water quality monitoring program
- Meet FDEP Watershed Information Network (WIN) data submission requirements
- Ensure data sufficiency for impaired waters assessments and TMDL development

Our field operations and QA/QC procedures are fully compliant with DEP-SOP-001/01 and Rule 62-160, F.A.C. We will coordinate closely with County staff on site selection, sample collection, data formatting, and QA audits, and leverage ESA's deep familiarity with regional hydrology and ecological modeling to support the design of special studies and alternate station protocols. Our team has participated in the Southwest Florida Regional Ambient Monitoring Program (RAMP) for over 20 years, providing consistent, high-quality data at low minimum detection limits critical for ambient monitoring.

## REGIONAL LEADERSHIP IN WATER QUALITY SCIENCE

ESA brings more than 75 environmental professionals in Florida and 750 firmwide across the U.S., including leading experts in:

- Water quality and ecological health monitoring
- Hydrologic and statistical modeling
- Regulatory analysis and permitting
- Environmental impact assessments
- Coastal and estuarine systems restoration
- GIS and geospatial analysis

We have had an office in the Charlotte and Sarasota County area since 2006, and our staff have worked in the Charlotte Harbor watershed since 1996, supporting local, state, and federal agencies on major monitoring programs. This legacy gives us institutional knowledge and practical insight into Charlotte County's history, mission, and environmental challenges.

## COMMITMENT TO EXCELLENCE AND PUBLIC STEWARDSHIP

ESA primarily serves public agencies and has no apparent conflicts of interest. Our commitment to scientific integrity, cost-effective implementation, and environmental stewardship aligns closely with the County's expectations for this contract.

We are confident that our cohesive team—ESA and Benchmark EA—offers a uniquely qualified and locally experienced group to deliver high-quality data, meet regulatory requirements, and support informed environmental management decisions for Charlotte County.

As Vice President and Southeast Biological Resources Director, I am fully authorized to commit ESA's resources to this contract. We are ready, enthusiastic, and fully equipped to continue supporting the County, ensuring a seamless continuation of services.

ESA appreciates the County's commitment to environmental stewardship, and we are eager to contribute to this mission with innovative, cost-effective, and science-driven solutions. I am authorized to execute agreements and allocate firm resources as needed to fully support this contract. Thank you for the opportunity to support your vital water quality program. Should you require any further details, please feel free to contact me.

Sincerely,

Christopher T. Warn

**Christopher T. Warn**
Vice President, Southeast Biological Resources Director
**cwarn@esassoc.com** | 941.650.9545


# 1 Team Proposed for this Project

ESA

1

# The Firms

ESA

1969
FOUNDED

100%
EMPLOYEE-OWNED

750+
STAFF

**Environmental Science Associates (ESA)** is proud to serve as the prime consultant for this proposal, supported by our long-standing teaming partner, Benchmark EnviroAnalytical, Inc. (Benchmark, EA). With the integration of Janicki Environmental, Inc. (JEI) into ESA in 2023, our firm combines decades of unmatched experience, local knowledge, and technical capabilities in water quality monitoring, environmental statistics, ecological assessment, and regulatory support under a single, unified team. For over two decades, ESA and Benchmark EA have successfully designed, implemented, and continue to manage many of the region's most respected and technically rigorous water quality monitoring programs—including long-term efforts that directly inform regulatory and resource management decisions throughout Southwest Florida.

ESA offers extensive expertise in ecological and environmental analysis, including nationally recognized capabilities in estuarine and freshwater ecology, watershed management, hydrodynamic and limnological modeling, monitoring program design, and statistical analysis of environmental data. Our team's advanced quantitative skillset directly supports the development of defensible, science-based environmental policies and regulatory decisions—particularly in areas such as Water Use Permits (WUPs), Minimum Flows and Levels (MFLs), compliance assessments, and Total Maximum Daily Load (TMDL), or Reasonable Assurance Plan (RAP) development. These integrated services enable resource managers to evaluate and respond to the impacts of past and future actions on water quality and ecosystem integrity with confidence and transparency.

With more than 750 environmental professionals nationwide, including over 75 based in Florida, ESA is a 100% employee-owned environmental consulting firm with deep regional roots and a long-standing presence in Southwest Florida. Our Florida operations are anchored by five hub offices in Sarasota (Osprey), Tampa, Orlando, Boynton Beach, and Pensacola, and are supported by a flexible "hub and spoke" staffing model that places staff and equipment close to key project areas. For Charlotte County, this includes a project director based in Sarasota and a principal-in-charge located in Englewood, both near Benchmark EA's laboratory facilities and central to the County's field sampling network.

ESA is, first and foremost, an environmental science firm—Science is our middle name. Our expertise aligns precisely with the anticipated scope of this contract, including:

- Environmental monitoring and assessment
- Water quality and aquatic health studies
- Biological and watershed resource evaluations
- Hydrodynamic, estuarine, and freshwater modeling
- Statistical and geospatial data analysis
- Environmental impact analysis
- Coastal resilience and climate adaptation solutions

Our team members are recognized experts in the Charlotte County region and have been selected by local, state, and federal agencies, estuary programs, and water supply authorities to implement high-priority environmental initiatives. We offer unmatched institutional knowledge, with decades of experience supporting projects within the Charlotte Harbor watershed and across Southwest Florida. While ESA serves a broad client base, our focus remains on public-sector work. We have no apparent conflicts of interest, ensuring alignment with the County's environmental mission.

As a firm, ESA is built on a foundation of long-term stability, controlled growth, and low staff turnover, which fosters enduring, trust-based relationships with our clients. We operate under a matrix organizational structure that integrates our technical disciplines and regional expertise to deliver responsive, cost-effective, and technically sound services. With our integrated team and deep regional experience, ESA is exceptionally well-positioned to support Charlotte County and advance its environmental stewardship goals. Over the past three years, ESA has successfully led the County's ambient monitoring effort, providing end-to-end program execution—including sampling design, monthly field data collection across 90+ sites, laboratory coordination, comprehensive QA/QC, and data reporting in full compliance with Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (SOPs) and Watershed Information Network (WIN) submission protocols. Our team has responded to unplanned events, implemented refinements to improve data reliability, and collaborated closely with County staff to ensure the program remains scientifically robust and operationally efficient. This proven track record demonstrates our team's readiness to seamlessly continue and build upon this essential work.

**Benchmark EnviroAnalytical (Benchmark EA)** brings over 30 years of experience in the analysis of water, soil, and sediment, with a proven track record of delivering high-quality, defensible data to support environmental monitoring and regulatory compliance programs across Florida. Benchmark EA is a locally owned and operated laboratory with approximately 30 employees and facilities strategically located in North Port/Port Charlotte, Palmetto, and Winter Haven—providing ready access to Charlotte County project sites and ensuring timely sample processing.

All Benchmark EA laboratories are National Environmental Laboratory Accreditation Program (NELAP) certified and staffed by professionals with academic degrees in chemistry, biology, or related sciences. The laboratory's certification encompasses a broad range of parameters including organics, inorganics, metals, physical properties, and microbiology, ensuring full coverage of the analytical scope required by the FDEP and Department of Health (DOH) for ambient water quality monitoring.

Benchmark EA is proud to be an FDOT-certified Disadvantaged Business Enterprise (DBE) and has served as a trusted analytical services partner for ESA for more than two decades. The firm's technical and managerial leadership are all degreed scientists with substantial experience in laboratory operations, quality systems, and client service. The laboratory is overseen by Dr. Dale Dixon, a Ph.D. chemist with deep expertise in organic chemistry and an intimate understanding of day-to-day lab functions and performance standards.

Benchmark EA's QA program is foundational to its operations, adhering strictly to NELAP protocols and Good Laboratory Practices (GLP). QA officers work in close coordination with the management team to fulfill the lab's guiding commitment to deliver "correct results the first time, on time." This culture of accountability and precision ensures the reliability of all reported results, particularly for data used in regulatory determinations and long-term trend analysis.

As an ongoing participant in the Southwest Florida Regional Ambient Monitoring Program (RAMP), Benchmark EA has extensive experience in ambient surface water monitoring and consistently meets the low method detection limits required for meaningful environmental assessments—an area in which the laboratory is often distinguished from others that focus primarily on wastewater analysis. This capability is essential for supporting Charlotte County's goals to meet data sufficiency requirements for FDEP's WIN submissions and for the identification of impaired waters and restoration plans (i.e., TMDLs, RAPs).

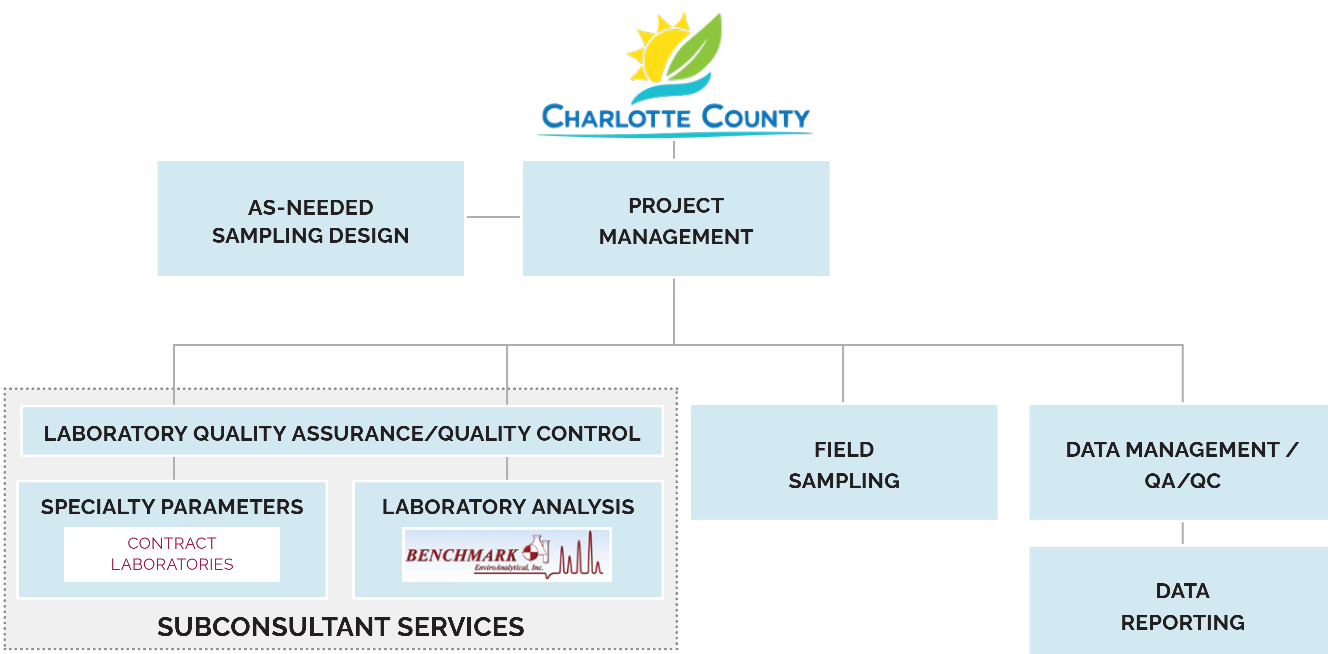
With its regional presence, technical credentials, and long-standing focus on surface water quality, Benchmark EA is uniquely positioned to provide Charlotte County with responsive, compliant, and scientifically rigorous laboratory services. Continued involvement from Benchmark EA ensures consistency with prior analytical efforts—minimizing the risk of data discrepancies that can result from changes in laboratories, methods, or detection limits—and supports long-term data integrity and comparability.

## The People – Background and Credentials of Key Personnel

The ESA team comprises a highly qualified group of technical professionals with decades of experience managing and executing projects of comparable design, scope, and regulatory complexity to those outlined in this RFP. Our personnel have successfully led and collaborated on ambient water quality monitoring programs, watershed assessments, and regulatory compliance initiatives throughout Florida, including our ongoing support for Charlotte County's One Water Initiative. A graphical representation of the proposed organizational structure is included in Section 2, and detailed resumes for key personnel and supporting staff are provided at the conclusion of this section.

ESA's leadership team—Project Director Bob Woithe, Project Manager Mike Poniatowski, and Principal-in-Charge Christopher Warn—offers decades of collective experience in surface water monitoring, watershed planning, and environmental assessment. ***Mike's direct involvement in the County's ambient water quality monitoring program over the past three years brings valuable institutional knowledge that will carry forward into the upcoming monitoring cycle.*** This core team provides consistent oversight, technical depth, and a clear understanding of the County's priorities. To maintain project continuity and quality, ESA affirms that these key personnel will remain in place for the duration of the contract, with no substitutions made without prior written approval from Charlotte County.

## Corporate Team Roles and Responsibilities



## PROJECT DIRECTOR

*Robert (Bob) Woithe, PhD.*

Bob is a senior environmental scientist with more than 33 years of experience in wetland and ecosystem assessment, watershed management, environmental monitoring, modeling, and data analysis. His work spans marine, aquatic, and terrestrial ecosystems throughout the Southeastern U.S., with a particular emphasis on water quality, habitat, and long-term ecological health.

Bob has served as project director and lead scientist for some of the region's largest and most enduring environmental monitoring programs, leading interdisciplinary teams that collect and analyze millions of measurements across rivers, wetlands, estuaries, and coastal systems. His leadership consistently delivers high-quality, defensible data to support regulatory and resource management goals.

As ESA's proposed Project Director for Charlotte County, Bob brings deep technical expertise and long-standing familiarity with the County's water resources. He served as Project Manager for the current ambient water quality monitoring contract, working collaboratively with County staff and ESA's sampling team to ensure successful implementation. Over the past three years, he has also mentored Mike Poniatowski, preparing him to assume project management responsibilities and ensuring a seamless leadership transition.

Bob has directed the Peace River HBMP since 1998 and the Alafia River/Tampa Bypass Canal HBMP since its inception—programs involving complex multi-parameter sampling, advanced statistical evaluation, and coordination with entities such as Benchmark EA, Mote Marine Laboratory, and Florida Fish and Wildlife Conservation Commission (FWCs) Fisheries Independent Monitoring Program. Bob's reputation for logistical leadership and scientific rigor is evidenced by his rapid coordination of ESA's 2021 response to the Piney Point gypsum stack spill, where he mobilized field crews and equipment within 24 hours and sustained intensive sampling operations for four months in support of the Tampa Bay Estuary Program.

In addition to Florida-based work, Bob has led projects with stringent quality and reporting standards across multiple states. Notably, he managed the United States Environmental Protection Agency (EPA's) Best Management Practices monitoring project across 54 mined watersheds in Appalachia, coordinating multiple laboratories and field teams and producing one of the most comprehensive datasets in the agency's program history.

Bob managed the South Florida Water Management District's Simulation Model Development for the Everglades Stormwater Treatment Areas, helping bridge field monitoring data with regulatory and restoration modeling. His experience in statistical, hydrologic, and mechanistic modeling is a critical asset for transforming raw data into actionable insights for resource managers.

Beyond project work, Bob is a recognized voice in environmental science and policy circles. He has held numerous national and regional advisory roles, including:

- U.S. Gulf Fisheries Management Council – Data Collection and Coastal Migratory Pelagics Advisory Panels
- National Marine Fisheries Service – Southeast Data, Assessment, and Review (SEDAR) 49 and 99 panels
- Federal Emergency Management Agency (FEMA) – Risk Index Data Analysis Working Group
- Manatee Chamber of Commerce – Natural Resources Committee
- Manatee Phosphate Community Advisory Panel
- Gulf Coast Ecosystem Restoration Council – Independent Science Reviewer

Bob previously led the water resources and modeling group and managed the headquarters office of Florida's largest engineering firm, where he oversaw technical delivery, operations, and strategic business development nationwide.

His combination of technical depth, practical leadership, established stakeholder trust, and extensive regional experience makes him exceptionally well-qualified to continue directing Charlotte County's ambient water quality monitoring program—delivering timely service, high-integrity data, and strong support for the County's environmental stewardship goals.

## PROJECT MANAGER / FIELD SAMPLING

***Michael (Mike) Poniatowski***

Mike is a seasoned Environmental Scientist with over 11 years of experience in aquatic ecology, regulatory field assessments, and surface water quality monitoring throughout Florida. Based in ESA's Tampa office, Mike brings to this project a depth of local knowledge and operational leadership—having directly supported and led several high-profile Charlotte County monitoring initiatives, including serving as Lead Field Scientist for the County's Ambient Water Quality Monitoring Program.

In that role, Mike oversaw the field execution of the County's ambient monitoring framework, coordinating surface water sample collection, in situ data profiling, and documentation across 90+ monitoring sites within the Mid, West, and East municipal stormwater business units. He collaborated closely with laboratory staff and ESA's data management team to support the submission of data to the FDEP WIN, contributing to Charlotte County's compliance with impaired surface water evaluations and restoration plan development protocols. His familiarity with the County's sampling expectations, QA/QC documentation procedures, and WIN reporting workflows make him exceptionally well-prepared to lead this next phase of the contract.

Mike also served as a field scientist for the County's Sunshine Lake/Sunrise Waterway Monitoring Program, a targeted effort addressing nutrient-driven algal blooms in Greater Port Charlotte. His work helped characterize phosphorus dynamics and guided the development of quantitative criteria to trigger appropriate management actions. Additionally, Mike was part of ESA's rapid response team following Hurricane Ian, supporting expedited water quality sampling and WIN-compatible data reporting in Charlotte Harbor under emergency conditions.

Before joining ESA, Mike spent six years with the FWC, where he contributed to optical water quality and seagrass restoration programs focused on light attenuation, nutrient thresholds, and habitat protection—topics closely aligned with Charlotte County's ecological priorities.

As Project Manager, Mike will be responsible for the end-to-end coordination of all field, laboratory, and data management activities, serving as the County's main point of contact and ensuring that work is executed with technical precision and operational efficiency.

Mike has worked alongside Bob Woithe for the past three years on this contract, gaining firsthand knowledge of its structure, expectations, and nuances. This direct experience—paired with his broader regional expertise and regulatory fluency—makes him exceptionally well-prepared to step into the Project Manager role and continue implementing the County's water quality monitoring program without disruption.

Key Qualifications and Responsibilities:

- Serves as Lead Field Scientist for Charlotte County's Ambient Water Quality Monitoring Program, overseeing field sampling and coordinating WIN-compliant data delivery.
- Directed routine and emergency surface water quality sampling across 90+ sites, including post-Hurricane Ian response.
- Familiar with FDEP Standard Operating Procedure (SOP) 001/01, field data documentation protocols, and QA/QC procedures required for data acceptance in state and federal regulatory programs.
- Experienced with multisensor water quality sondes, grab sampling tools, and real-time calibration verification protocols used across coastal, riverine, and stormwater systems.
- Coordinates closely with Benchmark EA laboratory staff to align field logistics with analytical schedules and NELAP-compliant sample handling procedures.
- Supports adaptive monitoring design, identifying trends and anomalies in the field to inform responsive sampling and data interpretation strategies.
- Experienced in cross-functional coordination with ESA's equipment managers, data managers, and GIS analysts to ensure field-to-database continuity.
- Trusted liaison for Charlotte County project stakeholders, offering consistent communication, schedule transparency, and technical leadership in field execution.

## Project Manager Reference List

| Name<br>Affiliation | Project Name | Brief Description | Contact Information |
|---|---|---|---|
| **Greg Blanchard**<br>Manatee County | **Manatee County Lab QA/QC Support** | ESA provided QA/QC reviews and reviewed data, procedures, and record keeping monthly for Manatee County's ambient water quality program. | greg.blanchard@mymanatee.org<br>941.742.5980 |
| **Katherine Burke**<br>Florida Fish & Wildlife Conservation Commission | **Babcock Webb Water Monitoring** | ESA supported the FWC on the Babcock Webb and Yucca Pens Water Level Monitoring project by providing environmental services including planning, quarterly water level downloads, and project management support to advance hydrologic modeling for restoration efforts. | katherine.burke@myfwc.com<br>850.591.0544 |
| **Cathleen Jonas**<br>Tampa Bay Water | **Alafia EOD Salt Wedge** | ESA led weekly sampling of the Alafia River to track the location of the salt wedge as part of an emergency permit modification for water withdraws. Tracking was conducted using a multi-parameter sonde to determine conductivity signatures via profiles along transects within the river. | cjonas@tampabaywater.org<br>727.791.2345 |
| **Cigdem Ozkan**<br>APTIM | **Belleair Bluffs Water Quality and SAV Survey** | ESA led data collection, analysis, and design efforts to address shoreline erosion along a 30-foot bluff adjacent to Clearwater Harbor in Belleair. SA led water quality and SAV data collection and analysis for compliance and performance monitoring of a nature-compatible solution that protected upland infrastructure while minimizing environmental impacts. This project highlights ESA's ability to integrate sound science and regulatory awareness to protect and improve coastal resources—skills directly applicable to Charlotte County's ongoing efforts to monitor, manage, and protect sensitive aquatic systems. | cigdem.ozkan@aptim.com<br>321.978.6989 |

## PRINCIPAL-IN-CHARGE

### *Christopher (Chris) Warn*

Chris is a Vice President at ESA and the Southeast Biological Resources Director, bringing more than 26 years of experience in water quality, coastal ecology, watershed management, and environmental restoration. As the proposed Principal-in-Charge for this contract, Chris offers a unique combination of executive leadership, hands-on technical expertise, and immediate geographic availability to support Charlotte County's ambient water quality monitoring program.

Chris is based in Englewood, Florida, placing him within minutes of Benchmark EA's North Port/Port Charlotte laboratory and the County's primary sampling locations. His local presence enables rapid, in-person support, ensuring continuous oversight of field activities, and laboratory coordination. Combined with Project Director, Bob Woithe's nearby location in Sarasota and Project Manager Mike Poniatowski's location in Tampa, Chris anchors a field-ready leadership team that can respond swiftly to County needs, whether for routine monitoring or emergent issues.

Chris has led or supported a wide range of complex, multidisciplinary environmental projects across the Gulf Coast, Florida, and California. He played a key role in the emergency response and Natural Resource Damage Assessment following the Deepwater Horizon oil spill, and remains actively engaged in long-term restoration projects funded through settlement dollars. His experience also includes high-profile efforts such as:

- Everglades restoration planning and implementation
- Port expansion, dredging impact analysis, and mitigation design
- Large-scale watershed and estuarine monitoring programs

Chris has supported a diverse clientele, including federal and state agencies, local governments, ports, utilities, private industry, and Non-Governmental Organizations. He has also provided critical technical support to several National Estuary Programs, including Mobile Bay, Sarasota Bay, Tampa Bay, and the Coastal & Heartland National Estuary Partnership (CHNEP), which directly encompasses Charlotte County. His deep familiarity with the estuarine science and regulatory landscape of Southwest Florida ensures that project outcomes align with both local priorities and statewide objectives.

With his executive leadership, extensive regional experience, and physical proximity to the project, Chris is well-positioned to contribute meaningfully to the success of Charlotte County's water quality monitoring program from day one. *As a senior officer at ESA, he also has the authority to allocate additional staff or resources as needed—providing the flexibility to respond to shifting priorities, technical challenges, or unexpected project demands.*

## ADDITIONAL KEY PERSONNEL

Mike Poniatowski, our proposed Project Manager, will be supported by a strategically assembled team of scientists, technical specialists, and field professionals who bring decades of experience in Florida's ambient water quality monitoring, hydrologic assessments, and regulatory compliance. This multidisciplinary group is deeply familiar with the region's aquatic systems and regulatory landscape, and multiple members have directly supported Charlotte County's monitoring program over the past several years—providing critical continuity and institutional knowledge.

Each team member has been selected to meet the County's technical, logistical, and reporting needs with precision. From field instrumentation and laboratory coordination to advanced data analysis and regulatory reporting, the team offers targeted expertise across every component of this contract. Many have led or contributed to similar large-scale monitoring programs across Southwest Florida and possess a clear understanding of the County's environmental priorities, watershed dynamics, and permitting framework.

The following section provides a summary of these key personnel, highlighting their roles, qualifications, and relevant project experience. Together, they form a highly responsive, technically proficient team ready to deliver consistent, high-quality service that supports the County's long-term water quality management objectives.

### *Jeff Winter*

**Field Technician / Sampling Equipment Manager.** Jeff is a highly experienced environmental professional with over 26 years of expertise in wetland ecology, water quality, biological monitoring, and jurisdictional wetland determinations. As ESA's proposed Lead Field Technician and Sampling Equipment Manager, Jeff brings extensive experience leading field operations for large, permit-mandated monitoring programs—work that has resulted in the collection of millions of environmental data points across Florida's aquatic systems.

For more than 16 years, Jeff has served as lead field scientist on long-term water quality efforts, managing both continuous and discrete sampling across rivers, estuaries, and wetlands. His responsibilities include the deployment and maintenance of continuously recording water quality and hydrologic sensors, implementation of FDEP-approved standard operating procedures, and coordination of sample delivery to NELAP-certified laboratories to ensure timely analysis and regulatory compliance.

Jeff is known for his precision in equipment calibration, field logistics, and real-time responsiveness during both scheduled and event-driven sampling. He previously supported ongoing quarterly surface water and benthic monitoring in Sunshine Lake/Sunrise Waterway, and currently supports the Alafia River/Tampa Bypass Canal and Peace River Hydrobiological Monitoring Programs.

With a deep understanding of Florida's monitoring protocols and strong coordination skills, Jeff ensures every field effort is executed with accuracy, efficiency, and a focus on data quality—making him an invaluable asset to the successful implementation of Charlotte County's water quality monitoring program.

### *Wes Henriquez, GISP*

**GIS analyst / Drone pilot / Digital Data Collection Lead.** Wes brings 19 years of experience in geospatial technologies, remote sensing, and digital data systems, with a strong focus on environmental applications. As ESA's proposed GIS Analyst, Drone Pilot, and Digital Data Collection Lead, Wes will be responsible for managing spatial data, implementing mobile field data collection platforms, and supporting real-time reporting and visualization tools critical to the success of Charlotte County's ambient water quality monitoring program.

Wes is a Federal Aviation Administration (FAA) Part 107 Certified Remote Pilot, authorized to operate unmanned aerial vehicles (UAVs) for data acquisition under federal regulations. He uses drone technology to capture high-resolution aerial imagery, generate photogrammetric maps, and develop 3D visualizations of sampling locations and surrounding watersheds—providing valuable context and supplemental data for project documentation and analysis.

In addition to UAV services, Wes leads the design and deployment of custom ArcGIS-based tools, dashboards, and mobile data collection apps to streamline field operations and enhance data accuracy. His workflows support efficient routing, tracking of field activities, and integration with centralized databases—enabling seamless coordination among sampling crews, project managers, and lab partners.

While not a laboratory compliance specialist, Wes's deep experience working alongside scientists and project managers on complex monitoring programs ensures that digital data is well organized, traceable, and aligned with project reporting needs. His proactive, solution-oriented approach enhances responsiveness and transparency, ensuring that project data is readily available to support environmental decision-making, regulatory submissions, and public communication.

Wes's combination of technical expertise, innovation, and responsiveness will strengthen the County's ability to manage field logistics and transform raw monitoring data into actionable environmental insights.

### *Kristin Jenkins*

**WIN Data Formatter / QA Officer.** Kristin is a Scientist at ESA with 23 years of experience in collecting, analyzing, and managing hydrobiological data—spanning hydrology, water quality, and biological indicators—in estuarine systems across Florida. As the proposed WIN Data Formatter for this contract, Kristin will oversee the preparation, QA, and submission of monitoring data in compliance with FDEP requirements for the Watershed Information Network (WIN).

As QA Officer, Kristin will oversee adherence to rigorous quality standards, including those set by FDEP, DOH, NELAP, and Rule 62-160, F.A.C. Her leadership will ensure that sampling methods, data integrity, and reporting practices are accurate, consistent, and defensible, providing Charlotte County with a high level of confidence in both the results and their application for regulatory and management decision-making.

Kristin's expertise includes watershed assessments, fisheries biology, and long-term environmental monitoring, with a specialized focus on the estuaries of Charlotte Harbor, Tampa Bay, and Sarasota Bay. She has led the data management components of several high-profile hydrobiological monitoring programs, ensuring data consistency, regulatory compliance, and usability for downstream analyses and reporting.

Her work throughout Florida has supported TMDL evaluations, MFL development, water quality and quantity trend analyses, and the assessment of ecological responses to altered hydrology. She brings a deep understanding of the regulatory landscape and data quality standards that will guide the successful implementation of Charlotte County's ambient water quality monitoring program.

With extensive experience in both the technical and regulatory dimensions of data submission, Kristin will play a vital role in ensuring the County's datasets are complete, accurate, and formatted to meet all state submission and sufficiency criteria.

### *Jon Perry, GISP*

**QA Auditor.**

Jon is a senior environmental scientist and geospatial analyst with more than 30 years of experience collecting and analyzing the physical, chemical, and biological properties of aquatic systems throughout Florida. As ESA's proposed QA Auditor, Jon will provide impartial technical review and oversight to ensure that all aspects of the County's ambient water quality monitoring program—field procedures, data handling, and reporting—comply with the most rigorous quality assurance standards, including those established by FDEP and NELAC.

Jon's areas of expertise include monitoring design, watershed assessment (status and trends), pollutant loading and hydrodynamic modeling, and GIS-based spatial analysis. He brings a broad perspective gained from decades of statewide project implementation and regulatory interface. His work has directly supported the development of MFLs, TMDLs, RAPs, and National Pollutant Discharge Elimination System (NPDES) compliance reporting.

He is frequently engaged by public sector clients to provide technical evaluations that support regulatory decision-making, including formal interactions with FDEP to review impairment assessments, recommend revisions to the Impaired Waters Rule (IWR) database, and assess the appropriateness and sufficiency of data for regulatory inclusion.

As a certified GIS Professional, Jon also integrates geospatial analysis into his QA audits, using mapping and modeling tools to assess sampling coverage, identify spatial trends, and support defensible data interpretation. His combined expertise in monitoring design, quality control, and regulatory policy ensures that data collected under this contract will be accurate, usable, and aligned with the County's long-term environmental objectives

### *Tony Janicki, PhD*

**As-Needed Data Analysis.**

Tony serves as Technical Advisor for this contract, bringing over 48 years of expertise in aquatic ecology, water quality modeling, and environmental monitoring design. He is a leading expert in Florida on estuarine science and regulatory data analysis, with extensive experience in Charlotte Harbor and surrounding coastal systems.

Tony has helped develop Numeric Nutrient Criteria (NNC) for Charlotte Harbor, Sarasota Bay, and Tampa Bay, and has supported regional efforts such as Charlotte County One Water Project, CHNEP and the Peace River HBMP. He led the development of a hydrodynamic model for the Lower Peace River and Upper Charlotte Harbor and contributed to establishing MFLs for key waterbodies in the County's watershed. His role will focus on supporting Charlotte County's sampling design and ensuring data analysis supports long-term management and compliance goals.

### *Michael Wessel*

**As-Needed Data Analysis.**

Mike is a quantitative ecologist and statistician with 30 years of experience addressing complex natural resource management challenges involving water quality, land use, and water supply across Florida's coastal and estuarine environments. As a Technical

Advisor for Sampling Design at ESA, Mike will play a key role in guiding Charlotte County's ambient water quality monitoring efforts with scientific rigor and clarity of purpose.

Mike's core expertise lies in the empirical analysis of large hydrobiological datasets to develop protection standards and management-level thresholds aimed at preserving the integrity of aquatic ecosystems. He has worked extensively to define water quality targets and nutrient thresholds that are now codified in Florida statute, directly influencing the management of the state's most vulnerable estuaries, including those within the Charlotte Harbor watershed.

Over his career, Mike has led the creation of Comprehensive Conservation and Management Plans, Water Quality Protection Plans, and Watershed Management Plans for several estuarine systems in southwest Florida. He is currently leading efforts to develop a RAP for Biscayne Bay, aimed at setting pollutant load reduction goals and achieving designated use water quality compliance.

Mike's long-standing work with the Tampa Bay (TBEP), Sarasota Bay (SBEP), and Coastal & Heartland National (CHNEP) Estuary Programs—combined with his involvement in Charlotte Harbor fisheries conservation—demonstrates his deep familiarity with the region's estuarine ecosystems and regulatory priorities. His applied research includes designing monitoring networks, modeling fish and benthic responses to environmental drivers, and implementing advanced statistical techniques to support decision-making on issues such as TMDLs, MFLs, and hydrologic restoration.

Beyond his technical expertise, Mike brings the ability to distill complex scientific findings into concise, actionable insights. He regularly communicates technical results to natural resource managers, policy makers, public boards, and stakeholders—translating data into informed environmental management strategies. His responsibilities often include direct client coordination, oversight of analytical work, and presentation of findings at national and international conferences and in peer-reviewed publications.

Mike's depth of experience, regional knowledge, and practical scientific insight make him a critical asset to the ESA team and to the success of Charlotte County's water quality monitoring program.

### *Victoria Scriven*

**Data Manager / Field Sampling.**

Victoria is an Environmental Scientist with ESA's Aquatic Sciences program, bringing a well-rounded background in water quality monitoring, ecological data analysis, and regulatory science. As Data Manager for Charlotte County's Ambient Water Quality Monitoring Program, she will oversee the review, organization, and management of field and laboratory data to support timely, accurate, and defensible reporting to FDEP's WIN.

Her expertise includes statistical analysis, watershed assessments, and the development of stressor-response models to support environmental thresholds and management decisions. Victoria has extensive experience supporting clients with regulatory consultation under Florida's IWR and TMDL evaluations. She also contributes to field operations by applying FDEP-approved SOPs, performing equipment calibrations, and assisting with sampling logistics.

Victoria's combination of data management skills, field experience, and regulatory insight makes her well-equipped to guide the data reporting process and support the County's long-term monitoring goals.

### *Dara Krachenfels*

**Field Sampling.**

Dara is an Environmental Scientist with experience supporting large-scale surface water monitoring programs through sample collection, equipment maintenance, and field data documentation. As a Field Sampling Technician, she collects and processes water, vegetation, and soil samples in accordance with FDEP SOPs and quality control protocols. Dara is skilled in the calibration and operation of multi-parameter sondes, GPS units, and other field instrumentation, and has experience operating airboats and stern-drive vessels. She also brings proficiency in native and invasive species identification, GIS tools, and electronic field data management, making her a valuable asset to the field team.

### *Brody Beckert*

**Field Sampling.**
Brody Beckert is an Environmental Scientist supporting ESA's Southeast Biological Resources Group as a Field Sampling Technician. He brings hands-on experience conducting site investigations, including soil sampling, contamination assessment, and remediation support. Brody is familiar with environmental compliance protocols and contributes to water quality monitoring efforts through sample collection, site documentation, and logistical field support. His background in site design, maintenance, and construction provides a practical foundation for addressing field challenges and ensuring efficient data collection under a variety of conditions.

### *Andrea Ramos Almodovar*

**Field Sampling.**
Andrea serves as a Field Sampling Technician on ESA's Southeast Biological Resources team. She brings a strong background in environmental science, with experience collecting biological and water quality data across a range of ecosystems. Andrea has supported fieldwork related to wetlands, protected species, and submerged aquatic habitats, contributing to multidisciplinary projects involving water resources, infrastructure, and environmental compliance. Her technical skills in remote sensing, GIS, and ecological field methods support high-quality data collection and site documentation.

### *Dale Dixon, PhD.*

**Analytical Services Lead.**
Dr. Dale Dixon, Co-Founder and Laboratory Director of Benchmark EnviroAnalytical, Inc., will serve as the Analytical Services Lead for this contract. With over 30 years of experience in environmental laboratory management, Dr. Dixon brings deep technical expertise in organic chemistry, polymer chemistry, catalytic chemistry, and analytical chemistry—essential foundations for delivering the high-quality water quality analyses required under Charlotte County's ambient monitoring program.

As one of the founding leaders of Benchmark EA, a certified MBE and ESA's long-standing laboratory partner, Dr. Dixon has overseen the laboratory's evolution from a small, manually operated facility to a fully modernized and automated analytical operation. Under his leadership, Benchmark EA has grown to a staff of more than 30 professionals and now operates three NELAP-certified laboratories in North Port/Port Charlotte, Palmetto, and Winter Haven.

Dr. Dixon's first-hand involvement in the development of Benchmark's analytical systems makes him intimately familiar with every facet of environmental laboratory operations—from instrument selection and maintenance to data validation, reporting automation, and electronic data deliverables tailored to client systems. His team routinely produces defensible data that support regional compliance with FDEP standards, as well as TMDLs, MFLs, and RAPs.

Benchmark EA has served as the analytical engine for several of the region's largest long-term ambient water quality programs, including those in the Peace River, Tampa Bay, and Sarasota Bay watersheds, as well as the County's surface water monitoring efforts. Under Dr. Dixon's direction, Benchmark EA will continue to uphold the County's data quality expectations through strict adherence to FDEP and NELAC SOPs, robust QA/QC protocols, and timely delivery of analytical results that support informed environmental decision-making.

Dr. Dixon holds a Ph.D. in Organic Chemistry from Oregon State University and is recognized throughout the region for his commitment to scientific integrity, technological advancement, and client-focused service.

## Available Resources to Support Project Execution

ESA is equipped with the personnel, infrastructure, and technical resources necessary to fully support Charlotte County's ambient water quality monitoring program—including rapid-response capabilities for both routine and unplanned sampling events. We understand that reliable access to properly functioning field equipment, vehicles, and data systems is essential for meeting regulatory objectives and keeping project schedules on track. To that end, ESA has made significant investments to ensure the availability, redundancy, and mobility of these critical resources.

We maintain a broad inventory of field sampling equipment, including multi-parameter sondes, grab samplers, groundwater sampling tools, flow meters, velocity sensors, sediment grabs, and side-scan sonar. Field operations are supported by trailered boats, 4WD vehicles, and ATVs, strategically stationed across Florida to ensure proximity and deployment efficiency. ESA also operates drones under FAA Part 107-certified pilots and utilizes advanced GPS survey equipment, rugged field tablets and laptops, and specialized biological sampling tools such as nets and traps for fish, wildlife, and benthic macroinvertebrates.

To support seamless data acquisition and analysis, ESA staff are proficient in and licensed for platforms including ESRI ArcGIS Pro, ArcCollector, Survey123, Power BI, R-Studio, and SAS. These platforms ensure timely, quality-controlled data processing, visualization, and reporting in accordance with FDEP and NELAC protocols.

Crucially, these resources are actively deployed across our current projects, including ongoing monitoring efforts for the Peace River Manasota Regional Water Supply Authority, Dona Bay, and Yucca Pens. This ensures that our equipment is well-maintained, staff are field-ready, and our response systems are already calibrated to deliver reliable, immediate support to Charlotte County, whenever needed.

# Robert (Bob) Woithe, PhD

Principal Scientist

**EDUCATION**

PhD, Systems Ecology and Environmental Engineering Sciences, University of Florida

MS, Systems Ecology and Environmental Engineering Sciences, University of Florida

Graduate Certificate in Wetlands, University of Florida

BA, Biology, Middlebury College

**33 YEARS OF EXPERIENCE**

**PROFESSIONAL AFFILIATIONS**

Ecological Society of America

Florida Association of Environmental Professionals, Tampa and SW Florida Chapters

Florida Water Resources Association

Society of Wetland Scientists

Bob is a senior environmental scientist with 33 years of experience in large wetland and ecosystem assessment, modeling, monitoring, and data analysis projects. Bob's focus has been watershed management and environmental monitoring and assessment programs in Southeastern U.S. marine, aquatic, and terrestrial ecosystems with particular emphasis on water quality and habitat. He is lead scientist for some of the largest, non-governmental, long-term river, wetland, and estuarine monitoring and modeling programs in the region that collect, process, and analyze several million measurements a year. Bob managed the water resources and modeling group and led the headquarters office for Florida's largest engineering firm. He has been a member of the U.S. Gulf Fisheries Management Council Data Collection Advisory Panel and Coastal Migratory Pelagics Advisory Panel, the National Marine Fisheries Service SEDAR 49 and 99 panels, the Federal Emergency Management Agency Risk Index Data Analysis Working Group, the Manatee Chamber of Commerce Natural Resources Committee, the Manatee Phosphate Community Advisory Panel, and a Gulf Coast Ecosystem Restoration Council Independent Science Reviewer.

## Relevant Experience

**Charlotte County, County Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Project Manager* responsible for design and implementation of county-wide ambient surface water quality monitoring program. ESA conducts and oversees water quality field monitoring, water sample collection, laboratory analytical services, and data reduction, qualification, management and reporting. ESA also formats program-generated data for submission to the Florida Department of Environmental Protection Watershed Information Network (WIN) as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load development. The program samples over 60 locations on a monthly basis including estuarine tributaries, freshwater streams, drainage canals, and navigational canals.

**Peace River Manasota Regional Water Supply Authority (PRMRWSA), Peace River Hydrobiological Monitoring Program Continuous Recorders Element, Desoto County, FL.** *Project Manager* and *Lead Scientist* for this ongoing, 19-year continuous, water quality monitoring and assessment in the Peace River for water use permit compliance. A scientific review panel and the Southwest Florida Water Management District requested the monitoring to improve accuracy of existing statistical models by improving the data used by the models. For 19 years, the project has collected, analyzed, and interpreted continuous, salinity, temperature, dissolved oxygen, and water level data at 8 continuous recorder stations. Data were also used in support of models used to predict impacts from salinity change due to current and future river water pumping by the Peace River Facility.

**PRMRWSA, Existing Scientific-Literature Review for the Peace River Watershed and Upper Charlotte Harbor, Charlotte, Lee, DeSoto, Hardee, and Polk Counties, FL.** *Senior Scientist*. Bob reviewed and interpreted existing peer-reviewed and gray literature as well as other scientific studies regarding water quality and wildlife and their relationship to freshwater inflow on the Peace River watershed and Charlotte Harbor. The resulting document was produced to orient and familiarize the Peace River Scientific Advisory Committee members to specific conditions and patterns in the region. ¤

**PRMRWSA, Chlorophyll Transect Monitoring, DeSoto and Charlotte Counties, FL.** *Project Manager and Lead Scientist* for spatially continuous, fluorometric measurements of chlorophyll over 25 kilometers of the lower Peace River. This monitoring project used field and laboratory measurements coupled with stepwise linear regression, LASSO, and similar analyses to determine the magnitude of both temporal and spatial variability of peak zones of high productivity in the lower river/upper harbor system. Determination of the seasonal influence of changes in river flow was then used to assess any potential influence of freshwater withdrawals under the current Facility withdrawal schedule established pursuant to current minimum flows and levels criteria and determine if observed chlorophyll spatial patterns and concentrations in the Peace River were the result of variations in river flow, nutrient concentrations, water color, temperature, or other physical or chemical factors.¤

**Sarasota County, Sarasota County Pollutant Loading Model Refinement, Sarasota, FL**. *Project Manager* for $550,000 data collection and analysis project to refine Sarasota County's existing countywide pollutant loading model. Project included continuous, storm-event driven, and monthly water quality, stream flow, and rainfall monitoring and laboratory analyses, event mean concentration calculation for various land uses, rating curve development and refinement, and model calibration using newly collected data and newly calculated relationships. This project used ISCO automatic water samplers and rain gauges, SonTek and Marsh McBirney ADVs and flow sensors, and YSI water quality monitoring sondes to continuously measure multiple water quality, flow, and rainfall parameters. The project was conducted in cooperation with the Sarasota and Manatee Counties, Southwest Florida Water Management District, the Sarasota Bay and Charlotte Harbor National Estuary Programs, and Florida Department of Environmental Protection.

**City of North Port, City of North Port, Source Water Assessment Project, North Port, FL**. *Project Manager and Lead Scientist* for $390,000, 1-year, water quality and hydrologic monitoring and modeling project to assess existing source water quality and flow conditions and identify feasible habitat and water quality enhancement projects in the City of North Port's water bodies. The project collected, analyzed, and modeled water quality and flow data and conditions within City's stream and drainage systems and developed recommendations for future projects to improve the water quality and downstream nutrient loadings.

**South Florida Water Management District (SFWMD), Simulation Model Development for Everglades Stormwater Treatment Areas (STAs), Palm Beach County, FL.** *Project Manager and Lead Coordinator* for this 2020–2024 effort to develop habitat, ecological, and chemical models of the STAs that will be used to integrate key information from past and current studies. The modeling process developed mathematical relationships for various paired interactions to assess how the relationships or processes influence directly or indirectly and enhance or inhibit phosphorus removal from the water column of the STAs. This effort supported the reduction of total phosphorus concentrations in discharge water to the Everglades Protection Area and the mandate that the STAs achieve ultra-low annual outflow total phosphorous concentrations. ¤

**Tampa Bay Water, Tampa Bypass Canal (TBC) Water Quality and Phytoplankton Characterization Study. Tampa, FL.** *Project manager and lead technical professional.* Designed and conducted a year-long, 2023 to 2024, water quality characterization effort in the TBC to provide recommendations for future monitoring efforts and management actions to ensure the long-term reliability of the TBC as a drinking water source. This effort was the first comprehensive monitoring program within the TBC focused on understanding water quality variability relative to: 1.) seasonal light, temperature, and rainfall differences; 2.) inflows and residence time; and 3.) Tampa Bay Water's Regional Surface Water Treatment Plant water quality needs. This project was initially designed to assess spatial differences in TBC potential contaminant concentrations particularly in relation to stormwater. The project used water quality grab sampling and laboratory analysis for most measurements coupled with continuous monitoring of certain parameters. As TBC phytoplankton blooms began to cause operational challenges for Tampa Bay Water the phytoplankton aspect of the project was expanded to include counts, taxonomy, and cell size analysis.

# Michael Poniatowski

Environmental Scientist

**EDUCATION**

BS, Marine Science, Florida Gulf Coast University

**11 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

Florida Boating Education

American Academy of Underwater Sciences, National Association of Underwater Instructors Scuba Certified

**PROFESSIONAL AFFILIATIONS**

Central Florida/Tampa Bay/Florida/National Associations of Environmental Professionals (CFAEP/TBAEP/FAEP/ NAEP)

**AWARDS**

2020 Florida Fish and Wildlife Conservation Commission Service Award

Mike has a broad technical background to support identifying solutions for wide range of environmental considerations that impact our clients. He has strong skills and experience in the coastal marine realm, which give him a unique perspective in wetland delineation, species surveys, permitting, GIS, and the other facets of the environmental services. Prior to working for consulting firms, Mike spent 6 years at the Florida Fish and Wildlife Conservation Commission as part of the optical water quality and seagrass survival and restoration group. He currently supports the implementation of several comprehensive hydrobiological monitoring programs as well as developing innovative solutions to water quality/water quantity issues impacting estuaries, rivers, and/or springs throughout the Southeast United States.

## Relevant Experience

**Charlotte County, Charlotte County Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Lead Field Scientist.* This project supports Charlotte County in the design and implementation of an ambient water quality monitoring program. The intent of the monitoring program is water quality monitoring, water sample collection, and laboratory analytical services to support the submission of data to the Florida Department of Environmental Protection (FDEP) Watershed Information Network as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load (TMDL) development. Specifically, ESA completed field sampling and data collection, coordinating laboratory analyses, data reduction, qualification, and management; data formatting and reporting; and other activities required for initiation and continued implementation of the County's ambient water quality monitoring program. As part of this effort, Mike coordinated the collection and documentation of surface water samples within the Mid, West, and South County municipal stormwater business units.

**Charlotte County, Sunshine Lake/Sunrise Waterway Monitoring Program, Charlotte County, FL.** *Field Scientist.* The Sunshine Lake/Sunrise Waterway system, located in Greater Port Charlotte, experienced extensive and persistent algal blooms. Due to the phosphorus-rich surface geology surrounding the watershed, there is a potential that the algal bloom may recur. A monitoring program that includes quantitative criteria designed to trigger various levels of management attention was recommended as part of the water quality management plan previously developed. Mike assisted in the collection, analysis, and interpretation of water quality and benthic sampling efforts used to characterize the waterbody and watershed-derived inputs.

**Sarasota County, Source Water Quality and Quantity and Downstream Environmental Benefit Determination for Dona Bay Water Storage Facility Phase III, Venice, FL.** *Field Scientist.* Water quality sampling, water level and flow recorder installation for this 2022 to 2025 assessment of source water quality and flow reduction effects on nutrient concentrations and salinities in Cowpen Slough and Dona Bay downstream of the Dona Bay Water Storage Facility project—continuous and discrete flow and water quality monitoring and statistical assessment of flow reduction effects on nutrient concentrations and salinities in Dona Bay downstream of surface water diversion. Extensive continuous telemetered hydrologic and water quality monitoring and modeling are being conducted to quantify actual benefits as a requirement of State and RESTORE Act cooperative project funding agreements and grants. Benefits assessed include improved water quality conditions in areas where salinities are both too low and too variable to allow for the development and persistence of healthy oyster reefs and nutrient concentrations are too high. Benefits are anticipated to allow an expansion of oligohaline marsh vegetation and seagrass meadows in downstream waters.

**Charlotte County, Charlotte County Ian Response, Punta Gorda, FL.** *Field Scientist* for Charlotte Harbor water quality sampling, rapid response field sampling. ESA provided water quality profile and grab sample collection, lab analyses, data quality assurance/quality control, and uploaded to state WIN database at over 90 locations in Charlotte County, Florida.

**Tampa Bay Water, Tampa Bypass Canal/Alafia River/Desalination Plant Water Supply Facilities Hydrobiological Monitoring Program (HBMP). Tampa Bay, FL.** *Field Scientist.* The Tampa Bypass Canal, Alafia River Supply and Desalination Facilities provide critical water supplies for Tampa Bay Water's regional system. Water use permits for The Tampa Bypass Canal and Alafia River facilities issued by the Southwest Florida Water Management District (WUP No. 2011794 and 2011796) require a hydrobiological monitoring program to provide assurance that withdrawals do not adversely impact environmental resources. In addition, Tampa Bay Water implements an elective water quality and biological monitoring project to monitor the effect of desalination brine discharge on the Big Bend area of the Tampa Bay estuary. Required tasks for this contract include water quality sampling, data management, quality assurance/quality control, data analysis, statistical and mechanistic water quality modeling, evaluation of watershed changes, meetings with regulatory agencies and other stakeholders, and annual and multi-year compliance assessment and reporting. ESA staff have been supporting these comprehensive hydrobiological monitoring plans since design and inception in 1999.

**Peace River/Manasota Regional Water Supply Authority, Hydrobiological Monitoring Program Continuous Recorders Program, Charlotte and DeSoto Counties, FL.** *Field Scientist.* This project is an ongoing, continuous, water quality monitoring and assessment in the Peace River for water use permit compliance. A scientific review panel and the Southwest Florida Water Management District requested the monitoring to improve accuracy of existing statistical models by improving the data used by the models. The project collects, analyzes, and interprets continuous, salinity, temperature, dissolved oxygen, and water level data at eight continuous recorder stations. Data were also used in support of models used to predict impacts from salinity change due to current and future river water pumping by the Peace River Facility. Mike assists with the maintenance and calibration of the continuously deployed multiparameter sondes in the Peace River. Monitoring is in support of continued freshwater diversions by the Authority.

**Peace River/Manasota Regional Water Supply Authority, Peace River Regional Reservoir (PR3) Intake Siting Continuous Water Quality Monitoring, DeSoto County, FL.** *Field Scientist.* Mike supported water quality monitoring efforts for feasibility studies related to the PR3 project and a new Peace River surface water intake. When data gaps were identified during the intake siting evaluation, ESA rapidly launched a comprehensive monitoring program within a week. This included a 3-year continuous and synoptic water quality monitoring initiative to assess the tidally influenced saltwater wedge and high-conductivity flows from tributaries during low river flow conditions. ESA installed and operates both surface-floating and bottom-fixed sensors at four river locations to measure specific conductance, salinity, temperature, and depth. Additionally, synoptic sampling is conducted every 0.5 km along a 6-km stretch upstream of the current intake and into Horse Creek. The data inform the frequency and suitability of withdrawals at potential intake sites and will later serve as baseline conditions for water use permit compliance monitoring post-construction. Mike's role focused on maintaining, calibrating, and reviewing data from the deployed multiparameter sondes in the Peace River.

# Christopher T. Warn

Vice President, Regional Business Group Director

**EDUCATION**

BS, Earth Systems Science and Policy, California State University Monterey Bay

AA, Manatee Community College

**26 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

40-Hour Hazardous Waste Site Training Course, OSHA 29 CFR 1910.120(e)(3), (2000)

Authorized Gopher Tortoise Agent, #GTA-20-00019

Bloodborne Pathogens Training, OSHA 29 CFR 1910.1030, (2004)

Confined Space Entry Training, OSHA 29 CFR 1910.146, (2004)

Safe Boating Course, U.S. Coast Guard (2004)

Site Safety Officer Training (2013)

**PROFESSIONAL AFFILIATIONS**

Florida Stormwater Association

Chris is a Vice President, Regional Business Group Director with more than 26 years of experience in coastal and watershed studies, management, and restoration. He has worked throughout the nation on complex environmental projects including the emergency response to the Deepwater Horizon oil spill and subsequent natural resource damage assessment and continues to be actively involved in restoration projects funded from the oil spill fines. He has supported a wide range of environmental programs from Everglades restoration to port deepening and expansion projects. He brings experience in multiple geographies including California, Florida, and across the Gulf Coast. Chris has supported numerous state, local, port, commercial, federal, and non-governmental organizations. He has a long history supporting National Estuary Programs including Mobile Bay, Sarasota Bay, and Tampa Bay, and Coastal and Heartland National Estuary Partnership.

## Relevant Experience

**Charlotte County, Water Quality Sampling FY22-23, Punta Gorda, FL.** *Principal Scientist.* ESA was tasked with the design and implementation of the first county-wide ambient surface water quality monitoring program in Charlotte County. The intent of the program is to characterize existing surface water conditions as well as nutrient and other contaminant loads entering Charlotte County and entering the County’s major estuaries and river. ESA conducts and oversees water quality field monitoring, water sample collection, laboratory analytical services, and data reduction, qualification, management and reporting. ESA also formats program-generated data for submission to the Florida Department of Environmental Protection Watershed Information Network (WIN) as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load development. The program samples over 60 locations on a monthly basis including estuarine tributaries, freshwater streams, drainage canals, and navigational canals.

**Southwest Florida Water Management District (SWFWMD), Library of Services Support, West-Central, FL.** *Environmental Scientist.* ESA has provided coastal engineering and biological support services for numerous projects for the SWFWMD since 2018. ESA values the long running relationship with the SWFWMD and their project partners. Environmental stewardship is at the forefront of every one of their projects. ESA performs project planning through data collection and environmental assessments; and produces 30%, 60%, and 100% design plans, which include an engineer’s probable opinion of cost and development of technical specifications and bidding documents. ESA staff assists the SWFWMD with bidding their projects and vetting contractor’s bids. ESA also provides inspection, administration, and permit compliance services during construction. ESA has supported numerous successful SWFWMD projects over the life of this contract, which primarily involve resource management and habitat improvement efforts for their priority water bodies (Tampa Bay, Sarasota Bay, Charlotte Harbor, Lake Tarpon, and bays and estuaries.)

# Christopher T. Warn (Continued)

Vice President, Regional Business Group Director

**Charlotte County, Burnt Store Water Reclamation Facility Expansion, Punta Gorda, FL.** *Principal Scientist* for the environmental/natural resources evaluations and permitting associated with the purchase of a 40-acre parcel for the expansion of the existing WRF. Scope of work included wetland delineation and listed species effort, pursuant to State of Florida delineation methodologies, as well as FWC and FWS assessment/survey methodologies for red-cockaded woodpecker, Florida bonneted bat, and gopher tortoise. Permits included Formal Determination of Wetlands permit applications for FDEP, state Environmental Resource Permit (FDEP; 62-330 FAC), and federal State 404 permit (FDEP; 63-331 FAC)

**Peace River Manasota Water Supply Authority (PRMWSA), PRMRWSA HBMP, DeSoto County, FL.** *Principal Scientist* for this ongoing, continuous, water quality monitoring and assessment in the Peace River for water use permit compliance. A scientific review panel and the Southwest Florida Water Management District requested the monitoring to improve accuracy of existing statistical models by improving the data used by the models. The project collects, analyzes, and interprets continuous, salinity, temperature, dissolved oxygen, and water level data at 8 continuous recorder stations. Data were also used in support of models used to predict impacts from salinity change due to current and future river water pumping by the Peace River Facility.

**Coastal and Heartland National Estuary Partnership (CHNEP), Habitat Restoration Needs Project, Punta Gorda, FL.** *Project Manager.* Chris led a team of habitat restoration experts and GIS specialists to develop the Habitat Restoration Needs data sources and plan to guide habitat conservation, sustainability, resiliency, and connectivity throughout the CHNEP study area and, specifically to: a) refine the CHNEP habitat restoration vision for the next 50 years; b) define the CHNEP habitat restoration goals for the next 20 years; c) identify habitat restoration, conservation, and land acquisition priorities throughout the CHNEP study area needed to reach the habitat restoration vision and goals; and d) develop a strategy for easy access and regular updates to the Habitat Restoration Needs.

**Collier County, Naples Beach Nourishment Project, Naples, FL.** *Principal Scientist.* Chris provided construction monitoring services. ESA supported Collier County for the Naples Beach Nourishment Project from R-58A to R-60, which included on-site construction inspection, facilitating project coordination meetings, providing constructability reviews on design plans, coordination with the regulatory agencies, and support preparation of bidding documents in support of the County’s solicitation of the bid.

**City of Bradenton, Mineral Springs Restoration and Living Shoreline Project, North Port, FL.** *Principal Scientist.* This unique riverwalk project includes a historic natural spring feature. Chris provided field environmental services in support of the design team to assess restoration options for removal of the seawall to implement a living shoreline feature. The living shoreline provided additional shoreline protection while maintaining stormwater conveyance and blending with park amenities.

**Mobile Bay National Estuary Program (MBNEP), Science in Residence: State of Alabama’s Estuaries and Coast, Mobile, AL.** *Project Manager.* Chris supported the MBNEP to develop an updated “State of Alabama’s Estuaries and Coast” report to document the ongoing impacts of watershed development and climate change. Through a consensus-based approach, ESA coordinated with the MBNEP Scientific Advisory Committee to select indicators of environmental health and evaluate the status and trends through the compilation and analysis of data collected over the 10-year period since the MBNEP’s last State of the Bay report. The ESA Team assisted MBNEP in developing strategies to continue improving coastal resource management.

# Jeffery Winter

Lead Field Scientist

**EDUCATION**

BS, Environmental Science, University of South Florida

BA, Mass Communications, University of South Florida

**26 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

Authorized Gopher Tortoise Agent, GTA-19-00137A

BoatU.S. Foundation's Online Boating Safety Course Certification

Florida Fish and Wildlife Conservation Commission, Imperiled Beach Nesting Bird Monitor, #LSIT-24-00349

Jeff has a 26-year background in wetland ecology, water quality, biological monitoring, and jurisdictional wetland determinations. For the last 16 years he has been the lead field scientist for several large permit mandated monitoring programs resulting in the collection of millions of datapoints. Jeff is responsible for implementing Florida Department of Environmental Protection (FDEP)-approved standard operating procedures (SOP), equipment maintenance and calibration, work scheduling, and all field activities. His responsibilities have included monitoring systems using continuously deployed water quality and hydrologic sensors and recorders, as well as conducting discrete water quality collections which requires the coordination with National Environmental Laboratory Conference (NELAC) certified laboratories to ensure timely sample delivery and analysis.

## Relevant Experience

**Charlotte County, Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Environmental Scientist.* This project supports Charlotte County in the design and implementation of an ambient water quality monitoring program. The intent of the monitoring program is water quality monitoring, water sample collection, and laboratory analytical services to support the submission of data to the FDEP's Watershed Information Network as an effort to meet data sufficiency requirements for impaired surface water evaluations and Total Maximum Daily Loads (TMDL) development. Specifically, ESA is completing field sampling and data collection; coordinating laboratory analyses, data reduction, qualification, and management; data formatting and reporting; and other activities required for initiation and continued implementation of the County's ambient water quality monitoring program. As part of this effort, Jeff is supporting the collection and documentation of surface water samples within the Mid, West, and South municipal stormwater business units.

**Peace River/Manasota Regional Water Supply Authority (PRMRWSA), Peace River Regional Reservoir (PR3) Intake Siting Continuous Water Quality Monitoring, DeSoto County, FL.** *Lead Field Scientist.* Jeff coordinated with the water quality monitoring conducted in support of feasibility studies for the third PR3 and a new Peace River surface water intake. When the Authority's evaluation of siting and operation options for a new Peace River surface water intake identified data gaps, ESA responded quickly. Less than a week after the data gap was identified, ESA implemented a 3-year continuous and a broad spatial coverage synoptic water quality monitoring program in support of siting evaluation. The monitoring programs document characteristics of a tidally influenced saltwater wedge that enters the bottom depths of the Peace River channel upstream of the current Peace River Facility intake under certain conditions and high conductivity water flowing downstream from Horse Creek, Joshua Creek, and other Peace River tributaries during low river flow conditions. ESA constructed, installed, and operates surface-floating and bottom-fixed depth continuous specific conductance, salinity, temperature, and depth recorders at four locations on the river. ESA also conducts synoptic water column profile sampling at half-kilometer distances from the current Authority withdrawal point 6 kilometers up the Peace River and into Horse Creek. Data collected are being used to determine the relative frequency and volumes at which river flow rates and river water quality conditions would be suitable for to withdrawals at various potential intake site locations. The data will later be used baseline conditions for water use permit reasonable assurance monitoring after construction of the new intake and PR3 reservoir.

**PRMRWSA, Hydrobiological Monitoring Program Continuous Recorders Program, Charlotte and DeSoto Counties, FL.** *Lead Field Scientist.* This project is an ongoing, 19-year continuous, water quality monitoring and assessment in the Peace River for water-use permit compliance. A scientific review panel and SWFWMD requested the monitoring to improve accuracy of existing statistical models by improving the data used by the models. The project collects, analyzes, and interprets continuous, salinity, temperature, dissolved oxygen, and water level data at eight continuous recorder stations. Data were also used in support of models used to predict impacts from salinity change due to current and future river water pumping by the Peace River Facility. Jeff has been responsible for water quality monitoring through the use of continuously deployed multiparameter sondes in the Peace River. Monitoring is in support of continued freshwater diversions by the Authority.

**City of Lakeland, Tenoroc Fish Management Area (TFMA) Pond Water Quality Characterization, Lakeland, FL.** *Project Manager* and *Senior Environmental Scientist.* The City of Lakeland, with support from ESA, has engaged the Florida Fish and Wildlife Conservation Commission (FWC) staff responsible for management of the TFMA in an effort to explore the ability to integrate the western portion of the TFMA and undeveloped COL property adjacent to Lake Parker, to assimilate nutrients from Lake Parker. Prior to refining an integrated effort, the implementation of a short-term investigative water quality monitoring program was identified to supplement the limited water quality data. The TFMA ponds are subjected to potentially elevated phosphorus concentrations due to the innate geology of the area, which could result in poor water quality conditions (i.e., elevated phytoplankton production). This project focuses on the coordination and collection of supplemental water quality and sediment data to characterize and assess the viability of incorporating the TFMA into the water quality restoration plan for Lake Parker. The surface water quality and sediment characterization of a subset of the TFMA ponds will be completed as part of this project. Jeff ensures that all equipment is maintained and calibrated appropriately and oversees sample collection implementing appropriate standard operating procedure. This project is underway.

**TBW, Hydrobiological Monitoring Program for the Alafia, Palm, and Hillsborough Rivers, Hillsborough County, FL.** *Lead Field Scientist* for this $19 million, 24-year, water quality, hydrologic, and biological monitoring effort to determine natural resource damages and other effect of freshwater withdrawals on the Tampa Bay estuary. Jeff implemented the monitoring efforts to successfully identify the effects of Tampa Bay Water operations on Tampa Bay estuarine resources and verify whether these effects constituted significant harm. The project collected, analyzed, modeled, and interpreted field hydrologic, water chemistry, benthic macroinvertebrate, adult, and juvenile fish, ichthyoplankton, phytoplankton, water dependent bird, seagrass, hard bottom, and wetland vegetation data. This project collected most of the field data used in determining minimum flows and levels for the Lower Alafia River, the Lower Hillsborough River, the Palm River/Tampa Bypass Canal, and Sulphur Springs. In addition to implementing the extensive water quality field component of this project, Jeff implemented water-dependent bird count surveys at migratory winter grounds and rookeries in the study area. Jeff also implemented a special study to investigate relationships between benthic invertebrate prey and wading bird predators to be evaluated as a potential indirect measure of potential environmental changes associated with freshwater withdrawals.

# Wes Henriquez, GISP

GIS Specialist

**EDUCATION**

BS, Geography, Florida State University

**19 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

Certified Geographic Information Systems Professional (#20940), renewed until 2025

Graduate Certificate in GIS, University of South Florida, Tampa, FL, May 2009

Federal Aviation Administration Part 107 Remote Pilot, September 2019 (4308423), renewed in 2021

**PROFESSIONAL AFFILIATIONS**

Florida Stormwater Association (FSA)

Seven Hills Regional User Group (SHRUG)

South Central Arc User Group (SCAUG)

Tampa Bay GIS User Group (TBGIS)

Wes is a results-oriented geospatial analyst with 19 years of experience providing technical expertise to both public and private sector clients in diverse team environments. Based in Florida and focused on applying geospatial technologies to ecological and environmental challenges within the Southeastern U.S., Wes offers a comprehensive skillset encompassing expert proficiency in the Esri ArcGIS platform (ArcGIS Pro, ArcGIS Online, Survey123, Field Maps); database design and data management solutions; data conversions; complex geospatial analysis; statistical analysis; cartographic design and map production; GPS and mobile data collection (including RTK and Z-level capabilities); application development; web mapping and dashboard creation; custom programming for web-based ArcGIS server applications; enterprise GIS implementation; quality assurance and control procedures; big data analysis; automation script development; remote sensing; photogrammetry; and unmanned aerial vehicle (UAV) services, backed by extensive commercial drone flight experience exceeding 50 flights.

## Relevant Experience

**Sarasota County, Sourcewater Quality and Quantity and Downstream Environmental Benefit Determination for Dona Bay Water Storage Facility Phase III, Venice, FL.** *GIS Lead.* Supported mobile data collection efforts for environmental permitting, data creation, and/or cartographic figure production. ESA led a multi-year assessment of source water quality and flow reduction impacts in Cowpen Slough and Dona Bay, supporting the Dona Bay Water Storage Facility project. The work involved continuous and discrete monitoring, along with statistical analysis, to evaluate how reduced flows affect nutrient concentrations and salinity levels downstream of surface water diversions. Extensive telemetered monitoring and modeling were conducted to meet State and RESTORE Act funding requirements. The project aims to improve water quality, enhance conditions for oyster reef development, and support the expansion of oligohaline marsh and seagrass habitats by stabilizing salinity and reducing nutrient loads.

**Charlotte County, County Ambient Water Quality Monitoring Program, Charlotte County, FL.** *GIS Lead.* Supporting mobile data collection efforts for environmental permitting, data creation, and/or cartographic figure production. ESA was tasked with the design and implementation of the first county-wide ambient surface water quality monitoring program in Charlotte County. The intent of the program is to characterize existing surface water conditions as well as nutrient and other contaminant loads entering Charlotte County and entering the County's major estuaries and river. ESA conducts and oversees water quality field monitoring, water sample collection, laboratory analytical services, and data reduction, qualification, management and reporting. ESA also formats program-generated data for submission to the Florida Department of Environmental Protection Watershed Information Network (WIN) as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load development. The program samples over 60 locations on a monthly basis including estuarine tributaries, freshwater streams, drainage canals, and navigational canals.

**Charlotte Harbor HEM Update – Charlotte County, FL.** *GIS Lead.* Contributed to GIS analysis and the development of mobile field data collection applications, planning and executing field visits to collect elevation data using RTK. This elevation data was utilized for land use spot checks. Assisted ESA in identifying the projected effects of climate change on habitat quality and connectivity, assessing opportunities for habitat retreat. This work supports CHNEP and its partners in both short- and long-term climate change resiliency planning. Additionally, developed a habitat evolution model for ecological forecasting, which focuses on projecting changes in land use and climate, anticipating climate change impacts on wetland conditions, and identifying opportunities for habitat retreat, restoration, and enhancement to facilitate wetland migration. This model guides project planning in the Charlotte Harbor NEP Study Area.

**Tampa Bay Water, Alafia Watershed Land Use and Discharges, Tampa, FL.** *GIS Lead.* Tampa Bay Water developed and implemented a comprehensive Source Water Assessment and Protection Program (SWAPP) to help maintain water quality and quantity for the region's drinking water supply sources. SWAPP components include water quality monitoring, evaluation of potential contaminant sources, land use and watershed change tracking/assessment, evaluation of treatment barriers, technical stakeholder coordination, development of focused source water protection plans, and other activities. ESA assisted Tampa Bay Water with the ongoing assessment of Alafia River watershed conditions and stressors, including land use changes and associated pollutant discharges, and the potential impacts of these stressors on current and future source water quality. Under a Task Assignment, applicable data sources were inventoried and reviewed, and relevant numeric and geospatial data were compiled and summarized. The geospatial data were compiled and incorporated into an Integrated Geospatial Data Model of the Alafia River watershed developed using Esri software and provided to Tampa Bay Water as a packaged ArcGIS Pro Project, and a packaged ArcMap Project. This GIS data model will support the ongoing SWAPP inventory and tracking of potential contaminant sources in the Alafia River watershed, and the associated potential hazards and risks to the Alafia River source water supply.

**Tampa Bay Water, Alafia River and Tampa Bypass Canal Hydrobiological Monitoring Program, Hillsborough County, FL.** *GIS Lead.* Wes provided GIS analysis for this $19 million, two-decade, water quality, hydrologic, and biological monitoring effort to assess potential impacts from river water withdrawals on the Tampa Bay estuary and its major tributaries. This project successfully identified the effects of Tampa Bay Water operations on Tampa Bay estuarine resources and verified whether these effects constituted significant harm. The project collected, analyzed, and interpreted field hydrologic, water chemistry, benthic macroinvertebrate, adult and juvenile fish, ichthyoplankton, phytoplankton, water dependent bird, seagrass, and wetland vegetation data. This project also collected most of the field data used in determining minimum flows and levels for the Lower Alafia River, the Lower Hillsborough River, the Palm River/Tampa Bypass Canal, and Sulphur Springs. The Tampa Bay Desalination Facility Hydrobiological Monitoring Program (which began in 2003) was added to the most recent contract assignment.

**City of Bradenton, Bradenton Riverwalk Oyster Habitat Restoration Permitting, North Port, FL.** *GIS Lead.* Supported mobile data collection efforts for environmental permitting, data creation, and/or cartographic figure production.

**City of Bradenton Beach, Bradenton Beach Bay Drive South Adaptation Project (Living Shoreline), Bradenton Beach, FL.** *GIS Analyst* throughout life cycle of living shoreline projects. Wes developed mobile data collection system using Esri field maps to collect RTK elevation data to incorporate into hydrologic models.

# Kristin Jenkins

Principal Environmental Scientist

**EDUCATION**

MS, Marine Science (Fisheries), The College of William and Mary

BS, Zoology, Michigan State University

**23 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

Florida Fish and Wildlife Conservation Commission (FWC) Imperiled Beach Nesting Bird Monitor, #LSIT-24-00344

SAS9 Base Programmer Certification

Kristin has 23 years of experience collecting and analyzing hydrobiological data (hydrology, biology, water quality) from estuaries throughout Florida. Her areas of expertise include implementation of monitoring programs, watershed assessments (status and trends), data management and analysis, and fisheries biology. In addition to her roles in large hydrobiological monitoring programs in estuaries of Southwest Florida, Kristin has worked in estuarine systems around the state, with focus on the evaluation of total maximum daily loads (TMDLs), analyses of status and trends of water quality and water quantity, minimum flows and levels (MFLs) development, and the effects of altered hydrology on estuarine systems.

## Relevant Experience

**Charlotte County, Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Data Management.* This project supports Charlotte County in the design and implementation of an ambient water quality monitoring program. The intent of the monitoring program is water quality monitoring, water sample collection, and laboratory analytical services to support the submission of data to the Florida Department of Environmental Protection Watershed Information Network (WIN) as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load (TMDL) development. Specifically, ESA is completing field sampling and data collection, coordinating laboratory analyses, data reduction, qualification, and management; data formatting and reporting; and other activities required for initiation and continued implementation of the County's ambient water quality monitoring program. As part of this effort, Kristin provides data QA/QC and formats and uploads collected data to WIN.

**Tampa Bay Water, Assessment of Changes in Watershed, River and Bay Conditions on Water Quality in Hydrobiological Monitoring Program (HBMP) Monitoring Areas, Tampa Bay, FL.** *Scientist.* Kristin performed data compilation and analyses and produced the technical report for this project, which was designed to assess the effects of various drivers on salinity and water quality in HBMP monitoring areas in the Tampa Bay estuary, and potential impacts on HBMP compliance. External drivers considered for this study were both naturally occurring and anthropogenically influenced, and included rainfall and freshwater flow, hydrologic modifications (e.g., withdrawals and diversions), land use and nonpoint source discharges, point source discharges, physical modifications (e.g., dredge and fill), and water quality in Tampa Bay.

**Tampa Bay Water, Tampa Bypass Canal/Alafia River HBMP, Tampa Bay, FL.** Kristin has served *as Scientist, Quality Assurance/Quality Control (QA/QC) Officer,* and *Project Manager* for this program that involves water quality and hydrologic and biological monitoring to determine the effect of freshwater withdrawals on Tampa Bay. Her responsibilities include integration and management of physical, chemical, and biological data from multiple sources; creation and adaptation of automated QA/QC programs; statistical data analysis with SAS software; and preparation of monitoring reports and other technical documents.

**Sarasota Bay Estuary Program (SBEP), Sarasota Bay Water Quality Assessment and Strategy, Sarasota, FL.** *Scientist.* This project was initiated to assist SBEP and its partners in understanding the underlying causes of observed increases in nutrients in their estuarine waterbodies. Understanding drivers of these increases and relationships to the assimilative capacity of these systems were identified as important first steps in identifying protective and timely potential remedial actions. Kristin's responsibilities included the summarization of existing biological data, assisting with the evaluation of water quality status and trends, and production of a technical report detailing data acquisition and synthesis for water quality, biological, and various regulatory-related information including TMDLs.

**City of St. Petersburg, Water Quality Report Card, St. Petersburg, FL.** *Scientist.* Kristin has served as lead author for multiple years on an annual report to address the City's MS4 NPDES permit requirement for FDEP. The annual report includes a dashboard-style Report Card and summarizes the City's water quality monitoring program as well as insights to the status and trends in water quality as they pertain to environmental health and human health.

**Peace River Manasota Regional Water Supply Authority, HBMP, Charlotte, DeSoto, Manatee, and Sarasota Counties, FL.** *Scientist.* As part of this program, which involves water quality and hydrologic and biological monitoring to assess the effect of freshwater withdrawals by the water supply authority, Kristin has been responsible for data collection, data management and analysis, and report writing. Additionally, she is responsible for performing QA/QC of HBMP data, formatting the data to specified standards, and loading the data to Florida STORET/WIN.

**Peace River Manasota Regional Water Supply Authority, Technical Support for Peace River Facility Water Use Permit (WUP) Renewal and Modification, Charlotte, DeSoto, Manatee, and Sarasota Counties, FL.** *Scientist.* Kristin provided data analysis and produced a technical report and sampling program plan in support of the Authority's WUP renewal and modification application. Available fisheries and associated water quality and hydrologic data for Charlotte Harbor were analyzed with respect to their spatial and temporal variation and the degree to which the variation on the data may be related to diversion from the Peace River by the Authority.

**Florida Department of Environmental Protection (FDEP), TMDL Support Services for Sarasota County, FL.** *Scientist.* Kristin was responsible for reviewing and synthesizing water quality data to evaluate status and trends of water quality conditions in Sarasota County surface waters. The purpose of this project was to provide technical support to FDEP with regard to the evaluation of existing TMDLs and the development of defensible TMDLs and BMAPs for Sarasota County surface waters.

**Pinellas County, Curlew Creek/Smith Bayou Watershed Management Plan, Pinellas County, FL.** *Scientist.* Kristin was key personnel for the development of a surface water resource assessment for the Curlew Creek and Smith Bayou Watershed Evaluation and Management Plan for Pinellas County. Her efforts included an overview of the regulatory status of Curlew Creek and Smith Bayou, identification of long-term trends in water quality, analysis of relationships between various water quality constituents, and a summary of water quality in each waterbody.

**Pinellas County, Surface Water Resource Assessment, Pinellas County, FL.** *Scientist.* Kristin was key personnel for the development of a surface water resource assessment for the Curlew Creek and Smith Bayou Watershed Evaluation and Management Plan for Pinellas County. Her efforts included an overview of the regulatory status of Curlew Creek and Smith Bayou, identification of long-term trends in water quality, analysis of relationships between various water quality parameters and a summary of water quality in each waterbody in the watershed.

# Jon Perry, GISP

Principal Environmental Scientist

**EDUCATION**

Graduate Certificate, Geographic Information Systems, University of South Florida

BS, Earth Science, Norwich University

**30 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

Certified Geographic Information Systems Professional, #58956

FDEP Qualified Stormwater Management Inspector, #8899

**SPECIALIZED EXPERIENCE**

EFDC Hydrodynamic and Water Quality Models

GIS

HEC-GeoRAS

Microsoft Products

SAS

SIMPLE Model

Jon has more than 30 years of experience collecting and analyzing the physical, chemical, and biological properties of aquatic systems throughout Florida. His areas of expertise include monitoring design, watershed assessment (status and trends), pollutant loading and hydrodynamic modeling, and geographic information system technology. He has regulatory experience with developing Minimum Flows and Levels (MFLs), Total Maximum Daily Loads (TMDLs), Reasonable Assurance Plan development, and National Pollution Discharge Elimination Systems (NPDES) reporting. His principal responsibilities are focused on providing clients with technical analysis to aid decision making.

## Relevant Experience

**Sarasota Bay Estuary Program (SBEP), Sarasota Bay Water Quality Assessment and Strategy, Sarasota County, FL.** *Water Quality Specialist/Modeler.* SBEP was interested in initiating efforts to address pending impairment listings for its estuarine waterbodies for nutrients and chlorophyll a. Tasks included convening a water quality consortium consisting of local stakeholders, the acquisition of existing data, estimating pollutant loads, and determining estuarine responses related to pollutant loads and estuarine water quality. Jon was responsible with the compilation of the water quality database and with updating the SBEP SIMPLE pollutant loading model to create a 20-year record of monthly loading estimates. Loadings were estimated for a variety of sources: direct runoff, baseflow, point sources, accidental releases (sewer spills), septic system, reclaimed water irrigation, and atmospheric deposition. The reclaimed water irrigation module built upon the original irrigation module, which now accounts for actual volumes and concentrations delivered to reclaimed customers. Subsequent phases of this project will lead to the development of a reasonable assurance plan for the SBEP estuaries.

**Sarasota County, Sarasota Bay Watershed Management Plan Best Management Practices Analysis, Sarasota County, FL.** *Water Quality Specialist/Modeler.* As a member of the team developing the Sarasota Bay Watershed Management Plan, ESA (formerly Janicki Environmental) provided water quality and pollutant load modeling assistance as part of the Best Management Practices Analysis. Jon was responsible for the collection, cataloging, and analysis of the available water quality data and the implementation of the Spatially Integrated Model for Pollutant Loading Estimates (SIMPLE) pollutant loading model developed for Sarasota County. The implementation included estimating loads, establishing loading targets, and the identifying of stormwater pollutant “hotspots.” The project provided Sarasota County a menu of projects that could be implemented to reduce the quantity and quality of stormwater runoff contributing to flooding and water quality impairments.

**City of Cape Coral, Permitting Assistance Regarding the South Spreader Canal, Cape Coral, FL.** *Water Quality Specialist.* Jon provided technical support in the development of the Environmental Fluid Dynamics Code (EFDC) hydrodynamic model used to support the permit application for the removal of the Chiquita Lock on the city's South Spreader Canal. Jon assisted the City staff in gathering the necessary hydrologic data used in the calibration of the model. He gathered, performed the necessary quality assurance/quality control activities, and formatted the water quality, meteorological, and hydrologic data used to drive the EFDC model. He also conducted the water quality analysis, particularly as it relates to the Caloosahatchee Total Maximum Daily Load.

**Coastal Heartland and National Estuary Partnership and Sarasota Bay Estuary Program, Development of Estuarine Numeric Nutrient Criteria (NNC) for Sarasota Bay and Charlotte Harbor, FL.** *Water Quality Specialist – Review of Methodology, Review of Criteria.* This project resulted in proposed estuarine NNC for the individual bay segments of Charlotte Harbor and Sarasota Bay. Analyses included evaluations of stressor-response relationships between loadings, water quality conditions, and seagrass extents; and selection of the most appropriate methodology for establishing water quality targets. The proposed NNC resulting from these projects were adopted by rule by Florida Department of Environmental Protection (FDEP). Jon was a member of the technical advisory committees of both estuary programs during the development of these efforts providing data, quality assurance/quality control, and technical review. Also, during this statewide effort to develop NNC, his review of the proposed stream criteria led to the correction of FDEP and United States Environmental Protection Agency nutrient regions.

**Collier County, Surface Water Quality Annual Assessment and Trend Report, Collier County, FL.** *Project Manager (Second and Third Iteration).* Jon was the project manager for second and third iterations, which involved the analysis of a 25-year water quality dataset to summarize existing conditions in the County's surface waters. Analyses included presentation of spatial and temporal trends in water quality. Nutrient load estimates were prepared using empirical water quality and flow data. Changes in water quality and loads were compared to land use and climatological events to determine the driver of change.

**City of St. Petersburg, 2021 Water Quality Report Card, National Pollutant Discharge Elimination System Report Card, and Normalized Loads, St. Petersburg, FL.** *Water Quality/Regulatory Specialist.* Jon supported the execution of this project, which ESA is completing for the City as a subcontractor. The work effort included development of pollutant loads from the City for the 2017–2021 period and included the results of non-parametric temporal trend analyses on water quality data. The 2021 Water Quality Report Card was completed, to include detailed information and relevant discussion for the City's Ambient Water Quality Monitoring Program. The report card included a color-coded grading system to categorize water quality relative to state regulatory and site-specific management thresholds.

**Brevard County, Indian River Lagoon (IRL) Total Maximum Daily Load (TMDL) Revision, Brevard County, FL.** *Water Quality Specialist – Seagrass Target Revisions, Nutrient Loading Target Development.* As a subcontractor, ESA (formerly Janicki Environmental) assisted in the update and revision of the TMDLs for the water body segments within the IRL. The initial phase of this project included data compilation, assessment, and TMDL approach development. Using the data compiled and following the approach, the objective of the second phase was determination of targets and assimilative capacity for the IRL and development of TMDL load reductions. ESA (formerly Janicki Environmental) worked closely with stakeholders and the Florida Department of Environmental Protection in development of the approach for TMDL revision, and provided extensive evaluation of empirical relationships between loadings, water quality, and seagrass. Jon's responsibilities included developing of seagrass targets and the evaluation of empirical relationships between loadings and water quality and seagrass responses.

# Anthony (Tony) Janicki, PhD

Senior Principal Environmental Scientist

**EDUCATION**

PhD, Biology, West Virginia University

MS, Biology, West Virginia University

BS, General Science, Gannon University

**50 YEARS OF EXPERIENCE**

**PROFESSIONAL AFFILIATIONS**

American Rivers

American Society of Limnology and Oceanography

American Water Resources Association

Coastal and Estuarine Research Federation

Estuarine Research Federation

Florida Stormwater Association

International Society of Limnology

North American Benthological Society

North American Lake Management Society

Tony's expertise is recognized in the areas of aquatic ecology, water quality modeling and assessments, monitoring program design, limnology, estuarine ecology, and biological assessments. ESA has been heavily involved in water quality issues related to Florida's Impaired Water Rule, Total Maximum Daily Loads (TMDLs), Minimum Flows and Levels (MFLs), and Basin Management Action Plans. Tony's clients include Tampa Bay Water, the Tampa Bay and Sarasota Bay Estuary Programs, Coastal and Heartland National Estuary Partnership (formerly the Charlotte Harbor National Estuary Program), the Florida Department of Environmental Protection, and the Southwest Florida, South Florida, St. Johns River, Suwannee River, and Northwest Florida water management districts. Tony has provided water use permitting support for Tampa Bay Water since the early 2000s and has directed MFL development and evaluation efforts for all five water management districts. He has worked with a number of local government agencies to develop watershed management plans and to address alternative water supply and TMDL issues. Tony has more than 50 years of experience and has a well-respected understanding of management issues facing municipalities, counties, and water management districts.

## Relevant Experience

**Coastal and Heartland National Estuary Partnership (CHNEP), Develop Pollutant Loading Estimates and Water Quality and Seagrass Targets, Charlotte County, FL.** *Project Director.* Tony directed this project related to establishing management level environmental targets for the CHNEP to address the goals and priorities set forth in its Comprehensive Conservation and Management Plan. The project involved several technical support tasks including the managed a multi-firm effort to develop a comprehensive suite of mechanistic and stochastic models to evaluate the effects of potential management actions to improve water quality, sediment characteristics, and expand seagrass coverage in Old Tampa Bay. The models include watershed loading, hydrodynamics, water quality responses, and ecological responses. These models were used to evaluate a series of management actions to address issues regarding seagrass recovery and muck accumulation.

**Peace River Manasota Regional Water Supply Authority (PRMRWSA), General Environmental Services, Charlotte, DeSoto, Manatee, and Sarasota Counties, FL.** *Project Manager.* This contract provides as-needed support to the Peace River Manasota Regional Water Supply Authority (Authority) to provide scientific review, analysis, and data management and quality control for hydrological and ecological data collected by the Authority's Hydrobiological Monitoring Program (HBMP). The HBMP is designed to assess potential impacts of permitted freshwater withdrawals by the Authority on the Lower Peace River/Upper Charlotte Harbor estuarine system. Through a series of work orders, Janicki Environmental, Inc. has assessed stage, flow, withdrawal quantity, and water quality data collected by the Authority and other entities. Annual data reports as well as multi-year interpretive reports provide the technical documentation of these data analyses. Analyses include: 1) status and trends in regional rainfall and flows, and Authority withdrawals, 2) status and trends in hydrobiological water quality indicators, 3) assessment of the influence of long-term and periodic change in upstream watershed water quality and potential influences of Authority water supply, 3) assessment of the influences of increasing conductivity on the Lower Peace River watershed, 4) assessment of salinity/flow/withdrawal relationships, 5) use of empirical salinity models to assess the effectiveness of the Authority's withdrawal schedule for preventing impacts to natural resources of the Lower Peace River/Upper Charlotte Harbor estuary, and 6) evaluation of the presence or absence of adverse impacts and appropriate indicators. Additional work orders under this contract have funded the formatting of HBMP data to specified standards and uploading the data to Florida STORET, coordinating between the Authority and the Florida Department of Environmental Protection.

**Peace River Manasota Regional Water Supply Authority, Technical Support for Water Use Permit Renewal and Modification, FL.** *Project Director.* Tony directed data analysis, reporting, and sampling program plan in support of the Authority's Water Use Permit renewal and modification application. Available fisheries and associated water quality and hydrologic data for Charlotte Harbor were analyzed with respect to their spatial and temporal variation and the degree to which the variation on the data may be related to diversion from the Peace River by the Authority.

**City of St. Petersburg, 2021 Water Quality Report Card, National Pollutant Discharge Elimination System Report Card, and Normalized Loads, St. Petersburg, FL.** *Project Director.* Tony is overseeing the execution of this project, which ESA is completing for the City as a subcontractor. The work effort includes development of pollutant loads from the City for the 2017–2021 period and include the results of non-parametric temporal trend analyses on water quality data. The 2021 Water Quality Report Card will also be completed, to include detailed information and relevant discussion for the City's Ambient Water Quality Monitoring Program. The report card includes a color-coded grading system to categorize water quality relative to state regulatory and site-specific management thresholds.

**City of St. Petersburg, Review and Comment on Proposed Verified List and Proposed Total Maximum Daily Loads (TMDLs) for Clam Bayou Waterbody Identification Numbers (WBIDs), St. Petersburg, FL.** *Project Manager.* A review of the proposed United States Environmental Protection Agency TMDLs for Clam Bayou WBIDs was completed, including WBID characterization, summary of the draft TMDLs, data review, evaluation of dissolved oxygen (DO) with respect to the Florida Department of Environmental Protection–proposed revised DO criteria, and recommendations for paths forward on the TMDLs. Tony served as the project manager, providing oversight and communicating with regulatory agencies.

**Hillsborough County, City of Tampa, Florida Department of Transportation, Tampa Bay Water, McKay Bay Determination of Revised Total Maximum Daily Load (TMDL) Development, FL.** *Project Director.* Tony contributed to the development of the revised TMDLs for these systems, based on an Environmental Fluid Dynamics Code (EFDC) hydrodynamic model and Water Quality Analysis Simulation Program (WASP) water quality model of the McKay Bay/Ybor City Drain/Palm River system. This model was developed in response to a proposed United States Environmental Protection Agency TMDL. The project also included determination of appropriate endpoints for dissolved oxygen and chlorophyll. EFDC hydrodynamic output was used as input to the WASP water quality model. The model was used to develop TMDL load reductions, and to set the currently existing EPA TMDL.

**Brevard County, Indian River Lagoon Total Maximum Daily Load (TMDL) Revision, Brevard County, FL.** *Project Director.* ESA worked with a group of stakeholders in the Indian River and Banana River Lagoons in assessing the scientific merit of TMDLs established for the Northern portion of the Indian River Lagoon system. Tony attended Basin Management Action Plan (BMAP) meetings to provide consultation to stakeholders on the validity of the current science used in establishing the TMDLs and provided recommendations for further analysis that should be conducted prior to adopting memoranda of agreement as part of the BMAP process. ESA conducted additional analytical work including development of refined pollutant loading estimates for the watershed and developing stressor-response models relating pollutant loadings to ecological endpoints in estuarine waters.

# Michael Wessel

Senior Principal Environmental Scientist

**EDUCATION**

MS, Biostatistics, University of South Florida • BS, Marine Biology, University of North Carolina – Wilmington

**30 YEARS OF EXPERIENCE**

**AREAS OF SPECIALIZATION**

***Statistical Analysis***

- Multiple Linear Regression
- Generalized Additive Models
- Generalized Linear Mixed Models
- Time Series Analysis
- Bootstrapping
- Monte Carlo Simulation
- Power Analysis
- Sampling Design

***Natural Resource Management***

- Clean Water Act
- Impaired Waters Rule
- Minimum Flows and Levels
- Program Optimization
- Reasonable Assurance Plans
- Total Maximum Daily Loads
- Watershed Planning

**PROFESSIONAL AFFILIATIONS**

American Water Resources Association

Coastal and Estuarine Research Federation

Ecological Indicators (Reviewer)

Florida Stormwater Association

North American Lake Management Society

River Research and Applications (Reviewer)

Mike is a quantitative ecologist and statistician with 30 years of experience working on complex natural resource management issues related to land use, water quality, and water supply. Mike specializes in the application of empirical data analysis to derive protection standards, and management-level targets and thresholds to protect valued ecosystem resources from water quality degradation, principally in estuarine environments. Mike has developed regulatory thresholds currently codified in Florida statute to protect southwest coastal estuaries from nutrient pollution; developed Comprehensive Conservation and Management Plans, Water Quality Protection Plans, and Watershed Management Plans for several coastal estuaries; and is currently working to establish a Reasonable Assurance Plan for Biscayne Bay to set pollutant load reduction goals to achieve water quality compliance with the Bay's designated Use. Mike's success as an environmental consultant is due to a combination of technical expertise and ability to communicate complex scientific subject matter in a concise and informative manner to natural resource managers, policy makers, and the lay public. Mike's responsibilities typically include serving as primary point of contact for clients; developing proposals, scopes, and budgets; conducting and overseeing data analysis with an emphasis on deriving solutions based on best available information; and presenting results to clients, management and policy boards, national and international conferences, and in peer-reviewed journals.

## Relevant Experience

**Sarasota Bay Estuary Program, Sarasota Bay Water Quality Assessment and Strategy, Sarasota County, FL.** *Project Manager.* Mike completed a project for the Sarasota Bay Estuary Program (SBEP) to update water quality assessments with respect to regulatory thresholds and update a pollutant loading models as first steps towards developing a Reasonable Assurance plan for SBEP estuarine waterbodies in need of pollutant load reductions. The model was specifically customized to include calculations of inorganic forms of nutrients to evaluate the effects of anthropogenic sources of nutrients in the watershed and partitioned to allow for simulations of nutrient load reductions from individual sources such as septics and reclaimed water irrigation as well as non-point sources runoff and atmospheric deposition. These results will be used to maximize cost effectiveness of future projects to reduce pollutant loads in the watershed of these nationally important estuarine waters.

**Sarasota Bay Estuary Program (SBEP), Tidal Creeks Numeric Nutrient Study, Sarasota, FL.** *Project Manager.* Mike served as principal investigator of two studies funded by the United States Environmental Protection Agency to recommend management-level nutrient concentration targets and thresholds protective of the biological integrity of Southwest Florida tidal creeks. The projects were managed by SBEP. The study highlighted the importance of tidal creeks as critical habitats for juvenile estuarine dependent sportfish and their prey and developed a water quality assessment framework to evaluate tidal creek water quality in the context of management-level targets and thresholds and contributing freshwater regulatory criteria. Michael was responsible for all aspects of the study including developing conceptual models to formulate the study hypotheses, developing a creek classification and selection process, designing a sampling scheme, and analyzing the collected data to make recommendation on protective targets and thresholds for all 306 tidal creeks in Southwest Florida. The study informed local natural resource managers and state and federal regulators on the dynamics between creek watershed inputs, instream processes, and biological responses indicative of the optimal biological integrity for estuarine dependent fish communities inhabiting Southwest Florida tidal creeks. Results of this effort were recently published in Estuaries and Coasts as a management applications paper (Wessel et al. 2021).

**Pinellas County, Curlew Creek/Smith Bayou Watershed Management Plan (WMP), Pinellas County, FL.** *Water Quality Data Analyst and QA/QC.* Assisted with development of the Surface Water Resource Assessment for the WMP, compiled existing water quality data from the Impaired Waters Rule database and the City of Dunedin, along with precipitation and flow data from USGS. Used water quality data to complete the waterbody assessments, directing completion of trend analyses for key parameters identified along with any relationships between nutrients and chlorophyll-a. We implemented the SIMPLE pollutant model to identify polluting loading “hot spots.” The information was synthesized to aid in identifying areas in need of load reduction BMPs.

**City of St. Petersburg, Water Quality Report Card and Trends, St. Petersburg, FL.** *Data Analyst.* Provided updates to the City’s water quality report card by conducting time series trend analysis on water quality data through June 2018. The trend tests provide information on changes in water quality on an individual and combined monitoring site basis.

**Tampa Bay Stakeholders, Total Maximum Daily Load (TMDL) Support, FL.** *Senior Scientist.* ESA worked with a group of stakeholders including Florida Department of Transportation (FDOT), Hillsborough County, Polk County, Pinellas County, the City of Tampa, and the City of St. Petersburg in a formal review of a group of TMDLs proposed by the Florida Department of Environmental Protection (FDEP) and the United States Environmental Protection Agency (EPA) including over 20 tidal tributaries to Tampa Bay. Mike's responsibility for this project was the review of scientific evidence used to establish the cause and effect relationships reported in the TMDLs and the resulting allocations associated with pollutant load reduction requirements to meet the TMDL.

**Tampa Bay Water, Technical Support for Hydro-Biological Monitoring Program (HBMP), Clearwater, FL.** *Principal Analyst.* Mike has been a principal analyst supporting the Tampa Bay Water HBMP since 2004. Mike has applied sophisticated analytical techniques including time series analysis, neural network analysis, general linear models, generalized linear models, classification trees, parametric and non-parametric power analysis, Monte Carlo simulation, and multivariate analysis to different aspects of evaluating program effectiveness to identify withdrawal effects. In each case, the goal of the analysis was to develop scientifically sound analytical techniques to ensure that Tampa Bay Water maintains an efficient and effective monitoring program to meet their regulatory compliance objectives and provide proper stewardship with respect to their Water Use Permit.

**Brevard County, Indian River Lagoon Basin Management Action Plan (BMAP) Support, Brevard County, FL.** *Senior Scientist.* ESA worked with a group of stakeholders in the Indian River and Banana River Lagoons in assessing the scientific merit of total maximum daily loads (TMDLs) established for the Northern portion of the Indian River Lagoon system. ESA conducted analytical work including development of refined pollutant loading estimates for the watershed and developing stressor-response models relating pollutant loadings to ecological endpoints in estuarine waters. Mike attended BMAP meetings to provide consultation to stakeholders on the validity of the current science used in establishing the TMDL and provided recommendations for further analysis that should be conducted prior to adopting memorandums of agreement as part of the BMAP process.

# Victoria Scriven

Environmental Scientist

**EDUCATION**

MS, Biology, University of South Florida

BS, Oceanography, Texas A&M University

**6 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

DAN First Aid, CPR, Oxygen Provider Instructor

FDEP SOPs for Water and Groundwater Sampling & Meter Testing, 2024

PADI Dive Master, #512503

Victoria supports all aspects of the ESA's Southeast Biological Resources business group. Her areas of expertise focus include environmental science, Florida ecology, protected species surveys, sustainability, implementation of monitoring programs, watershed assessments (status and trends), watershed management planning, data management and analysis, and strategic planning. Victoria provides statistical support, analysis and interpretation, and report writing to clients involved in natural resource decision making in Florida. She focuses on water quality data, development of stressor-response models to determine appropriate water quality thresholds based on important ecological endpoints, and consultation on regulatory aspects of the Florida's Department of Environmental Protection (FDEP) Impaired Waters Rule. While in the field, she is responsible for implementing FDEP-approved standard operating procedures, equipment maintenance and calibration, and work scheduling. Prior to joining ESA, Victoria actively pursued research projects, in the Pacific, Gulf of Mexico, and Atlantic Ocean, focused on principles of oceanography, data analytics, and ecology.

## Relevant Experience

**Charlotte County, Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Environmental Scientist.* This project supports Charlotte County in the design and implementation of an ambient water quality monitoring program. The intent of the monitoring program is water quality monitoring, water sample collection, and laboratory analytical services to support the submission of data to the Florida Department of Environmental Protection Watershed Information Network as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load (TMDL) development. Specifically, ESA is completing field sampling and data collection, coordinating laboratory analyses, data reduction, qualification, and management; data formatting and reporting; and other activities required for initiation and continued implementation of the County's ambient water quality monitoring program. As part of this effort, Victoria assists in the collection and documentation of surface water samples within the Mid, West, and South municipal stormwater business units.

**Charlotte County, Sunshine Lake/Sunrise Waterway Monitoring Program, Charlotte County, FL.** *Environmental Scientist.* The Sunshine Lake/Sunrise Waterway system, located in Greater Port Charlotte, experienced extensive and persistent algal blooms. Due to the phosphorus-rich surface geology surrounding the watershed, there is a potential that the algal bloom may recur. A monitoring program that includes quantitative criteria designed to trigger various levels of management attention was recommended as part of the water quality management plan previously developed. Victoria assists in the collection, analysis, and interpretation of water quality and benthic sampling efforts used to characterize the waterbody and watershed-derived inputs.

# Victoria Scriven (Continued)

Environmental Scientist

**Peace River/Manasota Regional Water Supply Authority, Hydrobiological Monitoring Program (HBMP) Continuous Recorders Program, Charlotte and DeSoto Counties, FL.** *Environmental Scientist.* This project is an ongoing, continuous, water quality monitoring and assessment in the Peace River for water use permit compliance. A scientific review panel and the Southwest Florida Water Management District requested the monitoring to improve accuracy of existing statistical models by improving the data used by the models. The project collects, analyzes, and interprets continuous, salinity, temperature, dissolved oxygen, and water level data at eight continuous recorder stations. Data were also used in support of models used to predict impacts from salinity change due to current and future river water pumping by the Peace River Facility. Victoria assists with the maintenance and calibration of the continuously deployed multiparameter sondes in the Peace River. Monitoring is in support of continued freshwater diversions by the Authority. In addition, she is responsible for performing quality assurance/quality control of HBMP data and formatting the data to specified standards.

**Manatee County, Beach Supplemental Bacteria Water Quality Monitoring Support Services, Manatee County, FL.** *Environmental Scientist.* This project included technical support, field data collection, and laboratory analysis services to supplement the Florida Department of Health's (FDOH) Healthy Beaches bacterial water quality monitoring program. In response to the elevated rainfall associated with the passage of Hurricane Idaline, Manatee County requested support with rapid response mobilization and implementation of bacterial surface water quality monitoring at identified beach sampling sites throughout the county. Within 24 hours, ESA scientists coordinated laboratory support, mobilized equipment, and collected samples to facilitate coordination between Manatee County and FDOH. With the data provided, FDOH removed the "Swim Advisory" released based upon anticipated elevated bacterial counts following storm landfall.

**Sarasota County, Source Water Quality and Quantity and Downstream Environmental Benefit Determination for Dona Bay Water Storage Facility Phase III, Venice, FL.** *Environmental Scientist.* This effort focuses on the assessment of source water quality and flow reduction effects on nutrient concentrations and salinities in Cowpen Slough and Dona Bay downstream of the Dona Bay Water Storage Facility project. The project involves continuous and discrete flow and water quality monitoring and statistical assessment of flow reduction effects on nutrient concentrations and salinities in Dona Bay downstream of surface water diversion. Extensive continuous telemetered hydrologic and water quality monitoring and modeling are being conducted to quantify actual benefits as a requirement of State and RESTORE Act cooperative project funding agreements and grants. ESA provides surface water level and flow and surficial aquifer level data for hydrodynamic model calibration and verification. Additionally, ESA collects surface water quality data to assess potential nutrient load reductions that could occur as a result of the construction and operation of a Phase 3 aquifer.

**Tampa Bay Water, Tampa Bypass Canal/Alafia River/Desalination Plant Water Supply Facilities Hydrobiological Monitoring Program (HBMP) for WY2021–2025, Tampa Bay, FL.** *Environmental Scientist.* The Tampa Bypass Canal, Alafia River Supply and Desalination Facilities provide critical water supplies for Tampa Bay Water's regional system. Water use permits for The Tampa Bypass Canal and Alafia River facilities issued by the Southwest Florida Water Management District (WUP No. 2011794 and 2011796) require a hydrobiological monitoring program to provide assurance that withdrawals do not adversely impact environmental resources. In addition, Tampa Bay Water implements an elective water quality and biological monitoring project to monitor the effect of desalination brine discharge on the Big Bend area of the Tampa Bay estuary. Required tasks for this contract include water quality sampling, data management, quality assurance/quality control, data analysis, statistical and mechanistic water quality modeling, evaluation of watershed changes, meetings with regulatory agencies and other stakeholders, and annual and multi-year compliance assessment and reporting. ESA staff have been supporting these comprehensive hydrobiological monitoring plans since design and inception in 1999.

# Dara Krachenfels

Environmental Scientist

**EDUCATION**

BS, Environmental Science (Minor: Geology), University of South Florida (USF), 2022

**2 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATIONS**

Florida Boating Safety Certified

Cardiopulmonary Resuscitation (CPR) Certified, 2023–2025

An environmental scientist, Dara's experience includes collecting and processing water, vegetation, and soil samples in various surface water treatment areas across South Florida, following the Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (SOPs) and quality control protocols. She has also conducted vegetation surveys, updated and maintained data files, and calibrated instruments and equipment. Dara's specialized experience includes equipment maintenance and calibration, operating airboats and stern drive boats, Florida native and invasive species identification, lab equipment and safety, technical writing and communication; as well as proficiency with ESRI ArcGIS and Field Maps, GPX, Garmin GPS, YSI ProDSS, and EXOSonde.

## Relevant Experience

**Charlotte County, Charlotte County Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Environmental Scientist.* This project supports Charlotte County in the design and implementation of an ambient water quality monitoring program. The intent of the monitoring program is water quality monitoring, water sample collection, and laboratory analytical services to support the submission of data to the Florida Department of Environmental Protection Watershed Information Network as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load (TMDL) development. Specifically, ESA is completing field sampling and data collection, coordinating laboratory analyses, data reduction, qualification, and management; data formatting and reporting; and other activities required for initiation and continued implementation of the County's ambient water quality monitoring program.

**Tampa Bay Water, Tampa Bay Desalination Facility Hydrobiological Monitoring Program, Hillsborough County, FL.** *Environmental Scientist* providing data support (data separation, writing summaries, and working data into Excel), review, and research. This is an ongoing, $5 million, 22-year, water quality and biological monitoring effort, which was previously implemented as a component of the SWFWMD WUP. The project initially included water chemistry, hydrologic, benthic macroinvertebrate, fish, and seagrass sampling and/or monitoring efforts. The monitoring program has been reduced in scope and is no longer implemented as a required permit condition. The project currently includes water chemistry and hydrologic monitoring efforts, data interpretation, review, analysis, and management, as well as quality assurance and control reviews.

**Peace River Manasota Regional Water Supply Authority (PRMRWSA), Hydrobiological Monitoring Program (HBMP), Bradenton, FL.** *Environmental Scientist* for monthly continuous recorder collection and replacement. ESA is providing environmental services to PRMRWSA for this Work Order, which includes specific tasks and duties conducted annually related to the development and completion of each element of the HBMP. Services generally consist of collection of monthly Lower Peace River and upper Charlotte Harbor HBMP water quality samples at the fixed and moving stations; laboratory analysis of HBMP monthly water samples; Quality Assurance (QA) and Quality Control (QC) of

# Dara Krachenfels (Continued)

Environmental Scientist

HBMP monthly water quality data; as-needed water quality data management and statistical analysis of HBMP data; development of the 2023 HBMP Annual Data Report; annual upload of HBMP data to the Florida Department of Environmental Protection's WIN; annual development of the HBMP aerial/satellite photos of the Peace River riparian vegetation and analysis of vegetation data; collecting monthly HBMP continuous recorders data in the river; servicing and maintaining the continuous recorders as needed; replacing continuous recorders as needed; obtaining and reviewing river flow and water quality data from other consultants or agencies as needed to complete the statistical analysis and reports required; and other environmental services required for the implementation of the Authority's HBMP.

**Sarasota County, Dona Bay Restoration Phase 3 Aquifer Recharge, Nokomis, FL.** *Environmental Scientist.* The Dona Bay Project is a multi-year, multiphase freshwater diversion and wetland creation project owned and managed by Sarasota County Government. One of the phases for freshwater diversion and coastal nutrient load reduction is to build and operate an aquifer storage and recovery well (ASR) at the project site. This project involves monitoring ambient water quality before and after this well is constructed. Funding for this project ultimately comes from the Gulf of Mexico RESTORE funding.

**Town of Longboat Key, Longboat Key Subaqueous Force Main Final Design, Longboat Key, FL.** *Environmental Scientist* for seagrass survey through snorkeling and GPS recording. ESA is supporting environmental assessment and regulatory permitting for a potable water transmission line replacement.

**Pinellas County – Environmental Management Division, Clearwater Harbor St. Joseph Sound, Pinellas County, FL.** As *Environmental Scientist,* provided production support. ESA supported the County's nature-based shoreline solutions and engineering.

**City of Lakeland, Lake Parker Tributary Swamp Restoration and Feasibility Study, Lakeland, FL.** *Environmental Scientist.* This project's objective was to complete a restoration feasibility study and evaluate potential projects to improve the ecosystem health and pollutant load assimilation capacity of the 200-acre swamp (Lake Parker Tributary Swamp) located west of Lake Parker, a nutrient-impaired lake with an existing Florida Department of Environmental Protection Nutrient Reduction Plan requirement. This feasibility study evaluated potential habitat restoration and water quality improvement alternatives to improve both the ecosystem health of the swamp, and to improve the swamp's capacity to effectively reduce pollutant loads from its surrounding watershed, prior to the discharge of those inflows out to Lake Parker. This project was partly funded by the Southwest Florida Water Management District, through the cooperative funding initiative, which assists local governments and private entities with creating sustainable water resources, provides flood protection, and enhances conservation efforts. Victoria assisted in monitoring effort though sample collection, in situ water quality parameter measurements, and flow velocity measurements. Victoria additionally assisted in the analysis and interpretation of results to support the recommendation of management options/alternatives and report writing.

**Environmental Consulting, Research, and Laboratory Services, Loxahatchee, FL.** *Field Science Technician I*. Executed the collection of surface water, vegetation, and soil/sediment samples in wetland environments, adhering to established protocols for accurate data acquisition. Conducted vegetation surveys in the Stormwater Treatment Areas utilizing plant identification skills. Compiled and documented comprehensive field data records for accurate analysis and reporting. Created and maintained data files such as Chains of Custody using MS Excel. Gained familiarity with Florida Department of Environmental Protection (FDEP) Standard Operating Procedures (SOP) for Field Activities (DEP-SOP-001/01), and experience in following quality control/quality assurance (QA/QC) protocols.

# Broderick (Brody) Beckert

Environmental Scientist

**EDUCATION**

BS, Environmental Studies, University of Tampa

**5 YEARS OF EXPERIENCE**

**REGISTRATIONS/ CERTIFICATIONS**

Florida Department of Environmental Protection (FDEP) Qualified Stormwater Management Inspector, #58082

Brody serves as an environmental intern supporting ESA's Southeast Biological Resources Group. His experience includes several years of direct, hands-on management of soil contamination and remediation projects from initial customer engagement through to project completion, as well as an understanding of environmental regulations and code compliance. Brody's specialized experience includes a variety of site-related work, including design, maintenance, and construction.

## Relevant Experience

**Charlotte County, Charlotte County Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Environmental Scientist.* This project supports Charlotte County in the design and implementation of an ambient water quality monitoring program. The intent of the monitoring program is water quality monitoring, water sample collection, and laboratory analytical services to support the submission of data to the Florida Department of Environmental Protection Watershed Information Network as an effort to meet data sufficiency requirements for impaired surface water evaluations and total maximum daily load (TMDL) development. Specifically, ESA is completing field sampling and data collection, coordinating laboratory analyses, data reduction, qualification, and management; data formatting and reporting; and other activities required for initiation and continued implementation of the County's ambient water quality monitoring program.

**Sarasota County, Dona Bay Restoration Phase 3 Aquifer Recharge, Nokomis, FL.** *Environmental Scientist.* The Dona Bay Project is a multi-year, multiphase freshwater diversion and wetland creation project owned and managed by Sarasota County Government. One of the phases for freshwater diversion and coastal nutrient load reduction is to build and operate an aquifer storage and recovery well (ASR) at the project site. This project involves monitoring ambient water quality before and after this well is constructed. Funding for this project ultimately comes from the Gulf of Mexico RESTORE funding.

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**Tampa Bay Water, Tampa Bay Desalination Facility Hydrobiological Monitoring Program, Hillsborough County, FL.** *Environmental Scientist* providing data support (data separation, writing summaries, and working data into Excel), review, and research. This is an ongoing, $5 million, 22-year, water quality and biological monitoring effort, which was previously implemented as a component of the SWFWMD WUP. The project initially included water chemistry, hydrologic, benthic macroinvertebrate, fish, and seagrass sampling and/or monitoring efforts. The monitoring program has been reduced in scope and is no longer implemented as a required permit condition. The project currently includes water chemistry and hydrologic monitoring efforts, data interpretation, review, analysis, and management, as well as quality assurance and control reviews.

**Town of Longboat Key, Longboat Key Subaqueous Force Main Final Design, Longboat Key, FL.** *Environmental Scientist* for seagrass survey through snorkeling and GPS recording. ESA is supporting environmental assessment and regulatory permitting for a potable water transmission line replacement.

**Polk Regional Water Cooperative (PRWC) Southeast Lower Floridan Aquifer Wellfield and Water Production Facility Final Design and Construction Services, Lakeland, FL.** *Environmental Scientist* responsible for skink board setting and weekly check. ESA is supporting comprehensive design phase environmental services to Team One for the SE Facility and infrastructure. The project includes ~75 miles of water transmission, one new treatment facility, and a raw water pipeline with up to 5 LFA production wells.

**Pinellas County – Environmental Management Division, Clearwater Harbor St. Joseph Sound, Pinellas County, FL.** As *Environmental Scientist,* provided production support. ESA supported the County's nature-based shoreline solutions and engineering.

**Eckerd College, Living Shoreline Design and Permitting Services, St. Petersburg, FL.** *Environmental Scientist* supporting meetings, site visits, progress checks, and contract coordination. ESA is providing identification of all potential living shoreline and living seawall opportunities at the Eckerd College campus.

**Eco Capital Advisors, Fox Branch Ranch Wetland Mitigation Bank, Polk County, FL.** *Environmental Scientist* supporting 11 different monitoring sites. Work includes taking quantitative measurements at numerous plots and transects. ESA is providing mitigation bank monitoring, compliance, oversight, and permit modifications.

**Florida Department of Environmental Protection, Clearwater Beach Pass – 2024 and 2025 Survey, Clearwater, FL.** *Environmental Scientist.* Took notes and collected data associated with the Seagrass Survey for development along Clearwater Pass. ESA, under a subcontract, is providing Florida Department of Environmental Protection–required survey for submerged aquatic vegetation for construction adjacent to Gulf Boulevard.

**Manatee County, Duette Preserve FDOT Mitigation Area, Bradenton, FL.** *Environmental Scientist* providing monitoring support. ESA is providing general environmental services to support the County's land preservation/restoration needs.

**Manatee County, Robinson Preserve Expansion Habitat Restoration Project, Manatee County, FL.** *Environmental Scientist.* Performing mangrove monitoring, collecting transect data, providing support for Year 3 mangrove report portion, surveying seagrass using quads, and providing Year 3 seagrass report for this 150-acre restoration project involving invasive species–infested fallow farmland and dredge spoil.

# Andrea Ramos Almodovar

Biologist

**EDUCATION**

Graduate Certificate, GIS Systems, University of South Florida

BS, Environmental Science and Policy, University of South Florida

**3 YEARS OF EXPERIENCE**

**CERTIFICATIONS/ REGISTRATION/ TRAINING**

FDEP Qualified Stormwater Management Inspector, #54324

FWC Imperiled Beach-Nesting Bird (IBNB) Permitted Monitor Training

FWC Lead Caracara Observer

**PROFESSIONAL AFFILIATIONS**

Florida Stormwater Association

Andrea's areas of expertise focus on environmental science, Florida ecology, wetland mapping and characterization, protected species surveys, remote sensing/GIS, and sustainability. She is efficient at collecting a wide variety of biological field data related to wetland, protected species, water quality, and submerged aquatic resources, and has collaborated on a wide variety of projects including transportation, public water supply, water resources, and airports.

## Relevant Experience

**Charlotte County, Charlotte County Ambient Water Quality Monitoring Program, Charlotte County, FL.** *Environmental Technician.* The project supports Charlotte County in the design and implementation of an ambient water quality monitoring program. The intent of the monitoring program is water quality monitoring, water sample collection, and laboratory analytical services to support the submission of data to the Florida Department of Environmental Protection (FDEP) Watershed Information Network as an effort to meet data sufficiency requirements for impaired surface water evaluations and Total Maximum Daily Loads (TMDLs) development. Specifically, ESA is completing field sampling and data collection, coordinating laboratory analyses, data reduction, qualification, and management; data formatting and reporting; and other activities required for initiation and continued implementation of the County's ambient water quality monitoring program.

**Lee County, Hurricane Ian Emergency Response, Lee County, FL.** *Biologist* responsible for soil collection and sampling. To assist Lee County with the implementation of Debris Management Sites (DMS) used to stockpile cleared hurricane debris in the aftermath of Hurricane Ian, ESA staff collected soil samples at up to three locations within each DMS to be used for baseline testing prior to debris collection and stockpiling. ESA staff were on site within 4 days of landfall and over the course of several weeks and collected more than 60 samples at 20+ DMS locations within Lee County. All samples were delivered to an independent laboratory for testing within 48 hours of collection for analysis and reporting.

**Manatee County, Robinson Preserve Expansion Habitat Restoration Project, Manatee County, FL.** *Environmental Technician.* Andrea assisted with the restoration of 150 acres of invasive species–infested fallow farmland and dredge spoil. She participated in the environmental construction observation that included seagrass and mangrove mitigation implementation to design the best management practices used to make the final tidal connection. Coordination with the County and an ad hoc committee of fisheries experts occurred to design the system to provide unique juvenile fish habitat specific to snook and tarpon.

**Manatee County, Perico Preserve Restoration, Manatee County, FL.** *Biologist.* This work was conducted with Manatee County staff to establish project goals, determine and document pre-restoration conditions, identify future management methods, conceptualize a restoration project, and develop and permit a large-scale restoration plan. This plan encompasses habitats from coastal scrub to mangroves and includes large-scale direct seeding to establish ground cover and more than 100 species of plants specified to return botanical diversity to this site. Some of the challenges associated with this site included implementing an overall restoration of the property while accommodating constantly changing uses of the property (including off-site mitigation projects), volunteer planting of a wetland creation area, identifying a potential seagrass mitigation site, and maintaining high standards for the ecological quality of planned upland habitats to be created from relatively low-quality uplands. Andrea assisted with the maintenance and data download of continuously deployed multiparameter sondes.

**Fox Branch Mitigation Holdings LLC, Fox Branch Ranch Wetland Mitigation Bank, Polk County, FL.** *Biologist.* This work included the permitting, design, and implementation of the 1,000+ acre wetland mitigation back. Initial field efforts included wetland delineations, natural community mapping, biological inventory, and identification of opportunities for ecological enhancement and restoration. The mitigation plan outlines specific goals, objectives, and methods for restoration of the on-site natural communities. The monitoring program is designed to measure restoration success and guides adaptive management decisions, such as exotic species management, supplemental planting, and prescribed fire management. Andrea assisted with vegetation monitoring data collection in accordance with the monitoring program.

**Hernando County, Hernando Beach Channel Dredging Project, Seagrass Monitoring, Hernando County, FL.** *Environmental Technician.* Andrea assisted with the monitoring of the seagrass transplant recipient sites, as well as the seagrass protection zones, established for the relocation of seagrass impacted by the widening of the boat channel leading to the Hernando Beach community. Andrea is currently assisting Hernando County in resolving permit success criteria shortfalls with the Florida Department of Environmental Protection and U.S. Army Corps of Engineers.

**Hillsborough County, South County Potable Water Transmission Main, Hillsborough County, FL.** *Biologist.* Provided environmental permitting, wetland delineations, protected species surveys, and construction compliance for the County's Progressive Design/Build of 10.6 miles of a 42-inch and 48-inch diameter potable water transmission main that extend from the intersection of Big Bend Road and Balm Riverview Road, through Balm Scrub Preserve to the intersection of US 301 and SR 674. Construction includes open-cut and horizontal directional drill (HDD) for crossings of Bullfrog Creek and associated tributaries. Species surveys conducted included gopher tortoise, burrowing owl, Florida scrub-jay and crested caracara, and permits obtained included FDEP Individual ERP, FDEP State 404, and Hillsborough County Miscellaneous Activities in Wetlands. Andrea assists with protected species surveys and as-needed construction oversight to maintain permit compliance for the contractor.

**Estancia at Wiregrass Community Development District, Estancia at Wiregrass Monitoring, Pasco County, FL.** *Biologist* responsible for wetland, vegetation mitigation monitoring and report. Standard Pacific of Florida, Inc., obtained permits from Southwest Florida Water Management District (SWFWMD) for the construction of four wetland mitigation sites within a 230-acre site to offset stormwater and wetland impacts from the development of the Estancia at Wiregrass community. The mitigation areas, known as H-16, I-17, K-17, J-17, and Woody Buffer Areas, provide a combined total 8.09 acres within the larger site. The community is located in Wesley Chapel, Florida, off Estancia Boulevard and Chancey Road, east of County Road 581 (Bruce B. Downs Boulevard). The sites consist of three Cypress Wetland (FLUCCS 621) mitigation areas totaling 5.97 acres (I-17: 3.20 acres, K-17: 1.06 acres, and H-16: 1.71 acres) and one Freshwater Marsh (FLUCCS 641) mitigation area totaling 2.12 acres (J-14). ESA monitoring has been conducted according to the environmental resource permit (ERP) and/or in accordance with typical SWFWMD and U.S. Army Corps of Engineers mitigation monitoring criteria.

# 2

# Proposed Management Plan

ESA

# 2 Proposed Management Plan

## Program Management

The success of Charlotte County's ambient water quality monitoring program relies not only on accurate field collection and laboratory analysis, but also on the ability to generate data that are fully compliant with the Florida Department of Environmental Protection's (FDEP) Watershed Information Network (WIN) standards. These data are critical for assessing the status and trends of surface waters, identifying impairments, and supporting restoration plan development and Minimum Flows and Levels (MFLs).

ESA will serve as the prime consultant, teaming with long-time subconsultant partner Benchmark EA. This unified team has designed, implemented, and managed many of the region's largest and longest-running ambient water quality monitoring programs, including those in the Peace River watershed, Tampa Bay, and throughout Southwest Florida. Our decades of collaboration and shared experience have fostered a seamless operational model grounded in technical excellence, scientific integrity, and dependable service delivery.

At the core of our program management approach is rigorous adherence to state-approved protocols and data standards. The ESA team routinely collects surface water quality data that meet all applicable FDEP WIN formatting and quality assurance requirements. These standards are not optional: data that fall short of WIN criteria cannot be used in regulatory determinations, and non-standardized results are of limited value in regional water quality evaluations. Our program management structure is designed to eliminate that risk through tight coordination between our project manager, QA/QC officer, field technicians, data analysts, and laboratory staff.

Additionally, we leverage our institutional knowledge of regional waterbodies, deep familiarity with regulatory expectations, and advanced geospatial and analytical tools to ensure that every aspect of the monitoring effort—from field logistics to final data uploads—is tightly managed, thoroughly documented, and aligned with the County's environmental management objectives. With our proven approach, robust quality systems, and locally based team, ESA is uniquely positioned to ensure that Charlotte County's water quality data are not only defensible but also actionable—supporting informed decision-making and sustainable resource management well into the future.

### TEAM ORGANIZATION AND RESPONSIBLE PARTIES

The success of this project depends on a well-structured, responsive, and collaborative team. The graphic and chart provided below outline our organizational structure, clearly defining communication pathways, roles, and responsibilities across team members to ensure seamless coordination, efficient task execution, and effective project oversight. This framework supports not only internal communication, but also the timely transfer of data, samples, and field equipment between ESA and Benchmark EA, as well as with Charlotte County staff.

**Project Director – Bob Woithe, PhD**

Bob will provide senior-level oversight and technical guidance for this contract. Based in ESA's Sarasota office, Bob brings both geographic proximity and long-standing familiarity with the County's watershed conditions, monitoring framework, and regulatory priorities. He will serve as a strategic resource for both the County and the project team—offering direct support to Project Manager, Mike Poniatowski, and stepping in as needed to address questions, resolve technical challenges, or guide refinements to sampling design, data analysis, and reporting protocols.

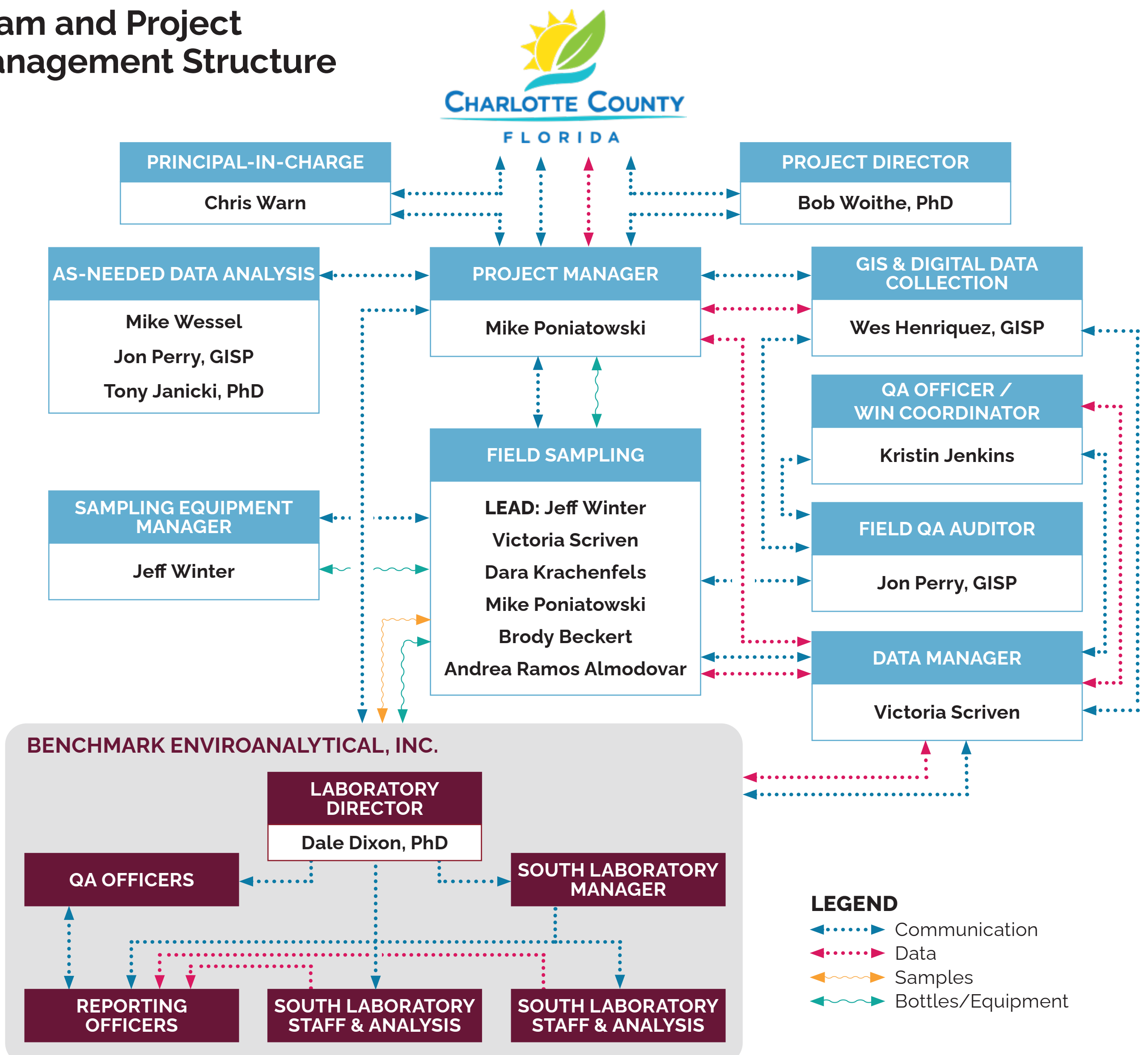
With decades of experience managing complex surface water monitoring programs across Southwest Florida, Bob adds deep institutional knowledge to this effort. He will remain actively engaged throughout the life of the contract, providing input on technical deliverables, participating in team coordination calls, and serving as an alternate liaison between ESA and County staff. His continued involvement supports the seamless execution of this project and reinforces ESA's commitment to responsive, high-quality service.

**Project Manager – Mike Poniatowski,** based in ESA's Tampa office, Mike Poniatowski will lead the day-to-day management of Charlotte County's ambient water quality monitoring contract. As the primary point of contact for the County, Mike is responsible for assigning staff, managing schedules and budgets, and coordinating the delivery of high-quality, on-time project deliverables.

Mike brings strong technical experience and familiarity with the County's monitoring framework, having supported this program over the past three years. In addition to overseeing team operations, he contributes directly to data analysis, reporting, and quality review, and remains field-ready to support sampling and logistics as needed.

He will maintain consistent communication with County staff and team partners, providing regular updates during monthly ESA–Benchmark EA coordination calls and leading quarterly operations and quality meetings. This integrated approach helps align field activities, data workflows, and client expectations—promoting a responsive, collaborative project environment. This streamlined, locally coordinated team organization ensures that all personnel—whether in the field, laboratory, or data management—are aligned and fully accountable to deliver the highest quality service to Charlotte County.

## Team and Project Management Structure



**Principal-in-Charge – Christopher Warn** (Englewood Spoke / Sarasota Hub Office)
Chris serves as the Principal-in-Charge for this contract and works directly alongside Mike Poniatowski to ensure seamless execution of project activities. Based in ESA's Sarasota Hub office, Chris provides executive oversight, resource allocation, and serves as the County's point of contact for matters related to performance or issue resolution beyond day-to-day management.

**Data Manager – Victoria Scriven** (Tampa Hub Office)
Victoria leads data processing, validation, and delivery for all project-related monitoring results. She is responsible for organizing raw and qualified field and lab datasets, overseeing quality control procedures, and ensuring completeness of associated metadata and calibration logs. Victoria also manages response timelines for client data requests and produces QA summaries. She maintains frequent contact with Kristin Jenkins to align final datasets with FDEP's WIN formatting and upload requirements. Victoria participates in monthly team meetings to report on data progress and resolve any integration issues across the field and lab teams.

**Sampling Equipment Manager *and* Field Water Sampling Lead – Jeff Winter** (Tampa Hub Office)
Jeff Winter, based in ESA's Tampa hub office, serves as both the Field Sampling Lead and Sampling Equipment Manager for the Charlotte County Ambient Water Quality Monitoring Program. With more than two decades of experience supporting large-scale, compliance-driven monitoring programs, Jeff plays a pivotal role in the daily execution and continuity of field operations.

As Field Sampling Lead, Jeff is the primary technician responsible for grab sampling and in situ water quality profiling across all project monitoring stations. He coordinates and conducts fieldwork ensuring all data—including meter readings, calibration verification logs, chain-of-custody forms, and site-specific documentation—are collected and transmitted accurately and promptly. He collaborates closely with the Data Manager to streamline data integration and uphold the standards required for submission to FDEP's WIN.

In his concurrent role as Sampling Equipment Manager, Jeff oversees the calibration, maintenance, and logistical deployment of all field instrumentation and gear, including sondes, grab samplers, and transport vehicles. His responsibilities include tracking and replenishing consumables, managing calibration schedules, and anticipating supply chain needs to prevent delays. Jeff's proactive planning and rapid response capabilities have enabled uninterrupted monitoring even under challenging conditions, such as post-storm sampling or unexpected equipment failures.

Jeff participates in monthly project operations and quality assurance calls, providing key field observations and logistical updates that support adaptive sampling decisions and overall project coordination. His operational insight and commitment to field readiness are critical to the ongoing success of this monitoring program.

**Field Water Samplers – Victoria Scriven, Brody Beckert, Dara Krachenfels, Andrea Ramos Almodovar, Jeff Winter, Mike Poniatowski** (Sarasota and Tampa Offices)
Victoria, Brody, Dara, Andrea, and Jeff support Mike Poniatowski by conducting independent or joint sampling tasks during routine monthly monitoring, synoptic studies, or emergency response events. Their flexibility and proximity enable the project to rapidly scale up field efforts when necessary, such as during pollutant spill events or concurrent site monitoring campaigns. They provide full documentation of sample collection and environmental conditions, with timely delivery to labs or staging facilities as needed.

**GIS and Electronic Data Form Manager – Wes Henriquez** (ESA – Tampa Hub Office)
Wes supports spatial logistics and mobile data workflow development. He creates GIS-based station routing plans, optimizing travel and sampling sequences to improve efficiency. Wes also develops digital data forms and applications to streamline field data capture and improve accuracy. As a certified FAA Part 107 Remote Pilot, he provides drone support for visual reconnaissance, mapping, or specialized data collection as needed. His contributions feed directly into operational planning and data pipeline automation.

**WIN Data Coordinator / Quality Assurance – Kristin Jenkins** (Tampa Hub Office)
In her role as QA Officer, Kristin is responsible for overseeing all QA protocols across field and laboratory operations. She ensures all procedures are compliant with the project's approved Quality Assurance Plan, FDEP SOPs, and contractual expectations. Kristin

coordinates closely with Field QA Auditor Jon Perry for field inspection review, and with Data Manager, Victoria Scriven, to confirm the integrity and usability of collected data.

Kristin ensures that all water quality data collected under this contract meets FDEP's WIN and MDQS criteria. She formats and reviews data in coordination with the Data Manager and interfaces directly with FDEP WIN staff to resolve formatting or content issues. Kristin's experience with long-term estuarine data systems enables her to catch formatting anomalies and anticipate regulatory expectations, ensuring successful uploads and long-term usability of project data.

**As-Needed Data Analysis – Mike Wessel, Jon Perry, GISP,** and **Tony Janicki, PhD** (Sarasota and Tampa Hub Offices)
To support special studies, adaptive monitoring, and regulatory evaluations, ESA has assembled an As-Needed Data Analysis Team available on a task-order basis. This group of senior scientists and analysts brings extensive experience in interpreting hydrobiological data and applying advanced statistical methods to inform resource management decisions. Services may include trend analysis, stressor-response modeling, pollutant source identification, and technical support for impaired waters evaluations, TMDLs, MFLs, Basin Management Action Plan (BMAPs), or RAPs.

The team's familiarity with Florida's regulatory framework and FDEP data standards ensures that all deliverables—whether technical reports, summaries, or data visualizations—are scientifically sound and ready for agency review. With a strong track record of local project success, ESA's analytical experts provide Charlotte County with flexible, high-quality support tailored to evolving monitoring objectives.

**Laboratory Director – Dale Dixon, PhD** (Benchmark EA – Palmetto Facility)
Under the leadership of Dr. Dale Dixon, Benchmark EA provides full-service laboratory support for this contract through a coordinated operation between its South Laboratory in North Port and reporting operations in Palmetto. Dr. Dixon oversees all aspects of analytical service delivery, including sample chain-of-custody, laboratory QA/QC compliance, and data reporting workflows, while maintaining alignment with FDEP and NELAC standards. He also manages coordination of third-party analytical services for any parameters outside of Benchmark EA's certification scope and serves as the laboratory's representative during quarterly team meetings.

**South Laboratory** (Benchmark EA – North Port Facility)
Benchmark EA's South Laboratory serves as the primary intake and processing facility for samples collected under this contract. Laboratory personnel handle day-to-day analytical workflows, instrument calibration, and inter-lab transfers when necessary. The lab works closely with ESA's field team to ensure efficient sample delivery, timely processing, and adherence to established turnaround times.

**Benchmark Reporting Officers** (Benchmark EA – Palmetto Lab)
Benchmark's reporting operations team is responsible for formatting and delivering electronic data deliverables (EDDs) that conform to FDEP's WIN requirements. These reporting officers coordinate with ESA's Data Manager to validate and finalize submissions, ensuring accuracy and regulatory compatibility. Together, this integrated laboratory network supports high-quality data generation and seamless coordination between field, lab, and reporting operations.

**Third-Party Laboratories – Various as Needed**
As necessary, ESA and Benchmark EA will engage certified third-party laboratories to analyze parameters not covered under Benchmark's accreditation. Responsibility for these arrangements falls to either Benchmark EA or ESA based on the parameters involved. This approach has been successfully implemented over two decades of team collaboration.

## SCHEDULING & LOGISTICS

ESA is fully prepared to commence field sampling on day one of the contract term. Because we currently hold this contract, our team is already familiar with the established monitoring station network, associated access points, and logistical workflows. Unless changes are directed by the County, no additional ramp-up time is required.

Over the past three years, ESA has worked closely with County staff to refine and improve the monitoring program, including the addition of new sites and real-time response to major weather events. Our sampling schedule is well-integrated with Benchmark EA's kit preparation and laboratory intake protocols, ensuring a seamless field-to-lab chain of custody and efficient turnaround times.

ESA's "hub-and-spoke" deployment model—anchored by regional hub offices and strategically located field personnel—ensures flexible, efficient mobilization across the County. Routine monitoring runs, special studies, and emergency response events can be executed with minimal notice, reflecting both our logistical strength and deep familiarity with Charlotte County's environmental conditions and regulatory expectations.

Overall project scheduling and logistical coordination will be led by ESA's Project Manager, who will assign field teams, oversee adherence to timelines, and manage coordination among ESA and Benchmark EA personnel. Drawing from successful implementation of other long-term programs, we will develop a comprehensive 12-month sampling schedule at project initiation. This schedule will include both primary and contingency sampling windows, allowing for adaptability in response to unforeseen circumstances such as severe weather, site inaccessibility, or field equipment issues.

Sampling kits—including pre-labeled bottles and custody forms—will be prepared by Benchmark EA, and all required field instruments and consumables will be scheduled and procured by ESA's Equipment and Field Sampling Leads.

Coordination of sampling logistics and equipment preparation is supported by our robust infrastructure, including multiple corporate vehicles, boats, and instrument backups across ESA's Sarasota and Tampa hub offices and Benchmark EA's laboratories in Palmetto and North Port. This logistical proximity ensures rapid mobilization and uninterrupted operations.

In alignment with our ongoing best practices, this contract will be added to ESA's existing monthly project operations and quality control coordination calls, which include ESA and Benchmark EA team members currently supporting joint water quality monitoring efforts. These standing meetings provide a consistent forum for communication between field, analytical, and management staff and ensure that any issues affecting schedule or data quality are quickly addressed.

ESA and Benchmark EA team members also regularly participate in the Southwest Florida Regional Ambient Monitoring Program (RAMP). ESA field and lab personnel attend quarterly RAMP meetings, where samples are collected from a common source for inter-laboratory and field instrument comparisons. Benchmark EA analyzes two sets of RAMP samples each quarter—one as a RAMP member laboratory and a second under the QA/QC framework of a long-term compliance monitoring program—to evaluate the sampling reliability of ESA field operations. ESA then reports the results of its side-by-side field meter comparisons (typically conducted annually or biannually) to both RAMP and to our clients. In accordance with RAMP protocol, only Benchmark EA's primary sample set is submitted to RAMP to avoid duplication.

ESA's participation in RAMP has established a high level of rigor and reliability in our sampling approach. This ensures that all collected data will be consistent with FDEP's WIN submittal standards, technically defensible, and usable in state-level regulatory processes such as TMDL and impaired waterbody determinations.

## FIELD SAMPLE COLLECTION & MEASUREMENT

Field data collection for this contract will be led by ESA's dedicated Field Sampling Lead, supported by trained and experienced field staff operating from our Sarasota and Tampa hub offices. ESA's team will follow rigorous field protocols and quality control procedures that are already well-established in our ongoing regional monitoring programs.

Benchmark EA, our long-time laboratory partner and certified FDOT DBE, will be responsible for assembling and providing water quality sampling kits tailored to the project's parameter list and QA/QC requirements. These kits, including pre-labeled sample bottles and chain-of-custody documentation, will be delivered to ESA's offices or picked up by field staff as part of a seamless, pre-coordinated monthly logistics process. The kits are prepared under Benchmark EA's strict quality protocols and are designed to ensure traceability and defensibility of every sample collected under this contract.

ESA will deploy a suite of calibrated, well-maintained sampling equipment from our robust inventory, including multi-parameter water quality sondes, intermediate-container grab samplers (e.g., Kemmerer vertical and horizontal bottles, dippers, swing samplers), peristaltic pumps, Secchi disks, GPS units, and field-ready laptops and tablets. Transportation assets—trucks, ATVs, and boats—will be utilized as appropriate to access stations across the County's diverse hydrological landscapes, from roadside canals to open estuarine waters.

Sampling stations will be logically grouped into "runs" based on geography and flow-path connectivity to ensure compliance with the project's watershed-based temporal sampling design. These runs will be scheduled to maximize spatial coverage and analytical efficiency while adhering to required sampling intervals and designations. ESA scientists will prioritize sample deliveries to Benchmark EA's South Laboratory in North Port due to proximity and processing capacity, though samples may also be routed to the Palmetto Laboratory if more efficient or logistically appropriate.


All field water quality measurements will be conducted using ESA's calibrated multi-parameter sondes, with calibration verifications performed daily at the close of each sampling shift. End-of-day calibration results will be reviewed and confirmed with the ESA Project Manager and Data Manager. Should a probe fail to meet calibration criteria, the ESA Project Manager will immediately notify Benchmark EA to suspend analysis of any parameters dependent on that instrument's readings. This safeguard prevents invalid data from being processed and ensures the integrity of the full dataset.

Electronic field data—including sonde readings, field notes, chain-of-custody records, and site documentation—will be uploaded to a secure, cloud-based ESA network on a daily basis, and in some cases, immediately following collection at each station. Paper forms, where used, will be scanned and archived daily within ESA's internal data management system to provide redundant records and allow real-time review by the Data Manager and QA Officer.

This disciplined, well-coordinated field approach ensures high-quality, defensible data collection that meets FDEP submission requirements and supports Charlotte County's ambient water quality monitoring goals. ESA's in-house capacity, local presence, and streamlined logistics with Benchmark EA allow our team to respond rapidly, maintain continuity, and adapt effectively to dynamic field conditions—all while keeping data quality and regulatory compliance at the forefront.

## LABORATORY ANALYSIS FOR PARAMETER LISTS A AND B

Charlotte County has provided two parameter lists to guide the development of the ambient water quality monitoring program. Parameter List A identifies the analytes that are required to be assessed during all routine sampling events. Benchmark EA, our NELAP-certified laboratory partner is qualified to analyze all parameters listed in Parameter List A. A copy of Benchmark EA's current NELAP certification is included at the end of Section 13, Appendix, for reference.

The table below outlines the analytical method(s), method detection limits (MDLs), and standard reporting units for each of the required parameters included in Parameter List A. Several of these parameters may be quantified using either calibrated in situ instrumentation or validated laboratory techniques. These dual-method parameters are shaded in the table for clarity.

Together, ESA and Benchmark EA provide the analytical capacity, quality assurance, and technical expertise required to meet the County's monitoring objectives with reliability and efficiency.

## Parameter List A

| PARAMETER NAME | METHOD | MDL | UNITS |
|---|---|---|---|
| Total Kjeldahl Nitrogen | EPA 351.2 | 0.05 | mg/L |
| Total Ammonia Nitrogen | EPA 350.1 | 0.008 | mg/L |
| Nitrite/Nitrate Nitrogen | EPA 300.0 | 0.02 | mg/L |
| Nitrite/Nitrate Nitrogen | EPA 353.2 | 0.004 | mg/L |
| Nitrite/Nitrate Nitrogen | Systea Easy-1 Reagant | 0.006 | mg/L |
| Total Phosphorus | EPA 365.3 | 0.008 | mg/L |
| Dissolved Orthophosphate | EPA 365.3 | 0.002 | mg/L |
| Total Nitrogen | Calculated | 0.05 | mg/L |
| Total Organic Carbon | SM5310B | 0.271 | mg/L |
| Chlorophyll a, corrected for Pheophytin | EPA 445.0 | 0.25 | µg/L |
| Chlorophyll a, corrected for Pheophytin | SM10200H | 3.46 | µg/L |
| Turbidity | EPA 180.1 | 0.11 | NTU |
| Total Suspended Solids | SM2540D | 0.57 | mg/L |
| True Color | SM2120B | 2.5 | CU |
| Fecal Coliform | SM9222D | 10 | #/100mL |
| E. Coli | SM9223B (QT) | 10 | #/100mL |
| Enterococci | Enterolert | 10 | #/100mL |
| Dissolved Oxygen, percent saturation | In situ | | % |
| Dissolved Oxygen, mg/L | In situ | | mg/L |
| pH | In situ | | SU |
| Specific Conductance, µS/cm | SM2510B | 1.24 | µmhos/cm |
| Specific Conductance, µS/cm | In situ | | µmhos/cm |
| Salinity, ppt | SM2510B | 0.217 | g/kg |
| Salinity, ppt | In situ | | ppt |
| Water Temperature, Celsius | In situ | | Celsius |

Charlotte County has also identified **Parameter List B,** which includes optional analytes that may be requested for collection and analysis on an as-needed basis throughout the duration of the contract. Benchmark EA maintains active NELAP certification to perform laboratory analysis for almost all parameters on this list. For parameters such as Gross Alpha Particle Activity and Radium 226 + Radium 228, PFAS, Artificial sweetners, plankton identification, and microbial source tracking, ESA chooses contract laboratories based on specific project timing and budget requirements as well as lab methods and expertise (such as knowledge of certain plankton taxa). For the remaining parameters not covered under Benchmark EA's certification, ESA has established successful protocols and partnerships with qualified third-party laboratories.

Our team is currently supporting a comparable suite of primary and secondary drinking water standards for a long-term monitoring project, including the integration of third-party analytical services to ensure reliable, high-quality results for specialized parameters.

Additionally, ESA is prepared to collect *Karenia brevis* phytoplankton samples at the County's request. These samples can be submitted to the FWC Fish and Wildlife Research Institute or a designated third-party laboratory. ESA routinely performs this service for Tampa Bay Water as part of its source water protection and assessment program near its Desalination Plant, ensuring data collection aligns with both regulatory and operational needs.

The table below presents the analytical method, MDL, and standard reporting units for each parameter that Benchmark EA is currently certified to analyze under Parameter List B. The ESA–Benchmark EA team is fully equipped and committed to accommodating any additional sampling and analytical needs the County may require throughout the life of this contract.

## Parameter List B

| PARAMETERS | METHOD | MDL | UNITS |
|---|---|---|---|
| Total Alkalinity | SM2320B | 0.594 | mg/L |
| Total Hardness | SM2340C | 0.682 | mg/L |
| Total Dissolved Solids | SM2540C | 7.26 | mg/L |
| Total Organic Carbon | SM5310B | 1.084 | mg/L |
| Karenia brevis (red tide) | Sample collection only with delivery to FWC | | |
| Biochemical Oxygen Demand - five-day | SM5210B | Based on Dilution | mg/L |
| Carbonaceous Biochemical Oxygen Demand | SM5210B | Based on Dilution | mg/L |
| Chemical Oxygen Demand | EPA 410.4 | 7.04 | mg/L |
| Gross Alpha Particle Activity | Third Party Laboratory Coordination would be required | | |
| Radium 226 + Radium 228 | | | |
| Oil and Greases | EPA 1664A | 1.37 | mg/L |
| Chloride | EPA 300.0 | 0.353 | mg/L |
| Sulfate | EPA 300.0 | 0.339 | mg/L |
| Fluoride | EPA 300.0 | 0.03 | mg/L |
| Arsenic | EPA 200.7 | 0.00602 | mg/L |
| Iron | EPA 200.7 | 0.029 | mg/L |
| Copper | EPA 200.7 | 0.004 | mg/L |
| Aluminum | EPA 200.7 | 0.023 | mg/L |
| Selenium | EPA 200.7 | 0.0038 | mg/L |
| Calcium | EPA 200.7 | 0.03 | mg/L |
| Magnesium | EPA 200.7 | 0.006 | mg/L |
| Chromium | EPA 200.7 | 0.002 | mg/L |
| Lead | EPA 200.7 | 0.003 | mg/L |
| Nickel | EPA 200.7 | 0.0018 | mg/L |
| Zinc | EPA 200.7 | 0.0014 | mg/L |
| Microbial analyses in support of microbial source tracking | Method varies | Varies | Varies |
| PFAS (PFAS suite of compounds, third-party lab) | EPA 533 | Varies by compound | ug/L |
| Streamflow and discharge | Method varies | N/A | cfs |
| Plankton (third-party lab) | Method varies | N/A | Varies by analysis |
| Other Phytoplankton or algae taxa (third-party lab) | Method varies | N/A | Varies by analysis |
| Caffeine (third-party lab) | Varies by lab | Varies by lab | Typically ug/L |
| Artificial Sweetener (third-party lab) | Varies by lab | Varies by lab | Typically ug/L |
| Pharmaceutical, Isotopic, and other analyses in support of nutrient source tracking (third-party lab) | Method varies | Varies by compound and lab | Varies by analysis |

# Data/Documentation Review and Reporting

## REPORTING SERVICES

ESA, working closely with Benchmark EA, brings extensive experience in managing, processing, and delivering high-quality data in support of long-term ambient water quality monitoring programs. Together, our team actively supports multiple major monitoring efforts across Southwest Florida, where millions of measurements are collected, reviewed, and reported each year. These data serve as the foundation for regional regulatory decisions, including the development of TMDLs, and MFLs, and broader watershed restoration planning.

ESA uses established data management platforms that are adaptable to meet a range of project requirements. For this contract, data will be organized in either a Microsoft Access-based format or within ESA's proprietary, cloud-hosted environmental data system. Both approaches support the integration of field results, laboratory data, calibration records, and QA/QC documentation in formats designed to support regulatory and management use. These platforms were developed over decades of work on large-scale hydrobiological programs like the Peace River and Tampa Bay Water HBMPs and have supported seamless, multi-stakeholder collaboration on data analysis and reporting.

On the analytical side, Benchmark EA employs a Laboratory Information Management System (LIMS) to manage the full sample lifecycle, from intake and custody tracking to method-specific reporting. Results are delivered in a variety of formats, including hard-copy NELAP-compliant certificates, spreadsheets, and custom Electronic Data Deliverables (EDDs) compatible with Automated Data Processing Tool (ADaPT), WIN, or client-specific platforms.

As required by Florida's regulatory framework, monitoring data generated through this contract will be submitted to the FDEP WIN, which replaced Florida STORET in 2017. Submission of valid, well-documented data to WIN allows the County's monitoring program to contribute to statewide water quality assessments and broader regulatory initiatives.

ESA team member Kristin Jenkins will serve as the program's WIN Coordinator. Kristin brings more than two decades of experience managing environmental datasets, including 20+ years of formatting and uploading data to Florida STORET and WIN. She currently leads WIN data submission efforts for both the Peace River and Alafia River/Tampa Bypass Canal HBMPs—programs that collectively contribute over 18,500 station records annually. Kristin has also submitted data collected by the Charlotte County monitoring program since the inception of the program. Her responsibilities include compiling and qualifying field and lab data, applying required metadata, and producing properly structured files for submittal to FDEP. She maintains direct communication with FDEP WIN coordinators and has supported the development of new organizational profiles within the WIN system.

This combined approach—grounded in long-term program experience, robust digital infrastructure, and personnel with direct WIN submission expertise—provides Charlotte County with a reliable framework for documenting and reporting water quality data throughout the life of the monitoring program.

# 3 Previous Experience of Team Proposed for this Project

# 3 Previous Experience of Team Proposed for this Project

The ESA and Benchmark EnviroAnalytical (Benchmark EA) team has a long-standing history of close, continuous coordination on ambient water quality monitoring programs of both regional and statewide significance. Our team works together on an ongoing, near-daily basis, delivering comprehensive scientific, regulatory, and laboratory services to public-sector clients. This includes operating some of Florida's largest, most complex, and longest-tenured hydrobiological monitoring programs, directly aligned with the scope and regulatory requirements described in this RFP.

Our integrated team is currently supporting major programs such as the Alafia River/Tampa Bypass Canal and Tampa Bay Desalination Facility Hydrobiological Monitoring Program (HBMP), the Peace River HBMP, Dona Bay Phase III monitoring, and the Longboat Key Subaqueous Sewer Force Main Leak Emergency Response Ambient Monitoring Program. These projects involve all aspects of program design and implementation, including field data collection, laboratory analysis, statistical and mechanistic modeling, stakeholder engagement, and regulatory reporting.


The Alafia River/Tampa Bypass Canal and Tampa Bay Desalination Facility HBMP is a prime example of the depth and continuity of our team's coordination. This program—managed by our team for over 23 years—was developed to fulfill Tampa Bay Water's (TBW) Water Use Permit (WUP) conditions and has become a benchmark for long-term, science-based water resource management. Since its inception, key ESA team members including Dr. Bob Woithe, Kristin Jenkins, and Jeff Winter have been central to the program's design, implementation, and continuous improvement. Benchmark EA joined the team in 2003 and has provided consistent laboratory support ever since.

What sets this collaboration apart is the remarkable continuity of team members across multiple employers over two decades. In fact, the project contract and subcontractor relationships have followed the same personnel through three consulting firms—ultimately culminating in their unified presence at ESA. This speaks not only to the strength of our technical qualifications, but also to the enduring trust, cohesion, and performance record that our team brings to complex, multi-disciplinary monitoring programs.

The TBW HBMP is an expansive, multi-faceted program designed to assess the ecological effects of surface water withdrawals on estuarine systems. Over its history, the program has included the collection, analysis, and interpretation of:

- Hydrologic and water chemistry data
- Benthic macroinvertebrate, fish (adult, juvenile, and ichthyoplankton), and bird community surveys
- Phytoplankton and seagrass assessments
- Wetland vegetation mapping
- Sediment and organic matter sampling

ESA has also led the development and application of a wide range of analytical tools and models for the HBMP, including statistical modeling, EFDC, ICPRv4, HEC-RAS, WASP, and various coupled 2D and 3D hydrodynamic and water quality models. The scope of work has evolved to include equipment procurement and maintenance, continuous and discrete water quality sampling, data management and QA/QC, stakeholder coordination, and annual and multi-year regulatory reporting.

As part of the program, ESA team members conducted numerous specialized studies to better understand system responses and improve data relevance, such as:

- Continuous salinity and dissolved oxygen monitoring
- Spatially distributed chlorophyll transects
- Synchronized nutrient and chlorophyll sampling
- High-frequency phytoplankton and sediment sampling
- Flow-coupled ecological response assessments

This sustained technical leadership culminated in a peer-reviewed evaluation of the program's monitoring strategy, during which ESA proposed and received approval for a streamlined sampling design focused on parameters responsive to flow alterations. These optimizations cut program costs by more than 65% while maintaining regulatory defensibility and scientific integrity—demonstrating our ability to balance cost-effectiveness with technical rigor.

***We halved the cost of the Alafia River/TBC HBMP (which was originally more than $1 million a year) and removed monitoring elements such as wading birds, fish, and benthic macroinvertebrates that were responding to causal factors other than Tampa Bay Water operations.***

The ESA-Benchmark EA team has not only supported Tampa Bay Water's regulatory compliance but also elevated their standing as environmental stewards. The Alafia/TBC HBMP alone has involved coordination with over 50 stakeholder groups, including the Tampa Bay Estuary Program, Environmental Protection Commission of Hillsborough County, and National Audubon Society, and has produced foundational data for setting minimum flows and levels (MFLs) and developing Total Maximum Daily Load (TMDLs) in multiple Tampa Bay tributaries.

In summary, the ESA and Benchmark EA team has decades of experience working together—frequently and effectively—on projects of identical scope and complexity to that requested by Charlotte County. This enduring collaboration reflects not only our mutual trust and technical acumen, but also our collective ability to deliver long-term, cost-effective, science-driven monitoring programs that support responsible water resource management and regulatory compliance across Florida.

***All scope tasks and deliverables required under these contracts have been completed on time and on budget.***

# 4 Project Control

# 4 Project Control

ESA applies a comprehensive and proven approach to project controls that ensures the delivery of high-quality data, adherence to established schedules, and strict budget compliance. Our methodology is grounded in decades of experience managing complex, large-scale water quality monitoring programs throughout Florida, including the Peace River HBMP, the Alafia River/Tampa Bypass Canal HBMP, and the Tampa Bay Desalination Facility HBMP. These projects were all delivered on time and within budget, providing a solid foundation for our proposed approach to project controls for Charlotte County.

At the core of our project controls is a rigorous commitment to up-front planning and protocol adherence. Each project begins with the development of a plan of action and schedule for sampling. These plans outline outline the technical details, field methodologies, laboratory requirements, and key assumptions associated with the contracted work. Establishing this level of detail early in the project lifecycle ensures:

- Clear expectations for all project team members and subcontractors
- Efficient scheduling of sampling events and laboratory analyses
- Minimized risk of cost overruns due to rework or miscommunication
- Early identification of potential deviations or needed adjustments in scope

High-quality data collection and cost control are inherently linked. Our team employs strict QA/QC protocols to reduce errors, minimize the need for re-sampling, and protect data integrity. By eliminating inefficiencies at the field and laboratory levels, we ensure that project resources are used effectively and avoid costly delays.

Additionally, ESA's field logistics planning plays a critical role in cost containment. We utilize efficient sampling schedules and routing to reduce travel time, minimize redundant mobilizations, and enhance field productivity. To further support uninterrupted operations, ESA maintains readily available backup equipment, vehicles, and cross-trained staff who can respond quickly to unanticipated field issues—avoiding costly schedule impacts while maintaining data quality standards.

Another advantage to ESA's project control strategy is our flexibility in managing scope changes. Because we establish a deep understanding of project objectives from the outset, we are able to accommodate variations such as special studies, event-based sampling, or changes in sampling locations within existing budgets and timelines, where feasible.

In summary, ESA's project control framework is built on a foundation of technical precision, operational efficiency, and proactive risk management. It is a system proven to deliver water quality monitoring programs that are scientifically sound, budget-conscious, and operationally resilient—attributes that we are fully prepared to bring to Charlotte County.

## Schedule

ESA brings a well-established system of schedule management and field execution controls that is built on decades of experience implementing water quality monitoring programs with strict regulatory, temporal, and logistical requirements. Our team is available to being sampling immediately to fully support a seamless project dataset.

The ESA Project Manager will assume full responsibility for maintaining the field and reporting schedule and for providing proactive communication to the County regarding any proposed or unanticipated schedule adjustments. To date, common causes of sampling delays have included:

- Severe weather or flooding events
- Temporary loss of access to sampling stations
- In-water activities (e.g., dredging) that may compromise sample integrity
- Equipment failures or site safety concerns

Any proposed schedule adjustments based on these conditions will be accompanied by recommendations for resampling or temporal substitutions, and ESA will obtain concurrence and approval from the County before proceeding with the modified plan.

To minimize the frequency and impact of schedule deviations, ESA maintains a robust inventory of redundant field equipment, including multi-parameter sondes, backup sampling devices, boats, vehicles, and cross-trained field personnel. This operational redundancy allows us to quickly substitute staff or equipment in the event of illness, malfunction, or logistical delays, keeping sampling activities on track without compromising data quality or safety.

In addition, our team performs daily monitoring of weather forecasts, rainfall events, tidal cycles, and river flows as part of ongoing field programs throughout Southwest Florida. These forecasting practices are already embedded in our operations and will be fully leveraged to plan optimal sampling windows, avoid high-risk days, and reduce the likelihood of last-minute cancellations.

Finally, ESA is committed to transparent and timely communication. Any emergent condition that may impact the sampling schedule will be reported to the County within 24 hours of identification, along with recommended mitigation steps and a plan for schedule recovery. Our track record with similar projects demonstrates our ability to maintain aggressive schedules without compromising compliance, quality, or safety—performance we intend to uphold for Charlotte County.

## Cost

### COMMUNICATING AND NEGOTIATING CHANGES TO COLLECTION OR ANALYSIS COSTS

ESA is committed to completing all water quality sampling and analysis tasks within the scope, schedule, and budget approved by Charlotte County. However, we recognize that unforeseen circumstances—such as changes in field conditions, regulatory updates to NELAC or FDEP SOPs, or operational shifts among prime or subcontractor personnel—can occasionally arise and impact the project scope or cost.

In such instances, the ESA Project Manager will promptly evaluate whether the change falls outside the limits of the current task order. If the change affects scope, timing, or budget, ESA will submit a formal written modification request to the County. No additional or modified work will be initiated without prior written approval from the County.

Any requested changes in cost will be:

- Justified in detail, including the reason for the scope change
- Aligned with pre-approved contract rates for labor, equipment, and laboratory analysis
- Structured to preserve the intent and integrity of the original contract
- Accompanied by a clear plan for the County to track progress and evaluate deliverables

ESA's approach to managing potential cost changes emphasizes transparency, technical justification, and minimal disruption to the contracted project objectives.

### DEMONSTRATED ABILITY TO MEET PROJECT COST CONTROL

ESA has a strong track record of delivering complex, long-term monitoring programs on budget and on schedule, including the Peace River HBMP, Alafia River/Tampa Bypass Canal HBMP, and the Tampa Bay Desalination Facility HBMP. Our proven success is based on a robust internal project controls system that ensures real-time budget awareness and proactive cost management.

To support cost control, ESA employs:

- A custom-built Power BI project manager dashboard, providing real-time visualization of labor, expenses, and task-level performance
- Deltek Vantagepoint project accounting software, enabling precise tracking of budgets, expenditures, and hours worked at the staff, task, and subcontractor levels
- Integrated project management and GIS-based routing tools that improve field efficiency and reduce costs associated with travel, logistics, and mobilization

These tools allow the Project Manager and task leads to monitor budget performance daily, weekly, monthly, and cumulatively, allowing early detection of potential overruns and immediate mitigation. Our cross-functional coordination and daily operational forecasting (including weather, tide, and site access planning) further minimize the risk of costly resampling or inefficient fieldwork.

Our team also understands the operational realities of public-sector monitoring programs and routinely balances high-quality scientific delivery with fiscal discipline. We bring extensive experience supporting on-call and emergency response efforts, ensuring that cost-effective, responsive mobilization can occur without sacrificing data quality or compliance.

### RESPONSIBILITY FOR COST CONTROL

Mike Poniatowski, ESA's proposed Project Manager, will have direct and ongoing responsibility for managing and controlling project costs. With decades of experience managing regulatory-driven water quality programs, Mike ensures that scope, schedule, and budget performance are continuously aligned and any potential issues are communicated early and resolved promptly.

ESA's project management culture emphasizes accountability, flexibility, and responsiveness. Mike and his team maintain strong working relationships with technical staff and subcontractors, along with a deep understanding of field logistics and regulatory expectations, enabling them to deliver high-quality outcomes without unnecessary expenditure.

In the event of urgent or short-turnaround assignments, ESA is prepared to initiate work immediately, using brief coordination via phone or email when necessary to meet compressed timelines. For these assignments, Mike will maintain continuous communication with the County's project manager, ensuring tasks are delivered efficiently, effectively, and within the timeframe allowed—without compromising cost control or quality.

ESA's experience with both recurring monthly and on-call water quality services has shown that strong communication, disciplined management systems, and operational readiness are key to effective cost control. We are fully equipped and available to provide this level of service to Charlotte County.

## Recent, Current and Projected Workload

ESA understands that a consulting firm's workload can fluctuate month to month based on the lifecycle of active and pending assignments. To ensure reliable staffing for our clients, ESA uses a structured and time-tested approach to workload tracking and forecasting, enabling us to confidently assess staff availability and allocate resources effectively across projects.

We define "workload" as the percentage of committed, billable time for each team member over a six-month horizon, using a 40-hour work week as the baseline. This approach offers a realistic snapshot of availability, accounting for both current obligations and anticipated transitions in workload as existing projects conclude or shift into lower-intensity phases. ESA's methodology has been refined through years of managing large-scale, multi-phase environmental contracts and is embedded in our project planning and resource management systems.

Our internal systems—including Deltek Vantagepoint and Power BI-based workload dashboards—provide real-time visibility into each staff member's assigned hours, task allocations, and schedule forecasting. These systems are actively monitored by project managers and regional operations leads, ensuring that workload projections remain up to date and responsive to changes in project status or scope. This data-driven approach allows us to balance team capacity, ensure no overcommitment, and strategically staff new projects with the right level of expertise and support.

The accompanying table illustrates the recent, current, and projected availability of our proposed team members for this contract. While availability will naturally vary over time, ESA has made proactive commitments of key staff and maintains a deep bench of technical and field personnel ready to support Charlotte County's monitoring needs. As some of our current assignments wind down, our available capacity will increase further, ensuring we can meet both baseline and surge requirements associated with this contract.

In short, ESA is fully prepared to undertake and sustain the County's monitoring program, providing the required labor, equipment, and technical oversight from day one—and scaling support as needed over the life of the contract. Our systems, staff, and operational practices are in place to maintain schedule fidelity, meet analytical demands, and support the County with continuity and responsiveness at every phase of this program.

## AVAILABILITY CHART

| STAFF | FIRM | WORKLOAD* | | |
|---|---|---|---|---|
| | | RECENT | CURRENT | PROJECTED |
| Bob Woithe, PhD | ESA | 50 | 60 | 60 |
| Mike Poniatowski | ESA | 10 | 50 | 60 |
| Chris Warn | ESA | 30 | 30 | 30 |
| Kristin Jenkins | ESA | 60 | 60 | 50 |
| Jeff Winter | ESA | 80 | 80 | 80 |
| Tony Janicki, PhD | ESA | 60 | 60 | 25 |
| Jon Perry, GISP | ESA | 60 | 60 | 50 |
| Mike Wessel | ESA | 60 | 50 | 25 |
| Wes Henriquez, GISP | ESA | 60 | 75 | 75 |
| Victoria Scriven | ESA | 60 | 60 | 45 |
| Brody Beckert | ESA | 60 | 60 | 60 |
| Dara Krachenfels | ESA | 60 | 60 | 60 |
| Andrea Ramos Almodovar | ESA | 60 | 50 | 60 |
| Dale Dixon, PhD** | Benchmark EA (North Lab) | Workload is based on report turn-around times. All lab positions are filled and labs are operating with dependable turn-around -times (TAT) of 5-7 workdays. An increase in TAT is not anticipated due to added volume associated with Charlotte County monitoring program. | | |
| | Benchmark EA (South Lab) | | | |
| | Benchmark EA (Central Lab) | | | |

*Estimated committed billable time.

**Potential impacts in turn-around-times associated with national supply chain constraints cannot be projected.


# 5

# Proposed Design Approach for this Project

# 5 Proposed Design Approach for this Project

## A. Process for Scheduling, Coordinating, and Executing Requested Sampling

The ESA team's project delivery model is based on decades of successful implementation of similar large-scale water quality monitoring programs throughout Southwest Florida. While earlier sections outline the team's capabilities, responsibilities, and quality control procedures, this section presents additional detail regarding the process for scheduling, coordinating, and executing sample collection and analyses—both as part of routine monitoring and in response to ad hoc County requests.

### CORE PROJECT TASKS AND WORKFLOW

We anticipate the contract will include two main components:

1. **Routine Monthly Monitoring and Reporting:**
   ESA will conduct monthly surface water quality sampling at approximately 92 designated sites across Charlotte County. Each month's fieldwork will follow a predefined schedule developed by the ESA Project Manager in coordination with County staff and the ESA Field Sampling Lead. Field data and laboratory analyses will be delivered on a monthly basis, with a complete data package submitted after each sampling event. Deliverables will include laboratory analytical results, field measurement data, quality control documentation, and associated metadata.
   At regular intervals (anticipated semi-annually), ESA will prepare formal Electronic Data Deliverables (EDDs) for submission to the Florida Department of Environmental Protection (FDEP) in Watershed Information Network (WIN) format. Kristin Jenkins, ESA's WIN Coordinator, will oversee formatting, review, and upload in consultation with FDEP coordinators.
   Monthly invoices will be submitted to the County upon delivery of that month's data, based on the contract-specified task rate.

2. **As-Needed and Event-Based Sampling:**
   In addition to routine monitoring, the contract will include provisions for ad hoc sampling needs—such as response to pollutant discharges, storm-driven events, or special studies. These requests may involve rapid deployment, typically within 24 hours, and will follow pre-approved labor, equipment, and laboratory rates specified in the contract.
   ESA field staff will mobilize with the necessary sondes, sampling gear, and logistical support, while sample delivery and analysis coordination will be managed in tandem with Benchmark EA.

### COORDINATION OF LABORATORY ANALYTICAL SERVICES

Benchmark EA will serve as the primary analytical laboratory for this project and holds current NELAP certification to perform all parameters included in Parameter List A. ESA regularly collects the parameters on List B for which Benchmark EA is not certified, usually for primary and secondary drinking water standard compliance, source water protection, and nutrient and microbial source tracking projects. We have established relationships with other local and specialty laboratories for analysis of these parameters. We select laboratories on a case by case basis for these parameters depending upon project budget, schedule, and technical needs.

For these parameters or any other future analytical needs not currently certified by Benchmark EA, the team will engage third-party NELAP-certified laboratories. This coordination will be handled by either Benchmark EA or ESA, depending on whether Benchmark is performing any portion of the day's parameter suite. Benchmark EA will coordinate third-party analysis when its own laboratory is already supporting the sample event. If no Benchmark parameters are involved, ESA will directly manage sampling kit preparation, laboratory submission, and analytical result integration with the larger dataset.

This integrated structure enables flexible, timely coordination of all laboratory services without interrupting the flow of project execution or data reporting.

## Work Plan for Regularly Scheduled Monthly Sampling

The following is an outline description of anticipated project tasks in sequence with emphasis on deliverables:

1. Monthly Sampling and Analysis
   a. Mobilization – Long lead
      i. Review tide predictions and schedule routing
      ii. Schedule staff and equipment
      iii. Sampling kit delivery from Benchmark EA to ESA
      iv. Sampling consumables inventory/purchase/resupply
   b. Mobilization – Previous day/Short lead
      i. Review weather forecast and potential wind effect on tide predictions
      ii. Sampling station form printing or electronic data form upload
      iii. Next-day sampling schedule notifications: County, lab, adjacent landowners and other stakeholders as necessary
   c. Sampling
      i. Equipment calibration
      ii. Procure ice and same-day consumables
      iii. Travel – office to 1st sample site
      iv. Site condition evaluation – data generated. Notify ESA PM if site cannot be sampled
      v. Profile sampling and data recording – data generated
      vi. Grab sample site prep as needed (ground sheets, container rinsing, etc.)
      vii. Grab sample collection and data recording (bottle date & times, custody form information) – sample and documentation generated
      viii. Site demobilization
      ix. Travel to next site and repeat c.iv through c.viii – repeat for all sites
      x. Review and finalize Chain of Custody for formal sample transfer to laboratory staff
      xi. Travel for laboratory delivery
      xii. To meet the shortest analytical holding times, an ESA courier will deliver samples collected in the morning to the lab while the remainder of the team continues to sample
      xiii. Equipment calibration post verification – documentation generated
      xiv. Water column profile data form scanning or digital data form download
   d. Laboratory
      i. Formal sample transfer from field staff to laboratory and lab sample intake (Chain of Custody) – documentation generated
      ii. Sample preparation – documentation generated
      iii. Sample analysis – data & documentation generated
      iv. Laboratory data entry
      v. Laboratory QAQC – documentation generated

vi. Laboratory reporting to ESA – data & documentation transfer

e. Data Management and QAQC
   i. ESA data entry, processing and reduction – data transferred & documentation generated
   ii. QAQC reviews - documentation generated
   iii. Programmatic responses to identified quality issues - documentation generated
   iv. Data qualification and acceptance/rejection – data transferred & documentation generated
   v. Upload to ESA Database – data transferred

f. Monthly report and data submittal to County (consistent with requested format) – data transferred

g. Monthly invoicing

6. WIN Data formatting
   a. Twice-yearly deliverable of WIN formatted dataset to County or upload to WIN – data transferred

The proposed sampling locations include a combination of tidal and non-tidal aquatic environments (e.g., dead end canal, stream, open water). Site specific sampling requirements will be documented to ensure all stations are collected at or near the thalweg or horizontal midpoint of the flowing system at 0.5-meter water depth (if less than one-meter-deep, samples will be collected at ½ of total water depth). Samples will be collected at non-tidal stations only if flow is observed at the time of sampling. For non-tidal stations, the Field Sampling Lead will coordinate sampling efforts after review of predicted tidal conditions to coincide sample collection during the ebb tide, as feasible. For each site sampled the following observations will be documented (see 5.c.iv):

- Visual estimation of color and turbidity
- Visual estimation of presence and abundance of aquatic vegetation and phytoplankton
- Current weather and evidence of ongoing or recent (<24 hours) rain
- Water elevation if a staff gauge or other measuring device is available onsite
- Tidal stage, if applicable
- Visual description of dominant benthic substrate, if the bottom of the water body is visible

## As-Needed Sampling

In addition to the core monthly monitoring, the ESA team is prepared to conduct as-needed sampling under this contract, which will generally fall into two categories:

**1. Special Studies, and**

**2. Event-Driven Response Sampling.**

### SPECIAL STUDIES

Special studies are targeted, time-bound efforts developed to investigate specific areas, seasonal conditions, or questions that could help inform and enhance the County's water quality management strategies. These studies may be used to test hypotheses, evaluate localized impacts, or support long-term planning objectives. Each special study will be scoped collaboratively with County staff and documented through a proposed sampling plan. The plan will include sampling design, staffing, equipment requirements, laboratory analysis, data management, and reporting tasks.

These studies will be authorized as discrete deliverable-based work assignments and executed under the master contract using pre-established labor, equipment, and analytical rates.

### EVENT-DRIVEN RESPONSE

Event-driven sampling addresses unanticipated incidents such as wastewater overflows, chemical spills, fish kills, algal blooms, or the presence of noxious odors. These situations typically require expedited mobilization and field deployment, sometimes within 24 hours of notification.

When sufficient advance notice is provided, these efforts can be scoped similarly to special studies. However, for truly urgent situations, ESA will initiate work under a time-and-materials not-to-exceed authorization, based on the approved rate schedule, to allow immediate mobilization while maintaining cost control and transparency.

### COORDINATION OF LABORATORY SUPPORT

For both special studies and event-based responses, ESA will coordinate all necessary laboratory services. Benchmark EA, the primary analytical laboratory for this contract, is certified to analyze nearly all required and optional parameters. In cases where Benchmark EA is not certified—such as for Gross Alpha Particle Activity or Radium 226 + 228—ESA and Benchmark EA will engage third-party NELAP-certified laboratories.

Responsibility for coordinating these services will be determined by the composition of the sampling day's analytical suite:

- If Benchmark EA is performing any portion of the analysis, it will coordinate third-party services for additional parameters.
- If Benchmark EA is not involved in that event's analysis, ESA will handle sampling kit preparation, lab coordination, and data integration directly.

This flexible but well-established process has been successfully implemented by the ESA–Benchmark EA team for over two decades across multiple multi-laboratory monitoring programs in Florida.

## B. Process for WIN

All data collected under this contract will be reviewed, qualified, and prepared for upload to the FDEP WIN, in full conformance with FDEP SOP 001/01 and the Minimum Data Quality Standards (MDQS) for submission.

### PROJECT INITIALIZATION AND CONFIGURATION

Because this is an established program, the ESA team will need to update for new stations, and load new results data.

ESA will configure WIN import templates for each data type. At minimum, these include:

- **Station details** (location-specific metadata)
- **Monitoring results** (field and laboratory data)

Separate import configurations will be created for distinct data types if field results (e.g., sonde readings, Secchi depth) and lab results (e.g., nutrient concentrations, metals) differ in structure or MDQS compliance.

## FORMATTING AND VALIDATION OF MONITORING DATA

Monitoring results will be consolidated from two primary sources:

- **Field data** collected by ESA (e.g., temperature, dissolved oxygen, Secchi depth).
- **Laboratory data** produced by Benchmark EA and qualified under their NELAP-certified quality system.

All data will be converted into WIN-compatible pipe- or tilde-delimited text files using standardized SAS workflows developed by the ESA team. These workflows apply FDEP-supplied tables of MDQS and conform to required formatting rules and allowed values.

Each file will undergo basic and advanced validation within WIN's staging environment:

- Any errors flagged by WIN's internal validation tools will be reviewed.
- Where applicable, discrepancies will be traced back to original lab records or field documentation, and revised files will be generated.
- A tracking log will be maintained (e.g., Excel-based) to document error checks, resolutions, and uploads.

Once a dataset has passed validation, it will be migrated into the WIN repository, where it becomes available for statewide use in:

- **Impaired Waters Rule assessments**
- **TMDL development**
- **BMAP implementation**

## UPLOAD ROLES AND COMMUNICATION

ESA team member Kristin Jenkins, a seasoned environmental data specialist, will oversee all WIN formatting and submissions. Kristin has over two decades of experience formatting and uploading water quality data to FDEP databases, including the current WIN platform and its predecessor, STORET. She has served as the designated Data Provider Administrator for large-scale hydrobiological monitoring programs, including:

- Peace River HBMP (Peace River Manasota Regional Water Supply Authority)
- Alafia River/Tampa Bypass Canal HBMP (Tampa Bay Water)
- Charlotte County Ambient Water Quality Monitoring
- Tampa Desaliniation Facility (Tampa Bay Water)
- Tampa Bypass Canal Monitoring Program (Tampa Bay Water)

Kristin will maintain ongoing communication with FDEP's WIN and STORET coordinators throughout the process and will respond to any FDEP inquiries related to newly uploaded datasets.

If Charlotte County prefers to manage WIN submissions directly, ESA will provide fully formatted and validated WIN data files, and will remain available to support County staff with technical guidance and troubleshooting during the FDEP coordination process.

# C. Project Data Quality Objective and Indicators

Achieving and maintaining high data quality is a core focus of ESA's approach to water quality monitoring. For this contract, the ESA and Benchmark EA team will implement a well-defined quality system designed to produce defensible, scientifically valid data that are directly usable by Charlotte County and compatible with FDEP data systems, including the WIN.

The Project Data Quality Objectives (DQOs) and associated data quality indicators will guide all aspects of sampling, laboratory analysis, data management, and reporting. These objectives ensure:

- **The precision, accuracy, representativeness, completeness, and comparability (PARCC parameters)** of all data are defined, documented, and evaluated throughout the life of the project.
- **Standardized methods and protocols** are applied consistently across all field and laboratory activities, enabling statistically sound comparisons to other regional water quality datasets and minimizing variability from procedural differences.
- **Potential sources of error**—including equipment failure, sampling inconsistencies, or transcription errors—are anticipated and mitigated through field redundancy, staff cross-training, and multi-level review.

- **Corrective action procedures** are in place to respond quickly to any deviation from protocol or potential data quality concern. For example, if laboratory results raise concerns (e.g., values outside expected range), sample reanalysis will be conducted within holding times, if possible, and root causes will be evaluated.

## FIELD AND LABORATORY QA/QC MEASURES

- **All field equipment** (e.g., multi-parameter sondes, grab samplers, pumps) will be routinely calibrated and maintained per manufacturer specifications and in accordance with FDEP SOPs.
- **Field sampling personnel** will be selected based on training, prior experience, and project-specific familiarity. Team leads will supervise and verify adherence to approved SOPs.
- **Data collection and handling** will use standardized field forms and/or digital systems with required QA/QC checks. Daily review by the task lead ensures immediate identification and resolution of discrepancies in recorded observations, chain of custody, and calibration documentation.
- **Benchmark EA laboratory operations** will follow their NELAP-certified Quality Manual and SOPs. Internal QA protocols include method blanks, duplicates, matrix spikes, laboratory control samples, and regular equipment calibration verification.
- **Project-specific QA/QC documentation,** including calibration logs, sonde verification records, and corrective action logs, will be maintained and reviewed by both the ESA QA Officer, Kristin Jenkins, and Field QA Auditor, Jon Perry.

By applying this comprehensive QA framework, the ESA–Benchmark EA team will deliver reliable and actionable monitoring data that meets the County's technical needs, complies with state and federal data acceptance standards, and supports confident environmental decision-making.

# 6

# Examples of Recently Accomplished Similar Projects

ESA

6

# Examples of Recently Accomplished Similar Projects

The following project summaries illustrate the ESA Team's extensive experience conducting surface water quality monitoring programs aligned with the requirements of FDEP's Watershed Information Network (WIN) and the broader regulatory framework for identifying impaired waters and supporting TMDL development. With over two decades of collaboration between ESA and Benchmark EA staff, our team brings unparalleled continuity, technical expertise, and local knowledge to Charlotte County's ambient water quality monitoring needs.

All members of our team participate in the existing Charlotte County Ambient Surface Water Monitoring Program. Key members of our proposed team—including Bob Woithe and Tony Janicki—played foundational roles in designing and implementing Hydrobiological Monitoring Programs (HBMPs) required under Southwest Florida Water Management District (SWFWMD) Water Use Permits for the Hillsborough River, Tampa Bypass Canal, Alafia River, Hillsborough Bay, and Peace River. Benchmark EA has been the laboratory services partner on these programs since 2003, scaling operations and adapting to evolving monitoring needs and special studies without interruption.

The four project examples that follow reflect our team's depth of experience and proven performance under both routine and emergent conditions:

1. **Peace River Hydrobiological Monitoring Program** – Demonstrates long-term collaboration and high-volume data management for regulatory compliance.
2. **Nutrient Source Tracking Study for Clearwater Harbor and St. Joseph Sound** – This effort demonstrates ESA's technical ability to design and implement targeted water quality monitoring programs, manage complex datasets, and support actionable nutrient reduction planning—directly aligning with Charlotte County's goals for improved ambient monitoring, data-driven management, and watershed health.
3. **Dona Bay Phase III Watershed Monitoring** – Represents the integration of continuous monitoring technology, complex parameter analysis, and data visualization for watershed management.
4. **Alafia River, Hillsborough River, and Tampa Bypass Canal Hydrobiological Monitoring Program and Desalination Facility Monitoring** – Demonstrates ESA's ability to design and cost-effectively implement large environmental monitoring programs.

Together, these examples underscore our team's ability to deliver responsive, rigorous, and scientifically defensible water quality monitoring solutions that mirror the scope, regulatory expectations, and technical challenges presented in Charlotte County's ambient monitoring program.

## Peace River Hydrobiological Monitoring Program

***Peace River Manasota Regional Water Supply Authority. Desoto County, Florida. 1996-ongoing***

The Peace River Manasota Regional Water Supply Authority's Hydrobiological Monitoring Program (HBMP) is a long-term, regulatory-mandated effort designed to evaluate the potential impacts of permitted freshwater withdrawals on the Lower Peace River and Upper Charlotte Harbor estuarine system. In place since the 1990s, the HBMP has evolved in response to changing water use permits, increased withdrawal thresholds, and new scientific understanding. ESA staff have led and supported this program for decades, bringing continuity, technical rigor, and regionally informed expertise to its design and implementation.

In 2020, the Authority consolidated several contracts under a single umbrella and selected ESA (formerly JEI) as the prime consultant. In this role, ESA leads a team, which includes long-time partner Benchmark EA, to execute all aspects of the HBMP. ESA's responsibilities span the full data lifecycle—ranging from water quantity and water quality data collection and QA/QC to comprehensive data evaluation and regulatory support. Annual data reports and multi-year interpretive summaries provide in-depth technical analysis on:

- Status and trends in hydrologic and water quality indicators
- Influence of upstream watershed inputs and withdrawal operations
- Conductivity shifts in the Lower Peace River
- Salinity–flow–withdrawal dynamics
- Empirical modeling to assess the effectiveness of withdrawal protocols
- Evaluation of potential ecological impacts using regulatory and site-specific indicators

ESA also prepares and submits formatted HBMP data to the Florida Department of Environmental Protection's WIN (formerly STORET) system. Enhancements to the HBMP—developed and implemented by ESA—include a revised monitoring design framework, technical support for permit modifications, investigation of upstream and estuarine water quality drivers, and publication of a summary report on HBMP history, performance, and findings. Notably, ESA scientists led a pump-test evaluation that directly measured short-term impacts of withdrawals on salinity and related ecological metrics in the Peace River.

All ESA team members presented in this proposal also support the Peace River HBMP and contribute to fieldwork design, continuous recorder calibration and deployment, QA/QC oversight, and analytical interpretation. Benchmark EA provides certified laboratory analysis of grab samples and participates in routine project coordination.

Because of ESA's trusted relationship with the Authority, ESA was requested to conduct additional annual water quality sampling in 2024 that had previously been conducted by Authority staff. This effort, referred to as the "Upper Peace River Silica Project" included the collection of grab sample and in situ data at ten sites in the Peace River watershed upstream of the HBMP monitoring transect and required careful monitoring of discharge in the watershed to meet the narrow target for the sampling effort in a watershed where discharge can respond swiftly to increased rainfall. In addition, all ten sites, spread across nine sub-basins of the watershed, were sampled in a single day. This involved the coordination of crews sampling from land and from the water. All sampling was conducted in accordance with FDEP SOPs and data deliverables met data submission requirements for WIN.

This project exemplifies ESA's long-standing partnership with the Authority and reflects more than 20 years of continuous, adaptive support in protecting and managing one of Florida's most important estuarine systems.

## Nutrient Source Tracking Study for Clearwater Harbor and St. Joseph Sound

***Pinellas County, Florida. 2024-Present***

ESA has been contracted to review existing watershed data and conduct additional monitoring to assess nutrient loading into the Clearwater Harbor and St. Joseph Sound watersheds, identify nutrient sources using stable isotope analyses, and other advanced source tracking methods, and develop recommendations to reduce nutrient loading from both surface and groundwater resources within the respective watersheds. The benefit of this project is the identification of nutrient sources in and nutrient load reduction projects within the Clearwater Harbor and St. Joseph Sound watershed. The results from the study will be used to develop data-driven nutrient load reduction projects and programs that result in water quality improvements.

ESA tasks include the following:

- Task 1 – Project Management and Meetings
- Task 2 – Data/Literature Review
- Task 3 – Design of Source Tracking Monitoring and Data Collection Plan
- Task 4 - Data Collection
- Task 5 - Data Compilation, Management and Analysis
- Task 6 – Development/Update of Pollutant Load Model
- Task 7 – Development of BMP Alternatives for Nutrient Reduction
- Task 8 - Draft Final Report
- Task 9 - Final Report

Key ESA staff supporting this effort—**Mike Wessel, Mike Poniatowski, Dara Krachenfels, Victoria Scriven, Wes Henriquez, Jon Perry,** and **Brody Beckert**—are also part of the proposed team for Charlotte County. Their involvement in this project demonstrates our team's ability to execute complex water quality assessments, manage high volumes of environmental data, and support actionable watershed management—skills directly aligned with the County's monitoring goals.

## Dona Bay Watershed Improvement Project Phase 3 Water Quality and Flow Monitoring

***Sarasota County (as subcontractor to Jacobs). Venice, Florida. 2022 - 2025***

For the past 3 years, the ESA and Benchmark team has designed and been implementing a surface water quality and flow monitoring program in support of Phase 3 of the Dona Bay surface water conveyance and aquifer recharge project. The pre-design study phase includes sampling design and implementation to:

- Expand the real-time water level and flow monitoring of the Dona Bay Watershed Monitoring Network
- Add real-time continuous water quality monitoring stations to the network
- Develop and implement a cloud-based real-time interpretive data dashboard for water quality, levels, and flows to be integrated into the Sarasota County Water Atlas
- Conduct monthly water column profiles and nutrient and chlorophyll sampling grab sampling
- Conduct quarterly tier I and tier II drinking water standards grab sampling
- Calculate and interpret the net environmental benefits accrued from downstream nutrient load reductions and salinity regime improvements from Phases 1 & 2 of the Dona Bay Watershed Restoration Project

ESA is collecting and evaluating water quality, flow monitoring, and water budget data related to surface water nutrient removal, estuarine habitat improvements, and potential potable water supply source quality. The project proposes to use excess surface water as source for recharge into the aquifer. The study project area includes upstream areas of Cow Pen Slough and former Venice Minerals Lake (Dona Bay Surface Water Storage Facility), Shakett Creek, Dona Bay, and the Myakka River.

This project is also an example of environmental data dashboarding services that ESA provides to help clients manage their watersheds and communicate water quality status and trends to constituents and stakeholders.

Key staff supporting this project include **Bob Woithe, Mike Poniatowski, Victoria Scriven, Dara Krachenfels,** and **Jeff Winter.**

## Alafia River, Hillsborough River, and Tampa Bypass Canal Hydrobiological Monitoring Program and Desalination Facility Monitoring

***Tampa Bay Water. Hillsborough County, Florida. 2016-Present***

ESA has served as prime consultant and Program Manager for Tampa Bay Water's HBMP since 2016, supporting WUP compliance for the Alafia River and Tampa Bypass Canal surface water supply projects. This long-standing program assesses the environmental effects of water withdrawals on the Lower Hillsborough River, Tampa Bypass Canal, and Lower Alafia River. Staff members from ESA have been involved in this program since the planning stages in 1999. As with the Peace River HBMP, all ESA staff included in this proposal currently support Tampa Bay Water's HBMP.

As Tampa Bay Water's largest and most comprehensive WUP monitoring effort, the HBMP includes hydrologic, water quality, and ecological data collection, analysis, and modeling to support MFLs, TMDLs, and adaptive management. ESA also oversees monitoring at the Tampa Bay Desalination Facility and has delivered over 60% cost savings through program refinements—while maintaining compliance and avoiding adverse environmental impacts.

Project Highlights:

- Full-service HBMP and WUP compliance support since 2016
- 20+ years of integrated environmental monitoring and modeling
- Coordination with 50+ stakeholders and scientific partners
- Ongoing regulatory support for TMDLs, MFLs, and desalination monitoring
- Long-term cost savings achieved through targeted program optimization

*The table illustrated below provides a reference list of several projects in which the proposed ESA Team has collaborated.*

## Firm Project Reference List

| **Name**<br>Affiliation | Project Name | Contact Information | ESA | Benchmark EA |
|---|---|---|---|---|
| **Jim Guida**<br>Peace River Manasota Regional Water Supply Authority | **Peace River Hydrobiological Monitoring Program** | jguida@regionalwater.org<br>941.316.1776 | ✓ | ✓ |
| **Rob Burnes**<br>Pinellas County, FL | **Nutrient Source Tracking Study for Clearwater Harbor and St. Joseph Sound** | rburnes@pinellas.gov<br>727.453.3149 | ✓ | |
| **Tom Farkas**<br>Jacobs | **Dona Bay Watershed Improvements Phase II** | tom.farkas@jacobs.com<br>813.335.3247 | ✓ | ✓ |

# 7

# Describe your Experience and Capabilities in the Following Areas

# 7 Describe your Experience and Capabilities in the Following Areas

Benchmark EA, ESA's long-time laboratory partner and incumbent on this contract, brings over 20 years of proven collaboration in delivering high-quality, regulatory-compliant analytical services. With three fully accredited Florida labs—North Port/Port Charlotte, Palmetto, and Winter Haven—Benchmark EA offers robust geographic coverage and analytical capabilities spanning organics, inorganics, metals, and microbiology. Their continued role on this team provides consistency, operational efficiency, and a seamless transition into the next phase of Charlotte County's monitoring program

## A. Current DOH Performance Evaluation Rating and NELAP Certifications for Analysis requested

**SHEPHERD TECHNICAL SERVICES, LLC**
6105 SIERRA LEON
AUSTIN, TX 78759
TELEPHONE/FAX: 512.335.0906

February 23, 2024

Haley Richardson
Quality Assurance Officer
Benchmark EnviroAnalytical, Inc.
1711 12th Street East
Palmetto, FL 34221

FL ID E84167

Ms. Richardson:

Shepherd Technical Services has received your response and Plan of Correction for the findings identified during the assessment conducted at your facility November 30, 2023 through December 1, 2023. The laboratory's response was received by Shepherd Technical Services on January 26, 2024.

Our review of the corrective actions planned and/or taken finds them to be acceptable to address the findings.

This audit will be closed.

Attached you will find an annotated copy of the laboratory's response document indicating the responses are acceptable.

Further, please note that your corrective actions generally do not include any evidence of root cause analysis or determination as is required under the standards for accreditation for any corrective action procedures. Any future assessments will require the inclusion of root cause analysis as part of your corrective action plans.

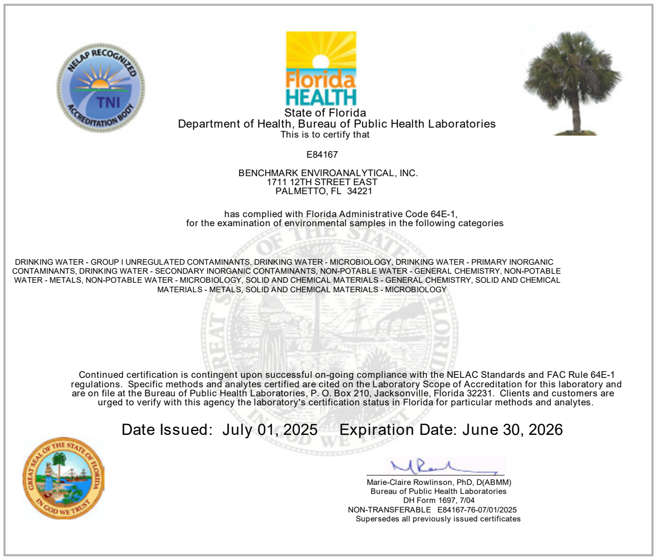
Please let us know if you have any further questions.

Respectfully,

Michael C. Shepherd
**SHEPHERD TECHNICAL SERVICES, LLC**

Copy: Vanessa Soto-Contreras, FL-DOH
Mei Beth Shepherd
Kaitlyn Rodriguez

# Benchmark EnviroAnalytical Certifications



State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E84167

BENCHMARK ENVIROANALYTICAL, INC.
1711 12TH STREET EAST
PALMETTO, FL 34221

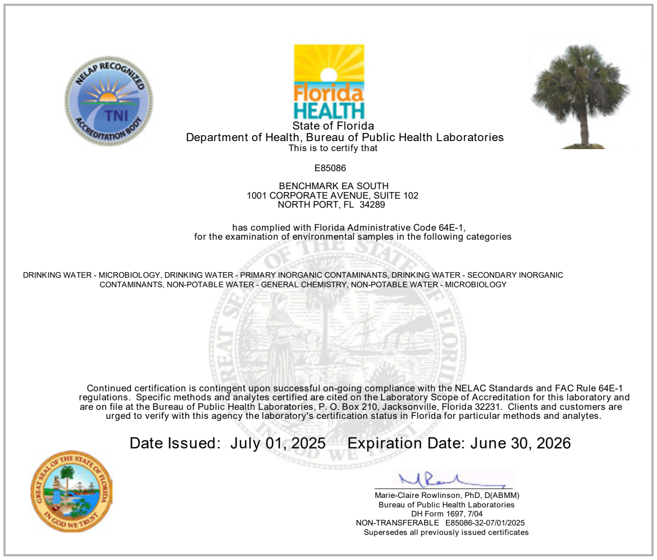
has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

DRINKING WATER - GROUP I UNREGULATED CONTAMINANTS, DRINKING WATER - MICROBIOLOGY, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - METALS, NON-POTABLE WATER - MICROBIOLOGY, SOLID AND CHEMICAL MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS - MICROBIOLOGY

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2025 Expiration Date: June 30, 2026

Marie-Claire Rowlinson, PhD, D(ABMM)
Bureau of Public Health Laboratories
DH Form 1697, 7/04
NON-TRANSFERABLE E84167-76-07/01/2025
Supersedes all previously issued certificates



State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E85086

BENCHMARK EA SOUTH
1001 CORPORATE AVENUE, SUITE 102
NORTH PORT, FL 34289

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

DRINKING WATER - MICROBIOLOGY, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - MICROBIOLOGY

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2025 Expiration Date: June 30, 2026

Marie-Claire Rowlinson, PhD, D(ABMM)
Bureau of Public Health Laboratories
DH Form 1697, 7/04
NON-TRANSFERABLE E85086-32-07/01/2025
Supersedes all previously issued certificates

## B. Brochure/Catalog of Analyses Benchmark is Certified to Perform

Benchmark EA's current Laboratory Scope of Accreditation is provided in the Section 13, Appendix.

## C. Quality Manual

In February 2023, Benchmark EA updated the Quality Manual applicable to the Palmetto and North Port lab locations. The full version of this manual is provided in Section 13, Appendix. The quality manual and quality system information document is compliant with FDEP SOP 001/01 and includes the below major sections.

- Laboratory Organization
- Quality Policy
- Organization Abilities
- Sample Custody and Documentation
- Analytical Procedures
- Calibration Procedures and Frequency
- Preventative Maintenance
- Minimum Quality Control Requirements and Routines to Calculate and Assess Precision, Accuracy and Method Detection Limits.
- Data Reduction, Validation and Reporting
- Corrective Actions
- Performance and Systems Audits
- General Management Responsivities
- Data Integrity Training
- Laboratory Document Filing and Storage

## D. Data Quality Objectives/ Indicators for Laboratory and Field Measurement Data

Section 3 of the Benchmark EA Quality Manual, Provided in Section 13, Appendix, outlines the Quality Policy and objectives in detail. For convenience and in response to RFP request VII(D), the policy is also included below.

### POLICY

Laboratory management is committed to good professional practice and to the quality of its environmental testing services for clients to ensure compliance with their permit and project requirements. This commitment is intended to:

- Produce data of known and documented quality that is scientifically valid
- Meet method specifications
- Satisfy regulatory requirements
- Accomplish the data quality objectives of the client

### OUR STANDARDS OF SERVICE

- Client satisfaction
- Results meet client's quality and accuracy requirements
- Turn-around time commitments are achieved

### OUR MOTTO

Do it right the first time, on time, and assume nothing

### OBJECTIVES OF THE QUALITY SYSTEM

A comprehensive Quality Control Program is in place to monitor the quality of test results. This program includes:

- Analysis and evaluation of internal quality control samples with every batch. (These samples include blanks, duplicated samples, standard reference materials, and spiked samples).
- Participation in external and quality control programs including:
    1. Proficiency Testing
    2. RAMP Studies
    3. Client blind samples
- Tracking, review and corrective action to exceptions
- Data integrity training

### PERSONNEL

Management's policy is to ensure the information within quality documentation is communicated to, implemented, and understood by all lab personnel. They are provided with the knowledge, training, and tools necessary to perform laboratory operations and testing.

### COMMITMENT

Laboratory management is committed to comply with its quality system and the guidelines within the NELAC Quality Systems Standard.

## Benchmark EA Capabilities for Surface Water Analysis

Benchmark EnviroAnalytical has extensive experience in analysis of all types of surface water. This experience includes long term studies, some of which, have been ongoing for 10-15 years. Surface water analysis has become a point of expertise for Benchmark EA and has resulted in implementation of up-to-date methodology including new method modifications allowed by C.W.A. 40 CRF Part 136. A summary description of Benchmark EA method modifications and special services are described below.

### METHOD DETECTION LIMITS (FAC 62-4.246(4))

Generated method detection limits meet FDEP requirements as described in F.A.C. 62-4.246(4) - "Guidance for Selection of Analytical Methods and for Evaluation of MDLs and PQLs". The 2016 version of the rule is followed for existing permits and the 2019 version is applied for new permits

### COST CONTROL OPTIONS

Nitrate-nitrite is a major contributor to nitrogen loading in surface water and is often analyzed using EPA 353.2 which uses copper/cadmium column for reducing nitrate to nitrite. The net result is the nitrate-nitrite mix is converted to all nitrite and then analyzed colorimetrically. Copper/cadmium columns are easily susceptible to column poisoning due to contamination found in non-potable water. Column replacement is often required once poisoning occurs imparting downtime expenses. Benchmark EA is NELAP certified for Easy 1-reagent method which is a direct reduction that does not require a column. Easy 1-reagant is efficient and easily accommodates saline samples. The method detection limit for this method is 0.006 mg/L. Easy 1-reagant method is approved in CRF table 1B-(2017 Methods Update Rule) – Parameter: 39 – Nitrate-Nitrite (as N): Methodology: reduction/colorimetric procedure - see footnote 6: Easy (1-Reagent) Nitrate Method.

Ion chromatography is used for one step analysis of nitrate and nitrite individually when the surface water sample is relatively free of interferences. This method is more efficient and more cost effective that two step methods of separately analyzing for nitrite and then for nitrate-nitrite followed by subtraction to calculate nitrate.

## LOWER DETECTION LIMITS

Chlorophyll-a is a key component in calculating the trophic state of a surface water body. Benchmark EA applies fluorometric analysis, equipped with narrow-band pass filters, to obtain lower detection limits than can be obtained by spectrophotometric methods ("Applicability of Chlorophyll a Methods", DEP-SAS –002/10).

The maximum contamination limit for Copper in Class III Marine waters (F.A.C. 62-302.530 Surface Water Criteria) is 3.7 µg/L, a very low value to dependably measure in saline water. BenchmarkEA conducts dependable low-level analysis of copper in saline surface water without pre-dilution of sample. The procedure, a modification of SM3113B, requires forming an organo-copper complex in the saline matrix followed by extraction of the complex with MIBX (i.e., methyl isobutyl ketone). The salt-free organic extract is then submitted to analysis by method SM3113B (MDL: 0.272 µg/L).

## QUICK TESTING OPTION

Benchmark EA provides certified UV254 analysis for circumstances where quick assessment is required for the presence of organics in surface water. Organic compounds, with unsaturation or aromaticity in their structure, absorb UV light as it passes through the sample. The method measures the amount of UV light absorbed by organics in surface water samples.

## BACTERIA

Full marina sampling and analysis capability are available to service new construction permits and currently operating permits. Services include diel studies and bacteriological studies for enterococci and fecal coliform bacteria including 30-day geometric mean studies.

# 8

# Volume of Work

# 8 Volume of Work

ESA currently holds the existing Charlotte County ambient surface water monitoring contract and has maintained a consistent and productive partnership with the County. As a result, our inclusion in past work volume calculations is a reflection of this ongoing engagement. However, it is important to note that the value of this work has been proportionate to its scope and modest in overall volume when considered within the broader context of County contracting. The success of the program to date has been achieved through a highly efficient, cost-effective, and technically rigorous approach—delivering high-value outcomes without undue burden on County resources. Our team remains committed to continuing this performance standard, offering dependable service without exceeding the scale or frequency of task authorizations needed to support the County's monitoring goals.

# 9 Location

# 9 Location

ESA's team is uniquely positioned—both geographically and operationally—to support Charlotte County's ambient water quality monitoring needs with exceptional responsiveness and flexibility. Through our refined "hub and spoke" staffing model, ESA has created a dynamic deployment structure that ensures key personnel, vehicles, and equipment are stationed in close proximity to project sites and ready to mobilize on very short notice.

This model integrates both regional ESA hub offices and strategically placed spoke locations (home offices and field-ready personnel), allowing us to maintain direct, on-the-ground presence across Southwest Florida. For Charlotte County, this means your dedicated project team is already in position and ready to respond immediately:

To further support rapid deployment, ESA maintains corporate response vehicles and pre-staged monitoring equipment at each of our Florida hub offices. Additionally, our Tampa warehouse serves as a central equipment depot, housing boats, sondes, and other large-scale gear within easy reach of major interstate corridors—enabling expedited transport to any location in Charlotte County within hours, if not sooner.

Our laboratory partner, Benchmark EA, adds another layer of logistical efficiency with three regional laboratories—in North Port/Port Charlotte, Palmetto, and Winter Haven. The North Port/Port Charlotte and Palmetto labs in particular offer convenient, same-day coordination points for sampling kit distribution and sample receipt, minimizing lag between collection and analysis and enhancing data integrity.

ESA's ability to rapidly respond is not theoretical—it is a documented strength. Our team has successfully mobilized field crews within hours to respond to storm-driven sampling events as part of the Sunshine Lake/Sunrise Waterway characterization project and continues to provide uninterrupted water quality monitoring for the Peace River Manasota Regional Water Supply Authority, even under challenging conditions.

Our deep roots in the region, combined with our integrated logistical and staffing infrastructure, allow ESA to be exceptionally nimble and responsive—traits that are critical for the type of high-frequency, adaptive monitoring required by this contract. Whether it's routine monthly sampling or an urgent unplanned event, we are already here, already equipped, and fully prepared to deliver.

**The table below provides the current hub and/or spoke locations of our key and supporting staff dedicated to this effort, underscoring the strategic positioning of our team across the Charlotte County service area.**

| STAFF | FIRM | HUB OFFICE | SPOKE OFFICE |
|---|---|---|---|
| **Bob Woithe, PhD** | ESA | Sarasota | Palmetto |
| **Chris Warn** | ESA | Sarasota | Englewood |
| **Mike Poniatowski** | ESA | Tampa | St. Petersburg |
| **Kristin Jenkins** | ESA | Tampa | Clearwater |
| **Wes Henriquez, GISP** | ESA | Tampa | Tampa |
| **Jeff Winter** | ESA | Tampa | Lakeland |
| **Victoria Scriven** | ESA | Tampa | Tampa |

<table>
<tr><th>STAFF</th><th>FIRM</th><th>HUB OFFICE</th><th>SPOKE OFFICE</th></tr>
<tr><td>Dara Krachenfels</td><td>ESA</td><td>Tampa</td><td>Tampa</td></tr>
<tr><td>Brody Beckert</td><td>ESA</td><td>Tampa</td><td>Tampa</td></tr>
<tr><td>Andrea Ramos Almodovar</td><td>ESA</td><td>Tampa</td><td>Tampa</td></tr>
<tr><td>Mike Wessel</td><td>ESA</td><td>Tampa</td><td>St. Petersburg</td></tr>
<tr><td>Jon Perry, GISP</td><td>ESA</td><td>Sarasota</td><td>Sarasota</td></tr>
<tr><td>Tony Janicki, PhD</td><td>ESA</td><td>Tampa</td><td>St. Petersburg</td></tr>
<tr><td rowspan="3">Dale Dixon, PhD</td><td>Benchmark EA (North Lab)</td><td colspan="2">Palmetto</td></tr>
<tr><td>Benchmark EA (South Lab)</td><td colspan="2">North Port/Port Charlotte</td></tr>
<tr><td>Benchmark EA (Central Lab)</td><td colspan="2">Winter Haven</td></tr>
</table>

This geographic alignment of personnel and resources reflects not only ESA's long-standing investment in supporting Charlotte County but also our commitment to practical, real-world readiness. With field-tested communication workflows, direct coordination lines between ESA and Benchmark EA, and a distributed team structure already operating within the region, we offer a continuity of service and responsiveness that few others can match. As the County's needs evolve, our strategically placed team will continue to provide fast, flexible, and high-quality monitoring services without delay or disruption.

# 10 Litigation

# 10 Litigation

Over the past five years, ESA has maintained an outstanding record of performance, successfully delivering every contract we have undertaken with the highest standards of quality, technical rigor, and client satisfaction. Our consistent ability to meet project goals and deadlines has reinforced our reputation for reliability, accountability, and professionalism across a wide range of environmental and regulatory assignments.

As a trusted partner on many complex, high-profile, and often controversial projects, ESA routinely works at the intersection of science, policy, and public interest. These efforts occasionally attract legal scrutiny or challenges—typically aimed at the public agencies we serve—due to the contentious nature of the underlying projects, not because of flaws in our technical work.

Importantly, no ESA-certified or approved document has ever been invalidated by the courts due to negligence or error on the part of ESA. Our work continues to withstand legal and technical review, affirming the integrity and defensibility of our methodologies and conclusions.

**ESA is not currently a party to, nor involved in, any active or pending litigation that would impair our ability to fulfill our responsibilities to Charlotte County. We remain fully available, focused, and committed to supporting the County with the same high standard of service that has long defined our firm.**

# 11

# Minority Business

# 11 Minority Business

While ESA is not a certified Minority Business Enterprise (MBE), we are deeply committed to advancing justice, equity, diversity, and inclusion across our organization and in every project we undertake.

**As part of this commitment, ESA has partnered with Benchmark EnviroAnalytical, Inc., an FDOT-certified DBE,** as a major subconsultant for this contract. Benchmark EA is a long-standing and highly qualified laboratory with a 30-year record of delivering high-quality analytical services throughout Southwest Florida. Their critical role in this project ensures that a significant portion of the contract budget will support MBE/DBE participation, directly contributing to the County's diversity and inclusion goals.

In addition, ESA is prepared to bring on additional certified MBE/DBE firms, as deemed necessary or beneficial by Charlotte County, to further enhance the diversity and inclusivity of the project team. We are also committed to considering small businesses and local firms whose involvement would contribute to economic development and reinvestment within Charlotte County. These partnerships not only align with the County's priorities but also strengthen the resilience and community focus of the project team.

ESA actively supports workforce equity in Florida through our paid internship programs, designed to provide opportunities to individuals from underrepresented communities and demographic groups in the environmental industry. These programs help build a more inclusive pipeline of future environmental professionals and demonstrate our broader commitment to systemic change.

Through these actions—both strategic and values-driven—ESA is proud to support a project team that reflects the diversity, capability, and community orientation that Charlotte County seeks to promote through its procurement and contracting practices.

*Florida Department of Transportation*

CHARLIE CRIST
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

STEPHANIE C. KOPELOUSOS
SECRETARY

June14, 2010

**Certified Mail – Return Receipt Requested**

Benchmark EviroAnalytical, Inc.
Ms. Katharine A.Dixon
1711 12th Street East
Palmetto FL 34221

**ANNIVERSARY DATE- Annually On June 6**

Dear Ms. Dixon:

The Florida Department of Transportation [FDOT] is pleased to announce that your firm is certified under the **Florida Unified Certification Program [UCP]** as a **Disadvantaged Business Enterprise [DBE]** in accordance with Part 49 Section 26, Code of Federal Regulations.

DBE certification is continuing, but is contingent upon the firm maintaining its eligibility annually through this office. You will be notified of your annual responsibilities in advance of the **Anniversary Date.** You must submit the annual **AFFIDAVIT FOR CONTINUING ELIGIBILITY** no later than the **Anniversary Date.** Failure to do so will result in immediate action to remove certification.

Only those firms listed in the UCP DBE Directory, are certified by Florida UCP Members. **Prime contractors and consultants should verify your firm's DBE certification status and identify the work area(s) for which the firm is DBE eligible, through this Directory.**
Your firm will be listed in Florida's UCP DBE Directory which can be accessed via the internet, at http://www.bipincwebapps.com/biznetflorida/ or through The Department's website at www.dot.state.fl.us/equalopportunityoffice, then select "DBE Directory."

DBE certification is **NOT** a guarantee of work, but enables the firm to compete for, and perform, contract work on all USDOT Federal Aid (FAA, FTA and FHWA) projects in Florida as a DBE contractor, sub-contractor, consultant, sub-consultant or material supplier.

www.dot.state.fl.us RECYCLED PAPER

If, at any time, tere is a material change, you **must advise this office, by sworn affidavit and supporting documents, within thirty [30] days.** Changes include, but are not limited to, ownership, officers, Directors, management, key personnel, scope of work performed, daily operations, on-going business relationships with other firms or individuals, or the physical location of your firm. After our review you should receive instructions as to how you should proceed, if necessary. Failure to do so will be deemed a failure, on your part, to cooperate, and will result in immediate action to Remove DBE certification.

Your firm is eligible to compete for, and perform, work on all USDOT Federal Aid projects throughout Florida, and may earn DBE credit for work performed in the following areas:

| NAICS: | FDOT Specialty Code & Description |
|---|---|
| 541380 | 944-Laboratory Testing Services |

All other concerns should be directed to this office by mail or telephone. Our telephone number is (850) 414-4747. Our Fax number is (850) 414-4879

Sincerely,

John Goodeman, Certification Manager
Equal Opportunity Office

# 12

# Required Forms

ESA

## PART IV - SUBMITTAL FORMS
## PROPOSAL SUBMITTAL SIGNATURE FORM

| 1. | Project Team Name and Title | Years experience | City of office individual will work out of for this project | City individual's office is normally located | City of individual's residence |
|---|---|---|---|---|---|
| | Bob Woithe, PhD | 30+ | Sarasota | Palmetto | Palmetto |
| | Chris Warn | 25+ | Sarasota | Englewood | Englewood |
| | Mike Poniatowski | 10+ | Tampa | St. Petersburg | St. Petersburg |
| | Kristin Jenkins | 20+ | Tampa | Clearwater | Clearwater |
| | Wes Henriquez, GISP | 20+ | Tampa | Tampa | Tampa |
| | Jeff Winter | 25+ | Tampa | Lakeland | Lakeland |
| | Victoria Scriven | 2+ | Tampa | Tampa | Tampa |
| | Dara Krachenfels | 1+ | Tampa | Tampa | Tampa |
| | Brody Beckert | 1+ | Tampa | Tampa | Tampa |
| | Andrea Ramos Almodovar | 2+ | Tampa | Tampa | Tampa |
| | Mike Wessel | 25+ | Tampa | St. Petersburg | St. Petersburg |
| | Jon Perry, GISP | 25+ | Sarasota | Sarasota | Sarasota |
| | Tony Janicki, PhD | 40+ | Tampa | St. Petersburg | St. Petersburg |
| | Dale Dixon, PhD | 30+ | Palmetto | Palmetto | Palmetto |

| 2. | Magnitude of Company Operations | |
|---|---|---|
| | A) Total professional services fees received within last 24 months: | $ 303,159,300 |
| | B) Number of similar projects started within last 24 months: | 23 |
| | C) Largest single project to date: | $ 28.9 million |

| 3. | Magnitude of Charlotte County Projects | |
|---|---|---|
| | A) Number of current or scheduled County Projects | 1 |
| | B) Payments received from the County over the past 24 months (based upon executed contracts with the County). | $ 407,307 |

| 4. | Sub-Consultant(s) (if applicable) | Location | % of Work to be Provided | Services to be Provided |
|---|---|---|---|---|
| | Benchmark EnviroAnalytical | Palmetto | 50% | Environmental Laboratory Services |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

| 5. | Disclosure of interest or involvement: List below all private sector clients with whom you have an active pending contract and who have an interest within the areas affected by this project. Also, include any properties or interests held by your firm, or officers of your firm, within the areas affected by this project. | |
|---|---|---|
| | Firm **NOT APPLICABLE** | Address |
| | Phone # | Contact Name |
| | Start Date | Ending Date |
| | Project Name/Description | |

**NAME OF FIRM** Environmental Science Associates Corporation

**(This form must be completed and returned)**

| **6. Minority Business:** The County will consider the firm's status as an MBE or a certified MBE, and also the status of any sub-contractors or sub-consultants proposed to be utilized by the firm, within the evaluation process. | **Yes** X **No** ____ |
| --- | --- |
| **Comments or Additional Information:** | |
| Benchmark EnviroAnalytical, Inc is certified under the Florida Unified Certification Program (I-JCP) as a | |
| Disadvantaged Business Enterprise (DBE) | |

The undersigned attests to his/her authority to submit this proposal and to bind the firm herein named to perform as per contract, if the firm is awarded the Contract by the County. The undersigned further certifies that he/she has read the Request for Proposal, Terms and Conditions, Insurance Requirements and any other documentation relating to this request and this proposal is submitted with full knowledge and understanding of the requirements and time constraints noted herein.

By signing this form, the proposer hereby declares that this proposal is made without collusion with any other person or entity submitting a proposal pursuant to this RFP.

In accordance with section 287.135, Florida Statutes, the undersigned certifies that the company is not on the Scrutinized Companies with Activities in Sudan List, the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, and does not have business operations in Cuba or Syria (if applicable) or the Scrutinized Companies that Boycott Israel List, or is not participating in a boycott of Israel.

As Addenda are considered binding as if contained in the original specifications, it is critical that the Consultant acknowledge receipt of same. The submittal may be considered void if receipt of an addendum is not acknowledged.

Addendum No. 1 Dated 7/9/25 Addendum No.____ Dated____ Addendum No.____ Dated____
Addendum No. 2 Dated 7/11/25 Addendum No.____ Dated____ Addendum No.____ Dated____

Type of Organization (please check one): INDIVIDUAL (_) PARTNERSHIP (_) CORPORATION (X) JOINT VENTURE (_)

Environmental Science Associates Corporation
Firm Name

415.896.5900
Telephone

N/A
Fictitious or d/b/a Name

94-1698350
Federal Employer Identification Number (FEIN)

575 Market Street, Suite 3700
Home Office Address

San Francisco, California, 94105
City, State, Zip

56
Number of Years in Business

5404 Cypress Center Drive, Suite 125, Tampa, Florida, 33609
Address: Office Servicing Charlotte County, other than above

Michael Poniatowski / Project Manager
Name/Title of your Charlotte County Rep.

727.433.3440
Telephone

Christopher Warn / Vice President
Name/Title of Individual Binding Firm (Please Print)

Christopher T. Warn
Signature of Individual Binding Firm

July 18, 2025
Date

cwarn@esassoc.com
Email Address

**(This form must be completed & returned)**

**DRUG FREE WORKPLACE FORM**

The undersigned vendor in accordance with Florida Statute 287.087 hereby certifies that Environmental Science Associates Corporation does:
(name of business)

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

Christopher T. Warn
Proposer's Signature

July 18, 2025
Date

**NAME OF FIRM** Environmental Science Associates Corporation
**(This form must be completed & returned)**

**DRUG FREE WORKPLACE FORM**

The undersigned vendor in accordance with Florida Statute 287.087 hereby certifies that Benchmark Enviro (name of business) does: analytical

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).

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5. Impose a sanction on or require the satisfactory participation in a drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign the statement, I certify that this firm complies fully with the above requirements.

Dale Clifton
Proposer's Signature

Date July 16, 2025

**NAME OF FIRM** Benchmark Enviro Analytical Inc.
**(This form must be completed & returned)**

## HUMAN TRAFFICKING AFFIDAVIT
## for Nongovernmental Entities Pursuant To FS. §787.06

### Charlotte County Contract #20250526

The undersigned on behalf of the entity listed below, (the "Nongovernmental Entity"), hereby attests under penalty of perjury as follows:

1. I am over the age of 18 and I have personal knowledge of the matters set forth except as otherwise set forth herein.

2. I am an officer or representative of the Nongovernmental Entity and authorized to provide this affidavit on the Company's behalf.

3. Nongovernmental Entity does not use coercion for labor or services as defined in Section 787.06, Florida Statutes.

4. This declaration is made pursuant to Section 92.525, Florida Statutes. I understand that making a false statement in this declaration may subject me to criminal penalties.

Under penalties of perjury, I declare that I have read the foregoing Human Trafficking Affidavit and that the facts stated in it are true.

Further Affiant sayeth naught.

Christopher T. Warn
Signature

Christopher Warn
Printed Name

Vice President
Title

Environmental Science Associates Corporation
Nongovernmental Entity

July 18, 2025
Date

**END OF PART IV**

**NAME OF FIRM** Environmental Science Associates Corporation

**(This form must be completed and returned)**

## HUMAN TRAFFICKING AFFIDAVIT
## for Nongovernmental Entities Pursuant To FS. §787.06

### Charlotte County Contract #20250526

The undersigned on behalf of the entity listed below, (the "Nongovernmental Entity"), hereby attests under penalty of perjury as follows:

1. I am over the age of 18 and I have personal knowledge of the matters set forth except as otherwise set forth herein.

2. I am an officer or representative of the Nongovernmental Entity and authorized to provide this affidavit on the Company's behalf.

3. Nongovernmental Entity does not use coercion for labor or services as defined in Section 787.06, Florida Statutes.

4. This declaration is made pursuant to Section 92.525, Florida Statutes. I understand that making a false statement in this declaration may subject me to criminal penalties.

Under penalties of perjury, I declare that I have read the foregoing Human Trafficking Affidavit and that the facts stated in it are true.

Further Affiant sayeth naught.

Dale Dixon
Signature

Dale Dixon
Printed Name

Laboratory Director
Title

Benchmark Enviro Analytical Inc
Nongovernmental Entity

July 16, 2025
Date

**END OF PART IV**

**NAME OF FIRM** Benchmark Enviro Analytical Inc.
**(This form must be completed and returned)**

# 13 Appendix

Ron DeSantis
Governor

## *Laboratory Scope of Accreditation*



**Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

State Laboratory ID: **E84167** EPA Lab Code: **FL00289** **(941) 723-9986**

**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Drinking Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1505 | Alkalinity as CaCO3 | SM 2320 B-2011 | 20045618 | Primary Inorganic Contaminants | 6/20/2022 |
| 1000 | Aluminum | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 5/25/2004 |
| 1515 | Ammonia as N | EPA 350.1 | 10063602 | Primary Inorganic Contaminants | 3/7/2011 |
| 1005 | Antimony | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1010 | Arsenic | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1015 | Barium | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1020 | Beryllium | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1020 | Beryllium | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1025 | Boron | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 3/7/2011 |
| 1535 | Bromate | EPA 300.1 | 10275602 | Primary Inorganic Contaminants | 11/21/2008 |
| 1540 | Bromide | EPA 300.0 | 10053200 | Primary Inorganic Contaminants | 5/25/2004 |
| 9312 | Bromoacetic acid | EPA 552.2 | 10095804 | Group I Unregulated Contaminants | 3/7/2025 |
| 9315 | Bromochloroacetic acid | EPA 552.2 | 10095804 | Group I Unregulated Contaminants | 3/7/2025 |
| 1030 | Cadmium | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1030 | Cadmium | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1035 | Calcium | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1570 | Chlorate | EPA 300.1 | 10275602 | Secondary Inorganic Contaminants | 11/21/2008 |
| 1575 | Chloride | EPA 300.0 | 10053200 | Secondary Inorganic Contaminants | 4/22/2024 |
| 1580 | Chlorine | SM 4500-Cl G | 20081441 | Primary Inorganic Contaminants | 3/7/2011 |
| 1595 | Chlorite | EPA 300.1 | 10275602 | Primary Inorganic Contaminants | 11/21/2008 |
| 9336 | Chloroacetic acid | EPA 552.2 | 10095804 | Group I Unregulated Contaminants | 3/7/2025 |
| 1040 | Chromium | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1040 | Chromium | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1605 | Color | SM 2120 B-2011 | 20039310 | Secondary Inorganic Contaminants | 6/20/2022 |
| 1610 | Conductivity | SM 2510 B-2011 | 20048617 | Primary Inorganic Contaminants | 6/20/2022 |
| 1055 | Copper | EPA 200.7 | 10013806 | Primary Inorganic Contaminants,Secondary Inorganic Contaminants | 5/25/2004 |
| 1055 | Copper | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1620 | Corrosivity (langlier index) | SM 2330 B | 20003207 | Secondary Inorganic Contaminants | 3/7/2011 |
| 1635 | Cyanide | EPA 335.4 | 10061402 | Primary Inorganic Contaminants | 1/7/2021 |
| 9357 | Dibromoacetic acid | EPA 552.2 | 10095804 | Group I Unregulated Contaminants | 3/7/2025 |
| 9360 | Dichloroacetic acid | EPA 552.2 | 10095804 | Group I Unregulated Contaminants | 3/7/2025 |
| 1710 | Dissolved organic carbon (DOC) | SM 5310 B | 20137819 | Primary Inorganic Contaminants | 11/21/2008 |
| 2525 | Escherichia coli | SM 9223 B | 20037676 | Microbiology | 1/3/2002 |
| 2525 | Escherichia coli | SM 9223 B (Colilert Quanti-Tray)-2016 | 20211647 | Microbiology | 6/20/2022 |

**Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.**

Certification Type NELAP

**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

**Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

State Laboratory ID: **E84167** EPA Lab Code: **FL00289** **(941) 723-9986**

**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Drinking Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1730 | Fluoride | EPA 300.0 | 10053200 | Primary Inorganic Contaminants,Secondary Inorganic Contaminants | 5/25/2004 |
| 1750 | Hardness | SM 2340 B-2011 | 20046611 | Secondary Inorganic Contaminants | 6/20/2022 |
| 2555 | Heterotrophic plate count | SM 9215 B | 20179811 | Microbiology | 6/25/2024 |
| 3840 | Hydrogen sulfide | SM 4500S= H (21st ed.) | 20125057 | Primary Inorganic Contaminants | 3/7/2011 |
| 1070 | Iron | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 5/25/2004 |
| 1075 | Lead | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1085 | Magnesium | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1090 | Manganese | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 5/25/2004 |
| 1095 | Mercury | EPA 245.1 | 10036609 | Primary Inorganic Contaminants | 1/3/2002 |
| 1100 | Molybdenum | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 3/7/2011 |
| 1105 | Nickel | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1105 | Nickel | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1810 | Nitrate as N | EPA 300.0 | 10053200 | Primary Inorganic Contaminants | 5/25/2004 |
| 1840 | Nitrite as N | EPA 300.0 | 10053200 | Primary Inorganic Contaminants | 5/25/2004 |
| 1855 | Odor | EPA 140.1 | 10007406 | Secondary Inorganic Contaminants | 1/3/2002 |
| 1870 | Orthophosphate as P | EPA 300.0 | 10053200 | Primary Inorganic Contaminants | 3/7/2011 |
| 1900 | pH | SM 4500-H+ B-2011 | 20105220 | Secondary Inorganic Contaminants | 6/20/2022 |
| 1125 | Potassium | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 5/25/2004 |
| 1955 | Residue-filterable (TDS) | SM 2540 C-2015 | 20050435 | Secondary Inorganic Contaminants | 6/20/2022 |
| 1140 | Selenium | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1990 | Silica as SiO2 | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 1150 | Silver | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 5/25/2004 |
| 1150 | Silver | EPA 200.8 | 10014605 | Secondary Inorganic Contaminants | 4/5/2024 |
| 1155 | Sodium | EPA 200.7 | 10013806 | Primary Inorganic Contaminants | 5/25/2004 |
| 2000 | Sulfate | EPA 300.0 | 10053200 | Primary Inorganic Contaminants,Secondary Inorganic Contaminants | 5/25/2004 |
| 2005 | Sulfide | SM 4500-S D/UV-VIS | 20026204 | Secondary Inorganic Contaminants | 3/7/2011 |
| 2025 | Surfactants - MBAS | SM 5540 C-2011 | 20145066 | Secondary Inorganic Contaminants | 6/20/2022 |
| 1165 | Thallium | EPA 200.8 | 10014605 | Primary Inorganic Contaminants | 4/5/2024 |
| 1165 | Thallium | EPA 200.9 | 10015404 | Primary Inorganic Contaminants | 1/3/2002 |
| 2500 | Total coliforms | SM 9223 B | 20037676 | Microbiology | 1/3/2002 |
| 2500 | Total coliforms | SM 9223 B (Colilert Quanti-Tray)-2016 | 20211647 | Microbiology | 6/20/2022 |
| 1645 | Total cyanide | EPA 335.4 | 10061402 | Primary Inorganic Contaminants | 1/7/2021 |
| 1825 | Total nitrate-nitrite | EPA 300.0 | 10053200 | Primary Inorganic Contaminants | 5/25/2004 |

**Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.**

Certification Type NELAP
**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

*Laboratory Scope of Accreditation*



**Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

State Laboratory ID: **E84167** EPA Lab Code: **FL00289** **(941) 723-9986**

**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Drinking Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 2040 | Total organic carbon | SM 5310 B-2014 | 20137831 | Primary Inorganic Contaminants | 6/20/2022 |
| 9642 | Trichloroacetic acid | EPA 552.2 | 10095804 | Group I Unregulated Contaminants | 3/7/2025 |
| 2055 | Turbidity | EPA 180.1 | 10011800 | Secondary Inorganic Contaminants | 1/9/2024 |
| 2060 | UV 254 | SM 5910 B | 20146401 | Primary Inorganic Contaminants | 11/16/2016 |
| 1185 | Vanadium | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 3/7/2011 |
| 1190 | Zinc | EPA 200.7 | 10013806 | Secondary Inorganic Contaminants | 5/25/2004 |

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Certification Type NELAP

**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

**Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

State Laboratory ID: **E84167** EPA Lab Code: **FL00289** **(941) 723-9986**

**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Non-Potable Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1505 | Alkalinity as CaCO3 | SM 2320 B-2011 | 20045618 | General Chemistry | 6/20/2022 |
| 1000 | Aluminum | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1000 | Aluminum | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1515 | Ammonia as N | EPA 350.1 | 10063602 | General Chemistry | 3/7/2011 |
| 1005 | Antimony | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1005 | Antimony | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1005 | Antimony | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1010 | Arsenic | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1010 | Arsenic | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1010 | Arsenic | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1015 | Barium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1015 | Barium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1020 | Beryllium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1020 | Beryllium | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1020 | Beryllium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1530 | Biochemical oxygen demand | SM 5210 B-2016 | 20135039 | General Chemistry | 6/20/2022 |
| 1025 | Boron | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1025 | Boron | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1540 | Bromide | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 1030 | Cadmium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1030 | Cadmium | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1030 | Cadmium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1035 | Calcium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1035 | Calcium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 3755 | Carbon dioxide | SM 4500-CO2 D | 20100430 | General Chemistry | 3/7/2011 |
| 1555 | Carbonaceous BOD (CBOD) | SM 5210 B-2016 | 20135039 | General Chemistry | 6/20/2022 |
| 1565 | Chemical oxygen demand | EPA 410.4 | 10077404 | General Chemistry | 1/3/2002 |
| 1575 | Chloride | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 9345 | Chlorophylls | EPA 445 | 10081400 | General Chemistry | 1/3/2002 |
| 9345 | Chlorophylls | SM 10200 H | 20300225 | General Chemistry | 5/25/2004 |
| 1040 | Chromium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1040 | Chromium | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1040 | Chromium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1045 | Chromium VI | SM 3500-Cr B (20th/21st/22nd Ed.)/UV-VIS | 20066255 | General Chemistry | 4/20/2009 |
| 1050 | Cobalt | EPA 200.7 | 10013806 | Metals | 5/25/2004 |

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Certification Type NELAP
**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

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**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Non-Potable Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1050 | Cobalt | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1605 | Color | SM 2120 B-2011 | 20039310 | General Chemistry | 6/20/2022 |
| 1610 | Conductivity | SM 2510 B-2011 | 20048617 | General Chemistry | 6/20/2022 |
| 1055 | Copper | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1055 | Copper | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1055 | Copper | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1620 | Corrosivity (langlier index) | SM 2330 B | 20003207 | General Chemistry | 3/7/2011 |
| 1635 | Cyanide | EPA 335.4 | 10061402 | General Chemistry | 3/7/2011 |
| 2520 | Enterococci | ENTEROLERT / QUANTI-TRAY | 60030208 | Microbiology | 3/7/2011 |
| 2525 | Escherichia coli | SM 9223 B-2016 (Colilert QT) | 20037701 | Microbiology | 6/20/2022 |
| 2530 | Fecal coliforms | COLILERT®-18 (Fecal Coliforms) | 60002688 | Microbiology | 7/1/2016 |
| 2530 | Fecal coliforms | SM 9221 E-2014 | 20227263 | Microbiology | 6/20/2022 |
| 2530 | Fecal coliforms | SM 9222 D-2015 | 20210020 | Microbiology | 6/20/2022 |
| 2540 | Fecal streptococci | SM 9230 C-2013 | 20217690 | Microbiology | 6/20/2022 |
| 1730 | Fluoride | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 1750 | Hardness | SM 2340 B-2011 | 20046611 | General Chemistry | 6/20/2022 |
| 1750 | Hardness | SM 2340 C-2011 | 20047614 | General Chemistry | 6/20/2022 |
| 1760 | Hardness (calc.) | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 2555 | Heterotrophic plate count | SM 9215 B | 20179811 | Microbiology | 3/7/2011 |
| 3840 | Hydrogen sulfide | SM 4500S= H (21st ed.) | 20125057 | General Chemistry | 11/21/2008 |
| 1070 | Iron | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1070 | Iron | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1795 | Kjeldahl nitrogen - total | EPA 351.2 | 10065404 | General Chemistry | 1/3/2002 |
| 1075 | Lead | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1075 | Lead | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1075 | Lead | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1085 | Magnesium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1085 | Magnesium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1090 | Manganese | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1090 | Manganese | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1095 | Mercury | EPA 245.1 | 10036609 | Metals | 1/3/2002 |
| 1100 | Molybdenum | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1100 | Molybdenum | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1105 | Nickel | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1105 | Nickel | EPA 200.8 | 10014605 | Metals | 4/5/2024 |

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**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Non-Potable Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1105 | Nickel | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1805 | Nitrate | Systea Easy (1-Reagent) Nitrate Method/UV-VIS | 90019117 | General Chemistry | 7/1/2016 |
| 1810 | Nitrate as N | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 1835 | Nitrite | SM 4500-NO2¯ B-2011 | 20113115 | General Chemistry | 6/20/2022 |
| 1840 | Nitrite as N | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 1860 | Oil & Grease | EPA 1664A | 10127807 | General Chemistry | 1/3/2002 |
| 1865 | Organic nitrogen | TKN minus AMMONIA | 60034437 | General Chemistry | 11/21/2008 |
| 1870 | Orthophosphate as P | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 1870 | Orthophosphate as P | EPA 365.3 | 10070801 | General Chemistry | 1/3/2002 |
| 1900 | pH | SM 4500-H+ B-2011 | 20105220 | General Chemistry | 6/20/2022 |
| 1910 | Phosphorus, total | EPA 365.3 | 10070801 | General Chemistry | 1/3/2002 |
| 1125 | Potassium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1125 | Potassium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1945 | Residual free chlorine | SM 4500-Cl G | 20081441 | General Chemistry | 7/31/2007 |
| 1955 | Residue-filterable (TDS) | SM 2540 C-2015 | 20050435 | General Chemistry | 6/20/2022 |
| 1960 | Residue-nonfilterable (TSS) | SM 2540 D-2015 | 20051223 | General Chemistry | 6/20/2022 |
| 1975 | Salinity | SM 2520 B | 20004006 | General Chemistry | 6/25/2004 |
| 1140 | Selenium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1140 | Selenium | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1140 | Selenium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1990 | Silica as SiO2 | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1990 | Silica as SiO2 | SM 4500-SiO2 C (20th/21st Ed.)/UV-VIS | 20128603 | General Chemistry | 7/31/2007 |
| 1150 | Silver | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1150 | Silver | EPA 200.8 | 10014605 | Metals | 4/5/2024 |
| 1150 | Silver | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1155 | Sodium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1155 | Sodium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 8043 | Specific Oxygen Uptake Rate (SOUR) | SM 2710 B | 20005805 | General Chemistry | 1/3/2002 |
| 1160 | Strontium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 2000 | Sulfate | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 2005 | Sulfide | SM 4500-S2¯ D-2011 | 20125864 | General Chemistry | 6/20/2022 |
| 2015 | Sulfite-SO3 | SM 4500-SO3 B | 20026806 | General Chemistry | 3/7/2011 |
| 2025 | Surfactants - MBAS | SM 5540 C-2011 | 20145066 | General Chemistry | 6/20/2022 |
| 1165 | Thallium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1165 | Thallium | EPA 200.8 | 10014605 | Metals | 4/5/2024 |

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Certification Type NELAP
**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

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State Laboratory ID: **E84167** EPA Lab Code: **FL00289** **(941) 723-9986**

**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Non-Potable Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1165 | Thallium | EPA 200.9 | 10015404 | Metals | 11/21/2008 |
| 1165 | Thallium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1175 | Tin | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1175 | Tin | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1180 | Titanium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1180 | Titanium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 2500 | Total coliforms | SM 9221 B-2014 | 20191289 | Microbiology | 6/20/2022 |
| 2500 | Total coliforms | SM 9222 B-2015 | 20208439 | Microbiology | 6/20/2022 |
| 2500 | Total coliforms | SM 9223 B-2016 (Colilert QT) | 20037701 | Microbiology | 6/20/2022 |
| 1645 | Total cyanide | EPA 9012B | 10243228 | General Chemistry | 3/1/2023 |
| 1825 | Total nitrate-nitrite | EPA 300.0 | 10053200 | General Chemistry | 5/25/2004 |
| 1825 | Total nitrate-nitrite | Systea Easy (1-Reagent) Nitrate Method/UV-VIS | 90019117 | General Chemistry | 7/1/2016 |
| 1827 | Total Nitrogen | EPA 351.2 + EPA 353.2 | 10238309 | General Chemistry | 3/7/2011 |
| 2040 | Total organic carbon | SM 5310 B-2014 | 20137831 | General Chemistry | 3/1/2024 |
| 2050 | Total Petroleum Hydrocarbons (TPH) | EPA 1664A | 10127807 | General Chemistry | 1/3/2002 |
| 1725 | Total, fixed, and volatile residue | SM 2540 G-2015 | 20005281 | General Chemistry | 6/20/2022 |
| 2055 | Turbidity | EPA 180.1 | 10011800 | General Chemistry | 1/3/2002 |
| 2058 | Un-Ionized Ammonia | DEP SOP 10/03/83 | 90015842 | General Chemistry | 1/3/2002 |
| 1185 | Vanadium | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1185 | Vanadium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1190 | Zinc | EPA 200.7 | 10013806 | Metals | 5/25/2004 |
| 1190 | Zinc | EPA 6010D | 10155950 | Metals | 3/1/2023 |

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Certification Type NELAP

**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

*Laboratory Scope of Accreditation*



**Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

State Laboratory ID: **E84167** EPA Lab Code: **FL00289** **(941) 723-9986**

**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Solid and Chemical Materials**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1000 | Aluminum | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1515 | Ammonia as N | EPA 350.1 | 10063602 | General Chemistry | 10/20/2023 |
| 1005 | Antimony | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1010 | Arsenic | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1015 | Barium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1020 | Beryllium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1025 | Boron | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1540 | Bromide | EPA 9056A | 10199607 | General Chemistry | 3/1/2023 |
| 1030 | Cadmium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1035 | Calcium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1575 | Chloride | EPA 9056A | 10199607 | General Chemistry | 3/1/2023 |
| 1040 | Chromium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1050 | Cobalt | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1055 | Copper | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 2530 | Fecal coliforms | SM 9221 E-2014 | 20227263 | Microbiology | 6/20/2022 |
| 1947 | Fixed Residue | SM 2540 G-2015 | 20005281 | General Chemistry | 6/20/2022 |
| 1730 | Fluoride | EPA 9056A | 10199607 | General Chemistry | 3/1/2023 |
| 1070 | Iron | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1795 | Kjeldahl nitrogen - total | EPA 351.2 | 10065404 | General Chemistry | 9/11/2023 |
| 1075 | Lead | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1085 | Magnesium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1090 | Manganese | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1095 | Mercury | EPA 7471B | 10166457 | Metals | 3/1/2023 |
| 1100 | Molybdenum | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1105 | Nickel | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1805 | Nitrate | EPA 9056A | 10199607 | General Chemistry | 3/1/2023 |
| 1835 | Nitrite | EPA 9056A | 10199607 | General Chemistry | 3/1/2023 |
| 1870 | Orthophosphate as P | EPA 9056A | 10199607 | General Chemistry | 3/1/2023 |
| 1900 | pH | EPA 9045D | 10198455 | General Chemistry | 3/1/2023 |
| 1910 | Phosphorus, total | EPA 365.3 | 10070801 | General Chemistry | 9/11/2006 |
| 1125 | Potassium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1950 | Residue-total | SM 2540 G-2015 | 20005281 | General Chemistry | 6/20/2022 |
| 1970 | Residue-volatile | SM 2540 G-2015 | 20005281 | General Chemistry | 6/20/2022 |
| 1140 | Selenium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1150 | Silver | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1155 | Sodium | EPA 6010D | 10155950 | Metals | 3/1/2023 |

**Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.**

Certification Type NELAP
**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

## *Laboratory Scope of Accreditation*



**Attachment to Certificate #: E84167-76, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

State Laboratory ID: **E84167** EPA Lab Code: **FL00289** **(941) 723-9986**

**E84167**
**Benchmark EnviroAnalytical, Inc.**
**1711 12th Street East**
**Palmetto, FL 34221**

Matrix: **Solid and Chemical Materials**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 1160 | Strontium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 2000 | Sulfate | EPA 9056A | 10199607 | General Chemistry | 3/1/2023 |
| 1460 | Synthetic Precipitation Leaching Procedure (SPLP) | EPA 1312 | 10119003 | General Chemistry | 3/7/2011 |
| 1165 | Thallium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1175 | Tin | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1466 | Toxicity Characteristic Leaching Procedure (TCLP) | EPA 1311 | 10118806 | General Chemistry | 3/7/2011 |
| 1185 | Vanadium | EPA 6010D | 10155950 | Metals | 3/1/2023 |
| 1190 | Zinc | EPA 6010D | 10155950 | Metals | 3/1/2023 |

**Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.**

Certification Type NELAP

**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

Ron DeSantis
Governor

Florida HEALTH



## *Laboratory Scope of Accreditation*

**Attachment to Certificate #: E85086-32, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

**State Laboratory ID:** **E85086** **EPA Lab Code:** **FL00068** **(941) 625-3137**

**E85086**
**Benchmark EA South**
**1001 Corporate Avenue, Suite 102**
**North Port, FL 34289**

**Matrix:** **Drinking Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 2525 | Escherichia coli | SM 9223 B | 20037676 | Microbiology | 2/7/2003 |
| 2525 | Escherichia coli | SM 9223 B /QUANTI-TRAY | 20211603 | Microbiology | 2/2/2018 |
| 2555 | Heterotrophic plate count | SM 9215 B | 20179811 | Microbiology | 1/26/2006 |
| 1855 | Odor | EPA 140.1 | 10007406 | Secondary Inorganic Contaminants | 7/1/2016 |
| 1900 | pH | SM 4500-H+-B | 20105219 | Primary Inorganic Contaminants | 8/14/2007 |
| 2500 | Total coliforms | SM 9223 B | 20037676 | Microbiology | 2/7/2003 |
| 2500 | Total coliforms | SM 9223 B /QUANTI-TRAY | 20211603 | Microbiology | 2/2/2018 |

**Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.**

**Certification Type** **NELAP**

**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

## *Laboratory Scope of Accreditation*



**Attachment to Certificate #: E85086-32, expiration date June 30, 2026. This listing of accredited analytes should be used only when associated with a valid certificate.**

**State Laboratory ID:** **E85086** **EPA Lab Code:** **FL00068** **(941) 625-3137**

**E85086**
**Benchmark EA South**
**1001 Corporate Avenue, Suite 102**
**North Port, FL 34289**

**Matrix:** **Non-Potable Water**

| Analyte# | Analyte | Method/Tech | Method Code | Category | Effective Date |
|---|---|---|---|---|---|
| 2520 | Enterococci | ENTEROLERT / QUANTI-TRAY | 60030208 | Microbiology | 2/2/2018 |
| 2525 | Escherichia coli | SM 9223 B /QUANTI-TRAY | 20211603 | Microbiology | 2/2/2018 |
| 2530 | Fecal coliforms | COLILERT®-18 (Fecal Coliforms) | 60002688 | Microbiology | 7/1/2016 |
| 2530 | Fecal coliforms | SM 9222 D | 20209238 | Microbiology | 1/31/2003 |
| 1855 | Odor | EPA 140.1 | 10007406 | General Chemistry | 7/1/2016 |
| 1900 | pH | SM 4500-H+-B | 20105219 | General Chemistry | 8/14/2007 |
| 2500 | Total coliforms | SM 9222 B | 20203401 | Microbiology | 1/31/2003 |
| 2500 | Total coliforms | SM 9223 B /QUANTI-TRAY | 20211603 | Microbiology | 2/2/2018 |

**Clients and Customers are urged to verify the laboratory's current certification status with the Environmental Laboratory Certification Program.**

**Certification Type** **NELAP**
**Issue Date: 7/1/2025** **Expiration Date: 6/30/2026**

# Benchmark EnviroAnalytical, Inc.

# Quality Manual

## Palmetto Lab and North Port Lab (North and South Lab)

November 2023 Update

# BENCHMARK ENVIROANALYTICAL, INC.
and
# BENCHMARK ENVIROANALYTICAL SOUTH

## Quality Manual
**Revision February 2020**

| | |
|---|---|
| LABORATORY NAME: | Benchmark EnviroAnalytical, Incorporated (BEA)<br>and<br>Benchmark EnviroAnalytical South (BEAS) |
| LABORATORY ADDRESSES: | 1711 12th Street East<br>Palmetto, FL 34221<br>and<br>1001 Corporate Ave, Suite 102<br>North Port, FL 34289 |
| Responsible Individual: | Dale D. Dixon<br>Laboratory Director<br>1711 12th Street East<br>Palmetto, FL 34221<br>(941) 723-9986 |
| Laboratory/Technical Director (BEA): | Dale D. Dixon |
| Laboratory/Technical Director (BEAS): | Melinda Merchant |
| Quality Assurance Officer: | Haley Richardson |

Dale Dixon
Laboratory Director (BEA) — 11-20-2023 Date

Melinda Merchant
Laboratory Director (BEAS) — 11/22/23 Date

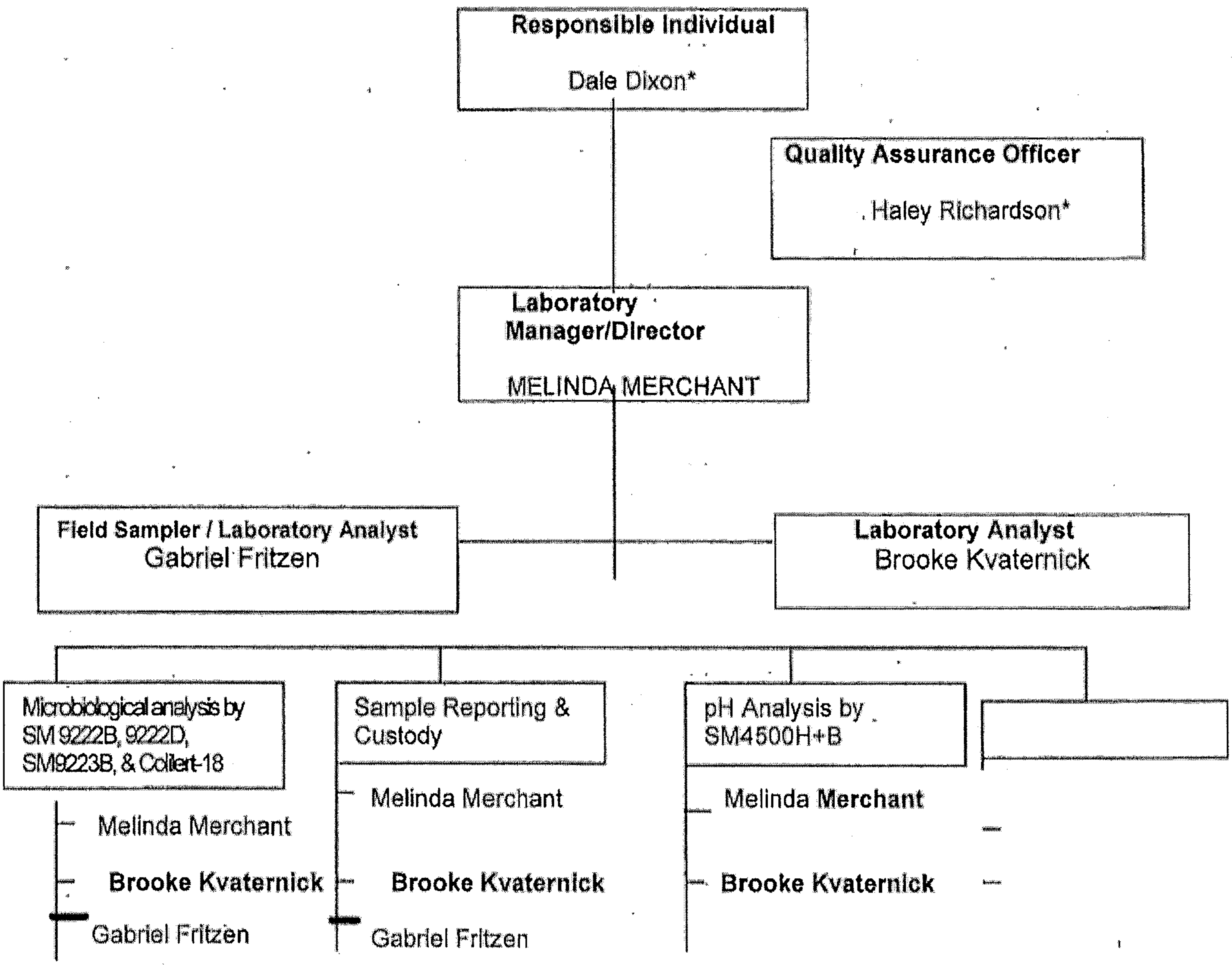
Haley Ri
Quality Assurance Officer — 11/16/2023 Date

**Note:** The Effective Date of this revision to the Quality Manual for Benchmark EnviroAnalytical will be the date associated with the above approval signatures, if above signature dates are the same; if above signature dates are not the same, the most recent approval signature date [ie, the above signature date of the last approver(s) to sign] will be the Effective Date of this revision to the Quality Manual for Benchmark EnviroAnalytical.

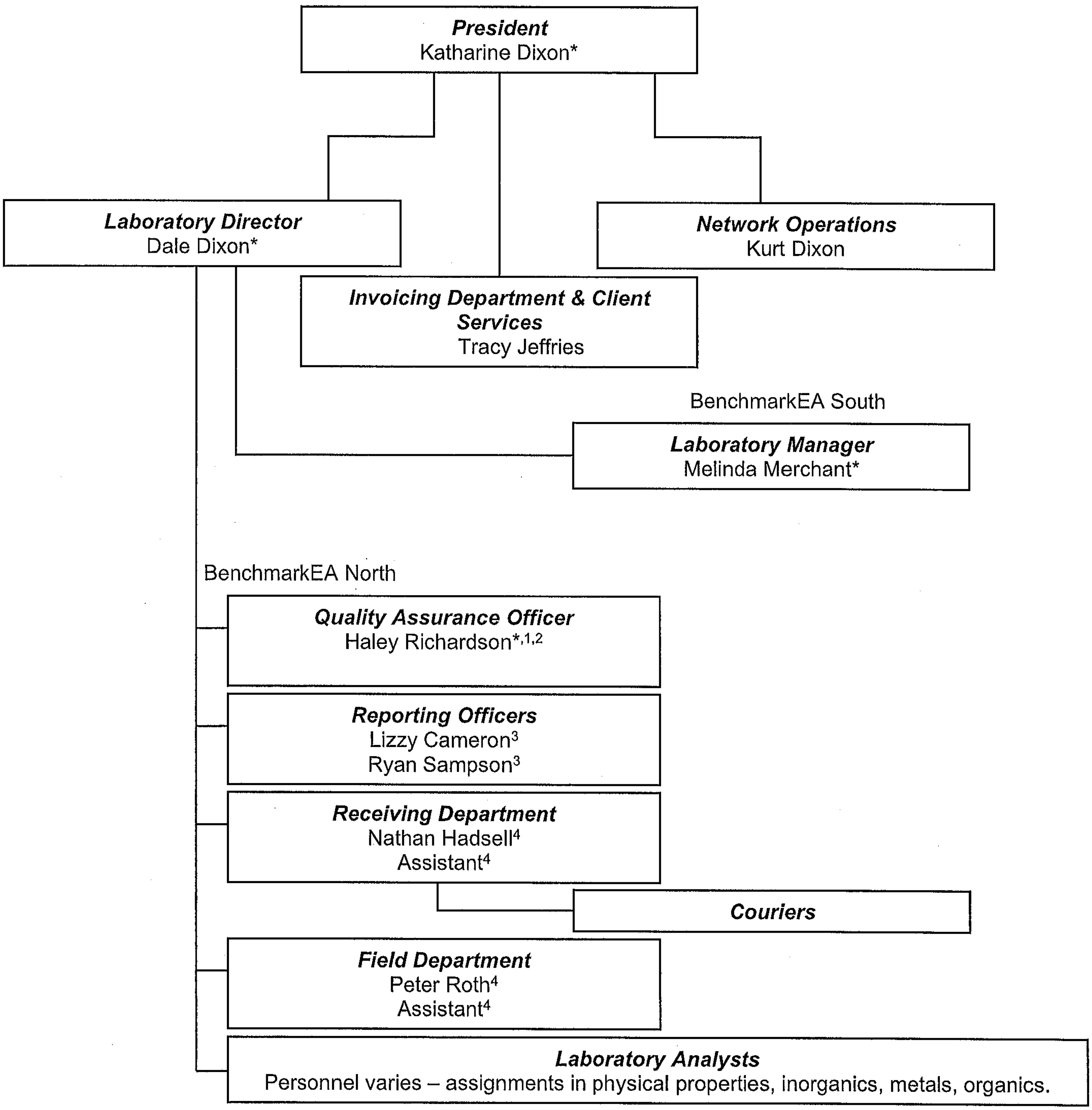
## Table 1.2 TABLE OF CONTENTS

## Table 1.3 LIST OF TABLES

## 2.1 B.E A S Laboratory Organization



## 2.2 B E A Laboratory Organization



NOTES * Signatory
[1] Lab Director nominee
[2] QA nominee
[3] Reporting nominee
[4] Field/Receiving nominee

## 2.3 Job Description of Key Staff

Specific job descriptions are available for all positions and include minimum requirements for the position. A three ring binder containing job descriptions is kept in the Laboratory Director's office. Electronic copies are located at Z:\ADMINISTRATION\BEA N.E.L.A.C. SYSTEM -- DON'T MOVE OR RENAME\8 ) Job Descriptions. The following key staff members are also responsible for ensuring Benchmark EnviroAnalytical, Inc. compliance with the NELAC standards.

**BEA:**

1) Dale D. Dixon, Ph.D. - Laboratory Director.
Responsible for management of all laboratory functions. Directly supervises technical operations and implementation of the quality plan, including corrective actions and changes to the quality plan.

2) Tracy Jeffries - Invoicing department & Client Services
Responsible for managing the billing and collections for client laboratory reports in addition to managing general client services.

4) Nathan Hadsell - Receiving.
Responsible for managing sample kit preparation and delivery, sample pick-ups and sample custody procedures.

5) Lizzy Cameron & Ryan Sampson - Reporting.
Responsible for construction of final analytical reports.

6) Haley Richardson - Quality Assurance Officer.
Responsible for data validation, data acceptance, approval of final reports, corrective action, compilations of control charts, production of quality control reports and maintaining the quality manual.

7) Job descriptions of other personnel are summarized in 2.1 BEA Laboratory Organization. Specific job descriptions are kept on file.

**BEAS:**

1) Melinda Merchant- Laboratory Manager/Director
Responsible for management of all laboratory functions. Approves all final reports. Directly supervises technical operations and implementation of the quality plan, including corrective actions.

2) Melinda Merchant/ Brooke Kvaternick/Gabriel Fritzen- Analysts
Responsible for conducting analysis according to NELAC Standards including development of SOP's and compilation of control chart.

3) Melinda Merchant/ Brooke Kvaternick/Gabriel Fritzen- Sample Custody and Reporting
Responsible for coordinating sample kit preparation and delivery, sample pick-ups, sample custody procedures and construction of final analytical reports.

4) Haley Richardson- Quality Assurance Officer
Responsible for data validation, data acceptance, corrective action, compilations of control charts, and production of quality control reports.

**Per TNI V1M2 4.1.7.2.e**: The laboratory's technical manager(s), however named, and/or his/her designee(s) shall have duties that include: if absent for a period of time exceeding fifteen (15) consecutive calendar days shall designate another full-time staff member meeting the qualifications of the technical manager(s) to temporarily perform this function. If this absence exceeds thirty-five (35) consecutive calendar days, the primary accreditation body shall be notified in writing. See Sections 2.1 and 2.2 of Quality manual for lab manager/director nominees that may fill this role.

## 3.0 STATEMENT OF QUALITY POLICY

**a) Policy**

Laboratory management is committed to good professional practice and to the quality of its environmental testing services for clients to ensure compliance with their permit and project requirements. This commitment is intended to:

- Produce data of known and documented quality that is scientifically valid
- Meet method specifications
- Satisfy regulatory requirements
- Accomplish the data quality objectives of the client

**b) Our *Standards of Service*:**

- Client satisfaction
- Results meet client's quality and accuracy requirements
- Turn-around time commitments are achieved

**c) Our *Motto*:**

- *Do it right the first time, on time, and assume nothing*

**d) Objectives of the Quality System:**

A comprehensive Quality Control Program is in place to monitor the quality of test results. This program includes:

- Analysis and evaluation of internal quality control samples with every batch. (These samples include blanks, duplicate samples, standard reference materials, and spiked samples)
- Participation in external quality control programs including:
    1. Proficiency Testing
    2. RAMP Studies
    3. Client blind samples
- Tracking, review, and corrective action to exceptions.
- Data integrity training

**e) Personnel:**

Management's policy is to ensure the information within quality documentation is communicated to, implemented, and understood by all lab personnel. They are provided with the knowledge, training, and tools necessary to perform laboratory operations and testing.

**f) Commitment:**

Laboratory management is committed to comply with its quality system and the guidelines within the NELAC Quality Systems Standard.

Laboratory Manager / Technical Director: ______________________________

# 4.0 ORGANIZATION ABILITIES

# Table 4.1

# List of Certified Analytes

# BEAS: E85086

**DRINKING WATER:**

Escherichia coli SM 9223 B
Escherichia coli SM 9223 B / QUANTI-TRAY
Heterotrophic plate count SM 9215 B
Odor EPA 140.1
pH SM 4500-H+-B
Total coliforms SM 9223 B
Total coliforms SM 9223 B / QUANTI-TRAY

**NON-POTABLE WATER:**

Enterococci ENTEROLERT / QUANTI-TRAY
Enterococci EPA 1600
Escherichia coli SM 9223 B / QUANTI-TRAY
Fecal coliforms COLILERT®-18
Fecal coliforms SM 9222 D
Odor EPA 140.1
pH SM 4500-H+-B
Total coliforms SM 9222 B
Total coliforms SM 9223 B / QUANTI-TRAY

# BEA: E84167

## DRINKING WATER:

1,1,1-Trichloroethane EPA 524.
1,1,2-Trichloroethane EPA 524.2
1,1-Dichloroethylene EPA 524.2
1,2,4-Trichlorobenzene EPA 524.2
1,2-Dibromo-3-chloropropane (DBCP) EPA 504.1
1,2-Dibromoethane (EDB, Ethylene dibromide) EPA 504.1
1,2-Dichlorobenzene EPA 524.2
1,2-Dichloroethane EPA 524.2
1,2-Dichloropropane EPA 524.2
1,4-Dichlorobenzene EPA 524.2
Alkalinity as CaCO3 SM 2320 B
Aluminum EPA 200.7
Ammonia as N EPA 350.1
Antimony SM 3113 B
Arsenic SM 3113 B
Barium EPA 200.7
Benzene EPA 524.2
Beryllium EPA 200.7
Boron EPA 200.7
Bromate EPA 300.1
Bromide EPA 300.0
Bromoacetic acid EPA 552.2
Bromodichloromethane EPA 524.2
Bromoform EPA 524.2
Cadmium EPA 200.7
Calcium EPA 200.7
Carbon tetrachloride EPA 524.2
Chlorate EPA 300.1
Chloride EPA 300.0
Chlorine SM 4500-Cl G
Chlorite EPA 300.1
Chloroacetic acid EPA 552.2
Chlorobenzene EPA 524.2
Chloroform EPA 524.2
Chromium EPA 200.7
cis-1,2-Dichloroethylene EPA 524.2
Color SM 2120 B
Conductivity SM 2510 B
Copper EPA 200.7
Corrosivity (langlier index) SM 2330 B
Cyanide EPA 335.4
Dibromoacetic acid EPA 552.2
Dibromochloromethane EPA 524.2
Dichloroacetic acid EPA 552.2
Dissolved organic carbon (DOC) SM 5310 B
Escherichia coli SM 9223 B
Orthophosphate as P EPA 300.0
pH SM 4500-H+-B
Potassium EPA 200.7
Escherichia coli SM 9223 B /QUANTI-TRAY
Ethylbenzene EPA 524.2
Fluoride EPA 300.0
Hardness SM 2340 B
Heterotrophic plate count SM 9215 B
Hydrogen sulfide, un-ionized (calculation) SM 4500-S H (21st Ed.)
Iron EPA 200.7
Lead SM 3113 B
Magnesium EPA 200.7
Manganese EPA 200.7
Mercury EPA 245.1
Methylene Chloride 524.2
Molybdenum EPA 200.7
Nickel EPA 200.7
Nitrate EPA 353.2
Nitrate as N EPA 300.0
Nitrite as N EPA 300.0
Nitrite as N EPA 353.2
Odor EPA 140.1
Selenium SM 3113 B
Silica as SiO2 EPA 200.7
Silver EPA 200.7
Sodium EPA 200.7
Styrene EPA 524.2
Sulfate EPA 300.0
Sulfide SM 4500-S D/UV-VIS
Surfactants - MBAS SM 5540 C
Tetrachloroethylene (Perchloroethylene) EPA 524.2
Thallium EPA 200.9
Toluene EPA 524.2
Total coliforms SM 9223 B
Total coliforms SM 9223 B /QUANTI-TRAY
Total dissolved solids SM 2540 C
Total haloacetic acids (HAA5) EPA 552.2
Total nitrate-nitrite EPA 300.0
Total nitrate-nitrite EPA 353.2
Total organic carbon SM 5310 B
Total trihalomethanes EPA 524.2
trans-1,2-Dichloroethylene EPA 524.2
Trichloroacetic acid EPA 552.2
Trichloroethene (Trichloroethylene) EPA 524.2
Turbidity EPA 180.1
UV 254 SM 5910 B
Vanadium EPA 200.7
Vinyl chloride EPA 524.2
Xylene (total) EPA 524.2
Zinc EPA 200.7

## NON-POTABLE WATER

1,1,1,2-Tetrachloroethane EPA 8260 D
1,1,1-Trichloroethane EPA 624.1
1,1,1-Trichloroethane EPA 8260 D
1,1,2,2-Tetrachloroethane EPA 624.1
1,1,2,2-Tetrachloroethane EPA 8260 D
1,1,2-Trichloroethane EPA 624.1
1,1,2-Trichloroethane EPA 8260 D
1,1-Dichloroethane EPA 624.1
1,1-Dichloroethane EPA 8260 D
1,1-Dichloroethylene EPA 624.1
1,1-Dichloroethylene EPA 8260 D
1,1-Dichloropropene EPA 8260 D
1,2,3-Trichlorobenzene EPA 8260 D
1,2,3-Trichloropropane EPA 8260 D
1,2-Dibromo-3-chloropropane (DBCP) EPA 8260 D

1,2-Dichlorobenzene EPA 624.1
1,2-Dichlorobenzene EPA 8260 D
1,2-Dichloroethane EPA 624.1
1,2-Dichloroethane EPA 8260 D
1,3-Dichlorobenzene EPA 624.1
1,3-Dichlorobenzene EPA 8260 D
1,3-Dichloropropane EPA 8260 D
1,4-Dichlorobenzene EPA 624.1
1,4-Dichlorobenzene EPA 8260 D
2,2-Dichloropropane EPA 8260 D
2-Butanone (Methyl ethyl ketone, MEK) EPA 8260 D
2-Chloroethyl vinyl ether EPA 624.1
2-Chloroethyl vinyl ether EPA 8260 D
2-Chlorotoluene EPA 8260 D
2-Hexanone EPA 8260 D
4-Chlorotoluene EPA 8260 D
4-Methyl-2-pentanone (MIBK) EPA 8260 D
Acetone EPA 8260 D
Acetonitrile EPA 8260 D
Acrolein (Propenal) EPA 624.1
Acrolein (Propenal) EPA 8260 D
Acrylonitrile EPA 624.1
Acrylonitrile EPA 8260 D
Alkalinity as CaCO3 SM 2320 B
Allyl chloride (3-Chloropropene) EPA 8260 D
Aluminum EPA 200.7
Aluminum EPA 6010 D
Ammonia as N EPA 350.1
Antimony EPA 200.7
Antimony EPA 6010 D
Antimony SM 3113 B
Arsenic EPA 200.7
Arsenic EPA 6010 D
Arsenic SM 3113 B
Barium EPA 200.7
Barium EPA 6010 D
Benzene EPA 624.1
Benzene EPA 8260 D
Beryllium EPA 200.7
Beryllium EPA 6010 D
Beryllium SM 3113 B
Biochemical oxygen demand SM 5210 B
Boron EPA 200.7 Metals
Boron EPA 6010 D
Bromide EPA 300.0
Bromobenzene EPA 8260 D
Bromochloromethane EPA 8260 D
Bromodichloromethane EPA 624.1
Bromodichloromethane EPA 8260 D
Bromoform EPA 624.1
Bromoform EPA 8260 D
Cadmium EPA 200.7
Cadmium EPA 6010 D
Cadmium SM 3113 B
Calcium EPA 200.7
Calcium EPA 6010 D
Carbon dioxide (calc.) SM 4500-CO2 D
Carbon disulfide EPA 8260 D
Carbon tetrachloride EPA 624.1
Carbon tetrachloride EPA 8260 D
Carbonaceous BOD (CBOD) SM 5210 B
Chemical oxygen demand EPA 410.4
Chloride EPA 300.0
Chlorobenzene EPA 624.1
Chlorobenzene EPA 8260 D
Chloroethane EPA 624.1
Chloroethane EPA 8260 D
Chloroform EPA 624.1
Chloroform EPA 8260 D
Chlorophylls EPA 445
Chlorophylls SM 10200 H
Chloroprene EPA 8260 D
Chromium EPA 200.7
Chromium EPA 6010 D
Chromium SM 3113 B
Chromium VI SM 3500-Cr B (20th/21st/22nd
cis-1,2-Dichloroethylene EPA 8260 D
cis-1,3-Dichloropropene EPA 624.1
cis-1,3-Dichloropropene EPA 8260 D
Cobalt EPA 200.7
Cobalt EPA 6010 D
Color SM 2120 B
Conductivity SM 2510 B
Copper EPA 200.7
Copper EPA 6010 D
Copper SM 3113 B
Corrosivity (langlier index) SM 2330 B
Cyanide EPA 335.4
Dibromochloromethane EPA 624.1
Dibromochloromethane EPA 8260 D
Dibromomethane EPA 8260 D
Dichlorodifluoromethane EPA 8260 D
Enterococci ENTEROLERT/ QUANTI-TRAY
Enterococci EPA 1600
Escherichia coli SM 9223 B /QUANTI-TRAY
Ethylbenzene EPA 624.1
Ethylbenzene EPA 8260 D
Fecal coliforms COLILERT®-18
Fecal coliforms SM 9221 E
Fecal coliforms SM 9222 D
Fecal streptococci SM 9230 C
Fluoride EPA 300.0
Hardness SM 2340 B
Hardness SM 2340 C
Hardness (calc.) EPA 200.7
Heterotrophic plate count SM 9215 B
Hexachlorobutadiene EPA 8260 D
Hexachloroethane EPA 8260 D
Hydrogen sulfide, un-ionized (calculation) SM 4500-S H (21st Ed.)
Iodomethane (Methyl iodide) EPA 8260 D
Iron EPA 200.7
Iron EPA 6010 D
Isopropylbenzene EPA 8260 D
Kjeldahl nitrogen - total EPA 351.2
Lead EPA 200.7
Lead EPA 6010 D
Lead SM 3113 B
m/p-Xylenes EPA 8260 D
Magnesium EPA 200.7
Magnesium EPA 6010 D
Manganese EPA 200.7
Manganese EPA 6010 D
Mercury EPA 245.1
Methacrylonitrile EPA 8260 D
Methyl bromide (Bromomethane) EPA 624.1
Methyl bromide (Bromomethane) EPA 8260 D
Methyl chloride (Chloromethane) EPA 624.1
Methyl chloride (Chloromethane) EPA 8260 D
Methyl tert-butyl ether (MTBE) EPA 8260 D
Methylene chloride EPA 624.1
Methylene chloride EPA 8260 D
Molybdenum EPA 200.7
Molybdenum EPA 6010 D
n-Butylbenzene EPA 8260 D
Nickel EPA 200.7

Nickel EPA 6010 D
Nickel SM 3113 B
Nitrate Systea Easy (1-Reagent) Nitrate Method/UV-VIS
Nitrate as N EPA 300.0
Nitrate as N EPA 353.2
Nitrate-nitrite EPA 353.2
Nitrite as N EPA 300.0
Nitrite as N SM 4500-NO2-B
Nitrobenzene EPA 8260 D
n-Propylbenzene EPA 8260 D
Oil & Grease EPA 1664A
Organic nitrogen TKN minus AMMONIA
Orthophosphate as P EPA 300.0
Orthophosphate as P EPA 365.3
o-Xylene EPA 8260 D
pH SM 4500-H+-B
Phosphorus, total EPA 365.3
p-Isopropyltoluene EPA 8260 D
Potassium EPA 200.7
Potassium EPA 6010 D
Propionitrile (Ethyl cyanide) EPA 8260 D
Residual free chlorine SM 4500-Cl G
Residue-filterable (TDS) SM 2540 C
Residue-nonfilterable (TSS) SM 2540 D
Salinity SM 2520 B
sec-Butylbenzene EPA 8260 D
Selenium EPA 200.7
Selenium EPA 6010 D
Selenium SM 3113 B
Silica as SiO2 EPA 200.7
Silica as SiO2 SM 4500-SiO2 C/UV-VIS
Silver EPA 200.7
Silver EPA 6010 D
Silver SM 3113 B
Sodium EPA 200.7
Sodium EPA 6010 D
Specific Oxygen Uptake Rate (SOUR) SM 2710 B
Strontium EPA 200.7
Sulfate EPA 300.0
Sulfide SM 4500-S D/UV-VIS
Sulfite-SO3 SM 4500-SO3 B
Surfactants - MBAS SM 5540 C
tert-Butylbenzene EPA 8260 D
Tetrachloroethylene (Perchloroethylene) EPA 624.1
Tetrachloroethylene (Perchloroethylene) EPA 8260 D
Thallium EPA 200.7
Thallium EPA 200.9
Thallium EPA 6010 D
Tin EPA 200.7
Tin EPA 6010 D
Titanium EPA 200.7
Titanium EPA 6010 D
Toluene EPA 624.1
Toluene EPA 8260 D
Total coliforms SM 9221 B
Total coliforms SM 9222 B
Total coliforms SM 9223 B QUANTI-TRAY
Total cyanide EPA 9012 B
Total nitrate-nitrite EPA 300.0
Total nitrate-nitrite Systea Easy (1-Reagent)
Total nitrogen EPA 351.2 + EPA 353.2
Total organic carbon SM 5310 B
Total Petroleum Hydrocarbons (TPH) EPA 1664A
Total, fixed, and volatile residue SM 2540 G
trans-1,2-Dichloroethylene EPA 624.1
trans-1,2-Dichloroethylene EPA 8260 D
trans-1,4-Dichloro-2-butene EPA 8260 D
Trichlorofluoromethane EPA 624.1
Trichlorofluoromethane EPA 8260 D
Turbidity EPA 180.1
Un-ionized Ammonia DEP SOP 10/03/83
Vanadium EPA 200.7
Vanadium EPA 6010 D
Vinyl acetate EPA 8260 D
Vinyl chloride EPA 624.1
Vinyl chloride EPA 8260 D
Xylene (total) EPA 8260 D
Zinc EPA 200.7
Zinc EPA 6010 D

**Soil and Chemical Materials**

Aluminum EPA 6010 D
Ammonia as N EPA 350.1
Antimony EPA 6010 D
Arsenic EPA 6010 D
Barium EPA 6010 D
Beryllium EPA 6010 D
Boron EPA 6010 D
Bromide EPA 9056 A
Cadmium EPA 6010 D
Calcium EPA 6010 D
Chloride EPA 9056 A
Chromium EPA 6010 D
Cobalt EPA 6010 D
Copper EPA 6010 D
Fecal coliforms SM 9221 E
Fluoride EPA 9056 A
Iron EPA 6010 D
Kjeldahl nitrogen - total EPA 351.2
Lead EPA 6010 D
Magnesium EPA 6010 D
Manganese EPA 6010 D
Mercury EPA 7471 B
Molybdenum EPA 6010 D
Nickel EPA 6010 D
Nitrate EPA 9056 A
Nitrite EPA 9056 A
Orthophosphate as P EPA 9056 A
pH EPA 9045 D
Phosphorus, total EPA 365.3
Potassium EPA 6010 D
Residue-fixed SM 2540 G
Residue-total SM 2540 G
Residue-volatile SM 2540 G
Selenium EPA 6010 D
Silver EPA 6010 D
Sodium EPA 6010 D
Strontium EPA 6010 D
Sulfate EPA 9056 A
Synthetic Precipitation Leaching Procedure EPA 1312
Thallium EPA 6010 D
Tin EPA 6010 D
Total cyanide EPA 9012 B
Total nitrate-nitrite EPA 353.2
Toxicity Characteristic Leaching Procedure EPA 1311
Vanadium EPA 6010 D
Zinc EPA 6010 D

# Table 4.2
# Field Analytes

| Method No. | Matrix | Analyte/Component |
|---|---|---|
| SM4500Cl-G | WW,SW, GW, DW, HW, SA | Residual Chlorine |
| SM4500-OC | WW,SW, GW, DW, HW, SA | Dissolved Oxygen |
| SM4500H+B | WW,SW, GW, DW, HW, SA | pH |
| SM2510B | WW,SW, GW, DW, HW, SA | Specific Conductance |
| EPA 170.1 | WW,SW, GW, DW, HW, SA | Temperature |
| EPA 180.1 | WW,SW, GW, DW, HW, SA | Turbidity |

# Table 4.3 (A & B)

# Laboratory Instrumentation, Equipment & Software

## A. Laboratory Instrumentation and Equipment

(ML): Metals Laboratory Area
(GL): General Laboratory Area
(OL): Organic Laboratory Area
(Micro): Microbiological Laboratory Area
(SL): Solids Laboratory Area

## BEA S LABORATORY INSTRUMENTATION AND EQUIPMENT LIST

| Lab ID No. | Equipment | Manufacturer | Model | Serial No. | Began Use |
|---|---|---|---|---|---|
| 1 | Water Bath, Circulating | Blue M Electric Co | MW-1120A-1 | 15364 | 5/13/02 |
| 2 | Culture Incubator | Fisher Scientific | 650D(Isotemp) | 50300110 | 5/13/02 |
| 3 | Refrigerator | Estate/Whirlpool | TTDKXBW10 | EE0619154 | 5/13/02 |
| 4 | Autoclave | Market Forge | STM-E | 163345 | 7/12/02 |
| 5 | pH Meter | Markson | 88 | JC000707 | 5/13/02 |
| 6 | Analytical Balance | Fischer Scientific | A-250 | B027062 | 9/20/02 |
| 8 | Colony Counter, Dark Field | American Optical, Inc. | N/A | N/A | 5/13/02 |
| 9 | Hot/Stir Plate | Corning | PC-420 | 230597335183 | 5/13/02 |
| 10 | Long Wave UV Lamp | Spectronics Corp. | Sepctroline EA-160 | 941515 | 5/13/02 |
| 11 | Pump, Vacuum | CMS/GE | 5KH33DN16GX | NJL141395 | 5/13/02 |
| 12 | Conductivity Meter | YSI Environmental | EC300 | JC00952 | 8/1/07 |
| 14 | Pipettes | Eppendorf,Oxford,VWR | Various | N/A | 5/13/02 |
| 15 | Mechanical Convection Oven | Precision | STM 40 | 24AX-2 | 11/22/04 |
| 16 | Desiccator | Labconco | N/A | N/A | 11/22/04 |
| 17 | Refrigerator | Whirlpool | ET18JKXMNLO | S415 28908 | 11/27/02 |
| 18 | DI System | Purification Technologies | Various | Various | 11/19/02 |
| 19 | Stir Plate | VWR | 200 | 6675 | 9/15/03 |
| 20 | Thermometers | Fischer, ERTCO, ASTM, Vee Gee Grande | Various | N/A | 5/13/02 |
| 21 | Water Bath, Isotemp | Fisher Scientific | 28L-M | 505038 | 5/24/06 |
| 22 | Balance | Denver Instrument Co | 100A | 37477 | 4/5/05 |
| 28 | Vacuum Pump | Gast | 0211-V45N-G8CX | 1292 | 4/14/16 |
| 32 | Field Multi-Meter | Hydrolab | Quanta | QD04071 | 1/3/13 |
| 33 | Field Turbidimeter | Hach | 46500-00 | 961000012176 | 1/3/13 |
| 36 | Microscope | Sargent-Welch | Compound | 30401437 | 1/2/16 |
| 37 | Dry Block Incubator | Crosstech | Dry Block | 77272 | 7/7/16 |
| 38 | Circulating Water Bath | Precision | 2 | 603051658 | 7/26/16 |
| 39 | Digital Verification Thermometer | Digi Sense | 91210-45 | 170585605 | 10/18/18 |
| 40 | Pocket Field Colorimeter | Hach | N/A | 18060E359903 | 10/18/18 |
| 41 | Hand Held pH Meter | Milwaukee | MI 106 | D0106789 | 11/06/18 |
| 42 | Incubator | Barnstead International | 310 | 1433060458390 | 5/2/19 |
| 43 | Field pH Meter | Milwaukee | NA | H0026718 | 12/6/21 |
| 44 | Quanti-tray Sealer | Idexx | Plus | QTP13215001065 | 1/17/22 |
| 45 | Incubator | Shell Lab | SM16s | 02005223 | 10/25/23 |

## BEA N LABORATORY INSTRUMENTATION AND EQUIPMENT LIST

| Lab ID No. | Equipment | Manufacturer | Model | Serial No. | Location |
|---|---|---|---|---|---|
| 3 | Water bath | Lindberg/Blue M | MW1110A-1 | MW6990 | Micro |
| 4 | Thermometer 0 to 50 | VWR Scientific | 61013-017 | N/A | Walk-in |
| 5 | Refrigerator | Gerald | GR-65 | 910900270 | Micro |
| 6 | Autoclave | Market Forge | STM-E | 20072909 | Micro |
| 8 | Desiccator, Cabinet | Labconco Auto Dry | N/A | 3929 | SL |
| 9 | Oven | VWR Scientific | 1370GD | 0701592 | SL |
| 10 | Oven | VWR Scientific | 1370GD | 0701692 | SL |
| 15 | Furnace, Muffle | Thermolyne | F30400 | 5449205863694 | GL |
| 16 | Spectrophotometer | Milton Roy | Spectronic 20D | 3322114040 | GL |
| 17 | Meter, Dissolved Oxygen | YSI | 58 | 95L43679 | GL |
| 19 | Conductivity Meter | Orion | 160 | 22945024 | GL |
| 20 | Auto titrator | Schott Instruments | Titronic basic | 530426 | ML |
| 26 | Digester, Metals (Hot Block) | Env. Express | SC 154 | 944CECO978 | OL |
| 28 | Gas Chrom (ECD) | HP | 5890 | 2750A18894 | GL |
| 31 | Digester (Reactor), COD | HACH | 45600-00 | 9.206E+11 | GL |
| 34 | Centrifuge | Becton Dickinson | DYNAC 420101 | 271127 | SL |
| 35 | Desiccator, Cabinet | Labconco Auto Dry | 1342 | 232587C | SL |
| 36 | Desiccator, Cabinet | Labconco Auto Dry | 1342 | 232588C | OL |
| 37 | Gas Chrom (M.S.) | HP | 5890 II Plus | 3336A50594 | SL |
| 38 | Desiccator, Cabinet | Labconco Auto Dry | N/A | N/A | Micro |
| 39 | Colony Counter, Dark Field | Reichert Jung | QUEBEC | 11228-1 | GL |
| 40 | Meter, Dissolved Oxygen | YSI | 58 | 95L43679 | GL |
| 42 | Digestion/Distillation Apparatus | Electrothermal | MQ3868 | 10016111 | GL-Fe |
| 44 | Spectrophotometer | Milton Roy | Spectronic 501 | 1183116G | GL |
| 45 | Pump, Vacuum | Gast | 522V4BG180DX | 692 | GL |
| 48 | Spectrophotometer, UV-VIZ | Milton Roy | 1201 | 3720166003 | GL |
| 56 | Hot Plate | Corning | PC-101 | N/A | GL |
| 58 | Thermometer, NIST Traceable | ERTCO | 1007 | D97-227 | Office |
| 59 | Mass. Spec. | HP | 5972 | 3329A00810 | OL |
| 60 | Walk-in Cooler | Eskimo Panels | 2000 | N/A | GL |

| | | | | | |
|---|---|---|---|---|---|
| 65 | Autoanalyzer, Discrete | Seal Analytical | AQ 2 E | 90388 | GL |
| 69 | Incubator, Culture | Lab-Line Instruments | 600 | 0485-0006 | Micro |
| 70 | Balance, Analytical | Mettler | AE100 | 38630 / SV-23315 | GL |
| 71 | Oven | Sheldon Manufacturing | 1350FM | 202104 | SL |
| 74 | Incubator, BOD (low-temperature) | Precision Scientific | MFU20F3GW1 | WB81030345 | GL |
| 75 | Autotitrator | Schott Instruments | Titronic universal | 695751 | GL |
| 78 | Desiccator, Micro | NIKKO | N/A | N/A | Micro |
| 85 | Blender | Hamilton Beach | 57199 Type B02 | B-230013012 | Micro |
| 101 | Purge and Trap | O-I-Analytical Eclipse | 4660 | E924466713P | OL |
| 102 | Purge and Trap | O-I-Analytical Eclipse | 4660 | E924466709P | OL |
| 104 | Autosampler, GC/MS | O-I-Analytical Eclipse | 4551-A | E92545B163 | OL |
| 105 | Mass. Spec. | HP | 5972 | 3341A01001 | OL |
| 106 | Gas Chrom (M.S.) | HP | 5890 II | 3336A53486 | OL |
| 111 | Thermometer, Digital | Control Company | 4126 | 91096807 | OL |
| 112 | Digester, Cyanide (Hot Block) | Env. Express | SC6002 | 5873DIS1031 | GL |
| 113 | Rotator (or agitation apparatus) | N/A | N/A | N/A | GL |
| 114 | Evaporator | TurboVap | N/A | N/A | GL |
| 115 | Pressure Filter | Millipore | N/A | N/A | GL |
| 117 | Thermometer, Digital | Cole Parmer | Cole Parmer | 101852139 | SL |
| 123 | Incubator, BOD | VWR Scientific | VWR Scientific | 900100 | GL |
| 124 | Digester, Metals (Hot Block) | Env. Express | Env. Express | 7021CECW3308 | ML |
| 125 | Probe, Dissolved Oxygen | YSI | YSI | 11M100178 | GL |
| 126 | PC-BOD Autosampler | Mantech | Mantech | 261A0N020 | GL |
| 127 | Desiccator, Cabinet | Boekel | Boekel | N/A | SL |
| 128 | Desiccator, Cabinet | Boekel | Boekel | N/A | SL |
| 129 | Desiccator, Cabinet | Boekel | Boekel | N/A | SL |
| 130 | ICP Spectrophotometer | Perkin Elmer | Perkin Elmer | 078S1208281 | ML |
| 131 | ICP Autosampler | Perkin Elmer | Perkin Elmer | 102S12083514 | ML |
| 132 | Incubator, BOD | VWR Scientific | VWR Scientific | 400296 | GL |
| 133 | Fluorometer | Turner Designs | Turner Designs | 720000908 | GL |
| 135 | Stirring Hotplate | Fisher Scientific | Fisher Scientific | 71003547 | Micro |
| 138 | Quanti-Tray Sealer | IDEXX | IDEXX | 6451-09-345 | Micro |
| 139 | TKN Autoanalyzer | N/A | N/A | N/A | GL |
| 140 | Oil & Grease/TPH Extraction Manifold | N/A | N/A | N/A | GL |

| | | | | | |
|---|---|---|---|---|---|
| 141 | Desiccator, Cabinet | Fischer Scientific | Fischer Scientific | N/A | SL |
| 142 | Water Bath | VWR Scientific | VWR Scientific | 10010305 | Micro |
| 143 | Thermometer, Digital | Cole Parmer | Cole Parmer | 130160050 | SL |
| 144 | Thermometer, Digital | Cole Parmer | Cole Parmer | 122505056 | SL |
| 145 | Thermometer | Thermco. | Thermco. | 2943 | Micro |
| 146 | Digestor, Block (TKN) | Seal | Seal | 5146V00318 | GL |
| 147 | Digestor, Block (TKN) | Westco | Westco | 1562 | GL |
| 148 | Refrigerator | Haier | Haier | K2003606334 | OL |
| 149 | Thermometer -10 to 260 | H-B Instrument Company | H-B Instrument Company | ACC11312 | GL |
| 150 | Thermometer -25 to 45 | H-B Instrument Company | H-B Instrument Company | 6672 | GL |
| 152 | Thermometer -20 to 70 | Thomas (Control Company) | 9338E75 | 130146515 | GL |
| 153 | Distillation Mantle | Glas-Col | TM114 | 169023A | GL |
| 155 | Thermometer 123 to 177 | Thermco. | ACC102C | 1579 | COD |
| 158 | Thermometer -20 to 70 | Thomas (Control Company) | 9338E75 | 130619991 | Micro |
| 159 | Spectrometer | Milton Roy | 1201 | 37C4124001 | GL |
| 160 | Thermometer -20 to 70 | Thomas (Control Company) | 9338E75 | 140174036 | Micro |
| 161 | Thermometer -20 to 70 | Thomas (Control Company) | 9338E75 | 140174042 | OL |
| 164 | Timer | Thomas (Control Company) | 1235D47 | 140710195 | GL |
| 165 | Timer | Thomas (Control Company) | 1235D47 | 140710186 | ML |
| 166 | Timer | Thomas (Control Company) | 1235D47 | 140710197 | GL |
| 167 | Timer | Thomas (Control Company) | 1235D48 | 140710179 | GL |
| 168 | Timer | Thomas (Control Company) | 1235D47 | 140710199 | GL |
| 169 | Meter, pH (Pocket-sized) | Hanna | HI98103 | M2 (15623) | ML |
| 170 | Thermometer 15 to 30 | Thermco. | ACCI300S | 2476 | GL |
| 171 | Turbidimeter | HACH | 2100N | 940700000663 | GL |
| 174 | XYZ Sampler | Bran+Luebbe | AIM 1250 | 950934 | GL-Gas Diff. |
| 175 | Thermometer -50 to 70 | Thomas (Control Company) | 1235D07 | 150338489 | OL -Prep |
| 176 | Miniature Water Bath | Fisher Scientific | 2LS | 307435 | OL |
| 177 | Corded Hand-Held UV Lamp | Spectroline | EA-160 | 1081721 | Micro |
| 180 | FIA Analyzer | Lachat | Quikchem 800 | A83000-658 | GL-Gas Diff. |
| 181 | FIA Analyzer | Lachat | Quikchem 800 | A83000-1179 | GL-NOX |
| 182 | FIA Analyzer | Lachat | Quikchem 800 | A83000-1828 | GL-TKN |
| 185 | Microscope | AmScope | M600 | G014036532 | Micro |
| 186 | Thermometer -30 to 50 | Baxter | T2008-1 | #2 | GL |

| | | | | | |
|---|---|---|---|---|---|
| 187 | Thermometer -30 to 50 | Baxter | T2008-1 | #1 | GL |
| 188 | General Refrigerator / Freezer | Hotpoint | HTR18ABMDRWW | ZA787588 | GL |
| 189 | Thermometer -20 to 70 | Thomas (Control Company) | 9338E75 | 150543214 | GL |
| 190 | TKN Manifold Thermometer 35 to 55 | N/A | N/A | 157-0283-08 | GL-TKN |
| 195 | Thermometer -35 to 50 | VWR Scientific | 61013-017 | N/A | Micro |
| 196 | Thermometer 80 to 135 | Kessler | Max Regr | autoclave | Micro |
| 199 | Incubator, Culture | Lab Line Instruments | 305 | 0598-0316 | Micro |
| 200 | Analog Vortex Mixer | Thomas Scientific | 945700 | 1306117002 | GL-TKN |
| 201 | Stir Plate (pH Station) | Cole Parmer | 4810 | 408662 | GL |
| 202 | Stir Plate (Solids) | Fisher Scientific | N/A | A242680 | SL |
| 203 | Stir Plate (BOD) | Thermolyne | Nuova II (S18525) | 30717052 | GL |
| 204 | Tissue Grinder | Jiangsu Jinyi Instrument | N/A | N/A | GL |
| 206 | Autosampler (ECD) | Hewlett Packard | 18593B | 3120A26994 | OL |
| 209 | Upright Freezer (Chlorophyll Standards) | IGLOO | FRF110 | A1511156030000238 | GL |
| 210 | Chest Freezer (Chlorophyll Samples) | IGLOO | FRF4341-B | A1508149140006074 | GL |
| 211 | Thermometer -30 to 50 | Baxter | T2008-1 | #4 | GL |
| 215 | Spore Dry-block Incubator | Nemko / McKesson | Dry-block Inc. | 73-2320 | Micro |
| 216 | Dry-block Thermometer 18 to 60 | SP Scienceware | 607010100 | 3848 | Micro |
| 217 | Water Bath | Precision Scientific | 51221035 | 603041717 | Micro |
| 219 | Multi Pulse Vortexer | Glas-Col | 099A-VB4 | 276819 | GL-TKN |
| 220 | Evaporator, O&G (Hot Block) | VWR Scientific Products | 13259-052 / 949036 | 1671 | GL |
| 221 | Autoanalyzer, Discrete | Seal Analytical | AQ 2 | 90411 | GL |
| 222 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 160722613 | Micro |
| 224 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | N/A | Micro |
| 226 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 160722630 | Micro |
| 227 | Meter, pH (Pocket-sized) | HANNA Instruments | HI98103 Checker | H02072622 | Receiving |
| 228 | NIST - Digital Thermometer (-50 to 1300 deg C) | Cole-Parmer (Control Company) | 91210-45 | 170585605 | SL |
| 229 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 170748348 | Micro |
| 231 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 170748353 | Micro |
| 232 | Thermometer (-10 to 150 deg C) | Thomas (HB Instrument) | Easy-Read | Q00070 | Micro |
| 233 | Autoanalyzer, Discrete | Seal Analytical | AQ 2 | 90700 | GL |
| 234 | Ion Chromatography Unit | Metrohm | 930 Compact IC Flex | 1930200043107 | GL |
| 235 | Spectrophotometer | Thermo Spectronic | BioMate 3 | 2K3F017006 | GL |

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|---|---|---|---|---|---|
| 236 | NIST - Thermometer (0 - 60 deg C) | ThermCo Products | ACC10613S | 1068 | QA Officer |
| 238 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 181158646 | Micro |
| 239 | Incubator | Imperial III | 306M | 0199-0089 | Micro |
| 240 | AA Spectrophotometer | Perkin Elmer | PinAAcle 900Z | PZAS15041001 | ML |
| 241 | pH Meter | Thermo Scientific | Orion Star A211 | X45843 | GL |
| 242 | Oven | VWR Scientific | 1350F | 600396 | GL |
| 243 | NIST - Digital Thermometer (-50 to 1300 deg C) | Cole-Parmer (Control Company) | 91210-45 | 181363715 | Office |
| 244 | VWR Waterbath | VWR | 2LS | 2H1250591 | GL-EZ Nox |
| 245 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 181691810 | Micro |
| 246 | Autosampler, GC/MS | Centurion | none | CENTW672121718 | OL |
| 247 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 192093408 | Micro |
| 248 | Thermometer, Digital (-20 to 70 deg C) | Thomas Scientific (Control Company) | 9338E75 | 1902093411 | Micro |
| 249 | pH/mV/Termperature Meter | Milwaukee | MI106 | H0026732 | Field (#F24) |
| 250 | NIST - Digital Thermometer (-50 to 1300 deg C) | Cole-Parmer (Control Company) | 91210-45 | 191915560 | QA Officer |
| 251 | Thermometer (0 - 150 deg C) | Thermo Scientific | 9313A38 | T80440 | Odor |
| 252 | Thermometer (0 - 150 deg C) | Thermo Scientific | 9313A38 | T80489 | Metals |
| 253 | Ion Chromatography Unit | Thermo Scientific (Dionex) | Integrion | 19080012 | GL-IC |
| 254 | Compact Refrigerator | Magic Chef | HMR330WE | THD1810HMR330WE00424 | OL |
| 255 | Balance, Analytical | Sartorius | Entris 124-ISUS | 38007982 | GL |
| 256 | Hot Block | Fisher Scientific | 2054FS | 1.65107E+12 | GL |
| 257 | Large Capacity Mixer | Gals-Col | 099A-LC1012100 | 472270 | GL |
| 258 | Raytek MiniTemp IR Thermometer | Raytek | N/A | RAYL000570277 | Receiving |
| 259 | Quanti-Tray Sealer PLUS | IDEXX | 89-0003936-00 | QTP13185104603 | Micro |
| 260 | Oven | ThermoScientific (Precision) | 6530 | 603823 | Solids |
| 262 | Autoanalyzer, Discrete | Seal Analytical | AQ 2 | 90749 | GL |
| 263 | Lotix TOC Autoanalyzer | Teledyne, Tekmar | Lotix 15-1600-000 | US20219001 | TOC |
| 264 | pH Meter, hand-held | Hanna | HI98107 | HA04203313 | Metals |
| 265 | BOD Incubator | ThermoElectron Corporation | 815 Precision-3721 | 305780 | BOD |
| 266 | Thermometer, Digital (-20 to 70 deg C) | Thomas Sci (Control Company) | 9338E75 | 200738841 | Micro |
| 267 | Thermometer, Digital (-40 to 185 deg C) Log Tag | Log Tag | Trix-8 | 2000043029 | Metals |
| 268 | pH Meter, hand-held | Hanna | HI98103 | H05481429 | Receiving |
| 269 | pH Meter | Thermo Scientific | Orion Star A111 | J27181 | GL |
| 271 | Water Bath Incubator | Thermo Sci | TSCIR35 | 300494082 | Micro |
| 270(A) | TKN Digestion Block | Environmental Express | 2021TKN221 | 054RB | TKN |

| | | | | | |
|---|---|---|---|---|---|
| 270(B) | TKN Digestion Controller | Environmental Express | 2021TKN221 | 054RB | TKN |
| 261(A) | Stable Weigh Filling Station | Environmental Express | N/A | N/A | SOLIDS |
| 261(B) | Static Line | HAUG | N/A | A91204A | SOLIDS |
| 261(C) | Static Transformer | HAUG | EN-C | 200516 | SOLIDS |
| 253(A) | Ion Chromatorgraphy Autosampler | Thermo Scientific (Dionex) | Dionex AS-AP | 12070978 | GL-IC |
| 234 (A) | Ion Chromatorgraphy Autosampler | Metrohm | 930 Compact IC Flex | 1930200043107 | GL |
| 240 (A) | AA Autosampler | Perkin Elmer | AS 900 | AS9C18120201 | ML |
| 240 (B) | AA Cooling System | Perkin Elmer | N/A | 319S15041303 | ML |
| 174 (A) | Peristaltic Pump | Lachat | 2200-000 | 2000-272 | GL-Gas Diff. |
| 130 (A) | ICP Chiller Unit | Polyscience | N0772046 | 1D12B0414 | ML |
| 134 (A) | Mercury Analyzer | Nippon Instruments | NIC RA-3A | 12400994 | GL |
| 134 (B) | Mercury Sample Changer | Nippon Instruments | NIC SC-3 | 12410525 | GL |
| 134 (C) | Mercury Reagent Dispenser | Nippon Instruments | NIC RD-3 | 12420764 | GL |
| 137 (B) | XYZ Sampler | Bran+Luebbe | AIM 1250 | 4421A2498 | GL |
| 139 (A) | Autoanalyzer, Digital Colorimeter | Bran+Luebbe | AutoAnalyzer3 | 9532061 | GL-NOX |
| 139 (B) | XYZ Sampler | Bran+Luebbe | EZkem | 246603 | GL-TKN |
| 139 (C) | Technicon II TKN Maniofld | Technicon | N/A | C60388 | GL-TKN |
| 139 (D) | Technicon III Presistalic Pump | Technicon | 133-A-014-01 | 02151101 | GL-TKN |
| 153 (A) | Distillation Controller | Glas-Col | 104A-PL120 | 276481 | GL |
| 153 (B) | Distillation Recirculator | Neslab | N/A | N/A | GL |
| 180 (A) | Peristaltic Pump | Lachat | RP100 Series | A82000-604 | GL-NOX |
| 182 (A) | Peristaltic Pump | Lachat | IPS-12 | A82000-473 | GL |
| 272 | NIST -Digital Thermometer | Cole-Parmer | 4425, 91210-45 | 210535323 | GL |
| 273 | Autoanalyzer, Discrete | Seal Analytical | AQ 400 | 341252 | GL |
| 274 | Spectrometer | Biomate 3 | 335904P | 2K1H337002 | GL |
| 275 | Refrigerator | Danby | DAR044ABDD-6 | 4.32109E+12 | Micro |
| 276 | Spectrometer | Thermo Spectronic | 4001/4 | 3SGG007002 | GL |
| 278 | Stir Plate/Hot Plate | Barnstead/Thermolyne | SP46925 | 1069980928203 | GL |
| 279 | Autoanalyzer, Discrete | Seal Analytical | AQ400 | 341320 | GL |
| 280 | Autoanalyzer, Discrete | Seal Analytical | AQ400 | 341252 | GL |
| 281 | Balance, Top Loading | Ohaus | SJX1502N/E | C203428141 | GL |
| 282 | Balance, Analytical | Ohaus | EX224 | C312870813 | GL (SOLIDS) |
| 286 | Vortex Mixer | Cole-Parmer | S0100A-CP | 23157171 | GL (TKN) |

| | | | | | |
|---|---|---|---|---|---|
| 287 | Stirring Hotplate | Corning | PC-420 | 4.00502E+11 | GL |
| 288 A/B | Temperature Data Logger | ThermoWorks | THS-292-501 | D23211548 | GL (TKN) |
| 289 | Nesslerizer | Lovibond | N/A | 25533 | GL |
| 290 | Agilent 7850 ICP-MS | Agilent | 7850 | SG20470812 | ML |
| 290A | Agilent SPS 4 Autosampler | Agilent | G8410A-SPS4 | AU20208655 | ML |
| 291 | Environmental Control System | PolyScience | N0772046 | 2005-01815 | ML |
| 292 | 6890N Series Gas Chromatograph | Hewlett Packard (Agilent) | 6890N | US10228129 | OL |
| 292A | 6890N Series Gas Chromatograph | Hewlett Packard (Agilent) | 6890N | CN10249006 | OL |
| 293 | 7683 Series Autosampler | Agilent | G2614A | US93205814 | OL |
| 293A | 7683 Series Auto-injector | Agilent | G2613A | CN12020360 | OL |
| 294 | 5973 Series Mass Spectrometer | Hewlett Packard (Agilent) | G2589A | US21884844 | OL |
| 295 | WaterBath | VWR | 1225 | 1105101 | GL |
| 296 | Digestor, Controller (TKN) | Environmental Express | TKN100 | 2021TKNBC196 | GL |
| 297 | Digestor, Controller (TKN) | Environmental Express | TKN100 | 2021TKNBC194 | GL |

# B. Laboratory Software

| Instrument/Equipment | Software Name | Software Version | Version Date | Publisher |
|---|---|---|---|---|
| Lotix Organic Carbon Analyzer | Tek Link | 3.3.7431-18150 | 2020 | Teledyne Advanced Chemistry |
| SEAL AQ2 Discrete Analyzer | AQ Software | 2.1.6 | 2016 | SEAL Analytical,Inc |
| SEAL AQ400 Discrete Analyzer | AQ Software | 2.4.13 | 2023 | SEAL Analytical,Inc |
| Mercury Autoanalyzer | RA-3AWin | 1.1.6 | 2008 | Nippon Instruments |
| Ion Chromatograph | MagIC Net | 3.2 | 2017 | Metrohm |
| Ion Chromatograph | Chromeleon | 7.2.10 | 2019 | Dionex |
| PC-BOD | PC-BOD | 3.0.0.142 | 2011 | ManTech, Inc |
| ICP Autoanalyzer | WinLab32 ICP | 5.3.0.0656 | 2011 | Perkin Elmer |
| AA Spec. (furnace) | Syngistix for AA | 3.1.0.1682 | 2017 | Perkin Elmer |
| Gas Chrom. / ECD | GC ChemStation | B.04.03-SP1 [87] | 2012 | Agilent |
| Gas Chrom. / Mass Spec. | MSD ChemStation | E.02.02.1431 | 2011 | Agilent |
| General Solids area | BalanceLink | 4.0.2 | 2007 | Mettler Toledo |
| Dissolved Oxygen Probe | YSI Data Manager | 1.1.8 | 2009 | YSI, Inc |
| LimsLink | LimsLink | 4.1 | 2009 | Labtronics, Inc |
| Laboratory LIMS System | Alpha Five Professional Ed. | Version 11, Build 3381 | 2013 | Alpha Software, Inc |
| ICP-MS 7850 | Agilent ICP-MS MassHunter 5.1 | 5.1 | 2020 | Agilent Technologies |

# Table 4.4 (A & B)

# REFERENCE MEASUREMENT STANDARDS & CALIBRATION SERVICES

## A. Reference Measurement Standards

BEA (Palmetto)

| No. | Reference Standards | Manufacturer | Model | Serial No. | Calibrated By: |
|---|---|---|---|---|---|
| R-1. | NIST Reference Thermometer | Thermco | ACC10613S | 1068 | Thermco Products Inc. |
| R-2. | Class S Equivalent Weights | Troemner | 1kg – Calibration Weight | 13626 | Troemner |
| R-3. | Class S-1 Equivalent Weights | Troemner | 9 Weight Set, 1g – 100g | 22435 | Troemner |

BEA S

| No. | Reference Standards | Manufacturer | Model | Serial No. | Calibrated By: |
|---|---|---|---|---|---|
| R-1. | NIST Reference Thermometer | Thermco | ACC10613S | 1068 | Thermco Products Inc. |
| R-2. | Class 1 Equivalent Weights | Fisher Scientific | ASTM E617-97 | 22141 | Troemner |
| R-3. | Traceable Workhorse Thermometer | Control Company | 1230N26 | 191915560 | Control Company |

## B. Calibration Services

| Service Provider | Representative | Phone No. | Account No. | Equipment Serviced: |
|---|---|---|---|---|
| Mettler Toledo | Jason Butehko | (800) METTLER<br>(800) 786-0034 x7127<br>Fax: (614) 438-4525 | 011533 | Balances |
| Perkin Elmer | Richard Green | (800) 762-4000<br>Fax: (813) 741-0152 | Not applicable | ICP/GFAA |
| Purification Technologies | Jane Coldiron/Mark | (813) 620-3922 | 32080 | De-ionized Water System |
| Troemner | Joann Scull | 856-686-4213<br>856-686-1601 FAX | Not applicable | Weights (which are used to check Laboratory Balances) |
| Thermco Products, Inc. | Susan Datria | (973) 300-9100<br>Fax: (973) 255-1000 | Not applicable | NIST Reference Thermometers (which are used to check Laboratory Thermometers) |
| Commercial Appliance | Not applicable | (941) 429-1536 | Not applicable | Autoclave |

**5.0 SAMPLE CUSTODY AND DOCUMENTATION**

The following discussions outline the minimum record keeping requirements as they relate to sample collection, sample handling and sample analysis activities. The protocols and requirements outlined in this section emphasize the use of unequivocal, accurate and methodical records to document all activities affecting sample data.

There are two levels of custody: 1) Sample custody or tracking and 2) Legal or evidentiary chain of custody.

1. Sample custody or tracking is required. It includes all records and documentation necessary to trace a sample from point of origin through final report and sample disposal. Sample custody requires that each event or procedure to which the sample is subjected be documented. These include, but are not limited to: sample collection, field preservation, sample receipt and log in, sample preparation, sample analysis and sample disposal. In addition, those tasks or activities that relate to each of the above-mentioned events (e.g. reagent preparation, calibration, preventative maintenance, quality control measures, etc.) must be documented. The history of the sample must be readily understood through the documentation. The required documentation that is associated with sample custody is outlined in Sections 5.1 through 5.5.

2. Legal or Evidentiary Chain of Custody (COC) is a special type of sample custody which requires that the physical possession, transport and storage of a sample be documented in writing. The records must account for all periods of time from sample container acquisition through sample disposal. COC protocols are not required, but are recommended. If implemented, the minimum documentation requirements outlined in Section 5.6 must be followed.

## 5.1 GENERAL REQUIREMENTS FOR CUSTODY AND DOCUMENTATION

### 5.1.1 Record Keeping System Design - General Requirements

The laboratory shall design and maintain a record keeping system that is succinct and efficient:

1. All records shall be maintained in a manner which facilitates documentation tracking and allows historical reconstruction of all analytical events and ancillary procedures that produced the resultant sample analytical data.

2. The system shall unequivocally link all documentation associated with a sampling event from sample collection through the final analytical result and sample disposal. This may be accomplished through either direct or cross-references to specific documentation.

3. The system shall be straightforward and shall facilitate the retrieval of all working files and archived records for inspection and verification purposes.

4. Final reports, data summaries, or other condensed versions of data that have been prepared by external parties shall be linked to internal records by an unequivocal cross-referencing mechanism (usually field and/or laboratory ID numbers).

### 5.1.2 Documentation Criteria

1. The history of a sample must be clearly evident from the retained records and documentation. Copies or originals of all documentation which are associated with the analysis or sample collection event must be kept. This includes the documentation that is sent to or received from all sampling and analysis organizations.

2. All applicable documentation specified in this section shall be available for inspection during any sampling-site, facility (laboratory or offices) or data audit conducted by authorized representatives of compliance agencies.

3. The records must contain enough information so that excessive clarifications, interpretations or explanations of the data are not required from the originator.

4. All documentation and record entries shall clearly indicate the nature and intent of each entry.
   a. All documentation entries shall be signed or initialed by responsible staff. The reason for the signature or initials shall be clearly indicated in the records (e.g. sampled by; prepared by; reviewed by, etc.).

   b. Often, documentation requirements can be met by making brief references to procedures written in internal SOPs or approved methodology promulgated by external sources. If these standard procedures are routinely repeated in your operations (e.g., sample preparation procedures, decontamination protocols, analytical method, etc.), then citing these references may be appropriate. Such citations must specifically identify the document, method or SOP (e.g. sample preparation by 3010; field decontamination per internal SOP for Teflon sampling equipment, etc.), and must include the revision number or revision date. Copies of all revisions must be retained as part of the laboratory documentation.

#### 5.1.3 Record-keeping Protocols

1. Entries into all records shall be made with waterproof ink.

2. **Entries on records shall not be obliterated by erasures or markings. All corrections to record-keeping errors shall be made by one line marked through the error. The individual making the correction shall sign (or initial) and date the correction.**

3. All laboratory records must be kept for a period of 5 years; this includes any NELAC related documentation.

### 5.2 Content Requirements For Sampling Kit Documentation

The contents of each prepared sampling kit (see Appendix A for definition) shall be documented. A packing list or similar record shall be transmitted to the receiving party with the sampling kit and a copy or other record shall be retained by the preparing party.

5.2.1.1 The following information shall be transmitted to the receiving party:

a. Quantity, description and material composition of all containers, container closures or closure liners (if method specified) and all sampling equipment
b. Intended application for each container type indicated by approved analytical method or method group
c. Type and concentration of preservative added to clean sample containers and/or shipped as additional preservative
d. Intended use of any additional preservatives or reagents
e. Description of any analyte-free water (i.e. deionized, organic-free, etc.)
f. Types and number of any quality control blanks (e.g., trip blanks)
g. Date of kit preparation
h. Description and material composition of all reagent transfer implements, i.e. pipettes, shipped in the kit.

This information may be in the form of a packing slip (e.g., 6-125 ml plastic containers for metals, 12 VOC vials for 601/602, etc.) or included on the chain of custody.

5.2.1.2 In addition to maintaining records of the above information, the preparing party shall maintain records or cross reference links of the following information:

a. Lot numbers of any commercially obtained sources of analyte-free water (if provided)
b. Material composition of all reagent and analyte-free water containers (if provided)
c. A code or reference (i.e. lot numbers) to dates in container and/or equipment cleaning logs;
d. A code or reference that links preservatives to preparation logs for preservatives or vendor lots
e. Name of receiver of kit
f. Project name for kit use, if known
g. Name of individual(s) preparing the kit
h. Date the kit was shipped or provided

5.2.1.3 If the sampling kits are prepared for internal use (i.e. they will not be shipped to any external party, including branch offices of the same organization) and the sampling kits are used for collecting routine (i.e. daily, weekly or monthly monitoring) samples, the records in 5.2.1.1 and 5.2.1.2 may be reduced to the following:

a. The cleaning records for sampling equipment and/or sample containers shall indicate who received the cleaned containers or equipment and the date of receipt.
b. The preservation and/or reagent preparation records shall indicate that the preservative or reagent was prepared for use in the field.

### 5.2.2 Documentation for Preservatives

Sample preservatives and other reagent preparations shall be traceable to preparation dates and vendor sources and/or lot numbers.

## 5.3 CUSTODY AND DOCUMENTATION REQUIREMENTS

### 5.3.1 General Protocols

1. Copies of all COC forms (if applicable) or sample transmittal forms shall be maintained with project records. If the sampling and analysis activities are performed by the same organization at the same physical location (e.g. wastewater sampling and analysis) and if all records are maintained in a central location, a single copy of the COC form (if used) or the laboratory transmittal form may be retained.

2. Entries into all field records shall be made with waterproof ink.

3. Errors in all documents shall be deleted with one line then initialed and dated by the person making the correction (see Section 5.1.3.2).

4. All documentation/logs shall be signed/initialed by the appropriate personnel.

5. All time shall be recorded using 24 hour notation (i.e., 2:00 PM is 1400 hours).

### 5.3.2 Required Information

5.3.2.1 Sample Transmittal Records

All samples that are submitted to a laboratory must be accompanied by a sample transmittal or Chain of Custody record (see Section 5.6). This record may be designed as individual forms for each sample or a summary form for a set of samples. AT A MINIMUM, the information transmitted to the laboratory shall include:

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1. Client name, address and phone number
2. Sample identification (i.e. site name)
3. Sample location (i.e. specific address or field #)
4. Date and time of collection
5. Collector's name and phone number
6. Preservation type
7. Sample type (sample matrix)
8. Number of samples
9. Intended analyses
10. Any special remarks concerning the sample (i.e. exceptions)

5.3.3 SAMPLE TRANSPORT:

1. All sample transmittal forms shall be placed in waterproof bags and sealed in the transport containers with the samples.
2. If shipped by common carrier, transport containers should be securely sealed with strapping tape or other means to prevent lids from accidentally opening. COC Seals (if used) shall be applied after containers have been secured.
3. All shipping bills from common carriers shall be kept with the COC or transmittal forms.

## 5.4 SAMPLE CUSTODY TRACKING AND DATA DOCUMENTATION FOR LABORATORY OPERATIONS

5.4.1 INITIAL CHECK OF SAMPLES AND DOCUMENTATION

When samples are received by the laboratory the following checks shall be made upon receipt:

1. Verify the integrity and condition of all sample containers.

   a. Check for leakage, cracked or broken closures or containers, evidence of grossly contaminated container exteriors or shipping cooler interiors, and obvious odors, etc.
   b. Check for air headspace or bubbles in VOC containers.
2. Verify receipt of complete documentation for each container. At a minimum the following shall be included:
   A. A unique identifier that can be cross-referenced with the COC or sample transmittal form (site name, specific address or field #). If a container can not be cross-referenced with the COC, then it will be rejected.
   B. Date and time of collection
   C. Collector's name
   D. Intended analyses
   E. Preservation type
3. All information on sample containers must be in indelible ink and labels (if applicable) must be water-resistant.
4. Samples must be received in sufficient quantity for analysis. Reference Table 5.5.

5.4.2 VERIFICATION OF SAMPLE PRESERVATION

1. Samples that require chemical preservation shall be checked upon arrival. In some cases, it may be the choice of the laboratory to issue sample containers without preservative (for the safety of

the customer). In this case, the laboratory must preserve the sample container upon arrival. Reference Table(s) 5.1, 5.2, 5.3 and 5.4 of this manual for type of preservation. If proper preservation can not be established the sample will be rejected.

2. Samples which require thermal preservation shall be considered acceptable if the arrival temperature is within +/-2°C of the required temperature. Reference Table(s) 5.1, 5.2, 5.3 and 5.4 of this manual for preservation temperatures. Samples that are hand delivered to the laboratory immediately after collection may not meet these criteria. In these cases, the samples shall be considered acceptable if there is evidence that the chilling process has begun. The following alternate techniques may be used to verify the actual sample temperature:

   a. The temperature may be verified by determining the temperature of a surrogate water sample which has been shipped with the samples or placed in the transport containers with the samples after arrival in the laboratory. In the latter case, the surrogate sample must be allowed to equilibrate to the temperature of the samples in the cooler.

   b. The temperature of incoming samples may also be verified by a non-invasive temperature probe.

   c. The temperature of the melted ice water in the cooler may also be used as an indicator of proper temperature.

**UNDER NO CONDITIONS SHALL A THERMOMETER OR OTHER TEMPERATURE MEASURING DEVICE BE PLACED INTO THE COLLECTED SAMPLE CONTAINER.**

5.4.3 REJECTION OF RECEIVED SAMPLES

1. Rejection Criteria - Samples shall be rejected according to the following criteria.
   a. Samples do not arrive with in the approved holding time.
   b. The integrity of sample containers is compromised as described in 5.4.1
   b. The identification of a container cannot be verified
   c. The proper preservation of the container cannot be established
   d. VOC vials contain bubbles of sizes greater than 1% of the vial volume (usually a bubble size of 5 mm in diameter). Note: the presence of any bubbles in VOC vials must be documented and reported with the final results.

2. The laboratory shall obtain concurrence or further instruction from the sample submitter regarding any proposed rejection. All correspondence and/or conversations concerning the final disposition of the samples shall be documented in the appropriate exception log.

3. Any decision to proceed with the analysis of compromised samples shall be fully documented including correspondence with the customer.
   a. The condition of these samples shall be noted in all documentation associated with the sample.
   b. The analysis data shall be appropriately qualified as estimated on all internal documentation and on the final report (see Data Qualifiers, Table 10.2).

4. Rejected samples shall be logged in the laboratory sample receipt log per Section 5.4.4 below with appropriate comments.

5. See also SOP# GM-1 (BEA) or GMS-7 (BEAS), Sample Acceptance Policy.

5.4.4 SAMPLE RECEIPT LOGGING

1. The laboratory shall employ a logical system for assigning a unique identification code to EACH SAMPLE CONTAINER received in the laboratory. Multiple aliquots of a sample that have been received for different analytical tests (e.g., nutrients, metals, VOCs, etc.) shall be assigned a different ID code.

   a. This laboratory code shall maintain an unequivocal link with the unique field ID assigned each container.
   b. The identification of containers by container shape or size is not adequate.
   c. Sample containers will be labeled with the unique code upon assignment of the code.
   d. The unique code must consist of:
      1) The submission number:
         A) The year (i.e. 2006 as 6).
         B) The month in two digits (i.e. January as 01).
         C) A consecutive number starting with 000 1 at the beginning of each month.
         **NOTE**: BEAS Submission numbers all begin with an 'S' (Designating South).

      2) Sub-categories to the submission number:
         A) Each sample identified in numerical order.
         B) Each bottle identified by preservative in alphabetical order.
         C) Each analyte identified by full name or accepted abbreviation (Reference Table 5.5).

2. A sample receipt log shall be employed to document receipt of all sample containers. The following information will be recorded in the laboratory sequential log:

   a. Client name, address and phone number
   b. Sample identification (i.e. site name)
   c. Sample location (i.e. specific address or field #)
   d. Date and time of collection
   e. Collector's name and phone number
   f. Preservation type
   g. Sample type (sample matrix)
   h. Number of samples
   i. Intended analyses, including method number
   j. Any special remarks concerning the sample (i.e. exceptions)
   k. Received date and time
   l. Laboratory sample submission number
   m. Field ID code supplied by sample submitter
   n. Signature or initials of logger
   o. Comments or references resulting from sample integrity inspection (Section 5.4.1) or sample rejection (Section 5.4.3).
   p. Sampling kit code (if applicable)

3. Smaller laboratories whose function is to analyze on-site samples that have been collected by the laboratory staff (e.g. in-house domestic wastewater treatment laboratories) may use the sample transmittal forms as the sample log provided:

   a. The information in 5.4.4.2 above is included on the forms; and
   b. The sheets are maintained in chronological order as a permanent laboratory record.

In these cases, the laboratory ID number may be the same as the field ID number, subject to the requirements listed in Sections 5.4.4.1 and 5.4.4.2 above.

4. Retain all documentation that is transmitted to the laboratory by the sample transmitter for a period of five years.

### 5.4.5 Sample Storage

1. Parent samples, sample replicates and subsamples received in the laboratory shall be stored under approved conditions as described in Tables 5.2, 5.3, 5.4 and 5.5. See also SOP# GM-2 (BEA) or GMS-8 (BEAS), Sample Handling and Storage.

2. Sample fractions, extracts, eluates, leachates, digestates, etc. shall be stored according to requirements of 5.4.5.1 above or according to guidance found in the approved preparation or analytical method used to prepare or analyze the subsample, as applicable. In cases of conflicting guidance, the storage/preservation requirements specified in 5.4.5.1 above shall supersede method guidance. No specific requirements apply to other cases not comprised by the above.

3. Samples and all subsamples, sample fractions, extracts, eluates, leachates and digestates shall be stored separately from all standards, reagents, cleaning supplies, fuels, food, etc.

4. VOC samples shall be stored separately from all other samples.

5. The manner in which samples and subsamples are stored shall be documented. This may be recorded in the sample receipt log or other linked documentation.

### 5.4.6 Sample Disposal

At a minimum, record the date of sample and/or subsample disposal and either the name (or initials) of the individual authorizing the disposal or the person who is responsible for the disposal.

### 5.4.7 Intralaboratory Distribution of Samples for Analysis

1. The laboratory shall utilize a proactive procedure to ensure that all samples and subsamples are analyzed within allowed maximum holding times (specified in 5.4.5.1 above).

2. All distribution of samples and subsamples for preparation and analysis shall be documented as to task assignment and analysis date deadline.

### 5.4.8 Laboratory Preparation of Samples for Analysis

Record all sample preparation procedures that may impact the analytical results.

#### 5.4.8.1 Preparation Records

a. Sample preparation records shall include, but are not limited to:
   1. digestions
   2. filtrations
   3. distillations
   4. extractions
   5. leachings
   6. sample extract cleanup procedures

b. The specific sample processing protocol shall be identified. Where the procedure is routinely performed according to approved methodology or internal SOPs, preparation records may refer to the specific method or SOP (see 5.1.2.4.b)

5.4.8.2 Required information.

a. All parameters associated with the preparation technique shall be recorded. These data shall include, but are not limited to:

1. Sample or subsample ID number
2. Duration times for processes (e.g., extraction cycles, digestions, distillations, sonications, etc.) if the method specifies a time limitation
3. Volumes or weights of subsamples, reagents or dilution water
4. Dilution factors
5. Meter and other instrument readings
6. Chromatography column elution profile retention times
7. Adsorption column efficiency or breakthrough determinations
8. pH checks

b. Where specific materials or supplies are explicitly required by the approved method, record description and the material composition of such equipment, labware or supplies. This information may be by reference to internal standard operating procedures (see 5.1.2.4.b).

c. Record all calculations associated with the preparation procedure.

d. Retain all elution profile chromatograms, pH meter recorder charts or other products of automatic instrument data recordings associated with the procedure.

e. Link all reagents that are used in the procedure to the applicable reagent preparation records.

5.4.8.3 pH Checks of Samples and Subsamples

a. The pH of all pH-preserved samples is verified before any sample preparation or sample analysis procedure. Additional pH checks and adjustments, where required by the approved method, shall be documented.

b. Record the results of pH checks on samples and subsamples.

c. The proper pH value as stipulated by approved preservation protocols or approved sample preparation methods shall follow the method prescribed procedures. If none are specified, the pH shall be determined as follows:

1. Use narrow-range pH paper.
2. Do not contaminate the sample or subsample by contact with pH paper or pH electrode.
3. Use non-contaminating transfer implements, if necessary, to obtain a sample portion for use in the pH check procedure.
4. Check pH of VOC samples after taking aliquot for analysis, or check pH on duplicate sample that can be destroyed for this purpose
5. Pour a portion of the sample on the pH paper, unless the sample is an analytical portion that cannot suffer significant quantitative loss. In this case, transfer a test specimen with disposable pipet or other implement to the pH paper (see 5.4.8.3.c.3 above)

### 5.4.9 Tracking for Interlaboratory Transfer of Samples/Subsamples

If samples or sample extracts/digestates are sent to another laboratory, the information transmitted to the receiving laboratory must include, at a minimum:

a. Clear identification of subcontracted work by approved method designation
b. Subcontract Lab Information (Legal name, certification no., address, phone no. & contact name)
c. Originating Lab Information (Legal name, certification no., address, phone no. & contact name)
d. Date and time of sample collection

e. Method of preservation
f. Comments about sample or sample container (if applicable)
g. Date of sample preparation (if applicable)
h. Originating Laboratory ID number (if applicable)

### 5.4.10 Sample Analyses Documentation Requirements

All sample analyses shall be completely documented by retaining all associated records. These records shall include, but are not limited to the following:

5.4.10.1 Information concerning all sample data:
a. All sample identifications
b. Dates and times of analyses
c. Instrumentation ID and instrumentation parameters affecting the analytical run
d. Approved method numbers for the analyses performed
e. All raw and reduced analytical data
f. All calculations
g. Analyst's initials or signature

5.4.10.2 GC/MS analyses:
a. Retain all electronically generated records (including the tune file and calibration date) on a write-protected diskette or tape in an orderly, logical manner; OR
b. Retain the hard copy records of all data in the analytical run (blanks, QC samples, standards, samples, etc.) which must include:
1. A copy of the total ion chromatogram, normalized to the highest non-solvent base peak;
2. Complete quantitation report;
3. Confirmation of all hits (mass spectra from the sample and library); and
4. Mass spectra from all unidentified compounds that exceed 5% of the highest base peak (excluding solvent fronts). This includes retention time, tabulation of mass abundances, and mass spectra of the 5 most probable library hits.

5.4.10.3 Assure that all analysis data is linked with records for ancillary data and procedures (e.g. sample preparation).

### 5.4.11 Documentation Requirements for Other Laboratory Operations

The following activities, which are not specifically discussed in this Section, shall be documented according to the requirements found in the cited sections.

1. Preparation of Reagents and Analyte-Free Water - Section 6.2
2. Preparation of Analytical Calibration Standards - Section 7.2
3. Analytical Calibrations and Standardizations - Section 7.5 and 7.8
4. Preventative Maintenance - Section 8.0
5. Quality Control - Section 9.4
6. Corrective Actions - Section 11.6

## 5.5 ELECTRONIC DATA DOCUMENTATION

These requirements apply to all laboratory and field records which are generated or stored electronically.

5.5.1 RETENTION OF AUTOMATIC DATA RECORDING PRODUCTS

1. All products or outputs of automatic data recording devices, such as chart strip recorders, integrators and computers, shall be retained either in electronic, magnetic or paper form.

2. All such records shall be properly identified as to purpose, analysis date, and field and/or lab ID number. The information in Section 5.4.10.1 shall be recorded for all laboratory and all applicable field analyses.

5.5.2 ELECTRONIC DATA SECURITY

1. Controlled or secured access to levels of data-editing capability are recommended. Software should provide prompts to the user for double-checking entries before executing deletions or changes to data. User-interaction or data-alteration tracking software is recommended, if available.

2. Raw data that is electronically collected from instrumentation shall not be altered in any fashion. Software that allows an analyst to correct raw data (e.g. change baseline) is acceptable.

5.5.3 ELECTRONIC DATA STORAGE AND DOCUMENTATION

1. Electronically or magnetically stored data shall be easily retrievable for printing to paper.

2. All electronic/magnetic data files shall be coded, indexed, cross-referenced, etc., to allow linkage to sample data, analytical events and other laboratory procedural records. These file designations shall allow easy retrieval of the record.

3. All software algorithms employed to perform calculations required by the approved methodology or procedures shall be verified for accuracy and conformance with the methodology protocols, formulas, etc. This verification shall be documented.
   a. This requirement applies to all automatic calculations and automatic data collection affecting calibrations, analyses, QC determinations, spread sheets, etc.
   b. The vendor literature for software products may fulfill this requirement, if sufficiently detailed.

4. All software problems and their resolution shall be documented in detail, where these problems affect the correctness of laboratory data documented per this Custody SOP or where problems affect the cross-indexing of records. Record the calendar date, time, responsible personnel and relevant technical details of all affected data and software files. Indicate which files have been affected. All software changes, updates, installations, etc. shall be similarly documented per the above concerns. File and link all associated service records supplied by vendors or other service personnel.

## 5.6 LEGAL OR EVIDENTIARY CUSTODY PROCEDURES

The use of Legal Chain-of-Custody (COC) protocols are not required by DEP. The following procedures are designed to document and track all time periods and the PHYSICAL POSSESSION AND/OR STORAGE of sample containers and samples from point of origin through the final analytical result and sample disposal.

This type of documentation is useful in establishing the evidentiary integrity of samples and/or sample containers. It can be used to demonstrate that the samples and/or sample containers were handled and transferred in such a manner to eliminate possible tampering. As such, these protocols are advantageous if data is to be used in legal cases such as law suits, criminal actions, enforcement actions, etc.

In addition to the records listed in Sections 5.1 through 5.5, the following protocols shall be incorporated IF legal COC is implemented by the organization:

### 5.6.1 GENERAL REQUIREMENTS

1. The Chain of Custody records shall establish an intact, contiguous record of the physical possession, storage and disposal of sample containers; collected samples; sample aliquots; and sample extracts or digestates. For ease of discussion, the above-mentioned items shall be referred to as "samples":
   a. The COC records shall account for all time periods associated with the samples.
   b. The COC records shall include signatures of all individuals who were actively involved with physically handling the samples.
      1. The signature of any individual on any record that is designated as part of the Chain of Custody is their assertion that they personally handled or processed the samples identified on the record.
      2. Each signature shall be accompanied by a short statement which describes the activity of the signatory (i.e. received by, relinquished by, etc.).
   c. In order to simplify record-keeping, the number of people who physically handle the sample should be minimized.
   d. The COC records are not limited to a single form or document. However, the lab will attempt to limit the number of documents that would be required to establish COC.
      1. Grouping activities on documents (e.g., a sample transmittal form to document field activities and laboratory receipt; a sample storage and disposal form to document storage; etc.).
      2. A COC Form shall document all sample transmittals from one party to another (see 5.6.3).
      3. The laboratory records such as initial sample log records, sample preparation logs, analyst's run logs, etc. shall also be considered as part of the chain of custody unless the organization has established other records or protocols to document these laboratory functions.

2. Legal chain of custody shall begin when the pre-cleaned sample containers are dispatched to the field.
   a. A COC form must be signed by the person relinquishing the prepared sample kits or containers and by the individual who receives the sample kits or containers.
   c. Thereafter, all parties handling the sample are responsible for sample custody (i.e. relinquishing and receiving) and documentation EXCEPT when the samples or sampling kits are relinquished to a common carrier.

3. The common carrier should not sign COC forms.
   a. The COC form shall indicate the name of a common carrier, when used. The shipping bill or other documents must be retained.
   b. All other transferor and transferee signatures associated with common carrier transfers are required. This shall include laboratory, field and other personnel releasing or accepting materials from the common carrier.
   c. COC will be relinquished by the party who seals the shipping container and accepted by the party who opens it. The COC form shall indicate the date and time that the transport container was sealed for shipment.
   d. Transport containers shall be sealed with strapping tape and a tamper proof custody seal. The custody seal must have space for the signature of the person who affixed the seal along with the date and time.

4. The COC forms shall remain with the samples during transport or shipment. They must be put in a waterproof closure inside the sealed cooler or shipping chest.

### 5.6.2 Required Contents for Custody Records

Tracking records shall include, by direct entry or linkage to other records:

1. Time of day and calendar date of each transfer or handling procedure
2. Signatures of transferors and transferees
3. Location of samples (if stored in the field or laboratory)
4. Handling procedures (e.g. sample preparation, sample analysis, etc.) performed on the samples
5. Storage conditions for the samples, including chemical and thermal preservation
6. Unique identification for all samples
7. History of access to samples by all personnel, with personnel names recorded
8. Final disposition of physical sample
9. Common carrier documents

### 5.6.3 Required Information to be Included on COC Forms Used for Sample Transmittal

A Chain-of-Custody record or form shall accompany all evidentiary samples and sub-samples that are transmitted and received by any party. The COC record or form shall specifically contain the following information:

1. Client name, address and phone number
2. Sample identification (i.e. site name)
3. Sample location (i.e. specific address or field #)
4. Date and time of collection
5. Collector's name and phone number
6. Preservation type
7. Sample type (sample matrix)
8. Number of samples
9. Intended analyses, including method number
10. Signatures of all transferors and transferees
11. Time and date of all custody transfers
12. Common carrier usage, if applicable (see 5.6.1.3)
13. Any special remarks concerning the sample (i.e. exceptions)
14. Received date and time
15. Laboratory sample submission number
16. Field ID code supplied by sample submitter
17. Signature or initials of logger
18. Sampling kit code (if applicable)

### 5.6.4 Chain-of-Custody Seals

At a minimum, tamper-indicating tape or seals shall be affixed to all shipping container closures when transferring or shipping sample container kits, or samples to another party.

1. The seal shall be placed so that the transport container cannot be opened without breaking the seal.
2. The time, calendar date and signatures of responsible personnel affixing and breaking all seals shall be recorded on the seals.
3. Seals shall be retained as a part of the COC documentation.
4. While not required, organizations may elect to apply seals to individual containers. This establishes the history of each individual sample. The requirements specified for transport container seals shall be followed.

5.6.5 CONTROLLED ACCESS TO SAMPLES

1. Access to all evidentiary samples and subsamples shall be controlled and documented. The number of individuals who physically handle the samples should be limited to those responsible for sample collection, initial laboratory receipt, sample preparation and sample analysis (see 5.6.1.1.c) and sample disposal.

2. Samples and subsamples shall be placed in locked storage (e.g., locked vehicle, locked storeroom etc.) at all times when not in the possession or view of authorized personnel.
   a. Some organizations maintain restricted access to their facilities and contend that storage under these conditions should constitute secure storage. This practice is acceptable as long as non-laboratory personnel (i.e. janitors, security guards, etc.) are not able to gain access to the samples after business hours.
   b. Field personnel shall not leave samples in unoccupied motel or hotel rooms.

5.6.6 TRANSFER OF SAMPLES TO ANOTHER PARTY

Transfer of samples, subsamples, digestates or extracts to another party are subject to all of the requirements of Section 5.6.

## 5.7 SAMPLE DISPOSAL

1. Disposal of the physical sample shall occur only with the concurrence of the affected legal authority, sample data user and/or submitter of the sample.
2. All conditions of disposal and all correspondence between all parties concerning the final disposition of the physical sample shall be recorded and retained.
3. Records shall indicate the date of disposal, the nature of disposal (i.e. sample depleted, sample flushed into sewer, sample returned to client, etc.), and the name of the individual who performed the task. Note: if samples are transferred to another party, custody transfer shall be documented in the same manner as other transfers (see 5.6.3 above).

## Table 5.1

### 40 CFR Part 136 TABLE II: REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES (WATER/WASTEWATER SAMPLES)

| PARAMETER # | PARAMETER NAME | CONTAINER[1] | PRESERVATION[2,3] | MAX HOLD TIME[4] |
|---|---|---|---|---|
| Table 1A - Bacterial Tests: | | | | |
| 1-5. | Coliform, total, fecal and *E. coli* | PA, G | Cool <10°C, 0.008% $Na_2S_2O_3$[5] | 6 hours[22, 23] |
| 6. | Fecal streptococci | PA, G | Cool <10°C, 0.008% $Na_2S_2O_3$[5] | 6 hours[22] |
| 7. | Enterococci | PA, G | Cool <10°C, 0.008% $Na_2S_2O_3$[5] | 6 hours[22] |
| Table 1H – Protozoan Tests: | | | | |
| 8. | Cryptosporidium | LDPE; field filtration | 0-8°C | 96 hours[21] |
| 9. | Giarida | LDPE; field filtration | 0-8°C | 96 hours[21] |
| Table 1B - Inorganic Tests: | | | | |
| 1. | Acidity | P, FP, G | Cool ≤6°C[18] | 14 days |
| 2. | Alkalinity | P, FP, G | Cool ≤6°C[18] | 14 days |
| 4. | Ammonia | P, FP, G | Cool ≤6°C[18], $H_2SO_4$ to pH<2 | 28 days |
| 9. | Biochemical oxygen demand | P, FP, G | Cool ≤6°C[18] | 48 hours |
| 11. | Bromide | P, FP, G | None required | 28 days |
| 14. | Biochemical oxygen demand carbonaceous | P, FP, G | Cool ≤6°C[18] | 48 hours |
| 15. | Chemical oxygen demand | P, FP, G | Cool ≤6°C[18], $H_2SO_4$ to pH<2 | 28 days |
| 16. | Chloride | P, FP, G | None required | 28 days |
| 17. | Chlorine, total residual | P, G | None required | Analyze within 15 mins. |
| 21. | Color | P, FP, G | Cool ≤6°C[18] | 48 hours |
| 23-24. | Cyanide, total and amenable to chlorination | P, FP, G | Cool ≤6°C[18], NaOH to pH>12[6], reducing agent[5] | 14 days |
| 25. | Fluoride | P | None required | 28 days |
| 27. | Hardness | P, FP, G | $HNO_3$ or $H_2SO_4$ to pH<2 | 6 months |
| 28. | Hydrogen ion (pH) | P, FP, G | None required | Analyze within 15 mins. |
| 31, 43. | Kjeldahl and organic nitrogen | P, FP, G | Cool ≤6°C[18], $H_2SO_4$ to pH<2 | 28 days |
| 38.. | Nitrate | P, FP, G | Cool ≤6°C[18] | 48 hours |
| 39. | Nitrate-nitrite | P, FP, G | Cool ≤6°C[18], $H_2SO_4$ to pH<2 | 28 days |
| 40. | Nitrite | P, FP, G | Cool ≤6°C[18] | 48 hours |
| 41. | Oil and grease | G | Cool ≤6°C[18], $H_2SO_4$ or HCl to pH<2 | 28 days |
| 42. | Organic carbon | P, FP, G | Cool ≤6°C[18], HCl or $H_2SO_4$ to pH<2 | 28 days |
| 44. | Orthophosphate | P, FP, G | Cool ≤6°C[18] | Filter within 15 mins; Analyze within 48 hours |
| 46. | Oxygen, Dissolved Probe | G (Bottle & top) | None required | Analyze within 15 mins. |
| 47. | Oxygen, Winkler | G (Bottle & top) | Fix on site and store in dark | 8 hours |
| 48. | Phenols | G | Cool ≤6°C[18], $H_2SO_4$ to pH<2 | 28 days |
| 49. | Phosphorus (elemental) | G | Cool ≤6°C[18] | 48 hours |
| 50. | Phosphorus, total | P, FP, G | Cool ≤6°C[18], $H_2SO_4$ to pH<2 | 28 days |
| 53. | Residue, total | P, FP, G | Cool ≤6°C[18] | 7 days |
| 54. | Residue, Filterable | P, FP, G | Cool ≤6°C[18] | 7 days |

Table 5.1, cont.

| PARAMETER # | PARAMETER NAME | CONTAINER[1] | PRESERVATION[2,3] | MAX HOLD TIME[4] |
|---|---|---|---|---|
| 55. | Residue, Nonfilterable (TSS) | P, FP, G | Cool ≤6°C[18] | 7 days |
| 56. | Residue, Settleable | P, FP, G | Cool ≤6°C[18] | 48 hours |
| 57. | Residue, volatile | P, FP, G | Cool ≤6°C[18] | 7 days |
| 61. | Silica | P or Quartz | Cool ≤6°C[18] | 28 days |
| 64. | Specific conductance | P, FP, G | Cool ≤6°C[18] | 28 days |
| 65. | Sulfate | P, FP, G | Cool ≤6°C[18] | 28 days |
| 66. | Sulfide | P, FP, G | Cool ≤6°C[18] add zinc acetate plus sodium hydroxide to pH>9 | 7 days |
| 67. | Sulfite | P, FP, G | EDTA | Analyze within 15 mins. |
| 68. | Surfactants (MBAS) | P, FP, G | Cool ≤6°C[18] | 48 hours |
| 69. | Temperature | P, FP, G | None required | Analyze immediately |
| 73. | Turbidity | P, FP, G | Cool ≤6°C[18] | 48 hours |
| Table 1B - Metals: | | | | |
| 18. | Chromium VI | P, FP, G | Cool ≤6°C[18], pH = 9.3-9.7[20] | 28 days |
| 35. | Mercury (CVAA) | P, FP, G | $HNO_3$ to pH<2 | 28 days |
| 35. | Mercury (CVAFS) | FP, G; and FP-lined cap[17] | 5 mL/L 12N HCl or 5 mL/L BrCl[17] | 90 days[17] |
| 3, 5-8, 12, 13, 19, 20, 22, 26, 29, 30, 32-34, 36, 37, 45, 47, 51, 52, 58-60, 62, 63, 70-72, 74, 75. | (All other Metals besides chromium VI and mercury) | P, FP, G | $HNO_3$ to pH<2, or at least 24 hours prior to analysis[19] | 6 months |
| Table 1C – Organic Tests[8] | | | | |
| 13, 18-20, 22, 24-28, 34-37, 39-43, 45-47, 56, 76, 104, 105, 108-111, 113. | Purgeable Halocarbons | G, FP-lined septum | Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5] | 14 days |
| 6, 57, 106. | Purgeable Aromatic Hydrocarbons | G, FP-lined septum | Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5], HCl to pH 2[9] | 14 days |
| 3, 4. | Acrolein and Acrylonitrile | G, FP-lined septum | Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5], pH to 4-5[10] | 14 days[10] |
| 23, 30, 44, 49, 53, 77, 80, 81, 98, 100, 112. | Phenols [11] | G, FP-lined cap | Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5] | 7 days until extraction, 40 days after extraction |
| 7, 38. | Benzidines [11, 12] | G, FP-lined cap | Cool ≤6°C[18], 0.008% $Na_2S_2O_3$[5] | 7 days until extraction[13] |
| 14, 17, 48, 50-52. | Phthalate esters [11] | G, FP-lined cap | Cool ≤6°C[18] | 7 days until extraction, 40 days after extraction |
| 82-84. | Nitrosamines [11, 14] | G, FP-lined cap | Cool ≤6°C[18], store in dark, 0.008% $Na_2S_2O_3$[5] | 7 days until extraction, 40 days after extraction |
| 88-94. | PCBs [11] | G, FP-lined cap | Cool ≤6°C[18] | 1 year until extraction, 1 year after extraction |
| 54, 55, 75, 79. | Nitroaromatics and Isophorone [11] | G, FP-lined cap | Cool ≤6°C[18], store in dark, | 7 days until extraction, 40 days |

Table 5.1, cont.

| PARAMETER # | PARAMETER NAME | CONTAINER[1] | PRESERVATION[2,3] | MAX HOLD TIME[4] |
|---|---|---|---|---|
| 1, 2, 5, 8-12, 32, 33, 58, 59, 74, 78, 99, 101. | Polynuclear Aromatic Hydrocarbons [11] | G, FP-lined cap | Cool ≤6°C[18], store in dark, 0.008% $Na_2S_2O_3$[5] | 7 days until extraction, 40 days after extraction |
| Table 1D-Pesticides Tests: | | | | |
| 1-70. | Pesticides [11] | G, FP-lined cap | Cool ≤6°C[18], pH 5-9[15] | 7 days until extraction, 40 days after extraction |
| Table 1E-Radiological Tests: | | | | |
| 1-5. | Alpha, beta and radium | P, FP, G | $HNO_3$ TO pH<2 | 6 months |
| Table 1H – Protozoan Tests: | | | | |
| 8. | Cryptosporidium | LDPE; field filtration | 0-8 °C | 96 hours[21] |
| 9. | Giardia | LDPE; field filtration | 0-8 °C | 96 hours[23] |

[1] "P" is polyethylene; "FP" is fluoropolymer (polytetrafluoroethylene (PTFE; Teflon®), or other fluoropolymer, unless stated otherwise in this table; "G" is glass; "PA" is any plastic that is made of sterilizable material (polypropylene or other autoclaveable plastic); "LDPE" is low density polyethylene.

[2] Add a reducing agent only if an oxidant (e.g. chlorine) is present. Reducing agents shown to be effective are sodium thiosulfate ($Na_2S_2O_3$), ascorbic acid, sodium arsenite ($NaAsO_2$), or sodium borohydride ($NaBH_4$). Be careful not to add excess reducing agent. For ascorbic acid, add approximately 0.1-0.6g of crystals, and then an additional 0.06g for each liter of sample volume.

[3] Except where noted in this table and the method for the parameter, preserve each grab sample within 15 minutes of collection. For a composite sample collected with an automated sampler, refrigerate the sample at ≤6°C during collection unless specified otherwise in this table or in the method(s). For a composite sample to be split into separate aliquots for preservation and/or analysis, maintain the sample at ≤6°C, unless specified otherwise in this table or in the method(s), until collection, splitting, and preservation has been completed. Add the preservative to the sample container prior to sample collection, as long as the integrity of the sample is maintained, otherwise add preservative to the sample within 15 minutes of collection. If a composite measurement is required but sample integrity would be compromised, individual grab samples may be collected at prescribed intervals and analyzed separately and the concentrations averaged. Alternatively, grab samples may be collected in the field and composited in the laboratory of the compositing procedure produces results equivalent to results produced by arithmetic averaging of the analysis results.

[4] When any sample is to be shipped by common carrier or sent via the U.S. Postal Service, it must comply with the Dept. of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transport is responsible for compliance. The Hazardous Materials Regulations do not apply to the following in this table: HCl in water solutions at concentrations of 0.04% by weight or less; $HNO_3$ in water solutions at concentrations of 0.15% by weight or less; $H_2SO_4$ in water solutions at concentrations of 0.35% by weight or less; and NaOH in water solutions at concentrations of 0.080% by weight or less.

[5] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before the start of analysis and still be considered valid. For a grab samples, the holding time begins at the time of collection. For composite samples, the holding time begins at the end of collection of the composite sample.

[6] Sample collection and preservation: Collect a volume of sample appropriate to the analytical method in a bottle of the material specified. If the sample can be analyzed within 48 hours and sulfide is not present, adjust the pH to >12 with sodium hydroxide solution (5% of the weight per volume), refrigerate as specified, and analyze within 48 hours. Otherwise, to extend the holding time to 14 days and mitigate interferences, treat the sample immediately using any or all of the following techniques, as necessary, followed by adjustment of the sample pH to >12 and refrigeration as specified.

1. Sulfur: To remove elemental sulfur, filter the sample immediately. If the filtration time will exceed 15 minutes, use a larger filter or a method that requires a smaller sample volume. Adjust the pH of the filtrate to >12 with NaOH, refrigerate the filter and filtrate, and ship or transport to the laboratory. In the laboratory, extract the filter with 100mL of 5% NaOH for a minimum of 2 hours. Filter the extract and discard the solids. Combine the 5% NaOH-extracted filtrate with the initial filtrate, lower the pH to approximately 12 with concentrated HCl or $H_2SO_4$, and analyze the combined filtrate. Because the detection limit for cyanide will be increased by dilution by the filtrate from the solids, test the sample with and without the solids procedure if a low detection limit for cyanide is necessary. Do not use the solids procedure if a higher cyanide concentration is obtained without it. Alternatively, analyze the filtrates from the sample and the solids

separately, add the amounts determined (in ug or mg) and divide by the original sample volume to obtain the cyanide concentration.

2. Sulfide: If the sample contains sulfide, as determined by lead acetate paper, or if sulfide is known or suspected to be present, immediately conduct one of the following volatilization treatments or the precipitation treatment as follows: Volatilization – Headspace expelling: In a fume hood or well-ventilated area, transfer 0.75 liter of sample to a 4.4 L collapsible container. Acidify with concentrated HCl to pH <2. Cap the container and shake vigorously for 30 seconds. Remove the cap and expel the headspace into the fume hood or open area by collapsing the container without expelling the sample. Refill the headspace by expanding the container. Repeat expelling a total of 5 headspace volumes. Adjust the pH to >12, refrigerate, and transport to the lab. Scaling to a smaller or larger sample volume must maintain the air to sample volume ratio. Dynamic stripping: In a fume hood or well, ventilated area, transfer 0.75 L of sample to a container of the material specified and acidify with concentrated HCl to pH <2. Using a calibrated air sampling pump or flowmeter, purge the acidified sample into the fume hood or open area through a fritted glass aerator at a flow rate of 2.25 L/min for 4 minutes. Adjust the pH to >12, refrigerate, and transport to the lab. Keep volume ratios the same if scaling. Precipitation: If the sample contains particulate matter that would be removed by filtration, filter the sample prior to treatment to assure that cyanide associated with the particulate matter is include in the measurement. Once in the lab, extract the filter with 100mL of 5% NaOH for a minimum of 2 hours. Filter the extract and discard the solids. Combine the 5% NaOH-extracted filtrate with the initial filtrate, lower the pH to approximately 12 with concentrated HCl or H2SO4, and analyze the combined filtrate. (See the last three sentences of footnote 6(1.) above.) For removal of sulfide by precipitation, raise the pH of the sample to >12 with NaOH, then add approximately 1 mg of powdered cadmium chloride for each mL of sample. Cap and shake the container to mix. Allow the precipitate to settle and test the sample with lead acetate paper. If necessary, add cadmium chloride, but avoid adding an excess. Finally, filter through a 0.45 micron filter. Cool the sample as specified and transport the filter and the filtrate to the lab. For lab procedure, reference footnote 6(1.). If a ligand-exchange method is used (e.g. ASTM D6888), it may be necessary to increase the ligand-exchange reagent to offset any excess of cadmium chloride.
3. Sulfite, thiosulfate, or thiocyanate: If these interferences are known or suspected to be present, use UV digestion with a glass coil (Method Kelada-01) or ligand exchange (Method OIA-1677) to preclude cyanide loss or positive interference.
4. Aldehyde: If formaldehyde, acetaldehyde, or another water-soluble aldehyde is known or suspected to be present, treat the sample with 20mL of 3.5% ethylenediamine solution per liter of sample.
5. Carbonate: Carbonate interference is evidenced by noticeable effervescence upon acidification in the distillation flask, a reduction in the pH of the absorber solution, and incomplete cyanide spike recovery. When significant carbonate is present, adjust the pH to ≥12 using calcium hydroxide instead of sodium hydroxide. Allow the precipitate to settle and decant or filter the sample prior to analysis (also see SM4500-CN.B.3.d).
6. Chlorine, hypochlorite, or other oxidant: Treat a sample known or suspected to contain these interferences as described in fotenote 5.

[7] For dissolved metals, filter grab samples within 15 minutes of collection and before adding preservatives. For a composite sample collected with an automated sampler, filter the sample within 15 minutes of completion of collection and before adding preservatives. If it is known or suspected that dissolved sample integrity will be compromised during collection of a composite sample collected automatically over time (e.g. by interchange of a metal between dissolved and suspended forms), collect and filter grab samples to be composited (footnote 2) in place of a composite sample collected automatically.

[8] Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[9] If the sample is not adjusted to pH 2, then the sample must be analyzed within 7 days of sampling.

[10] The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within three days of sampling.

[11] When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to ≤ 6°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9. Samples preserved in this manner may be held for 7 days before extraction and for 40 days after extraction. Exception to this optional preservation and holding time procedure are noted in footnote 5 (regarding the requirement for thiosulfate reduction), and footnotes 12 and 13 (regarding the analysis of benzidine).

[12] If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.

[13] Extracts may be stored up to 30 days at <0°C.

[14] For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

[15] The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.
[16] Sufficient ice should be placed with the samples in the shipping container to ensure that ice is still present when the samples arrive at the laboratory. However, even if ice is present when the samples arrive, it is necessary to immediately measure the temperature of the samples and confirm that the preservation temperature maximum has not been exceeded. In the isolated cases where it can be documented that this holding temperature cannot be met, the permitee can be given the option of on-site testing or can request a variance. The request for a variance should include supportive data which show that the toxicity of the effluent samples is not reduced because of the increased holding temperature.
[17] Samples collected for the determination of trace level mercury (<100 ng/L) using EPA method 1631 must be collected in tightly-capped fluoropolymer or glass bottles and preserved with BrCl or HCl solution within 48 hours of sample collection. The time to preservation may be extended to 28 days if a sample is oxidized in the sample bottle. A sample collected for dissolved trace level mercury should be filtered in the laboratory within 24 hours of the time of collection. However, if circumstances preclude overnight shipment, the sample should be filtered in a designated clean area in the field in accordance with procedures given in Method 1669. If sample integrity will not be maintained by shipment to and filtration in the laboratory, the sample must be filtered in a designated clean area in the field with the time period necessary to maintain sample integrity. A sample that has been collected for determination of total or dissolved trace level mercury must be analyzed within 90 days of sample collection.
[18] Aqueous samples must be preserved at ≤ 6°C, and should not be frozen unless data demonstrating that sample freezing does not adversely impact sample integrity is maintained on file and accepted as valid by the regulatory authority. Also, for purposes of NPDES monitoring, the specification of "≤ °C" is used in place of the "4 °C" and "< 4 °C" sample temperature requirements listed in some methods. It is not necessary to measure the sample temperature to three significant figures (1/100th of a degree); rather, three significant figures are specified so that rounding down to 6 °C may not be used to meet the ≤ 6°C requirement. The preservation temperature does not apply to samples that are analyzed immediately (within 15 minutes).
[19] An aqueous sample may be collected and shipped without acid preservation. However, acid must be added at least 24 hours before analysis to dissolve any metals that absorb to the container walls. If the sample must be analyzed within 24 hours of collection, add the acid immediately (see footnote 2). Soil and sediment samples do not need to be preserved with acid. The allowances in this fotenote supersede the preservation and holding time requirements in the approved metals methods.
[20] To achieve the 28-day holding time, use the ammonium sulfate buffer solution specified in EPA Method 218.6. The allowance in this footnote supersedes preservation and holding time requirements in the approved hexavalent chromium, unless measurement is compromised.
[21] Holding time is calculated from time of sample collection to elution for samples shipped to the laboratory in bulk and calculated from the time of sample filtration to elution for samples filtered in the field.
[22] Sample analysis should begin immediately, preferably within 2 hours of collection. The maximum transport time to the laboratory is 6 hours, and samples should be processed within 2 hours of receipt at the laboratory. (Table II of 40 CFR Part 136.3 was amended in May 2007. An additional 2 hours of laboratory preparation time has been added to the 6 hour transport holding time for water samples collected for bacterial analyses. Joint memorandum attached at the end of Section 5 of this Quality Manual.)
[23] For fecal coliform samples for sewage sludge (biosolids) only, the holding time is extended to 24 hours for the following sample types using either EPA Method 1680 (LTB-EC) or 1681 (A-1); Class A composted, Class B aerobically digested, and Class B anaerobically digested.

Table 5.2

## APPROVED WATER AND WASTEWATER PROCEDURES, CONTAINERS, PRESERVATION AND HOLDING TIMES FOR PARAMETERS NOT FOUND IN 40 CFR 136 **

| PARAMETER | METHOD | REFERENCE[1] | CONTAINER[2] | PRESERVATION[3] | MAXIMUM HOLDING TIME[4] |
|---|---|---|---|---|---|
| Bromine | DPD Colorimetric [6] | SM 4500-Cl-G | P, G | None required | Analyze immediately |
| Bromates | Ion Chromatography | EPA-300.0 B [6] | P, G | Cool, 6°C | 30 days |
| Chlorophylls | Spectrophotometric | SM 10200H | P, G [7] | Unfiltered, dark 6°C<br>Filtered, dark -20°C | 48 hrs chilled until filtration [8], and analyze immediately or<br>28 days after filtration if frozen |
| Corrosivity | Calculated (CaCO₃ Stability, Langelier Index) | SM 2330<br>ASTM D513-82 | P, G | Cool, 6°C [9] | 7 days [9] |
| Odor | Human Panel | SM 2150<br>EPA 140.1 | G only | Cool, 6°C | 6 hours |
| Salinity | Electrometric [10]<br>Hydrometric [10] | SM 2420 B<br>SM 2520 C | G, wax seal | Analyze immediately or use wax seal | 30 days [10] |
| Taste | Human Panel | SM 2160 B<br>SM 2160 C<br>SM 2160 D<br>ASTM E679-91 | G only | Cool, 6°C | 24 hours |
| Total Dissolved Gases | Direct-Sensing Membrane-Diffusion Method | SM 2810 | --- | --- | Analyze in-situ |
| Transparency | Irradiometric [11] | 62-302.200(6), FAC | --- | --- | Analyze in-situ |
| Un-ionized Ammonia | Calculated [12] | DEP-SOP [13] | P, G | Cool, 6°C<br>$Na_2S_2O_3$ [12] | 8 hours unpreserved<br>28 days preserved [12] |
| UV 254 | Spectrophotometric | SM 5910 B | G | Cool, 6°C | 48 hours |
| Organic Pesticides [14] | GC and HPLC | EPA(600-series)[14] | [15] | [15] | [15] |

**Reference: 62-160.700, F.A.C., Table 4 and DEP-SOP-001/01, FS 1000, Table FS 1000-5 March 31, 2008

[1] SM XXXX = procedures from "Standard Methods for the Examination of Water and Wastewater", APHA-AWWA-WPCF, 20th Edition, 1998 and Standard Methods Online.

ASTM XXXX-YY= procedure from "Annual Book of ASTM Standards", Volumes 11.01 and 11.02 (Water I and II), 1999.

[2] P= plastic, G= glass.

[3] When specified, sample preservation should be performed immediately upon sample collection.

[4] The times listed are the maximum times that samples may be held before analysis and still be considered valid.

[5] The approved procedure is for residual chlorine. However, in the absence of chlorine, the DPD colorimetric procedure can be adapted to measure bromine content of the sample. In such case, the validity of this assumption must be verified by using another procedure for chlorine which is not affected by the presence of bromine (i.e. negligible interference).

[6] "The Determination of Inorganic Anions in Water Ion Chromatography", EPA Method 300.0 B, Revision 2.1, August 1993, by John D. Pfaff, Carol A. Brockoff and James W. O'Dell, U.S. EPA, Cincinnati, Ohio 45268.

[7] Collect samples in opaque bottles and process under reduced light. Samples on filter taken from water having a pH ≥ 7 may be placed in airtight plastic bags and stored frozen for up to three weeks. Samples from acidic water must be processed promptly to prevent chlorophyll degradation.

[8] Samples must be filtered within 48 hours of collection. Add magnesium carbonate to the filter while the last of the sample passes through the filter.

[9] Temperature and pH must be measured on site at the time of sample collection. 7 days is the maximum time for laboratory analysis of total alkalinity, calcium ion, and total solids.

[10] Samples collected for laboratory analysis, when properly sealed with a paraffin wax stopper, may be held indefinitely. The maximum holding time of 30 days is recommended as a practical regulatory limit.

[11] Transparency in surface waters is defined as a compensation point for photosynthetic activity, i.e., the depth at which one percent of the light intensity entering at the water surface remain unabsorbed. The DEP Chapter 62-302, FAC requires that the light intensities at the surface and subsurface be measured simultaneously by irradiance meters such as the Kahlsico Underwater Irradiometer, Model No. 268 WA 310, or an equivalent device having a comparable spectral response.

[12] The results of the measurement of pH, temperature, salinity (if applicable) and the ammonium ion concentration in the sample are used to calculate the concentration of ammonia in the unionized state. Temperature, pH, and salinity must be measured on-site at the time of collection. Laboratory analysis of the ammonium ion concentration should be conducted within 8 hours of sample collection. If prompt analysis of ammonia is impossible, preserve samples with $H_2SO_4$ to pH between 1.5 and 2. Acid preserved samples, stored at 4C, may be held up to 28 days for ammonia determination. Sodium thiosulfate should only be used if fresh samples contain residual chlorine.

[13] DEP Central Analytical Laboratory, Tallahassee, FL, Revision No. 1, October 3, 1983. The 1983 draft is available from the DEP Bureau of Laboratories.

[14] Other pesticides listed in approved EPA methods (608.1, 608.2, 614, 614.1, 615, 617, 618, 619, 622, 622.1, 627, 629, 631, 632, 632.1, 633, 642, 643, 644 and 645) that are not included in Table ID of 40 CFR Part 136 (March 2007).

[15] Container, preservation and holding time, as specified in each individual method, must be followed.

Table 5.3

**RECOMMENDED SAMPLE CONTAINERS, SAMPLE VOLUMES, PRESERVATION TECHNIQUES AND HOLDING TIMES FOR RESIDUALS, SOIL AND SEDIMENT SAMPLES**

| PARAMETER | METHODS | REFERENCES | CONTAINER | PRESERVATION[1] | MAX HOLDING TIMES |
|---|---|---|---|---|---|
| Volatile Organics | Purge-and-Trap GC and GC-MS | 8015, 8021, 8260, 5035 | Glass (40 ml vial or 4 oz. wide-mouth) with Teflon® -lined lid | Cool 6°C | 14 days |
| Semivolatile Organics | GC, HPLC, and GC-MS | 8041, 8061, 8070, 8081, 8082, 8091, 8111, 8121, 8131, 8141, 8151, 8270, 8275, 8280, 8290, 8310, 8315, 8316, 8318, 8321, 8325, 8330, 8331, 8332, 8410, 8430, 8440, FL-PRO | Glass, 8 oz. widemouth with Teflon® -lined lid (50g sample) | Cool 6°C | 14 days until extraction, 40 days after extraction |
| Dioxins | | 8290 | | Cool 6°C | 30 days until extraction, 45 days after extraction |
| Total Metals-except mercury and chromium VI | Flame AA, Furnace AA, Hydride and ICP | All 7000-series methods (except 7195, 7196, 7197, 7198, 7470, and 7471) and 6010 (ICP) | Glass or plastic, 8 oz. widemouth (200g sample) | None | 6 months |
| Chromium VI | Colorimetric, Chelation with Flame AA | 7196 and 7197 (prep 3060) | Glass or plastic, 8 oz. widemouth (200g sample) | Cool 6°C ± 2°C | 24 hours |
| Mercury | Manual Cold Vapor AA | 7471 | Glass or plastic, 8 oz. widemouth (200g sample) | Cool 6°C ± 2°C | 28 Days |

Reference: 62-160.700, F.A.C., Table 5 and DEP-SOP-001/01, FS 1000, Table FS 1000-6 March 31, 2008

[1] Keep soils, sediments, and sludges cool at 4°C from collection time until analysis. No preservation is required for concentrated waste samples.

Table 5.4

## PRESERVATION METHODS AND HOLDING TIMES FOR DRINKING WATER SAMPLES THAT DIFFER FROM 40 CFR PART 136, TABLE II

| PARAMETER | PRESERVATION [1] | HOLDING TIME [2] | HOLDING TIME FOR EXTRACT [3] | CONTAINER [4] |
|---|---|---|---|---|
| Microbiologicals | Cool < 8°C, $NaS_2O_3$ [5] | 30 hours [6] | --- | P, G |
| Heterotropic Plate Count | Cool < 8°C, $NaS_2O_3$[5] | 8 hours | --- | P, G |
| Radiologicals | | | | |
| Group A | HCl or $HNO_3$ pH<2 [7,8,9] | 6 months | --- | P, G |
| Cesium-134 | HCl pH <2 [8,9] | 6 months | --- | P, G |
| Iodine-131 | None | 8 days | --- | P, G |
| Tritium | None | 6 months | --- | G |
| Asbestos | Cool 6°C | 48 hours | --- | P, G |
| Bromate | Ethylenediamine (50 mg/L) | 28 days | --- | P, G |
| Cyanide | Cool 6°C, Ascorbic acid (if chlorinated), NaOH pH >12 | 14 days | --- | P, G |
| Nitrate | | | | |
| Chlorinated | Cool 6°C | 28 days | --- | 48 hours |
| Nonchlorinated | Cool 6°C | 48 hours | --- | 48 hours |
| Odor | Cool 6°C | 24 hours | --- | G |
| 502.2 | $Na_2S_2O_3$ or Ascorbic acid, 6°C, HCl pH <2 if Ascorbic acid is used | 14 days | --- | Glass with PFTE -Lined Septum |
| 504.1 | $Na_2S_2O_3$, Cool 6°C | 14 days | 6°C, 24 hours | Glass with PFTE -Lined Septum |
| 505 | $Na_2S_2O_3$, Cool 6°C | 14 days (7 days for Heptachlor) | 6°C, 24 hours | Glass with PFTE -Lined Septum |
| 506 | $Na_2S_2O_3$, Cool 6°C, Dark | 14 days | 6°C, Dark, 14 days | Amber Glass with PFTE - Lined Cap |
| 507 | $Na_2S_2O_3$, Cool 6°C, Dark | 14 days (see method for exceptions) | 6°C, Dark, 14 days | Amber Glass with PFTE - Lined Cap |
| 508 | $Na_2S_2O_3$, Cool 6°C, Dark | 7 days (see method for exceptions) | 6°C, Dark, 14 days | Amber Glass with PFTE - Lined Cap |
| 508A | Cool 6°C | 14 days | 30 days | Glass with PFTE -Lined Cap |

Table 5.4, cont.

| PARAMETER | PRESERVATION [1] | HOLDING TIME [2] | HOLDING TIME FOR EXTRACT [3] | CONTAINER [4] |
|---|---|---|---|---|
| 508.1 | Sodium Sulfite, HCl pH <2, Cool 6°C | 14 days (see method for exceptions) | 30 days | Glass with PFTE -Lined Cap |
| 515.1 | $Na_2S_2O_3$, Cool 6°C, Dark | 14 days | 6°C, Dark, 28 days | Amber Glass with PFTE - Lined Cap |
| 515.2 | $Na_2S_2O_3$, Cool 6°C, HCl pH <2, Dark | 14 days | ≤ 6°C, Dark, 14 days | Amber Glass with PFTE - Lined Cap |
| 515.3 | $Na_2S_2O_3$, Cool 6°C, HCl pH <2, Dark | 14 days | ≤ 6°C, Dark, 14 days | Amber Glass with PFTE - Lined Cap |
| 515.4 | Sodium Sulfite, HCl pH <2, Cool ≤ 10°C for 1st 48 hours ≤ 6°C thereafter, Dark | 14 days | ≤ 0°C, 21 days | Amber Glass with PFTE - Lined Cap |
| 524.2 | Ascorbic acid, HCl pH <2, Cool 6°C | 14 days | --- | Glass with PFTE -Lined Septum |
| 525.2 | Sodium Sulfite, Dark, HCl pH <2, Cool 6°C | 14 days (see method for exceptions) | ≤ 6°C, 30 days from collection | Glass with PFTE -Lined Cap |
| 531.1, 6610 | Sodium Sulfite, Monochloroacetic acid pH <3, Cool 6°C | 28 days | --- | Glass with PFTE -Lined Septum |
| 531.2 | Sodium Thiosulfate, Potassium Dihydrogen Citrate buffer to pH 4, Dark, ≤ 10°C for first 48 hrs, ≤ 6°C thereafter | 28 days | --- | Glass with PFTE -Lined Septum |
| 547 | Sodium Thiosulfate, Cool 6°C | 14 days (18 months frozen) | --- | Glass with PFTE -Lined Septum |
| 548.1 | Sodium Thiosulfate (HCl pH 1.5-2 if high biological activity), Cool 6°C, Dark | 7 days | ≤ 6°C, 14 days | Amber Glass with PFTE - Lined Septum |
| 549.2 | Sodium Thiosulfate ($H_2SO_4$ pH <2 if biologically active), Cool 6°C, Dark | 7 days | 21 days | High Density Amber Plastic or Silanized Amber Glass |

Table 5.4, cont.

| PARAMETER | PRESERVATION [1] | HOLDING TIME [2] | HOLDING TIME FOR EXTRACT [3] | CONTAINER [4] |
|---|---|---|---|---|
| 550, 550.1 | Sodium Thiosulfate, Cool 6°C, HCl pH <2 | 7 days | 550, 30 days<br>550.1, 40 days<br>Dark, 6°C | Amber Glass with PFTE - Lined Cap |
| 551.1 | Sodium Thiosulfate, Sodium Sulfite, Ammonium Chloride, pH 4.5-5.0 with phosphate buffer, Cool 6°C | 14 days | --- | Glass with PFTE -Lined Septum |
| 552.1 | Ammonium Chloride, Cool 6°C, Dark | 14 days | ≤ 6°C, dark 48 hours | Amber Glass with PFTE - Lined Cap |
| 555 | Sodium Sulfite, HCl, pH ≤ 2, Dark, Cool 6°C | 14 days | --- | Glass with PFTE -Lined Cap |
| 1613B | Sodium Thiosulfate, Cool 0-6C, Dark | | Recommended 40 days | Amber Glass with PFTE - Lined Cap |

Reference: 62-160.700, F.A.C., Table 6 and DEP-SOP-001/01, FS 1000, Table FS 1000-8, March 31, 2008

1 Preservation, when required, must be done immediately upon sample collection.

2 Stated values are the maximum regulatory holding times. Sample processing must begin by the stated time.

3 Stated time is the maximum time a prepared sample extract may be held before analysis.

4 (P) polyethylene or (G) glass. For microbiology, plastic sample containers must be made of sterilizable materials (poly-propylene or other autoclavable plastic).

5 Addition of sodium thiosulfate is only required if the sample has a detectable amount of residual chlorine, as indicated by a field test using EPA Method 330.4 or 330.2 or equivalent.

6 If samples are analyzed after 30 hours, but within 48 hours of collection, the laboratory is to indicate in the analytical report that the data may be invalid because of excessive delay in sample processing. No samples received after 48 hours are to be accepted or analyzed for compliance with the regulations of the Department of Environmental Protection or the Department of Health.

7 Group A parameters are: Gross Alpha, Gross Beta, Strontium-89, Strontium-90, Radium-226, Radium-228, Uranium, and Photon Emitters.

8 It is recommended that the preservative be added at the time of collection unless suspended solids activity is to be measured. It is also recommended that samples be filtered, if suspended or settable solids are present, prior to adding preservative, at the time of collection. However, if the sample has to be shipped to a laboratory or storage area, acidification of the sample (in its original container) may be delayed for a period not to exceed 5 days. A minimum of 16 hours must elapse between acidification and analysis.

9 If HCl is used to acidify samples, which are to be analyzed for gross alpha or gross beta activities, the acid salts must be converted to nitrate salts before transfer of the samples to planchets.

## Table 5.5

**List of Analytes , Acceptable Abbreviations & Sample Quantity Required in Water & Solid**

| Analyte | Abbreviation | Sample Quantity in ml/g |
|---|---|---|
| Alkalinity, Total | Alka., T-Alka | 100 |
| Bicarbonate Alkalinity | BiCarb Alk, B-Alka | calculation |
| Carbonate Alkalinity | Carb Alk., C-Alka | calculation |
| Aluminum | Al | 150/100 |
| Ammonia | $NH_3$ | 150/100 |
| Antimony | Sb | 150/100 |
| Arsenic | As | 150/100 |
| Barium | Ba | 150/100 |
| Beryllium | Be | 150/100 |
| Biochemical Oxygen Demand | BOD, BOD5 | 400 |
| Boron | B | 150/100 |
| Bromate | BrO3- | 100 |
| Bromide | Br | 100 |
| Cadmium | Cd | 150/100 |
| Calcium | Ca | 150/100 |
| Carbonaceous BOD | CBOD, CBOD5 | 400 |
| Chemical Oxygen Demand | COD | 50 |
| Chlorate | ClO3- | 100 |
| Chloride | Cl | 150 |
| Chlorite | ClO2- | 100 |
| Chlorophyll | Chloro a; chloro a, b, c | 500 |
| Chlorine, Residual | $Cl_2$ | 50 |
| Chromium | Cr | 150/100 |
| Chromium VI | CrVI; Cr6+ | 200/200 |
| Cobalt | Co | 150/100 |
| Color | Color | 100 |
| Conductivity | Cond., Specific Conductance | 50 |
| Copper | Cu | 150/100 |
| Copper in Drinking Water | Cu | 500 |
| Dissolved Oxygen | DO | 300 |

| | | |
|---|---|---|
| Dissolved Organic Carbon | DOC | 15 |
| *E. coli* | E-coli (MPN) | 100 |
| Enterococci | Enterococcus, Entero | 100/100 |
| Fecal Coliform | FC (MF), FC (MPN) | 100/100 |
| Fecal Streptococci | F Strep (MF), F Strep (MPN) | 100 |
| Fluoride | F | 150 |
| Gross Alpha | Gross Alpha; Gross α | 900 |
| Haloacetic Acids | HAA(5)'s | 950 |
| Hardness, Total<br>Hardness (calc) | T-Hard,<br>C-Hardness, Mg-Hard, Fe-Hard | 100<br>calculation |
| Heterotrophic Plate Count | HPC, Standard Plate Count | 100 |
| Iron | Fe | 150/100 |
| Kjeldahl Nitrogen, Total | TKN | 20/100 |
| Lead | Pb | 150/100 |
| Lead in Drinking Water | Pb | 500 |
| Magnesium | Mg | 150/100 |
| Manganese | Mn | 150/100 |
| Mercury | Hg | 100/100 |
| Mixed Liquor Suspended Solids | MLSS | 20 |
| Mixed Liquor Volatile Suspended Solids | MLVSS | 20 |
| Molybdenum | Mo | 150/100 |
| Nickel | Ni | 150/100 |
| Nitrate as N | $NO_3$ | 100 |
| Nitrate-Nitrite | NOX | 10/100 |
| Nitrite as N | $NO_2$ | 100 |
| Nitrogen, Total | T-N | calculation |
| Odor | Odor | 250 |
| Oil & Grease | O & G | 950 |
| Organic Nitrogen | O-N | calculation |
| Ortho-phosphorous | O-P; ortho-Phos; σ-phos; ortho-phosphate | 20 |
| Oxidation Reduction Potential | ORP | Field Measure |
| pH | pH | 50 |
| Phosphorous, Total | T-P, Total Phos, Phos, Phosphate, Total Phosphate | 10/100 |
| Potassium | K | 150/100 |
| Radium 226 | Rad 226 | 900 |

| | | |
|---|---|---|
| Radium 228 | Rad 228 | 900 |
| Salinity | Salinity | 20 |
| Selenium | Se | 150/100 |
| Silica | Silica | 20 |
| Silver | Ag | 150/100 |
| Sodium | Na | 150/100 |
| Specific Oxygen Uptake Rate | SOUR | 1500 |
| Sulfate | $SO_4$ | 200 |
| Sulfide | Sulfide | 300 |
| Surfactants | MBAS | 300 |
| Temperature | Temp | 25 |
| Thallium | Tl | 150/100 |
| Tin | Sn | 150/100 |
| Titanium | Ti | 150/100 |
| Total Coliform | TC (MF), TC (MPN), TC (MMO-MUG),(READYCULT) | 100/100 |
| Total Dissolved Solids | TDS | 50 |
| Total Fixed Solids | TFS | calculation |
| Total Organic Carbon | TOC | 15 |
| Total Petroleum Hydrocarbons | TPH | 950 |
| Total Phenolics | Phenol | 950 |
| Total Solids | TS; %TS | 10 |
| Total Suspended Solids | TSS | 950 |
| Total Trihalomethanes | T-THM'S | 120 |
| Total Volatile Solids | TVS | 20 |
| Trihalomethanes | THM'S | 120 |
| Turbidity | ntu, Turbid. | 100 |
| Unionized Ammonia | Un-Ion Ammonia; Un-$NH_3$ | calculation |
| UV-254 | UV-254 | 20 |
| Vanadium | V | 150/100 |
| Volatile Organic Compounds | VOC's | 120 |
| Volatile Suspended Solids | VSS | 950 |
| Zinc | Zn | 150/100 |

## 6.0 ANALYTICAL PROCEDURES

### 6.1 LABORATORY GLASSWARE CLEANING PROCEDURES

In the analysis of samples, the preparation of scrupulously clean glassware is mandatory. Lab glassware cleaning procedures must follow specific written method requirements. If procedures are not listed then the method of cleaning should be adapted to both the substances that are to be removed, and the determinations (tests) to be performed. Recommendations for such cleaning procedures are listed below.

If documentation through an active quality control program using spiked samples and reagent blanks can demonstrate that certain steps in the cleaning procedure are not required for routine samples, then those steps may be eliminated from the procedure.

Lab Glassware Cleaning Procedures

| Analysis/Parameter | Cleaning Procedure (in order specified) |
| --- | --- |
| ORGANICS | |
| Semi-Volatile: (Pesticides, Herbicides, HPLC, Oil & Grease, TRPH & Total Recoverable Phenolics) | Solvents: 5, 1-4, 5 or 6, 13, 15 OR Muffle: 5, 1-4, 12, 13, 15 OR Oxidizer: 5, 1-3, 14, 3-5, 13, 15 |
| Volatile or Purgeable: (and EDB, DBCP, THMS) | 1-4, (6 optional), 10 OR 1-4 (5 & 7 optional), 10 |
| TOC, POX, TOX: | 14, 1-4, 12 |
| INORGANICS | |
| Trace Metals: | 1-4, 9, 8 (optional), 4 |
| Nutrients, Minerals: | 1-4, 8, 4 |
| Analysis/Parameter | Cleaning Procedure (in order specified) |
| Solids: | 1-4, 11 (Volatile Solids 16) |
| Non-Metals, Physical Properties: (Cyanide, BOD, COD) | 1-4, (14 optional BOD) |
| MICROBIOLOGY | 1-4, (Sterilize per approved method) |

| Analysis/Parameter | Cleaning Procedure (in order specified) |
| --- | --- |
| BIOASSAY | |
| Freshwater: | 18, 2, 3, 9 or 8, 4, 5, 4, 20 |
| Marine & Estuarine: | 19, 2, 3, 9 or 8, 4, 5, 4, 20 |
| RADIONUCLIDES | 17, 3, 8, 4 |

Cleaning Procedures:

1. Remove all labels using sponge or acetone.
2. Wash with hot tap water and a brush to scrub inside of glassware, stopcocks, and other small pieces, if possible, using a suitable laboratory-grade detergent.
   - Organics- Liquinox, Alconox or equivalents
   - Inorganic anions- Liquinox or equivalent
   - Inorganic cations- Liquinox, Acationox, Micro or equivalents
   - Microbiology- must pass inhibitory residue test
3. Rinse thoroughly with hot tap water.
4. Rinse thoroughly with deionized water.
5. Rinse thoroughly with pesticide grade Acetone.
6. Rinse thoroughly with pesticide grade Methanol.
7. Rinse thoroughly with pesticide grade Hexane.
8. Rinse or soak with 1:1 HCl (Hydrochloric Acid).
9. Rinse or soak with >10% $HNO_3$ (Nitric Acid).
10. Bake at 105 C for 1 hour.
11. Bake at 180 C (prior to use as per method).
12. Drain, then heat in muffle furnace for 30-60 minutes at 400 C.
13. Clean, dry glassware should be sealed and stored in dust-free environment.
14. Soak in oxidizing agent (Chromic acid or equivalent); preferably hot (40-50 C).
15. Last step (prior to use) should be a rinse with the solvent used in analysis.
16. Drain, then heat in muffle furnace for 1 hour at 550 C.
17. Heat 1 hour in EDTA solution at 90-100 C.
18. New glassware must be soaked overnight in 10% $HNO_3$ or HCl.
19. New glassware must be soaked overnight in seawater.
20. Rinse thoroughly with dilution water.

CLASS A VOLUMETRIC GLASSWARE SHOULD NOT BE BAKED

## 6.2 LABORATORY REAGENT STORAGE

1. Laboratory reagents and chemicals must be stored according to method guidance and the manufacturer's instructions. All solvents used for VOC analyses shall be stored separately.

2. Reagents should be segregated according to compatibility groups (e.g. Solvents {flammable/non-flammable}, bases, acids, reactive chemicals, etc.). Storage should follow all OSHA requirements.

3. A permanent record of reagent storage and preparation shall be maintained for all chemicals. At a minimum, these records shall document:
   a. storage conditions and location for reagents (implemented internal laboratory SOPs and/or safety plans that outline storage conditions and location may be used in lieu of specific reagent container records)
   b. vendor name
   c. date received/date opened
   d. expiration dates
   e. lot numbers
   f. preparation dates
   g. amounts and concentration of all source reagents and compounds used
   h. signature or initials of preparer.
   I. pH of microbiological culturing medias before and after sterilization

4. Documentation shall be maintained on all sources of analyte-free water. This documentation shall include records on all maintenance, cartridge-changing and miscellaneous tasks performed to upkeep or repair the system and all routine QC analysis protocols specifically scheduled and performed to monitor the system. Records must be maintained which identify the source and the specific use of analyte-free water that is obtained from commercial vendors.

## 6.3 LABORATORY WASTE DISPOSAL

Handling, storage and disposal of laboratory-related hazardous wastes are subject to the regulations contained in the Resource Conservation and Recovery Act.

It is the responsibility of the laboratory to store, package, label, ship and dispose of hazardous wastes in a manner which ensures compliance with all Federal, State and local laws, regulations and ordinances.

A waste is considered hazardous if:
1. The waste material is listed as hazardous in 40 CFR Part 261.30-261.33.
2. The material exhibits any of the characteristics of hazardous waste: (ignitability, corrosivity, reactivity or TC toxicity).
3. The waste is listed in 1 or 2 above and is not excluded by any provisions under the Resource Conservation and Recovery Act.

A waste is considered an acute hazardous waste if it is identified in 40 CFR Part 261.31, 261.32 or 261.33 (e) as an acute hazardous waste.

Laboratories that generate hazardous waste are put into 3 categories based on the amount of hazardous waste generated monthly. These categories are: 1) conditionally exempt small quantity generator; 2) small quantity generator and; 3) full generator:

1. Conditionally Exempt Small Quantity Generator
A generator who generates no more than 100 kilograms of hazardous waste or 1 kilogram of acute hazardous waste in a calendar month and accumulates no greater than 1000 kilograms of hazardous wastes (40 CFR Part 261.5).

2. Small Quantity Generator
A generator who generates 100-1000 kilograms of hazardous waste per calendar month and accumulates no greater than 6000 kilograms of hazardous waste or more than 1 kilogram per month of acute hazardous waste (40 CFR Part 262.34).

3. Full Generator
A generator who generates hazardous wastes in excess of 1000 kilograms per calendar month or more than 1 kilogram per month of acute hazardous waste (40 CFR Part 262.34).

It is the responsibility of the laboratory to know which category their organization falls under. Since most laboratories will fall into the conditionally exempt small quantity generator category these disposal requirements are listed below.

Facilities falling into the small quantity generator and full generator categories must adhere to all regulations pertaining to waste, transport, storage and disposal in the Resource Conservation and Recovery Act.

Conditionally exempt small quantity generators must dispose of hazardous waste in an on-site facility or ensure delivery to a treatment, storage or disposal facility, which is:
1. Permitted under 40 CFR Part 270;
2. In interim status under 40 CFR Parts 270 & 265;
3. Authorized to manage hazardous waste by a state with a hazardous waste management program approved under Part 271; or
4. Permitted, licensed, or registered by a state to manage municipal or industrial solid waste*.
*(subject to local regulations).

### 6.3.1 GENERAL DISPOSAL/TREATMENT CONSIDERATIONS

1. Hazardous waste solvents, as identified in the 40 CFR Part 261 may not be evaporated off in a fume hood. Solvents evaporated off during the extraction/testing process are exempt.
2. Acidic & Basic wastes may be neutralized and disposed of via the sanitary sewer if they are not hazardous due to the presence of other constituents*. (*subject to local regulations).
3. Heavy metals may be precipitated out and the liquid portion disposed of via the sanitary sewer*. (*subject to local regulations).

### 6.3.2 STORAGE AND ACCUMULATION

Hazardous waste storage is limited to quantity and/or accumulation time and must comply with RCRA regulations as specified in the 40 CFR. These wastes should be packaged and separated according to compatible groups (e.g. solvents, acids, etc.)

### 6.3.3 SAMPLE DISPOSAL

Samples submitted to a laboratory for analysis are excluded from regulation as hazardous waste under 40 CFR Part 261.4(d) provided the samples are being transported to or from the laboratory, are being analyzed, are being held for analysis or are being maintained in custody for legal reasons. However, once a decision is made to dispose of laboratory samples, the exclusion provisions of 40 CFR Part 261.4(d) no longer apply. Samples that have been identified as hazardous may either be: 1) returned to the generator; or 2) disposed of according to applicable RCRA regulations summarized in this document. Samples which are determined to be non-hazardous may be subject to local environmental regulations. It will be the responsibility of the laboratory to be familiar with any such local regulations.

A sample collector shipping samples to a laboratory and a laboratory returning samples to a sample collector must comply with U.S. Department of Transportation (DOT), U.S. Postal Service (USPS), or any other applicable shipping requirements.

## 7.0 CALIBRATION PROCEDURES AND FREQUENCY

### 7.1 INTRODUCTION

This SOP stipulates minimum calibration requirements necessary to ensure that the measuring system is capable of producing acceptable data. Acceptable calibration protocol must involve a demonstration that the instrument or measuring system is capable of acceptable performance at the beginning of the analysis sequence and that initial calibration is still valid after continued system operation.

### 7.2 GENERAL CONSIDERATIONS

7.2.1 Calibrations must be performed according to all analytical method directives OR as indicated in this Guidance Document if specifics are not addressed in the cited method.

7.2.2 Analytical method calibration acceptance criteria must be followed or if acceptance criteria are not specified in the method, general criteria presented in this SOP shall be used to verify an acceptable calibration.

7.2.3 The number of calibration standards used to achieve an acceptable calibration must adhere to the cited method. If this information is not in the method, then a minimum of a blank and 3 standards must be employed to develop calibration curves. See Section 7.5.3 for guidance on other types of analyses.

7.2.4 The lowest calibration standard shall be at a concentration at or below the practical quantitation limit for the method. By using a calibration standard at that level, the laboratory can verify the PQL with each initial calibration.

### 7.3 STANDARD RECEIPT AND TRACEABILITY

7.3.1 Records to be retained for primary stock standards must include source, type of standard, date of receipt, lot number (if applicable), expiration date and purity statement.

7.3.2 Records to be maintained for preparation of intermediate standards must include identification of primary standards used, preparation date, methods of preparation (including specific dilution information), preparer identification, concentration prepared and expiration date.

7.3.3 Preparation records for working standards must include identification of primary and intermediate standards used in working standard preparation, date of preparation, method of preparation (including dilutions), concentrations prepared and preparer identification.

## 7.4 FREQUENCY OF STANDARD PREPARATION AND STANDARD STORAGE

### 7.4.1 STANDARD STORAGE

1. Standards must be stored according to analytical method guidance or supplier recommendations.

2. If no method or supplier guidance is available standards must be replaced upon decreased instrument response.

### 7.4.2 FREQUENCY OF STANDARD PREPARATION

1. If no method or supplier guidance is available standards must be renewed upon decreased instrument response.

2. It is recommended that all primary standards be held for no longer than one year.

3. Working standards are to be prepared on a daily basis unless specific method guidance stipulates differently.

7.4.3 Tables specifying standard storage protocol and standard preparation frequencies must be available for inspection at the laboratory.

## 7.5 LABORATORY INSTRUMENTS

### 7.5.1 INITIAL CALIBRATION

1. Instruments must be initially calibrated each time the instrument is set up or upon failure of any quality control calibration checks.

2. The number of standards to be used for initial calibration must conform to method protocol or general requirements in Section 7.5.3.

3. Correlation coefficients for photometric analyses must be calculated and documented and should be greater than or equal to 0.995.

4. A minimum of one quality control check standard at a mid-range concentration shall be analyzed prior to sample analyses to verify initial calibration. This quality control check standard shall be prepared independently of the calibration standards. Recoveries for this check standard should be between 90 and 110%, or as specified by the method.

### 7.5.2 CONTINUING CALIBRATION

1. One mid-range continuing calibration standard must be analyzed for each group of 20 samples analyzed. The check standard used for initial calibration verification will verify acceptable calibration for the first set of 20 samples.
Subsequent sample sets of 20 or portions thereof (if a complete set of 20 is not available), must have a continuing calibration check standard analyzed at the beginning of each sample set.

2. Recovery for the continuing calibration check standard shall be between 80 and 120%, the range specified by the analytical method or the documented acceptance range that is determined by internal historical data (see 9.2.3.4).

### 7.5.3 GENERAL CALIBRATION RECOMMENDATIONS BY SPECIFIC ANALYSIS OR ANALYSIS TYPE**

1. Titrimetric Analyses - Standardize all titrants just prior to use.

2. Residue or Solids Analyses
   a. Analyze Quality Control Check Samples on a quarterly basis.***
   b. See calibration requirements for analytical balances and ovens (Section 7.7.1 and 7.7.3).

3. Conductivity
   a. A minimum of 2 KCL standards must be analyzed bracketing the expected concentration of the samples to be analyzed.
   b. The readings for the calibration standards must be within 1% of the expected value.
   c. Continuing calibration checks must be within 1% of the true value.

4. Turbidity
   a. Calibration must be checked for each instrument testing range applicable to the levels of turbidity to be measured.
   b. If formazin standards are not used for the daily calibrations, then formazin standards must be prepared on a quarterly basis and compared with daily standards.
   c. Calibration must be checked every 20 samples with 1 standard in each applicable testing range.
   d. Acceptance criteria for all calibration and standard checks must be established per instrument accuracy specifications.

5. Dissolved Oxygen
   a. Probe - Calibrate against Winkler Titration on an annual basis. Results should agree within 0.2 mg/l.
   b. Winkler Titration - see titration section (7.6.3.1).

6. Color and Chlorine
   Final determination made by comparison against Nessler Tubes or sealed color standards.
   a. Confirm results against an approved alternate test procedure on a quarterly basis.
   b. Results should be within 10% of the original value.

7. Temperature
   a. Laboratory thermometers must be checked against an NIST certified thermometer on an annual basis. Results must be within the manufacturer's specifications.
   b. Other devices used to record temperature must be checked on a monthly basis against a thermometer that has been calibrated against an NIST certified thermometer.

8. BOD
   a. Analyze a glucose/glutamic acid check sample each day BODs are analyzed.
   b. Check standard recovery must satisfy method criteria.
   c. See Dissolved Oxygen calibration protocols (7.5.4).

9. Oil and Grease
   a. See calibration criteria for the analytical balance (7.7.3).
   b. Analyze a QC check sample on a quarterly basis (all applicable matrices).

10. Flash Point
    a. Analyze a solution of known flash point each day of operation.
    b. The flash point temperature should be within 5% of the literature flash point value.

11. Salinity
    a. Electrical Conductivity Method - follow protocols for conductivity calibration and standardize instrument for seawater analyses according to method protocol on a semiannual basis.
    b. Argentometric Method - standardize titrant daily and check method against a known seawater sample or alternate method quarterly.
    c. Hydrometric Method - check method against the argentometric method or with a QC check sample quarterly.
    d. Alternate method comparisons should agree within 10%.

12. Chlorophyll - analyze a QC check sample quarterly (if available).

13. Sulfate
    a. Gravimetric - analyze a QC check sample quarterly and follow calibration requirements for the analytical balance (Section 7.6.3).
    b. Turbidimetric - see requirements for calibration of turbidity (Section 7.5.3.4).
    c. If sulfuric acid is used for standard preparation, then it must be standardized with each preparation.

## 7.6 SUPPORT EQUIPMENT CALIBRATION

### 7.6.1 Temperature Monitoring

1. Ovens - temperature recorded daily. Temperatures must be within acceptable method range.
2. Incubators and water baths – monitor and record temperature twice daily, at least 4 hours apart, for microbiological work and once for other applications. Temperatures must be within acceptable method ranges.

### 7.6.2 Autoclaves

Must document that sterilization temperature and pressure has been achieved by the use of sterilization indicators with every autoclave run.

### 7.6.3 Analytical Balances

Monthly monitoring with Class S Weights. Results must fall within the suppliers acceptance criteria.

## 7.7 CALIBRATION DOCUMENTATION

Records must be maintained to document and verify acceptable instrument or measuring system calibration for each analysis.

7.7.1 Records must be maintained for all standard preparations and working standards must be easily traced to intermediate and primary standards used for preparation.

7.7.2 Acceptable calibration verification (% recoveries, correlation coefficients) must be recorded and easily identified with applicable daily calibrations.

7.7.3 If calibration acceptance criteria are based on manufacturer's instrument specifications or acceptable recoveries specified by QC check sample suppliers, then records of such activities must be maintained. Such records must be easily accessible and must establish verification of acceptance criteria.

7.7.4 Laboratories must have available for inspection a table specifying calibration acceptance criteria for all parameters.

## 7.8 DEFINITIONS

7.8.1 Mid-Range Standard - a standard in the middle of the linear range of the established calibration curve or a standard concentration in the middle of the expected sample concentration range depending on the type of determination to be performed.

7.8.2 Intermediate Standard - a standard prepared from the primary stock standard which is diluted to prepare the working calibration standards.

7.8.3 Working Standards - the standards that are actually analyzed to perform the instrument or measuring system calibration.

* Acceptance criteria presented in this guidance document are general advisory limits. Variances to the listed criteria must be supported with documentation. If the method stipulates different criteria, then the method criteria must be used to verify acceptable calibration.

** If analysis or analysis type is not mentioned in this SOP then method calibration protocol and general requirements as presented in this guidance document must be followed.

*** Recoveries for QC Check Samples should be between 90 and 110% or within acceptable ranges specified by the supplier.

## 8.0 PREVENTIVE MAINTENANCE

Preventive maintenance is the key ingredient to possessing analytical equipment that will produce reliable data over the life of the instrument. Proper maintaining of the equipment will greatly reduce non-conformances in the laboratory.

Responsibility for preventive maintenance lies with the analyst and supervisory personnel in charge of monitoring the equipment. The analytical staff must be dedicated to the implementation of the preventive maintenance program and always watchful for signs that there is a need for maintenance activities. A maintenance schedule is often necessary to ensure equipment is maintained properly. The analyst and supervisory personnel must be supported by vendor specialists or in-house experts that handle activities beyond simple repairs or maintenance.

The Preventive Maintenance (PM) Program must consist of:

1. A written PM schedule;
2. Documentation of all maintenance and repairs (records must be kept in an easily accessible manner);
3. Vendor operation and maintenance manuals available for all instrumentation; and
4. A written contingency plan specifying that backup equipment will be maintained for all instrumentation or stating that sampling events will be postponed and current sample load be invalidated until repairs are accomplished. If samples are sent to another laboratory the subject laboratory must have an approved CompQAP for the parameters of concern and the Project Manager must be notified if the analytical work is being performed under a Quality Assurance Project Plan.

Table 8.1 identifies general preventive maintenance activities by instrument type with recommended frequencies. Please note that it may be necessary to perform activities more frequently depending on heavy workloads, sample types analyzed and/or instrument performance. If the instrument manufacturer recommends more frequent or additional maintenance activities these shall also be incorporated into the facility maintenance program. More detailed procedures can be found in the back of specific method SOPs and in the manufacturer operation manuals.

Table 8.1
**PREVENTIVE MAINTENANCE ACTIVITIES**

| INSTRUMENT/ACTIVITY | FREQUENCY |
|---|---|
| **SEAL** | |
| Run autowash, extra wash, water baseline and syringe prime | D |
| Inspect function of probe wash ring and rinse well fill | D |
| Switch pump-tubing end for end or replace as needed | M |
| Clean well wash with cotton swab | M |
| Clean lamp filter and lubricate rollers on both pumps | Q |
| Replace lamp and optimize water baselines | A |
| Replace aspiration, sampling and waste water tubing | A |
| Run mechanical adjustment function | A |
| Replace syringe barrel, plunger and O ring | A |
| **AUTOANALYZERS** | |
| Check lamp function | D(1) |
| Replace pump tubing | M |
| Flush all tubing with bleach solution | M |
| Clean and lubricate pump and autosampler moving parts | M |
| **AA SPECTROPHOTOMETER (FURNACE)** | |
| Check graphite tubes | D(1) |
| Flush autosampler tubing | D |
| Replace graphite electrodes and Shrouds | SA |
| Clean furnace housing and injector tip | D |
| Check electronics | A(3,4) |
| Check noise levels for lamps | 3,4 |
| **ICP** | |
| Clean and realign torch | M |
| Clean nebulizer and spray chamber; Check peristaltic pump tubing | W(1) |
| Check entire optical system (mirrors, windows, etc.) | A(3,4) |
| Check water lines, torch compartment and gases | D |
| Check electronics (voltages, waveforms, etc.) | SA |
| Check wavelength calibration and adjust as needed | SA |
| Run interference (interelement) standard | D |
| **GAS CHROMATOGRAPHS** | |
| **GENERAL** | |
| Check septa, cylinder gas pressure, oxygen/moisture traps | D |
| Bake out injector body | 2 |
| Check electronics (voltages, waveforms, etc.) | Q(3,4) |
| Check GC temperature calibrations (injector, oven, detector) | Q |
| **COLUMNS** | |
| Change glass sleeve inserts, shorten ends of columns, change glass wool plugs, check for leaks or replace | 3 |
| **ELECTRON CAPTURE DETECTOR** | |
| Wipe Tests | SA |
| Bake detector at elevated temperature | 3 |
| Returned to factory for cleaning and refoil | 3,4 |

Table 8.1, cont.
**PREVENTIVE MAINTENANCE ACTIVITIES**

| INSTRUMENT/ACTIVITY | FREQUENCY |
|---|---|
| **GAS CHROMATOGRAPHS**, Cont. | |
| **FLAME IONIZATION DETECTOR** | |
| Clean | Q |
| Replace Flame Tip | A |
| **HALL ELECTROLYTIC CONDUCTIVITY DETECTOR** | |
| Replace resin, change solvent and clean conductivity cell | 3,4 |
| Change Ni tube | Q |
| **NITROGEN PHOSPHORUS DETECTOR** | |
| Clean | Q |
| **MASS SPECTROMETER** | |
| Replace vacuum pump oil and change desiccant | A |
| Check ion source and analyzer (dismantle and clean, replace parts as needed) | Q |
| Check mechanicals (vacuum pumps, relays, gas pressures and flows) | Q |
| Check mass calibration w/ BFB | D |
| **PURGE AND TRAP** | |
| Clean sparger | W |
| Change Trap | A |
| Bake Trap | 2 |
| Check purge flow | M |
| Check for leaks | M |
| Flush sample lines with methanol | 3 |
| **HIGH PRESSURE LIQUID CHROMATOGRAPHY** | |
| Gas lines checked for leaks | D |
| Clean mobile phase flow system with nitric acid | SA |
| Clean detector flow cells with nitric acid | SA (3) |
| Clean injection valve | A |
| Check solvent filters | W |
| Check pumps seals and check valve assemblies (clean and replace as pressures & flows of mobile phase indicate) | D |
| Lubricate oil felts, if present | M |
| Lubricate post column reagent pumps and check valve assembly oil felts | M |
| **INFRARED SPECTROPHOTOMETER** | |
| Clean instrument housing | M |
| Change desiccant and clean cells | Q |
| Clean windows | M |
| **UV-VISABLE SPECTROPHOTOMETER** | |
| Check lamp function | D(1) |
| Check linearity & wavelength accuracy with potassium dichromate | A |
| Check stray light | A |
| Check wavelength of Didymium filter absorbance minimum | A |
| **FLUORIMETER** | |
| Check lamp function | D(1) |

Table 8.1, cont.
**PREVENTIVE MAINTENANCE ACTIVITIES**

| INSTRUMENT/ACTIVITY | FREQUENCY |
|---|---|
| **ORBECO COLOR COMPARATOR** | |
| Wipe outside with damp cloth and check light | W |
| **ION CHROMATOGRAPH** | |
| Check for leaks | D |
| Check all lines for wear and discoloration | W(1) |
| **TOC ANALYZER** | |
| Check reagent levels, waste drains and gas pressure | D |
| Clean injection port and clean/change catalyst | M |
| Replace combustion tube | Q |
| Replace scrubbers, membrane filter, O rings and syringe | A |
| Clean and lubricate worm drive | A |
| **REFRIGERATORS, INCUBATORS, OVENS** | |
| Check and record temperature | D |
| Clean interior | M |
| Check thermometer temperature against certified thermometer or equivalent | A |
| **ANALYTICAL BALANCES** | |
| Clean pan and compartment | D |
| Check with class S weights | D |
| Manufacturer cleaning and calibration | A |
| **AUTOCLAVES** | |
| Gaskets checked | W(1) |
| Timing mechanism checked | Q |
| Clean interior | M |
| Sterilization indicator tape | D |
| **MICROSCOPES** | |
| Clean optics | M |
| **pH AND ION SELECTIVE ELECTRODES** | |
| **PROBE** | |
| Check probe for cracks and proper levels of filling solution; check reference junction; clean electrode | D(1) |
| Check response time | D |
| Check temperature calibration against NIST thermometer | A |
| **METER** | |
| Check batteries and electronics for loose connections and cracked leads | D(1) |
| Check internal temperature calibration | A |
| **TURBIDIMETER** | |
| Clean instrument housing | M |

Table 8.1, cont.
**PREVENTIVE MAINTENANCE ACTIVITIES**

| INSTRUMENT/ACTIVITY | FREQUENCY |
|---|---|
| **QUANTI-TRAY SEALER** | |
| Wipe down outside of sealer & check outside of trays for leaks | D |
| **CONDUCTIVITY METER** | |
| Check batteries and probe cables | D |
| Check temperature calibration against NIST thermometer | A |
| **DISSOLVED OXYGEN METERS** | |
| **PROBE** | |
| Check membrane for deterioration; check filling solution | D(1) |
| Clean electrode with ammonium hydroxide | A |
| **METER** | |
| Battery level and electronics checked | D(1) |
| Check temperature calibration against NIST thermometer | A |
| **THERMOMETERS** | |
| Check for cracks and gaps in the mercury | D(1) |
| Check temperature calibration against NIST thermometer | A |
| **TEMPERATURE PROBES** | |
| Check connections, cables | D |
| Check temperature calibration against NIST thermometer | A |
| **AUTOSAMPLERS** | |
| Check needles and tubing | D(1) |
| Clean | Q |
| **AUTOMATIC SAMPLE COLLECTION SYSTEMS** (ex. ISCO, Sigma, etc.) | |
| Check sampler operation (forward, reverse, automatic through three cycles of the purge-pump-purge cycle) | D(6) |
| Check purge-pump-purge cycle when sampler is installed | D(7) |
| Check the flow pacer that activates the sampler to assure proper operation | |
| Check desiccant | D(1,6) |
| Check batteries | D(1,6) |
| Check pumping rate against manufacturer's specifications | D(1,6) |
| **DATA SYSTEMS** | |
| Clean computers, check battery backup and check ventilation fans | Q |

**KEY:**

| | | | |
|---|---|---|---|
| 1 | Replace as necessary | D | Daily* |
| 2 | High background | W | Weekly |
| 3 | Loss of sensitivity or failing resolution | M | Monthly |
| 4 | Erratic response | Q | Quarterly |
| 5 | QC failure | SA | Semi-Annually |
| 6 | Prior to sampling event | A | Annually |
| 7 | In situ (under field conditions) | | |

*Daily is defined as prior to use or a 12-hour period if equipment is run continuously.

## 9.0 MINIMUM QUALITY CONTROL REQUIREMENTS AND ROUTINES TO CALCULATE AND ASSESS PRECISION, ACCURACY AND METHOD DETECTION LIMITS

## 9.1 QC CHECKS

### 9.1.1 LABORATORY QC CHECKS

The laboratory shall follow the minimum quality control requirements specified by each method. If no quality control requirements are listed in the method, or if the method quality control requirements are less stringent than those listed below, the laboratory shall follow the guidelines listed below:

#### 9.1.1.1 Chemistry QC Checks

a. Method reagent blanks - shall be prepared and analyzed at a rate of one per sample set (see definitions in Appendix A).
b. Matrix Spikes - At least one sample in a sample set (or 5%, whichever is greater) with similar matrices shall be prepared and analyzed by the specified method. If a set contains samples of different matrices, matrix spikes should be prepared and analyzed for each matrix type. Matrix spikes must be included as routine protocol.
c. Reagent water or reagent matrix spikes - Reagent water or reagent matrix spikes may be used as additional QC checks to monitor the effectiveness of the method. If used, these must be analyzed at a frequency of 5%.
d. Quality control check samples - shall be analyzed in duplicate semiannually. Such samples shall be analyzed as blind samples (i.e., the component concentrations in these samples shall not be provided to the analyst until after analysis). If the data are not acceptable, the analytical results must be reported in a QA report (see Section 13).
e. Quality control check standards - shall be analyzed at a continuing frequency equivalent to 5% of the samples in the analytical set (i.e. one every 20 samples) or shall be analyzed at the beginning of each run to verify the standard curve.
f. Duplicate samples or matrix spike duplicates - at least one or 5% of all samples in a sample set with a similar matrix shall be selected and analyzed in duplicate. If a sample set contains samples from different matrices (e.g., effluent and drinking water), then duplicates or matrix spike duplicates should be analyzed for each matrix.
g. Continuing calibration standards shall be analyzed at a frequency equivalent to 5% of the samples in an analytical set. Alternatively, quality control check standards may be used (see e. above). At least one of these checks shall be a standard at a concentration of 1 - 2 times the laboratory stated PQL.
h. Additional quality control checks may be included and shall be used if specified by the approved method:

   1. Reagent purity checks
   2. Internal standards
   3. Surrogate spikes

#### 9.1.1.2 Microbiology QC Checks

a. Blanks
   1. Membrane Filter Analysis: For each set of samples, a control blank shall be run at the beginning (dilution water blank), every tenth plate, and at the end of the set.
   2. IDEXX Analyses: For Presence / Absence testing, a blank (sterile DI) shall be run each day. For Quantitray, a blank (sterile DI) shall be run with each set of samples.
   3. MPN Analysis: No blank is analyzed.

b. Duplicates
   1. Membrane Filter Analysis: A lab replicate shall be performed in each run and for every 10 plates within a run when sufficient volume is available.
   2. IDEXX Analysis: For Presence / Absence testing no duplicate is analyzed. For Quantitray, a lab replicate is analyzed every 10 samples.
   3. MPN Analysis: A lab replicate including all dilutions shall be performed with each run.

c. Spikes
   1. Membrane Filter Analysis: (EPA 1600) A spike shall be performed each day a run is performed and for every 10 samples within a run.
   2. IDEXX Analysis: No spike is performed.
   3. MPN Analysis: No spike is performed.

d. Positive/Negative Controls: Microorganisms obtained from the American Type Culture Collection (ATCC) or equivalent sources shall be used to confirm the morphological and biochemical responses to test media. Positive and negative controls shall be run with each new lot of media prior to use.

e. Water Quality Indicators:
   1. Water source shall be tested monthly for chlorine residual, conductivity, TOC, and standard plate count.
   2. The use-test shall be conducted quarterly.
   3. The concentration of metals in the water source shall be determined annually.

f. Verification
   1. Membrane Filter Analysis: 10 colonies per method per month shall be verified with the appropriate confirmation media.
   2. IDEXX Analysis: Instantaneous against comparator and UV fluorescence.
   3. MPN Analysis: Instantaneous with growth and gas production.

9.1.1.3 Laboratory QC Checks (Bioassays)

a. At least one set of controls (dilution water and hardness or salinity, if appropriate) shall be run with each test.
b. Analytical equipment shall follow the chemistry laboratory quality control checks listed above.

9.1.1.4 Laboratory QC Checks (Species Identification)

a. Should maintain or have access to a type specimen collection.
b. Must, at a specified frequency use outside experts to corroborate species identification.

## 9.2 ROUTINE METHODS USED TO ASSESS PRECISION AND ACCURACY

9.2.1 Precision and accuracy targets listed in the tables of Methods, Matrices and QA Targets must be generated from matrix spikes and matrix spike duplicates or duplicates of environmental samples. The laboratory must maintain a list of QC checks, as presented in Section 9.1, which identifies applicable analytical methods and the concentrations to be used to make the determination in terms of low, mid or high levels:

a. Low level is defined as concentrations from the minimum detection limit to a level 5 times the MDL.
b. Mid level is defined as the mean level between the minimum detection level and the upper end of the linear range.
c. High level is defined as concentrations at the upper and of the linear range.

9.2.2. The laboratories shall use the following formulas for calculating the precision and accuracy of test measurements and the associated acceptance ranges:

9.2.2.1 The precision of replicate pairs shall be calculated using one of the following formulas:

a. Percent Relative Standard Deviation (% RSD)

1. Precision multiple values

$$\% \text{ RSD} = \frac{\text{S}}{\bar{\text{X}}} \text{ x } 100$$

Where: ẍ = Mean (average) of the data points
s = Standard deviation calculated as:

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

Where: n = total number of values
$x_i$ = each individual value
ẍ = mean of n values

2. Precision duplicate values:

$$\% \text{ RSD} = \frac{|\text{A-B}|}{\text{A+B}} \text{ x} \sqrt{2} \text{ x } 100$$

Where: A = concentration in aliquot A of sample
B = concentration in aliquot B of sample

b. Relative Percent Difference (RPD)

$$\% \text{ RPD} = \frac{|\text{A-B}|}{(\text{A+B}) / 2} \text{ x } 100$$

Where: A = concentration in aliquot A of sample
B = concentration in aliquot B of sample

9.2.2.2 The accuracy of a measurement shall be determined by the recovery of a known amount of analyte in a real sample as:

$$\% R = \frac{C_s - C_u}{S} \times 100$$

Where: Cs = concentration of spiked sample
Cu = concentration in unspiked sample
S = expected concentration of spike in sample
%R = percent recovery

9.2.2.3 Upper and Lower Warning and Control Limits to be used as acceptance criteria shall be calculated as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}}$$

Where: s = Standard Deviation
n = Number of points or data pairs to be included
$x_i$ = Sample Percent Recovery or precision of replicates
ẍ = Mean (average) of the data points

$CL = P_{av} \forall 3 S$
Where: CL = Control limit (upper and/or lower)
$P_{av}$ = Mean of P (average percent recovery or average % RSD)

$WL = P^{av} \forall 2 S$
Where: WL = Warning limit (upper and/or lower)

9.2.3. Microbiological quality control acceptance criteria shall be calculated per formulae specified in Standard Methods for the Examination of Water and Wastewater, 22nd Edition, Method Number 9020, Section 9 (pp. 9-17 and 9-18).

9.2.4 Quality Control charts must be prepared or other easily followed system instituted to track results of QC checks.

9.2.5 Quality control charts or tabulation systems must be updated every 20 data points or annually at a minimum.

## 9.3 METHOD DETECTION LIMITS AND PRACTICAL QUANTITATION LIMITS

### 9.3.1 METHOD DETECTION LIMITS (MDLS)

a. The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.

b. MDLs shall be determined in accordance with 40 CFR Part 136, Appendix B Rev. 2.

**NOTE: IN ALL CASES, THE METHOD DETECTION LIMIT IS DEFINED TO BE THREE TIMES THE STANDARD DEVIATION DERIVED FROM THE STUDY.**

### 9.3.2 PRACTICAL QUANTITATION LIMIT (PQLS)

a. The PQL is defined as the smallest concentration of an analyte of interest that can be reported with a specific degree of confidence.
b. The PQL is defined as 12 times the standard deviation that is derived from the procedures used to determine MDL.

### 9.3.3 VERIFICATION

a. MDLs shall be verified at a minimal frequency of annually.
b. PQLs shall be verified at a minimal frequency of quarterly.

## 9.4 DOCUMENTATION

### 9.4.1 FIELD QC CHECKS

See the Custody Section for Field QC checks.

### 9.4.2 LABORATORY CHECKS

a. Records which document sample/standard preparation, source and concentration (this includes protocols for preparation and certification, if applicable) must be maintained. All required records specified in the Calibration SOP must be maintained.
b. Identification of analyses set that the applicable QC sample is associated with.
c. Calculations performed to determine QC results.
d. Control limits used to evaluate analysis results and how these were determined.

### 9.4.3 MDL STUDIES

a. Documentation for the MDL studies must be conducted according to all other SOPs regarding sample and standard handling procedures, calibrations, QC checks and analyses.
b. Documentation must include:
   1. Date of study
   2. Analytical Method
   3. Identification of analyst responsible for analysis
   4. Compound(s) covered by study
   5. Unique ID of standards used for the study with respect to traceability

# 10.0 DATA REDUCTION, VALIDATION AND REPORTING

## 10.1 DATA REDUCTION

Data reduction includes all activities that convert instrument/computer responses into reportable results. These activities may involve mathematical calculations, compound identification and summary statistics. The final results may be obtained in two ways:

1. Direct readings from the instrument; or
2. Calculations based on instrument output, readings or responses.

The initial data reduction is the responsibility of the analyst or field technician who operates the analytical instrument. In addition to the general duties specified below, additional responsibilities for manual and computer related data reduction have been specified.

1. Calculate spike recoveries and precision for duplicates;
2. Identify quality control data (blank, spikes, duplicates, etc.) for review by quality assurance officer;
3. Assure accurate transcription of sample identification numbers on all records;

### 10.1.1 MANUAL DATA REDUCTION

1. If applicable, assure that all readings or output are precisely measured and noted on strip charts;
2. Select appropriate formulae for calculating final results;
3. Enter the formulae and at least one complete sample calculation on the strip chart or in the notebook;
4. Assure that all data are accurately transcribed into notebooks, forms or spreadsheets;
5. Enter all manual calculations into notebook or data records;
6. Check raw data entries with final computer output to assure accurate initial data entry;
7. Record appropriate and accurate information concerning sample identification, operating conditions, etc.

If raw data is entered into a computer program or spreadsheet for data reduction, the organization must be aware of and have on file a record of the mathematical formulae that are being used by the computer. If such information is not available, the organization shall verify the formula by manual calculations and maintain a record of the verification process.

All raw data output (strip charts, tabular printouts, etc.) must be retained as a part of the records. These records at a minimum must be identified with the following information: Date of run; sample ID numbers; analyst or operator; type of analysis (nitrate, metals, etc.). In addition, the following information must be maintained: instrument operating conditions (if applicable); detector and column types; instrument configuration; etc. The latter information may be kept in cross referenced records or may be entered on the various output records.

### 10.1.2 COMPUTER/INTEGRATOR REDUCTION

1. Assure that all data to be used in final calculations are entered accurately: sample weights or volumes; final extract volumes; dry weight factors; dilution factors; surrogate standard concentrations, etc.;
2. Properly interpret the computer output in terms of properly identified components, positive or negative identifications, and appropriate confirmatory measures;
3. Record appropriate and accurate information concerning sample identification, operating conditions, etc.;
4. Calculate surrogate recoveries and internal standard responses (if applicable);

5. GC and GC/MS analyses should be checked to verify that target components are within acceptable retention time windows and that additional confirmation (if needed) is initiated.

Many analytical instruments are interfaced with computers or integrators that automatically evaluate, identify and calculate final values. The results are printed in combinations of graphic (ex. chromatograms) and tabular forms. As with manual data reduction, the organization must be aware and should have a record on file of the mathematical formulae or algorithms that are being used by the computer. If the information is not available, the organization shall maintain records which demonstrate that the software is providing the expected results (e.g. check sample or check standard data is acceptable).

Typically, computer data files are identified by a queue number or a data file number. In such cases, the organization must maintain a cross reference index or log to identify the computer data files with sample ID numbers. Additional information that should be entered into the data file records are: date of run, analysis type, and analyst initials. Cross referenced auxiliary records are required to identify instrument operating conditions (if applicable); detector and column types; instrument configuration; etc.

### 10.1.3 Formulae and Calculations

The final results of each test shall be calculated by the formula specified in the analytical method that is being used.

The final result should be rounded off to an appropriate number of significant figures (typically 3 significant figures). If the digit 6,7,8 or 9 is dropped, increase the preceding digit by one unit; if the digit 0,1,2,3, or 4 is dropped, do not alter the preceding digit. If the digit to be dropped is 5, round off the preceding digit to the nearest even number: 2.225 becomes 2.22 and 2.335 becomes 2.34.

As a general rule the results should be converted to the reporting units presented on Table 10.1. Other reporting conventions (i.e. wet weight instead of dry weight) should be clearly identified on the final reports with appropriate justification.

Note: If components of interest are detected in any quality control blank (e.g. method blanks, digestion blanks, etc.), the blank concentration must be reported. The blank concentration shall not be subtracted from any associated sample data.

## 10.2 DATA VALIDATION

### 10.2.1 DATA INTEGRITY

The purpose for implementing a data integrity plan is to promote shared accountability among staff that are responsible for analysis, reporting, and record keeping. This plan is designed to recognize that there is no single accountable person, but multiple persons and departments that must share the responsibility of maintaining integrity in laboratory testing. Benchmark's data integrity procedures are defined in detail in SOP GM-19(BEA) or GMS-3 (BEAS), found among the Management SOP's.

A mandatory data integrity training session will be given for all new hires. At this session the laboratory manager or QA officer will define data integrity and review the data integrity plan:

- Employees will be given examples of unethical behavior as related to data manipulation.
- Employees will be informed that all reports and data are subject to in-depth review and that any infractions found will be investigated.
- Any violations witnessed by an employee should be reported to a senior staff member or the QA Supervisor. This information will be kept confidential.
- A written ethical agreement will be signed stating employees will not engage in any unethical practices concerning data integrity.

The QA officer may randomly select reports for an in-depth review, or submit blind samples to the laboratory as a means of verifying that data integrity requirements are being met. If any violations are found, an immediate investigation will be conducted. Any disciplinary actions taken as a result of the investigation will be documented in locked file cabinets and protected by passwords electronically, to ensure confidentiality. Data integrity procedures will be reviewed by management with all employees on an annual basis.

Table 10.1
**DATA REPORTING UNITS**

| TEST NAME OR COMPONENTS | REPORTING UNITS | | | |
|---|---|---|---|---|
| | WATER | SED | FISH | WASTE |
| Metals except: | ug/L | mg/kg | mg/kg | mg/kg |
| Reports for potable(drinking water), | | | | |
| Calcium, magnesium, sodium, potassium | mg/L | mg/kg | mg/kg | mg/kg |
| Microbiological parameters except: | cfu/100mL | #/gram | | |
| Heterotrophic Plate Count (HPC) | cfu/mL | | | |
| Purgeable organic components (VOCs and VOAs) | ug/L | ug/kg | mg/kg | mg/kg |
| Extractable organic components Including pesticides and herbicides except: | ug/L | ug/kg | mg/kg | mg/kg |
| Dioxin/Furan Scan and Dibenzo dioxins and dibenzofurans | ng/L | ng/kg | ng/kg | ng/kg |
| Odor (60°C) | TON | | | |
| Odor (Room Temp) | TON | | | |
| pH (Laboratory) | units | | | |
| Carbon Dioxide | mg/L | mg/kg | mg/kg | mg/kg |
| Color (True-PTCO) | CU | | | |
| Color (Apparent-PTCO) | CU | | | |
| Conductivity | uMHOS/cm | | | |
| Corrosivity | SI units | | | |
| Flash Point | | | | DEG F |
| Hardness (as CaCO3) | mg/L | | | |
| Settleable Solids | ml/L/h | | | |
| Total Solids | mg/L | mg/kg | | mg/kg |
| Volatile Total Solids | mg/L | mg/kg | | mg/kg |
| Total Suspended Solids | mg/L | mg/kg | mg/kg | |
| Volatile Total Suspended Solids | mg/L | mg/kg | | mg/kg |
| Total Dissolved Solids (180 Degree C) | mg/L | | | |
| Volatile Total Dissolved Solids | mg/L | mg/kg | mg/kg | |
| Toxicity (EP and TCLP) | mg/L | | | |
| Turbidity | NTU | | | |
| Radium-226, Total | pCi/L | pCi/g | | |
| Radium-228, Total | pCi/L | pCi/g | | |
| Radium-226, Diss | pCi/L | pCi/g | | |
| Radium-228, Diss | pCi/L | pCi/g | | |
| Gross Alpha, Total | pCi/L | pCi/g | | |
| Gross Beta, Total | pCi/L | pCi/g | | |
| Acidity | mg/L | mg/kg | mg/kg | mg/kg |
| Alkalinity, Bicarbonate (as $CaCO_3$) | mg/L | | | |
| Alkalinity, Carbonate (as $CaCO_3$) | mg/L | | | |
| Alkalinity, Total (as $CaC0_3$) | mg/L | mg/kg | mg/kg | mg/kg |
| Bicarbonate (as HCO3 ION) | mg/L | mg/kg | | |
| Carbonate (as $CO_3$ ION) | mg/L | mg/kg | | |
| Ammonia (an N) | mg/L | mg/kg | mg/kg | mg/kg |

Table 10.1
**DATA REPORTING UNITS**, cont.

| TEST NAME OR COMPONENTS | REPORTING UNITS | | | |
|---|---|---|---|---|
| | WATER | SED | FISH | WASTE |
| Ammonia, Dissolved (as N) | mg/L | | | |
| Ammonia, Unionized (as $NH_3$) | mg/L | | | |
| Bromide | mg/L | mg/kg | | mg/kg |
| Chlorate | mg/L | mg/kg | | mg/kg |
| Chloride | mg/L | mg/kg | | mg/kg |
| Chlorite | mg/L | mg/kg | | mg/kg |
| Chlorine Residual | mg/L | mg/kg | mg/kg | mg/kg |
| Cyanide | mg/L | mg/kg | mg/kg | mg/kg |
| Cyanide Amenable to Chlorination | mg/L | mg/kg | mg/kg | mg/kg |
| Cyanide, Free | mg/L | ug/kg | mg/kg | mg/kg |
| Dissolved Oxygen (Winkler) | mg/L | | | |
| Dissolved Oxygen (Electrode) | mg/L | | | |
| Fluoride | mg/L | mg/kg | mg/kg | mg/kg |
| Nitrate-Nitrogen | mg/L | mg/kg | mg/kg | mg/kg |
| Nitrite-Nitrogen | mg/L | mg/kg | | |
| Nitrate+Nitrite Nitrogen | mg/L | mg/kg | mg/kg | mg/kg |
| Nitrate+Nitrite Nitrogen, Dissolved | mg/L | | | |
| Ortho-Phosphate Phosphorus | mg/L | mg/kg | mg/kg | mg/kg |
| Silicon (Si) | mg/L | mg/kg | mg/kg | mg/kg |
| Silica ($SiO_2$) | mg/L | mg/kg | mg/kg | mg/kg |
| Sulfate | mg/L | mg/kg | | mg/kg |
| Reactive Sulfides (as $H_2S$) | mg/L | mg/kg | | mg/kg |
| Sulfides | mg/L | mg/kg | | mg/kg |
| Sulfite | mg/L | mg/kg | | mg/kg |
| Temperature | Deg C | | | |
| Total Dissolved Phosphorus | mg/L | mg/kg | | mg/kg |
| Total Kjeldahl Nitrogen | mg/L | mg/kg | mg/kg | mg/kg |
| Total Kjeldahl Nitrogen, Dissolved | mg/L | | | |
| Total Petroleum Hydrocarbons (TPH) | mg/L | mg/kg | mg/kg | mg/kg |
| Total Phosphorus | mg/L | mg/kg | mg/kg | mg/kg |
| Bio-Chemical Oxygen Demand, 5 Day | mg/L | mg/kg | mg/kg | |
| Bio-Chemical Oxygen Demand, 5 Day, Dissolved | mg/L | mg/kg | mg/kg | |
| Bio-Chemical Oxygen Demand, 20 Day | mg/L | mg/kg | mg/kg | |
| Bio-Chemical Oxygen Demand, 60 Day | mg/L | mg/kg | mg/kg | |
| BOD, Carbonaceous, 5 Day | mg/L | | | |
| Chemical Oxygen Demand | mg/L | mg/kg | mg/kg | mg/kg |
| Chemical Oxygen Demand, Dissolved | mg/L | | | |
| Linear Alkyl Sulfonate (MBAS) | mg/L | mg/kg | mg/kg | mg/kg |
| Oil and Grease | mg/L | mg/kg | mg/kg | mg/kg |
| Phenols (4AAP) | ug/L | mg/kg | mg/kg | mg/kg |
| Total Organic Carbon | mg/L | mg/kg | mg/kg | mg/kg |
| Total Organic Carbon, Dissolved | mg/L | | | |
| Purgeable Organic Carbon | mg/L | | | |
| Total Organic Halogen | ug/L | ug/kg | mg/kg | |

### 10.2.2 Data Validation

Data validation is accomplished through a series of checks and reviews that are intended to assure that the reported results are of a verifiable and acceptable quality. Data validation takes place at multiple levels within the organization.

The first step in the process takes place in the Receiving department as samples are received. Section 5.0 of this Quality Manual describes, in detail, Benchmark's sample receiving protocol and policies. Deviations or exceptions that may occur from these protocols and policies are to be noted on the chain of custody and brought to the attention of management or quality control personnel. From there, the appropriate actions are to be taken at the discretion of management.

The second step in data validation occurs at the bench level with the analyst. The analyst is responsible for reading, understanding and following information found in the laboratory SOPs and applicable reference methods. The analyst must also maintain equipment according to Section 8.0 of this Quality Manual, lab SOPs, and manufacturer's instructions. When non-conformances occur, they are to be documented in the raw data and brought to the attention of management as instructed in SOPs GM-7 (BEA) or GMS-16 (BEAS) and GM-23 (BEA) and GMS-22 (BEAS).

The third step in data validation is the responsibility of the QC officer. The bulk of data validation ultimately lies in this step. The quality control elements listed in the individual method SOPs and in Section 9.0 of this Quality Manual are evaluated prior to result reporting to the client. Acceptance criteria can be found in the method SOPs, Table 11.1 of this Quality Manual, and in current calculated laboratory control limits. Data is reviewed by a QC officer after manual data entry by the analyst or upon uploading into the laboratory LIMS system. The data is then initialed and dated by the QC officer.

1. Verify that all quality control blanks meet criteria;
2. Review all other applicable quality control data (spikes, duplicates, quality control check standards, quality control check samples, etc.) for acceptability;
3. Review all surrogate and standard additions spike recoveries and internal standard responses for acceptability;
4. Identify any sample set or data that are unacceptable and initiate appropriate corrective action measures;
5. Assign data qualifiers (if needed) to reported values;
6. Verify mass spectral interpretation (if applicable) and/or component identification;
7. Assign data qualifiers to all applicable data (see Table 10.2).
   Note: The reported value always precedes the data qualifier code.

The fourth step in data validation is the reporting of the results described in Section 10.3 below.

## 10.3 DATA REPORTING AND OVERALL PROJECT VALIDATION

### 10.3.1 Laboratory Data Reports

The final reports from the laboratory may be generated in several different ways:
1. Hand written report forms;
2. Manually typed reports and narrative;
3. Computer generated reports;
4. Any combination of the above methods.

All parties who are involved with the data review and validation process are responsible for providing data entry operators or clerical personnel with accurate records for transcription. If data are automatically reported through a LIMS system, the final reviewer must assure that the appropriate commands have been input to release the data for final reports. More detailed reporting validation can be found in SOP GM-5 (BEA) and GMS-10 (BEAS).

### 10.3.2 Engineering Project Reports

The final reports from an engineering firm or the organization responsible for a project involves assimilating and presenting data from both the laboratory and field. These reports may also include narratives on site history, an analysis of current findings; and conclusions and/or recommendations on further project work.

### 10.3.3 Project Validation

Project validation is the process by which all project data is reviewed prior to reporting the data to the client. Data is examined to ensure that results are consistent with project expectations. If any suspect data is observed, management or a QC officer is to be notified for confirmation of the results. When applicable, the results are compared with sample history as another form of validation. When historical discrepancies arise, the data is again reviewed and confirmed. This task is normally assigned to the project manager but may be performed by an individual who is responsible for overall management operations, such as the laboratory director or QC officer. More detailed reporting validation can be found in SOP GM-5 (BEA) and GMS-10 (BEAS).

Table 10.2
**DATA QUALIFIER CODES**

| SYMBOL | MEANING |
|---|---|
| | (Per 62-160.700 Table 1) |
| A | Value reported is the arithmetic mean (average) of two or more determinations. This code shall be used if the reported value is the average of results for two or more discrete and separate samples. These samples shall have been processed and analyzed independently. Do not use this code if the data are the result of replicate analysis on the same sample aliquot, extract, or digestate. |
| B | Results based upon colony counts outside the acceptable range. This code applies to microbiological tests and specifically to membrane filter colony counts. The code is to be used if the colony count is generated from a plate in which the total number of coliform colonies is outside the method indicated ideal range. This code is not to be used if a 100 mL sample has been filtered and the colony count is less than the lower value of the ideal range. |
| F | When reporting species: F indicates the female sex. |
| H | Value based on field kit determination; results may not be accurate. Value based on field kit determination; results may not be accurate. This code shall be used if a field screening test (i.e., field gas chromatograph data, immunoassay, vendor-supplied field kit, etc.) was used to generate the value and the field kit or method has not been recognized by the Department as equivalent to laboratory methods. |
| I | The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit. |
| J | Estimated value. A "J" value shall be accompanied by a narrative justification for its use. Where possible, the organization shall report whether the actual value is less than or greater than the reported value. A "J" value shall not be used as a substitute for K, L, M, T, V, or Y, however, if additional reasons exist for identifying the value as estimate (e.g., matrix spike failed to meet acceptance criteria), the "J" code may be added to a K, L, M, T, V, or Y. The following instances shall be noted along with the "J" qualifier for justification:<br>1. Surrogate recovery limits have been exceeded.<br>2. No known quality control criteria exists for the component.<br>3. The reported value failed to meet the established quality control criteria for either precision or accuracy.<br>4. The sample matrix interfered with the ability to make any accurate determination.<br>5. The data are questionable because of improper laboratory or field protocols (e.g. composite sample was collected instead of a grab sample). |
| K | Off scale low. Actual value is known to be less than the value given. This code shall be used if:<br>1. The value is less than the lowest calibration standard and the calibration curve is known to be non-linear<br>2. The value is known to be less than the reported value based on sample size, dilution or some other variable<br>NOTE:<br>This code shall not be used to report values that are less than the laboratory practical quantitation limit or laboratory method detection limit. |

Table 10.2
**DATA QUALIFIER CODES**, cont.

| SYMBOL | MEANING |
|---|---|
| | (Per 62-160.700 Table 1) |
| L | Off scale high. Actual value is known to be greater than the value given. To be used when the concentration of the analyte is above the acceptable level for quantitation (exceeds the linear range or highest calibration standard) and the calibration curve is known to exhibit a negative deflection. |
| M | When reporting chemical analyses: presence of material is verified but not quantified; the actual value is less than the value given. The reported value shall be the laboratory practical quantitation limit. This code shall be used if the level is too low to permit accurate quantification, but the estimated concentration is greater than the method detection limit. If the value is less than the detection limit use "T" below. |
| N | Presumptive evidence of presence of material. This qualifier shall be used if: 1. The component has been tentatively identified based on mass spectral library search; or 2. There is an indication that the analyte is present, but quality control requirements for confirmation were not met (i.e. presence of analyte was not confirmed by alternative procedures). |
| O | Sampled, but analysis lost or not performed. |
| Q | Sample held beyond accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis. |
| T | Value reported is less than the laboratory method detection limit. The value is reported for informational purposes only and shall not be used in statistical analysis. |
| U | Indicates that the compound was analyzed for but not detected. This symbol shall be used to indicate that the specified component was not detected. The value associated with the qualifier shall be the laboratory method detection limit. Unless requested by the client, less than the method detection limit values shall not be reported. |
| V | Indicates that the analyte was detected in both the sample and the associated method blank. Note: The value in the blank shall not be subtracted from associated samples. |
| Y | The laboratory analysis was from an improperly preserved sample. The data may not be accurate. |
| Z | Too many colonies were present (TNTC); the numeric value represents the filtration volume. |
| ? | Data are rejected and should not be used. Some or all the quality control data for the analyte were outside criteria, and the presence or absence of the analyte cannot be determined from the data. |
| * | Not reported due to interference. |

Table 10.2
**DATA QUALIFIER CODES**, cont.

| SYMBOL | MEANING |
|---|---|

(Per 62-160.700 Table 1)

The following codes deal with certain aspects of field activities. The codes shall be used if the laboratory has knowledge of the specific sampling event. The codes shall be added by the organization collecting samples if they apply:

| | |
|---|---|
| D | Measurement was made in the field (i.e. in situ). This applies to any value (except pH, specific conductance, dissolved oxygen, temperature, total residual chlorine, transparency, or salinity) that was obtained under field conditions using approved analytical methods. If the parameter code specifies a field measurement (e.g. "Field pH"), this code is not required. |
| E | Indicates that extra samples were taken at composite stations. |
| R | Significant rain in the past 48 hours. (Significant rain typically involves rain in excess of ½ inch within the past 48 hours.) This code shall be used when the rainfall might contribute to a lower than normal value. |
| ! | Data deviate from historically established concentration ranges. |

**NOTE: 1) The following codes found in Table 10.2 may or may not be acceptable for use with results submitted for compliance with 62-550 and 92-555, depending on the parameter(s) and/or the circumstances. Results with these codes will be evaluated on a case by case basis:**

**J, Q, R, and Y**

**2) The following codes found in Table 10.2 are not acceptable for results submitted in compliance with 62-550 and 62-555 (i.e. Drinking Water):**

**A, F, H, N, O, T, Z, ? and ***

10.3.3.1 Laboratory

a. Review all identified quality control checks. Assure that any deviations or questionable data have been reported with qualifiers or with appropriate explanations;
b. Check for overall project consistency and any obvious anomalous values;
c. Check for clerical errors, transposed numbers and accurate data transfer.

10.3.3.2 Field/Engineering

a. Review all quality control data (field and laboratory) for project acceptability. Attach appropriate justification or explanation for any questionable data;
b. Check for overall project consistency, including comparison with historical or expected results;
c. Check for clerical errors, transposed numbers and accurate data reporting.

All final reports should be verified and signed by the project manager(s), laboratory director or other individual who is responsible for the overall operations of the organization.

## 10.4 DATA STORAGE

All records of the laboratory that are pertinent to NELAC standards or a specified project must be retained for a period of at least 5 years after the completion of the project. These records include:

1. All field notebooks, data sheets and documentation on the sampling event;
2. All field and laboratory analytical records including supporting calibration, raw data, data reduction calculations, quality control information and all data output records (chromatograms, strip charts and other instrument response readout records);
3. All field and laboratory custody records including shipping receipts, sample transmittal forms, internal routing and assignment records and sample disposal;
4. All notebooks, data forms, and logs pertaining to laboratory operations including sample receipt and log in;
5. All records concerning receipt, preparation and use of calibration standards;
6. All statistical calculations used in data reduction and in determination of quality control limits;
7. Preventative maintenance records for all analytical and support equipment and instrumentation;
8. Copies of final reports;
9. Standard operating procedures.

Records such as SOPs, manuals and reference documents must clearly indicate the time period during which the procedure or document was in force.

Records that are stored by computers or PCs must have hard copy or write-protected backup copies.

The records must be protected from environmental degradation; stored under secure conditions to discourage tampering or vandalism; and must be cross indexed by project number, laboratory ID number or some other common identifier for easy retrieval.

Access to archived information shall be documented with an access log or an electronic audit trail for applicable electronic data.

## 10.5 DOCUMENT CONTROL SYSTEM

Management will follow the procedure below to create or revise SOPs or guidance documents used in the laboratory. This procedure describes the requirements for drafting, revising, implementing, and tracking SOPs and guidance documents as instructed in SOP GM-31 (BEA) or GMS-18 (BEAS).

1. Staff member prepares a draft after review of current or proposed lab procedure based upon reference method or guidance documents. A procedure is created based on template or modification of existing SOP or document for that methodology. A copy of this new procedure is printed and marked as DRAFT and submitted for review.
2. Draft is reviewed by staff members performing the analysis. It is checked for grammatical or procedural errors or clarification of required steps or requirements. Any changes are marked on the draft.
3. Draft is given back to the draftee to review and update any needed changes.
4. Final draft is submitted for review/acceptance by quality personnel and/or lab director. The tracking log will include: revision number, reference method, details of changes made, existing procedure, and any needed signatures.
5. Document is then implemented and tracked. Signed tracking log sheet, old and new documents are filed in the Document Control Log. Signed copy of new procedure is placed in area of operation. Tracking Log Summary Sheet is updated to reflect new revision number, revision date (also date that new document is in force) and cited reference method.

## 11.0 CORRECTIVE ACTIONS

Quality controls are used to monitor and assess the effectiveness and validity of a sampling or analysis activity. If a specified quality control measure is determined to be out of a predetermined acceptance range, and the source or reason for the deviation is not identified and corrected, the sample data associated with the quality control measure may not be useful or valid information.

Some quality control criteria (ex. calibration) have a direct effect on the test results. Others (ex. blanks and duplicates) are indicators of improper protocols or contamination.

## 11.1 QUALITY CONTROL MEASURES AND ACCEPTANCE CRITERIA

Table 11.1 identifies each of the quality control checks that are required by test methods acceptance criteria. The acceptance range criteria or the source of the acceptance range has been identified.

## 11.2 IDENTIFYING AND ASSESSING QC MEASURES

Generally, quality control information is reviewed by several individuals. The responsibility for the initial assessment of a quality control measure lies with the individual who (1) identifies the sample or procedure as a QC measure; and (2) has access to the test results:

11.2.1. The individual responsible for operating the analytical instrument or equipment must be responsible for assessing the following applicable QC Measures:

1. Method, reagent and calibration blanks
2. Calibration integrity: initial and continuing calibration, interference standards, and QC check standards
3. System performance checks
4. Tuning criteria
5. Surrogate and internal samples
6. Titrating solutions

11.2.2. The following checks are normally assessed by a secondary reviewer (supervisor or QA Officer), but may be evaluated by the primary analyst:

1. Standard Reference Material
2. QC Check Samples
3. Spiked samples (matrix and blank)
4. Duplicates

11.2.3. The following must be assessed by the organization or individual(s) responsible for sample collection, but may be reviewed by laboratory personnel if the sample has been identified as:

1. Precleaned and field cleaned equipment blanks
2. Trip blanks
3. Field collected duplicates
4. Split samples

## 11.3 DETERMINING THE SOURCE OF QC PROBLEMS

Once a problem has been identified, the process (whether analytical or review) should be halted until the reason for the problem has been identified. Finding the source of a QC problem involves identifying probable sources of error, and checking each source to determine if the protocols were properly followed. Common sources of error and expected follow-up protocols are outlined on Table 11-2. Usually, the individual who is responsible for identifying the problem is responsible for determining the cause. However, other personnel and organizations may need to cooperate.

## 11.4 INITIATING CORRECTIVE ACTION

When the source of a QC error has been identified, appropriate steps must be taken to eliminate or minimize recurrences.

11.4.1. If a QC measure listed in 11.2.1 above is not acceptable, testing cannot continue until the QC check meets specifications. Corrective actions may be initiated:

1. By the individual who is operating the instrument; or
2. By an individual in oversight authority (i.e. supervisor or QA Officer) if a solution is not immediately apparent.

11.4.2. Corrective actions for QC measures in 11.2.2 and 11.2.3 must be initiated by the individual who identifies the problem.

## 11.5 SPECIFIC CORRECTIVE ACTIONS

A list of expected corrective actions for each QC measure is included on Table 11-2. Since many QC problems have unique solutions, the corrective action protocols are not limited to those listed. Further assessment based on an individual's experience and knowledge may be warranted.

## 11.6 DOCUMENTATION AND NOTIFICATION OF AFFECTED PARTIES

If a quality control measures fails to meet acceptance criteria, the QC measure, and the procedures were used to correct the problem must be documented.

Documentation does not imply a formal memo or corrective action form:

1. Corrective actions that are initiated during an on-going analytical run may be documented on the chromatogram, integrator or strip chart recorder records as well as in the instrument, analytical and/or field logs.
2. Corrective actions that require input or intervention of more than one individual must at a minimum be documented in the related logs and records. Corrective action forms for larger organizations are recommended.
3. If more than one organization is involved with identifying a QC problem and the associated corrective actions, formal memos are recommended, although dated and signed phone logs are acceptable. In all cases, a copy of all documentation should be maintained in the project files.

If an identified quality control problem affects more than one set of data or multiple projects, the documentation associated with identifying and resolving the problem must be cross referenced to all associated projects.

## 11.7 CORRECTIVE ACTIONS FROM EXTERNAL SOURCES

The need to initiate corrective action may be the result of activities or audits from external sources. Sources include systems audits; performance audits; split samples; blind QC samples; and findings from project or data validation review.

**IN ALL CASES, CORRECTIVE ACTIONS MUST BE INITIATED.**

Table 11.1
**ACCEPTANCE CRITERIA AND CORRECTIVE ACTIONS FOR QUALITY CONTROL CHECKS**

| QC CHECK | | ACCEPTANCE CRITERIA |
|---|---|---|
| **BLANKS** | | |
| Method blank<br>Reagent blank<br>Calibration blank<br>Precleaned Equipment Blanks<br>Field Cleaned Equipment Blanks<br>Trip Blanks | | <MDL or less than 1/10 of concentration of any batch sample |
| **CALIBRATION** | | |
| Calibration Standard (CALSTD) | | a. Reference any method specific acceptance criteria, if none exists, use following criteria.<br>b. A minimum correlation coefficient of 0.995 must be achieved. |
| Quality Control Sample (QCS) | **Nutrients:** | a. Reference any method specific acceptance criteria, if none exists, use following criteria.<br>b. A standard deviation of +/- 10% of the standard's true value must be achieved. |
| Laboratory Check Standard (LCS) | **Nutrients:** | a. Reference any method specific acceptance criteria, if none exists, use following criteria.<br>b. Must be within laboratory generated control limits. If outside control limits see following criteria.<br>c. Data acceptable with a standard deviation of +/- 15% however, it must be footnoted on final report. |
| Interference standard | | Method acceptance criteria |
| Tuning criteria | | Method acceptance criteria |
| **SYSTEM PERFORMANCE CHECKS** | | |
| Pesticide | | Method acceptance criteria |
| Standard Reference Materials | | Within certified limits |
| QC Check Samples | | Within specified limits |
| **SPIKES** | | |
| Matrix Spike (MS) | **Nutrients:** | a. Must be within laboratory generated control limits. If outside control limits see following criteria.<br>b. Data acceptable with a standard deviation of +/- 20% however, it must be footnoted on final report. |
| Laboratory Fortified Blank (LFB) | | Within method specified criteria |

Table 11.1, cont.
**ACCEPTANCE CRITERIA AND CORRECTIVE ACTIONS FOR QUALITY CONTROL CHECKS**

| QC CHECK | ACCEPTANCE CRITERIA |
|---|---|
| **DUPLICATES** | |
| Laboratory Duplicates | Nutrients: Within range specified in laboratory generated control limits |
| Matrix Spike Duplicates | Within range specified in laboratory generated control limits |
| Field Duplicates | Within range specified in laboratory generated control limits |
| **OTHERS** | |
| Surrogate Standards | Method acceptance criteria |
| Internal Standards | Method acceptance criteria |
| Split Samples | Meets precision criteria in laboratory generated control limits |
| Titrating Solutions | a. +/- 10% of expected (lab determined) value<br>b. Replicate sample aliquot results are within method specified limits |
| **MICROBIOLOGY** | |
| Monthly parameters<br>Chlorine Residual<br>Conductivity<br>Heterotrophic Count | Per Page 305 of EPA-600/8-78-017 |
| Annual metals concentration | Per Page 305 of EPA-600/8-78-017 |
| Distilled water suitability test | Per Table IV-A-3 of EPA-600/8-78-017 |
| Incubators | 35 +/-0.5 C, 44.5 +/-0.2 C, or 41 +/-0.5 C |
| Duplicates | Within calculated precision criteria (See Standard Methods 22nd Ed., pp. 9-17 and 9-18) |
| Morphological and Biochemical Confirmation | Per Table IV-A-5 of EPA-600/8-78-017 |
| Positive and negative media controls | Per Table IV-A-4 of EPA-600/8-78-017 |
| MF Blanks | <1 CFU |
| MPN dilution blanks | <1 |
| Inhibitory Residue Test | The RPD between Groups A, B and C should be less than 15% if there are no toxic or inhibitory substances. |
| Inhibitory Residue Blank | <1 CFU |

Table 11.1, cont.
**ACCEPTANCE CRITERIA AND CORRECTIVE ACTIONS FOR QUALITY CONTROL CHECKS**

| QC CHECK | ACCEPTANCE CRITERIA |
|---|---|
| **MICROBIOLOGY**, cont. | |
| Membrane Filter Analysis | Verified colonies must be coliforms |
| MPN Analysis | Verified colonies must be coliforms |

Table 11.2
**PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS**

1. **BLANKS**
   a. Sources and expected review procedures:
      1. Contaminated reagents - verify reagent sources
      2. Environmental Contamination (all sample collection, sample and analysis conditions) - review sampling handling protocols
      3. Improper or incomplete laboratory and/or field decontamination/cleaning procedures - review cleaning protocols
      4. Contaminated sample containers - verify source and storage conditions
      5. Contaminated source water - verify water source
   b. Expected Corrective Actions:
      1. Review data with respect to reported contamination levels. If sample concentrations are near the reported blanks levels, reprocess (re-extract or digest) associated samples or resample. If sample concentrations or the reporting levels are significantly higher than blanks, or contaminants are not detected in the samples, report the sample data and concentrations in blank.
      2. Take measures to eliminate future problems: discard reagents, revise protocols, perform preventative maintenance on system, adjust use of interfering chemicals (solvents, fuels, etc.).

2. **CALIBRATION**
   a. Sources and expected review procedures:
      1. Improperly prepared or outdated standards - review preparation logs for calculation/dilution errors and use of expired sources.
      2. Improperly prepared or outdated check standard - verify check standard
      3. Poor instrument response - determine if preventative maintenance is required
      4. Incorrect calculations - review and verify all calculations
      5. Contamination problems (see blanks above)
   b. Expected Corrective actions:
      1. Recalculate calibration curve
      2. Prepare fresh standards
      3. Recalibrate instrument
      4. Perform preventative maintenance
      5. Perform mass calibration and retune
      6. Reanalyze all samples bracketing those from previous ACCEPTABLE QC check through next acceptable QC check.
      7. Take measures to eliminate sources of contamination

3. **SYSTEM PERFORMANCE CHECKS**
   a. Sources and expected review procedures:
      1. Pesticides:
         Poor column performance - replace/repack column
      2. Standard Reference Materials and QC Check Samples:
         a. Improper sample preparation or analysis - review all protocols associated with sample preparation and analysis
         b. Incorrect dilutions or calculations - recheck all calculations
         c. Contamination (see blanks above)
   b. Expected Corrective Actions:
      1. Reanalyze all samples bracketing those from previous ACCEPTABLE QC check through next acceptable QC check
      2. Reprocess all samples associated with QC check sample or standard reference material (unless the problem is unique to processing of the check sample)
      3. Take measures to eliminate sources of contamination

Table 11.2, cont.

# PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS

**4. SPIKES**

a. Sources and expected review procedures:
   1. Error in calculation - review/recheck all calculations
   2. Error in preparing or using spike solutions - review all preparation and/or analytical logs (including sample preparation) for proper dilutions, solvents, buffers, etc.
   3. Outdated standards - review expiration dates and standard preparation logs
   4. Contamination problems (see blanks above)
   5. Poor instrument response - determine if preventative maintenance is required

b. Expected Corrective Actions:
   1. Take measures to eliminate contamination problems, reprocess if necessary
   2. Perform required maintenance and revise pm schedules
   3. Review preparation, calculation and record keeping to determine if additional training or more stringent protocols are needed
   4. If the laboratory has no historical data to show that the sample matrix produces consistently unacceptable (out of control) recoveries, and none of the sources discussed above are responsible for the problem, the sample must be reprocessed and reanalyzed. If reanalysis produces the same result, associated samples should be reported with qualified results. If results are different, all associated samples must be reprocessed for analysis.

**5. DUPLICATES**

a. Sources and expected review procedures:
   1. Non representative sample - review sample collection and/or sample processing protocols
   2. Error in calculations - recheck calculations
   3. Contamination problems (see blanks above)
   4. See matrix spikes above

b. Expected Corrective Actions:
   1. Report data with qualifiers and explanation
   2. Revise sample collection/sample processing protocols to assure a representative sample
   3. Takes measures to eliminate contamination problems.
   4. Reprocess and reanalyze sample set (if laboratory generated replicate).

**6. SURROGATE SPIKES**

a. Sources and expected review procedures:
   1. See 4.a above

b. Expected Corrective Actions:
   1. See 4.b above

**7. INTERNAL STANDARDS**

a. Sources and expected review procedures:
   1. See 4.a above

b. Expected Corrective Actions:
   1. See 4.b above
   2. Reanalyze samples from last acceptable QC check to next acceptable QC check

**9. SPLIT SAMPLES**

a. Sources and expected review procedures:
   1. See 5.a above

b. Expected Corrective Actions:
   1. See 5.b above

Table 11.2, cont.
**PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS**

**10. TITRATING SOLUTIONS**

a. Sources and expected review procedures:
   1. Error in calculation - review/recheck all calculations
   2. Error in preparing or using titrant and standard solutions - review all preparation and/or analytical logs (including sample preparation) for proper dilutions, solvents, buffers, etc.
   3. Outdated standards and/or - review expiration dates and standard preparation logs
   4. Contamination problems (see blanks above)
   5. Non representative sample - review sample collection and/or sample processing protocols
   6. Indistinct or inconsistent endpoint readings

b. Expected Corrective Actions:
   1. Take measures to eliminate contamination problems, reprocess if necessary
   2. Review preparation, calculation and record keeping to determine if additional training or more stringent protocols are needed
   3. If replicate analyses are not acceptable, titrate additional aliquots
   4. Reanalyze samples from last acceptable QC check to next acceptable QC check
   5. Train analysts to titrate to consistent endpoint

**11. MICROBIOLOGY - MONTHLY PARAMETERS, METALS, WATER SUITABILITY**

a. Sources and expected review procedures:
   1. Deionizer/Water not functioning properly

b. Expected Corrective Actions:
   1. Clean, replace cartridges and/or perform other preventative maintenance tasks
   2. Reanalyze water
   3. Reprocess samples (if still within holding times) or resample

**12. MICROBIOLOGY - AUTOCLAVE**

a. Sources and expected review procedures:
   1. Autoclave not functioning properly

b. Expected Corrective Actions:
   1. Perform preventative maintenance and re-sterilize

**13. MICROBIOLOGY - INCUBATORS**

a. Sources and expected review procedures:
   1. Incubator not functioning properly
   2. Thermometers or recording devices not functioning properly

b. Expected Corrective Actions:
   1. Perform preventative maintenance on devices, recalibrate if necessary
   2. Reprocess samples (if still within holding times) or resample

**14. MICROBIOLOGY - DUPLICATES**

a. Sources and expected review procedures:
   1. Counting errors or difficulties in identifying coliform organisms (membrane filter).
   2. Nonrepresentative sample.
   3. Contamination problems.

b. Expected Corrective Actions:
   1. Recount or re-examination colonies to determine counting error or misidentifications.
   2. Examine blanks and samples analyzed to determine possible sources of contamination.

Table 11.2, cont.
**PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS**

**MICROBIOLOGY – DUPLICATES,** Expected Corrective Actions, cont.

3. If 14.a.2 above is found to be the problem, or the problem has not been identified, data must be invalidated and resampling and retesting must occur.

**15. MICROBIOLOGY - ATCC AND BIOCHEMICAL CONFIRMATION**

a. Sources and expected review procedures:
   1. Media prepared improperly (incorrect pH, sterilized too long, etc.).
   2. Incorrect incubator temperatures.
   3. Media shelf life has expired and no longer functions properly.

b. Expected Corrective Actions:
   1. Isolate problem with media preparation.
   2. Confirm proper incubator temperatures.
   3. Prepare new batch of media from the same lot to determine media acceptability or discard media if the shelf life has expired.
   4. Prepare new media from a different lot number.
   5. Invalidate all affected data linked to the media that was not functioning acceptability.

**16. MICROBIOLOGY - POSITIVE AND NEGATIVE MEDIA CONTROLS**

a. Sources and expected review procedures:
   1. See 15.a.1-3 under ATCC or biochemical confirmation.
   2. Samples used were not positive or negative.
   3. Improper analytical protocol.
   4. Contamination problems (negative control).
   5. Colony misidentification.
   6. Stressed organisms that did not respond in a typical fashion.

b. Expected Corrective Actions:
   1. See 15.b.1-4 under corrective actions for ATCC or biochemical confirmation.
   2. Re-examine response for misidentifications.
   3. Use alternate positive and negative control samples to confirm media response and check on original samples.
   4. Invalidate data and retest if problem was with the media or testing system.

**17. MICROBIOLOGY - MF BLANKS**

a. Sources and expected review procedures:
   1. Equipment or rinse water/dilution water improperly sterilized.
   2. Rinsing technique not adequate.
   3. Contamination problems.

b. Expected Corrective Actions:
   1. Review sterility checks on the autoclave for rinse/dilution water and other associated equipment.
   2. Evaluate rinsing protocols between samples.
   3. Review testing procedures and test location for other sources of contamination.
   4. Reject data and resample

**18. MICROBIOLOGY - MPN DILUTION BLANKS**

a. Sources and expected review procedures:
   1. Equipment or dilution water not properly sterilized.
   2. Contamination problems during test procedure.

b. Expected Corrective Actions:
   1. Review sterility checks on the autoclave for dilution water and other sterilized equipment.
   2. Review testing procedures and location for possible sources of contamination.

Table 11.2, cont.
**PROBABLE SOURCES AND EXPECTED CORRECTIVE ACTIONS**

**19. MICROBIOLOGY - INHIBITORY RESIDUE TESTS**

a. Sources and expected review procedures:
   1. Detergent residues inhibit bacterial growth.
   2. Alternate rinsing practice alleviates the problem.

b. Expected Corrective Actions:
   1. Implement rinsing protocols that produce an acceptable inhibitory residue test.
   2. Change detergents to one that produces an acceptable test result under normal rinsing operations.

**20. MICROBIOLOGY - MEMBRANE FILTER VERIFICATION**

a. Sources and expected review procedures:
   1. Compare original counts against verified colony counts.

b. Expected Corrective Actions:
   1. Adjust initial colony count based upon positive verification percentage and report as verified coliform count.

**21. MICROBIOLOGY - MPN COMPLETED TESTS**

a. Sources and expected review procedures:
   1. Compare original results against completed test results.

b. Expected Corrective Actions:
   1. Adjust original MPN result calculated from the completed test results.

**22. BIOASSAY - DILUTION WATER CONTROLS**

a. Sources and expected review procedures:
   1. See 1.a.1-5 above

b. Expected Corrective Actions:
   1. Invalidate data and retest

### 11.8 NON-CONFORMING WORK

The need to initiate corrective action may be the result of non-conforming work. The responsibilities and authorities for the management of non-conforming work are designated and actions (including halting of work and withholding of test reports, as necessary) are taken when non-conforming work is identified. These designated individuals include: Laboratory Director, Laboratory Manager, and/or Quality Assurance officers unless otherwise specified by the Laboratory Director. These same individuals are responsible for ensuring all non-conformances are documented, affected parties are contacted when appropriate, and work is qualified, if needed.

Once non-conforming work has been addressed, it is the responsibility of the above mentioned individuals to authorize the resumption of work. In some cases this will be followed by in-depth further review to address the situation and ensure that correct procedures were followed and the cause for non-conformance has been corrected, along with preventative action taken.

# 12.0 PERFORMANCE AND SYSTEMS AUDITS

## 12.1 REQUIREMENTS FOR AUDITS OF LABORATORY OPERATIONS

### 12.1.2 INTERNAL AUDITS

#### 12.1.2.1 Internal Systems Audit

Internal systems audits should be conducted as the complement to implementation and use of internal SOPs and Quality Plans, in order to assure good Quality Assurance management practices.

In general, procedures for conducting internal audits should be developed according to the following guidelines:

a. Schedule systems audits to occur with routine frequency. Annual auditing of all lab operations is a minimum recommendation. Audits of selected systems may be staggered throughout the year to accomplish this goal.

b. Develop a standardized protocol and list of minimum requirements which will constitute the style and scope of the audit and which will provide the criteria list by which operational deficiencies can be detected. These protocols and criteria should reflect the intent of all internal SOPs and Quality Plans, and should at a minimum conform to all regulatory requirements for procedures and documentation. The use of standardized audit forms and checklists is recommended.

c. Designate appropriate personnel as Quality Assurance staff and charge these officials with auditing responsibility and authority, preferably independently of and lateral to the chain of authority responsible for laboratory operations.

d. Encourage all staff members to adopt good Quality Assurance practices, at all levels of the organization and to perceive audits as an educational opportunity.

The scope of internal systems audits of lab operations should include, but is not limited to the proper execution of:

a. Electronic and paper documentation and filing associated with sample and data handling and all ancillary or support procedures, to include procedures employed to track all records pertinent to any sample results.
b. All sample log-in, trafficking, log-out and disposal.
c. Sample preparations.
d. Calibrations.
e. Sample analyses.
f. Data reduction, validation and reporting.
g. Standard and reagent preparation and storage.
h. Waste disposal and segregation.
I. Non-contaminating practices and the design/maintenance of non-contaminating laboratory environments.
j. Container and labware decontamination and storage.
k. Preventative maintenance and repair procedures.
l. QC management practices and assessment of analytical precision, accuracy and sensitivity.
m. proper promulgation and execution of established written procedures.

12.1.2.2 Requirements For Internal Performance Audits

Conduct blind, internal performance audits on all analytical systems. These audits shall be conducted at least annually.

General requirements for internal performance audits are:

a. QC samples of certified assay from external sources or vendors, or internally prepared QC check samples can be used. Routine samples may also be utilized for the audit.
b. Samples may be composed in artificial matrices such as analyte-free laboratory water or in other matrices whose characteristics are well delineated and can be consistently controlled from sample to sample.
c. Analysts whose systems are to be audited shall not be made aware of the intent to audit the parameter(s) in order to audit the routine practices in the laboratory. They may be informed of the nature of the samples, or the audit samples may be inserted into the routine laboratory sample analysis without the knowledge of the applicable analysts.
d. Replicated analysis of the audit samples is discretionary. However, all routine QC procedures and sample handling procedures must be followed when analyzing performance samples. This is required in order that the performance audit may best represent the actual routine operations for the system.
e. Any corrective action taken must be completed within ninety days of an internal audit.

12.1.2.3 Documenting and Reporting Internal Audits

Document all aspects of the audit. Retain all standard forms used in the audit, as well as all notes and final reports. Distribute audit reports or deficiency lists and corrective action orders to appropriate management staff affected, and verify execution of satisfactory corrective actions with follow-up documentation (see Section 11). Provide copies of all of the above to all staff at all levels involved in the audit or whose system area was affected. The following may also be included in all documentation and reports:

a. Audit dates.
b. Auditor names.
c. Systems audited.
d. Parameters analyzed in performance audits.
e. Analysts involved in performance audits.
f. Personnel interviewed for systems audits.
g. All supporting documentation solicited or submitted in support of any systems, performance or data-package audit.
h. Narrative description or report of findings, including summary charts and tables.
I. Report condensations for executive summaries.
j. Statistical evaluation report for performance audit analytical results.
k. Recommended or required corrective actions.
l. List of personnel for report distribution and follow-up responsibilities associated with corrective actions.

## 13.0 GENERAL MANAGEMENT RESPONSIBILITIES

### 13.1 Client Complaints

The laboratory shall operate from a standard operation procedure for responding to client complaints. The procedures include provisions for conducting an internal audit of laboratory operations that are called into question by the client. If audit findings cast doubt on the correctness or validity of the laboratory's calibrations or test results, the laboratory shall take immediate corrective action and shall immediately notify in writing, any client whose work may have been affected. The laboratory will maintain a record of complaints and subsequent actions to resolve the complaint. Laboratory management shall review feedback from clients and corrective actions in response to client complaints.

The laboratory shall address client complaints through the following steps:

1) Obtain precise definitions of the complaint.

2) Complaints regarding issues other than reported data will be reviewed on a case-by-case basis by management.

3) Complaints regarding reported results or procedures will initiate internal audit:
   (a) Review all quality control checks.
   (b) Check for consistency and any obvious anomalous values.
   (c) Check for clerical errors, transposed numbers and accurate data transfer.
   (d) Verify that the sample ID numbers are correct and consistent with the chain of custody.

4) If the internal audit is not satisfactory or, if the client requests, then a reanalysis will be conducted:
   (a) Reanalyze the same sample if within hold time requirements.
   (b) Collect a new sample and reanalyze.

5) Client complaints will be documented as case narratives.

## 13.2 <u>Confidentiality and Proprietary Rights</u>

The laboratory does not currently conduct work requiring high security (i.e. National security). The laboratory will maintain this standard operating procedure to ensure that client's confidential information and proprietary rights are not compromised. Client confidentiality will be retained through the following procedures:

a) Employees will be cautioned to avoid discussing laboratory business in social circles.

b) Employees will be cautioned to avoid discussing laboratory business in front of other visiting clients in the laboratory.

c) Reporting operations will carefully check mailings to ensure results are mailed to the correct clients.

d) Discarded reports will be submitted to a paper shredder.

e) Client results will not be discussed with other clients or compliance agencies without written permission of the client.

f) Data will not be transferred electronically without request from the client.
g) Electronically transmitted data that is sent via facsimile or other electronic means must include a blanket statement that is used to protect the confidentiality of client information sent in error.

h) Client ID's will be removed from copies of worksheets when a client requests a copy of raw data.

## 13.3 Personnel Training Processes/Procedures

13.3.1 Undue Pressure on Employees
All personnel are required to notify the laboratory of any outside burdens or conflicts that may adversely affect the quality of their work (i.e. secondary employment, self-employment, internship, etc.) by completing a Secondary Employment Form.

13.3.2 Technical staff members shall have the education and experience to demonstrate specific knowledge of their duties, laboratory operations, test methods, QA/QC procedures and records management.

The training process will operate from a documented standard operating procedure with the following components:

a) Technical degree.

b) College level technical courses completed.

c) Initial demonstration of capability.

d) Verification of familiarity with latest version of laboratory's quality manual relating to his/her responsibilities.

e) Verification that the most recent version of the test method or SOP has been read.

f) Demonstration of continued proficiency.

g) Verification of advisement of ethical and legal responsibilities.

h) Attendance of training courses or workshops on specific equipment, analytical techniques or laboratory procedures.

13.3.3 Demonstration of Capability

As a part of data validation, lab analysts are required to demonstrate that they can properly follow test method protocol. Therefore, an Initial Demonstration of Capability (IDC) must be completed by each analyst prior to first use of a given test method and at any time there is a change in test method or instrumentation related to the test method. In addition to the IDC, a Continuing Demonstration of Capability (CDC) must also be completed by the analyst on an annual basis following the IDC.

Method requirements for demonstrations of capability, if given, will be followed unless an analyte cannot be spiked (i.e. coliforms, pH, etc). If an analyte cannot be spiked, then correct analysis of four duplicate quality control samples within the laboratory's acceptance criteria will be acceptable. A passed proficiency test may also be used as a continued demonstration of capability.

## 13.4 Mechanisms for Reviewing New Work Relative to Facilities and Resources

The laboratory has the following procedure for reviewing all new work to ensure that it has the appropriate facilities and resources before commencing such work.

Evaluate whether:

a) The laboratory has the correct method certifications to meet compliance requirements of the client's permit.

b) Evaluate the time-line expectations of the client relative to the ability of the laboratory to meet the client's expectations.

c) Evaluate the laboratory's current operating effectiveness,
- Data integrity
- Corrective actions
- Customer complaints
- Proficiency testing results

d) Evaluate whether the space and type of space is appropriate for the new work.

e) Evaluate whether sufficiently trained personnel are currently available for assignment to new work.

f) Evaluate whether currently available equipment has the capacity and correct performance for new work.

## 13.5 Legal and Ethical Responsibilities of Employees

The Code of Conduct shall apply to all directors, officers and personnel in the laboratory and its purpose is to articulate Company standards of conduct and to provide guidance to employees in discharging their obligations under this Code.

a) The Company will not tolerate unlawful, improper or unethical conduct, or the appearance of impropriety by an employee. Employees are expected to use good judgement in a legal and ethical manner consistent with the standards established by the Code, in all their dealings on behalf of the Company. Each employee must use common sense and his/her own judgement in applying these standards to specific situations that may arise.

b) Company employees have their first business responsibility to the Company and are expected to avoid any activity that may affect their ability to impartially perform contract work.

c) Employees should not become involved in any activity that results in or may result in obtaining or acquiescing in the unauthorized receipt of competitor's confidential bid/proposal information.

d) Employees are strictly prohibited from engaging in any fraudulent conduct (including deceit, deception, concealment, breach of trust and any other act of dishonesty). All employees are expected to obey the law in this area and to deal fairly and openly in all business relations.

e) Company employees should not promise future employment or business opportunities to a procurement official or give anything of value to a procurement official. Both state and federal criminal statues strictly prohibit bribery, dispensing of gratuities and sub contractor kickbacks at the workplace.

f) The Company reserves the right not to employ close relatives of officers, or other high level employees of customers including competitors, or others with whom the company deals with, to avoid the appearance of conflict of interest, or to protect confidential information.

g) Any employee who knows of or suspects an unethical or prohibited practice has a duty to immediately report the incident to his/her supervisor. The Company will not tolerate violation of the Code of Conduct by any director, officer or employee and disciplinary action, up to and including dismissal, may result from any violation of this Code.

## 13.6 Departures from Documental Policies and Procedures

The laboratory performs work, (under special request from clients) that is not for compliance reporting. In some cases, work will be performed under procedures supplied by the client or under modified procedures that do not meet compliance requirements. This work will be conducted in the following way:

1) Samples will be provided unique log-in ID's in the same manner as compliance samples.

2) Those parameters using non-compliance procedures, will be marked as "non-compliance" on the chain of custody.

3) Containers will be marked as "non-compliance".

4) Routine, repeat out-of-compliance work will be collected in separate notebooks or files.

5) If the procedure for a non-compliance sample departs from documented procedures and is recorded in a compliance workbook, then that data will be noted in the margin as "non-compliance".

6) The final report will not contain reference to Benchmark's certification numbers.

# 14.0 Data Integrity Plan

## 14.1 Training

The laboratory manager will present all new hires with a training session about Benchmark's Data Integrity Plan. This training will include the following:

a. Emphasis on the need for honesty and full disclosure in all analytical, reporting and record keeping.
b. After the new hire has read the laboratory SOP's, the manager will review these SOP's with respect to proper procedure and adequacy of record keeping. Examples of unethical behavior as related to data manipulation will also be discussed. Such examples may include, but are not limited to the following:
    1. Not running samples, but fabricating the results based on previous tests from the client.
    2. Not running Dilution Water through for the blanks in membrane filtration analysis, but just placing the filter directly in the petri dish.
    3. Manipulating any computer generated curved to force the spike or standard to be correct.
    4. Running a sample out of hold time, but writing a time in the logbook to make it appear that the sample was run within hold time.
c. New hires will be informed that all reports and data are subject to in-depth review.
d. It will be disclosed that any infractions found will be investigated. Any violations found may result in disciplinary action, immediate termination, and/or prosecution.

e. It will be explained that any violations they witness should be immediately reported to a senior staff member or the Quality Assurance Supervisor. These reports will be kept confidential. Violations can also be anonymously reported by placing a written explanation of the violation in the locked suggestion box in the laboratory. Only the individual responsible for the laboratory checks this box.

### 14.2 Signed Data Integrity Documentation

The new hire will sign a training roster, indicating that they have received the training and that they will not engage in any unethical practices concerning data integrity. Also, that they will not tolerate such practices from others.

### 14.3 Monitoring of Data Integrity

1. The Quality Assurance Officer may randomly audit data reports.
2. The QA Officer may also submit blind samples to the laboratory as a means to verify that the data integrity requirements are being met.
3. If any violations or ethical concerns are found, laboratory management will be informed and a detailed investigation will be conducted.

### 14.4 Data Integrity Procedure Documentation

1. If any data integrity incidents occur, they must be documented along with the investigative findings and any disciplinary actions. Also any disclosure to clients and the eventual outcome will be recorded.
2. To ensure confidentiality, locked file cabinets may be used and key electronic files, such as SOP's, will be password protected.
3. Any and all records will be maintained for seven years.
4. The data integrity procedure will be reviewed annually by senior management and updated as needed. The senior management will sign off on the Training Roster.

## 15.0 Laboratory Document Filing and Storage

### 15.1 Sample Submission Chains of Custody

Chains of custody are to be stored in a file box labeled: BEAN or BEAS, COC's and shall include the month and year for each set of Chains placed in the box. A month of Chains shall be added to the box at the end of the month, until the box is full.

### 15.2 Raw Data

Raw data may include workbooks and bench sheets. They are to be stored in a box labeled with (for example): Raw Data Notebooks-BEAS- the test methods- and the dates of use. Multiple test methods may be kept in the same box. Retired workbooks going into the box will have the start and end dates of use on the front page of the workbook.

### 15.3 Reported Data

a. The reports for the current year from January 1st to December 31st will be kept in folders in the file cabinets in the office. The folders will be labeled with the client's name and time period of reports in that folder. The time period may be weekly, monthly, yearly, or any other appropriate time frame for that client. The folders will be stored alphabetically A-Z by the client's name. Individuals will be filed by last name. If the name starts with "the", use the next word. Also if the client is "City of", file them by their city name.

b. The reports from the previous year will be moved to file boxes and kept in alphabetical order. These boxes will be labeled (for example): BEAS- the year- and the client's name. Note that smaller clients can be grouped in a box labeled A-Z (or whatever letters are appropriate). Only the previous year's report file boxes will be kept in the lab area. Other years will be moved to the Benchmark storage facility. Accessing the archived reports must be logged into the Archive Access Log. If the laboratory closes or is sold, clients must be informed and given the choice as to what they want done with their reports.

### 15.4 Equipment Monitoring Records

The current and previous year's logs are kept in the Equipment Monitoring Logs. Old logs are filed in a box labeled (for example): BEAS – Equipment Logs – and the year. Maintenance and service logs are kept with that piece of equipment either in the binder or in the file box.

### 15.5 Disposal Records

A log will be kept of samples that are disposed. This log will include the sample number, date of disposal, place disposed of, and initials. There is a clipboard for the individual sheets and then they will be transferred to a binder, when necessary, or filed electronically.

### 15.6 Quality Control Records

Correspondence logs and exception logs will each be filed by year in the "Misc." file. The Fax confirmation sheets will be stored each month in a file box labeled with "Fax Confirmations", BEAS, and the month and year of each set of confirmations in the box. They may also be filed electronically. Precision criteria records are stored in the computer in the "D" drive in the Precision Criteria file in the BEAS folder. For BEA, these files are kept electronically via SentryFile.

### 15.7 Personnel Records

Records for current and former employees are kept confidential and stored with the laboratory owner's records.

### 15.8 Receiving Records

Commercial reagents and standards and consumables received by the lab are recorded on the appropriate clipboard. Standards are also recorded in the "Commercial Standards Receipt Log". Laboratory prepared reagents and standards are recorded on their preparation log sheet in the "Laboratory Reagent Preparation Log".

--------------------------------- END OF MANUAL ---------------------------------

## APPENDIX A-1

## DEFINITIONS

The following definitions are used by Benchmark EA, Inc. and Benchmark South. Employees are encouraged to use these terms as defined.

**µmho** – Unit of measurement used when analyzing samples for specific conductivity. One µmho is equal to one µS.

**Acceptance Criteria** – The numerical limits prescribed for accepting or rejecting generated data.

**Accuracy** – The degree of agreement of a measurement with an accepted reference or true value

**Aliquot** – Portion of a sample or standard prepared in accordance with prescribed criteria.

**Ambient Temperature** – For the purposes of this laboratory, the surrounding room temperature of the laboratory (~20-25°C).

**Analytical Bias** - The consistent appreciable noise observed in a method which is greater than zero.

**Analytical Set** - The basic unit for analytical quality control. Also known as sample set or analytical batch. The analytical set is defined as samples which are analyzed (or sampled together) with the same method sequence, the same lots of reagents and with the same treatment common to all samples. The samples must have been analyzed (or collected) within the same specified time period or in continuous sequential time periods. Samples in each set should be of similar composition.

**Apparent Color** - The color of water resulting from the presence of dissolved substances, which absorb light. Only applies to samples that have not been filters.

**Aqueous** – Laboratory testing matrix defined as an aliquot of sample consisting mostly of water. Any fresh water laboratory samples, <20% solid, are aqueous, i.e. ground, drinking and some surface water (<5ppt salinity) samples.

**Audits** - A systematic check to determine the quality of the operation of some function or activity.

Performance Audits - Quantitative data are independently obtained for comparison with routinely obtained data in a measurement system. Examples of these audits are EPA performance evaluation programs, commercial performance evaluation programs, split sampling program involving at least two laboratories, blind spike samples.

Systems Audits - These are qualitative in nature and consist of an on-site review and evaluation of a laboratory or field operations quality assurance system and physical facilities for sampling, calibration and measurements.

Project Audits - These consist of an independent review of all sampling and analytical activity records that are associated with a specific project or event to determine if the resulting data are valid and acceptable. Enough documentation must be available so that a reviewer is able to reconstruct the history of the samples from time of sample collection (or sample container acquisition) through final results and sample disposal.

**Brilliant Green Lactose Bile Broth (BGB)** – The culture medium used during the total coliform confirmed phase of the MPN and MF techniques.

**Calibration** - Process by which the correlation between instrument response and actual value of a measured parameter is determined. Calibration Curve: A curve which plots the concentration of known analyte standards against the instrument response to the analyte. Also known as a Standard Curve.

**Calibration Standard** (**CALSTD**) - A solution prepared from the primary dilution standard solution or stock standard solutions and the internal standards and surrogate analytes. The **CALSTD** solutions are used to calibrate the instrument response with respect to analyte concentration.

**Quality Control Sample** (**QCS**) – A solution of method analytes of known concentrations that is used to fortify an aliquot of **CALBLK** or when appropriate the **METHBLK.** The **QCS** is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory performance with externally prepared test materials, ie. "Second Source" and is typically half the concentration of the highest standard in the curve.

**Laboratory Check Standard** (**LCS**)- A solution of analytes prepared in the laboratory by adding appropriate volumes of the Stock Standard Solutions to reagent grade water. Typically there are three **LCS** per analytical run: low, medium, and high in concentration that span the range of the calibration curve.

**Calibration Blank** (**CALBLK**) – A volume of reagent grade water fortified with the same matrix as the calibration standards, but without the analytes, internal standards, or surrogates.

**Chemical Waste** - Includes sludge and residual from domestic or industrial wastewater processing, and liquid or solid chemicals that are no longer used for its intended purpose.

**Chlorophyll a** (***chl a***) – A photosynthetic pigment present in all green plants, including planktonic algae. It is known to 1 to 2% of the dry weight of the algae. It can be quantitatively measured to estimate the biomass of phytoplankton.

**Chromogenic Substrate** – Used in microbiological testing to detect the presence of an enzyme, ß-D-galactosidase. When ß-D-galactosidase is present the enzyme substrate reaction causes chromogen to be released resulting in a color change. The color change indicates the presence of total coliform bacteria.

**Colilert®** – One brand of reagent used for the Enzyme Substrate Test. See MMO-MUG.

**Colloidal Matter** – Finely divided organic or inorganic matter; examples include clay, silt, plankton, microscopic organisms, etc.

**Colorimetric** – A laboratory method used to analyze certain chemical properties by measuring color spectrophotometrically.

**Community Water System** – A public water system that serves at least 15 connections used by year round residents or regularly serves at least 25 year round residents.

**Confidence Level** - The statistical probability associated with an interval of precision (or accuracy) values in a QC chart. The values of confidence intervals are generally expressed as percent probability. It is a commonly accepted convention that the result being tested is significant if the calculated probability is greater than 90 percent, and is highly significant if the probability is greater than 99 percent.

**Confluent Growth** (**CFG**) – A continuous bacterial growth covering the entire filtration area of a membrane filter or a portion thereof, in which bacterial colonies are not discrete.

**Contaminant** – Any physical, chemical, biological or radiological substance, or matter in water.

**Correction Factor** – A substitution factor used to compensate measurements of instruments not in agreement with traceable standards.

**Correlation coefficient** ($r^2$) – value obtained through linear regression of calibration standards.

**Data Quality** - The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability. These characteristics are defined as follows:
Representativeness - Expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
Comparability - Expresses the confidence with which one data set can be compared to another.

**Data Quality Objectives** - A set of specifications that the environmental data must meet in order to be acceptable for its intended use in a program area. DQOs are commonly established for limits of detection and quality of data (precision, accuracy, representativeness and comparability).

**Deionized Water** (**DI**) – Water used by the laboratory that has ions and particulates (turbidity and microorganisms) removed by means of a purification system.

**Detection Limits** - The smallest concentration/amount of an analyte of interest that can be measured with a stated probability of significance. Detection limits must be further defined as:
Instrument Detection Limit - The smallest amount of an analyte of interest that generates an instrument response (signal) under prescribed conditions such that the magnitude of the signal is larger than the absolute uncertainty (error) associated with it.

**Drinking Water** (**DW**) - Water intended for human consumption, dermal contact, culinary purposes or dishwashing as approved by the Florida Department of Health.

**EC Broth** (**ECB**) – The culture medium used during the fecal coliform confirmed phase of the MPN and MF techniques.

**EDTA** – Aka ethylenediamine tetraacetate.

**Environmental Sample** - Means any sample from a natural source or source that may reasonably be expected to contribute pollution to or receive pollution from ground waters or surface waters of the state. This includes, but is not limited to: receiving waters; waters used to define natural background conditions; soils; sediments; industrial, domestic or municipal discharge effluents; chemical storage or handling facilities; waste disposal facilities or areas; industrial or agricultural chemical handling or application areas; surface water run-off; and facilities for handling or applying of chemicals for weed or insect control [definition per Rule 10D-41.101(7), F.A.C.].
Parent Sample - Refers to a sample from which aliquots are taken for testing purposes.
Subsample - Refers to any derivative obtained from a sample. These include, but are not limited to: aliquots; filtrates; digestates; eluates; fractions; extracts; reaction products; supernatants; etc.

**Enzyme Substate Coliform Test** – See chromogenic and fluorogenic substrate definitions for an example.

**Equilibrium** - A state of balance between opposing forces or actions that is either static (as in a body acted on by forces whose resultant is zero) or dynamic (as in a reversible chemical reaction when the rates of reaction in both directions are equal).

**Field Duplicates** – Two separate samples collected at the same time and placed under identical circumstances and treated exactly the same throughout field and laboratory procedures. Analyses of field duplicate indicate the precision associated with sample collection, preservation, and storage, as well as with laboratory procedures.

**First draw sample** – A one-liter sample of tap water that has been standing in plumbing pipes uninterrupted, for at least 6 hours and is collected without flushing the tap.

**Fluorogenic Substrate** – Used in microbiological testing to detect the presence of an enzyme, ß-glucuronidase. When ß-glucuronidase is present the enzyme substrate reaction produces a substance to be released resulting in fluorescence at 366nm of UV light. The fluorescence indicates the presence of *Eschericia coli (E. coli)* bacteria.

**Gravimetric** – A laboratory method used to analyze certain chemical properties by measuring mass.

**Ground water under the direct influence of surface water (GWUDI)** – Any water beneath the surface of the ground with significant occurrence of insects, macroorganisms, algae, large diameter pathogens (i.e.*Giardia lamblia* or *Cryptosporidium),* significant and rapid shifts in water characteristics (i.e.turbidity, temperature, conductivity or pH) which closely correlate to climatological conditions.

**Ground Water** (**GW**) - Any water that comes from beneath the surface of the ground. Includes all waters found below ground in confined or unconfined aquifers.

**Haloacetic acids (five) (HAA5)** – The sum of the concentrations in milligrams per liter of the haloacetic acid compounds, there are five: monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid and dibromoaceticacid, rounded to two significant figures after addition.

**Halogen** – One of the chemical elements: chlorine, bromine or iodine.

**Heterotrophic Plate Count (HPC)** – Formerly known as the standard plate count (SPC). A microbiological procedure for estimating the number of heterotrophic bacteria in water and measuring changes during water treatment and distribution. Unless stated otherwise, HPC refers to method (9215 A&B), the pour plate method, as set forth in Standard Methods for Examination of Water and Wastewater, American Public Health Association, 22nd Edition, 2012, pp. 9-49 to 9-54.

**Humic Material** – Derived from humus, which is a dark material resulting from partially decomposed plant or animal matter.

**Interferents** – Substances present in a sample that may interfere with the final outcome of a laboratory procedure.

**Ion-selective electrode** (ISE) - an electrode that is used to measure the concentration of a specific ion in a solution by use of an ion-selective membrane.

**Kjeldahl Nitrogen, Total** – Sum of organic nitrogen; ammonia ($NH_3$) and ammonium ($NH_4^+$) in the chemical analysis of soil, water, or wastewater. To calculate Total Nitrogen (TN), the concentrations of nitrate-N and nitrite-N are determined and added to TKN. TKN is determined in the same manner as organic nitrogen, except that the ammonia is not driven off before the digestion step.

**Laboratory Fortified Blank** (**LFB**) – An aliquot of reagent grade water or other blank matrices to which known quantities of the method analytes are added in the laboratory. The **LFB** is analyzed exactly like a sample, and is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements.

**Lauryl Tryptose Broth** (**LTB**) – The culture medium used during the presumptive phase of the MPN and MF techniques.

**Limited Use System** – All water systems that have less than 15 service connections or which regularly serve less than 25 individuals daily at least 60 days out of the year or at least 25 individuals daily less than 60 days out of the year.

**Limited Use Community Public Water System** – Serves 2 or more rental residences or 5 or more non-rental homes. I.e. a triplex with 2 rental units, two rental mobile homes, at least 5 homes connected to the same system or a small group care facility.

**Limited Use Commercial Public Water System** – Serves any non-residential building. I.e. Stores that have the employees at the site or stores that have public access.

**Linear Dynamic Range** (**LDR**) - The concentration range over which the analytical curve remains linear.

**Materials Safety Data Sheet** (**MSDS**) – Written information provided by vendors concerning a chemical's toxicology, health hazards, physical properties, fire, and reactivity data including storage, spill, and handling precautions.

**Matrix** – specified sample type such as Aqueous, Saline, or Solid and Chemical Materials. The characteristic of an environmental or laboratory sample, associated with its physical and chemical properties, which defines how such a sample is handled when subjected to the intended analytical process.

**Matrix Duplicate** (**MD**) – Two aliquots of the same sample that are treated exactly the same throughout laboratory procedures

**Matrix Spike** (**MS**) – An aliquot of an environmental sample to which known quantities of method analytes are added in the laboratory. The **MS** is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the **MS** corrected for background concentrations.

**Matrix Spike Duplicate** (**MSD**) - A second aliquot of a solid matrix sample to which known quantities of method analytes are added in the laboratory. The **MSD** is analyzed exactly like the matrix spike, and its purpose is to determine the precision between the two spikes.

**Maximum Contamination Level (MCL) –** The maximum permissible level of a contaminant in water, which is delivered to any user of a public-water system.

**Membrane filter technique** (**MF**) – A microbiological procedure for estimating the number of bacteria present in a sample. This laboratory conducts the MF procedure for the following bacteria: total coliform, fecal coliform, Fecal streptococcus and Enterococcus. Unless otherwise stated MF refers to method (9222 A, B&D and 9230C), as set forth in Standard Methods for the Examination of Water and Waste Water, American Public Health Association, 22nd edition, 2012.

**Method Detection Limit (MDL) -** The smallest amount of an analyte of interest that can be measured and reported with 99% confidence that the concentration is greater than zero.

**m-Endo** – The growth medium used to cultivate total coliform bacteria for the membrane filtration method. Available in agar or broth.

**Method Blank** (**METHBLK**) – An aliquot of reagent grade water or other blank matrices that are treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The **METHBLK** is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

**m-FC** – The growth medium used to cultivate fecal coliform bacteria for the membrane filtration method. Available in agar or broth.

**MMO-MUG** - Also known as the Enzyme Substrate Test. A microbiological procedure used for the simultaneous detection of total coliform and E. coli. Unless stated otherwise, MMO-MUG refers to method (9223 A&B), as set forth in Standard Methods for Examination of Water and Wastewater, American Public Health Association, 22nd Edition, 2012.

**Most Probable Number** (**MPN**) – The reporting unit per 100mL that is the estimation of bacterial density used for the Multiple Tube Fermentation technique. For the purposes of this laboratory the terms MPN and Multiple Tube Fermentation are analogous.

**Multiple Tube Fermentation** – A microbiological procedure for estimating the number of Enterobacteria present in a sample. This laboratory conducts the Multiple Tube procedure for the following bacteria: total coliform and fecal coliform. Unless otherwise stated Multiple Tube Fermentation refers to method (9221A, C&E), as set forth in Standard Methods for the Examination of Water and Waste Water, American Public Health Association, 22nd edition, 2012.

**Nesslerization** – The addition of Nessler's reagent to a sample aliquot that yields a gold color when nitrogen is present.

**Non-Community Water System –** A public water system that is not a community water system i.e. a church. A non-community water system is either a "transient non-community water system " or a "non-transient non-community water system".

**Non-Transient Non-Community Water System** (**NTNCWS**) – A public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

**Organizational Terms**:
Internal - Refers to operations, personnel, documents and protocols within the specified organization.
External - Refers to operations, personnel, documents and protocols from a party that is separate from or outside the specified organization.

**Package Plant** - In order to use less space, treat difficult waste, deal with intermittent flow or achieve higher environmental standards, a number of designs of hybrid treatment plants have been produced. Such plants often combine all or at least two stages of the three main treatment stages into one combined stage.

**Parameter Group** - Is defined as a group of samples that have been preserved in the same manner, prepared by similar protocols and analyzed using instruments of similar technology (also known as analyte group). Examples of parameter groups are:
- Volatiles - (EPA methods 601, 602, and 624)
- Pesticides - (EPA methods 608, 614, 622)
- Trace Metals - (All metals except mercury)
- Nutrients - (Total Kjeldahl Nitrogen, Nitrate + Nitrite, Total Phosphorous)

**Performance Evaluation Samples** - A sample submitted for analysis whose composition and concentration are known to the submitter but unknown to the analyst. Also known as a Blind Sample.

**Pheophytin a** (***phe a***) – A magnesium-free degradation product or derivative of *chlorophyll a.*

**Point-of-entry treatment device (POE) –** Treatment device applied to the drinking water entering a house or building for the purpose of reducing contaminants in the drinking water distributed throughout the house or building.

**Point-of-use treatment device (POU) –** Treatment device applied to a single tap used for the purpose of reducing contaminants in drinking water at that one tap.

**Potentiometric** - The apparent equivalence point of a titration at which a relatively large potential change is observed.

**Potentiometric Surface** - An imaginary surface formed by measuring the level to which water will rise in wells of a particular aquifer. For an unconfined aquifer the potentiometric surface is the water table; for a confined aquifer it is the static level of water in the wells. (Also known as the piezometric surface.)

**Practical Quantitation Level (PQL)** - The smallest concentration of an analyte of interest that can be reported with a specific degree of confidence. Per Benchmark EA's Quality Manual, this value is twelve times the standard deviation of the replicate analyses.

**Precision** - A measure of mutual agreement among individual measurements of the same property.

**Primary Dilution Standard Solution (PDS)** – A solution of several analytes prepared in the laboratory from stock standard solutions and diluted as needed to prepare calibration solutions and other needed analyte solutions.

**Public Water System –** A system that provides water to the public for human consumption through pipes or other conveyances, if such a system has at least 15 service connections or regularly serves an average of 25 individuals daily at least 60 days out of the year. A public water system is either a "community water system" or a "non-community water system".

**Qualifiers** - These codes shall be used by laboratories when reporting data values that either meet the specified description outlined below or do not meet the quality control criteria of the laboratory. Reference Table 10.2 of this Quality Manual for complete list.

**Quality Assurance** - A system of activities whose purpose is to provide the producer or user of environmental data the assurance that it meets defined standards of quality with a stated level of confidence.

**Quality Plans (QP)** - An orderly assembly of detailed and specific procedures which delineates how data of a known and accepted quality is produced.

**Quality Control** - The overall system of activities whose purpose is to document and control the quality of environmental data so that it meets the needs of the users.

**Quality Control Measures**:
1) Blanks - An artificial sample of an analytical matrix designed to monitor the introduction of artifacts into the system.
   a) Field Quality Control Blanks
1) Field Blanks - Blanks of analyte free water that are prepared on-site by filling appropriate sample containers with the water, adding appropriate preservatives, sealing the containers, and completing the appropriate documentation. These blanks should be prepared during the middle to end of a sampling event by filling sample containers with water from the equipment decontamination water transport containers. They are to be treated, stored, transported, and analyzed in the same manner as the sample group for which it was intended. These blanks may be submitted for all water parameter groups.

2) Equipment Blank - Blanks of analyte-free water that are prepared on-site by pouring the equipment decontamination water through decontaminated field equipment. Appropriate sample containers, for each analyte group must be used, preservatives added, if required, and appropriate documentation must be completed. These blanks are to be stored, transported and analyzed with the intended parameter groups. At least one equipment blank is required for each water and solid matrix analytical group, and must be collected **at the beginning** of the sampling episode. If field decontamination is performed on-site, additional equipment blanks must be submitted for all water and solid matrix analytical groups.
3) Trip Blank - These blanks are required for only VOC samples. Blanks of volatile organic free water that are prepared by the organization that is providing the sample containers. These are transported to the site with the empty VOC sample containers, and shipped to the analyzing laboratory in the same containers as the VOC samples. They remain unopened for the entire trip. Proper labeling and documentation must be completed. A trip blank must be submitted for each cooler that transports VOC samples.

b) Laboratory:

1) Replicate Sample - Samples that have been collected at the same time from the same source (field replicates) or aliquots of the same sample that are prepared and analyzed at the same time (laboratory replicates). Duplicate samples are one type of replicate sample. The analytical results from replicates are used to determine the precision of a system. If the concentration of analytes in the sample are below detectable limits, Duplicate Spike Samples may be used to determine precision. Blind Replicates (Duplicates) are replicates that have been collected (field replicate) or prepared (laboratory replicate) and are submitted and analyzed as separate samples (analyst does not know they are replicates).

2) Quality Control Checks - Standards or samples from an independent source that are analyzed at a specified frequency.

3) Split Samples - Replicates of the same sample that are given to two independent laboratories for analysis.

4) Acceptance Criteria - The numerical limits, prescribed by the approved analytical method or internal data, by which an analytical system is verified. These numerical limits may be generated from internal, historical data using the formula specified in Section 9.2.3.4. Acceptance criteria shall be generated and used for all Quality Control Measures described above. Also known as Control Limits.

**ReadyCult®** - One brand of reagent used for the Enzyme Substrate Test. See MMO-MUG.

**Reagent Water** – A sample of water which conforms to ASTM grades II, III or IV. For the purposes of this laboratory, deionized water used in a chemical reaction, especially one used to detect, measure, or prepare reagents

**Recreational Water** (**RW**) – Samples from a body of water where people swim recreationally i.e. public pool, public beach, public springs, etc.

**Relative Percent Difference (RPD)** - The difference between two sample results divided by their mean and expressed as a percentage.

**Registered Water System** – A commercial entity that does not use it's piped water for consumption, are required to provide bottled water as an alternative. Main uses include hand washing and toilet flushing.

**Saline** (**SA**) - Laboratory testing matrix defined as an aqueous aliquot of sample containing high levels of salts. Any laboratory samples >5ppt salinity are considered saline; examples of this are marina, estuary and seawater samples.

**Sample Custody** - All records and documentation required to trace a sample from point of origin through disposal after analysis. These records must include, but are not limited to:

1) Field notebooks;
2) Field sample ID tags;

3) Laboratory transmittal forms (if applicable);
4) Laboratory sample receipt logs;
5) Sample extraction/preparation logs or worksheets;
6) Analytical (instrument) logs or worksheets;
7) Calibration and quality control data associated with a sample set;
8) Instrument maintenance logs;
9) Sample disposition logs; and
10) Final reports.

Legal Chain of Custody is a special type of sample custody in which all events (i.e. possession, transport, storage, and disposal) and time intervals that are associated with a specific sample must be documented in writing. In addition to the records described above, chain of custody records must include the following:

1) Sample transmittal forms or tags that have adequate spaces for the dated, original signatures of all individuals who handle the sample (or cleaned sample containers if obtained from a contracted laboratory) from time of collection (or container receipt) through laboratory delivery.
2) Laboratory sample storage logs that identify date, time, and individuals who remove samples from storage.
3) Secure, limited access storage areas.

**Sampling Kit** - A set of sampling accessories that has been assembled for a specified use or project. A Sampling Kit may include, but is not limited to: sample containers; sampling equipment (e.g., bailers); sample preservatives, trip blanks; reagent transfer tool (e.g., disposable pipets); calibration standards; indicator papers (e.g., pH paper); or reagents. Sampling Kits shall be subject to the documentation outlined in Section 5.0.

**Sediment** (**SDMNT**) – Surface or subsurface soils and sediments of fresh or salt water origin (i.e. lake, stream, marina, etc.).

**Sensitivity** - The slope of the analytical curve.

**Sludge** (**SLDG**) - A muddy or slushy mass, deposit, or sediment as precipitated solid matter produced by water and sewage treatment processes

**Solid** - Laboratory testing matrix defined as an aliquot of sample consisting mostly of solid, but may have some liquid present. Any laboratory samples >20% solid material are considered solid; examples of this are sludge, digester and soil samples.

**Source Water** – Water as it enters a system.

**Standard Bacteria Sample or "Bacti" -** The standard aliquot, not less than one hundred milliliters (100 ml), of raw or finished drinking water that is examined for the presence of coliform bacteria.

**Standard Methods Agar (SMA) -** The growth medium used to cultivate heterotrophic bacteria for the Heterotrophic Plate Count.

**Stock Standard Solution** (**SSS**) – A concentrated solution containing a certified standard that is a method analyte. Stock Standards are used to prepare secondary or working standards.

**Stoichiometric** - Calculation of the quantities of chemical elements or compounds involved in a chemical reaction.

**Subpart H System** – A public water system using surface water or ground water under the direct influence of surface water as a source that are subject to the requirements of 40 CFR, Part 141 (National Primary Drinking Water Standards), Subpart H.

**Supplier of Water** – Any individual; corporation; company; association; partnership; municipality; State agency, Federal agency or tribal agency that owns or operates a public water system.

**Surface Water** (**SW**) – All water which is open to the atmosphere and subject to surface runoff.

**Threshold Odor** – Method used for measuring the intensity of odor.

**Titrimetric** - A common laboratory method of quantitative/chemical analysis that can be used to determine the unknown concentration of a known reactant.

**Too Numerous To Count** **(TNTC) -** When the total number of bacterial colonies exceed 200 on a 47-millimeter diameter membrane filter. Reported as >200cfu/100mL.

**Total Trihalomethanes** **(TTHM)** - The sum of the concentration in milligrams per liter of the trihalomethane compounds: trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, tribromomethane (bromoform), rounded to two significant figures.

**Transient Non-Community Water System** **(TWS) –** A non-community water system that does not regularly serve at least 25 of the same persons over six months per year i.e. campground.

**True Color** – The color of water once turbidity has been removed.

**Volumetric** – A laboratory method used to analyze certain chemical properties by measuring volume.

**Wastewater** - Includes any influent or effluent associated with domestic or industrial waste treatment facilities.

**Water System** – The mechanical and electrical assembly of one or more pumps, pipes, storage structures, treatment equipment and distribution network meant to provide water to the plumbing of a building or premise.

**Well** - Any excavation that is constructed when the intended use of such excavation is to conduct ground water from a source bed to the surface (by pumping or natural flow) when ground water from such excavation is used for a public water supply system.

# Appendix A-2

## Key Words Associated with Regulatory Language

- **Must**
  Denotes a requirement that must be met.
  This action, activity or procedural step is required.
- **Requirement**
  Denotes a mandatory specification.
  Often designated by the term "shall" or "must".
- **Shall**
  Denotes a mandatory specification.
  Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled.
- **Should**
  Denotes a non-mandatory specification.
  Denotes a guideline or recommendation whenever noncompliance with the specification is permissible.
  This action, activity or procedural step is suggested but not required.
- **May**
  Denotes permitted action, but not required action.
  This action, activity or procedural step is neither required nor prohibited.
- **And**
  together with, along with, in addition to, as well as
- **Or**
  Used as a function word to indicate an alternative.
  Used to connect different possibilities.
  Used to link alternatives.

# APPENDIX B

## Selected References

Quality Control/Quality Assurance

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