

Southeast Coast Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure 2.2.07

Estuarine Water-Quality Monitoring Data Management and Database Technical Documentation—Version 2.0

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Summary

This standard operating procedure (SOP) provides instructions for the development, maintenance, and distribution of monitoring data associated with the protocol for estuarine water-quality monitoring in the Southeast Coast Network. All fixed-station water-quality monitoring data (e.g., calibration data, field data sheets, Sonde data, and discrete nutrient data) will be stored in the SECN data management system. It is the responsibility of the network data manager and water-quality protocol lead and staff to be thoroughly familiar with the standards and procedures within the protocol and companion SOPs, and ensure this SOP is updated to reflect any substantial changes made to that plan. All proposed changes to this SOP must be routed through the data manager for approval.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
May 2021	Wright, Flanders	Updated with new methods and reference material	New database. New user interface.	2.0

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Overview

The Southeast Coast Network (SECN) Estuarine Water Quality Monitoring Database (EWQD) consists of an SQL Server back-end database and a Microsoft Access front-end user interface. Both applications can be accessed by multiple users simultaneously.

The database manuals (SOP 2.2.10 *Fixed-station Discrete Water-Quality Data Entry, Processing and QA/QC* [Starkey et al. 2021a] and SOP 2.2.11 *Park-wide Assessment Data Entry, Processing and QA/QC* [Starkey et al. 2021b]) provide documentation and instructions for using the database module created using Microsoft Access, Microsoft SQL, and Microsoft Report Builder. This database module consists of two primary components: data entry and storage, and data application and reporting. The data entry component is designed for the manual entry of associated field (e.g., calibration data sheets) and lab data (e.g., nutrient and chlorophyll *a* results and associated field QA/QC sample data). The application component includes all subsequent data analysis and data reporting required for both internal and external use. This data management SOP provides a general overview of the functionality of the database.

Expected Audience

This SOP is written specifically for the data manager and data interns, protocol lead, project crew members, and cooperating partners who desire to build data management solutions to support implementation of the SECN (or similar) protocols. In all cases, it is intended that this SOP will reduce the overall time needed to accomplish required tasks. To accomplish this goal:

- Data managers need to read the entire SOP and be familiar with all aspects of the document. Data managers will be looking for ways to improve the system but must first understand the system being used.
- Protocol leads are responsible for understanding and fulfilling the data stewardship tasks, as well as ensuring that anyone under their supervision understands and fulfills their assigned responsibilities.

Data Stewardship and Data Workflow

Three data sets are being collected as a part of estuarine water-quality monitoring: continuous data being gathered by permanently deployed data sondes, monthly discrete data collected at a subset of those stations, and park-wide data collected in probabilistic studies that occur on a rotation. The park-wide studies include water-quality and sediment condition data. Continuous data are managed and stored in Aquarius and will not be addressed as part of this data storage system (see SOP 2.2.09 *Fixed-Station Continuous Water-quality Data Entry, Processing, and QA/QC* [Starkey et al. 2021c]). However, storage of QAQC information for deployment and retrieval of continuous data loggers (data sondes) is included in this data structure. An overview of the data management processes associated with the monitoring is shown in Figure 1.

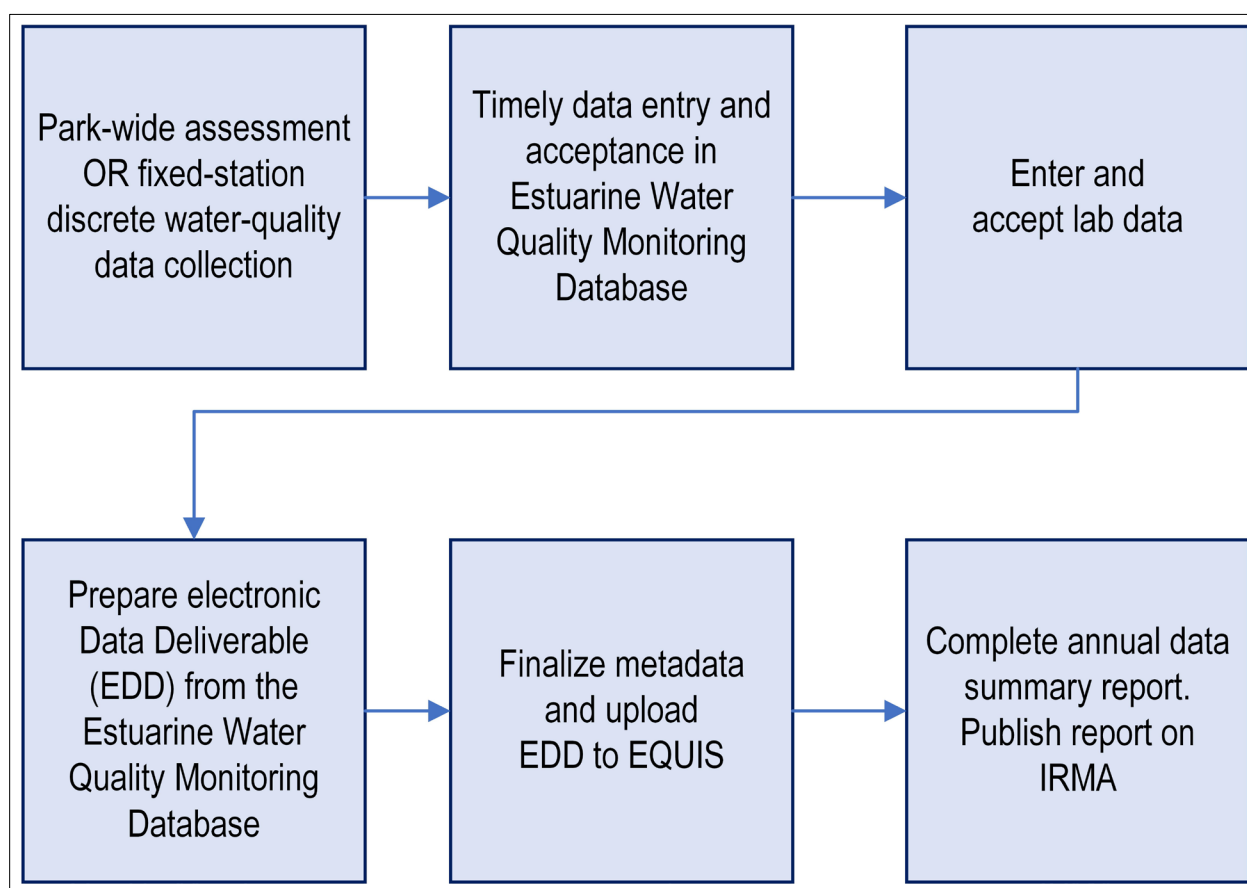


Figure 1. Estuarine water-quality monitoring workflow diagram.

Fixed Station

Fixed-station water-quality monitoring and discrete nutrient sampling are currently being conducted at the following park units: Cape Hatteras National Seashore (CAHA), Cape Lookout National Seashore (CALO), Canaveral National Seashore (CANA), Congaree National Park (CONG), Cumberland Island National Seashore (CUIS), Fort Matanzas National Monument (FOMA), Fort Pulaski National Monument (FOPU) and Timucuan Ecological and Historic Preserve (TIMU). Upon

return from the field, original paper field data sheets are entered into the SECN data management system using the Microsoft Access user interface by the water-quality technician or other staff member. Prior to submitting the data to the database, field crews will recheck the field data forms against the digital entries to ensure the data are complete and accurate. The protocol lead or hydrologic technician will validate or accept (data QA/QC review) the data set in the SECN data management system within 90 days post-sampling. Details about data processing levels can be found in SOPs 2.2.09 (fixed-station continuous data), and 2.2.10 (fixed-station discrete data; Starkey 2022a, b).

Pre- and post-deployment data will be entered into the SECN data management system within 30 days of sampling (approximately once a month). Additionally, data sonde files are downloaded from the data sondes and stored on the SECN server at

S:\Monitoring\EstuarineWaterQuality\FixedStation\Data\Sonde Data. Data resulting from the discrete nutrient samples collected and sent to the laboratory for analysis will be entered within 30 days of receipt from the lab. Files received from labs are stored at

S:\Monitoring\EstuarineWaterQuality\FixedStation\Data\Lab Nutrient Data.

Data are entered by the hydrologic technician(s), or other designated water-quality staff. Paper field forms are scanned and archived by the hydrologic technician following data entry. Hard copies of paper forms are stored in the Athens network location, and scanned field data sheets are stored on the SECN server at S:\Monitoring\EstuarineWaterQuality\FixedStation\Data\Sonde Data. After data have been entered, data verification and validation (data acceptance) are completed and reviewed by the protocol lead.

Park-wide Assessments

Southeast Coast Network park-wide assessments will occur once every five years at seven units within the network: Canaveral National Seashore, Cape Hatteras National Seashore, Cape Lookout National Seashore, Cumberland Island National Seashore, Fort Matanzas National Monument, Fort Pulaski National Monument, and Timucuan Ecological and Historic Preserve. Cape Hatteras and Cape Lookout National Seashores will be included as one study design since the park boundaries on the estuarine side are limited in size, and virtually the same water body is being sampled throughout (Albermarle-Pamlico Sound). Although water-quality parameters will be sampled and assessed on a five-year rotating basis, sediments will be sampled on a 10-year rotating basis. This decision was made due to the overall cost of sediment analysis, and the typical slow rate of change expected in the measured parameters.

For each survey, 30 base sites and 30 alternate sites are randomly selected using protocols developed by the EPA (Stevens 1997; Stevens and Olsen 1999; Stevens and Olsen 2004). Alternate sites are used when appropriate according to EPA field protocols (EPA 2014). After each round of sampling (one to two weeks per year in July and/or August) pre-calibration, post-calibration, sampling event, and field data will be entered into the SECN data management system within 30 days. Prior to submitting the data to the database, field crews will recheck the field data forms against the digital entries to ensure the data are complete and accurate. Data resulting from nutrient and sediment samples collected and sent to the laboratory for analysis will be entered within 30 days of receipt

from the lab. Following these guidelines, no more than 90 days should pass from data collection in the field to data certification (data QA/QC review) in the SECN data management system. Details about data processing levels can be found in SOP 2.2.11 (park-wide assessments; Starkey 2022b).

Data are entered by the hydrologic technician or other designated water-quality staff. Paper field forms are scanned and archived by the hydrologic technician following data entry. Hard copies of paper forms are stored in the SECN Athens headquarters, and scanned field data sheets are stored on the SECN server at S:Monitoring\EstuarineWaterQuality\Parkwide_Assessment\Data. Data will be compiled by the SECN data manager on an annual basis (at minimum) for data submission to EQUIS.

Roles and Responsibilities

Data stewardship is the responsibility of the SECN staff, from the field crew who collect, verify, and enter data; to the protocol lead and technician who validate, analyze, and summarize data; to the network data manager, who ensures that master data sets are of high quality and that proper data management standards and practices are in place and followed. General roles and responsibilities of key personnel are described below in Table 1.

Table 1. Fixed-station water-quality monitoring protocol roles and responsibilities for core personnel [NERRS—National Estuarine Research and Reserve System].

Position	Roles & Responsibilities
Water protocol lead	Operational lead for SECN water monitoring program. Protocol development and publication lead, reviews and analyzes data, develops reports for publication, establishes partnerships and creates agreements as needed, reviews data and metadata prior to publication. Ensures data quality.
Hydrologic technician	Manages fixed-station operation and maintenance. Calibrates equipment, manages equipment, collects field data, provides training to field crew, ensures protocols are followed, reviews and analyzes data, assists in publication development, reviews data and metadata prior to publication.
Partners (NERRS staff)	Field data collection, calibrates equipment, manages equipment.
Data manager	Technical point of contact for all tasks concerning network and NPS database and information management standards, including (but not limited to): security, data quality, data documentation, database structure, reporting, and linkages to other NPS information management systems. Technical point of contact for all tasks concerning database, application development, and database administration. Ensures data quality.

Database Reporting

Reports, or data queries, are created through the SQL report builder application, and all completed reports are stored as “.rdl” files on the Reston server. Accessing the SQL report server requires a valid NPS login, registration as a “user” on the production server, and an entry in the database user list. A list of server addresses and access points is available in [*Data Access Points for the Southeast Coast Network Estuarine Water Quality Database System*](#) (Wright 2022).

The fixed station continuous event reports and their corresponding filenames are as follows:

1. Deployment Summary QC Report - Deployment_Summary_QC_Report- Recent.rdl
Contains calibration information and data quality rating information about a single continuous event. Events are filtered based on a fixed station and date range value set.

The fixed station discrete event reports are as follows:

1. Monthly Nutrient Output for Annual Reporting -
Fixed_NutrientOutputForAnnualReporting.rdl
2. Fixed Station Discrete Event Output - Fixed_DiscreteEventOutput.rdl
3. EQUIS/WQX Fixed Station Discrete Nutrient Output -
Discrete_EQUIS_output_report.rdl
4. Fixed Station Water-Quality Monitoring Condition Criteria – Summary Output -
Fixed_WaterQualityConditionCriteria.rdl

The park-wide reports are as follows:

1. Site Info and Physical Attributes Output - Parkwide_SiteInfo.rdl
2. Water-Quality Parameter Values and Condition Output -
Parkwide_WaterQualityParamValueAndConditionOutput.rdl
3. Park-wide Assessment Water-Quality Monitoring Condition Criteria -
Parkwide_WaterQualityConditionCriteria.rdl
4. Park-wide Assessment Water- Quality Condition Summary Index- Site and Park -
Parkwide_WaterQualityConditionSummary.rdl
5. EQUIS, WQX Park-wide Assessment Nutrient Output - Synoptic_Nutrient_EQUIS.rdl
6. EQUIS, WQX Park-wide Assessment Sediment Output - Synoptic_Sediment_EQUIS.rdl
7. Concentrations of Select Metals- Parkwide_ConcentrationsOfSelectMetals.rdl
8. Organic Contaminant Concentrations -
Parkwide_ConcentrationsOfOrganicContamination.rdl

Other general reports include:

1. Overall Processing Status - Processing_Status.rdl

This report generates information about all the various forms that obtain a processing status. This form is intended to be used alongside data entry to easily check which physical forms have been entered into the database and which forms have had quality assurance applied to them.

Data Archiving and EQuIS

The water-quality component of the Natural Resource Challenge (NRC) requires that Vital Signs Networks archive all physical, chemical, and biological water-quality data collected with NRC water-quality funds in the National Park Service's EQuIS database maintained by the NPS Water Resources Division (WRD). Networks are encouraged to also archive any other aquatic-related data collected with base Vital Signs funding in EQuIS.

Database Maintenance and Administration

Data Security and Integrity

Because many different users will be accessing the database, it is critical that the data remain secure. Only SECN personnel involved with the estuarine database will have access to data files. The SECN data management system uses the Windows Active Directory login information to control access to the SQL database back end. The Microsoft Access UI is only provided to authorized users. The SECN data server and shared drive are also protected using Windows Active Directory login for system users. A list of server addresses and access points is available in [*Data Access Points for the Southeast Coast Network Estuarine Water Quality Database System*](#) (Wright 2022).

Changes to the Database

Datasets are rarely static. They often change through additions, corrections, and improvements made following the verification process. However, there are three main caveats to any editing requested on an accepted dataset:

1. Only make changes that improve or update the data while maintaining data integrity.
2. Once accepted, document any changes made to the dataset.
3. Be prepared to recover from mistakes made during editing.

Any editing of archived data is accomplished jointly by the protocol lead, hydrologic technician, and data manager. Every change must be documented in the edit log and accompanied by an explanation that includes pre- and post-edit data descriptions.

Database Specifications

The primary source for obtaining the Microsoft Access Front End for data entry is the Azure Dev Ops SECN_WaterQuality Repository. A link to the DevOps repository is available in [*Data Access*](#)

[Points for the Southeast Coast Network Estuarine Water Quality Database System](#) (Wright 2022). This document also provides server addresses for the development and production SQL servers.

Backup copies of all Microsoft Access files are stored on the SECN server; however, the primary database must be downloaded from Azure and all changes must first be uploaded to the Azure Repository before being backed up to the SECN server. Shared drive backups are not a guaranteed source for the most recent Microsoft Access file version. The Microsoft Access Front End backup location will be located at: S:\Data Management\Databases\EstuarineWaterQuality\2020 Database (Active)\User Interface - Production.

Changes to the backend schema and the current build of the backend will be stored in the Azure repository. Additionally, a single backup of records is stored on the Azure repository and labeled “Initial_Development_Backup.bak.” This initial backup was used at the time of database creation and includes populated lookup tables and some event records. DOI contractors responsible for the servers in Reston maintain a separate set of backups that are created on a nightly basis. This contractor (currently MBS and Dan Kocol) should be contacted directly to retrieve these backups in case there is a database malfunction or loss of data.

Development of the Microsoft Access Front End requires a full subscription to Microsoft Access 2016, or a compatible version. Data entry does not require a full version of Microsoft Access as long as the runtime Microsoft Access program is compatible with Microsoft Access 2016. Development of the SQL Back-End Solution requires Visual Studio 2019 with the Data Tools extension installed.

There are two files involved in Front End Development: EstuarineDatabase.accdb and EstuarineDatabase.accdr. The ‘accdb’ file is a decompiled Microsoft Access Database file that can be edited and developed directly. The ‘accdr’ file is a runtime application that restricts access to application code. The primary purpose of the ‘accdr’ file is data entry and the purpose of the ‘accdb’ file is application development.

Notably, ‘accdb’ files must not be used for data entry purposes and will not be distributed to anyone other than database developers for the purpose of development. The security implications of allowing unauthorized updating of these database files includes, but is not limited to, undesired changes to the application code or injection of malicious code into the application.

The following process will be followed for making approved **changes to the Microsoft Access Front End** (feature addition, bug fix, etc.):

1. Clone the current front-end ‘accdb’ and ‘accdr’ files via the Azure DevOps repository.
2. Use the Visual Basic for Microsoft Access code editor along with the form designer to make the intended changes.
3. Test the changes with the Microsoft Access development file connected to the Development Database.
4. Continue to make changes and test as needed.

5. Change the target database location to the Production server address and save the file as a '.accde' file. Rename the output file's extension to '.accdr.'
6. Use git to commit both the database file and runtime application file to the Azure Repository. Push the changes to the Azure Repository to finalize changes and update the history of application development.

Changes to the Microsoft Access front end do not require an external code review and can be considered 'complete' as soon as they are pushed to the Azure Repository. This means that only thoroughly tested '.accdr' files should exist on the Azure Repository.

Changes to the backend data tool solution will be done by following this procedure:

1. Clone the current solution file data from the Azure Dev Ops Repository
2. Make any SQL changes in Visual Studio using DQL Server Data Tools (SSDT).
3. Deploy any changes to the Estuarine Water-quality Development Database and test.
4. Continue to make changes and test until the desired back-end structure is met.
5. Commit the solution file updates to the Azure Dev Ops Repository.
6. Open a 'Product Backlog' work item on the Azure Dev Ops website and assign the work item to the project quality assurance point of contact.
7. Assess the current state of the Microsoft Access Front-End and update the application as needed.

Data Models

The general data model for water-quality monitoring consists of metadata, field collection data, calibration data and lab analysis data. Proper linking of these datasets is critical for effective long-term monitoring and analysis of water-quality and provides researchers and policy makers with information necessary to make decisions regarding the use and conservation of the park natural resources. Field descriptions and more information about the data model and tables can be found in Appendix A.

Fixed-Station Water-Quality Monitoring Table Relationship Diagram

Figure 2 represents the data model used to store the collected data for the fixed-station water-quality monitoring protocol. Lime green tables are lookup tables used across the data model. Blue tables are site and location information. Yellow tables contain information about individual events. Aqua tables contain information about field water samples and sonde QC readings, and the orange table contains information about nutrient values.

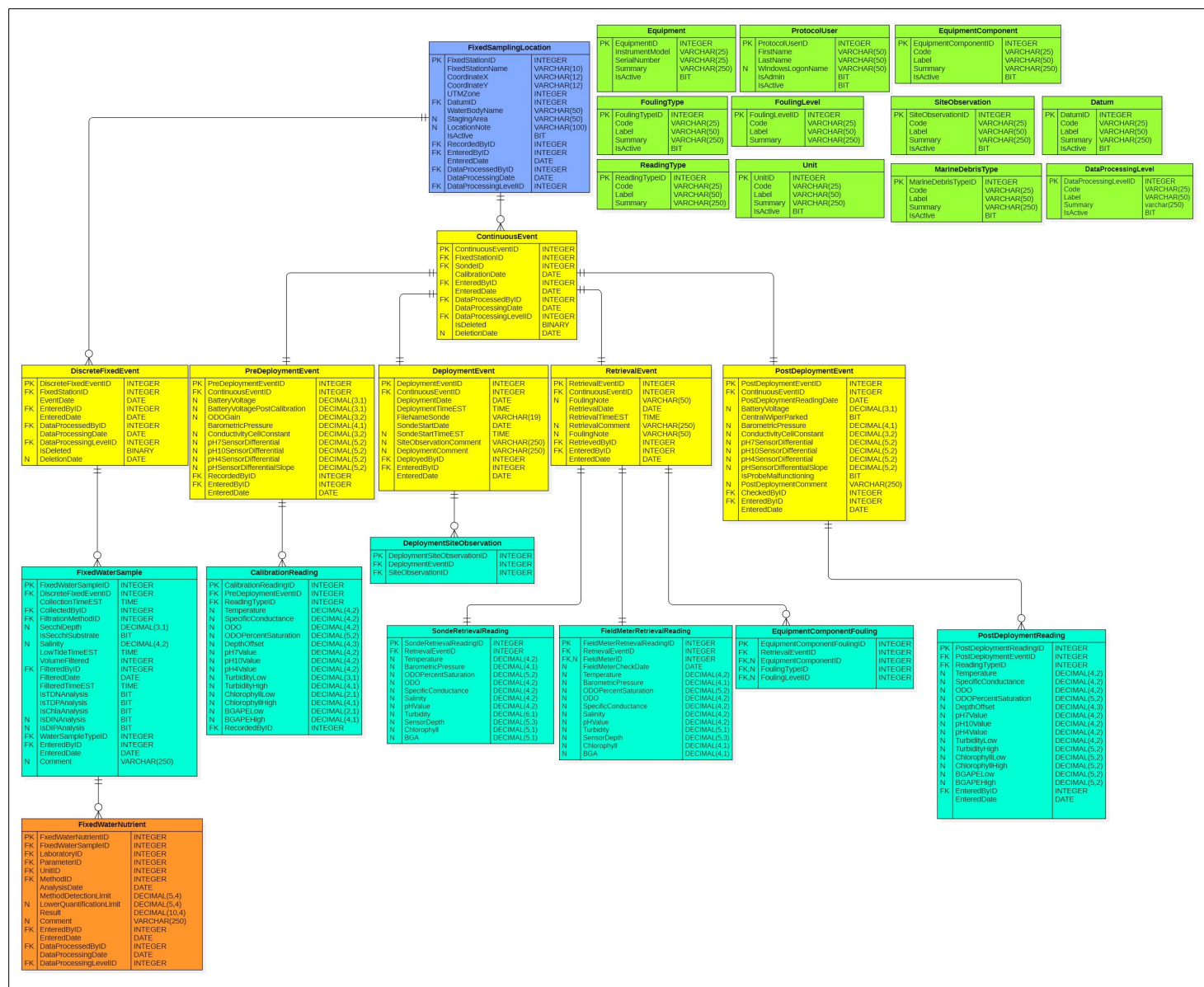


Figure 2. Data diagram for fixed station data.

Park-wide Assessment Sediment and Water-quality Data Model Table Relationship Diagram

Figure 3 presents the data model used to store the collected data for the park-wide assessment component of the estuarine water-quality monitoring protocol. Lime green tables are lookup tables used across the data model. Blue tables are site and location information. Yellow tables contain information about individual events. Aqua tables contain information about field measurements, and the orange tables contains information about nutrient and sediment values obtained from a lab. The data dictionary is included in Appendix A. All database components are identified and documented within this appendix. This is a separate document from the user manual—which is a guidance document for using the data management system to enter and report out on data/information from the SECN park-wide assessment protocol.

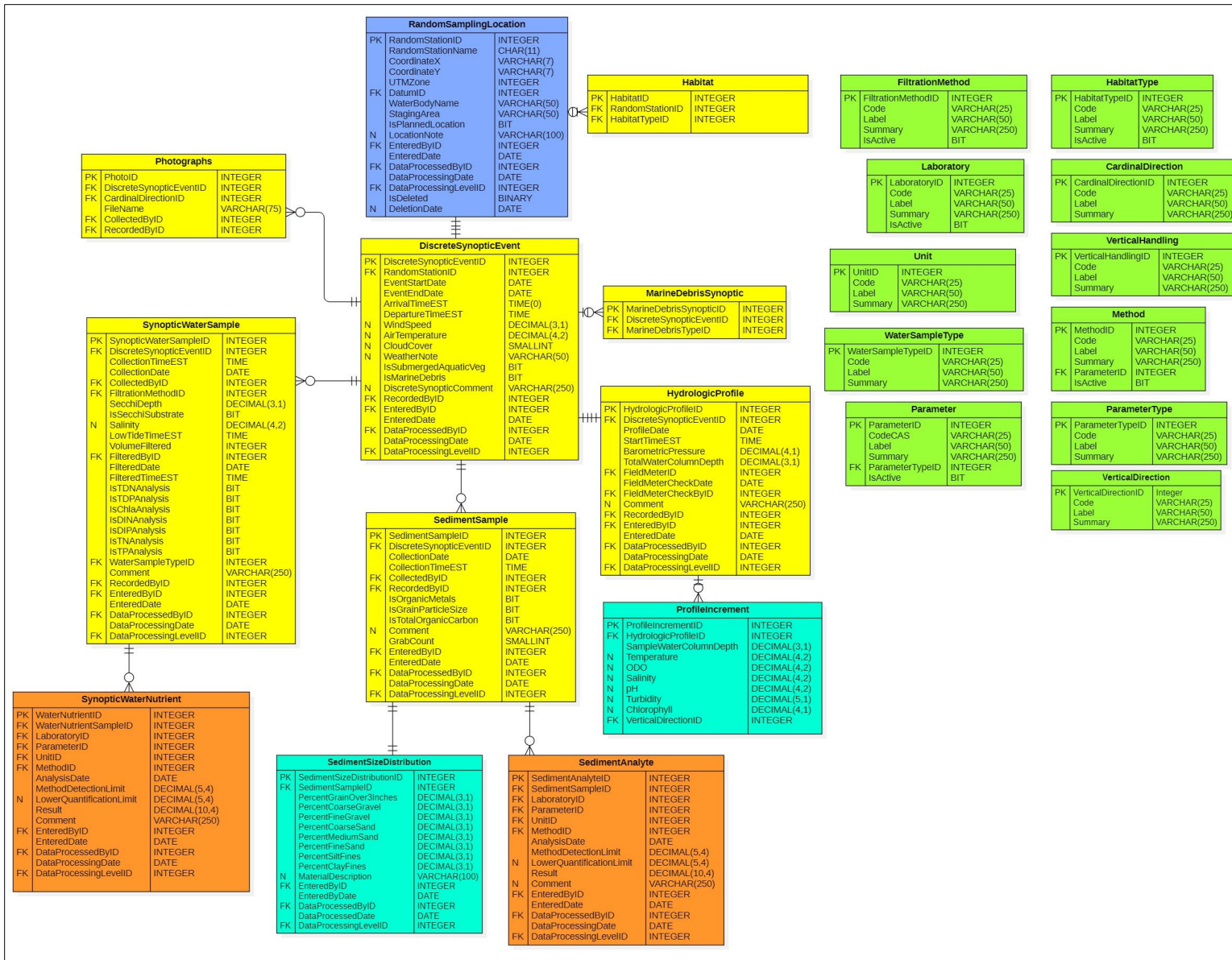


Figure 3. Data model for the park-wide water-quality and sediment monitoring.

Literature Cited

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Appendix A. Data Dictionary

Table A-1. Descriptions of fields in tbl_FixedSamplingLocation in the Estuarine Water-Quality Monitoring Database. A fixed sampling location is a (mostly) static record that will have other records connected to it. Records contain location and meta information about a sampling location that is used for continuous and long-term data collection.

Field Name	Key	Data Type	Units	Required	Description
FixedStationID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a FixedSamplingLocation record.
FixedStationName	–	varchar (10)	–	Not NULL	Identifying name of the monitoring station. Each FixedStationName is unique.
CoordinateX	–	varchar(7)	–	Not NULL	Longitude recorded in decimal degrees.
CoordinateY	–	varchar(7)	–	Not NULL	Latitude recorded in decimal degrees.
UTMZone	–	Integer	–	Not NULL	UTM Zone of the Fixed Sampling Location
DatumID	FK (Lookup)	Integer	–	–	Datum corresponding to CoordinateX and CoordinateY; value is typically NAD83.
WaterBodyName	–	varchar(50)	–	Not NULL	Name of water body where fixed station is located.
StagingArea	–	varchar(50)	–	Allow NULL	Name of location from which the fixed station is accessed (boat launch, pier, etc.)
LocationNote	–	varchar(100)	–	Allow NULL	Description of or more information related to the fixed station location or staging area. Typically useful for field operations knowledge.
IsActive	–	bit	–	Not NULL	Field used to determine if a FixedSamplingLocation value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No
RecordedByID	FK (Lookup)	Integer	–	Not Null	Foreign key to the ProtocolUser lookup table. The RecordedByID is the user that physically recorded the form information.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the FixedSamplingLocation table.

Field Name	Key	Data Type	Units	Required	Description
EnteredDate	–	date	date	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the FixedSamplingLocation table.
DataProcessingDate	–	date	date	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	Integer	–	–	Current level of data processing for the record.

Table A-2. Descriptions of fields in tbl_ContinuousEvent in the Estuarine Water-Quality Monitoring Database. Continuous event records serve as a parent table connecting the various portions of the sonde deployment process. The continuous event also holds some information from the pre-deployment event that will be accessed multiple times throughout the pre-deployment through post deployment datasheet entry.

Field Name	Key	Data Type	Units	Required	Description
ContinuousEventID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a Continuous Water-quality Event record.
FixedStationID	FK	Integer	–	Not NULL	Foreign key to the parent FixedSamplingLocation table. Each ContinuousEventID is associated with a particular FixedStationID.
SondeID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Equipment lookup table. The SondeID represents a unique Sonde device identified in the Equipment lookup table. Each ContinuousEventID is associated with a single Sonde device that records continuous water-quality data.
CalibrationDate	–	date	date	Not NULL	Date on which the Sonde used for this Continuous Water-quality Event was Calibrated.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the ContinuousEvent table.
EnteredDate	–	date	date	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the ContinuousEvent table.
DataProcessingDate	–	date	date	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	Integer	–	–	Current level of data processing for the record.
IsDeleted	–	bit	–	–	Indicates if the event has been deleted from the database. The most likely explanation for a deleted entry is a mistake in data entry. A database administrator should use sql to remove 'deleted' entries from the database after verifying deletion intent with the user corresponding to 'EnteredByID'.
DeletionDate	–	DATE	–	–	Indicates the date that the IsDeleted field was set to true.

Table A-3. Descriptions of fields in tbl_PreDeploymentEvent in the Estuarine Water-Quality Monitoring Database. This table corresponds to the 'Pre-Deployment Information' portion of the Fixed Station Continuous Monitoring Datasheet.

Field Name	Key	Data Type	Units	Required	Description
PreDeploymentEventID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a PreDeploymentEvent record. Each PreDeploymentEvent is one of four sub-events that occur during each ContinuousEvent.
ContinuousEventID	FK	Integer	–	Not NULL	Foreign key to the parent ContinuousEvent table.
BatteryVoltage	–	decimal (3,1)	V	Allow NULL	Battery voltage prior to calibration.
BatteryVoltagePostCallibration	–	decimal (3,1)	V	Allow NULL	Battery voltage after calibration.
ODOGain	–	decimal (3,2)	–	Allow NULL	Dissolved Oxygen Sensor quality assurance check.
BarometricPressure	–	decimal (4,1)	mmHg	Not NULL	Absolute (non-corrected) atmospheric barometric pressure.
ConductivityCellConstant	–	decimal (3,2)	–	Allow NULL	Conductivity Sensor quality assurance check.
pH7SensorDifferential	–	decimal (5,2)	mv	Allow NULL	pH Sensor quality control check. A new sensor starts at or near 0.00. As the sensor ages, this value moves towards -55.00. If a sensor goes bad it can have readings <-55.00
pH10SensorDifferential	–	decimal (5,2)	mv	Allow NULL	pH Sensor quality control check. A new sensor starts at or near -180.0. As the sensor ages, this value moves towards or beyond -190.0. If a sensor goes bad it can have readings <-190.0
pH4SensorDifferential	–	decimal (5,2)	mv	Allow NULL	pH Sensor quality control check. A new sensor starts at or near 180.0. As the sensor ages, this value moves towards and beyond 190.0. If a sensor goes bad it can have readings >190
pHSensorDifferentialSlope	–	decimal (5,2)	–	Allow NULL	pH Sensor quality control check. Values near 180.0 mean that the sensor passes QC. As the sensor goes bad this value moves away from 180.

Field Name	Key	Data Type	Units	Required	Description
DeployedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The RecordedByID represents the User who physically deployed the Sonde.
RecordedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded in the lab.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the PreDeploymentEvent table.
EnteredDate	–	date	date	–	Date on which the record in this table was entered.

Table A-4. Descriptions of fields in tbl_CalibrationReading in the Estuarine Water-Quality Monitoring Database. This table stores records for the Pre-Deployment Sonde Calibration information. Readings can be one of the following: Standard, Measured, Calibrated. There will normally be a total of three readings per pre-deployment.

Field Name	Key	Data Type	Units	Required	Description
CalibrationReadingID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a Calibration activity associated with a PreDeploymentEvent.
PreDeploymentEventID	FK	Integer	–	Not NULL	Foreign key to the parent PreDeploymentEvent table.
ReadingTypeID	FK (Lookup)	Integer	–	Not NULL	Foreign key to ReadingType lookup table that indicates whether the record corresponds to a standard, measured, or calibrated value.
Temperature	–	decimal (4,2)	°C	Allow NULL	Temperature of standard from NIST traceable (certified) thermometer, and temperature measured sensor reading. Sensor can't be calibrated.
SpecificConductance	–	decimal (4,2)	mS/cm	Allow NULL	Specific conductance standard value. [Note: Value corresponds to appropriate ReadingType: specific conductance measured by sensor, and specific conductance measured after calibration]
ODO	–	decimal (4,2)	mg/L	Allow NULL	ODO = optical dissolved oxygen concentration. [Note: Value corresponds to appropriate ReadingType: ODO standard, ODO measured, ODO calibrated]
ODOPercentSaturation	–	decimal (5,2)	%	Allow NULL	ODO = optical dissolved oxygen. Optical dissolved oxygen percent saturation, standard value, measured, calibrated

Field Name	Key	Data Type	Units	Required	Description
DepthOffset	–	decimal (4,3)	m	Allow NULL	Depth offset. This offset is necessary to account for barometric pressure. Has a standard value, measured value and calibrated value.
pH7Value	–	decimal (4,2)	pH	Allow NULL	pH value for pH7.00 at a given Temperature. Standard value is temperature compensated (indicated by manufacturer for given temperatures). Measured and Calibrated values are temperature compensated within instrument.
pH10Value	–	decimal (4,2)	pH	Allow NULL	pH value for pH10.00 at a given Temperature. Standard value is temperature compensated (indicated by manufacturer for given temperatures). Measured and Calibrated values are temperature compensated within instrument.
pH4Value	–	decimal (4,2)	pH	Allow NULL	pH value for pH4.00 at a given Temperature. Standard value is temperature compensated (indicated by manufacturer for given temperatures). Measured and Calibrated values are temperature compensated within instrument.
TurbidityLow	–	decimal (4,1)	FNU	Allow NULL	Turbidity of deionized water.
TurbidityHigh	–	decimal (5,1)	FNU	Allow NULL	Turbidity for a 124.0-value Standard.
ChlorophyllLow	–	decimal (5,1)	µg/L	Allow NULL	Chlorophyll pertaining to a "low" (0.0) Standard Value dilution of Rhodamine dye.
ChlorophyllHigh	–	decimal (5,1)	µg/L	Allow NULL	Chlorophyll pertaining to a "high" (66.0) Standard Value.
BGAPELow	–	decimal (5,1)	µg/L	Allow NULL	Blue Green Algae (BGA) Phycoerythrin (PE) - low concentration standard, measured and calibrated
BGAPEHigh	–	decimal (5,1)	µg/L	Allow NULL	Blue Green Algae (BGA) Phycoerythrin (PE) - high concentration standard, measured and calibrated
RecordedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded in the lab.

Table A-5. Descriptions of fields in tbl_DeploymentEvent in the Estuarine Water-Quality Monitoring Database. This table corresponds to the 'Deployment Information' portion of the Fixed-Station Continuous Monitoring Datasheet.

Field Name	Key	Data Type	Units	Required	Description
DeploymentEventID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a DeploymentEvent record. Each Deployment event is one of four sub-events that occur during each ContinuousEvent.
ContinuousEventID	FK	Integer	–	Not NULL	Foreign key to the parent ContinuousEvent table.
DeploymentDate	–	date	date	Not NULL	Date the Sonde device is deployed into the water.
DeploymentTimeEST	–	time	HH:MM	Not NULL	Time the Sonde device is deployed into the water. Time is recorded in eastern time.
FileNameSonde	–	varchar(19)	–	Not NULL	Name given to the raw instrument log file. Typically the file name is 6 digits for SondeName followed by underscore, followed by 8 digit date.
SondeStartDate	–	date	date	Not NULL	Date set on the the Sonde device when continuous water-quality data recording will begin.
SondeStartTimeEST	–	time	HH:MM	Allow NULL	Time set on the the Sonde device when continuous water-quality data recording will begin.
SiteObservationComment	–	varchar(250)	–	Allow NULL	Comment field pertaining to the site observations.
DeploymentComment	–	varchar (250)	–	Allow NULL	This field is to document any qualitative information pertaining to the deployment.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in this table.
EnteredDate	–	date	date	–	Date on which the record in this table was entered.

Table A-6. Descriptions of fields in tbl_DeploymentSiteObservation in the Estuarine Water -Quality Monitoring Database. Site Observation records indicate the presence of a specific observation (from the SiteObservation lookup table) for the specified deployment event.

Field Name	Key	Data Type	Units	Required	Description
DeploymentSiteObservationID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a DeploymentSiteObservation record.
DeploymentEventID	FK	Integer	–	Not NULL	Foreign key to the parent Deployment Event table.
SiteObservationID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the SiteObservation lookup table.

Table A-7. Descriptions of fields in tbl_RetrievalEvent in the Estuarine Water-Quality Monitoring Database. This table corresponds to the ‘Retrieval Information’ portion of Fixed Station Continuous Datasheet. Each continuous event will have a maximum of one retrieval event record linked to it.

Field Name	Key	Data Type	Units	Required	Description
RetrievalEventID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a RetrievalEvent record. Each Retrieval event is one of four sub-events that occurs during each ContinuousEvent.
ContinuousEventID	–	Integer	–	Not NULL	Foreign key to the parent ContinuousEvent table.
RetrievalDate	–	date	–	Not NULL	Date the instrument was removed from the water.
RetrievalTimeEST	–	time	HH:MM	Not NULL	Time the instrument was removed from the water.
RetrievedByID	FK (Lookup)	Integer	–	Not Null	Foreign key to the ProtocolUser lookup table. The RetrievedByID represents the User who physically retrieved the equipment.
FoulingNote	–	varchar (50)	–	Allow NULL	Notes regarding fouling.
RetrievalComment	–	varchar (250)	–	Allow NULL	Comment field for anything pertaining to the retrieval.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in this table.
EnteredDate	–	date	date	–	Date on which the record in this table was entered.

Table A-8. Descriptions of fields in tbl_SondeRetrievalReading in the Estuarine Water -Quality Monitoring Database. This table corresponds to the 'In Situ Sonde Reading' table row within the 'Retrieval Information' section of the Fixed Station Continuous Datasheet.

Field Name	Key	Data Type	Units	Required	Description
SondeRetrievalReadingID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a SondeRetrievalEvent record.
RetrievalEventID	FK	integer (auto-incrementing)	–	Not NULL	Foreign key to the parent RetrievalEvent
Temperature	–	decimal (4,2)	°C	Allow NULL	On site water temperature as measured by a Sonde. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
BarometricPressure	–	decimal (4,1)	mmHg	Allow NULL	On site barometric pressure as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
ODOPercentSaturation	–	decimal (5,2)	%	Allow NULL	On site dissolved oxygen percent saturation as measured by a Sonde. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
ODO	–	decimal (4,2)	mg/l	Allow NULL	On site dissolved oxygen concentration as measured by a Sonde. This value is used for processing and quality grading of associated Continuous data from the Sonde's file.
SpecificConductance	–	decimal (4,2)	mS/cm	Allow NULL	On site specific conductance as measured by a Sonde. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
Salinity	–	decimal (4,2)	ppt	Allow NULL	On site salinity as measured by a Sonde. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
pHValue	–	decimal (4,2)	pH	Allow NULL	On site pH as measured by a Sonde. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
Turbidity	–	decimal (6,1)	FNU	Allow NULL	On site turbidity as measured by a Sonde. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.

Field Name	Key	Data Type	Units	Required	Description
SensorDepth	–	decimal (5,3)	m	Allow NULL	On site water depth (water above sensor) as measured by a Sonde. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
Chlorophyll	–	decimal (5,1)	µg/L	Allow NULL	Chlorophyll pertaining to a Standard Value dilution of Rhodamine dye.
BGA	–	decimal (5,1)	µg/L	Allow NULL	Blue Green Algae (BGA) contents

Table A-9. Descriptions of fields in tbl_FieldMeterRetrievalReading in the Estuarine Water -Quality Monitoring Database. This table corresponds to the 'Field Meter Readings' table row within the 'Retrieval Information' section of the Fixed-Station Continuous Datasheet.

Field Name	Key	Data Type	Units	Required	Description
FieldMeterRetrievalReadingID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a FieldMeterRetrievalEvent record.
FieldMeterID	FK (Lookup)	Integer	–	Allow NULL	Foreign key to the Equipment lookup table. The FieldMeterID represents a unique device identified in the Equipment lookup table. Each RetrievalEventID is associated with a single FieldMeter device that records water-quality data at the point when the SondeID is collected from the Station.
RetrievalEventID	FK	integer (auto-incrementing)	–	Not NULL	Foreign key to the parent RetrievalEvent
FieldMeterCheckDate	–	date	–	Allow NULL	Date the field meter was calibrated.
Temperature	–	decimal (4,2)	°C	Allow NULL	On site water temperature as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
BarometricPressure	–	decimal (4,1)	mmHg	Allow NULL	On site barometric pressure as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
ODOPercentSaturation	–	decimal (5,2)	%	Allow NULL	On site dissolved oxygen percent saturation as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.

Field Name	Key	Data Type	Units	Required	Description
ODO	–	decimal (4,2)	mg/l	Allow NULL	On site dissolved oxygen concentration as measured by a field meter. This value is used for processing and quality grading of associated Continuous data from the Sonde's file.
SpecificConductance	–	decimal (4,2)	mS/cm	Allow NULL	On site specific conductance as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
Salinity	–	decimal (4,2)	ppt	Allow NULL	On site salinity as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
pHValue	–	decimal (4,2)	pH	Allow NULL	On site pH as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
Turbidity	–	decimal (6,1)	FNU	Allow NULL	On site turbidity as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
SensorDepth	–	decimal (5,3)	m	Allow NULL	On site water depth (water above sensor) as measured by a field meter. This value is used for processing and quality checking of associated Continuous data from the Sonde's file.
Chlorophyll	–	decimal (5,1)	µg/L	Allow NULL	Chlorophyll pertaining to a Standard Value dilution of Rhodamine dye.
BGA	–	decimal (5,1)	µg/L	Allow NULL	Blue Green Algae (BGA) contents

Table A-10. Descriptions of fields in tbl_EquipmentComponentFouling in the Estuarine Water -Quality Monitoring Database. Equipment component fouling records indicate the type and level of fouling on equipment for a specific retrieval event. This table corresponds to the 'Fouling presence' row of the 'Retrieval Information' section of the Fixed-Station Continuous Datasheet.

Field Name	Key	Data Type	Units	Required	Description
EquipmentComponentFoulingID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying an EquipmentComponentFouling record.
RetrievalEventID	FK	Integer	–	Not NULL	Foreign key to the parent PostDeploymentEvent table.
EquipmentComponentID	FK (Lookup)	Integer	–	Allow NULL	Foreign Key to EquipmentComponent lookup table. Equipment components are distinct components of a Sonde susceptible to fouling. Values include: Sonde guard, external screen, temperature/conductivity probe, ODO probe, pH probe, turbidity probe
FoulingTypeID	FK (Lookup)	Integer	–	Allow NULL	Foreign key to the FoulingType lookup table. The FoulingType represents the kind of issue with an Equipment component that could affect the validity of the associated data records. Values include: A= algae, B= barnacles, C = crabs, E= eggs, F=fish, O=other
FoulingLevelID	FK (Lookup)	Integer	–	Allow NULL	Foreign key to the FoulingLevel lookup table. The FoulingLevel represents how extreme the Fouling type of an EquipmentComponent is. Values include: H= Heavy, M= Moderate, L = Light

Table A-11. Descriptions of fields in tbl_PostDeploymentEvent in the Estuarine Water-Quality Monitoring Database. This table corresponds to the 'Post Deployment Readings' portion of the Fixed-Station Continuous Monitoring Datasheet.

Field Name	Key	Data Type	Units	Required	Description
PostDeploymentEventID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a Post-deployment Event record. Each Post-deployment event is one of four sub-events that occur during each Continuous Water-quality event.
ContinuousEventID	FK	Integer		Not NULL	Foreign key to the parent ContinuousEvent table.
PostDeploymentReadingDate	–	date	date	Not NULL	Date of post deployment sonde evaluation.
BatteryVoltage	–	decimal (3,1)	V	Allow NULL	Battery voltage read during post deployment event.
CentralWiperParked	–	bit	–	Not NULL	Field that confirms if the central wiper element is in correct position (180 degrees from the Optic sensor's position). 1=Yes, 0=No
BarometricPressure	–	decimal (4,1)	mmHg	Allow NULL	Absolute (non-corrected) atmospheric barometric pressure when instrument is evaluated in post deployment event.
ConductivityCellConstant	–	decimal (3,2)		Allow NULL	Conductivity Sensor quality assurance check.
pH7SensorDifferential	–	decimal (5,2)	mv	Allow NULL	pH Sensor quality control check. A new sensor starts at or near 0.00. As the sensor ages, this value moves towards -55.00. If a sensor goes bad it can have readings <-55.00
pH10SensorDifferential	–	decimal (5,2)	mv	Allow NULL	pH Sensor quality control check. A new sensor starts at or near -180.0. As the sensor ages, this value moves towards or beyond -190.0. If a sensor goes bad it can have readings <-190.0
pH4SensorDifferential	–	decimal (5,2)	mv	Allow NULL	pH Sensor quality control check. A new sensor starts at or near 180.0. As the sensor ages, this value moves towards and beyond 190.0. If a sensor goes bad it can have readings >190
pHSensorDifferentialSlope	–	decimal (5,2)	–	Allow NULL	pH Sensor quality control check. Values near 180.0 mean that the sensor passes QC. As the sensor goes bad this value moves away from 180.

Field Name	Key	Data Type	Units	Required	Description
IsProbeMalfunctioning	–	bit	–	Not NULL	Field identifies if a malfunction in Sonde sensor or any equipment component affected the ContinuousEvent. Yes= 1 A malfunction was detected; No= 0 no malfunction detected.
PostDeploymentComment	–	varchar (250)	–	Allow NULL	Note describing issues that may have occurred during the deployment (sonde or sensor failure, etc.)
RecordedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded in the field.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in this table.
EnteredDate	–	date	date	–	Date on which the record in this table was entered.

Table A-12. Descriptions of fields in tbl_PostDeploymentReading in the Estuarine Water-Quality Monitoring Database. This table corresponds to the 'Post Deployment Information' portion of the continuous event datasheet.

Field Name	Key	Data Type	Units	Required	Description
PostDeploymentReadingID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a PostDeployment Reading activity associated with a PostDeploymentEvent.
PostDeploymentEventID	FK	Integer	–	–	Foreign key to the parent PostDeploymentEvent table.
ReadingTypeID	FK (Lookup)	Integer	–	–	Foreign key to ReadingType lookup table that indicates whether the record corresponds to a standard, measured, or calibrated value.
Temperature	–	decimal (4,2)	°C	Allow NULL	Temperature of standard from NIST traceable (certified) thermometer, and temperature measured sensor reading. Sensor can't be calibrated.
SpecificConductance	–	decimal (4,2)	mS/cm	Allow NULL	Specific conductance standard value. [Note: Value corresponds to appropriate ReadingType: specific conductance measured by sensor, and specific conductance measured after calibration]
ODO	–	decimal (4,2)	mg/L	Allow NULL	ODO = optical dissolved oxygen concentration. [Note: Value corresponds to appropriate ReadingType: ODO standard, ODO measured, ODO calibrated]

Field Name	Key	Data Type	Units	Required	Description
ODOPercentSaturation	–	decimal (5,2)	%	Allow NULL	ODO = optical dissolved oxygen. Optical dissolved oxygen percent saturation for standard, measured, and calibrated ReadingTypes.
DepthOffset	–	decimal (4,3)	m	Allow NULL	Depth offset. This offset is necessary to account for barometric pressure. Has a standard value, measured and calibrated.
pH7Value	–	decimal (4,2)	pH	Allow NULL	pH value for pH7.00 at a given Temperature. Standard value is temperature compensated (indicated by manufacturer for given temperatures. Measured and Calibrated values are temperature compensated within instrument.
pH10Value	–	decimal (4,2)	pH	Allow NULL	pH value for pH10.00 at a given Temperature. Standard value is temperature compensated (indicated by manufacturer for given temperatures. Measured and Calibrated values are temperature compensated within instrument.
pH4Value	–	decimal (4,2)	pH	Allow NULL	pH value for pH4.00 at a given Temperature. Standard value is temperature compensated (indicated by manufacturer for given temperatures. Measured and Calibrated values are temperature compensated within instrument.
TurbidityLow	–	decimal (4,1)	FNU	Allow NULL	Turbidity of deionized water.
TurbidityHigh	–	decimal (5,1)	FNU	Allow NULL	Turbidity for a 124.0-value Standard.
ChlorophyllLow	–	decimal (5,1)	µg/L	Allow NULL	Chlorophyll pertaining to a "low" (0.0) Standard Value dilution of Rhodamine dye.
ChlorophyllHigh	–	decimal (5,1)	µg/L	Allow NULL	Chlorophyll pertaining to a "high" (66.0) Standard Value.
BGAPELow	–	decimal (5,1)	µg/L	Allow NULL	Blue Green Algae (BGA) Phycoerythrin (PE) - low concentration standard, measured and calibrated
BGAPEhigh	–	decimal (5,1)	µg/L	Allow NULL	Blue Green Algae (BGA) Phycoerythrin (PE) - high concentration standard, measured and calibrated
CheckedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The CheckedByID represents the User who physically checked for probe malfunctions.

Table A-13. Descriptions of fields in tbl_DiscreteFixedEvent in the Estuarine Water-Quality Monitoring Database. A Discrete Fixed Event Data Processing Level applies to all Fixed-Station Water Samples that relate to that event record.

Field Name	Key	Data Type	Units	Required	Description
DiscreteFixedEventID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a Fixed Station, Discrete Water-quality Event record.
FixedStationID	FK	Integer	–	Not NULL	Foreign key to the parent FixedSamplingLocation table. Each ContinuousEventID is associated with a particular StationID.
EventDate	–	date	date	Not NULL	Date of discrete fixed station visit.
RecordedByID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the DiscreteFixedEvent table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the DiscreteFixedEvent table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	Integer	–	–	Current level of data processing for the record.
IsDeleted	–	bit	–	–	Indicates if the event has been deleted from the database.
DeletionDate	–	DATE	–	–	Indicates the date that the IsDeleted field was set to true.

Table A-14. Descriptions of fields in tbl_FixedWaterSample in the Estuarine Water-Quality Monitoring Database. This table stores records about a single water sample obtained from a Fixed Sampling Location. There will generally be only one 'Normal Sample' per Discrete Event, but there can also be 'QC Blank' or 'QC Duplicate' water samples collected (See SOP 2.2.10 *Fixed-station discrete data entry, processing and QA/QC* for more information).

Field Name	Key	Data Type	Units	Required	Description
FixedWaterSampleID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a FixedWaterSample record.
DiscreteFixedEventID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the parent DiscreteFixedEvent table.
CollectionDate	–	Date	date	NOT NULL	Date the water sample was collected on site.
CollectionTimeEST	–	time	HH:MM	Not NULL	Time the water sample was collected on site.
CollectedByID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the ProtocolUser that collected the water sample.
FiltrationMethodID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the FiltrationMethod Lookup table. Filtration method refers to the method used to separate the sample - water separated from suspended solids. Both components are sent to a lab. [Default value should be Vacuum. The other option is Syringe.]
SecchiDepth	–	decimal (3,1)	m	Allow NULL	Depth at which the Secchi disk is no longer visible to the observer, measured to the nearest 10cm. This measure is related to and allows general inference to water turbidity.
IsSecchiSubstrate	–	bit	–	Not NULL	Indicates if the Secchi disk reaches the bottom (substrate) without losing visibility. If so, the value in SecchiDepth field equals the distance to the bottom.
Salinity	–	decimal (4,2)	ppt	Allow NULL	Salinity as measured in parts per thousand. [This value may come from a RetrievalEvent on the same date as this DiscreteFixedEvent. In rare cases, it is measured separately during this DiscreteFixedEvent.]
LowTideTimeEST	–	time	HH:MM	Not NULL	Low tide estimate from the nearest pertinent station. This is recorded in local eastern time (eastern standard or eastern daylight).
VolumeFiltered	–	integer	mL	Not NULL	The total volume of water filtered.

Field Name	Key	Data Type	Units	Required	Description
FilteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The FilteredByID represents the User who actually filtered the water sample in the field.
FilteredDate	–	date	–	Not NULL	Date water sample was filtered.
FilteredTimeEST	–	time	HH:MM	Not NULL	Local time water sample was filtered. This is recorded in local eastern time (eastern standard or eastern daylight).
IsTDNAnalysis	–	bit	–	Not NULL	Indicates if a analysis for Total Dissolved Nitrogen is requested. Values: Yes or No
IsTDPAnalysis	–	bit	–	Not NULL	Indicates if a analysis for Total Dissolved Phosphorous is requested. Values: Yes =1 or No = 0.
IsChlaAnalysis	–	bit	–	Not NULL	Indicates if a analysis for Chlorophyll A is requested. Values: Yes =1 or No = 0.
IsDINAnalysis	–	bit	–	Allow NULL	Indicates if a analysis for Dissolved Inorganic Nitrogen is requested. Values: Yes =1 or No = 0. These values are only required to be taken quarterly (February, May, August, November)
IsDIPAnalysis	–	bit	–	Allow NULL	Indicates if an analysis for Dissolved Inorganic Phosphorous is requested. Values: Yes =1 or No = 0. These values are only required to be taken quarterly (February, May, August, November)
WaterSampleTypeID	FK (Lookup)	Integer	–	Not NULL	Foreign key to WaterSampleType table. Values correspond to Normal sample, QC sample, QC blank.
Comment	–	varchar(250)	–	Allow NULL	A comment regarding the current fixed water sample.
RecordedByID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the FixedWaterSample table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the FixedWaterSample table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.

Table A-15. Descriptions of fields in tbl_FixedWaterNutrient in the Estuarine Water-Quality Monitoring Database. This table stores records about individual water nutrients that are obtained from Water Samples collected at Fixed Sampling Locations. Water Samples are processed by laboratories and return multiple records of nutrient information per sample.

Field Name	Key	Data Type	Units	Required	Description
FixedWaterNutrientID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a FixedWaterNutrient record.
FixedWaterSampleID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the parent FixedWaterSample table.
LaboratoryID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Laboratory lookup table. Denotes which laboratory was used to perform sample testing.
ParameterID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Parameter lookup table. Denotes the water-quality parameter.
UnitID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Unit table. Denotes the measurement units corresponding to the parameter results.
MethodID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Method lookup table. Denotes standard method used for preparation and analysis of water-quality parameters.
AnalysisDate	–	date	–	Not NULL	Date that the sample was analyzed for the nutrient.
MethodDetectionLimit	–	decimal (5,4)	–	Not NULL	The method detection limit (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. (Revision 2 of the method detection limit procedure from 40 CFR 136 Appendix B)
LowerQuantificationLimit	–	decimal (5,4)	–	Allow NULL	The Lower Quantification Limit (often referred to as the Practical Quantitation Limit - PQL or reporting limit-RL) represents the smallest amount of the target substance or characteristic that could be quantified by the instrument or analytical process. Values above the lower and below the upper quantification limits are reported as valid numeric results. The PQL is greater than the Detection Limit. Values less than the PQL but greater than the detection limit must be considered semi-quantitative estimates indicating that the substance is present but not quantified.
Result	–	decimal (10,4)	–	Not NULL	Numeric value corresponding to the result of an analysis on a particular nutrient parameter.

Field Name	Key	Data Type	Units	Required	Description
Comment	–	varchar (250)	–	Allow NULL	Additional information about this record. Typically provided by laboratory.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the FixedWaterNutrient table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the FixedWaterNutrient table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	Integer	–	–	Current level of data processing for the record.

Table A-16. Descriptions of fields in tbl_RandomSamplingLocation in the Estuarine Water-Quality Monitoring Database. Each record of this table corresponds to a single park-wide assessment's sampling location information. The 'RandomSamplingLocation' table stores information that is independent of the sampling event date. For example, 'CoordinateX' will remain the same regardless of the date that the assessment was conducted and the UTM coordinates can always be used to return to the sampling location.

Field Name	Key	Data Type	Units	Required	Description
RandomStationID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a RandomSamplingLocation record. Also referred to as a Park-wide Assessment.
RandomStationName	–	char(11)	–	Not NULL	Identifying name of the monitoring station and year sampled. Each RandomStationName is unique. PARK00-YYYY.
CoordinateX	–	varchar(7)	–	Not NULL	Longitude recorded in decimal degrees.
CoordinateY	–	varchar(7)	–	Not NULL	Latitude recorded in decimal degrees.
UTMZone	–	Integer	–	Not Null	UTM Zone of the Park-wide Assessment
DatumID	FK (Lookup)	Integer	–	Not NULL	Datum corresponding to CoordinateX and CoordinateY; value is typically NAD83.

Field Name	Key	Data Type	Units	Required	Description
WaterBodyName	–	varchar(50)	–	Not NULL	Name of water body from which samples are drawn.
StagingArea	–	varchar(50)	–	Not NULL	Name of location from which the random location is accessed (boat launch, pier, etc.)
IsPlannedLocation	–	bit	–	Not NULL	Denotes whether CoordinateX and CoordinateY are located where originally planned. Value =1 means Yes; Value = 0 means No
LocationNote	–	varchar (100)	–	Allow NULL	Description of or more information related to the random sampling location or staging area. Typically useful for field operations knowledge.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the RandomSamplingLocation table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the RandomSamplingLocation table.
DataProcessingDate	–	Date	–	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	Integer	–	–	Current level of data processing for the record.

Table A-17. Descriptions of fields in tbl_DiscreteSynopticEvent in the Estuarine Water-Quality Monitoring Database. Records in this table store some information obtained from Park-wide Assessment ‘Station Form.’ These records also serve the purpose of linking all Park-wide Assessment form data to its corresponding ‘RandomSamplingLocation’ location information. The ‘DiscreteSynopticEvent’ table holds information that is dependent upon the time and date that the Park-wide Assessment Event took place. For example, ‘WindSpeed’ can change based on the day’s weather.

Field Name	Key	Data Type	Units	Required	Description
DiscreteSynopticEventID	PK	Integer (Auto-Incrementing)	–	Not Null	Primary key field identifying a DiscreteSynopticEvent record.
RandomStationID	FK	Integer	–	–	Foreign key to the parent RandomSamplingLocation table. Each DiscreteSynopticEventID is associated with a particular RandomStationID.
EventStartDate	–	date	–	Not NULL	Date of visit to the random sampling location.
ArrivalTimeEST	–	time	HH:MM	Not NULL	Time of arrival at the monitoring location. This is recorded in local eastern time (eastern standard or eastern daylight).
DepartureTimeEST	–	time	HH:MM	Not NULL	Time of monitoring location departure. This is recorded in local eastern time (eastern standard or eastern daylight).
WindSpeed	–	decimal (3,1)	mph	Allow NULL	Wind speed recorded with handheld weather instrument such as a Kestrel. Field crew does not collect data if wind speed exceeds 45 mph.
AirTemperature	–	decimal (4,2)	°C	Allow NULL	Air temperature recorded with handheld weather instrument such as a Kestrel.
CloudCover	–	tinyint	%	Allow NULL	% of sky that is cloudy
WeatherNote	–	varchar (50)	–	Allow NULL	Additional weather information of interest.
IsSubmergedAquaticVeg	–	bit	–	Not NULL	Field describes whether Submerged Aquatic Vegetation is present at the random sampling location during the DiscreteSynopticEvent. Yes=SubmergedAquatic vegetation is present; No=Submerged aquatic vegetation is not present.

Field Name	Key	Data Type	Units	Required	Description
IsMarineDebris	–	bit	–	Not NULL	Field describes whether marine debris is present at the random sampling location during the DiscreteSynopticEvent. Yes= marine debris is present; No= marine debris is not present.
DiscreteSynopticComment	–	varchar (250)	–	Allow NULL	Comments related to the station visit.
RecordedByID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the DiscreteSynopticEvent table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the DiscreteSynopticEvent table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	Integer	–	–	Current level of data processing for the record.
IsDeleted	–	bit	–	–	Indicates if the event has been deleted from the database.
DeletionDate	–	DATE	–	–	Indicates the date that the IsDeleted field was set to true.

Table A-18. Descriptions of fields in tbl_SynopticWaterSample in the Estuarine Water-Quality Monitoring Database. This table stores records about a single water sample obtained during a Park-wide Assessment. There will generally be only one 'Normal Sample' per Park-wide Assessment, but there can also be 'QC Blank' or 'QC Duplicate' water samples collected (See SOP: Database User Manual for more information).

Field Name	Key	Data Type	Units	Required	Description
SynopticWaterSampleID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a SynopticWaterSample record.
DiscreteSynopticEventID	FK (Lookup)	Integer	–	–	Foreign key to the parent DiscreteSynopticEvent table.
CollectionTimeEST	–	time	HH:MM	–	Time the water sample was collected on site.
CollectionDate	–	DATE	–	–	The date that the water sample was collected on site.
CollectedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
FiltrationMethodID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the FiltrationMethod Lookup table. Filtration method refers to the method used to separate the sample - water separated from suspended solids. Both components are sent to a lab. [Default value should be Vacuum. The other option is Syringe.]
SecchiDepth	–	decimal (3,1)	m	Not NULL	Depth at which the Secchi disk is no longer visible to the observer, measured to the nearest 10cm. This measure is related to and allows general inference to water turbidity.
IsSecchiSubstrate	–	bit	–	Not NULL	Indicates if the Secchi disk reaches the bottom (substrate) without losing visibility. If so, the value in SecchiDepth field equals the distance to the bottom.
Salinity	–	decimal (4,2)	ppt	Allow NULL	Salinity as measured in parts per thousand. [This value may come from a RetrievalEvent on the same date as this DiscreteFixedEvent. In rare cases, it is measured separately during this DiscreteFixedEvent.]
LowTideTimeEST	–	time	HH:MM	Not NULL	Low tide estimate from the nearest pertinent station. This is recorded in local eastern time (eastern standard or eastern daylight).
VolumeFiltered	–	integer	mL	Not NULL	The total volume of water filtered.
FilteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The FilteredByID represents the User who actually filtered the water sample in the field.

Field Name	Key	Data Type	Units	Required	Description
FilteredDate	–	date	date	Not NULL	Date water sample was filtered.
FilteredTimeEST	–	time	HH:MM	Not NULL	Local time water sample was filtered. This is recorded in local eastern time (eastern standard or eastern daylight).
IsTDNAnalysis	–	bit	–	Not NULL	Indicates if a analysis for Total Dissolved Nitrogen is requested. Values: Yes =1 or No = 0.
IsTDPAnalysis	–	bit	–	Not NULL	Indicates if an analysis for Total Dissolved Phosphorous is requested. Values: Yes =1 or No = 0.
IsChlaAnalysis	–	bit	–	Not NULL	Indicates if a analysis for Chlorophyll A is requested. Values: Yes =1 or No = 0.
IsDINAnalysis	–	bit	–	Not NULL	Indicates if a analysis for Dissolved Inorganic Nitrogen is requested. Values: Yes =1 or No = 0. These values are only required to be taken quarterly (February, May, August, November)
IsDIPAnalysis	–	bit	–	Not NULL	Indicates if an analysis for Dissolved Inorganic Phosphorous is requested. Values: Yes =1 or No = 0. These values are only required to be taken quarterly (February, May, August, November)
IsTNAnalysis	–	bit	–	Not NULL	–
IsTPAnalysis	–	bit	–	Not NULL	–
Comment	–	varchar (250)	–	Allow NULL	A comment regarding the current synoptic water sample.
WaterSampleTypeID	FK (Lookup)	Integer	–	Not NULL	Foreign key to WaterSampleType table. Values correspond to Normal sample, QC sample, QC blank.
RecordedByID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the SynopticWaterSample table.

Field Name	Key	Data Type	Units	Required	Description
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the SynopticWaterSample table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.

Table A-19. Descriptions of fields in tbl_SynopticWaterNutrient in the Estuarine Water-Quality Monitoring Database. This table stores records about nutrient analysis results. The nutrient results are obtained from analysis conducted on water samples collected during the Park-wide Assessment.

Field Name	Key	Data Type	Units	Required	Description
WaterNutrientID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a SynopticWaterNutrient record.
WaterNutrientSampleID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the parent SynopticWaterSample table.
LaboratoryID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Laboratory lookup table. Denotes which laboratory was used to perform sample testing.
ParameterID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Parameter lookup table. Denotes the water-quality parameter.
UnitID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Unit table. Denotes the measurement units corresponding to the parameter results.
MethodID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the Method lookup table. Denotes standard method used for preparation and analysis of water-quality parameters.
AnalysisDate	–	date	–	Not NULL	Date that the sample was analyzed for the nutrient.
MethodDetectionLimit	–	decimal (5,4)	–	Not NULL	The method detection limit (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. (Revision 2 of the method detection limit procedure from 40 CFR 136 Appendix B)

Field Name	Key	Data Type	Units	Required	Description
Result	–	decimal (10,4)	–	Not NULL	Numeric value corresponding to the result of an analysis on a particular nutrient parameter.
LowerQuantificationLimit	–	decimal (5,4)	–	Allow NULL	The Lower Quantification Limit (often referred to as the Practical Quantitation Limit - PQL or reporting limit-RL) represents the smallest amount of the target substance or characteristic that could be quantified by the instrument or analytical process. Values above the lower and below the upper quantification limits are reported as valid numeric results. The PQL is greater than the Detection Limit. Values less than the PQL but greater than the detection limit must be considered semi-quantitative estimates indicating that the substance is present but not quantified.
Comment	–	varchar (250)	–	Allow NULL	Additional information about this record. Typically provided by laboratory.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the SynopticWaterNutrient table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the SynopticWaterNutrient table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	integer	–	–	Current level of data processing for the record.

Table A-20. Descriptions of fields in tbl_SedimentSample in the Estuarine Water-Quality Monitoring Database. This table stores information on sediment sample collection. A sediment sample's corresponding 'sediment grabs' are sent to a laboratory and analyzed to determine sediment analyte information.

Field Name	Key	Data Type	Units	Required	Description
SedimentSampleID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a SedimentSample record.
DiscreteSynopticEventID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the parent DiscreteSynopticEvent table.
CollectionDate	–	date	date	Not NULL	Date sediment sample was collected. In most cases this is identical to the EventStartDate, but in few cases, it may differ.
CollectionTimeEST	–	time	HH:MM	Not NULL	Time sediment sample was collected. Recorded in local time (eastern standard or eastern daylight).
CollectedByID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
RecordedByID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
IsOrganicMetals	–	bit	–	Not NULL	Indicates if a analysis for Organic metals is requested. Values: Yes =1 or No = 0.
IsGrainParticleSize	–	bit	–	Not NULL	Indicates if a analysis for Grain particle size is requested. GrainParticleSize is the sieve size through which particles pass. Values: Yes =1 or No = 0.
IsTotalOrganicCarbon	–	bit	–	Not NULL	Indicates if a analysis for Total Organic carbon is requested. Values: Yes =1 or No = 0.
Comment	–	varchar (250)	–	Allow NULL	Additional comments about sediment sample.
GrabCount	–	tinyint	count	Not NULL	Number of grab samples collected and homogenized to reach minimum necessary sediment volume.
EnteredByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the SedimentSample table.

Field Name	Key	Data Type	Units	Required	Description
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	Integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the SedimentSample table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.

Table A-21. Descriptions of fields in tbl_SedimentAnalyte in the Estuarine Water-Quality Monitoring Database. This table stores information about individual analytes that are the results of laboratory analysis of a sediment sample. Each sediment sample corresponds to many sediment analytes.

Field Name	Key	Data Type	Units	Required	Description
SedimentAnalyteID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a SedimentAnalyte record.
SedimentSampleID	FK (Lookup)	Integer	–	Not NULL	Foreign key to the parent SedimentSample table.
LaboratoryID	FK (Lookup)	integer	–	Not NULL	Foreign key to the Laboratory lookup table. Denotes which laboratory was used to perform sample testing.
ParameterID	FK (Lookup)	integer	–	Not NULL	Foreign key to the Parameter lookup table. Denotes the sediment parameter.
UnitID	FK (Lookup)	integer	–	Not NULL	Foreign key to the Unit table. Denotes the measurement units corresponding to the parameter results.
MethodID	FK (Lookup)	integer	–	Not NULL	Foreign key to the Method lookup table. Denotes standard method used for preparation and analysis of water-quality parameters.
AnalysisDate	–	date	–	Not NULL	Date that sample was analyzed.
MethodDetectionLimit	–	decimal (5,4)	–	Not NULL	"The method detection limit (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." (Revision 2 of the method detection limit procedure from 40 CFR 136 Appendix B)

Field Name	Key	Data Type	Units	Required	Description
LowerQuantificationLimit	–	decimal (5,4)	–	Allow NULL	The Lower Quantification Limit (often referred to as the Practical Quantitation Limit - PQL or reporting limit-RL) represents the smallest amount of the target substance or characteristic that could be quantified by the instrument or analytical process. Values above the lower and below the upper quantification limits are reported as valid numeric results. The PQL is greater than the Detection Limit. Values less than the PQL but greater than the detection limit must be considered semi-quantitative estimates indicating that the substance is present but not quantified.
Result	–	decimal (10,4)	–	Not NULL	Numeric value corresponding to the result of an analysis on a particular sediment parameter.
Comment	–	varchar (250)	–	Allow NULL	Additional information about this record. Typically provided by laboratory.
EnteredByID	FK (Lookup)	integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the SedimentAnalyte table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.
DataProcessedByID	FK (Lookup)	integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the SedimentAnalyte table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	integer	–	–	Current level of data processing for the record.

Table A-22. Descriptions of fields in tbl_SedimentSizeDistribution in the Estuarine Water-Quality Monitoring Database. This table holds records of individual sediment size distribution summaries that are provided from a laboratory. Within a returned analyte laboratory report, there will also be a 'Particle Size Distribution Report.' This report will be used to enter quantitative data on the sediment sample's composition as well as qualitative information on the material's description.

Field Name	Key	Data Type	Units	Required	Description
SedimentSizeDistributionID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a SedimentSizeDistribution record
SedimentSampleID	FK (lookup)	Integer	–	Not Null	Foreign key to the parent SedimentSample table.
PercentGrainOver3Inches	–	decimal (3,1)	–	Not Null	–
PercentCoarseGravel	–	decimal (3,1)	–	Not Null	Percent of the current sediment sample that is composed of coarse gravel.
PercentFineGravel	–	decimal (3,1)	–	Not Null	Percent of the current sediment sample composed of fine gravel.
PercentCoarseSand	–	decimal (3,1)	–	Not Null	Percent of the current sediment sample composed of coarse sand
PercentMediumSand	–	decimal (3,1)	–	Not Null	Percent of the current sediment sample composed of fine sand
PercentFineSand	–	decimal (3,1)	–	Not Null	Percent of the current sediment sample composed of fine sand
PercentSiltFines	–	decimal (3,1)	–	Not Null	Percent of the current sediment sample composed of silt fines
PercentClayFines	–	decimal (3,1)	–	Not Null	Percent of the current sediment sample composed of clay fines
MaterialDescription	–	varchar(100)	–	Allow Null	–
EnteredByID	–	Integer	–	Not Null	–
EnteredByDate	–	date	–	Not Null	–
DataProcessedByID	–	Integer	–	Not Null	–
DataProcessedDate	–	date	–	Not Null	–
DataProcessingLevelID	–	Integer	–	Not Null	Current level of data processing for the record.

Table A-23. Descriptions of fields in tbl_HydrologicProfile in the Estuarine Water-Quality Monitoring Database.

Field Name	Key	Data Type	Units	Required	Description
HydrologicProfileID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a HydrographicProfile record.
DiscreteSynopticEventID	FK (Lookup)	integer	–	Not NULL	Foreign key to the parent DiscreteSynopticEvent table.
ProfileDate	–	date	date	Not NULL	Date profile was conducted.
StartTimeEST	–	time	HH:MM	Not NULL	Time profile was conducted. Recorded in local time (either eastern standard or eastern daylight).
BarometricPressure	–	decimal (4,1)	mmHg	Not NULL	Absolute (non-corrected) atmospheric barometric pressure.
TotalWaterColumnDepth	–	decimal (3,1)	m	Not NULL	Distance from water surface to bottom at time of visit. This is dependent on the tide. Used to determine the position in the water column at which samples will be taken.
FieldMeterID	FK (Lookup)	integer	–	Not NULL	Foreign key to the Equipment lookup table. The FieldMeterID represents a unique device identified in the Equipment lookup table used for the hydrographic profile effort.
FieldMeterCheckDate	–	date	date	Not NULL	Date the field meter was calibrated.
FieldMeterCheckByID	FK (Lookup)	integer	–	Not NULL	Foreign key to the User lookup table. The FieldMeterCheckedByID represents the User who ensured proper checks and calibrations on the FieldMeter.
RecordedByID	FK (Lookup)	integer	–	Not NULL	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.
EnteredByID	FK (Lookup)	integer	–	–	Foreign key to the User lookup table. The EnteredByID represents the User who entered the record in the HydrologicProfile table.
EnteredDate	–	date	–	–	Date on which the record in this table was entered.

Field Name	Key	Data Type	Units	Required	Description
DataProcessedByID	FK (Lookup)	integer	–	–	Foreign key to the User lookup table. The DataProcessedByID represents the User who certified the record in the HydrologicProfile table.
DataProcessingDate	–	date	–	–	Date on which the record in this table was certified.
DataProcessingLevelID	FK (Lookup)	integer	–	–	Current level of data processing for the record.

Table A-24. Descriptions of fields in tbl_ProfileIncrement in the Estuarine Water-Quality Monitoring Database. This table's records are single profile increments (depths) from the hydrologic profile datasheet. There are multiple profile increments.

Field Name	Key	Data Type	Units	Required	Description
ProfileIncrementID	PK	integer (auto-incrementing)	–	Not NULL	Primary key field identifying a ProfileIncrement record.
HydrologicProfileID	FK (Lookup)	integer	–	Not NULL	Foreign key to the parent HydrologicProfile table.
SampleWaterColumnDepth	–	decimal (3,1)	m	Not NULL	Distance from water surface to location where data are collected. This is dependent on the tide.
Temperature	–	decimal (4,2)	°C	Allow NULL	On site water temperature as measured by a field meter at given sample depth.
ODO	–	decimal (4,2)	mg/l	Allow NULL	On site dissolved oxygen concentration as measured by a field meter at given sample depth.
Salinity	–	decimal (4,2)	ppt	Allow NULL	On site salinity as measured by a field meter at given sample depth.
pH	–	decimal (4,2)	pH	Allow NULL	On site pH as measured by a field meter at given sample depth.
Turbidity	–	decimal (6,1)	FNU	Allow NULL	On site turbidity as measured by a field meter at given sample depth.

Field Name	Key	Data Type	Units	Required	Description
Chlorophyll	–	decimal (5,1)	µg/L	Allow NULL	On site chlorophyll as measured by a field meter at a given sample depth.
VerticalDirectionID	FK (Lookup)	integer	–	Not NULL	Foreign key to VerticalDirection lookup table. Indicates whether the record is associated with lowering (down) the field meter or pulling (up) the field meter during execution of the hydrographic profile.
Comment	–	varchar (250)	–	Allow NULL	Additional comments about this profile increment.

Table A-25. Descriptions of fields in tbl_PhotoGraph in the Estuarine Water-Quality Monitoring Database. Photograph records store information about the direction of the photo, the photograph file name, and who took the photograph.

Field Name	Key	Data Type	Units	Required	Description
PhotoID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a Photograph record.
DiscreteSynopticEventID	FK (Lookup)	integer	–	–	Foreign key to the parent DiscreteSynopticEvent table.
CardinalDirectionID	FK (Lookup)	integer	–	–	Foreign key to the CardinalDirection lookup table. Denotes which cardinal direction the camera was pointed toward when the photo was taken.
FileName	–	varchar (75)	–	–	Name of the final / official file stored on server and used to locate and identify this image file.
CollectedByID	FK (Lookup)	integer	–	–	Foreign key to the User lookup table. The RecordedByID represents the User who took the photo in the field.
RecordedByID	FK (Lookup)	integer	–	–	Foreign key to the User lookup table. The RecordedByID represents the User who physically recorded data in the field.

Table A-26. Descriptions of fields in tbl_Habitat in the Estuarine Water-Quality Monitoring Database. Each habitat record corresponds to a single habitat type and a single park-wide assessment (RandomStation).

Field Name	Key	Data Type	Units	Required	Description
HabitatID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a Habitat record.
RandomStationID	FK (Lookup)	integer	–	–	Foreign key to the parent RandomSamplingLocation table.
HabitatTypeID	FK (Lookup)	integer	–	–	Foreign key to the HabitatType lookup table. Denotes which Habitat types exist at the sampling location.

Table A-27. Descriptions of fields in tbl_MarineDebrisSynoptic in the Estuarine Water-Quality Monitoring Database. This table's records store the type of marine debris (from Marine Debris lookup table) and which synoptic event this marine debris was recorded at. Each synoptic event will have at most one marine debris present but might not have any records. The corresponding DiscreteSynopticEvent's "isMarineDebris" record will indicate whether there should be a MarineDebrisSynoptic record.

Field Name	Key	Data Type	Units	Required	Description
MarineDebrisSynopticID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a MarineDebrisSynoptic record.
DiscreteSynopticEventID	FK (Lookup)	integer	–	–	Foreign key to the parent DiscreteSynopticEvent table.
MarineDebrisTypeID	FK (Lookup)	integer	–	–	Foreign Key to MarineDebrisType lookup table. Denotes which marine debris types exist at the sampling location during the Discrete synoptic event.

Table A-28. Descriptions of fields in tbl_Equipment in the Estuarine Water-Quality Monitoring Database. The primary equipment stored will be Datasondes.

Field Name	Key	Data Type	Units	Required	Description
EquipmentID	PK	integer (auto-incrementing)	–	–	Primary key field identifying an Equipment lookup record.
InstrumentModel	–	Varchar(25)	–	Not NULL	–
SerialNumber	–	Varchar(25)	–	Not Null	–
Summary	–	Varchar(250)	–	Not Null	Description of this lookup value.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-29. Descriptions of fields in tbl_EquipmentComponent in the Estuarine Water-Quality Monitoring Database. Equipment Components are portions of equipment rather than entire or specific pieces of equipment. The intended use of this table is to track portions of equipment that have fouling on them. For specific information on equipment pieces that have fouling, a fouling record's parent Post Deployment Event record should be consulted.

Field Name	Key	Data Type	Units	Required	Description
EquipmentComponentID	PK	integer (auto-incrementing)	–	–	Primary key field identifying an EquipmentComponent lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-30. Descriptions of fields in tbl_FoulingType in the Estuarine Water-Quality Monitoring Database. This table stores information on the types of fouling that could be present on equipment as a result of the continuous event process.

Field Name	Key	Data Type	Units	Required	Description
FoulingTypeID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a FoulingType lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-31. Descriptions of fields in tbl_FoulingLevel in the Estuarine Water-Quality Monitoring Database. This table stores general options for the amount of fouling that could be present on a piece of equipment used for a continuous event. Options include: Light, Moderate, and Heavy.

Field Name	Key	Data Type	Units	Required	Description
FoulingLevelID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a FoulingLevel lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
ReadingTypeID	PK	integer (auto-incrementing)	–	–	Primary key field identifying an ReadingType lookup record.

Table A-32. Descriptions of fields in tbl_ReadingType in the Estuarine Water-Quality Monitoring Database. Records include the options for pre-deployment calibration reading types. Options include: Standard, Measured, Calibrated. These options will be mostly static, but could be changed to match any changes in the Pre-Deployment Information Datasheet.

Field Name	Key	Data Type	Units	Required	Description
Code		Varchar(25)		Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label		Varchar(50)		Not NULL	A brief identifying name associated with this lookup value.
Summary		Varchar(250)		Not NULL	A meaningful description of this lookup value.
SiteObservationID	PK	integer (auto-incrementing)			Primary key field identifying an SiteObservation lookup record.

Table A-33. Descriptions of fields in tbl_SiteObservation in the Estuarine Water-Quality Monitoring Database. This table stores general observations that can be present or not present during a deployment event. Options include: Fish Kill, Algal Bloom, Debris, Hurricane/TS, and other.

Field Name	Key	Data Type	Units	Required	Description
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-34. Descriptions of fields in tbl_ProtocolUser in the Estuarine Water-Quality Monitoring Database. Each record will correspond to a real person that interacted with data entry or data collection in some manner. Database entry requires that a protocol user exists along with a valid NPS 'WindowsLogonName.'

Field Name	Key	Data Type	Units	Required	Description
ProtocolUserID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a User lookup record.
FirstName	–	Varchar(50)	–	Not NULL	User's First name.
LastName	–	Varchar(50)	–	Not NULL	User's family name (last name).
WindowsLogonName	–	varchar(50)	–	–	User's NPS issued Windows logon name.
IsAdmin	–	Bit	–	Not Null	Whether or not the user has administrative privileges.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-35. Descriptions of fields in tbl_FiltrationMethod in the Estuarine Water-Quality Monitoring Database. This table stores options for separating water samples from suspended solids. The two methods are: Vacuum and Syringe.

Field Name	Key	Data Type	Units	Required	Description
FiltrationMethodID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a FiltrationMethod lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-36. Descriptions of fields in tbl_Laboratory in the Estuarine Water-Quality Monitoring Database. This table stores records on United States laboratories that the SECN Water-quality program interacts with.

Field Name	Key	Data Type	Units	Required	Description
LaboratoryID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a Laboratory lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive		bit		Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-37. Descriptions of fields in tbl_MarineDebrisType in the Estuarine Water-Quality Monitoring Database. This table stores the options for types of marine debris that could be present during a Park-wide Assessment. There will not necessarily be Marine Debris Present at every Park-wide Assessment. Options include: Plastic, Wood, Glass, Cans, and Other.

Field Name	Key	Data Type	Units	Required	Description
MarineDebrisTypeID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a MarineDebrisType lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-38. Descriptions of fields in tbl_Unit in the Estuarine Water-Quality Monitoring Database. The table stores the various units of measurement that could be used. This is especially important for lab data (sediment and nutrient analyte data) where the unit of measurement depends upon the parameter.

Field Name	Key	Data Type	Units	Required	Description
UnitID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a Unit lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive	–	bit	–	Not NULL	–

Table A-39. Descriptions of fields in tbl_WaterSampleType in the Estuarine Water-Quality Monitoring Database. This table's records are the options for water sample types. Records include: Normal, QC Blank, and QC Duplicate.

Field Name	Key	Data Type	Units	Required	Description
WaterSampleTypeID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a WaterSampleType lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.

Table A-40. Descriptions of fields in tbl_Parameter in the Estuarine Water-Quality Monitoring Database. These table records are the various parameters that a laboratory will return from analyzing a Water Sample or Sediment Sample. Each analyte/nutrient will correspond to exactly one parameter type.

Field Name	Key	Data Type	Units	Required	Description
ParameterID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a Parameter lookup record.
CodeCAS	–	Varchar(25)	–	Not NULL	Either a code or a standardized CAS number. Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
ParameterTypeID	FK (Lookup)	–	–	–	Foreign key to the ParameterType lookup table. Denotes which parameter type this value is associated with. This will aid in drop-down filtering.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-41. Descriptions of fields in tbl_HabitatType in the Estuarine Water-Quality Monitoring Database. These records are the various habitat types that a Park-wide Assessment could be recorded in.

Field Name	Key	Data Type	Units	Required	Description
HabitatTypeID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a Habitat lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-42. Descriptions of fields in tbl_CardinalDirection in the Estuarine Water-Quality Monitoring Database. Options include: North, South, East, and West.

Field Name	Key	Data Type	Units	Required	Description
CardinalDirectionID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a CardinalDirection lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.

Table A-43. Descriptions of fields in tbl_VerticalDirection in the Estuarine Water-Quality Monitoring Database. Options include: Up and Down.

Field Name	Key	Data Type	Units	Required	Description
VerticalDirectionID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a VerticalDirection lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.

Table A-44. Descriptions of fields in tbl_Method in the Estuarine Water-Quality Monitoring Database. These table records are the various methods that a laboratory will to analyze a Water Sample or Sediment Sample and obtain information about a specific nutrient or sediment analyte. Each analyte will correspond to exactly one method type.

Field Name	Key	Data Type	Units	Required	Description
MethodID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a Method lookup record. Methods are typically standard EPA methods determined acceptable to a certain laboratory nutrient or sediment analysis.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
ParameterID	FK (Lookup)	–	–	–	Foreign key to the Parameter lookup table. Denotes which parameter this method lookup value is associated with. This will aid in drop-down filtering.
IsActive	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-45. Descriptions of fields in tbl_ParameterType in the Estuarine Water-Quality Monitoring Database. These records are used for associating each parameter in the Parameter lookup table with either 'Sediment' or 'Nutrient' entry. These options can be used for limiting parameter drop down lists based on the type of lab data entry.

Field Name	Key	Data Type	Units	Required	Description
ParameterTypeID	PK	integer (auto-incrementing)	n/a	–	Primary key field identifying a ParameterType lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.

Table A-46. Descriptions of fields in tbl_Datum in the Estuarine Water-Quality Monitoring Database. The datum used for storing FixedSamplingLocation coordinate information and RandomSamplingLocation coordinate information. Options include: NAD83 and WGS84.

Field Name	Key	Data Type	Units	Required	Description
DatumID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a Datum lookup record.
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
Is Active	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No

Table A-47. Descriptions of fields in tbl_DataProcessingLevel in the Estuarine Water-Quality Monitoring Database. This table holds NPS standard processing levels that can be applied to all data groups. Some parent record data processing levels will govern the level of their child records. All records will begin in the 'raw' processing state.

Field Name	Key	Data Type	Units	Required	Description
DataPreprocessingLevelID	PK	integer (auto-incrementing)	–	–	Primary key field identifying a DataPreprocessingLevel lookup record. These are standard National Parks data processing levels
Code	–	Varchar(25)	–	Not NULL	Shortened alphanumeric value or abbreviation assigned to this lookup value.
Label	–	Varchar(50)	–	Not NULL	A brief identifying name associated with this lookup value.
Summary	–	Varchar(250)	–	Not NULL	A meaningful description of this lookup value.
Is Active	–	bit	–	Not NULL	Field used to determine if a lookup value is currently active and should appear in front-end application lookup table and corresponding drop-down lists. 1=Yes; 0= No