Expanded and Enhanced Water Quality Monitoring for East Bay (St. Andrew Bay), Lake Wimico, Gulf County Canal, and the Intracoastal Waterway
Grant AT003

Data Collection Summary Report
Fiscal Year 2024-2025
(July 1, 2024 - June 30, 2025)

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1 Introduction

In the late 1930s and early 1940s, the Gulf County Canal (GCC) and Intracoastal Waterway (ICW) were excavated by the U.S. Army Corps of Engineers (Figure 1-1). These waterways were created to provide a safe route for shipping agricultural products to northern markets by allowing for an inshore navigational route connecting multiple bays along the Gulf Coast from Texas to Florida. The waterways produced by these projects not only facilitated easy and safe navigation, but also hydrologically connected waterbodies which were previously isolated or minimally connected. Within Gulf, Bay, and Franklin counties, Florida, the GCC and ICW connected St. Andrew Bay, St. Joseph Bay, and Apalachicola Bay.

In recent years, potential changes in the water quality and ecology of St. Joseph Bay and Lake Wimico have been reported by residents and anecdotally attributed to freshwater flows through the GCC and ICW. Previous studies involving hydrodynamic models in East Bay (St. Andrew Bay) reported water tends to flow from the East Bay portion of St. Andrew Bay into the Intracoastal Waterway, with reversal during some conditions (Rodriguez and Wu 1990, Blumberg and Kim 2000). Detailed data concerning discharge estimates and the timing of these historical flows is unavailable. Due to the connecting waterways, any investigation into changes in water quality of St. Joseph Bay should include investigations into the surrounding watersheds and their potential connectivity to St. Joseph Bay. As a result, understanding the connectivity between St. Andrew Bay, St. Joseph Bay, and Apalachicola Bay is imperative for understanding how flows may influence changes in the water quality and, potentially, the ecology of these multiple interconnected bay systems.

Historically, much of the land surrounding the East Bay portion of St. Andrew Bay (where St. Andrew Bay is connected to the ICW) was managed for pine silviculture. Conversion of forested lands to pasture to support cattle production began during the last decade and accelerated after October 2018 when Hurricane Michael made landfall and destroyed most of the trees in the area. These changes have the potential to affect sediment transport and water quality parameters such as nitrate levels, suspended solids, and turbidity. Adverse changes in water quality can impact aquatic ecology by promoting algal growth, reducing light availability for photosynthesis, and burying benthic habitats in sediment. Due to the hydrologic connectivity described above, water quality constituents can potentially be transported among St. Andrew Bay, St. Joseph Bay, Lake Wimico, and/or Apalachicola Bay.

The Northwest Florida Water Management District (NWFWMD) was asked by the Department of Environmental Protection (DEP) to prepare a broad scope of work for assessing the hydrologic connectivity of St. Joseph Bay, Apalachicola Bay, and St. Andrew Bay and the potential of hydrologic connections to transport constituents that affect water quality. The work is funded under DEP grant AT003 which was initiated during FY 2019-2020. Previous versions of the scope of work were developed and completed to begin addressing the following questions:

1. How are Apalachicola Bay, St. Joseph Bay, and St. Andrew Bay hydrologically connected through the Intracoastal Waterway in a given year?
2. What are the water quality conditions, trends, and data gaps within East Bay (St. Andrew Bay) and its contributing watershed?
3. What are the general salinity characteristics of Lake Wimico throughout a year?
4. What are additional surface water inputs to St. Joseph Bay in addition to the GCC?

During FY 2024-2025, the scope of work continued data-collection efforts to address the question of hydrologic connections and flows through the Intracoastal Waterway under Amendment 9 to Grant AT003. In February 2025, Amendment 10 was executed to the grant which provided additional funding to collect additional lab-analyzed water quality samples at locations around St. Joseph Bay, in addition to attempting to collect satellite-based water quality maps of the bay. The satellite-based mapping efforts were originally anticipated to be conducted using sole-source procurement, however during the advertisement period an alternative vendor was identified which provided similar enough services as to make the sole source procurement inappropriate. Due to time constraints which limited procurement alternatives, Amendment 11 was executed during March 2025 which removed that task from the grant, keeping only the discharge and lab-analyzed water quality monitoring efforts. This report summarizes the data collected as part of Amendments 9, 10, and 11 to Grant AT003. Additional tasks and data which were collected as part of previous amendments during FY 2019-2020, FY 2020-2021, FY 2021-2022, FY 2022-2023, and/or FY 2023-24, but not during FY 2024-2025, are not included in this report, but are described in previous annual reports. While Amendments 9, 10, and 11 extended the contract period from 7/1/2024 through 6/30/2025, all flow and continuous water quality data collection continued under these amendments are included in the analysis.

Figure 1-1: *General Study Area for Grant AT003*

2 Study Area

The study area for the project includes the Intracoastal Waterway and the Gulf County Canal in Gulf County, FL (Figure 1). In addition, water quality samples were collected around St. Joseph Bay.

3 Hydrology

This section provides information on existing knowledge concerning flows among Apalachicola Bay, St. Joseph Bay, and St. Andrew Bay (East Bay) (Figure 3-1).

3.1 Previous Studies

Three sources of available information concerning flows relevant to the ICW and GCC were identified. In 1990, Rodriguez and Wu prepared a three-dimensional hydrodynamic model to investigate contaminant flushing in St. Andrew Bay associated with wastewater treatment (Rodriguez and Wu 1990). Their investigation reported that, under some conditions, the water in East Bay remains relatively isolated from the rest of St. Andrew Bay and East Bay water may be transferred into the ICW and flow toward St. Joseph Bay and Apalachicola Bay.

Blumberg and Kim developed a subsequent three-dimensional hydrodynamic model for St. Andrew Bay which showed that flows within the St. Andrew Bay were highly variable (Blumberg and Kim 2000). During some periods, flows entered East Bay and St. Andrew Bay from the ICW, while at other times water from St. Andrew Bay into the ICW.

The United States Geological Survey produces and maintains the National Hydrography Dataset (NHD) which depicts the water drainage network of rivers, streams, canals, lakes and coastlines throughout the United States (NHD Plus, Version 2). The NHD depicts the fundamental flow network of streams, rivers, and other waterways in a series of line vectors. This dataset indicates that flows in the ICW tend to flow from East Bay towards St. Joseph Bay and Apalachicola (Figure 3-1).

In addition, several other studies have reported information relevant to salinity in St. Joseph Bay. In 1999, the USGS reported estimated instantaneous discharges at the mouth of St. Joseph Bay as ranging between -116,000 cubic feet per second (cfs) and 110,000 cfs during October 1997 and -132,000 cfs and 121,000 cfs during March 1998 (Berndt and Franklin 1999).

Figure 3-1: *Flow Directions from the National Hydrography Dataset, Version 2*

3.2 Continuous Discharge Data Collection

As part of the current study funded under DEP grant AT003, flows through the Gulf County Canal are being estimated using two continuous recording monitoring stations located along the ICW on either side of the Gulf County Canal (Figure 3-2).

The United States Geological Survey (USGS) was contracted to install two discharge monitoring stations to measure flows entering and leaving the Gulf County Canal at the confluence with the Intracoastal Waterway (Figure 3-2). During a site inspection, no suitable locations for monitoring stations were identified along the Gulf County Canal due to a large amount of boat traffic and public recreation use, poor site access, unconsolidated shoreline sediments, and a large volume of debris in the channel. Two suitable locations were identified in the Intracoastal Waterway in collaboration with the USGS. However, due to the remoteness of the site, shoreline access was not possible, and the sample locations required the construction of two platforms using pilings and boat access for maintenance.

Under a separate contract, the USGS was contracted to construct a third monitoring station located in the Box R Wildlife Management Area on the Jackson River (Figure 3-2). This site was originally designed to monitor flow from the main stem of the Apalachicola River/Apalachicola Bay into Lake Wimico. This station was determined to be necessary due to the possibility of additional freshwater flows being added to Lake Wimico and the Intracoastal Waterway between the Apalachicola River and GCC discharge monitoring stations. Collection of accurate discharge measurements at this site proved impossible because of the presence of dense submerged aquatic vegetation and shallow water depths. However, this station was maintained to collect stage and limited water quality data, and discharge data collection was discontinued.

All data collected at these three locations are available at the websites listed below:

1. https://waterdata.usgs.gov/fl/nwis/uv/?site_no=295323085151700&agency_cd=USGS (USGS Station 295323085151700 (IWW WEST OF GULF CO CANAL NEAR PORT ST JOE, FL).
2. https://nwis.waterdata.usgs.gov/fl/nwis/uv/?site_no=295308085143700&agency_cd=USGS (USGS Station 0298308085143700 (IWW EAST OF GULF CO CANAL NEAR PORT ST JOE, FL).
3. https://waterdata.usgs.gov/fl/nwis/uv/?site_no=02359223&agency_cd=USGS (USGS Station 02359223 (JACKSON RIVER AT RANCH ROAD NR APALACHICOLA, FL). This station is scheduled for decommission on October 1, 2025.

Discharge estimates at all locations are being collected using the Index Velocity (IV) Method as described in Levesque and Oberg (2012). The IV method is required due to tidal influences which extend well into the ICW. The IV method uses calculations from two

separate rating curves: 1- a stage rating curve which provides the cross-sectional area of water flowing by the sensors and 2- a velocity rating curve which relates water velocity and direction at a point in the channel to the average channel velocity. Discharge data was subsequently tidally filtered using a Godin filter and converted to daily averages by the USGS. Flows through the GCC are estimated using a mass balance approach.

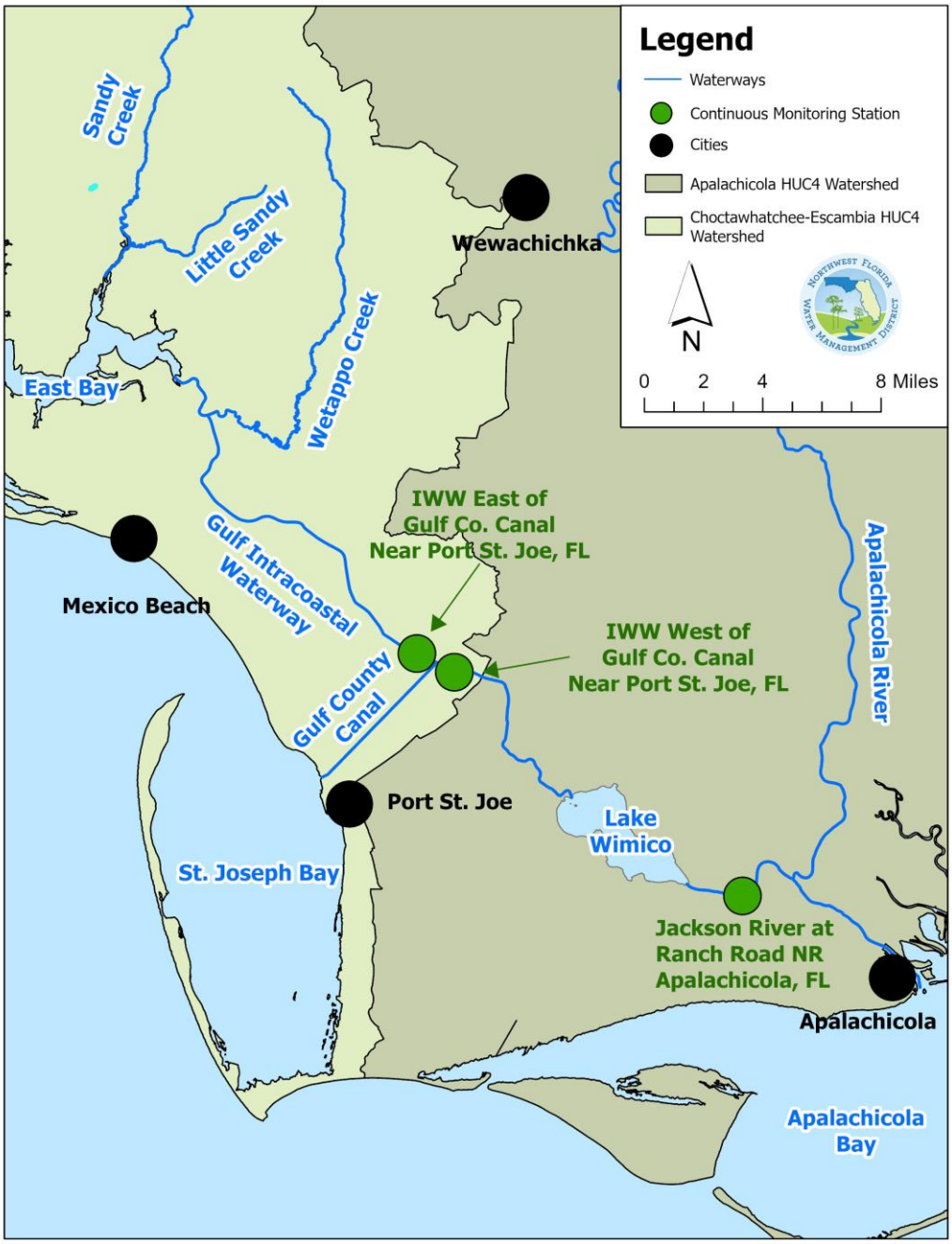


Figure 3-2: *Location of Monitoring Stations*

3.2.1 Continuous Station Discharge Results

Due to the complex hydrology of the system, index velocity ratings take an extraordinary amount of information and time to develop. As a result, much of the discharge data described in this report remains provisional at the time of this document's preparation. Discharge values are therefore subject to change following QA/QC efforts by the USGS. The USGS does not anticipate any major changes; however, and it is assumed that the general trends described will remain accurate even though actual values (average, median, minimum, maximum, etc.) may change.

3.2.1.1 USGS Station 295323085151700 (IWW WEST OF GULF CO CANAL NEAR PORT ST JOE, FL)

A total of 1,516 daily estimates of tidally filtered discharge were available at Station 295323085151700 between 10/24/2020, and 6/30/2025 (Figure 3-3). Several data gaps are present in the flow record which occurred as a result of sensor malfunction. During this period, the average daily flow at this location was 764 cfs (median = 705 cfs) and ranged between -1,720 cfs (flowing towards the Gulf County Canal) and 3,490 cfs (flowing towards St. Andrew Bay. Negative average daily tidally filtered flows towards the Gulf County Canal/Lake Wimico occurred nearly 20 percent of the time (301 days total) during the period of record. Flows west of the Gulf County Canal appear to exhibit seasonality with higher flows occurring during winter/early spring months.

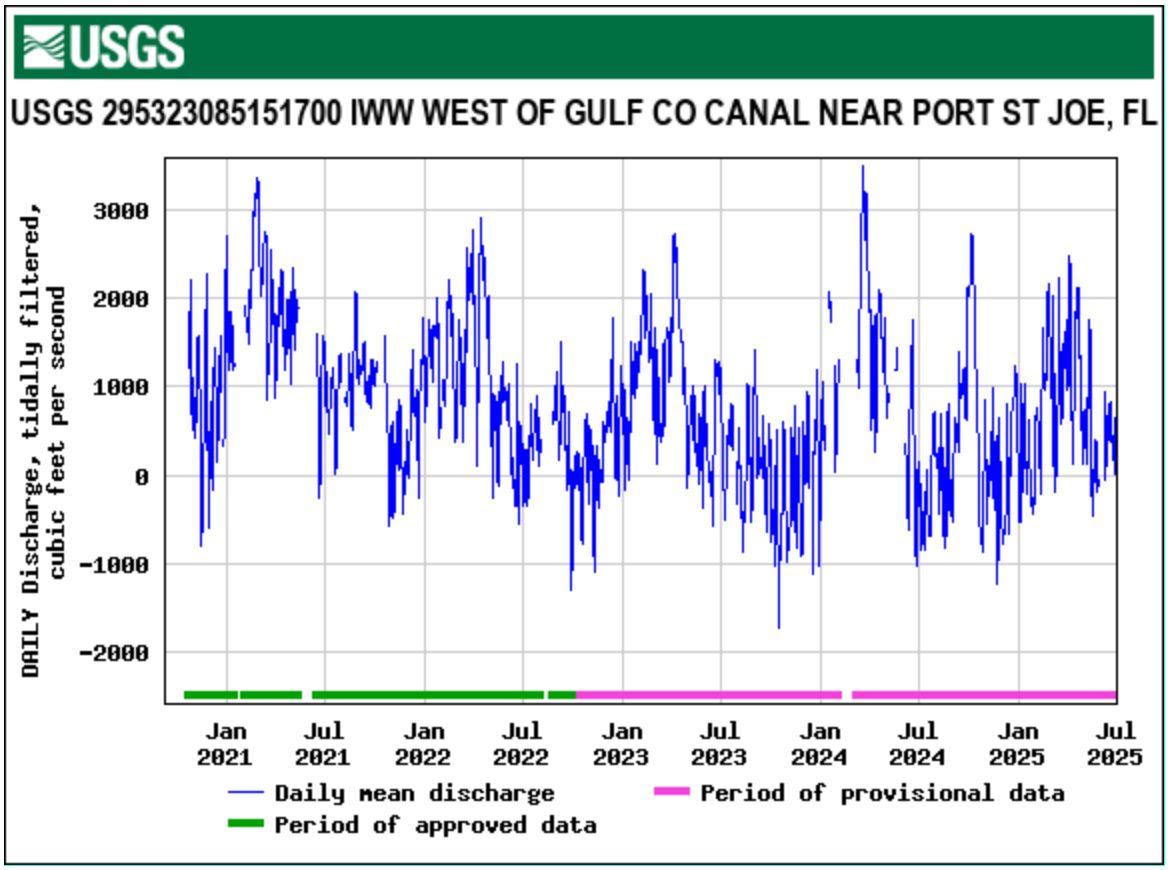


Figure 3-3: *Flows Measured at USGS Station 295323085151700 (IWW WEST OF GULF CO CANAL NEAR PORT ST JOE, FL). Positive flows are towards St. Andrew Bay and negative flows are towards the Gulf County Canal/Lake Wimico.*

3.2.1.2 USGS Station 0298308085143700 (IWW EAST OF GULF CO CANAL NEAR PORT ST JOE, FL)

A total of 1,443 daily estimates of tidally filtered discharge were available at Station 0298308085143700 between 9/25/2020, and 6/30/2025 (Figure 3-4). Several data gaps are present in the flow record which occurred as a result of sensor malfunction. In addition, a large data gap exists between 11/20/2021, and 3/21/2022, when the platform holding the sampling equipment was completely destroyed, presumably by a large barge. During this period the average daily flow at this location was 2,848 cfs (median = 2,440 cfs) and ranged between -1,950 cfs (flows towards Lake Wimico) and 11,600 cfs (flows towards the Gulf County Canal/St. Andrew Bay). Net daily flows were almost always positive with water flowing towards the Gulf County Canal/St. Andrew Bay on 1433 days (>99 percent of the time) with available data. Only 10 days displayed average daily flows to the southeast.

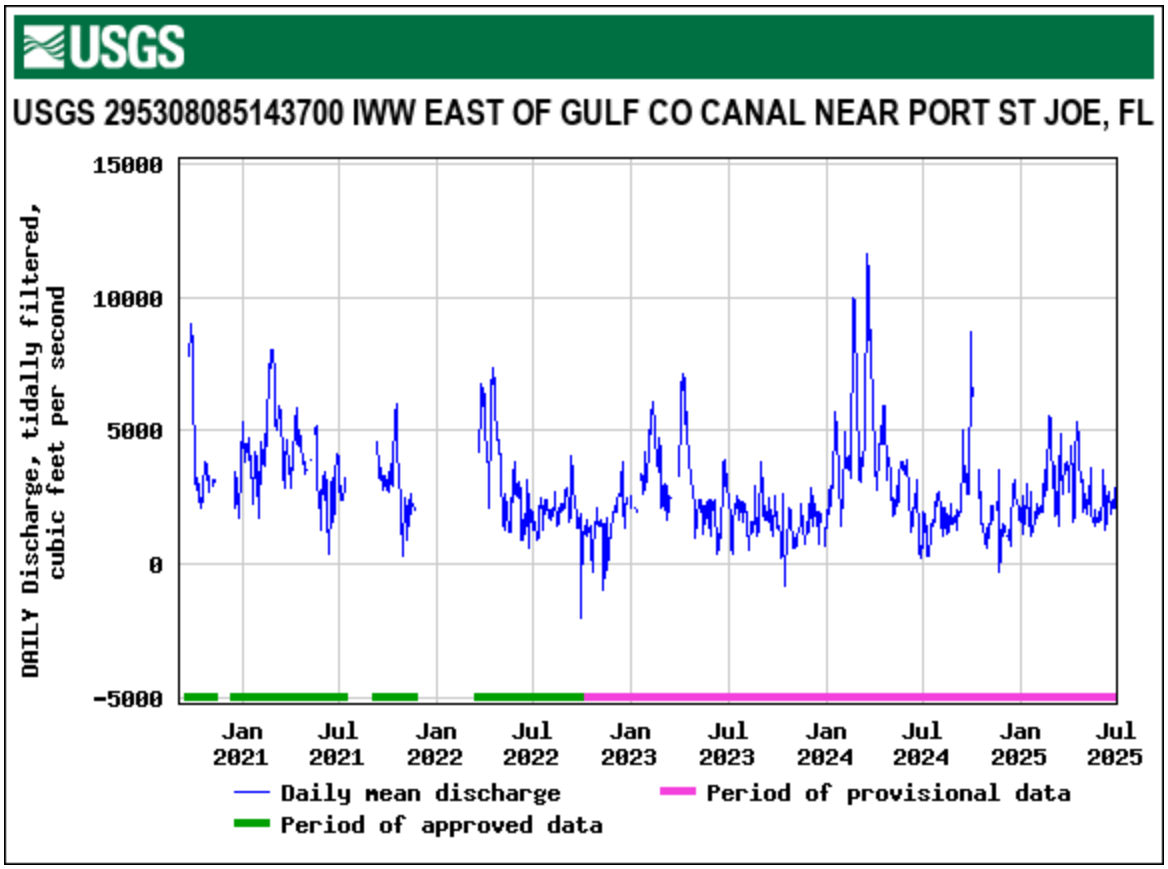


Figure 3-4: *Flows Measured at USGS Station 0298308085143700 (IWW EAST OF GULF CO CANAL NEAR PORT ST JOE, FL. Positive flows indicate flows towards the Gulf County Canal and St. Andrew Bay.*

3.2.1.3 Flows Into the Gulf County Canal

A mass balance approach using the two stations located on the Intracoastal Waterway near the Gulf County Canal was used to calculate the net daily discharge of water flowing into or out of the Gulf County Canal. Flows into the Gulf County Canal were determined by subtracting tidally filtered flows measured at USGS Station 295323085151700 (IWW WEST OF GULF CO CANAL NEAR PORT ST JOE, FL) from tidally filtered flows measured at USGS Station 0298308085143700 (IWW EAST OF GULF CO CANAL NEAR PORT ST JOE, FL). The difference in flows from these stations is estimated to represent the quantity of water diverted into the Gulf County Canal towards St. Joseph Bay.

A total of 1234 concurrent daily, tidally filtered flow observations at USGS Station 295323085151700 and USGS Station 0298308085143700 were available between 10/24/2020, and 6/30/2025. Positive flows indicate water flowing into the Gulf County Canal towards St. Joseph Bay, while negative flows represent flows from the Gulf County Canal into the ICW. During this period, the average measured discharge was 2,025 cfs (median flow = 1,841 cfs) of water flowing into the Gulf County Canal from the ICW (Figure 3-5). These flows ranged from -670 cfs to 8,110 cfs.

During the period of available data, there was almost always (99 percent of the time; all but one day on September 29, 2022) a net daily flow of water into the Gulf County Canal from the ICW (Figure 6). The bulk of this flow is comprised of water originating from the east side of the canal; however, at times water entered the Gulf County Canal from the west. Flows into the canal from the west occurred nearly 20% of the days for which flow data into the Gulf County Canal were available. While available data indicates that flows into the Gulf County Canal may increase during the winter/early spring season, additional data collection is needed to better define long-term and seasonal trends.

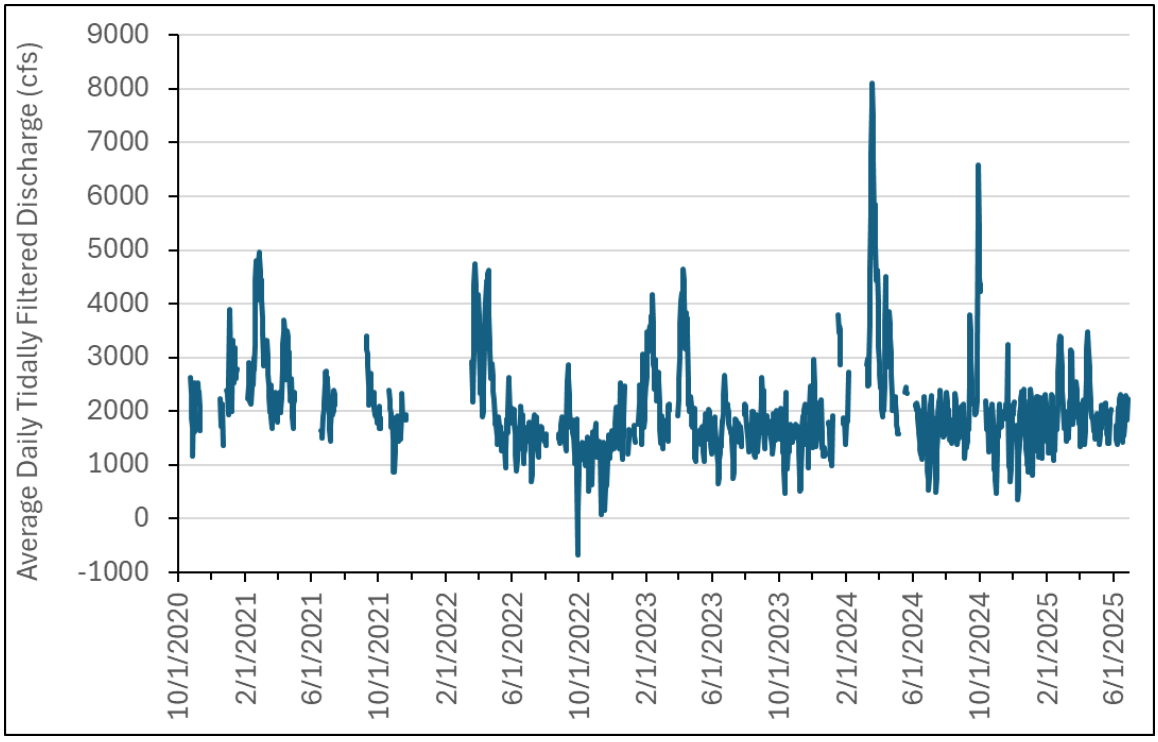


Figure 3-5: *Discharge Entering or Leaving the Gulf County Canal via the Gulf Intracoastal Waterway. Positive flows are entering the Gulf County Canal, with water flowing towards St. Joseph Bay.*

3.3 Flow Data Conclusions and Synthesis

Flows through the system are determined by a series of constantly changing water levels associated with coastal boundary conditions (tides, sea level, etc.) and inland boundary conditions which are also affected by river/stream flows and nearby groundwater levels. Because water levels further inland from the coast are typically higher than coastal water levels (when tidal fluctuations are removed), water tends to flow from more inland areas into coastal bays. Results indicate that if flows and/or water levels on one side of the Gulf

County Canal are reduced, then those flows may be offset by increased flows from the other side of the canal.

Data collected under Grant AT003 provides considerable insight into the hydrologic connectivity between St. Joseph Bay (Gulf County Canal) and the Gulf Intracoastal Waterway. Results show that on the 1,234 days with available data during the study period (10/24/2020 through 6/30/2025), there was a net-positive flow into the Gulf County Canal from the Gulf Intracoastal Waterway on all but a single day (9/29/2022) when Hurricane Ian made landfall in South Florida. While there was almost always a net daily average flow of water into the Gulf County Canal, instantaneous flows were highly variable with the direction and magnitude of flows being largely affected by tides and/or weather conditions.

Flows from the Gulf Intracoastal Waterway can enter the Gulf County Canal from two directions: (1) from the direction of St. Andrew Bay (northwest of the canal) and/or (2) from the direction of Lake Wimico (southeast of the canal). Flows measured in the Gulf Intracoastal Waterway on the northwest side of the Gulf County Canal displayed a net daily average flow toward St. Andrew Bay on approximately 80 percent of the days with available data and with flow being towards the Gulf County Canal and/or Lake Wimico approximately 20 percent of the time. On the southeast side of the Gulf County Canal flows in the Gulf Intracoastal Waterway were almost always (99 percent of the time) flowing to the northwest.

On days when flows from both sides of the Gulf County Canal were flowing toward the Gulf County Canal, flows from both directions would be diverted into the Gulf County Canal and toward St. Joseph Bay. On the days when flows from the northwest were flowing to the southeast, it appears most of these flows were being diverted into the Gulf County Canal with a small portion rarely, but potentially, flowing past the canal and toward Lake Wimico. This is supported by the flows measured on the southeast side of the Gulf County Canal almost always being greater than flows on the northwest side and nearly constant average daily flows into the Gulf County Canal.

These observations contradict data from NHD concerning flows through the system as described in Section 3.1 Previous Studies. The NHD data report that water flows to the southeast from St. Andrew Bay toward St. Joseph Bay and Apalachicola Bay (Figure 3-1)(NHD Plus, Version 2). Both Rodriguez and Wu (1990) and Blumberg and Kim (2000) reported flows between the East Bay portion of St. Andrew Bay and the Gulf Intracoastal Waterway were highly variable changing with environmental conditions. Flows toward St. Andrew Bay occurred approximately 80% of the time. Our results indicate that during the study period flows were nearly exclusively to the northwest and toward St. Joseph Bay from the Apalachicola Bay watershed and generally to the northwest toward St. Andrews Bay from the Apalachicola Bay watershed.

Further investigation into the flow distribution through the system reveals additional insight into the system. Flows from the IWW East and IWW West were highly correlated (Pearson's Correlation Coefficient = 0.95) indicating flows at the IWW West Station generally increased in conjunction with flows at the IWW East Station (Figure 3-6). However, as flows from the IWW East declined to approximately 2,500 cfs, flows at the IWW West station began experiencing reversals (i.e. negative flows) with water now flowing to the southeast additionally towards St. Joseph Bay. This indicates that if flows from the east were reduced or eliminated, flows into St. Joseph Bay from the Gulf Intracoastal Waterway System would likely continue, however this water would originate from St. Andrew Bay.

Although significant progress has been made in understanding the flows in the Gulf Intracoastal Waterway and Gulf County Canal, considerable questions remain which limit the conclusions we can make from the available data. Answers to questions such as these are critical to identifying factors affecting the bay and determining potential restoration and management activities for St. Joseph Bay. Examples of remaining questions include, but are not limited to:

1. What is the source distribution of net flows into the Gulf County Canal? It is assumed these flows are largely comprised of fresh water; however, it is unknown what proportion of this water originates from the larger Apalachicola River and Bay watershed, or other surface water flows from the numerous creeks and rivers located to the southeast of the Gulf County Canal, or diffuse groundwater discharge into the canal and waterways, other unidentified sources, or some combination.
2. How are trends in sea levels affecting flows?
3. Are the flows measured during the study period representative of those occurring historically, i.e., since the construction of the Gulf County Canal and Gulf Intracoastal Waterway, or have fundamental changes occurred in the region which are affecting long-term water levels and flow distributions?
4. How are flows in the system affected by periods of drought and/or flooding conditions?
5. How do flows entering the Gulf County Canal and Gulf Intracoastal Waterway to the northwest of the canal change as they flow towards St. Joseph Bay and St. Andrew Bay, respectively? There is the potential for flows in the waterway to either increase or decrease as a result of interactions with both groundwater and surface water.

It is anticipated that data-collection activities described in this report will continue through June 30, 2026, under a subsequent grant with DEP. During this time, the District

will be in contact with the DEP to discuss future research direction and efforts for the system.

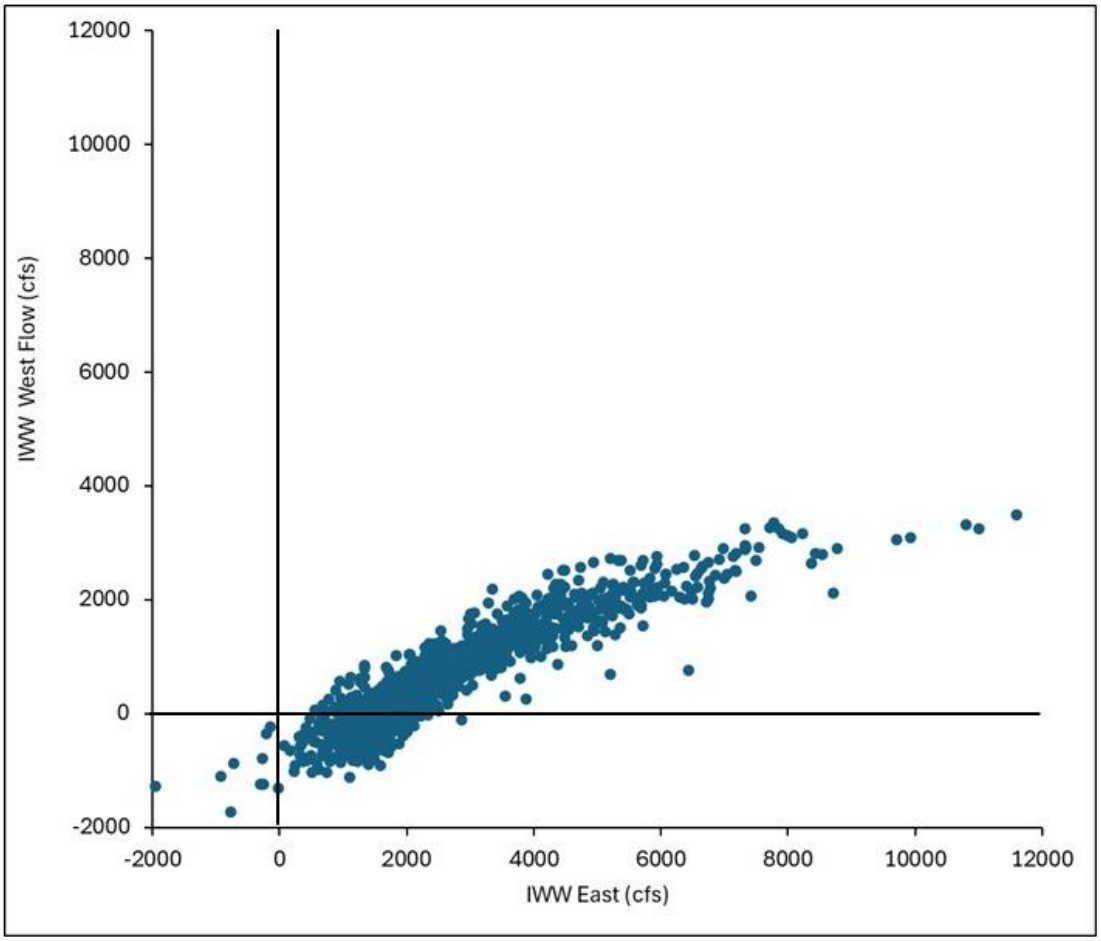


Figure 3-6: *Scatterplot of Concurrent Flow Measurements at the IWW East and IWW West Stations Between 10/24/2020 and 6/30/2025*. Zero (0) axis are included for reference.

4 Water Quality Data – Continuous Discharge Stations

In addition to continuous discharge data, other parameters such as water levels, pH, dissolved oxygen, temperature, specific conductivity, and nitrate were collected on a 15-minute basis, however results presented are the daily averages. In addition, daily minimum and maximums for man parameters are depicted in the figures but not discussed in the text. Summaries of these data collection results are provided below. ***Caution should be taken in using the data presented in this report as an indicator of environmental conditions at the sites. Much data from these USGS stations remains provisional at the time of this document's completion and are subject to revision.***

4.1 USGS Station 295323085151700 (IWW WEST OF GULF CO CANAL NEAR PORT ST JOE, FL)

Average daily stage data between 9/10/2020 and 7/28/2023 has been approved and data collected after this time period remains provisional and subject to change following USGS QA/QC procedures. Water- surface elevations at Station 0295323085151700 averaged 0.94 ft NAVD 88, ranging between -1.5 ft NAVD 88 and 4.6 ft NAVD 88 (Figure 4-1). In general, lower water surface elevations were observed during the winter months (November through March) and higher water surface elevations were observed during spring and summer months (April through October). Isolated periods of high and low water levels were regularly observed throughout the time period likely as a result of extreme tidal and/or weather conditions such as tropical systems.

Daily nitrate plus nitrite (nitrate) data between 12/16/2020 and 5/17/2022 has been approved by the USGS, while data post 5/17/2022 remains provisional and is subject to change following USGS QA/QC procedures. Nitrate values collected at the surface of Station 0295323085151700 averaged 0.16 mg/L, ranging between 0 mg/L and 0.56 mg/L (Figure 4-2). Nitrate data was only collected at the surface and not collected at the channel bottom. In general, higher nitrate concentrations appear to be observed during winter/spring months (November through April) with lower values during the summer and fall (May through October).

Daily temperature data between 9/10/2020 and 10/2/2024 has been approved, while data collected after 10/2/2024 remains provisional and is subject to change following USGS QA/QC procedures. Temperature values at Station 0295323085151700 averaged 22.8°C on the surface and 23.3°C on the bottom, ranging from minimum values of 6.7°C and 7°C (surface and bottom, respectively) to maximum values of 34.5°C and 34.1°C (surface and bottom, respectively) (Figure 4-3. Higher water temperatures were observed during summer months and lower temperatures were observed during winter months, reflecting seasonal climatic variations.

Daily pH data collected between 9/10/2020 and 10/2/2024 has been approved, while data collected after 10/2/2024 remains provisional and is subject to change following USGS QA/QC procedures. The pH values at Station 0295323085151700 averaged 7.2 on both the surface and bottom, ranging from minimum values of 5.6 and 5.1 (surface and bottom, respectively) to maximum values of 8.5 and 8.9 (surface and bottom, respectively) (Figure 4-4). Higher pH values were generally observed during winter and spring months, and lower pH values were observed during summer and fall months.

Daily dissolved oxygen (DO) data between 9/10/2020 and 10/2/2024 has been approved, while data collected after 10/2/2024 remains provisional and is subject to change following USGS QA/QC procedures. The DO values at Station 0295323085151700 averaged 7.2 mg/L on the surface and 7.0 mg/L on the bottom, ranging from minimum values of 2.5 mg/L and 1.0 mg/L (surface and bottom, respectively) to maximum values of 12.0 mg/L and 11.5 mg/L (surface and bottom, respectively) (Figure 4-5). Higher DO values were generally observed during winter and spring months when water temperatures were low and lower DO values were observed during summer and fall months along with higher water temperatures.

Daily specific conductivity data between 9/10/2020 and 10/2/2024 has been approved, while data collected after 10/2/2024 remains provisional and is subject to change following USGS QA/QC procedures. Specific conductivity values at Station 0295323085151700 averaged 3,847 microsiemens per centimeter (µS/cm) on the surface and 4,906 µS/cm on the bottom, ranging from minimum values of 35 µS/cm and 35 µS/cm (surface and bottom, respectively) to maximum values of 47,200 µS/cm and 48,600 µS/cm (surface and bottom, respectively) (Figure 4-6). At times, the water column at this location became considerably stratified with higher conductivity (saltier) water being found on the bottom and lower conductivity (fresh water) on the surface.

Due to staffing and budget constraints of the USGS, beginning October 1, 2025, all water quality data at the surface will be discontinued at this station. In addition, pH and DO data collection will be discontinued at the bottom of the channel. The District is reviewing the need and options to collect surface water quality data for future efforts related to the project.

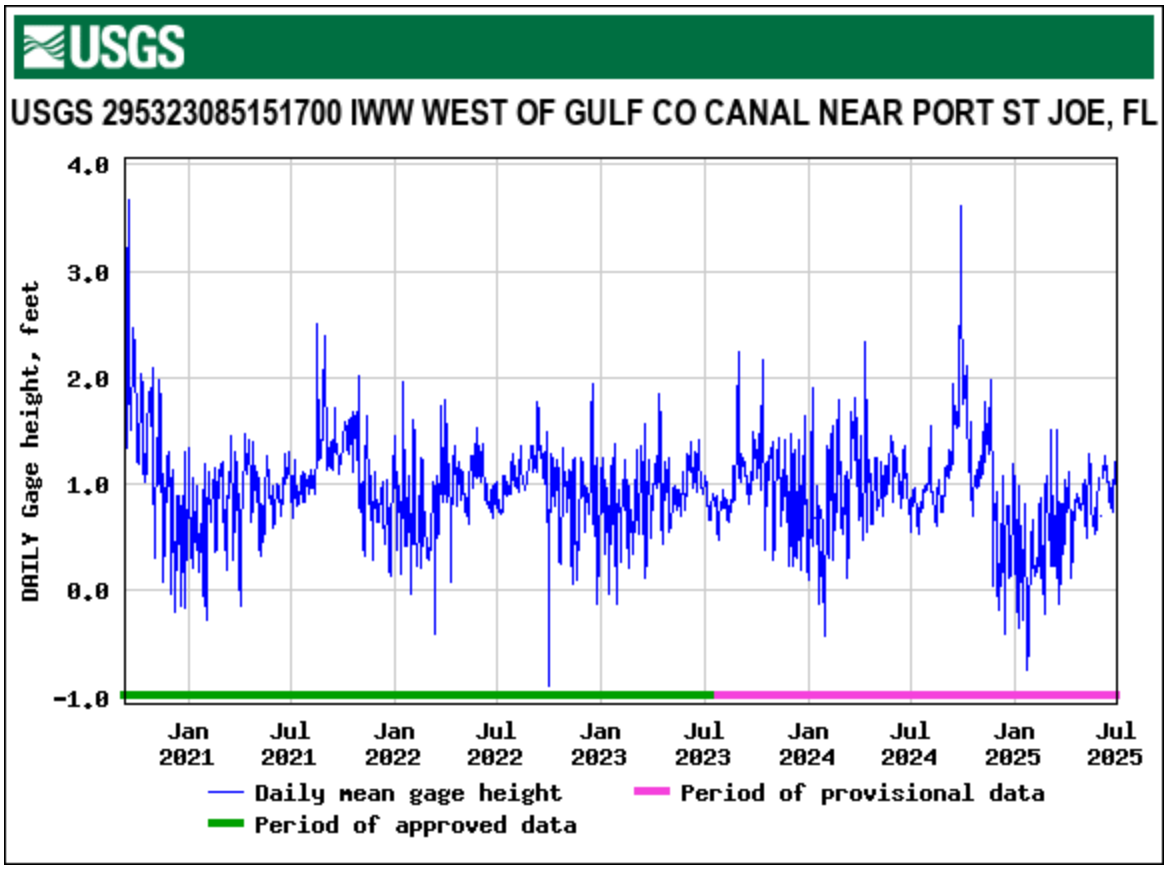


Figure 4-1: *Daily average stage (ft, NAVD 88) as measured at Station 0295323085151700 (IWW West of Gulf Co. Canal Near Port St. Joe, Fl.) between September 10, 2020, and June 30, 2025. Figure provided by the USGS.*

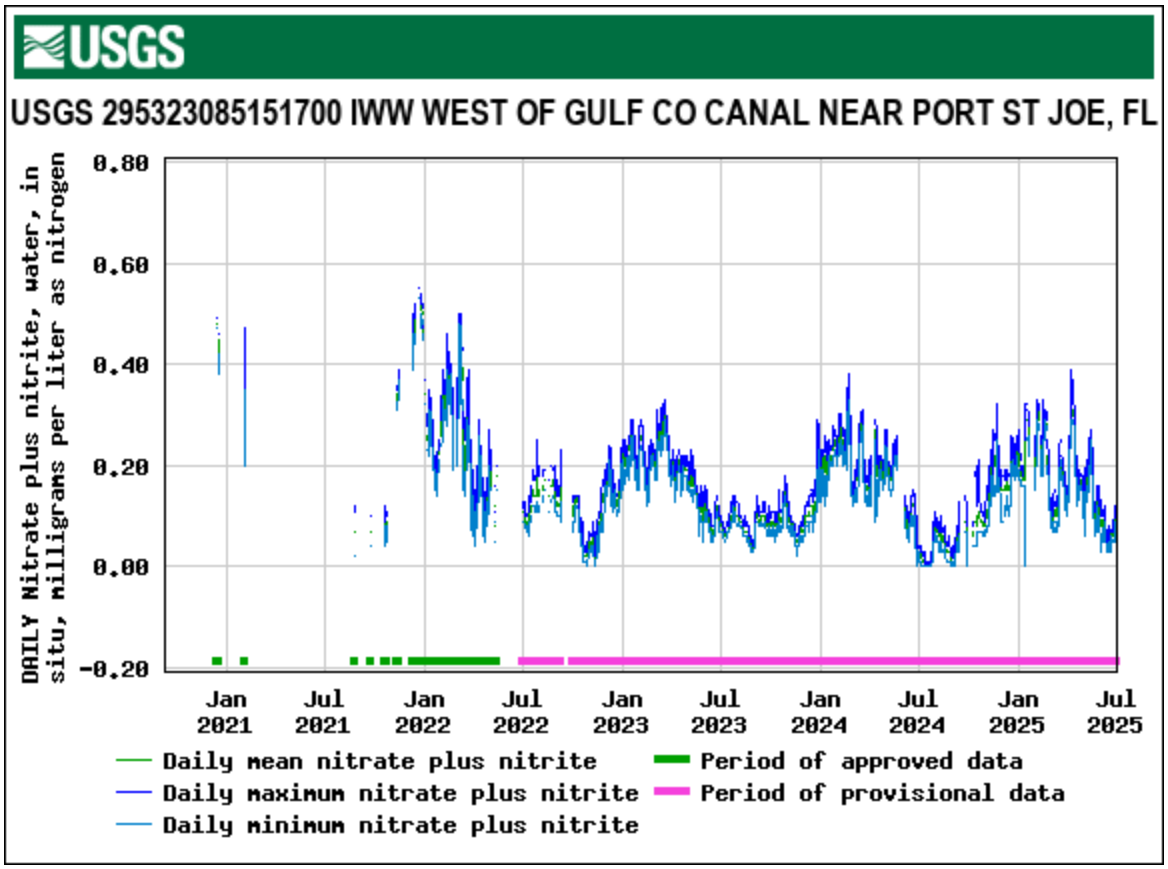


Figure 4-2: *Daily nitrate plus nitrite (mg/L) as measured at Station 0295323085151700 (IWW West of Gulf Co. Canal Near Port St. Joe, Fl.) between September 10, 2020, and June 30, 2025. Figure provided by the USGS.*

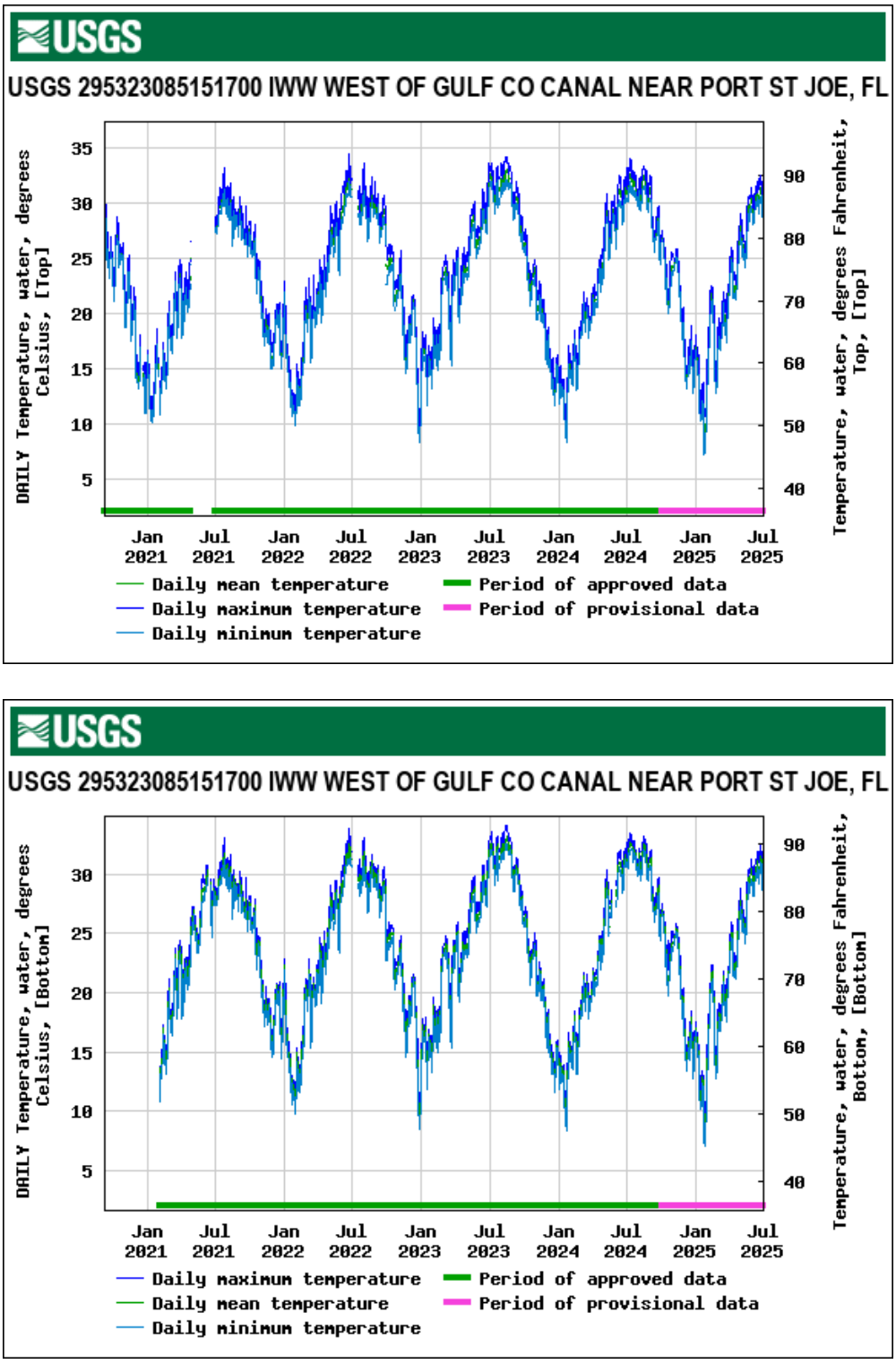
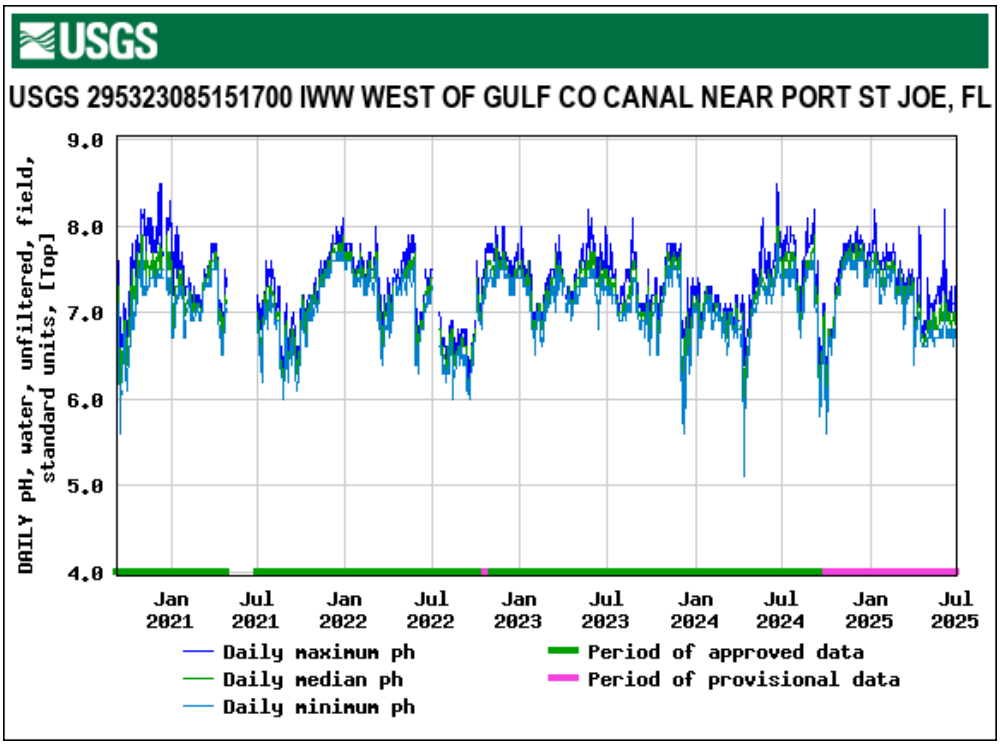


Figure 4-3: *Average, minimum, and maximum daily temperature (°C) as measured on both the surface (top graph) and bottom (bottom graph) at Station 0295323085151700 (IWW West of Gulf Co. Canal Near Port St. Joe, Fl.) between September 10, 2020, and June 30, 2025. Figure provided by the USGS.*



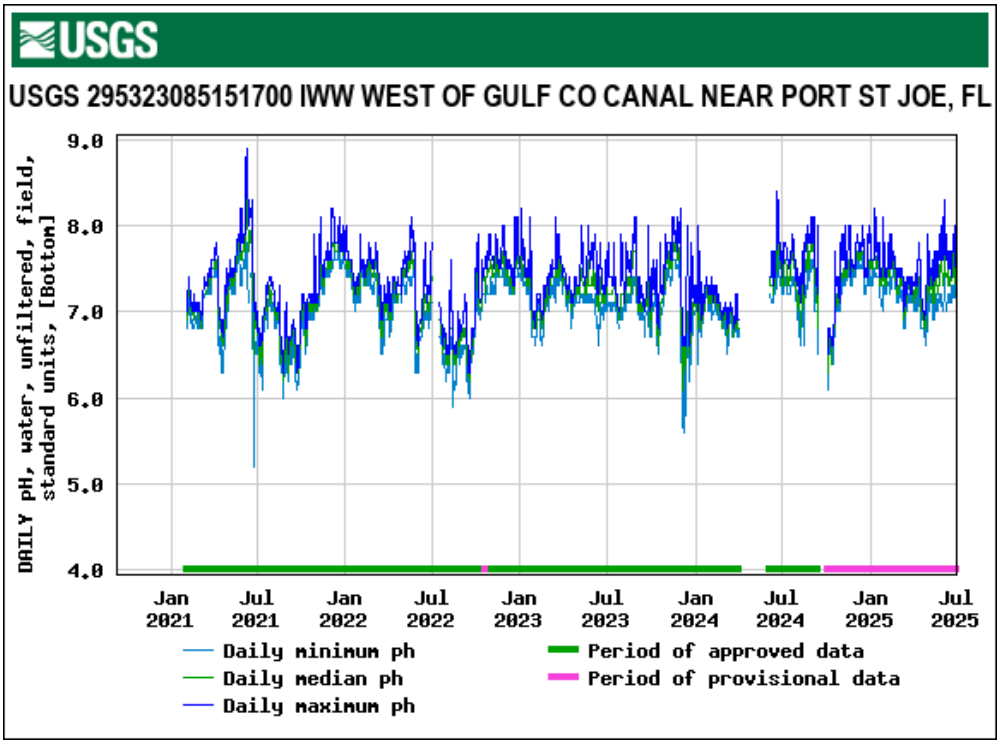


Figure 4-4: *Average, minimum, and maximum daily pH as measured on both the surface (top graph) and bottom (bottom graph) at Station 0295323085151700 (IWW West of Gulf Co. Canal Near Port St. Joe, Fl.) between September 10, 2020, and June 30, 2025. Figure provided by the USGS.*

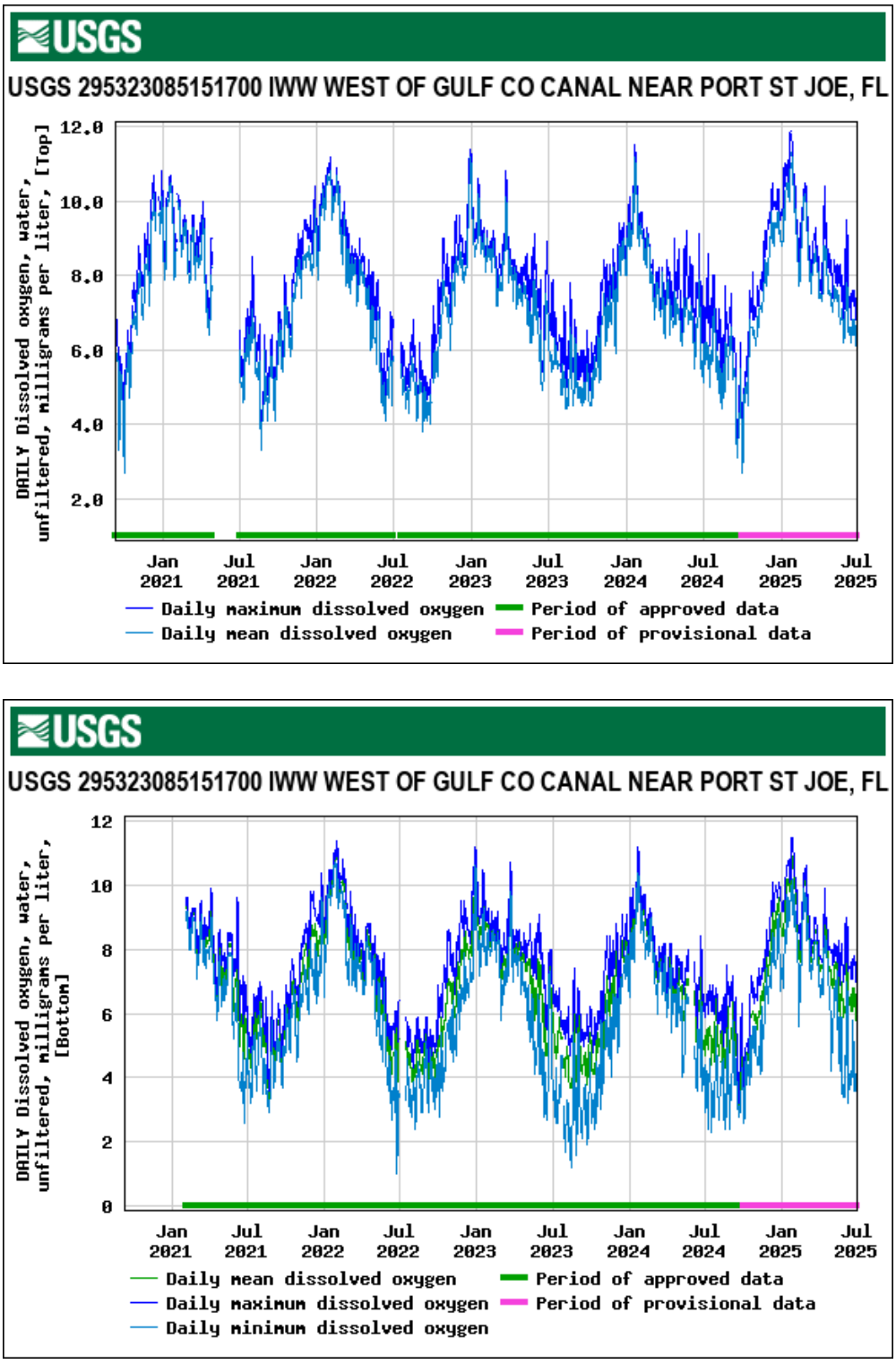
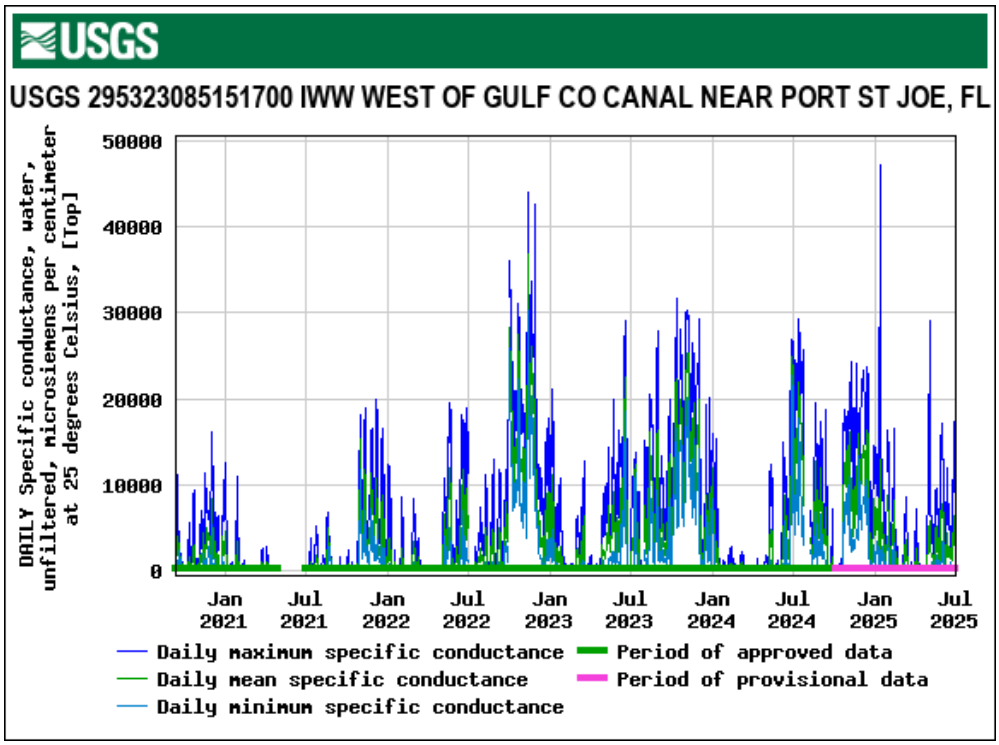


Figure 4-5: *Average, minimum, and maximum daily dissolved oxygen (mg/L) as measured on both the surface (top graph) and bottom (bottom graph) at Station 0295323085151700 (IWW West of Gulf Co. Canal Near Port St. Joe, Fl.) between September 10, 2020, and June 30, 2025. Figure provided by the USGS.*



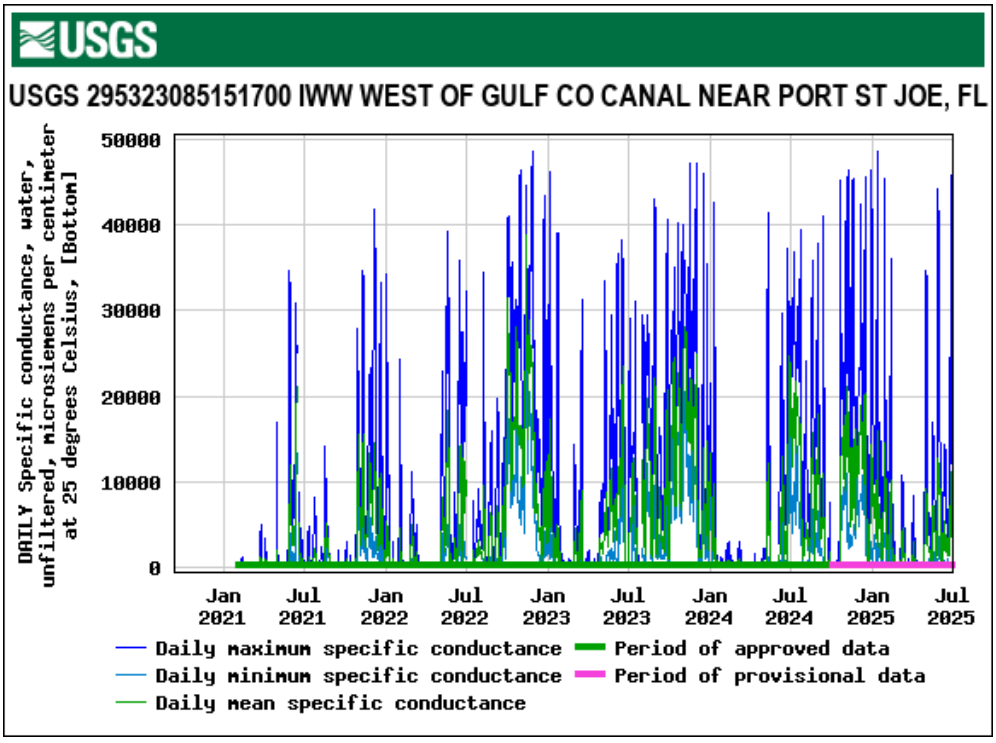


Figure 4-6: *Average, minimum, and maximum daily specific conductance (µS/cm) as measured on both the surface (top graph) and bottom (bottom graph) at Station 0295323085151700 (IWW West of Gulf Co. Canal Near Port St. Joe, Fl.) between September 10, 2020, and June 30, 2025. Figure provided by the USGS.*

4.2 USGS Station 0298308085143700 (IWW EAST OF GULF CO CANAL NEAR PORT ST JOE, FL)

Average daily stage data between 9/4/2020 and 10/18/2022 has been approved, while data collected after 10/18/2022 remains provisional and is subject to change following USGS QA/QC procedures. Water surface elevations at Station 0298308085143700 averaged 0.85 ft NAVD 88, ranging between -1.6 ft NAVD 88 and 4.5 ft NAVD 88 (Figure 4-7). In general, lower water surface elevations were observed during the winter months (November through March) and higher water surface elevations were observed during spring and summer months (April through October). Isolated periods of high and low water levels were regularly observed throughout the time period likely as a result of extreme tidal conditions and weather conditions such as tropical systems.

All daily nitrate data remains provisional at the time of this document's preparation and is subject to change following USGS QA/QC procedures. Nitrate values collected at the surface at Station 0298308085143700 averaged 0.14 mg/L, ranging between 0 mg/L and 0.41 mg/L (Figure 4-8). Nitrate data was not collected at the channel bottom. In general, higher nitrate concentrations appear to be observed during winter/spring months (November through April) with lower values during the summer and fall (May through October). Nitrate sensor data was discontinued on July 1, 2025.

Daily temperature data between 9/4/2020 and 10/2/2024 has been approved, while data collected after 10/24/2023 remains provisional and is subject to change following USGS QA/QC procedures. Temperature values at Station 0298308085143700 averaged 23.6°C on the surface and 23.4°C on the bottom, ranging from minimum values of 6.9°C and 6.9°C (surface and bottom, respectively) to maximum values of 34.5°C and 34.3°C (surface and bottom, respectively) (Figure 4-9). Higher water temperatures were observed during summer months and lower temperatures were observed during winter months, reflecting seasonal climatic variations.

Daily pH data between 9/4/2020 and 10/2/2024 has been approved, while data collected after 10/2/2024 remains provisional and is subject to change following USGS QA/QC procedures. The pH values at Station 0298308085143700 averaged 7.2 on surface and 7.3 on the bottom, ranging from minimum values of 5.5 and 5.6 (surface and bottom, respectively) to maximum values of 9.1 and 8.8 (surface and bottom, respectively) (Figure 4-10). Higher pH values were generally observed during winter and spring months, and lower pH values were observed during summer and fall months.

Dissolved oxygen (DO) data at the surface between 9/4/2020 and 10/24/2023 has been approved, while data collected after 10/24/2023 remains provisional and is subject to change following USGS QA/QC procedures. Similarly, average Daily Dissolved oxygen (DO) data at the surface between 9/4/2020 and 10/2/2024 has been approved, while data collected after 10/2/2024 remains provisional and is subject to change following USGS

QA/QC procedures. The DO values at Station 0298308085143700 averaged 6.9 mg/L on the surface and 6.9 mg/L on the bottom, ranging from minimum values of 0.6 mg/L and 0.6 mg/L (surface and bottom, respectively) to maximum values of 11.5 mg/L and 11.6 mg/L (surface and bottom, respectively) (Figure 4-11). Higher DO values were generally observed during winter and spring months when water temperatures were low and lower DO values were observed during summer and fall months along with higher water temperatures.

Daily specific conductivity data between 9/4/2020 and 10/2/2024 has been approved, while data collected after 10/2/2024 remains provisional and is subject to change following USGS QA/QC procedures. Specific conductivity values at Station 0298308085143700 averaged 4,418 microsiemens per centimeter (µS/cm) on the surface and 6,202 µS/cm on the bottom, ranging from minimum values of 53 µS/cm and 50 µS/cm (surface and bottom, respectively) to maximum values of 45,200 µS/cm and 49,600 µS/cm (surface and bottom, respectively) (Figure 4-12). At times, the water column at this location became considerably stratified with higher conductivity (saltier) water being found on the bottom and lower conductivity (fresh water) on the surface.

Due to staffing and budget constraints of the USGS, beginning October 1, 2025, all water quality data at the surface will be discontinued at this station. In addition, pH and DO data collection will be discontinued at the bottom of the channel. The District is reviewing the need and options to collect surface water quality data for future efforts related to the project.

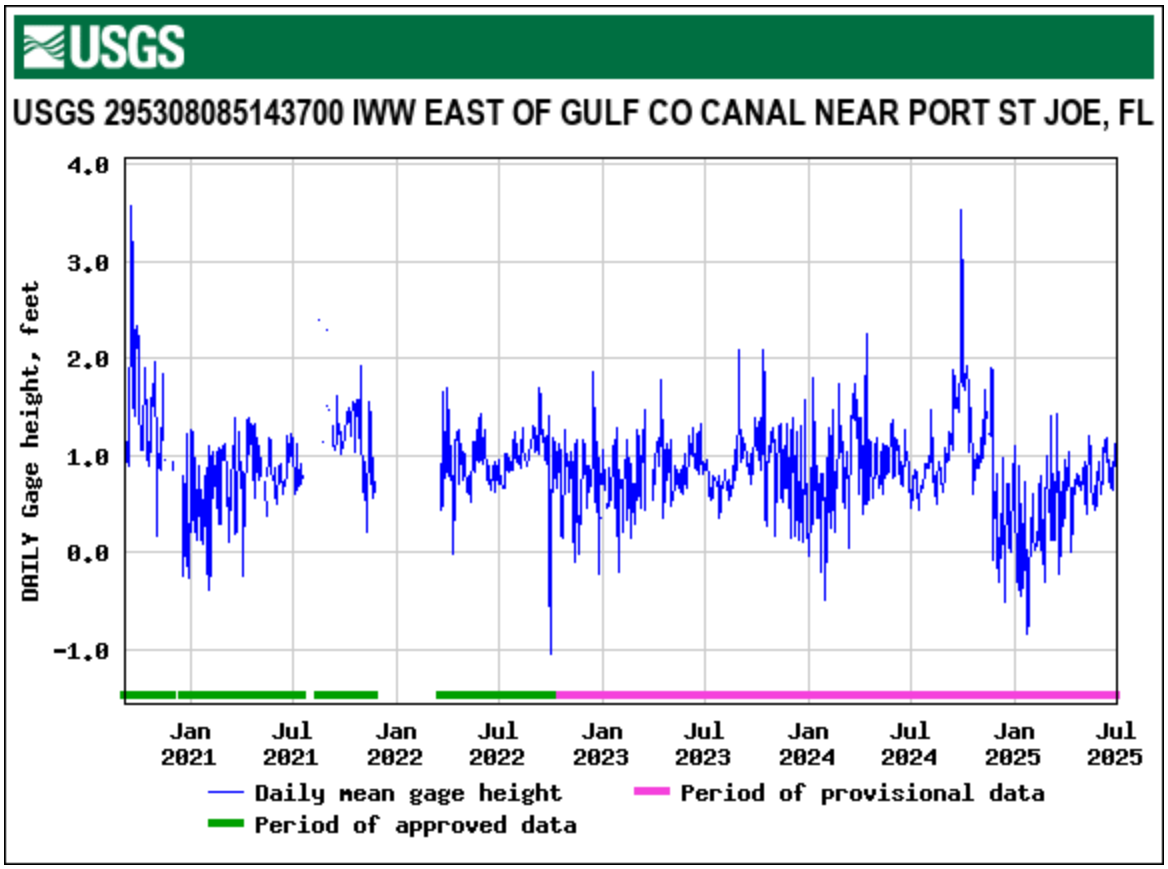


Figure 4-7: *Daily mean stage (ft, NAVD 88) as measured at Station 0298308085143700 (IWW East of Gulf Co. Canal Near Port St. Joe, Fl.) between September 4, 2020, and June 30, 2025. Figure provided by the USGS.*

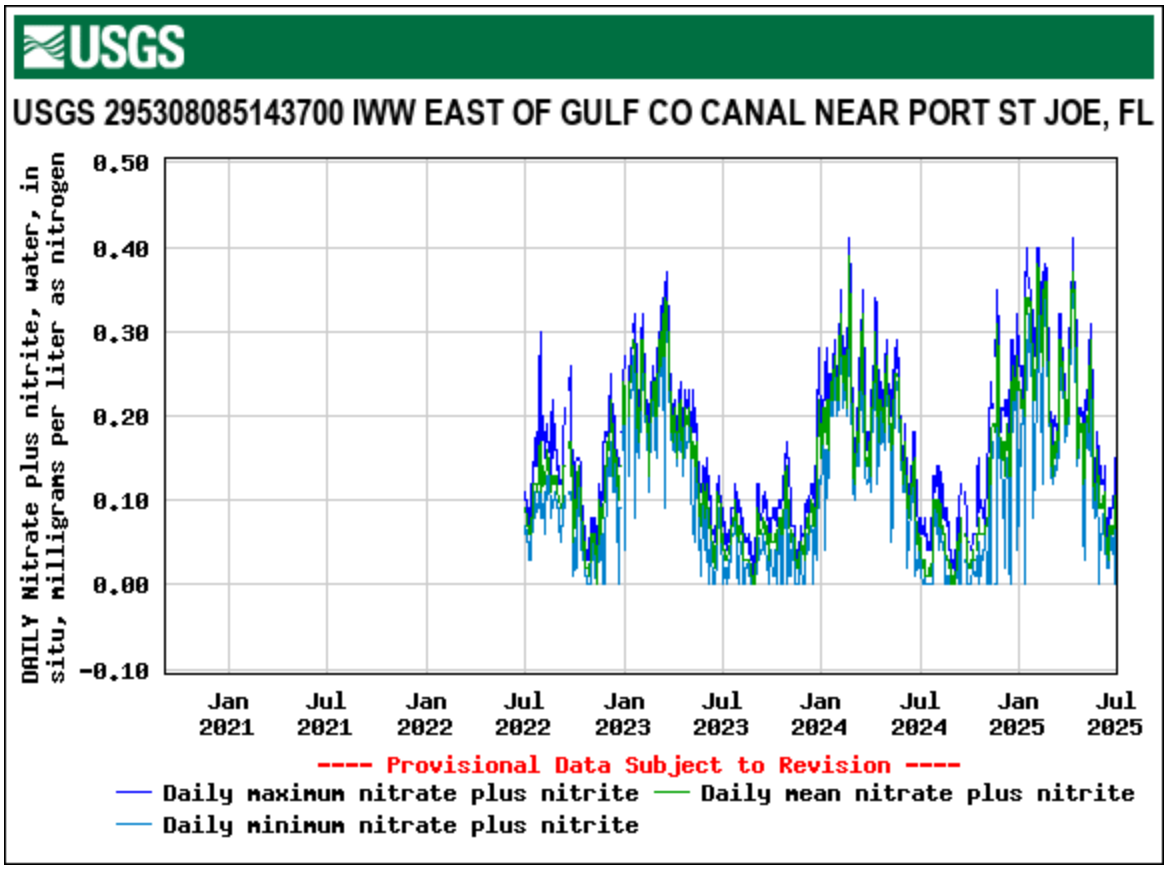


Figure 4-8: *Average, minimum, and maximum daily nitrate plus nitrite (mg/L) as measured at Station 0298308085143700 (IWW East of Gulf Co. Canal Near Port St. Joe, Fl.) between September 4, 2020, and June 30, 2025. Figure provided by the USGS.*

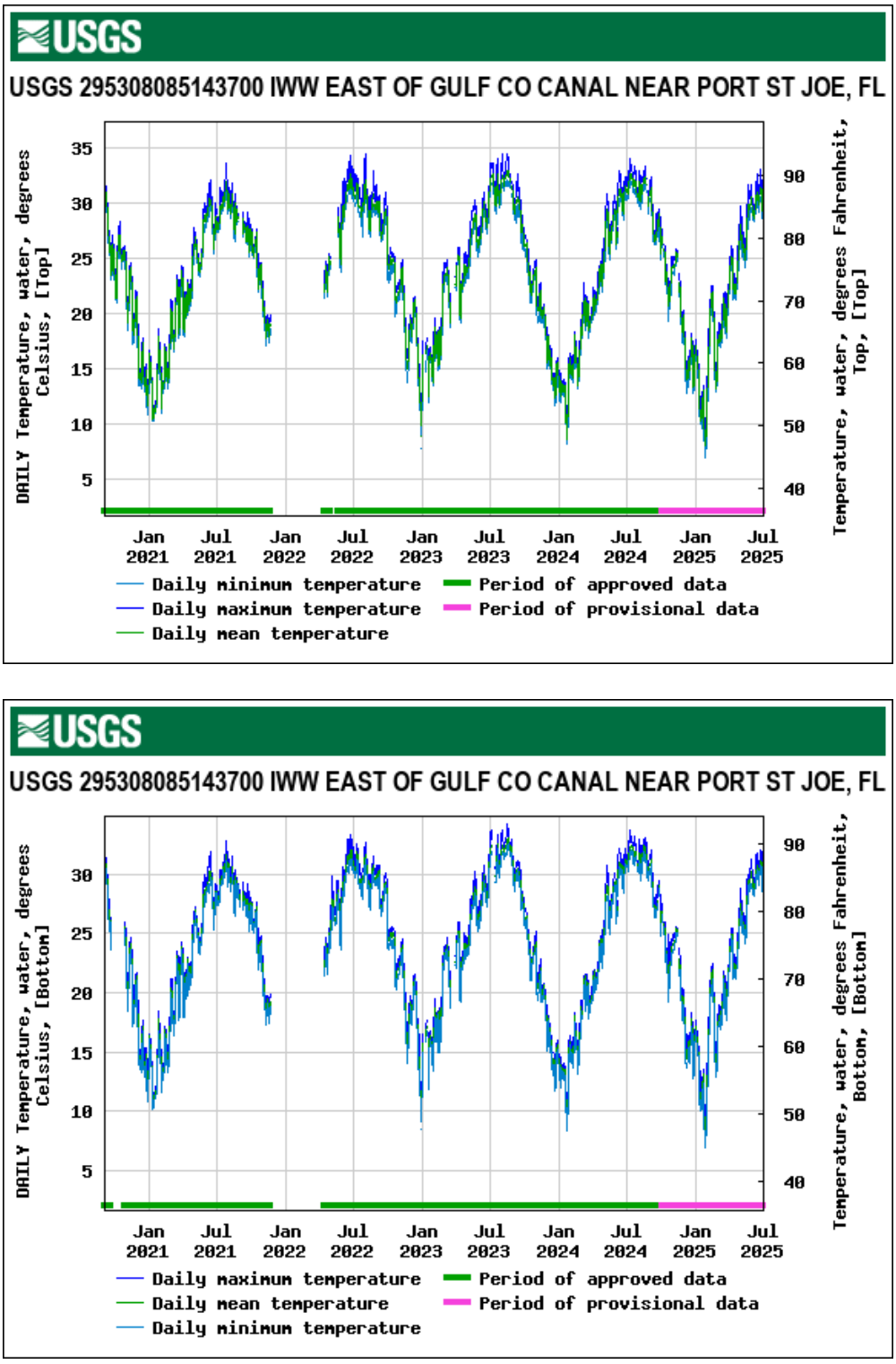


Figure 4-9: *Average, minimum, and maximum daily temperature (°C and °F) as measured on both the surface (top graph) and bottom (bottom graph) at Station 0298308085143700 (IWW East of Gulf Co. Canal Near Port St. Joe, Fl.) between September 4, 2020, and June 30, 2025. Figure provided by the USGS.*

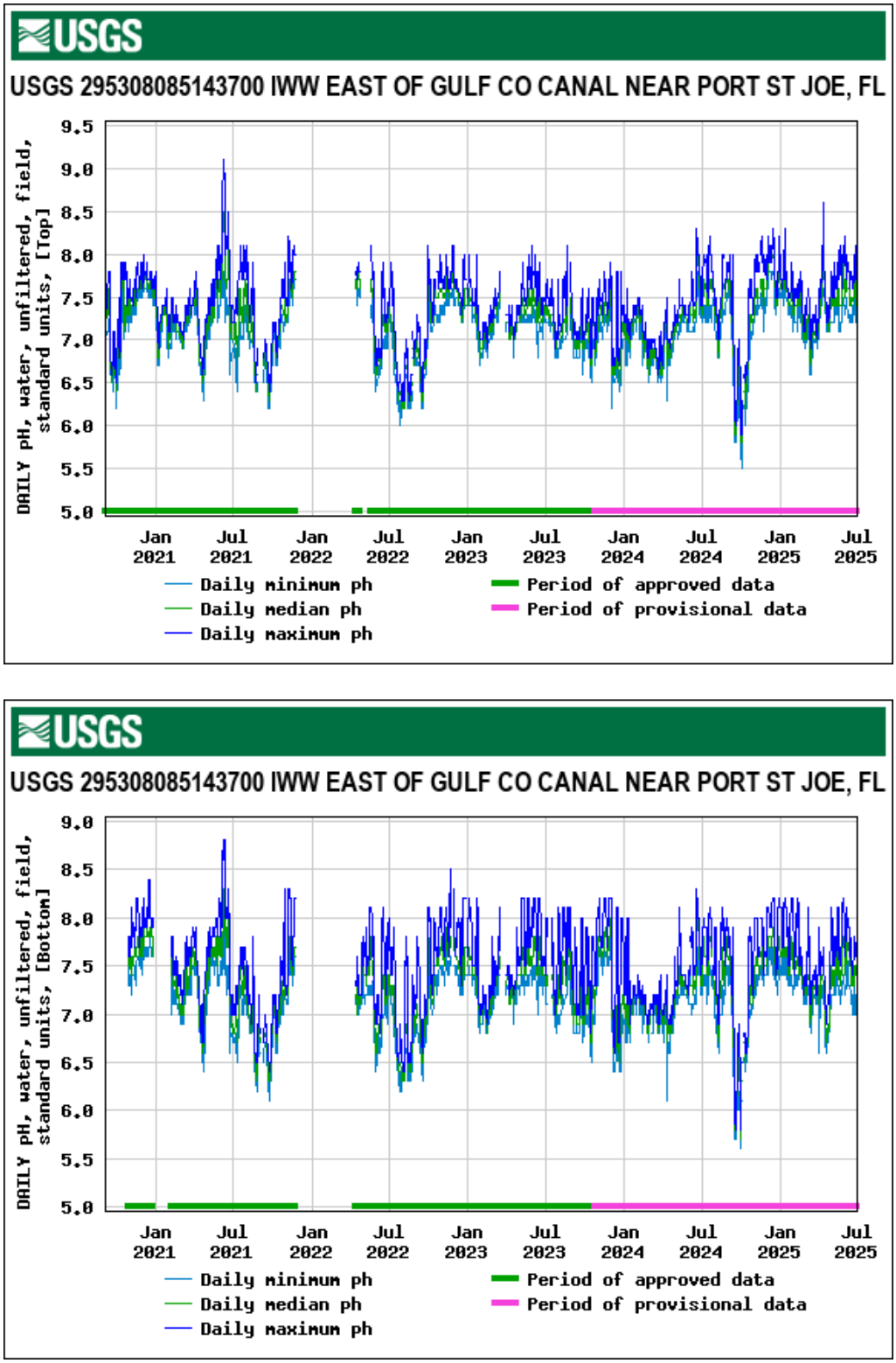


Figure 4-10: *Average, minimum, and maximum daily pH as measured on both the surface (top graph) and bottom (bottom graph) at 0298308085143700 (IWW East of Gulf Co. Canal Near Port St. Joe, Fl.) between September 4, 2020, and June 30, 2025. Figure provided by the USGS.*

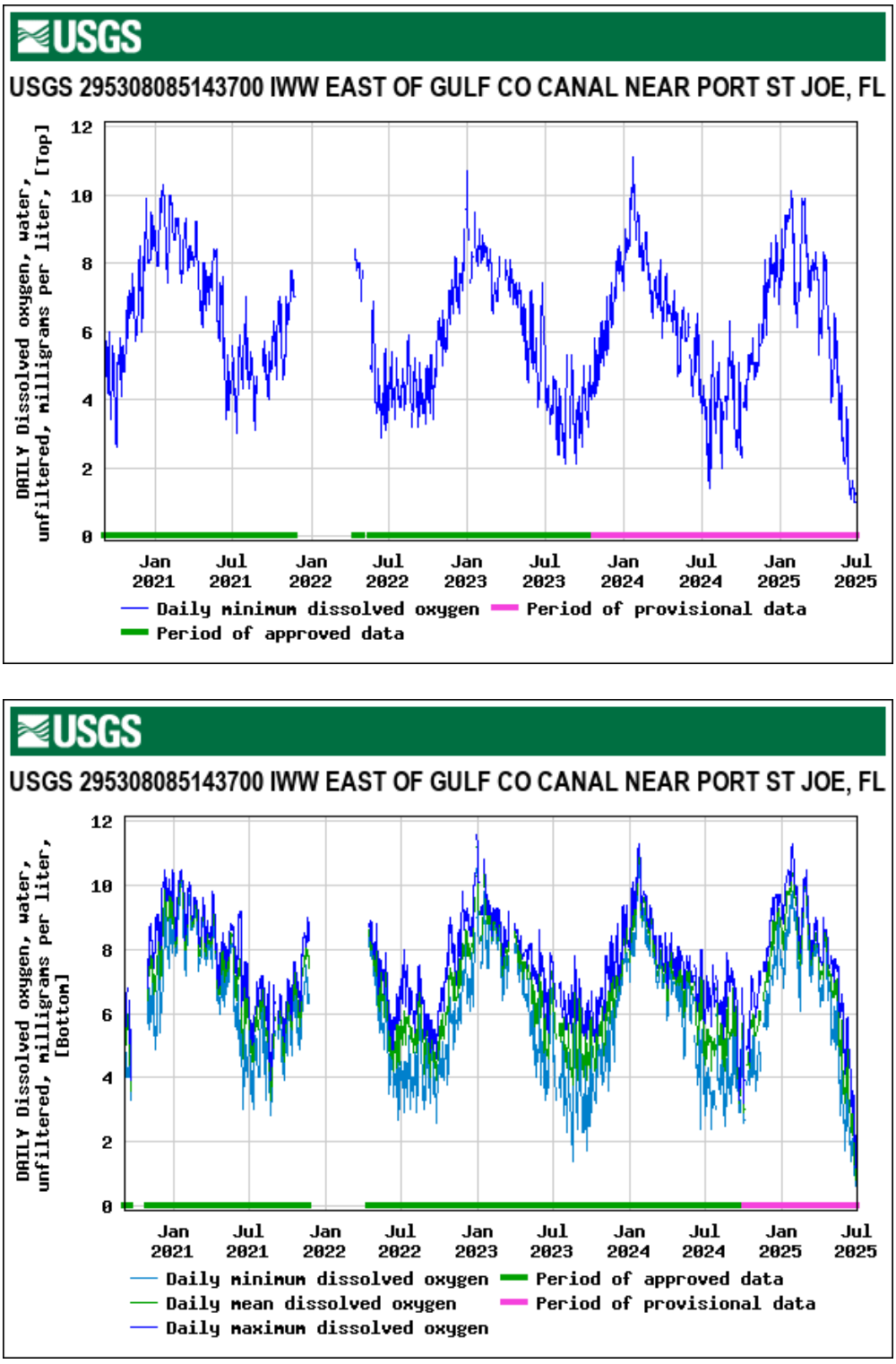


Figure 4-11: *Average, minimum, and maximum daily dissolved oxygen (mg/L) as measured on both the surface (top graph) and bottom (bottom graph) at Station 0298308085143700 (IWW East of Gulf Co. Canal Near Port St. Joe, Fl.) between September 4, 2020, and June 30, 2025. Figure provided by the USGS.*

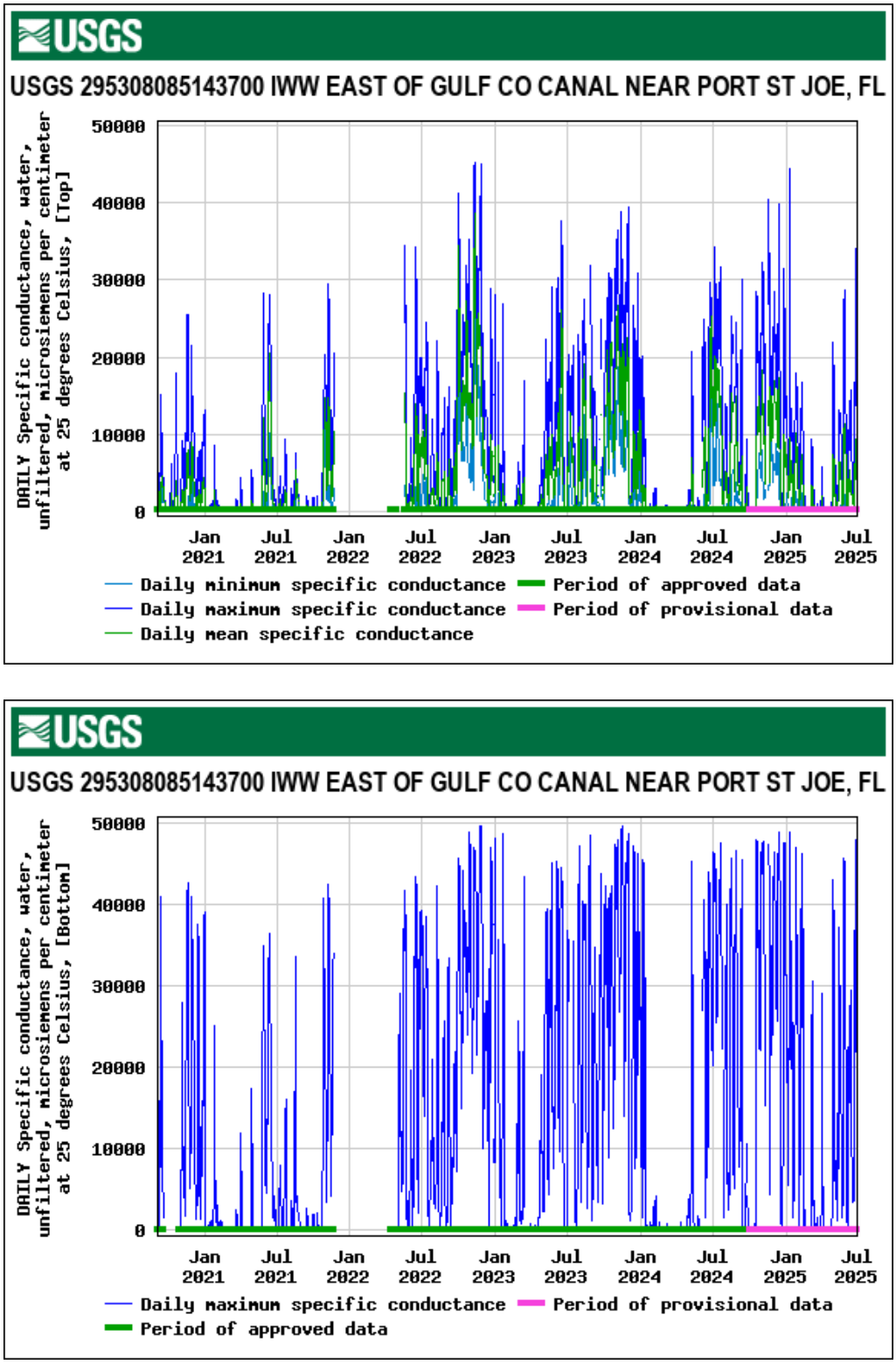


Figure 4-12: *Daily specific conductance (µS/cm) as measured on both the surface (top graph) and bottom (bottom graph) at Station 0298308085143700 (IWW East of Gulf Co. Canal Near Port St. Joe, Fl.) between September 4, 2020, and June 30, 2025. Figure provided by the USGS.*

4.3 USGS Station 02359223 (JACKSON RIVER AT RANCH ROAD NR APALACHICOLA, FL)

Average daily stage data collected between 9/15/2020 and 12/3/2024 has been approved by the USGS, however data reported after 12/3/2024 remains provisional at the time of this document's preparation and is subject to change following USGS QA/QC procedures. Water surface elevations at Station 02329223 averaged 1.04 ft NAVD 88, ranging between -1.5 ft NAVD 88 and 4.4 ft NAVD (Figure 4-13). Water surface elevations at this location are highly variable throughout the year.

Daily temperature data between 9/15/2020 and 10/23/2023 has been approved, while data collected after 10/23/2023 remains provisional and is subject to change following USGS QA/QC procedures. Temperature values at Station 02329223 averaged 22.0°C, ranging between 5.6°C and 34.4°C (Figure 4-14). Higher water temperatures were observed during summer months and lower temperatures were observed during winter months, responding to climatic variations.

Daily pH data between 9/15/2020 and 10/1/2024 has been approved, while data collected after 9/30/2024 remains provisional and is subject to change following USGS QA/QC procedures. The pH values at Station 0298308085143700 averaged 7.2, ranging between 5.4 and 9.2 (Figure 4-15). The pH was highly variable throughout the year at this location.

Daily dissolved oxygen (DO) data between 9/15/2020 and 10/1/2024 has been approved, while data collected after 10/23/2023 remains provisional and is subject to change following USGS QA/QC procedures. The DO values at Station 02359223 averaged 7.2 mg/L, ranging between 0 mg/L and 15 mg/L (Figure 4-16). Higher DO values were generally observed during winter and spring months when water temperatures were low and lower DO values were observed during summer and fall months along with higher water temperatures.

Daily specific conductivity data between 9/15/2020 and 10/23/2023 has been approved, while data collected after 10/23/2023 remains provisional and is subject to change following USGS QA/QC procedures. Specific conductivity values at Station 0298308085143700 averaged 322 microsiemens per centimeter (µS/cm) with a median of 126 µS/cm. Specific conductivity ranged between 29 µS/cm and 28,700 µS/cm (Figure 4-17). A noticeable increase in specific conductivity occurred on 08/16/2021 (maximum 28,700 µS/cm) associated with storm surge from Tropical Storm Fred.

Due to staffing and budgeting constraints of the USGS, this station will be discontinued beginning October 1, 2025.

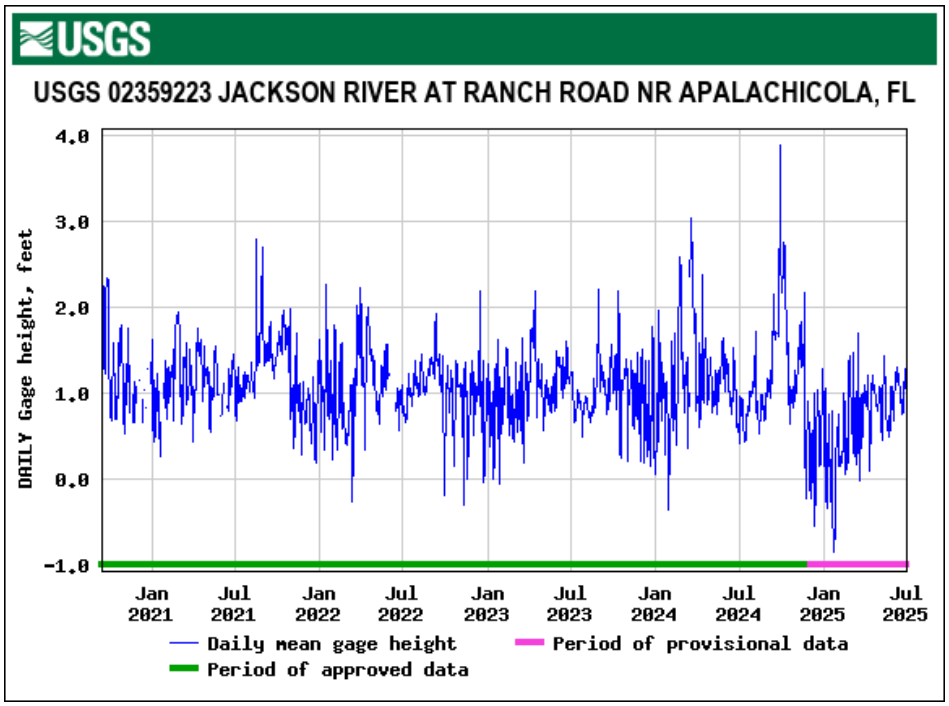


Figure 4-13: Average daily stage (ft, NAVD 88) as measured at Station 02359223 (Jackson River at Ranch Road Nr. Apalachicola, Fl.) between September 15, 2020, and June 30, 2025. Figure provided by the USGS.

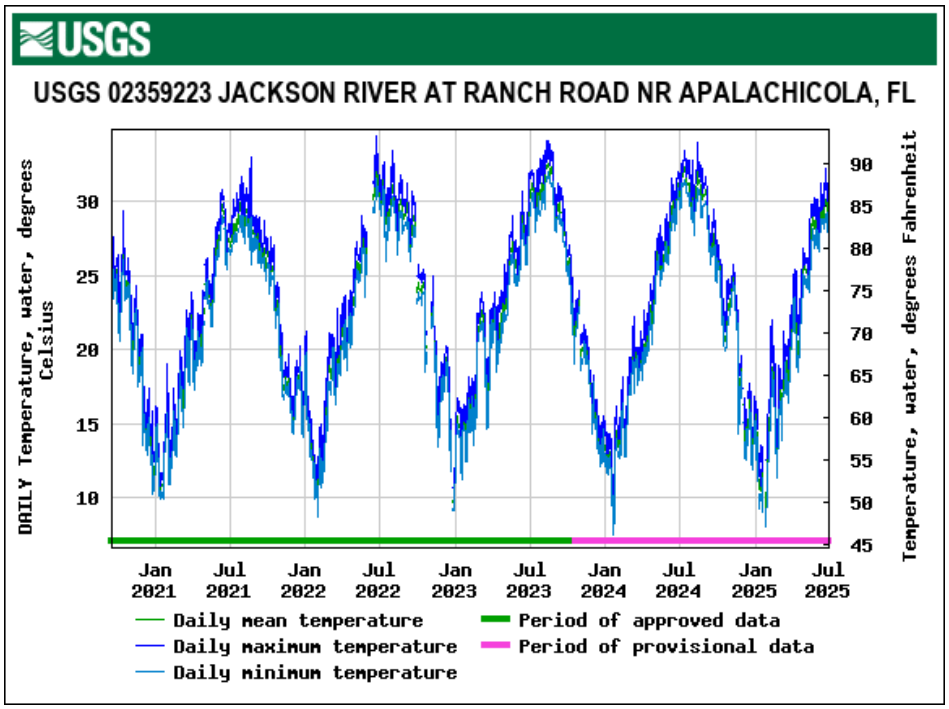


Figure 4-14: Average, minimum, and maximum daily temperature (°C) as measured at Station 02359223 (Jackson River at Ranch Road Nr. Apalachicola, Fl.) between September 15, 2020, and June 30, 2025. Figure provided by the USGS.

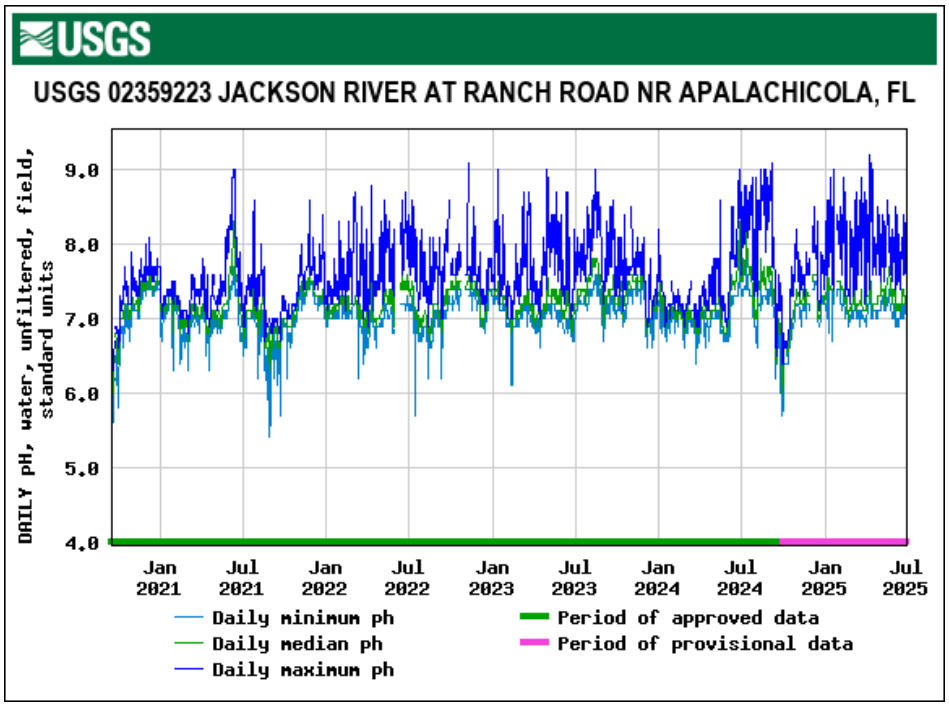


Figure 4-15: Average, minimum, and maximum daily pH as measured at 02359223 (Jackson River at Ranch Road Nr. Apalachicola, Fl.) between September 15, 2020, and June 30, 2025. Figure provided by the USGS.

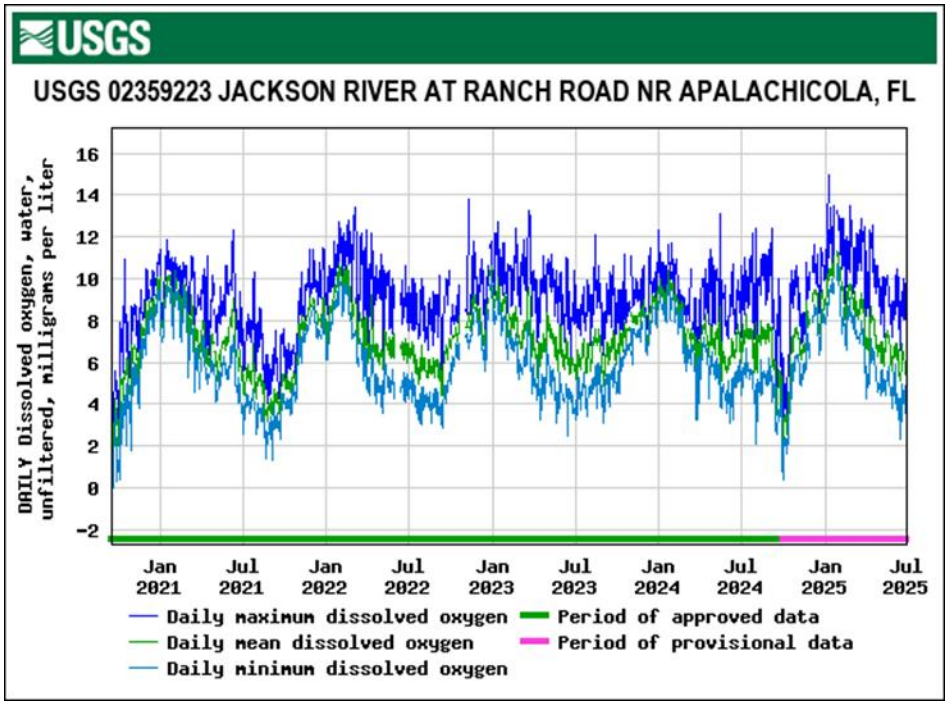


Figure 4-16: Average, minimum, and maximum daily dissolved oxygen (mg/L) as measured at Station 02359223 (Jackson River at Ranch Road Nr. Apalachicola, Fl.) between September 15, 2020, and June 30, 2025. Figure provided by the USGS.

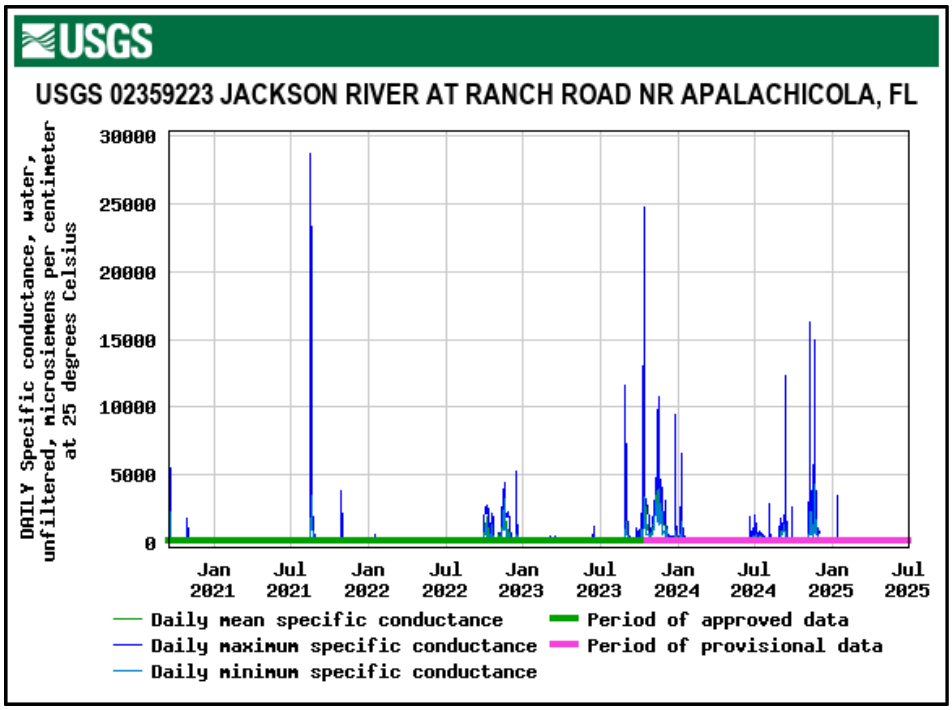


Figure 4-17: Average, minimum, and maximum daily specific conductance (µS/cm) as measured at Station 02359223 (Jackson River at Ranch Road Nr. Apalachicola, Fl.) between September 15, 2020, and June 30, 2025. Figure provided by the USGS.

4.4 Lab Analyzed Water Quality Samples

Water quality has been identified as a primary concern for St. Joseph Bay by multiple stakeholders. Under this task, water quality samples were collected from multiple locations around St. Joseph Bay. Water quality samples were also collected from selected second magnitude springs in the Florida Panhandle to provide updated information regarding these springs. Unlike water quality data previously discussed in this report, these samples consisted of water samples taken in the field and analyzed in a NELAP certified laboratory.

A contractor was hired to collect the water quality samples described in this section. All samples were collected according to DEP standard operating procedures (DEP-SOP-001/01), stored on ice as appropriate, and transported for analysis on the same day as sample collection. All samples were processed and analyzed by Advanced Environmental Laboratories, Inc. located at 2639 North Monroe Street, Suite D, Tallahassee, Florida 32303 (NELAP Accredited E811095). Multiple water quality parameters were analyzed as indicated in Table 4-1. While multiple parameters were analyzed, only results from nitrate+ nitrite (N), phosphorus, and fecal coliform/*Escheria coli* are presented in this report since those are the primary water quality parameters of interest in this study.

Table 4-1: List of Lab Analyzed Water Quality Sample Parameters.

Analyte	Total (T) Dissolved (D) Other (O)
Nitrate + Nitrite (as N)	T
Ammonia (as N)	T
Total Phosphorus	T
Total Organic Carbon	T
Calcium	T
Magnesium	T
Sodium	T
Potassium	T
Chloride	T
Sulfate	T
Carbonate	T
Bicarbonate	T
Ortho-Phosphate	T

Analyte	Total (T) Dissolved (D) Other (O)
Fluoride	T
Alkalinity	T
Dissolved Solids (TDS)	T
Suspended Solids (TSS)	T
Color	T
Temperature (C)	O
pH	O
Specific Conductance (µS/cm)	O
Dissolved oxygen (mg/L)	O
Field turbidity	O
Fecal coliform	O
E. coli	O

4.4.1 St. Joseph Bay

A total of 15 locations were sampled around St. Joseph Bay as part of the lab-analyzed water quality sampling effort (Figure 4-18, Table 4-2). Locations were selected based upon potential surface water inputs on the east side of St. Joseph Bay and public access points

along Cape San Blas and the St. Joseph Peninsula. This work expands upon similar data collection completed during FY 2020-2021 and again in June 2024.

Sampling at locations around St. Joseph Bay occurred twice during the period covered by this grant amendment. Once between 2/17/2025 and 2/18/2025 and again between 4/29/2025 and 5/1/2025. (Table 4-3 and Table 4-4). All locations were sampled once during the morning, and samples were submitted to the lab for analysis later that same day.

Table 4-3 and Table 4-4 display the results of basic water quality parameters collected using a calibrated, hand-held water quality sampling meter. During February, water temperature at the sampling locations ranged from 13.9°C at Station SJB14 (St. Joe Peninsula Near J. "Billy Joe" Rish Recreation Area) to 21.2°C at the Station SJB4 (Gulf County Canal) (Table 4-5 through Table 4-8). During the April/May 2025 sampling event, water temperatures ranged from 22.9°C at Station SJB1 (St. Joseph Beach) to 29.8°C at Station SJB12 (St. Joseph Bay Aquatic Preserve Canoe Launch). Salinity was highly variable among sites. During February, salinity (specific conductivity) at the sampling locations ranged from 0.18 psu (338.7 µS/cm) at Station SJB1 (St. Joeph Beach) to 37.3 psu (45,791 µS/cm) at Station SJB15 (Eagle Harbor Boat Ramp) (Table 4-5 through Table 4-8). During the April/May 2025 sampling event, salinity (specific conductivity) ranged from 0.15 psu (335.1 µS/cm at Station SJB9 (SR 30A at Country Club Rd South) to 34.57 psu (53,575 µS/cm) at StationSJB2 (U.S. 98 at Sunset Shores). Dissolved oxygen, pH, and field turbidity ranged from 1.37 mg/L to 9.61 mg/L, 6.96 to 8.18, and 13.9 NTU to 20.9 NTU, respectively during February 2025. During the April/May 2025 sampling event, dissolved oxygen, pH, and field turbidity ranged from 1.93 mg/L to 7.37 mg/L, 6.84 to 8.17, and 0.04 NTU to 10.47 NTU.

Nitrogen and phosphorus are two primary water quality constituents that can cause adverse effects on algae and native seagrass populations in estuaries. During February 2025, combined nitrate (NO^3) and nitrite (NO^2) concentrations measured at all 15 sample locations were below the detection limit of 0.24 mg/L at all but one station, SJB4 (Gulf County Canal) where the measured value was 0.457 mg/L (Table 4-5 through Table 4-8). During the April/May 2025 sampling event, combined nitrate (NO^3) and nitrite (NO^2) concentrations measured at all 15 sample locations were below the detection limit of 0.24 mg/L. Ammonia (NH^4) concentrations were somewhat more variable ranging from 0.010 to 0.88 mg/L during February 2025 and 0.01 mg/L to 0.14 mg/L during April/May 2025. Similarly, total phosphorus concentrations at all sample locations were below the detection limit of 0.15 mg/L or between the detection limit and quantifiable limit during February 2025 and at all but one location, SJB 14 (St. Joe Peninsula Near J. "Billy Joe" Rish Rec Area) (0.081 mg/L). Ortho-phosphate concentrations were either below the detection limit or between the detection limit and the practical quantitation limit at 13 of the 15 sample locations. The two locations with detectable ortho-phosphate concentrations

included locations SJB1 (St. Joe Beach, 0.043 mg/L) and SJB13 (St. Joe Peninsula Near Pig Island, 0.022 mg/L) during February 2025. During April/May 2025 all Ortho-phosphate samples were below the below the detection limit or between the detection limit and the practical quantitation limit at all locations except SJB1 (St. Joseph Beach) (0.075 mg/L). Results from additional water quality parameters analyzed for but not described in text, are provided in Table 4-5 through Table 4-8.

During February 2025 fecal coliform and E. coli samples at most sampling locations were below 78 colonies/100mL and 66 colonies/100mL, respectively (U.S. 98 at Sunset Shores, SJB 2) (Table 4-6). In comparison, fecal coliform and E. coli samples at three locations were elevated. Butlers Bay Road (SJB 3) displayed fecal coliform and *E. coli* densities of 900 colonies/100mL and 880 colonies/100mL, respectively. SR30A at Country Club Rd North (SJB 7) displayed fecal coliform and *E. coli* densities of 500 colonies/100mL and 500 colonies/100mL, respectively. Gulf County Canal (SJB 4) displayed fecal coliform and *E. coli* densities of 144 colonies/100mL and 98 colonies/100mL, respectively.

During April, May 2025, densities of fecal coliform and *E. coli* samples at most locations were below 20 colonies/100mL (multiple sites) (Table 4-8). St. Joe Peninsula Near J. “Billy Joe” Rish Rec Area (SJB 14) and Butlers Bay Road (SJB 3) displayed fecal coliform samples (52 colonies/100mL and 48 colonies/100mL) and *E. coli* densities (52 colonies/100mL and 38 colonies/100mL) somewhat elevated compared to other locations.

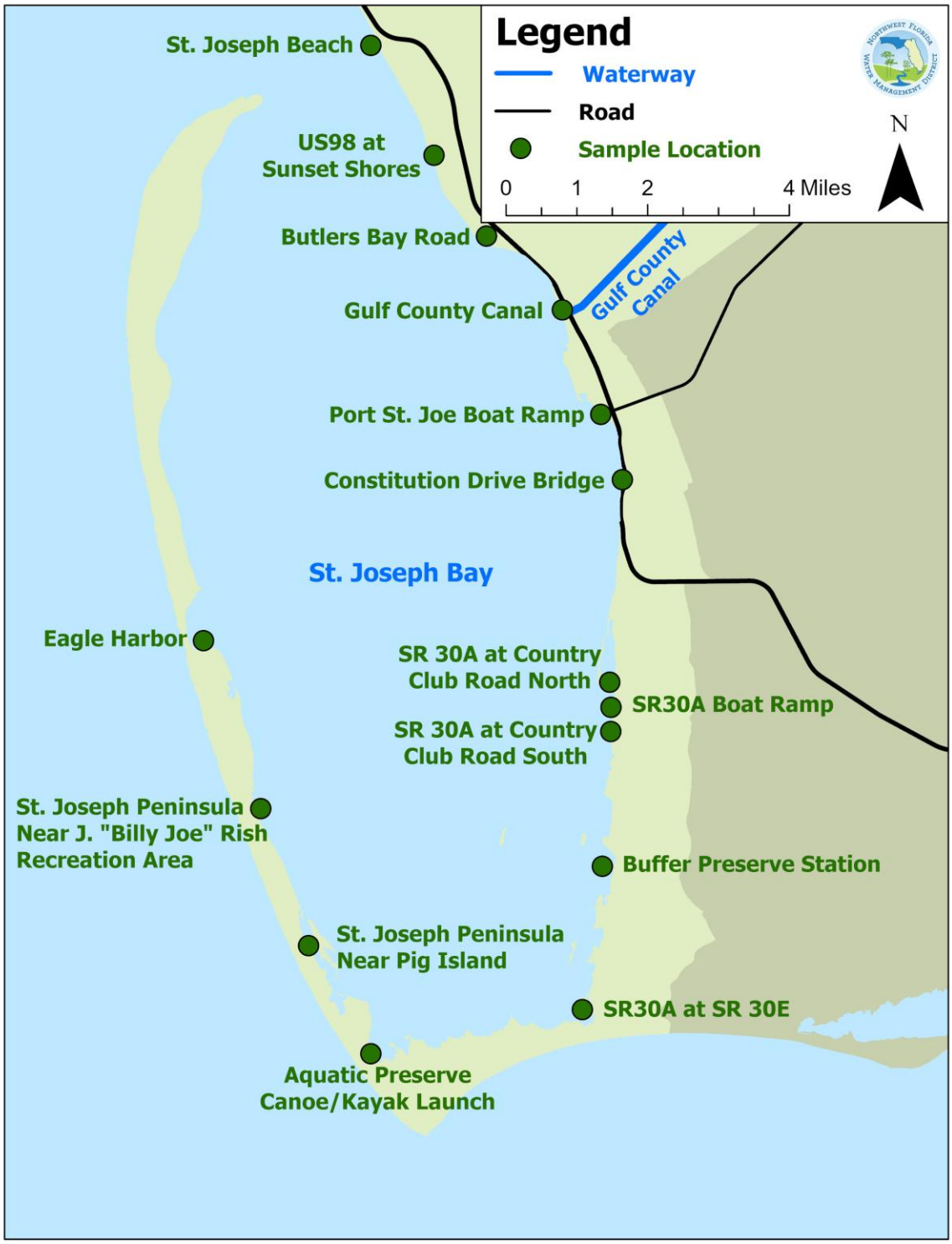


Figure 4-18: *Location of lab analyzed water quality samples Collected around St. Joseph Bay under Amendment 8 to Grant AT003 during May/June 2024.*

Table 4-2: Location of Lab Analyzed Water Quality Samples Collected Around St. Joseph Bay Under Amendment 8 to Grant AT003 during May/June 2024.

Location Name	Monitoring Location ID	Approximate Latitude	Approximate Longitude
St. Joseph Beach	SJB1	29.896753	85.361428
US 98 at Sunset Shores	SJB2	29.880642	85.351158
Butlers Bay Road	SJB3	29.845694	85.328114
Gulf County Canal	SJB4	29.832019	85.313322
Port St. Joe Public Boat Ramp	SJB5	29.810806	85.306436
Constitution Drive Bridge	SJB6	29.798369	85.300550
SR30A at Country Club Rd North	SJB7	29.756328	85.303456
SR30A Boat Ramp	SJB8	29.747833	85.303100
SR30A at Country Club Rd South	SJB9	29.736431	85.301753
Buffer Preserve Station	SJB10	29.717878	85.304619
SR30E at Salinas Park	SJB11	29.686939	85.311886
SJB Aq. Pres. Canoe Launch	SJB12	29.679094	85.364111
St. Joe Peninsula Near Pig Island	SJB13	29.700464	85.375122
St. Joe Peninsula Near J. “Billy Joe” Rish Rec Area	SJB14	29.728264	85.387486
Eagle Harbor Boat Ramp	SJB15	29.764431	85.402419

Table 4-3. Field Parameters Collected at Sample Locations Around Port St. Joe During February 2025.

Location Name	WIN ID	Sampling Date	Water Depth	Sample Depth	Temp.	Spec. Cond.	Diss. Oxygen	pH	Salinity	Field Turb.
			ft	ft	°C	µS/cm	mg/L	s.u.	ppt	NTU
St. Joseph Beach	SJB1	2/17/2025	1.36	0.5	20.5	338.7	2.85	7.12	0.18	2.94
US 98 at Sunset Shores	SJB2	2/17/2025	2.5	0.5	20.1	15543	1.37	7.05	10.13	15.1
Butlers Bay Road	SJB3	2/17/2025	1.25	0.5	19.3	3621	3.90	7.08	2.16	4.54
Gulf County Canal	SJB4	2/17/2025	4.08	0.5	21.2	3380	7.09	7.65	1.92	6.92
				1.0	20.5	31120	6.50	8.18	23.14	6.97
Port St. Joe Public Boat Ramp	SJB5	2/17/2025	2.32	0.5	19.5	41304	6.90	8.18	30.05	4.37
Constitution Drive Bridge	SJB6	2/17/2025	4.62	0.5	19.0	37885	9.09	8.16	27.72	1.59
				1.0	19.1	38762	9.29	8.20	28.25	2.17
SR30A at Country Club Rd North	SJB7	2/17/2025	1.02	<0.5	20.9	3981	8.32	7.10	2.30	3.47
SR30A Boat Ramp	SJB8	2/18/2025	3.21	0.5	17.5	44461	6.42	8.03	34.30	2.28
SR30A at Country Club Rd South	SJB9	2/18/2025	1.96	<0.5	17.0	241.6	6.05	6.96	0.14	2.86
Buffer Preserve Station	SJB10	2/18/2025	0.56	<0.5	20.2	35337	8.08	7.91	24.82	2.14
SR30E at Salinas Park	SJB11	2/18/2025	1.07	<0.5	15.7	30363	6.40	7.80	23.46	3.79
SJB Aq. Pres. Canoe Launch	SJB12	2/18/2025	1.29	<0.5	16.6	45236	7.19	7.91	35.64	5.03
St. Joe Peninsula Near Pig Island	SJB13	2/18/2025	1.06	<0.5	15.4	43901	7.43	7.97	35.47	1.23
St. Joe Peninsula Near J. “Billy Joe” Rish Recreation Area	SJB14	2/18/2025	0.68	<0.5	13.9	36138	9.61	8.16	29.77	1.78
Eagle Harbor Boat Ramp	SJB15	2/18/2025	2.95	0.5	15.5	45791	5.84	7.98	37.27	3.20

Table 4-4. Field Parameters Collected at Sample Locations Around Port St. Joe on April 29, April 30, and May 1, 2025.

Location Name	WIN ID	Sampling Date	Water Depth	Sample Depth	Temp.	Spec. Cond.	Diss. Oxygen	pH	Salinity	Field Turb.
			ft	ft	°C	µS/cm	mg/L	s.u.	ppt	NTU
St. Joseph Beach	SJB1	4/29/2025	0.67	<0.5	22.9	428.6	3.77	6.84	0.21	6.49
US 98 at Sunset Shores	SJB2	4/29/2025	1.24	<0.5	26.0	53575	6.87	8.09	34.57	0.40
Butlers Bay Road	SJB3	4/29/2025	1.94	0.5	27.9	54035	6.79	8.12	33.56	2.62
Gulf County Canal	SJB4	4/29/2025	8.83	0.5	27.5	54227	7.45	8.17	33.89	4.36
				1.0	27.5	54149	7.37	8.16	33.87	1.48
				1.5	27.5	54218	7.37	8.16	33.85	0.58
				2.0	27.5	54082	7.37	8.17	33.84	1.34
				2.5	27.5	54078	7.37	8.17	33.87	1.42
Port St. Joe Public Boat Ramp	SJB5	4/29/2025	3.35	0.5	28.3	55294	5.37	8.10	34.13	3.15
				1.0	28.2	55161	5.12	8.08	34.10	9.15
Constitution Drive Bridge	SJB6	5/1/2025	5.95	0.5	24.6	45967	4.94	7.88	30.05	0.27
				1.0	24.6	46043	4.84	7.92	30.09	0.07
				1.5	24.7	46084	4.80	7.92	30.09	0.63
SR30A at Country Club Rd North	SJB7	5/1/2025	2.12	0.5	23.8	48010	1.93	7.32	32.13	2.73
SR30A Boat Ramp	SJB8	5/1/2025	7.59	0.5	25.3	49547	2.24	7.62	32.17	3.12
				1.0	25.5	49728	2.08	7.64	32.18	1.97
				1.5	25.1	49141	1.94	7.60	32.12	10.47
SR30A at Country Club Rd South	SJB9	5/1/2025	1.64	<0.5	24.5	335.1	2.13	7.09	0.15	2.38
Buffer Preserve Station	SJB10	4/30/2025	1.21	<0.5	27.0	46889	4.74	7.60	29.15	0.00
SR30E at Salinas Park	SJB11	4/30/2025	2.76	0.5	26.8	45284	5.14	7.59	28.19	0.15
SJB Aq. Pres. Canoe Launch	SJB12	4/30/2025	1.08	<0.5	29.8	47079	7.04	7.88	27.64	4.98
St. Joe Peninsula Near Pig Island	SJB13	4/30/2025	2.36	0.5	26.4	42917	4.05	7.54	26.77	0.61
St. Joe Peninsula Near J. “Billy Joe” Rish Recreation Area	SJB14	4/30/2025	1.15	<0.5	25.0	41648	3.84	7.70	26.67	0.06
Eagle Harbor Boat Ramp	SJB15	4/30/2025	5.50	0.5	25.1	40339	5.33	7.79	25.70	2.44
				1.0	25.0	40258	5.00	7.78	25.70	2.78
				1.5	25.2	40461	4.77	7.77	25.77	0.11

Table 4-5: Results of Lab Analyzed Water Quality Samples Collected Around St. Joseph Bay During February 2025.

Location Name	WIN ID	N	NH4	Total P	Ortho P	TOC	Ca	Mg	Na	K	Cl	SO4
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
St. Joseph Beach	SJB1	0.24 U	0.064	1.5 U	0.043	21	32	84	660	30	1600	150
US 98 at Sunset Shores	SJB2	0.24 U	0.53	1.5 U	0.011 I	15	200	390	3000	120	4100	690
Butlers Bay Road	SJB3	0.24 U	0.010 U	1.5 U	0.013 I	21	40	69	540	24	1600	130
Gulf County Canal	SJB4	0.457	0.010 U	1.5 U	0.048 U	3.8	33	71	571	27	2000	150
Port St. Joe Public Boat Ramp	SJB5	0.24 U	0.25	1.5 U	0.048 U	2.1	380	1200	8900	400	24000	2800
Constitution Drive Bridge	SJB6	0.24 U	0.31	1.5 U	0.048 U	2.9	340	1100	8100	370	3700	2200
SR30A at Country Club Rd North	SJB7	0.24 U	0.028	1.5 U	0.048 U	10	42	10	13	2.1	26	11
SR30A Boat Ramp	SJB8	0.24 U	0.36	0.15 U	0.048 U	3.8	460	1400	9400	490	20	2.0 U
SR30A at Country Club Rd South	SJB9	0.24 U	0.010 U	0.15 U	0.048 U	15	8.0	4.4	15	1.8	26	6.7
Buffer Preserve Station	SJB10	0.24 U	0.14	0.15 U	0.048 U	12	370	940	7800	400	26000	4500
SR30E at Salinas Park	SJB11	0.24 U	0.088	0.15 U	0.048 U	20	250	760	5700	260	11000	1600
SJB Aq. Pres. Canoe Launch	SJB12	0.24 U	0.41	0.15 U	0.048 U	5.3	420	1300	9300	430	17000	5800
St. Joe Peninsula Near Pig Island	SJB13	0.24 U	0.16	0.15 U	0.022	3.7	410	1300	9500	430	17000	2000
St. Joe Peninsula Near J. "Billy Joe" Rish Rec Area	SJB14	0.24 U	0.49	0.15 U	0.048 U	4.6	410	1300	9700	430	24000	2800
Eagle Harbor Boat Ramp	SJB15	0.24 U	0.86	0.15 U	0.008 I	2.4	470	1500	10000	500	27000	3100

U – Analyte was not detected and the indicated value is the detection limit

I – The reported value is between the laboratory method detection limit and the practical quantitation limit

Table 4-6: Results of Lab Analyzed Water Quality Samples Collected Around St. Joseph Bay During February 2025, continued.

Location Name	WIN	CO^3	HCO^3	F	Alk.	TDS	TSS	Color	Fecal Coliform	E. coli
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CU	Colonies/100mL	Colonies/100mL
St. Joseph Beach	SJB1	5.0 U	32	2.5	32	2000	2.0 U	25	24	22
US 98 at Sunset Shores	SJB2	5.0 U	150	4.0	150	4900	11	40	78	66
Butlers Bay Road	SJB3	5.0 U	73	2.4	73	2800	2.0 U	45	900 B	880 B
Gulf County Canal	SJB4	5.0 U	49	2.6	49	2300	4.3	25	144	98
Port St. Joe Public Boat Ramp	SJB5	5.0 U	110	42	110	34000	23	5.0 U	2.0 U	2.0 U
Constitution Drive Bridge	SJB6	5.0 U	110	42	110	35000	17	10	8	5
SR30A at Country Club Rd North	SJB7	5.0 U	140	1.8	140	560	4.9	65	500	500
SR30A Boat Ramp	SJB8	5.0 U	110	2.0 U	110	36000	30	15	4	4
SR30A at Country Club Rd South	SJB9	5.0 U	31	0.20 U	31	120	2.0 U	10	36	20
Buffer Preserve Station	SJB10	5.0 U	97	43	97	26000	18	10	6	6
SR30E at Salinas Park	SJB11	5.0 U	76	18	76	18000	16	40	60	38
SJB Aq. Pres. Canoe Launch	SJB12	5.0 U	140	37	140	36000	29	40	2	2
St. Joe Peninsula Near Pig Island	SJB13	5.0 U	130	36	130	33000	20	15	4	4
St. Joe Peninsula Near J. "Billy Joe" Rish Rec Area	SJB14	5.0 U	140	37	140	35000	33	20	15	15
Eagle Harbor Boat Ramp	SJB15	5.0 U	140	43	140	39000	22	7.5	2.0 U	2.0 U

U – Analyte was not detected and the indicated value is the detection limit

B – Colony count exceeded the ideal of 20 – 80 (total coliform) or 20 – 60 (fecal coliform)

I – The reported value is between the laboratory method detection limit and the practical quantitation limit

Table 4-7: Results of Lab Analyzed Water Quality Samples Collected Around St. Joseph Bay on April 29, April 30, and May 1, 2025.

Location Name	WIN ID	N	NH4	Total P	Ortho P	TOC	Ca	Mg	Na	K	Cl	SO4
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
St. Joseph Beach	SJB1	0.24 U	0.075	0.30 U	0.075	10	46	11	18	1.6	26	8.9
US 98 at Sunset Shores	SJB2	0.24 U	0.020 I	0.30 U	0.0048 U	2.1	350	1200	9400	380	45000	6500
Butlers Bay Road	SJB3	0.24 U	0.012 I	0.30 U	0.0048 U	2.0	330	1100	8900	350	45000	6400
Gulf County Canal	SJB4	0.24 U	0.010 U	0.30 U	0.0048 U	1.81	320	1100	9200	350	46000	6600
Port St. Joe Public Boat Ramp	SJB5	0.24 U	0.10	0.30 U	0.008 I	2.3	330	1100	9200	360	44000	6200

Constitution Drive Bridge	SJB6	0.24 U	0.016 I	0.15 U	0.0048 U	2.5	380	1200	8800	380	17000	2400
SR30A at Country Club Rd North	SJB7	0.24 U	0.11	0.15 U	0.0048 U	6.4	410	1300	9500	410	17000	2300
SR30A Boat Ramp	SJB8	0.24 U	0.067	0.15 U	0.0048 U	5.3	110	38	24	2.4	18000	2400
SR30A at Country Club Rd South	SJB9	0.24 U	0.021 I	0.15 U	0.0048 U	15	12	7.4	30	2.4	57	7.3
Buffer Preserve Station	SJB10	0.24 U	0.010 U	0.30 U	0.0048 U	6.1	390	1200	10000	420	18000	2800
SR30E at Salinas Park	SJB11	0.24 U	0.010 U	0.30 U	0.0048 U	6.3	380	1200	1000	410	19000	2700
SJB Aq. Pres. Canoe Launch	SJB12	0.24 N	0.023 I	0.15 U	0.0048 U	4.2	360	1200	9600	400	18000	2400
St. Joe Peninsula Near Pig Island	SJB13	0.24 U	0.046	0.30 U	0.0048 U	3.6	350	1100	9400	390	17000	2200
St. Joe Peninsula Near J. “Billy Joe” Rish Rec Area	SJB14	0.24 U	0.14	0.81	0.0048 U	5.6	350	1100	9400	380	16000	2300
Eagle Harbor Boat Ramp	SJB15	0.24 U	0.017 I	0.30 U	0.0048 U	2.5	340	1100	9200	380	17000	2300

U – Analyte was not detected and the indicated value is the detection limit

I – The reported value is between the laboratory method detection limit and the practical quantitation limit

Table 4-8: Results of Lab Analyzed Water Quality Samples Collected Around St. Joseph Bay on April 29, April 30, and May 1, 2025, continued.

Location Name	WIN	CO^3	HCO^3	F	Alk.	TDS	TSS	Color	Fecal Coliform	E. coli
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	CU	Colonies/100mL	Colonies/100mL
St. Joseph Beach	SJB1	5.0 U	140	0.42 I	140	250	2.0 U	70	18	2.0 U
US 98 at Sunset Shores	SJB2	5.0 U	110	0.20 U	110	32000	21	7.5	20	12
Butlers Bay Road	SJB3	5.0 U	100	500	100	32000	26	5.0	48	38
Gulf County Canal	SJB4	5.0 U	100	460	100	31000	25	5.0	2.0 U	2.0 U
Port St. Joe Public Boat Ramp	SJB5	5.0 U	100	280	100	32000	26	7.5	20	18
Constitution Drive Bridge	SJB6	5.0 U	110	28	110	33000	18	10	20	4
SR30A at Country Club Rd North	SJB7	5.0 U	130	28	130	32000	23	30	10	8
SR30A Boat Ramp	SJB8	5.0 U	120	30	130	37000	10	25	6	6
SR30A at Country Club Rd South	SJB9	5.0 U	31	0.20 U	37	270	2.0	70	16	14
Buffer Preserve Station	SJB10	5.0 U	130	36	130	39000	23	20	6	2.0 U
SR30E at Salinas Park	SJB11	5.0 U	120	37	120	37000	21	25	8	4
SJB Aq. Pres. Canoe Launch	SJB12	5.0 U	120	35	120	36000	31	20	16	14
St. Joe Peninsula Near Pig Island	SJB13	5.0 U	120	35	120	34000	8.5	15	8	8
St. Joe Peninsula Near J. “Billy Joe” Rish Rec Area	SJB14	5.0 U	130	28	130	22000	23	25	52	52
Eagle Harbor Boat Ramp	SJB15	5.0 U	110	30	110	33000	21	7.5	2.0 U	2.0 U

U – Analyte was not detected and the indicated value is the detection limit

I – The reported value is between the laboratory method detection limit and the practical quantitation limit

4.5 Water Quality Data Conclusions and Synthesis

Nitrate + Nitrite and total phosphorus concentrations were most often below the detection limit or between the detection limit and quantifiable limit. Noticeable exceptions include the nitrate + nitrite at the Gulf County Canal on February 17, 2025 (0.457 mg/L) and total phosphorus at St. Joe Peninsula Near J. “Billy Joe” Rish Rec Area on April 30, 2025 (0.81 mg/L).

Bacteria (fecal coliform, *E. coli*) concentrations were generally low with elevated concentrations relative to other locations around St. Joseph Bay only found at two locations. Butlers Bay Road (900 colonies/100mL and 880 colonies/100mL) and SR30A at Country Club Rd North (500 colonies/100mL and 500 colonies/100mL). The Gulf County Canal also displayed fecal coliform, *E. coli* concentrations elevated to other sites (144 colonies/100mL and 98 colonies/100mL, respectively). Regular sampling is required in order to monitor long-term trends and help determine factors that may be related to any adverse water quality conditions measured in St. Joseph Bay.

5 Additional Data Entry into DEP Watershed Information Network (WIN)

In Amendment 10 to Grant AT003, a task was added for the District to begin entering water quality data previously collected by the District into DEP's watershed information network. Much data collected by the District is stored in the District's database which may be of value to researchers investigating water quality trends in the Florida panhandle.

At the time of the grant's execution, the number of samples available and appropriate for inclusion in the Watershed Information Network (WIN) database was unknown. To begin facilitating this effort, the District obtained a per-sample cost estimate from a contractor who was familiar with the WIN data entry. Based on the cost per sample, the relatively short timeframe, and the District's budget/spending authority for the grant the grant was amended to allow for an estimated 300 to 391 samples to be entered. The difference in estimated samples was dependent on whether a location required set up in WIN or not. Once data entry began, the contractor was able to more efficiently enter the data and streamline the process resulting in a reduction in per sample cost to the District. In total, 459 total samples were entered as described below.

Two groups of data were prioritized for entry into the WIN database. The first group of data prioritized for entry into WIN was for water quality samples collected around St. Joseph Bay and the East Bay portion of St. Andrew Bay (East Bay) as part of this grant (AT003). A total of 205 samples (135 samples from around St. Joseph Bay and 70 samples from around East Bay were entered into WIN which were collected under prior iterations of this grant (Table 5-1). These data were collected between 5/27/2020 and 6/27/2022. Results of these data collection efforts are available in previous annual monitoring reports and are not discussed here.

Once data collected as part of past iterations of this grant were completed DEP was consulted on which samples should be prioritized for entry. DEP requested that samples collected around Econfina Creek be prioritized. The remaining budget for this task allowed for an additional 254 samples from eight locations along Econfina Creek to be entered into WIN. These data were collected at approximately monthly intervals between 1/27/2015 and 8/30/2017. Results of these data collection efforts are not included in this report as the data collection was not part of this grant.

Table 5-1. Water Quality Samples Entered into WIN as Part of Amendment 10 to Grant AT003.

Location	WIN ID	Sampling Period of Record	# Samples
Sandy Creek	1111	10/28/2020 - 6/27/2022	20
Wetappo Creek North	1069A	10/28/2020 - 7/20/2021	10
Sandy Creek North	1111A	10/28/2020 - 7/20/2021	10
Britt Branch	1155	10/28/2020 - 7/20/2021	10
Wetappo Creek*	1069	10/28/2020 - 6/27/2022	20
St. Joseph Beach	SJB1	8/10/2020 - 6/27/2022	17
U.S. 98 at Sunset Shores	SJB3	8/10/2020 - 7/20/2021	13
Butlers Bay Road	SJB4	8/10/2020 - 6/27/2022	17
Gulf County Canal	SJB6	8/10/2020 - 6/27/2022	17
Port St./ Joe Boat Ramp	SJB8	10/13/2020 - 6/24/2022	14
	SJB16	10/12/2020 - 7/20/2021	10
	SJB17	10/13/2020 - 6/27/2022	14
	SJB18	10/13/2020 - 7/19/2021	10
	SJB19	10/13/2020 - 7/19/2021	10
	SJB20	8/10/2020 - 7/20/2021	13
Econfina Creek	SJB2550	1/27/2015 – 8/30/2017	32
Econfina Creek	013030	1/27/2015 – 8/30/2017	32
Econfina Creek	013031	1/27/2015 – 8/30/2017	30
Econfina Creek	013032	1/27/2015 – 8/30/2017	32
Econfina Creek	013034	1/27/2015 – 8/30/2017	32
Econfina Creek	013035	1/27/2015 – 8/30/2017	32
Econfina Creek	013038	1/27/2015 – 8/30/2017	32
Econfina Creek	013039	1/27/2015 – 8/30/2017	32
Total			459

6 Future Direction of the Project

Results of the project, including additional available water quality data, to date have demonstrated that water quality is of concern throughout several areas in and around St. Joseph Bay. DEP and the NWFWMD are committed to not only monitoring but improving water quality in St. Joseph Bay. Collectively, DEP and the NWFWMD have agreed that a circulation model (i.e. hydrodynamic model) is of vital interest to St. Joseph Bay as circulation in the bay is poorly understood.

DEP and NWFWMD are discussing the continuation of this project to develop and calibrate a hydrodynamic model, followed by the modeling of select scenarios to gain insight into the flow patterns of St. Joseph Bay. This effort includes three distinct tasks, which can largely overlap each other. These efforts include:

1- **Discharge and Water Quality Monitoring in the Gulf Intracoastal Waterway.** This task is to continue the continuous discharge monitoring at the IWW East and IWW West stations as discussed in Section 3.2 of this report. In addition to stage and discharge, temperature and specific conductivity (salinity) will be collected at the bottom sensor location. Due to USGS funding and staffing reductions, they are no longer capable of collecting any water quality data at the surface location or dissolved oxygen/pH data at the bottom sensor. Additional data needed to develop a hydrodynamic model are proposed to be addressed in Task 2 below.

2- **Hydrodynamic Circulation Model for St. Joseph Bay.** Under this task a Hydrodynamic modeling plan is proposed to be developed as the first step. This plan will identify the process, model type, data needs, etc. required to develop a well calibrated model. Additional data collection may be collected as identified in the modeling plan. Following data collection, a hydrodynamic model is proposed to be developed and calibrated. All data collection and modeling efforts follow DEP standard operating procedures and have quality assurance plans developed as needed.

3- **Hydrodynamic Circulation Model Scenario Runs.** This task would consist of a minimum of three scenario runs to evaluate the effects of changing boundary conditions on St. Joseph Bay such as changing freshwater inflows, offshore boundary conditions, etc. Actual scenarios to be modeled would be determined in collaboration with DEP.

It is anticipated this effort would take three years and cost up to $2,000,000 to complete. Actual schedule and cost estimates would be finalized during the modeling plan development in Task 1 above.

7 References

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