

**QUALITY ASSURANCE PROJECT PLAN**

**for**

**Receiving Water Assessment**

**Government of the District of Columbia  
Department of Energy and Environment  
Natural Resources Administration  
Water Quality Division**

**1200 First St NE, 5<sup>th</sup> Floor  
Washington, DC 20002**

**2019**

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## LIST OF ACRONYMS

<b>DOEE</b>	Department of Energy and Environment
<b>DQO</b>	Data Quality Objective
<b>EPA</b>	Environmental Protection Agency
<b>GIS</b>	Geographic Information System
<b>GPS</b>	Global Positioning System
<b>MAB</b>	Monitoring and Assessment Branch
<b>MBSS</b>	Maryland Biological Stream Survey
<b>MS4</b>	Municipal Separate Storm Sewer System
<b>NRA</b>	Natural Resources Administration
<b>NPDES</b>	National Pollutant Discharge Elimination System
<b>PRB</b>	Planning and Reporting Branch
<b>QA</b>	Quality Assurance
<b>QAPP</b>	Quality Assurance Project Plan
<b>QC</b>	Quality Control
<b>RSA</b>	Rapid Stream Assessment
<b>SOP</b>	Standard Operating Procedure
<b>WPD</b>	Watershed Protection Division
<b>WQD</b>	Water Quality Division

## **PREFACE**

This document is a component of a comprehensive Quality Assurance (QA)/Quality Control (QC) program that includes a Field Data Collection Guide for Rapid Stream Assessments (Appendix 1), Quality Assurance & Quality Control Program for Rapid Stream Assessments (Appendix 2) and a Standard Operating Procedures for Rapid Stream Assessments (Appendix 3).

This document covers the field activities that will be implemented by staff of the Natural Resources Administration and their contractor support (LimnoTech). Activities include conducting a rapid assessment of all safely wadeable District streams (i.e. all streams approx. fourth order and smaller).

## **GROUP A: PROJECT MANAGEMENT**

### A.1. Distribution List

This document has been distributed to the following list of individuals and organizations as well as to others involved in this project.

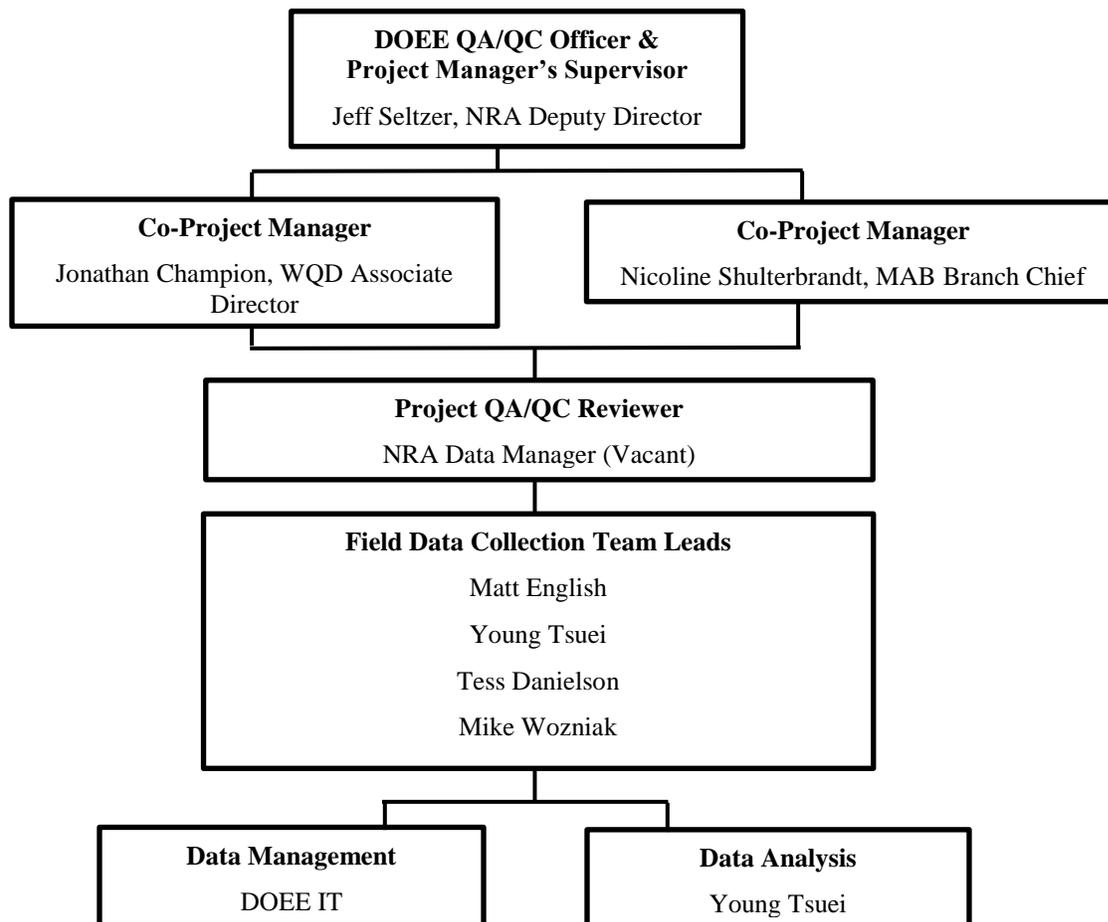
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## A2. Project Organization

The purpose of this document is to present the Quality Assurance Project Plan (QAPP) for collecting and analyzing environmental data from wadeable streams in the District. This Rapid Stream Assessment (RSA) Program has been developed to support the District Department of Energy and the Environment's (DOEE's) Municipal Separate Storm Sewer System (MS4) Program as well as collect data to be used by the Monitoring and Assessment Branch (MAB), and the Watershed Protection Division (WPD).

The QAPP provides general descriptions of the work to be performed to collect and analyze the data, and the procedures used to ensure the data are scientifically valid and defensible and that uncertainty has been reduced to a known and practical minimum. Key project roles are filled by those responsible for ensuring the collection of valid data and the routine assessment of these data.

The project organizational chart is presented in Figure 1. It reflects the relationships and the lines of communication among all participants and data users.



**Figure 1. Key personnel and their corresponding responsibilities for the Rapid Stream Assessment Program.**

The primary responsibilities of the QA/QC Officer include the following:

- Providing support to the Project Manager in the preparation and distribution of the QAPP.
- Reviewing and approving the QAPP
- Ensure QA/QC is maintained throughout the assessment program in the field and subsequent analysis

The primary responsibilities of the Project Managers include the following:

- Preparing and distributing the QAPP
- Providing guidance and technical advice to those assigned to the project
- Schedule field staff and assign watersheds to be assessed
- Track staff certification, training attendance, and ensure that field audits are performed

The primary responsibilities of the QA/QC Reviewer include the following:

- Providing support to the Project Manager in the preparation and distribution of the QAPP.
- Monitoring QC activities to determine conformance and provide feedback to team leads
- Providing written documentation of QC reviews documenting if/when the standards set forth in the QAPP are met or exceeded.

The primary responsibilities of the Field Data Collection Leads include the following:

- Schedule field staff and assign watersheds to be assessed, as requested by project manager
- Conducting rapid stream assessments in accordance with project SOPs and QAPP
- Conducting equipment/device operation check and logging device performance issues
- Conduct training and audits

The primary responsibilities of the Data Management/Analysis lead includes the following:

- Ensuring data is routinely backed up
- Assisting QA/QC Reviewer to review data and ensure completeness

Other QA/QC Staff, such as technical reviewers and technical editors selected as needed, will provide peer review oversight on the content of work products and ensure that work products comply with DOEE specifications.

### **A3. Problem Definition/Background**

The Department of Energy and Environment's Natural Resources Administration (NRA) (herein after referred to as "DOEE") implements water quality and related monitoring in the District's waterbodies. In 2015, DOEE submitted a Revised Monitoring Program to EPA as required by the District's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit<sup>1</sup>. This Revised Monitoring Program included reference to a number of water quality monitoring efforts such as wet weather stormwater monitoring, dry weather screening, and receiving water/surface water quality monitoring.

While DOEE has conducted these types of monitoring activities for years within the District, some of which beginning in the early 1960's, it has been several decades since a comprehensive, high-level assessment of stream condition has been conducted on many of the streams within the District. A Rapid Stream Assessment (RSA) was developed as a way to collect information to provide a high-level overview of the entire Wadeable Stream Network within the District.

Additionally, while the 2015 Revised Monitoring Program was designed to meet the specific goals and objectives of the MS4 permit, DOEE recognized the opportunity to use the RSA to collect data and information that could be used by other Divisions of the NRA as well. This integrated approach to monitoring is being addressed in DOEE's Integrated Monitoring Strategy (in development).

The purpose of the RSA is three-fold:

- 1) To develop a complete inventory of the District's streams and the characteristics associated with these streams
- 2) To develop a baseline from which to compare changes or trends over time, and
- 3) To identify issues that need to be investigated further and addressed (i.e., potential restoration projects, dump sites, illicit connections, severe stream erosion).

The RSA seeks to address several goals and objectives driven by the MS4 permit as well as the draft Integrated Monitoring Strategy including:

Goals:

- Provide data and basic information on the health and integrity of the District's waters and related aquatic ecosystems.
- Accurately characterize the quality of the District's waterbodies, and more clearly set expectations for their protection, use and enjoyment.

Objectives:

- Evaluate the health of the receiving waters to include the identification of stressors and their ecological effects

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<sup>1</sup> Authorization to Discharge under the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer Permit. NPDES Permit No. DC0000221 (2011)

- Assess trends to evaluate progress toward meeting water quality standards
- Determine status and trends of MS4 impacts in receiving waters through effective monitoring (MS4 permit)
- Provide adequate quantity and quality of data to assess, analyze, and evaluate status of DC waterbodies

#### **A4. Project Description**

The full length of all perennial, safely wadeable stream reaches within the District, including Rock Creek, will be assessed during the stream walks in the Rapid Stream Assessment.

The RSA includes several types of assessments including:

- Reach assessments
  - Open channel (above-ground) streams;
  - Closed channel (underground) streams
  - Outfall reach
- Point assessments

The RSA will include general stream characterization, habitat evaluation, and evaluation of geomorphological features. In addition, infrastructure along each stream reach (i.e., stormwater outfalls, exposed sewer pipes, illicit discharges) and environmental features (i.e., dump sites, stream buffer deficiencies) will be identified and recorded (if not already documented by the District).

Hand-held, GPS enabled devices, will be used during RSA to facilitate rapid and accurate data collection. Examples of these electronic data collection field forms, and tutorials for using them, are included in the associated SOP (Appendix 3).

At a minimum, 18 sites will be evaluated during the first year of MS4 permit implementation per the current MS4 permit<sup>2</sup>. All accessible stream reaches will be assessed within every five-year permit cycle.

#### **A5. Data Quality Objectives and Measurement Performance Criteria**

Data quality objectives (DQO's) are qualitative and quantitative statements that clarify the intended use of the data, define the type of data needed to support the decision, identify the conditions under which the data should be collected, and specify tolerable limits on the probability of making a decision error due to uncertainty in the data (if applicable). DQOs are developed by data users to specify the data quality needed to support specific decisions. DQOs are also used as an indicator of potential method problems. However, if issues are identified, data are not always discarded simply

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<sup>2</sup> Authorization to Discharge under the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit No. DC0000221 (2018)

because DQOs are not met. Instead, this is a signal to further investigate and correct problems. Once the problem(s) are rectified, the data can still be utilized, as long as the correction is satisfactory.

The quality of an environmental monitoring program can be evaluated in three steps: (1) establishing scientific assessment quality objectives, (2) evaluating program design for whether the objectives can be met, and (3) establishing assessment and measurement quality objectives that can be used to evaluate the appropriateness of the methods being used in a program. The process of establishing DQOs involves identifying the allowable uncertainty of a dataset which may lead to two types of error: false positives (Type I error: a difference is found to exist when in fact it does not) and false negatives (Type II error: a difference is not found when in fact it does exist).

The acceptance probabilities of those errors as established by the data users are the DQOs. The DQO process entails establishing action-triggering values and selecting rates of false positives and false negatives that are acceptable to the data user (decision maker). The quality of a particular dataset is some measure of the types and amount of error associated with the data.

Sources of error or uncertainty associated with variables and indicators include the following:

- Sampling (or random) error: The difference between sample values and in situ “true” values from unknown biases due to sampling design. Sampling error includes natural variability (spatial heterogeneity and temporal variability in population abundance and distribution) not specifically accounted for in a design (for design-based inference), and variability associated with model parameters or incorrect model specification (for model-based inference).
- Measurement (or systematic) error: The difference between sample values and in situ “true” values associated with the measurement process. Measurement error includes bias and imprecision associated with sampling methodology, specification of the sampling unit, identification, instrumentation, etc.

The data requirements for the RSA encompass aspects of field data collection, data analysis, and database management to reduce sources of errors and uncertainty in the use of the data. Methods and procedures described in this document are intended to reduce the magnitude of measurement error sources and frequency of occurrence. Project quality objectives include the following:

- Use of standardized, repeatable field assessment procedures
- Use of trained staff to perform the field assessment
- Evaluation of duplicate field team assessments of the same reaches to assess consistency
- Review of collected data

Data generated under this QAPP are used, in part, to meet requirements of the Districts MS4 permit. Therefore, it is of utmost importance that the data are of sufficient quality to meet this need.

DQOs are qualitative and quantitative statements that clarify the intended use of the data, define the type of data needed to support the decision, identify the conditions under which the data should be collected, and specify tolerable limits on the probability of making a decision error because of uncertainty in the data. To ensure the collection of high-quality data, specific DQOs have been set

for field data collection procedures on a method basis for precision, accuracy, representativeness, comparability and completeness.

### Precision

Precision is a measure of the degree to which two or more measurements of the same sample are in agreement as well as a measurement of random error. The level of precision which is acceptable is specific to individual metrics and has been determined based upon inherent variation expected (Appendix 2).

Repeat assessments at quality control sites will provide data with which to compare values. Inconsistent values across multiple measurements will result in investigation on the reason for inconsistencies and the need for any corrective action (i.e. training).

### Accuracy

Accuracy is an evaluation of the degree to which a measured value and a known reference value or true value are in agreement. This is a measurement of systematic error and is often referred to as "bias". Accuracy is determined by the analysis of reference material and comparison of the resulting value to that of the accepted value. The difference between the accepted and reference value is the percent difference.

Field data will be collected in a manner in which the metrics were designed (i.e., according to protocol). For this reason, DOEE provides RSA training for all field staff. Additionally, an audit program is used to ensure that they retain necessary knowledge and properly complete their RSAs (see Appendix 2 for more details). The level of accuracy, which is required to pass staff certification audits and the level of accuracy deemed acceptable for individual metrics, has been determined based upon inherent variation evaluated in year one of the RSA and is discussed further in Appendix 2 (Quality Assurance & Quality Control Program for Rapid Stream Assessments).

Because data are entered directly into the Collector/Survey123 application tool, any transcription errors that may impact accuracy are not an issue. Additionally, geodatabase domains and the Collector/Survey123 tool's conditionally programmed restrictions ensure that only appropriate data may be entered associated with a particular metric or data entry point.

### Representativeness

Representativeness is the determination of how representative a sample is of the population. Representativeness of the sampling approach for the RSA is inherent in its design as this program evaluates the entire wadeable stream network within the District.

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### Comparability

Comparability is a measure of how comparable proposed methods are to accepted methods. Two datasets are considered comparable when there is confidence that they are equivalent with respect to the measurement of a specific variable or group of variables. For this project, data will be considered comparable if they meet the performance criteria, or DQOs, for each step of the sampling process. Measurement data collected in this project will follow procedures adapted from MBSS and documented in the RSA SOP. Comparability is dependent on the proper design of the sampling program, and on adherence to sampling techniques and SOPs.

Comparability in field data will also be maintained through the audit program by ensuring staff complete RSA in a consistent manner. Regular mixing of field staff teams also supports ongoing promotion of comparability.

### Completeness

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected to be obtained under normal conditions. Geographic completeness is considered to be assessment of greater than 90% of all safely wadeable streams in the District. Data completeness of each stream assessment is expected to be 100%. Use of the Collector/Survey 123 data collection tool requires that all applicable data, based on survey type, is collected before an assessment is submitted. If any required data is missing, this data collection tool prompts staff to complete the missing information before allowing submission.

## **A6. Special Training/Certification**

All MAB personnel and contractors participating in the rapid stream assessment program are environmental protection specialists with the relevant education and experience needed to carry out the field sampling and analysis programs. In addition, all staff participating in the RSA program shall be certified to conduct these assessments. Certification level will be based upon completed training, audits, and the number of assessment hours completed. All staff will attend an annual refresher training session focused on reviewing the procedures for RSA and for scoring the metrics described in the field manual. New staff will receive comprehensive training. To maintain their certification, all staff will be audited every 2-3 years based upon their certification level to ensure that all staff are able to demonstrate proper application of knowledge and skills necessary for conducting RSAs (Appendix 2).

## **A7. Documents and Records**

Thorough documentation of all field activities is necessary for proper interpretation of study results. To facilitate accurate documentation, field crews will be using mobile devices to record field observations.

Mobile devices will also use a built-in camera to capture photographs of features within the tributaries including various point assessments (e.g., erosion points, buffer deficiencies, dump

sites) and the overall character of a reach. Appendix 3, Field Data Collection Guide for Rapid Stream Assessment.

RSA data will be preserved in the geodatabase and later integrated into the Division's database.

Observations made at the watershed scale will be recorded as an attribute to the watershed reference layer. These notes can be added in real-time by field staff using mobile devices or on a desktop computer in the office after an entire watershed has been assessed.

DOEE will submit findings of the RSA in the MS4 Annual Report. Additionally, any issues that may be identified during field assessments, such as dump sites or erosion that may warrant remediation, will be reported to the appropriate point of contact for necessary follow-up (Appendix 4).

The District makes every effort to have reporting information readily available to the public and state and federal agencies. To further ensure that DOEE reports are accessible, informational reports, including the MS4 Annual Report and its companion ArcGIS StoryMap, within which these data will be reported, will be posted on the DOEE website.

## **GROUP B: DATA GENERATION AND ACQUISITION ELEMENTS**

### **B1. Sampling Process Design**

The intent of the RSA is to collect data that provides a high-level overview of the entire wadeable stream network within the District. To accomplish this, the program was designed such that all wadeable first through fourth order streams would be evaluated. Additionally, temporary reaches will also be evaluated as feasible in an effort to establish a baseline for the District's stream network.

As it is not anticipated that significant changes will occur as a whole within the stream network on a frequent basis, the RSA has been designed with the intent that approx. 20% of stream miles will be assessed each year such that the entire networked will be assessed each MS4 permit cycle (once every five years).

The following will be assessed through the RSA:

- Open channel streams
- Closed-channel streams, which are in line with the rest of the stream reach.
- Outfall reach, which are reaches less than 75 meters in length that have been created by flow coming from an outfall.
- Point assessment are locations within a stream reach where a distinct or discrete feature is identified.

### **Reach Assessments**

Reach assessments are performed in association with both open-channel streams as well closed-channel (e.g., piped) streams. Additionally, outfall reaches are also evaluated. These are reaches less than 75 meters in length that have been created by flow coming from an outfall. The same metrics will be evaluated for this assessment as are evaluated for open channel reach assessments.

For each stream reach, the following will be collected:

- Basic data, including field team lead (recorded automatically when staff sign in to Collector/Survey 123) and date,
- A broad range of physical habitat metrics on perennial reaches and an abbreviated assessment for temporary reaches
- Representative photos
- Optional comments describing features of the reach that may not be fully captured in assessment questions

The metrics evaluated for reaches include: water presence, water flow, water clarity, odor (from water or sediment), maximum depth encountered, average depth, maximum width, fish presence, aquatic vegetation, algae, bacteria presence, trash, , dominant riparian vegetation, riparian vegetation width, substrate type, shading, , bank erosion, woody debris and root wads, recreation evidence, floodplain connectivity, and approximate Rosgen classification.

## Point Assessments

Points are considered locations within a stream reach where a distinct or discrete feature is identified. Point assessments will be recorded for:

- Deficient buffers: location and length of deficiency, type of cover in deficient buffer area, and impact score
- Crossings (of bridges, roads, etc.): type, diameter/width, length, and material of crossing; presence of debris, bed erosion, sediment deposition, and impact score
- Dumpsites: bank where the dumpsite is located, location of the dumpsite (bank, floodplain, etc.), cleanup potential, dumped material, trash volume, and impact score
- Erosion: erosion location, severity, and impact score
- Pipes: location, diameter, and type of pipe material; deposits/stains, floating solids/trash, erosion due to pipe, and impact score
  - If there is a discharge from the pipe, additional metrics evaluated include: discharge type, quality of discharge, discharge odor, discharge clarity
- Utility lines: utility line type, line diameter, material, condition, and impact score
- Non-piped blockage to fish passage: blockages to fish passage are located where there is a greater than a 0.3 meter (approximately one foot) change in stream bed elevation.
- Inaccessible Reach: reaches that are not accessible to survey teams due to fences or other limitations, but are still recognized as present.

“Other impacts” are also recorded as needed. These include issues like erosion and sediment control violations; anything unsafe, such as sudden drops from an outfall, or a partially collapsed outfall.

## B2. Sampling Methods

The protocols used for this project are detailed in the Field Data Collection Guide for Rapid Stream Assessment and the SOP for Rapid Stream Assessment (Appendix 1 and 3). Specific details on use of the use of the Collector/Survey123 app is included in the SOP. Prior to each round of sampling the Field Manual and SOP will be reviewed and updated according to any changes made in equipment or procedures (changes will first be approved by the Project Managers and the QA Officer).

The RSA approach is visual-based and consists of evaluating a series of metrics along stream reaches as well as select points along the reach. Both perennial and temporary streams are evaluated through the RSA. Reach assessments are performed on 300-meter segments unless a change in stream character occurs first, which will trigger the beginning of a new stream reach. Changes in character may be the result of:

- Changes in flow or water quality characteristics (e.g., clarity, odor)
- Changes in stream geomorphology (e.g., floodplain connectivity, approximate Rosgen classification)
- Changes of in-stream physical habitat (e.g., substrate type, erosion, riparian area)

Data collection will occur from downstream to upstream. The right and left banks will then be oriented as such while looking upstream.

Within each stream reach, particular points of interest may be identified that are distinct from the overall stream character (e.g., buffer deficiency that is visually distinct from the surrounding riparian area). These points will be assessed as they are found as the field team walks the 300-meter stream reach (the reach may be shorter if it is determined the character of the reach has changed before this). These Point assessments will be evaluated before the assessment for that Reach is completed.

All data will be collected within the Collector/Survey123 app and saved to ArcGIS online (AGOL). Data will be backed-up regularly from ESRI hosted ArcGIS online servers to DOEE servers. Backups will be retained for 60 days.

Assessments will not occur on a tributary if there is no access to a site (e.g., the site is fenced off, the property owners have expressly restricted site access), if there are dangerous conditions, or if the reach is part of the mainstem. Assessment will only occur between April 1 and October 1, or until leaf drop as occurred.

### **B3. Sample Handling and Custody**

The RSA does not require any sample handling nor chain of custody.

### **B4. Analytical Methods**

There are no analytical methods required in the RSA program.

### **B5. Quality Control**

Data quality is addressed through consistent performance of procedures documented in the SOP and Field Guide. It is enhanced by the training and experience of project staff and documentation of project activities. All field team leaders will be selected based on maximum availability to conduct field work. Field Data Collection team leaders and support staff will receive both field and office training. The field training will include multiple teams conducting practice evaluations of the same stream reach so that results can be compared for consistency and it may be determined if additional training is necessary. Office training will include metric scoring and the use of RSA dashboard/desktop interface.

This QAPP and other supporting materials will be distributed to all project personnel. Annual training sessions will be held in the spring prior to commencement of sampling. The QA/QC Officer will ensure that field assessments are done according to the established protocols and that all RSA-related forms are completed correctly during the stream assessment. Staff performance will be reviewed during the sampling and analysis phases to ensure adherence to project protocols (Appendix 2).

### **B6. Instrument/Equipment Testing, Inspection, and Maintenance**

Internal quality control also includes protocols for insuring proper equipment performance. These quality assurance procedures are accomplished through the use of operation checks of field tablets

at specific periodic intervals.

Each day before staff leave the office for RSAs, the operation of field tablets should be tested. If the device does not turn on properly, does not have sufficient battery life, or if either the Collector or Survey 123 applications cannot be log into, the issue should be logged and that device shall not be used for RSA until the issue has been resolved. If a device exhibits performance issues in the field (i.e. apps closing out, camera not focusing) they should be logged and the device not used until performance problem has been resolved.

Field staff have the responsibility to conduct pre-departure device operation checks and to log all operation and performance issues. The QA officer has the responsibility for ensuring that the logged problems are resolved and that properly performing devices are available.

### **B7. Instrument/Equipment Calibration and Frequency**

Field equipment will be checked the day of a sampling event. This includes evaluating battery strength as well as access to Arc GIS Online Accounts.

### **B8. Inspection/Acceptance of Supplies and Consumables**

Monitoring equipment (e.g., tablets) are ordered from various manufacturers and are inspected upon arrival by DOEE personnel. Broken or malfunctioning equipment is shipped back to the manufacturer for replacement.

### **B9. Data Management**

For the RSA, DOEE will receive monitoring data directly from data exported from the Collector/Survey123 app. All data will be viewed within ArcGIS online or by downloading a local copy to open and work within ArcMap/desktop. All data will be reviewed by field team leads at the end of each sampling day to ensure all surveys have been uploaded and there are no obvious issues are identified.

Digital data will be backed-up regularly from ESRI hosted ArcGIS online servers to DOEE servers. Backups occur daily and will be retained for 60 days. Upon completion of sampling each season, final data files will be transferred to the project directory for QC checks and processing.

Field data will be stored electronically in the manner consistent with the requirements set forth by the SOP. The findings associated with the RSA will be submitted in association with the MS4 Annual Report.

Data manipulation will be conducted primarily using ArcGIS, Microsoft Excel, or Microsoft Access, after all QC checks have been conducted and approved. All computer files associated with the project will be stored on the DOEE GIS servers and will be copied to disk for archive for at least five years subsequent to project completion. Data will be maintained in an ESRI Personal Geodatabase; however, manipulations and statistical analyses may be performed in other software packages after all QC checks are completed.

## **GROUP C: ASSESSMENT AND OVERSIGHT ELEMENTS**

### **C1. Assessments and Response Actions**

Careful planning and implementation of the project, documented instructions and SOPs, and use of qualified and experienced personnel are expected to prevent most problems associated with data quality or quantity. Any failure to meet data quality standards will be evaluated. If the cause is found to be equipment malfunction, maintenance will be performed and the equipment will be repaired or replaced when necessary. If the problem is found to be human error, personnel will be retrained and protocols will be assessed.

When a reach or point cannot be collected due to accessibility, safety, or other hindrance, the issue will be noted in the Collector/Survey123 app. Data will be checked to flag questionable responses or missing data that may have not been flagged. If results from a stream reach or point assessment are identified to be questionable or if metrics were missed during the assessment, the site will be investigated again during the next field season. Errors during data entry will be minimized by the use of conditional programming and pre-defined domains within the electronic data collection forms. User features built upon these features include pull-down lists of acceptable responses and warning messages for invalid data entry (i.e. missing response, out of range values)

System and performance audits verify that procedures specified in the project are being utilized effectively. These audits ensure that the quality of reported data is adequate for its intended use. Field audits evaluate field operations with SOPs and other requirements established for the RSA. The primary audit elements are; sampling methodology, field QA procedures, field equipment performance and preventive maintenance, field documentation, data quality, quantity and timeliness, problem identification, key personnel and responsibility, follow up recommendations (if appropriate).

### **C2. Reports to Management**

Reporting to the EPA is performed as described above in Section A9 Documents and Records. All publications are available in .pdf format on the DOEE website.

## **GROUP D: DATA REVIEW AND USABILITY**

### **D1. Data Review, Verification, and Validation**

Data review, validation, and verification provide methods for determining the usability and limitations of data, and provide a standardized data quality assessment. Field Data Collection Team Leads will be responsible for reviewing their field data entries for completeness and adherence to QC requirements. Data quality will be assessed by the QA/QC officer to determine whether to accept, reject, or qualify the data.

Additional evaluations will be performed to verify and validate the data and metric calculations. The Acceptability Rubric worksheet (Appendix 5) will be used in order to determine if data collected for QAQC meets the data quality objectives described in this QAPP (Section A5) and in the Quality Assurance and Quality Control Program for Rapid Stream Assessments (Appendix 2).

All data generated through the RSA are reviewed prior to distribution to ensure the validity of the reported data. The reviews verify the accurate transfer of data and that the data is complete. The internal process consists of DOEE staff:

- Ensuring that the data have been entered into Collector/Survey123 are correct and complete
- Providing supporting documentation, such as field notes, subsequent review
- Assuring that there were not technical issues with the Collector/Survey123 app so data were entered correctly per the standards established within the forms
- Evaluating the data to ensure compliance with the associated analytical SOP
- Ensuring that the analysis can be reconstructed and verified
- Ensuring that data uploaded to the geodatabase are complete

Data are accepted or rejected based on results of the best professional judgment as guided by the Acceptability Rubric (Appendix 2, Appendix 5).

### **D2. Validation and Verification Methods**

Verification confirms that specified requirements have been fulfilled. The data will be evaluated for data completeness and consistency with overlapping quality control reaches. Metrics that are missing or data collected that deviate significantly from that which is expected will be subject to strenuous review and re-evaluation in the field.

Validation confirms that the particular requirements for a specific intended use are fulfilled. Data will be reviewed and examined for errors or nonsensical results by the QA/QC Officer. The QA/QC Officer will also evaluate data using the appropriate rubric (Appendix 2) and note any deviations from expected results.

Results of the verification and validation processes will be reported to the Project Managers who will make the final determination to reject data and remove the unusable data from the master

geodatabase. If data does not receive a passing score using the Acceptability Rubric (Appendix 5) statistical procedures and best professional judgment will be applied to verify whether it is possible to draw the correct conclusions for the project with the remaining data. Limitations in the dataset will be communicated in the MS4 Annual Report.

## **APPENDICES**

# List of Appendices

Appendix 1: Field Data Collection Guide for Rapid Stream Assessment

Appendix 2: Quality Assurance & Quality Control Program for Rapid Stream Assessments

Appendix 3: Standard Operating Procedures for using RSA Technical Tools

Appendix 4: Contact List for Reporting Urgent Concerns/Flags

Appendix 5: Acceptability Rubrics

Appendix 1:  
Field Data Collection Guide for Rapid Stream  
Assessment

# Field Data Collection Guide for Rapid Stream Assessment



District Department of Energy &  
the Environment

Water Quality Division



GOVERNMENT OF THE DISTRICT OF COLUMBIA

2019

Edition #3

**LimnoTech** 

Water | Scientists  
Environment | Engineers

Contact	Telephone
<b>Field Team Coordinator:</b> Matt English	(202) 481-3943 (desk) (202) 308-0453 (cell)
<i>For immediate threat to human health and/or the environment:</i> <b>DC Fire and EMS Services (FEMS)</b>  <b>DOEE Emergency Operations:</b> <b>Janye Deichmeister</b>  <i>For controlled spill (typically 5 gallons or less under control), minor equipment leaks, minor sheen, sediment plumes, or sewage (observed or odor):</i> <b>DOEE MS4 Operations:</b> <b>Ibrahim Famuditimi</b>	<b>911</b>  (202) 535-2262 (desk) (202) 369-3656 (cell)  (202) 535-2643 (desk) (202) 439-5698 (cell)
Emergency/Police/Fire/Ambulance	911
Poison Control Center (National Toll Free)	(800) 222-1222
National Response Center	(800) 424-8802

## Purpose

This *Field Data Collection Guide for Rapid Stream Assessment* documents data collection protocols, procedures, and assessment and scoring guidance for the evaluation of stream reaches conducted by DOEE's Natural Resources Administration. This guide is intended for use by field assessment teams to help ensure consistent data collection.

## Important Safety Reminders

When conducting stream assessments, DOEE's number one priority is to do so safely. Important safety reminders include:

- Always conduct stream assessments in pairs
- Do not enter high stream flows, such as after a rainstorm
- Ensure you are visible, such as in high-traffic areas
- Make sure you carry a charged cell phone in case of emergency
- Make sure the field coordinator knows where you are conducting assessments for the day

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# RAPID STREAM ASSESSMENT OVERVIEW

The intent of the Rapid Stream Assessment (RSA) is to collect information to provide a high-level overview of the entire wadeable stream network within the District. This information can help identify potential issues as well as locations that may warrant follow-up inspections or more in-depth evaluations. The information from the RSA can also serve as a baseline with which to compare information from these assessments in the future.

The RSA includes several types of assessments including:

- Reach assessments
  - Open channel (above-ground) streams;
  - Closed channel (underground) streams
  - Outfall reach
- Point assessments
- Watershed notes

Reach and Point assessment types, as well as watershed notes, are discussed further in the following pages.

*An assessment will not be performed if:*

- *There is no access to a site (e.g., site is fenced off, the property owners have expressly restricted site access),*
- *If there are dangerous conditions, or*
- *If the reach is part of the mainstem (only tributary reaches are assessed in the RSA).*

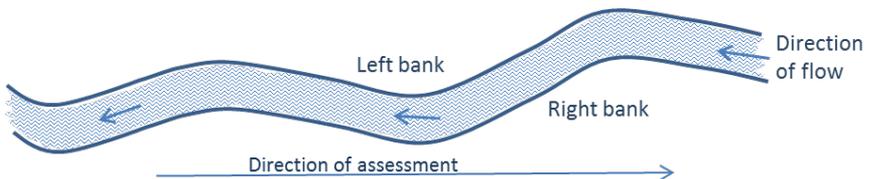
## Reach Assessment: Open Channel Streams

Both perennial and temporary streams are evaluated through the RSA. Reach assessments are performed on 300-meter (approximately 1,000 foot) segments unless a change in stream character occurs first, which will trigger the beginning of a new stream reach. Changes in character may be the result of:

- Changes in flow or water quality characteristics (e.g., clarity, odor)
- Changes in stream geomorphology (e.g., floodplain connectivity, approximate Rosgen classification)
- Changes of in-stream physical habitat (e.g., substrate type, erosion, riparian area)

*Note: metric as well as **approximate** conversions in standard measurements (e.g., inches, feet) are provided to aid staff in quickly evaluating data in the field.*

As shown in Figure 1, data collection will occur from downstream to upstream. The right and left banks will then be oriented as such while looking upstream.



**Figure 1. Direction of data collection**

Additional discussion on differentiating between overall stream character and identifying the need for a Point Assessment, which captures these discrete issues, is included on page 8.

Within each stream reach, particular points of interest may be identified that are distinct from the overall stream character. This may include features such as a buffer deficiency, which may be visually distinct from the surrounding riparian area conditions.

It could also include distinct or discrete erosion points, which may be more dramatic than surrounding bank erosion.

For each stream reach:

- Basic data, such as field team members, will be recorded.
- A broad range of physical habitat metrics will be assessed for perennial reaches.
- An abbreviated assessment will be conducted on temporary reaches that includes fewer metrics.
- At least one representative photo will be provided for each reach regardless of flow type. Optional comments describing features of reach not fully captured in assessment questions.

### ***How do I identify a temporary reach?***

*The RSA begins with a field crew following a perennial reach upstream. At some point in the assessment, flow will reduce and, ultimately, cease. While possibly dry during the RSA, there may be pathways for flow following rain events or when the water table is high.*

*Understanding temporary reaches is an important part of understanding the District's stream network. Identifying these temporary reaches, however, is often challenging as the channel can be inconspicuous, including being covered by leaves and lighter debris. Indicators of a temporary reach can include:*

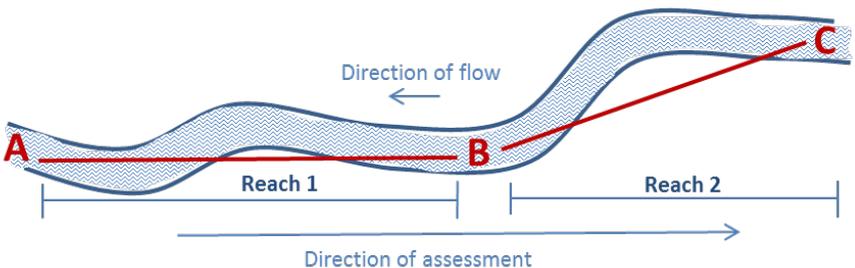
- *slight depression in the substrate*
- *presence of pools*
- *damp or black decomposing leaf litter*
- *silt or sediment accumulating on debris or plants*
- *drift lines where sticks, leaves, and other debris may accumulate on the streambank or surrounding vegetation*

A stream reach will be identified within the GIS-based field form as a line feature (as shown with the two red lines in Figure 2).

The process for identifying and assessing reaches includes:

1. Identifying where the stream reach begins (location “A”)
2. Walking upstream from location “A”
3. Identifying any discrete issues that require a Point assessment (e.g., dump sites, deficient buffers). See page 7 for additional information on conducting Point Assessments
4. Identifying when either 300 meters has been walked or there is a change in character that signifies the beginning of a new reach (location “B” in Figure 2)  

*The measurement tool in Collector can be used to determine if 300 meters has been reached.*
5. Drawing a line from the beginning of the reach (location “A” to the end of the reach (location “B”)
6. Completing the questions associated with the stream reach metrics at location “B”



**Figure 2. Open channel stream assessment**

**Note:** The line depicting the stream reach (red line in Figure 2) may not coincide with the actual stream channel in some cases, which is acceptable in this assessment.

## Reach Assessment: Closed-channel Streams

A closed channel, or underground or piped stream, is typically a conveyance that collects stream flow from an open channel and transports it to downstream point or another open channel reach. A simplified example is depicted in Figure 3, below. The process for identifying and assessing a closed-channel stream includes:

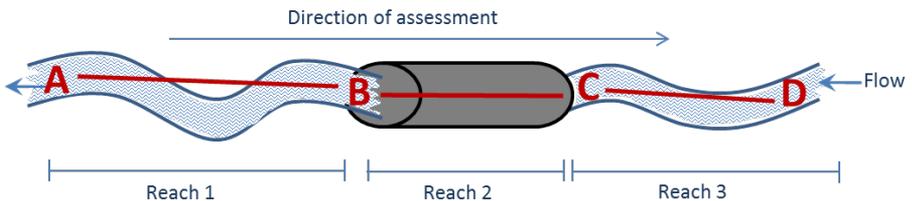
1. Assessing the preceding reach (Reach 1, Figure 2) as discussed on page 5
2. Beginning to draw a line from location “B” (the beginning of the closed channel reach)

**Note:** this initial line may be short and not extend yet the length of the channel

3. Evaluating initial reach metrics at location “B”
4. Proceeding upstream to location “C”, the end of the closed-channel reach, where the remainder of the metrics will be evaluated

5. Editing the line, if needed, to extend it fully to location “C”

Reach 3 (Figure 3) will then be assessed as discussed on page 5.



**Figure 3. Closed channel stream assessment**

## Reach Assessment: Outfall Reach

These assessments are to be performed on reaches less than 75 meters in length that have been created by flow coming from an outfall. The same metrics will be evaluated for this assessment as are evaluated for open channel stream reach assessments. Additionally, the outfall at the end of the outfall reach also will need to be assessed separately within a point assessment.

## Point Assessments

Points are considered locations within a stream reach where a distinct or discrete feature is identified.

This includes:

- Deficient Buffers
- Crossings
- Dumpsites
- Erosion
- Pipes
- Utility lines
- Non-piped Blockage to Fish Passage
- Inaccessible Reach
- Other Impacts

*Reminder: Points are discrete in nature - they are not representative of an entire reach nor reflect a change in character of the reach, which would necessitate the beginning of a new stream reach.*

*Each Point Assessment can be flagged as requiring “urgent attention”. This allows field staff to identify issues that will require additional follow-up. As the default for this question is “no”, it must be actively changed to “yes” if a problem is flagged. Contacts are included in Appendix 4 of the QAPP.*

## General Data Collection Procedures

Field teams will:

- Collect information on the Point features encountered in each reach regardless of perennial or temporary status.
- Record each observed instance encountered in the field with the following exception:

- Discrete areas of erosion along a reach may be aggregated into a single point as long as the characteristics and impacts are identical.
- Place Point at center of each feature.
- Take at least one representative photo of each feature.
- Optional comments describing features of the reach not fully captured in assessment questions.
- Place multiple points when a Point feature crosses a Reach break (e.g., deficient buffer or erosion that spans two or more reaches).

*More than one photo should be taken at a Point if additional visual information will help provide clarification of an issue at a particular location.*

### ***Evaluating stream character vs. discrete issues***

Stream buffers and erosion issues are evaluated both through the Reach Assessments as well as the Point Assessments. These metrics, however, are evaluated in different ways.

In a Reach Assessment, *Riparian Vegetation* and *Riparian Width* are assessed. These metrics are used to reflect the average character of a stream reach.

A Point Assessment is used to evaluate a specific *Erosion* point or *Deficient Buffer* at a particular location.

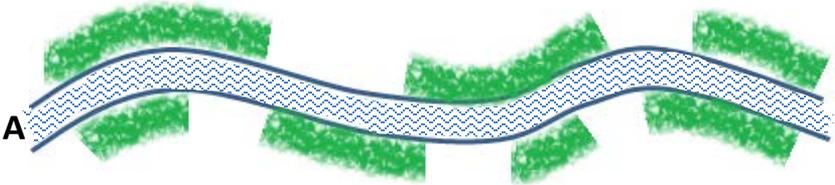
Figure 4 demonstrates, in a simplified way, how buffers and erosion points can be evaluated differently. “A” shows a “patchwork” of riparian buffer representing the character of the stream in the Reach Assessment (where green is a riparian buffer and the white gap is the deficient buffer). Alternatively, “B” shows a more isolated and specific location along the reach that should be evaluated further through a Buffer Point Assessment.

Similarly, “C” shows how erosion is part of the overall stream character (depicted through a Reach Assessment), while there are two discrete erosion points in “D” that can be specifically assessed through two Erosion Point Assessments.

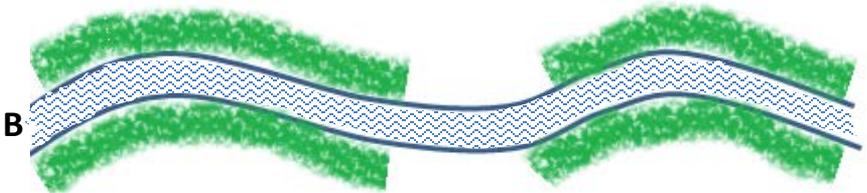
**Note:** Points will be assessed as they are found as the field team walks the 300-meter (approximately 1,000 foot) stream reach (the reach may be shorter if it is determined the character of the reach has changed before this).

These Point assessments will be evaluated before the assessment for that Reach is completed. **It is important to finish either a point or a reach assessment before another is started. Data may be lost if field crews attempt to toggle between assessments.**

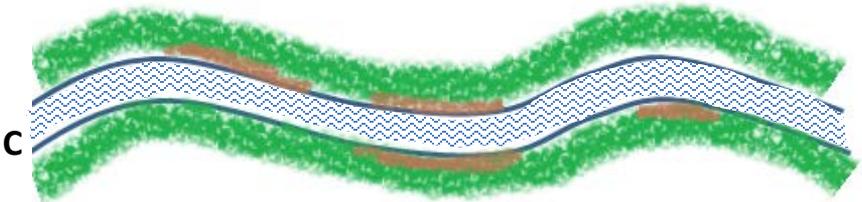
← Flow



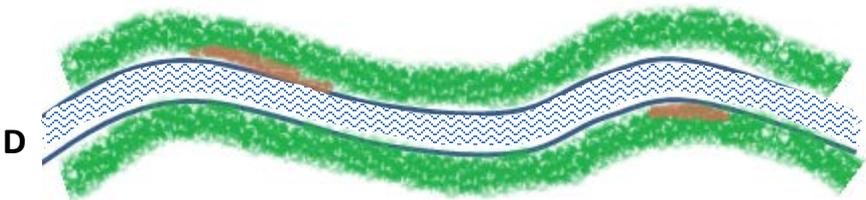
A “patchwork” of riparian buffer represents the overall character of the stream reach.



An isolated gap in the riparian buffer is evaluated through a “Point Assessment”.



Consistent or repeated erosion points represent character of the stream reach.



Each isolated erosion point should be evaluated through a Point Assessment.

Direction of assessment →

 = riparian buffer  
 = erosion

**Figure 4. Differentiating between stream character and Point Assessments**

# REACH ASSESSMENTS

## Reach Assessment Metrics

For each stream reach, the following will be evaluated:

---

Water  
presence

Is water present: Yes / No

- If water is present: is there flow or is the water stagnant/not flowing
  - If water is not present, but there are characteristics indicative of a stream channel or previous flow, the field form will focus the evaluation on metrics such as, riparian buffer width, etc.
- 

Water  
clarity

Choose one or more of the following:

Clear / Foamy / Greenish / Dark Brown /  
Light Brown / Milky / Oily Sheen / Reddish /  
Turbid / Iron Floc / Other

- If water clarity is characterized as “other”, describe in text box.
  - Take a photo of any water discoloration/ clarity issue that may be indicative of a larger issue or may warrant subsequent investigation
- 

Odor (from  
water or  
sediment)

Choose one or more of the following:

Chlorine / Fishy / Petroleum / Rotten Eggs /  
Sewage / None / Other

- If odor is characterized as “other”, describe in text box
-

Maximum depth encountered	Record the maximum depth encountered along the reach in centimeters <ul style="list-style-type: none"> <li>Enter as positive, numeric value (no fractions)</li> </ul>
Average depth	Record the estimated average depth of the reach 0-30 cm / 30-60 cm / >60 cm (0-12 in / 12-24 in / >24-in)
Maximum width	Record the wetted width of the stream in meters 0-1 m / 1-3 m / 3-6 m / >6 m (0-3 ft / 3-10 ft / 10-20 ft / >20 ft)
Aquatic vegetation (not algae)	Choose one or more of the following (examples shown below): Submerged / Emergent / Floating / None If present, note if vegetation type is extensive

Submerged



Emergent



Floating



---

Fish  
presence

Note if fish are absent or present.

*(Only note if fish are seen, not if it is possible  
fish may be present)*

---

Algae

Note if algae are absent or present (examples  
shown below).

- If present, note if algae area extensive (such  
as in the photos below)?
  - If extensive, take a photo of the algae for  
subsequent evaluation.
- 



*If there is a question regarding any metric (e.g., if algae are extensive or not), drop an “other impacts” point, record observations in the comment section, and take a photo at that point for subsequent follow-up.*

---

**Bacteria presence**

Note if bacteria are absent or present. Bacterial presence can be identified by what appears to be an oily sheen or a rusty coating on the stream bank (iron flocculant).

If present:

- Is it extensive?
  - If extensive, take a photo of the bacteria for subsequent evaluation.
  - Describe the character (iron floc / sheen/ other)
-

---

Trash

Note if trash is:

Absent – little or none visible in stream channel or riparian area

Minor – trash present in minor amounts

Moderate – trash present in moderate amounts

Extensive – abundant and unsightly

---



Trash abundance:

1. Minor (e.g., one or two tires)
2. Moderate
3. Extensive (e.g., widespread within stream or riparian area)

---

Riparian  
vegetation  
width

Note the vegetation width on each side of the stream channel

Right bank: None / 0-25 m / 25-50 m / >50 m  
(0-80 ft / 80-165 ft / >165 ft)

Left bank: None / 0-25 m / 25-50 m / >50 m  
(0-80 ft / 80-165 ft / >165 ft)

Determine if any lack of vegetation is characteristic of the whole stream reach or if it is a discrete issue that will require further evaluation through a “Deficient Buffer” point assessment (reminder: see page 8).

---

Dominant  
riparian  
vegetation

Rank up to four the types of riparian vegetation in order of abundance within 50 meters of the stream (or visual distance if 50 meters is not within the sightline):

Right bank: Grasses / Forbs / Shrubs / Trees / None / Other

Left bank: Grasses / Forbs / Shrubs / Trees / None / Other

- If “other” is specified, describe in text box
- 

*A forb is defined as an herbaceous plant that is not a grass.*

---

Substrate  
type

Rank in order of abundance (up to 4):  
Sand / Gravel / Clay / Cobbles / Boulders /  
Concrete Channel / Bedrock / Other

- If “other” is specified, describe in text box

---

Shading

Estimate degree and duration of shading during  
summer leaf-out as:

Low shading – less than 25% shaded

Medium shading – 25% to 75%

High shading – more than 75% shaded

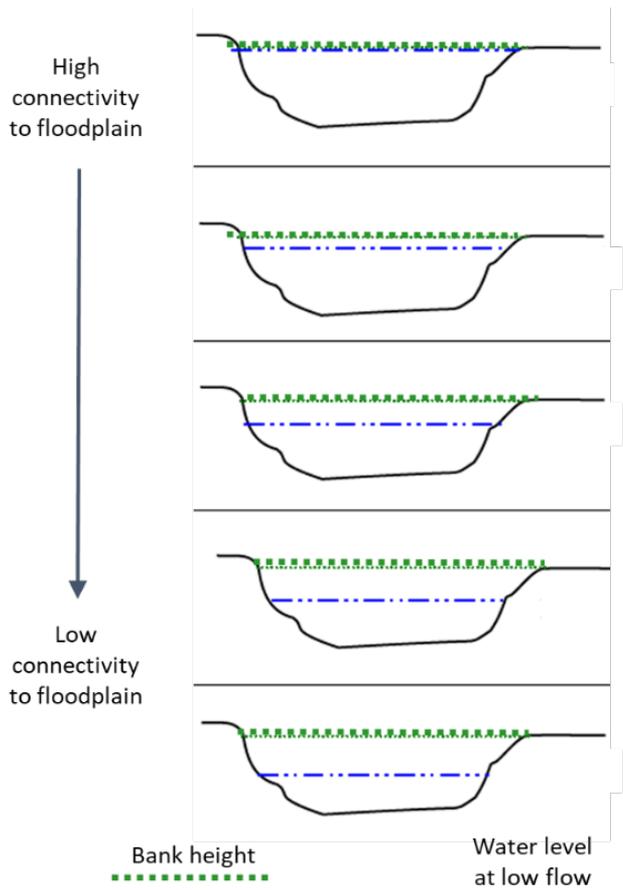
---

## Floodplain Connectivity

The figure below provides a simplistic guide for evaluating how readily flows may escape the channel into the floodplain. Other indicators can include matted vegetation in the riparian area and deposition of sediment, trash or debris.

Characterize the connectivity to the floodplain:

High / Medium / Low:



---

**Bank  
erosion**

Evaluate the impact of erosion on each bank. The banks are oriented by looking upstream. The right bank and left bank will be evaluated separately. Check all that apply:

- None (little to no erosion is present or does not appear to be causing issues)
- Instream degradation (e.g., substrate sedimentation, filling in of riffles)
- Adding to sediment loading (e.g., turbidity)
- Slumping banks
- Falling trees/vegetation
- Threat to property (e.g., buildings, yards)
- Threat to infrastructure (e.g., bridge or road may collapse, fence may fall)
- Exposed infrastructure (e.g., exposed pipe)
- Other (describe observations)

---

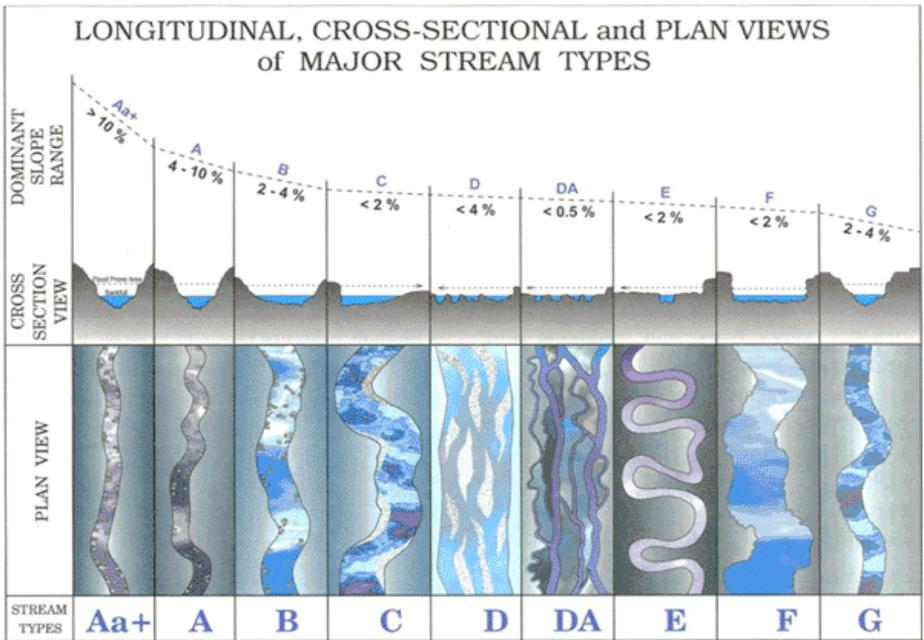
**Woody  
debris and  
root wads**

Count the woody debris/root wads within the channel as the field team moves up stream. This should include:

- Woody debris >10 cm (4 in) diameter, more than 1.5 m (5 ft) long
  - Root wads on live trees with a diameter at breast height (DBH) of at least 15 cm (6 in)
  - Only woody debris or root wads found in wetted (or likely to become wetted) portions of stream
-

## Approximate Rosgen Classification

Perform quick estimate of Rosgen Level I stream type classification using the following figure:



Rosgen, David L. "A classification of natural rivers." *Catena* 22 (1994): 179. [www.wildlandhydrology.com](http://www.wildlandhydrology.com)

*Note: Photos can be labeled within the data collection platform to help distinguish what the photo is of (e.g., 1<sup>st</sup> photo: "downstream view", 2<sup>nd</sup> photo "upstream view".*

## Photo Tips

Where possible, take photo from a location that best captures channel sinuosity and slope represented by the Rosgen category.



---

Recreation  
evidence

Identify if there is any evidence of recreation along the stream reach. Select all that apply:

None / Rafts / Life jackets / Rope swings /  
Marked Trails / Unmarked Paths / Coolers /  
Fishing line / Other

If “other” is selected, describe observations.

---

## Photo Tips

Take photo within channel. Photo should capture channel cross section and floodplain (see below) and should be representative of entire reach.



# POINT ASSESSMENTS

## Deficient Buffers

Deficient buffers are stretches of riparian area without sufficient canopy or understory. The deficient buffer may still include vegetation (e.g., lawn) or may consist of impervious surface (e.g., parking lot).

Buffer deficiencies should be recorded for areas within 50 meters (approximately 165 feet) of the stream channel.

Linear footage of the buffer deficiency should be reported as the longitudinal distance along the stream. A deficiency reported on both sides of the stream should be measured as the average distance on both sides of the stream



*Note: The riparian area is considered 50 meters on each side of the stream reach, for a total of 100 meters.*

**Example:** the deficiency should *not* be doubled if it appears on both sides of the stream; if there is 20 meters (65 feet) of deficiency on the right bank and 40 meters (130 feet) of buffer deficiency on the left bank, it should be recorded as 30 meters (approximately 100 feet) on both banks).

---

Stream bank where deficient buffer occurs	Looking upstream, on which side does the deficient buffer exist: <ul style="list-style-type: none"><li>• Right / Left / Both</li></ul>
---	--

---

---

Length of  
deficiency

The length of deficiency is the area along the  
length of stream

Estimate the length of the deficiency within one  
of the following:

0-25 m / 25-50 m / >50 m

(80 ft / 80-165 ft / >165 ft)

---

Type of cover  
in deficient  
buffer area

Identify what types of cover are present within  
the 50-meter riparian area:

Lawn / Invasives / Pavement / Structure (*e.g.*,  
retaining wall) / Other

- If “other”, describe in text box
-

---

Impact score

Estimate the extent of the impact that this deficient buffer has on the stream reach:

- *Severe:* Impervious/commercial area in close proximity to stream, banks may be modified or engineered. Stream character such as bank/bed stability, sediment deposition, and/or shading is obviously degraded by adjacent use.
  - *Moderate:* Some impervious and/or just turf up to the bank, very little vegetation aside from turf within 50-meter (165 feet) riparian area, stream character probably degraded by adjacent uses.
  - *Minor:* Encroachment mostly from residential uses and yard; some vegetation within 50-meter riparian area, but very little other than turf within remainder of 50-meter riparian area; stream character may be changed slightly by adjacent use.
  - *None:* Vegetated buffer primarily intact within 50-meters of stream.
-

## Photo Tips

Take photo that captures the buffer deficiency's proximity to the stream, if possible (*e.g.*, stream channel in the foreground). Also ensure that the buffer type is discernible.



## Crossings

Crossings are defined as points within the stream reach through which the stream must pass. This is different than an underground/ piped stream reach, which is in line with the remaining stream bed and is often longer than a crossing would be. If a crossing has already been documented, it will be included on the map included in the Collector tool that includes DCGIS GIS information.



- If the Crossing is not inventoried (does not already exist on the map):
  - Drop a point within GIS
  - Assess the metrics
- If the Crossing is already documented:
  - Verify the information currently documented
    - If correct, no additional steps are needed.
    - If not correct, then drop a point and address the metrics.

---

Type	Box / Elliptical / Circular / Bridge / Foot Bridge / Other
------	--

- If another type of crossing is identified, specify in the notes section

---

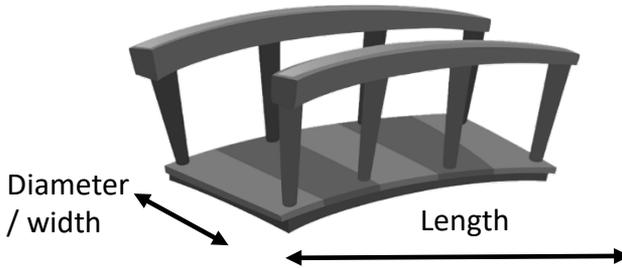
Diameter/ width	0-1m / 1-5m / >5m (0-3 ft / 3-16 ft / >16 ft)
--------------------	--

---

---

Length	0-1m / 1-5m / >5m (0-3 ft / 3-16 ft / >16 ft)
--------	--

---



---

Material	Concrete / Corrugated Metal / Plastic / Wood / Other
----------	--

- If there is a material that is not one of the above, specify in the notes section

---

Downstream debris	Yes / No
-------------------	----------

---

Downstream bed erosion	Yes / No
------------------------	----------

Erosion height: 0-1m / 1-2m / >2m  
(0-3 ft / 3-6 ft / >6 ft)

- Erosion here can include the measurement from the bottom of the pipe, culvert, etc. to the stream bed.

---

Downstream sediment	Yes / No
---------------------	----------

---

Upstream debris	Yes / No
Upstream bed erosion	<p>Yes / No</p> <p>Erosion height: 0-1m / 1-2m / &gt;2m (0-3 ft / 3-6 ft / &gt;6 ft)</p> <ul style="list-style-type: none"> <li>• Bed erosion is measured from the bottom of the pipe to the bottom of the eroded stream bed.</li> </ul>
Upstream sediment	Yes / No
Impact score	<p>Estimate the extent that this crossing has on the stream reach:</p> <ul style="list-style-type: none"> <li>• <i>Severe:</i> Condition probably poses threat to road or other structure. Problem should be addressed to avoid bigger problem in future.</li> <li>• <i>Moderate:</i> Condition does not appear to pose threat to road or other structure, but should be addressed to enhance stream integrity and future stability of structure.</li> <li>• <i>Minor:</i> Condition is noticeable but may not warrant repair.</li> <li>• <i>None:</i> No observable impact as a result of the crossing.</li> </ul>

## Photo Tips

Take photos at both the downstream and upstream ends of the crossing. If possible, take photos from within stream channel. Photo should provide appropriate context and include the crossing structure as well as the stream bed and banks. Include all barrels in single photo, if possible. Highlight erosion or sediment or debris deposition, if present, in additional photos, if needed.



# Dumpsites

Dumpsites are points at which trash and debris has been purposely deposited (this is different than locations where trash appears to accumulate, although in some cases, distinguishing these may be difficult.

In general, record only dumpsites encountered within your visual distance within the riparian area.



---

Bank where the dumpsite is located

Right / Left / Both

- Reminder: bank side (right or left) is determined by looking upstream.

---

Location of the dumpsite

Bank / Floodplain / Instream / Other

- If "other", specify in the notes section

---

Cleanup potential

Yes / No

- Consider the ease of access, the weight or bulk of the items, and any potential hazards to cleanup crews

---

Dumped material

Appliances / Petroleum / Tires / Trash / 55 gal drum / Other

- If "other", specify in the notes section
-

---

Trash volume <20 sq. m / 20-200 sq. m / >200 sq. m  
(215 sq ft / 215-2,150 sq ft / > 2,150 sq ft)

- When estimating the volume of material at the dumpsite, this value must be a compacted volume. Estimates of volume should ignore void space and account only for the volume of physical materials that compromise the objects.

---

Impact score *Severe:* Active and/or threatening. Material may be considered toxic or threatening to environment (concrete, petroleum, empty 55 gallon drums) or site is large (>750 sq. meters / 8,073 sq ft).

*Moderate:* Dumpsite (<750 sq. meters) containing non-toxic material, does not appear to be used often, however clean-up would definitely be a benefit.

*Minor:* Dumpsite appears small (<20 sq. meters / 215 sq ft) and material stable (will not likely be transported downstream by high water). Not high priority.

*None:* No observable impact as a result of the dumpsite.

---

## Photo Tips

Take photo that captures context of dumpsite relative to the stream, if possible. Take additional photos that capture the largest impact items.



# Erosion

This Point Assessment is triggered by the identification of discrete erosion point that is distinct in nature from the character of the rest of the stream reach.



- Discrete areas of erosion along a reach may be aggregated into a single point as long as the characteristics and impacts are identical. For instance, similar erosion on both sides of a particular area of the stream bank can be included as one point.
- Multiple erosion points should be placed along the stream reach when erosion crosses a reach break (e.g., erosion that spans two or more reaches).
- The length of the erosion point should be reported as the longitudinal distance along the stream.
- Reminder: bank side (right or left) is determined by looking upstream.

---

Erosion location	Note the side of the bank experiencing erosion: (Right / Left / Both)
------------------	---

---

Length	Note the length of the erosion point: Right bank: 0-3 m / 3-5 m / 5-8 m / >8 m (0-6.5 ft / 6.5-16 ft / 16- 26 ft / >26 ft) Left bank: 0-3 m / 3-5 m / 5-8 m / >8 m (0-6.5 ft / 6.5-16 ft / 16- 26 ft / >26 ft)
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**Bank height**

Identify the bank height at the point of erosion:

Right bank: 0-1m / 1-2m / 2-3m / 3-4m / 4-5m / 5-6m / >6m

(0-3.5 ft / 3.5-6.5 ft / 6.5-10ft / 10-13 ft / 13-16 ft / 16-20 ft / >20 feet)

Left bank: 0-1m / 1-2m / 2-3m / 3-4m / 4-5m / 5-6m / >6m

(0-3.5 ft / 3.5-6.5 ft / 6.5-13 ft / 13-16 ft / 16-20 ft / >20 feet)

---

**Impact**

Evaluate the impact of erosion on each bank.

The banks are oriented by looking upstream. The right bank and left bank will be evaluated separately. Check all that apply:

- None (little to no erosion is present or does not appear to be causing issues)
- Instream degradation (e.g., substrate sedimentation, filling in of riffles)
- Adding to sediment loading (e.g., turbidity)
- Slumping banks
- Falling trees/vegetation
- Threat to property (e.g., buildings, yards)
- Threat to infrastructure (e.g., bridge or road may collapse, fence may fall)
- Exposed infrastructure (e.g., exposed pipe)

Other (describe observations)

---

## Photo Tips

Take photos that capture bank(s) with erosion in context of the stream. Also include area upstream or downstream of immediate erosion, if possible.



# Pipes

Pipes, or discharge points to open channels, are discharges into the stream reach. In general, record only pipe outfalls that are encountered within your line of sight within the riparian area.

Standing water in a downstream channel should not be used as a surrogate for discharge quality parameters when no flow is present. Poor quality standing water should be noted, however, in the *Notes* field.

Upon locating a pipe that discharges into the stream reach determine if the pipe/discharge point is currently included/inventoried in the GIS data layer.

- If the Pipe is **not** inventoried:
  - Drop a point within GIS
  - Assess the metrics in groups A and B.
- If the Pipe is already documented:
  - Verify the information currently documented
    - If correct and the pipe has no discharge, no action is necessary.
    - If correct but the pipe has discharge, assess metrics in group B



*Note: It can be difficult to know if a pipe or outlet has just been placed on the map in the wrong location or if it is actually missing from the map and needs to be added. If there is a question regarding this, drop a point and flag it for follow-up.*

- If not correct, drop a point as if it was not inventoried and assess metrics in groups A and B.

**A.**

---

Bank where pipe is located	Right / Left / End of outfall reach
----------------------------	-------------------------------------

---

Pipe diameter	0-15cm / 15-30cm / 30-45cm / >45cm (0-6 inches / 6-12 inches / 12-18 inches / >18 inches)
---------------	--

---

Type of pipe material	Clay / Corrugated Metal / High-density Polyethylene (HDPE) / Iron / Polyvinyl Chloride (PVC) / Reinforced Concrete / Riprap / Other <ul style="list-style-type: none"> <li>• If there is another type of material used, specify in the notes section</li> </ul>
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Floating solids/ trash	Yes / No
------------------------	----------

---

Erosion due to pipe	<p>None / Minor / Moderate / Severe</p> <p><i>Severe:</i> Large area of erosion that is damaging stream habitat and/or causing obvious instream degradation.</p> <p><i>Moderate:</i> Moderate area of erosion that may be damaging habitat and causing some instream degradation.</p> <p><i>Minor:</i> Minor area of erosion, no noticeable instream degradation.</p>
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Impact

Severe / Moderate / Minor / None

*Severe:* Pipe causing a severe erosion and/or has discharge which may be illicit.

*Moderate:* Pipe has discharge occurring but there is no indication this discharge is illicit.

*Minor:* Pipe is causing some erosion but there is no discharge occurring.

*None:* Pipe is not causing erosion problem and no discharge is occurring. No observable impact as the result of the pipe.

- If severe, take a photo of the location
- 

**B.**

---

Discharge concern

Indicate all immediate concerns regarding this discharge which may indicate there is an illicit connection.

Sheen (e.g. oil, bacterial) / Odor (e.g. chlorine, fishy, petroleum, sewage, rotten eggs) / Discharge is foamy or ill colored (e.g. greenish, dark brown, milky, reddish) / Deposit or Stain / Other / None

- If “other”, specify in the text box
  - Enter “none” if discharge has no concerning characteristics
-

## Photo Tips

Context is important, do not zoom in on pipe opening, include flow path out of pipe and erosion, if present.



## Utility Line

Utilities are sometimes found near or crossing stream channels. In some cases, these crossings can impact the stream channel by causing erosion or by leaking pipe contents.



---

Utility line type	Is this an exposed sewer line: Yes / No <ul style="list-style-type: none"><li>If not, note what type of utility line it is by entering text into the associated text box.</li></ul>
Utility line diameter	What is the diameter of this utility line? 0-6in / 6-12in / 12-18in / >18in
Utility line material	Note the type of material the utility line is made of from the drop down list: Clay / Corrugated Metal / High-density Polyethylene (HDPE) / Iron / Polyvinyl Chloride (PVC) / Reinforced Concrete / Riprap / Other
Utility line condition	Categorized the condition of the utility line: <ul style="list-style-type: none"><li>Poor: utility line is exposed and in need of immediate repair or repair in the future</li><li>Fair: Utility line is exposed and aging</li><li>Good: Utility line is exposed, but condition of pipe does not warrant urgent attention</li></ul> Take a photo of the utility line, being sure to capture any leaks or associated impacts to the stream reach.

---

## Photo Tips

Include location of utility line relative to stream and/or banks. Use additional photos as necessary to capture any erosion or other impacts.



## Non-piped blockage to fish passage

Blockages to fish passages are locations where there is greater than a **0.3 meters** (approximately one foot) change in stream bed elevation.

---

Fish blockage  
present

Record only non-piped blockages. Blockages will be assumed to be possible up/downstream of all closed channel reaches.

Record the height of the fish blockage:

0.3-0.5 meters / 0.5-1 meters / >1 meter

(1-1.6 feet / 1.6-3.3 feet / >3.3 feet)

Take at least one photo of the fish blockage.

Note if the blockage is natural or man-made.

---

## Inaccessible Reach

Occasionally, a stream reach that should be assessed may be visible, but inaccessible, from the location where the field team is currently assessing. For instance, a side channel may require assessment, but access to this reach may be blocked by a fence or is too deep.

The location of this inaccessible reach will be identified by dropping a point in GIS. Include in the comment box any information that may be needed for the subsequent investigation.

## Other Impacts

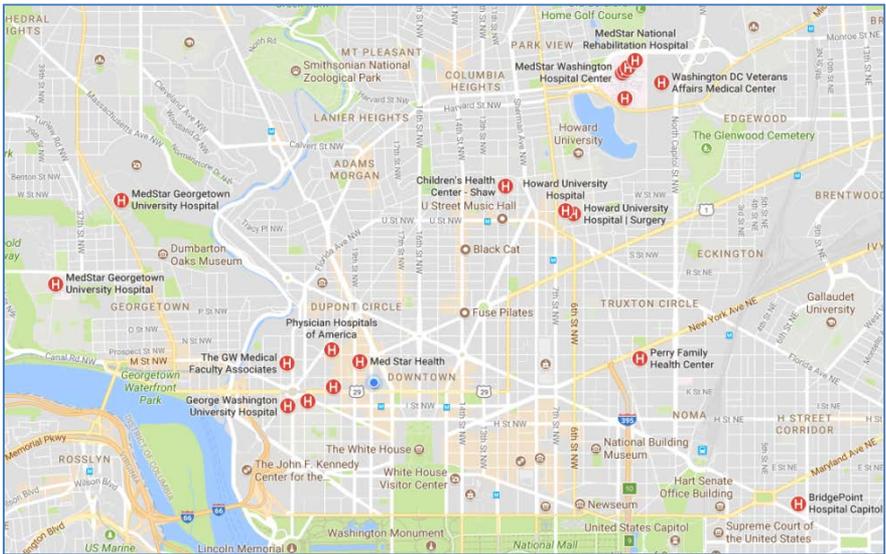
Any additional issues identified by field staff during the RSA (*e.g.*, erosion and sediment control violations; exposed utilities that are causing erosion issues; anything unsafe, such as sudden drops from an outfall, partially collapsed crossing, etc.) should also be documented. To do this:

- Select “Other Impacts”
- Drop a point
- Take one or more photos of the impact
- Provide a brief description of the impact in the notes section

## WATERSHED NOTES

Due to the comprehensive nature of the RSA, it is possible that field staff may make observations representative at a watershed scale, in addition to individual stream reaches. When field staff make these observations they should be documented as ‘watershed notes’ either in the Collector/Survey 123 tool or in the ArcGIS dashboard.

# Hospitals/Emergency Care Facilities



Hospital	Address	Phone Number
<b>George Washington University Hospital</b>	900 23 <sup>rd</sup> Street NW	202-715-4000
<b>MedStar Georgetown University Hospital</b>	3800 Reservoir Road NW	855-546-2805
<b>Howard University Hospital</b>	2041 Georgia Ave NW	202-865-6100
<b>Sibley Memorial Hospital</b>	5255 Loughboro Road NW	202-537-4000
<b>MedStar Washington Hospital Center</b>	110 Irving Street NW	202-877-7000



Appendix 2:  
Quality Assurance & Quality Control Program  
for Rapid Stream Assessments

# Quality Control & Quality Assurance Program for Rapid Stream Assessments



District Department of Energy &  
the Environment

Water Quality Division



GOVERNMENT OF THE DISTRICT OF COLUMBIA

2019



Water | Scientists  
Environment | Engineers

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## Purpose

The District Department of Energy and Environment's (DOEE) Water Quality Division (WQD) is responsible for assessment of receiving waters within the District of Columbia. The Rapid Stream Assessment (RSA) allows DOEE to provide a high-level overview of the entire wadeable stream network within the District.

DOEE developed the RSA program to comply with the District of Columbia's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit issued by the U.S. Environmental Protection Agency (USEPA).

This manual identifies a two-tiered approach to Quality Assurance and Quality Control in association with the RSA program and describes the level of accuracy and precision which is required to ensure RSA QAQC standards are upheld.

## Important Safety Reminders

When conducting stream assessments, DOEE's number one priority is to do so safely. Important safety reminders include:

- Always conduct stream assessments in pairs
- Do not enter high stream flows, such as after a rainstorm
- Ensure you are visible, such as in high-traffic areas
- Make sure you carry a charged cell phone in case of emergency
- Make sure the field coordinator knows where you are conducting assessments for the day

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# Staff Certification

All certification related records (i.e. certification levels, training attendance, audit performance results) shall be maintained by the Project QA/QC Reviewer.

## Certification Levels

The first tier of the RSA QA/QC approach is staff certification. All staff participating in the RSA program shall be certified to conduct these assessments. Certification level will be based upon completed training, audits, and the number of assessment hours complete. Certifications will be updated near the beginning of each field season immediately following annual training and audits.

**Level A** certification indicates that a staff person is an expert in the RSA program.

Level A certification can be obtained by staff members who have:

- Completed a lifetime minimum of 48 RSA hours as a Level B certified staff person
- Successfully completes annual training; and
- Passed a required field audits within the past two years

Level A certification is maintained by:

- Successfully completing annual training;
- Passing a required field audits every two years; and
- Completing a minimum of 48 RSA hours annually

Staff with Level A certification may serve as Field Data Collection Team Leads, conduct trainings, and/or serve as auditors.

**Level B** certification indicates that a staff person has demonstrated an ability to properly conduct assessments but does not have significant experience doing so.

Level B certification can be obtained by staff members who have:

- Completed a lifetime minimum of 16 RSA hours under the supervision of a Level A certified team lead;
- Successfully completed annual training; and
- Passed a required field audits within the past three years

Level B certification is maintained by:

- Successfully completing annual training;
- Passing a required field audits every three years; and
- Completing a minimum of 8 RSA hours annually

Whenever possible, Level B certified staff should work with a Level A certified staff person to conduct RSA activities. Level B certified staff should not be assigned to conduct RSA activities with an uncertified person.

## **Training Requirements**

All staff participating in the RSA program will participate in appropriate training activities. All training will be conducted by Level A certified team leads. Returning staff will attend an annual, in-office training session focused on reviewing the procedures for RSA and for scoring the metrics described in the field manual. This annual training will be held each spring each spring within 1 month prior of RSA activities commencing. Training for new team members will consist of comprehensive in-office and field components.

## **Audit Requirements**

All certified staff will be audited every 2-3 years based upon their certification level. The purpose of these audits are to ensure that all staff are able to demonstrate proper application of all knowledge and skills necessary for conducting RSAs. Audits will be held each spring within one month of RSA activities commencing. Audits will be performed by Level A certified staff observing auditees in the field while they conduct RSAs. A checklist of proficiencies which auditors expect to be demonstrated during these audits can be found in Appendix A.

All staff, regardless of certification level, must demonstrate 'acceptable' proficiency for at least 75% of the knowledge/skills. If 75% of the knowledge/skills are not deemed acceptable during an audit, field staff will receive repeat training before being allowed to retake their audit. Field staff who are unable to pass their audit will not participate in RSA that year. They may re-attempt certification the following field season.

## Field Verification

The second tier of the RSA QA/QC approach is field verification. In order to ensure reproducible data are being collected, a subset of all streams (5%) will be assessed in duplicate. To the extent possible, both staff and streams for field verification will be selected at random.

Field verification will involve two assessment teams completing a RSA of the same stream reach(s) independently from one another. Teams will conduct the assessment at least two hours apart to minimize influence on each other, but on the same day to help ensure similar conditions exist in the reach. Teams will also record data using a mirror copy of the projects Collector/Survey123 data collection tool so that they cannot see each other's assessment data.

During the first year of the RSA program, duplicate assessments were used to determine expected levels of variation between by two, Level A certified teams. In subsequent years, field staff will be selected at random and the duplicate assessments they conduct must fall within the expected variation established in year one (Appendix B). Duplicate assessments will be evaluated using the appropriate acceptability rubric (Appendix C). If duplicate assessments exceed expected variation, the appropriate data flag will be assigned in the geodatabase and corrective action (i.e. additional training) will be taken as is detailed in the project's Quality Assurance and Protection (QAPP).

During subsequent years of the RSA program, field verification will occur on a monthly basis. A high-level review of the data will be performed to ensure that there are no significant differences in data collection that would warrant additional training or protocol review with staff. The full analysis of the QA/AC data will be performed at

the end of the field season to ensure sufficient data points<sup>1</sup> for a robust analysis.

---

<sup>1</sup> If 5% of the total assessed distance does not yield at least 20 reaches, duplicate assessments should continue until this minimum is reached.

## Appendix A: RSA Auditor Checklist

Knowledge/Skill	Acceptable	Not Acceptable (note why)
Staff conducts RSAs in the correct direction, relative to flow direction		
Staff records RSA observations/survey in the appropriate order and at the appropriate <sup>2</sup> locations		
Staff creates new line features in Collector as intended		
Staff creates new point features in Collector as intended		
Staff accesses Survey 123 forms from within Collector		
After submitting a Survey 123 form, staff verifies it has synced back to Collector (cellular data/wifi service permitting)		
Staff is able to turn reference layers on/off in the Collector map		
Staff never edits an already submitted Survey 123 form from within the Collector app		

---

<sup>2</sup> Appropriate/appropriately is defined here as being done so according to applicable SOPs and protocols.

and they do not click the survey hyperlink within Collector in an attempt to re-open a previously submitted survey form.		
Staff demonstrates ability to use Collector’s “measurement tool”		
Staff appropriately distinguishes between features characteristic of reach vs. discrete point features		
Staff knows where to appropriately break reaches based on maximum length		
Staff knows where to appropriately break reaches based on character change		
Staff appropriately identifies changes in flow or water quality (e.g. clarity, odor)		
Staff appropriately identifies changes in stream geomorphology (e.g. channel incision, Rosgen classification)		
Staff appropriately identifies changes of instream physical habitat (e.g. substrate type, erosion, riparian area)		
Staff appropriately identifies the presence of temporary reaches		

Staff appropriately identifies deficient buffers		
Staff appropriately identifies crossings		
Staff appropriately identifies dumpsites		
Staff appropriately identifies point erosion		
Staff appropriately identifies pipes		
Staff appropriately identifies utility lines		
Editing field collected data using RSA Dashboard (Level A staff only)		
Ability to contribute watershed notes (Level A staff only)		

## Appendix B: Acceptable Variation in Data Collection

Many elements of the RSA program are inherently qualitative. Although staff certification is intended to help ensure that assessments are reproducible, some amount of variation is still expected. This section describes the amount of variation which is acceptable during field verification activities.

Two sets of criteria have been identified for this process. Criteria 1 includes the possible responses for each metric, as discussed below (e.g., identical match, difference with explanatory comment) at the site level (e.g., Overlap 1, Point 1). Each site will be scored according to the percent of all of the metrics passing at that site.

Criteria 2 includes the percentage of agreeance for a particular metric across all of the sites (e.g., shading at Overlap 1 through Overlap 18). Each metric will be assessed by factors such as the number of sites that matched identically for that metric and/or the percentage of responses that passed Criteria 1 evaluation.

Each of the metrics used in Criteria 1 and 2 are described below. Appendix C demonstrates how these criteria are scored and used in conjunction with one another to assess consistency at both the metric and overall site level.

### Reach Assessment Metrics

---

Reach Type	90% of responses should pass. Passing Responses are: <ul style="list-style-type: none"><li>• Identical Match</li><li>• Difference with explanatory comment</li></ul> <p><i>Example:</i> Team 1 - “Closed channel”; “Evidence of surface flow too” Team 2 - “Open channel”</p>
------------	---

---

---

Water  
presence

85% of responses should match identically  
and 90% of responses should pass.  
Passing responses are:

- Identical Match
- Difference with explanatory comment

*Example:*

Team 1 - "Yes"

Team 2 - "No"; "Reach mostly dry  
but several wet patches  
present"

---

Water Flow

90% of responses should pass. Passing  
Responses are:

- Identical Match
- Difference with explanatory comment

*Example:*

Team 1 - "Stagnant"

Team 2 - "Flowing"; "Very little to  
no distinguishable flow"

---

Water  
clarity

60% of responses should match identically  
and 75% of responses should pass.  
Passing responses are:

- Identical Match
  - At least one common water clarity  
AND no more than two differing  
responses per assessment
-

---

Odor

80% of responses should match identically and 85% of responses should pass.  
Passing responses are:

- Identical Match
- If presence/absence of odor differs – no more than 1 odor present
- If odor is present but differs – assessments should include at least one common odor

---

Maximum depth encountered

80% of responses should pass. Passing responses are:

- Max depth is <100cm and responses differ by <5cm
- Max depth is >100cm and responses differ by <20%

---

Average depth

75% of responses should match identically and 85% of responses should pass.  
Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

Maximum width

65% of responses should match identically and 85% of responses should pass.  
Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

---

Fish  
presence

85% of responses should pass. Passing responses are:

- Identical Match

---

Aquatic  
vegetation

80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Assessments include at least one common vegetation type and no more than one differing type

---

Algae

80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match in regards to presence/absence
- Compared responses do not indicate both “absent” and “extensive”

---

Bacteria  
presence

75% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match in regards to presence/absence
  - Responses do not match in regards to presence/absence but bacteria is not extensive
-

---

Trash

60% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

Riparian  
vegetation  
width

80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category on either bank

---

Riparian  
vegetation  
type

85% of responses should pass. Passing responses are:

- Top ranked vegetation type of Team 1 is within the top two vegetation types ranked by Team 2 and top ranked vegetation type of Team 2 is within the top two vegetation types ranked by Team 1
  - Top ranked vegetation type of Team 1 is within the top two vegetation types ranked by Team 2 AND Top ranked vegetation type of Team 2 is listed by Team 1.
-

---

Substrate  
type

85% of responses should pass. Passing responses are:

- Top ranked substrate type of Team 1 is within the top two substrate types ranked by Team 2 AND Top ranked substrate type of Team 2 is within the top two substrate types ranked by Team 1.
- Top ranked substrate type of Team 1 is within the top two substrate types ranked by Team 2 AND Top ranked substrate type of Team 2 is listed by Team 1.

---

Shading

60% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

Floodplain  
Connectivity

75% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

Bank erosion

75% of responses should pass. Passing responses are:

- Identical Match
- If presence/absence of bank erosion differs – Compared responses should not include both “non” and more than 1 impact
- If bank erosion is present – assessments should include at least one common impact and no more than 2 differing impacts

---

Woody debris and root wads

60% of responses should pass. Passing responses are:

- Responses which do not differ by >5 or exceed 65% difference (whichever is greater)

---

Recreation evidence

60% of responses should match identically in regards to presence/absence and 85% of responses should pass. Passing responses are:

- Identical Match
  - Responses which include “none” and not more than 1 recreation type
  - Responses which do not include “none” and include at least one common type and no more than 1 differing type of recreation per assessment
-

---

Rosgen  
Classification

60% of responses should match identically and 80% of responses should pass. Passing responses are:

- Identical Match
  - Responses do not differ by more than one category
-

# Point Assessment Metrics

## Deficient Buffers

---

**Bankside** 80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

**Length of deficiency** 85% of responses should pass. Passing responses are:

- Identical Match
- One common bankside

---

**Type of cover in deficient buffer area** 85% of responses should pass. Passing responses are:

- Identical Match
- All, or all but one, type of covers are the same on both assessments

---

**Impact score** 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

## Crossings

---

Type 85% of responses should pass. Passing responses are:

- Identical Match
- 

Diameter/  
width 65% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
  - Responses do not differ by more than one category
- 

Length 65% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
  - Responses do not differ by more than one category
- 

Material 75% of responses should pass. Passing responses are:

- All, or all but one, of the material type(s) are the same on both assessments
- 

Downstream  
debris 85% of responses should pass. Passing responses are:

- Identical Match
-

Downstream bed erosion	<p>75% of responses should match in regards to presence/absence and 85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Responses match in regards to presence/absence and erosion height is within one category (if present)</li> <li>• Responses do not match in regards to presence/absence but erosion height is 0-1m</li> </ul>
Downstream sediment	<p>85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Identical Match</li> </ul>
Upstream debris	<p>85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Identical Match</li> </ul>
Upstream bed erosion	<p>75% of responses should match in regards to presence/absence and 85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Responses match in regards to presence/absence and erosion height is within one category (if present)</li> <li>• Responses do not match in regards to presence/absence but erosion height is 0-1m</li> </ul>
Upstream sediment	<p>85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Identical Match</li> </ul>

---

Impact score	85% of responses should pass. Passing responses are: <ul style="list-style-type: none"><li>• Identical Match</li><li>• Responses do not differ by more than one category</li></ul>
--------------	--

---

## Dumpsite

---

Bankside	80% of responses should match identically and 85% of responses should pass. Passing responses are: <ul style="list-style-type: none"><li>• Identical Match</li><li>• Responses do not differ by more than one category</li></ul>
----------	--

---

Location of the dumpsite	80% of responses should match identically and 85% of responses should pass. Passing responses are: <ul style="list-style-type: none"><li>• Identical Match</li><li>• Responses do not differ by more than one category</li></ul>
--------------------------	--

---

Cleanup potential	85% of responses should pass. Passing responses are: <ul style="list-style-type: none"><li>• Identical Match</li></ul>
-------------------	--

---

---

Dumped material

80% of responses should pass. Passing responses are:

- All, or all but one, of the dumped material(s) are the same on both assessments

---

Trash volume

80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

Impact score

85% of responses should pass. Passing responses are:

- Identical Match

Responses do not differ by more than one category

---

## Erosion

---

Bankside

80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
  - Responses do not differ by more than one category
-

---

Bank height	80% of responses should match identically and 85% of responses should pass. Passing responses are: <ul style="list-style-type: none"><li>• Identical Match</li><li>• Responses do not differ by more than one category</li></ul>
-------------	--

---

Impact	75% of responses should pass. Passing responses are: <ul style="list-style-type: none"><li>• Identical Match</li><li>• If presence/absence of bank erosion differs: Compared responses should not include both “none” AND more than 2 impacts.</li><li>• If bank erosion is present: Assessments should include at least one common impact AND no more than 2 differing character type per assessment</li></ul>
--------	---

---

## Pipes

---

Bank where pipe is located	80% of responses should match identically and 85% of responses should pass. Passing responses are: <ul style="list-style-type: none"><li>• Identical Match</li><li>• Responses do not differ by more than one category</li></ul>
----------------------------	--

---

---

Pipe diameter 75% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

Type of pipe material 80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Difference with explanatory comment

---

Floating solids/trash 85% of responses should pass. Passing responses are:

- Identical Match

---

Erosion due to pipe 65% of responses should match identically and 75% should pass. Passing responses are:

- Identical Match
- If presence/absence of erosion differs: Compared responses should not include both “none” AND more than 2 impacts.
- If erosion is present: Assessments should include at least one common impact AND no more than 2 differing character type per assessment

---

---

Impact	<p>75% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Identical Match</li> <li>• Responses do not differ by more than one category</li> </ul>
<hr/>	
Discharge concern	<p>85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• All, or all but one, of the discharge concern is listed on both assessments (is discharge is present)</li> </ul>

---

## Utility Line

---

Utility line type – Is this an exposed sewer?	<p>85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Identical Match</li> </ul>
<hr/>	
Utility line diameter	<p>80% of responses should match identically and 85% of responses should pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Identical Match</li> <li>• Responses do not differ by more than one category</li> </ul>
<hr/>	
Utility line material	<p>80% of responses should match identically and 85% pass. Passing responses are:</p> <ul style="list-style-type: none"> <li>• Identical match</li> <li>• Difference with explanatory comment</li> </ul>

---

---

Utility line  
condition

80% of responses should match identically and 85% of responses should pass. Passing responses are:

- Identical Match
- Responses do not differ by more than one category

---

Utility line  
impact score

85% of responses should pass. Passing responses are:

- Identical Match
  - Responses do not differ by more than one category
- 

## **Fish blockage**

---

Man-made

85% of responses should pass. Passing responses are:

- Identical Match
- 

Height

85% of responses should pass. Passing responses are:

- Identical Match
  - Responses do not differ by more than one category
-

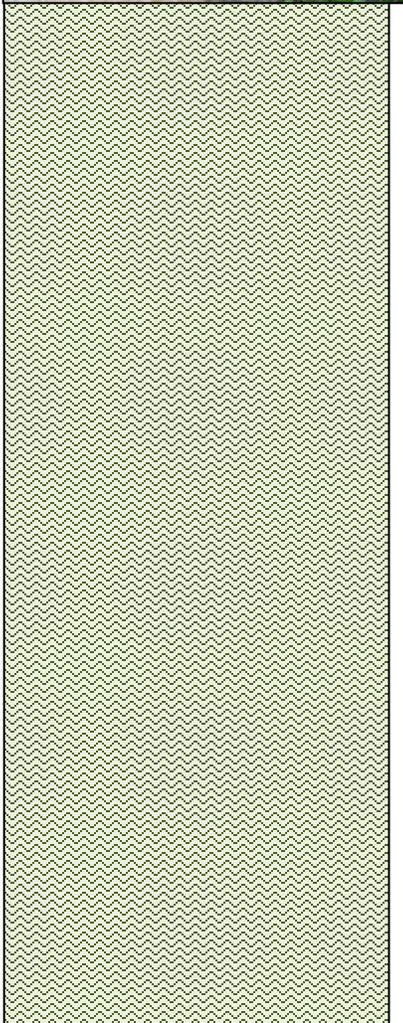
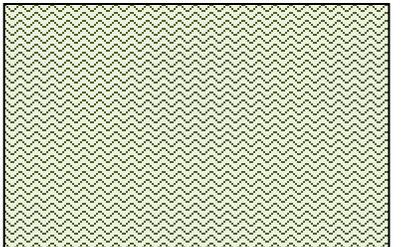
# **Appendix C: Acceptability Rubrics**

**Reach Rubric**

**Point Rubric**

**Assessment Conflicts**

Appendix 3:  
Standard Operating Procedures for using RSA  
Technical Tools



# Standard Operating Procedures for Using RSA Technical Tools

Department of Energy & the Environment  
Water Quality Division



2019



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<b>Water Quality Division</b>	
TYPE <b>Planning and Reporting Branch</b>	REVISION <b>0</b>
TITLE <b>Standard Operating Procedures for Using RSA Technical Tools</b>	EFFECTIVE DATE <b>5/1/2019</b>
PURPOSE <p>This document provides instructions for using Rapid Stream Assessment (RSA) Technical Tool including Collector for ArcGIS, Survey 123, and Operations Dashboard. It also covers procedures for backing up, viewing, and downloading collected data.</p>	
REVISION SUMMARY	
APPROVED BY  Branch Chief _____ Date _____  Associate Director _____ Date _____	

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## 1.0 Background

The District Department of the Environment (DOEE) Water Quality Division is responsible for the assessment of receiving waters within the District of Columbia. The Rapid Stream Assessment (RSA) allows DOEE to provide a high-level overview of the entire wadeable stream network within the District. This information can help identify potential issues as well as locations that may warrant follow-up inspections or more in-depth evaluations. The information from the RSA can also serve as a baseline with which to compare information from these assessments in the future. This assessment is being used to help comply with the District of Columbia's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit issued by the U.S. Environmental Protection Agency (USEPA).

This document provides instructions for using Rapid Stream Assessment (RSA) Technical Tool including Collector for ArcGIS, Survey 123, and Operations Dashboard. It also covers procedures for backing up, viewing, and downloading collected data.

## 2.0 Hardware and Software Set-up

### 2.1. Selection of Mobile Devices

Mobile devices used for RSA data collection must have ESRI's Collector and Survey 123 downloaded (See Section 2.2 for system requirements). Devices must have cellular data service and/or be capable of connecting to a mobile wi-fi hotspot. In addition mobile devices should have a built-in camera and have GPS capabilities.

### 2.2. Mobile App Downloads

Mobile devices used for RSA data collection must have ESRI's Collector and Survey 123 downloaded. Downloading Adobe Acrobat Reader or another pdf reader is also recommended to allow the electronic version of the Field Guide to be saved to the device before initiating the RSA.

#### 2.2.1. Collector

There are two versions of Collector currently available:

- Classic Collector
- Collector for ArcGIS<sup>1</sup>

The choice between which version of Collector can be made based upon the specs of the available mobile device and/or user preference. The RSA tool is fully featured and compatible with both.

The system requirements for Classic Collector can be referenced here:

<https://doc.arcgis.com/en/collector-classic/overview/requirements.htm>

---

<sup>1</sup> Collector for ArcGIS is currently only available for iOS (March 2019)

The system requirements for Collector for ArcGIS can be referenced here:

<https://doc.arcgis.com/en/collector/faq/requirements.htm>

Classic Collector can be downloaded at:

<https://doc.arcgis.com/en/collector-classic/>

Collector for ArcGIS can be downloaded at:

<https://www.esri.com/en-us/arcgis/products/collector-for-arcgis/resources>

### 2.2.2. Survey 123

The system requirements for Survey 123 can be referenced here:

<https://doc.arcgis.com/en/survey123/reference/systemrequirements.htm>

Survey123 can be downloaded at:

<https://doc.arcgis.com/en/survey123/download/>

## 2.3. Login Credentials

An ArcGIS Online (AGOL) or Enterprise account will be needed to sign into Collector and Survey 123. Note that ESRI does not allow the same account to be logged into at the same time on multiple devices.

DOEE staff who do not have an AGOL or Enterprise account should contact IT in order to obtain one. Participating staff should contact the field coordinator with their AGOL/Enterprise username and request to be added to RSA AGOL group.

### 2.3.1. Signing in with an Enterprise account:

Collector:

1. Start Collector
2. Click on "Sign In with ArcGIS Online"
3. Click on "Enterprise Login" if not already selected
4. type "**dcgis**" in the box in front of **.maps.arcgis.com** (click on remember URL) if this step has already been done previously, skip down below
5. Click Continue
6. Click on the blue box with "DC GOV AD Credentials"
7. Sign in with your DC Network login information (email address and password)

Survey123:

1. Start Survey 123.
2. Click on the 3 dashes on the top right corner
3. Click Sign in
4. Click on "Enterprise Login" if not already selected
5. type "**dcgis**" in the box in front of **.maps.arcgis.com** (click on remember URL) if this step has already been done previously, skip down below
6. Click Continue

7. Click on the blue box with “DC GOV AD Credentials”
8. Sign in with your DC Network login information (email address and password)

### **2.3.2. Signing in with an AGOL account:**

Collector:

1. Start Collector
2. Click on “Sign In with ArcGIS Online”
3. Click on “ArcGIS login” if not already selected/expanded
4. Sign in with your AGOL login information (username and password)

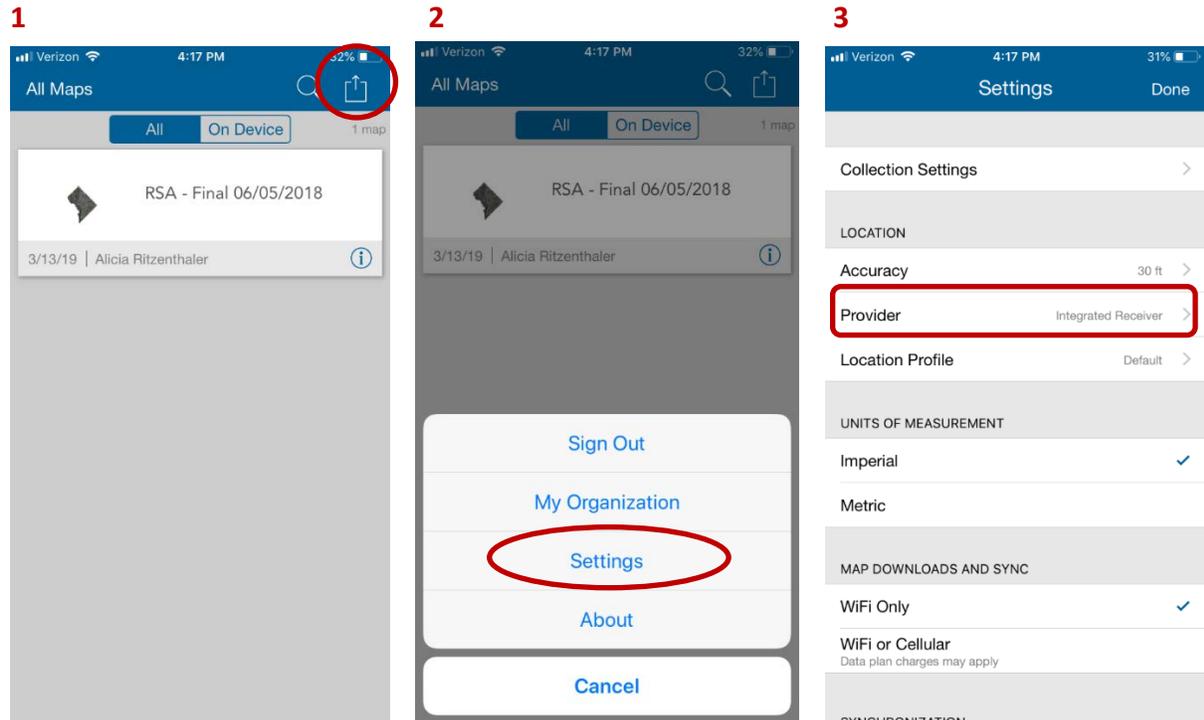
Survey123:

1. Start Survey 123.
2. Click on the 3 dashes on the top right corner
3. Click on “ArcGIS login” if not already selected
4. Sign in with your AGOL login information (username and password)

## 2.4. Collector Settings

### 2.4.1 Setting the GPS Receiver

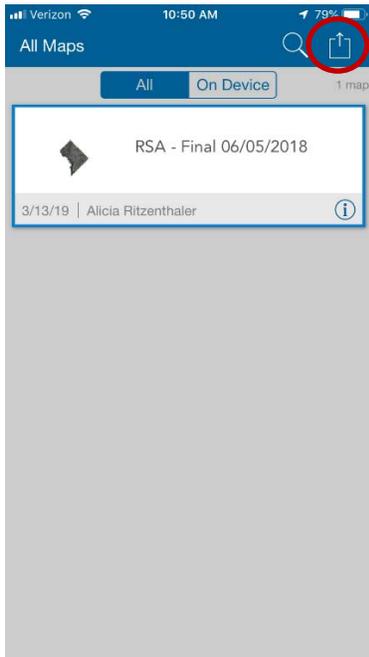
Collector will use the devices internal GPS receiver unless otherwise specified. If an external GPS receiver is paired to your devices you select it within Collector's settings.



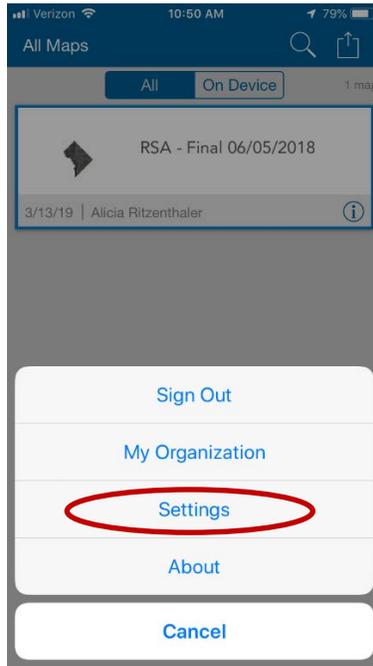
### 2.4.2 Required Accuracy

Although the RSA program will use manually placed points and features, not based upon the GPS, Collector may persistently notify the user if the GPS signal accuracy is out of range. To change the accuracy required by Collector, modify within Collector's settings.

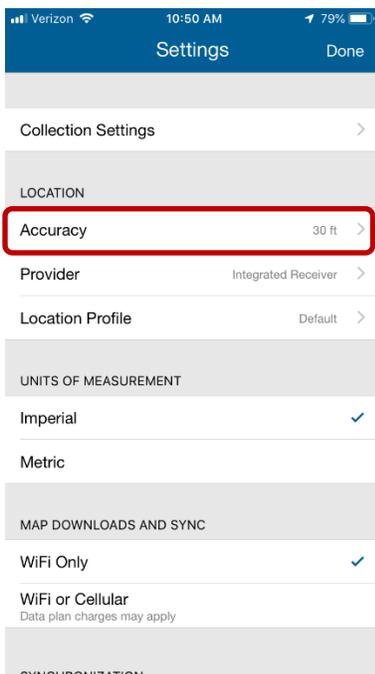
1



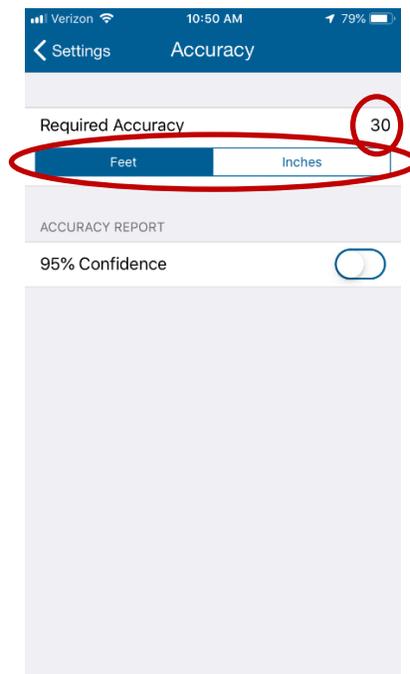
2



3



4



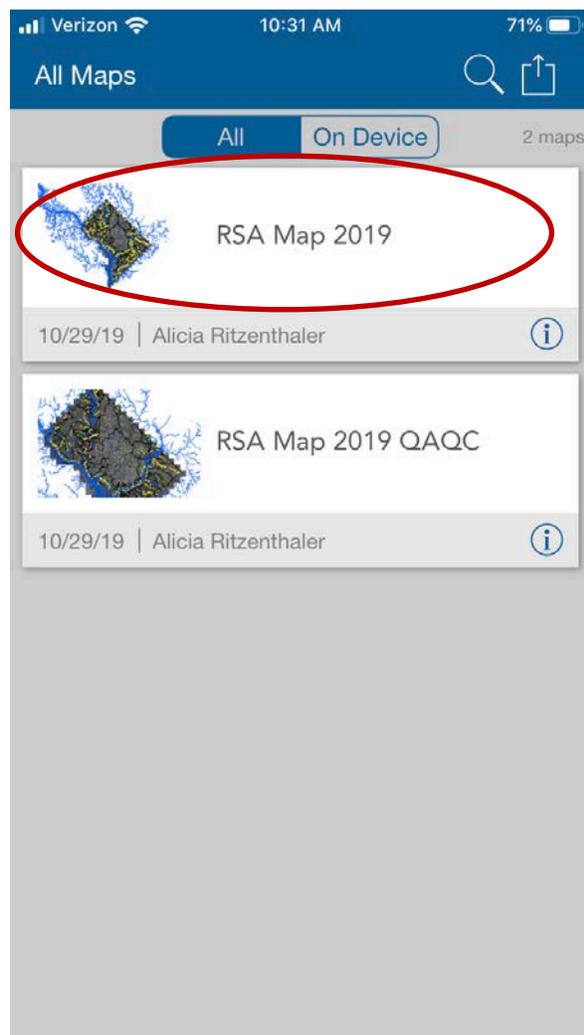
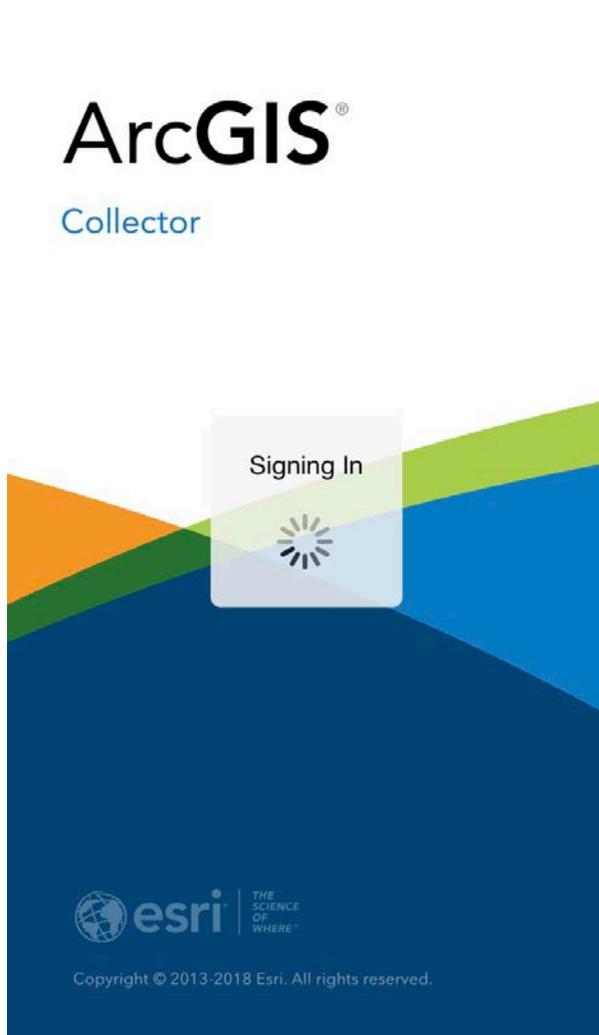
### 3.0 RSA Collector/Survey 123 Tool

#### 3.1. Adding new points and reaches

Open Collector and sign in with AGOL user account info. Tap the final/most recent version of the RSA map to open it. If the GPS of the device is active, the map will open to your current location. Use the touchscreen to navigate, zoom in, and/or otherwise adjust your view.

1

2

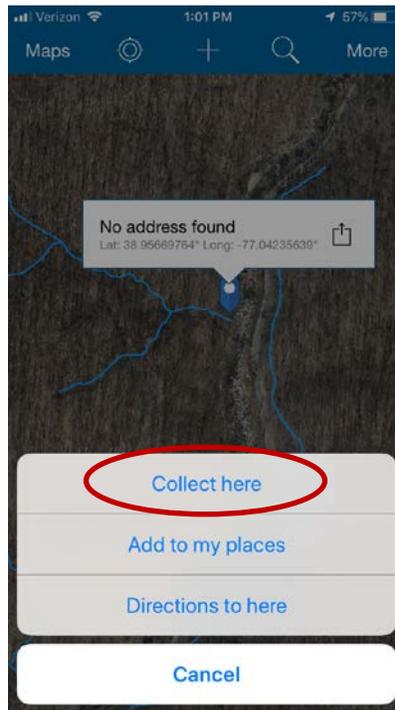


Briefly hold your finger on the screen where you would like to place a point or at one end of the reach you would like to draw. Lift finger and tap the box & arrow icon (1). Tap “Collect here” (2). Tap to select if the new feature is a point or a reach (3).

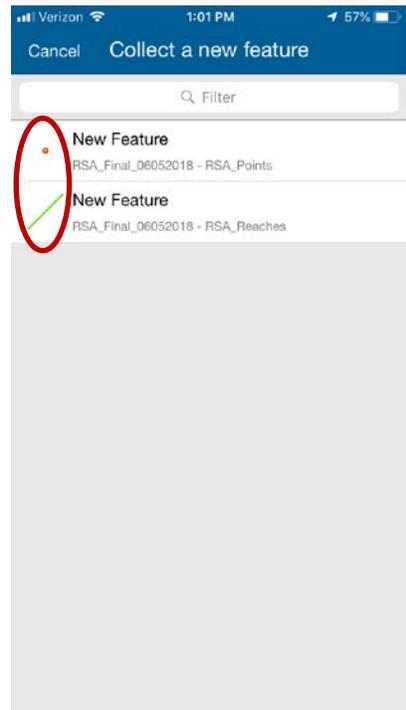
1



2

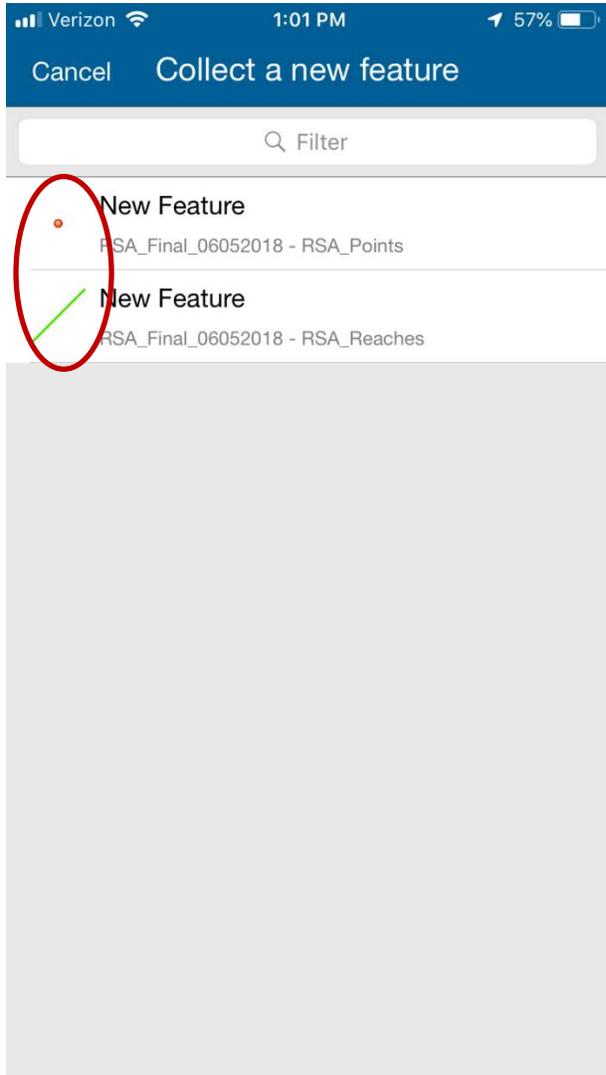


3



Select the red dot ( • ) to place a point feature. Select the green line ( / ) to place a reach feature.

1

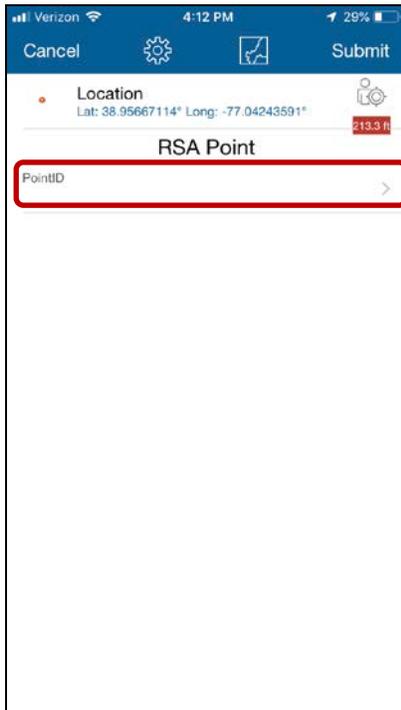


### 3.1.1. Point Features

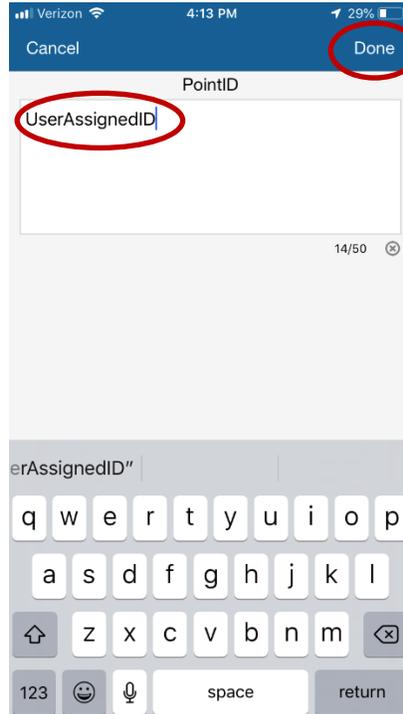
Initiate a point survey (See Section 2.1).

Enter User defined PointID. This ID does not have to be unique but should be meaningful to you.

**1** Tap PointID



**2** Type ID  
Tap 'Done'



**3** Tap Submit

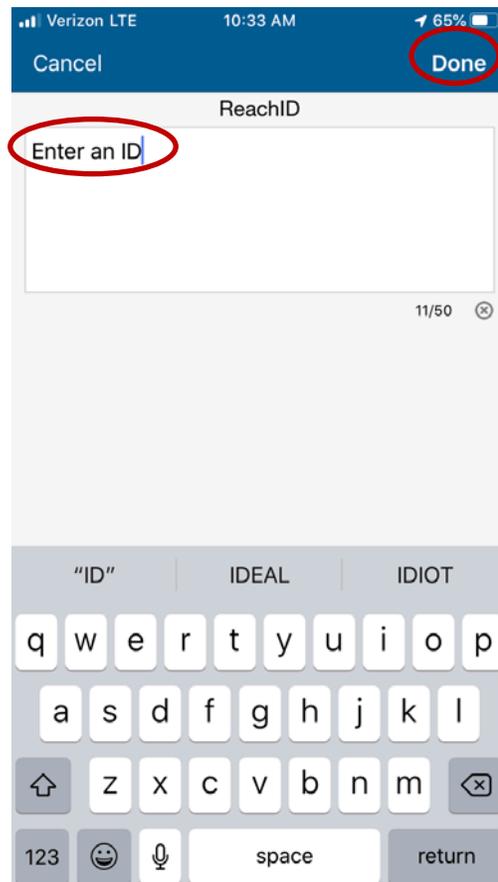
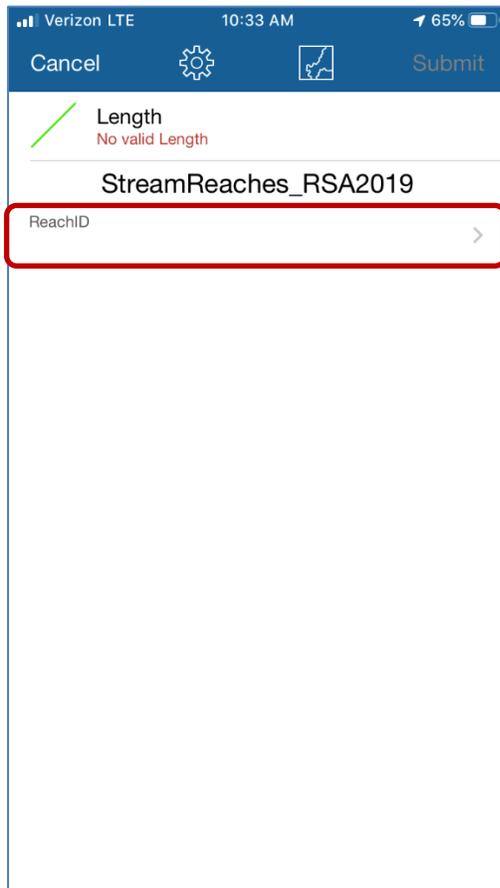


### 3.1.2. Reach Features

Initiate a reach survey (See Section 2.1).

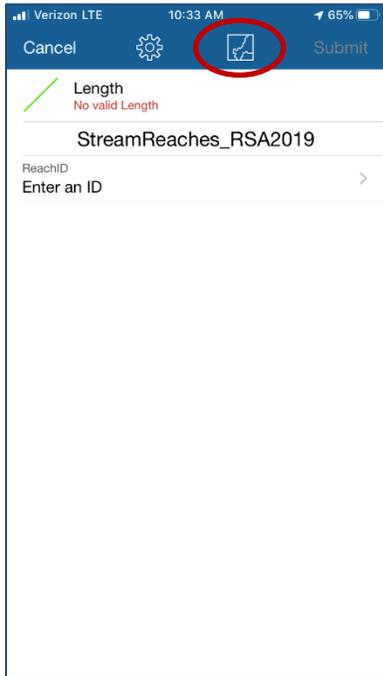
Enter User defined ReachID. This ID does not have to be unique but should be meaningful to you.

- 1 Tap ReachID
- 2 Type ID  
Tap 'Done'



Draw reach line onto the map and submit.

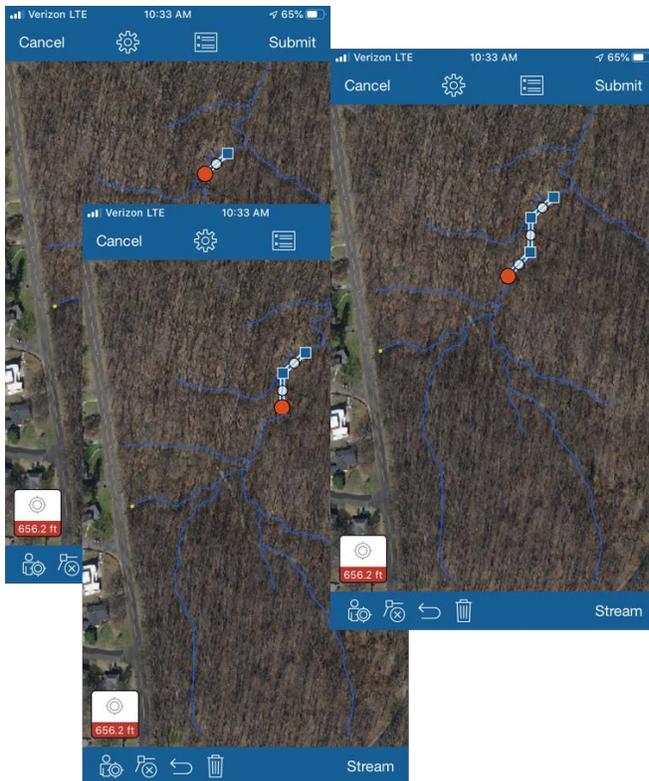
**1** Tap the Map icon



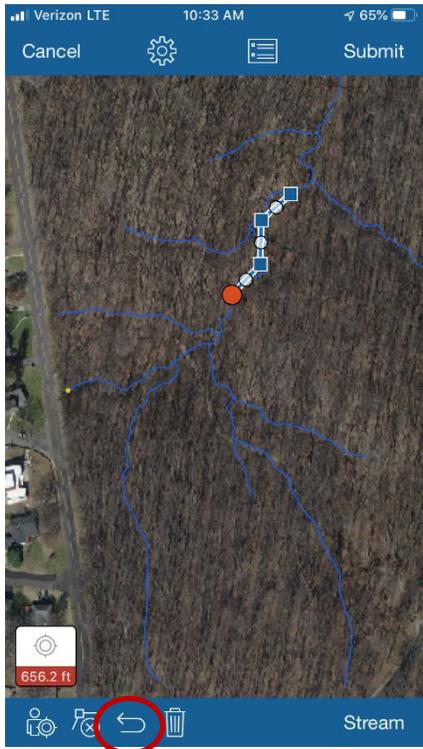
**2** Feature will begin where survey was initiated



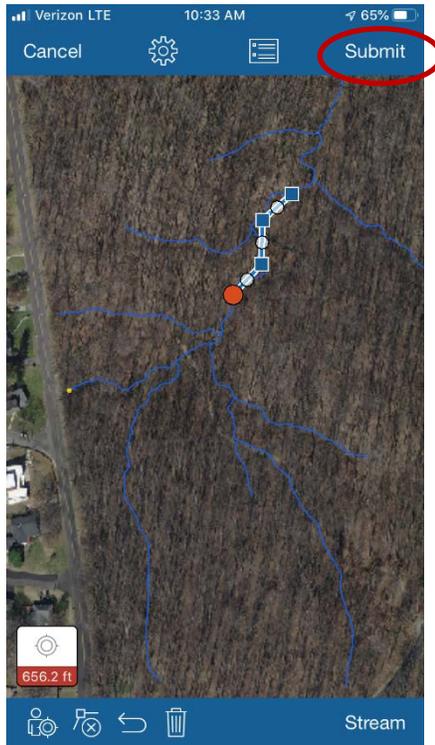
**3** Tap on map to draw reach line



**4** Use back button if you tapped the wrong place on the map and need to revise.

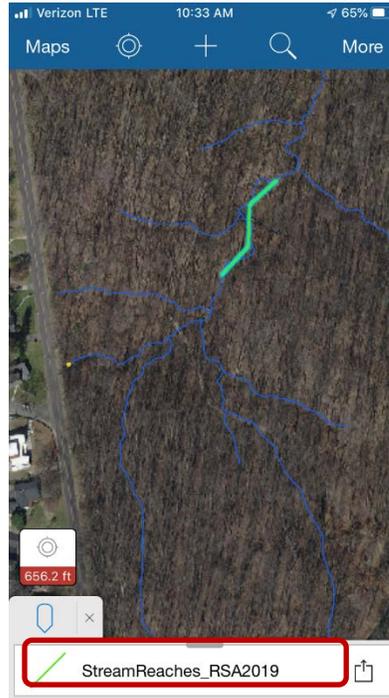
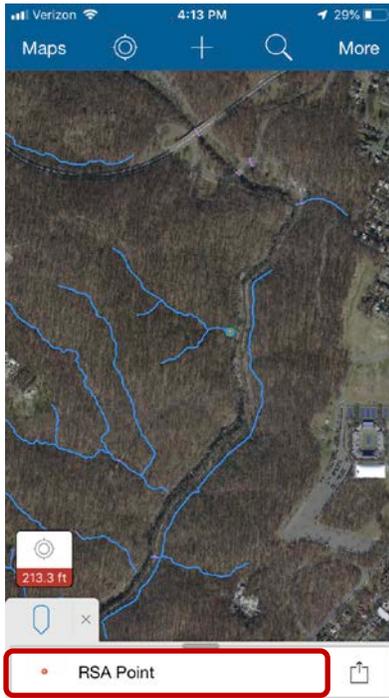


**5** Submit reach feature when complete

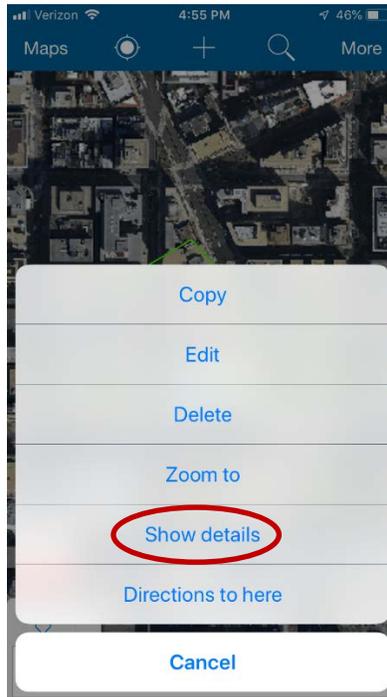
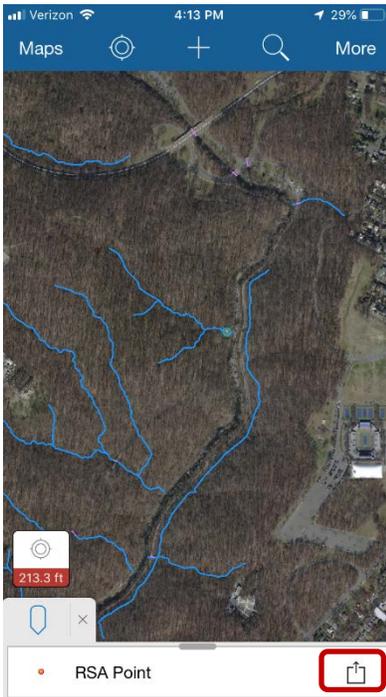


### 3.2. Initializing survey

Once the feature (point or reach) is submitted, Collector will return to the map. The new point (or reach) will be selected (notice teal outline around point and banner along bottom of the screen). Tap the banner along the bottom of the screen to open the new, selected feature. Avoid the box & arrow icon.

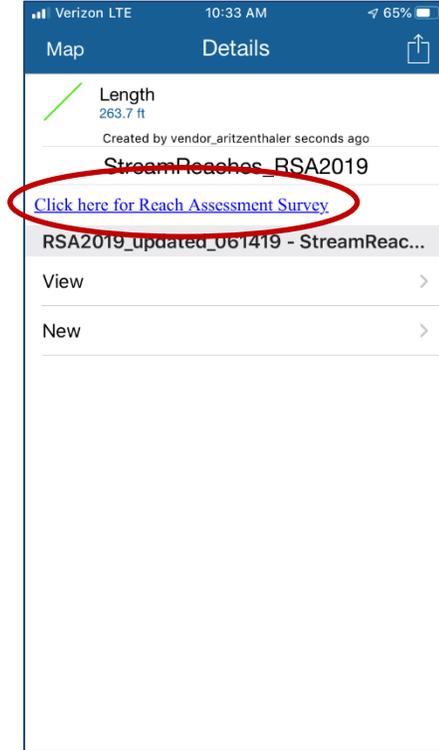
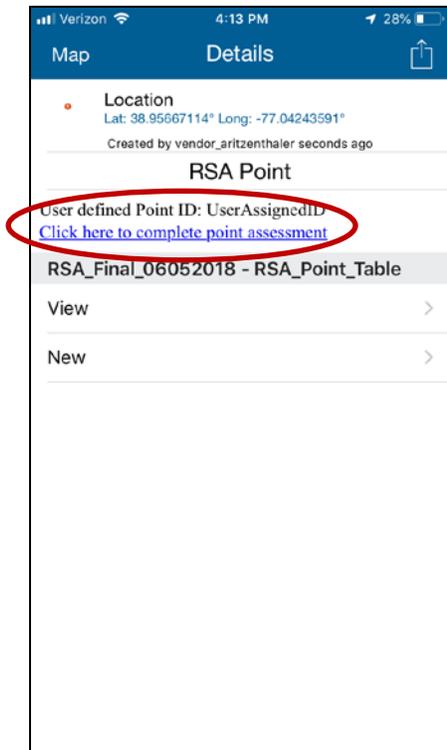


If you accidentally tap the part of the banner with the box & arrow icon simply tap 'show details' to continue.



Verify the User defined Point ID (or Reach ID) and tap 'Click here to complete point assessment' (or 'Click here for reach assessment survey').

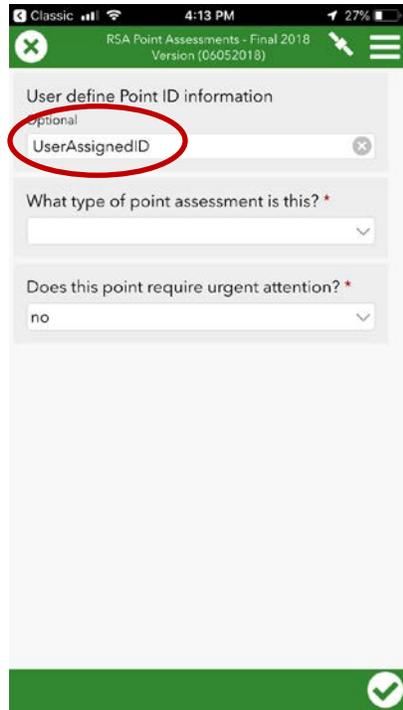
Don't be deceived, **DO NOT** tap 'new'!



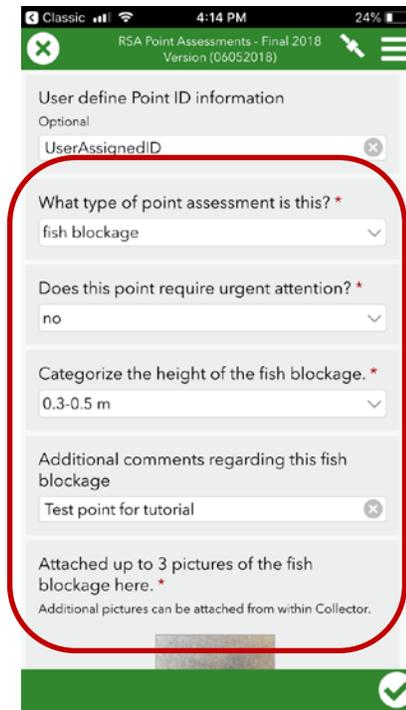
Survey 123 will launch and open, automatically, the correct survey form. DO NOT self-select a form, wait for a moment and let Survey 123 open the correct form for you! Continue to Section 2.3 and complete survey.

### 3.3 Complete Survey

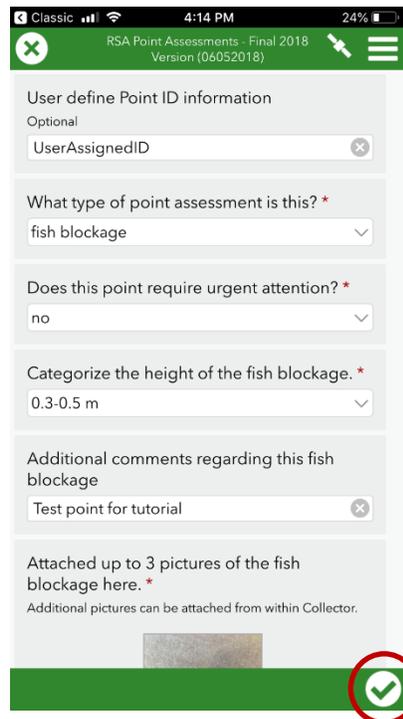
1 Verify user defined Point/Reach ID



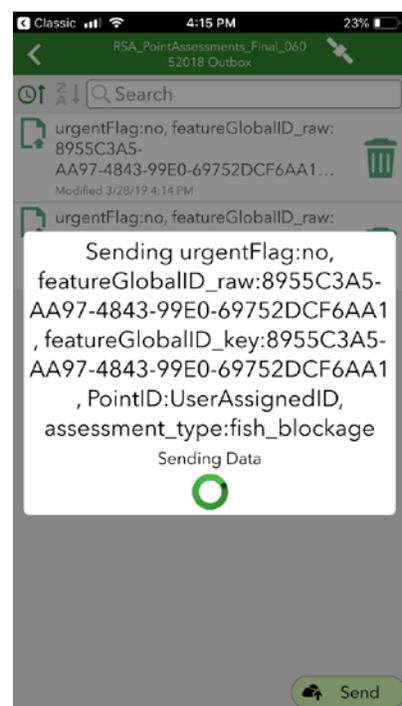
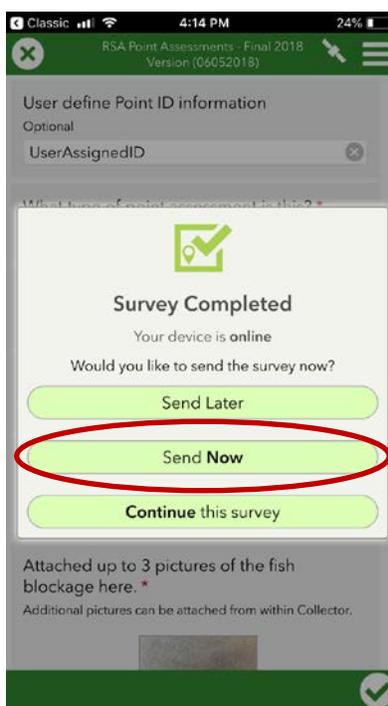
2 Respond to questions, take photos



3 Submit, tap the checkmark'



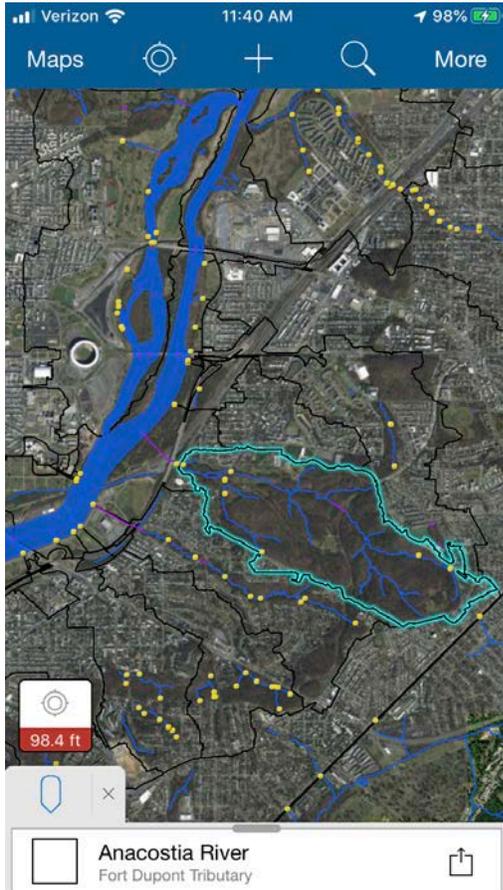
4 'Send now'



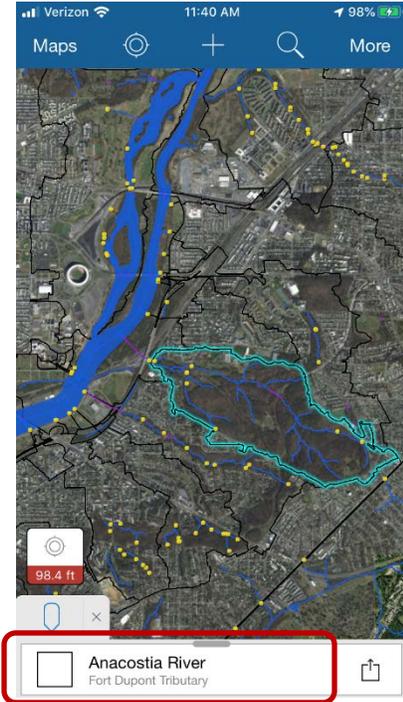
## 4.0 Watershed Notes

When observations are made at the watershed-scale, there notes should be added via the Collector/Survey 123 tool.

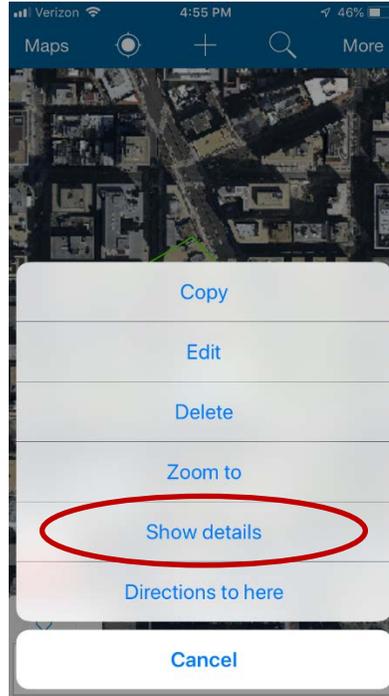
- 1 Tap watershed to select it



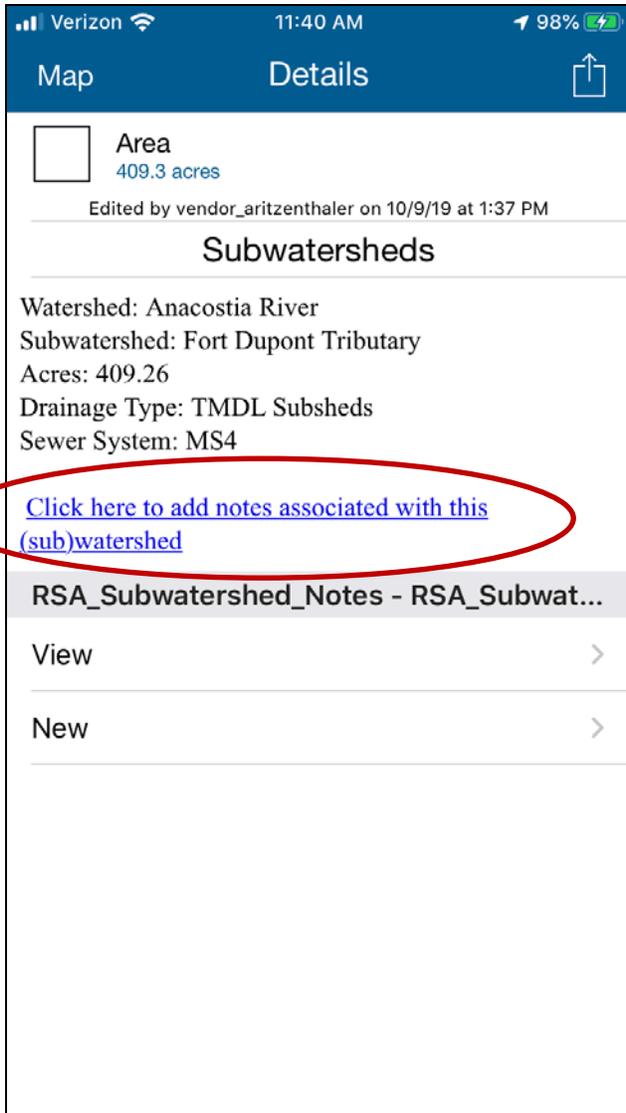
**2** Tap the banner along the bottom of the screen to open the new, selected feature. Avoid the box & arrow icon.



**3** If you accidentally tap the box & arrow icon, tap "Show details".



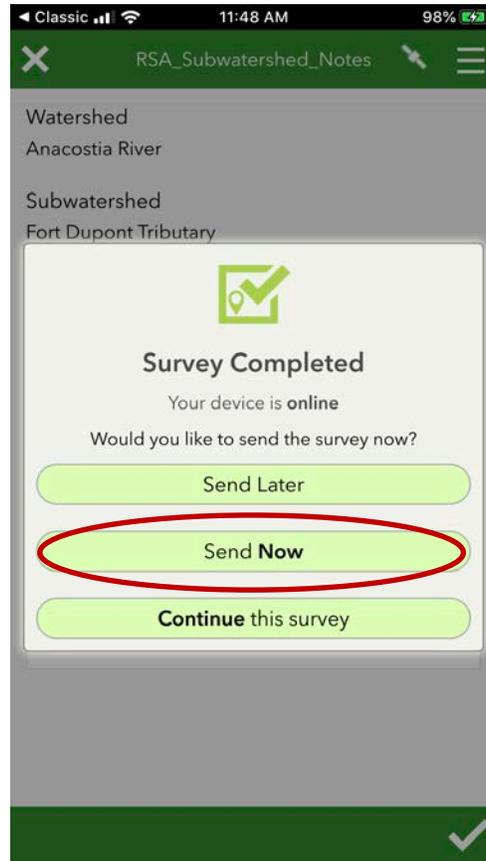
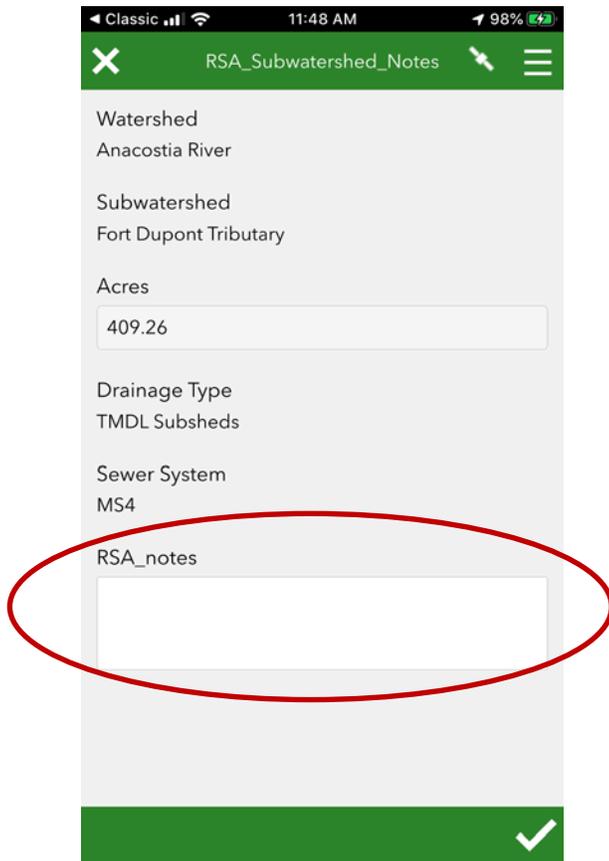
4 Verify the User defined Point ID (or Reach ID) and tap 'Click here to add notes associated with the (sub)watershed'.



**5** Survey 123 will launch and open, automatically, the correct survey form. DO NOT self-select a form, wait for a moment and let Survey 123 open the correct form for you!

**6** Verify information and add your notes in the “RSA\_notes” section.

**7** Tap “Send now” to save/submit.

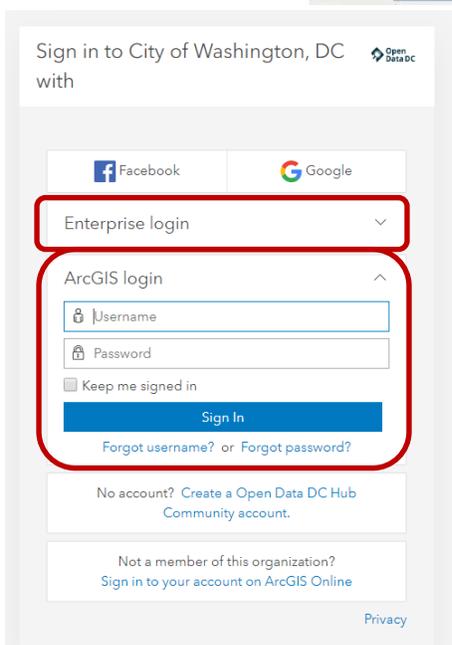
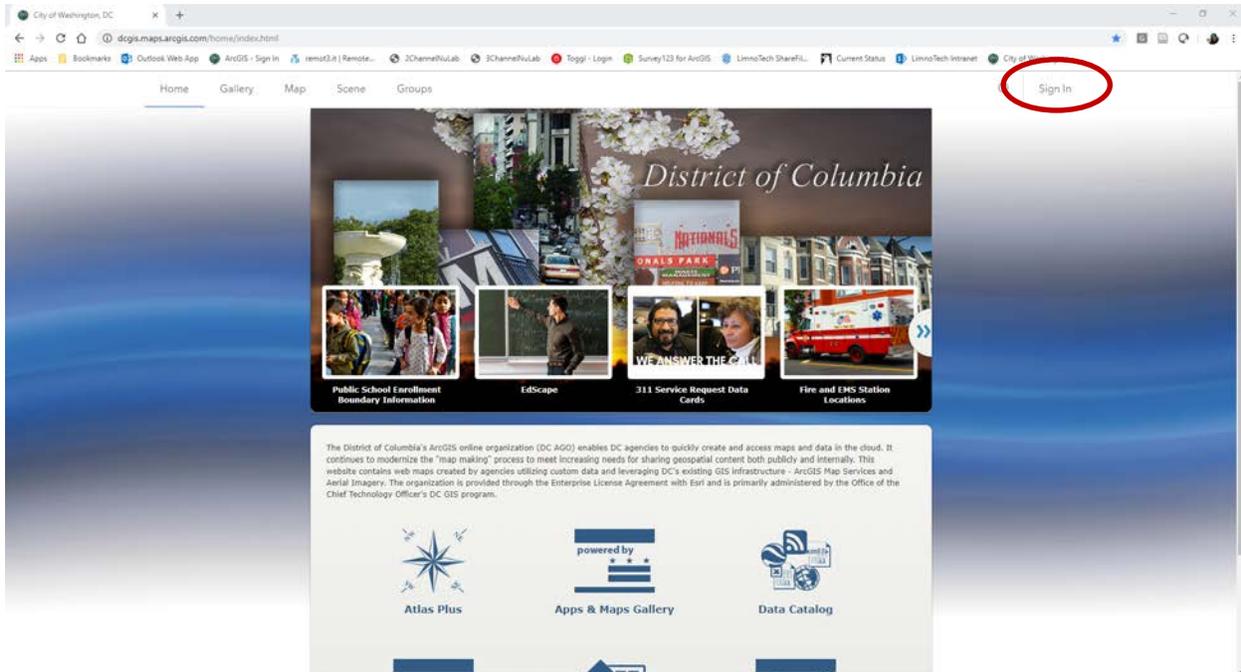


## 5.0 Operations Dashboard

The RSA Operations Dashboard allows staff to monitor assessment progress and provides an environment in which completed assessments can be edited if necessary.

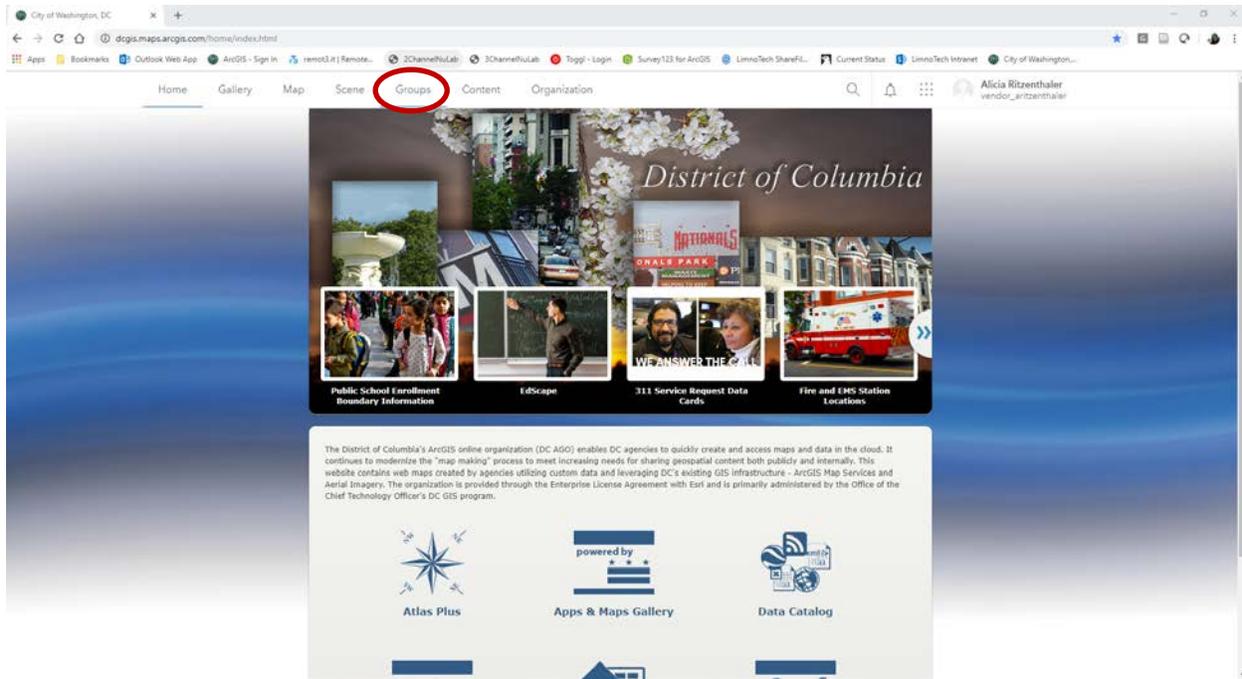
### 5.1. Accessing the Dashboard

The RSA Operations Dashboard is hosted on AGOL. Users must log in with their AGOL or Enterprise credentials. <https://dcgis.maps.arcgis.com/home/index.html>

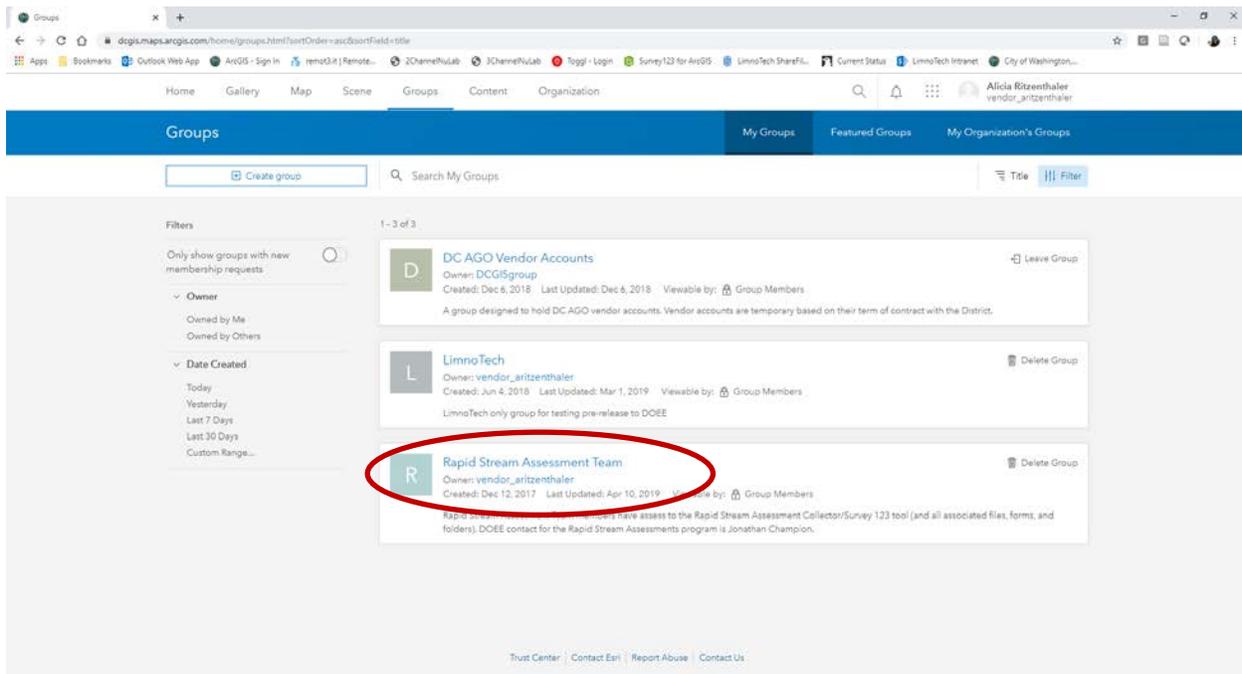


Navigate to the dashboard

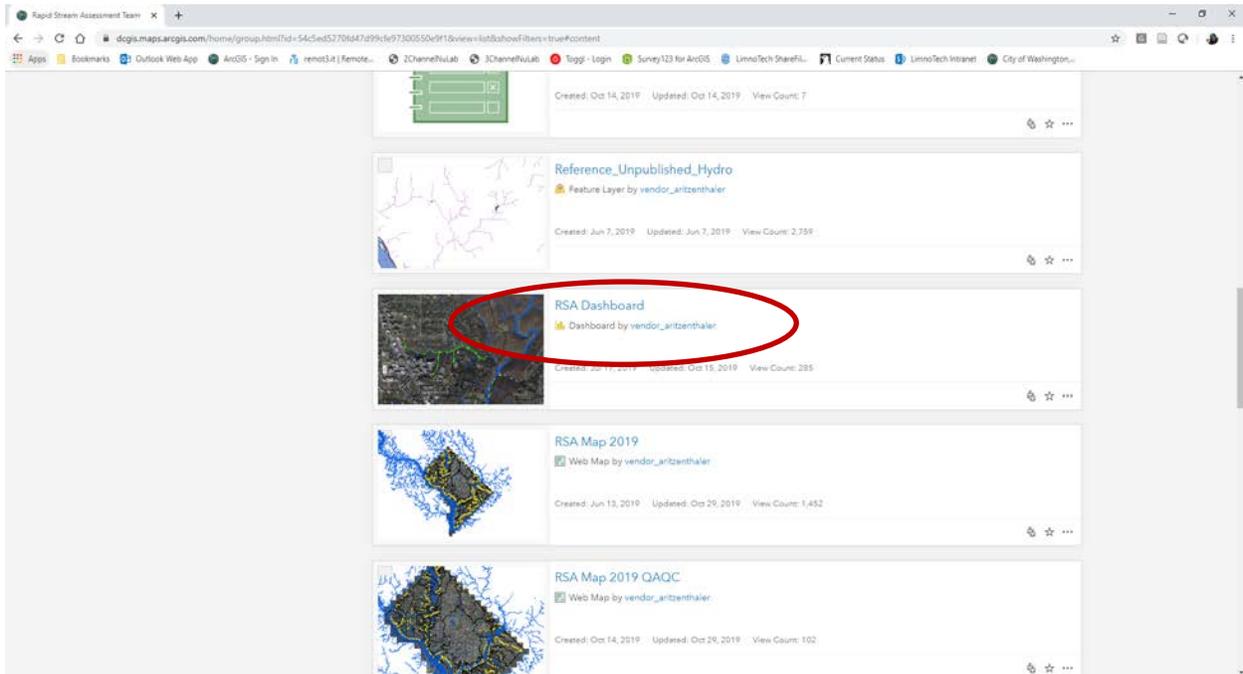
5 Click “Groups”



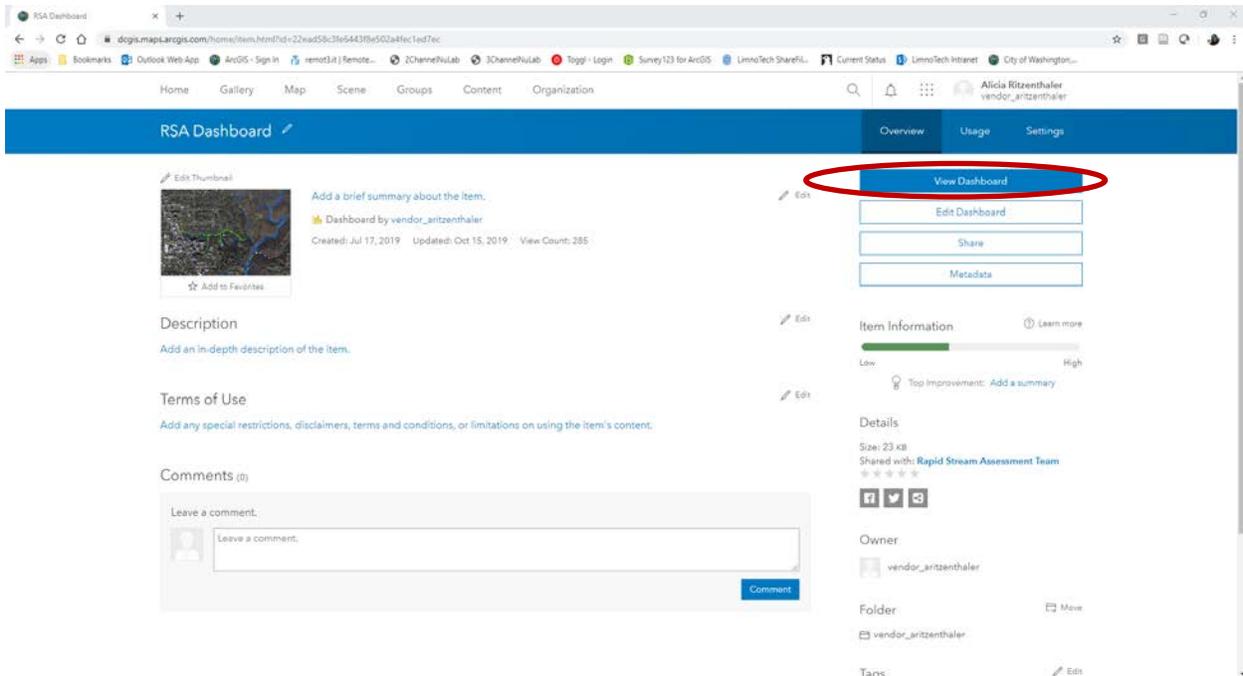
5 Find and click “Rapid Stream Assessment Team”



**6 Find and click “RSA Dashboard”**



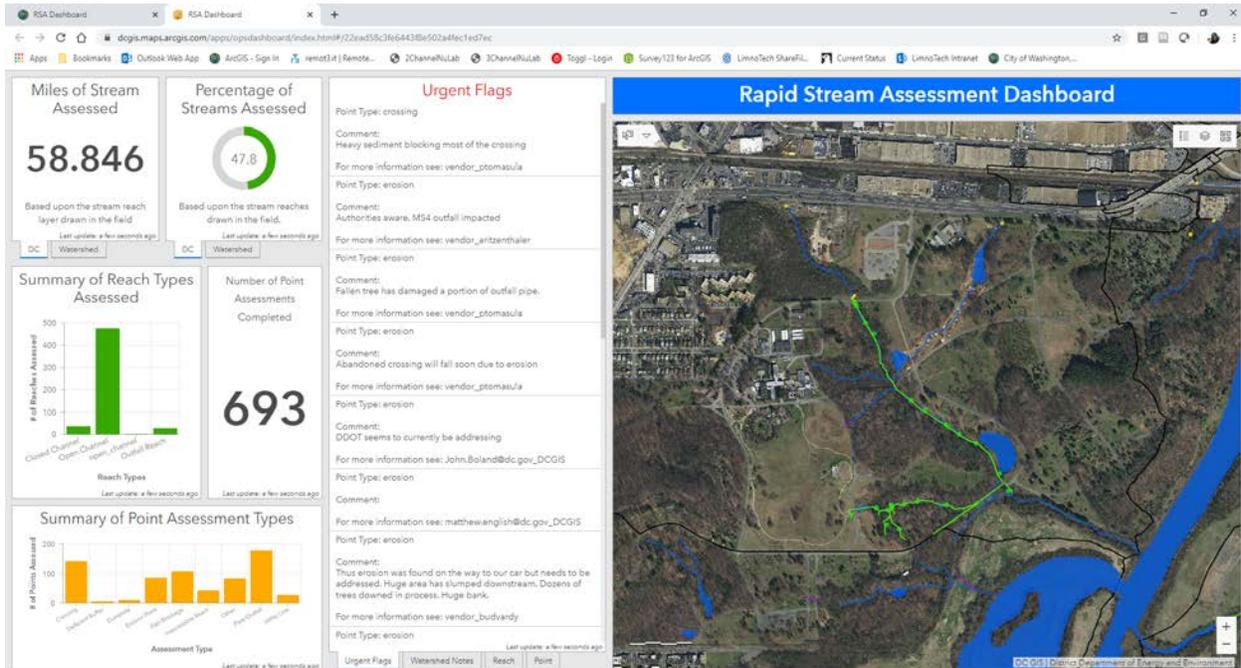
**7 Click “View Dashboard”**



## 5.2. Interacting with the Dashboard

### 5.2.1. Monitoring Progress

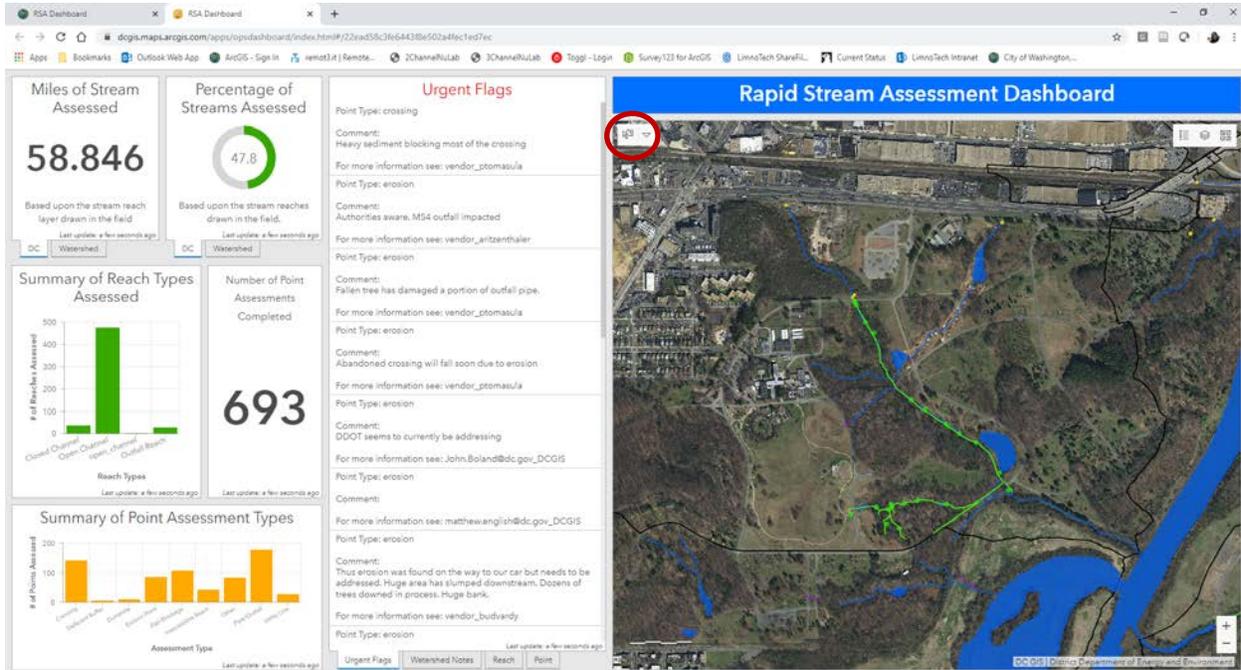
The main page of the RSA Operations Dashboard displays real-time information regarding assessment progress.



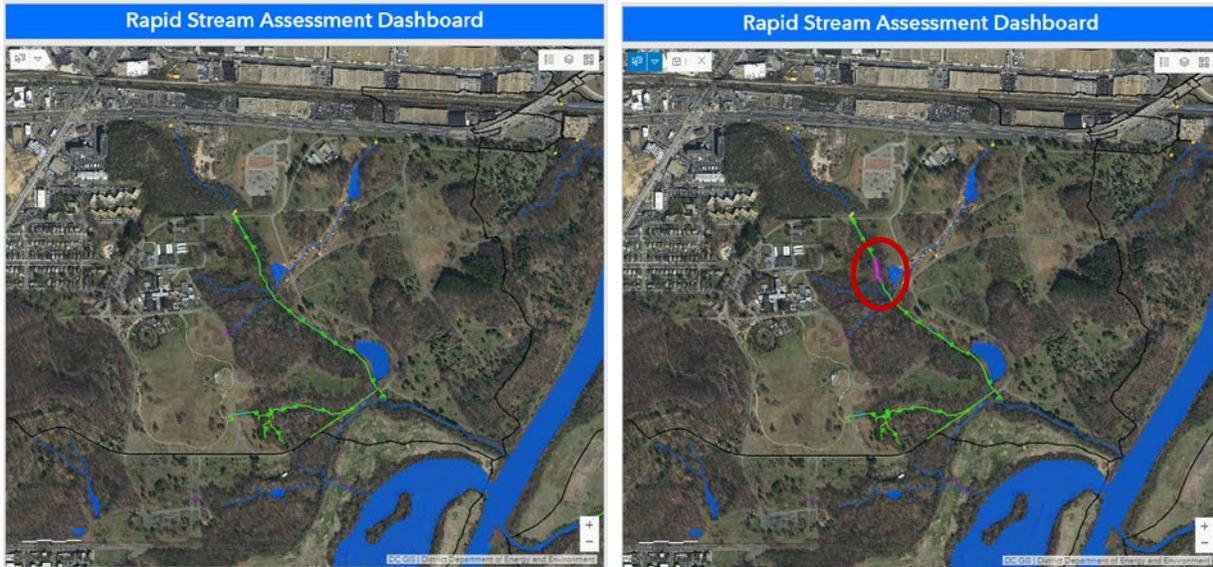
### 5.2.1. Editing Completed Surveys

The RSA dashboard provides a safe platform for editing already completed assessments.

#### 1 Click the selection icon



**2** Tap the feature associated with the assessment requiring editing. Once selected, your feature will appear with a purple highlight.



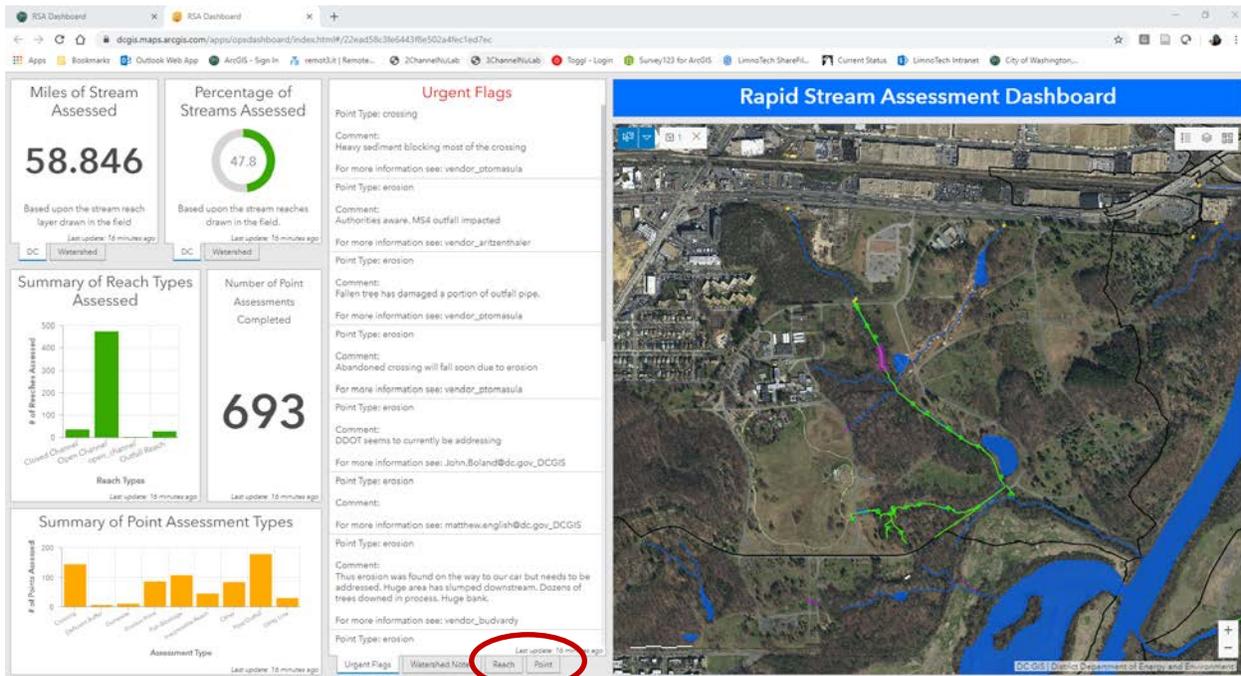
Note that you may be prompted to specify your tapped selection.



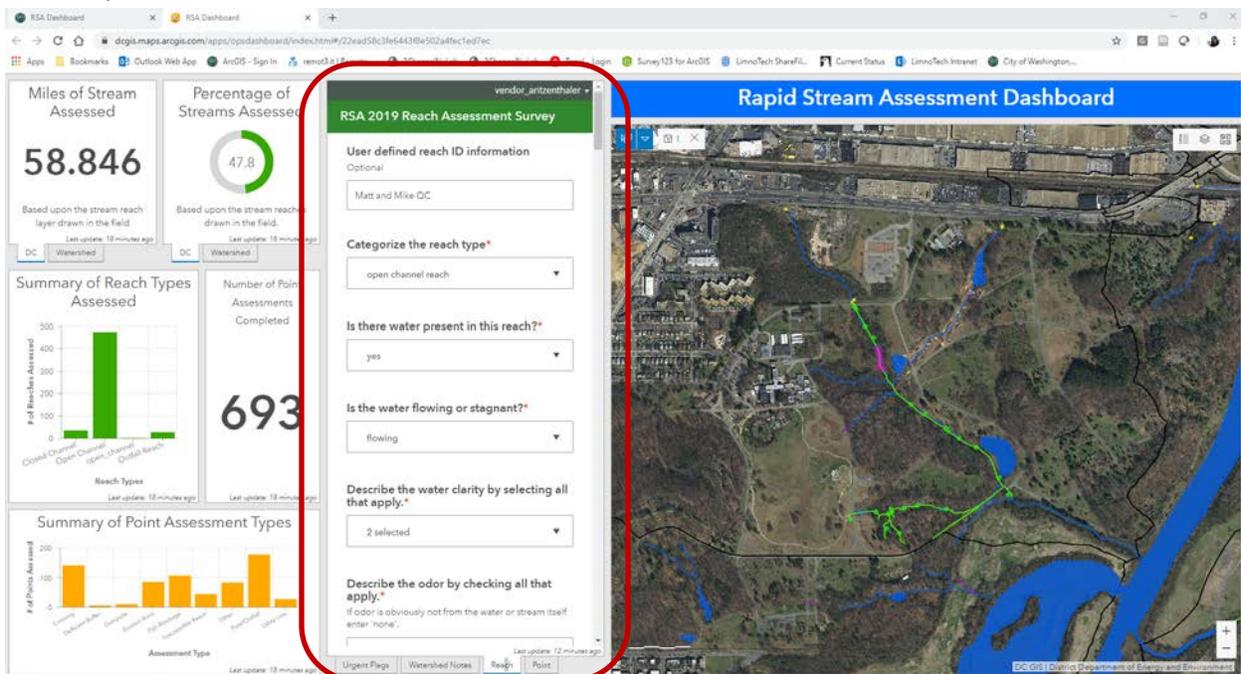
**3** Make sure you have only 1 selected feature before proceeding!!!! If you have multiple, click the "X" and try again.



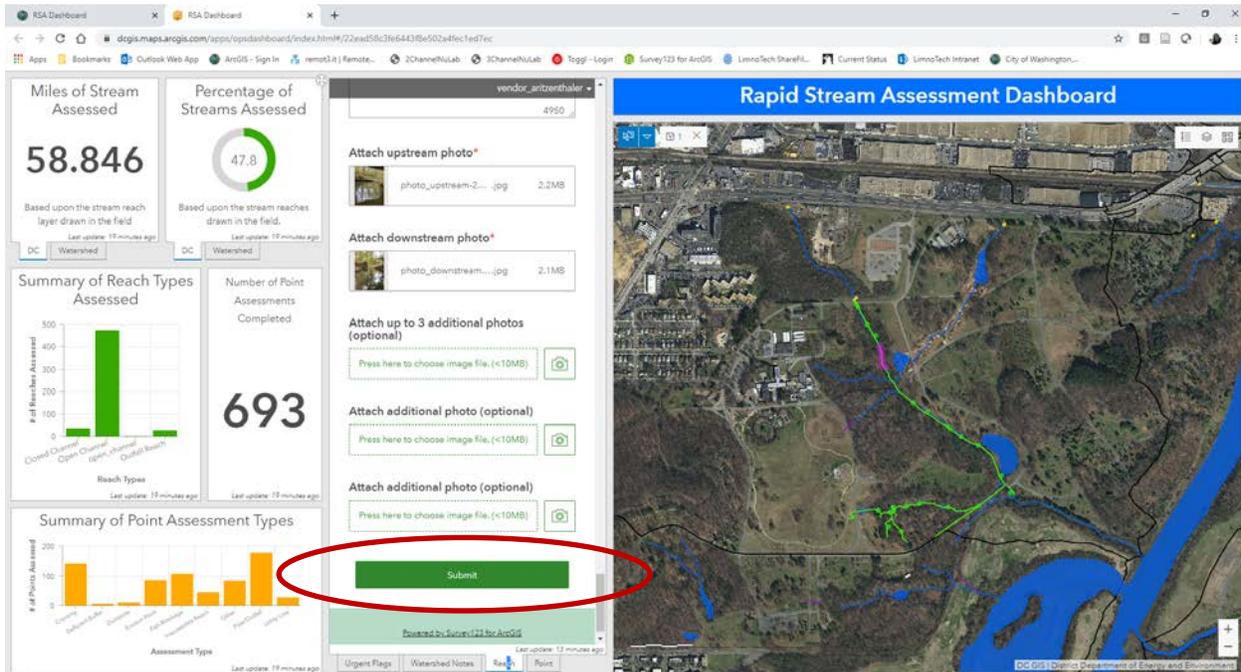
4 Select the appropriate tab based upon what feature type you have selected.



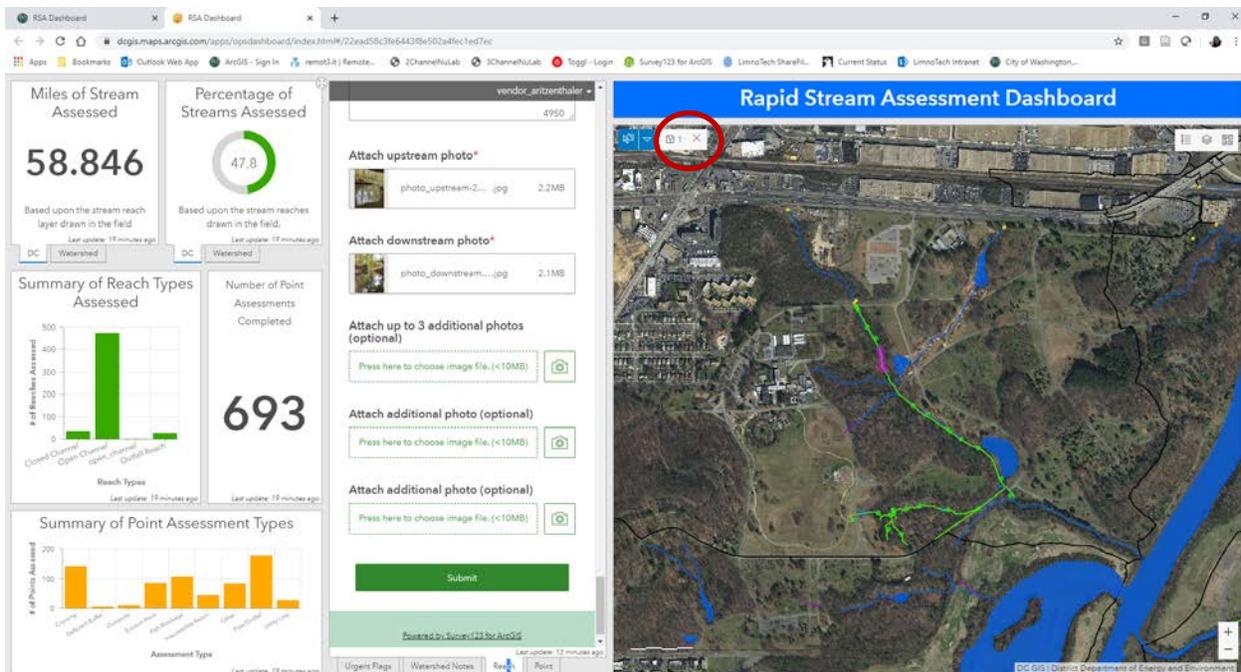
5 The previously completed Survey123 form will appear. Look through existing responses and ensure it's the one you want to edit!



6 Once your edits have been made, click "Submit"



7 Finally, unselect feature on the map by clicking the "x" to ensure no accidental changes are made.



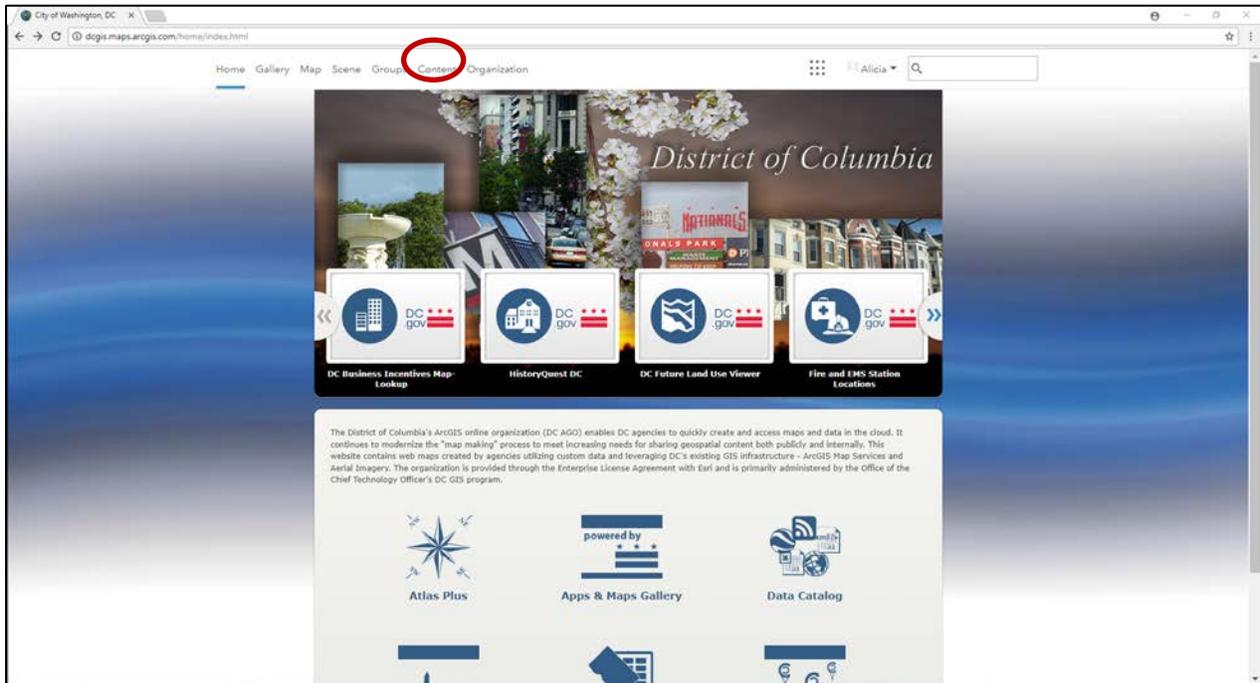
## 6.0 Viewing and Downloading Data

All data can be viewed in either ArcGIS online or by downloading a local copy to open and work within ArcMap/desktop.

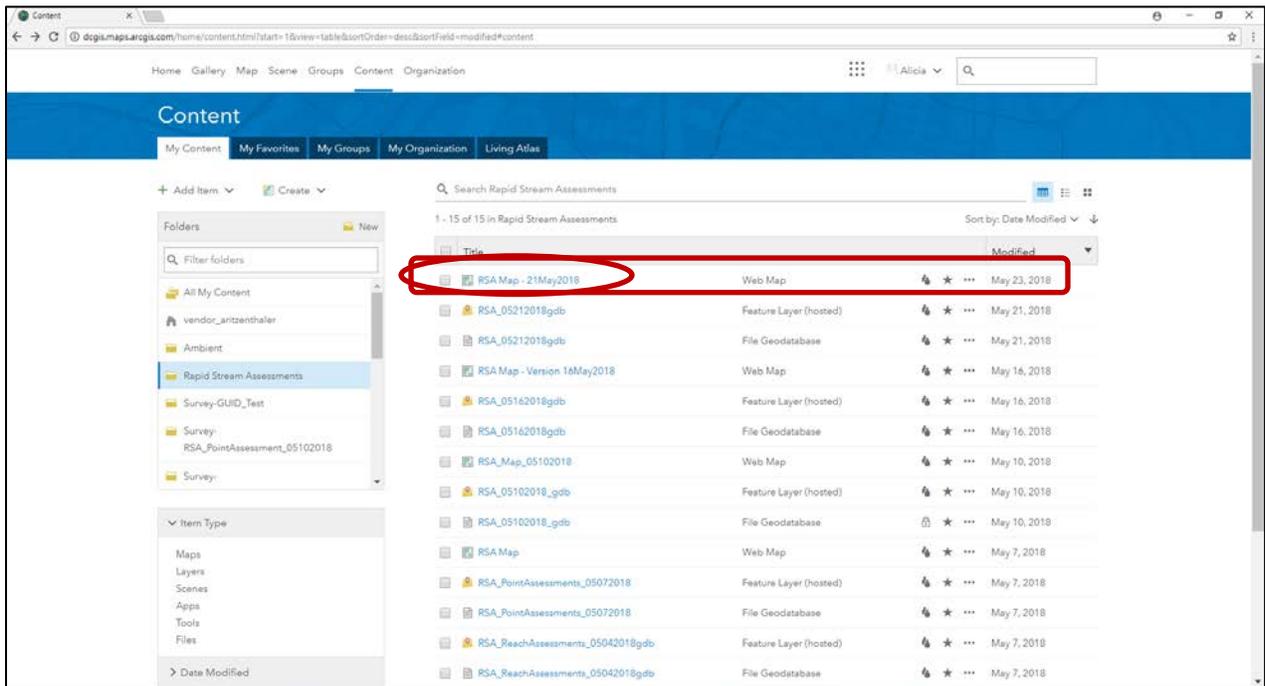
### 6.1. Viewing in ArcGIS online

Sign into your ArcGIS online account.

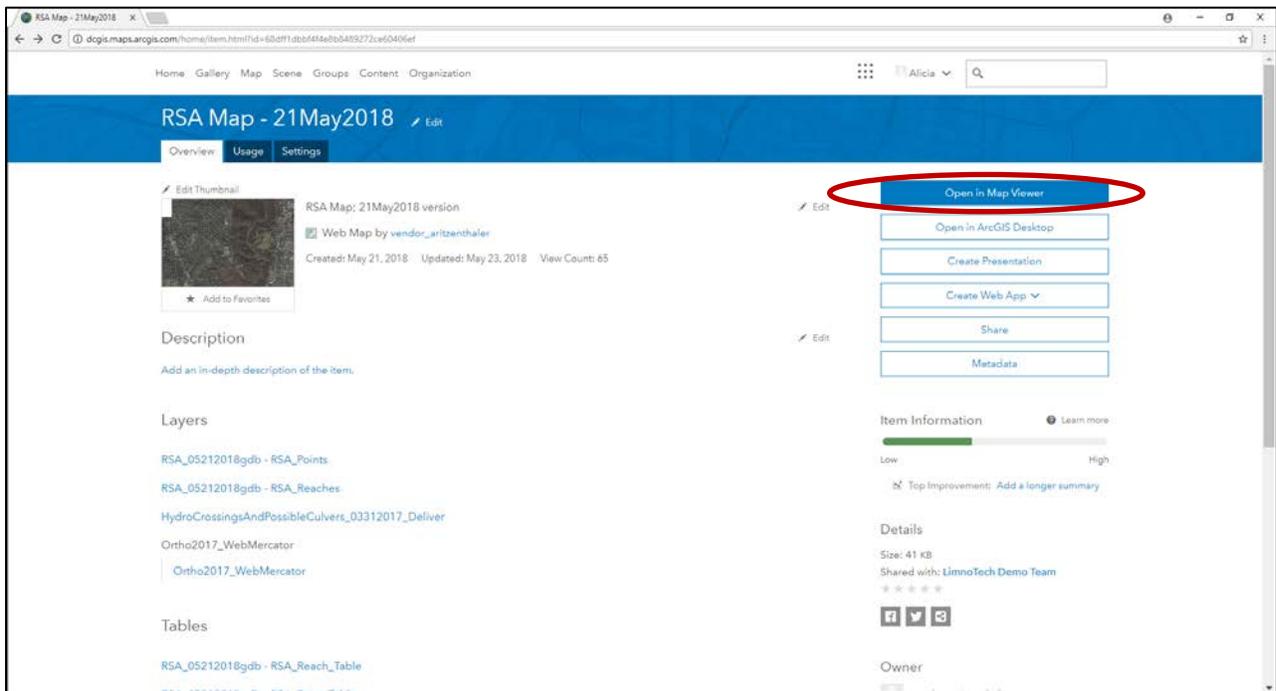
Click “Content”



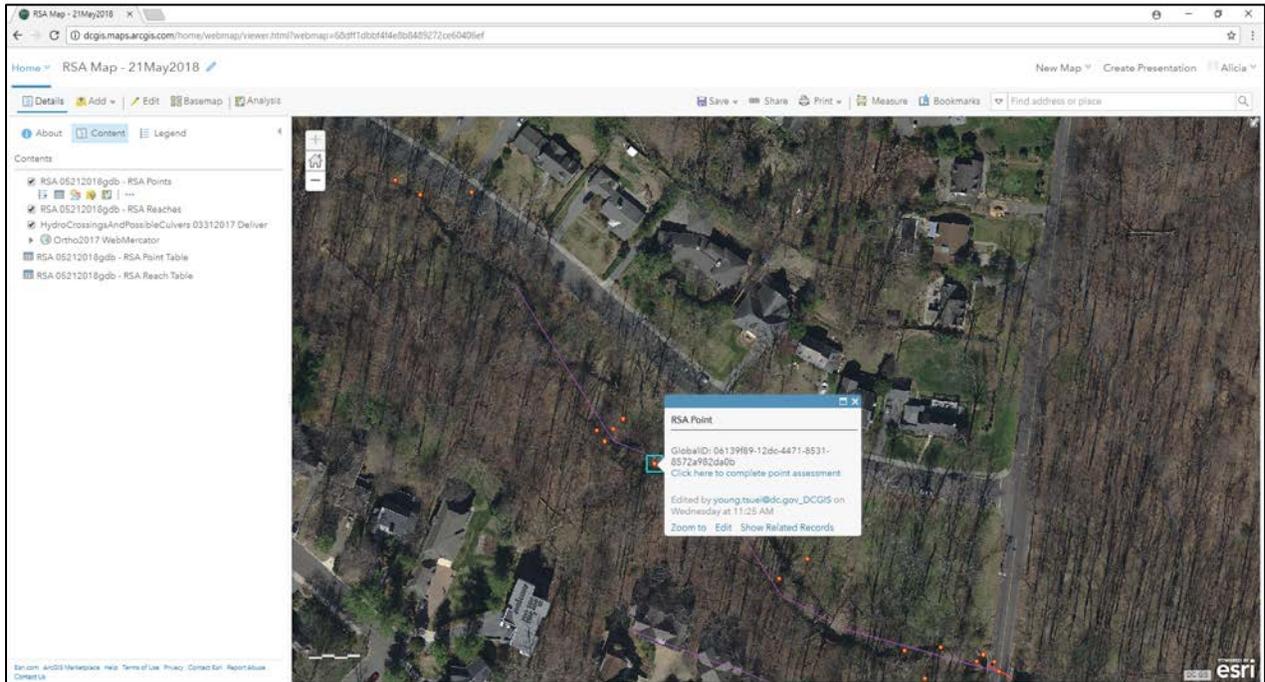
Navigate to your Web Map (same Map as used in the field) and select by clicking its title.



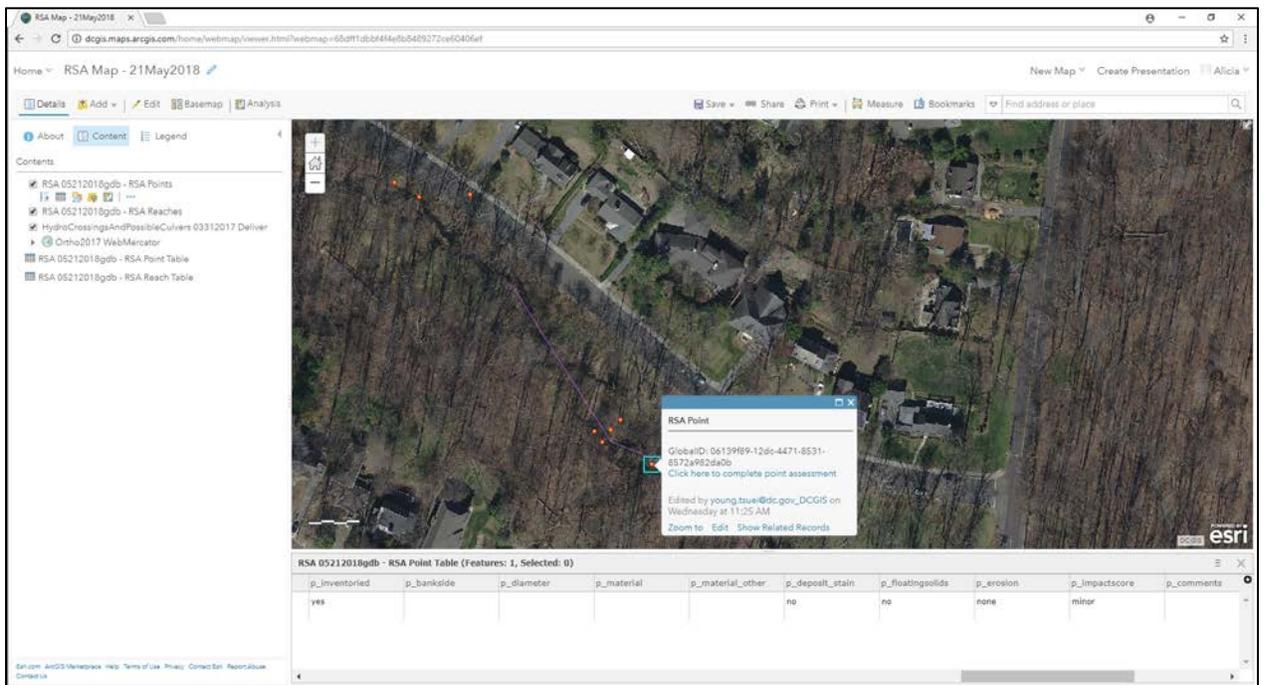
Click "Open in Map viewer"



Features on the map can be selected by clicking on them.



Attribute data collected about the selected feature can be viewed by clicking "Show Related Records" in the pop-up window.

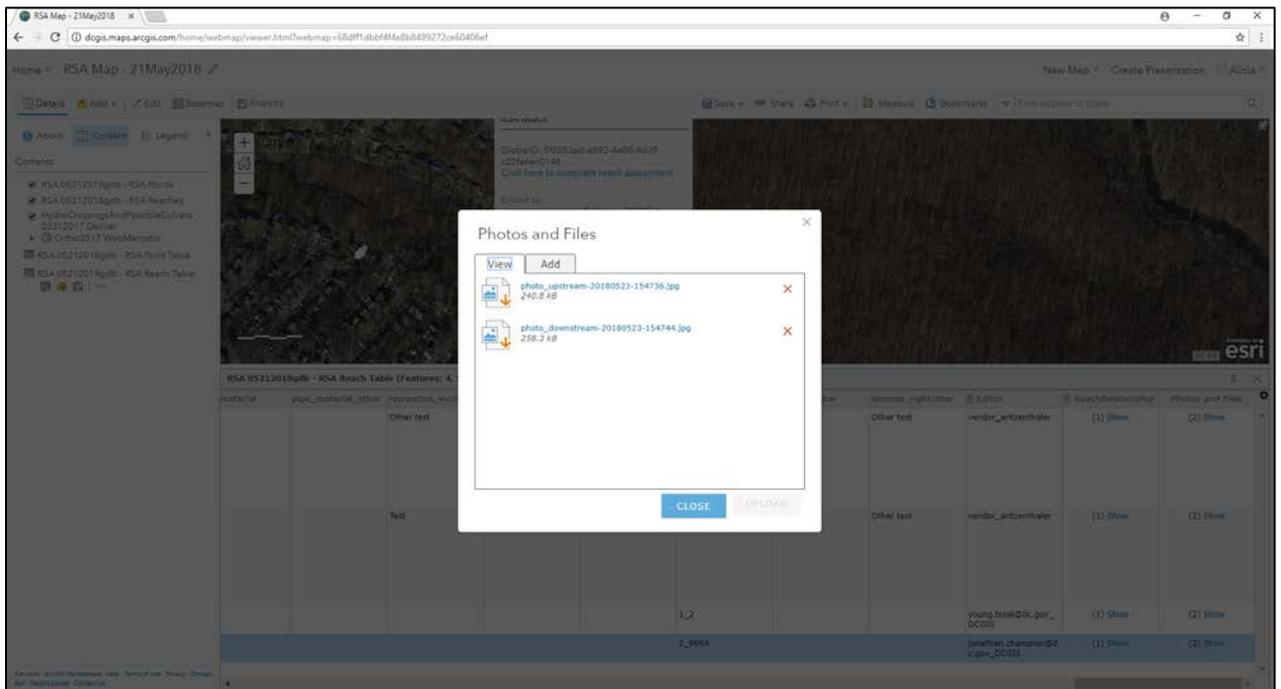
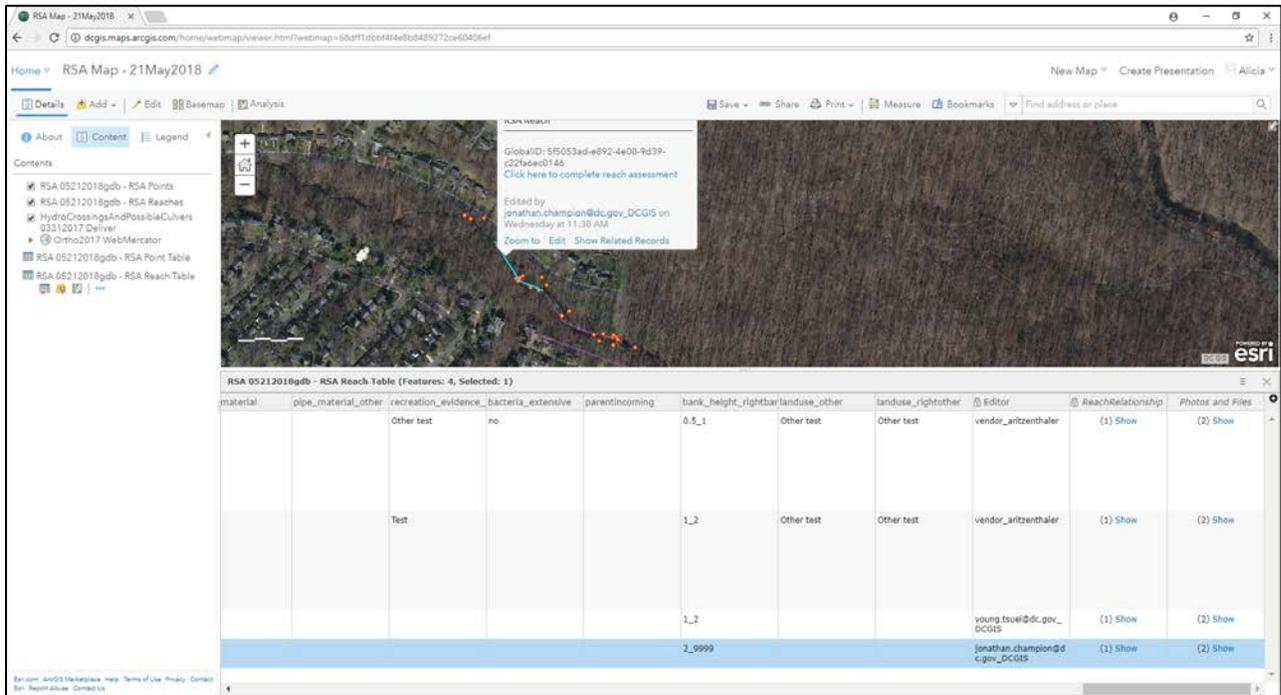


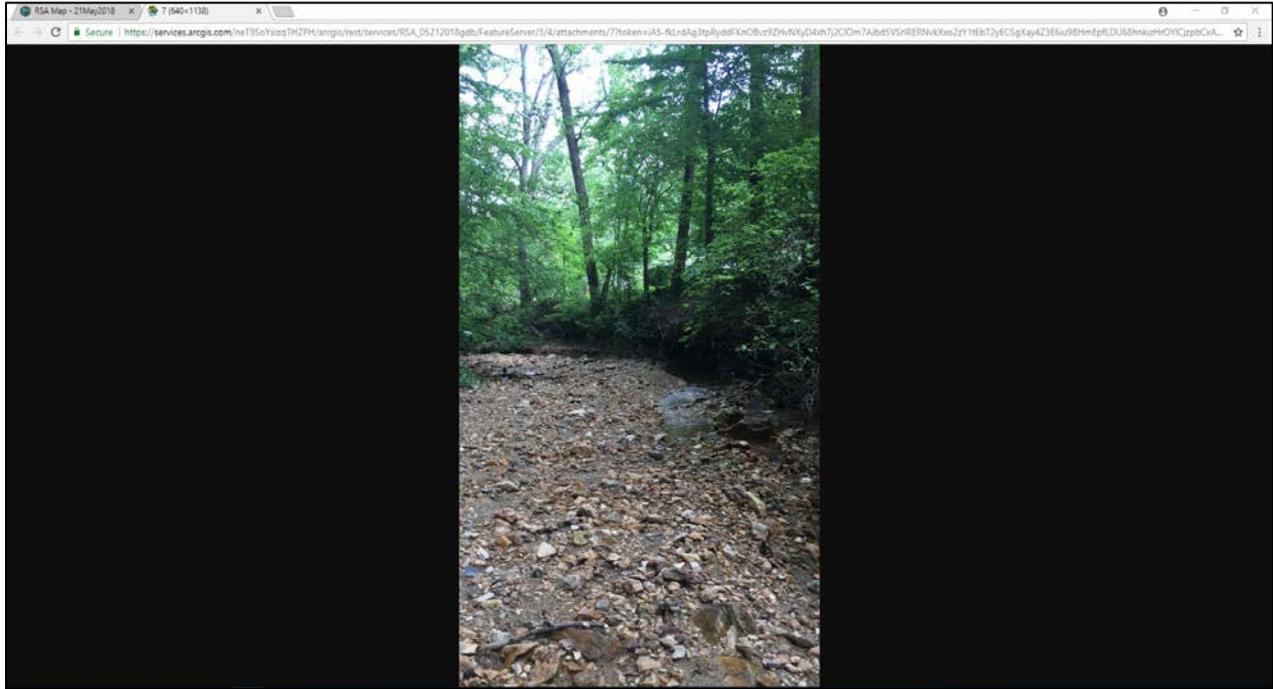
Attributes can also be viewed for all records at once, in a tabular format, by opening the table.

The screenshot shows an ArcGIS web map interface. The map displays a stream reach assessment with several orange points along a stream. A pop-up window is visible over the map, showing details for a specific reach. Below the map, a table titled "RSA 05212018gdb - RSA Reach Table (Features: 4, Selected: 1)" is displayed. The table has the following columns: ReachID, reach\_type, water\_present, water\_presence, water\_clarity, odor, max\_depth\_cm, avg\_depth\_cm, width\_cm, fish\_present, and aquatic\_veg\_pr. The first row is highlighted in blue.

ReachID	reach_type	water_present	water_presence	water_clarity	odor	max_depth_cm	avg_depth_cm	width_cm	fish_present	aquatic_veg_pr
TestReachA1	open_channel	yes	stagnant	clear,milky,other,foamy greenish,dark_brown, light_brown,oily_shee r,redfish,turbid,iron, loc	chlorine,fishy,sewage, petroleum,rotten_eggs, none,other	7	0_10	0_1	yes	submerged,floati mergent
	open_channel	no								
	open_channel	yes	flowing	clear	none	90	10_30	3_6	yes	submerged
	open_channel	yes	flowing	clear	none	60	10_30	3_6	yes	emergent

Once you're viewing attributes, either all records or for a selected record(s), scroll to the far right of the table to view photo attachments.



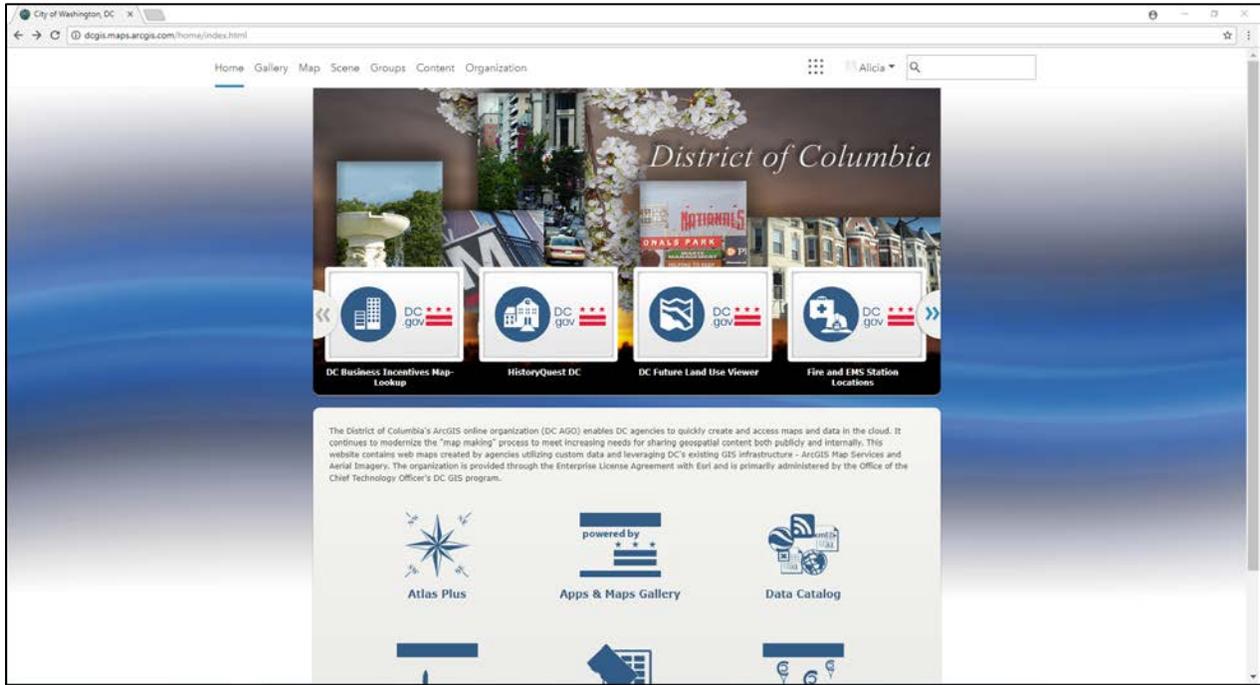


Right click photo to save and download if desired.

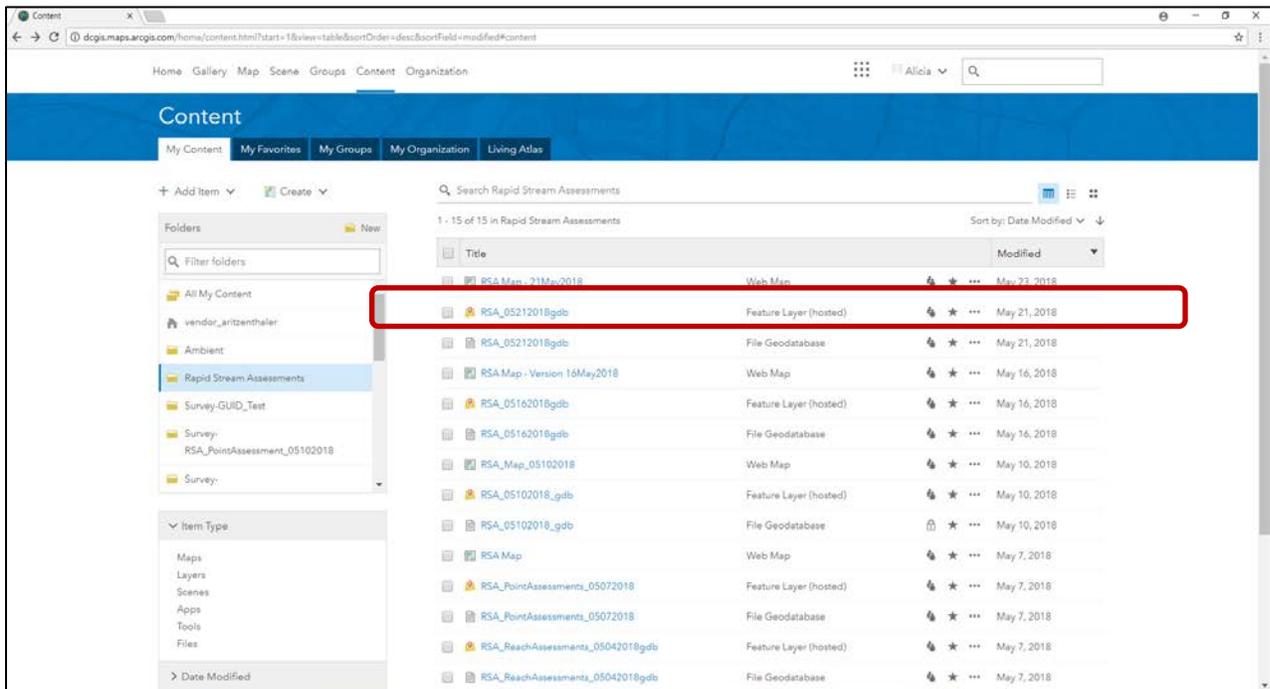
## 6.2. View in ArcMap

Sign into your ArcGIS online account.

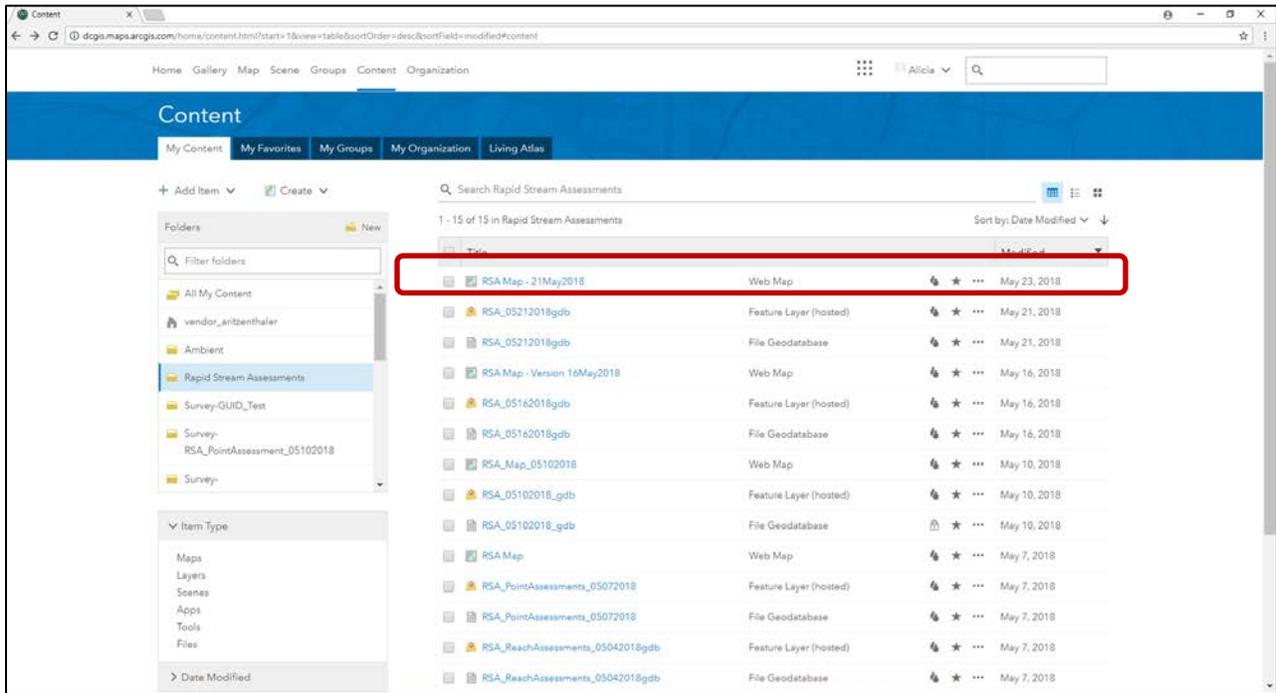
Click "Content"



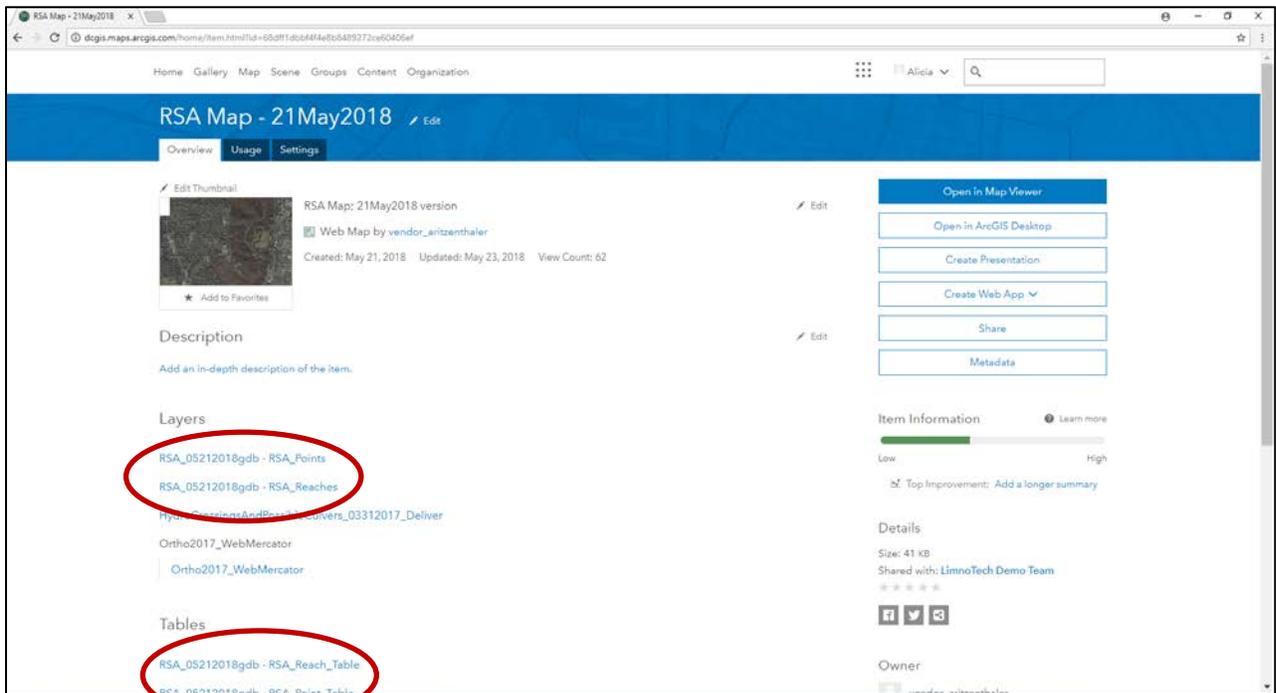
Navigate to your feature layer. Your feature layer is the file in which all data you've collected is saved.



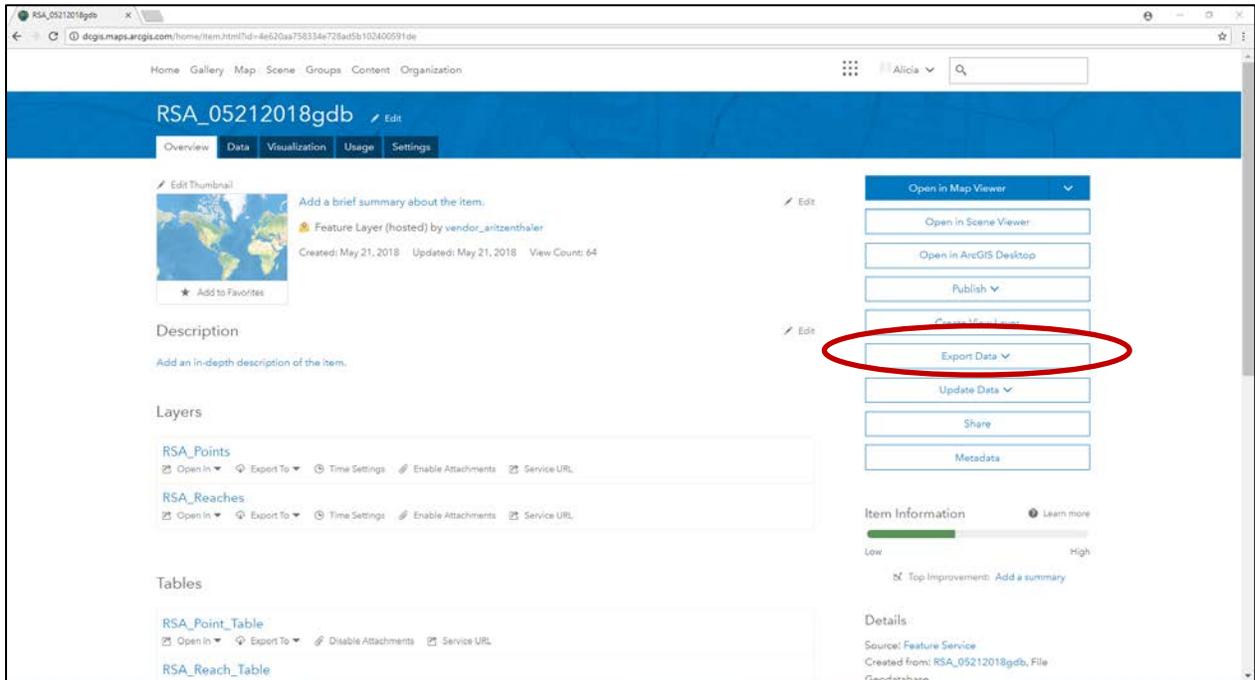
If you have trouble identifying which feature layer you need you can look this up by clicking on the Web Map that was used in Collector.



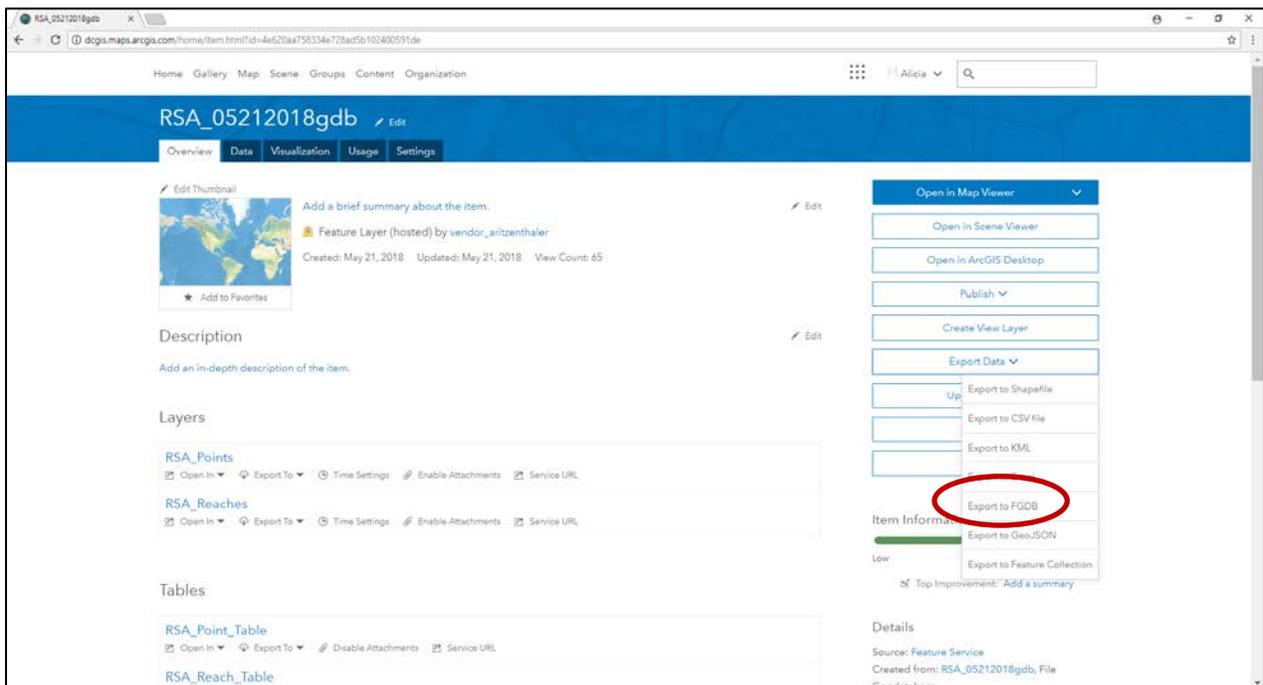
Check layer names present in map.



Once you've selected your feature layer click "Export Data".



Then select "Export to FGDB".



Provide title, tags, summary, and a folder to which the file will be saved. Click “Export”.

### Export to File Geodatabase ✕

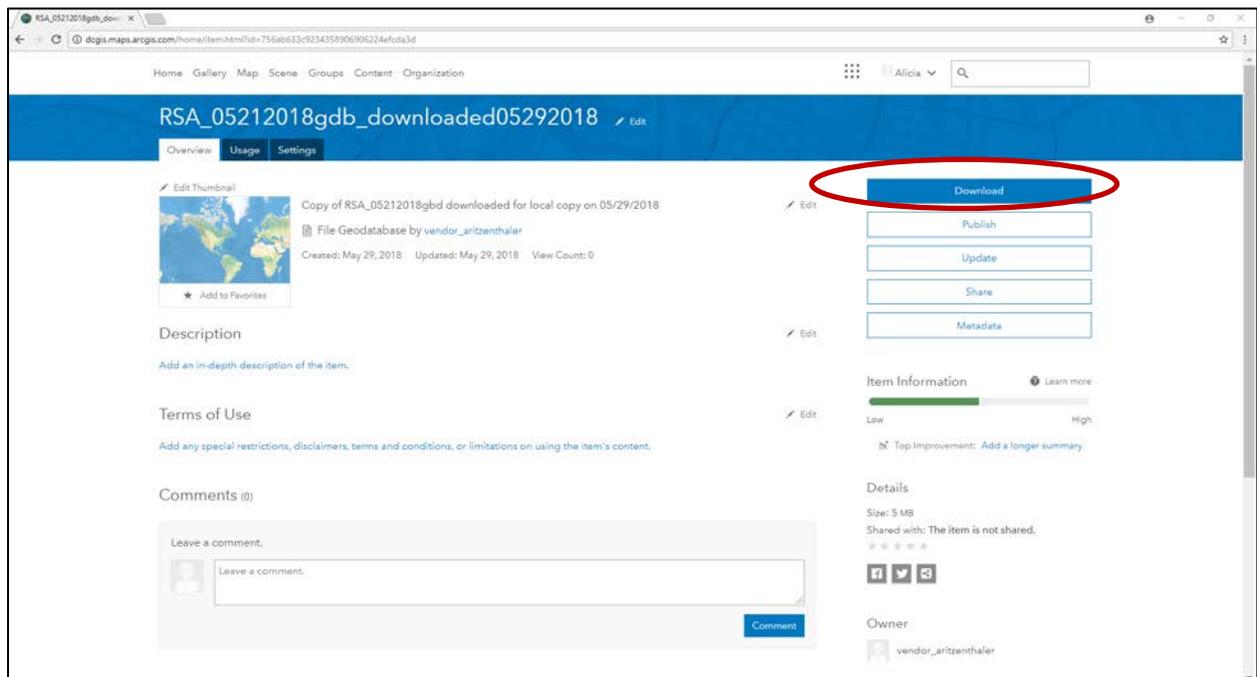
Title:

Tags:  
  
Add tag(s)

Summary:

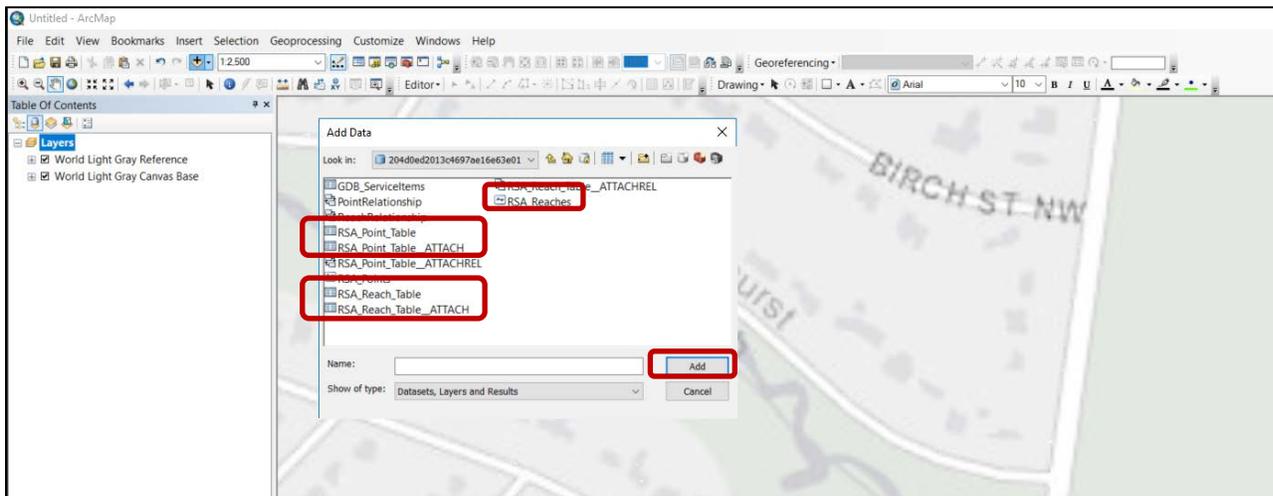
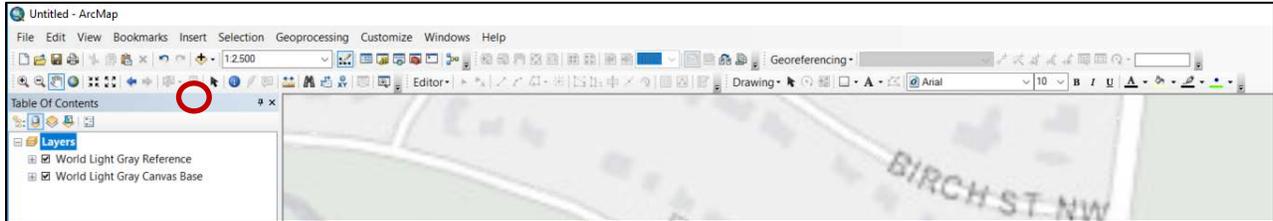
Save in folder:  
  
▼

After the export is complete, download a local copy by selecting “Download”.



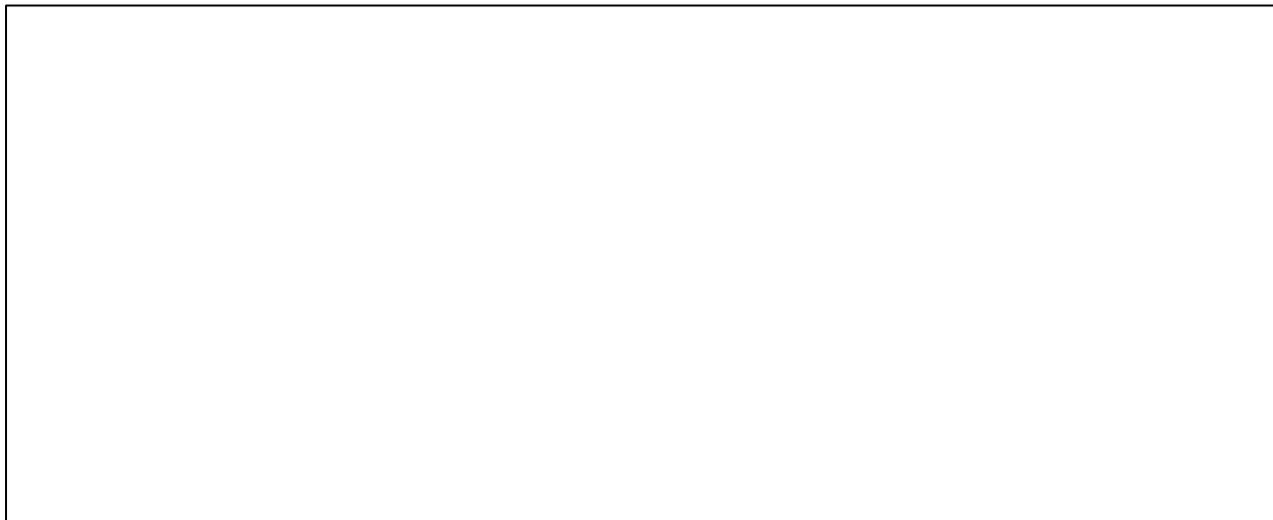
Open ArcMap.

Click the “ ” icon and navigate to the folder your geodatabase is saved. Add your feature class(es), table(s), and ATTACH table(s) to your map.

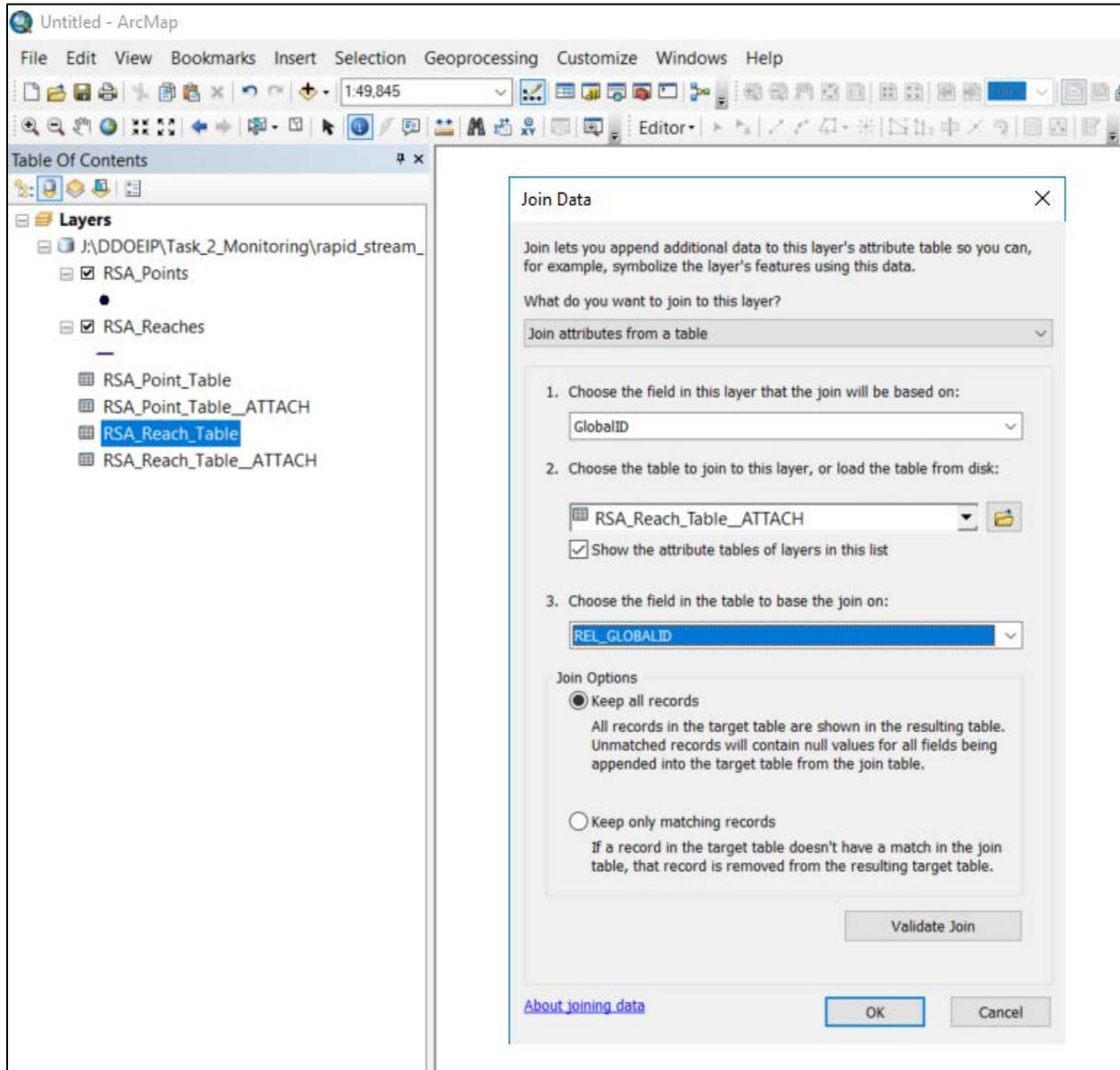


To see all the data in a single table, join the table and ATTACH table to the feature, as done below. Repeat the following steps for each set of features in your map (i.e. join the reach table, reach ATTACH table, and reach features. Repeat process with point table, point ATTACH table, and point feature.)

*Right click the table and select “Join”.*

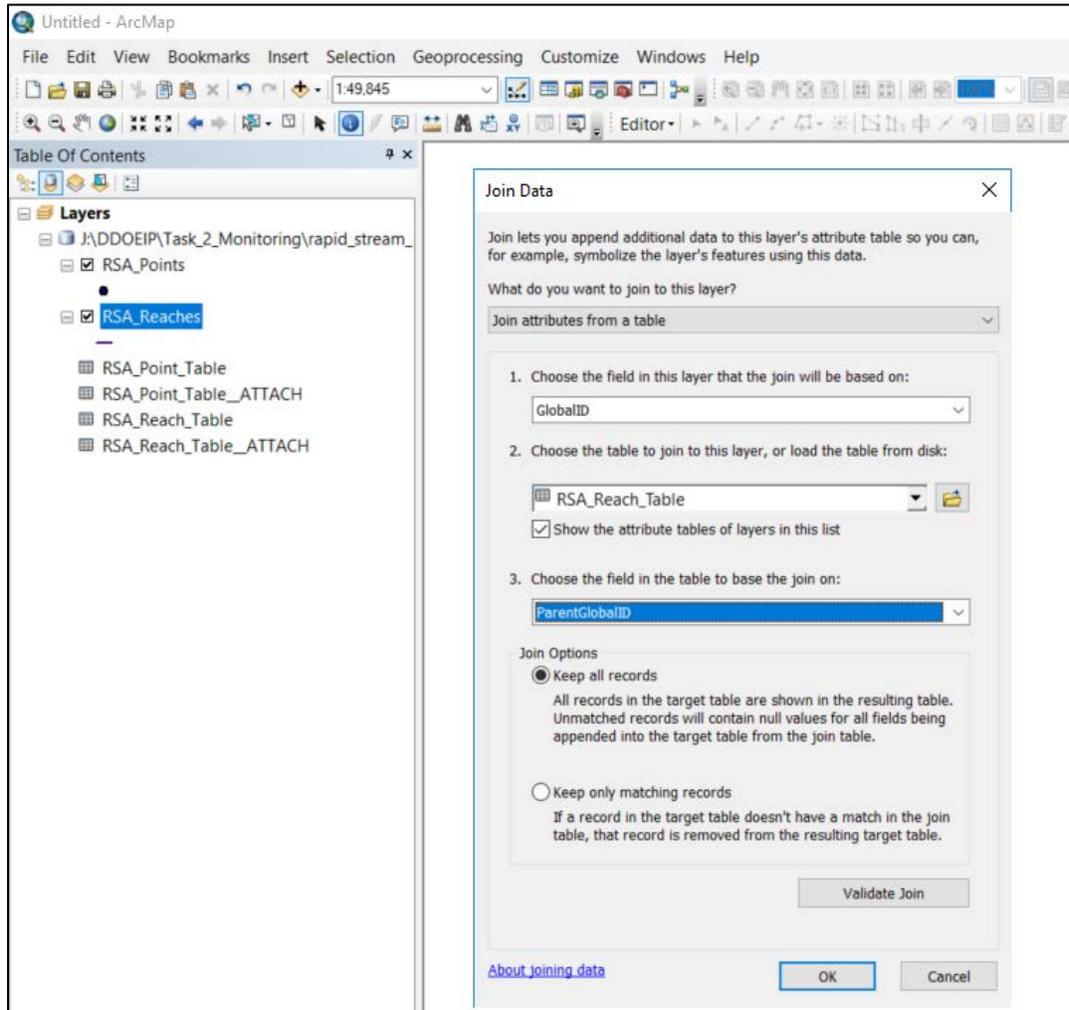


Join the ATTACH table to the table as illustrated below.



*Now right click the feature and join the table to the features as shown below:*

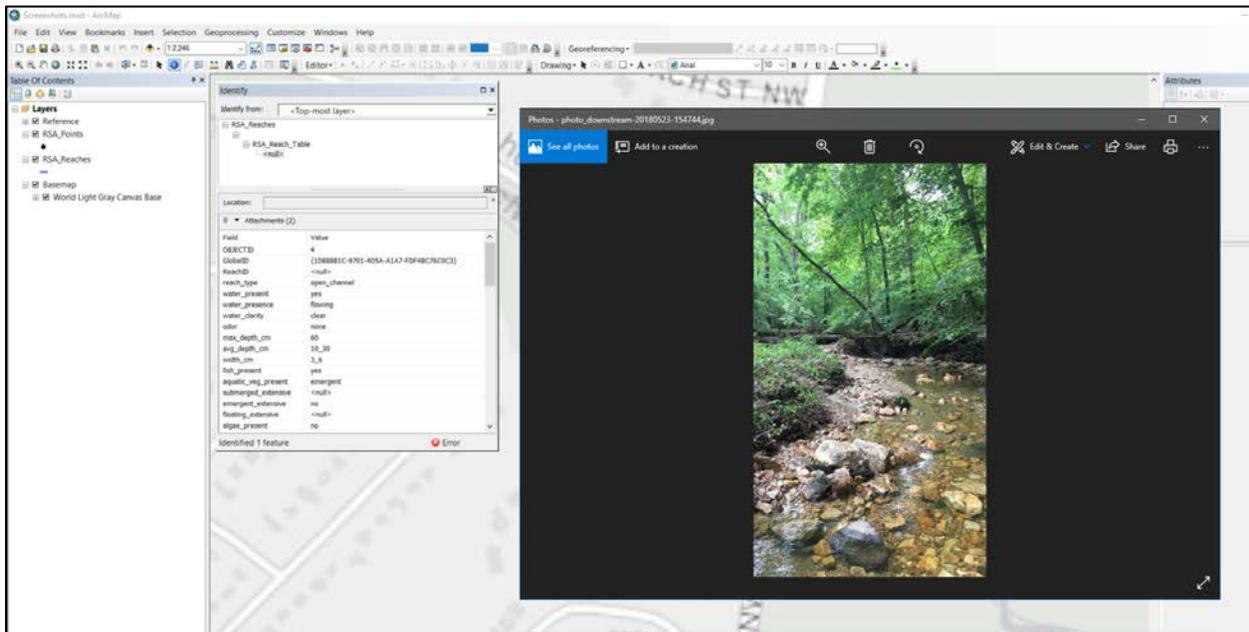
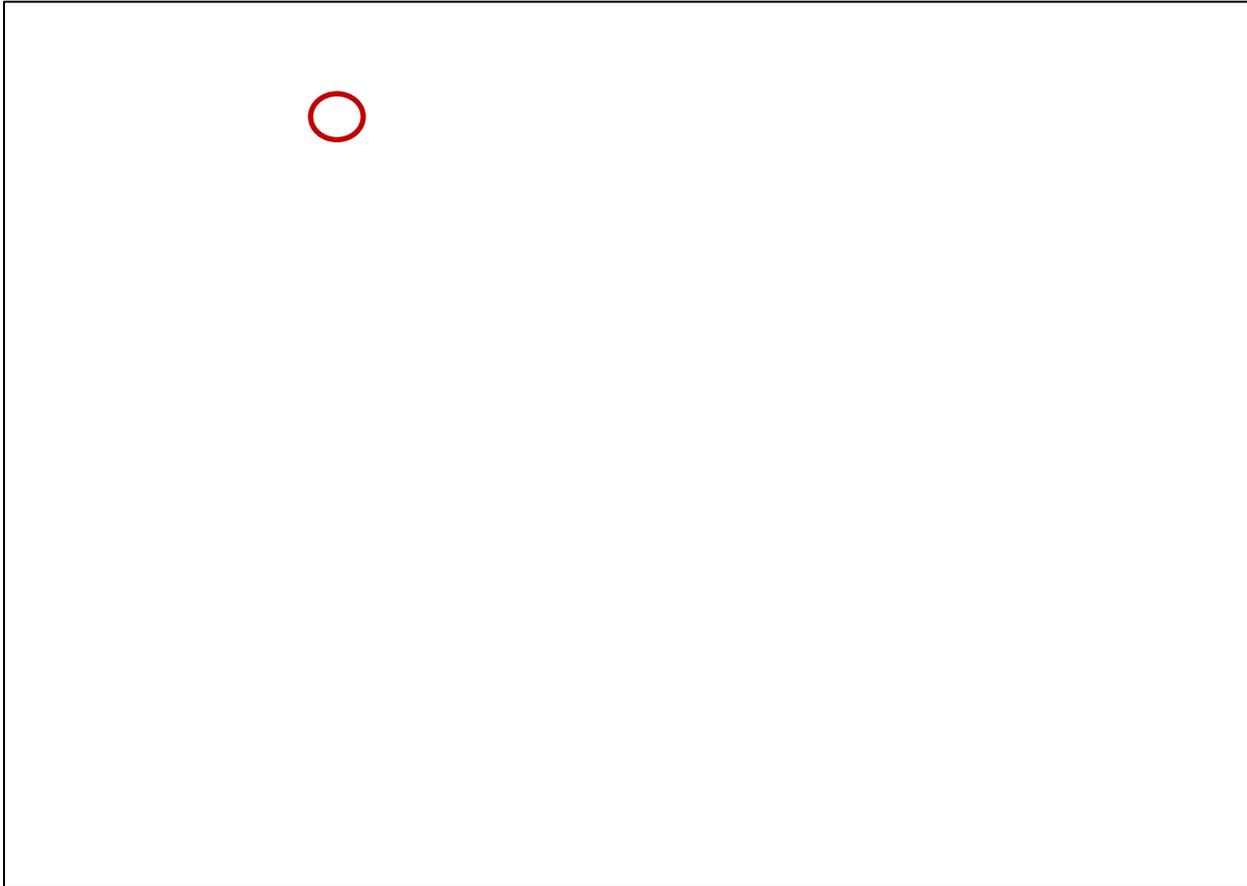




Data from the table can now be viewed in the attribute table of the feature class by right clicking the feature class and choosing "Open Attribute Table".



Using the “Identify” tool, you can view (and download) the photos associate with an identified feature by clicking on the feature of interest, expanding the nested related layers, and clicking on attachments.



If you wish to export photos out of the geodatabase all at once you can do so following the directions ESRI has provided online here: <https://support.esri.com/en/technical-article/000011912>

## **7.0 Data backup**

Data collected using the Collector/Survey 123 tool is backed up from AGOL as a geodatabase and saved to DOEE GIS servers using a python script, scheduled daily. This script is overseen by DOEE IT staff.

Appendix 4:  
Contact List for Reporting Urgent  
Concerns/Flags

# Appendix 4

## Contact List for Reporting Urgent Concerns/Flags

Urgent concerns (i.e. downed power lines, leaking sewage lines, critical infrastructure damage threatening human safety) should be reported by the field collector immediately to the proper authority. The project manager or their designee should review the database for point assessments that have been flagged as needing non-urgent attention. Non-urgent concerns (i.e. dumpsite, bank erosion for potential restoration, aging infrastructure) should be reported to the appropriate department within six weeks of identifying the concern.

Contacts are as follows:

Issue	Contact
<b>Immediate threats to humans and the environment</b>	911
<b>Downed power lines</b>	202-872-3432 (Pepco)
<b>Leaking sewage lines</b>	202-612-3400
<b>Water main breaks</b>	202-612-3400
<b>Fallen trees/limbs in public space</b>	311 (DDOT)
<b>Dumpsites</b>	311 (DPW)
<b>Severe bank erosion for potential restoration</b>	NRA WPD
<b>Illicit discharges</b>	NRA IED
<b>Deteriorating infrastructure</b> <ul style="list-style-type: none"><li>• <b>Bridges</b></li><li>• <b>Outfalls</b></li></ul>	DDOT –GI Section And Maintenance Division

## Appendix 5: Acceptability Rubrics

# Appendix 5

## Acceptability Rubrics

The following rubrics have been developed using the data collected during the first year of the Rapid Stream Assessment (RSA) program. This process has been used to establish an acceptable level of variation that can be expected between teams and across sites. As additional data are collected in subsequent years of this program, providing a more substantive basis upon which to establish acceptable variation, it is expected that minor modifications will be made (e.g., percentage of responses that must pass). Additionally, professional judgement should be taken into account in evaluating RSA data within these rubrics. This may include taking additional information into consideration in evaluating data including narrative comments associated with a site, the review of photos, and the a general understanding of a site/reach and its characteristics.

To ensure the quality of each survey conducted, 85% of the answers within each overlapping survey must achieve a passing score. To ensure the quality of all QAQC surveys throughout the field season, 85% of overlapping surveys must receive a passing score.

To determine if specific metric is being evaluated properly, 85% of all scores across all QAQC surveys throughout the field season must achieve a passing score for that specific metric.

Table 1. Reach Rubric

Metric	Criteria 1	Criteria 2
Reach Type	Identical Match	90% of responses should pass
	Difference w/ explanatory comment	
Water Presence	Identical Match	> 85% of responses should match identically <b>AND</b>
	Difference w/ explanatory comment	90% of responses should pass
Water Flow	Identical Match	90% of responses should pass
	Difference w/ explanatory comment	
Water Clarity	Identical Match	> 60% of responses should match identically <b>AND</b>
	At least one common water clarity <b>AND</b> no more than two differing response per assessment	75% of responses should pass

Odor	Identical Match	> 80% of responses should match identically <b>AND</b>
	If presence/ absence of odor differs: No more than 1 odor present	85% of responses should pass
	If odor is present but differs: Assessments should include at least one common odor	
Maximum Depth Encountered	Max depth is <100cm and responses differ by <5cm	80% of responses should pass
	Max depth is >100cm and responses differ by <20%	
Average Depth	Identical Match	> 75% of responses should match identically <b>AND</b>
	Responses which differ do not differ by more than one category	85% of responses should pass
Maximum Width	Identical Match	> 65% of responses should match identically <b>AND</b>
	Responses which differ do not differ by more than one category	85% of responses should pass
Fish Presence	Responses should match identically	85% of responses should pass
Aquatic Vegetation	Identical Match	> 80% of responses should match identically <b>AND</b>
	Assessments include at least one common vegetation type <b>AND</b> no more than one differing type	85% of responses should pass
Algae	Responses match in regards to presence/absence	> 80% of responses should match regarding presence/absence <b>AND</b>
	Compared responses do not indicate both "absent" and "extensive"	85% of responses should pass
Bacteria Presence	Responses match in regards to presence/absence	> 75% of assessments should match regarding presence/absence with common character <b>AND</b>

	Responses do not match regarding presence/absence but bacteria is not extensive	85% of responses should pass
Trash	Identical Match	> 60% of responses should match identically <b>AND</b>
	Responses which differ do not differ by more than one category	85% of responses should pass
Riparian vegetation width	Identical Match	> 80% of responses should match identically <b>AND</b>
	Responses which differ should not be more than one category apart on either bank.	85% of responses should pass
Riparian Vegetation Type - <b>Left Bank</b>	<b>Left Bank:</b> Top ranked vegetation type of Team 1 is within the top two vegetation types ranked by Team 2 <b>AND</b> Top ranked vegetation type of Team 2 is within the top two vegetation types ranked by Team 1.	85% of responses should pass
	<b>Left Bank:</b> Top ranked vegetation type of Team 1 is within the top two vegetation types ranked by Team 2 <b>AND</b> Top ranked vegetation type of Team 2 is listed by Team 1.	
Riparian Vegetation Type - <b>Right Bank</b>	<b>Right Bank:</b> Top ranked vegetation type of Team 1 is within the top two vegetation types ranked by Team 2 <b>AND</b> Top ranked vegetation type of Team 2 is within the top two vegetation types ranked by Team 1.	
	<b>Right Bank:</b> Top ranked vegetation type of Team 1 is within the top two vegetation types ranked by Team 2 <b>AND</b> Top ranked vegetation type of Team 2 is listed by Team 1.	

Substrate Type	Top ranked substrate type of Team 1 is within the top two substrate types ranked by Team 2 <b>AND</b> Top ranked substrate type of Team 2 is within the top two substrate types ranked by Team 1.	85% of responses should pass
	Top ranked substrate type of Team 1 is within the top two substrate types ranked by Team 2 <b>AND</b> Top ranked substrate type of Team 2 is listed by Team 1.	
Shading	Identical Match	> 60% of responses should match identically <b>AND</b>
	Responses which differ should not be more than one category apart.	85% of responses should pass
Floodplain Connectivity	Identical Match	> 75% of assessments should match identically <b>AND</b>
	Responses which differ should not be more than one category apart.	95% of responses should pass
Bank Erosion	Identical Match	75% of responses should pass
	If presence/absence of bank erosion differs: Compared responses should not include both "none" <b>AND</b> more than 1 impact.	
	If bank erosion is present: Assessments should include at least one common impact <b>AND</b> no more than 2 differing impacts per assessment	
Woody Debris	Responses should not differ >5 <b>OR</b> exceed 65% difference (whichever is greater)	60% of responses should pass
Recreation Evidence	Identical Match	> 60% of assessments should match identically in regards to presence/absence of recreation <b>AND</b>
	Compared responses include "none" <b>AND</b> 1 recreation type	85% of responses should pass

	Responses do <b>NOT</b> include "none" <b>AND</b> include at least one common type <b>AND</b> no more than 1 differing type per assessment	
Rosgen Classification	Identical Match	> 60% of responses should match identically <b>AND</b>
	Responses which differ should not be more than one category apart.	80% of responses should pass
<b>OVERALL TARGETS</b>	85% of All overlapping reaches pass	85% of all Metrics Pass

Table 2. Points Rubric

Metric		Criteria 1	Criteria 2
Deficient Buffer	Bankside	Identical response	> 80% of responses should match identically <b>AND</b>
		One common bankside	85% of responses should pass
	Length of deficiency	Identical response	85% of responses should pass
		Responses which differ do not differ by more than one category	
	Riparian Cover in Deficient Buffer Area	All, or all but two, of the cover type(s) are the same on both assessments.	85% of responses should pass
Impact Score	Identical Match	85% of responses should pass	
	Responses which differ do not differ by more than one category		
Crossing	Type	Responses should match identically	85% of responses should pass
	Diameter/width	Identical Match	>65% of responses should match identically <b>AND</b>
		Responses which differ do not differ by more than one category	85% of responses should pass
	Length	Identical Match	> 65% of responses should match identically <b>AND</b>
		Responses which differ do not differ by more than one	85% of responses should pass

	category		
	Material	All, or all but one, of the material type(s) are the same on both assessments.	75% of responses should pass
	Downstream debris	Responses should match identically	85% of responses should pass
	Downstream Erosion	Responses match in regards to presence/absence <b>AND</b> erosion height is within one category (if present)	> 75% of assessments should match regarding presence/absence with similar height <b>AND</b>
		Responses do not match in regards to presence/absence <b>but</b> erosion height is 0-1m	85% of responses should pass
	Downstream sediment	Responses should match identically	85% of responses should pass
	Upstream debris	Responses should match identically	85% of responses should pass
	Upstream Erosion	Responses match in regards to presence/absence <b>AND</b> erosion height is within one category (if present)	> 75% of assessments should match regarding presence/absence with similar height <b>AND</b>
		Responses do not match in regards to presence/absence <b>but</b> erosion height is 0-1m	85% of responses should pass
	Upstream sediment	Responses should match identically	85% of responses should pass
	Impact Score	Identical Match	85% of responses should pass
Responses which differ do not differ by more than one category			
Dumpsite	Bankside	Identical response	> 80% of responses should match identically <b>AND</b>
		One common bankside	85% of responses should pass
	Location	Identical response	> 80% of responses should match identically <b>AND</b>
		At least one common location	85% of responses should pass
	Cleanup potential	Responses should match identically	85% of responses should pass
Material dumped	All, or all but two, of the dumped material(s) are the	75% of responses should pass	

		same on both assessments.	
	Trash Volume	Identical Match	> 80% of responses should match identically <b>AND</b> 85% of responses should pass
		Responses which differ do not differ by more than one category	
	Impact Score	Identical Match	85% of responses should pass
		Responses which differ do not differ by more than one category	
Erosion	Bankside	Identical response	> 80% of responses should match identically <b>AND</b> 85% of responses should pass
		One common bankside	
	LEFT Bank Height	Identical Match	> 80% of responses should match identically <b>AND</b> 85% of responses should pass
		Responses which differ do not differ by more than one category	
	Right Bank Height	Identical Match	
		Responses which differ do not differ by more than one category	
	Impact of Erosion	Identical Match	75% of responses should pass
If presence/absence of bank erosion differs: Compared responses should not include both "none" <b>AND</b> more than 2 impacts.			
If bank erosion is present: Assessments should include at least one common impact <b>AND</b> no more than 2 differing character type per assessment			
Pipes	Bankside	Identical response	> 80% of responses should match identically <b>AND</b>
		One common bankside	85% of responses should pass
	Pipe diameter	Identical Match	> 75% of responses should match identically <b>AND</b>
		Responses which differ do not differ by more than one category	85% of responses should pass

	Pipe material	Identical Match	> 75% of responses should match identically <b>AND</b>
		Difference w/ explanatory comment	85% of responses should pass
	Floating solids/trash	Responses should match identically	85% of responses should pass
	Erosion due to pipe	Identical Match	> 65% of responses should match identically <b>AND</b>
		Responses which differ do not differ by more than one category	75% of responses should pass
	Impact Score	Identical Match	75% of responses should pass
Responses which differ do not differ by more than one category			
Discharge concern	All, or all but one, of the discharge concern is listed on both assessments (if discharge present)	85% of responses should pass	
Utility Line	Exposed sewer	Responses should match identically	85% of responses should pass
		Fail Comparison	
	Utility diameter	Identical Match	> 80% of responses should match identically <b>AND</b>
		Responses which differ do not differ by more than one category	85% of responses should pass
	Utility material	Identical Match	> 75% of responses should match identically <b>AND</b>
		Difference w/ explanatory comment	85% of responses should pass
	Condition	Identical Match	> 80% of responses should match identically <b>AND</b>
		Responses which differ do not differ by more than one category	85% of responses should pass
	Impact Score	Identical Match	85% of responses should pass
		Responses which differ do not differ by more than one	

		category	
Fish Blockage	Man-made	Responses should match identically	85% of responses should pass
	Height	Identical response	85% of responses should pass
Responses which differ do not differ by more than one category			
<b>OVERALL TARGETS</b>		85% of all overlapping points pass	85 % of all Metrics pass

Table 3. Assessment Conflicts Rubric

Conflict	Criteria 1	Criteria 2
Feature Conflicts	Feature type conflicts; Assessments describe similar conditions/observations	Should account for >65% of feature conflicts
	Feature type conflicts; Assessments describe incomplete conditions/observations	Should account for <35% of feature conflicts
	Feature type conflicts; Assessments do NOT describe similar conditions/observations	Should account for <5% of feature conflicts
Missing Points	Located along unassessed reach	Should not exceed 10% of all points assessed
	Unobserved - Deficient Buffer	
	Unobserved - Crossing	
	Unobserved - Dumpsite	
	Unobserved - Erosion	
	Unobserved - Pipes	
	Unobserved - Utility line	
	Unobserved - Fish blockage	
Unobserved - Other		
Differing Point Assessments	Considered unobserved, missing points	

Missing Reaches	Distance of reach when a feature conflict occurs (if assessments do not describe conditions/observations, or describe them incompletely)	Should not exceed 10% of the assessed distance
	Distance of reach that is unobserved	
Differing Reach Assessment Type	Assessment contains explanatory note	Should account for >95% of reach assessment type conflicts
	Assessment contains no explanation	Should account for <5% of reach assessment type conflicts