BLM’s Aquatic Assessment, Inventory, and Monitoring (AIM)

Data Management & Stream and River Assessment Hub (SARAH) Protocol - 2019 Field Season

VERSION 2.0

Produced by BLM National Operations Center (NOC) and the BLM/USU National Aquatic Monitoring Center (NAMC) – 3/2019
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1.0 Protocol Overview

The purpose of this protocol is to define and describe the data collection, data management, quality assurance (QA), and quality control (QC) steps for all aquatic Assessment, Inventory, and Monitoring (AIM) implementation members. The protocol starts with a high level overview of AIM data management and QA/QC during training, data collection, data submission and post-collection data processes (Section 3). This high level overview is followed by step by step instructions for processes such as:

- Downloading and using Stream and River Assessment Hub (SARAH) (Section 4 & 4.7)
- Completing QA/QC checks within SARAH (Section 4.4)
- Backing up data (Section 4.5)
- Submitting data to the National AIM Team (Section 4.6)
- Completing one month and end of season check-ins (Appendix B & C)
- Troubleshooting SARAH (Section 4.8)

In addition to this protocol, all members of the AIM implementation team should frequently reference the aquatic AIM field method protocol (TR 1735-2) and the aquatic AIM Site Evaluation and Design Management Protocol throughout the field season to ensure data quality. Project leads, state leads, monitoring coordinators, and crew supervisors should additionally be familiar with the general AIM steps and additional resources found here. Prior to data collection it is also important to define roles and responsibilities of all implementation team members. Individuals involved in project planning should consult contract task orders and this example roles and responsibilities table to define roles and responsibilities on contract kick-off calls.

2.0 What is Data Management and QA/QC?

Data management: processes, and means of organizing and storing data. Data management is a key tenet of AIM and is critical to the success of the AIM program.

Quality Assurance (QA): A proactive process intended to minimize the chance of an error being inserted into the data. The actions included for quality assurance include: training, calibration, data management, electronic data capture, and data checks.

Quality Control (QC): A reactive process of detecting, noting, and if possible, fixing errors which occurred in the data collection and storage process. The goal is to identify errors/problems after the data are collected but before data are released. The actions included for quality control include: identifying missing data, conducting data checks, and data management.

Importance of Data QA/QC: Although implementing AIM QA/QC steps may seem tedious, they are critical steps in the monitoring process. Careful attention must be paid to the QA/QC processes because errors in the data will be amplified as data are used to make land management decisions. QA/QC should be implemented throughout the data life cycle, but in this document we focus on measures that can be taken during and just after data collection. The spirit of these requirements is to protect us all from a bad investment in monitoring! Rigorous QA/QC strategies make our datasets stronger and more defensible.
QA/QC checks are composed of the following components:

**Data accuracy**: a measure of how close the data are to the “truth”.

**Data precision**: a measure of how repeatable data are.

**Data completeness**: ensures all data are collected, saved, and stored.

**Chain of custody**: a form that tracks the individuals responsible for data at different points in time, as data are transferred from field crew, to project lead, to NAMC, and to final storage at the NOC in AquADat.

### 3.0 Aquatic AIM QA/QC Steps

#### 3.1 Overview

Aquatic AIM QA/QC consists of steps that occur during five general processes: 1. training; 2. data collection; 3. data submission; 4. check-ins; 5. post-collection data processing. Table 1 details the QA/QC steps that need to be completed during each of these processes and why they are important. Table 2 details who is primarily responsible for each step and when it should occur. A written description of each step follows the tables.

Table 1. The aquatic AIM QA/QC steps and their purpose.

<table>
<thead>
<tr>
<th>Process</th>
<th>QA/QC Step</th>
<th>Purpose</th>
<th>Accuracy</th>
<th>Precision</th>
<th>Completeness</th>
<th>Chain of Custody</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>Field training</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calibration</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field orientation to critical concepts for local FOs</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data collection</td>
<td>Electronic data capture</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data backup</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Data submission</td>
<td>Weekly updating of design management file</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pre-submission data review</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Critical concept QC for first month of work</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electronic data submission</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI &amp; WQ sample submission to NAMC</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Check-ins</td>
<td>One month and end of season check ins</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Post-collection data processing</td>
<td>Repeat sampling by independent field crew</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Raw data QC</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computed indicator QC</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AquADat ingestion</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Table 2. Timeframe and implementation team member responsible for completing aquatic AIM QA/QC steps.

<table>
<thead>
<tr>
<th>Process</th>
<th>QA/QC Step</th>
<th>Lead</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>Field training</td>
<td>National AIM team</td>
<td>May-June</td>
</tr>
<tr>
<td></td>
<td>Calibration</td>
<td>National AIM team</td>
<td>May-June</td>
</tr>
<tr>
<td></td>
<td>Field orientation to critical concepts for local FOs</td>
<td>Project lead or crew supervisor</td>
<td>After field training before data collection</td>
</tr>
<tr>
<td>Data collection</td>
<td>Electronic data capture</td>
<td>Field crew</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Data backup</td>
<td>Field crew</td>
<td>Daily</td>
</tr>
<tr>
<td>Data submission</td>
<td>Weekly updating of design management file</td>
<td>Field crew</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Pre-submission data review</td>
<td>Crew supervisor or project lead</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Critical concept QC for first month of work</td>
<td>Crew supervisor or project lead</td>
<td>Weekly (first month)</td>
</tr>
<tr>
<td></td>
<td>Electronic data submission</td>
<td>Field crew</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>BMI &amp; WQ sample submission to NAMC</td>
<td>Crew supervisor or project lead</td>
<td>End of field season</td>
</tr>
<tr>
<td>Check-ins</td>
<td>One month and end of season check ins</td>
<td>State lead or monitoring coordinator</td>
<td>End of June and September</td>
</tr>
<tr>
<td>Post-collection data processing</td>
<td>Repeat sampling by independent field crew</td>
<td>National AIM team</td>
<td>Varies</td>
</tr>
<tr>
<td></td>
<td>Raw data QC</td>
<td>National AIM team</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Computed indicator QC</td>
<td>Project lead</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>AquADat ingestion</td>
<td>National AIM team</td>
<td>Bi-annually</td>
</tr>
</tbody>
</table>

3.2 Training QA/QC Steps

Training: The National AIM Team leads annual week long aquatic AIM field methods trainings in late spring and early summer to teach field collection methods following TR 1735-2. Pre-training coursework is also required and can be found [here](#). All members of the implementation team must participate. Those collecting AIM data in the field must attend every year. Project leads and crew supervisors should attend the first 3.5 days field methods training at least every two years and should review updates to protocols every year.

Calibration: comparison between data collectors that occurs during training. Trainers will discuss any discrepancies, use them as a learning opportunity, and store the results.

Field orientation to critical concepts for local FOs: Field methods trainings cannot fully introduce individuals to the diversity of stream types present on BLM lands so a local orientation to critical concepts such as bankfull and floodplain height is required. This additional training should be led by project leads and crew supervisors should participate where possible. This training could include reviewing local crew photos from previous years, going out to field sites, and reviewing existing regional reference curves for local gauged sites.
3.3. Data Collection QA/QC Steps

Electronic data capture: all data (including photos and GPS coordinates) will be collected electronically using an iPad (see here for requirements). The iPad battery lasts for approximately one site worth of data collection and iPads will overheat if the temperature gets above 95 degrees. Therefore, care should be taken to maximize battery life and keep iPads out of direct sunlight. The data collection application, SARAH, has numerous QA/QC checks included within the system. These include but are not limited to: providing pop-ups when there are missing data or data that are outside typical or possible ranges for a specific measurement. Additionally, when data collection has concluded at a site, the program will list all missing data and outlier values. Crews correct any data errors found during these checks prior to leaving a site. Use of the data collection program will be part of the training in May. For more information about SARAH, see Section 4.

Data backup: The crew will need to backup data during each field trip whenever internet access (4G or Wi-Fi) is available. Preferably this occurs daily after every site but it MUST occur after every three sites. This will allow data recovery if, for example, the iPad is lost or stolen. External backup USB drives should be used for crews that have poor access to internet (AK). Field data sheets should be used as a backup for data entry in case the iPad battery dies or malfunctions, but all data entered on data sheets must eventually be entered electronically into SARAH. See section 4.5 for more information.

3.4 Data Submission QA/QC Steps

Weekly updating of design management file: The Design Management google sheet contains the worksheet “Trip Planning and Field tracking” that is used to track field visits to sample sites, manage sample designs, and as a chain of custody form for electronic data submission of BMI and WQ samples. It can be filled out after each site or all at once at the end of the trip. Crews are primarily responsible for updating this worksheet, but project leads, crew supervisors, and the National AIM Team are also responsible for filling out certain columns. See Section 4.6.1 for more information.

Pre-submission data review: Field crews and project leads or crew supervisors are expected to meet and review a data summary before the field crew submits their final data for a given field trip. This catches common data errors prior to data submission and serves as a chain of custody when project leads or crew supervisors sign off on data. To facilitate this process, a .csv file from the iPad is automatically saved to the project-specific folder within the AIM_Aquatic FieldWork google drive folder when a crew backs up data via Wi-Fi. This is a spreadsheet that contains a limited summary of the data and specific fields that have been found to have frequent errors in previous years. The project lead or supervisor should review this file along with site photos, which can be found using a BOX link provided prior to field methods training. Crews and project leads or supervisors should consult Appendix A for specifics on how data should be checked during this review process. This meeting must occur prior to field crews submitting final data so that the crew can rectify all errors prior to submitting final data. Therefore, the meeting would ideally occur after every multi-day field trip (i.e. weekly) but should occur at least once
per month. See Section 4.6.2 for more information.

**Critical Concept QC for first month of work:** The process of identifying scour line, bankfull, and floodplain geomorphic features (i.e., Critical concepts) are particularly error prone. Therefore, a [supplemental photo protocol](#) has been created to better QC these features. In summary, crews take photos of the critical concept geomorphic features in the field, annotate the photos with the location of different geomorphic features, and review these with Project Leads. The QC of critical concepts should occur for every site sampled during the first month of the field season at a minimum.

**Electronic data submission to the National AIM Team:** After making any corrections identified during the pre-submission data review, field crews will send data to the National AIM Team through the SARAH application. Crews should submit data as frequently as possible to avoid memory issues on the iPad and so that the National AIM Team can start additional QC of data. See Section 4.6.3 for more information.

**BMI and WQ sample submission to NAMC:** Project leads should submit all bug samples and water quality samples to NAMC following the protocol found [here](#). These samples should be submitted at the end of the field season, but arrangements can be made to submit samples mid-season if needed. The Field Tracking and Trip Planning worksheet, within the design management spreadsheet, serves as an electronic chain of custody for BMI and water quality samples. The number of BMI and water quality jars and samples should be tracked throughout the field season in this worksheet.

### 3.5 Check-ins QA/QC Steps

**One month and end of season check-ins:** Meeting of the crew, project lead, state lead and/or monitoring coordinator, partner organization, and the National AIM Team to make sure QA/QC steps are being completed and that there is communication among all members of the implementation team. During this meeting, the one month and end of season check lists (Appendix B & C) can provide a starting point of questions to address unresolved protocol questions, app and iPad quirks, or logistical and gear issues such as YSIs malfunctioning. The state leads or monitoring coordinators should schedule and lead these meetings and all other parties should come prepared to discuss any issues that have arisen thus far throughout the season. If the state lead or monitoring coordinator is not able to schedule and lead these meetings, they should coordinate with the project leads to ensure these meetings occur. The one month check-in should ideally occur at the end of June and the end of season check-in should be scheduled before the end of contracts such that crews and crew supervisors are still available to clear up any data questions that may arise. Prior to end of season checks, all should all final data should have been submitted, and design management spreadsheets should be finalized and submitted to the National AIM team.

### 3.6 Post-Collection Data Processing QA/QC Steps

**Repeat sampling by independent crew:** The National AIM Team may have a dedicated crew to revisit and sample a proportion of sites sampled throughout the field season. Note this will assess...
crew and indicator precision rather than crew and indicator accuracy.

**Raw data QC:** The National AIM Team runs weekly QC reports on submitted raw data for missing data, legal, or typical value violations, logic checks, and outliers. Crew supervisors, project leads, and field crews may be contacted with specific data questions generated from QC reports if further information is needed to resolve issues. Edits and decisions on questionable data will be made and appropriately documented.

**Computed indicator QC:** Once a month, indicators will be calculated for project leads and posted as a spreadsheet within the AIM_Aquatic FieldWork google drive folder. The National AIM Team will do some preliminary checks on these computed indicators to ensure values fall within possible ranges, but QC of computed indicators is primarily the project lead’s responsibility. Indicator values should be evaluated in ecoregional and other ecological contexts after reviewing the values and photos. Specifically, QC could include viewing min and max indicator values, creating boxplots to view the distribution of values, and comparing values to values from previous years. Determine if the data tells a consistent story across multiple indicators. For example, if a site has unstable banks, it may also have poor riparian vegetative complexity and excessive fine sediment. If it doesn’t, you may identify that you have ecological concerns about the site or that the crew possibly made a mistake in data collection. The benchmark tool could assist with determining the condition of indicators. Indicator values can be pasted into the tool and default or project benchmarks can be used to assign sites condition classes. It’s important to give special attention to indicator values early in the season to ensure the crew does not continue to incorrectly collect data. Any issues found should be discussed with the National AIM Team, which will make and appropriately document any final edits.

**AquADat Ingestion:** The National AIM Team computes final indicators and data are ingested into AquADat every February, with the exception of macroinvertebrate data. Macroinvertebrate data is processed and then ingested into AquADat in August of the following year. Macroinvertebrate O/E or MMI scores can be provided earlier on an as needed basis.
4.0 SARAH-Field Data Collection and Submission

4.1 Overview
The Stream and River Assessment Hub (SARAH) application is a FileMaker iPad data application developed in conjunction with SAGEEnvironmentalResearch. SARAH is revised every year to address any quirks that arise throughout the field season and to continually improve data QA/QC and crew efficiency. Updates to the application can be made during the field season if any serious issues arise. Starting in April 2019, a current copy of SARAH can be found here on the AIM website, and download and set up instructions can be found in Section 4.7. Questions during the field season about iPad or SARAH use should be directed to Logan Shank: (303) 236-1161, lshank@blm.gov.

All aquatic AIM data should be collected using the SARAH application. Any data entered on paper data sheets must be entered into the SARAH application as soon as possible and prior to submitting data to the National AIM Team for ingestion into AquADat. Additionally, photos should be taken of paper datasheets and uploaded to the google drive. Data entry should be intuitive to the user if they are familiar with the field protocol. Most layouts match closely to the protocol and do not require additional explanation. However, a few layouts are specific to the app and are described in more detail here.

SARAH is designed to allow as much flexibility in data collection workflow as possible, while still insuring data integrity and preventing missing data. Therefore, the app is designed for data entry in a semi-flexible order specified below. This protocol goes over the main screens of SARAH and the data entry workflow. SARAH QA/QC checks are then described to ensure crews understand the errors and warnings that SARAH gives and when they can and can’t move on without fixing the errors. This protocol then describes the data backup and data submission process including the weekly updating of the design management spreadsheet and pre-submission data review steps.

Summary of the data collection, backup, and submission processes

<table>
<thead>
<tr>
<th>Collect Data</th>
<th>Data Backup</th>
<th>Pre-submission data review</th>
<th>Data submission</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All paper data sheets, photos, and GPS coordinates entered into SARAH</td>
<td>• Data automatically backed up on iPad via XML files</td>
<td>• Ensure all data has been entered</td>
<td>• Electronic data</td>
</tr>
<tr>
<td>• QA/QC warnings in SARAH</td>
<td>• Upload data via Wi-Fi to the server after every site as Wi-Fi access allows</td>
<td>• Project lead or supervisor review site summaries &amp; photos for common errors after every trip</td>
<td>• Make any remaining edits</td>
</tr>
<tr>
<td>• Final QA/QC check page</td>
<td></td>
<td></td>
<td>• Confirm all data has been successfully uploaded via Wi-Fi</td>
</tr>
</tbody>
</table>

Design management spreadsheet updates – chain of custody of data from data collection to data submission

• Crew records sites visited, field eval date, status, and comments, and number of bug jars & WQ samples
• Project lead or supervisor signs off on data after pre-submission data review
• Crew records date data was submitted
• The National AIM Team confirms data was received
4.2 Main Menu

1. To open SARAH, open the “FileMaker Go” app
   • Go to the Device tab
   • Click on the file folder icon labeled “SARAH” with the most recent version number. The version number of the app in the screenshot below would be 1.80.
   • If the app opens at a previous site or different screen, exit out to the main screen using the provided “Main Menu” buttons before proceeding with data collection.

2. Once inside the app, SARAH is designed to run in landscape orientation, and the main menu has the below options to navigate. Buttons are in the general order that you would use them, going from data collection to data submission.
   • Sections 4.3-4.4 focus on the “Collect Data” and “View/Edit Previous Data” buttons.
   • Section 4.5 focuses on Data Backup processes using the “Upload Data via Wi-Fi” and “Exit app” buttons
   • Section 4.6 focuses on Data Submission processes using the “View Site Summaries”, “View Site Photos”, and “View Upload Status and Confirm Final Data” buttons.
   • Section 4.7 focuses on Downloading and Updating SARAH and covers the “Register this Device” and “Update Dropdowns” buttons.
Collect Data = Initiate a New Site (most common option!)
View/Edit Previous = Search for an existing site
Upload Data via Wi-Fi = Backup your data from the iPad to the National AIM Team’s online server
View Site Summaries = View summaries of your data during the pre-data submission meeting
View Site Photos = Photos can be viewed using this button or using the BOX link provided at training
View Upload Status and Confirm Final Data = This button should be used to submit your data to the National AIM Team. You can confirm that the National AIM Team received your data via Wi-Fi and submit your data as final after reviewing your site summaries, photos, and field tracking spreadsheet with your project lead or supervisor.
Exit App = Will take you to file storage within the app so that you can view exported photos, app files, and xml and csv backup files
Register this Device = Each new device must be registered with the National AIM Team to enable data submission.
Update Dropdowns = Each year SARAH dropdowns are updated with a revised list of site codes or values. Dropdowns should be updated prior to collecting the first site of data.

3. To return to the main menu of the SARAH app from any screen, tap the BugLab logo in the upper left next to the text “Main Menu”
   - “Finish Site” will mark run “Final QA/QC”
   - Return to Main Menu and Finish later using “View/Edit Previous”
4.3 Collect Data
You can collect all data within one session and run final QA/QC data checks or you can exit back to the main menu at any time without running the final QA/QC data checks. To return to the site and finish data collection, use the “View Edit” previous button with appropriate filters. You can use as many or as few filters as you want but always make sure to double check that you are returning to the appropriate site and that there are not multiple records with the same site code. To view all sites that match your filters, use the < > arrows at the top to switch between records.

- Troubleshooting tips:
  - If you accidently start a site by mistake, select “Test or Fake Data” as the Project and exit back to the main menu.
  - If you selected the wrong contingent indicators to collect, flag indicators that you are not collecting as not collected. DO NOT ENTER FAKE DATA. If you need to collect additional indicators that were not selected you will need to start the site over again.

4.3.1 General Layout/Workflow
Navigating major screens and pages within a site:
1. Indicator selection:
   - Consult your project lead and design management spreadsheet for which indicators you are measuring
     - Select any contingent indicators that you are collecting
   - Three protocol modifications are also available
     - Alaska which collects only 5 pebbles per transect and does not collect pools
     - Adding additional bank stability plots to match MIM protocols
     - Collecting data at only a subset of core indicators- select indicators to collect by checking the boxes that appear on the left side of the page
   - **Make sure that you select the correct indicators or modifications because you cannot return to this screen**
2. Verification page:
   This must be filled out first and all fields on the first page must be completed! The comments page (access via the arrow at the bottom of the page) can be filled in during this time or revisited at the end of the site.

   • Note that most site codes associated with a project should be found in the site ID dropdown. However, if a site does not appear in these dropdowns, sites can be added using the “+” button. **TAKE ESPECIAL CARE TO ENTER SITE CODES CORRECTLY!!!** All entered site codes should also appear on the design management spreadsheet. If a site code does not appear on the design management spreadsheet, **enter the latitude and longitude on the design management spreadsheet and then notify the National AIM Team to get a site code generated or to double check the site code.**

   • Note that if your design management file indicates a site was merged. Make sure to indicate this on the comments page!

3. Additional pages:
   Once the verification page is filled out you can move on to other pages in any order. In general, each page represents a set of protocols that “pass” of the reach. The current page is highlighted in blue. In general navigating from one page to another will initiate missing data checks. However, navigating between ‘Transect,’ ‘LWD,’ and ‘Photos’ will not initiate missing data checks.

4. Submenus:
   Within a page, you have submenus. For example, within transects the page you have up to 7 submenus with the active submenu highlighted in blue. Additionally on the transects page, you have a transect bar on the left to navigate among transects. The
active transects is displayed in a lighter color. Side channels will appear under the ‘Bank’ protocol tab.

Intermediate transects will appear as a second column of buttons next to the main transect buttons if thalweg is not being collected (above). If thalweg is collected, intermediate transects can be accessed via a separate button on the thalweg page (below).
5. Workflow:

- **Verification** - Must fill out all fields before filling out any other pages
  - Sampling comments can be filled out at any time during sampling, but are required for failed sites and will reappear on the final QA/QC page prior to finishing the site.
- **WQ** - All information should be filled out at once
- **Bugs** - may be filled out at any time but once you start this page you must fill in all fields except number of jars used.
- **Transects**
  - Has three different workflow options:
    - **Physical habitat only**-
      - Example use - If in a three-person crew, one person can do visual estimates on paper (entering data into the app later) while the other two do all other transect data collection.
    - **Visual estimates only**-
      - Example use - While one person is doing bugs and water quality, another can be doing visual estimates. Once bugs are complete, the crew can switch to collecting “PHAB only” or “All transect data” if the crew member doing visuals did not finish before the bugs were done.
    - **All transect data**-
      - Example use - Bug data collection was very quick and the crew decided to do PHAB and visuals together in one pass.
        - Within each of the workflow options, data can be collected in any order but all data at a given main transect (e.g. A) or intermediate transect (e.g. A-B) should be collected before moving on to the next transect. Otherwise the app will warn you that you having missing data, but you may return to enter it later.
        - You cannot jump to an intermediate transect before collecting data at the corresponding main transect.
        - You may jump between a transect and either the LWD page or the photos page without having any missing data checks run.
        - **Bank stability** – this should typically be collected within the transects workflow. However, if the more bank stability plot modification is selected, this will appear as a separate pass and tab not associated with transects.
- **Flood prone width** – can be collected at any time
- **LWD, slope and pools** - can be collected at any time.
- **Photos** - can be taken at any time and can switch between any page and photos without missing data checks running.
4.3.2 Good Data Entry Practices

Entry assistance
- For field data collection to proceed quickly, the fields, tabs, and buttons are given in the suggested workflow.
- To quickly navigate between fields (boxes), you can click the blue “Next” button that appears above the keyboard or you can click the return/enter button on the keyboard.
- Dropdown menus will automatically jump to the next field after a selection is made.

Flags and Comments
- Use the following flags to alert data analysts of potential issues with the data:
  - E = Estimated values. Comment should specify why the measurement is suspect, why it was estimated, or alternate methods used. When in doubt, record a value in the field, flag it as estimated, and leave a comment rather than leaving it blank and recording the estimated value in the comments.
  - N = Sample not collected. This includes areas blocked by barriers, such as brush or deep water that cannot be visually estimated. Comment should specify why the measurement could not be taken.
  - C = Custom flag. This is for any other reason a comment is needed, such as noting odd conditions like high turbidity, or providing additional information not captured by the provided options. Comments should be detailed.
- Do NOT make extraneous comments such as “the sky is blue”. This clutters the data and makes it hard to sort through the important comments.
- The “Sample Comments” field on the final QA/QC screen should be the comment field used to tell the data analyst of any general data issues such as any data needs to be omitted or changed.

Zeros are data too!!!!
- Make sure all fields are filled in or flagged “N” for not collected.
- Entering 0s can be onerous for certain fields such as fish cover, human influence and LWD. For these fields, a button is provided in the app that says “No fish cover” for example. This button will fill in all blank fields with 0 and leave the filled in fields alone.
- If a whole transect is not collected, select the “Flag Not Collected” button in the upper left corner of the screen when you are on the bank page associated with the transect that was not collected. This function can also be used on intermediate transects. This will flag any missing fields as not collected but leave collected fields alone.
4.4 SARAH QA/QC Checks

4.4.1 Missing data

- Missing checks are run according to the above workflow.
- SiteID, Sample Status, pool survey status, reach length surveyed for pools, and whether slope was collected are all required fields prior to exiting a site regardless of where in the workflow you are.
  - If the site was entered by accident, select “Test or Fake data” as the project and site ID.
- If there are no missing values, no window appears and the app will proceed to the next page or transect.
- If there are missing values, they will be flagged in red and remain red until filled in. You can proceed without filling them in, by clicking “continue to next page”.

If an entire transect is not collected or most of a transect is not collected, there is a “Flag Not Collected” button that appears in the upper left hand corner next to the main menu when you are on the bank page. Selecting this will automatically flag all unpopulated data at that transect as “N” for not collected.

4.4.2 Legal values

- Certain fields have very specific ranges of possible values. For example:
  - pH cannot be <0 or >14.
  - Canopy cover cannot be <0 or >17.
- If you enter a value that is not within the range of legal values, the app will not let you leave the field without changing the value.

4.4.3 Typical values

- Certain fields (particularly water quality) have ranges that are not very likely to occur in nature. For example:
  - pH can be <6 or >8.5 but it is pretty unlikely
- If you enter a value that is not within the range of typical values, the app will flag the value in yellow and you will get a pop window that tells you the “typical” range of values for the field.
• You can move on without changing the value but you should think carefully about whether your value makes sense.
• For water quality fields, you should recalibrate before deciding on a final value.
• If you choose to leave the value, you should flag the value and make a comment as to why you left the value.

4.4.4 Cross validation
• These are logic checks based on the protocol. For example:
  o Wetted width cannot be greater than bankfull width
  o Bank height cannot be greater than floodplain height
• You cannot leave the field without changing the value.

4.4.5 Final QA/QC page

4.4.5 Final QA/QC page

- Outlier checks
  o At the end of a site, the app calculates the mean and standard deviation of bankfull width, bankfull height, and floodplain height across all transects.
  o Bankfull width and height and floodplain height should be determined using relatively continuous surfaces throughout the reach. Therefore, there should be minimal variation in these measurements.
  o Any values that are outside 2 standard deviations of the mean are flagged with hyperlinks.
  o For any outliers that appear, think back to the channel dimensions at the transect. Was there a constraining feature such as a hillslope that caused the channel to change shape partway throughout the reach? Verify that you did not use a local feature that was not continuous throughout multiple transects to determine channel dimensions.
Re-measure, omit, or flag the value if you do not feel confident in the measurement.

Note reasons for any remaining outliers in the final confirmation page.

Final missing data checks

Any remaining missing data will be flagged with a hyperlink that will take you back to the field to fill it in.

Any data that was not collected should have the appropriate flag “N” (see below). Note that 0s are data to and should be filled in.

Fields that have “N” flags will not be flagged as missing in this final check.

Make sure if slope or pools were not collected that they are recorded as such in the dropdowns on each respective pages.

If one or more transects of PHAB were not completed, classify the site as “partial” and note how many transects of PHAB were not collected and the reach length for PHAB. This reach length is used for calculating sinuosity and should match the corresponding bottom of reach and top of reach coordinates.

4.4.6 Indicator specific checks and automatic calculations

• Verification
  
  Reach length and transect spacing is computed by averaging the five typical bankfull widths. The number of thalweg stations and the location of the middle station are also based on the computed reach length.
  
  Because this is such an important field, there is an outlier check to make sure that these values are correct. If flagged, please check over these values carefully before proceeding and consider if your values are “typical” of the reach.
  
  The point coordinates are compared to the original design coordinates and if they are more than the allowable moving distance a warning pops up.
  
  The elevation of the point coordinates should be recorded in meters and a warning will pop up to check the units if elevation is greater than 4000.

• WQ/Bugs
  
  The sampling area and total area sampled for benthic macroinvertebrates is automatically calculated based on the style of sampler net and the collection method that the user selects.
  
  There is a cross validation check on the # of locations sampled and the bug method used. If reachwide is selected, then the # of locations sampled should be 11 and if the targeted riffle is selected then the # of locations sampled should be 8.
  
  If it has been more than 7 days since the recorded YSI calibration date, the app will warn you that you need to calibrate or provide a comment.
  
  Adding additional instrument ids (WQ-sonde) is possible, but should only be done if the desired value is not in the dropdown menu. Extreme care should be taken to
enter data in the same format every time so that data can easily be tracked and analyzed.

- All YSIIs should have the capability for collecting temperature corrected conductivity values so if “No” is selected for “Temp Corrected?” you will receive a warning that a comment should be provided.

- Transects
  - If an entire transect is not collected or most of a transect is not collected, there is a “Flag Not Collected” button that appears in the upper left hand corner next to the main menu when you are on the bank page. Selecting this will automatically flag all unpopulated data at that transect as “N” for not collected.
  - Bank angle is automatically subtracted from 180° if the angle is obtuse. Do not perform this calculation in your head, or you will receive a warning message.

- Substrate
  - Non-measurable substrate types are automatically defaulted to the desired alpha numeric values as follows:
    - Fine = 1 (too small to measure)
    - Sand = 2 (too small to measure)
    - Bedrock = 4097 (too large to measure)
    - Hardpan = 4098 (compacted fines, but acts like bedrock)
  - The app checks to make sure there are at least 5 pebbles collected from the “wetted” channel or “dry-middle”. If there are not enough it will warn you, and add the number of additional pebbles needed to the top of the screen. Replace the -99 value with the approximate location. The location must be unique. If the distance from the left bank is exactly the same as a previous pebble but upstream or downstream add a “.1” to the value.
  - There is an “All wet” button on substrate that auto-populates the location with “wet”. If the transect is flagged as dry on the “bank” page, then an “All dry” button also appears with similar functionality.

- Visuals
  - The “no fish cover”, “no land use”, and “no development” buttons fill in 0 for any blank fields but do not replace the measurements already entered.
  - Fish cover is automatically populated as all “0” if the transect is selected as dry.
  - The total % cover of each vegetation layer (canopy, understory, ground) can’t exceed 100. Therefore, the app will not allow the user to enter two 4s or a 3 and a 4 for the same layer. If this is accidently done, a pop window will appear and you can only move on after changing the value that was most recently entered.
  - If veg type is “None”, 0s populate for the cover categories.

- Flood-prone height
o Flood-prone height is automatically calculated when the user enters the max water depth in the flood-prone width layout. If the flood-prone width is > 3 times the bankfull width, the user may tap the “Set Max” button to automatically calculate the max flood-prone width.

o Floodprone width must be greater than bankfull width.

• Slope
  o Slope is calculated by subtracting the Start and End Heights. This can result in both positive and negative values, so make sure you are working in a consistent direction for each Pass.

  o When you tap the “Finish or add new pass” button, individual shots are summed and checks are run to see if multiple passes are within 10% of one another. If the first two passes are within 10%, it will not let you add a third pass.

  o At the end of slope, the two passes within 10% are averaged to get the Mean Elevation Change and then this number is converted to m and divided by the Slope Reach Length (automatically calculated as the distance between the start and end transects) to get the Percent Grade for the reach. The Mean Elevation Change, Slope Reach Length, and Percent Grade are displayed so that the user can double check that these summary statistics are reasonable.

  o Note you must press the “Finish or add new pass” button at the end of slope data collection to generate the final slope statistics explained above, and you will get an error if you try to run the final QA checks for the site before doing so.

• Pools
  o Pools are checked to make sure the maximum depth is greater than 1.5 times the tail depth, as required to be a qualifying pool.

  o Pool reach length is automatically filled in with the total reach length if “Collected” is selected or 0 if “Not Collected” is selected.

  o Pool tail fines are also checked to ensure that the sum of the number of <2 mm intersections and non-measurable intersections or the sum of the number of < 6 mm intersections and non-measurable intersections is less than 50. Additionally the number of < 2mm intersections must be \( \leq \) the number of < 6 mm intersections.

  o Once you start a row within the pool tail fines grid, you must fill out <2 mm, <6mm, and Non-Meas.

• LWD
  o Tapping the “plus” button will add one to the measurement in the cell allowing easy tally of LWD.

  o The “No pieces within bankfull” or “no pieces above bankfull” will populate all unfilled out cells with “0”s. It will not replace any already entered data with a “0”.

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4.5  Data Backup

4.5.1  Automatic data backup
Data is automatically backed up on the iPad after running the final QA/QC checks or after exiting back to the main menu. This process should take a minute or less. If it is taking more, see the troubleshooting section below. Note that there is no save button within a site because data are automatically saved when you enter data in a field. However if the app crashes while entering data on a page, data on the current page may be lost.

- Backups of data are in the form of XML files that are named with the site code, unique database ID, and the date the backup was created. A new backup file is created for each day that you edit that site’s data. Backups of data remain on the iPad even after data has been confirmed as final and deleted from the main database.
- Csvs with site summary data are also automatically generated and are saved with the iPad device ID and the week that the csv was generated. Csvs are over written every time data is edited, and all sites from the field season should appear in them regardless of whether the data has been confirmed as final and deleted from the main database. However, a new csv will be generated each week as a backup. Make sure you are always viewing the csv from the most recent week.
- Backups XMLs and csvs can be accessed using the “Exit App” button described below.
- Troubleshooting Tips
  - The automatic backup process should take a minute or less.
    - If it is taking more than 10 minutes, make sure the screen was active for the whole 10 minutes. You can change the timeout duration by going to “settings”, “general”, “auto lock”, and selecting “Never”.
    - If you still get a never ending spinning wheel, swipe up to close the app and try entering and exiting the site again after moving to a different window within the site. Additionally, check to make sure that a backup was created by going to the “View all Backups” button within the “View Upload Status and Confirm Final Data” button.

4.5.2  Upload Data via Wi-Fi
As soon as you get internet, backup all collected data to date to the National AIM Team’s online server by clicking the “Upload Data via Wi-Fi” button on the main menu. Do this as frequently as possible, preferably daily after every site if cellular service/Wi-Fi connection allows. It MUST be done at least after every three sites. **You must re-upload data via Wi-Fi after any edits are made.** You will receive a pop-up window indicating whether the backups were successfully received or not. You have the ability to back up your photos at this time or later when you have a better connection.

```
Success!
1 backup(s) out of 1 sent were successfully uploaded to the server.

OK
```

- Troubleshooting Tips
If the data upload process takes more than 10 minutes, you likely have a slow internet connection and may want to wait until a better connection is available. Additionally, uploading data more frequently will lessen the amount of data transferred each time you upload and therefore can also lessen the time it takes to upload.

- If you get a failure message for 1 or more backups, try submitting data again with a different or better internet connection.
- If you still get a failure message, go to the “View all Backups” button within the “View Upload Status and Confirm Final Data” main menu button to view which backups failed to upload. Make note of the site code and date the backup was created.

Then go to “exit app” to find the XML file with that site code and date. Upload this XML file to your project folder on the google drive and then send Logan Shank (lshank@blm.gov) an email detailing issue. Make sure to include the site code, date of the backup, and date and time you tried to submit the data, as well as any other useful information about quirks in the data collection process that might have caused the issue.

4.5.3 Exit App and Uploading Files to the Google Drive
The “Exit App” button on the main menu should generally only be used for backup troubleshooting purposes and to get access to raw backup files such as exported photos or XMLs. This function is also used if you need to download a new version of SARAH.

Viewing Files
- To view all app related files, click the “Exit App” button on the main menu. This should take you to a file viewer.
• In general this screen should show you 4 types of files:
  o SARAH application (file folder icon)
    ▪ Clicking on this file takes you to the main menu screen where you can access the application. This file also is a database that stores all raw data that hasn’t been submitted as final.
  o Csv files
    ▪ Site summaries that are automatically uploaded to the google drive.
  o XML files
    ▪ Back up files containing all data from a given site. These files remain on the iPad even after final data is submitted and should NEVER be deleted!
  o Any exported photos
    ▪ Site photos that have been exported using the “View Photos” button on the main menu can be found here. Photos remain in this window even after deleting data from the main database. Photos may need to be deleted periodically from this screen manually to prevent app file size from getting too large.

• If you can’t find the files you are looking for, make sure you have selected “device” on the bottom of the screen rather than “recent”.
• NEVER delete files from this screen unless you have uploaded them to the google drive or are told to by Jennifer.

Uploading files to the Google Drive
• Uploading files to the National AIM Team server via Wi-Fi should be your main method of backup but on occasion you may want to manually back up your files to the google drive. For example, if automatic upload of site summary csvs fails you may need to manually upload these files to the google drive.
• To upload files to the google drive from this screen, select the paper with the check box in the upper right hand corner of the screen (See picture on pg. 24). Then click the upload button (box with the arrow) and select the google drive icon (see picture below). You can also scroll to the right to “Copy to Drive” but this option doesn’t allow you to select where you want to save your file on the drive.
After selecting the google drive icon you should then see this screen (below). Do NOT just click “Upload” from this screen as that saves the file in the main AIM aquatics folder not your project specific folder. Instead, select “My Drive” at the bottom and navigate to your project folder. Then click the “Upload” button.

If you don’t see your project folder or the AIM aquatic fieldwork folder, you can search using the search tool and it should come up.

**Versions of SARAH**
- If you have multiple versions of the SARAH app on your iPad, you can use this screen to select which one you want to collect data with.
- You should NEVER delete a SARAH app on your iPad unless you have submitted all current data as final data or you have first uploaded the SARAH app file to the google drive. If the file is too large to upload, contact Logan Shank (lshank@blm.gov).
- The version of SARAH is in the file name. For example, “SARAH_v180.fmp12” is version 1.80. You can also view the version of SARAH that you are using by clicking on the Filemaker app file. A start up screen will appear with the SARAH, BLM, and NAMC logo. In the lower right hand corner, there should be a version number with a prefix of “v”. Always make sure you are using the most up to date version. See the Updating your SARAH app (Section 4.7) for more details.
4.6 Data Submission

4.6.1 Weekly updating of design management file

The Trip Planning and Field tracking is a worksheet within the Design Management spreadsheet on the google drive. It should be filled out for any site that was visited and is used both for design management purposes as well as a chain of custody form for electronic data submission and BMI and WQ sample submission. It can be filled out after each site or all at once at the end of the trip. Note that content can be viewed and updated with or without internet access. All crews should set the spreadsheet to be viewed and edited offline (instructions). After editing the design management spreadsheet offline, open the spreadsheet while online to sync all changes.

1. Field crew fills out the site code, field eval date, field eval status, field eval comments, # bug jars, and # of water quality (WQ) samples. With the exception of the WQ column, these fields can all be copy and pasted from the automatically exported csv saved on the google drive after uploading data via Wi-Fi. If no WQ sample was collected, make sure to input a “0” and do NOT leave the cell blank.
2. Project lead or crew supervisor checks data and signs off on the data after the pre-data submission meeting described below.
3. Field crew submits final data and records the date that data was submitted.
4. The National AIM team verifies that submitted data was received.
4.6.2 Pre-submission data review

Data summaries and photos should be reviewed by the project lead or crew supervisor before the crew submits final data for each site. Data summaries and photos can be viewed in two different ways: on the iPad or on a desktop computer.

- If viewing files on the iPad, use the “View Site Summaries” and “View Photos” buttons on the main menu. Note that the “View Photos” button also allows for exporting photos. These exported photos can be found by clicking “Exit App” and looking for the files in Filemaker files.
- If viewing files on a desktop computer, navigate to your project folder on the google drive to find the automatically uploaded csv called “Data Summary”. Photos can be viewed using the BOX link provided during training.
- The Site Summary page on the iPad (see below) can be easier to review the data, while the BOX link for photos provides larger clearer photos.

Steps

1. Crews should make sure the final QA check has been run for the site, any data edits have been made, and external data collection such as GPS coordinates, photos, or paper field forms get input into the correct fields in SARAH.

2. Project lead or crew supervisor should review the site summaries and photos prior to crews submitting final data for each site. Ideally project leads or crew supervisors would then meet with crews to discuss any issues found and to provide crews an opportunity to discuss any issues they had with implementing the protocol at these sites.

3. The purpose of the data and photo review is the following:
   - a. Verify the sample status of all sites.
b. Verify the crew did not move the point more than the allowable distance, and if
   there are any concerns, plot the coordinates.
c. Verify the crew collected all needed indicators.
d. Verify all paper data was entered into the app.
e. Verify that all WQ and bug samples are appropriately logged and labeled.
f. Review pH and conductivity measurements and the paper calibration log in each
   YSI case.
g. Review photos and floodplain and bankfull height and width means.
h. Review photos and bank cover and stability metrics.
i. Review all general site comments to discuss any other special protocol situations
   that might have arisen such as partial data, side channels, dry transects, or beaver
   impacts.

4. See Appendix A for tables describing all fields in the csv and common problems or
   things to check associated with each field. **This list can seem overwhelming but keep in
   mind that checking for missing data in any of these fields and reviewing accuracy of
   geomorphic surfaces are the most important things to focus on for this check.** The
   National AIM Team will do additional checks on the rest of fields. However, missing
   data can’t be easily corrected once sent to the National AIM Team, and accuracy of
   geomorphic surfaces is best assessed via conversations with crews. Making sure crews
   are following special protocol situations such as interrupted flow sites is also best
   assessed via conversations with crews and is important to catch any errors early in the
   field season.

5. Crews should make corrections as needed to the raw data after the meeting and upload
   data via Wi-Fi again after all edits have been made.

6. All unresolved issues should be recorded in the notes column within the Trip Planning
   and Field Tracking worksheet.
4.6.3 Submit data
Use the “View Upload Status and Confirm Final Data” button on the main menu to submit final data. Confirming data as final will notify the National AIM Team that data is final and further QC and statistics are ready to be run and calculated. The National AIM Team will NOT process any data that has not been confirmed as final so make sure that this is completed for all sites!

Steps
1. Click the “View Upload Status and Confirm Final Data button. This will take you to a screen that has a list of all sites collected throughout the field season.
2. Make sure your project lead or supervisor has signed off on your field tracking sheet prior to confirming data as final.
3. Make sure all desired data edits have been made and all backups were successfully uploaded via Wi-Fi. If all backups were not successfully uploaded, see the troubleshooting directions within the data backup section. You will get an error if you try to mark data as final and all backups have not been uploaded!
4. Check the final data button next to the desired site. This step can be reversed if need be. If you have completed the above steps, click Yes to the following message:

   Warning: Check with supervisor

   Marking this data as final means your project lead or NAMC must have approved your field tracking spreadsheet and site summary/csv. Additionally all desired edits to the data should have been made. If both of these requirements have been met, mark this site as final and then press “confirm final data and delete checked” after marking all desired sites as final data. Do you still want to confirm this site as final?

   No  Yes

5. Then click the “Confirm Final Data and Delete Checked” button. Note that you must have Wi-Fi for this to work! This step is irreversible, will remove the raw data from the FileMaker database, and edits for this site will no longer be able to be made. Deleting the raw data from the iPad prevents the database from getting too large and causing app quirks. You will still be able to access the site summary, any exported photos, and any backup XML files or csvs. If you have completed the above steps, click Yes.

   CAUTION: Confirming this as final data will delete marked site's raw data from the database and edits to these sites will no longer be able to be made. Deleting the raw data from the iPad prevents the database from getting too large and causing app quirks. Additionally this step submits final data to NAMC for further QA/QC and analysis and data storage. The site summary and backup history will still be available. Do you still want to confirm these sites as final and delete the raw data?

   No  Yes

You should then get the following confirmation message with a count of the number of sites submitted as final data:
4.7 Downloading and Updating SARAH

4.7.1 Downloading SARAH

The most recent version of SARAH can be downloaded onto iPads using three different methods:

1. Direct download on iPad from the AIM website using a google drive link (requires gmail account)
2. Download from AIM website onto a desktop computer and then using an iTunes account to transfer the file to the iPad
3. Download from an email attachment

Regardless of the method used, the Filemaker Go app (see iPad requirements for correct version) must be installed on the iPad before SARAH is downloaded.

Direct download

1. Using Safari web browser on the iPad, go to the Crew Hiring and Equipment page of the AIM website to download SARAH.
2. Click the download link on the website. You will then be prompted to log into a google account (you can use the aim.aquatics account or a different one).
3. You will then see a black screen with the file name. To download the file, click the three dots in the upper right hand corner. Then click “Open In”. Scroll to the right until you find “Copy to FileMaker Go”.
4. Clicking the “Copy to FileMaker Go” will then download SARAH into the Filemaker Go application and open up the app to the main menu.

iTunes file transfer

1. Download SARAH from the Crew Hiring and Equipment page of the AIM website (no google account should be needed).
2. Connect the iPad to a computer and open up iTunes. Click “File Sharing” on the left panel. Click on Filemaker Go. Then click add file and navigate to the downloaded SARAH file. Sync changes to the iPad.
3. Open the Filemaker Go app on the iPad and then click on the SARAH file to open the app.
Email download

1. Go to the iPad gmail account. Find the email attachment and click the attachment where it says “tap to download”. Once it has downloaded click the attachment again.

2. Scroll to the right until you see the “Copy to Filemaker Go” icon. Click on this icon. It should take you to Filemaker Go application and then open up app to the main menu.
4.7.2 Register Device
Each new device must be registered with the National AIM Team to enable data submission. To register the device, click the “Register Device” button on the main menu. Fill out the form (shown below) and click register. You should receive an email notifying you that your request was received. You will receive a second email once your device has been approved. Note you should NOT need to redo the registration if you download a new version of the app during the field season.

- If data is not to be sent to the National AIM Team, for example another agency wants to use the app for data collection, a web address can be provided to register the device with a different agency or system so that XML files will automatically be sent to this address. Alternatively, XML files can be manually retrieved off the iPad. Free online tools exist to parse the XML file into a useable excel file.

4.7.3 Updating SARAH

Updating Dropdowns

Each year SARAH dropdowns are updated with a revised list of site codes or values. Dropdowns should be updated prior to collecting the first site of data. To update dropdowns, simply click the “Update Dropdown” button on the main menu while connected to the internet. You should receive a message back indicating whether the updates were successful. Updating dropdowns does not delete or modify any already collected data so it can be done throughout the field season if needed. Each time you download a new version of SARAH you must update dropdowns.
**Updating version of SARAH**

Throughout the field season you may need to download new versions of SARAH to fix application quirks. The most recent version of SARAH can be found on the AIM website [here](#). Crews will also receive notification of these updates via the aim.aquatics gmail account so it is important to check this email frequently. The following explains how to download a new version of your SARAH application as needed.

1. You should only update your SARAH application if you have submitted final data for all sites within your current version (see data submission above) because deleting the app deletes all associated data that you have collected to date (except backup XML and csv files). The exception is if your app is corrupted and is not allowing any further data collection or final data submission.

2. After submitting final data for all sites, delete your current version of SARAH. From the main menu of SARAH, click exit app. Go to the device tab and find the file folder labeled “SARAH”. Click the paper with the check mark in the upper right. This should then change the screen so you can select files. Next select the SARAH file folder and click the trash can in the upper left.

3. Download the new version of SARAH using one of the above methods and then double check that version number is correct.
4.8 Frequently Asked Questions and Troubleshooting

1. **Q:** I accidently clicked on data collection and am not ready to enter data but I can’t get back to the main menu.
   **A:** To get back to the main menu, you need to continue through the indicator selection page and then select “Test/Fake Data” as the project and site code. Select that pools and slope were not collected. Then exit the site to the Main Menu.

2. **Q:** I selected the wrong contingent indicators.
   **A:** If you selected the wrong contingent indicators to collect, flag indicators that you are not collecting as “not collected.” DO NOT ENTER FAKE DATA. If you need to collect additional indicators that were not selected, you will need to start the site over again.

3. **Q:** What site code do I use for targeted sites?
   **A:** Project leads should add the latitude and longitude of the site to the bottom of the design management spreadsheet and then contact the National AIM team for targeted site codes.

4. **Q:** I can’t get off of a page because of the missing data checks or other QC checks.
   **A:** Go to the appropriate missing data or QA/QC section above that matches where you are stuck and determine why you can’t move on. In general, missing data checks should never prevent you from moving on. Exceptions are SiteCode, Sample Status, pool survey status, reach length surveyed for pools, and whether slope was collected, which are all required fields prior to exiting a site regardless of where in the workflow you are. You must complete all fields on the WQ or bug pages once you start them, except for the number of bug jars used. Never enter fake data to move on to the next screen. If you did not collect data, make sure to flag data as “N” for not collected. QA/QC checks should only prevent you from moving on if you entered an illegal value. The message should tell you what legal values are for the field. If all else fails, double click the home button and swipe up to exit the app and then try going back into the app and the site again.

5. **Q:** I get a spinning wheel of “death” that never stops. What should I do?
   **A:** If it is taking more than 10 minutes, make sure the screen was active for the whole 10 minutes. You can change the timeout duration by going to “settings”, “general”, “auto lock”, and selecting “Never”. If you still get a never ending spinning wheel, double click the home button and swipe up to close the app and try entering and exiting the site again after moving to a different window within the site. Additionally, if the spinning wheel occurred when you tried to exit a site, check to make sure that a backup was created by going to the “View all Backups” button within the “View Upload Status and Confirm Final Data” button. If a backup was not created and all attempts to enter and exit the site again don’t fix the problem, call Logan Shank (303-236-1161) ASAP to troubleshoot!

6. **Q:** How and when do I backup my data?
   **A:** Your data are automatically backed up on the iPad via XML files every time you exit a site. However, we additionally require you to back up your data via the internet (4G or
Wi-Fi), using the upload data via Wi-Fi button. This should be done after every site if cellular service/Wi-Fi allows but at a minimum should be done after every 3 sites. Note that there is no save button within a site because data are automatically saved when you enter data in a field. However if the app crashes while entering data on a page, data on the current page may be lost.

7. **Q: What do I do if I get a failure message when I try to upload data?**
   **A:** Try again with a different or better Wi-Fi connection. If you still get a failure message, go to the “View all Backups” button within the “View Upload Status and Confirm Final Data” button to view which backups failed to upload. Make note of the site code and date the backup was created. Then go to “exit app” to find the XML file with that site code and date. Upload this xml file to your project folder on the google drive and then send Logan Shank (lshank@blm.gov) an email detailing issue. Make sure to include the site code, date of the backup, and date and time you tried to submit the data, as well as any other useful information about quirks in the data collection process that might have caused the issue.

8. **Q: How and when do I confirm my data as final?**
   **A:** You can confirm your data as final after you have meet with your project lead or supervisor to review your site summaries and field tracking sheet. Then make sure all desired data edits have been made. To confirm the data as final, click the “View upload status and confirm final data button”. Find the desired site and make sure all backups have been uploaded via Wi-Fi. If so, check the final data button next to the desired site. Then click the “Confirm Final Data and Delete Checked” button. This step is irreversible, will remove the data from the Filemaker database, and edits for this site will no longer be able to be made.

9. **Q: When is it OK to delete data?**
   **A:** You should be confirming data as final after meeting with your project lead or supervisor, after all desired edits have been made, and after you have confirmed that all backups for the site have been successfully uploaded. This confirmation does three things:
   - It deletes the raw data from the iPad.
   - It sends a message to the National AIM Team that further QC and analysis can be done on the data.
   - It prevents the Filemaker app from taking up too much memory/space, which could start to cause app malfunctions.
   You will still be able to access the site summary, any exported photos, and any backup XML files or csvs. Never delete the backup XML files or csvs. You may want to delete exported photos at some point to prevent Filemaker app size from getting too large.

10. **Q: What do I do if my iPad cracks or is overheating?**
    **A:** If your iPad cracks, make sure that you keep it as waterproof as possible. Put packing tape over the crack to keep water out and to keep the glass in place. Call your supervisor to let them know what happened ASAP to determine if a replacement iPad is needed.
If your iPad starts to overheat, you may notice that it starts to get slow and quirky. You may be in danger of losing data.

- If you have a waterproof case, cool the iPad off by placing it carefully on top the stream or splashing it with water. Make sure the case is still watertight before attempting this (check that the gasket is still intact, there are not cracks or breaks in the case, and all plugs units are closed off).
- If you do not have a waterproof case, try shutting the screen off and keeping the iPad screen facing down in the shade.

11. Q: How long do the iPad batteries last and how do I save battery life?
A: Battery life is approximately equal to the data collection time at a single site (6-8 hours). To save battery life:

- Close unused apps on a regular basis to conserve battery life.
  - Click the “Home” button twice and “flick” or “swipe” up for each app you want to close.
  - Keep screen brightness as low as possible.
  - Turn Wi-Fi and Bluetooth off whenever Wi-Fi or GPS is not needed.

12. Q: What do I do if the iPad GPS is not working or I get a message saying the coordinates have poor accuracy?
- Double check that Wi-Fi is on. No Wi-Fi connection is necessary, but Wi-Fi must be enabled to take a GPS coordinate.
- If GPS coordinates still cannot be obtained using the iPad due to low accuracy/signal, an external GPS may be used, but these external GPS coordinates must be entered into SARAH.

13. Q: What do I do if I get an error message saying that the file has been corrupted and must be repaired?
A: This message means the data you collected to date is likely still intact but can only be retrieved by the National AIM Team. You should send all unbacked up data to the National AIM Team ASAP and you will need to continue data collection using a fresh download of SARAH. To do this, follow the following steps:

- You should swipe up to close Filemaker. Reopen Filemaker. It should take you to the screen where you can view all app related files.
- Find the app file. It should be a file folder that says “SARAH”.
Using Wi-Fi, upload this file to your project folder on the google drive (see instructions under the exit app section of this document for further details of how to upload files to the google drive.)

Upload the xml and csv files for all sites that had not yet been confirmed as final data to your project folder on the google drive.

Then send Logan Shank an email detailing 1) what you were doing on the app just prior to the corruption message 2) which sites had not been submitted as final data yet but were completed 3) which site(s) you were still collecting data on and will continue collecting data in a fresh version of the app.

Download a fresh version of SARAH but do NOT delete the corrupted version from your iPad. Use this fresh version for all subsequent data collection. Do not repeat data that you had already collected in the previous version if you were more than 20-30% finished with the site before it corrupted.

14. Q: How do I tell if I have the most recent version of SARAH?
   A: The version number appears in the file name. For example, “SARAH_v180.fmp12” is version 1.80. Additionally, the version appears on the start-up page. To access this page, click “exit app” from the main menu to get to the BLM logo and start up screen below. The version number can be found on the lower right hand corner of the screen with a “v” in front of it. The most recent version of SARAH can be found on the AIM website here. Additionally, crews can check aim.aquatics email for any recent messages from the National AIM team indicating what the latest version of the app should be.
# Appendix A. Description of fields in the site summary csv and guidance to check for common errors

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Column</th>
<th>Description</th>
<th>Possible values or example data</th>
<th>Common problems or things to check</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Information</td>
<td>z_Week</td>
<td>Week of the year</td>
<td>18</td>
<td>Make sure you don't have multiple rows in the csv with the same site code for a sampled site. If you do, this indicates that the crew entered some of the data is in one record while the rest is in another. If the data is minimal in one record have the crew entered all data into only one record. If there is too much data to feasibly do this, record this error in the field tracking spreadsheet so that the NOC can merge the two datasets after the fact (this should be reserved for a last resort, it is very difficult).</td>
</tr>
<tr>
<td></td>
<td>pk_Sample Event</td>
<td>UID- unique database identifier.</td>
<td>C582F88B-DDF6-4CA3-865E-F50E519E9930</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Project</td>
<td>Project assigned in the design phase to the site</td>
<td>UT_WD_STANDARD_2016</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Site ID</td>
<td>Design site code</td>
<td>SL-SS-12345</td>
<td>Make sure you don't have multiple rows in the csv with the same site code for a sampled site. If you do, this indicates that the crew entered some of the data is in one record while the rest is in another. If the data is minimal in one record have the crew entered all data into only one record. If there is too much data to feasibly do this, record this error in the field tracking spreadsheet so that the NOC can merge the two datasets after the fact (this should be reserved for a last resort, it is very difficult).</td>
</tr>
<tr>
<td></td>
<td>Location Name</td>
<td>Stream name</td>
<td>Big Creek</td>
<td>Make sure targeted sites have a stream name. This facilitates easy querying of data.</td>
</tr>
<tr>
<td></td>
<td>Date Collected</td>
<td>Date the site was sampled</td>
<td>5/4/2017</td>
<td>NA</td>
</tr>
<tr>
<td>Comments</td>
<td>Sample Comment</td>
<td>Comment crew made on verification page regarding any data related issues such as missing data or transects that need data switched</td>
<td>Full site except ran out of time for slope</td>
<td>Bring any unresolved critical issues raised in the comments to the National AIM Team's attention by adding them to the notes column in the field tracking spreadsheet. This field can also be used to check the site status and designation categories.</td>
</tr>
<tr>
<td></td>
<td>Access Comment</td>
<td>Comment crew made on verification page regarding how they accessed the site</td>
<td>Take HWY 2 off of I70 and site is easy access right off the road</td>
<td>This can be used to assist other crews that might reattempt the site and can also be used to check the site status and designation categories.</td>
</tr>
<tr>
<td>Data Type</td>
<td>Column</td>
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<td>Possible values or example data</td>
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</tr>
<tr>
<td>Site Status</td>
<td>Site Status</td>
<td>The highest level site evaluation categories</td>
<td>One of the following categories: Sampled-Wadeable, Sampled-Boatable, Revisit, Permanently inaccessible, Non-target</td>
<td>Make sure crews are distinguishing properly between sites that can be revisited and successfully sampled at a later date vs. those that should be written off as permanently inaccessible. Additionally, make sure crews are distinguishing properly between sites that are non-target vs. inaccessible because this distinction has implications for design management and bias introduced into designs. Consult pg 15-20 of TR 1752-2 and the rejection criteria and directions in the design management protocol if questions arise.</td>
</tr>
<tr>
<td>Designation</td>
<td>Designation</td>
<td>More specific site evaluation categories</td>
<td>One of the following categories: Sampled, Partially Sampled, Interrupted Flow Sampled, Different route or permission needed, Other, Access denied - Private, Access denied Terrain, Non-Wadeable -Too High, Non-Wadeable - Boatable, Dry -Ephemeral, Dry-Intermittent, Lentic system, Map error</td>
<td>Make sure crews are properly distinguishing between sampled, partially sampled, and interrupted flow sampled. These categories influence what indicators are able to be computed and assist with QC checks that make sure the crew followed the appropriate special situations protocols. Consult crew comments, additional fields in the csv (special situations) and pg 15-20 TR 1735-2 if unsure about what category the site should have been. Properly distinguishing among failed site categories assists with knowing what additional information is needed to successfully sample the site or if the site is permanently inaccessible what bias not sampling the site might impart on the data (i.e. remote sites might be in better condition that sites along a private road).</td>
</tr>
<tr>
<td>Indicators Used</td>
<td>Indicators Used</td>
<td>A list of the contingent or subset of core the indicators that the crew selected to be collected</td>
<td>Bank Angle Thalweg Profile Fish Cover Pool Tail Fines Total Nitrogen Total Phosphorous Turbidity</td>
<td>Make sure the crew selected the appropriate contingent or subset of core indicators for the project as specified in the monitoring design worksheet.</td>
</tr>
<tr>
<td>Data Type</td>
<td>Column</td>
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</tr>
<tr>
<td>Bug and WQ.</td>
<td>Bug Collection Method</td>
<td>Bug protocol used</td>
<td>One of the following categories: Reach Wide, Targeted Riffle</td>
<td>Used to check the bug area sampled. This is a required field and critical information.</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>Bug Sampler</td>
<td>The kind of net used to sample bugs</td>
<td>One of the following categories: Hess Net, Kick Net, Mini Surber Net, Surber Net</td>
<td>Used to check the bug area sampled. Note hess nets should have an area of 0.086 and mini-surfers have an area of 0.041 vs. 0.93 for a surber or kick net so if these are used the total area will differ from the 2 values listed below.</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>Bug Area Sampled</td>
<td>Total area sampled for bugs in m² (number of locations sampled * net area). This information is critical to calculate BMI densities.</td>
<td>Should be 1.02 for reach wide methods or 0.74 for targeted riffle methods if a kick net or surber net was used</td>
<td>If the value is something other than 1.02 or 0.74, ask the crew how many locations were sampled and why they deviated from the protocol. This is a required field and critical information.</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>Bug Num Jars</td>
<td>Number of jars used to preserve bug samples</td>
<td>Typically around 3-4 jars are used</td>
<td>If crews consistently have a large number of jars (7+), they may be incorrectly applying the protocol and digging too much in the muck. If crews consistently have only one jar per site they may not be sufficiently collecting bugs or may be removing all vegetation. Crews may frequently forget to fill this field out but it is important for making sure all jars are submitted to NAMC.</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>pH</td>
<td>Value measured by crew (SU)</td>
<td>Typical pH values are 6-8.5</td>
<td>Check with crew to confirm values if outside typical range. For any extreme values ensure the crew checked the YSI calibration.</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>Conductivity</td>
<td>Value measured by crew (uS)</td>
<td>Typical Conductivity values are 30-1,000</td>
<td>Check with crew to confirm values if outside typical range. For any extreme values ensure the crew checked the YSI calibration. Add a comment in the Trip Planning &amp; Field Tracking worksheet if local knowledge of the site confirms this outlier (e.g., local geology has large salt deposits and conductivity is naturally high)</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>Temp Corrected</td>
<td>Whether conductivity was corrected for temperature.</td>
<td>Y, N</td>
<td>All YSIs should have this capability and any samples not corrected for temperature should be suspect.</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>Temperature</td>
<td>Value measured by crew (°C)</td>
<td>Typical values are 5-30</td>
<td>Check with crew to confirm values if outside typical range.</td>
</tr>
<tr>
<td>Bug and WQ.</td>
<td>Turbidity</td>
<td>Value measured by crew (NTU)</td>
<td>Typical values are 0-4000</td>
<td>Check to make sure units are NTU; crews in the past have recorded values in AU, which can't be easily converted to NTU.</td>
</tr>
<tr>
<td>Data Type</td>
<td>Column</td>
<td>Description</td>
<td>Possible values</td>
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</tr>
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</tr>
<tr>
<td>Channel Measurements</td>
<td>Mean Floodplain Height</td>
<td>Average floodplain height (cm) across all 11 transects</td>
<td>Typical values are 0-250</td>
<td>Look at pictures to make sure these geomorphic surfaces were correctly identified. This should at least be done on the first couple hitches but should be done any time the crew is unsure or values are outside the typical range.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>Mean Bankfull Height</td>
<td>Average bankfull height (cm) across all 11 transects</td>
<td>Typical values are 0-250</td>
<td>Look at pictures to make sure these geomorphic surfaces were correctly identified.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>Mean Wetted Width</td>
<td>Average wetted width (m) across all 21 transects</td>
<td>Typical values are 0.1-10</td>
<td>This can be used for context to evaluate other fields in the csv.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>Mean Bankfull Width</td>
<td>Average bankfull width (m) across all 11 transects</td>
<td>Typical values are 1-30</td>
<td>Look at pictures to make sure these geomorphic surfaces were correctly identified.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>PctErosionalBanks_Total</td>
<td>The percent of banks that were classified as erosional.</td>
<td>0-100</td>
<td>Crews struggle to differentiate between erosional and depositional banks. Verify this % by looking at photos. Depositional banks are excluded from bank cover and stability indicator calculations so it is important to properly differentiate between these two bank types.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>PctErosionalCovered</td>
<td>The percent of erosional banks that were ≥50% covered by perennial veg, cobbles, bedrock, or LWD.</td>
<td>0-100</td>
<td>Verify this % by looking at photos. Common errors are crews not placing the plot properly because of misidentification of scour line and not counting roots as cover.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>PctErosionalBanks_Stable</td>
<td>The percent of erosional banks that had no erosional features (absent).</td>
<td>0-100</td>
<td>Verify this % by looking at photos. Again make sure the plot was placed properly.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>Mean Elevation Change</td>
<td>Average change in elevation from the top of the reach to the bottom of the reach (cm) as measured by the average of the two passes of slope that are with 10% of each other.</td>
<td>Typical values are 20 -1800</td>
<td>Unit issues are common with slope so check values to make sure they are not an order of magnitude off based on photos and other available site context information.</td>
</tr>
<tr>
<td>Channel Measurements</td>
<td>Pct Grade</td>
<td>Percent slope of the reach- the mean elevation change (converted to m) divided by the reach length for which slope was measured.</td>
<td>Typical values are 0.1 -14</td>
<td>Unit issues are common with slope so check values to make sure they are not an order of magnitude off based on photos and other available site context information.</td>
</tr>
<tr>
<td>Data Type</td>
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</tr>
<tr>
<td></td>
<td>Beaver Signs</td>
<td>Categorical assessment of the amount of beaver signs within the reach</td>
<td>One of the following categories: Absent, Rare, Common</td>
<td>This field should be used to double check the site status and designation and for fodder to discuss any protocol questions the crew may have had regarding the beaver special situation protocol.</td>
</tr>
<tr>
<td></td>
<td>Beaver Flow Modifications</td>
<td>Categorical assessment of the amount of beaver flow modification within the reach</td>
<td>One of the following categories: None, Minor, Major</td>
<td>This field should be used to double check the site status and designation and for fodder to discuss any protocol questions the crew may have had regarding the beaver special situation protocol.</td>
</tr>
<tr>
<td></td>
<td>Water Withdrawals</td>
<td>Whether water withdrawals were present within the reach</td>
<td>Absent, Present</td>
<td>This field is useful immediate information for the field office and can also be used to double check the site status and designation.</td>
</tr>
<tr>
<td>Special Situations</td>
<td>Num Dry Transects</td>
<td>The number of transects recorded as dry out of 21</td>
<td>Typical values are 0-11</td>
<td>This field should be examined carefully in the presence of dry transects to make sure the crew only assessed flowing portions of the reach and if there was no flow indicated this and did not collect pool data. Additionally check that crews are distinguishing properly between No Pools and Not Collected.</td>
</tr>
<tr>
<td></td>
<td>Pools Collected</td>
<td>Categories of indicating whether pools were collected</td>
<td>One of the following categories: Collected, Partial Collected/Partial Flow, No Flow, No Pools, Not Collected</td>
<td>This field should be examined carefully in the presence of dry transects to make sure the crew only assessed flowing portions of the reach. This field is required but is often inaccurate. If pools were Collected, this field should equal the reach length. If Partial Collected/Partial Flow is selected, this field should be the length of reach assessed for pools and must be less than the reach length.</td>
</tr>
<tr>
<td></td>
<td>Pool Reach Length</td>
<td>The length of the reach assessed for pools</td>
<td>Possible values are 150-4000</td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Data Type</th>
<th>Column</th>
<th>Description</th>
<th>Possible values or example data</th>
<th>Common problems or things to check</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Situations</td>
<td>Partial_ Num Incomplete Transects</td>
<td>The number of transects not sampled or incompletely sampled</td>
<td>Possible values are 0-6</td>
<td>This field should be used to double check the site status and designation and for fodder to discuss any protocol questions the crew may have regarding the partial data collection special situation protocol.</td>
</tr>
<tr>
<td></td>
<td>Partial_ Reach Length</td>
<td>The reach length sampled if less than the total reach length supposed to be sampled according the average bankfull width for the stream.</td>
<td>Possible values are 75-4000</td>
<td>This value is most important for calculating sinuosity and this should correspond to where the bottom and top of reach coordinates were taken. Additionally this field should be used to double check the site status and designation and for fodder to discuss any protocol questions the crew may have regarding the partial data collection special situation protocol.</td>
</tr>
<tr>
<td></td>
<td>Reach Length</td>
<td>Automatically calculated field from average bankfull widths. Note this is reach length is not the sampled reach length for partial reaches, rather it is the reach length that should have been sampled according to the protocol.</td>
<td>Possible values are 150-4000</td>
<td>This field provides context for the rest of the csv information including the partial reach length so one can determine how much of the reach was not sampled. Additionally, this is an automatically calculated field so if reaches were shorten to maintain compatibility with historical monitoring and is different than the value in this file that should be highlighted in the field tracking notes. Reach lengths for boating sites have been calculated incorrectly in the past so this value should be double checked with bankfull width and BR and TR coordinates for boating sites.</td>
</tr>
<tr>
<td>Data Type</td>
<td>Column</td>
<td>Description</td>
<td>Possible values or example data</td>
<td>Common problems or things to check</td>
</tr>
<tr>
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<td>-----------------------------------</td>
</tr>
<tr>
<td>GPS Locations</td>
<td>Reach Slid</td>
<td>Was the original point moved to meet sampleability requirements</td>
<td>Y,N</td>
<td>If this was the first time the crew moved the point make sure to ask the crew if they understood Moving the point coordinates protocol (page 18-20 of the field protocol). Additionally, always make sure the point was moved within the allowable distance (250 m for reaches 150-500 m or reach length/2 for reaches &gt;500 m) using the Meters From Original Point field.</td>
</tr>
<tr>
<td></td>
<td>Meters From Original Point</td>
<td>The straight line distance (m) between the design coordinate and the coordinate the crew sampled</td>
<td>Typical values 0-250. If the point is a targeted site, no original coordinates are within the app and the value will be blank or a question mark.</td>
<td>We encourage plotting coordinates on google earth for any values over 100 m, and values exceeding 500 m generally either indicate GPS/app errors, crew applying the moving the point coordinates incorrectly, or the crew selecting the wrong site code.</td>
</tr>
<tr>
<td></td>
<td>Lat_ Mid Reach</td>
<td>F transect coordinate decimal degrees NAD 83</td>
<td>46.3454</td>
<td>Use the meters from original point field to determine if plotting coordinates is necessary.</td>
</tr>
<tr>
<td></td>
<td>Long_ Mid Reach</td>
<td>F transect coordinate decimal degrees NAD 83</td>
<td>-110.12434</td>
<td>Use the meters from original point field to determine if plotting coordinates is necessary. Make sure all longitude values are (-).</td>
</tr>
<tr>
<td></td>
<td>Lat_ Top Reach</td>
<td>Top of the reach coordinate decimal degrees NAD 83</td>
<td>46.554</td>
<td>Make sure the top of reach, bottom of reach coordinates, and mid reach coordinates are independent locations.</td>
</tr>
<tr>
<td></td>
<td>Long_ Top Reach</td>
<td>Top of the reach coordinate decimal degrees NAD 83</td>
<td>-110.17434</td>
<td>Make sure the top of reach, bottom of reach coordinates, and mid reach coordinates are independent locations. Make sure all longitude values are (-).</td>
</tr>
<tr>
<td></td>
<td>Lat_ Bottom Reach</td>
<td>Bottom of the reach coordinate decimal degrees NAD 83</td>
<td>46.4454</td>
<td>Make sure the top of reach, bottom of reach coordinates, and mid reach coordinates are independent locations.</td>
</tr>
<tr>
<td></td>
<td>Long_ Bottom Reach</td>
<td>Bottom of the reach coordinate decimal degrees NAD 83</td>
<td>-110.32434</td>
<td>Make sure the top of reach, bottom of reach coordinates, and mid reach coordinates are independent locations. Make sure all longitude values are (-).</td>
</tr>
</tbody>
</table>
Appendix B. One month check list and agenda topics

The purpose of the mid season check meeting is to discuss QA/QC processes for design management and data collection and submission to date with the goal of resolving any questions or issues so they don't propagate throughout the field season.

Pre-meeting preparation checklist:

☐ The project lead has prepared a quick assessment of number of points sampled and crew productivity.
☐ The crew has submitted ~1 month's worth of data 1 week prior to this meeting.
☐ The crew has selected bankfull, scour, and floodplain photos from at least 3 sites and posted them on the google drive for meeting discussion. Sites should include: 1) a normal site, 2) the most quirky site visited to date, and 3) something in between or that warrants discussion.
☐ All parties involved have prepared a list of protocol questions and clarifications and potentially some photos to help discussion.
☐ All parties involved have prepared a list of design management and data QAQC questions to discuss during the meeting.
☐ The National AIM Team has a list of questions in regards to any final data QC to discuss during the meeting.

Discussion topics and questions:

If crews are taking more than 4-8 hours per site, or not sampling 1-1.5 sampled sites per day, what can we do to help improve efficiency. 
Consider: 

<table>
<thead>
<tr>
<th>Consider</th>
<th>Action Items and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the crew feel they have been provided with adequate office evaluation information to get to sites? Does the crew feel the trip plans are organized in a realistic manner? If not, what do they suggest for improvements?</td>
<td></td>
</tr>
<tr>
<td>Does the project lead feel that it is realistic to meet the project's total sample size by the end of the summer. If not, how do we adjust and prioritize, what's in the contract, etc.?</td>
<td></td>
</tr>
<tr>
<td>Is it clear to the crew who they are suppose to call for protocol questions, access issues, trip schedule issues, etc. ?</td>
<td></td>
</tr>
</tbody>
</table>

Design management spreadsheet

<table>
<thead>
<tr>
<th>Consider</th>
<th>Action Items and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the crew updating the Trip Planning &amp; Field Tracking worksheet often and completely?</td>
<td></td>
</tr>
<tr>
<td>Is the crew labeling BMI samples with an inside and outside label, storing appropriately, and recording number of jars collected in the Trip Planning &amp; Field Tracking worksheet?</td>
<td></td>
</tr>
<tr>
<td>Is it clear to the crew when they should be collecting 3 WQ samples and how to label and record these, especially in the Trip Planning &amp; Field Tracking worksheet? How many sites has the crew collected 3 samples for so far?</td>
<td></td>
</tr>
<tr>
<td>Are project leads finalizing eval statuses so that designs can be managed iteratively? Are there questions in regards to this?</td>
<td></td>
</tr>
</tbody>
</table>

Table continued on next page
<table>
<thead>
<tr>
<th><strong>Local Field/District Office orientation training:</strong></th>
<th><strong>Action Items and Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Who was able to make it to this local training? How many and what types of sites were visited?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Did this enhance everyone's understanding (especially the crew) of how to identify the critical concepts? Which critical concept caused the most discussion?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Which other indicators caused a lot of discussion and why?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Was this productive for all parties?</td>
<td>Action Items and Notes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Photo review:</strong></th>
<th><strong>Action Items and Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The crew presents bankfull photos and discusses their experience at 3 sampled sites: 1) a typical site, 2) a challenging site, and 3) 1 other site that you would like to share. Does everyone agree on these critical concept locations? Does the crew feel confident with identifying the three critical concepts for a diversity of sites? Other discussion about these sites?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Does anyone else have photos or specific indicators they want to discuss?</td>
<td>Action Items and Notes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Has the crew encountered any of the below special situations (Appendix C) yet this field season, and how did they go? What indicators were difficult in these systems?</strong></th>
<th><strong>Action Items and Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupted flow</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Beaver impacts</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Partial data</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Side Channels</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Braided systems</td>
<td>Action Items and Notes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>SARAH and QAQC</strong></th>
<th><strong>Action Items and Notes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Has the crew found any SARAH glitches preventing efficient data collection, QAQC, backup, and submission that the National AIM Team can work on fixing?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Is the crew backing up data after at least every three sites? If not, why not?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Are there reoccurring themes or issues being discussed at the weekly QAQC meetings? Who is attending? If these meetings are not occurring, why not? How can we improve?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>How often is the project lead able to review indicator values? What issues have arisen?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Does the National AIM Team have questions for the team about final data?</td>
<td>Action Items and Notes</td>
</tr>
<tr>
<td>Are there any other unresolved data issues?</td>
<td>Action Items and Notes</td>
</tr>
</tbody>
</table>
C. End of season check list

The purpose of the end of season meeting is to ensure all that all QA/QC questions have been resolved, all design and field data have been finalized, and no more information or tasks are required prior to the end of the field season.

Pre-meeting preparation checklist:

☐ Crews have submitted all final data.
☐ Project Lead has reviewed all indicator data and will come to the meeting with any questions.
☐ National AIM team has reviewed final data and will come to the meeting with any questions.
☐ Crews, contractors, and project leads have finalized the Design Management Spreadsheets.
☐ The National AIM Team has reviewed the finalized Design Management Spreadsheet and will come to the meeting with any questions.
☐ Crews prepare a list of gear that needs to be replaced, replenished, or fixed and share with whomever is responsible for gear (using the master gear list as a checklist could be helpful).
☐ Contractors have coordinated with NAMC to submit bug and water quality samples.
☐ Final step, State Lead/Coordinator organizes meeting with National AIM Team, project leads, contractors, and crews. Keeps notes in the Field Work folder of the Google drive under Mid and End of season check folder.

Pre-meeting table to be completed by Project Lead:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Lead Name</td>
<td></td>
</tr>
<tr>
<td>Project Area</td>
<td></td>
</tr>
<tr>
<td>Year of design (e.g., first year of 3)</td>
<td></td>
</tr>
<tr>
<td>Field season start and end dates (e.g., May 1-August 31)</td>
<td></td>
</tr>
<tr>
<td>Contract/agreement company and crew members</td>
<td></td>
</tr>
<tr>
<td>Number of random sampled sites</td>
<td></td>
</tr>
<tr>
<td>Number of targeted sampled sites</td>
<td></td>
</tr>
<tr>
<td>List of sites that were suppose to be sampled this year but for various reasons will need to be sampled next year (discuss list)</td>
<td></td>
</tr>
<tr>
<td>List of sites that are boatable and will need National AIM Team support to sample</td>
<td></td>
</tr>
<tr>
<td>Preliminary notes about the design (e.g., next year we will need more points in Field Office A, next year we will want an intensification because there are not enough points in X allotment, or the design was great and should continue as is next year) National AIM Team will follow up during the planning stages.</td>
<td></td>
</tr>
</tbody>
</table>
Discussion topics/questions, and final checks at minimum:

Design management

☐ Resolve any disagreements on final eval status in Design Management Spreadsheets.
☐ Resolve any other questions in regards to the Design Management Spreadsheets.
☐ Is there any other follow up needed on sites that should be revisited in future years?
☐ Have all sites that were merged been properly noted as such with the merged site code in the design management spreadsheet? Sites that were intended to be merged but not sampled should not have any final designation.

Data

☐ Discuss any remaining problem sites, photos, indicators, or field methods.
☐ Final data QAQC follow-up.
☐ Have bug and WQ sampled been submitted? If not, what is the plan?
☐ All electronic data, photos, etc. have been sent to National AIM Team. If not, resolve issues at meeting.