D07 AQUATIC INSTRUMENT SYSTEM (AIS) SITE CHARACTERIZATION REPORT

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See Configuration Management System for approval history

Change Record

REVISION	DATE	ECO #	DESCRIPTION OF CHANGE
A	02/03/2014	ECO-01433	Initial Release
B	05/26/2015	ECO-02923	Updates to sensor locations and site design

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 DESCRIPTION

1.1 Purpose

Information collected and described here is used to inform the site design activities for the NEON project Aquatic Instrument System (AIS). This report includes information gathered by the Aquatic (AQU)/STREON (STR) and Environmental, Health, & Safety (EHS) teams. The purpose of this report is for the science team to outline what is desired at each site within a domain in order to obtain the best scientific data possible to help answer NEON's Grand Challenge Questions; therefore, this is not a design document, but a report that is an input to the design process.

The Appendices include summary tables for the convenience of the multiple audiences of this report; some of the information in the tables is repeated from the body of this report while other information is exclusive to the summary tables.

1.2 Scope

AQU site characterization information presented in this document is for the D07 aquatic locations: Walker Branch – AQU (core), LeConte Creek (relocatable), and Walker Branch STREON (STREON). Issues and concerns for each site that need further review are also addressed in this document according to our best knowledge. Unless otherwise noted, the information contained herein takes precedence over the same information repeated elsewhere; thereby, this document contains the official change-controlled information pertinent to these sites.

Disclaimer: All latitude and longitude coordinates are subject to the variation inherent in our GPS equipment and the conditions at the site. Some of the Aquatic sites are in narrow canyons with limited satellite coverage; resulting in coordinates that are not accurate to within 50 cm.

This report takes precedence over other documents and reports that may repeat the information contained herein.

2 RELATED DOCUMENTS AND ACRONYMS

2.1 Applicable Documents

AD[01]	
AD[02]	
AD[03]	
AD[04]	

2.2 Reference Documents

RD[01]	NEON.NPR.000008	NEON Acronym List
RD[02]	NEON.NPR.000243	NEON Glossary of Terms
RD[03]	[Reference to photos]	
RD[04]	[Reference to map(s)]	

2.3 Verb Convention

"Shall" is used whenever a specification expresses a provision that is binding. The verbs "should" and "may" express non-mandatory provisions. "Will" is used to express a declaration of purpose on the part of the design activity.

3 D07 AIS SITE CHARACTERIZATION REPORT

3.1 Walker Branch – AQU

The Walker Branch – AQU site is a wadeable, 1st order stream located on the U.S. Department of Energy's Oak Ridge Reservation in eastern Tennessee.

3.1.1 Aquatic Auxiliary and Aquatic Portal Locations for Construction

The initial estimated location for the Aquatic Auxiliary Portal is collocated with the Aquatic Portal (Figure 1, Tables 1-2). There is line power running along the access road to the huts at the weirs located at the end of the West and East Branches. The Portal can be placed near the West Hut which is near S1 and the Met Station.

Figure 1 A Google-Earth-Derived Image of Aquatic Auxiliary Portal for D07 Walker Branch – AQU

Table 1 Aquatic Auxiliary Portal Location

Aquatic Auxiliary Portal	Latitude	Longitude
Location	35.958600°	-84.279550°

Table 2 Aquatic Portal Location

Aquatic Portal	Latitude	Longitude
Location	35.958600°	-84.279550°

Figure 2 Picture of West Branch weir and powered hut. Power pole next to existing parking space.

3.1.2 Sensor Locations for Construction

The GPS coordinates for S1 and S2 obtained by AQU and EHS are presented in Table 3. Many aquatic sites are in narrow canyons or covered by dense canopy, which reduces satellite availability. In these situations, AQU will provide a description of the location and an approximate GPS location (e.g. not accurate to within <1m). This description will suffice for the planning stages, but sites will likely need to be physically marked prior to construction. While the sensor locations are located below the confluence of the east and west branches of Walker Branch, some AOS Aquatic sampling protocols are expected to include the west branch of Walker Branch. The top and bottom of the aquatic sampling reach are shown in Figure 1.

These coordinates are to be used for the input to the AIS design:

~~5.95845~~	~~84.27934~~
~~5.95722~~	~~84.27915~~

Table 3 S1, S2 and Met Station and Associated Field Device Posts Locations

Sensor	Latitude	Longitude
S1	35.958452	-84.279341
FDP – S1	35.958452	-84.279376
S2	35.957220	-84.279151
FDP – S2	35.957220	-84.279312
Met Station	35.958657	-84.279327
FDP – Met	35.958680	-84.279284
Staff Gauge	35.958452	-84.279341
Camera	35.958452	-84.279376

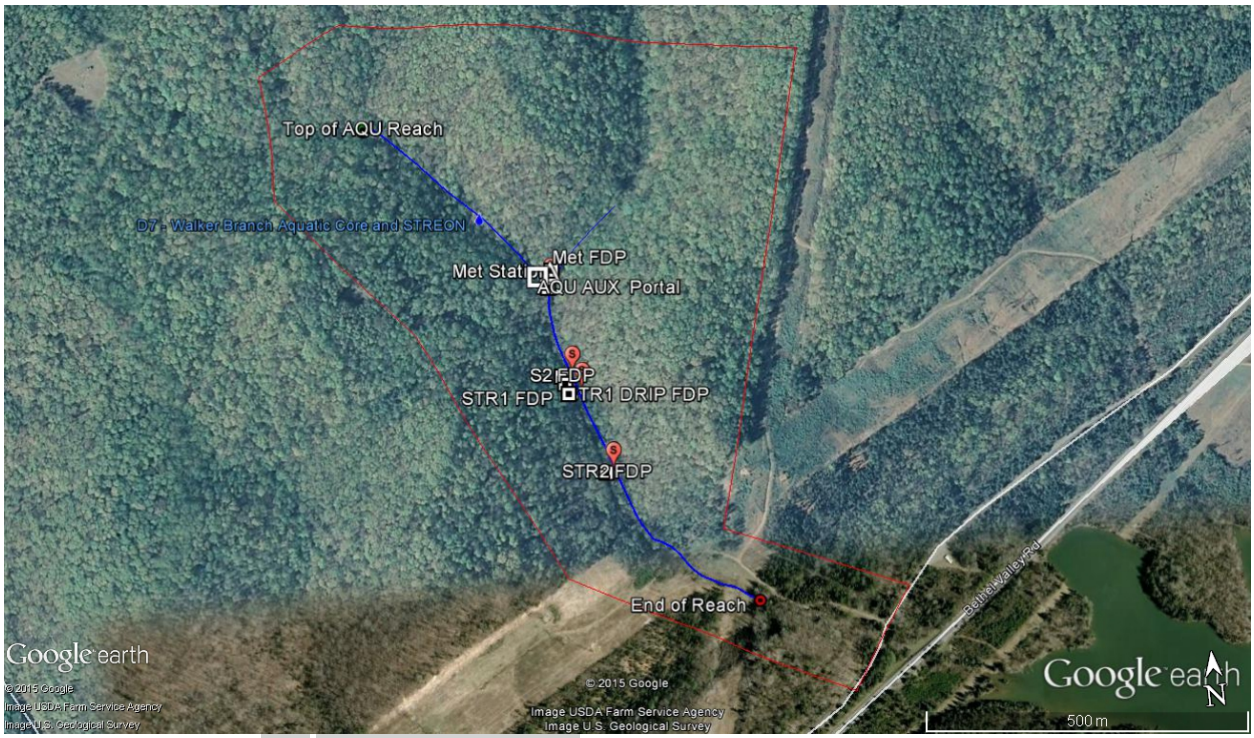

Figure 3 Kmz File of D07 Walker Branch – AQU Denoting Locations of S1, S2, and Met Station

Figure 4 Photo of S1 Location at D07 Walker Branch – AQU

Figure 5 Photo of S2 Location at D07 Walker Branch – AQU

3.1.3 Groundwater Wells

The groundwater observation wells network at the site (Figure 6, Table 4) will consist of 8 – 2" diameter wells installed using a powered hand auger. Topography at the site is dominated by narrow flat valley bottom surrounded by relatively steep hillslopes on both sides. The wells will be installed in the flat valley bottom and a short distance up toe of the hillslope. Required drilling depths will vary due to the topography of the reach with total depths between ~1-4 meters below ground surface. Access to the site will be via the existing gravel road directly to the west of the AIS reach.

The exact location of wells may vary during the drilling process due to the presence of sandstone boulders in the subsurface which were observed during the visit. These will be hard to detect from the surface using geophysical methods due to their size and may pose an issue if one is encountered during the drilling activities. Thus, actual locations of wells will vary slightly from the plan if an obstruction is encountered.

Installation of the wells will utilize drilling methods that will be minimally invasive to the site. The wells will be constructed using an acceptable grout to fill the annular space such as neat cement, bentonite chips, or a bentonite / cement mixture; and, a surface seal of the well will utilize a concrete or cement slab poured around a steel outer casing with a locking cap. These measures are typically required by the State Water Resources/Environmental Departments in the well construction regulations, but also aid in protecting the well and limiting surface water intrusion down the borehole.

Figure 6 Initial Groundwater Well Locations Based on EMS kmz File at D07 Walker Branch – AQU

Table 4 Groundwater Observation Well Locations

Well ID	Latitude	Longitude
D07-WB-OW-01	35.958455	-84.279419
D07-WB-OW-02	35.958411	-84.279269
D07-WB-OW-03	35.958161	-84.279195
D07-WB-OW-04	35.957825	-84.279551
D07-WB-OW-05	35.957796	-84.279370
D07-WB-OW-06	35.957484	-84.279530
D07-WB-OW-07	35.957191	-84.279297
D07-WB-OW-08	35.957186	-84.279058

3.1.4 Riparian Vegetation Cover

During 2010-2011 site visits, the following plant density and type were observed by the AQU team: The canopy is comprised of hardwood forest. The % canopy closed is ~90% when leaves are out. The understory is mostly leaves and groundcover.

Figure 7 The Riparian Canopy at D07 Walker Branch – AQU is dense hardwood. Kirsten Ruiz is walking on the moveable boardwalk that is currently in the upper West Branch (property of ORNL).

3.1.5 Bank Morphology

The bank angle is estimated from the top of the bank, where one might stand to observe the stream, to the top of the water. The estimated angle is from the water to the bank, as illustrated in the figure below.

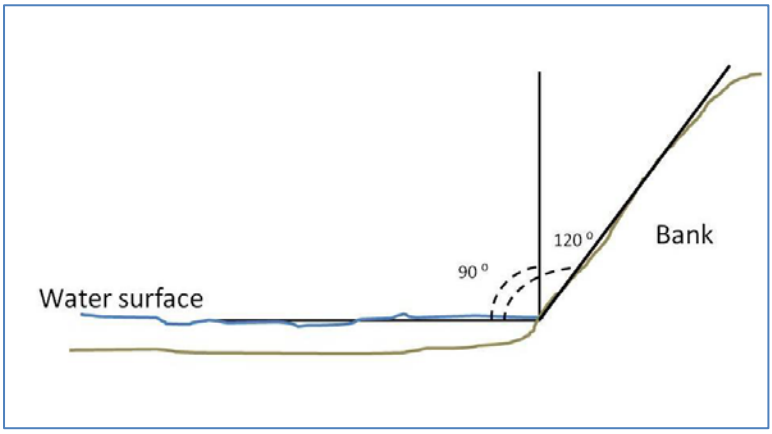

Figure 8 How Bank Angle is Measured

During 2015 site visits, AQU observed the following bank conditions at S1 and S2:

Table 5 Bank Conditions At D07 Walker Branch – AQU In 2015

Morphology Type	S1	S2
RB* angle	100	120
LB* angle	150	130
Maximum water height	120cm	75 cm
Bankfull width	5 m	6 m
Substrate composition	Bedrock/cobble	Bedrock/cobble

* RB (right bank) and LB (left bank) are determined by facing downstream.

Figure 9 Picture of steep stream banks typical in the AQU and STREON sensor reaches.

3.1.6 Site Photos

The following photos of are representative of the site.

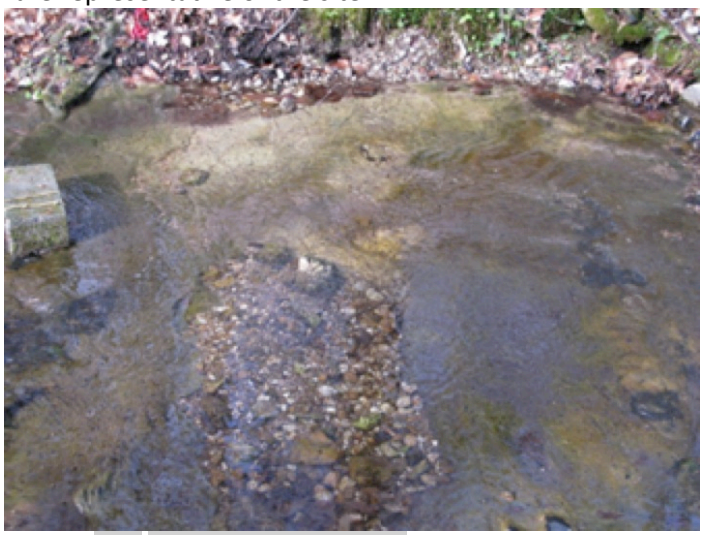

Figure 10 Typical Substrate in D07 Walker Branch – AQU are mostly bedrock and some cobble. Bedrock is the dominant substrate in AQU reach and may make installations tricky

Figure 11 Bridges built across stream to minimize walking in stream upstream of the sensor sets, above the weir.

Figure 12 Parking at the weir near S1.

Figure 13 Lots of old research equipment in and around stream.

Figure 14 Additional science trash in upper West Walker Branch.

There are 11 springs that are readily identifiable in West Walker Branch and are typical feature of the ecosystem.

Figure 15 Springs feed into Walker Branch throughout the reach. This shows three of the eleven springs that are in the upper West Branch.

Figure 16 Google Earth image showing locations of 11 springs in the West Branch and a spring in the lower STREON reach.

3.1.7 Site Access Needs

3.1.7.1 Science Perspective on Access Needs (Pathways, Stairs, Etc.) to Reduce Site Erosion/Impact

Stairs to the sensors sets in both the AQU and STREON reaches will be needed for both safety and to control erosion during maintenance and sampling activities. Stairs shall be added near S1, the nutrient addition station (between S2 and STR S1) and at STR S2. These three locations will allow for safe access across the main Walker Branch reach.

Suggest using something like 17" wide TuffSteps (**NO handrails to allow for carrying sampling and maintenance equipment**): (http://www.tuffbuiltproducts.com/catalogues/Access-Related-Products/tuff-step-2012-12-01.pdf)

Figure 17 Picture of installed narrow section of Tuff Steps.

Table 6 S1 Stairs Locations & Length

Stairs	Latitude	Longitude
Top of Stairs	35.958452	-84.279376
Length of Stairs	2m	

Table 7 S2/Nutrient Addition Station Stairs Location & Length

Stairs	Latitude	Longitude
Top of Stairs	35.957117	-84.279267
Length of Stairs	8m	

Table 8 STR S2 Stairs Location & Length

Stairs	Latitude	Longitude
Top of Stairs	35.955837	-84.278743
Length of Stairs	8m	

There are existing walkways (e.g. boardwalks) at the site that NEON can use in upper West Walker Branch to facilitate sampling activities. The boardwalks are small and moveable, allowing for shifting of the boardwalk as necessary due to water conditions at the site. Some broken and corroding boardwalks should be removed.

There is a large amount of "science trash" in upper West Walker Branch that should be removed at the time of deployment. These efforts will need to be coordinate with faculty at ORNL to understand what is no longer in use. There are plastic garbage and laundry tubs that are broken and deteriorating- at some points in the stream. In addition there are metal items which will provide ongoing contamination to our trace metal sampling. For example there is a small 1 x 4' metal weir at the top of the reach.

3.1.8 Communications at the Site

Cell and internet service on cell phones AT&T and Verizon was good (full bars). Satellite coverage is spotty even during winter with minimal canopy coverage.

3.1.9 Power at the Site

The local power utility company is City of Oak Ridge (Denny Boss C 865-755-5362, O 865-425-3582).

3.1.10 Site Science Construction Constraints and Limitations

Site-specific issues to consider at D07 Walker Branch – AQU are:

- Most of the substrate is bedrock. This will make installations difficult; power and communication runs to the junction boxes may need to be above ground or anchored into bedrock.

- The area is often covered in dead leaves and plant material; minimize the disturbance or removal of plant material during construction. This can be partially achieved by walking on the existing boardwalks.

Driving and access constraints for D07 Walker Branch – AQU are:

- Parking is located at Walker Branch Weir; walk upstream to reach the top of the AQU stream reach. Walk downstream to locate the S1, S2, STR S1 and STR S2 sensor set locations.

3.1.11 Other Issues

- There are a variety of snakes in the area. Appropriate protective equipment should be worn to minimize dangers.

3.2 LeConte Creek

The LeConte Creek site is a 2nd order wadeable stream located in the steep mountainous terrain of the Great Smokey Mountains National Park. The stream reach is characterized as a high gradient stream, ranging from about 2 to 4m wide with series of steps and pools with many large granitic boulders up to 5m in diameter. Vegetation surrounding the stream is dominated by tall deciduous and coniferous trees forming the canopy and the riparian ground vegetation is dominated by thick rhododendron bushes, small to large granitic boulders, and poison ivy.

3.2.1 Aquatic Auxiliary and Aquatic Portal Locations for Construction

The aquatic portal is the Instrument Hut on the GSMNP tower site.

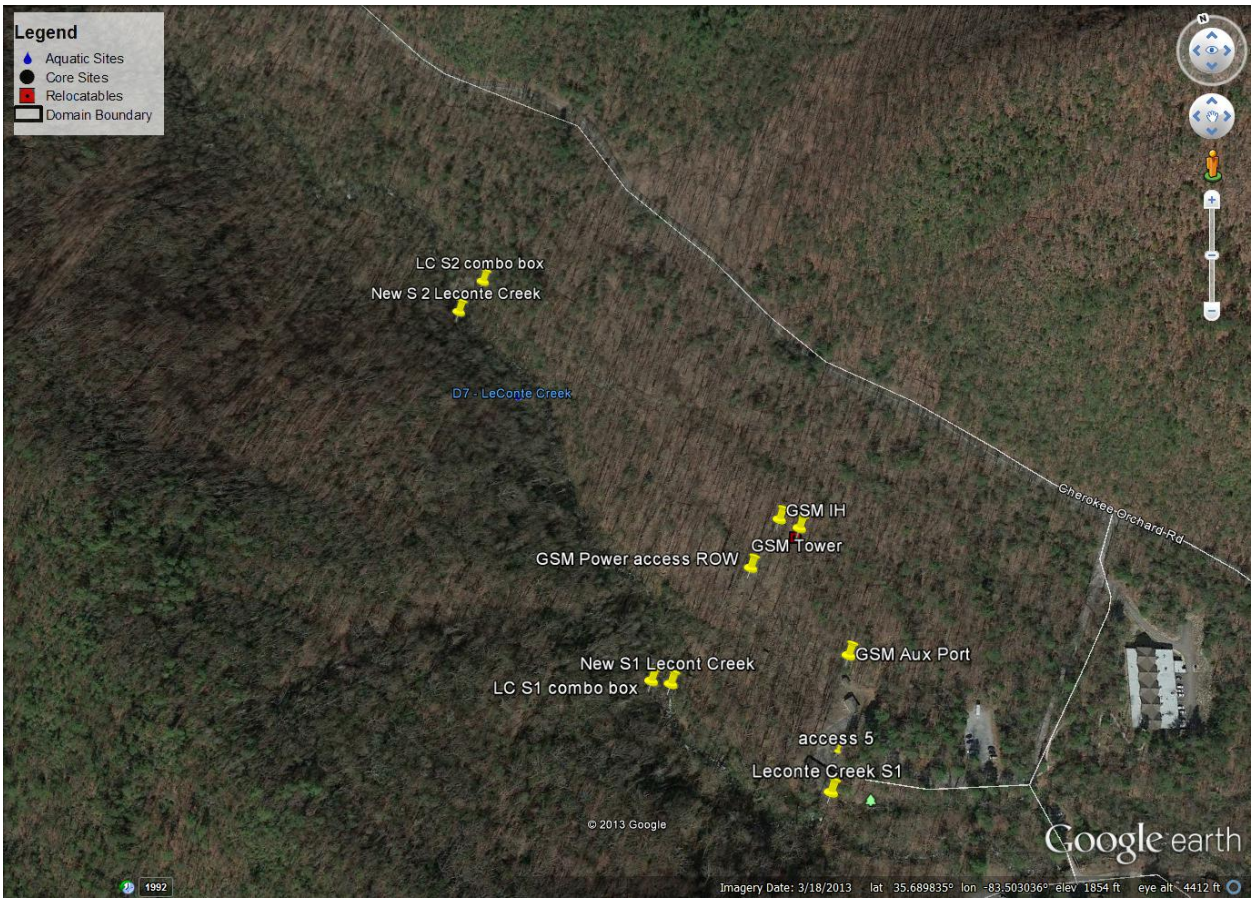

Figure 18 A Google-Earth-Derived Image of Aquatic Auxiliary Portal for D07 LeConte Creek

Table 9 Aquatic Auxiliary Portal Location

Aquatic Auxiliary Portal	Latitude	Longitude
Location	35.689247	-83.502086

The initial estimated location for the Aquatic Portal (see above map).

Table 10 Aquatic Portal Location

Aquatic Portal	Latitude	Longitude
Location	35.689247	-83.502086

3.2.2 Sensor Locations for Construction

LeConte Creek will have two sensor sets located at the top and bottom of the reach. Both sensor sets are positioned in deep pools (approximately 3ft deep for S1 and 2ft deep at S2). The distance between the sensor sets is approximately 400m. In-stream sensor locations are defined in Table 7 and the meteorological station location is defined in Table 8. The meteorological station location is planned to be installed adjacent to the stream near the S2 sensor set approximately 50-70 feet to the right, when looking down stream, on the flat riparian region. To facilitate the installation of the meteorological station a few small trees may need to have branches trimmed.

Table 11 Sensor 1 & Sensor 2 Locations

Sensor	Latitude	Longitude
S1	35.689028	-83.503361
S1 – FDP	35.689093	-83.503211
S2	35.692194	-83.504417
S2 - FDP	35.692164	-83.504345

Table 12 Met Station & Discharge Sensor Locations

Sensor	Latitude	Longitude
Discharge	35.689028	-83.503361
Camera	35.689082	-83.503268
Met Station	35.689215	-83.503264
Met – FDP	35.689095	-83.503193

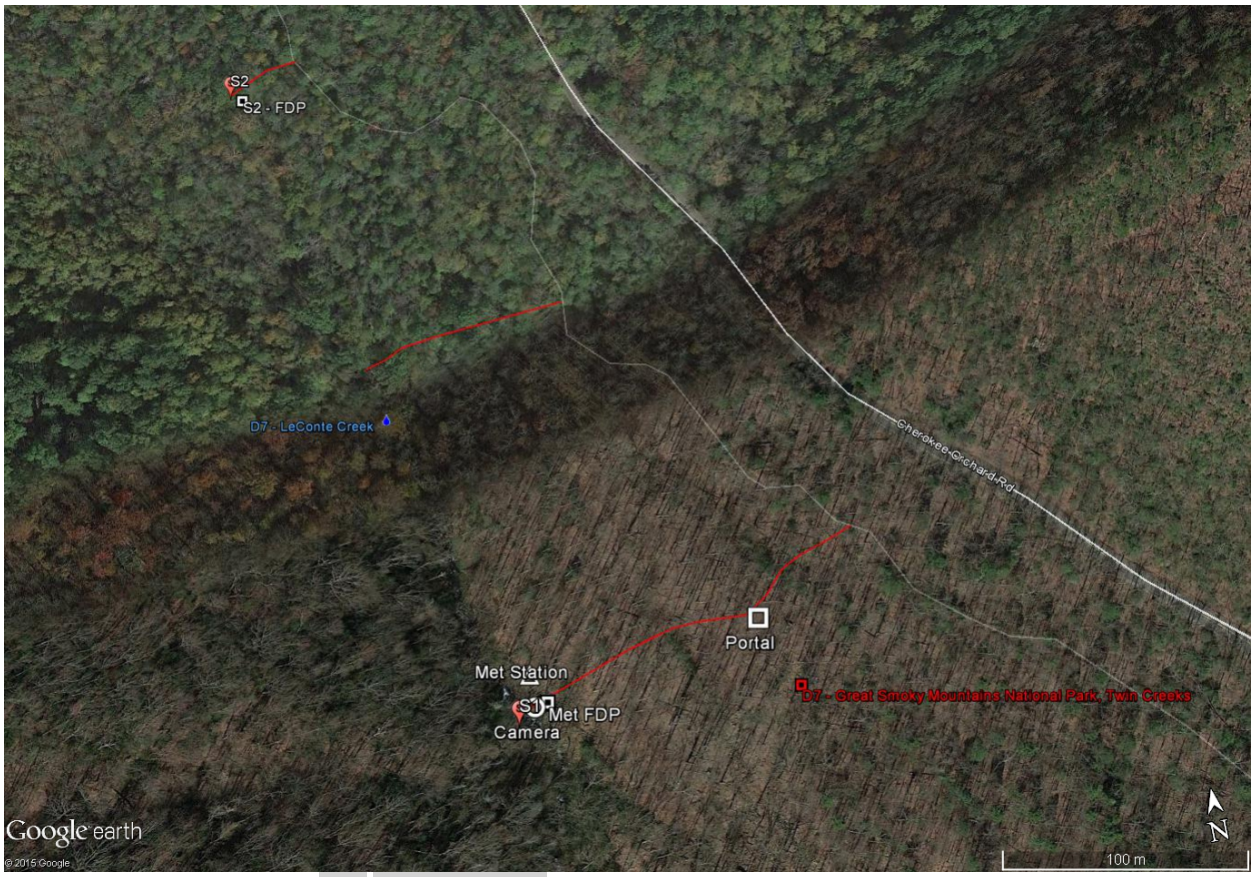

Figure 19 Kmz File of D07 LeConte Creek Denoting Locations of S1, S2, and Met Station

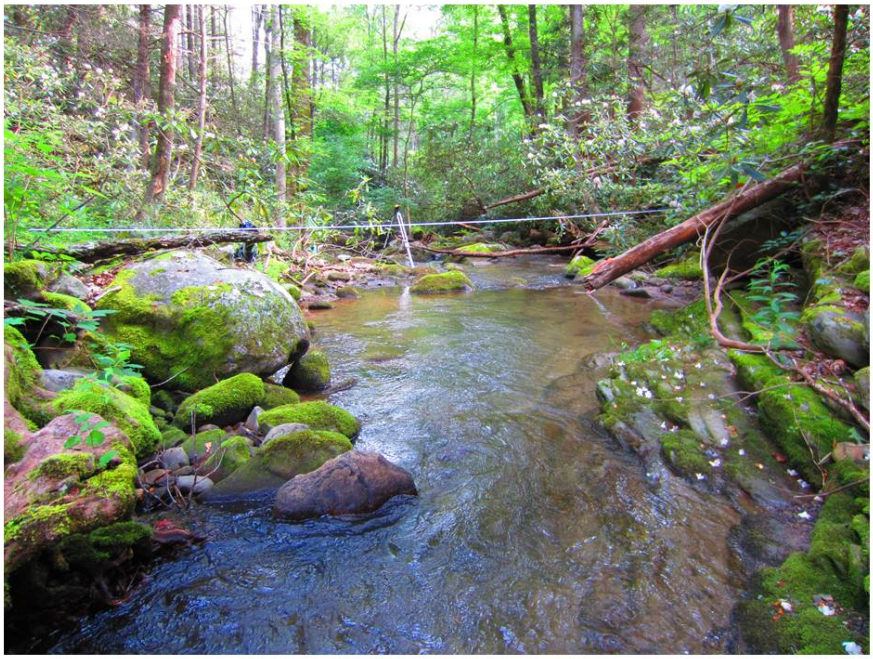

Figure 20 Photo of S1 Location at D07 LeConte Creek

Figure 21 Photo of S2 Location at D07 LeConte Creek

Figure 22 Picture of Met Station location (foreground) showing the field device post in the background.

3.2.3 Groundwater Wells

The groundwater observation wells network at the site (Figure 23, Table 13) will consist of 8 wells installed using a combination of hand auguring near the stream and a rotary auger rig for the two wells far from the stream. Topography at the site is dominated by relatively steep gradient hillslopes dipping towards the stream and gentler slopes further from the stream on both sides. Six of the wells will be installed adjacent to the stream (within 50 feet of the stream edge) using a powered hand auger, while two wells will be installed further from the stream using either a rotary/sonic auger or geoprobe rig. Well depths will vary from about 10 feet in depth for the near stream wells and up to 60 feet in depth for the wells further away from the stream. Access to the site will be via the existing unimproved access path directly to the east of the stream. Rig access to those wells located farthest from the streams is anticipated to require the adjustment and moving of some of the dead ground vegetation (such as downed trees), and potentially the minor trimming of some live tree branches (all less than 1" in diameter). Wells near the stream may also require the adjustment of downed trees to facilitate access to the well locations, and trimming of a few small live branches (less than 1" in diameter). Care will be taken while moving the drilling equipment around the site to not impact any existing rock walls.

The exact location of wells may vary during the drilling process due to the heavy presence of granitic boulders which were observed during the visit. Though prevalent on the surface, these will be hard to detect prior to drilling in the subsurface and may pose an issue if one is encountered during the drilling activities. Thus, actual locations of wells and the path of the drill rig will vary slightly from the plan if a boulder is encountered. If drilling access to the west side of the stream proves to be too challenging for the selected equipment, then wells on the west side of the stream will be omitted from the design.

Installation of the wells will utilize drilling methods that will be minimally invasive to the site. The wells will be constructed using an acceptable grout to fill the annular space such as neat cement, bentonite chips, or a bentonite / cement mixture; and, a surface seal of the well will utilize a concrete or cement slab poured around a steel outer casing with a locking cap. These measures are typically required by the State Water Resources/Environmental Departments in the well construction regulations, but also aid in protecting the well and limiting surface water intrusion down the borehole.

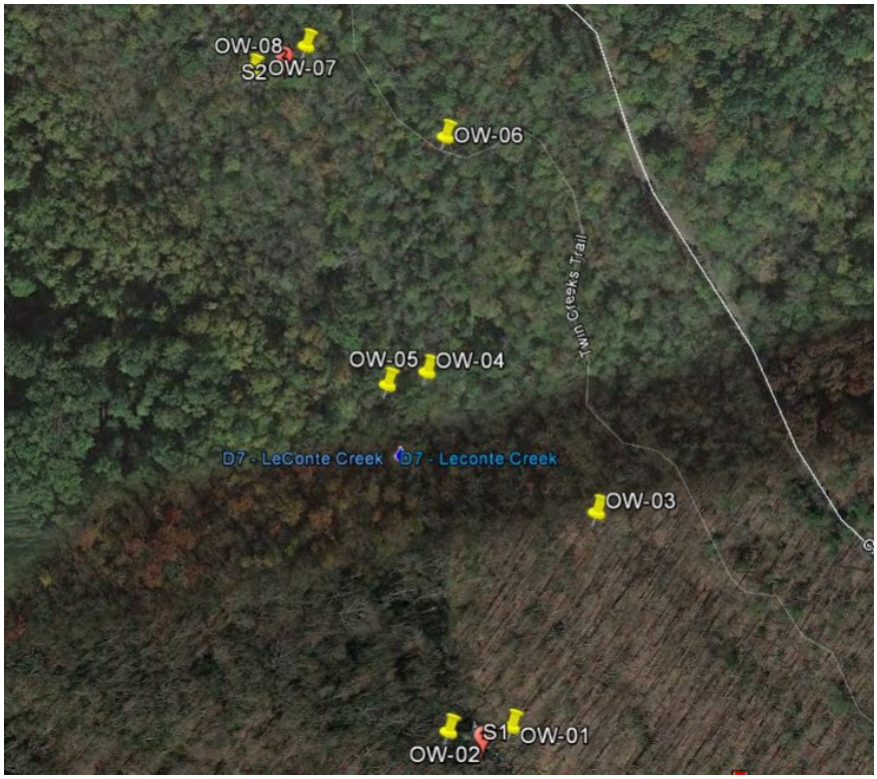

Figure 23 Initial Groundwater Well Locations Based on EMS kmz File at D07 LeConte Creek

Table 13 Groundwater Observation Well Locations

Well ID	Latitude	Longitude
D07-LECO-OW-01	35.689109	-83.503224
D07-LECO-OW-02	35.689105	-83.503580
D07-LECO-OW-03	35.690079	-83.502722

D07-LECO-OW-04	35.690734	-83.503655
D07-LECO-OW-05	35.690679	-83.503882
D07-LECO-OW-06	35.691821	-83.503520
D07-LECO-OW-07	35.692273	-83.504311
D07-LECO-OW-08	35.692170	-83.504630

3.2.4 Riparian Vegetation Cover

Figure 20 below shows the typical riparian vegetation and canopy cover which exists in a nearly homogeneous pattern across the site. Of note is the dense population and distribution of rhododendron bushes along the edges of the stream reach.

Figure 24 The Riparian Canopy at D07 LeConte Creek

3.2.5 Bank Morphology

The bank angle is estimated from the top of the bank, where one might stand to observe the stream, to the top of the water. The estimated angle is from the water to the bank, as illustrated in the figure below.

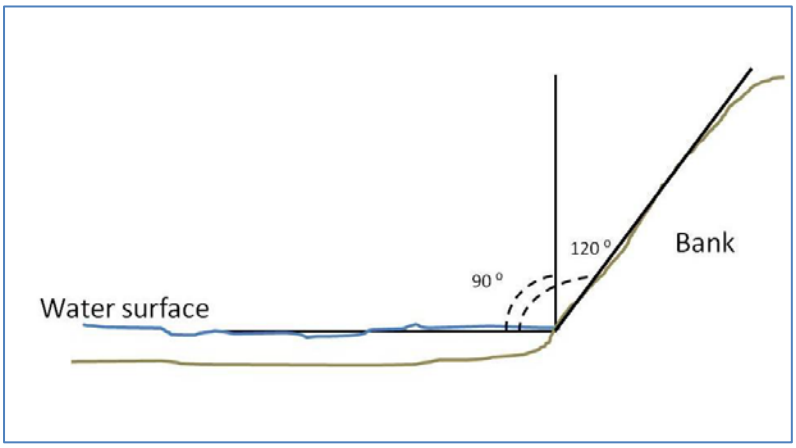

Figure 25 How Bank Angle is Measured

The banks along the LeConte Creek range from very steep slippery slopes near the S1 location (~125°) which gradually decrease to more gentle slopes in the vicinity of S2 (160 °) along the eastern edge of the stream. Along the western edge of the stream the slopes are fairly gentle for the full length of the reach ranging from 150-170 °.

Table 14 Bank Conditions At D07 LeConte Creek In 2011

Morphology Type	S1	S2
RB* angle	~ 125 °	~ 170 °
LB* angle	~ 150 °	~ 170 °
Maximum water height	4ft	2ft
Bankfull width	5m	7m
Substrate composition	cobbles	cobbles and coarse sands

* RB (right bank) and LB (left bank) are determined by facing downstream.

3.2.6 Site Photos

The following photos of are representative of the site.

Figure 26 Typical Substrate in D07 LeConte Creek are mostly cobbles and coarse sediments.

Figure 27 The reach is characterized by stretches of high gradient shallow stream flow frequently interrupted by large deep pools.

Figure 28 The riparian groundcover along the stream reach is typically very dense clusters of rhododendron bushes, small boulders, and deciduous trees.

3.2.7 Site Access Needs

3.2.7.1 Science Perspective on Access Needs (Pathways, Stairs, Etc.) to Reduce Site Erosion/Impact

Unimproved pathways (cleared trail – see Figure 29), will be required from the main Twin Creeks Trail to the edge of the stream at S1, S2 and GWWs 04 and 05 to facilitate movement to the stream reach and sensor locations due the sometimes very dense presence of groundcover which ranges from thick rhododendrons to patches of thick poison ivy and briar bushes.

No stairs will be needed at this site.

Table 15 S1 Pathway Coordinates

Pathway Location	Latitude	Longitude
Start	35.689550	-83.501517
End	35.689028	-83.503361

Table 16 GWW 04/05 Pathway Coordinates

Pathway Location	Latitude	Longitude
Start	35.690785	-83.502721
End	35.690679	-83.503882

Table 17 S2 Pathway Coordinates

Pathway Location	Latitude	Longitude

Start	35.692301	-83.503987
End	35.692194	-83.504417

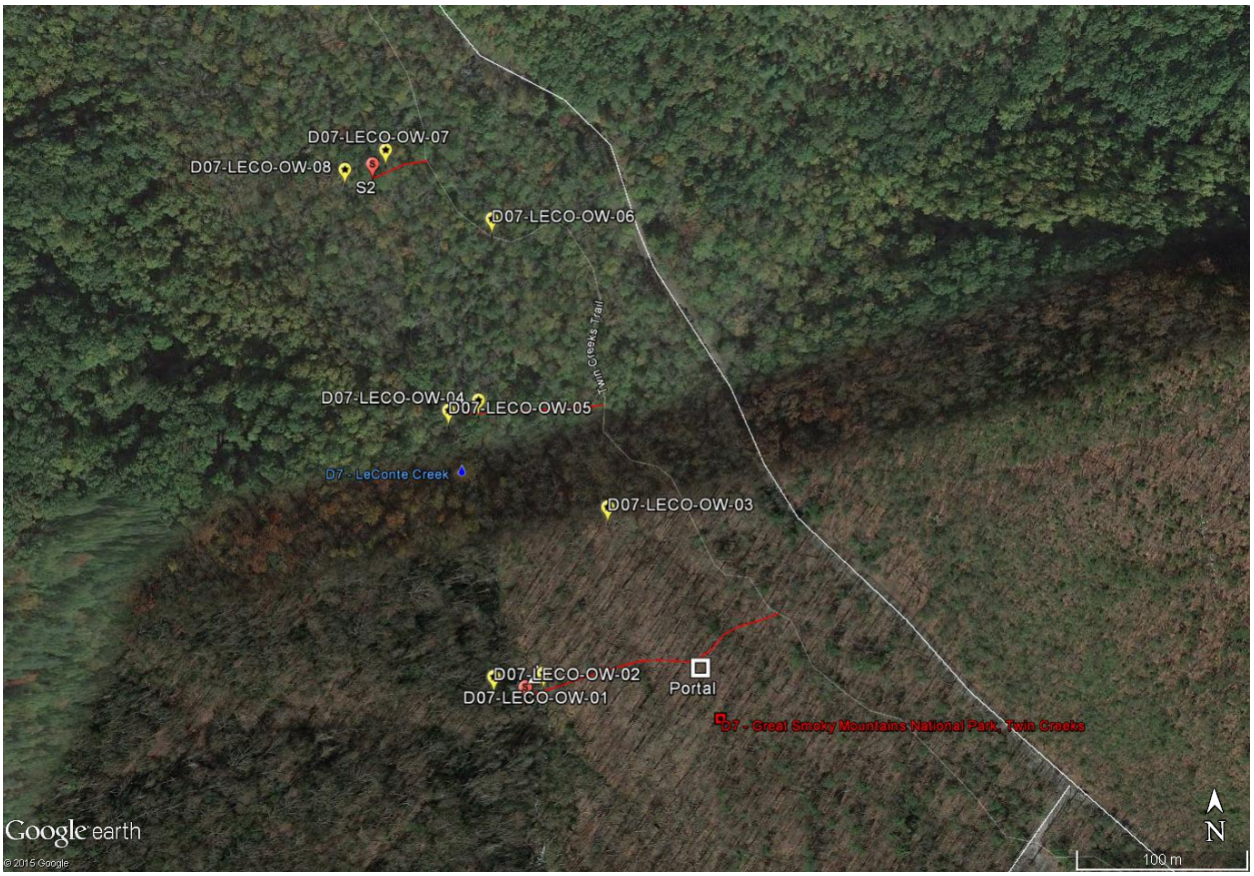

Figure 29 Map showing access pathways (red) from Twin Creeks Trail to sensor locations.

3.2.8 Communication at the Site

See Communications documentation.

3.2.9 Power at the Site

The local power utility company is Sevier County Electric Brent Ogle 865-774-6238

3.2.10 Site Science Construction Constraints and Limitations

No Site specific constraints have been identified.

3.2.11 Other Issues

No other science issues are identified at this time.

3.3 Walker Branch STREON

The Walker Branch STREON site is a wadeable, 2nd order stream in the mountains of eastern Tennessee. The stream is shallow (<20 cm) and has low, stable flows (<60 L/s). The stream is mostly bedrock, with some cobble.

3.3.1 Aquatic Auxiliary and Aquatic Portal Locations for Construction

The initial estimated location for the Aquatic Auxiliary Portal is same as for the Walker Branch AQU site. Please refer to information above. Tables 12 and 13 re-summarize the portal locations.

Table 18 Aquatic Auxiliary Portal Location

Aquatic Auxiliary Portal	Latitude	Longitude
Location	35.95860	-84.27955

The initial estimated location for the Aquatic Portal is:

Table 19 Aquatic Portal Location

Aquatic Portal	Latitude	Longitude
Location	35.95860	-84.27955

3.3.2 Sensor Locations for Construction

AQU, with support from EHS, has the following field GPS coordinates for S1 and S2 locations. Many aquatic sites are in narrow canyons or covered by dense canopy, which reduces satellite availability. In these situations, AQU will provide a description of the location and an approximate GPS location (e.g. not accurate to within <1m). This description will suffice for the planning stages, but sites will likely need to be physically marked prior to construction.

These coordinates are to be used for the input to the AIS design:

Table 20 Nutrient Addition Station, Sensor 1 & Sensor 2 and Associated Field Device Posts Locations

Sensor	Latitude	Longitude
Nutrient Addition Station	35.957117	-84.279267
STR S1	35.956985	-84.279020
FDP – STR1	35.956973	-84.279227
STR S2	35.955844	-84.278638
FDP – STR2	35.955837	-84.279743

The STREON hut/nutrient addition station may be co-located with the STREON S1 sensor set. Only one nutrient addition station is required at Walker Branch STREON. STR2 is located upstream from a

groundwater spring that significantly changes the common hydrology and aquatic vegetation and habitat diversity. No measurements should be made below this spring, shown in Figure 3

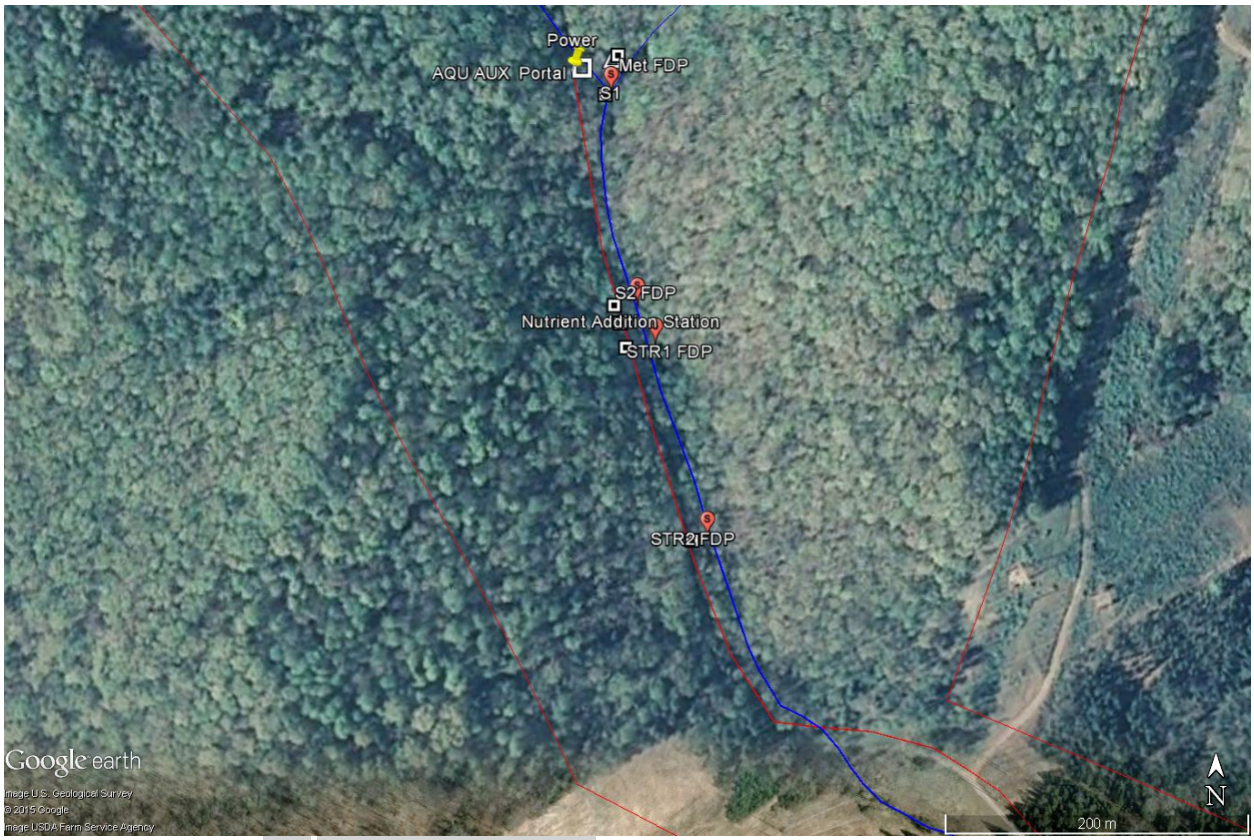

Figure 30 Kmz File of D07 Walker Branch STREON Denoting Locations of STR S1, S2, and STREON hut/nutrient addition station.

Figure 31 Photo of STR S1 Location at D07 Walker Branch STREON

Figure 32 Photo of STR S2 Location at D07 Walker Branch STREON.

Figure 33 Nutrient Injection Point.

3.3.3 Groundwater Wells

See section 3.1.3 for details.

3.3.4 Riparian Vegetation Cover

During 2010-2011 site visits, the following plant density and type were observed by the AQU team: The canopy is comprised of hardwood forest. The % canopy closed is ~90% when leaves are out. The understory is mostly leaves and groundcover.

Figure 34 The Riparian Canopy at D07 Walker Branch STREON

3.3.5 Bank Morphology

The bank angle is estimated from the top of the bank, where one might stand to observe the stream, to the top of the water. The estimated angle is from the water to the bank, as illustrated in the figure below.

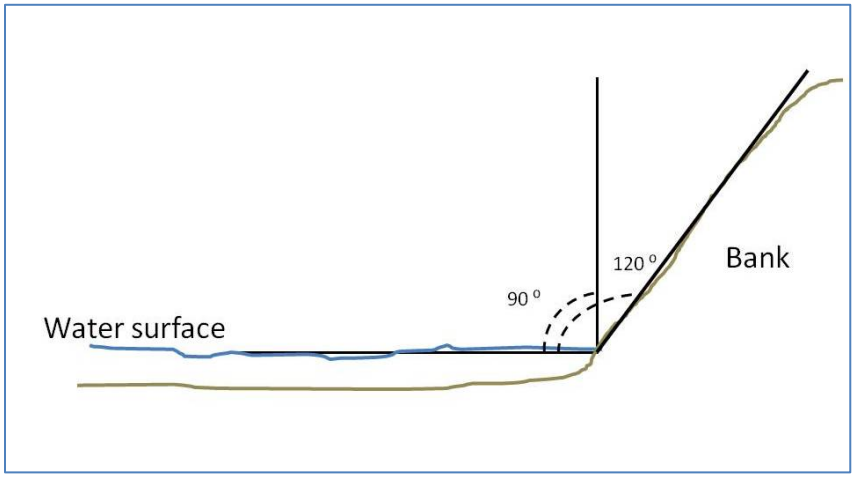

Figure 36 How Bank Angle is Measured

During 2011 site visits, AQU observed the following bank conditions at S1 and S2:

Table 21 Bank Conditions At D07 Walker Branch STREON In 2011.

Morphology Type	S1	S2
RB* angle	120	130
LB* angle	130	120
Maximum water height	38.6 cm	34.9 cm
Bankfull width	6.08 m	3.2 m
Substrate composition	Bedrock, cobble	Bedrock, cobble

* RB (right bank) and LB (left bank) are determined by facing downstream.

Figure 35 Stream Banks near STR S1.

3.3.6 Site Photos

The following photos of are representative of the site.

Figure 36 Typical Substrate in D07 Walker Branch STREON are mostly bedrock and cobbles.

Figure 37 Road and power runs alongside the stream.

Figure 38 Typical flows, extremely shallow water depth.

Figure 39 Intermittently flowing culvert between Aquatic and STREON reaches.

Figure 40 Large bedrock slabs present throughout the reach

Figure 41 Spring feeding into the lower STREON reach has impact on aquatic biology.

3.3.7 Site Access Needs

Stairs will be needed in both the AQU and STREON reaches for safe access to the stream for sampling and maintenance activities as well as to control erosion on the very steep banks.

See Section 3.1.7 above for installation and location details.

3.3.8 Communications at the Site

Please refer to information in the Walker AQU site section for details on communication.

3.3.9 Power at the Site

Please refer to information in the Walker AQU site section for details on power.

3.3.10 Site Science Construction Constraints and Limitations

Site-specific issues to consider at D07 Walker Branch STREON are:

Water levels are generally low and may be hard to find deep locations for sensors. Additionally, water flows can rapidly increase due to local storms and so sensor must be anchored in such a way to allow for sensor stability during super high flows.

Driving and access constraints for D07 Walker Branch STREON are:

Access must be granted by Oak Ridge National Lab. New traffic patterns and security gates were installed in 2015. Check with local NEON staff or Oak Ridge National Lab contacts for the most recent instructions for access.

3.3.11 Other Issues

No other science issues are identified at this time.

4 APPENDIX A. FCC SUMMARY TABLES FOR AIS SITE COMPONENTS AT D07

4.1 Walker Branch – AQU FCC Summary Table

Site Component	Latitude	Longitude	Units
Stream, Lake, or Stream+STREON	Stream		Description
Aquatic Auxiliary Power Portal location	35.958600	-84.279550	Lat, Long in degrees
Aquatic Portal location	35.958600, -84.279550		m away from bank, direction
Pathway needed? What is length?	No		Yes/no, description w/ length
Stairs or ladder needed?	Yes, aluminum, no handrail		Yes/no, description
S1 Stairs top location	35.958452	-84.279376	Lat, Long in degrees
S1 Stairs length	2m		Meters
S2/ Nutrient Addition Station Stairs top location	35.957117	-84.279267	Lat, Long in degrees
S2/ Nutrient Addn. Stn. Stairs length	8m		Meters
STR S2 Stairs top location	35.955837	-84.278743	Lat, Long in degrees
STR S2 Stairs length	8m		Meters
Boardwalk needed? What is length?	No		Yes/no, description w/ length
Boardwalk start location	Site1-BrdwlkStartLat	Site1-BrdwlkStartLong	Lat, Long in degrees
Boardwalk end location	Site1-BrdwlkEndLat	Site1-BrdwlkEndLong	Lat, Long in degrees
Shall stairs, boardwalk be installed during construction?	Yes		Yes/no, description
Fencing needs	None		Description
Site management			Description
Any additional site specific information			Description

4.2 LeConte Creek FCC Summary Table

Site Component	Latitude	Longitude	Units
Stream, Lake, or Stream+STREON	Stream		Description
Aquatic Auxiliary Power Portal location	35.689247	-83.502086	Lat, Long in degrees
Aquatic Portal location	35.689247, -83.502086		m away from bank, direction
Pathway needed? What is length?	Yes – 3 unimproved paths to sensor locations from main trail		Yes/no, description w/ length
S1 Pathway start location	35.689550	-83.501517	Lat, Long in degrees
S1 Pathway end location	35.689028	-83.503361	Lat, Long in degrees
GWW 04/05 Pathway start location	35.690785	-83.502721	Lat, Long in degrees
GWW 04/05 Pathway end location	35.690679	-83.503882	Lat, Long in degrees
S2 Pathway start location	35.692301	-83.503987	Lat, Long in degrees
S2 Pathway end location	35.692194	-83.504417	Lat, Long in degrees
Stairs or ladder needed?	No		Yes/no, description
Boardwalk needed? What is length?	No		Yes/no, description w/ length
Boardwalk start location	Site2-BrdwlkStartLat	Site2-BrdwlkStartLong	Lat, Long in degrees
Boardwalk end location	Site2-BrdwlkEndLat	Site2-BrdwlkEndLong	Lat, Long in degrees
Shall stairs, boardwalk be installed during construction?	No		Yes/no, description
Fencing needs	None		Description
Site management			Description
Any additional site specific information			Description

4.3 Walker Branch STREON FCC Summary Table

Site Component	Latitude	Longitude	Units
Stream, Lake, or Stream+STREON	Stream – STREON		Description
Aquatic Auxiliary Power Portal location	35.95860	-84.27955	Lat, Long in degrees
Aquatic Portal location	35.958600, -84.279550		m away from bank, direction
STREON Hut location	4 meters away from left bank.		m away from bank, direction
Pathway needed? What is length?	No		Yes/no, description w/ length
Pathway start location	STR-PathStartLat	STR-PathStartLong	Lat, Long in degrees
Pathway end location	STR-PathEndLat	STR-PathEndLong	Lat, Long in degrees
Stairs or ladder needed?	YES – SEE WALKER BRANCH ABOVE (AQU)		Yes/no, description
STR S2 Stairs top location	35.955837	-84.278743	Lat, Long in degrees
STR S2 Stairs length	8m		Meters
Ladder top location	STR-LadderTopLat	STR-LadderTopLong	Lat, Long in degrees
Ladder length	STR-LadderLength		Meters
Boardwalk needed? What is length?	No		Yes/no, description w/ length
Boardwalk start location	STR-BrdwlkStartLat	STR-BrdwlkStartLong	Lat, Long in degrees
Boardwalk end location	STR-BrdwlkEndLat	STR-BrdwlkEndLong	Lat, Long in degrees
Shall stairs, boardwalk be installed during construction?	Yes		Yes/no, description
Fencing needs	None		Description
Site management			Description
Any additional site specific information			Description

5 APPENDIX B. EHS SUMMARY TABLES FOR AIS SITE COMPONENTS AT D07

5.1 Walker Branch – AQU EHS Summary Table

Site Component	Latitude	Longitude	Units
Sensor 1 (S1) location	35.958452	-84.279341	Lat, Long in degrees
Sensor 2 (S2) location	35.957220	-84.279151	Lat, Long in degrees
S1 – FDP	35.958452	-84.279376	Lat, Long in degrees
S2 – FDP	35.957220	-84.279312	Lat, Long in degrees
Discharge Sensor location (if needed)	35.958452	-84.279341	Lat, Long in degrees
Camera	35.958426	-84.279382	Lat, Long in degrees
Met Station location	35.958657	-84.279327	Lat, Long in degrees
Met – FDP	35.958680	-84.279284	Lat, Long in degrees
Aquatic Auxiliary Power Portal location	35.958600°	-84.279550°	Lat, Long in degrees
Aquatic Portal location	35.958600°	-84.279550°	Lat, Long in degrees

5.2 LeConte Creek EHS Summary Table

Site Component	Latitude	Longitude	Units
Sensor 1 (S1) location	35.689028	-83.503361	Lat, Long in degrees
Sensor 2 (S2) location	35.692194	-83.504417	Lat, Long in degrees
S1 – FDP	35.689093	-83.503211	Lat, Long in degrees
S2 – FDP	35.692164	-83.504345	Lat, Long in degrees
Discharge Sensor location (if needed)	35.689028	-83.503361	Lat, Long in degrees
Camera	35.689082	-83.503268	Lat, Long in degrees
Met Station location	35.689215	-83.503264	Lat, Long in degrees
Met - FDP	35.689095	-83.503193	Lat, Long in degrees
Aquatic Auxiliary Power Portal location	35.689247°	-83.502086°	Lat, Long in degrees
Aquatic Portal location	35.689247,	-83.502086	Lat, Long in degrees

5.3 Walker Branch STREON EHS Summary Table

Site Component	Latitude	Longitude	Units
Sensor 1 (S1) location	35.956985	-84.279020	Lat, Long in degrees
S1 – FDP	35.956973	-84.279227	Lat, Long in degrees
Sensor 2 (S2) location	35.955844	-84.278638	Lat, Long in degrees
S2 – FDP	35.955837	-84.278743	Lat, Long in degrees
Discharge Sensor location (if needed)	STR-DSLat	STR-DSLong	Lat, Long in degrees
Aquatic Auxiliary Power Portal location	35.958600	-84.279550	Lat, Long in degrees
Aquatic Portal location	35.958600	-84.279550	Lat, Long in degrees
STREON Nutrient Addition Station	35.957117	-84.279267	Lat, Long in degrees