

MEETING NOTES

SOUTH CAROLINA ELECTRIC & GAS COMPANY
Water Quality TWC Meeting

March 23, 2016

Final KMK 5-12-16

ATTENDEES:

Bill Argentieri (SCE&G)	Rusty Wenerick (SCDHEC)
Ray Ammarell (SCE&G)	Chuck Hightower (SCDHEC)
Randy Mahan (SCE&G)	Bill Marshall (SCDNR)
Amy Bresnahan (SCE&G)	Ron Ahle (SCDNR)
Steve Summer (SCANA)	Gerrit Jobsis (American Rivers)
Brandon Stutts (SCANA)	Bill Stangler (Congaree Riverkeeper)
Caleb Gaston (SCANA)	Henry Mealing (Kleinschmidt)
Tom McCoy (USFWS)	Kelly Kirven (Kleinschmidt)
Fritz Rohde (NOAA) via conf. call	

These notes are a summary of the major points presented during the meeting and are not intended to be a transcript or analysis of the meeting.

Henry opened the meeting with introductions and stated that the purpose of the meeting was to discuss the Water Quality in Downstream West Channel Study Report and the Parr Shoals Dam Turbine Venting Report. A PowerPoint presentation was put together with summaries of the two reports; this presentation is included at the end of these notes.

Parr Shoals Dam Turbine Venting Report

Henry explained that during the summer of 2015, SCE&G tested the turbines at Parr for venting capabilities. Five of the six turbines will vent. Results of the venting showed an increase in DO in the tailrace ranging from 0.16 mg/L to 0.45 mg/L. Based on this information a turbine venting plan was put together, where turbine vents will be opened from June 15th through July 31st each year. The plan will be tested during the summer of 2016 and results of the test will be shared with the TWC.

Caleb mentioned that having the vents open does affect generation efficiency of the units, so the venting window should be as short as possible. Tom asked how much efficiency is lost and Ray said he wasn't sure since he hasn't run the numbers. Henry stated that generation efficiency losses are usually around 5% at other projects with turbine venting.

Gerrit said the plan looked good and asked how benefits of the plan will be measured. Henry said we will just open the vents and make sure the operators can actually follow the plan. SCE&G will also monitor the Jenkinsville gage to determine if there is an excursion outside of the venting

window. If this happens, the vents will be turned on and DO will be monitored to see if there is an improvement.

Water Quality in Downstream West Channel Study Report

Henry gave an overview of the study that was performed during 2015, and explained that the HOB0 meters used to collect data were subject to a lot of fouling over the summer and that data collected showed extreme diel fluctuations. The data did confirm that DO levels can be very low in the west channel immediately downstream of the dam during summer months. Ron agreed that further down the west channel, flows are influenced by backflow from the east channel side, however the upper section of the west channel is impacted by lack of flow.

Henry said that SCE&G met with DHEC in February to discuss the Parr Shoals Dam Turbine Venting Report and the Water Quality in Downstream West Channel Study Report. SCE&G agreed to collect one additional week of data in August 2016 to verify the information collected in 2015. HOB0 meters will be deployed at the three west channel sites for one week. Temperature and DO data will also be collected using a separate DO meter when the HOB0s are deployed and retrieved.

The group discussed ways to increase flow in the west channel as a way to increase DO. Henry explained that the west side of the river is naturally higher than the east side. There is a natural crest immediately downstream of the dam that separates the two channels. This crest is the upper tip of Henderson Island. The dam was built through the northern tip of Henderson Island, so all turbine releases move down the east channel. Spillway releases through gates 1 through 6 send water down the west channel and releases through gates 7 through 10 flow towards the east channel. The group reviewed the DEM data collected as part of the IFIM study to observe the changes in elevation downstream of the dam. Additionally, original USGS maps from before the dam was built and 1912 construction blueprints show that the west channel area is higher in elevation and was a secondary channel of the original river.

Henry mentioned that any flows that are diverted from the east channel to the west channel could have a negative effect on the east channel habitat. There is only so much water that is available, and any flows that are redirected to the west channel will result in a loss of flows to the “species diverse” east channel. Gerrit said that the TWC will have to weigh the benefits of how to partition the water. Ron said he believes that the west channel needs to be restored to a point that it meets state standards. He doesn’t believe that there will be a significant impact on the east channel if a portion of flow is diverted to the west channel.

The group agreed that the challenge will be figuring out how to get flows over to the west channel. Several ideas were discussed, including installing a siphon system, using spillway pulse flows at night when DO levels are lowest, and creating a channel through Henderson Island to allow for flows to naturally flow from the east channel to the west during turbine operations. The group also discussed several factors including the volume of water needed in the west channel, how to show compliance to FERC, and whether continuous flow or pulsing flows would be best.

Ray mentioned that using a siphon system might not work because of the elevation of the dam, so a pump may need to be installed as part of a continuous flow system.

The group discussed the idea of nighttime pulse flows during the summer months. The pulse of water released by lowering spillway gates on the west side of the dam would flush and refresh the west channel. The spill would occur approximately in late afternoon or early evening and would last for a few hours until Fairfield begins pumping at around 11 pm. This can be tested during the summer of 2016 to see if it's possible and makes a measurable difference in DO levels.

The group then discussed the idea of pumping water into the west channel. Henry said the pump would need to be placed in the corner or further down the west channel to ensure the water flows into the right area. A piping system could be blown out during a high flow or flood scenario. Ray said there would be design issues with this option. The pump and pipe would need to be sited for a specific flow and we might not know what that flow would be. Also a very large pump would be needed just to move 50 cfs.

Ron then brought up the idea of cutting a channel through the current tip of Henderson Island and the rocky area just upstream of the island to allow flows to naturally run from east to west. Bill A. asked Brandon if the U.S. Army Corps of Engineers would permit this work. Brandon said it might be permitted, even though the work would be done in a non-navigable area. Blasting was discussed as a method to create this channel. This raises concerns from a dam safety perspective.

Henry brought the conversation back to the idea of pulse flows. Ron asked if there was any examples of where this has been done before. Henry said at Logan Martin Dam, part of the Coosa River Project in Alabama, generation pulses at night are used to improve DO. Pulse flows may also help to flush out the filamentous algae that grows in the area and contributes to the low DO. Ron said that water temperature needs to be controlled as well. He is also concerned that habitat that would be refreshed at night would dry out each day.

Bill M. brought up the idea of using leakage to increase flows in the west channel. Is there a way to increase leakage on that side of the dam, such as removing the seals from the gates? Bill A. said this isn't a good option, and you normally don't want to create leakage at a dam. Ray said you wouldn't want to remove the entire seal, but there could possibly be an engineering design that could allow for increased leakage. Leakage would also shut off during period of low flows and when the lake level drops below about 261' msl.

DHEC and USFWS said that the goal for the west channel is to try and pass enough flows to improve water quality to the extent possible. Ron added that he personally wants the west channel water quality to be improved to a point where the channel is revived and species diversity increases.

The group agreed that the easiest option would be to test pulsing flows this summer. SCE&G will test this approach during several nights during one week in August. Ray suggested that an observation test be completed during the day to get a visual and decide on which gates to use and estimate a target volume of water that would be needed. Brandon asked if the releases would be minor enough so as not to affect the habitat around the Parr Reservoir shoreline. Henry said that while it might have some affect, it would be minor, and the pulse flows would occur at a different time of the year than when spring spawning occurs.

Ron said that pulse flows should be triggered by inflow instead of a calendar date, and that a drought contingency should be considered. Ray asked what the window would be for releasing

flows in the west channel. The group agreed that June through September would be the ideal window.

Gerrit said that he believes the best scenario would be the release of continuous flows on the west channel. Ron agreed and said that it's good to evaluate pulse flows but would like additional investigation into the option of continuous flows. Henry said that with the option of continuous flows, the volume of flow would also need to be examined.

The group agreed that a site visit in June or July 2016 should be scheduled prior to testing in August. Maps of the area will be prepared and the site visit will be planned to coincide with low flows, so the rocky areas are easily visible. Then in August, after the week of baseline DO data collection in the west channel, pulse flows will be tested for approximately three or four days.

The meeting adjourned. Action items are listed below.

ACTION ITEMS:

- Follow up items for various flow options:
 - Determine if the USACE will allow excavation below the dam – Initial discussion with the USACE indicates this would require a 404 permit as well as a 401 (State Navigable Waters) permit through SCDHEC (SCE&G)
 - Determine who owns the land downstream of the dam. (SCE&G)
 - Determine the flow at which the DEM data was collected. (Kleinschmidt)
 - Investigate the option of increased leakage from the seals on the gates. (SCE&G)
 - Investigate what would be needed to allow for continuous flow – pipe, pump, siphon? (SCE&G)
 - Test pulse flows during August 2016. (SCE&G)
- Schedule a site visit for TWC in June/July timeframe to plan for pulse flow testing. (Kleinschmidt)
- Test Turbine Venting Plan from June 15th through July 31st. (SCE&G)

Water Quality TWC Meeting

March 23, 2016

Parr Shoals Dam Turbine Venting Report

Water Quality in Downstream West Channel Study Report

Parr Shoals Dam Turbine Venting Report

- Methods for Turbine Venting
 - Determined in 2014 that 5 of the 6 turbines can self-vent (#6 can't self-vent)
 - DO, temperature and percent saturation were taken immediately downstream of each turbine prior to and after each vent was opened
 - Repeated testing in the summer of 2015 during period of low DO



Parr Shoals Dam Turbine Venting Report

- Results of Turbine Venting
 - Unit 3 venting had most significant increase in DO, followed by units 1, 5, and 2.

TABLE 4-1 DISSOLVED OXYGEN MEASUREMENTS (MG/L)

Unit No.	Vent Closed	Vent Open	Increase in DO
1	4.65	5.04	0.39
2	4.60	4.80	0.20
3	4.70	5.15	0.45
4*	5.66	5.82	0.16
5	4.84	5.20	0.36
6**	5.10	N/A	N/A

*test data from 2014

**Unit 6 is not equipped with a vacuum breaker.



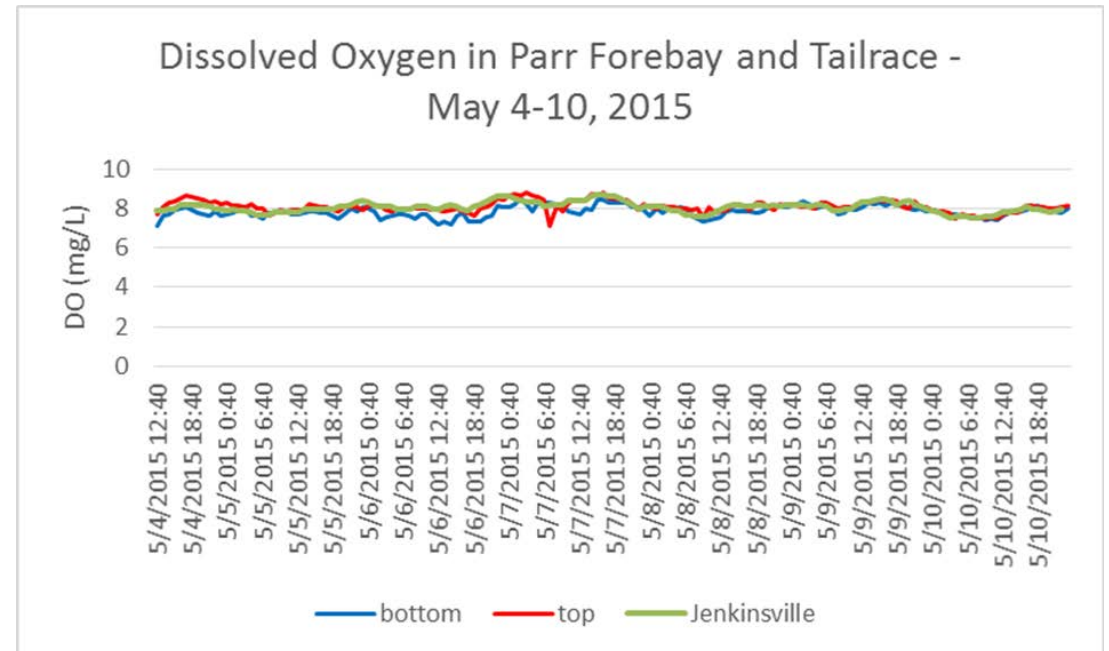
Parr Shoals Dam Turbine Venting Report

- Methods for Forebay DO Sampling
 - DO and temperature were collected in the forebay of Parr Shoals Dam using HOBO data loggers
 - Data was logged on an hourly basis from May 4, 2015 through October 16, 2015
 - Hourly data was also collected from USGS gage at Jenkinsville (02160991)

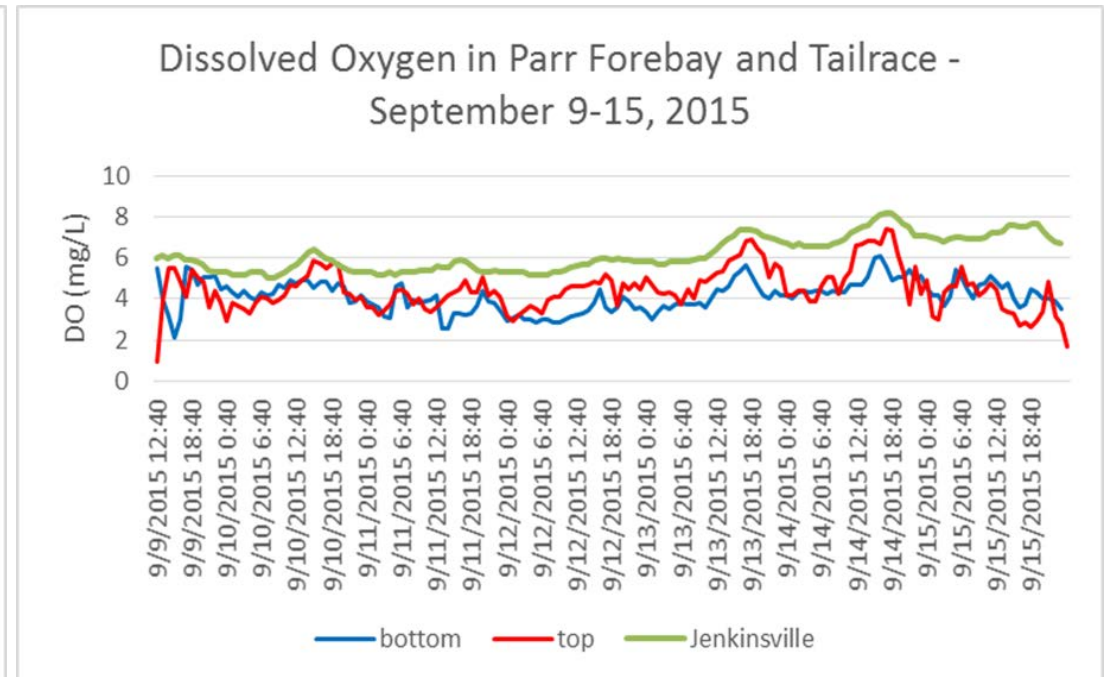
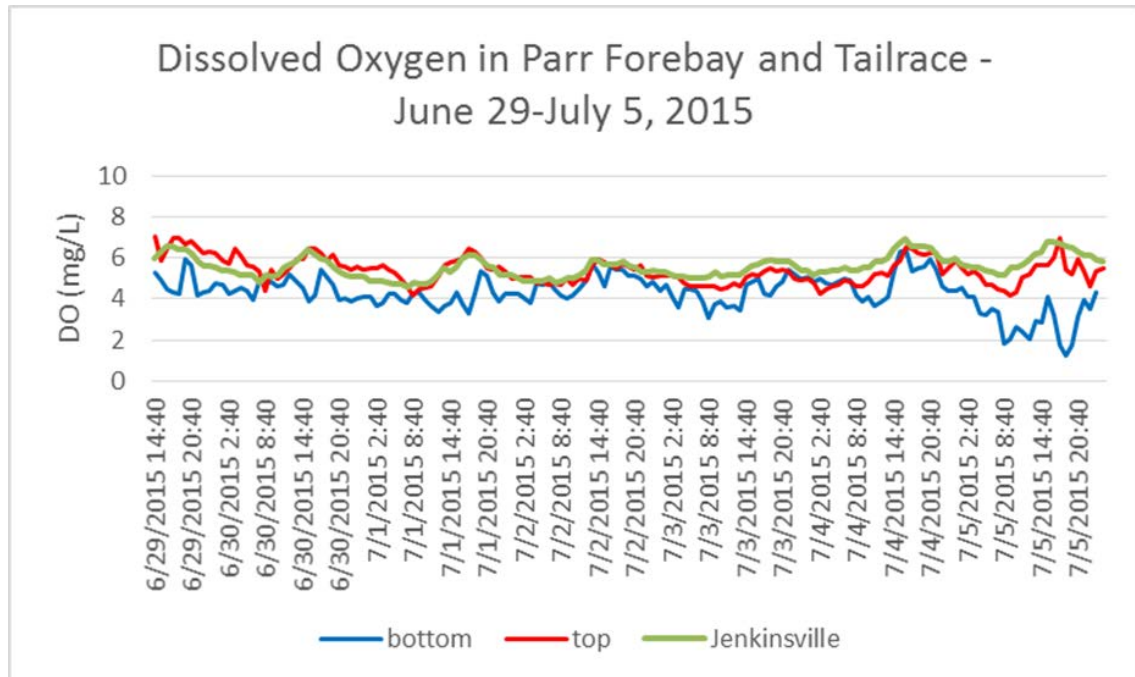


Parr Shoals Dam Turbine Venting Report

- Results of Forebay Sampling
 - Loggers were compromised due to fouling after one week of deployment
 - Not a reliable representation of DO in the Parr forebay
 - Lower DO levels and a diel shift in DO levels from end of June through end of September



Parr Shoals Dam Turbine Venting Report



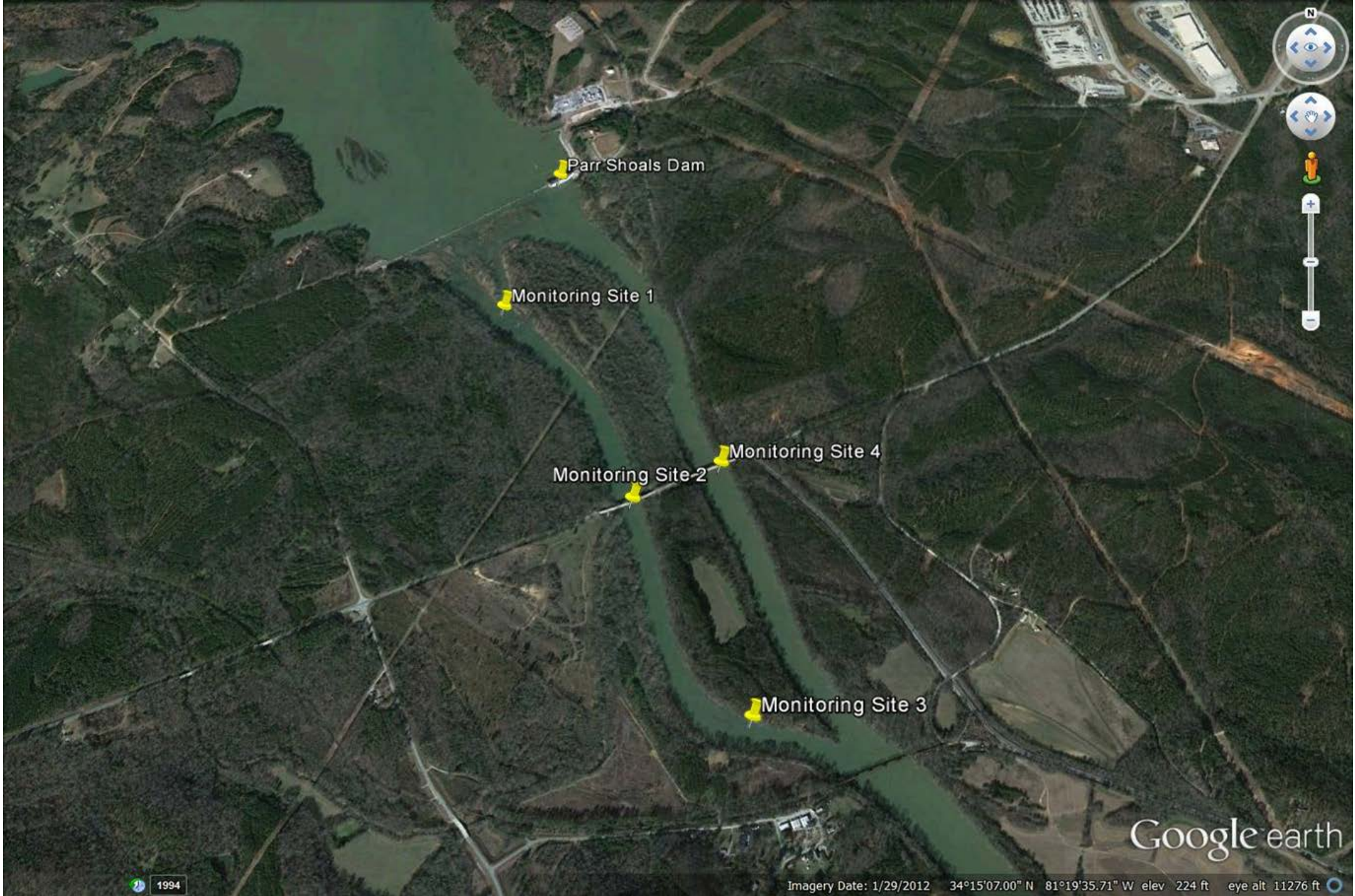
Turbine Venting Plan

- Venting Plan
 - Open turbine vents each year between June 15 – July 31
 - Order of turbine operation - first-on/last-off order: 3, 1, 5, 2, 4, and 6
 - The “venting window” may be expanded based on results
- Documentation / Compliance
 - SCE&G will provide a list of DO excursions below the standard (based on the Jenkinsville USGS gage) within 10 days of occurrence
 - SCE&G will maintain a log of operation records and maintenance activities

Water Quality in Downstream West Channel Report

- Methods
 - Temperature and DO monitored in west channel of Broad River using HOBO U26 Dissolved Oxygen Loggers
 - March 31, 2015 through October 15, 2015
 - DO data collected from USGS gage at Jenkinsville (02160991)
 - Loggers were subject to extreme fouling from algae, sediments and occasional de-watering





Parr Shoals Dam

Monitoring Site 1

Monitoring Site 2

Monitoring Site 4

Monitoring Site 3

Google earth

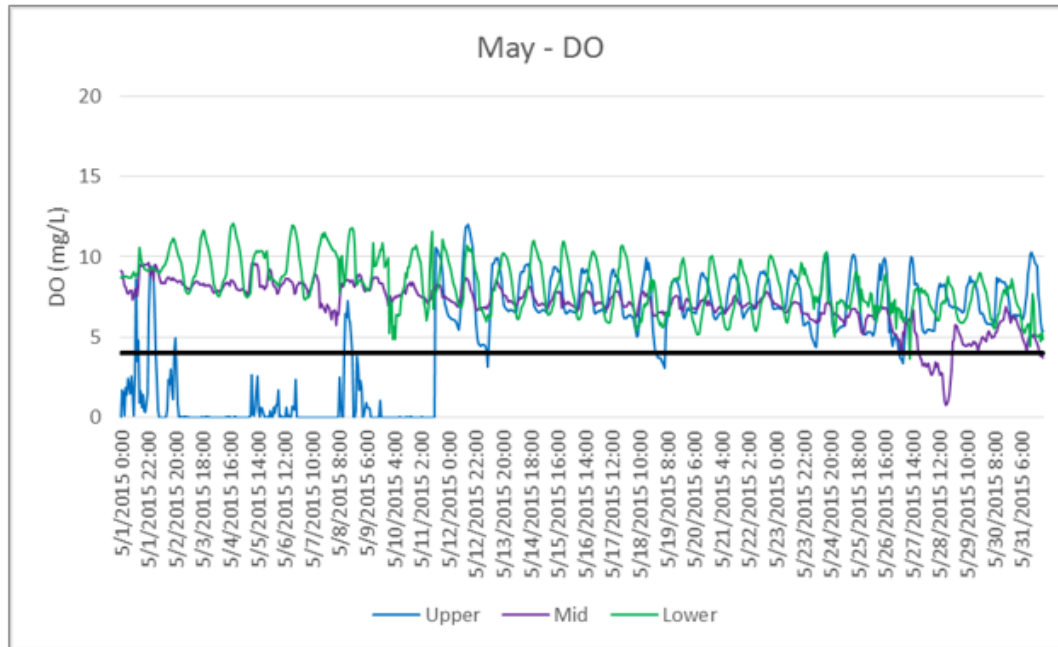
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Imagery Date: 1/29/2012 34°15'07.00" N 81°19'35.71" W elev. 224 ft eye alt 11276 ft

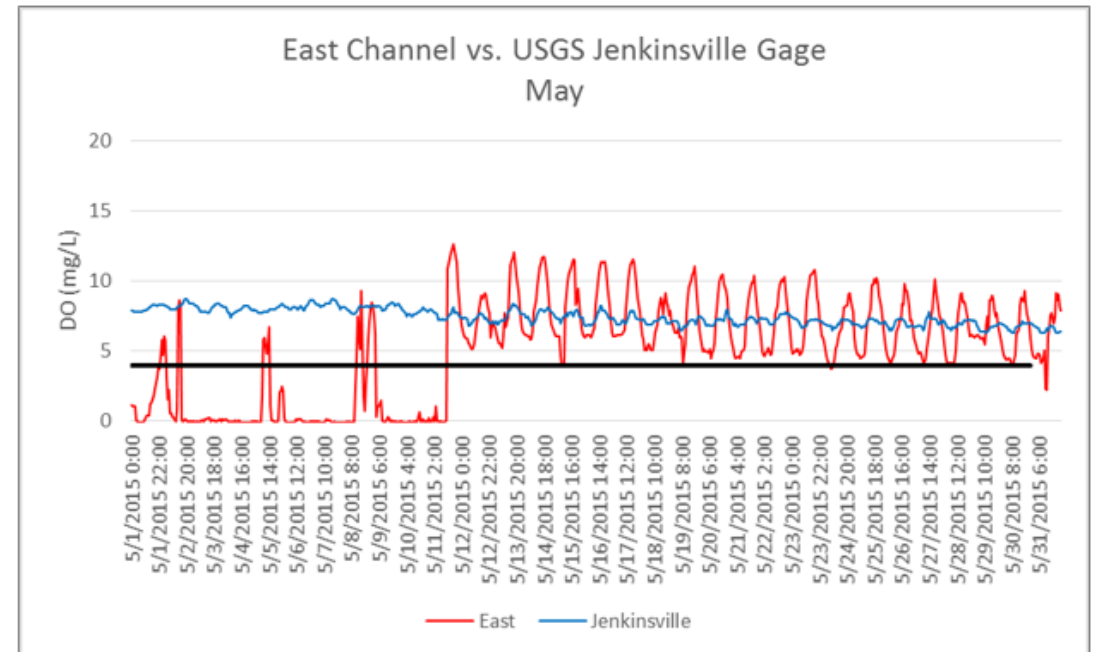
Water Quality in Downstream West Channel Report

- Results
 - DO levels in west channel were periodically below the DHEC standard of 4.0mg/L
 - DO levels in the upper west channel downstream of Parr Dam were consistently lower than those further down the west channel and the east channel
 - Fouling of the HOBO loggers was a constant issue
 - DO levels were lowest in the west channel directly downstream of the dam during the summer months

Water Quality in Downstream West Channel Report

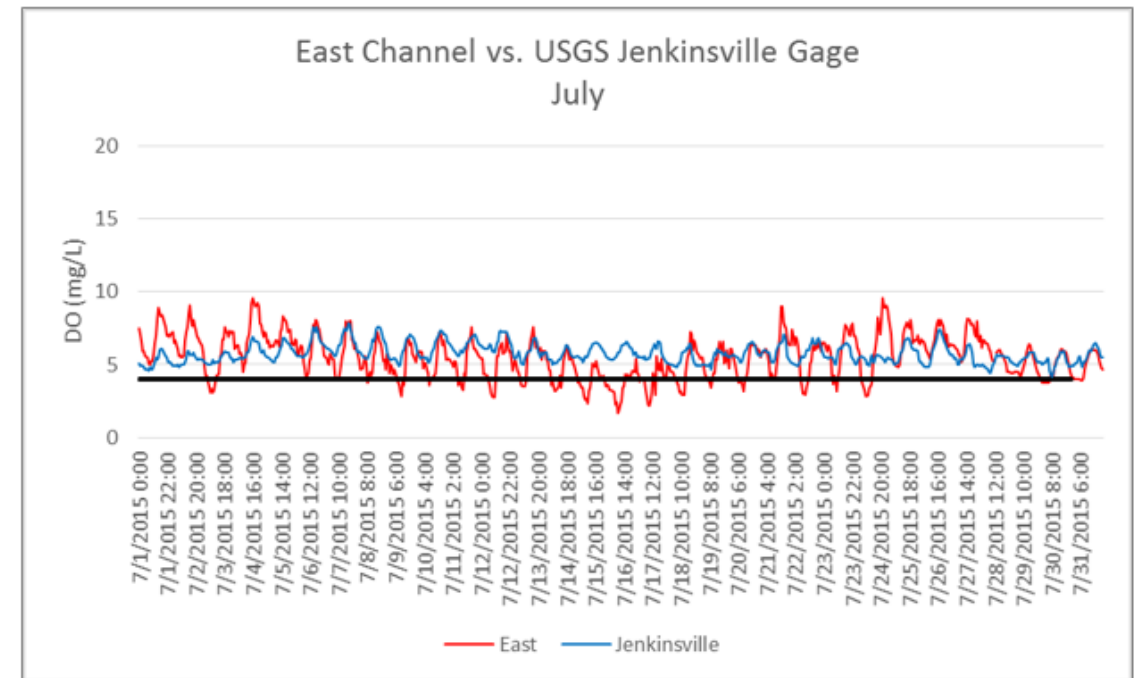
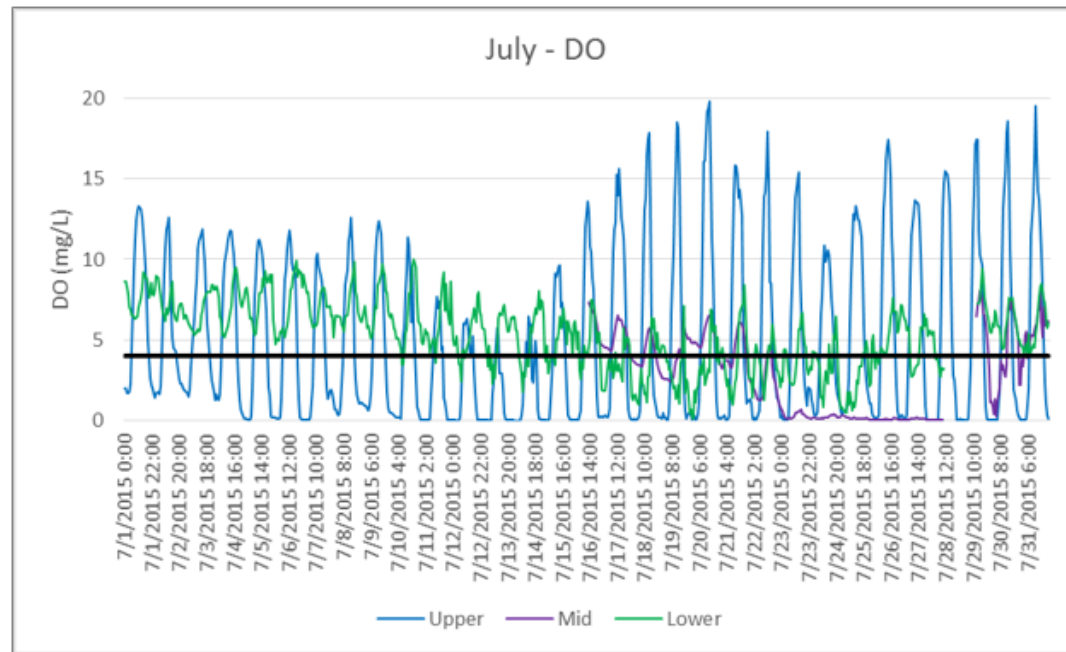


*Upper west channel was relocated on May 11, 2015 during a routine data download. Previous to the relocation, the logger was subject to fouling and de-watering.



*East channel was relocated on May 11, 2015 during a routine data download. Previous to the relocation, the logger was subject to fouling and de-watering.

Water Quality in Downstream West Channel Report



*The middle west channel logger was at the manufacturer for repair through July 16, 2015. The lower west channel logger was also removed from the river for repair in the Kleinschmidt office for one day in late July.

SCE&G/SCDHEC/KA Meeting – 2/9/2016

Parr Shoals Dam Turbine Venting Report

- Agreed to extend the venting window – June 15-July 30
- Revise report to clearly mark bad forebay data
- SCE&G will test the Turbine Venting Plan this summer (2016)

Water Quality in Downstream West Channel Report

- Site visit of West Channel area immediately downstream of Parr Shoals Dam during late summer
- Provide information of how dam construction could have affected diversion of water
- Collect additional DO samples for one week this summer (August of 2016)

2016 Next Steps

- Turbine Venting during 2016 – will provide results to TWC in a memo
- Site visit of West Channel with SCDHEC late summer 2016
- Collect a week of additional DO/Temp data in the West Channel during August 2016 – provide results as an Addendum to the report
- Begin discussion of PM&E Measures

Potential Mitigation Measures

- What is the goal for the West Channel?
 - Spawning
 - Fishing
 - ???
- What are potential SCE&G operations that may be available?
 - Spillway flows
 - Continuous flow
 - Seasonal flow
- How do we show compliance?
 - Off license agreement
 - 401 requirements