

Lateral Mixing of the North and West Branches of the Susquehanna River at the Shady Nook Site

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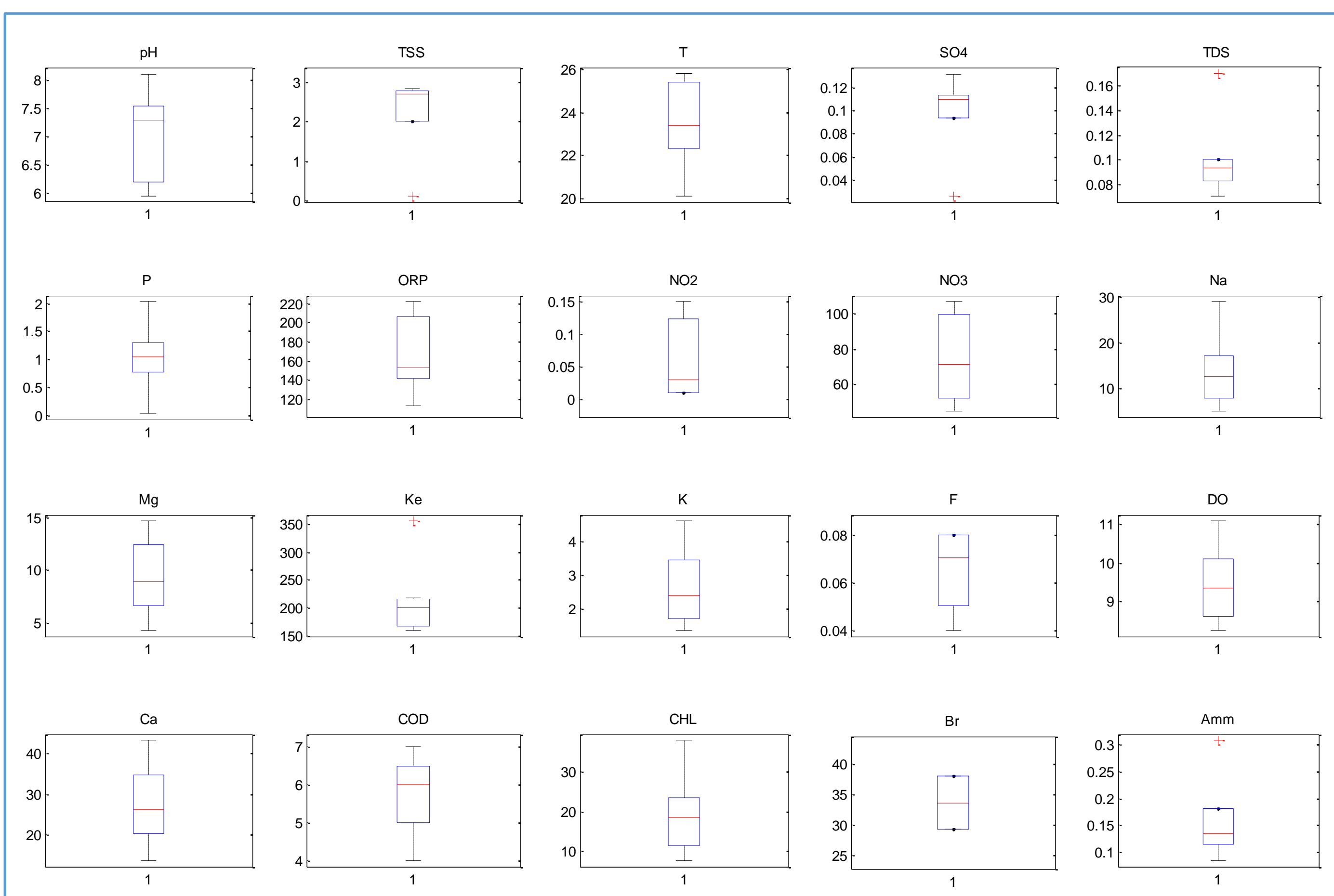
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10th Annual Susquehanna River Symposium



Introduction

The North and West branches of the Susquehanna River converge at Sunbury, Pennsylvania to create a Lateral Mixing Zone (LMZ) that extends all the way downstream from Selinsgrove, after which islands help to facilitate mixing. In this study, the movement of the LMZ was observed in accordance with multiple precipitation events over a four month span from June to September of 2015 in addition to other data acquired from prior years. The goal of this study is to identify if the water from the two branches is present at all times between site 1 and 2 to eventually place two permanent monitoring stations in the same area.



YSI 556 Multimeter and a boat were used to continuously take data samples across the river between sites 1, 2, 3, and 4. Site 1 is located on the West Branch of the Susquehanna River while Sites 2 and 3 are located on opposite sides of Byer Island, while Site 4 is on the East bank (Figure 1). A GPS was used to track movement and help identify the location of the LMZ along with the data associated with each data point along all transect. Data was collected before and after various periods of precipitation and discharge rates. Four Hydrolab sondes were also deployed twice at each site in June and again in September, to support the identification of the water of the two branches. Among all the measured parameters including water chemistry, physical properties, from both the YSI multimeter and the sondes have demonstrated that specific conductivity produced the clearest trends of LMZ between the two branches. During the study period, the values of specific conductivity has increases, but the trend identifying the type of water sources was still noticeable. The analyses of all data determined that as the discharge increases, the LMZ moves away from the West branch and towards the North branch up until a threshold point and then slightly shifts back to the West branch.

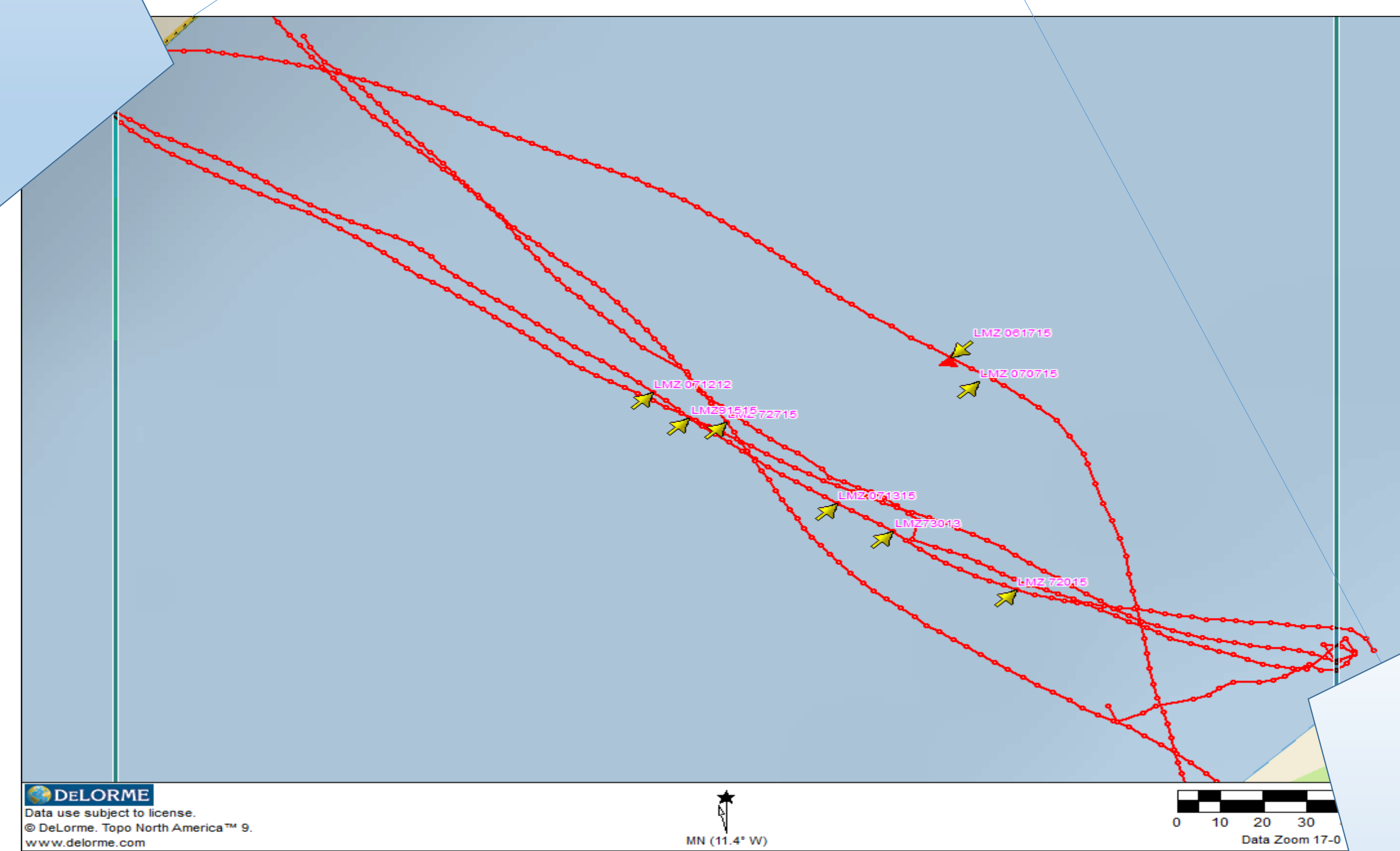
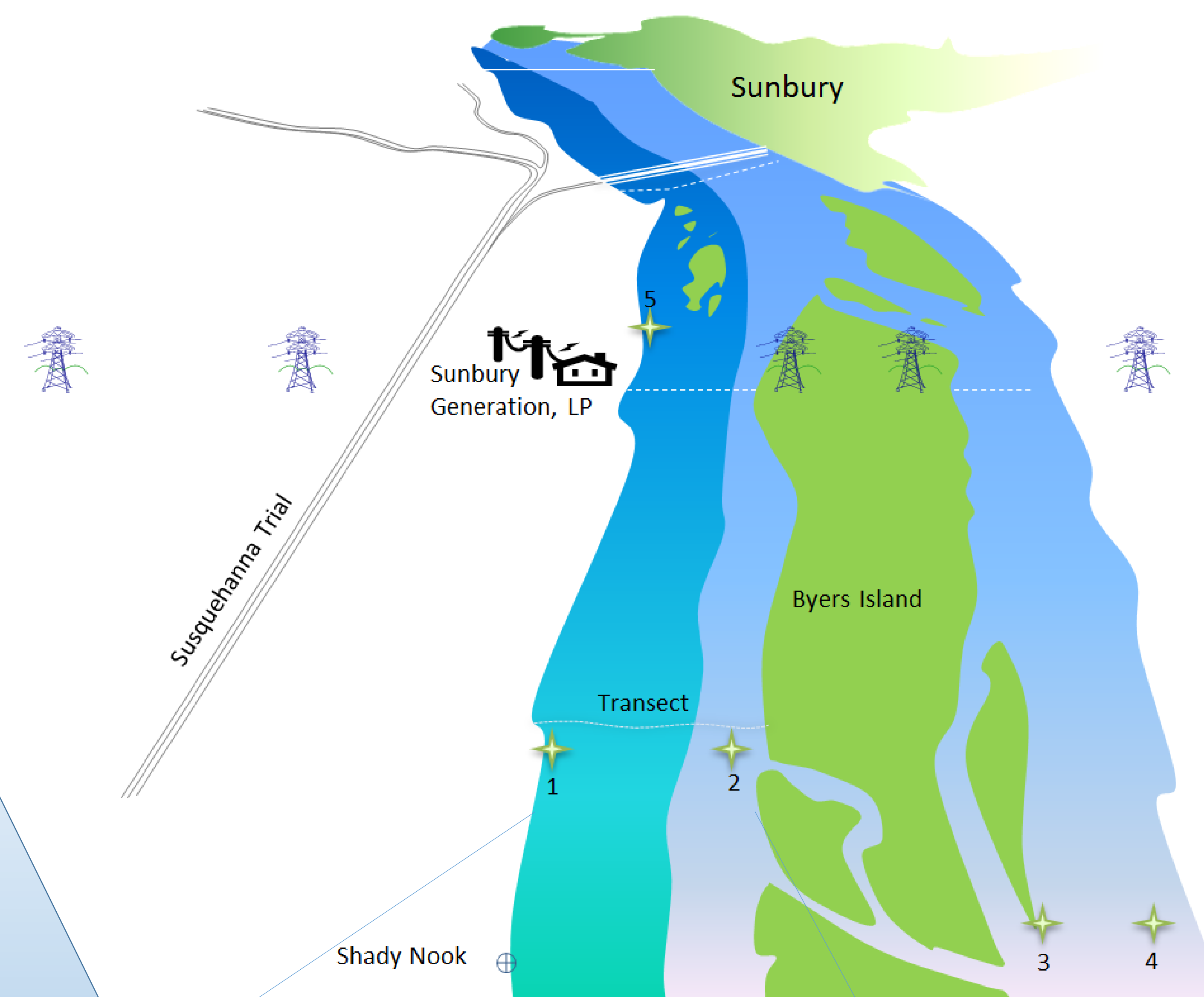
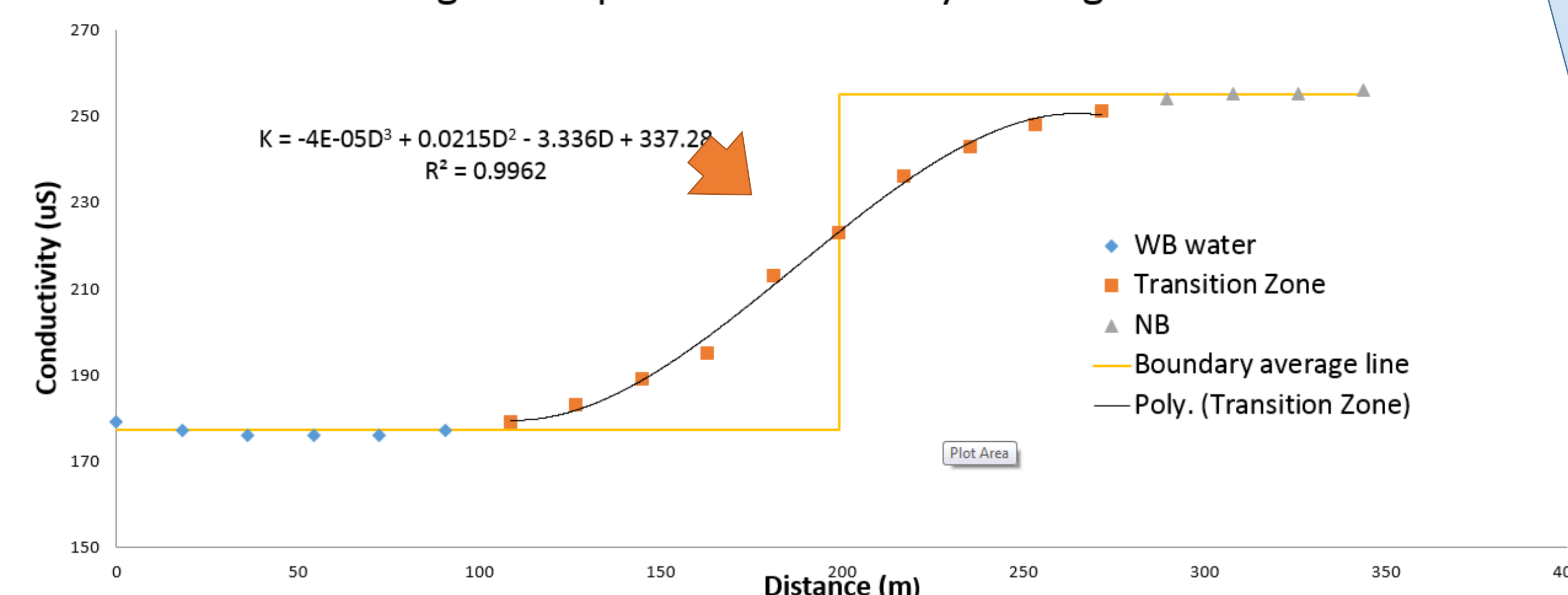


Figure 2: Specific Conductivity K along site 1-2 transect

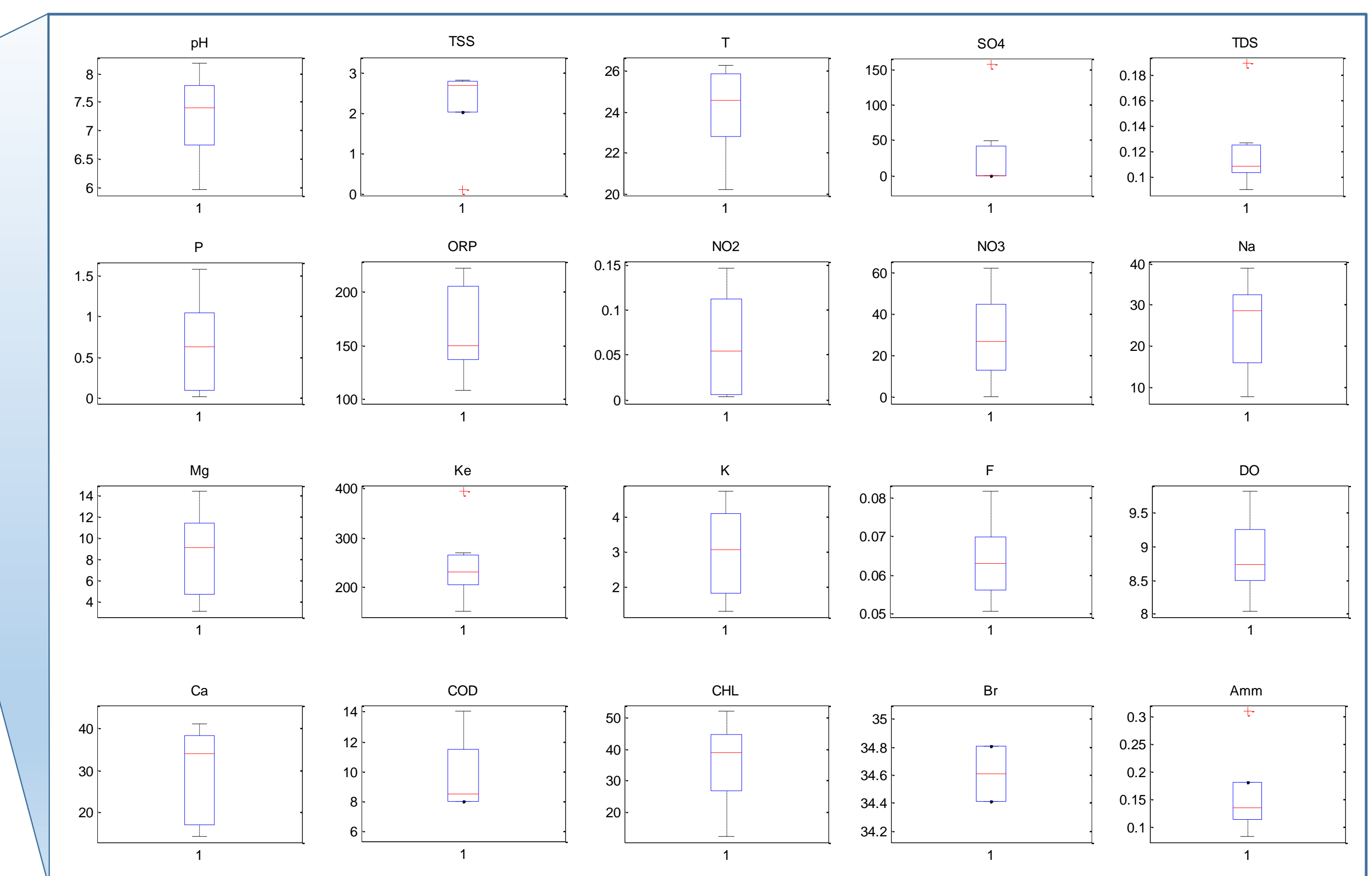


Methods

- Four sites along the Susquehanna River were selected to study the LMZ. Sites 1 and 2 are between the Shady Nook shore and the west shore of Byer Island, site 3 is on the opposite side of Byer Island and site 4 is on the Eastern bank of the river.
- YSI 556 Multimeter and a boat were used to take data samples along the transect of sites 1 and 2 as well as between sites 3 and 4.
- Four Hydrolab-multimeter water quality sondes were deployed at sites 1, 2, 3, and 4 and were left for 5 days before and during various precipitation events.
- A GPS was used to track movement and the data was later used to help find the location of the LMZ along with the data collected from the YSI transects.
- Water chemistry data has been collected since 2009 and was used during this project to help determine the shifting of the LMZ. The water chemistry data that was taken included temperature, specific conductivity, pH, salinity, dissolved oxygen, saturated dissolved oxygen, and oxidation reduction potential.
- Discharge data was obtained from the United States Geological Survey (USGS) from sites 01554000, 01540500, and 01553500 and precipitation data was obtained from Weather Underground.

Results

- Specific conductivity has produced the clearest trends of LMZ between the two branches (Figure 2).
- As the discharge increases due to precipitation events, the LMZ moves away from the West branch and towards the North Branch.
- The LMZ will move towards the North branch up until a threshold point after which it shifts slightly back towards the West branch.
- Data from the ICS was averaged across all four sites to produce a chemical analysis of the river as a whole (Figure 5).
- We are also considering tracking the LMZ at its merging point in Lake Augusta near Sunbury, PA.



Acknowledgements: The Degenstein Foundation for funding the summer internship and this project