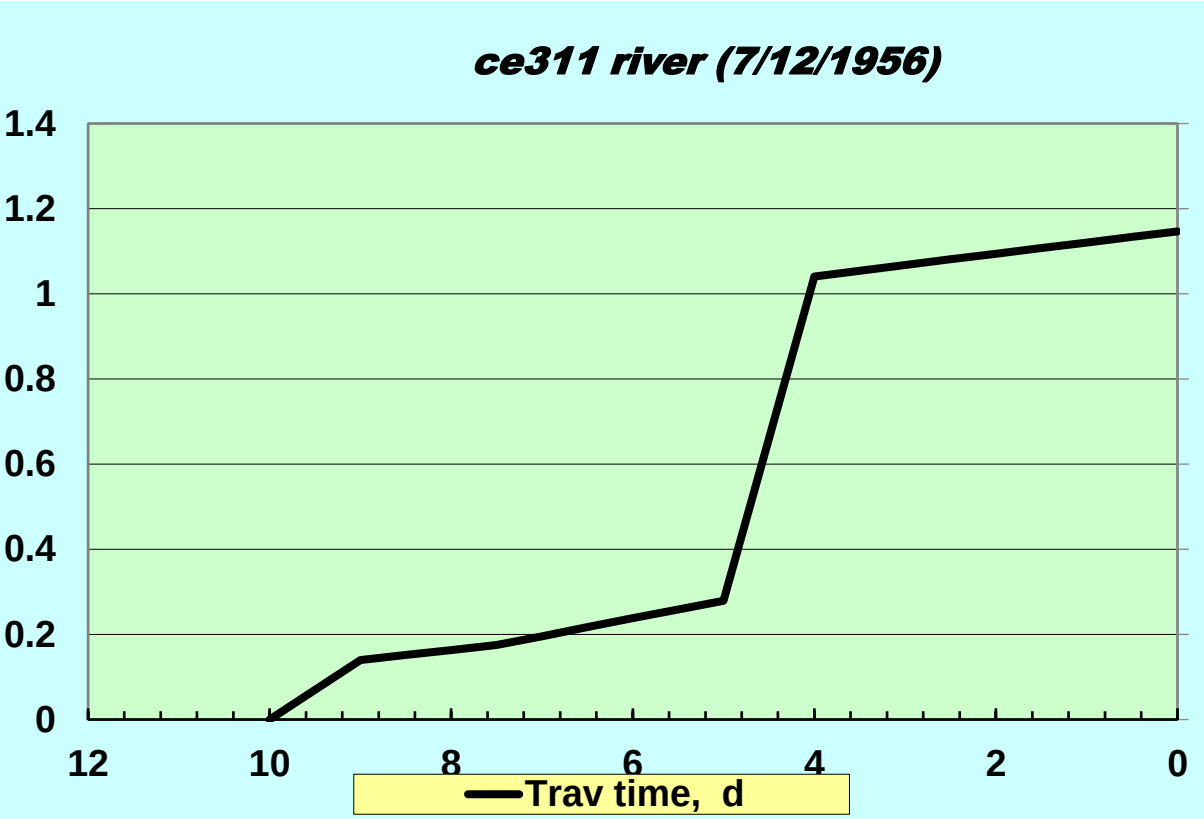
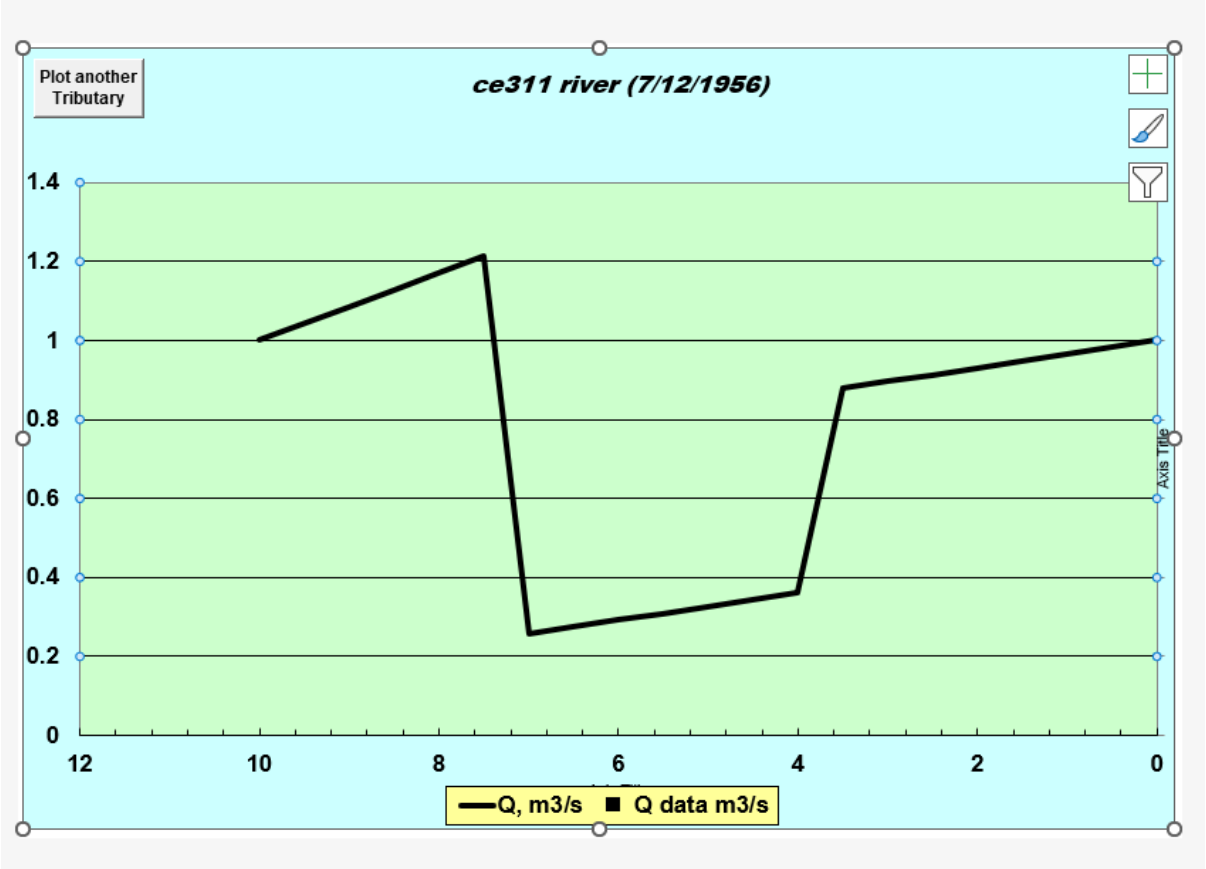
211056
Srijan Kumar

1. Find out the time in hours to “reach” at 0 km of water parcel in the river from the beginning.

The time in hours to "reach" at 0 km of water parcel in the river from the beginning is 0.28 d given on the X-axis in the Travel Time graph.

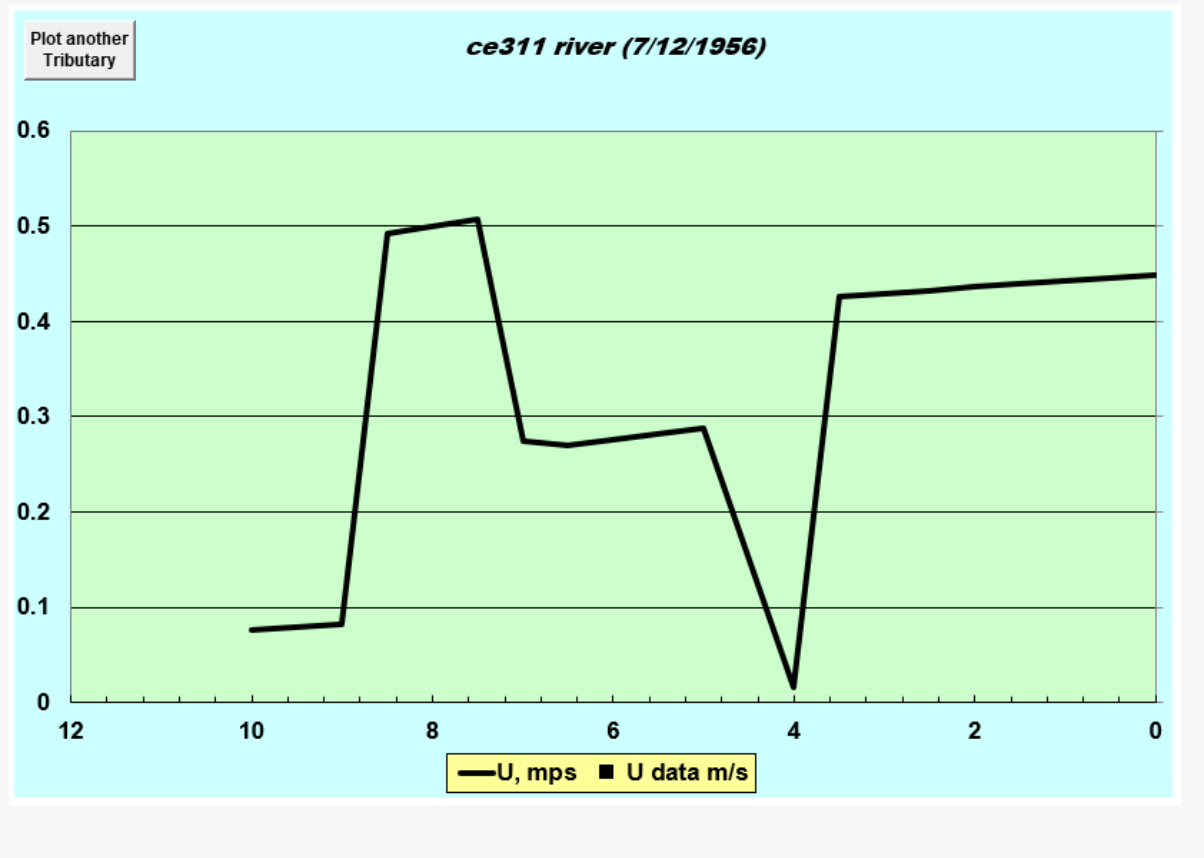


2. Find out least flow “reaches” in tributary.
   Ans:0.22m3/s

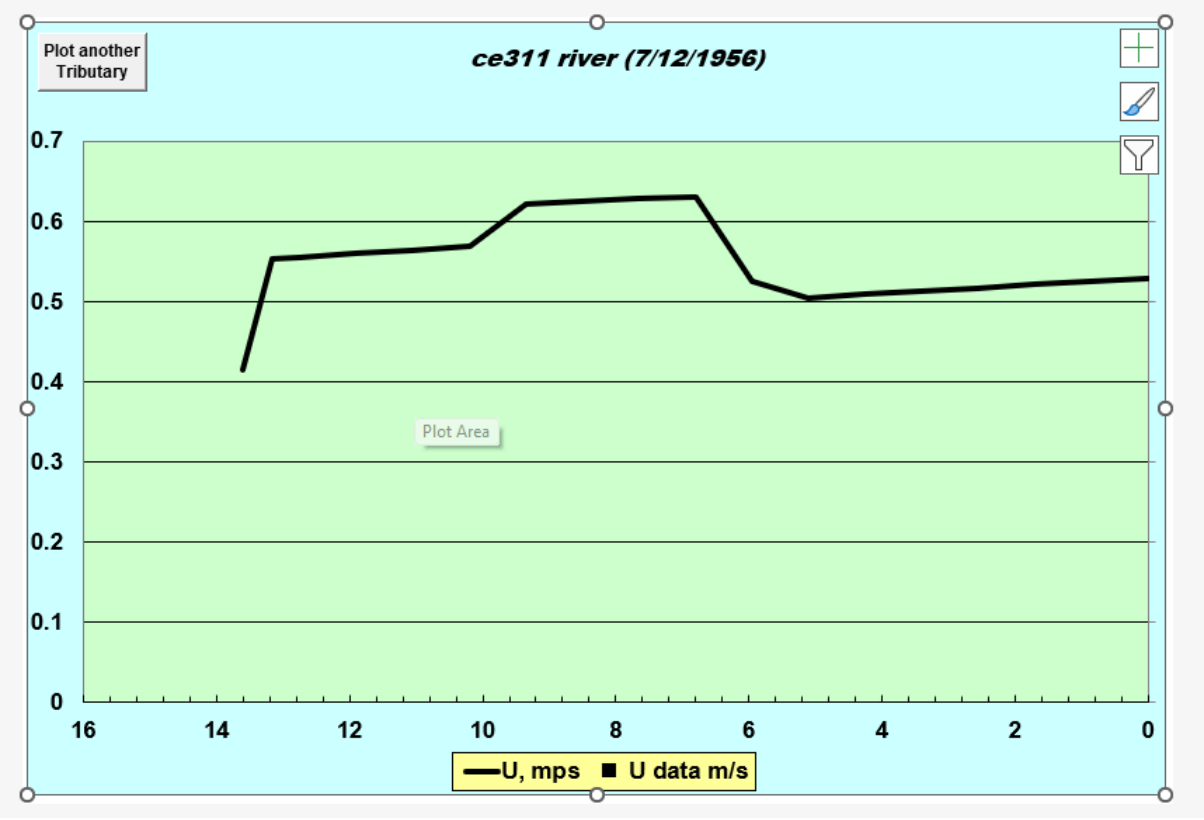


3.Least flow rates of river and tributary with “reaches” and why.

For tributaries -0.22m3/s

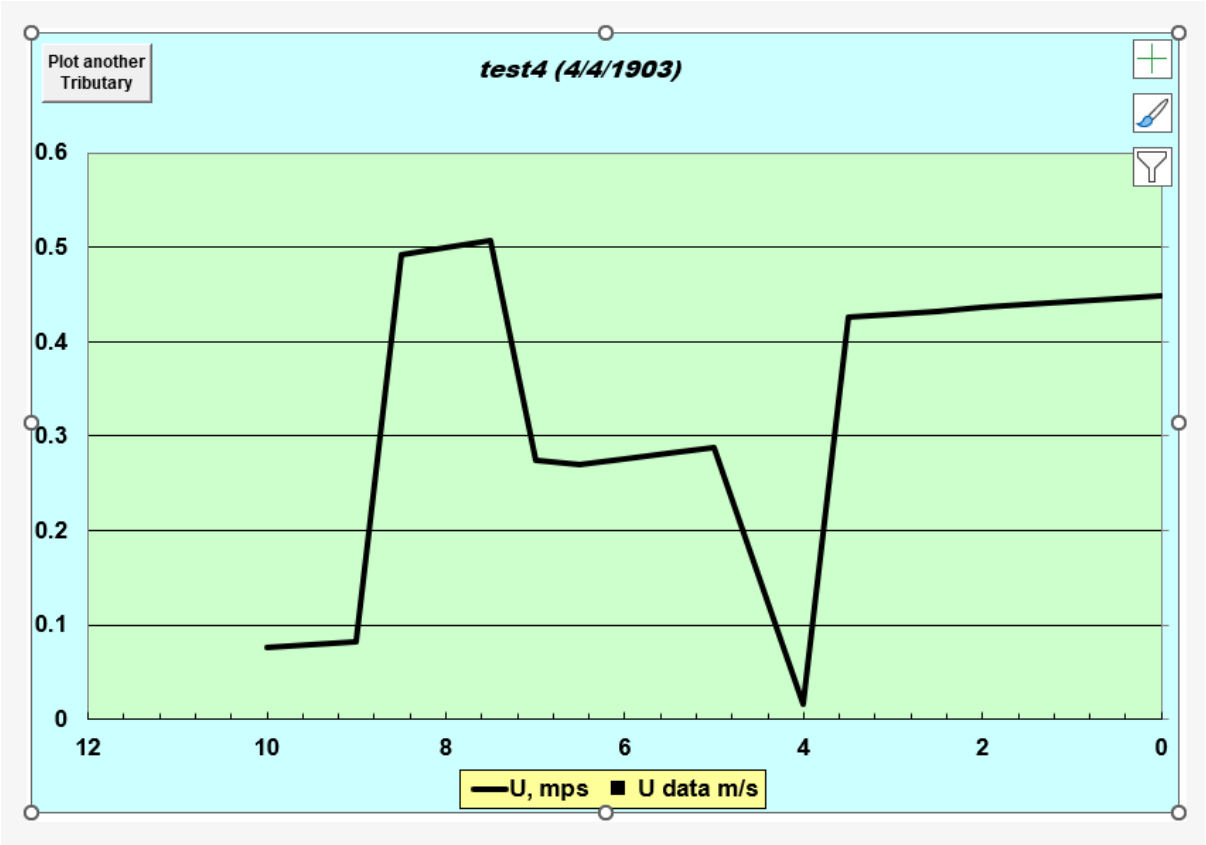


River-0.6m3/s



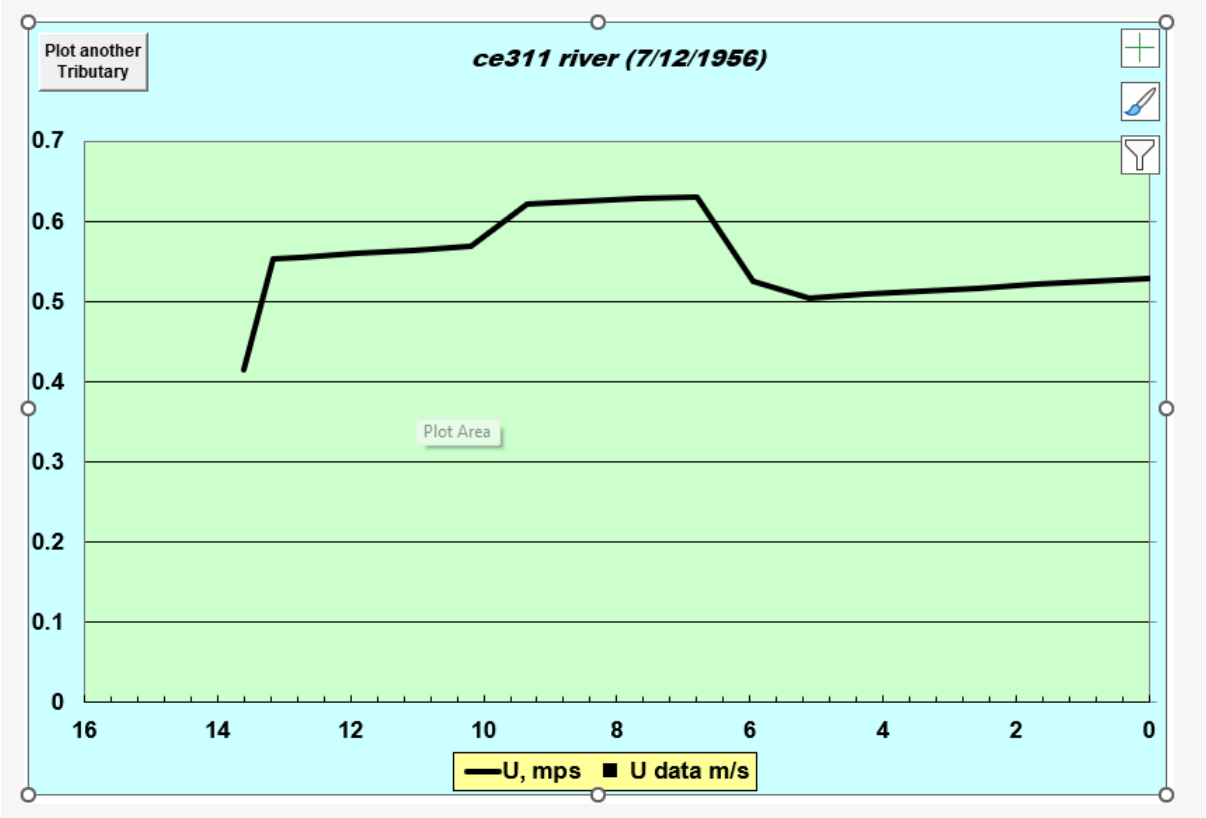
4.Find out lowest velocity in tributary with “reaches”.-

0.02m/s

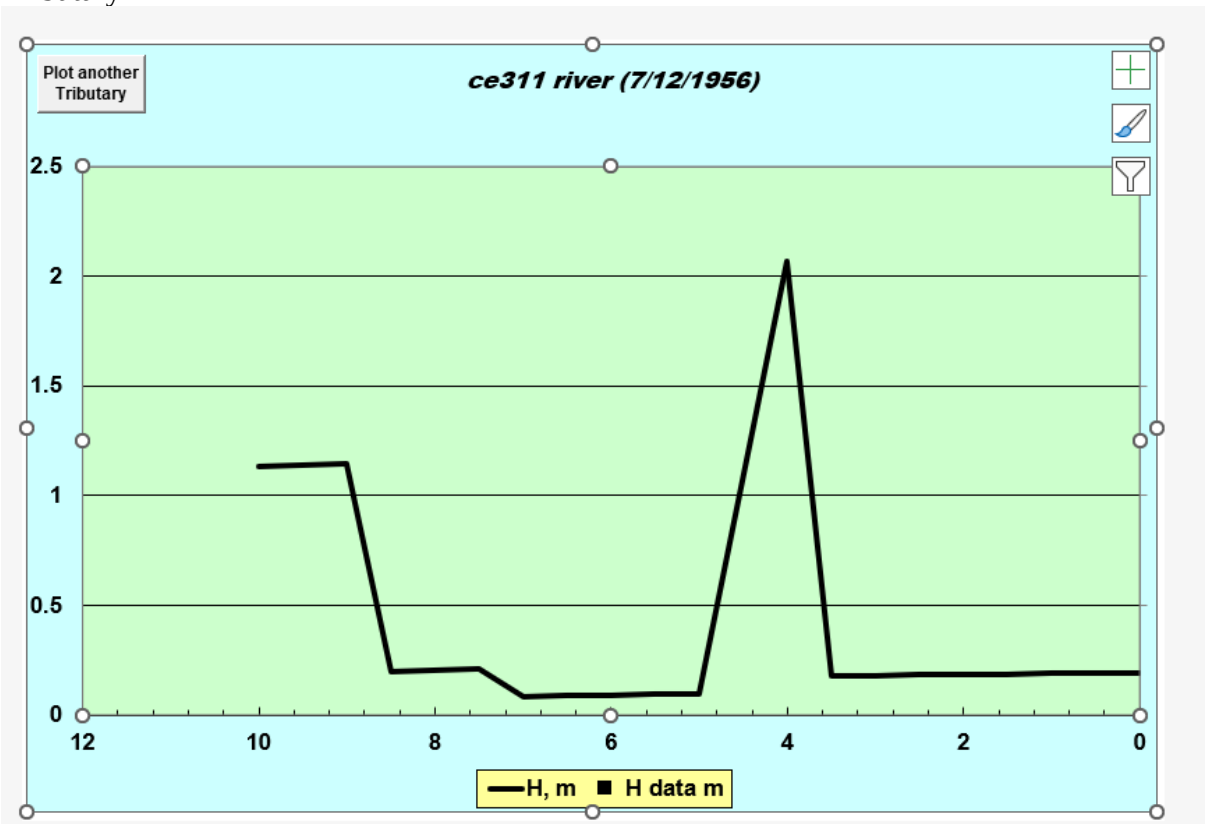


5.Find out lowest point in river and tributary with “reach”.- The lowest point in the river and tributary with "reach"- a. River- The lowest point is Point 2.1 in the Depth graph with a value of 0.14 b. Tributary- In the tributary the lowest point is Point 7 with a value of 0.08

River-



Tributary-



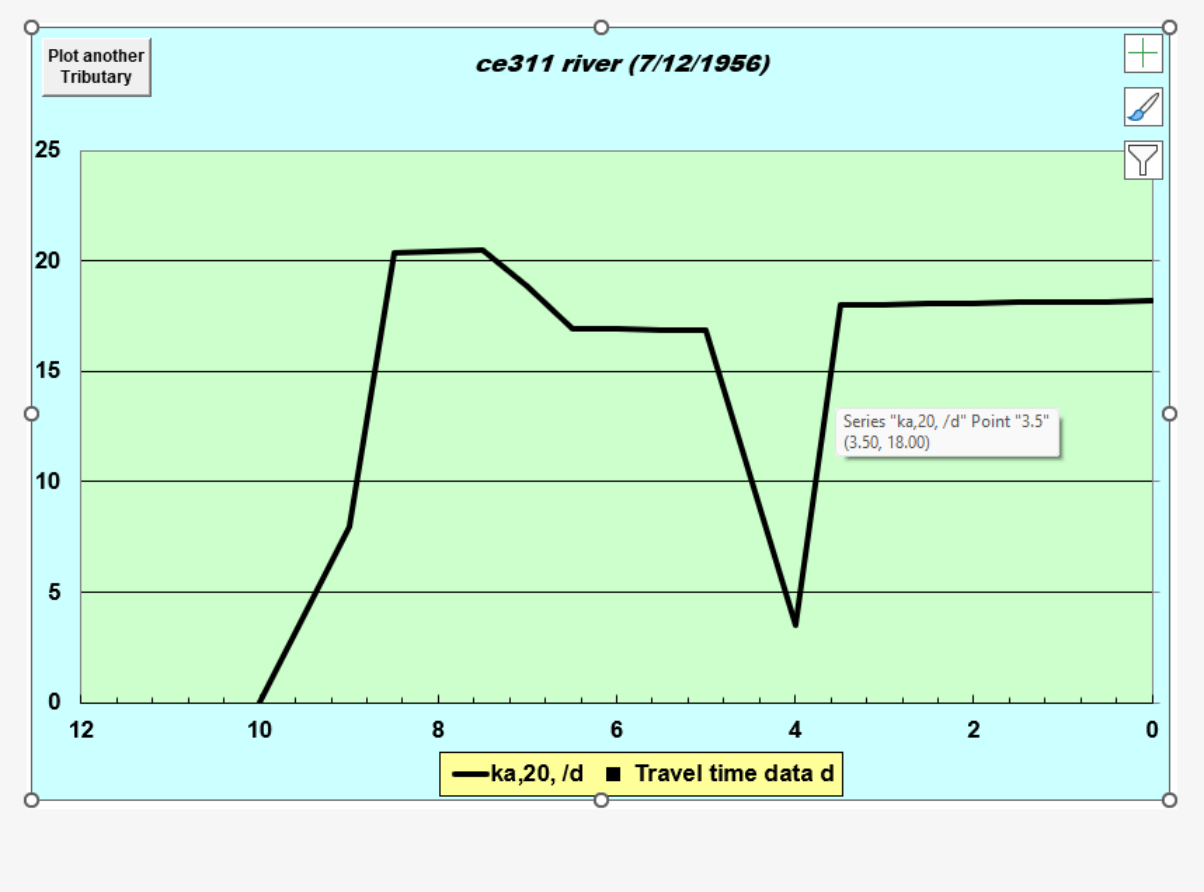
6. What is reaeration, find out at which “reach” reaeration was highest for river and for tributary and why.

. Reaeration is the process by which dissolved oxygen is replenished in a water body, typically because of the exchange of gasses between the water and the atmosphere. This process is crucial for maintaining adequate oxygen levels in aquatic environments, which is essential for the survival of aquatic life and for various ecological and water quality considerations.

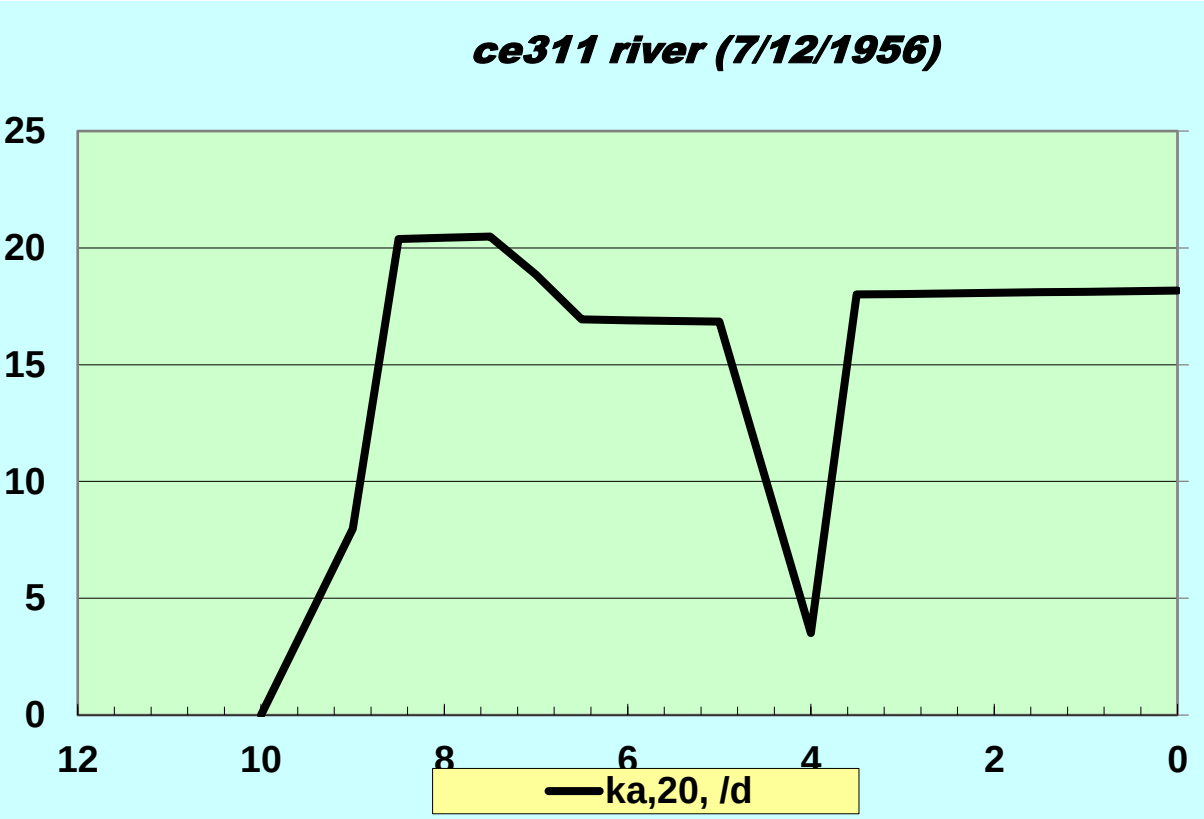
a. River-The reaeration is highest for the Point 9 with a value of 22.397

b. Tributary- The reaeration is highest for the Point 9 with a value of 20.48 The reaeration is highest for these points due to increase in width of the river

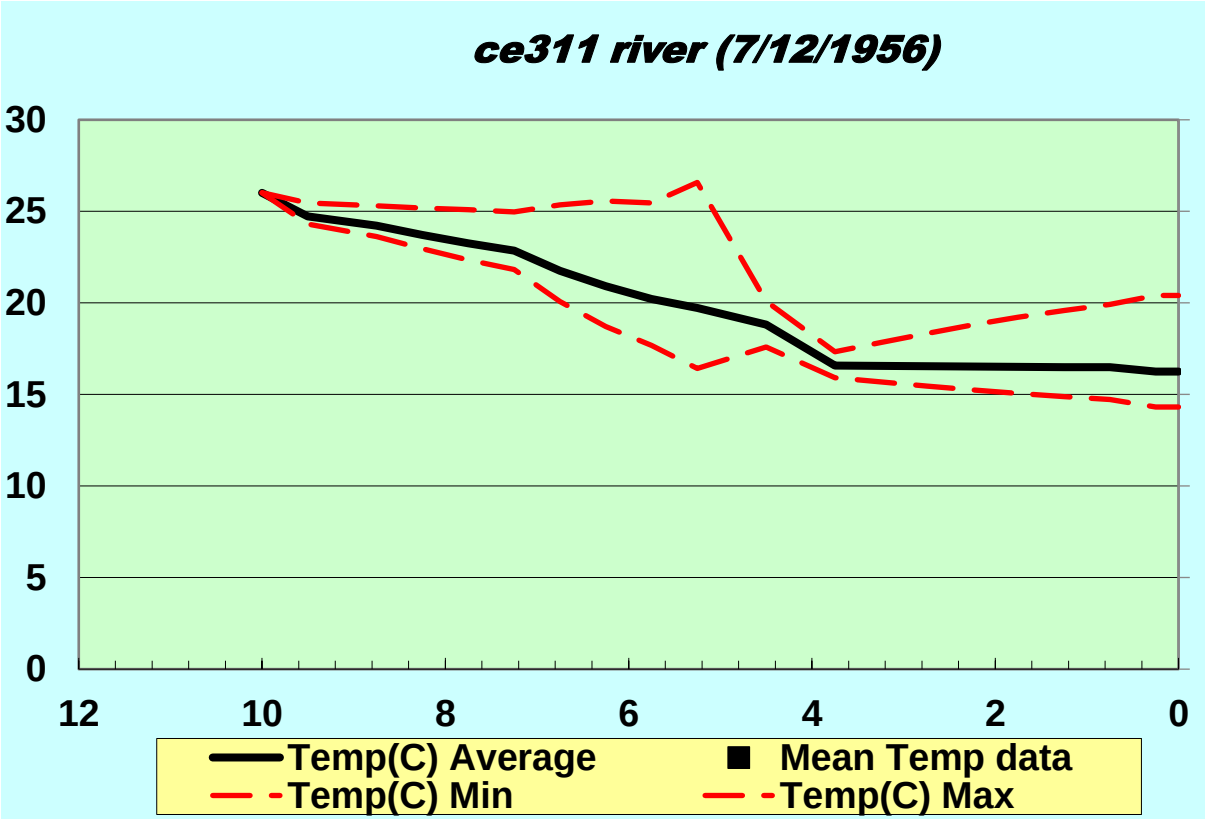
Mainstream-20



Tributary-20



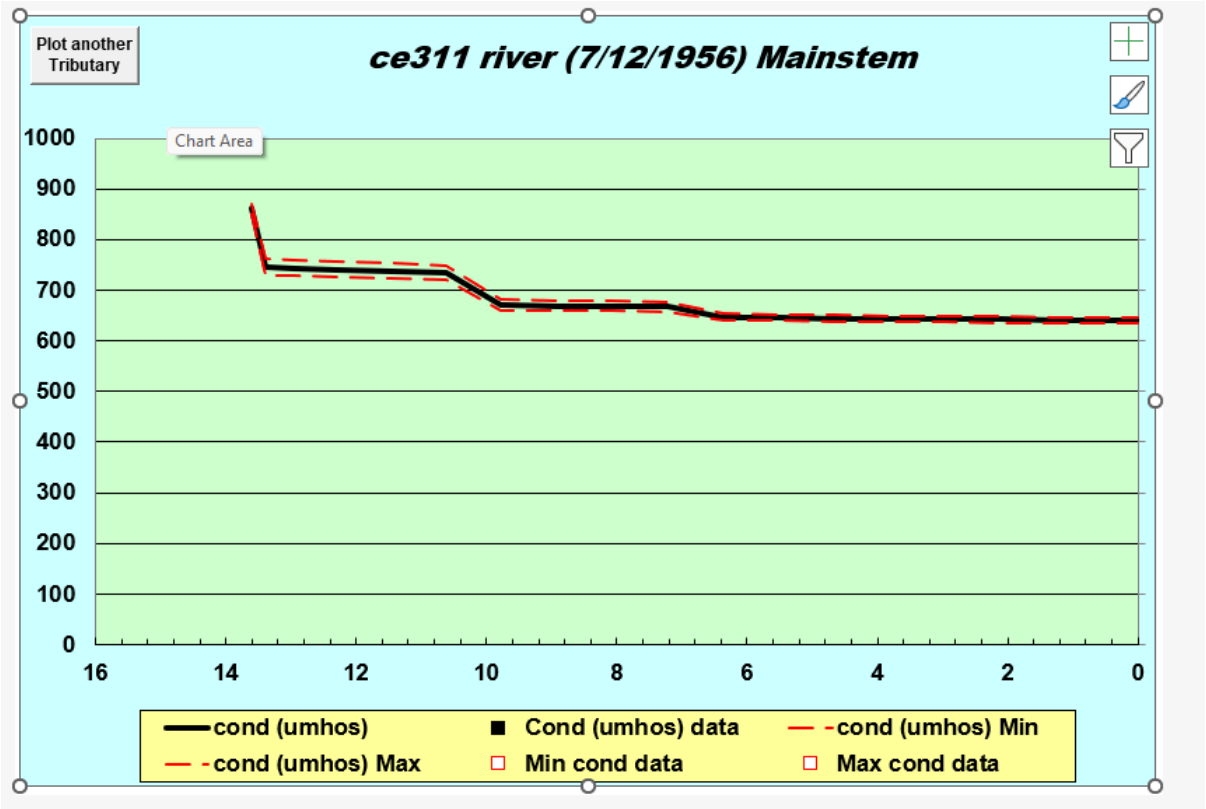
7.How much modelled temperature is differed with measured data and why.



= 15.2 degree Celsius: no uniform mix of heat.

The temperature variation is observed between the maximum and minimum values. Initially, there is a significant difference, but this difference gradually decreases as we progress downstream. The maximum deviation occurs at approximately Point 5.25 on the temperature graph. Subsequently, the temperature begins to approach the modelled values again, eventually converging by the end of the observation.

8. Measured conductivities have no much differences why.



Because conductivity is a bulk phenomenon

The similarities between measured and modelled conductivities can be attributed to the following factors:

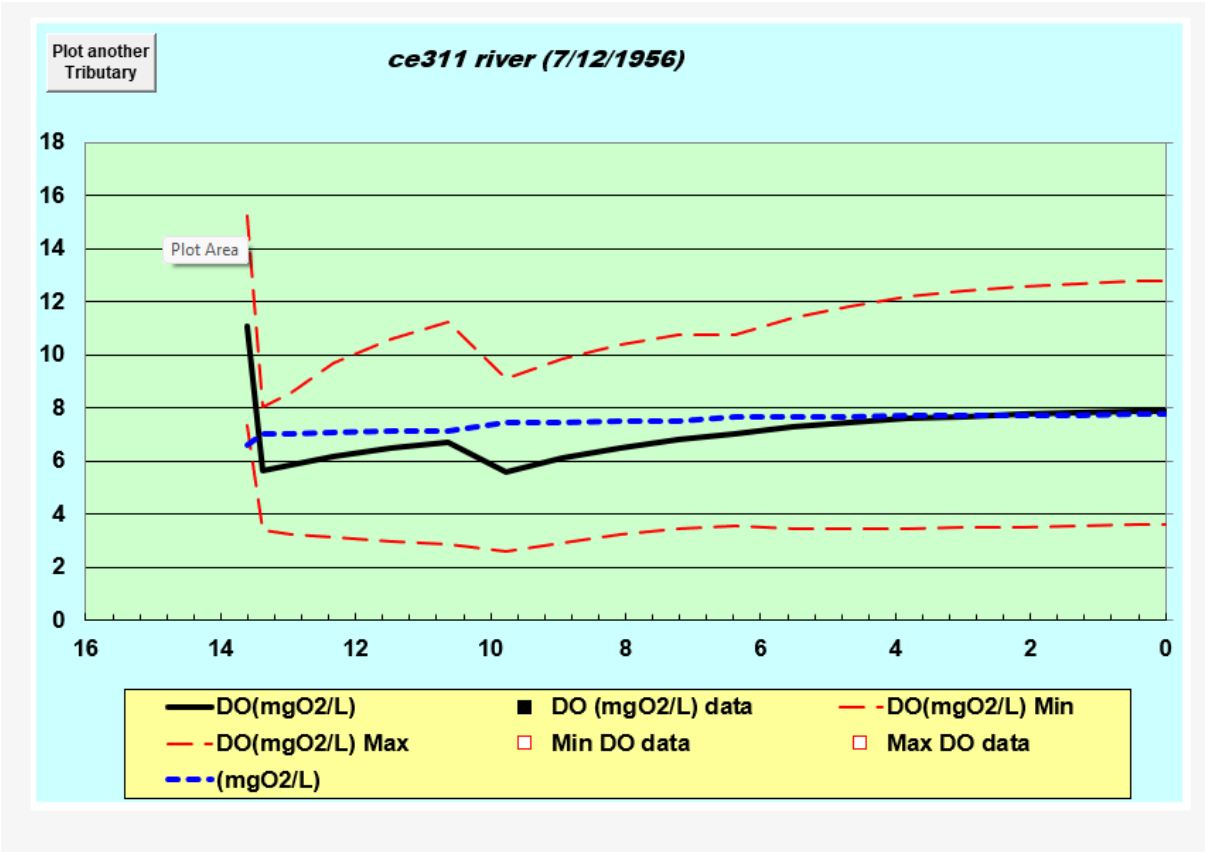
a. High-quality data input

b. Stable and uniform conditions due to the limited reach lengths

c. Conductivity's sensitivity

d. Availability and quality of data

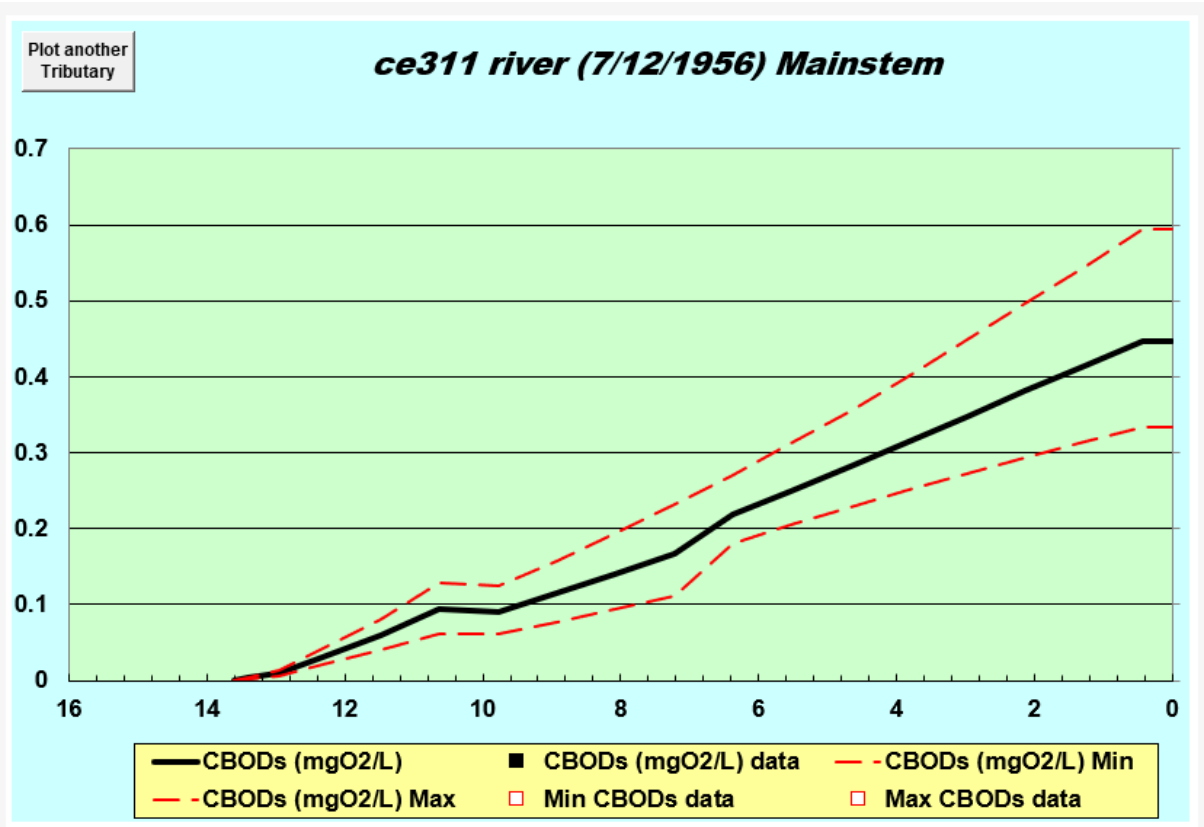
9 Explain DO levels in river and tributary in “reaches”.

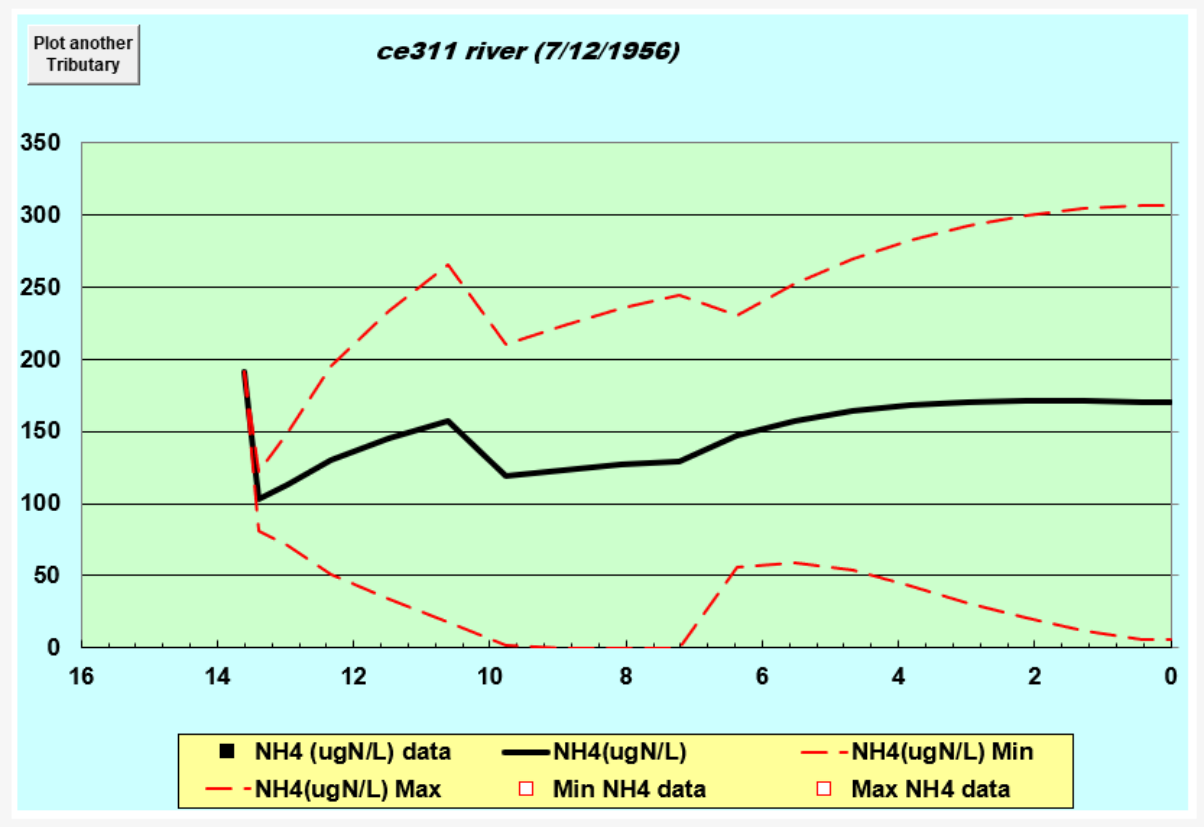


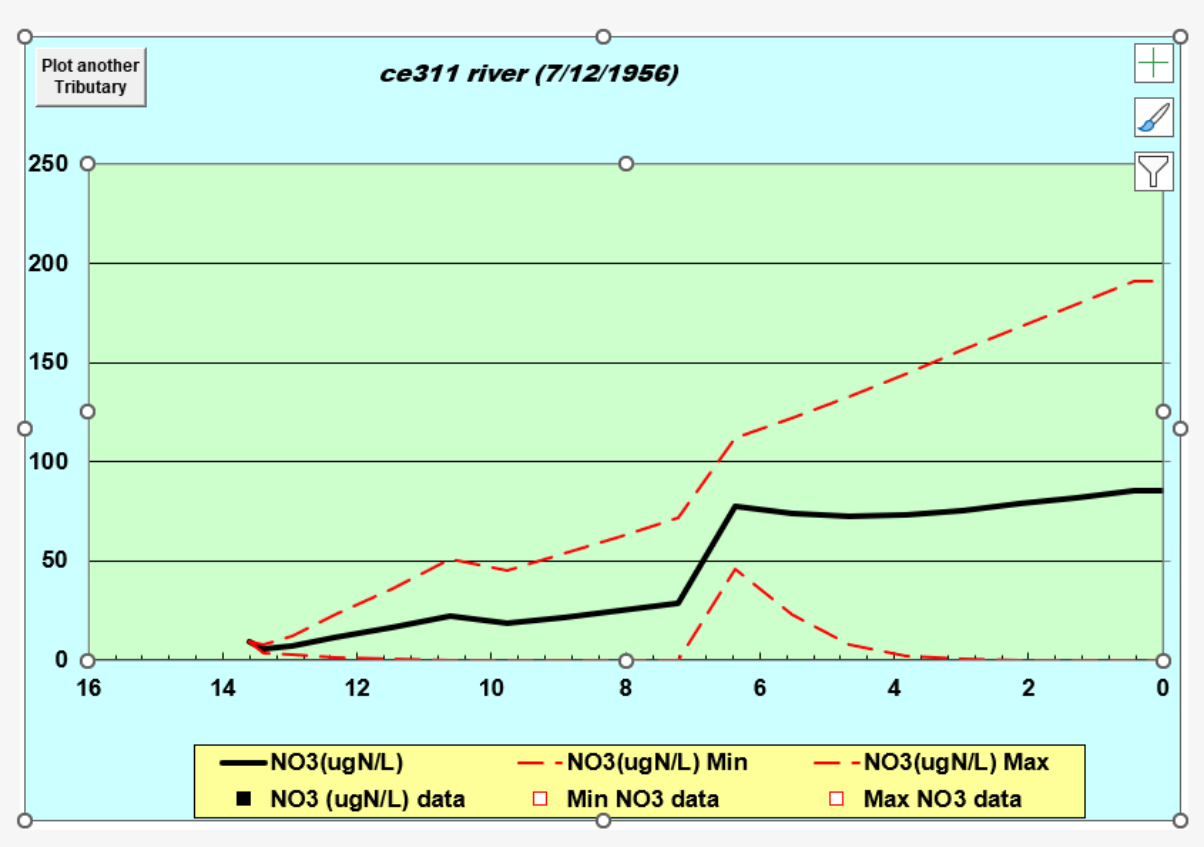
Do in mainstream remains nearly constant due to large flow. While in tributary its less stabilized. The initial decrease in modeled dissolved oxygen (DO) is followed by a significant deviation from the maximum and minimum DO levels. This decrease is primarily attributed to the introduction of wastewater. Subsequently, there is an increase in DO levels due to aeration, and from that point onward, it maintains a relatively constant value.

10.In tributary, relate organic carbon output with CBOD slow, NH_4 and NO_3 and explain.

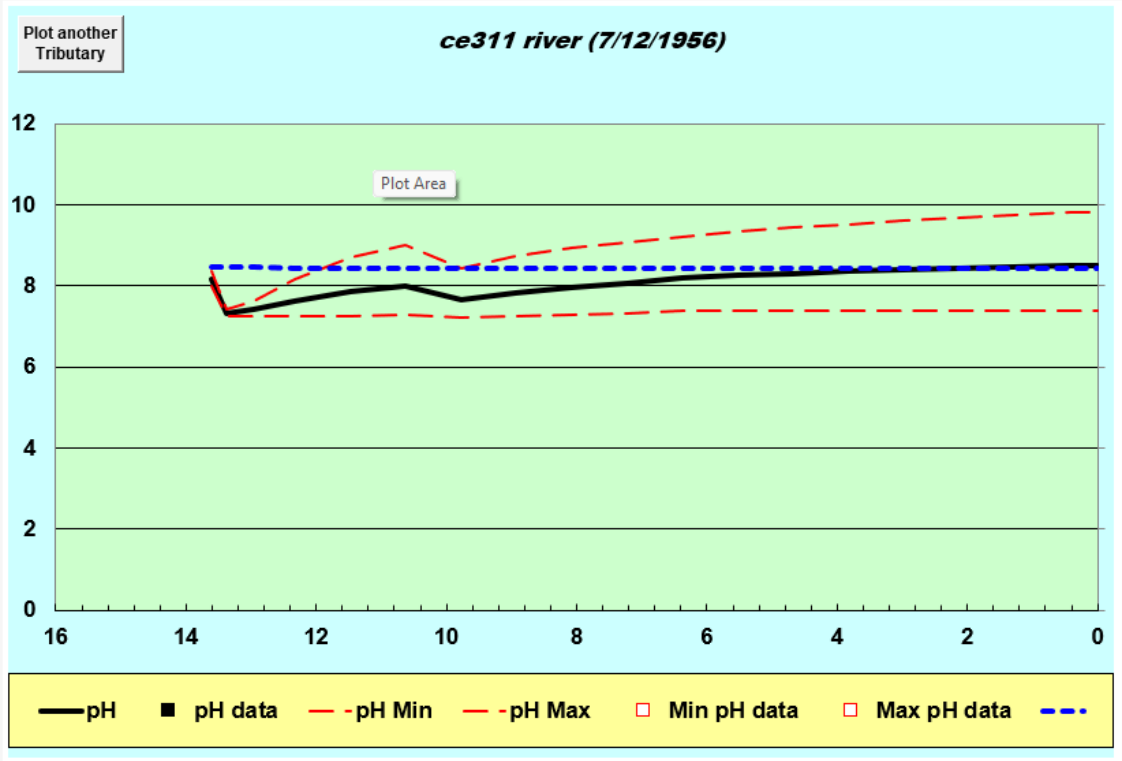
The tributary contains organic carbon, serving as a reservoir of carbon-based substances that can be metabolized by microorganisms. CBOD Slow specifically pertains to the fraction of this organic carbon responsible for oxygen consumption during biochemical processes. It signifies the segment of organic carbon that depletes dissolved oxygen as it decomposes. Thus, there is a correlation between the organic carbon content and CBOD Slow since a portion of the organic carbon undergoes biodegradation, contributing to CBOD Slow.

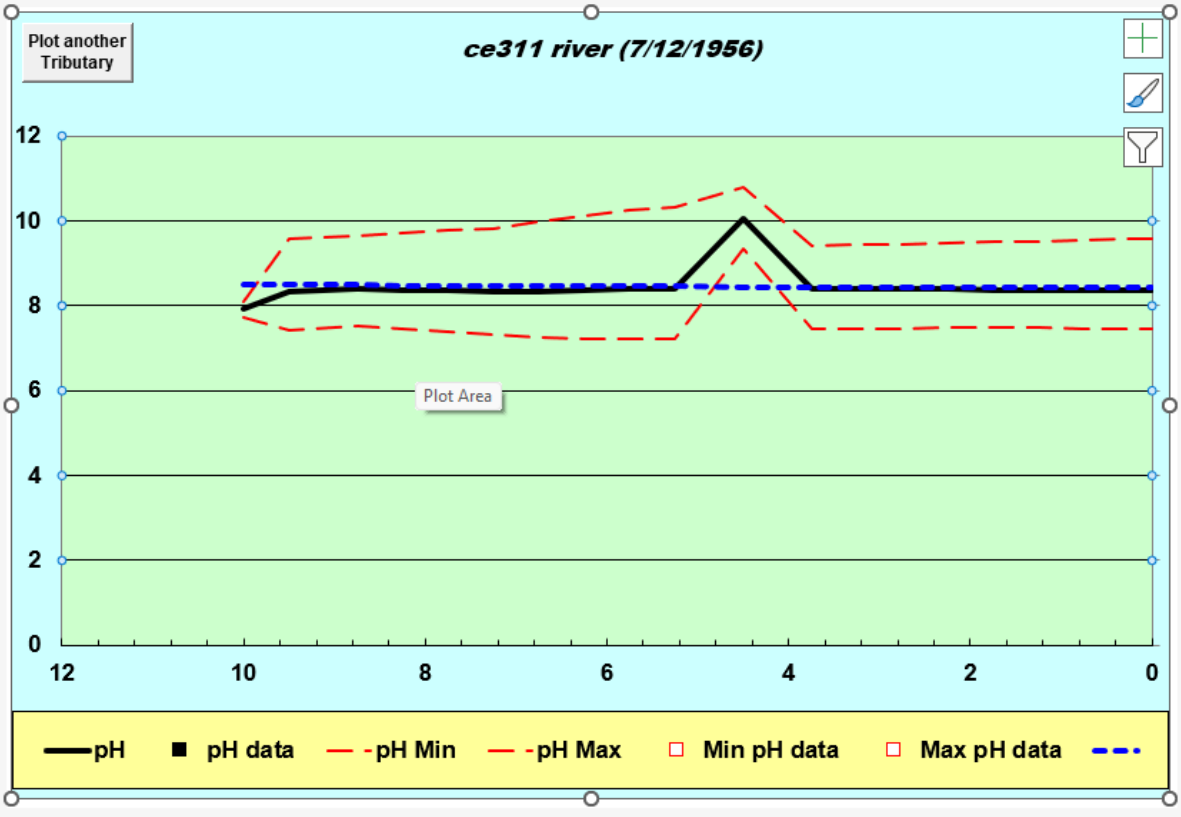

Plot another Tributary
ce311 river (7/12/1956) Mainstem
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
16
14
12
10
8
6
4
2
0
CBODs (mgO2/L)
CBODs (mgO2/L) data
CBODs (mgO2/L) Min
CBODs (mgO2/L) Max
Min CBODs data
Max CBODs data


Plot another Tributary
ce311 river (7/12/1956)
350
300
250
200
150
100
50
0
16
14
12
10
8
6
4
2
0
NH4 (ugN/L) data
NH4(ugN/L)
NH4(ugN/L) Min
NH4(ugN/L) Max
Min NH4 data
Max NH4 data



11.In tributary find out highest organic phosphorous with “reaches” and explain why it is highest.

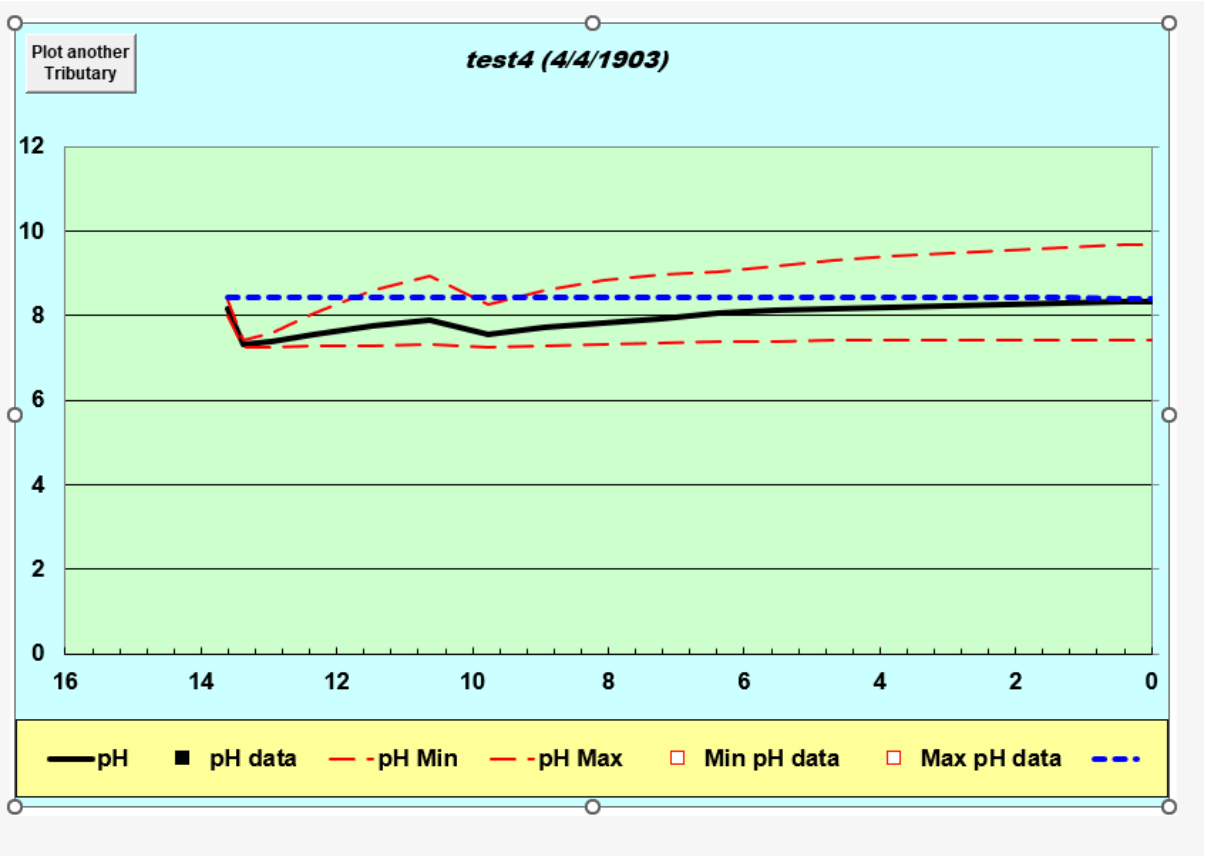

Plot another Tributary
ce311 river (7/12/1956)
Plot Area
12
10
8
6
4
2
0
16
14
12
10
8
6
4
2
0
pH
pH data
pH Min
pH Max
Min pH data
Max pH data

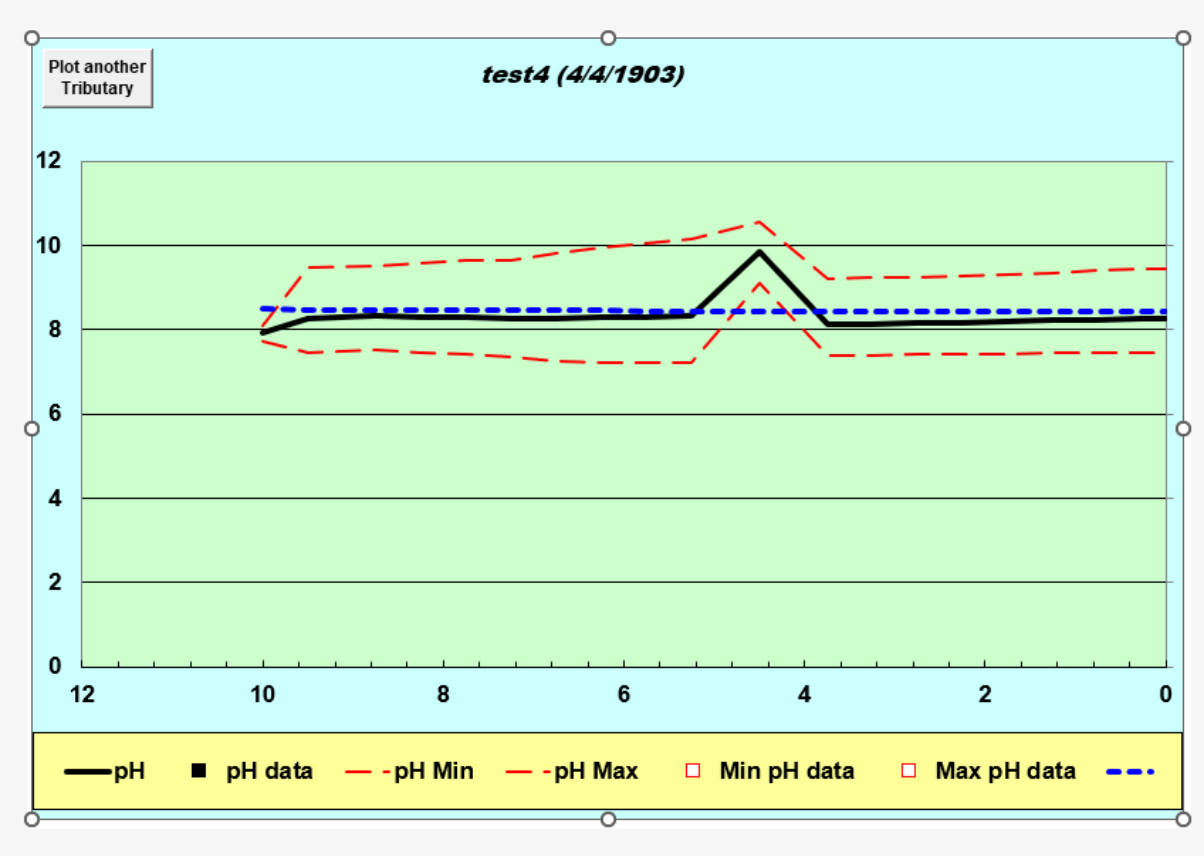

Plot another Tributary
ce311 river (7/12/1956)
Plot Area
12
10
8
6
4
2
0
12
10
8
6
4
2
0
pH
pH data
pH Min
pH Max
Min pH data
Max pH data

All values are below detection level.

12.Explain modelled and measured Ph data in river and tributary.

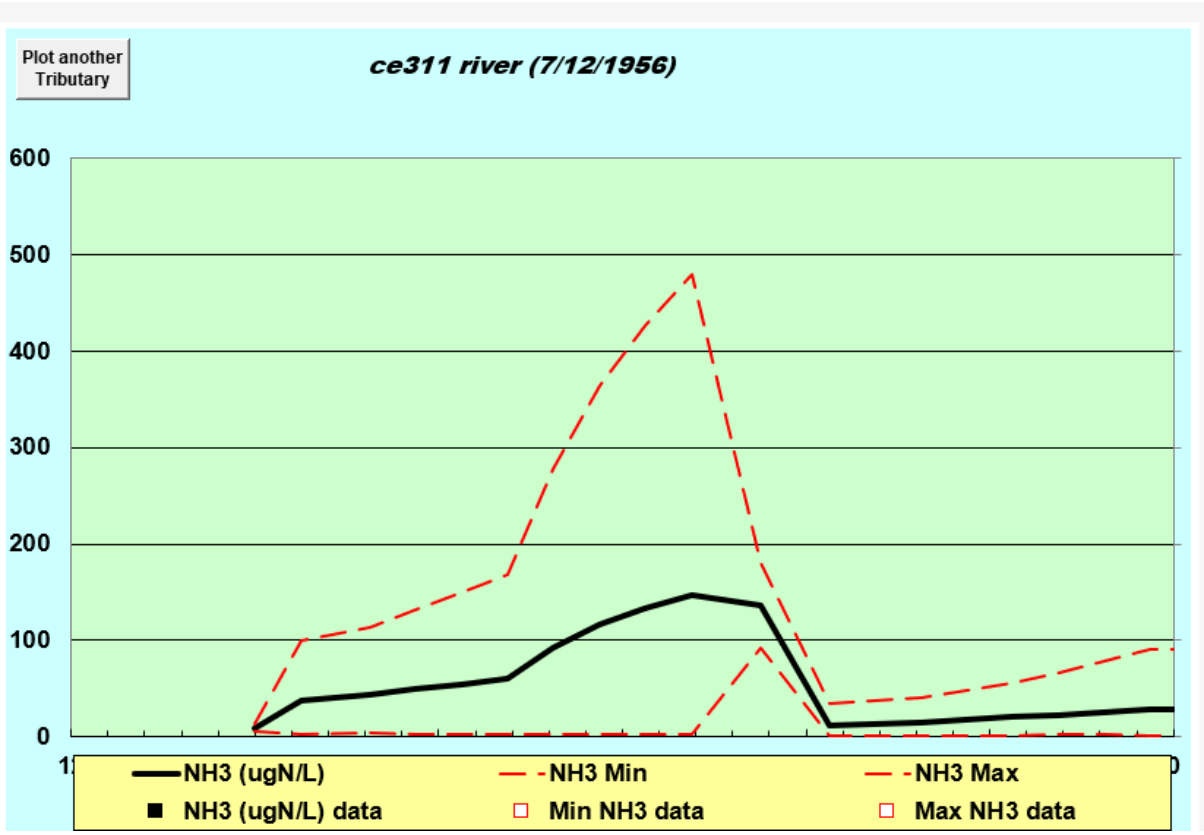
River-





The estimated parameters and assumptions within the model may not precisely reflect the real-world pH variations. The model is constructed based on specific assumptions and parameter values that might not perfectly correspond to the inherent chemistry of the water. Within the tributary, there's a gradual pH increase, reaching its peak around reach 4.25. In contrast, within the river, the pH gradually decreases, hitting its lowest point at the final segment.

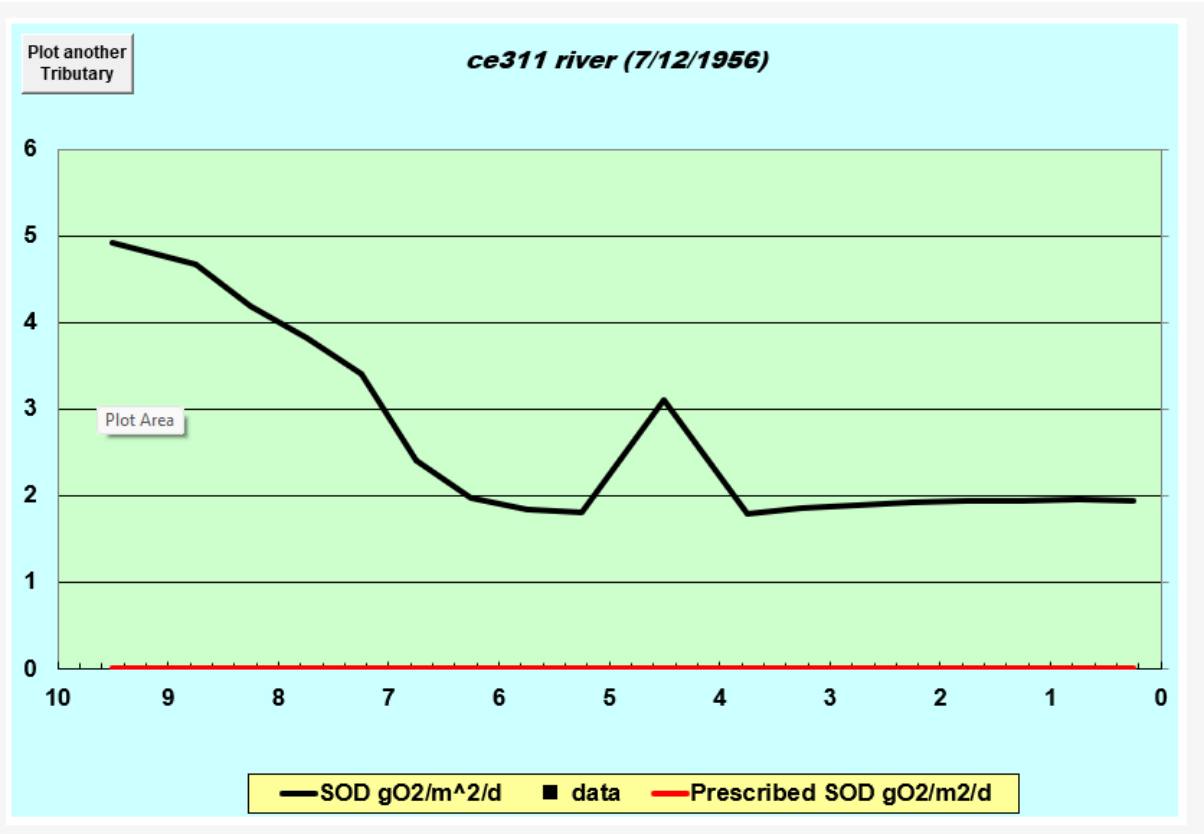
13.Why NH_3 is decreased in modelled output for tributaries around 4.5-3.5 km.



Nitrification is a key process in reducing ammonia levels in rivers and tributaries. It's a biological phenomenon where ammonia (NH3) is converted into nitrite (NO2-) and then into nitrate (NO3-) by specialized bacteria called nitrifiers. This biochemical process plays a crucial role in removing ammonia from the water. Nitrification typically occurs within a range of approximately 3.5 to 4.5 kilometers and is influenced by factors like temperature, dissolved oxygen levels, and the presence of nitrifying bacteria. As nitrification progresses, it effectively lowers ammonia concentrations by transforming NH3 into NO2- and NO3-.

14.What is supplementary SOD, why this needed in the model?

Supplementary SOD, or Supplemental Oxygen Demand, is a critical parameter in water quality modeling, particularly in the QUAL2K model. It quantifies oxygen consumption beyond typical BOD components, improving model accuracy by accounting for additional oxygen demands arising from various processes in aquatic systems. This ensures a more realistic representation of oxygen dynamics and quality.


Plot another Tributary
ce311 river (7/12/1956)
Plot Area
6
5
4
3
2
1
0
10
9
8
7
6
5
4
3
2
1
0
SOD gO2/m^2/d
data
Prescribed SOD gO2/m2/d