Details about the experimental set up

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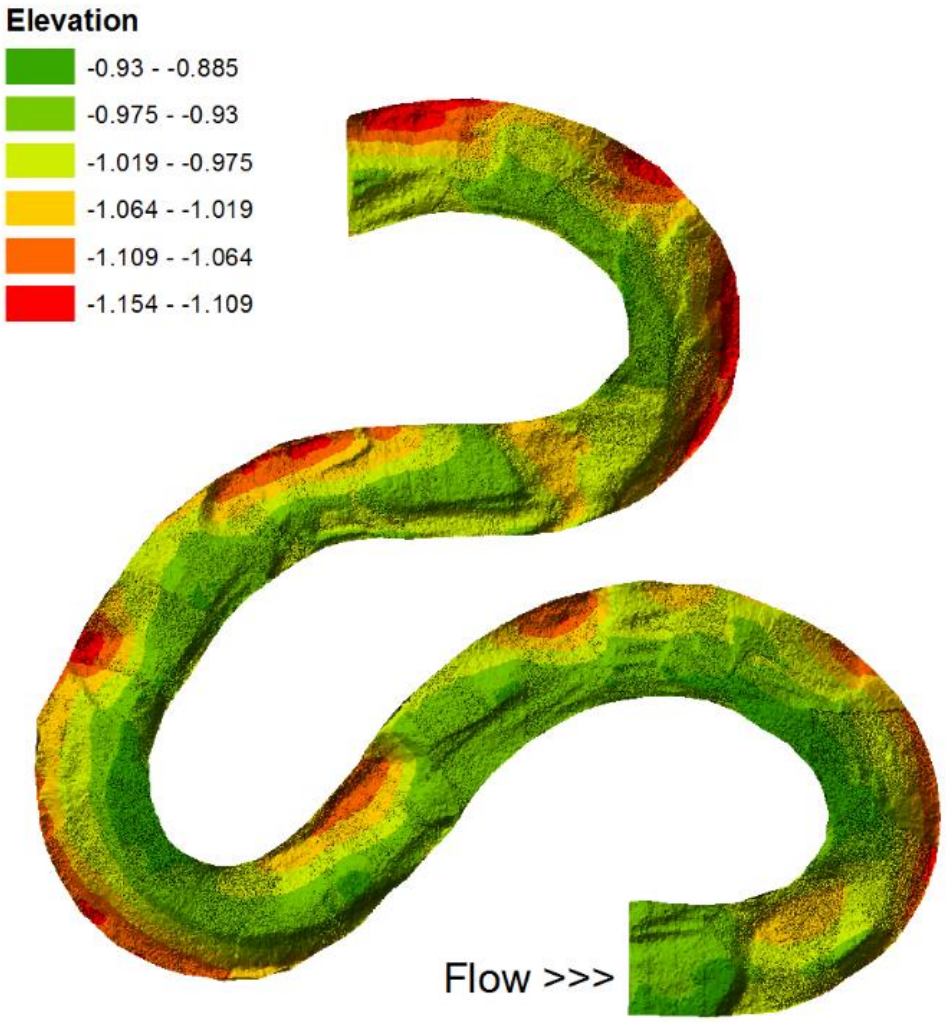
Bathymetry from Czapiga (2013)

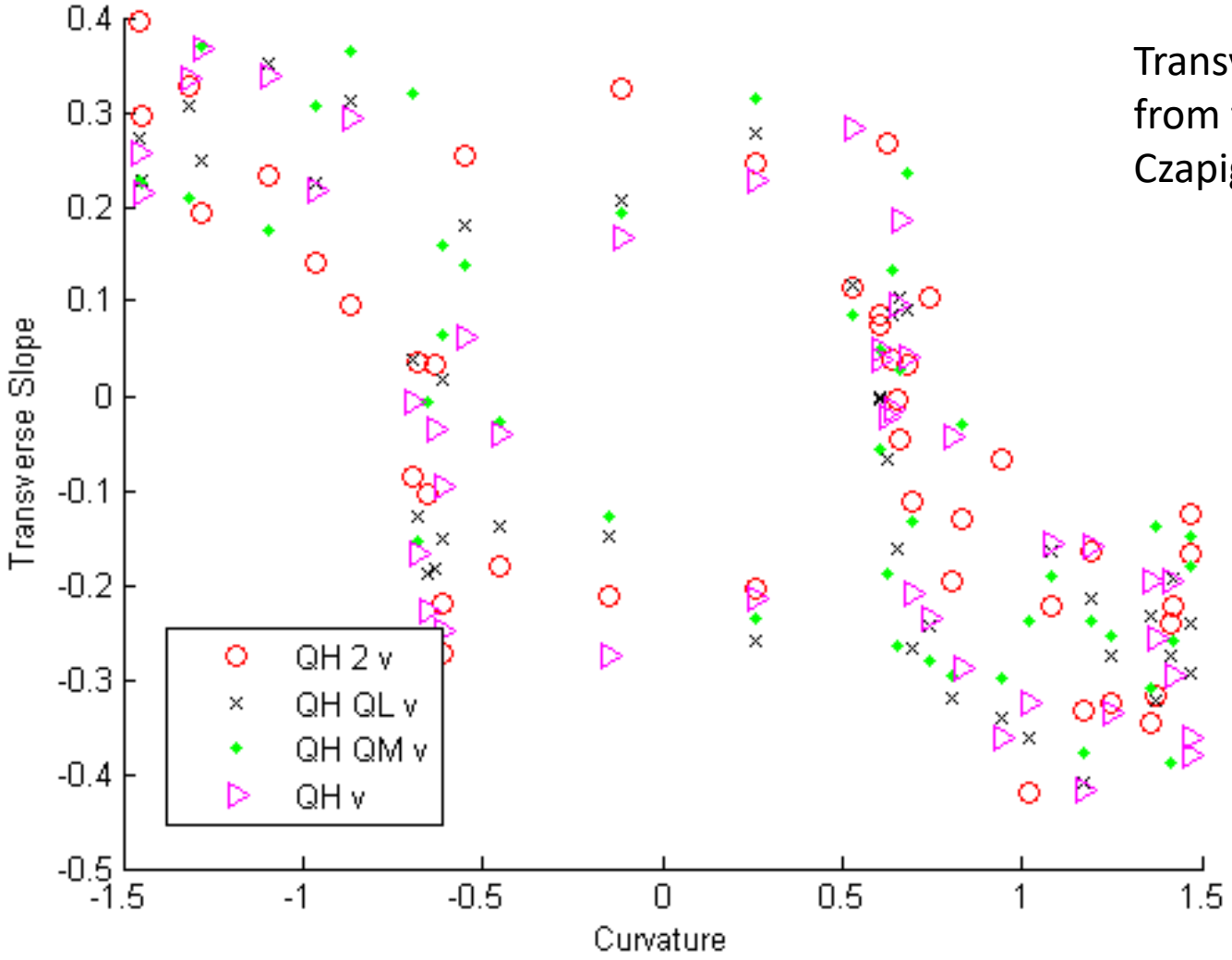
This is the experimental alluvial bathymetry
Used as the basis for the bedrock bed.

The point cloud was processed in MatLab.
A relation between streamwise location and transverse slope was obtained (see slides 3-5).

Using this relation, the skeleton for the bedrock bed was computed (see slide 6).



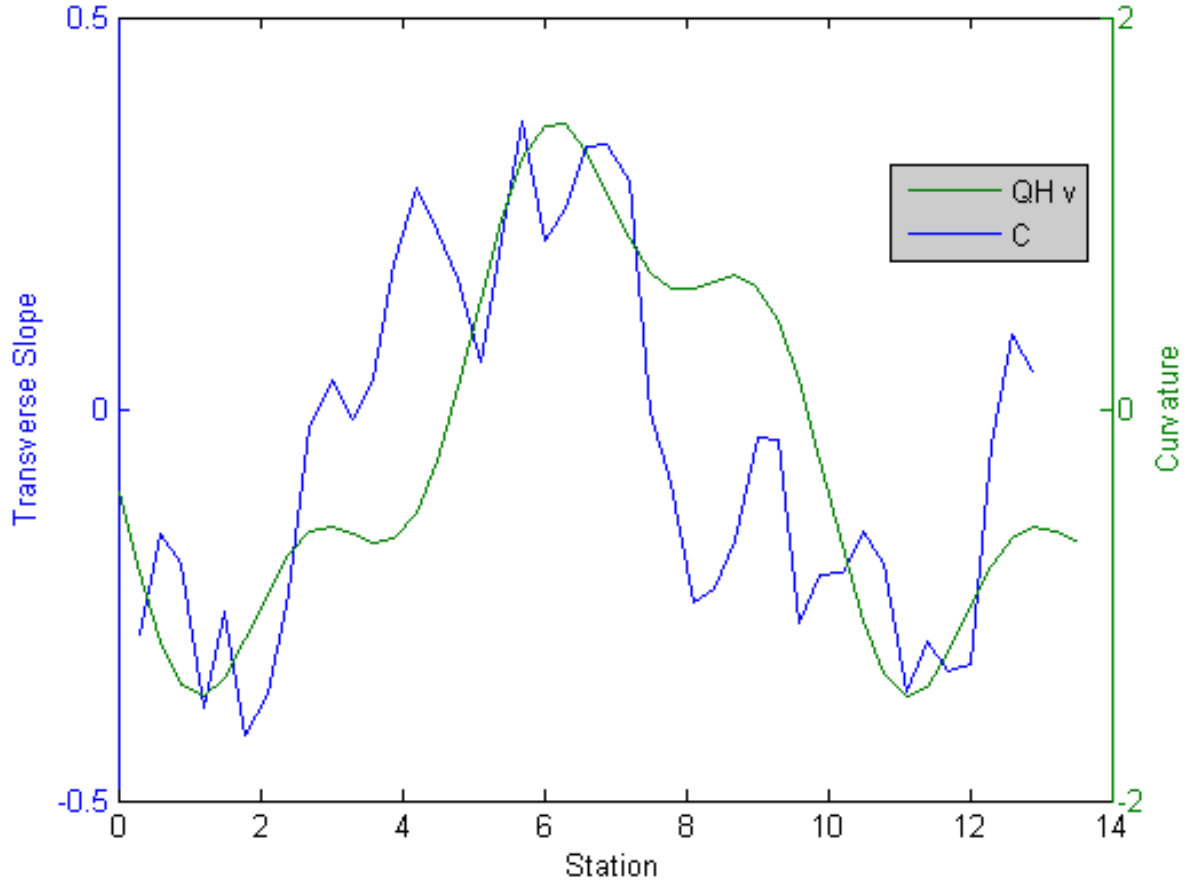
How do Transverse Slope and Curvature Relate?



Transverse slopes extracted from the experiments of Czapiga (2013).

How do Transverse Slope and Curvature Relate?

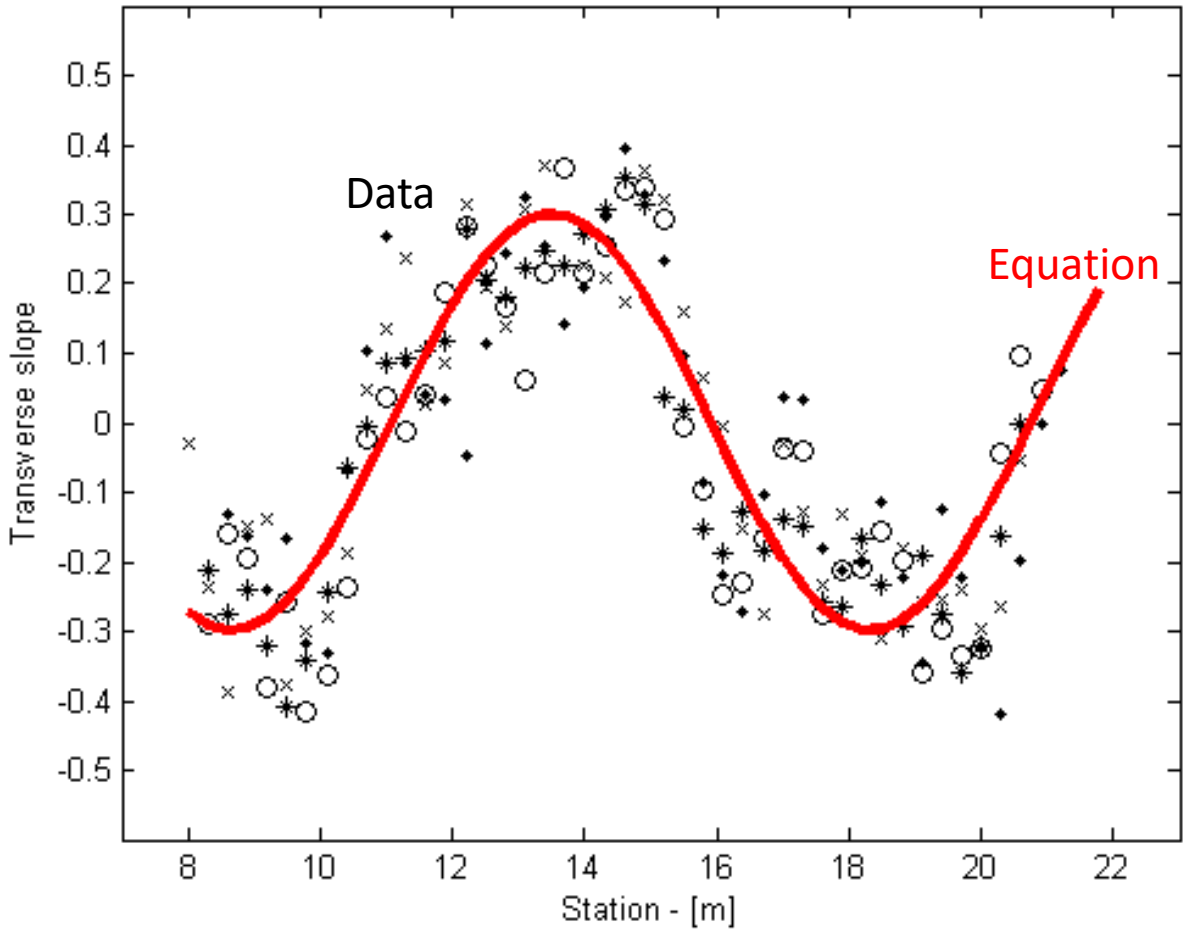
Transverse slope vs. station along the Kinoshita flume, and the negative value of curvature also plotted against streamwise station. Data used here corresponds with bathymetry shown in slide 2.



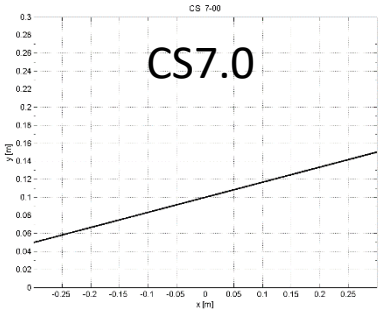
Relation between transverse slope and streamwise location

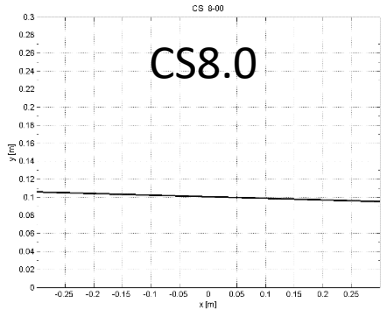
$$S_t = a \cdot \sin(b \cdot s - c);$$

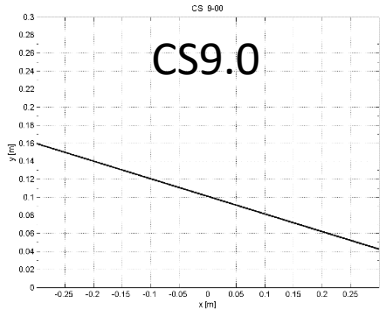
$a = 0.27$ a - amplitude
$b = 0.63$ b - wavelength
$c = 1.93$ c - shifts

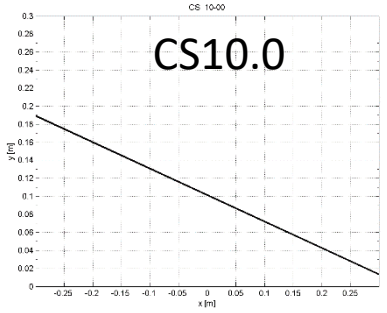


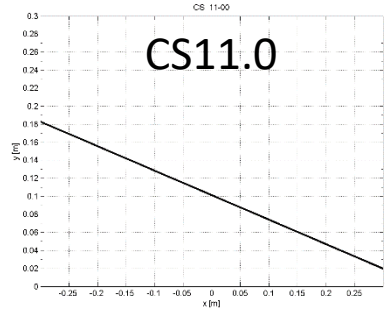
Transverse slope at every meter along the Kinoshita flume.
Elevations from 0 to 0.3 m. Lateral distances from left wall to right wall; -0.30 to 0.30 (0.0 is the centerline)

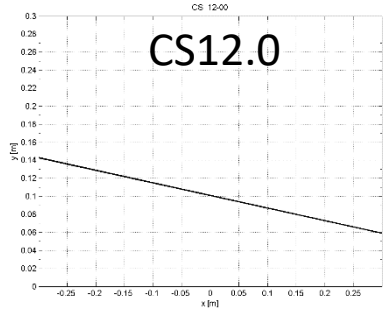


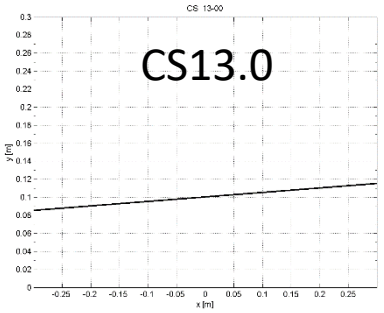


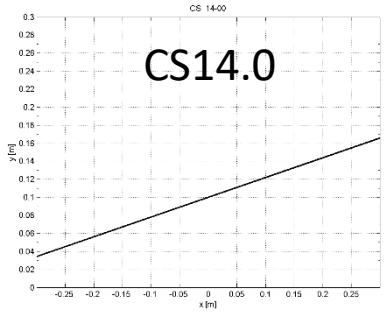


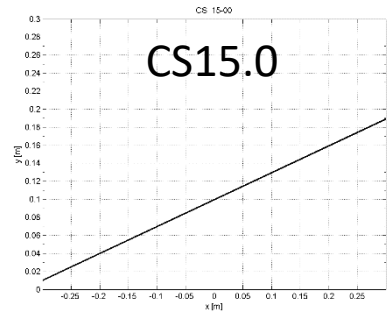


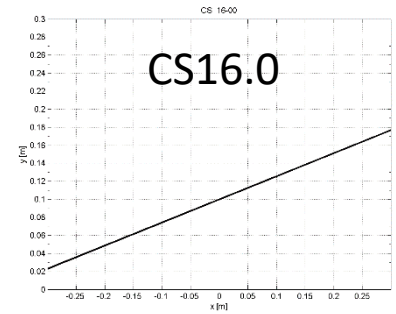


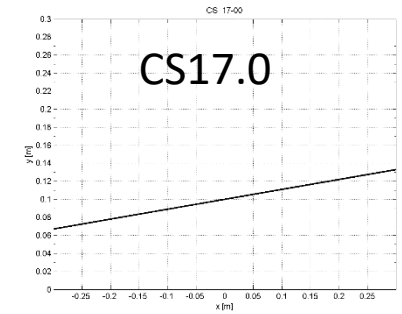


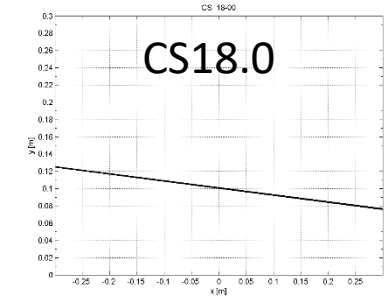


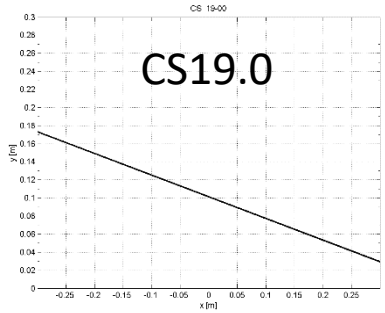


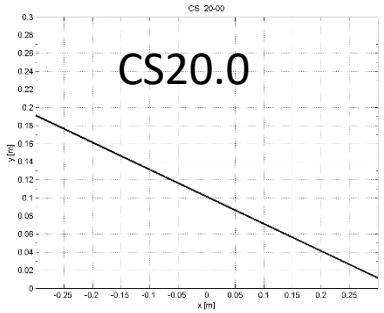


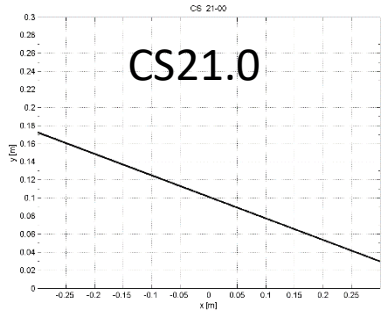


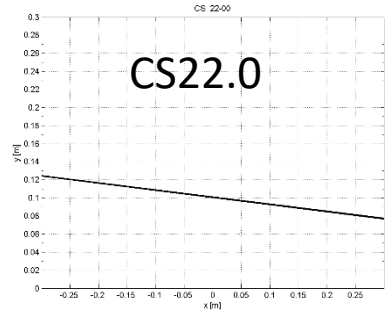


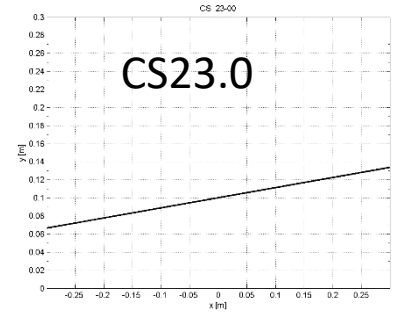








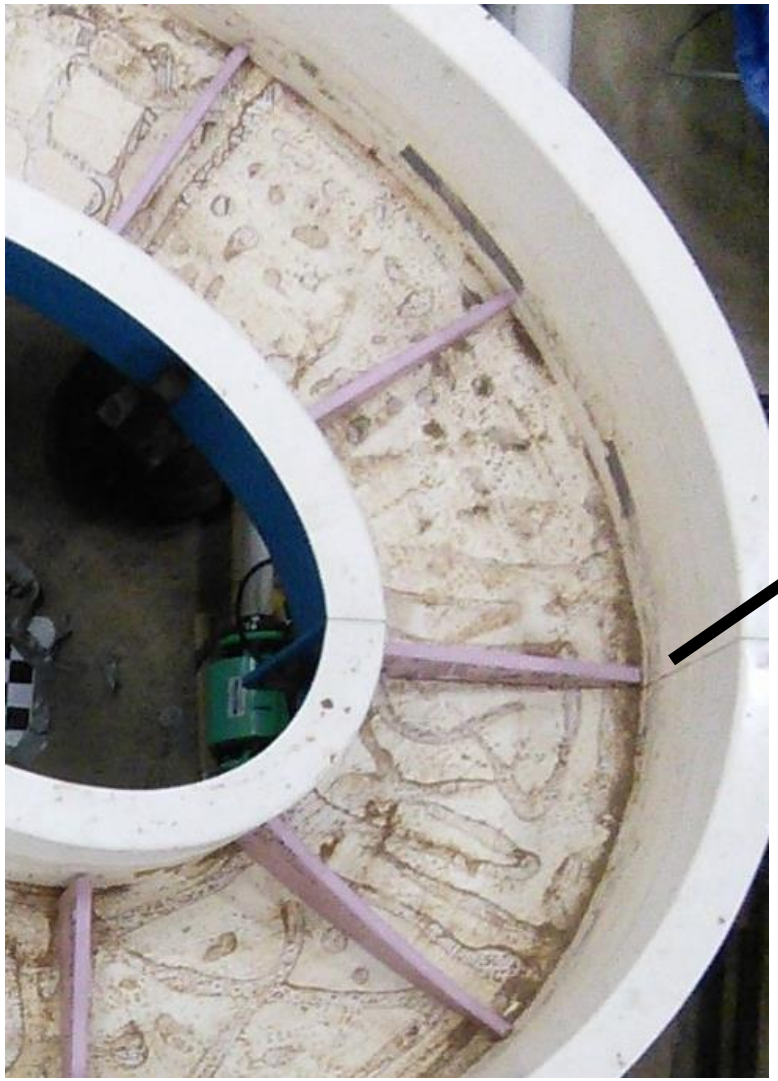


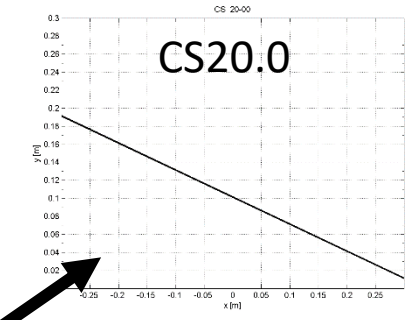


Flume with flat bed

Flume with foam cross sections

Flume with XSs – Zoomed in





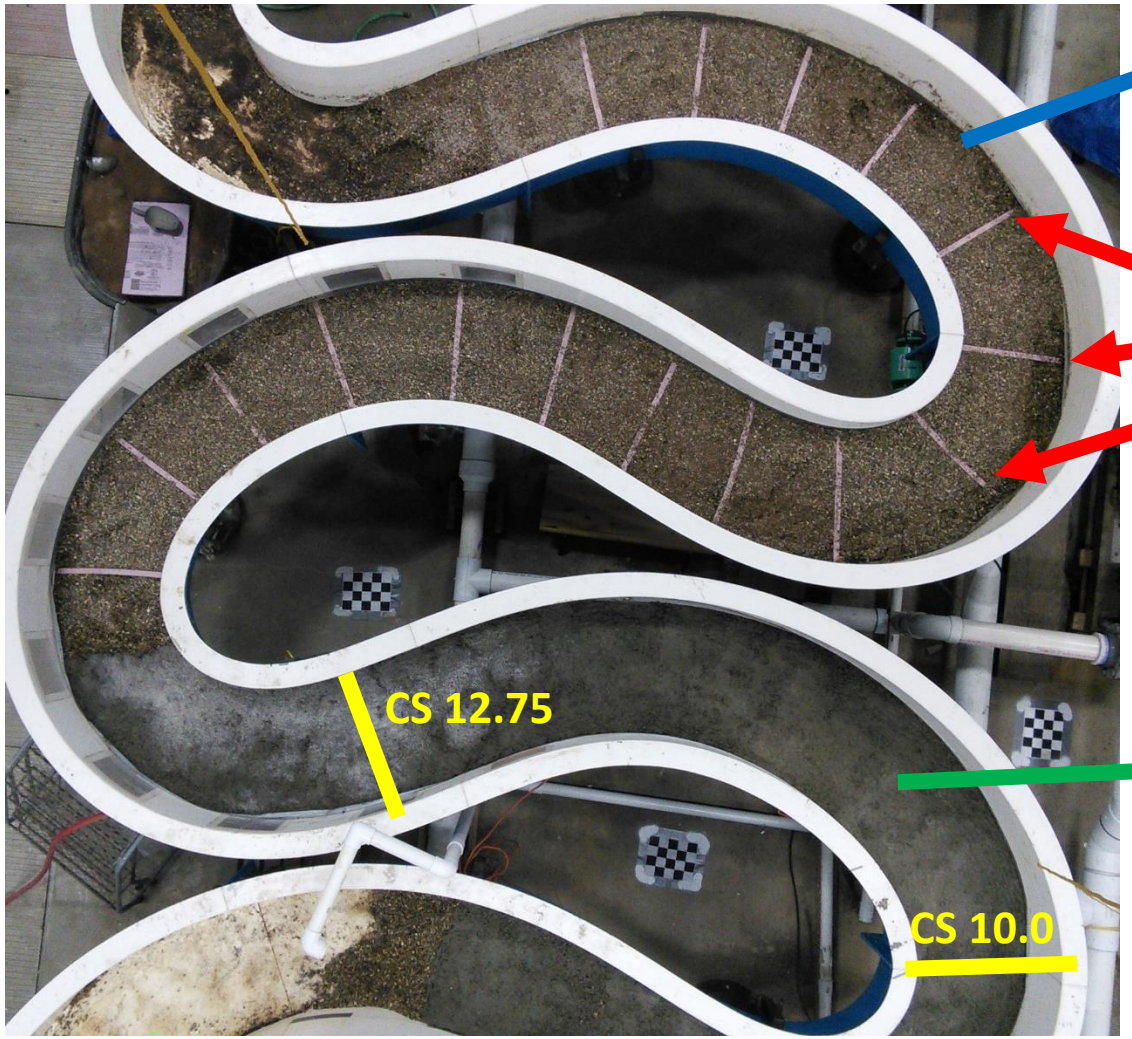
Flume with foam cross sections and gravel filling the pockets between XSs

Flume with foam cross sections and pockets fully filled with gravel

Flume with foam cross sections, gravel and thin layer of concrete between CS7 and CS14

Flume with bedrock bed (all gravel and foam covered with thin layer of concrete).

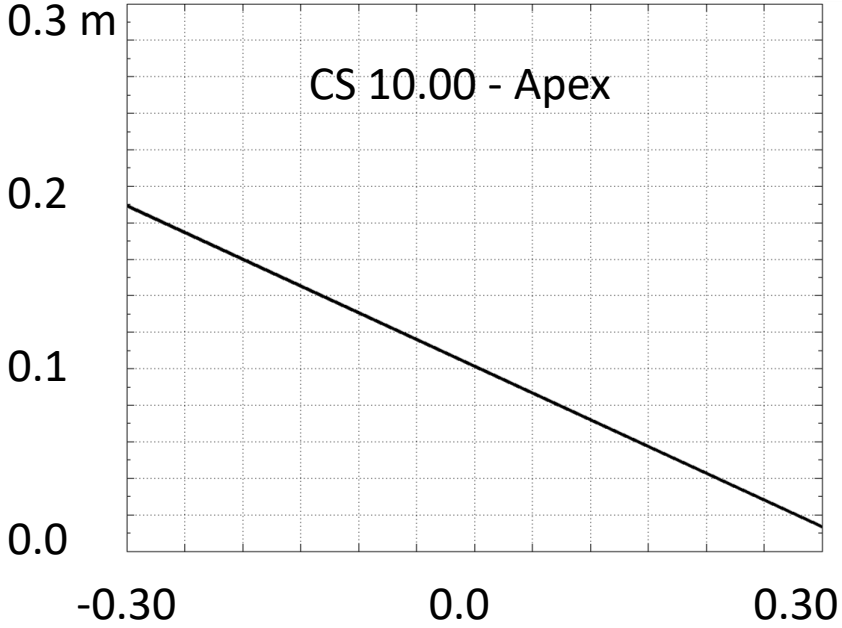
Bedrock bed painted white to increase contrast between bed and alluvium.

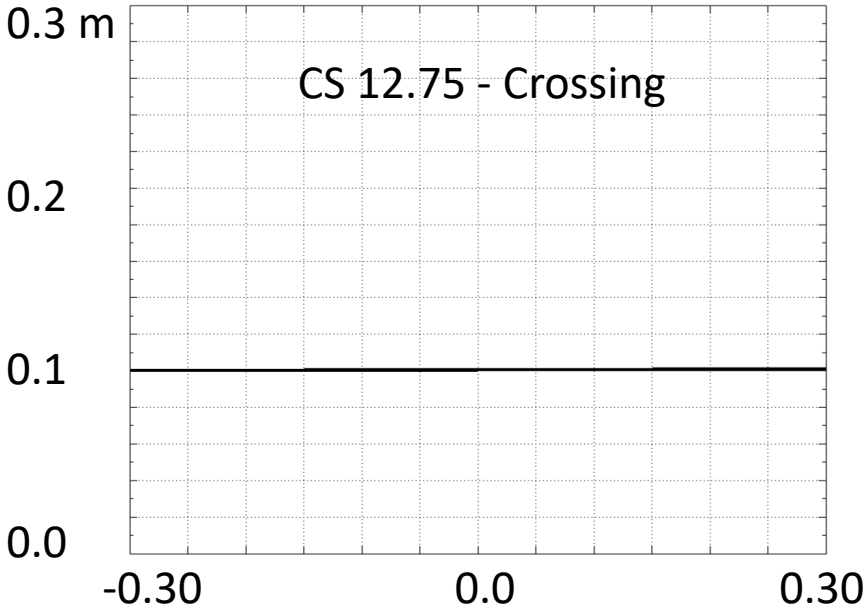


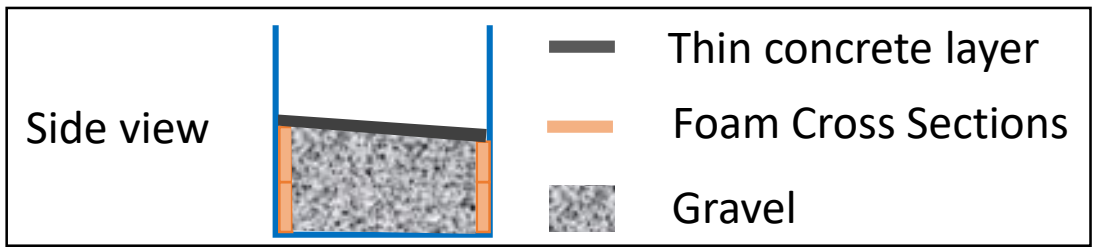
Pea gravel between foam

Foam Cross Sections

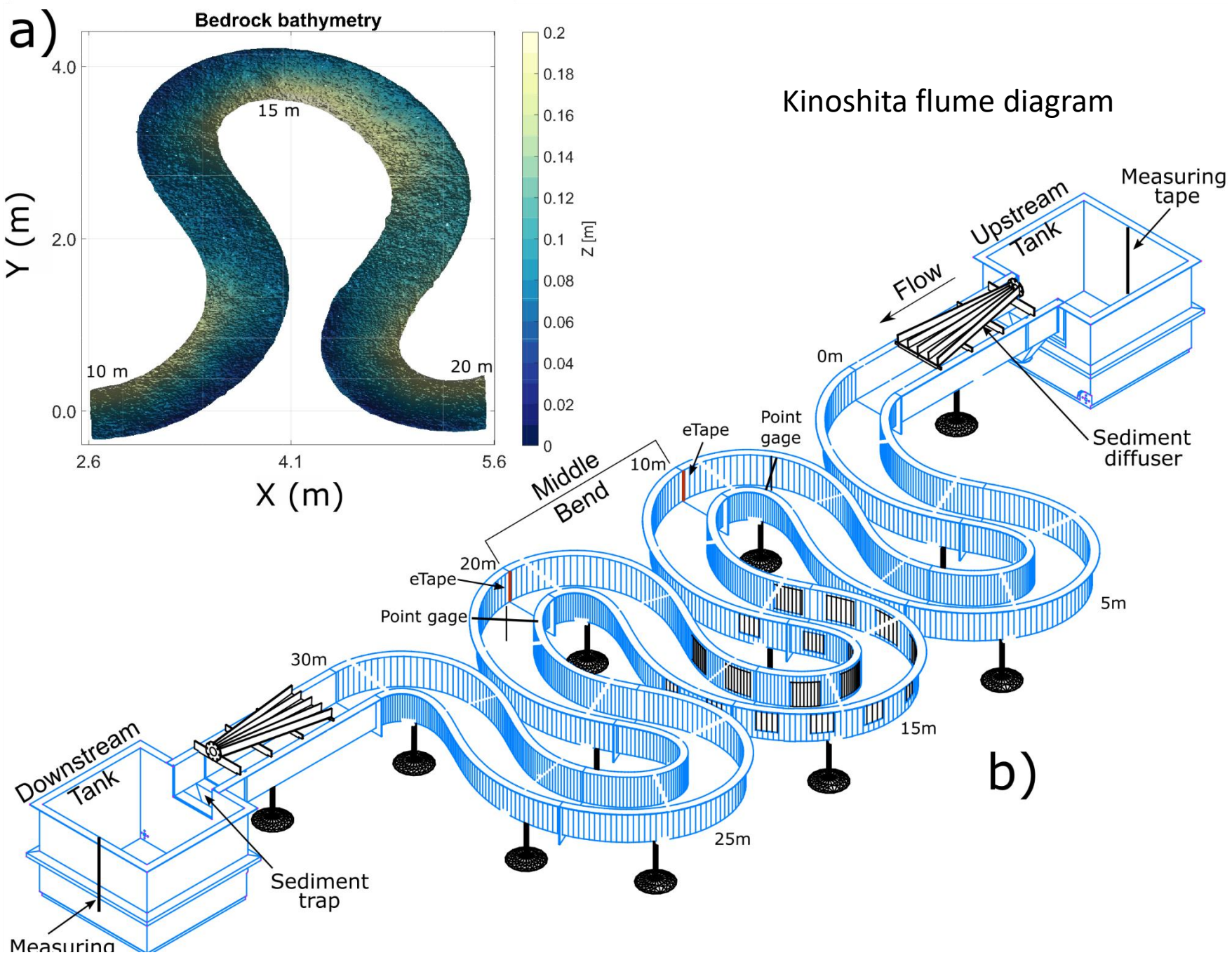
Thin concrete layer

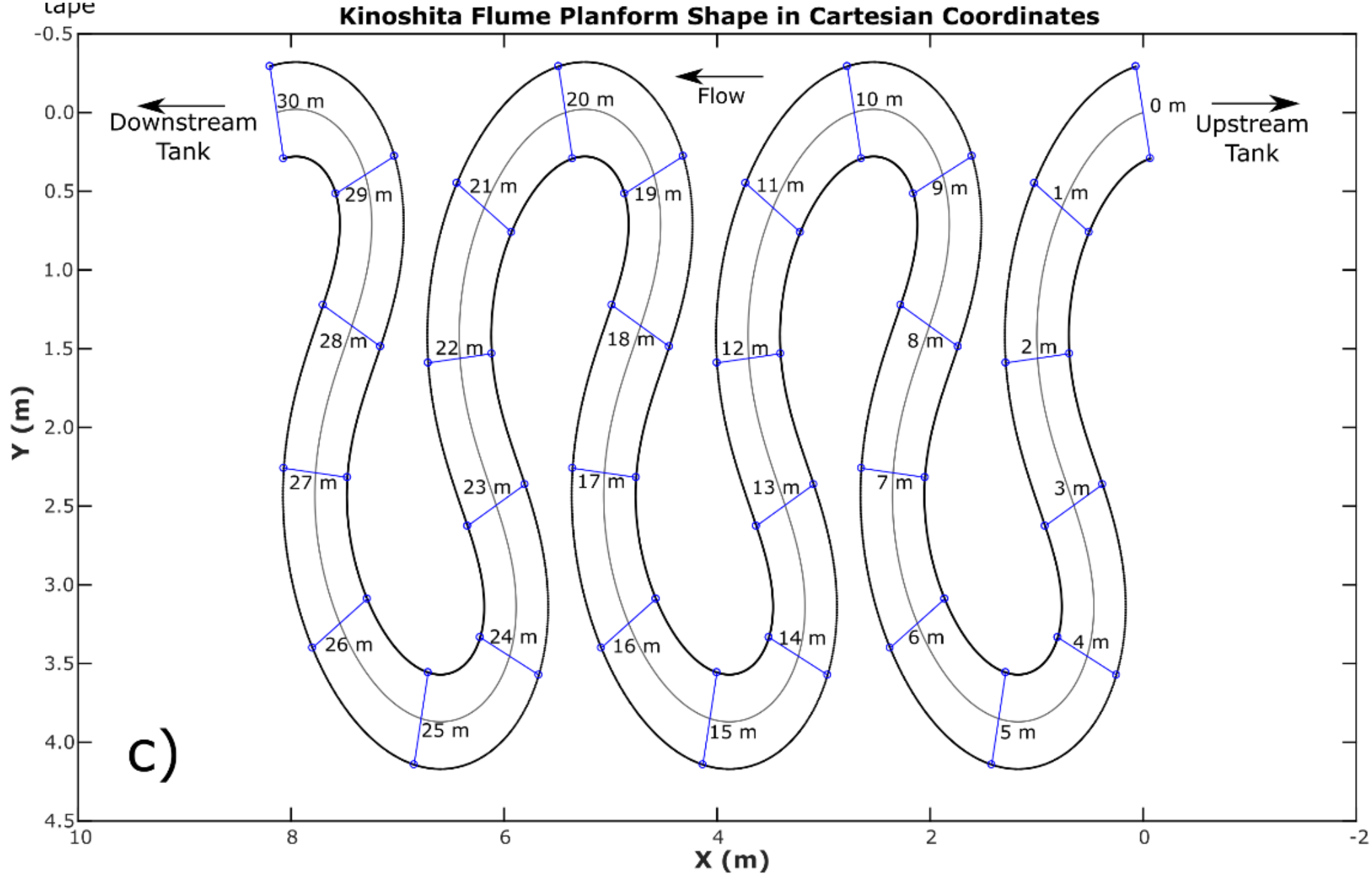






Close-up view of bedrock bed, alluvial cover and eTape at bend.


a)
Bedrock bathymetry
15 m
10 m
20 m
Y (m)
X (m)
Z [m]
Kinoshita flume diagram
Measuring tape
Upstream Tank
Flow
0m
Sediment diffuser
Point gage
eTape
10m
Middle Bend
20m
eTape
Point gage
30m
5m
15m
25m
Downstream Tank
Sediment trap
Measuring
b)


tape
Kinoshita Flume Planform Shape in Cartesian Coordinates
Downstream Tank
Flow
Upstream Tank
30 m
29 m
28 m
27 m
26 m
25 m
24 m
23 m
22 m
21 m
20 m
19 m
18 m
17 m
16 m
15 m
14 m
13 m
12 m
11 m
10 m
9 m
8 m
7 m
6 m
5 m
4 m
3 m
2 m
1 m
0 m
c)
Y (m)
X (m)
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
10
8
6
4
2
0
-2