### Definitions of Total Sediment Load

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TYPES OF SAMPLERS

- Suspended Sediment
- Bed Load
- Bed Material
Unmeasured Load – Unmeasured Zone

Flow

Suspended Load

Unmeasured Bed Load

$Q_{wt}$ = Total water discharge.

$Q_{wum1}$ = Water discharge in zone between the lowest point sampled by the suspended-sediment sampler and the highest point sampled by the bedload sampler.

$Q_{wt2}$ = Water discharge in zone sampled by the bedload sampler.

$C_m$ = Mean velocity weighted suspended-sediment concentration in the zone above the lowest point sampled by the suspended-sediment sampler.

$C_{usm1}$ = Mean velocity weighted suspended-sediment concentration in zone defined by $Q_{wum1}$.

$C_{ts2}$ = Mean velocity weighted suspended-sediment concentration in zone defined by $Q_{wt2}$.

$Q_{usm1}$ = Suspended-sediment discharge computed by $C_m Q_{wt} K$ (K = constant based on units used; Porterfield, 1972).

$Q_{usm1}$ = Suspended-sediment discharge in zone defined by $Q_{wum1}$ and computed by $Q_{wum1} C_{usm1} K$.

$Q_{ts2}$ = Suspended-sediment discharge in zone defined by $Q_{wt2}$ and computed by $Q_{wt2} C_{ts2} K$.

$D$ = Sediment discharge of a given size range as measured with the bedload sampler.
Bed Load Variation

- Bed load movement is extremely even when the streamflow is constant
  - Spatially
  - Temporally

![Graph showing bedload transport rate over time]

- Mean rate
ISSSDOTv2 Bedload Measurement
Sediment Load Summary

- Bed load rates vary greatly over space and time
- Unmeasured zone between suspended load and bed load zones
- Most sediment data collected is suspended load
Reservoir Sedimentation Data

- Hydrographic survey – a reservoir survey involving both above water and underwater surveys
  - Topographic survey – Above water
  - Bathymetric survey – Underwater
- Type of data and coverage determined by:
  - Study purpose
  - Site conditions
  - Schedule
  - Budget
Land Survey Techniques

- Tag Line and Level
- Transit
- Total Station
- Global Positioning System (GPS)
Terrestrial LiDAR – Aerial Collection

Capture vertical and horizontal features
Photogrammetry

- Multiple sets of overlapping aerial photos
- Ground control points or targets are matched up in overlapping photos
- Less expensive than aerial LiDAR
Types of Bathymetric Surveys

- Lead Line
- Single Beam
- Multibeam – Swath System
- Bathymetric LiDAR
Lead Line

- Old Technology
- Single depth measurement at each location
- Minimal data processing
- Time consuming
- Sparse data
- Good for depth calibration or survey of small shallow areas
Single Beam

- Simple
- Cost Effective
- Survey at higher speeds
- Less equipment required than other SONAR
- Less data processing than other SONAR
Multibeam – Swath System
Lead Line vs Single Beam vs Multibeam Coverage

- May be missing significant detail with single beam
Bathymetric LiDAR – Green LiDAR

- Best results in shallow clear water
- Accuracy affected by
  - Turbidity
  - Aeration
- Can be collected with terrestrial LiDAR simultaneously
  - Different instruments mounted to same aircraft
Reservoir Sedimentation Data Summary

- Used for monitoring sediment levels and updating area-capacity relationships
- Measurement over entire reservoir often requires a combination of above water and underwater data collection
- Many data collection methods are available depending on
  - Study Purpose
  - Site Conditions
  - Schedule
  - Budget
Questions?