2020 Decennial Flow Monitoring & Data Finalization

Presented to MWPAAC

Engineering and Planning Subcommittee

October 6, 2022

King County

Department of Natural Resources and Parks

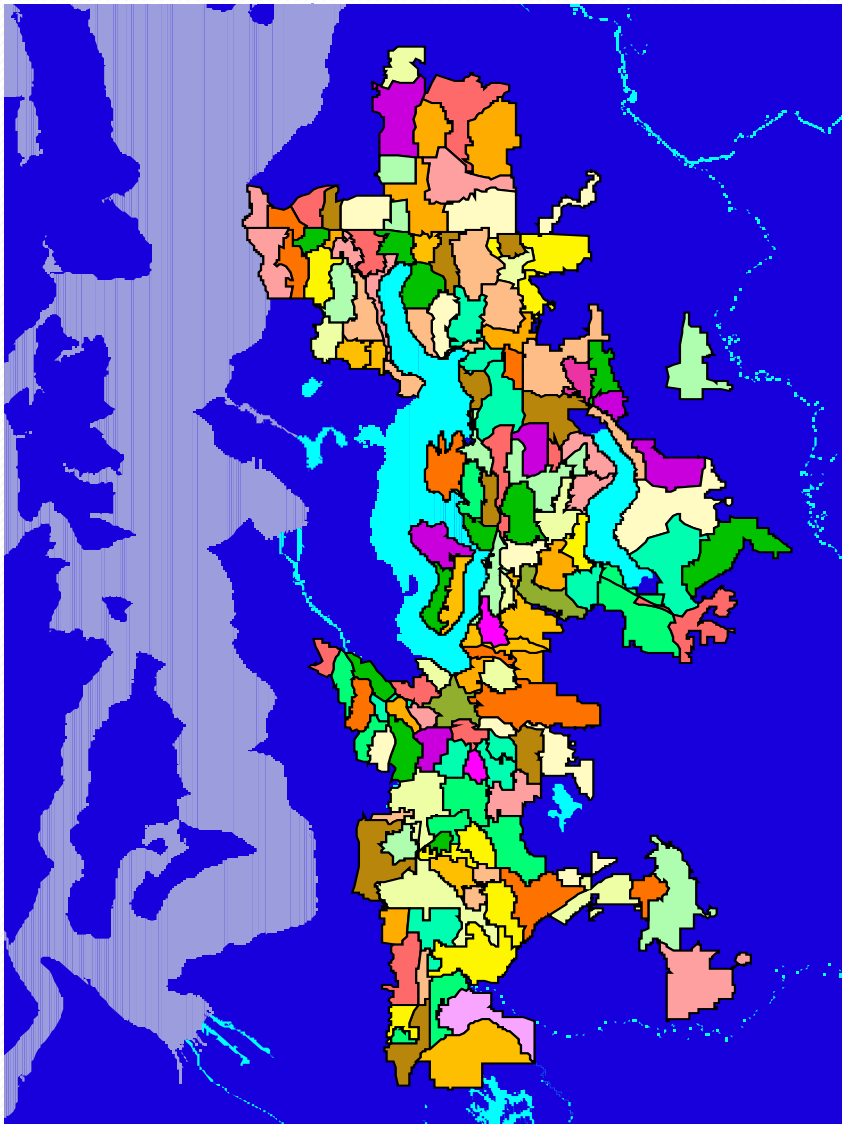
Wastewater Treatment Division

Presentation Overview

- Project Objective
- 2020 Decennial Flow Monitoring (DFM) Approach
- Site Locations
- Equipment
- Data Review
- Data Finalization
- Current Status
- Conveyance System Improvement Plan

Monitoring Approach

- 2000 – 2002 I/I Project deployed meters at the Mini Basin level
- 2010 DFM deployed meters at the Modeling Basin level
- 2020 DFM – Deploy meters at the Modeling Basin level, primarily in King County Wastewater Treatment Division pipes

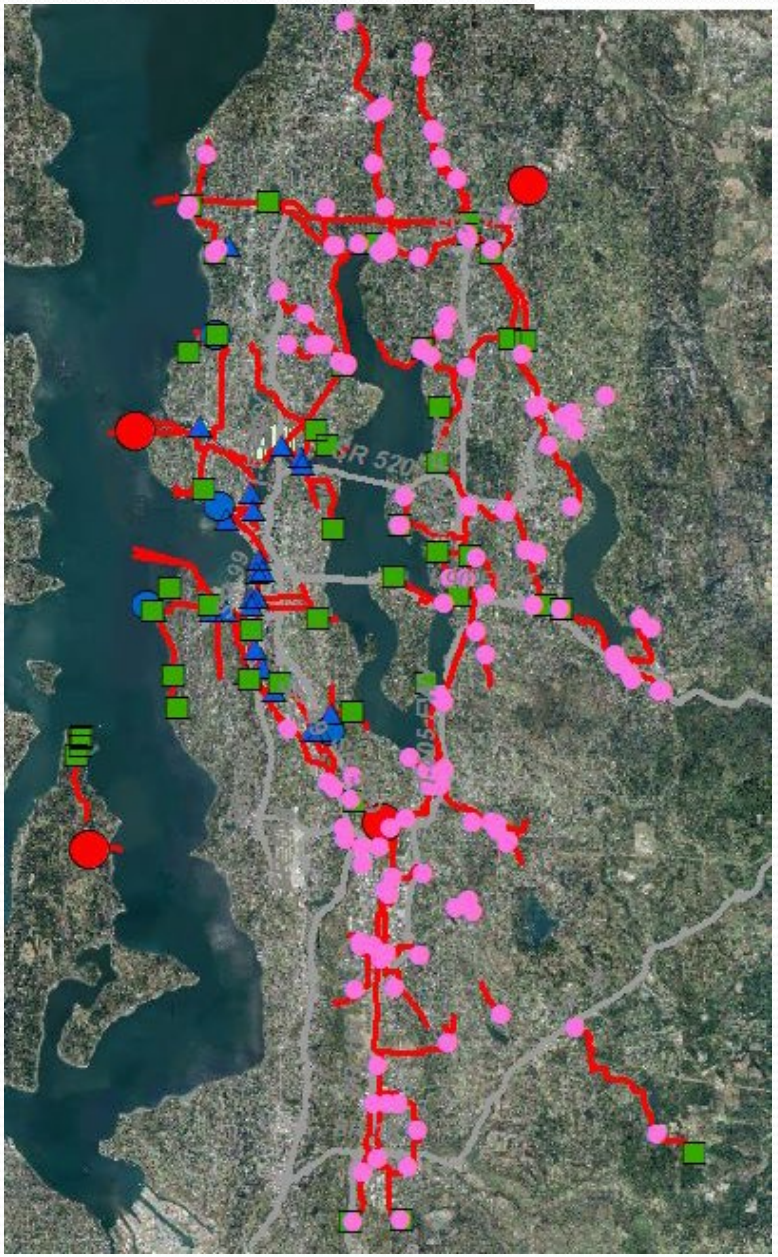


Goals of 2020 DFM Monitoring Approach

- Maintain existing sewer model basins and update for growth and changes in local systems
- Install meters to monitor:
  - areas primarily new construction/development
  - high priority CSI needs
  - project areas in CIP plan
- Leverage existing sewer model to assess meter locations

2020 DFM Site Locations

- 132 sites
- Interactive Map (https://bit.ly/3Cmc9Zw)

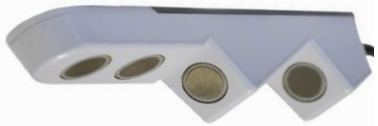


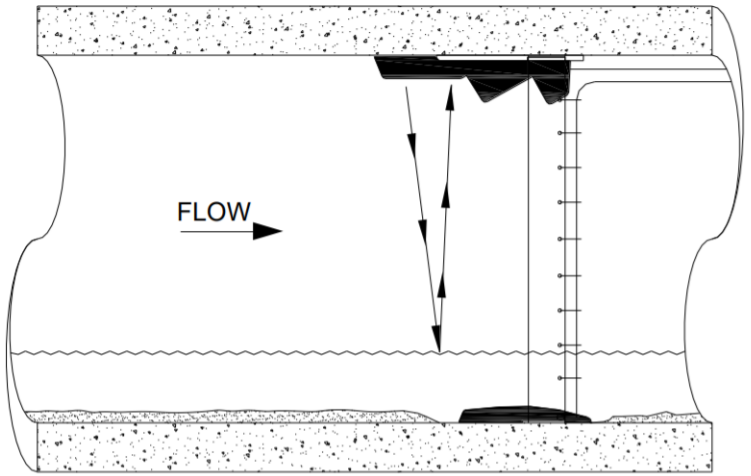
Site Investigations

- Look out for…
  - Safety/Accessibility
  - Laminar flow
  - Bends in pipe
  - Inputs
  - Silt/Sediment
  - Evidence of surcharging
- Auto fail conditions:
  - Negative or stagnant velocity
  - Inputs that affect hydraulics
  - Inaccessible or unsafe
  - Site is surcharge in dry conditions

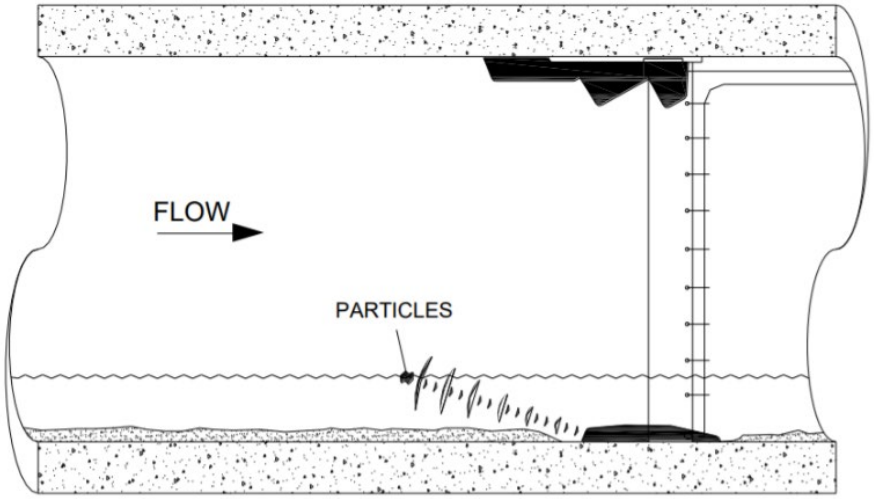
Equipment – ADS Triton+

Smart Depth Ultrasonic Sensor





Peak Combo Sensor



ADS Triton+ Installation

Smart Depth Ultrasonic Sensor

Peak Combo (Ultrasonic, Velocity and Pressure) Sensor

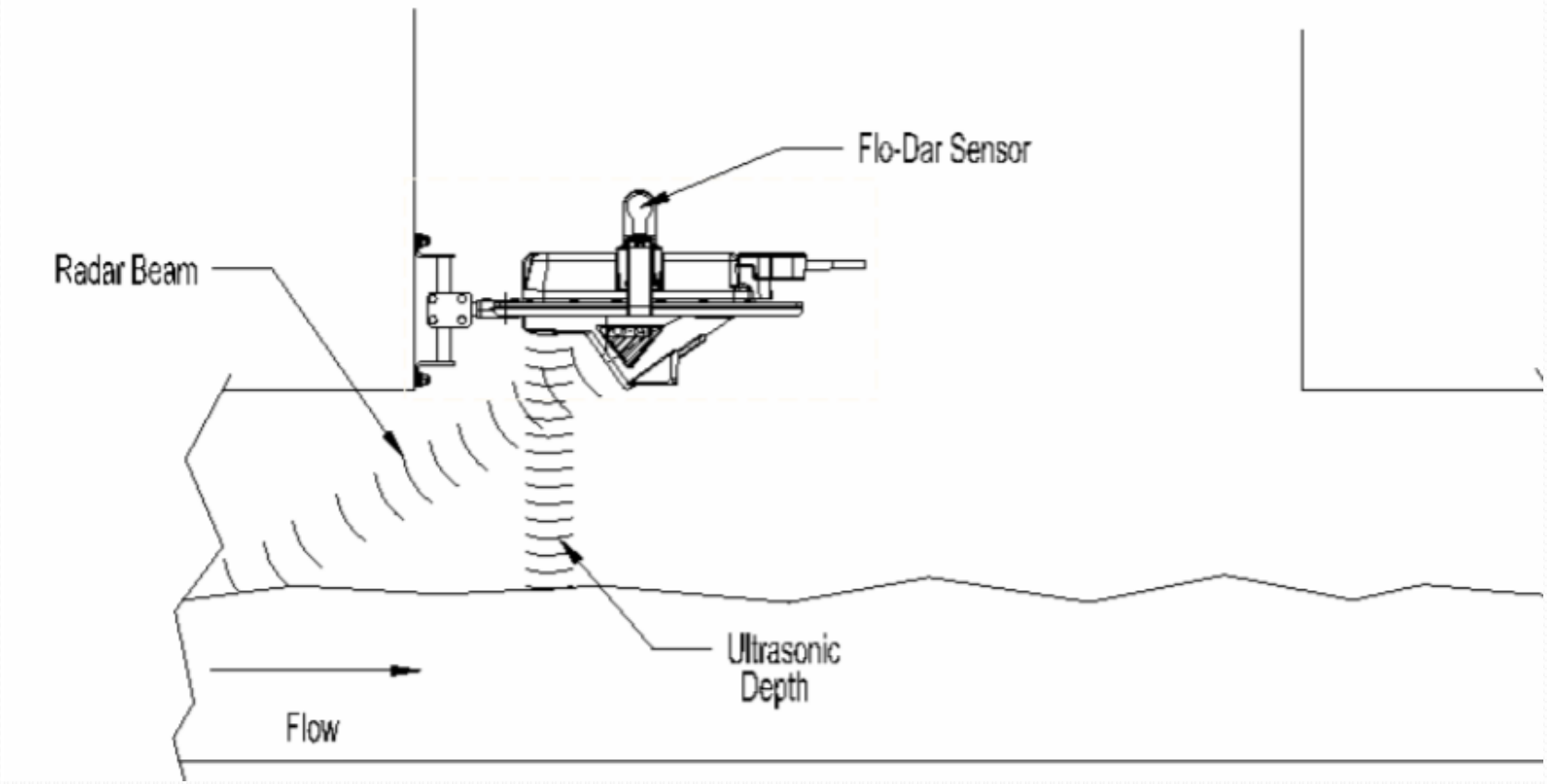
Equipment - HACH

HACH Flo-Dar

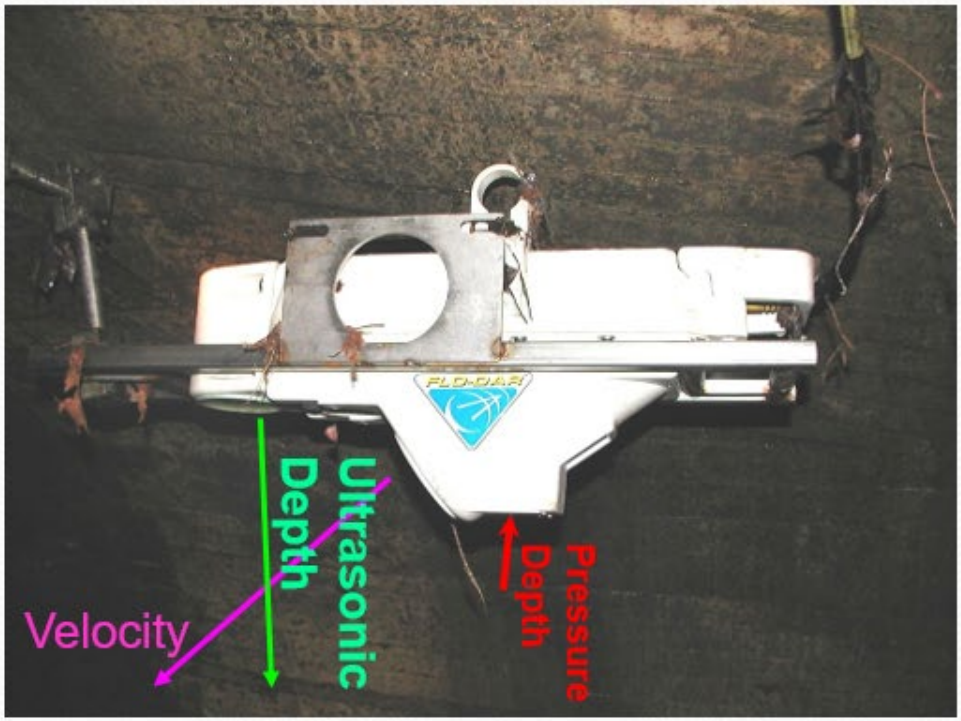
Area Velocity Sensor

In-pipe Ultrasonic Sensor

HACH Flo-Dar



Typical HACH Flo-Dar Installation

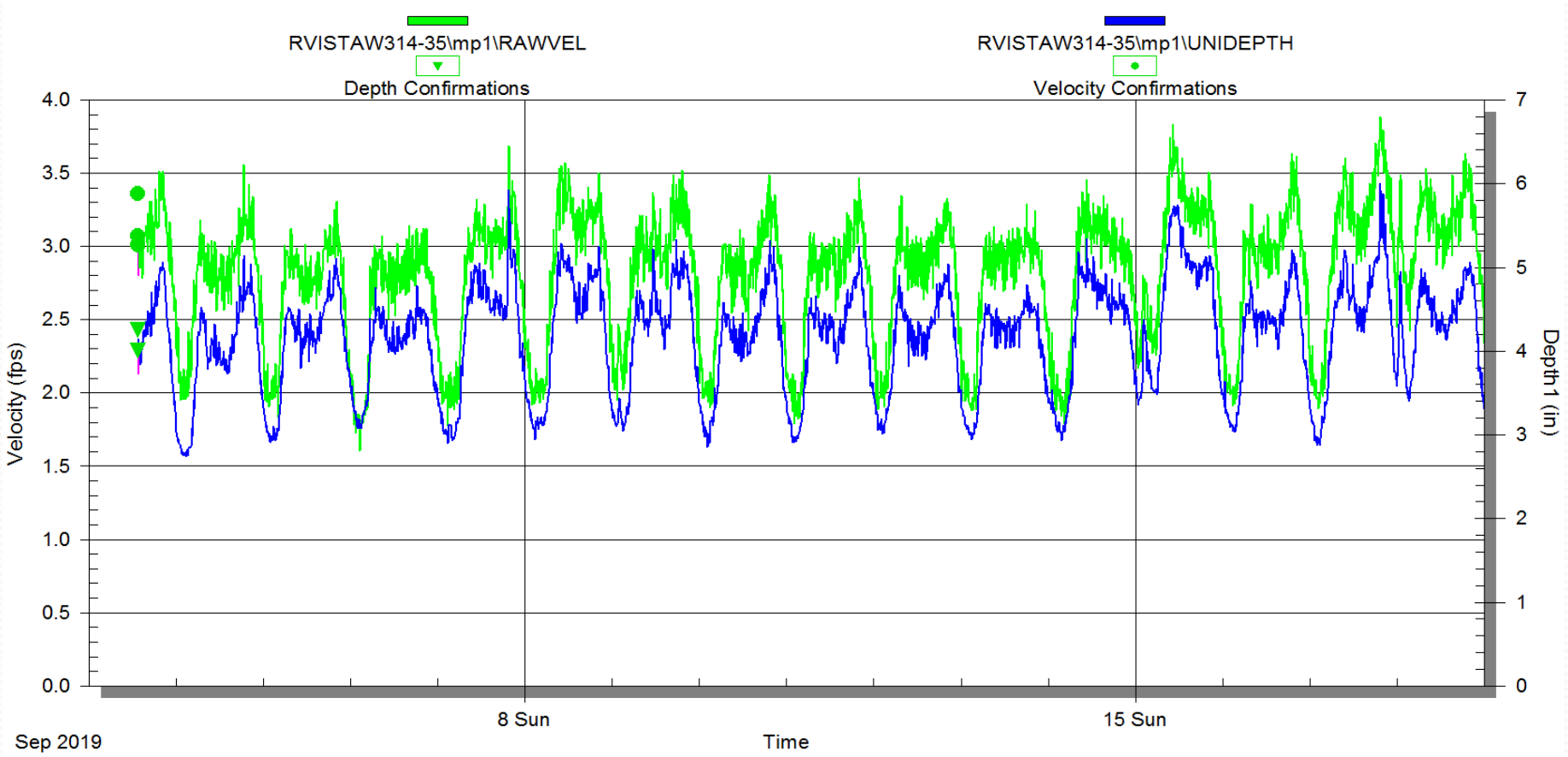


Flow Data Reviews

- Review data twice a week
- Maintenance requests twice a week

- Battery issues
- Communication issues
- Bad depth/velocity (flat lining, erroneous data, drifting)
- Missing data/data gaps
- Incorrect programming

Hydrograph

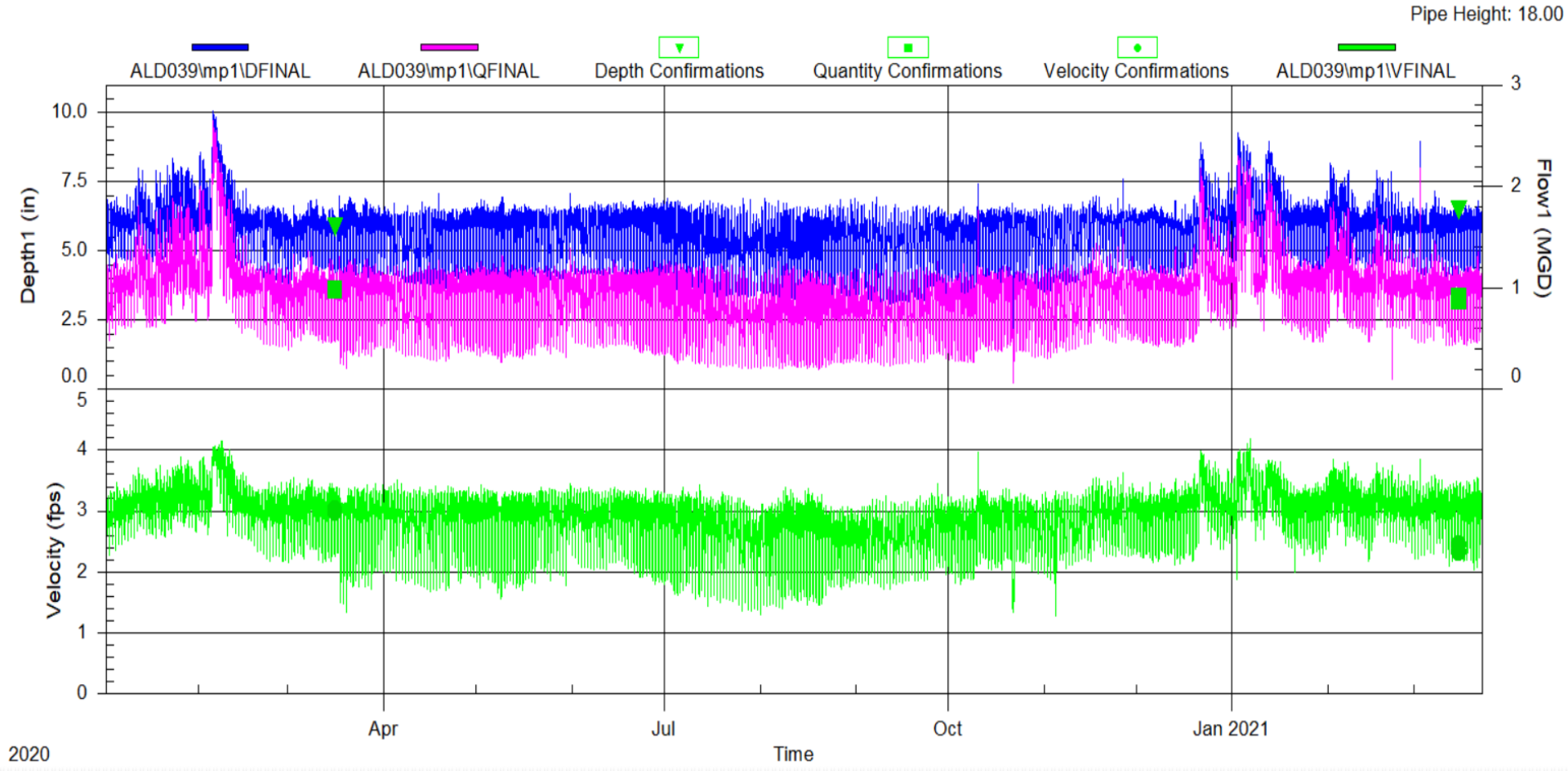


Peak Velocity (fps)

Ultrasonic depth (in)

Flow (MGD)

Hydrograph with Verifications

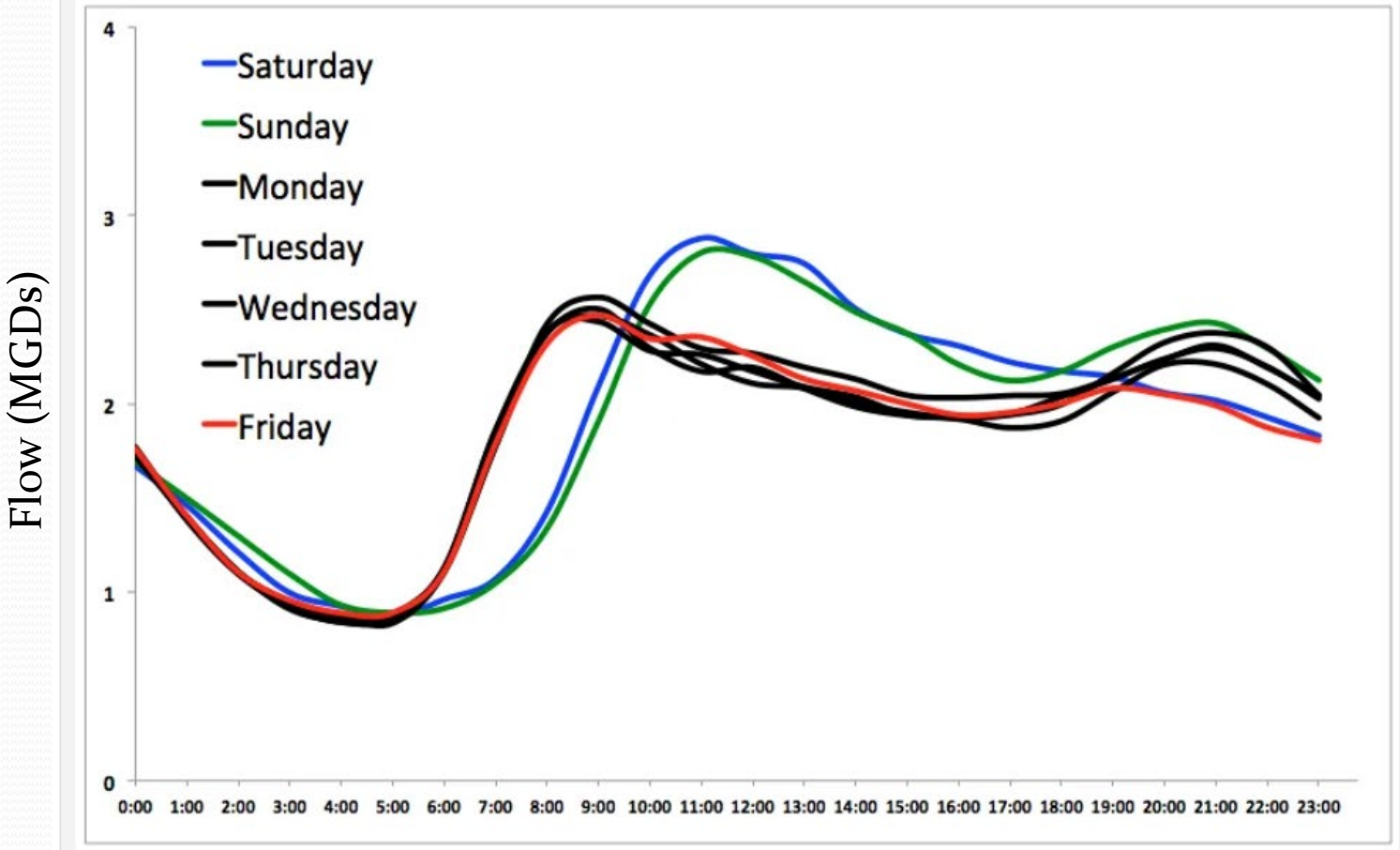


Peak Velocity (fps)

Ultrasonic depth (in)

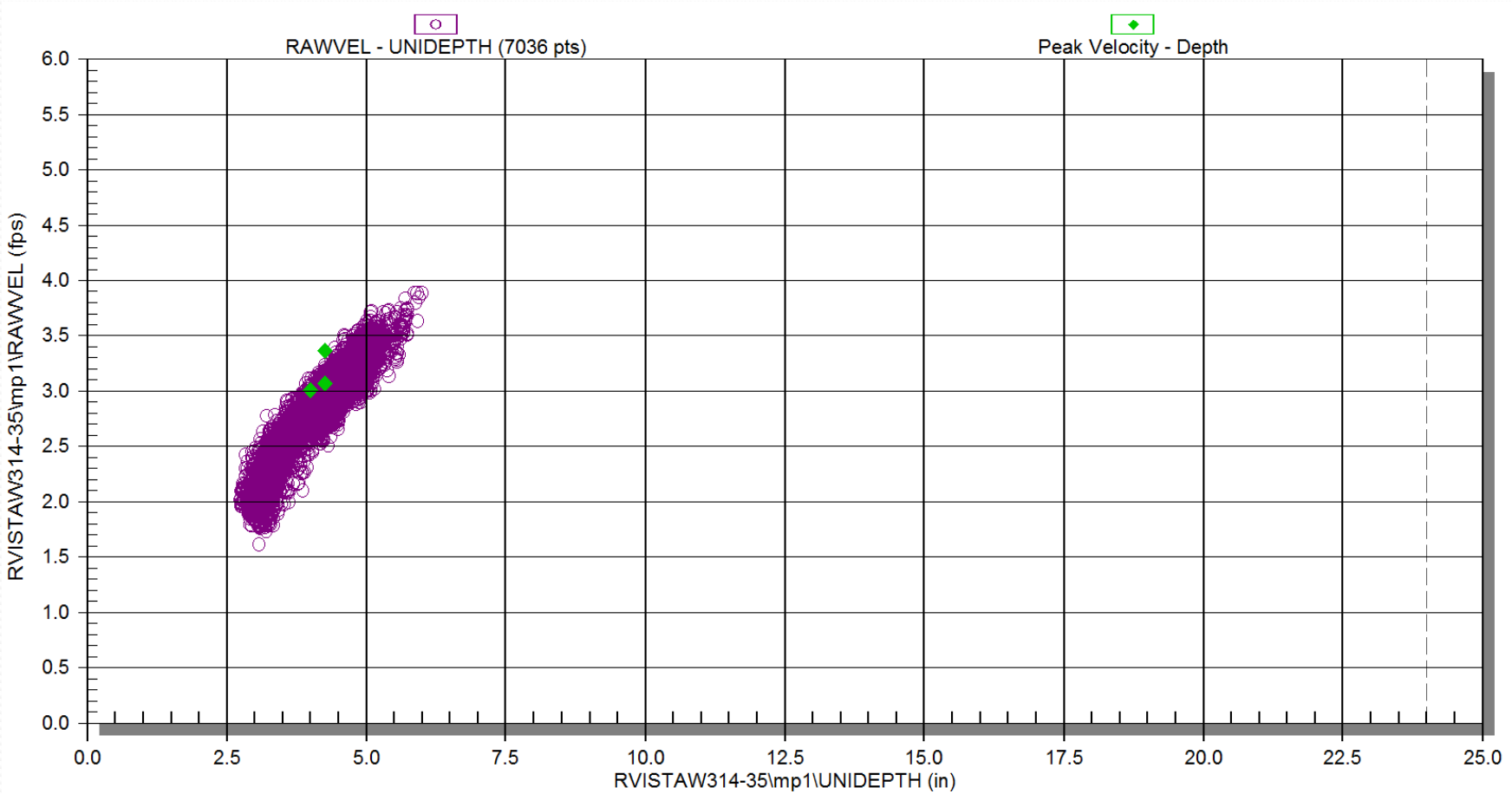
Flow (MGD)

Diurnal Flow Pattern



Diurnal flow for each day of the week.

Scatter graph

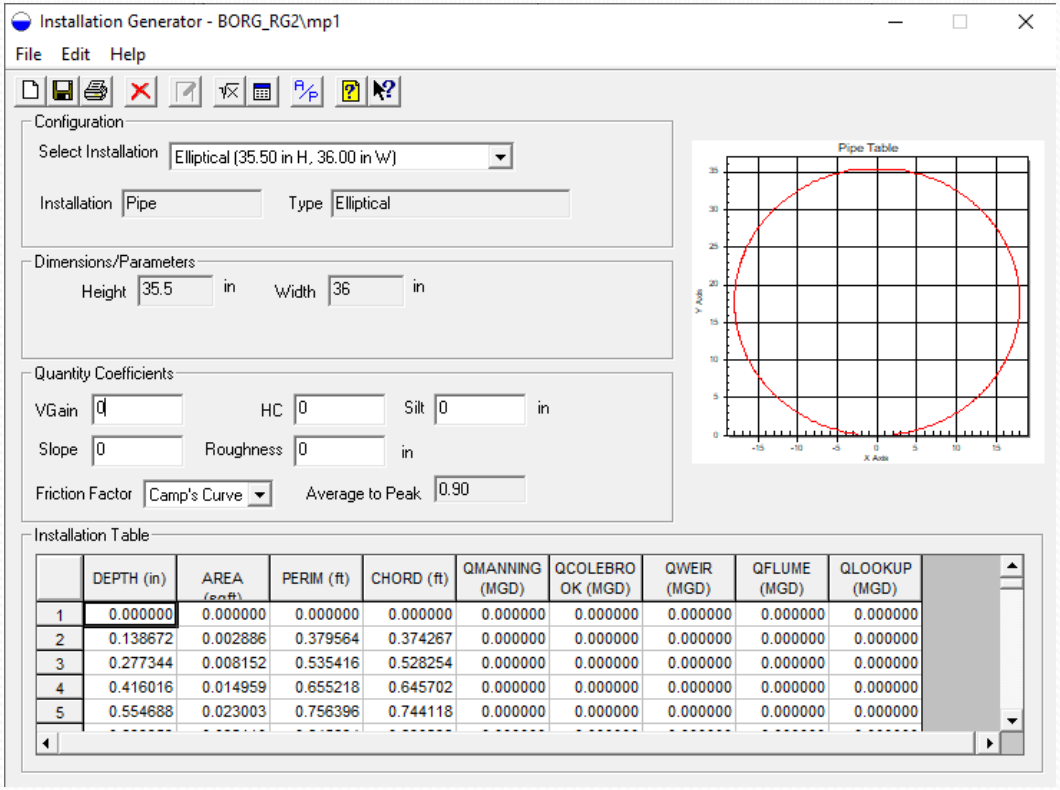


Velocity (fps)

Ultrasonic depth (in)

Flow Data Finalization Elements

- Q=vA
- Pipe Dimensions
- Accurate depth
- Accurate velocity

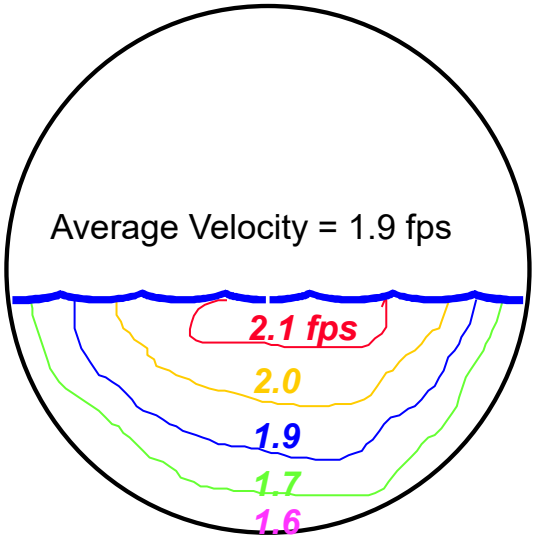


Data Finalization and Verifications

- Verifications of flow meters
  - Manual depth
  - Hand-held velocity meter
  - Velocity Profiles
- Performed periodically
  - At installation
  - "2 weeks" after installation
  - Dry and wet seasons
  - At removal

Flow Velocity Verification

- **Flows > 6 inches measured using a portable velocity meter**
- **Low flow (usually < 1 to 2 inches of DOF) measured using Propeller Meter**



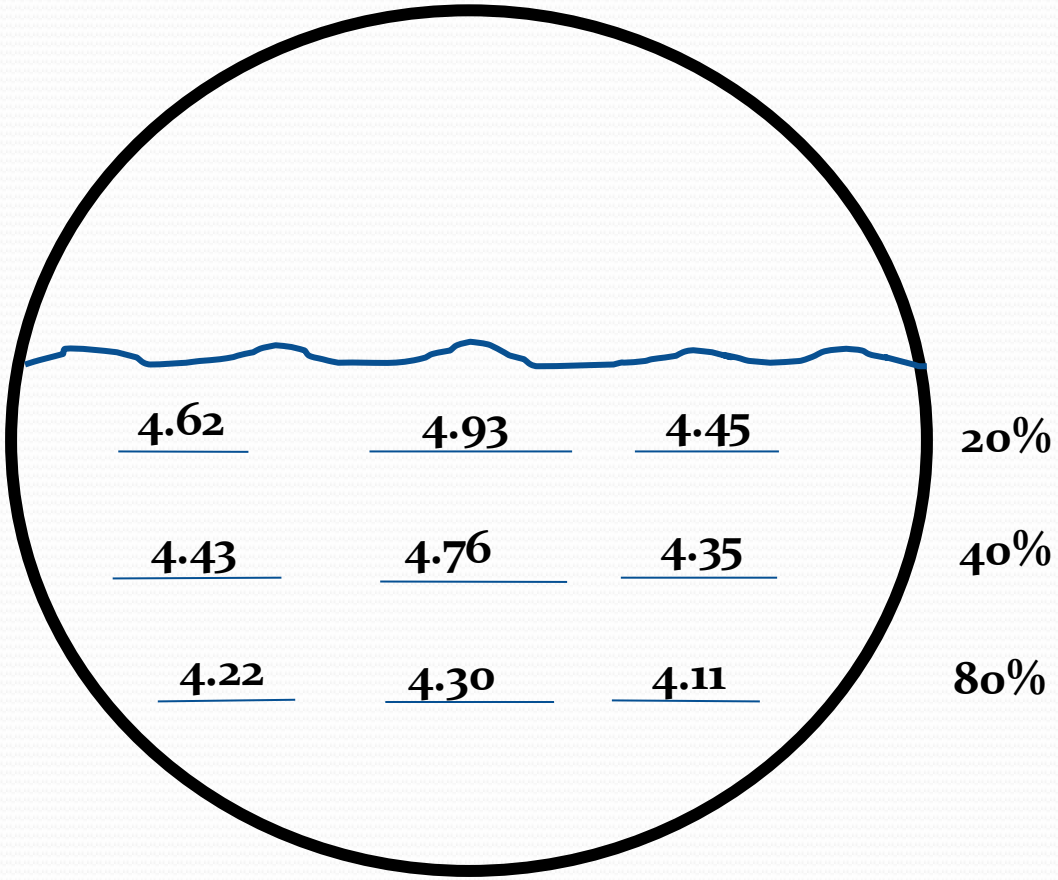
Average to Peak Ratio K

= 1.9 fps/2.1 fps = 0.9

- slow flow near pipe wall (friction)
- fastest flow near surface and near center
- velocity profile measured by a grid of point velocity measurements

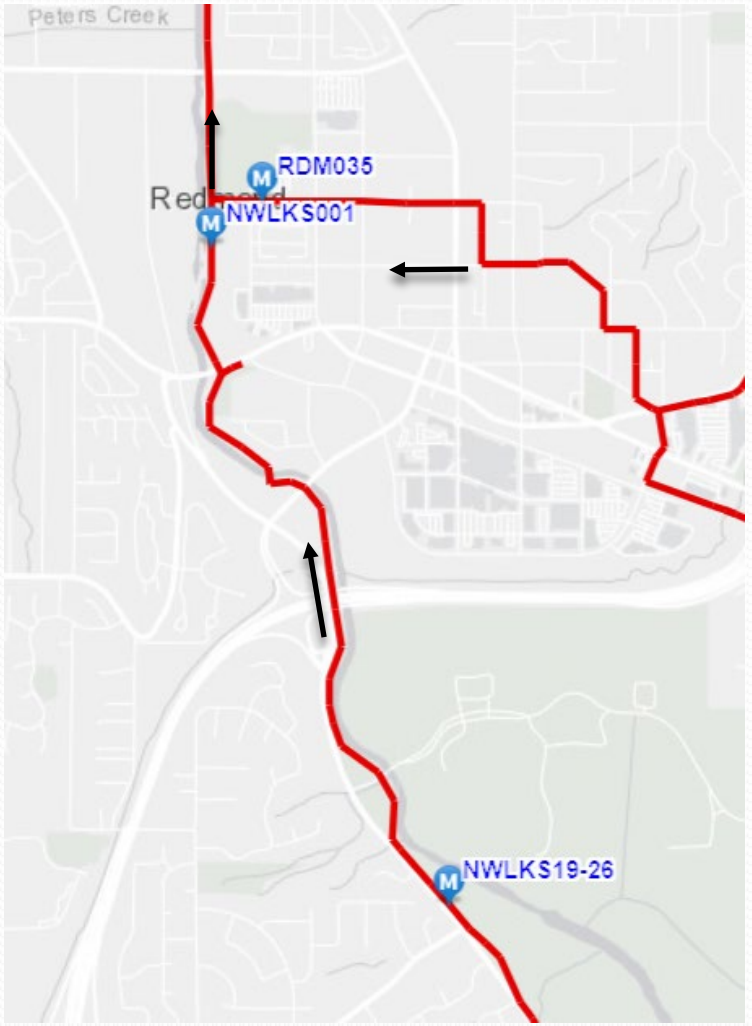
Velocity Profiles

Typical Velocity Profile
(feet per second)

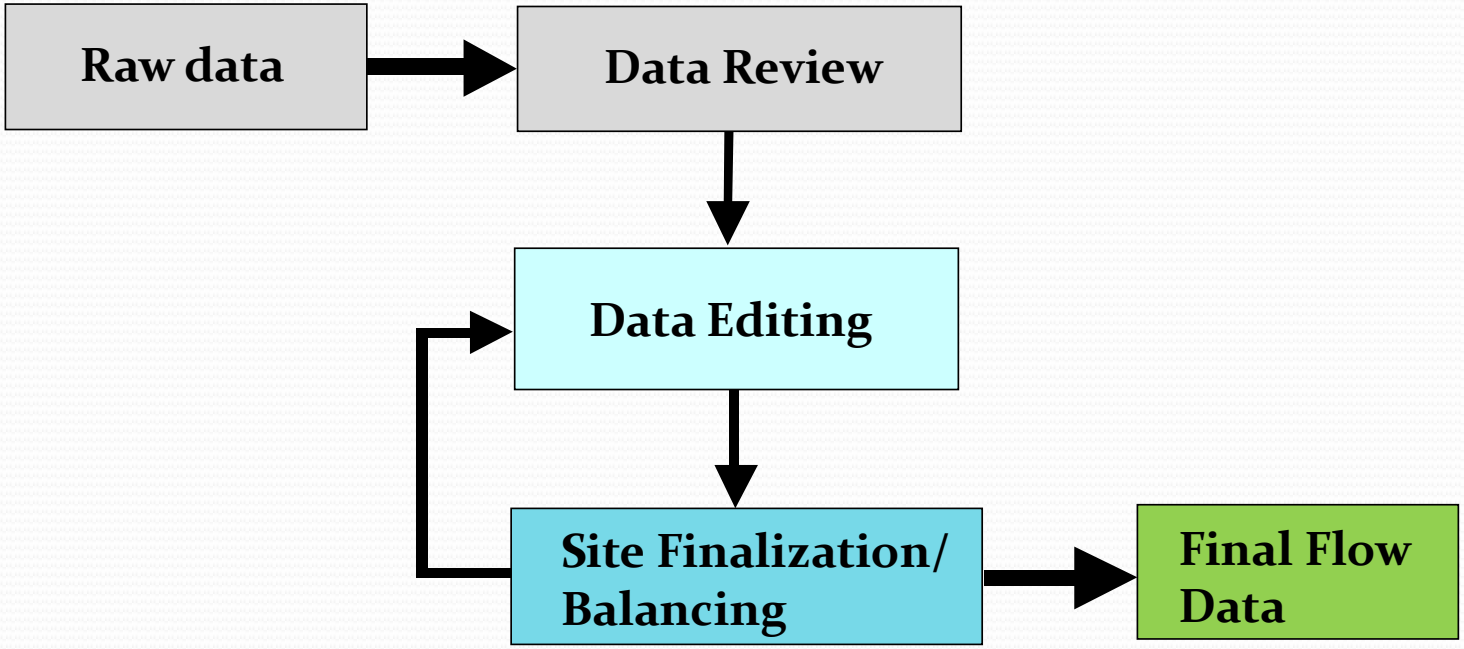


Upstream / Downstream

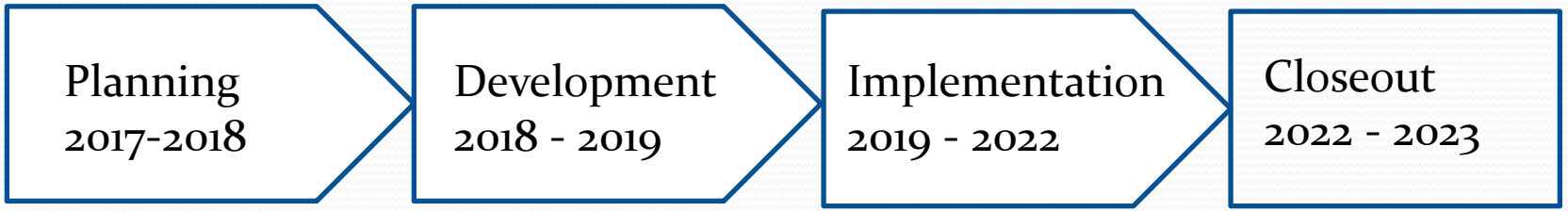
- Data Analysts to perform upstream / downstream comparison where applicable in the system



Data Review & Finalization Process



Current Status



- Closeout Phase of project
- Began removals in May 2022, finished September 2022
- 54 removed
- 78 sites of 132 installed sites remain in

Conveyance System Improvement (CSI) Program

- DFM is part of the CSI Program
- Conveyance policies call for monitoring coincident with the Census
- Flow monitoring data will inform model calibration and update of planning assumptions

MWPAAC input opportunity at each step

Update Planning Assumptions

↓

Complete Regional Conveyance System Needs Assessment

↓

Develop Conceptual Projects

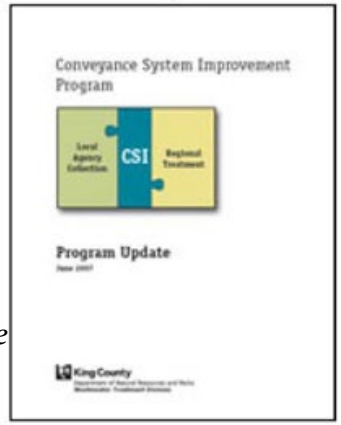
↓

Conceptual Project Cost Estimating

↓

Prioritize Projects

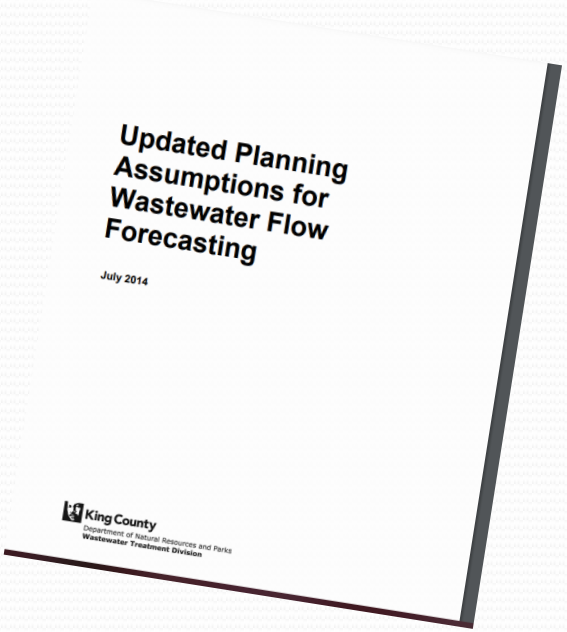
↓



Planning process for 2017 CSI Program Update

Update Planning Assumptions for Wastewater Flow Forecasting in 2023-24

- Planning horizon
- Model basin and service area delineation
- Future population
- Sewered areas growth rate
- Water consumption
- Water conservation
- Degradation I/I
- New construction I/I



2014 Report available in CSI Program Library:
https://kingcounty.gov/services/environment/wastewater/csi/library.aspx

Questions?

Jenny Ho, 2020 Decennial Flow Monitoring Project Manager
Jenny.Ho@kingcounty.gov

Nicole Smith, Conveyance System Improvement Program Manager
Nicole.Smith@kingcounty.gov