

Benthic Total Maximum Daily Load Study for the Accotink Creek Watershed

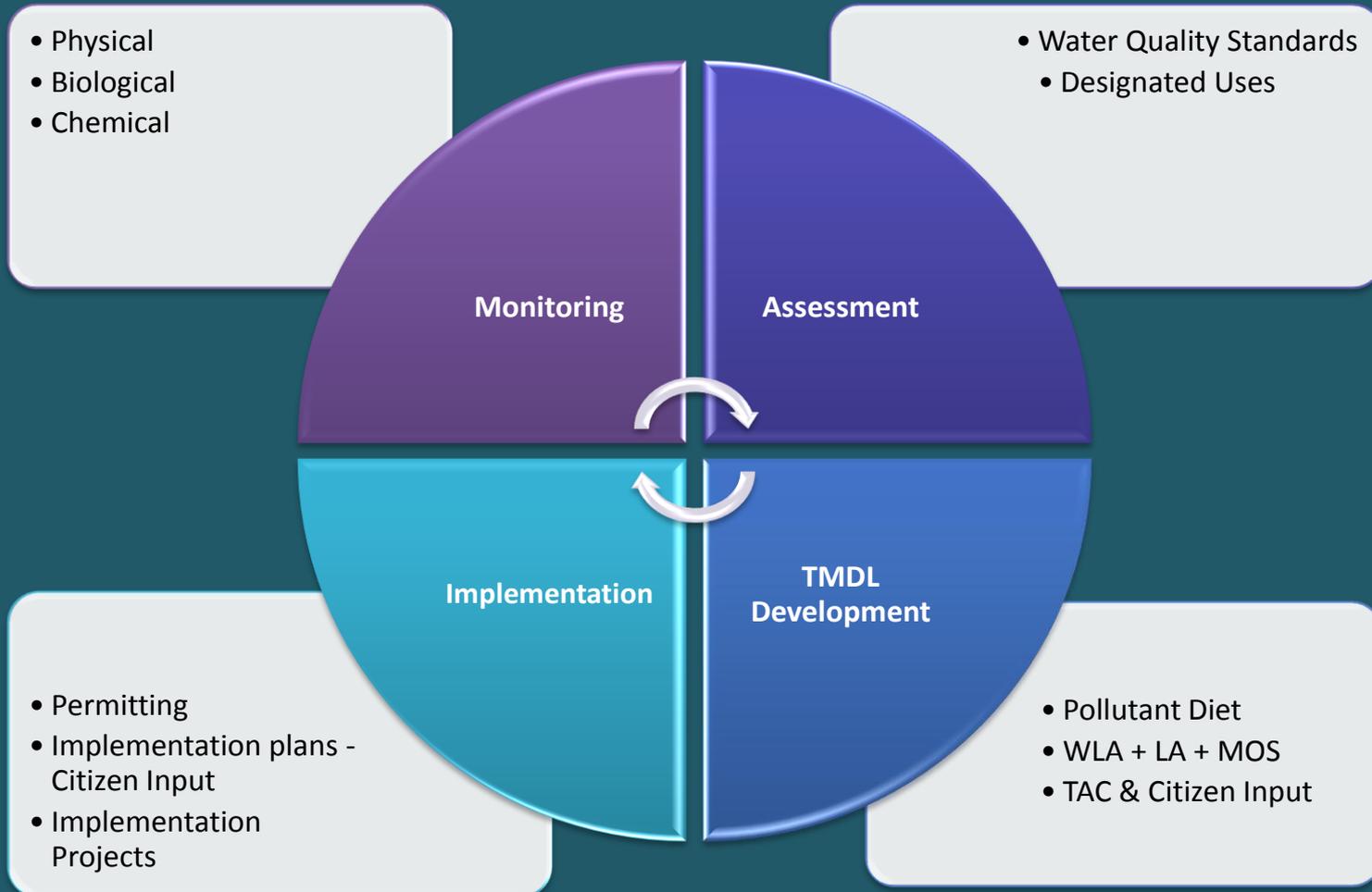
Technical Advisory Committee Meeting #3
December 14, 2015

Meeting Agenda

1. Introductions
2. The TMDL development process
3. Summary of progress to date
4. The modeling process
5. The path forward
6. Questions and Discussion



TMDL Development Process



TMDL Development Process for Accotink Creek

- Biological

- VSCI score
- Aquatic Life Use

Monitoring

Assessment

VSCI Score Threshold = 60



| | Upper Accotink (2005-2007) | Long Branch (2007) | Lower Accotink (1994-2008) |
|-------------|----------------------------|--------------------|----------------------------|
| Min | 21.2 | 24.5 | 22.8 |
| Max | 31.6 | 29.5 | 41.9 |
| Mean | 26.3 | 27.0 | 32.1 |
| Samples | 14 | 2 | 17 |

TMDL Development Process for Accotink Creek

- Total Maximum Daily Load based on endpoint
- Aquatic Life Use impairments require stressor identification analysis

*Stressor Analysis Report for the
Benthic Macroinvertebrate Impairments
in the Accotink Creek Watershed,
Fairfax County, Virginia*



Prepared for
Virginia Department of Environmental Quality

Prepared by
Interstate Commission on the Potomac River Basin

September 29, 2015

TMDL
Development

- Pollutant Diet
- WLA + LA + MOS
- TAC & Citizen Input

Review of Stressor Analysis

- Most Probable Stressors
 - Pollutants: Sediment & Chloride
 - Non-pollutants: *Hydromodification, Habitat Modification*
- Comments resulting in changes:
 - Non-Stressor → Least Probable Stressor – change made
 - Chloride-Specific Conductance regression in lieu of measured exceedance for Long Branch and Lower Accotink Creek
 - Winter 2015-2016 more monitoring

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September 26, 2015

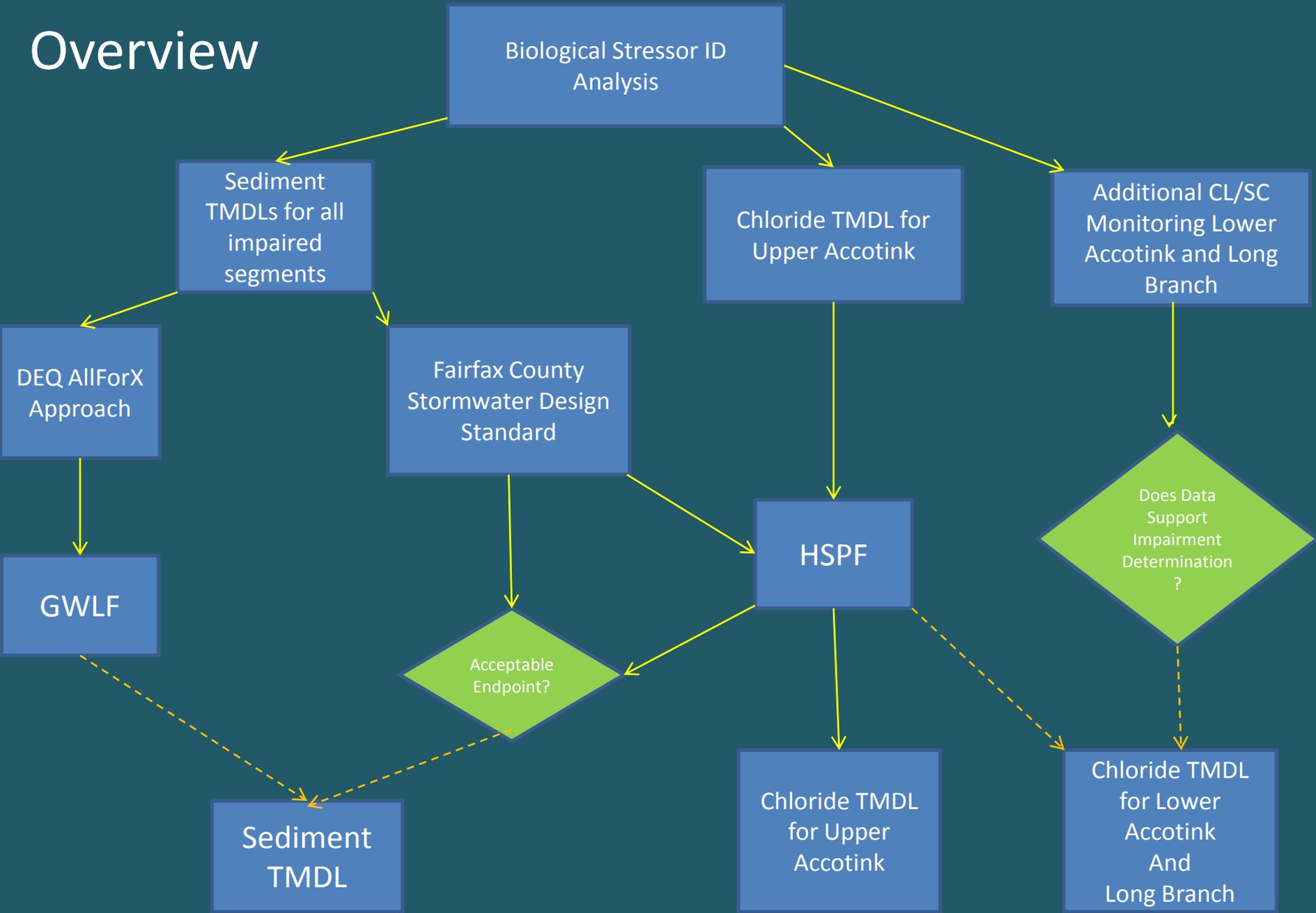
| Category | Stressor | |
|--------------------------|------------------|-----------------------------|
| Least Probable Stressors | Temperature | pH |
| | Dissolved Oxygen | Metals |
| Possible Stressors | Nutrients | Toxics |
| Most Probable Stressors | <u>Chloride</u> | <i>Hydromodification</i> |
| | <u>Sediment</u> | <i>Habitat Modification</i> |

Next Steps

- TMDL modeling for Sediment & Chloride
 - Chloride monitoring in Lower Accotink and Long Branch
- Completed Project → SWCB & EPA approval
- Implementation in permits when permits are renewed (5 year cycle)



Overview



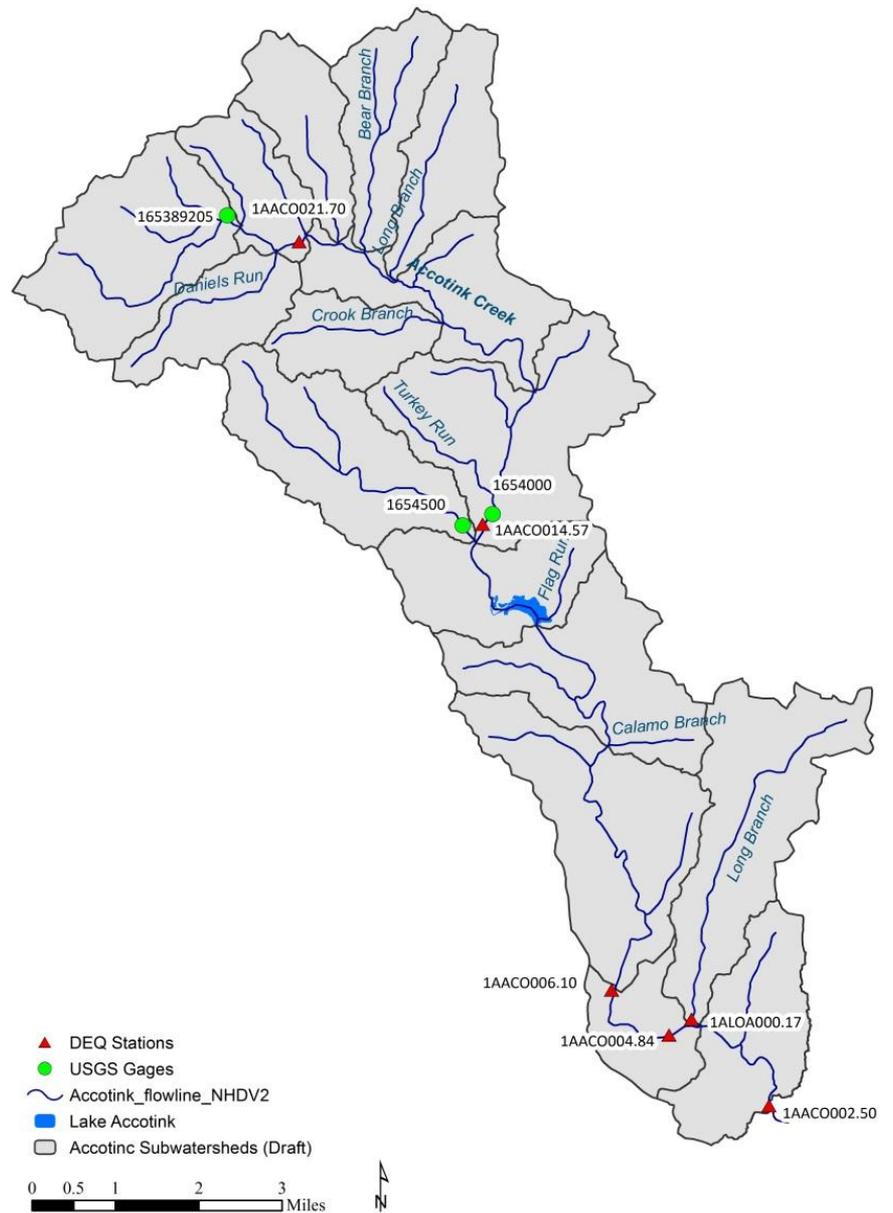
DEQ Chloride and Conductance Monitoring (Winter 2015-16)

1. DEQ monitoring this winter in lower Accotink Creek at Station 1AACO004.84:
 1. Grab samples analyzed for chloride from station 1AACO004.84 and at USGS gage on Long Branch
 2. Perform continuous monitoring of specific conductance at 1AACO004.84
2. Analysis:
 1. Exceedances of acute chloride criteria
 2. Estimate chloride concentrations from (1) continuous specific conductance data and (2) chloride-conductance relation
3. Develop chloride TMDLs for lower Accotink Creek and Long Branch if data and analysis warrant

Possible Approaches for Sediment TMDLs

- AllForX Approach
 - Revised (Gene Yagow, VT) form of reference watershed approach
 - Used in VA in EPA-Approved Sediment TMDLs
 - AllForX: ratio of sediment load (current or future conditions) to sediment load (all-forested conditions)
 - Model: Generalized Watershed Load Functions (GWLF) model
- Sediment Threshold
 - Based on Fairfax County Uniform Stormwater Design Standard currently being developed with assistance of AMEC Foster Wheeler
 - Identify magnitude and frequency of sediment concentration events that cause biological impairment
 - Model: Hydrological Simulation Program Fortran (HSPF)

Subwatershed Delineation

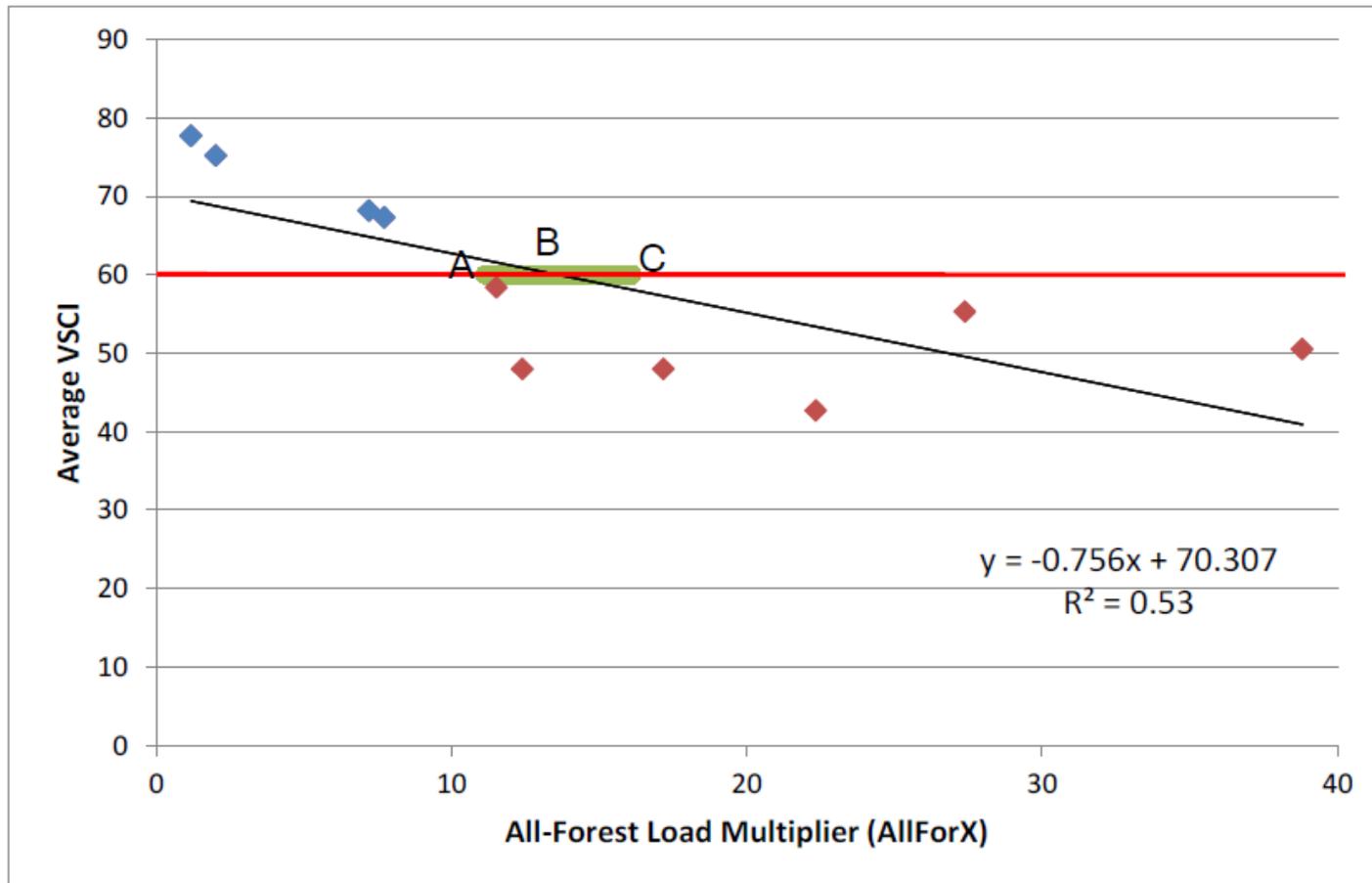


AllForX Method

- Calculate AllForX for impaired watershed (current conditions) and unimpaired watersheds
- Regress AllForX values against Virginia Stream Condition Index (VSCI) scores
- Identify AllForX threshold where regression line crosses VSCI impairment threshold (60)
- Sediment TMDL: AllForX threshold (from regression) multiplied by all-forested load from impaired watershed

AllForX: Little Otter River and Buffalo Creek TMDLs

<http://www.deq.virginia.gov/portals/0/DEQ/Water/TMDL/drftmdls/littleotterbuffaloben.pdf>



B = AllForX value used for the TMDL; AC = the 80% Confidence Interval (shown in green);
B - A = AllForX value used for the MOS; A = AllForX value used for the target allocation load.

GWLF

- Simulates hydrology; erosion and sediment transport; in-stream erosion; and nutrients (not used in Accotink)
- Can simulate nested watersheds
- Output on monthly basis
- Has been used extensively in VA sediment TMDLs

GWLF

| Model Component | Implementation |
|------------------------------|--|
| Hydrology | Curve Number Method |
| Sediment edge-of-field loads | Universal Soil Loss Equation |
| Instream Sediment | Penn State Regression Model with following independent variables: % urban land Animal population Average erodibility in watershed |

Sediment TMDL: Alternative Approach

- Fairfax County developing Uniform Stormwater Design Standard
 - Based on identification of threshold erosive event: cause erosion and maintain it long enough to harm biota
 - Magnitude
 - Duration
 - Frequency
 - Recovery time (time between events)
 - Determine threshold event through literature review and statistical assessment of unimpaired streams in VA
- Use threshold event to determine sediment TMDL endpoint
 - Simulate current conditions and TMDL scenario using HSPF

HSPF Model

- Used extensively in VA bacteria TMDLs
- Hourly time step; results analyzed on daily average basis
- Use North American Land Data Assimilation System (NLDAS) meteorological data so model can be quickly updated to current conditions
- Chloride simulation
 - Try to simulate deicing application on event basis
 - Simulate fate and transport of chloride through groundwater (capture year-round elevated Cl concentrations)

HSPF Model: Available Calibration Targets

| Model Component | Calibration data and/or targets |
|------------------------|--|
| Hydrology | Average daily flow at three USGS gages |
| Edge-of-Field Sediment | <ol style="list-style-type: none">1. Fairfax County Watershed Management Plan2. CBP RUSLE2 estimates3. MS4 Monitoring data |
| In-stream Sediment | <ol style="list-style-type: none">1. Fairfax County Watershed Management Plan2. USGS geomorphic regression study |
| Overall Sediment | <ol style="list-style-type: none">1. Sediment rating curves2. Estimate sediment loads from sediment- turbidity relations3. Regression Models using USGS software |
| Chloride | <ol style="list-style-type: none">1. Observed chloride concentrations2. Estimated chloride concentrations from specific conductance continuous monitoring data |

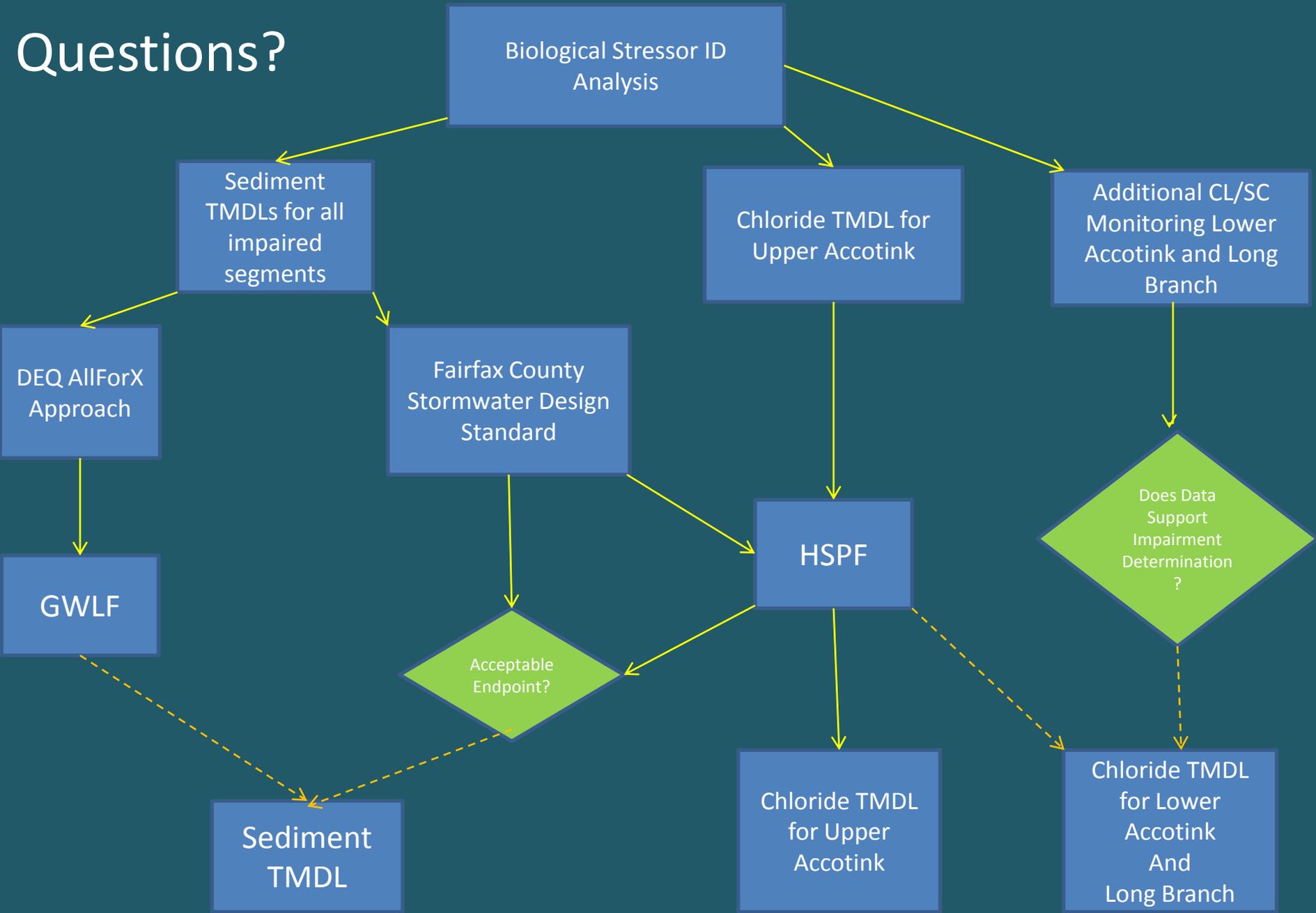
Chloride Application Rates

| | |
|---------------------|---|
| Ideal | <ol style="list-style-type: none">1. Dates of Application2. Application Rates (lbs/ac/d)3. Application Surface Area and Type (road, parking lots, sidewalks, driveways) |
| Useful | Annual Application Rates |
| Better than nothing | Average annual rate |

Data Needs

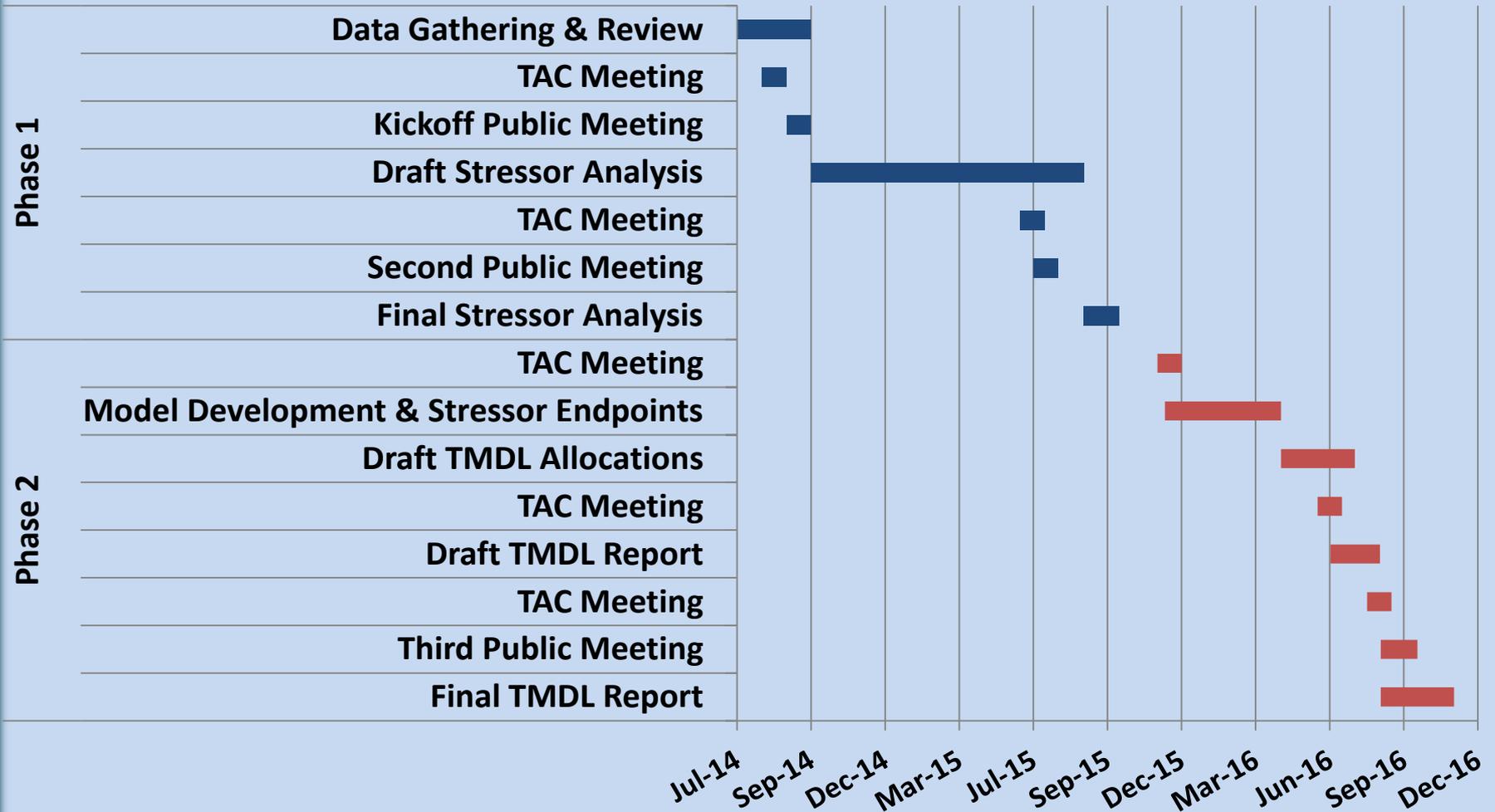
- Deicing salt application data
- Land use by impervious type (roads, driveways, sidewalks, parking lots, building footprints)—Fort Belvoir, City of Fairfax
- Current level of BMP Implementation
 - Types
 - Location
 - Acres treated
- Lake Accotink:
 - Bathymetry
 - Dredging history
 - Management

Questions?



Proposed Project Timeline

Accotink Creek TMDL Project Revised Timeline



The Path Forward

- Dual Track TMDL endpoint development – Sediment
 - DEQ using AllForX
 - Fairfax County using Uniform Stormwater Design Standard
- Chloride TMDL development
 - Monitoring to determine what watersheds receive TMDLs
- TAC meeting schedules
 - Regular meetings?
 - If so, when to start?



Questions? Comments?



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Meeting Materials

<http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/DocumentationforSelectTMDLs.aspx>