

Modernizing & Automating Processes for 303(d) Program Activities

A WORK IN PROGRESS IN THE CTDEEP WATER QUALITY GROUP

Guiding Principles

- Focus on tasks that are performed for multiple projects over time
- If you can write a rule or outline a process to follow, you may be able develop a tool to streamline or automate that task.
- Leverage technology to support program work
- Develop SOPs to document process & provide training and transfer to other staff

Goals:

- Reduce staff frustration
- Make it easier to do what needs to get done
- Improve workflow efficiency to improve program productivity

Creating Useful Tools

Create structure that has all components needed to successfully use tool, including for:

- Instructions, Tracking Updates to Tool, References
- Conducting analyses or displaying results
- Raw data to support analysis

Create formats that:

- Provide areas for user inputs and outputs formatted to typical screen viewing area
- Hide areas that are used in calculation support or to protect raw data

Creating Useful Tools

Pay Attention to Functionality

- Clearly identify areas for user inputs
- Incorporate instructions, etc. in areas where analyst is working
- For tools supporting complex or multiple analyses, create one data entry location to distribute data to other workbook tabs, etc. to avoid multiple data entry
- Include approaches to make formatting and extraction of results simple and easily incorporated into other workbooks

Document and comment your work

Issue: Analyzing Land Use and Impervious Cover Data

Land Use and Impervious Cover Data

The majority of 303(d) based plans developed in CT include an analysis of Land Use/Land Cover and Impervious Cover within the project area

- Landscape level information on LU/LC and IC is not updated frequently
 - Extract data once for use in multiple projects over time
 - Avoid extracting data by multiple people over multiple projects
- Created an Excel-based tool to facilitate custom analysis of data and easy extraction into charts and tables to incorporate into project documents, etc.
- Provide instructions to make tool useful for all staff

Tool Development Process

GIS Project

Create a GIS project to extract LU/LC and IC information at common spatial divisions used for projects

- Watersheds (CT Local and Subregional Basins)
- Town
- Extract information for both entire spatial area and for buffers around waterbodies within that area for LU/LC and IC

Excel Workbook

- Add data to Excel Workbook
- Develop User Facing Front End to Support Custom Data Analysis

- Slicer to make single or multiple selections
- VBA User Defined Function to extract slicer selections for use in calculations
- Excel Lookup Functions used to extract data from main data table for user selections
- Link Pie Chart and Table to extracted data
- Create buttons to copy and format pie chart and table for use in other documents

Demonstration

Land Use by Subregional Basin (SBAS)

Instructions

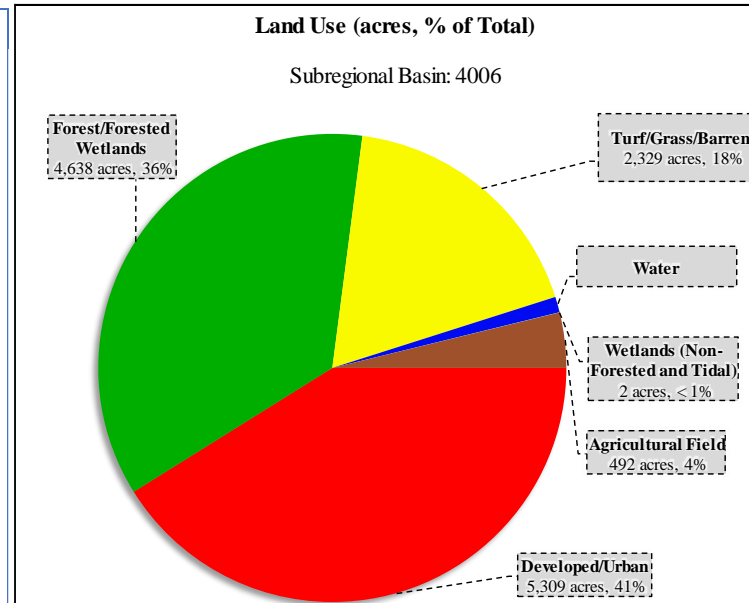
- 1) On the Left side of the Pie Chart, choose the area that covers your study area.
- 2) To adjust the labels, click the label once to select the Pie Chart. Click the label a second time to select that specific label. Click and drag the label to fit better. [For a video example of this, see the "Instructions" worksheet tab.](#)
- 3) Click the "Copy Pie Chart" or "Copy Table" button to copy an image of the Pie Chart/Table. Paste this into your document

- Clears Selections and Selects All
- Multiple Selections

Copy Pie Chart

Copy Table

Subregional Basin
3903
3904
3905
3906
3907
4000
4001
4002
4003
4004
4005
4006
4007
4008
4009



Data Source: UConn CLEAR (2015)

Land Use - Area & Percent		
Subregional Basin: 4006		
Land Use	Acres	% Cover
Developed/Urban	5,309	41%
Forest/Forested Wetlands	4,638	36%
Turf/Grass/Barren	2,329	18%
Water	139	1%
Wetlands (Non-Forested and Tidal)	2	< 1%
Agricultural Field	492	4%
Total Subregional Basin Area:	12,909.0	

Data Source: UConn CLEAR (2015)

Issue: Determining whether ambient data were collected under wet or dry conditions

Characterizing ambient data collection conditions

Analysis of ambient water quality parameter data within 303(d)-based plans require understanding of whether the data was collected under wet or dry conditions

- Historic Precipitation information doesn't change
 - Extract data once for use in multiple projects over time
 - Avoid extracting data by multiple people over multiple projects
- Develop a statewide database for precipitation at sentinel weather stations over an extended time period to cover timeframe for data collection supporting plan in development
- Use output of this tool as input to TMDL Table Tool

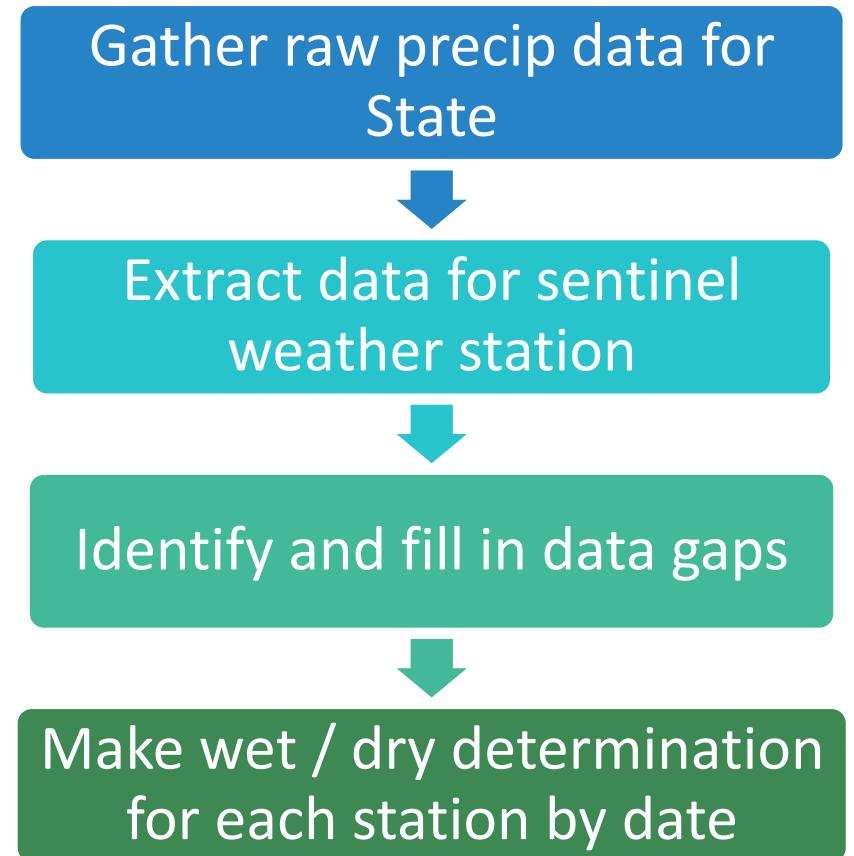
In CT a sample is considered "wet" if any of the following conditions are true:

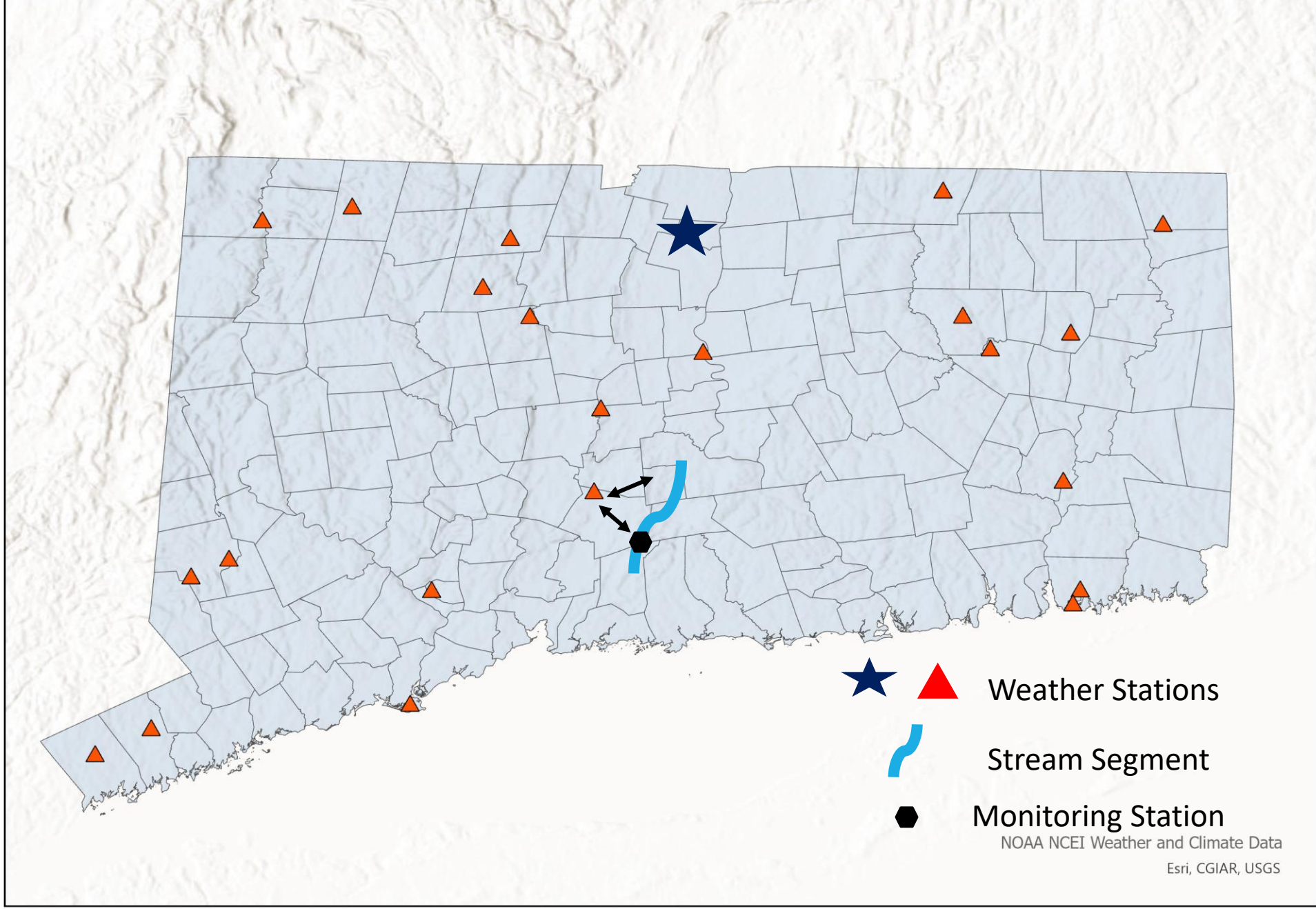
- >0.1" precip in 24 hrs or
- >0.25" precip in 48 hrs or
- >2.0" precip in 96 hrs

Wet/Dry Analysis of Monitoring Data

Two Tools Developed:

- **Excel – based tool for individual projects**
 - This tool is good for single, smaller projects if the analysis hasn't already been done on a larger scale
- **R-based tool for multiple or large-scale projects**
 - Allows for analysis of large statewide scale datasets for extended time period
 - Evaluates use of primary weather station data for filling data gaps in other stations
 - Automates analysis of “wet” or “dry” designations





Identify Sentinel Weather Stations with most complete long term data sets



Associate weather stations with waterbody segments using GIS, selecting station closest to waterbody



Associate monitoring locations with waterbody segments



Link monitoring location to precipitation data through the waterbody segment and related weather station

Issue: TMDL Data Analysis and Table Development

Analysis & Display of Information

Development of statewide approaches and commitment to “categories” for plan development creates repeated workflows which may be automated to some degree

- Standardized collection of electronic data & information
- Worked with agency database manager to create 303(d) Program specific queries
- Developed new statewide datasets to streamline TMDL development and create standardized information sources
- Reviewed & revised tables to be included in TMDLs, identifying tables to be used in all TMDLs
- Automated data analysis
- Addressed formatting issues for incorporating tables into TMDL documents

Gather or Develop Data on Statewide Scale

Stand Alone Data Sets

- Monitoring Data
- Permitted Facilities / Source
- IWQR Assessment Status
- Discharge monitoring data
- List of Waterbodies with established TMDLs

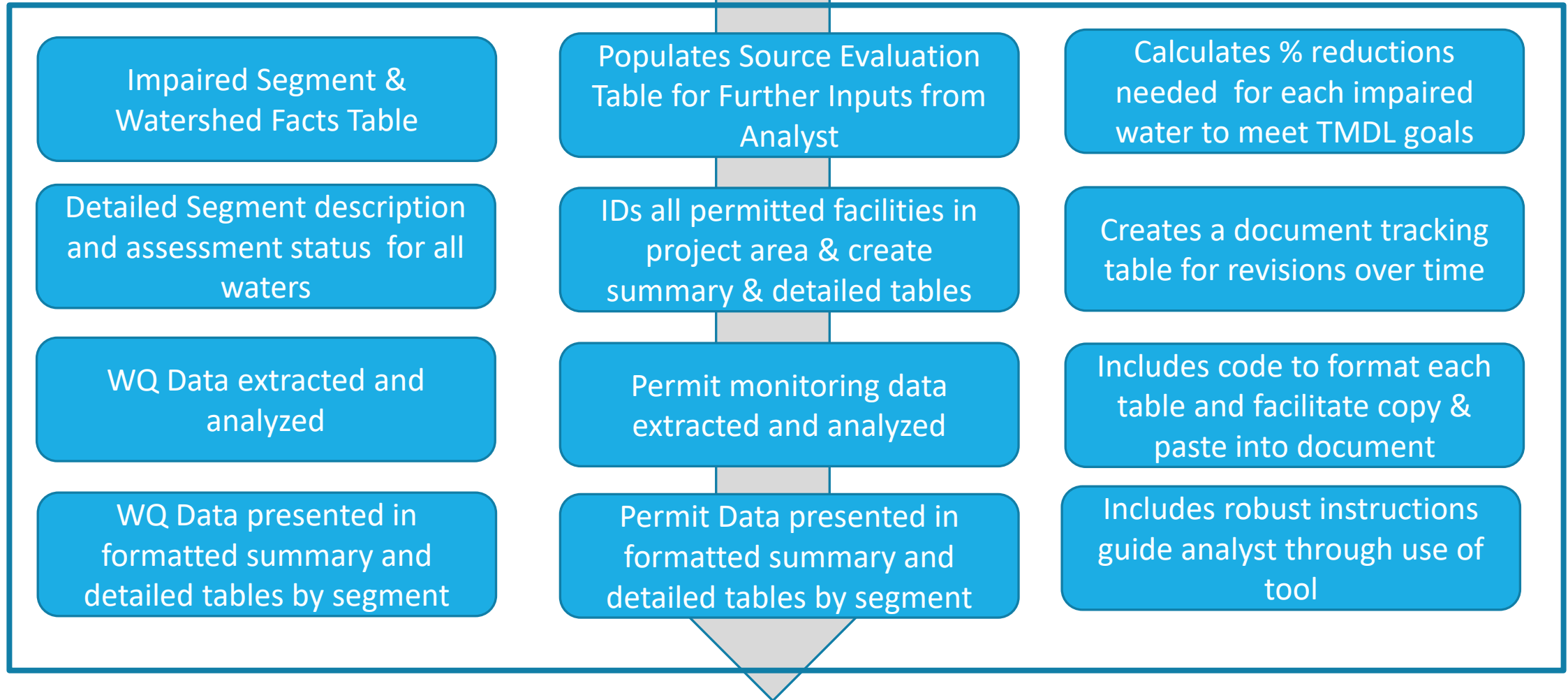
Statewide Data Set Development

- Associating Monitoring Stations with Stream Segments and connect to wet/dry data
- Associate beach locations with stream segments and create location maps
- GIS project created to associate towns with watersheds, segments,
- Develop table identifying management measures, etc. related to stormwater and bacteria from each town in state

Excel based tool supported by coding in Visual Basic & various Excel functions

Table Tool Automation

Analyst enters Watershed ID and Waterbody IDs to be included in TMDL into Tool



Analyst copies completed tables from Tool and pastes into formatted document

Demonstration

TMDL SBAS # or Estuary #: <input type="text"/>		TMDL Summary Tool						
SBAS Name:	<input type="text"/>							
TMDL Towns:	<input type="text"/>							
IMPAIRED WATERBODY/SEGMENT INFORMATION								
Segment New/Additional/Prior/ (If Prior, Clickable Link)	Waterbody ID	Water Type	Watershed / Estuary	Waterbody Name & Stream Name	Water Quality Class	Segment Length/Area	Municipality(ies) Crossed by segment	Bathing Beach (BB) in/on Subregional Basin (Y/N), Segment (Y/N) (Clickable Link to Map)
	<input type="text"/>							
	<input type="text"/>							

Current Challenge: Can document preparation be automated for “simple” projects?

So who did all this work?



Jeff Gill



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Co conspirators: Design Input & Review Team



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Questions?

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