

# Electronic Field Sheets using EDGE



Kari Winfield  
Massachusetts Department of  
Environmental Protection  
Watershed Planning Program

The logo for earthsoft is located in the bottom right corner. It features the word 'earthsoft' in a green, lowercase, sans-serif font. The letter 'o' is replaced by a small, stylized globe showing blue oceans and green continents.

# Background

---

- MassDEP Watershed Planning Program

- Monitoring, assessment, TMDLs for CWA 305(b)/303(d)
- Survey types: Fish Population, Fish Toxics, Water Quality, Benthic Macroinvertebrate, Cyanobacteria

- Field sheets types

- Rivers
- Bacterial Source Tracking (Rivers)
- Lakes (Index/Deep Hole)
- Lakes (Shoreline)
- Pipes
- Deployed probes
- Habitat
- Bench sheets (bug/fish counts)

# Field Data Collected: Water Quality Surveys

---

## ◉ Field observations

- Weather/flow/lake level
- Algal blooms
- Aquatic plants
- Secchi disk

## ◉ Samples

- Lab-analyzed samples
- Probe measurements
- Associated meta data

# Goals

---

- Develop electronic field sheets to replace paper field sheets
  - For use by in-house monitoring staff
  - Water quality first, then biological
- Save time and effort
  - Record data once
  - Eliminate proofing step
  - Standardization
  - Reduce errors

“Get it right  
the first time!”

# EQuIS: A "COTS" Data Solution

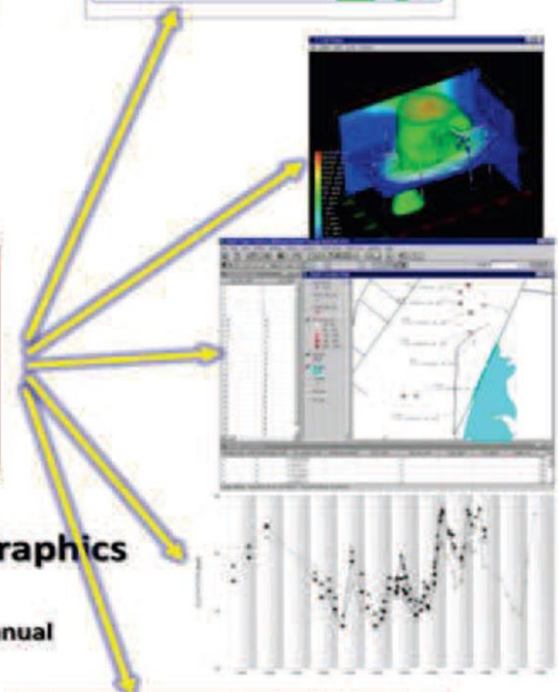
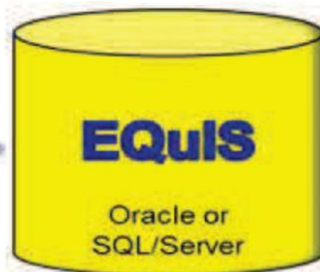
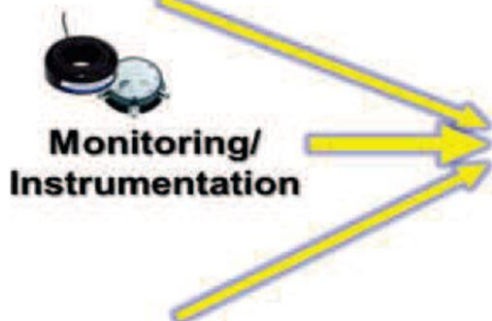
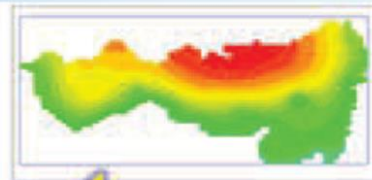
EDGE  
(EQuIS Data Gathering Engine)



Field  
Collection

## EQuIS:

Data Collection to Graphics



Laboratory EDDs

Work_Inst_Code	Dev_Inst_Code	W_Coord	V_Coord
4129-00000	NONE	519971 4941	339792 757
4129-00000	NONE	519995 495	339809 48
4129-00010	NONE	519996 5006	339949 514
4129-00011	NONE	519995 707	339908 760
4129-MV005	4129-MV005	519443 7851	339953 146
4129-MV005	4129-MV005	5201 33 2955	3401 95 230
4129-MV007	4129-MV007	520162 5517	340127 659
4129-00006	NONE	519971 4941	339792 757
4129-00009	NONE	519995 495	339809 48
4129-00010	NONE	519996 5006	339949 514
4129-00011	NONE	519995 707	339908 760
4129-MV005a	4129-MV005	519443 7851	339953 146
4129-MV005a	4129-MV005	5201 33 2955	3401 95 230
4129-MV007a	4129-MV007	520162 5517	340127 659

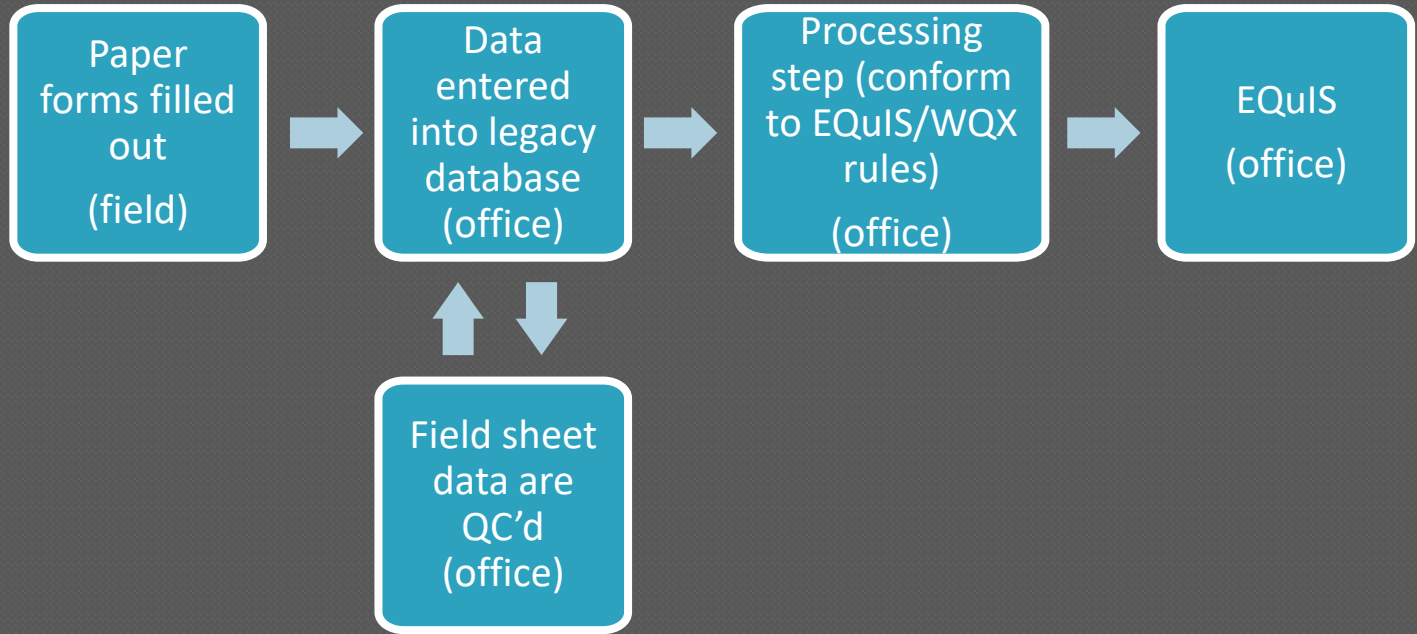
Data In:  
Automated/Manual

Reports and Graphics  
Out:  
Automated/Manual

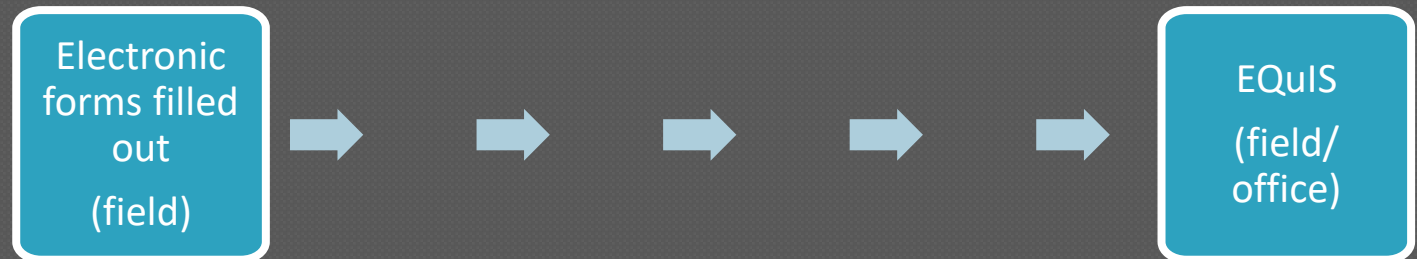
Inst Code	Work Code	Dev Code	W Coord	V Coord	Inst Name	Inst Type	Inst Status
4129-00000			519971 4941	339792 757			
4129-00000			519995 495	339809 48			
4129-00010			519996 5006	339949 514			
4129-00011			519995 707	339908 760			
4129-MV005	4129-MV005		519443 7851	339953 146			
4129-MV005	4129-MV005		5201 33 2955	3401 95 230			
4129-MV007	4129-MV007		520162 5517	340127 659			

# Process

Current



Future



# EDGE Components

---

## ○ Inputs

- Choice lists
  - Lookup table values from EQulS
  - Custom lists (if no lookup tables)
- Station and project definitions
- WQX-required fields

## ○ Output

- EDDs
- Uploaded to EQulS database, via
  - Email
  - Web interface
  - PC with EQulS EDP software

## ○ Built-in tools

- Mapping/GPS
- File attachment (photos, sketches)
- Signatures
- Barcodes (potential future use)
- Probe data uploads (potential future use)

# EDGE Forms

- Issues:
  - Too many versions of forms
  - Same fields but different choice lists
- Standardize sheets by form type

Form type	Field observations	Data sent to labs	Discrete Probe Readings	Continuous Probe Readings
River	x	x	x	
Lake	x	x	x	
Pipe	x	x		
Probe*	x		x	x

\*Future EDGE project (data mapping to EQUIS not yet defined)

- Group common elements into subforms that appear for specific form types



# EDGE Example Form: Field Observations

MADEP Observation MADEP Sample



## MADEP Observation

Selector

Field Sheet Type

General

Field Sheet Login #  Site Name (STAID)  Date/Time  Time Zone  Station Description

Unique ID #  Station Description and Access  Town  Water Body Name  Water Body Code

Latitude  Longitude  Field Latitude  Field Longitude  Field Lat/Long Method

Crew Lead  Other Crew  Project  Weather Conditions  Sketches

Air Temperature  Photos  Photos Description  Water Turbidity  Water Odor

Water Color  Floating Scum  Floating Scum (Description)  General Notes

River

Discharge (Reference)  Discharge Description  Tidal Condition  Staff Gage Reading

Flow Condition  Dominant Substrates  Estimated Flow Velocity  % Open Sky

Moss (Density)  Moss (Color)  Moss (Substrate)

River and Lakes

Water Level  Water Level, ft above/below  Objectionable Deposits

Objectional Deposits (Description)  Shoreline Erosion  Shoreline Erosion (Description)

Wildlife  Wildlife (Description)  Beneficial Uses  Beneficial Uses (Description)

# EDGE Example Form: Field Samples

MADEP Observation MADEP Sample



## MADEP Sample

[-] Sample-General

Field Sheet Log # (read-only)  Samples Taken From  Samples Taken From Description

[-] Sample-Lab

1 of 1 + X

OWMID	<input type="text" value="KW-0001"/>	OWMID Parent	<input type="text"/>
Start Time	<input type="text" value="05/17/2019 09:00:00"/>	End Time	<input type="text"/>
Start Depth	<input type="text"/>	End Depth	<input type="text"/>
Medium	<input type="text" value="Water"/>	Medium Subdivision	<input type="text"/>
Field Latitude	<input type="text"/>	Field Longitude	<input type="text"/>
Gear Type	<input type="text"/>	Gear Serial #	<input type="text"/>
Sample Type	<input type="text"/>	Composite	<input type="text" value="N"/>
		Composite Description	<input type="text"/>

Sample Notes

Sample Code	Bottle Group	Bottle Collected	Preservative	Filtered in Field	Parent Sample Code
KW-0001	<input type="text" value="none"/>	<input type="text" value="Samples Collected"/>	<input type="text" value="9N H2SO4"/>	<input type="text" value="N"/>	-

[+] Sample-Probe

# EDGE Example Form: Field Samples

MADEP Observation

MADEP Sample



## MADEP Sample

Sample-General

Field Sheet Log # (read-only)  Samples Taken From  Samples Taken From Description

Sample-Lab

Sample-Probe

1 of 1

OWMID	<input type="text" value="KW-0002"/>	Depth Calibrated On Site?	<input type="text" value="Yes"/>	Field Latitude	<input type="text"/>
Manual (watch) Time (24hr)	<input type="text" value="05/17/2019 10:00:00"/>	Sample Time Zone	<input type="text" value="EDT"/>	Field Longitude	<input type="text"/>
Medium	<input type="text" value="Water"/>	Medium Subdivision	<input type="text" value="SW"/>	Field Lat/Long Method	<input type="text"/>
Gear Type (Sonde)	<input type="text" value="Sonde-Multi"/>	Gear Type (Logger)	<input type="text" value="Logger"/>		
Sonde Serial #	<input type="text" value="42235"/>	Logger Serial #	<input type="text" value="S1454"/>		
Sample Collected?	<input type="text" value="Samples Collected"/>	Sample Type	<input type="text" value="P_ATT"/>		

Probe Notes

Add Remove Refresh Lock Autofit Analytes Show

Time	Temp. (N)	SpCond (N)	pH (N)	DO (N)	DOsat (N)
Unit	deg C	uS/cm	None	mg/l	%
13:33	16.37	216.6	6.65	10.02	103.5
13:38	16.38	217.1	6.64	9.99	103.1

# EQuIS/EDGE Implementation

---

## ⦿ Earthsoft's EQuIS software

- Timeframe: 2015 to 2019
- Goals:
  - Get all WPP data under one roof
  - Staff access to data
  - Reporting to WQX

## ⦿ EDGE

- Timeframe: Mar 2017 to Fall 2019
- Costs
  - Development: ~\$70,000 to date
  - Licenses: \$1,000 each + annual maintenance fees
  - Ruggedized Tablets: ~\$2,000 each

# Benefits

---

- Save time on data entry, data proofing
- Reduce/eliminate errors (transposed #s, wrong values, missing values)
- Standardized forms, field names, choice lists
- Pre-populated EDDs
- Make data available (faster turn around time)

# Process Considerations

---

## ⦿ Contractor interaction

- Work constrained to the contractor's sprint cycle
- Time lag between versions
- Clear communication
- Monthly meetings or as needed technical meetings
- Multiple iterations to get right

## ⦿ Contracts

- Available funding (fiscal year and beyond, e.g. annual licenses and maintenance fees)
- Unexpected expenses (revisions outside of original scope or underestimated costs)
- Timing (in house: writing RFQ, legal review, IT review, posting, reviewing RFQ responses)

## ⦿ Equipment

- Tablets (evaluation, finding a vendor within constraints of State contracting, funding, warranty)