

An Evaluation of Electronic Field Data Collection Solutions: Lessons Learned

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- 15+ years experience in the environmental and geotechnical consulting fields
- Manage GES Environmental Informatics team
- Specialize in database architecture, model development, programming, and GIS applications



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- 02 Types and Purpose of Data Being Collected
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Benefits of Digital Data Collection



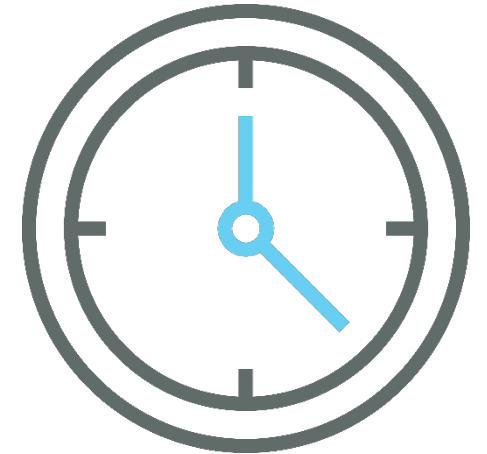
Eliminate transcription, reduce typographical errors



Control of observational language



**Reduce missing\ overlooked required information
Qualify Data objectives**



Real time relay of critical information

Types and Purpose of Digital Data Collected

Paper-like forms

- Standardized paper space in appearance
- No or limited data use beyond form filling
- Generally signatures and record of approval are very important
- The form itself is a deliverable
- Examples – pdf with fields, html page, check out signature



Types and Purpose of Digital Data Collected

Data Collection

- Numerical and textual data to be uploaded into a specific database structure
- The form is not necessarily a deliverable in itself
- Open ended in terms of number of observations\pictures etc.
- Examples – Access Database, XML documents, Survey Monkey, custom solutions



Current Technologies Reviewed

- Vendor Developed
 - » Earthsoft's EDGE
 - » ESRI Survey123
 - » ESRI Collector for ArcGIS
 - » Mi-Forms
 - » Qnopy
- Internal Developed
 - » MS Access Forms
 - » Distributed Excel Files
 - » Web based – Sharepoint forms

Management

Roadblocks to Efficient Systems

Issues



Case Study

Tank Inspection Forms

- No existing data structure adequately addressed field data collection or data upload needs
- Regulatory requirements for website submittal did not allow batch uploading
- Field form needs to be flexible during production to accommodate additional client requests
- Costs for development were presented along with estimate for increase in efficiency in submittals

Tank Registration 10530 Registration Form Complete
1-1

V. DESCRIPTION OF ABOVEGROUND STORAGE TANKS

1. Status of Tanks
Tank Status: Active Property Use: Undeveloped

2. Date of Installation:
Tank Installation Date: 6/1/2001 Estimated

3. Year Tank Constructed:
Tank Construction Date: 1/1/2001 Estimated

4. Maximum Tank Capacity:
Maximum Tank Capacity (gal): 4200

5. Compartments:
Number of Tank Compartments: 1

Num	Status	Substance	Capacity (gal)	Mixed	Changed	Change Notes
1	In Use	Produced Fluids	4200	<input type="checkbox"/>	<input type="checkbox"/>	Active storage tank contain

Compartment Capacity (gal): 4200
Comment:

6. Substance Stored:
Substance Stored Name: Produced Fluids
Substance Mixed: 0
Substance Stored Changes:
Comment: Active storage tank containing petroleum distillates.

7. National Fire Protection Association Health Rating: 1

8. Is tank regulated under existing State or Federal Programs? If Yes, provide identifying information concerning the program:
Regulated by State or Federal Program:
State or Federal Program Name: N/A
Program Permit Number: N/A
Program Registration Number: N/A
Other (Specify): N/A

9. Tank Construction Material and Corrosion Protection (mark all that apply):
Brand/Model: Unknown
Steel: On saddles, legs, stilts, rack, or cradle
Stainless Steel: In direct contact with ground, asphalt, or concrete
Fiberglass Coated Steel: Cathodic Protection (galvanic)
Plastic: Cathodic Protection (impressed current)
Fiberglass Reinforced Plastic: Unknown
Other (Specify):
Tank Wall Type: Single Tank Bottom Type: Single

Solutions



Great question!
The efficiencies gained should result in a better quality product not necessarily an overall cheaper product.

Let's make sure we're all on the same page.
What are data quality objectives?

Workflows

Roadblocks to Efficient Systems

Home Devices Plugins EDGE Lite

Task Chooser
Filter (1 of 1) Show All

Task Code Start Date Pr

2016-Q1 SAMPLING

Location Chooser/Filter
Location (3 of 3) Filter

Filter By Selection

Alerts data_provider sys_loc_code

	MW-1
	MW-2
	MW-3

Location FieldSampleForm ActivityForm Boring Log ActivityForm2 SafetyForm WaterLev

New Save Delete Print Max/Restore Sample (2) Default Layout Setup Sections Signatures Files (0) Disp

sys_sample_code MW-3-20160115-WG start_depth

end_depth depth_unit

sample_date 01/15/2016 00:00 (24hr) composite_yr N

filter_type filtered_screened

parent_sample_code sampler TW

sampling_company_code GES sampling_method Bailer

sent_to_lab_date 01/15/2016 00:00 (24hr) task_code 2016-Q1 SAMPLING

sample_matrix_code WVG sample_type_code N

comment

Field Results

Part F: SAMPLING

Sample ID 006-PA-131-110817-1630-1-499

Sampled		Sampling Point Location		
<input type="radio"/> Before Treatment	<input type="radio"/> After Treatment	<input type="radio"/> Inside Faucet	<input checked="" type="radio"/> Outside Faucet	<input type="radio"/> Overflow/Discharge Pipe
<input checked="" type="radio"/> No Treatment	<input type="radio"/> Not Sure	<input type="radio"/> Seep	<input type="radio"/> Pressure Tank	<input type="radio"/> Bailed
		<input type="radio"/> Wellhead	<input type="radio"/> Other:	<input type="text"/>

Was the water source purged before sampling? Yes No Volume 60 GALLON Time (min) 15

Is it possible to run water for 30 minutes? Yes No If No, please explain

Average water usage within the last 24 hours Chain of custody attached? Yes No

Field Analyses:

Turbidity (ntu): 1.87 pH (ph units): 8.25

Specific Conductance (umhos/cm): 0.510 Temperature (deg c): 11.32

Gas Readings:


Type	PPM	% LEL	% GAS
Wellhead	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="radio"/> Peak <input type="radio"/> Sustained	<input type="radio"/> Peak <input type="radio"/> Sustained	<input type="radio"/> Peak <input type="radio"/> Sustained
Cold Tap	80	0	0
	<input checked="" type="radio"/> Peak <input type="radio"/> Sustained	<input checked="" type="radio"/> Peak <input type="radio"/> Sustained	<input checked="" type="radio"/> Peak <input type="radio"/> Sustained
Cold Headspace	3320	6	0
	<input checked="" type="radio"/> Peak <input type="radio"/> Sustained	<input checked="" type="radio"/> Peak <input type="radio"/> Sustained	<input checked="" type="radio"/> Peak <input type="radio"/> Sustained
	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="radio"/> Peak <input type="radio"/> Sustained	<input type="radio"/> Peak <input type="radio"/> Sustained	<input type="radio"/> Peak <input type="radio"/> Sustained
	<input type="text"/>	<input type="text"/>	<input type="text"/>
	<input type="radio"/> Peak <input type="radio"/> Sustained	<input type="radio"/> Peak <input type="radio"/> Sustained	<input type="radio"/> Peak <input type="radio"/> Sustained

Part G: SITE SKETCH and PHOTOGRAPHS

Add Images 4 pictures attached to the form

SAMPLER

Please sign in the box below acknowledging that I have supplied the correct information to the best of my knowledge.



Accept Clear

Case Study

E&P Groundwater Sampling Forms

- » Presented in similar format and size as existing paper forms
- » Added real time checking of values as the forms were populated
- » Eliminated data transcription and QC
- » Thorough documentation of and training for QA processes. Identified downstream use of the data and better way to record information.

Lessons Learned and *Better* Practices

Issues can arise when...

- The digital application is based on receipt of paper forms
- The QA/QC process is poorly defined and/or documented
- The purpose of collected information is poorly defined
- The data collection process lacks structure

There's a better way!

- Review and adjust the workflow to best use digital collection for collating and organizing structured data
- Minimize unstructured and/or redundant data requirements
- Take advantage of the opportunity to create better QC\QA process

Field Staff

Roadblocks to Efficient Systems

The Challenge

- Confusing UI
- This isn't how it was done before
- I don't know how to use the hardware
- It takes too much time

Section Name SF-S2 Visit Crew RC Reid Visit Date 7/8/2013

Structure Condition

Structure Integrity: Completely Structure Porosity: Partly Porous Posts Remaining: 7-8 Post Integrity: Mostly Solid % Channel Constriction: 60-70

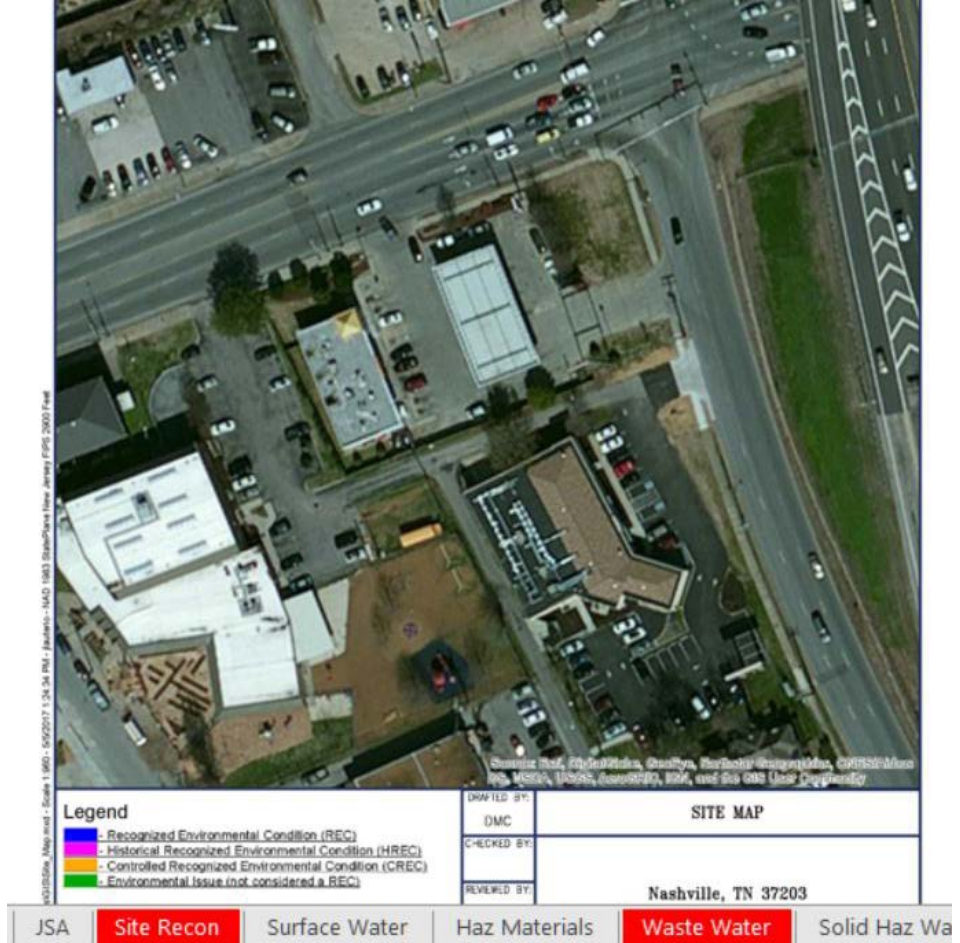
LWD Accum.: Not Present SWD Accum.: Certain Visit Type: Post High Flow Conditions: Low Flow/No

General Habitat Wood Photos

Unit #	Geo Tier 4	Unit Loc	% Bar Exp	Start Dist	Unit Lgth	Unit Width	Max Depth (cm)	Rifle Crest/Ave Depth (cm)	Dominant Forcing Mechanism	Dominant Substrate
9	Bar Forced Pool	DS	NA	3.5	1	.5	55	15	Bar	Cobble

Unit #	Geo Tier 4	Unit Loc	Start Dist	Unit Lgth	Unit Width	Cross Dist	UC	RR	RL	UC
1	Glide	US	0.0	1.0	1.0	0				
2	Undercut	US	0.25	0.75	NA	0	Undercut		1 - Glide	
3	Point Bar	DS	0.0	1.0	0.75	.25				
4	Rapid	DS	0.0	1.0	0.25	0		4 - Rapid	3 - Point Bar	

Site Recon & Project Description (Section 3.2.2.1)				
Date Completed:			Inspector(s):	
Weather:		Wind (mph)	Temp (F)	
Project Address:	1401 Charlotte Ave., Nashville, TN			
Land Area (Acres):				
Buildings (List):				
Car Wash:			Auto Repair:	
Areas observed:				
Access Limitations:				
On-Site Interview				
Name:			Relation to Site:	
Contact Info:			# Years at Site:	
Aware of any past environmental testing / studies / concerns:				
Utilities				
Utility	In area	At Site	Status	Comment
Potable Water				
Process Water			Well	
Storm Sewer			Public	
			Surface	
Electric			Unknown	



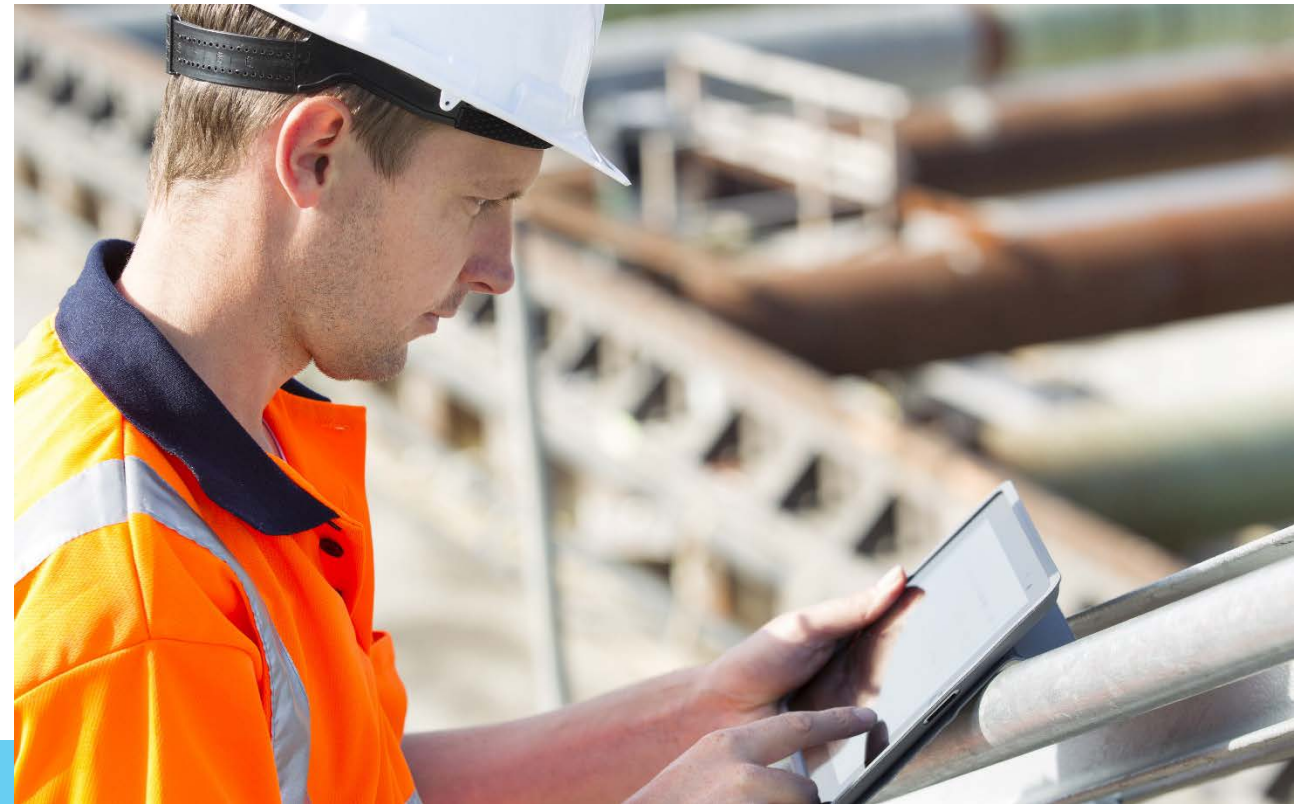
Case Study

Phase I Environmental assessments

- Nationwide scope (700+ sites), disparate hardware
- Well defined information requirements
- Delivery to 3rd party for final report collation
- Integration into existing work order system

Solutions

- Present senior field staff with example\demo interface
- Sell on the benefit of use
- Simplify\automate forms



Key Findings

Key Questions for Successful Implementation

Questions to consider during planning and preparing for digital field data collection...

- What is the purpose of collecting field data?
- What downstream decisions are made based on the field data?
- What has been missed in historical data collection? What is actually needed? Are the number of observations, photos, etc. fixed or open?
- What is the final deliverable? How is it submitted?
- Who needs to review forms before final submittal?
- What decisions must be made by field staff based on observations? What information must have controlled data entry?

Benefits of Digital Data Collection



**Eliminate
transcription, reduce
typographical errors**



**Control of
observational
language**



**Reduce missing/
overlooked required
information
Qualify Data
Objectives**



**Real time relay of
critical information**

THANK YOU.

Questions & Answer

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