
TIME-SAVING TIPS FOR CREATING MAP SETS FROM SUBSURFACE CHEMISTRY DATA

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TUESDAY, 15 JUL 2014, 3:15PM - 4:30PM
SAN DIEGO CONVENTION CENTER***

UC1146

WHAT'S THE PROBLEM?

1. We've got **mountains of data**.
2. The data mountain keeps **growing**.
3. We're producing **stacks of maps** from these mountains of data.
4. We have **ever-changing** cleanup criteria.
5. We've got data in **three*** **dimensions**... and only two dimensions on which to display it.
6. Everyone likes a **pretty** map.

** four, if you count time.*

SOIL BORINGS



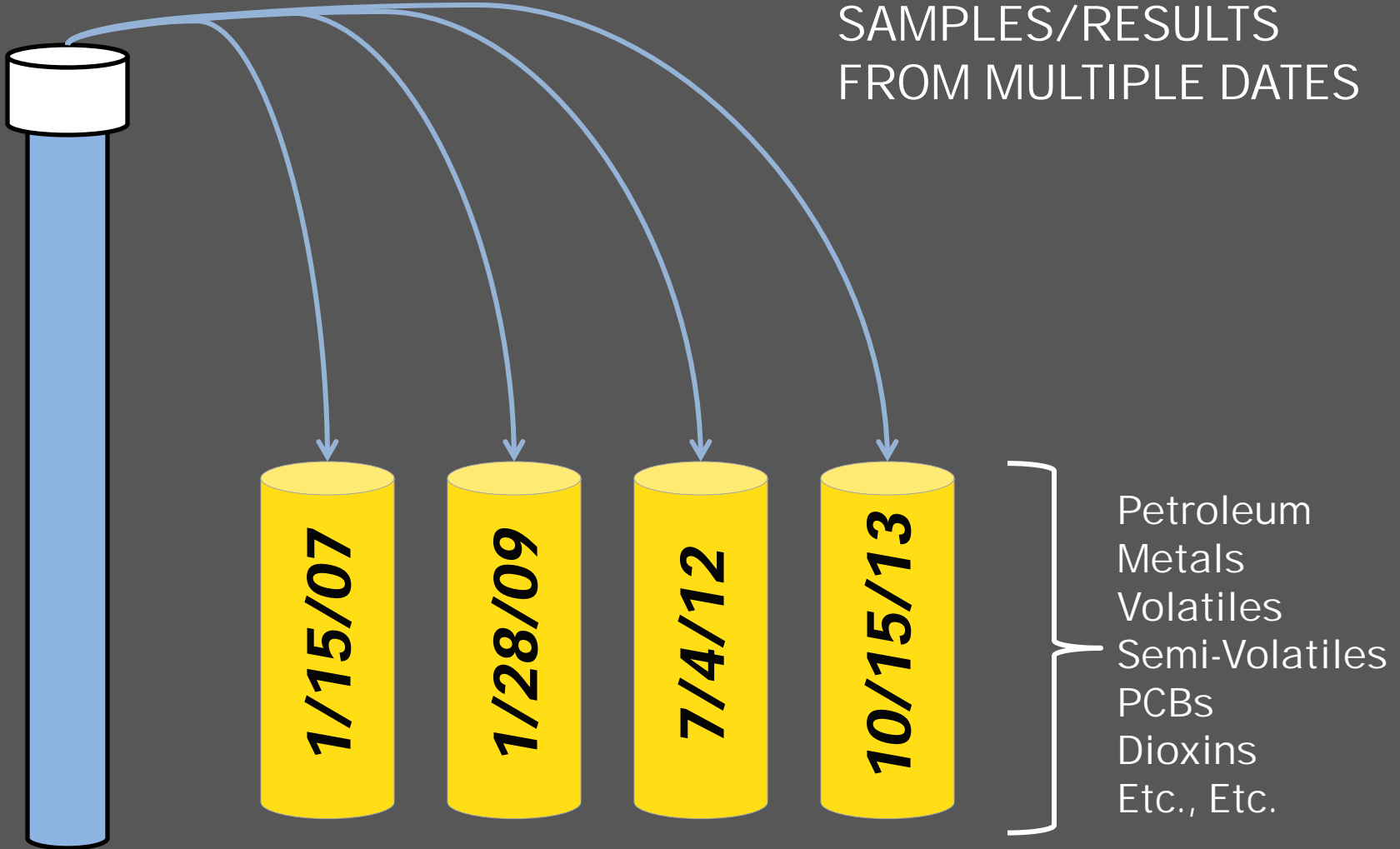
ONE X/Y
LOCATION,
WITH
SAMPLES/
RESULTS
FROM
MULTIPLE
DEPTHS

Petroleum
Metals
Volatiles
Semi-Volatiles
PCBs
Dioxins
Etc.
Etc.
Etc.

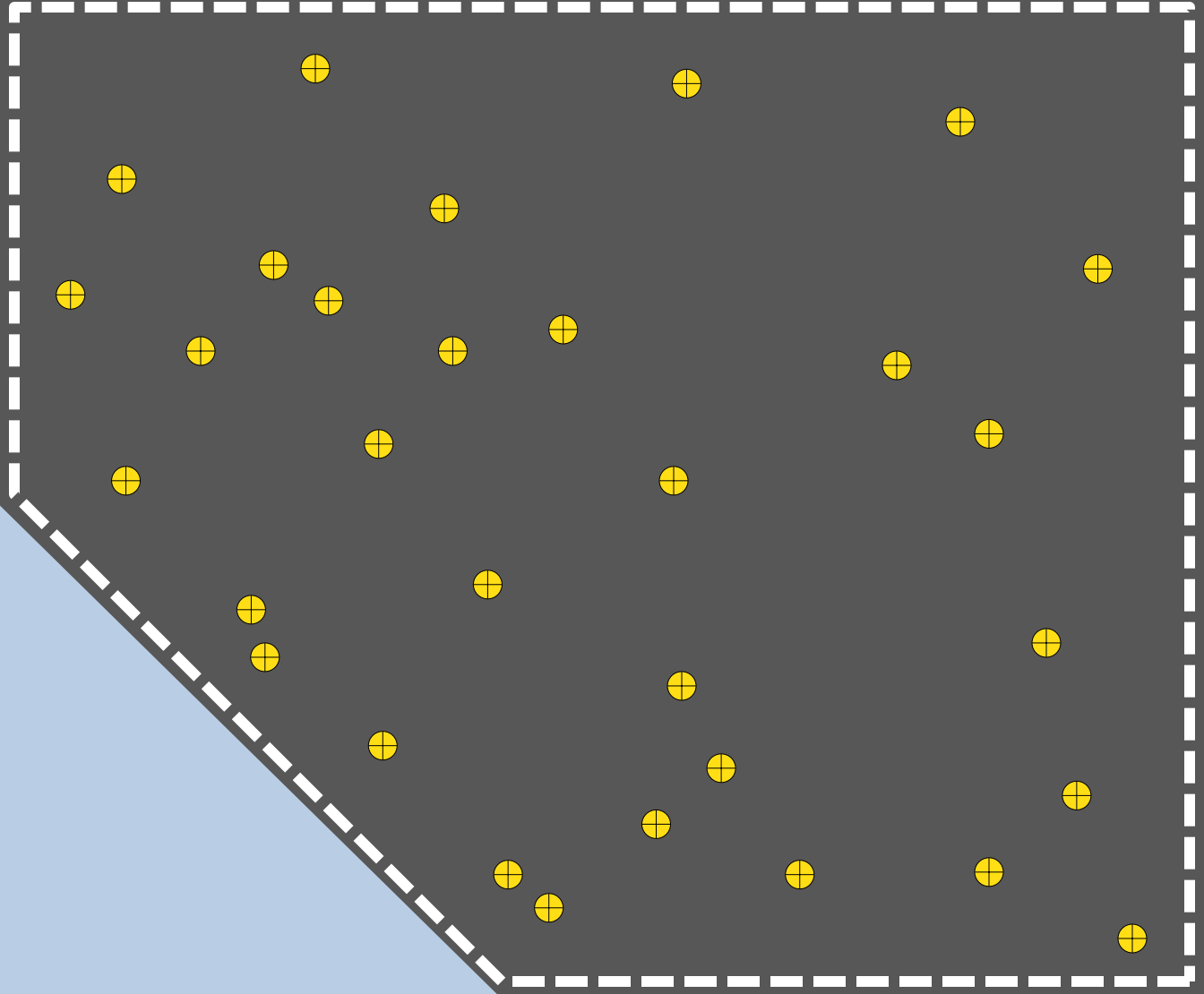
**Soil
Sample**

MONITORING WELLS

ONE X/Y LOCATION, WITH
SAMPLES/RESULTS
FROM MULTIPLE DATES



AND WE'RE ALWAYS ADDING EXPLORATIONS...



SO WHAT DO WE DO?

1. Create thoughtful templates and organize input data to simplify map updates.
2. Use ‘small multiples’.
3. Let logic live outside the MXDs.
4. Break out a little bit of arcpy.mapping.
5. Use sneaky tricks to create “table labels”.

**...AND WE NEED MAP UPDATES
TO BE AS EASY AND FAST AS
POSSIBLE.**

CARTOGRAPHIC APPROACH

Small
Multiples

June 2010

Groundwater elev. contours - May 2010
 Groundwater chemistry sample dates
 - Art Bore - 5/25/10 to 6/17/10
 - Coker - 6/23/10 to 6/28/10
 - Baker - None this quarter



September 2010

Groundwater elev. contours - October 2010
 Groundwater chemistry sample dates
 - Art Bore - 9/20/10 to 9/24/10
 - Coker - 9/27/10 to 9/30/10
 - Baker - None this quarter



December 2010

Groundwater elev. contours - January 2011
 Groundwater chemistry sample dates
 - Art Bore - 12/15/10 to 12/17/10
 - Coker - 12/24/10 to 12/28/10
 - Baker - 1/7/11



March 2011

Groundwater elev. contours - January 2011
 Groundwater chemistry sample dates
 - Art Bore - 3/24/11 to 3/28/11
 - Coker - 3/27/11 to 3/29/11
 - Baker - 3/8/11 to 3/9/11



Monitoring Well Sample Locations:

- Well Sampled During WQ
- Well Sampled Before 90 (most recent) data point
- Well (Inactive)

Samples Exceeding Cleanup Criteria (color):

- Detected, No Exceedance
- Not Detected, No Exceedance

Legend:

- Red shaded area: TCE concentrations in Art Bore (6.8 µg/L Cleanup Level)
 Max: 200 µg/L
 Min: 10 µg/L
- Blue line: TCE concentration line (at 6.8 µg/L Cleanup Level)
- Green line: Half-foot Water Table Interval Groundwater Elev. Contours (NAD83 Vertical Datum)

* Concentration Data as shown in Appendix A, Figure 13



Seasonal Groundwater Quality:
Trichloroethene (TCE) - Water Table Interval
 Art Bore Plating Site - Seattle, Washington

	WQ-2010 3/24/11 to 3/28/11	WQ-10 12/15/10	WQ-10 12/15/10
			PAGES 46 23



Groundwater Sample Locations
 - Blue: Active
 - Green: Inactive

Sample Location Symbol Color
 - Red: Exceeds/Approaches Screening Level
 - Orange: Approaches/Exceeds MCL
 - Yellow: Approaches/Exceeds MCL
 - Green: Not Detected/Not Exceeds MCL

Data Notes
 - All data points are the result of an analytical laboratory report at the specific location in the given interval. All data shown on this map is based on the most recent analytical data available.
 - All data shown on this map is based on the most recent analytical data available.
 - All data shown on this map is based on the most recent analytical data available.

Trichloroethene (TCE) Occurrence in Groundwater
 401 Basin Pumping Station
 Quarter 1 2024 Progress Report
 North, Washington

Aspect 4/15/2024 3



Groundwater Sample Locations
 - Blue: Active
 - Green: Inactive

Sample Location Symbol Color
 - Red: Exceeds/Approaches Screening Level
 - Orange: Approaches/Exceeds MCL
 - Yellow: Approaches/Exceeds MCL
 - Green: Not Detected/Not Exceeds MCL

Data Notes
 - All data points are the result of an analytical laboratory report at the specific location in the given interval. All data shown on this map is based on the most recent analytical data available.
 - All data shown on this map is based on the most recent analytical data available.
 - All data shown on this map is based on the most recent analytical data available.

Vinyl Chloride Occurrence in Groundwater
 401 Basin Pumping Station
 Quarter 1 2024 Progress Report
 North, Washington

Aspect 4/15/2024 5

***KEEP YOUR BASE SIMPLE,
DESATURATED, AND VECTOR...***

(your data will thank you for it)

IT'S ALL IN THE SETUP.

IT'S ALL IN THE SETUP.

Free the logic
from your
MXDs.

DON'T DO THIS:

- Symbolize based on *quantities* (binning)
- Hard-code screening levels into definition queries
- Use separate featureclasses or shapefiles



DO THIS:

- Add an attribute that defines it's "bin"
- Compare your data to screening levels *before* it becomes map data
- **Use one big dataset and make use of definition queries!**

ASK YOURSELF:

“Can I make this a new map simply by updating a few definition queries?”



Trichloroethene (TCE) Occurrence in Groundwater
 Quarter 1 2014 Progress Report
 North, Washington

Groundwater Sample Locations

- Sample Location Symbol Status
- Exceeded/Exceeding Screening Level
- Detected
- Not Detected
- Not Sampled
- Not Detected, Not Sampled

Data Notes:

Groundwater data is presented as the location of the monitoring well (indicated by colored dots) and the specific interval of the groundwater. The data is presented as a map showing the location of the monitoring well and the specific interval of the groundwater. The data is presented as a map showing the location of the monitoring well and the specific interval of the groundwater.

Data Labels:

Color of dot indicates the status of the monitoring well. The color of the dot indicates the status of the monitoring well. The color of the dot indicates the status of the monitoring well.

Legend:

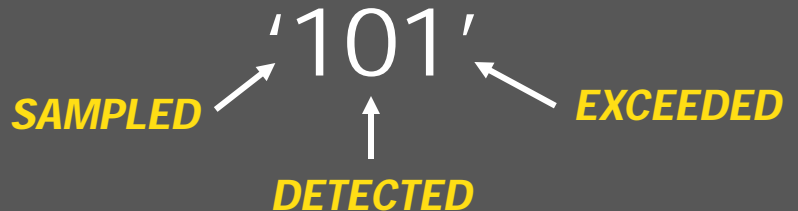
- Water Table Interval
- Shallow Interval
- Intermediate Interval
- Other Occurrence in Groundwater

Aspect | 10/21/14 | 3

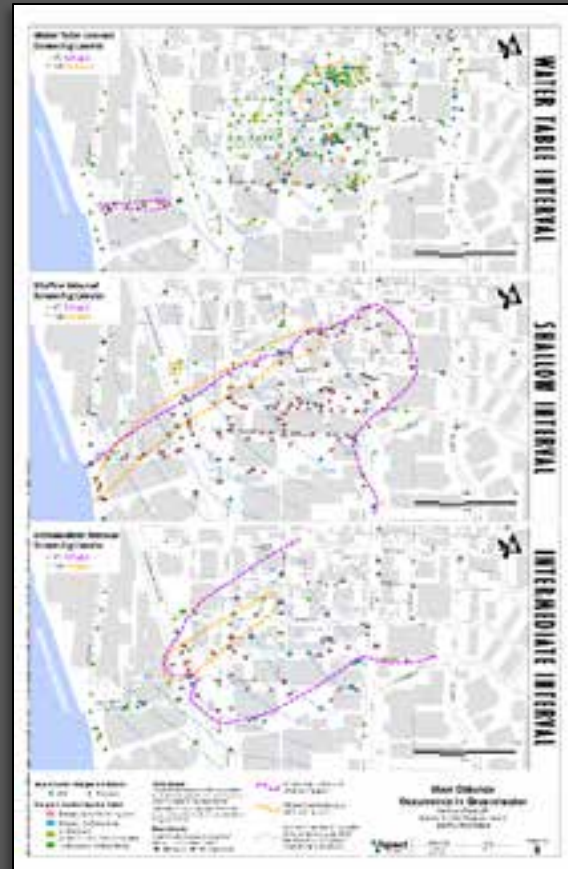
SAME X/Y DATA TABLE FEEDS ALL MAPS + FRAMES.

EACH FRAME IS A UNIQUE COMBO OF INTERVAL + ANALYTE.

SYMBOLOLOGY DRIVEN BY FIELD CALLED "SYMBOL CODE".



(SAME FOR ALL)



EASY!



PYTHON TO THE RESCUE!

FIND AND REPLACE IN DEFINITION QUERIES

```
mxd = arcpy.mapping.MapDocument("CURRENT")
findtext = "Arsenic"
replacetext = "Mercury"

for lyr in arcpy.mapping.ListLayers(mxd):
    if lyr.supports("DEFINITIONQUERY"):
        lyr.definitionQuery =
            lyr.definitionQuery.replace(findtext, replacetext)

del mxd, findtext, replacetext
```

EASY!

...BUT WHY STOP THERE?

...BUT WHY STOP THERE?

If you **stay consistent** in your naming conventions you can (easily) find/replace globally!

(THAT IS, IF YOU CAN HELP IT, DON'T CALL IT "MERCURY" ALL OVER THE LAYOUT, "HG" IN ONE DATA TABLE AND "MERC" IN ANOTHER...)

FIND AND REPLACE IN DEFINITION QUERIES AND TEXT ELEMENTS:

```
mxd = arcpy.mapping.MapDocument("CURRENT")
findtext = "Arsenic"
replacetext = "Mercury"

# Loop through each text element in the map document
for textElement in arcpy.mapping.ListLayoutElements(mxd,
"TEXT_ELEMENT"):

    # Find and replace string in Text Element
    textElement.text =
    textElement.text.replace(findtext, replacetext)

# Find and replace string in MXD title/summary
mxd.title = mxd.title.replace(findtext, replacetext)
mxd.summary = mxd.summary.replace(findtext, replacetext)

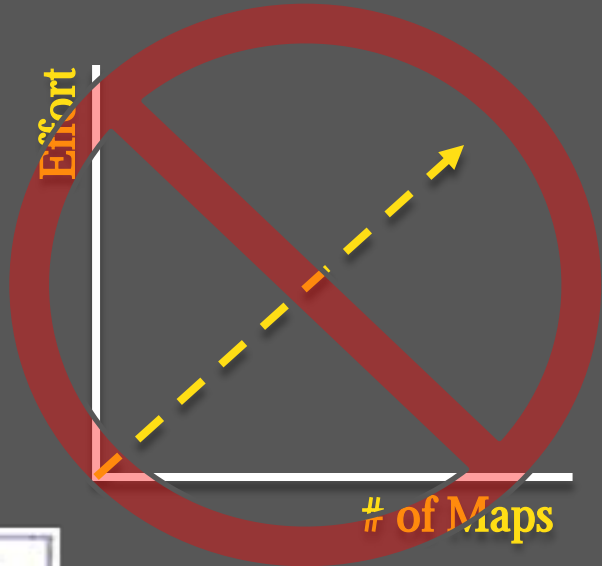
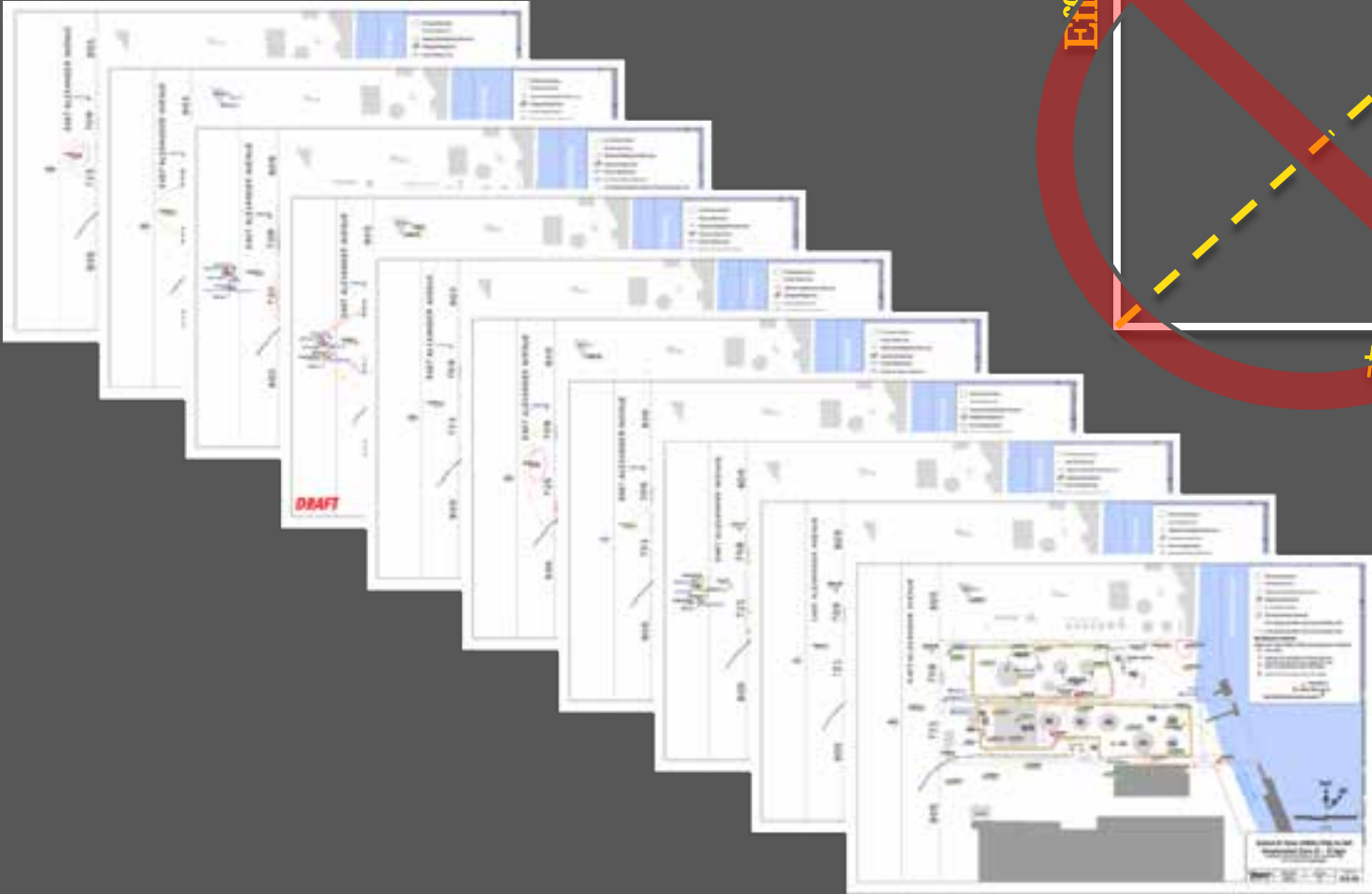
# Find and replace in def queries
for lyr in arcpy.mapping.ListLayers(mxd):
    if lyr.supports("DEFINITIONQUERY"):
        lyr.definitionQuery =
        lyr.definitionQuery.replace(findtext, replacetext)

del mxd, findtext, replacetext
```

***AND THAT'S JUST THE TIP
OF THE ICEBERG***

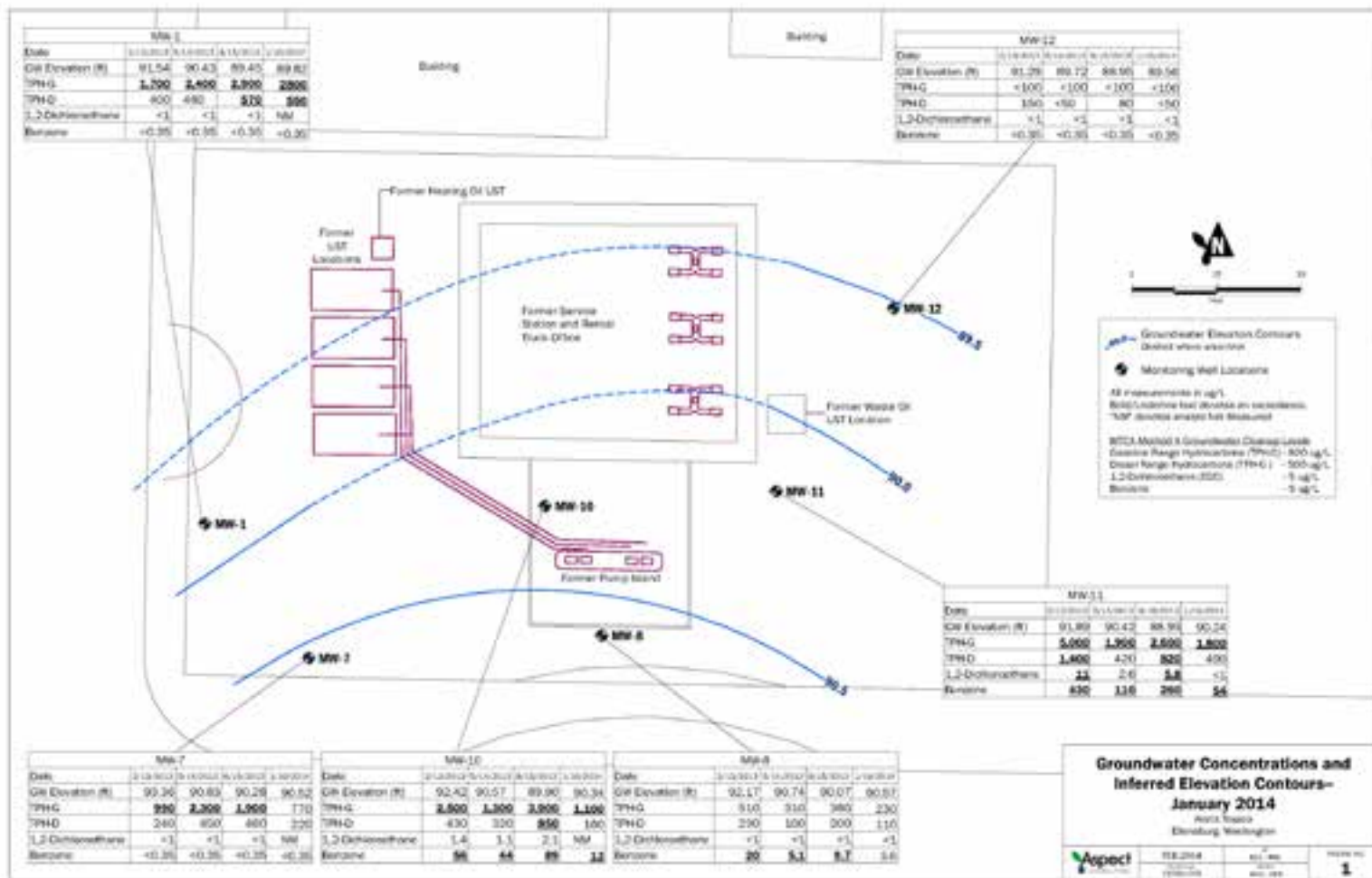
(you can iterate, create parameterized
tools, and so much more.)

NEVER MAKE ONE MAP WHEN TEN WILL DO.



***YET... SOMETIMES THINGS
AREN'T THAT SIMPLE***

ATTACK OF THE "TABLE LABELS"



***WHAT IF WE COULD CREATE THEM
DYNAMICALLY INSIDE OF ARCMAP?***

[LabelField] (Value):

```
<UND><BOL>MW-01</BOL>***LEAD***MERCURY</UND>#0-  
2FT***2.0U***0.1U#<CLR red='255'><BOL>2-4FT</BOL>  
</CLR>***<CLR red='255'><BOL>50</BOL></CLR>  
*****0.1U#8-12FT**8.0****<CLR red='255'><BOL>10  
</BOL></CLR>
```

199
Chars
(yikes)

Label Expression:

```
Replace(Replace([LabelField], "*" , "  "), "#", VbNewLine)
```

**Beware
of field
length
limits!**



<u>MW-01</u>	<u>LEAD</u>
<u>MERCURY</u>	
0-2FT	2.0U
0.1U	
2-4FT	50

MONOSPACED FONT!
8-12FT 8.0 **10**

***REMINDER: LEAVE THE LOGIC
OUTSIDE OF ARCMAP.***

[LabelField] (Value):

? {MW-01} ***LEAD***MERCURY@#0-2FT***2.0U***0.1U#! {2-4FT} ; ***! {50} ; *****0.1U#8-12FT**8.0****! {10} ;

Label Expression:

Replace (Replace (Replace (Replace (Replace (Replace (Replace (Replace ([LabelField], "{", "<BOL>"), "}", "</BOL>"), "?", "<UND>"), "@", "</UND>"), "!", "<CLR red='255'>"), ";", "</CLR>"), "#", vbNewLine), "*", " ")



<u>MW-01</u>	<u>LEAD</u>
MERCURY	
0-2FT	2.0U
0.1U	
2-4FT	50

0.1U

8-12FT 8.0

10

{ = <BOL> = (Begin Bold Formatting)
} = </BOL> = (End Bold Formatting)
? = <UND> = (Begin Underline Formatting)
@ = </UND> = (End Underline Formatting)
! = <CLR red='255'> = Begin Red Text Formatting
; = </CLR> = End Red Text Formatting
= vbNewLine = Carriage Return
* = Space

If you stay consistent in your library of formatting marks, you can use the same label expression for all sorts of “table labels”.

{ = <BOL> = (Begin Bold Formatting)
} = </BOL> = (End Bold Formatting)
? = <UND> = (Begin Underline Formatting)
@ = </UND> = (End Underline Formatting)
! = <CLR red='255'> = Begin Red Text Formatting
j = </CLR> = End Red Text Formatting
= vbCrLf = Carriage Return
* = Space



<u>SB-16</u>	<u>SHAL</u>
<u>DEEP</u>	
ARSENIC	1.3
ND	
COPPER	10
37	
LEAD	ND

140

MERCURY ND

<u>SB-15</u>	<u>SHAL</u>
<u>DEEP</u>	
ARSENIC	ND
5.6	
COPPER	8.1
ND	
LEAD	ND

ND

MERCURY ND

0.2



[LabelField] (for SB-16):

```
?{SB-16}***SHAL***DEEP@#ARSENIC***1.3***ND#
!{COPPER};***!{10};*****37#!{LEAD};***ND*****!{140};#
!{MERCURY};***ND***!{1.5};#NICKEL***ND***6.1#
!{ZINC};*****!{18};*****!{12};i 1.9
```

Same Label Expression (!):

```
Replace(Replace(Replace(Replace(Replace(Replace(Replace(
Replace([LabelField],"{","<BOL>"),"}","</BOL>")
,"?","<UND>"),"@","</UND>"),"!","<CLR red='255'>")
,"i","</CLR>"),"#",vbNewLine),"*"," ")
```

Col 1 Width =
Max(length) +
a couple

Width doesn't
matter. Just add a
line break.



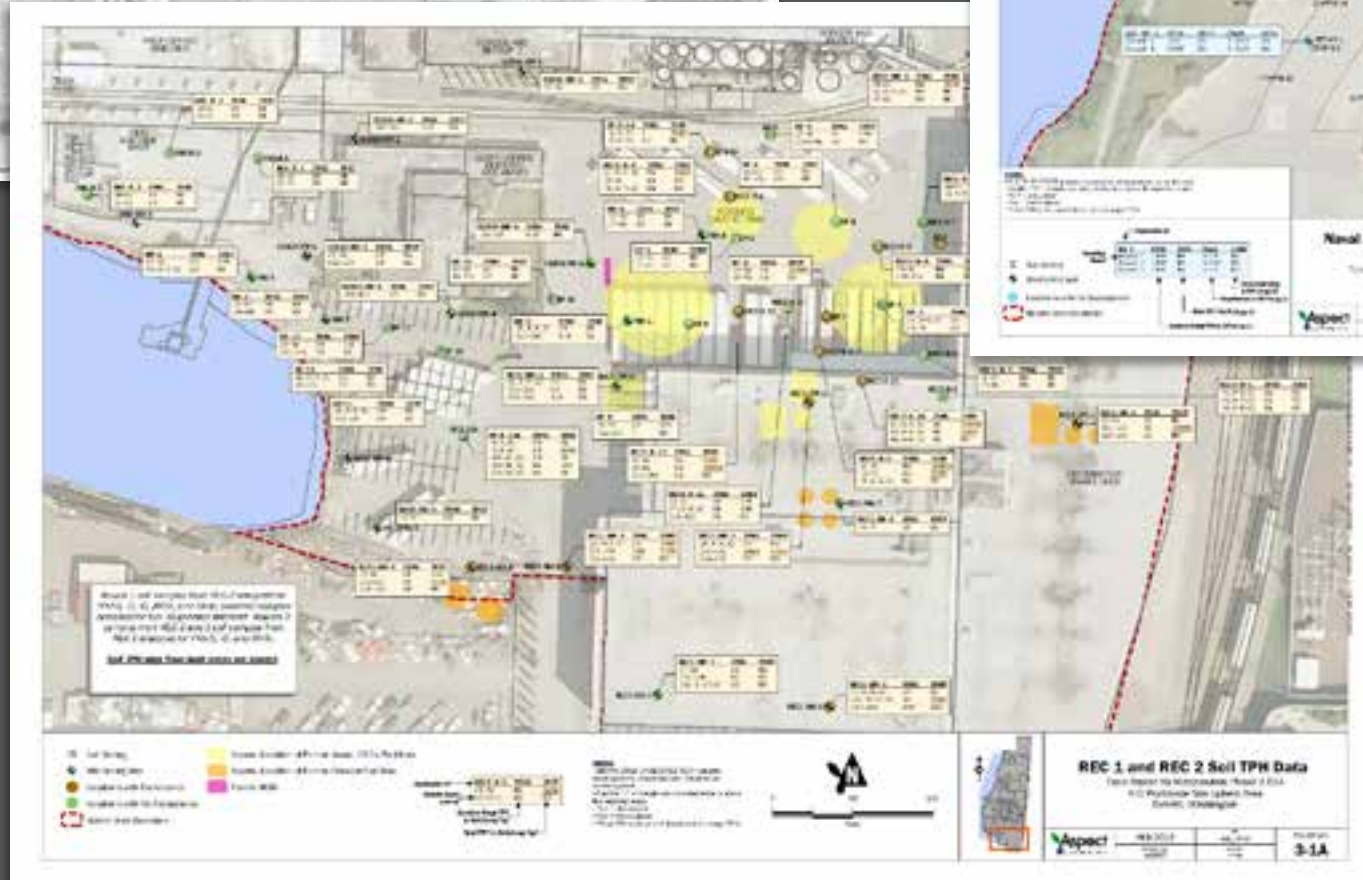
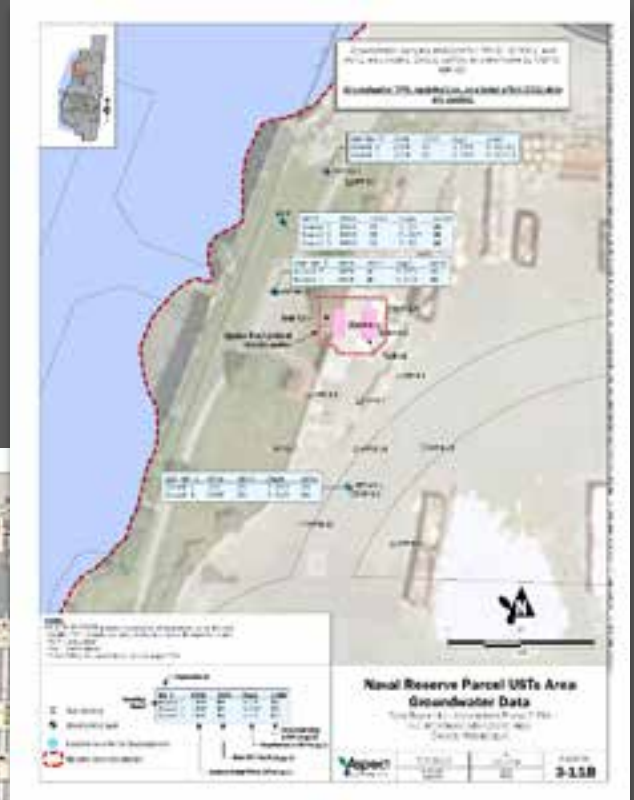
<u>SB-15</u>	<u>SHAL</u>
<u>DEEP</u>	
ARSENIC	ND
5.6	
COPPER	8.1
ND	
LEAD	ND
ND	
MERCURY	ND
0.2	
NICKEL	ND
1.3	
ZINC	1.1
1.9	

Col 2 Width =
Max(length) +
a couple

**THE TRICKY PART
IS CREATING THE
LABEL STRING...**
*(but even that's not so
bad once you get the
hang of it.)*

THE FORMULA TO CREATE THE STRING LOOKS SOMETHING LIKE:

```
"?" & [LocName] & Repeat("*", [Col1Width] - Len([LocName])) ... & "@" & "#"...  
& [Row1Name] & Repeat("*", [Col1Width] - Len([Row1Name])) & [Row1Value1] &  
Repeat("*", [Col2Width] - Len([Row1Value1]))...
```

THANKS!

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Aspect Consulting – Seattle, WA

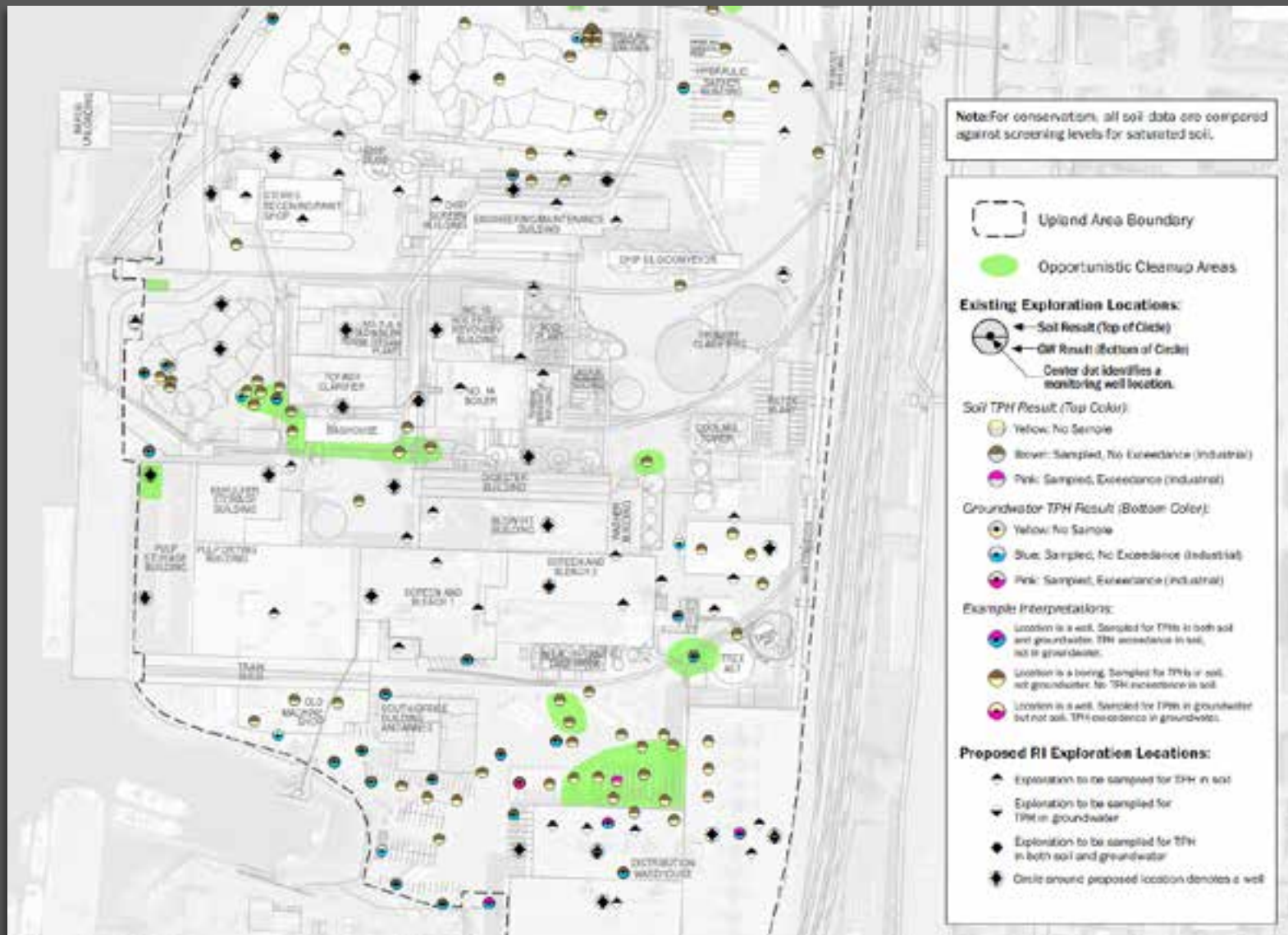


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@ParkerPW

EXTRA TIME?

MULTI-VARIABLE SYMBOLOGY (IF YOU MUST)



SKIP THE FANCY LOGIC. LAYER IT UP.

- Data Frame
 - Proposed Sampling
 - Wells
 -
 - Proposed Soil
 -
 - Proposed GW
 -
 - white background
 - Existing Data
 - Wells
 -
 - Outer Frame
 -
 - Soil
 - AnySoilExceed
 - <Null>
 - No
 - Yes
 - GW
 - AnyGWExceed
 - <Null>
 - No
 - Yes
 - Base
 - buildings (labels)
 - Upland Area Boundary
 - C277-L-11112-D-01_grid.dwg
 - Opportunistic_Cleanup_Areas_Oct2012
 - BW Func: aex2009.tif
 - Value
 - High : 255
 - Low : 0

Definition Query:

```
[Matrix] = 'Soil' AND [Group] = 'Polycyclic Aromatic Hydrocarbons (PAHs)' AND [AnySoilExceed] IS NOT NULL
```

Query Builder...

Definition Query:

```
[Matrix] = 'GW' AND [Group] = 'Polycyclic Aromatic Hydrocarbons (PAHs)' AND [AnyGWExceed] IS NOT NULL
```

Query Builder...

