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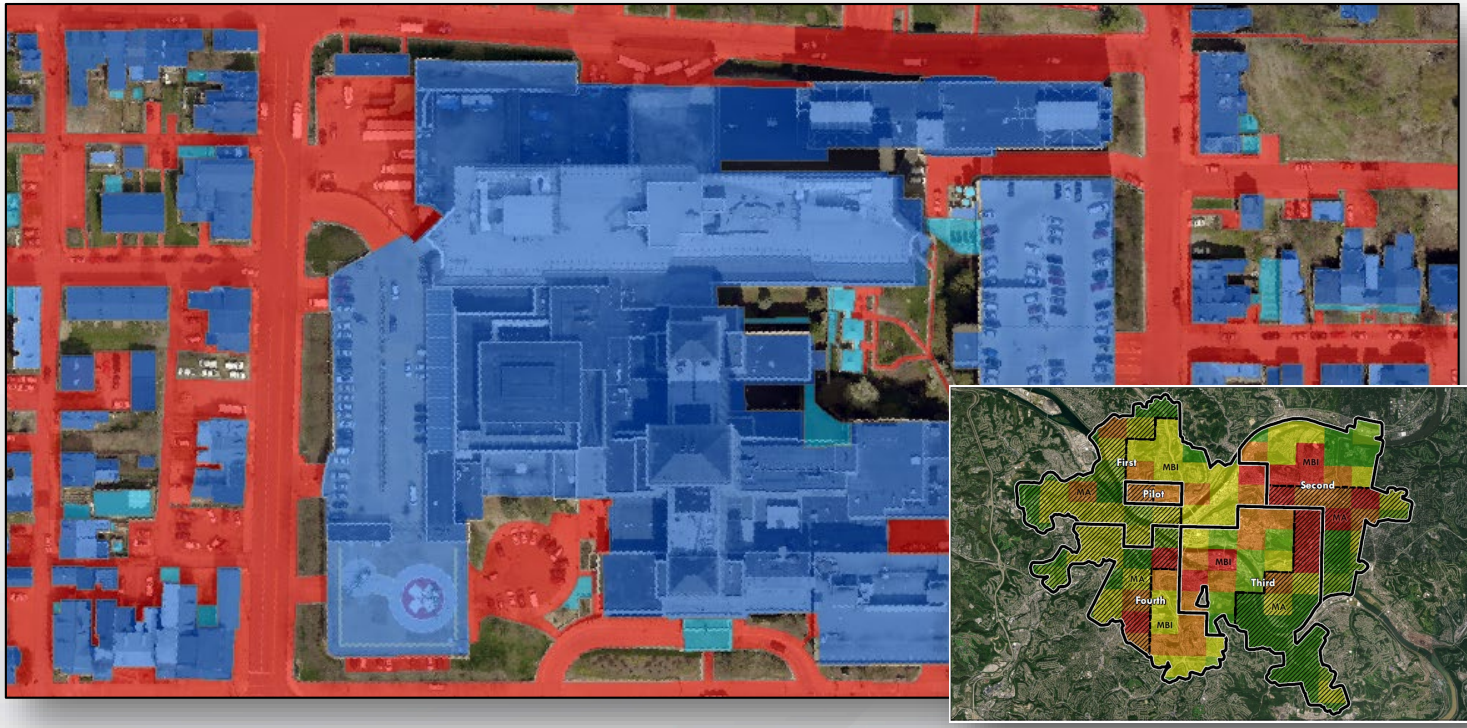
We Make a Difference



Impervious Surface Mapping

City of Pittsburgh

ASPRS Eastern Great Lakes Region | Fall Meeting | November 1, 2019

Today's Presenter

Jeremy Jurick

- Moon Township, PA
- GIT Technical Manager

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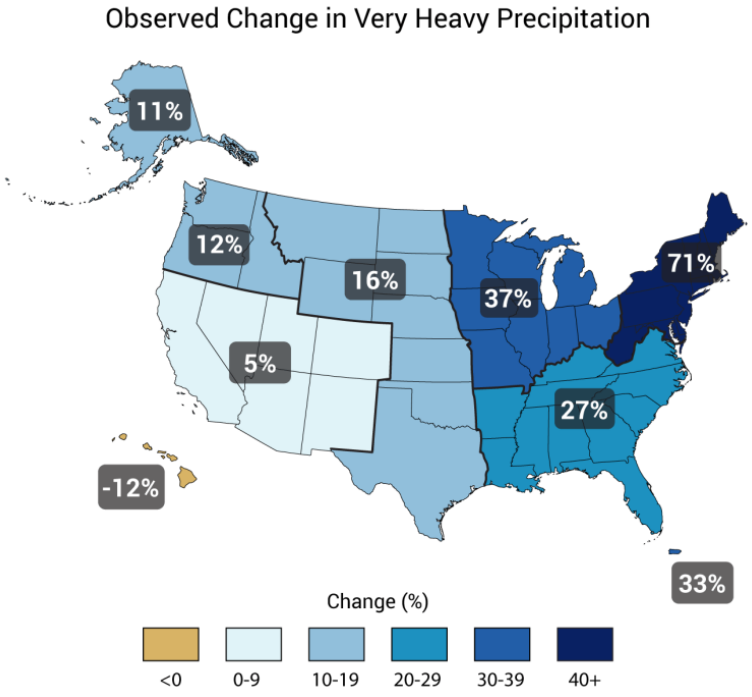
Stormwater Fee Implementation

- Why is it necessary?
  - Increased precipitation
  - Additional funding needed



Stormwater Fee Implementation

- Current sewer conveyance fee not equitable
- Impervious surface based rate structure:

Residential → Uniform Flat Fee

Non-Residential & Condominiums → Equivalent Residential Units (ERUs) calculated based on Actual Impervious Area

Undeveloped & Vacant Non-Residential → ERUs calculated based on Actual Impervious Area

Accuracy Matters!

- 2013 Stormwater Rate Structure Feasibility Study
  - Low resolution review
- Stormwater fee planned for inclusion by 2021
  - High accuracy for better program cost distribution
  - Better platform for "challenge" process

Residential Parcels:
Residential sample: average impervious area = 1,647 ft^2

Non-Residential Parcels:
Impervious Area estimated via GIS Analysis

Condominiums:
Impervious Area estimated via GIS Analysis

High Density	Moderate Density	Low Density
Southside	Brookline	Squirrel Hill

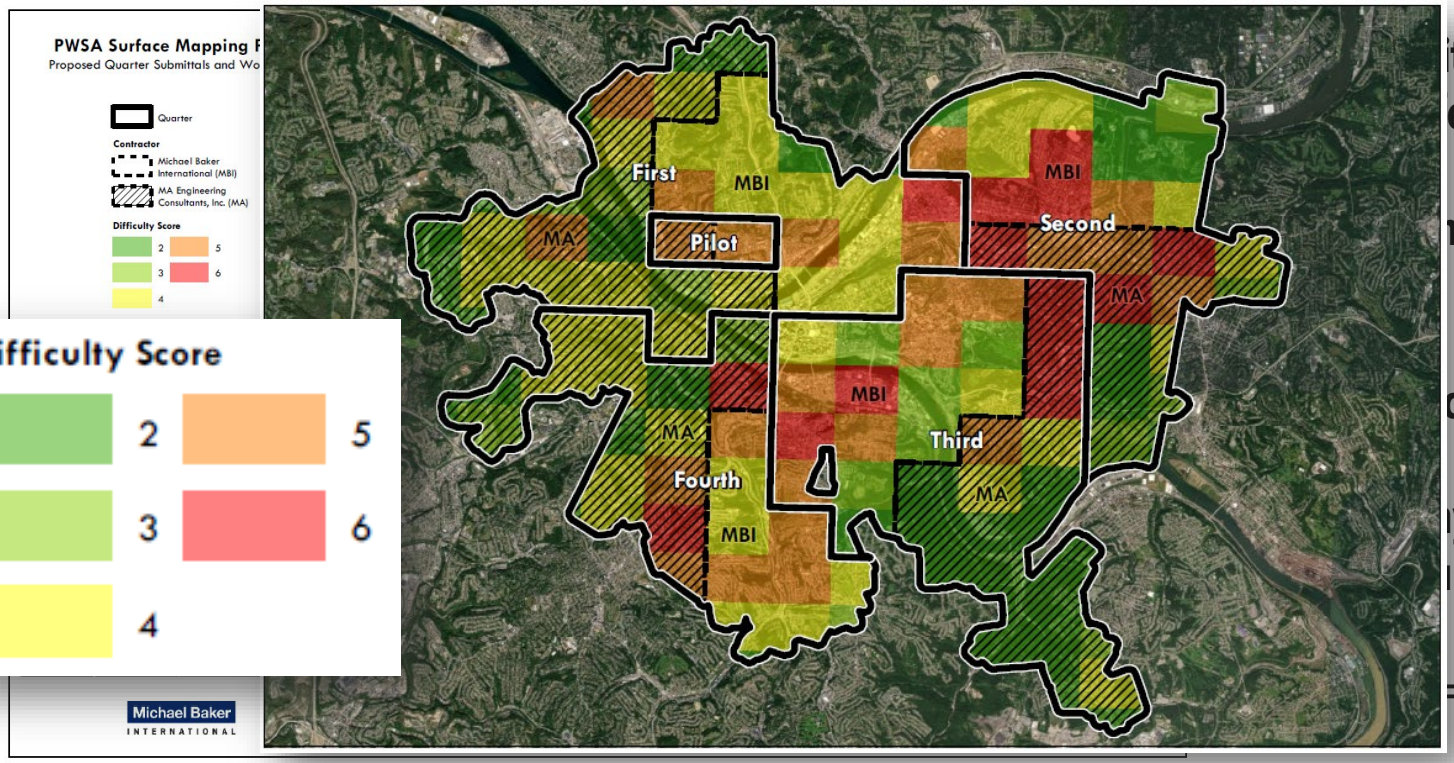
PWSA Surface Mapping Goal

Develop GIS layers for the purpose of stormwater runoff calculation

- Buildings
- Bridges
- Transportation
- Other Impervious Surfaces
- Major Rivers (Allegheny, Monongahela & Ohio)

1	Roads- Paved
2	Roads- Unpaved
3	Bridges
4	Sidewalks
5	Driveways- Paved
6	Driveways- Unpaved
7	Parking Lots- Paved
8	Parking Lots- Unpaved
9	Buildings
10	Decks/Patios
11	Pools- In Ground
12	Pools- Above Ground
13	Non-motorized bike trails
14	Athletic Facilities (Basketball/ Tennis/ Track/ Baseball & Softball Diamonds)
15	Railroad Tracks
16	Concrete Pads
17	Misc. Structures
18***	Three Rivers Delineation

Project Area



ttsburgh + 500
er

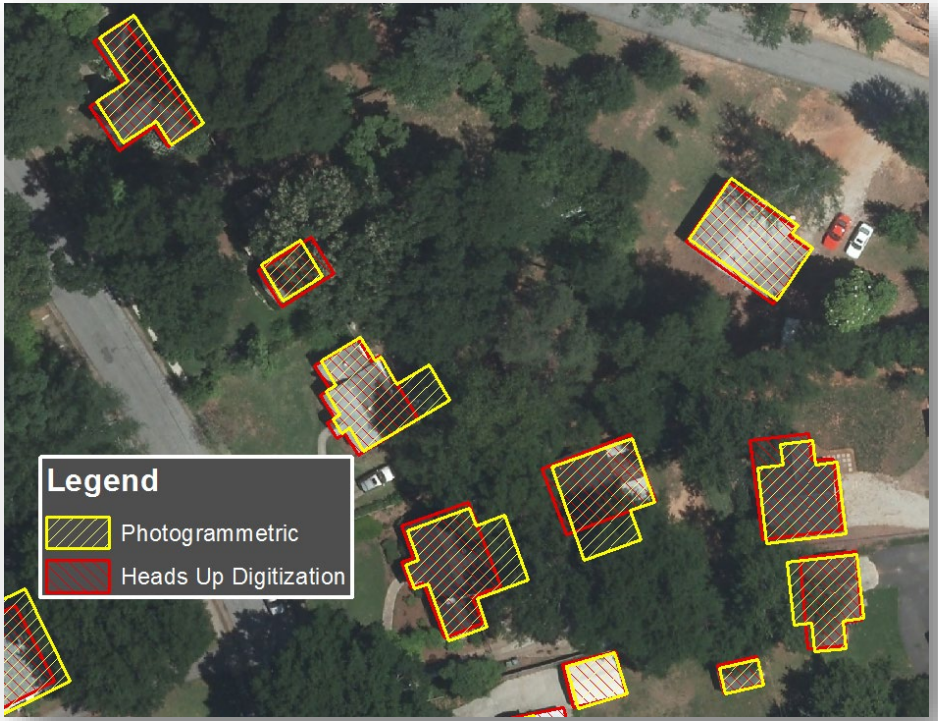
nately 65 square

cres

y County Grid
sed for tiling

= 0.59 Sq Mi

Photogrammetric Collection vs Heads Up Digitization



Michael Baker tested both compilation techniques on 60 mixed residential/commercial buildings:

Photogrammetric: 166,398 sq ft

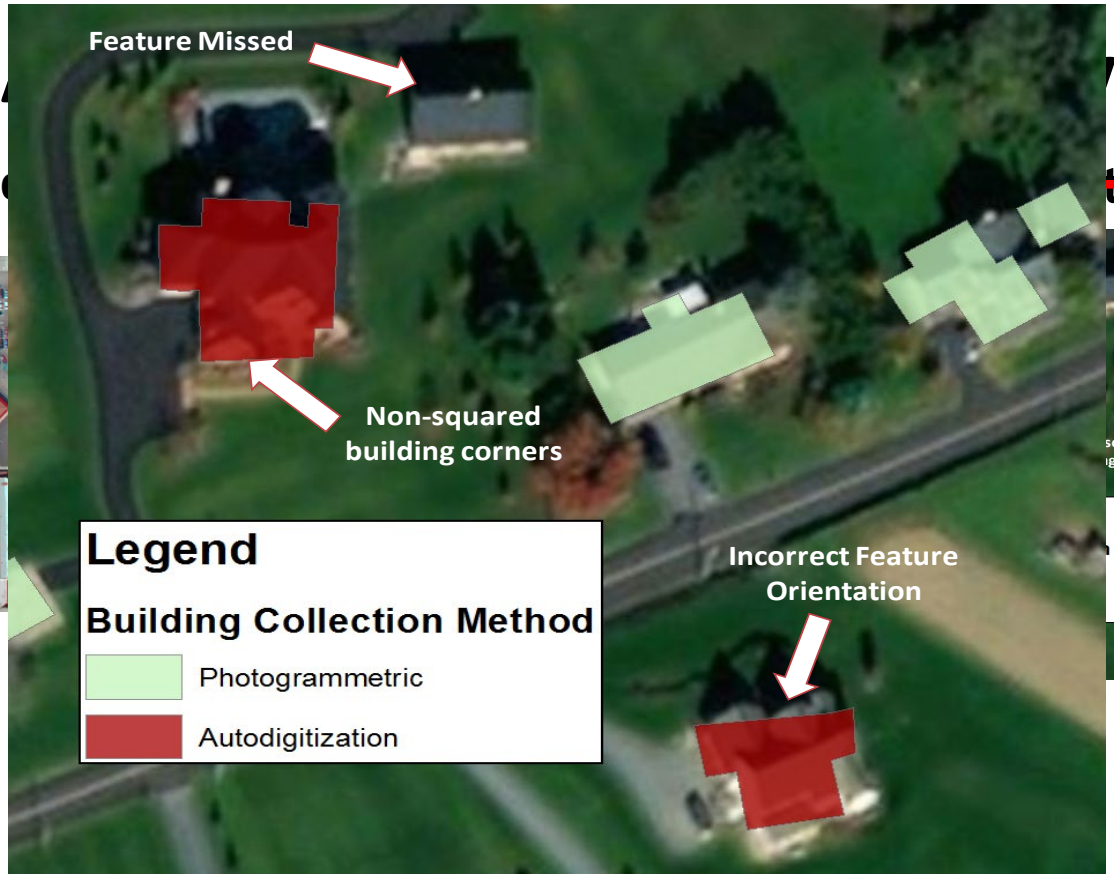
Heads Up Digitization:
168,945 sq ft

Difference:
2,547 more sq ft in Heads Up Digitization

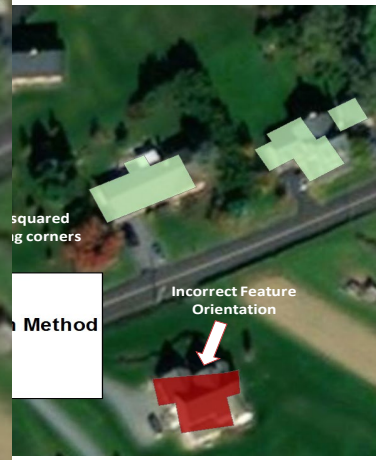
Approach and Methodology

Imagery	Collection Method	Accuracy	Effort
2016 – 6” Pixels	Photogrammetric		$$
2017 – 3” Pixels	Heads-up-Digitization	!	$

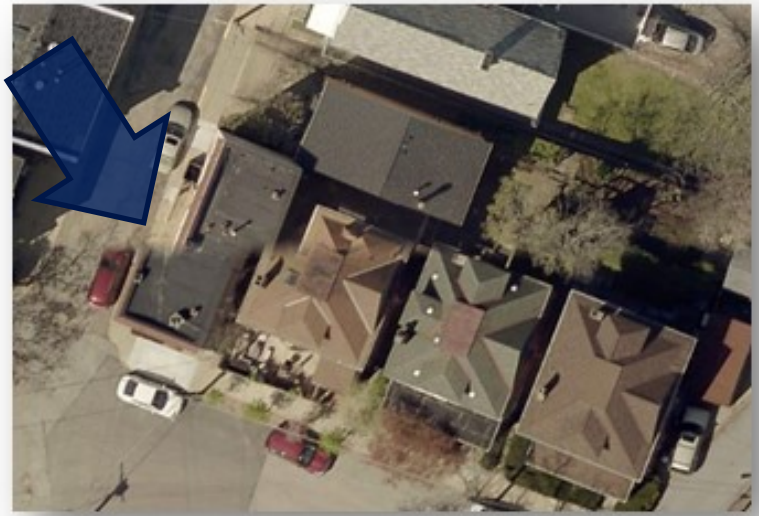
Photogrammetric C

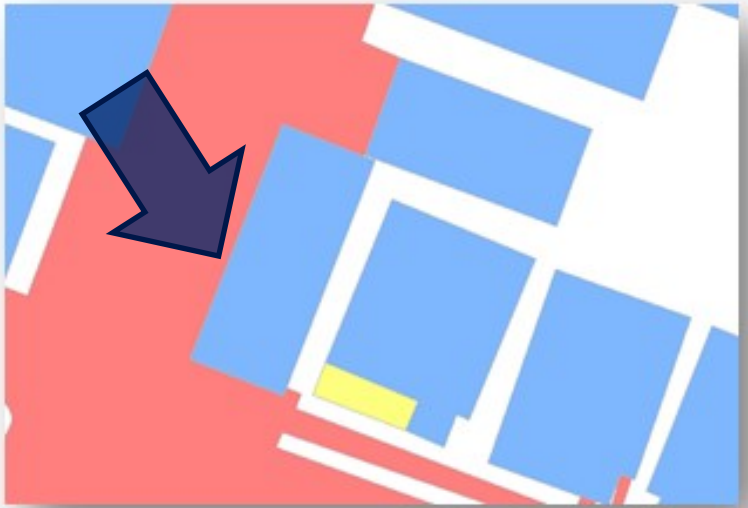


tomation

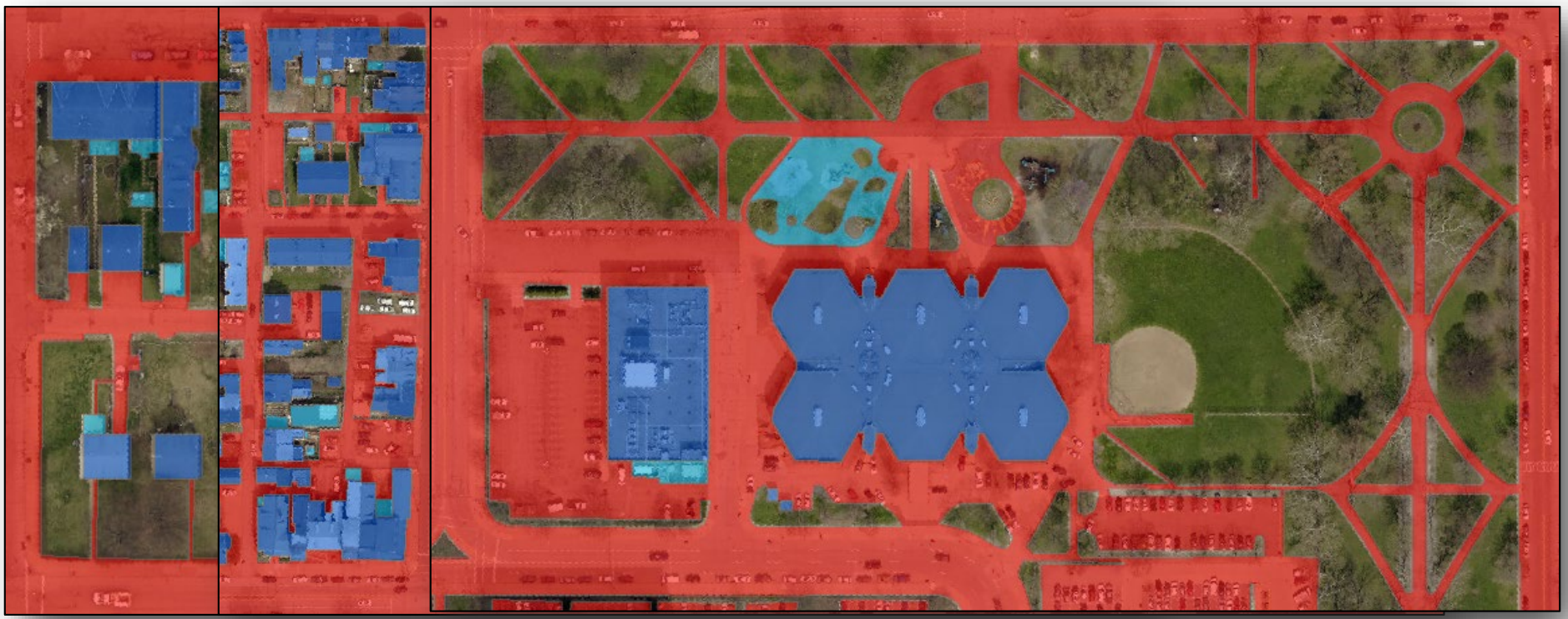


Approach and Methodology

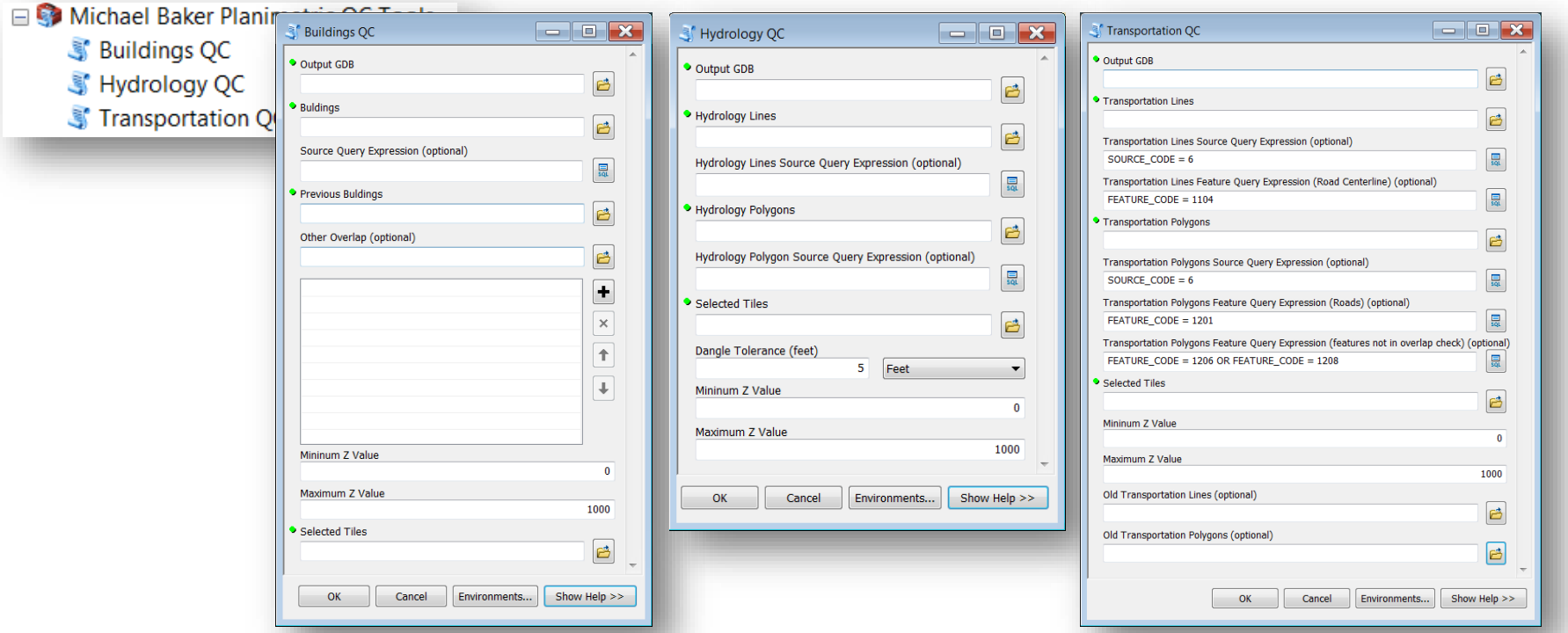




Mapping Results

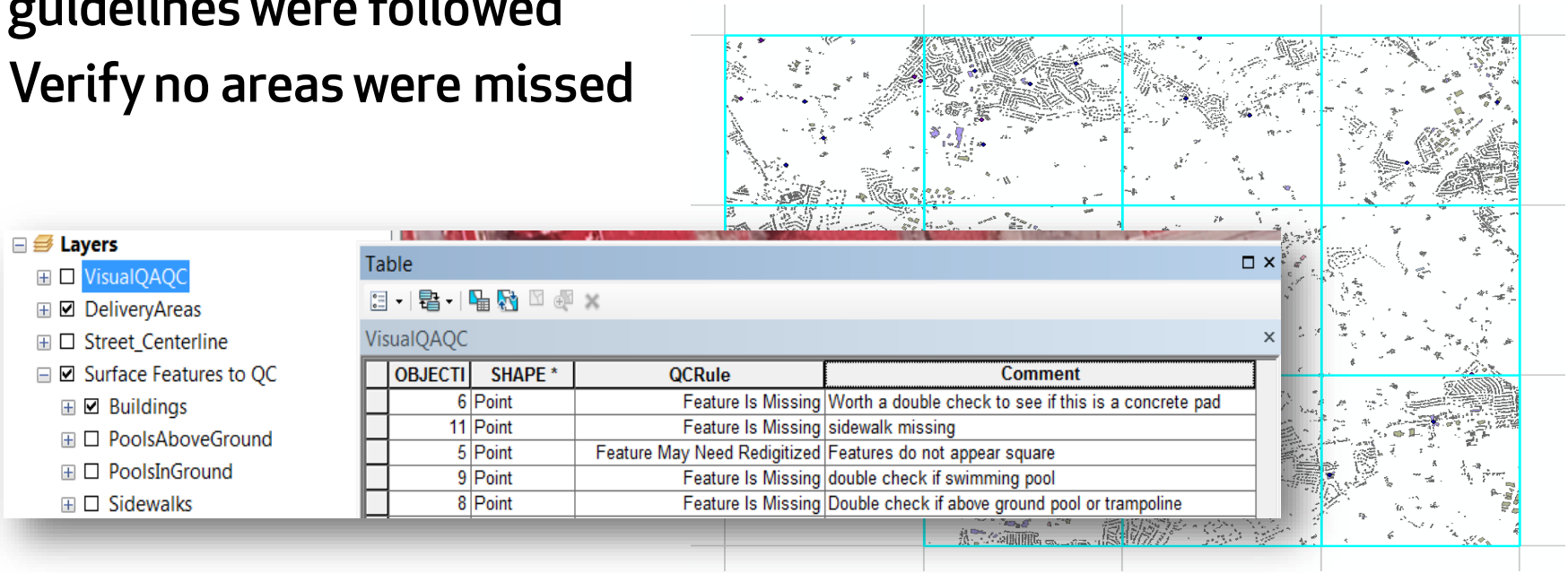


Automated GIS Quality Control



Visual GIS Quality Control

- Grid system set up with checklist to verify guidelines were followed
- Verify no areas were missed



OBJECTI	SHAPE *	QCRule	Comment
6	Point	Feature Is Missing	Worth a double check to see if this is a concrete pad
11	Point	Feature Is Missing	sidewalk missing
5	Point	Feature May Need Redigitized	Features do not appear square
9	Point	Feature Is Missing	double check if swimming pool
8	Point	Feature Is Missing	Double check if above ground pool or trampoline

PWSA QC Process

Table I—Sample size code letters

Lot or batch size			Special inspection levels			
			S-1	S-2	S-3	S-4
2	to	8	A	A	A	A
9	to	15	A	A	A	A
16	to	25	A	A	B	B
26	to	50	A	B	B	C
51	to	90	B	B	C	C
91	to	150	B	B	C	D
151	to	280	B	C	D	E
281	to	500	B	C	D	E
501	to	1200	C	C	E	F
1201	to	3200	C	D	E	G
3201	to	10000	C	D	F	G
10001	to	35000	C	D	F	H
35001	to	150000	D	E	G	J
150001	to	500000	D	E	G	J
500001	and	over	D	E	H	K

Table II-A—Single sampling plans for normal inspection (Master table)

(See 9.4 and 9.5)

Sample size code letter	Sample size	Acceptance Quality Limits, *AQLs*, in Percent Nonconforming Items and Nonconformities per 100 Items (Normal Inspection)																												
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A	2														↓	↓	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓
B	3																													
C	5														0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓	
D	8													↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓			
E	13												↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓				
F	20											↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓					
G	32										↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓						
H	50									↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓							
J	80							↓	↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓								
K	125						↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓										
L	200					↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓											
M	315				↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓												
N	500			↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓													
P	800		↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓														
Q	1250	↓	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓															
R	2000	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↓																

↓ = Use the first sampling plan below the arrow. If sample size equals, or exceeds, lot size, carry out 100 percent inspection.

↑ = Use the first sampling plan above the arrow.

Ac = Acceptance number.

Re = Rejection number.

PWSA QC Process

Other Uses

- High accuracy surface data
  - Cartographic Mapping
  - Sewershed Modeling
  - Stormwater BMP effectiveness

Thank you!

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