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Equity-Focused Tree Planting

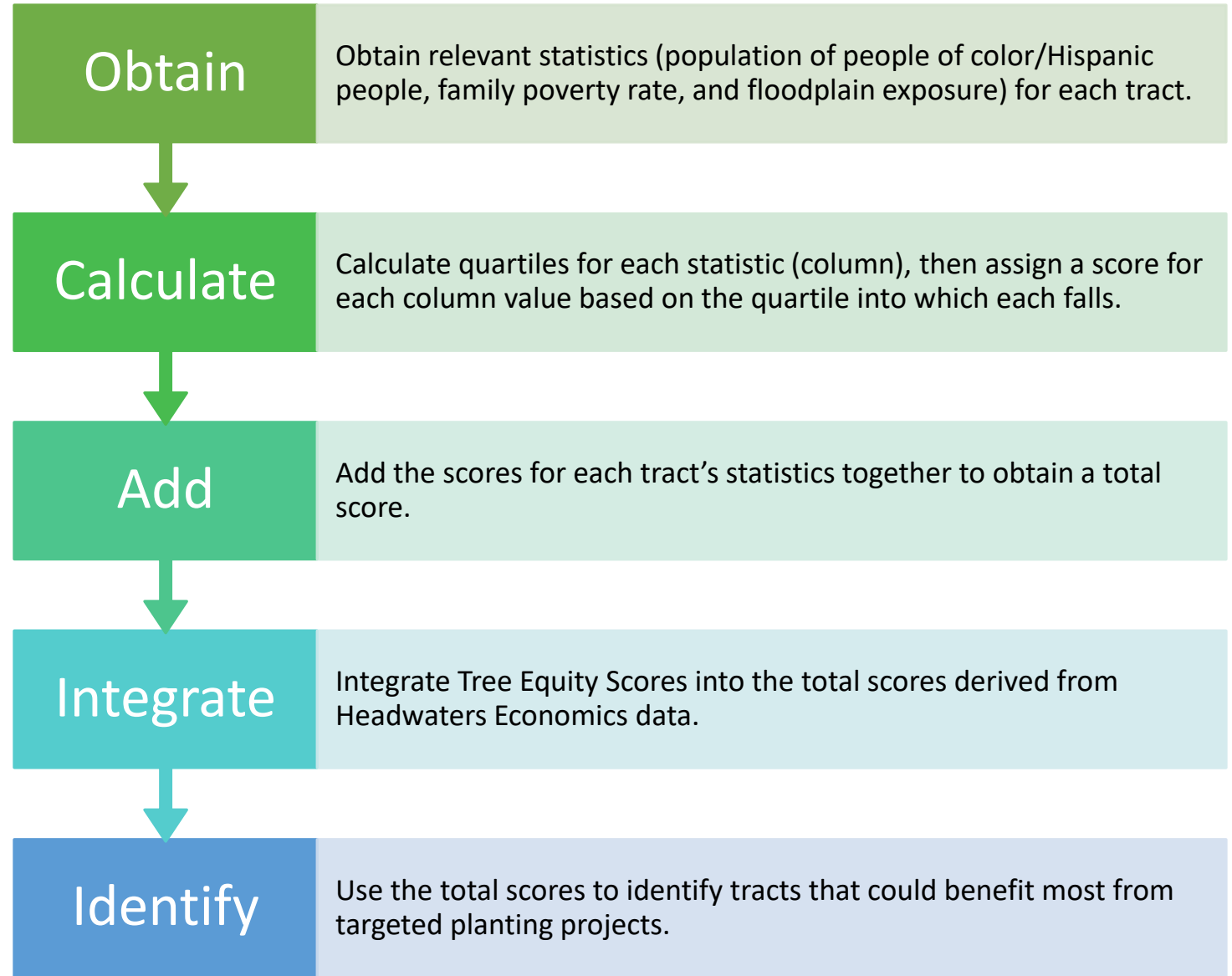
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Introduction

- Marginalized groups have long been underrepresented or ignored throughout the various branches of American society and governance.
 - Ex: people of color, low-income individuals, etc.
 - The Elizabeth Dean Fund and the Ann Arbor Forestry Department have an opportunity to address systemic inequality through targeted tree planting projects.
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Selecting Areas of Interest



Obtaining Statistics: Headwaters Economics

- Statistics were retrieved from Headwaters Economics using the [Neighborhoods at Risk](#) tool.
- I calculated quartiles for each variable (field) based on the tracts I collected information for.
 - I excluded tracts whose area fell mostly or completely outside the boundaries of the City of Ann Arbor. (Example: Tract 4060 falls mostly in Ann Arbor Charter Township, and thus was not included in my analysis.) This resulted in somewhat different medians than those that appear on the Headwaters website.



Assigning Scores to Fields Based on Field Values

Variable	Q ₁	Q ₂	Q ₃
People of color/Hispanic population	21	26.4	43.2
Poverty	1.05	4.5	12.1
Canopy-deficient area	77.8	80.7	88.1
Impervious coverage	29	35.8	43.7
Floodplain area	0.05	3.7	8.95
Seniors*	8.0	14	18.1
Children under 5	2.05	4.4	6.1
Uninsured rate	1.6	2.5	3.85

Scoring Criteria

$$Q_1 \geq x \rightarrow 0$$

$$Q_2 \geq x > Q_1 \rightarrow 1$$

$$Q_3 \geq x > Q_2 \rightarrow 2$$

$$x > Q_3 \rightarrow 3$$

Example

- 55% of the population of Tract 4056 is of color/Hispanic. I assign a 3 to the “Population POC” field for that tract because $55\% > 43.2\%$.
- 29.1% of Tract 4036’s area is covered by impervious material. Because $35.8\% \geq 29.1\% > 29\%$, I assign a 1 to the “Impervious Coverage” field.

Values in table are given in percentages.

Factoring in Tree Equity Scores

“[Tree Equity Score] calculates scores based on how much tree canopy and surface temperature align with income, employment, race, age and health factors in the U.S.”

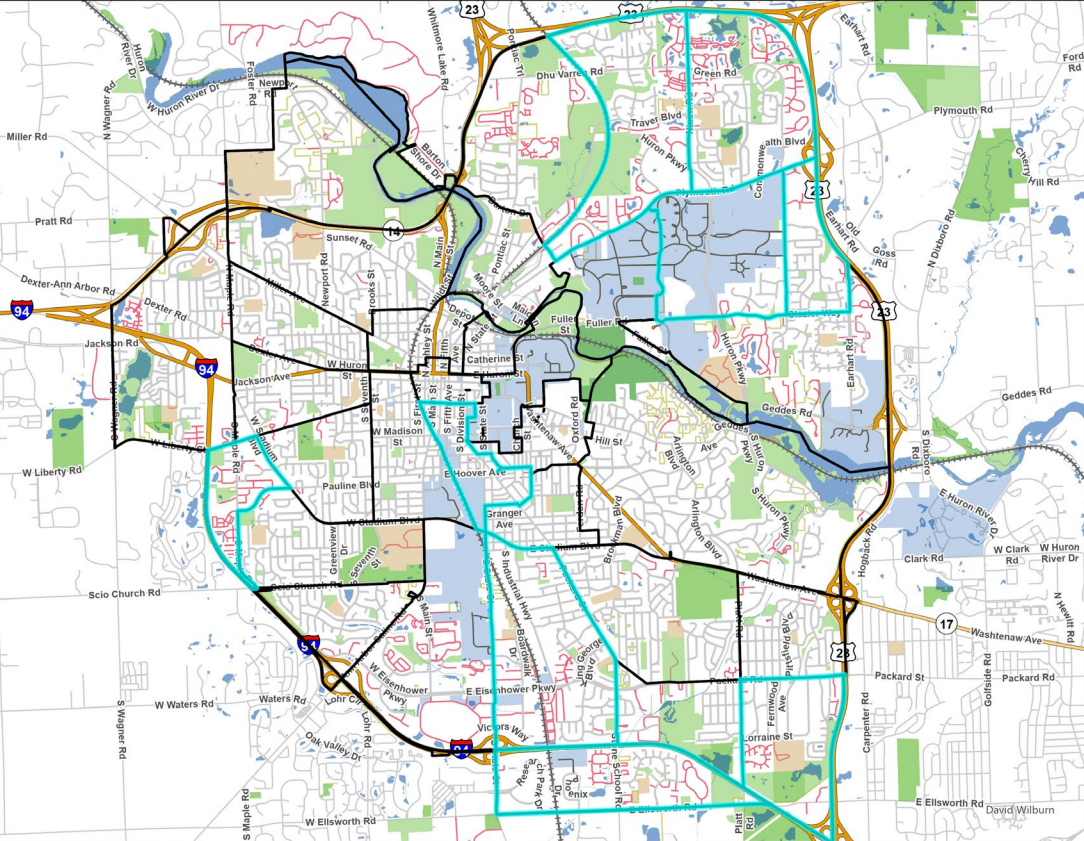
- [Tree Equity Score](#) website, “About” page

- Tree Equity Scores are calculated by census block group.
- I used TES to modify the priority scoring derived from Headwaters.
 - Sort TES into quartiles.
 - Assign scoring modifiers:
 - $x < Q_1 \rightarrow +[\text{average TES} \times 3]$
 - $Q_2 > x \geq Q_1 \rightarrow +[\text{average TES} \times 2]$
 - $Q_3 > x \geq Q_2 \rightarrow +[\text{average TES}]$
 - $Q_3 \leq x \rightarrow +0$

Other Factors in Tract Selection

- Some tracts that would have been included based on their scores have been excluded or revised.
 - University ownership
 - Current planting areas
 - Ex: Tract 4045 was originally included due to its high priority score, but it was removed because it is a plant area for spring of FY 2022.
 - Future planting areas
 - Ex: The southern portion of Tract 4036 was slated to be a large potential project, but that area also fell into a plant area for FY 2023. The area of interest for this tract was thus shifted to a different area of the tract.

Overview of Selected Tracts



Tracts outlined in turquoise contain areas of interest.

Project Scope

So exactly what kind of work can we do?



TREE PLANTING ON
VACANT SITES



STUMP REMOVALS



REMOVALS OF
UNHEALTHY STANDING
TREES



REPLACEMENT
PLANTINGS AT
REMOVAL SITES

What can't we do?



PARK TREES

Factors in Tree Species Selection



Wildlife



Road size and traffic volume



Air quality



Soil type

Species Selection

- Species choices might change as contracts are altered or awarded.
- Lists are intended to establish a starting point; they are not exclusive.
- Residents should have at least some input on the species of tree planted in their rights-of-way.
- Residents should be encouraged to choose a tree of the maximum size class a site can accommodate. However, if they are resistant to planting a larger tree but open to planting a smaller one, the city should allow the planting of a smaller tree. Less canopy is better than none.

Price Estimates

- Prices for tree plantings and waterings are derived from the current (FY 2023) contract with Margolis Companies. The costs listed are the maximums for each of those services.
- The listed stump removal cost is an average per stump based on city expenses.

Item	Cost
Small tree planting	\$325
Medium tree planting	\$375
Large tree planting	\$395
Watering (12 waterings) per tree	\$60
Stump removal	\$116.88
Stump removal, replacement, and watering	\$571.88

Price Estimates (cont.)

- The cost of removing a standing tree depends on a variety of factors, such as the location and the size of the tree. Therefore, the standing tree removal cost has not been estimated here.
- Expect to add the cost of stump removal to the removal of a standing tree unless stump removal is included in the quote.
- If the EDFC chooses to replace removed trees, the estimated cost of removing each stump and replacing it is \$471.88, most likely in addition to the cost of removing the tree itself.

Areas of Interest

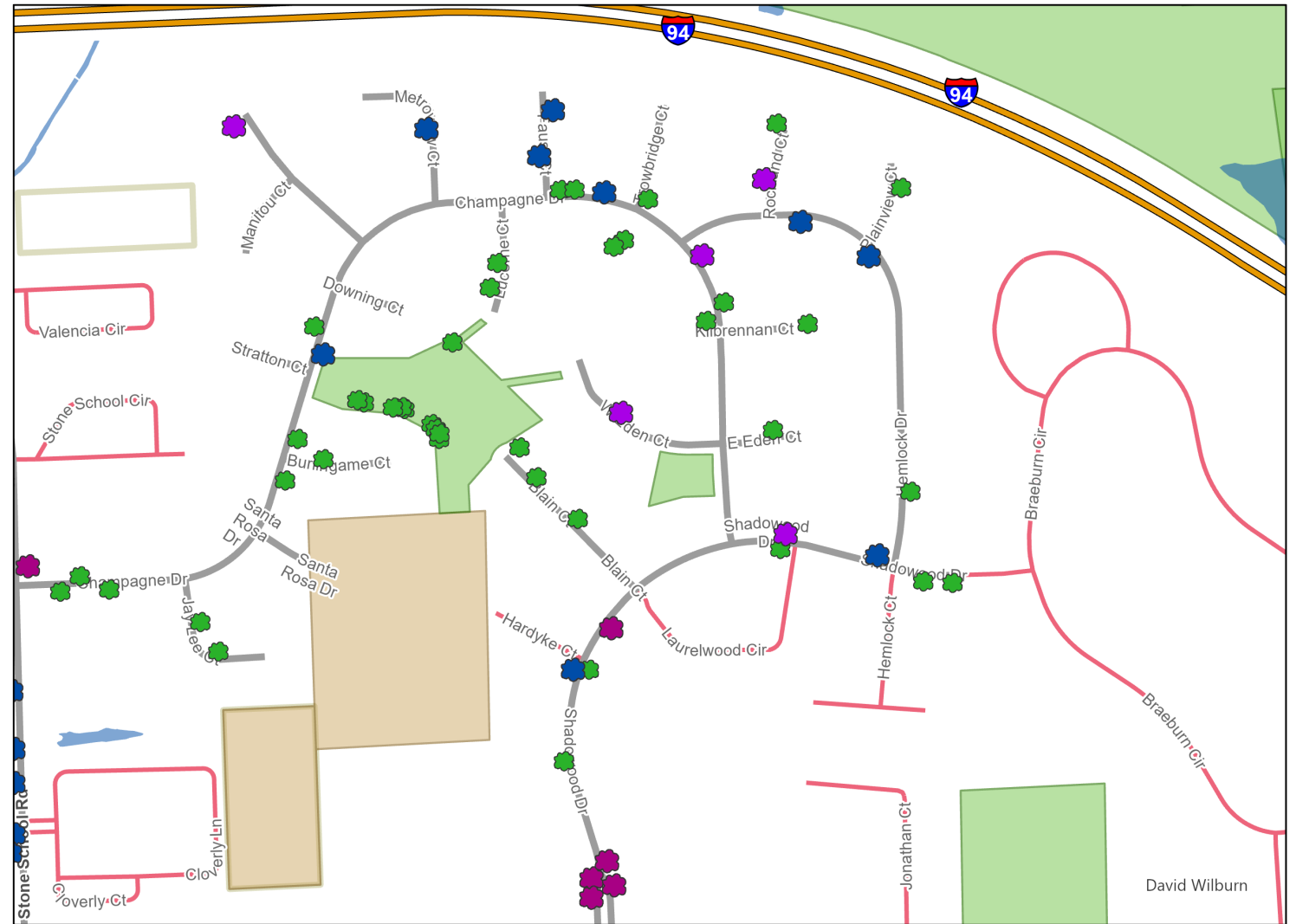
A decorative white torn paper effect is located at the bottom of the page, extending across the entire width. The edge of the paper is irregular and jagged, creating a layered appearance as it separates the black background from the white background below.



Tract 4056

Score: 28

4056: Bryant Neighborhood Score: 28



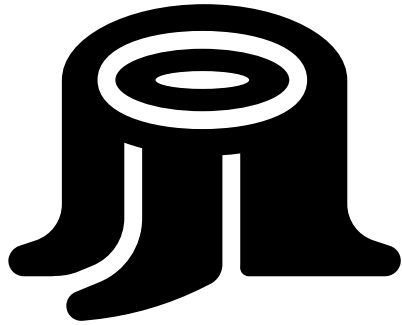
Vacant Planting Sites
Size
 • Large
 • Medium
 • Small
 □ Census Tracts

Note: The vacancies along Stone School and E Ellsworth and in Arbor Oaks Park are not included in price calculations.

Note: The green icons represent vacant sites of unspecified size class.

Size	Number	Max Cost Per Tree	Max Total Per Size Class	Watering Cost (12 waterings)	Maximum Total
Small	5	\$325	\$1,625	\$60	-
Medium	5	\$375	\$1,875	\$60	-
Large	9	\$395	\$3,555	\$60	-
Unassigned	31	\$395	\$12,245	\$60	
Total	50	-	\$19,300	\$3,000	\$22,300

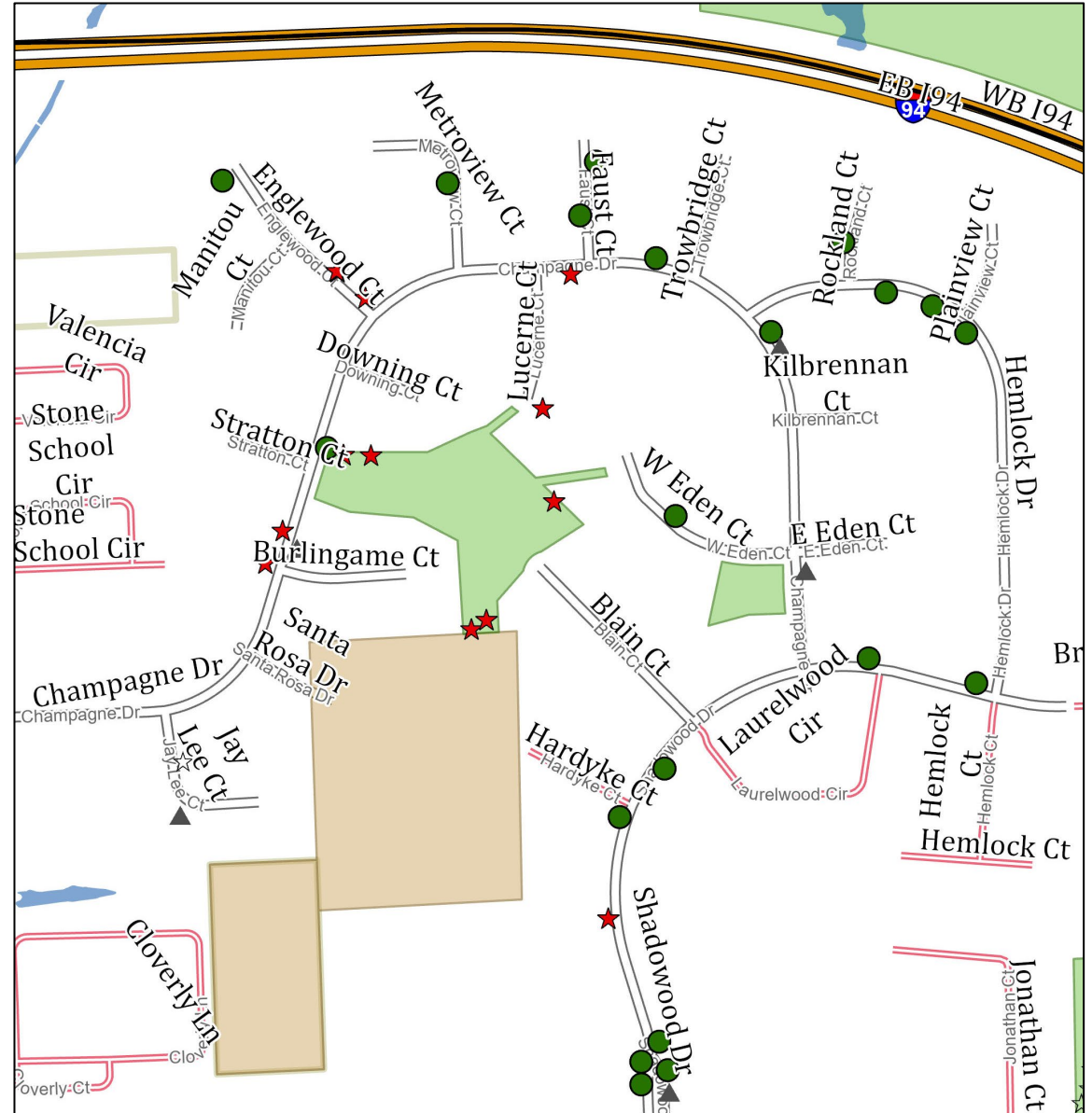
Stumps and Removals



Item	Quantity
Stumps	4
Priority 1 Removals	0
Priority 2 Removals	0
Priority 3 Removals	3

Estimated stump removal, replacement, and watering: **\$2,287.52**

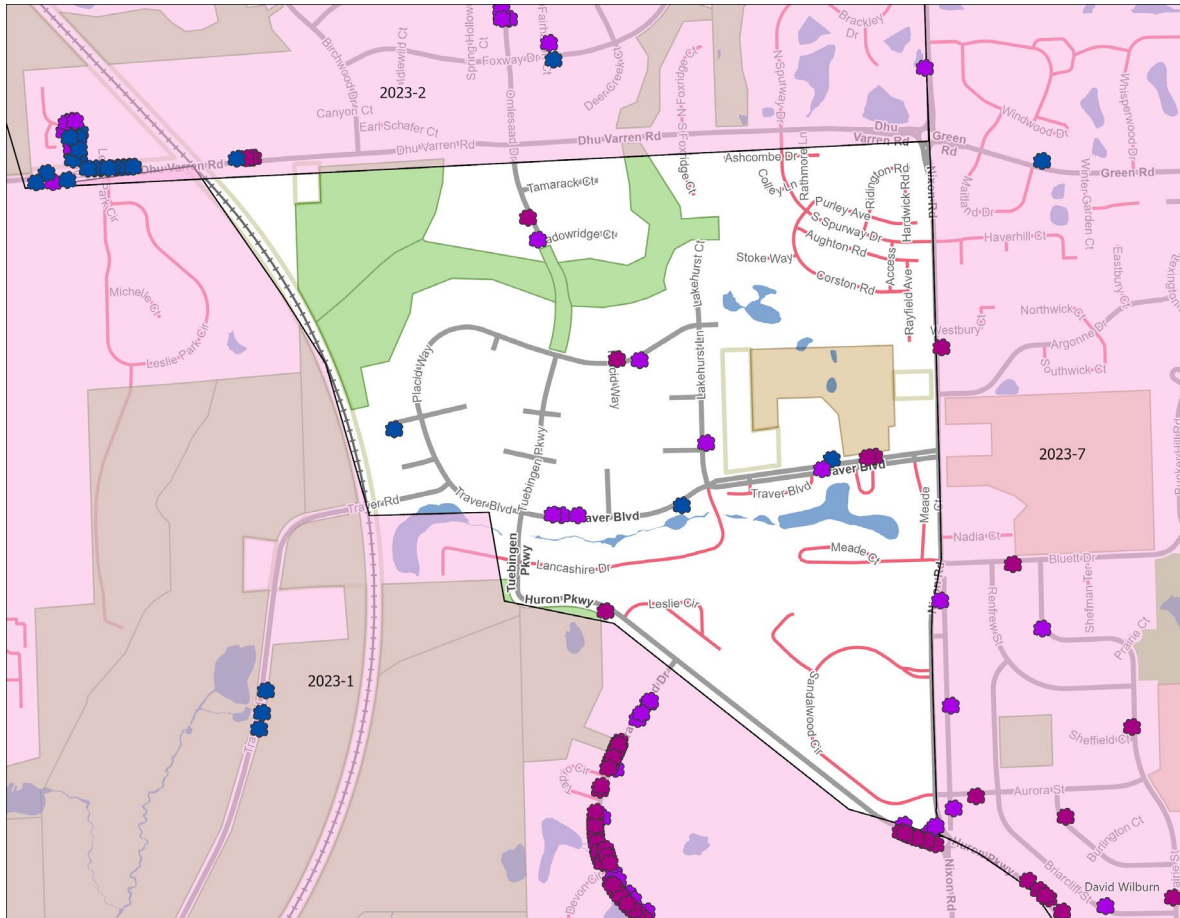
Estimated stump removal, replacement, and watering (including standing removals): **\$4,003.16**



Suggested Species

Common Name	Scientific Name	Size
Downy serviceberry	<i>Amelanchier arborea</i>	Small
Allegheny serviceberry	<i>Amelanchier laevis</i>	Small
Common hackberry	<i>Celtis occidentalis</i>	Large
Sweetgum	<i>Liquidambar styraciflua</i>	Large
Blackgum	<i>Nyssa sylvatica</i>	Medium
London planetree	<i>Platanus x acerifolia</i>	Large
Swamp white oak	<i>Quercus bicolor</i>	Large
Bald cypress	<i>Taxodium distichum</i>	Large
American elm or cultivars	<i>Ulmus americana</i>	Large
Tuliptree	<i>Liriodendron tulipifera</i>	Large
American hornbeam	<i>Carpinus caroliniana</i>	Medium

Tract 4036



Vacant Planting Sites

Size

● Large

● Medium

● Small

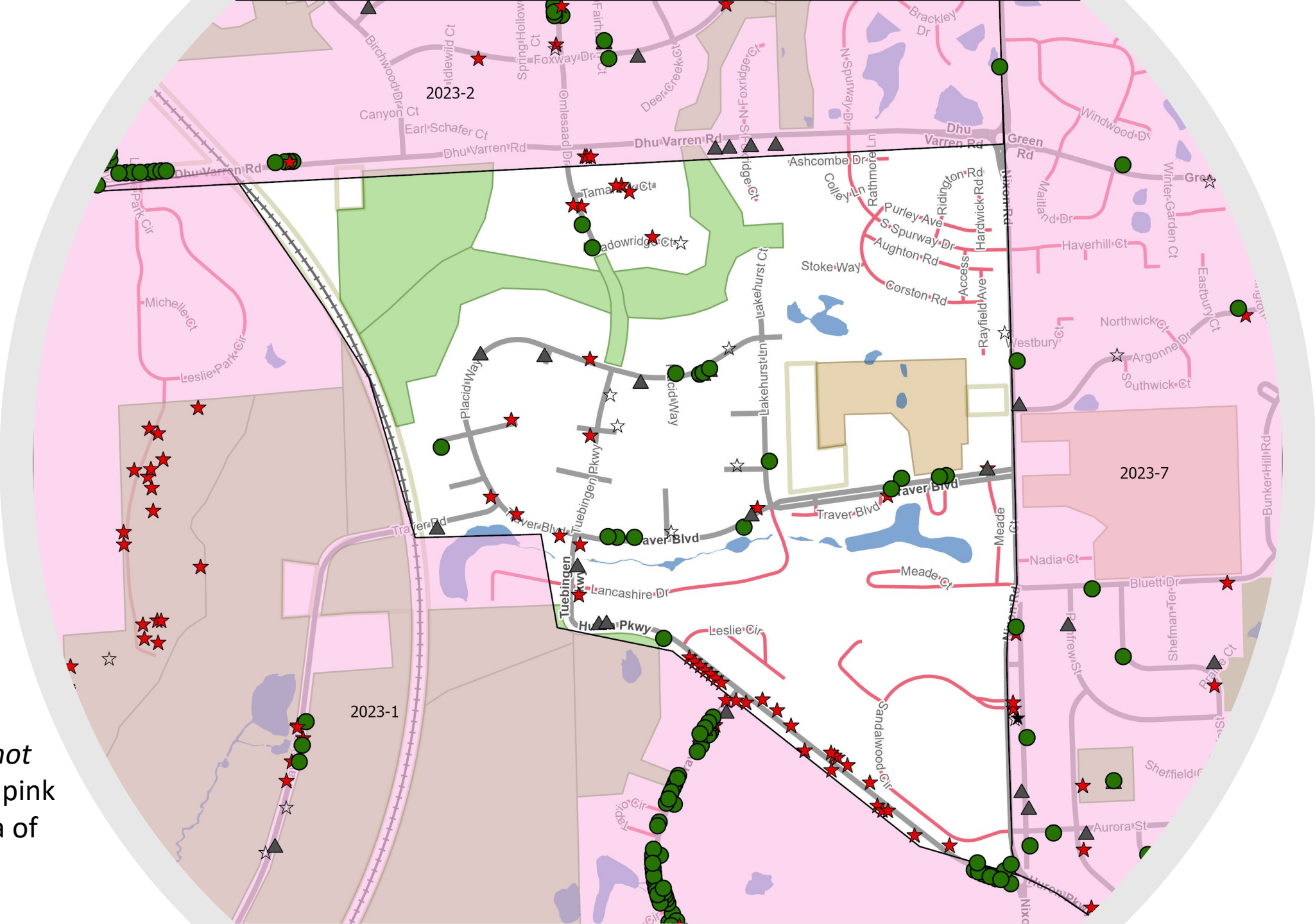
□ Census Tracts

The area *not* shaded in pink is our area of interest.



Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	5	\$325	\$1,625	\$60	-
Medium	8	\$375	\$3,000	\$60	-
Large	3	\$395	\$1,185	\$60	-
Total	14	-	\$5,810	\$840	\$6,650



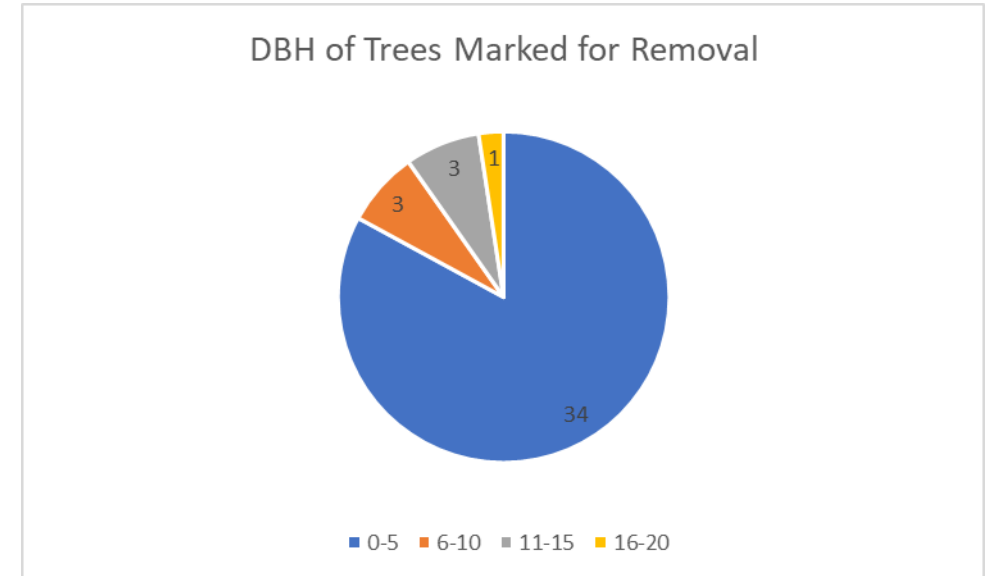


The area *not* shaded in pink is our area of interest.

Stumps and Removals

Item	Quantity
Stumps	11
Priority 1 Removals	0
Priority 2 Removals	7
Priority 3 Removals	34

Estimated stump removal, replacement, and watering: \$6,290.68



Most removals have a DBH of 5 inches or less.

Tract 4042

Score: 25



S Maple Rd

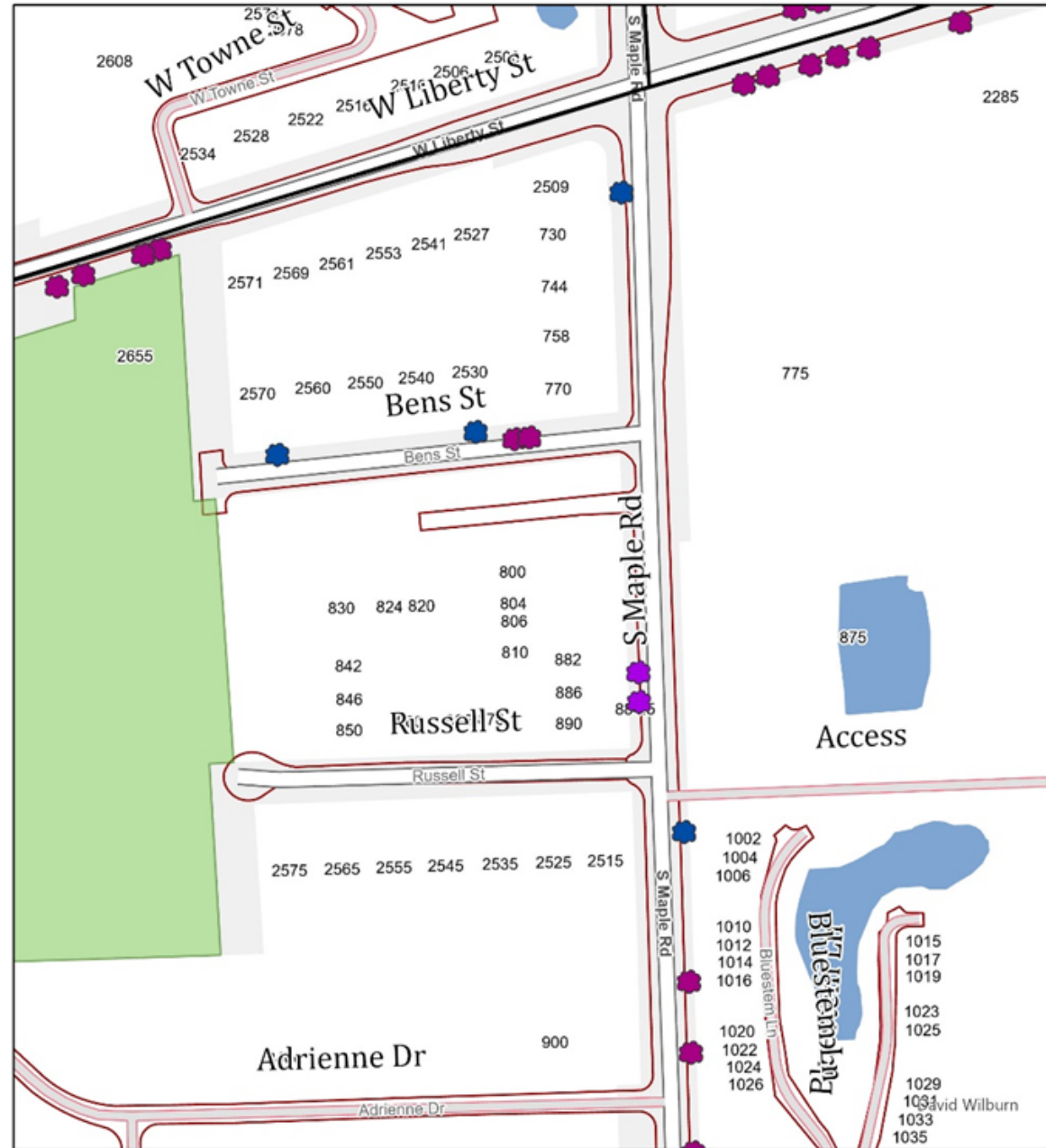
(W Liberty St to Adrienne Dr)


Vacant Planting Sites

Size

- Large
- Medium
- Small

Census Tracts





Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	14	\$325	\$4,130	\$60	-
Medium	2	\$375	\$750	\$60	-
Large	4	\$395	\$1,580	\$60	-
Total	20	-	\$6,460	\$1,200	\$7,660



S Maple Rd

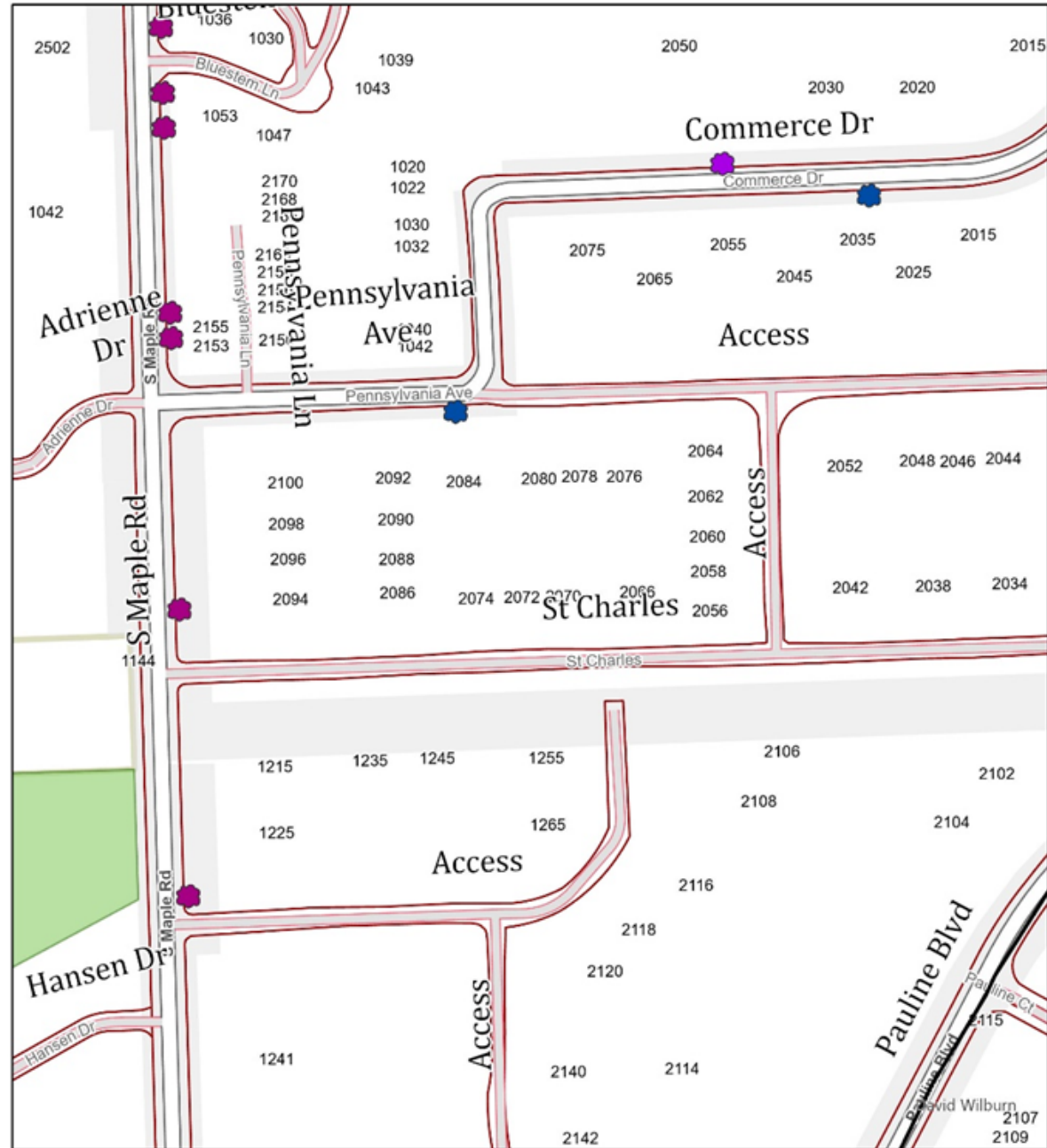
(Bluestem Ln to Hansen Dr)

Vacant Planting Sites

Size

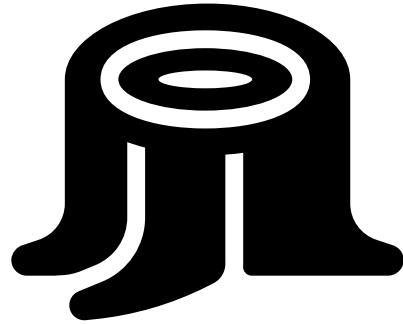
- Large
- Medium
- Small

Census Tracts



Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	7	\$325	\$2,275	\$60	-
Medium	1	\$375	\$375	\$60	-
Large	2	\$395	\$790	\$60	-
Total	10	-	\$3,440	\$600	\$4,040

Stumps and Removals



Item	Quantity
Stumps	16
Priority 1 Removals	0
Priority 2 Removals	0
Priority 3 Removals	8

Trees

Maintenance

- Plant Tree
- ★ Priority 1 Removal
- ☆ Priority 2 Removal
- ★ Priority 3 Removal
- ▲ Stump Removal
- Census Tracts

Estimated stump removal, replacement, and watering: **\$9,150.08**



Tract 4046

Score: 24.5

Vacant Planting Sites

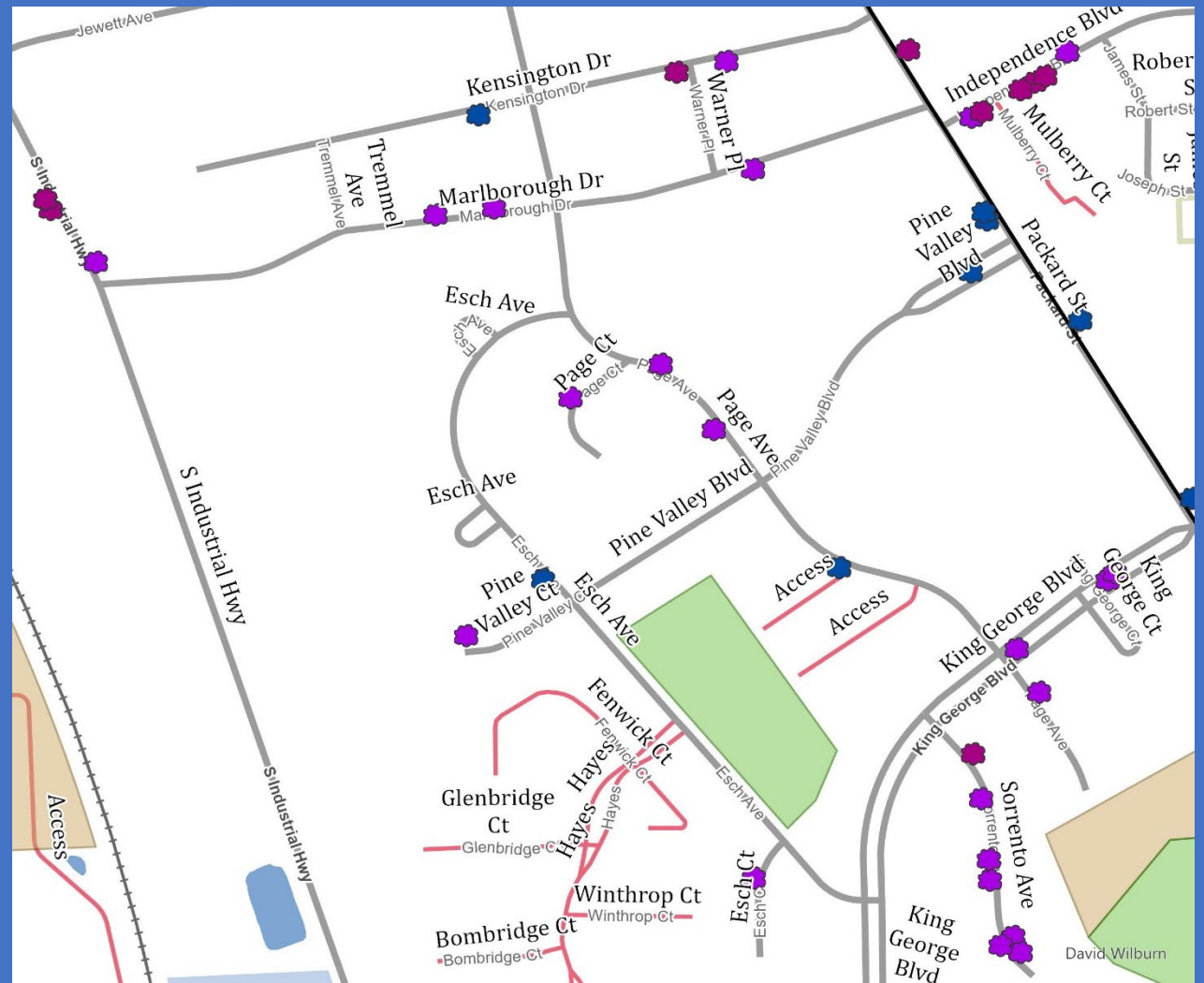
Size

Large

Medium

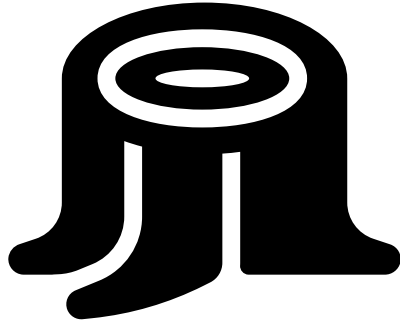
Small

Census Tracts



Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	4	\$325	\$1,300	\$60	-
Medium	20	\$375	\$7,500	\$60	-
Large	6	\$395	\$2,370	\$60	-
Total	30	-	\$11,170	\$1,800	\$12,970

Stumps and Removals



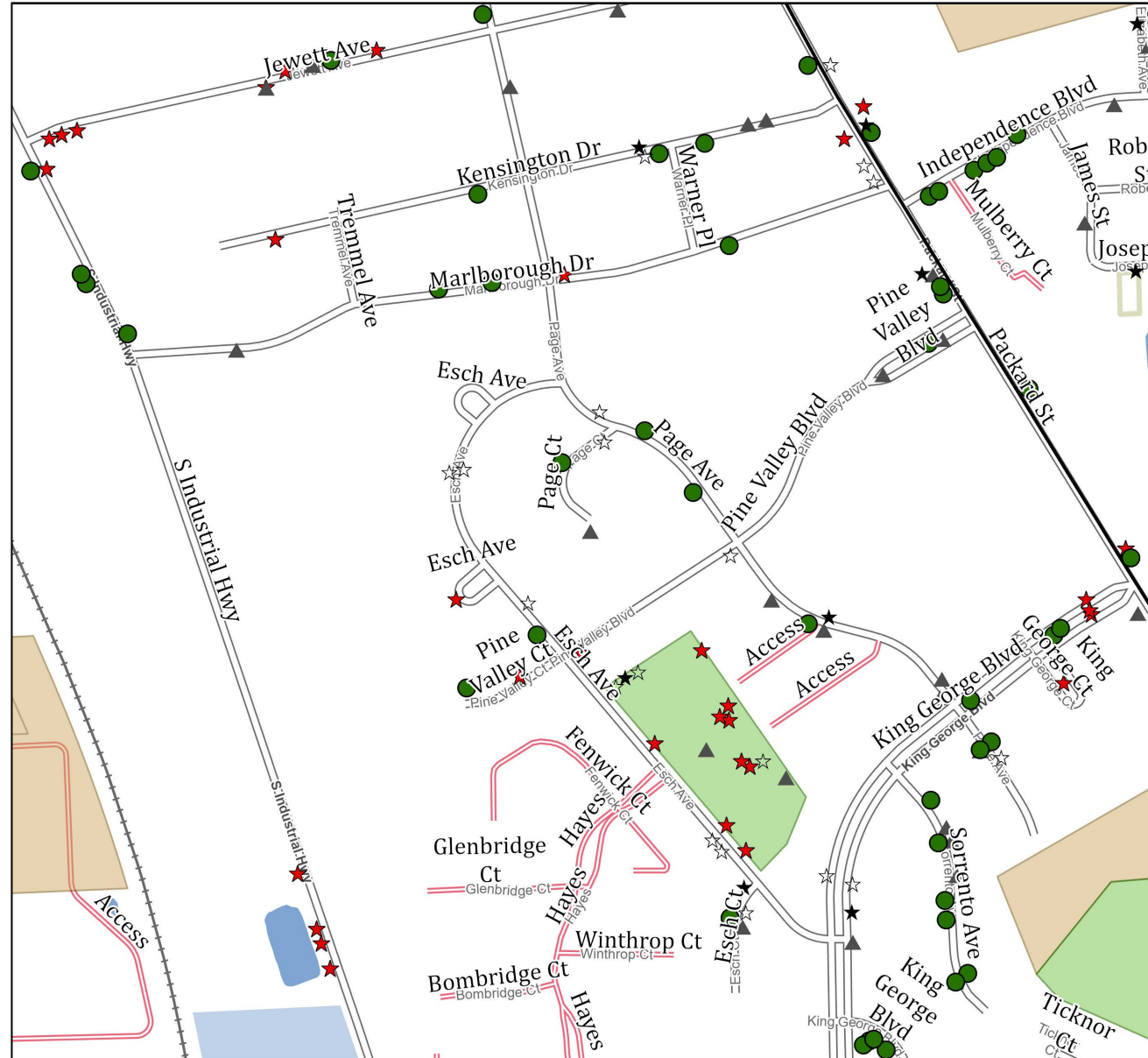
Item	Quantity
Stumps	20
Priority 1 Removals	4
Priority 2 Removals	15
Priority 3 Removals	21

Trees

Maintenance

- Plant Tree
- ★ Priority 1 Removal
- ☆ Priority 2 Removal
- ★ Priority 3 Removal
- ▲ Stump Removal
- Census Tracts

Estimated cost of stump removal, replacement, and watering: **\$9,437.60**



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Tract 4027

Score: 22.01

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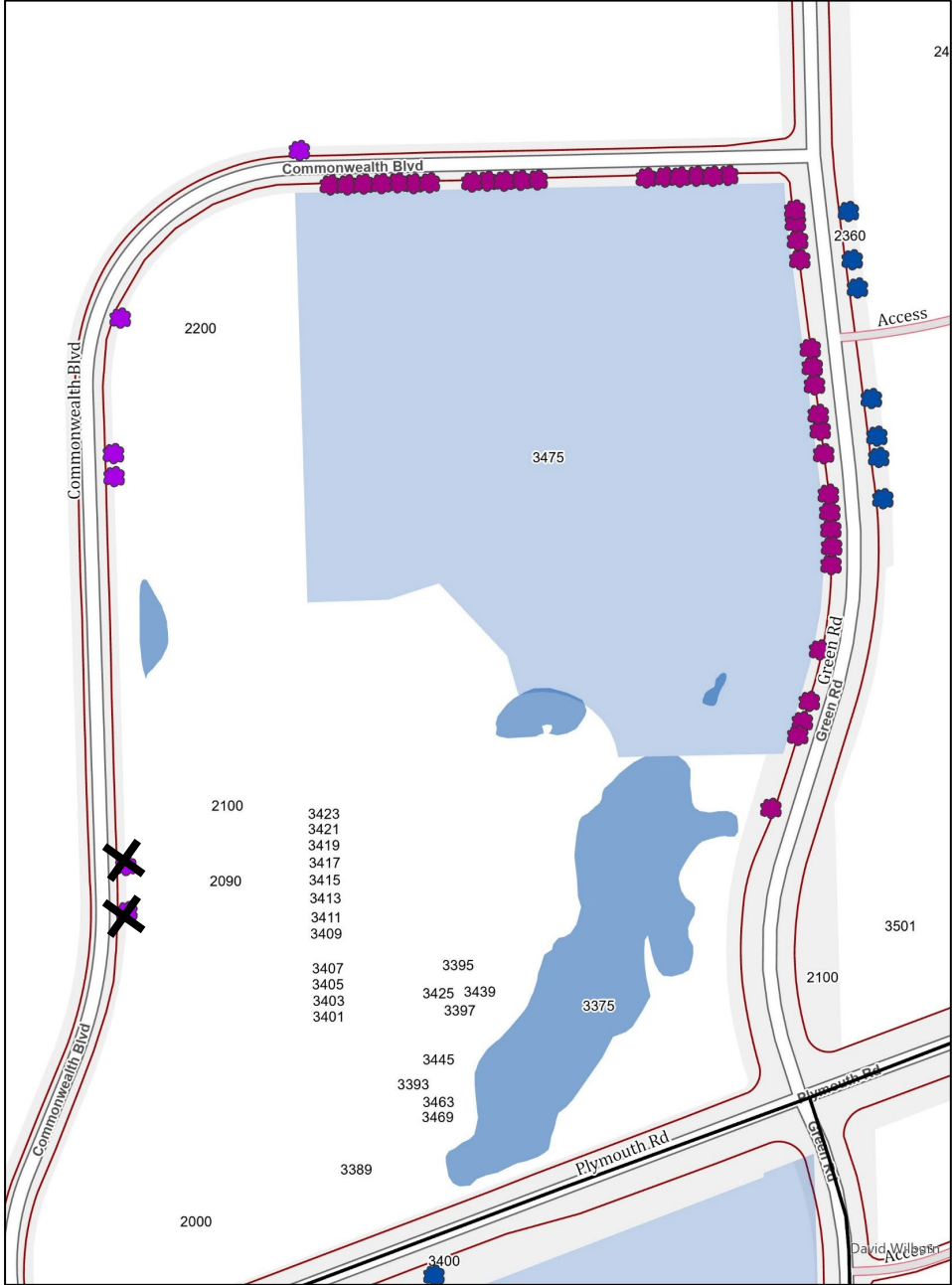
Commonwealth Blvd and Green Rd


Vacant Planting Sites

Size


- Large
- Medium
- Small

□ Census Tracts



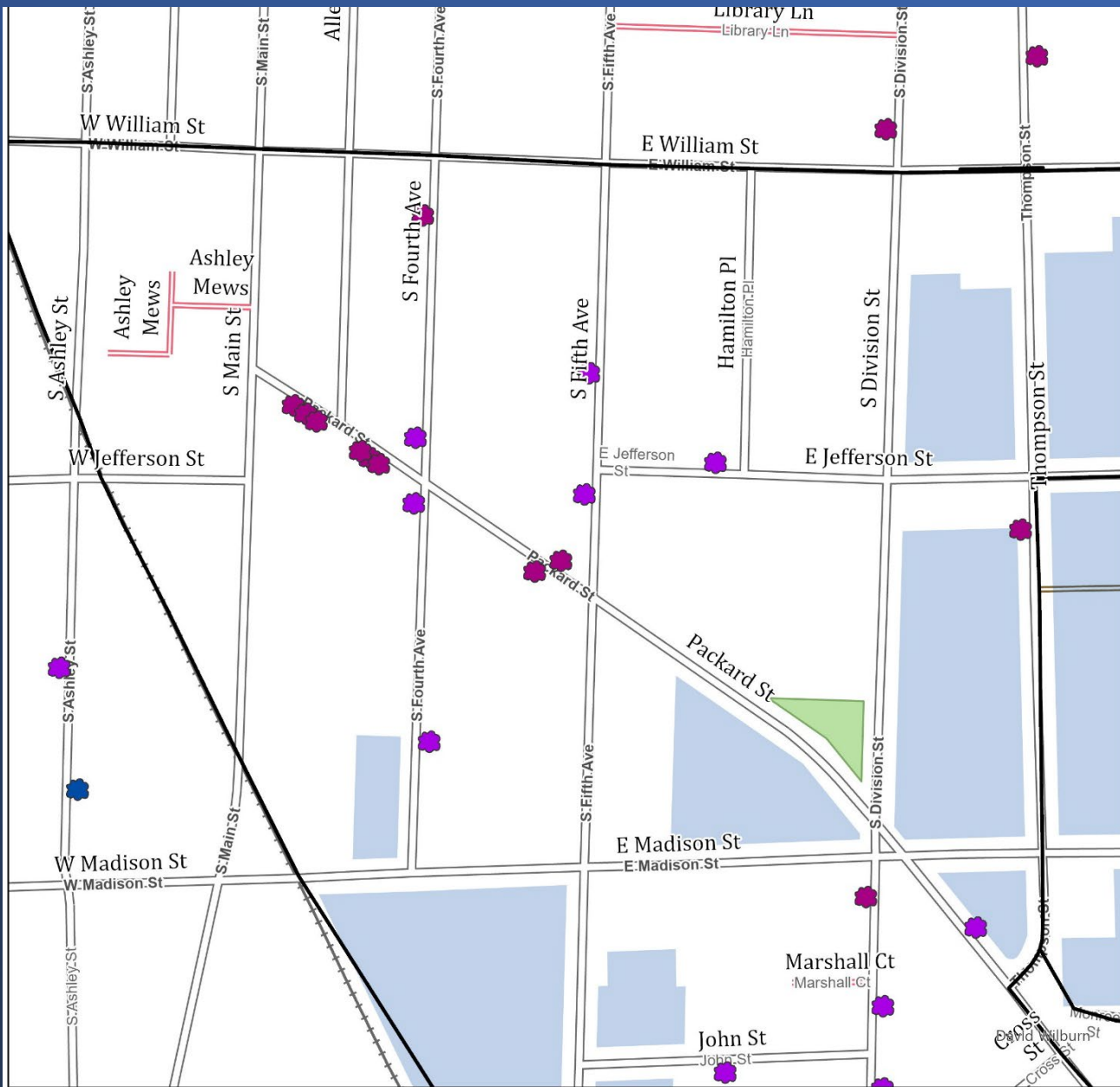


Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	38	\$325	\$12,350	\$60	-
Medium	6	\$375	\$2,250	\$60	-
Large	7	\$395	\$2,765	\$60	-
Total	51	-	\$17,365	\$3,180	\$20,545



Tract 4005

Score: 21.2

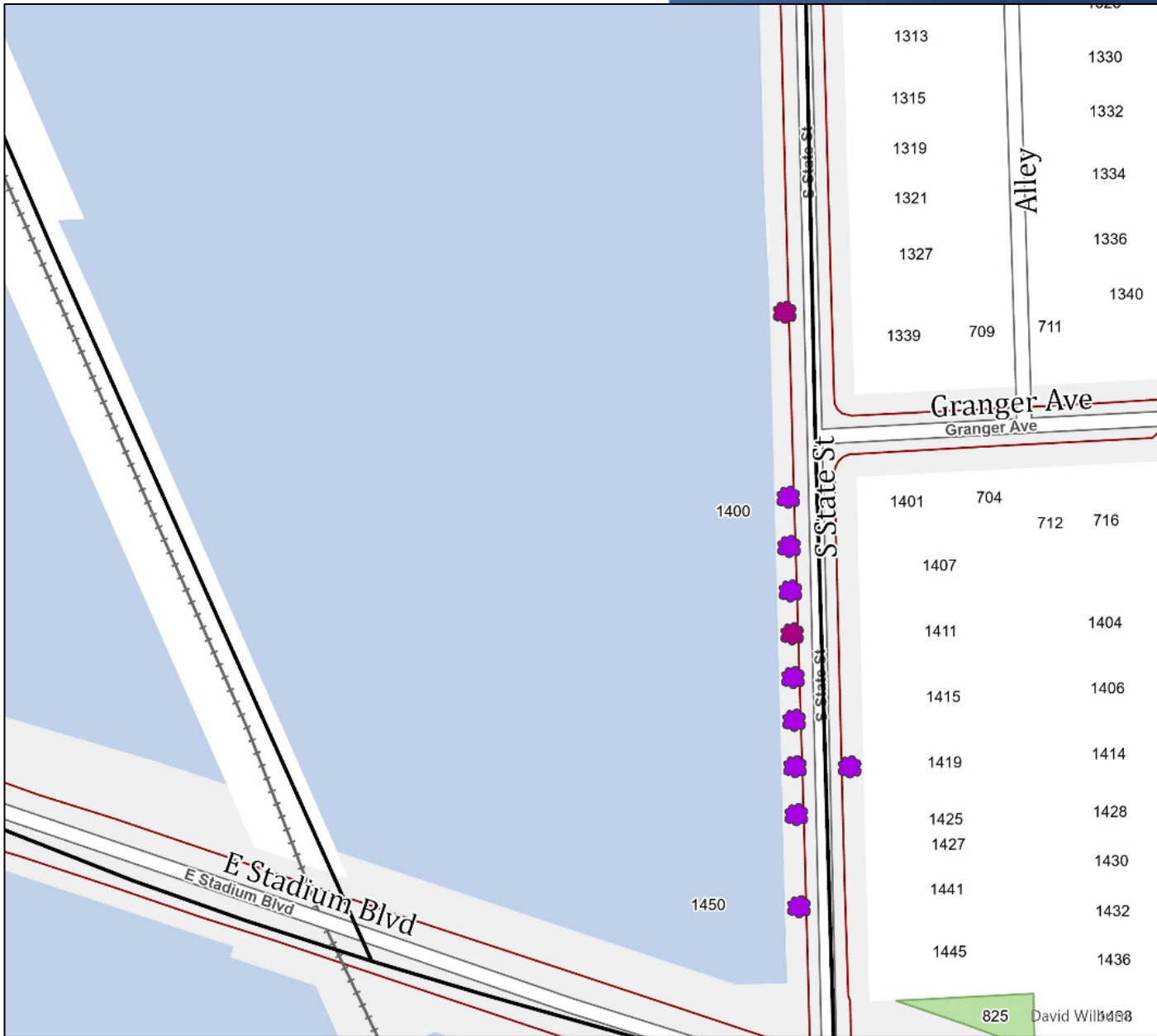


Vacant Planting Sites

Size

- Large
- Medium
- Small
- Census Tracts

Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	11	\$325	\$3,575	\$60	-
Medium	9	\$375	\$3,375	\$60	-
Large	0	-	-	-	-
Total	20	-	\$6,950	\$1,200	\$8,150



Vacant Planting Sites

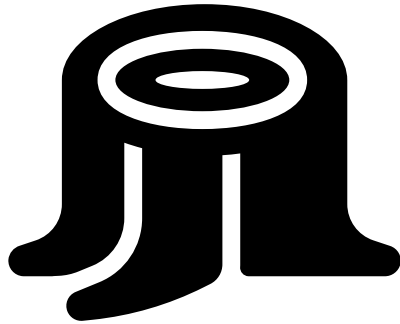
Size

- Large
- Medium
- Small
- Census Tracts

Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	2	\$325	\$650	\$60	-
Medium	8	\$375	\$3,000	\$60	-
Large	0	-	-	-	-
Total	10	-	\$3,650	\$600	\$4,250

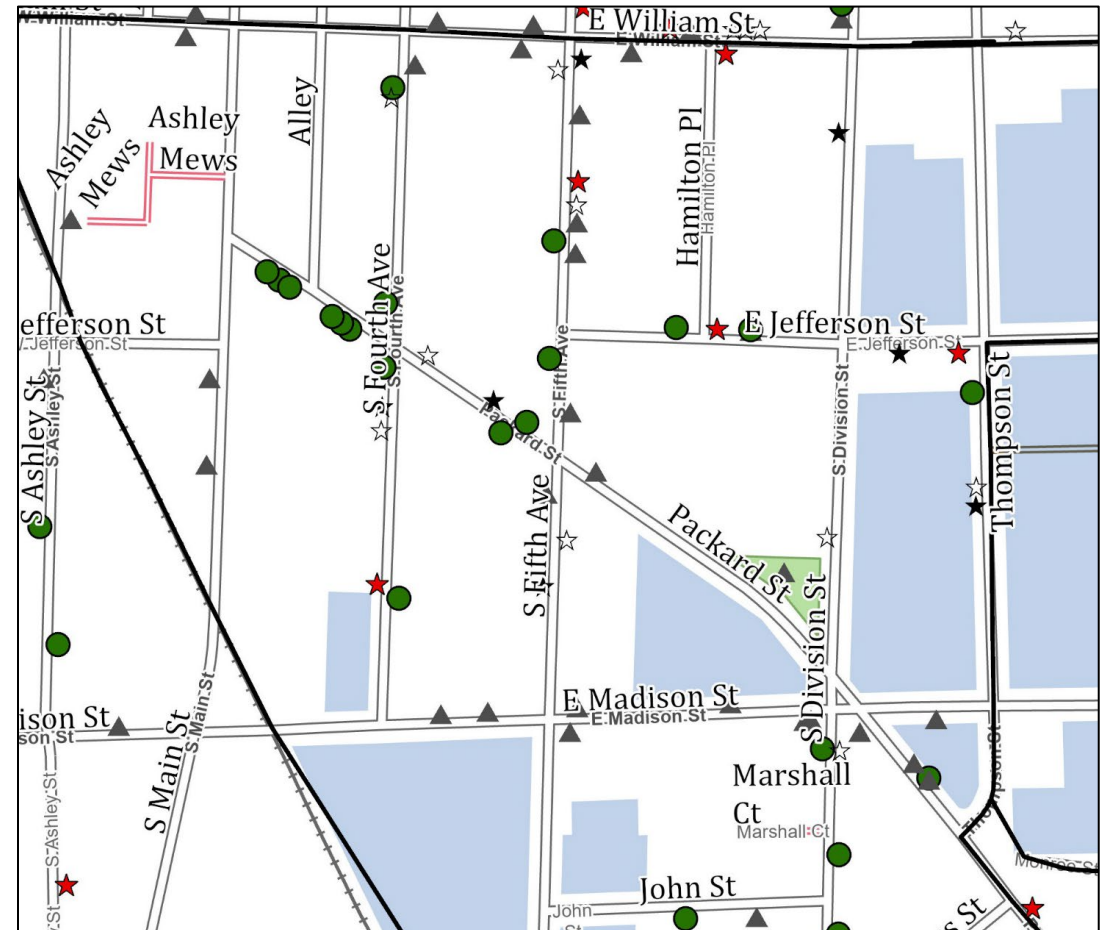
Note: The medium vacant site on the east side of S State St (outside the tract boundaries) could – for the sake of completing that stretch of road - be planted and watered for an additional \$435, bringing the maximum total to \$4,685.

Stumps and Removals



Item	Quantity
Stumps	12
Priority 1 Removals	6
Priority 2 Removals	8
Priority 3 Removals	5

Estimated cost of stump removal, replacement, and watering: **\$6,862.56**



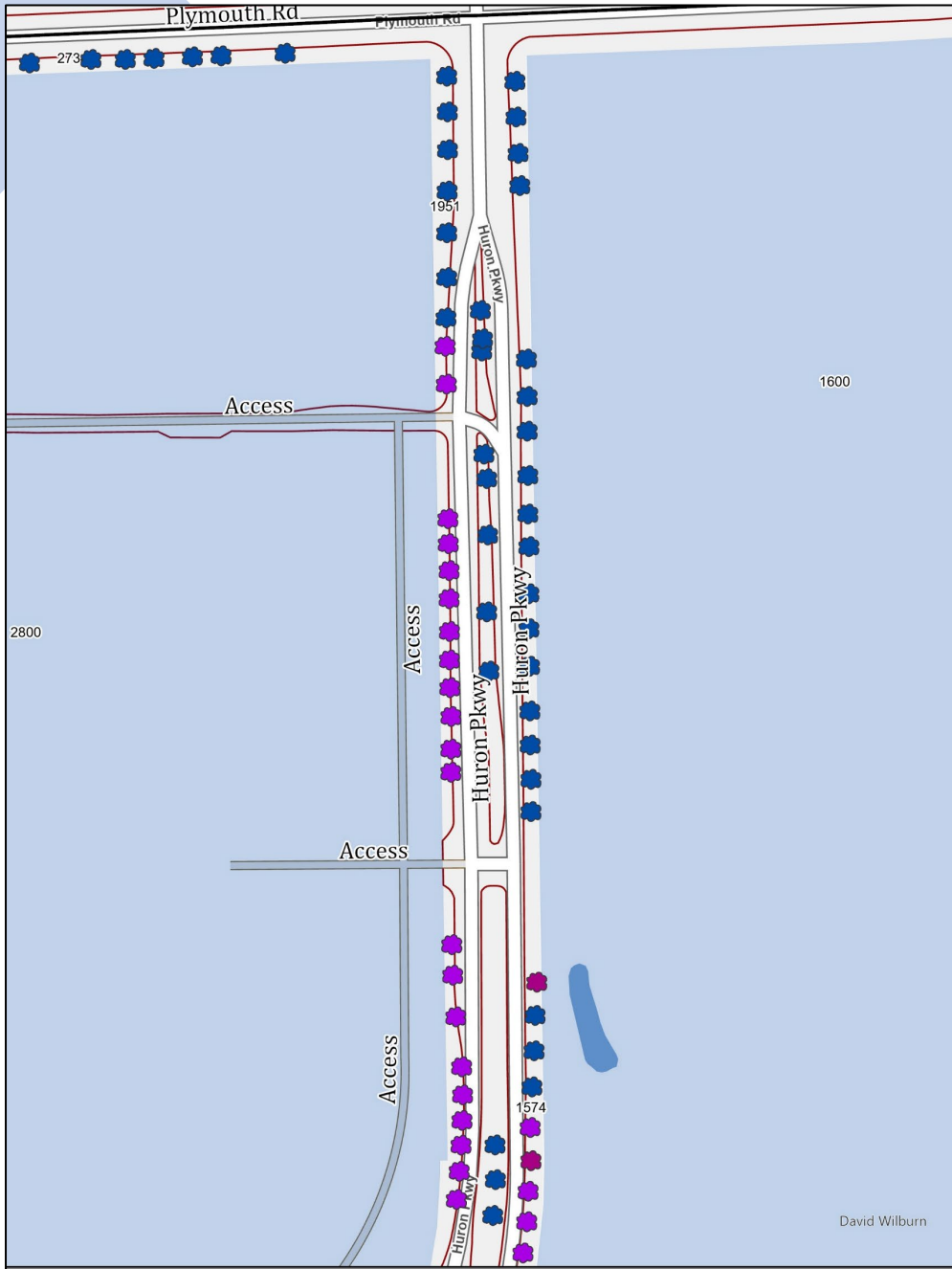
Trees

Maintenance

- Plant Tree
- ★ Priority 1 Removal
- ☆ Priority 2 Removal
- ★ Priority 3 Removal
- ▲ Stump Removal
- Census Tracts

Tract 4026

Score: 20.5



Vacant Planting Sites

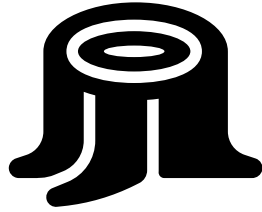
Size

- Large
- Medium
- Small

Census Tracts

Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	2	\$325	\$650	\$60	-
Medium	25	\$375	\$9,375	\$60	-
Large	45	\$395	\$17,775	\$60	-
Total	72	-	\$27,800	\$4,320	\$32,120

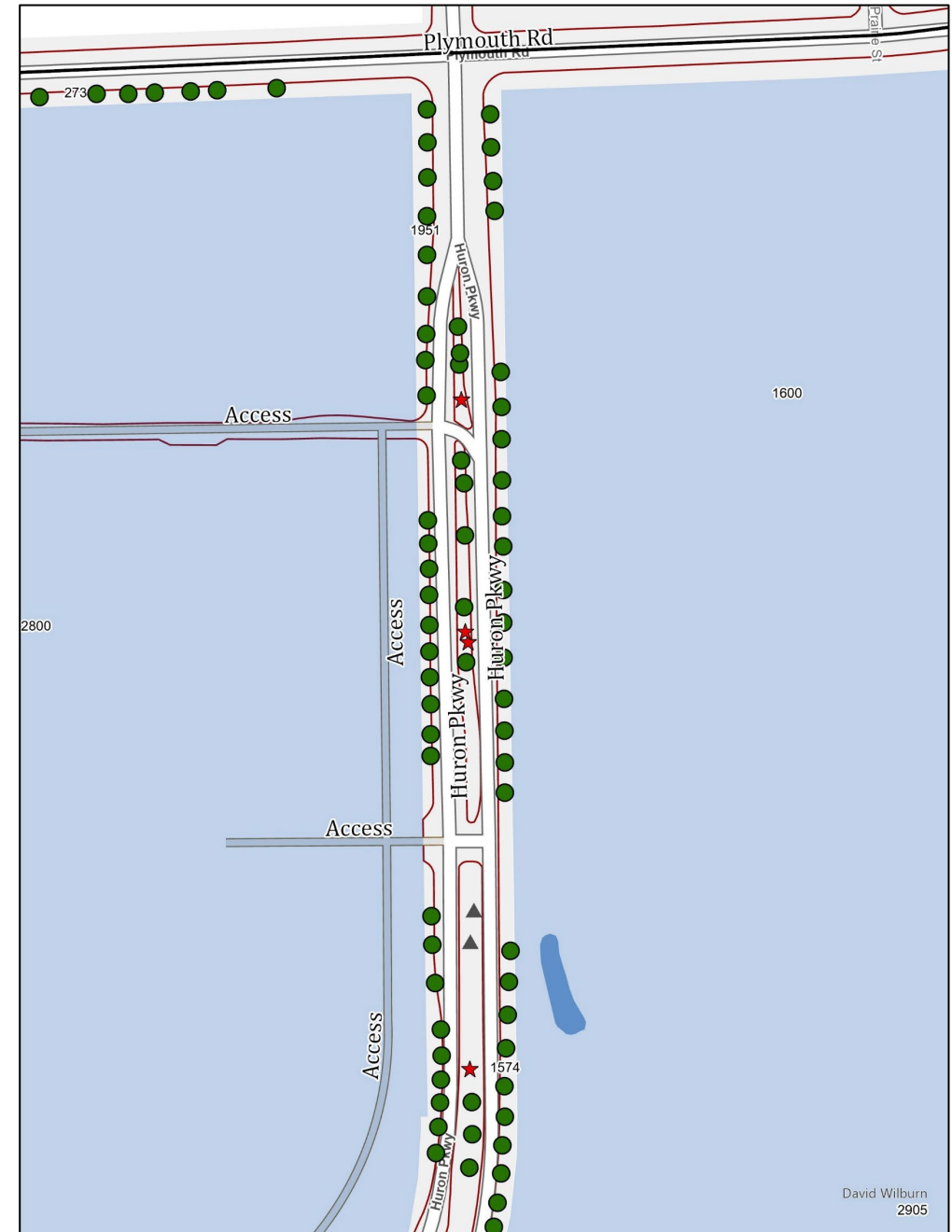
Stumps and Removals



Item	Quantity
Stumps	2
Priority 1 Removals	0
Priority 2 Removals	0
Priority 3 Removals	3

Estimated cost of stump removal, replacement, and watering: **\$1,143.76**

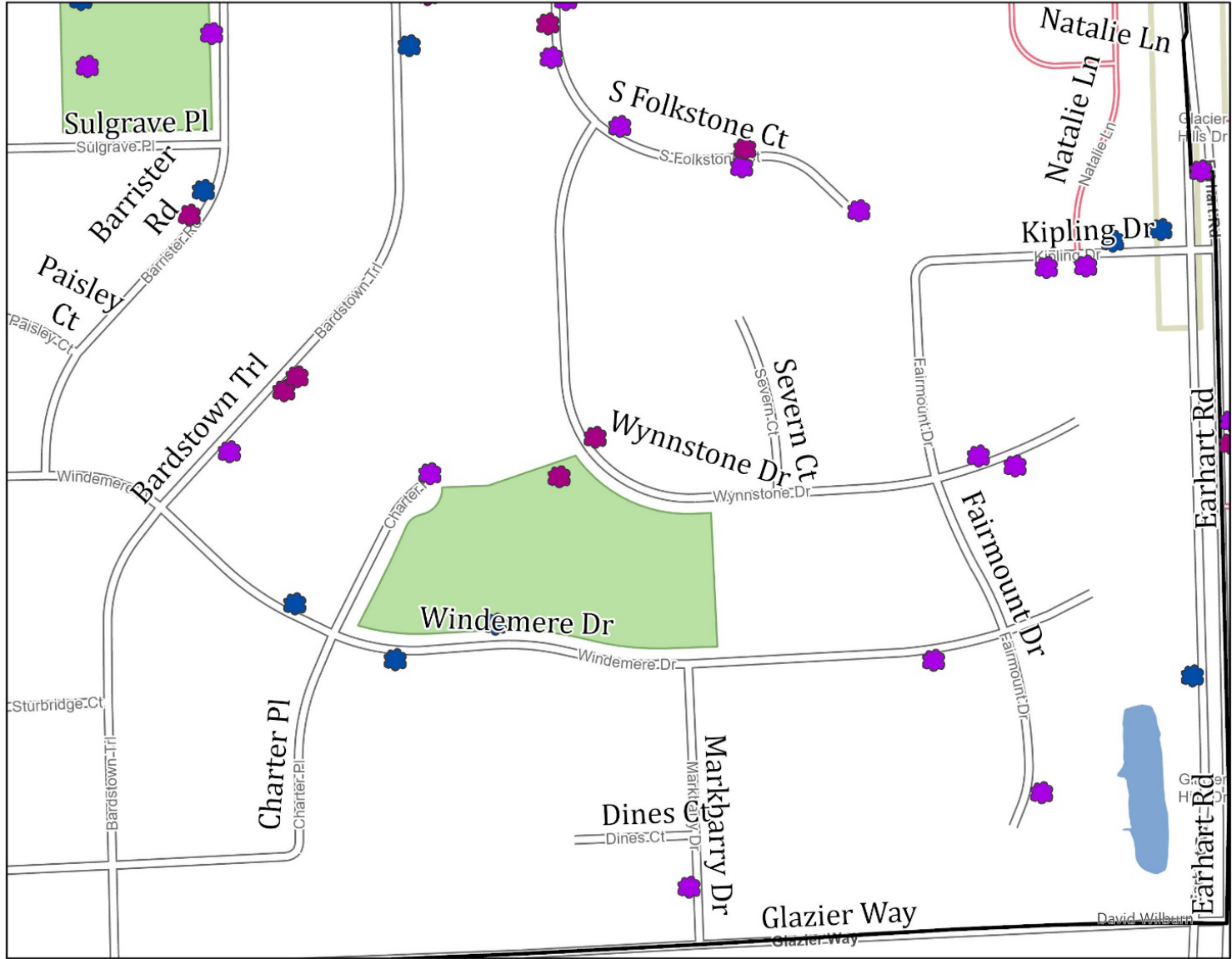
- Trees
Maintenance
- Plant Tree
 - ★ Priority 1 Removal
 - ☆ Priority 2 Removal
 - ★ Priority 3 Removal
 - ▲ Stump Removal
 - Census Tracts



Tract 4025

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Score: 19



Vacant Planting Sites

Size

• Large

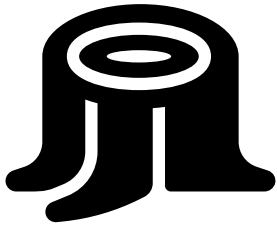
• Medium

• Small

□ Census Tracts

Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	6	\$325	\$1,950	\$60	-
Medium	13	\$375	\$4,875	\$60	-
Large	5	\$395	\$1,975	60	-
Total	24	-	\$8,800	\$1,440	\$10,240

Stumps and Removals



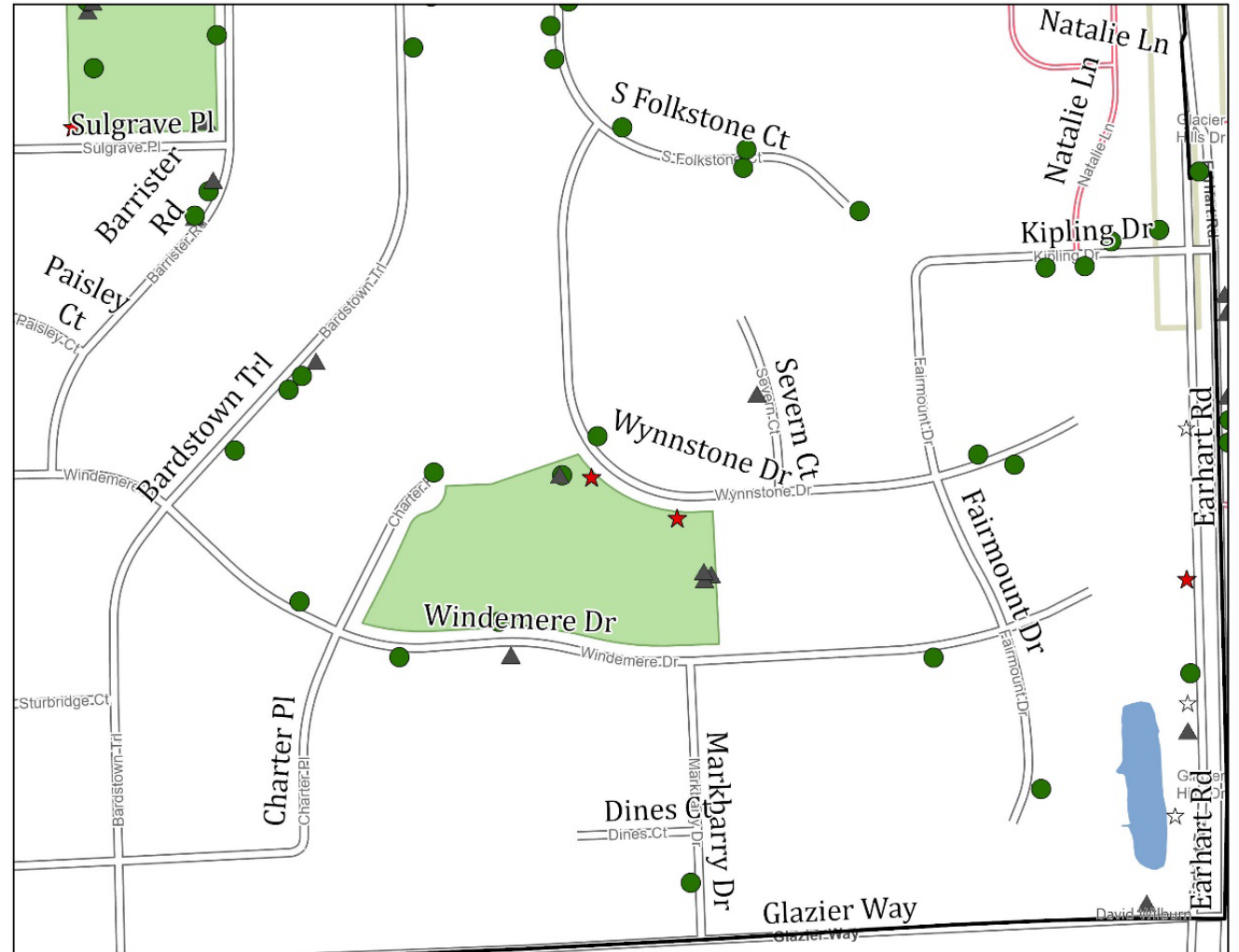
Item	Quantity
Stumps	6
Priority 1 Removals	0
Priority 2 Removals	3
Priority 3 Removals	1

Estimated cost of stump removal, replacement, and watering: **\$3,431.28**

Trees

Maintenance

- Plant Tree
- ★ Priority 1 Removal
- ☆ Priority 2 Removal
- ★ Priority 3 Removal
- ▲ Stump Removal
- Census Tracts



Tract 4055

Score: 19

Vacant Planting Sites

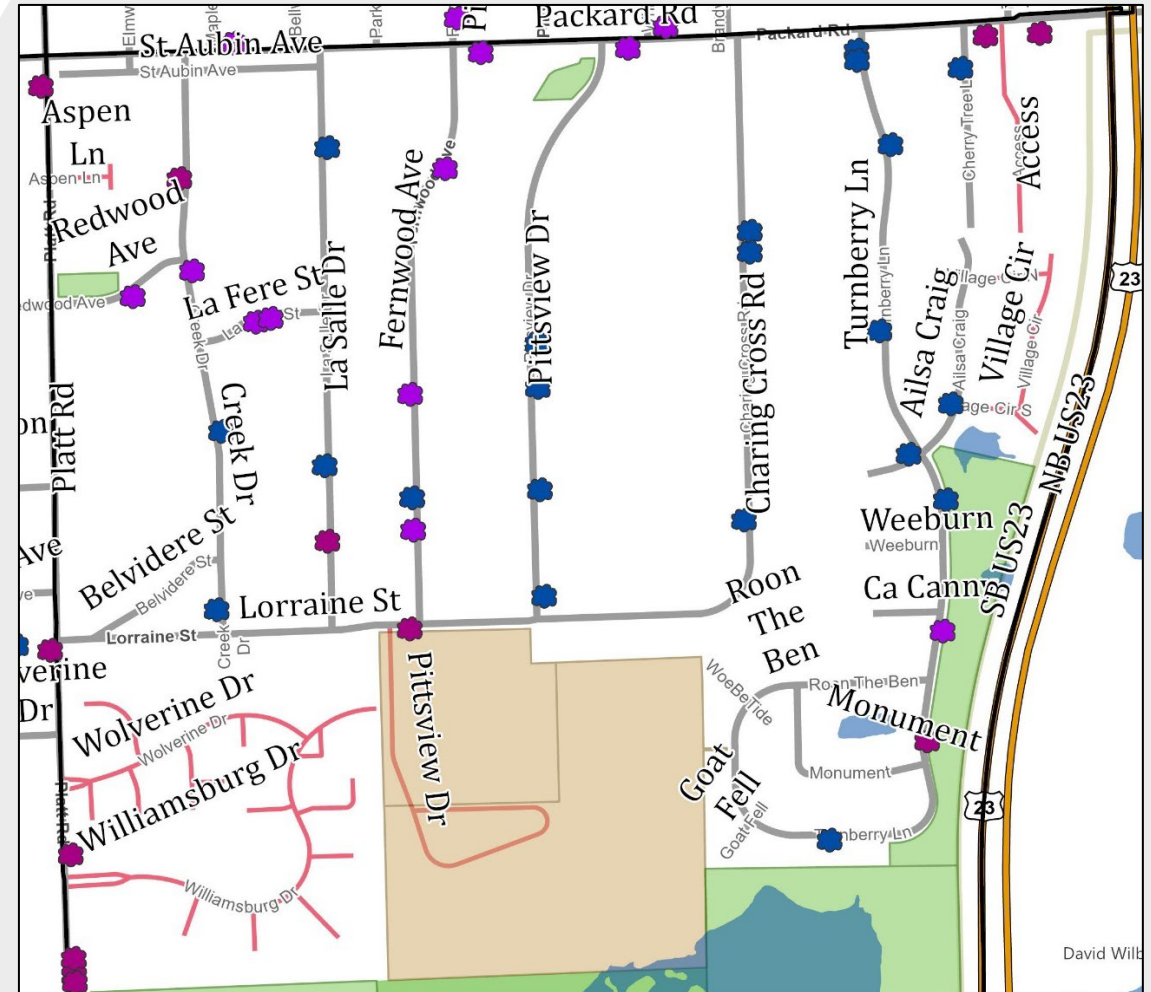
Size

● Large

● Medium

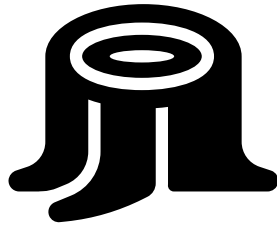
● Small

□ Census Tracts



Size	Number	Max Cost For Size Class	Size Class Total	Watering Cost Per Tree (12 waterings)	Maximum Total Cost
Small	10	\$325	\$3,250	\$60	-
Medium	10	\$375	\$3,750	\$60	-
Large	21	\$395	\$8,295	\$60	-
Total	41	-	\$15,295	\$2,460	\$17,755

Stumps and Removals



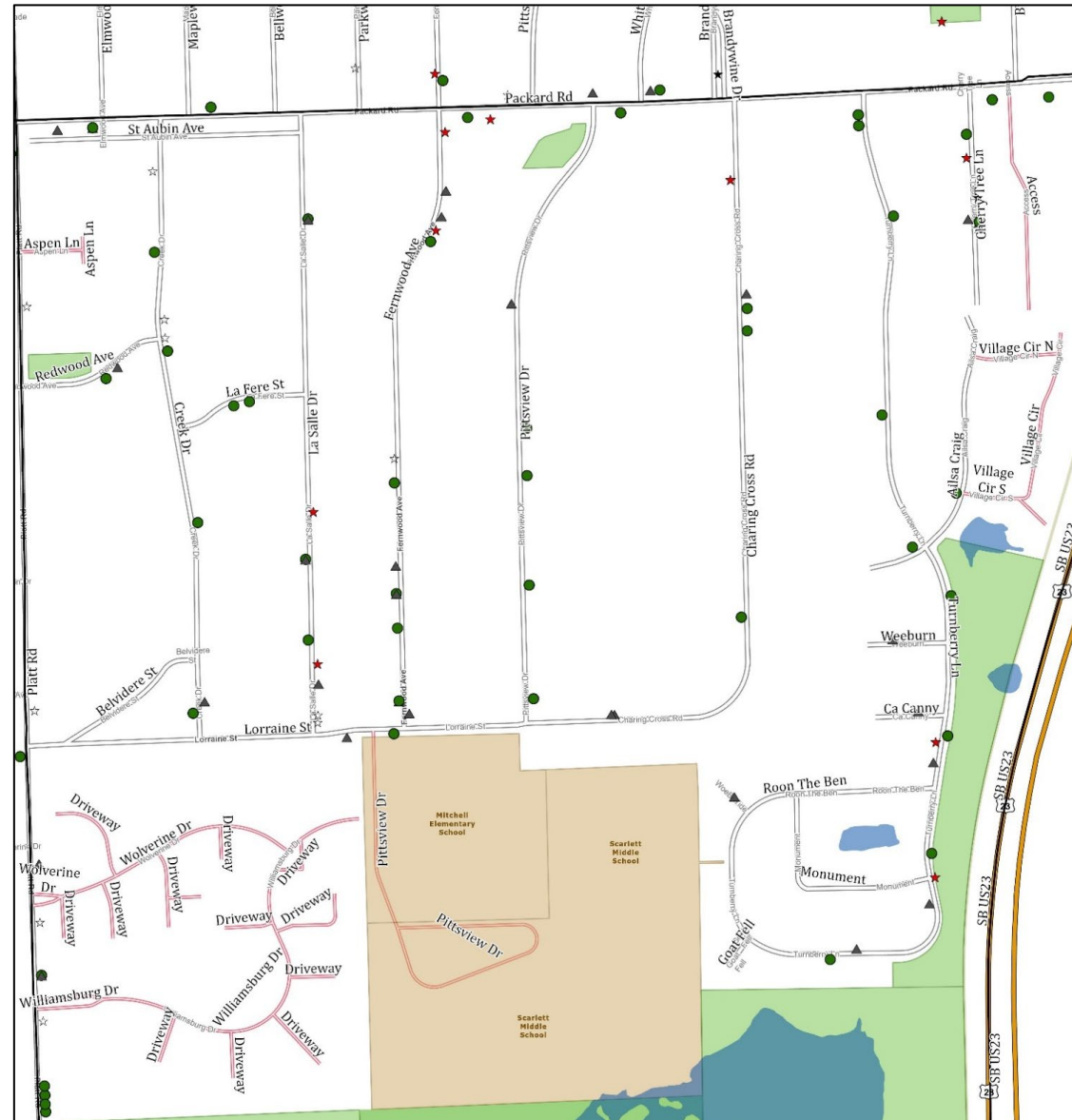
Item	Quantity
Stumps	24
Priority 1 Removals	1
Priority 2 Removals	10
Priority 3 Removals	11

Estimated cost of stump removal, replacement, and watering: **\$13,725.12**

Trees

Maintenance

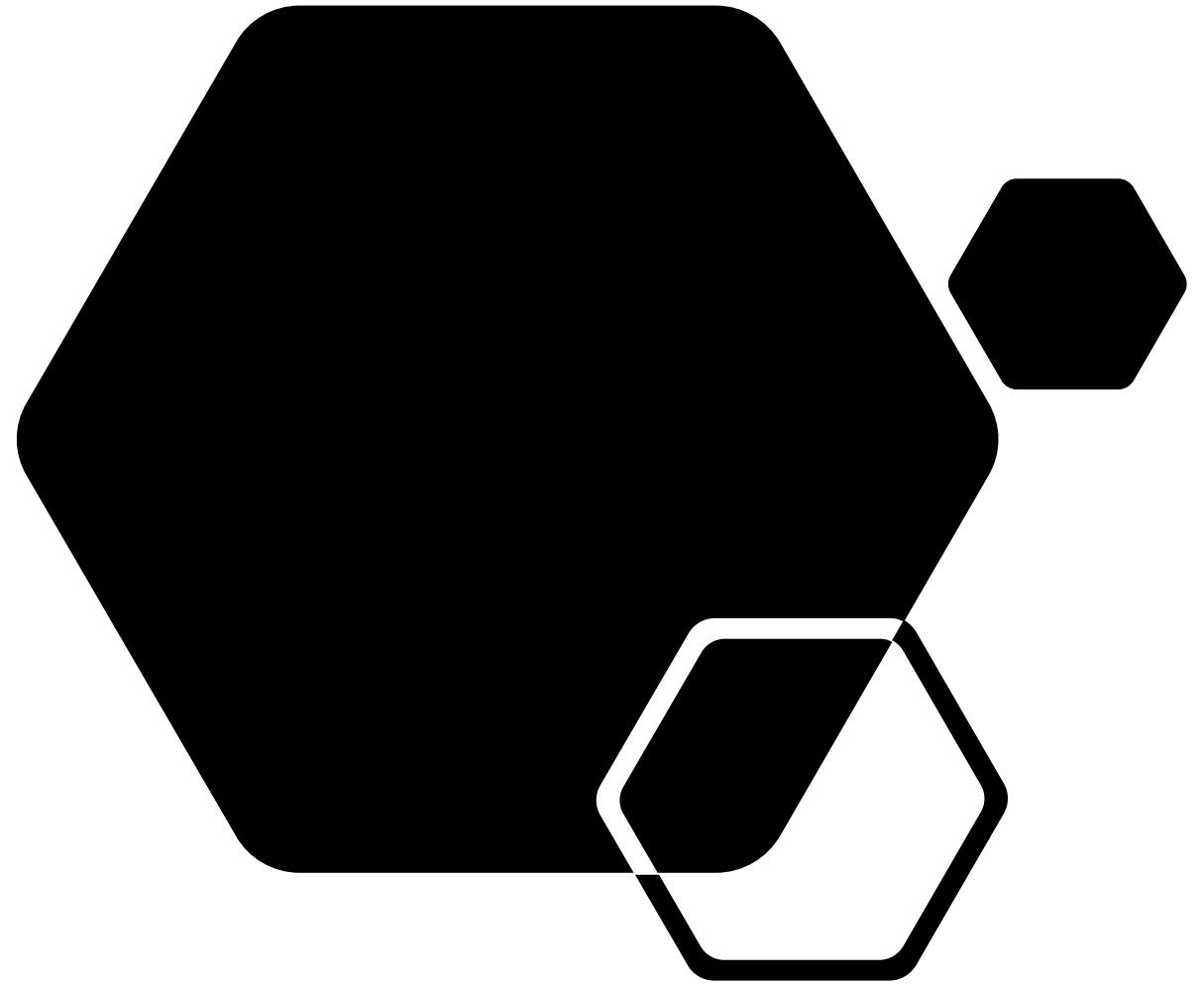
- Plant Tree
- ★ Priority 1 Removal
- ☆ Priority 2 Removal
- ★ Priority 3 Removal
- ▲ Stump Removal
- Census Tracts





Appendices

Tree Equity Score Integration



Tract	Headwaters Score	TES-Derived Score	Modifier	New Score
4056	19	3	9	28
4045	14	4	12	26
4036	14	3.67	11.01	25.01
4042	16	3	9	25
4046	14	3.5	10.5	24.5
4002	13	3.5	10.5	23.5
4027	11	3.67	11.01	22.01
4005	16	2.6	5.2	21.2
4026	10	3.5	10.5	20.5
4025	14	2.5	5	19
4055	14	2.5	5	19
4007	14	2.33	4.66	18.66
4035	12	2.5	5	17
4044	12	2.5	5	17
4008	17	1.67	0	17
4054	11	2.67	5.34	16.34

Tract	Headwaters Score	TES-Derived Score	Modifier	New Score
4043	10	2.5	5	15
4051	13	2	2	15
4006	11	2.25	2.25	13.25
4033	11	2	2	13
4041	11	2	2	13
4022	12	1.5	0	12
4038	12	1.5	0	12
4001	11	1	0	11
4021	10	1.67	0	10
4023	7	2	2	9
4052	9	1.67	0	9
4053	9	1.25	0	9
4003	9	1	0	9
4031	8	1	0	8
4032	8	1.67	0	8
4034	6	1.67	0	6

Headwaters Statistics

Tract	Population POC	Family Poverty	Area Without Canopy	Impervious Coverage	Floodplain Area	Senior Population	Population Under 5	Uninsured Rate
4001	40.2	6.1	99.6	92.8	2.1	5.3	0	1.6
4002	36.8	0	90.4	54.9	13.9	1.5	0	3.2
4003	25.1	6.2	80.5	42.3	0	1.7	0	6.2
4004	19	0	80.7	28.2	0	11.9	4.6	2.9
4005	22.3	32.1	96	64	31.9	1.1	0.3	5.9
4006	12.1	6	80.1	45.3	8.1	11.1	4.3	2.5
4007	22.9	0	88	47	28	14.7	1.5	4.5
4008	35.5	13.3	92.4	56.9	9.8	0.9	0	4.4
4021	40.9	10.8	79.9	29.2	15.6	8.9	1.1	1
4022	57.4	19.8	80.3	28.4	12.3	1.7	0	3.2
4023	26.4	0.6	76.1	22.1	5.5	34.6	3.6	1.3

Tract	Population POC	Family Poverty	Area Without Canopy	Impervious Coverage	Floodplain Area	Senior Population	Population Under 5	Uninsured Rate
4025	48.8	5.1	84.9	38.8	0	14	6.1	3.3
4026	63.1	21.1	78	35.8	0	4.7	5.3	1.6
4027	46	8.2	85.3	38.4	0	12.4	4.4	1.2
4031	22	1.1	64.7	12.4	9.6	23.9	2.6	0.6
4032	14.2	2	77.4	27.2	3.8	19	4.3	2.1
4033	18.2	3.2	83.2	35.8	0	19.5	7.1	1.7
4034	13.7	2.3	74.7	29	2.7	17.7	4.9	1
4035	22.8	3.3	85.6	39.6	1.7	14.6	3.5	3.5
4036	64.8	17.3	82.7	29.1	0.4	16	2.6	1.7
4038	45.5	1	73	15.3	5.9	10.1	6.7	5.7
4041	23.8	7.6	21.2	34.1	0.1	16	5	1.9

Tract	Population POC	Family Poverty	Area Without Canopy	Impervious Coverage	Floodplain Area	Senior Population	Population Under 5	Uninsured Rate
4042	28.1	15	83.4	44	0	8.2	4.8	5.9
4043	20	0	85.7	34.4	0.1	23.1	6.4	1.9
4044	24.4	0	88.3	33.6	1.3	19.8	8.5	1.6
4045	34.2	16.3	94.4	41.4	3.7	15.2	4.4	1.6
4046	32.6	4.5	92.2	50.5	2.9	12.5	3.8	3
4051	27.6	24.3	77.7	29	12.1	10.3	3.5	7.4
4052	23.7	1.9	20.9	28.9	0.5	18.6	6.1	0.5
4053	14.8	1.9	67.5	17.6	7.5	23.2	6.2	0.6
4054	18.1	2.4	74.3	38.9	8	16	4.9	3.2
4055	46.7	0	80	31.2	4.5	16	8.1	3.4
4056	55	14.8	93.7	43.3	8.3	7.8	7.6	4.2

Tree Species Suggestions

