

Qualitative Analysis and Mapping Insights in Southern Dallas

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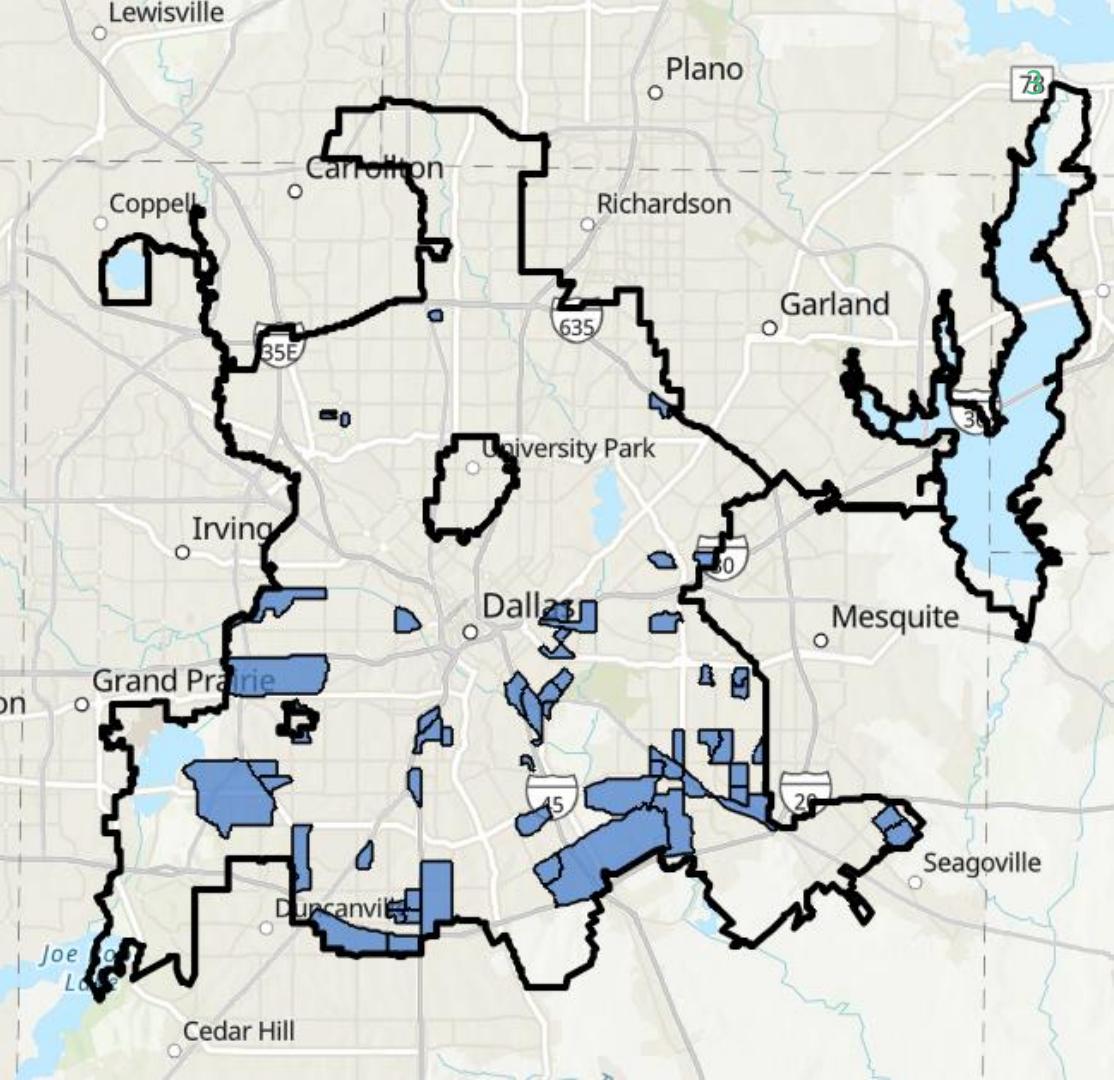
Venkata Sai Raviteja Nerellapally, M.Sc. in Civil and Environmental Engineering

Contents

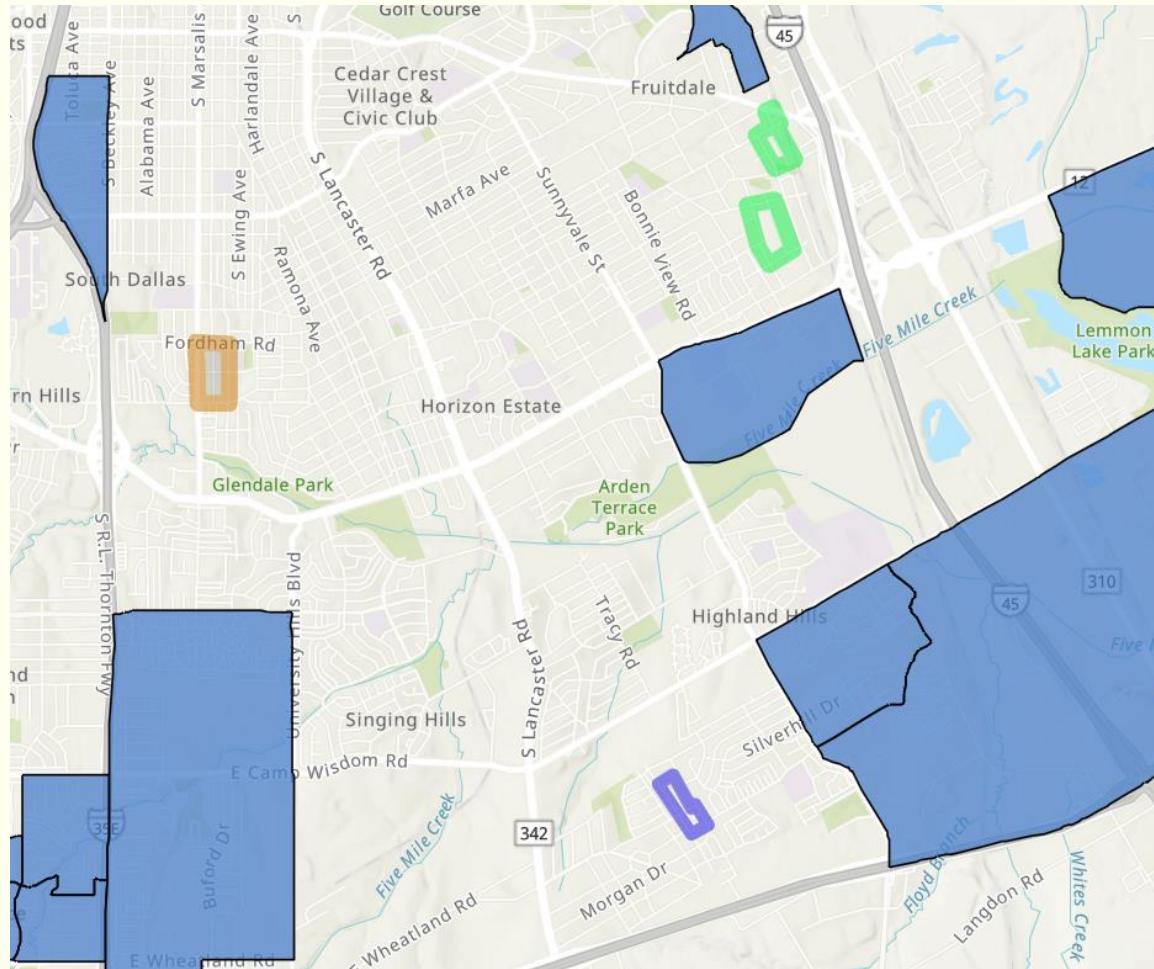
- Introduction
- Air pollution and water pollution
- Feeling of Safety derived from public surveys and interaction
- Bus routes and stops linked to fence heights
- Walkability, sidewalks, and responsiveness
- Enrichment & Development According to Accessibility
- Places for potential enrichment walkability
- Conclusion

Infrastructure desert

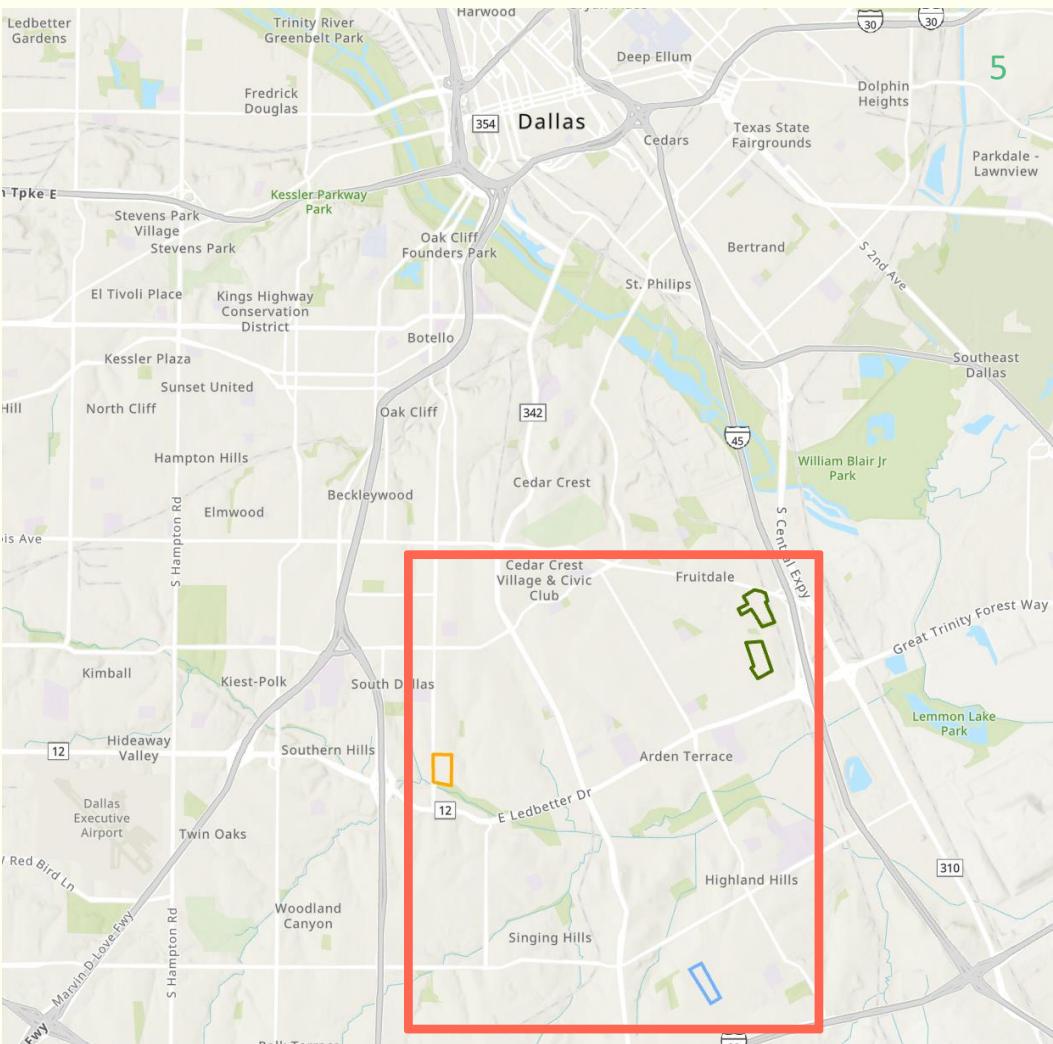
- Sidewalk
- Pavement
- Crosswalk
- Noise wall
- Internet
- Bank Service
- Medical Service
- Public Transit
- Community Gathering
- Food Service
- Trail Access
- Steer tree canopy



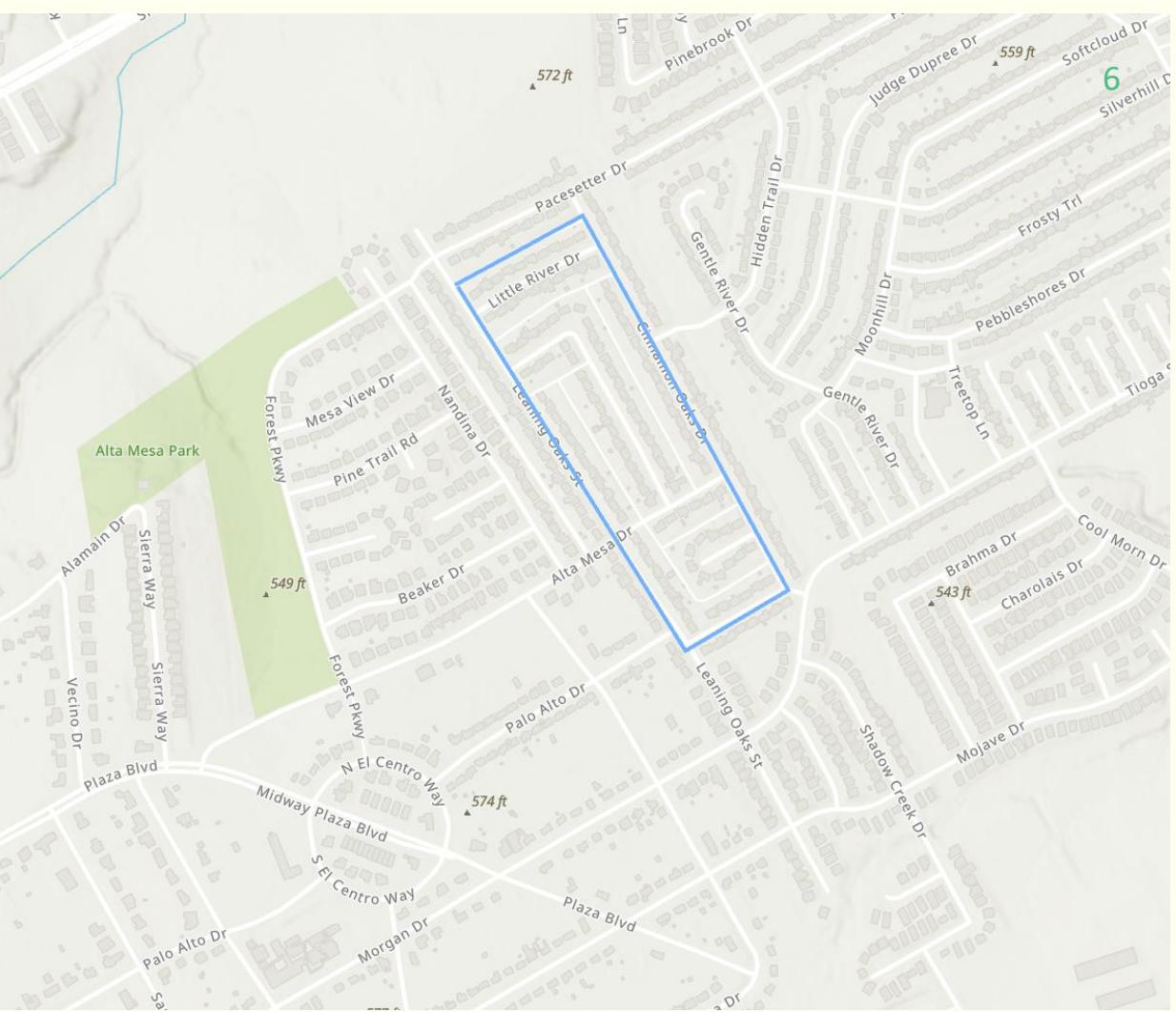
Infrastructure deserts areas vs. visited neighborhoods



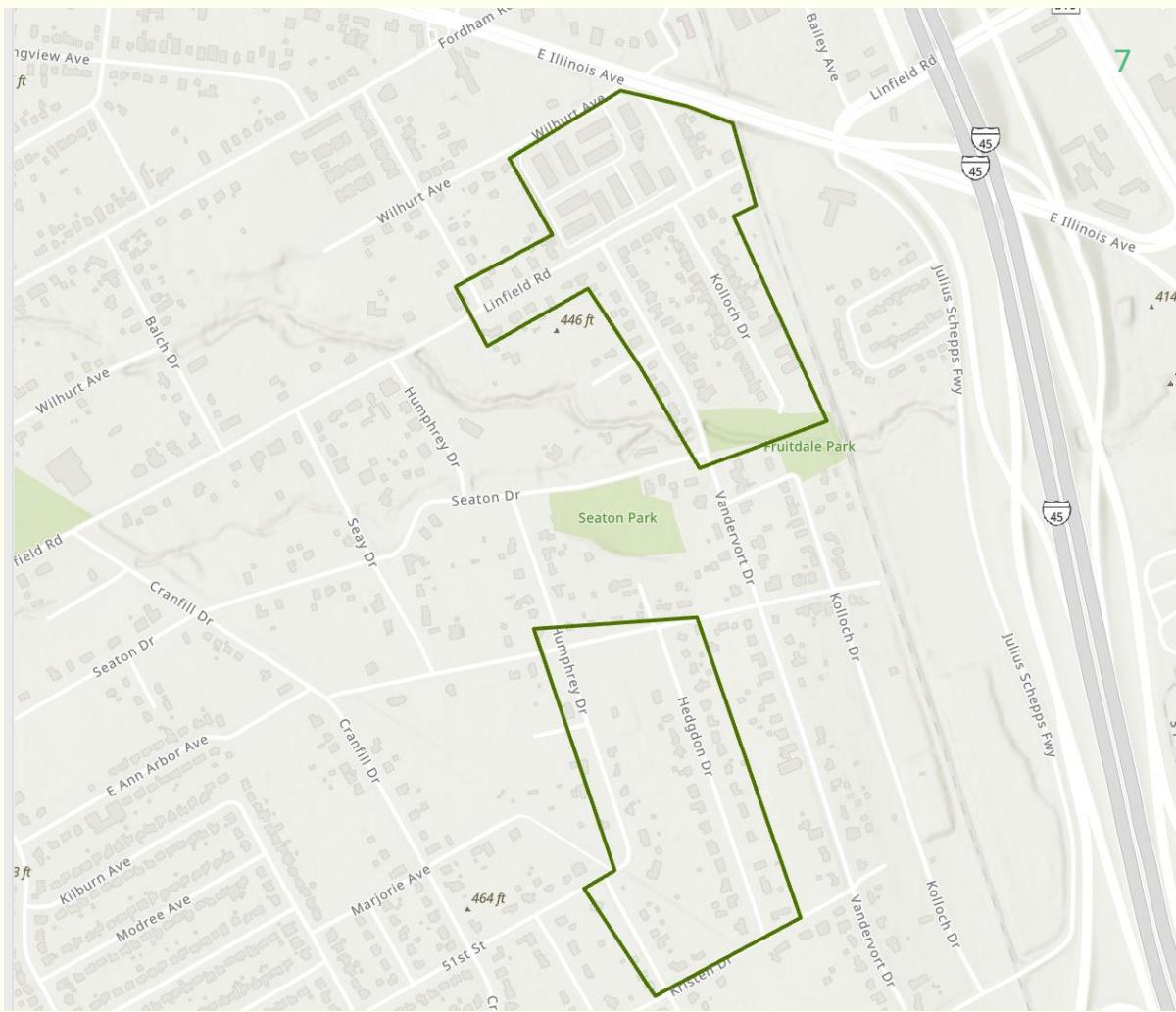
Visited neighborhoods and zip codes



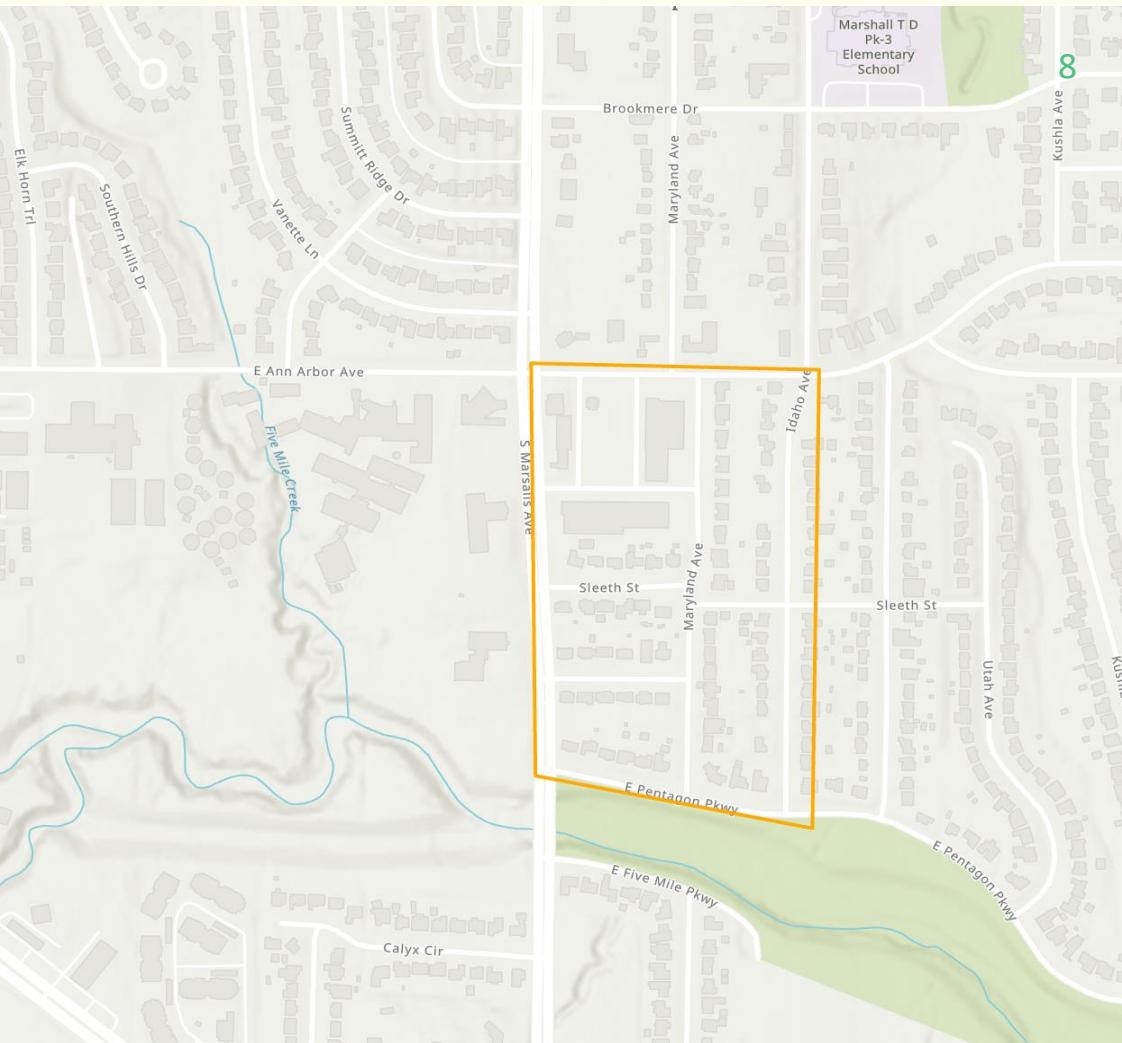
Cinnamon Oaks, 75241



Fruitdale, 75216



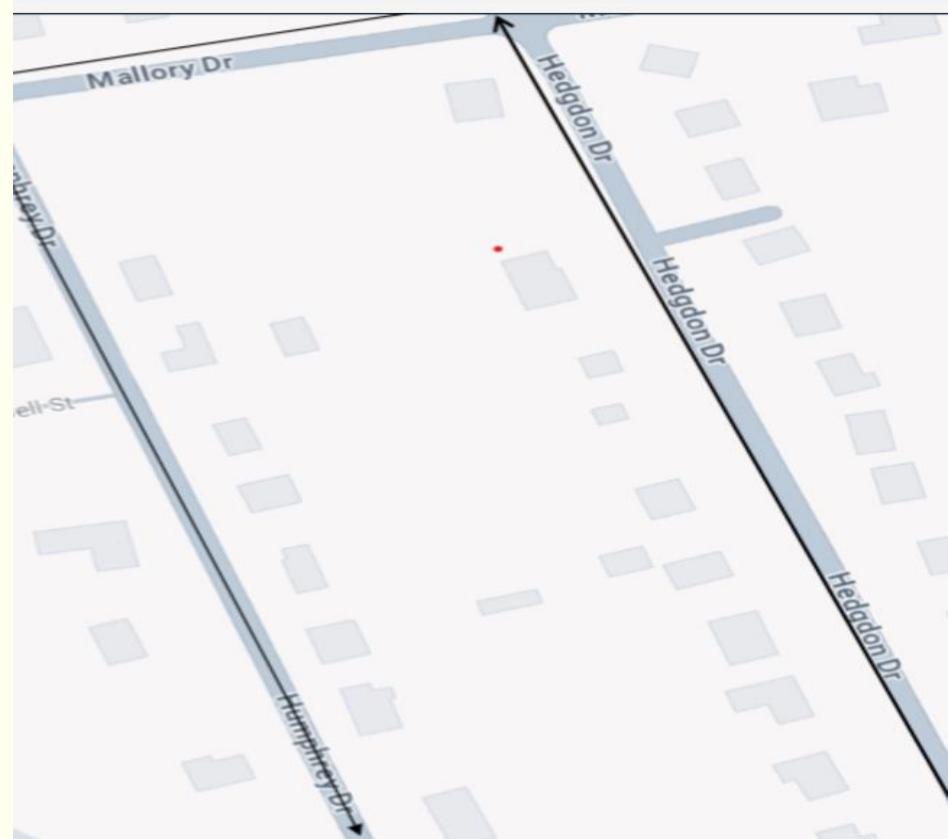
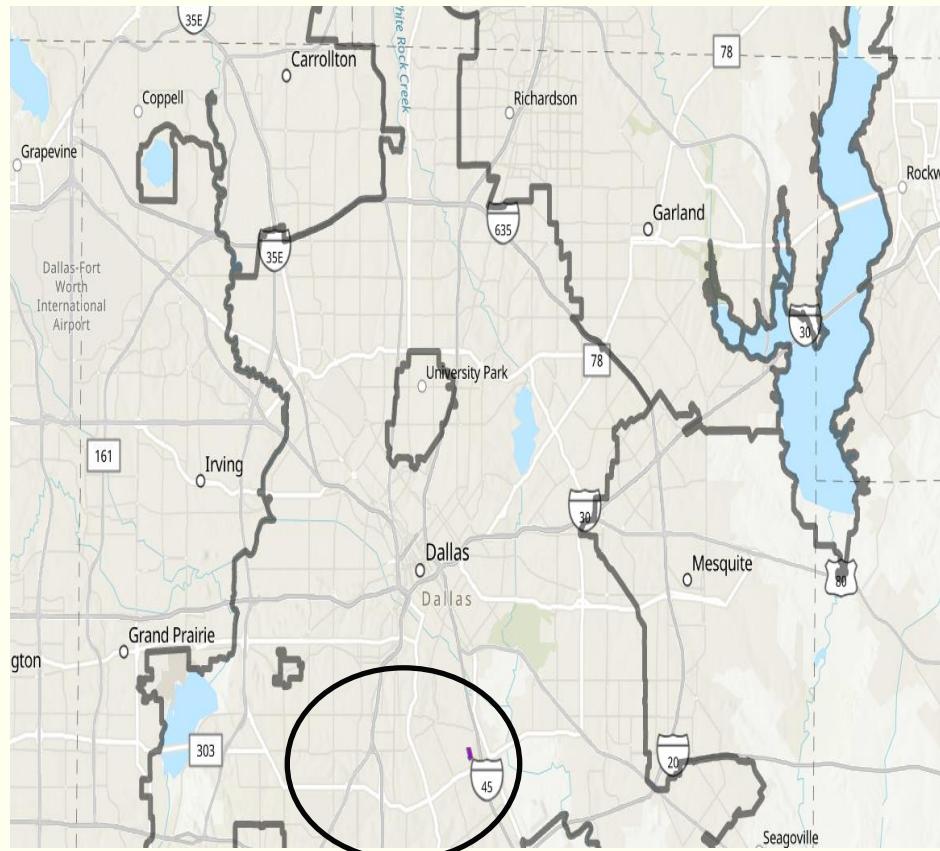
Idaho Avenue, 75216



Ashwaq Hamad Binasser

Air and water pollution

The neighborhood we visited in southern Dallas

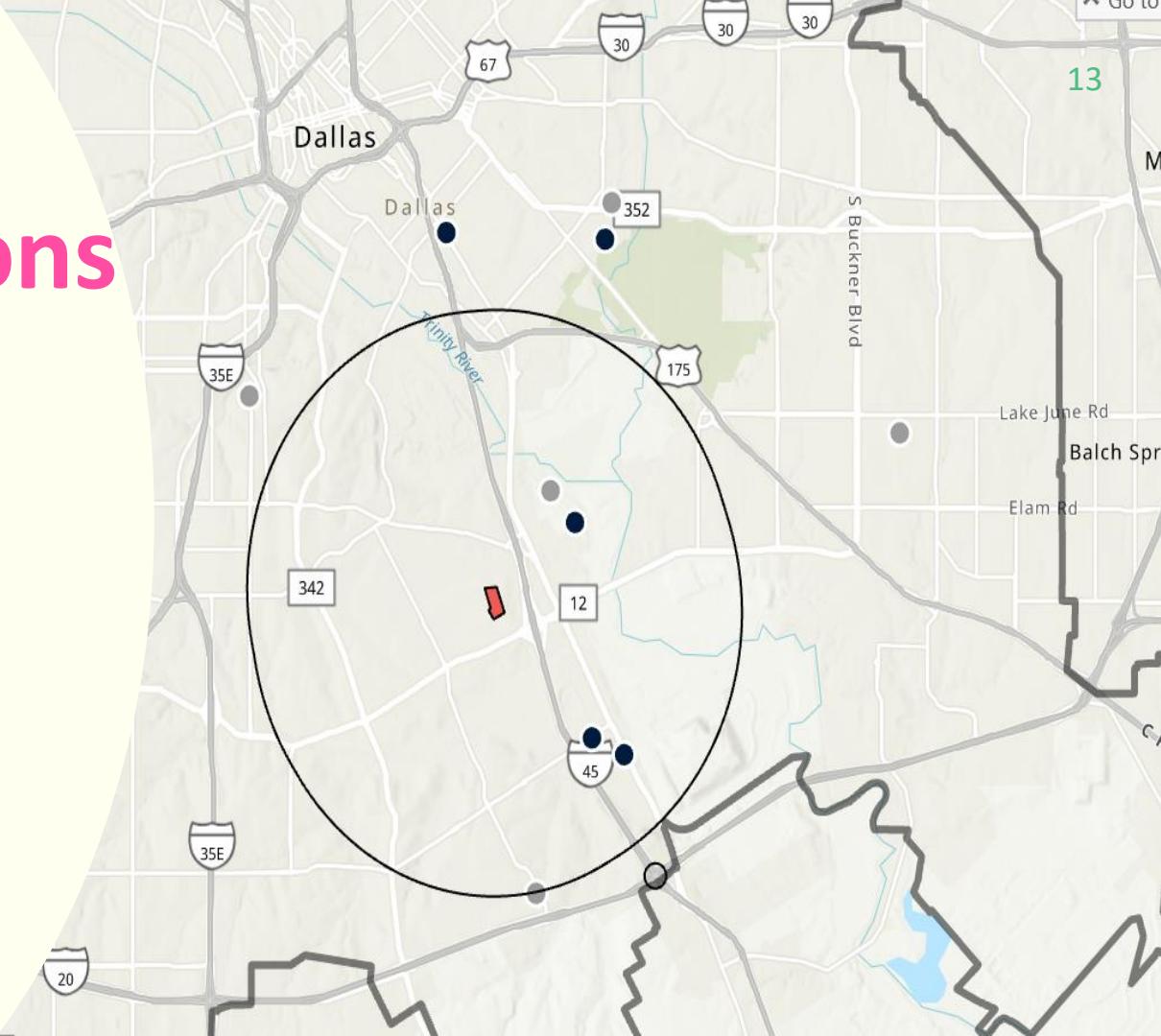






Air Quality Monitor Stations

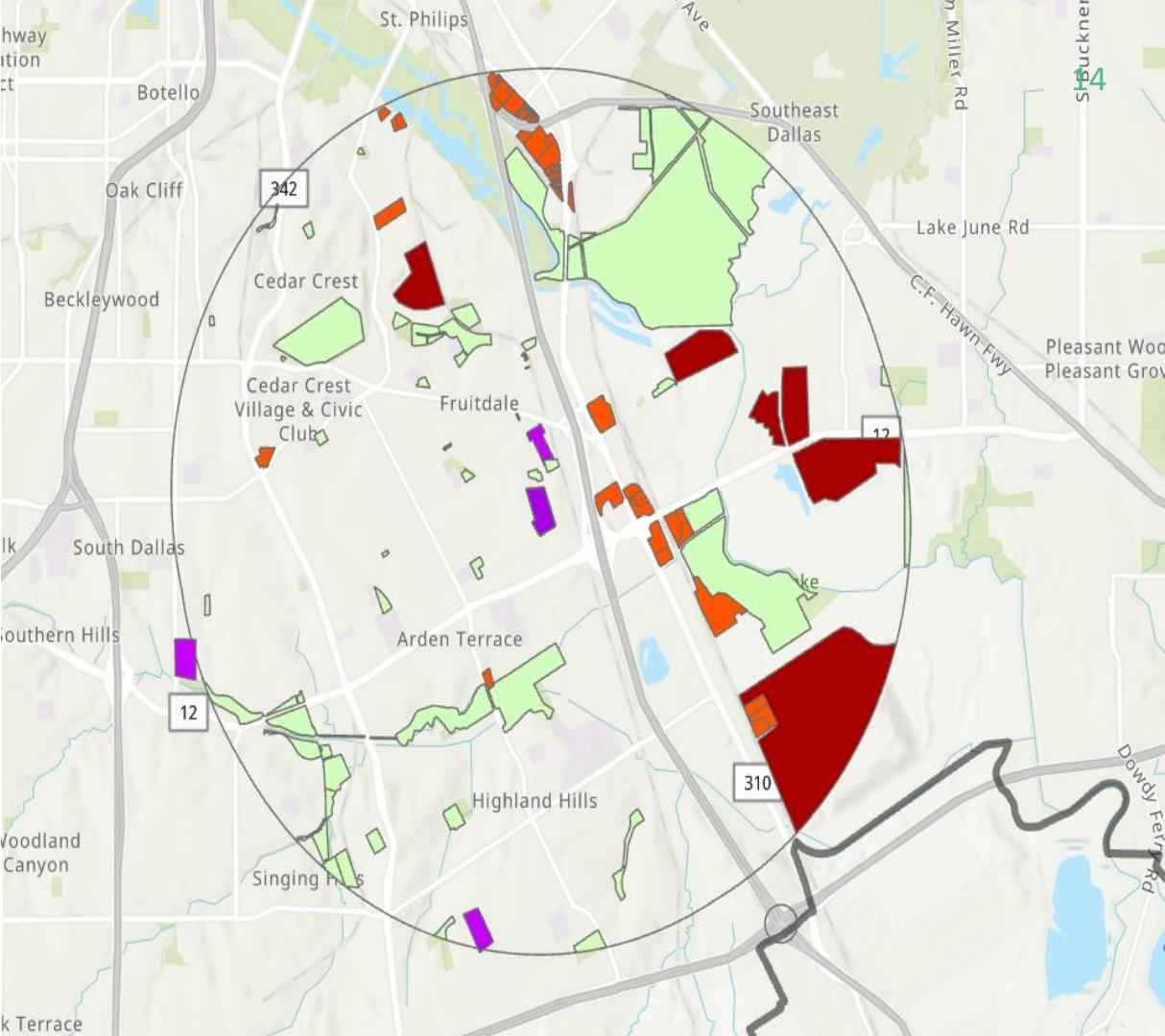
- * The black dots are active
- * the grey dots are inactive.



Comparing between the parks and landfill lands/Industrial land use inside the circle.

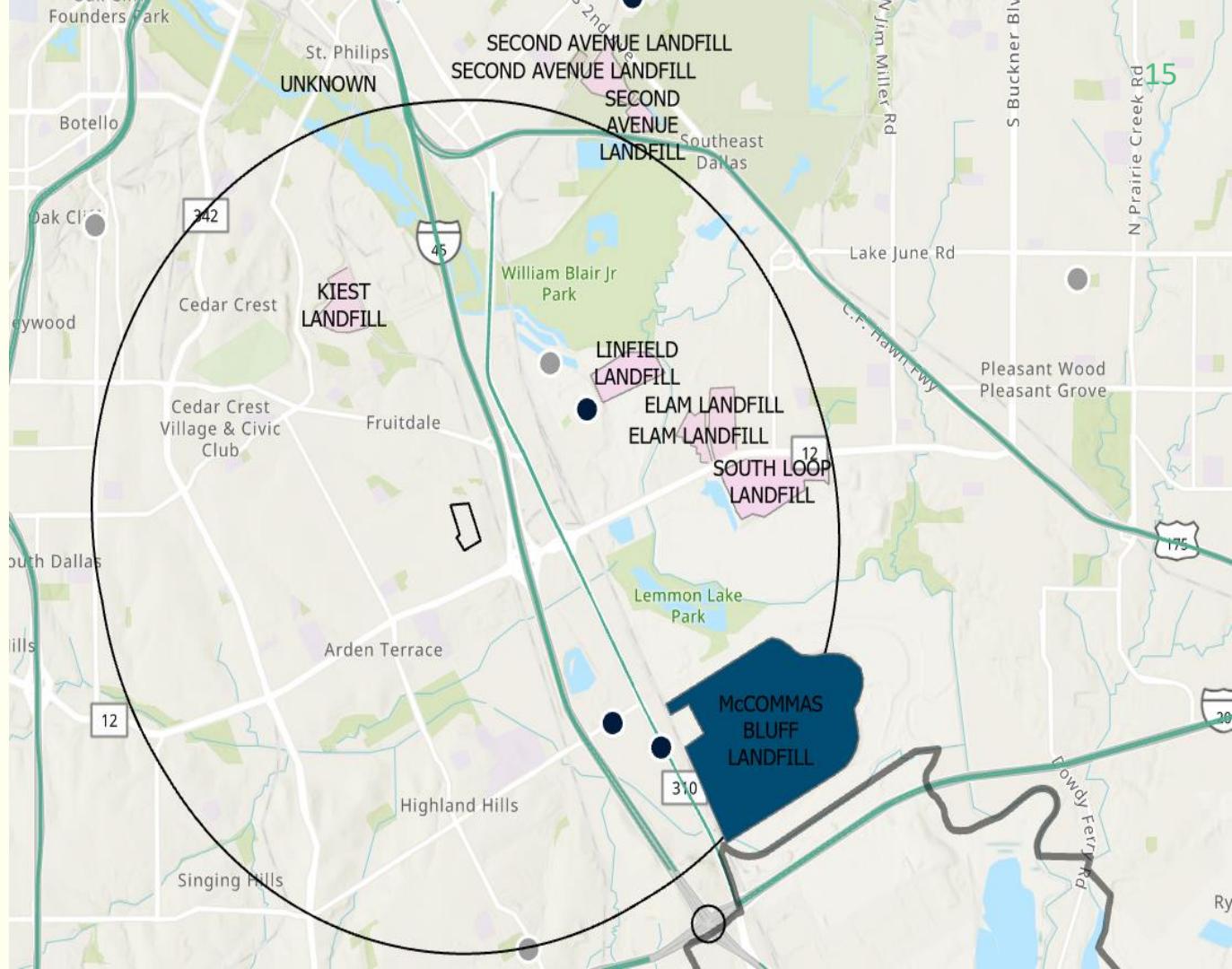
- The green color is parks
- The pink color is landfill
- The orange color is industrial land use

The combined area of landfill and industrial land use, totaling 1754.219047 hectares, is significantly larger than the park, which covers 1198.311655 hectares.

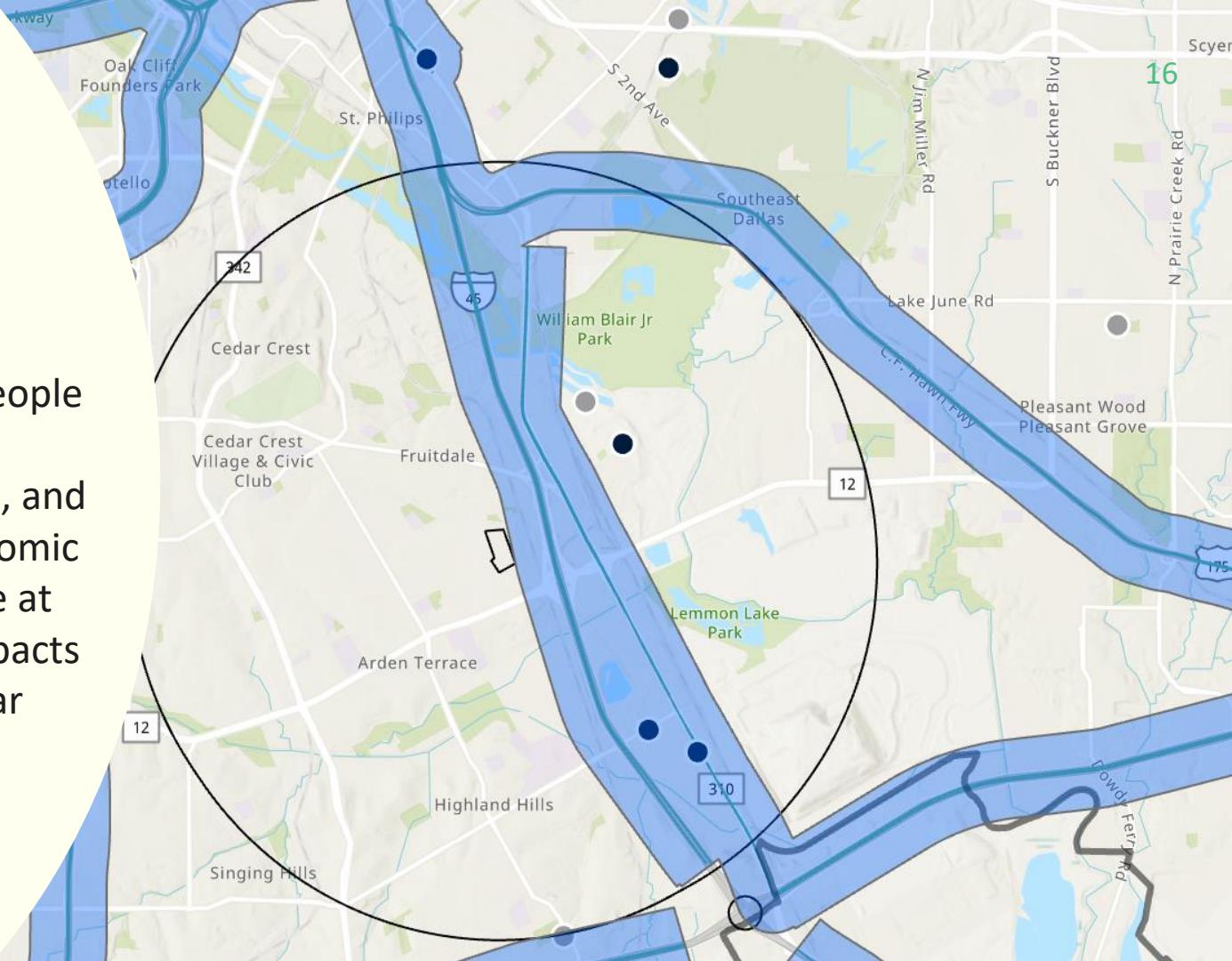


McCommas Bluff Landfill is a source of various pollutants, including:

- *Carbon Dioxide (CO₂)
- *Hydrogen Sulfide (H₂S)
- *Volatile Organic Compounds (VOCs)
- *Trace contaminants in water



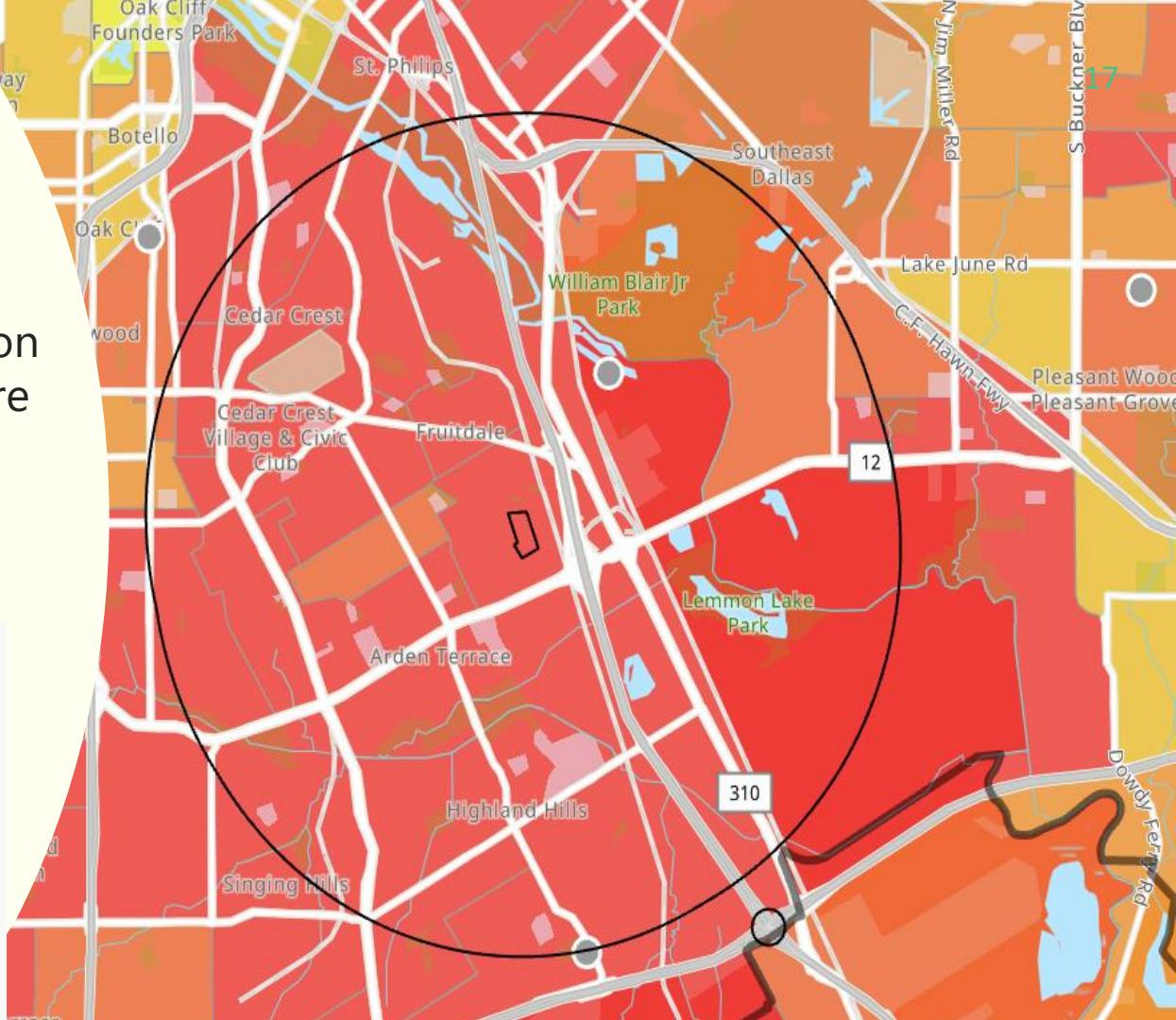
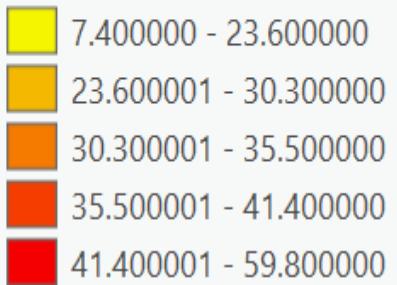
Children, older adults, people with preexisting cardiopulmonary disease, and people of low socioeconomic status are among those at higher risk for health impacts from air pollution near roadways.

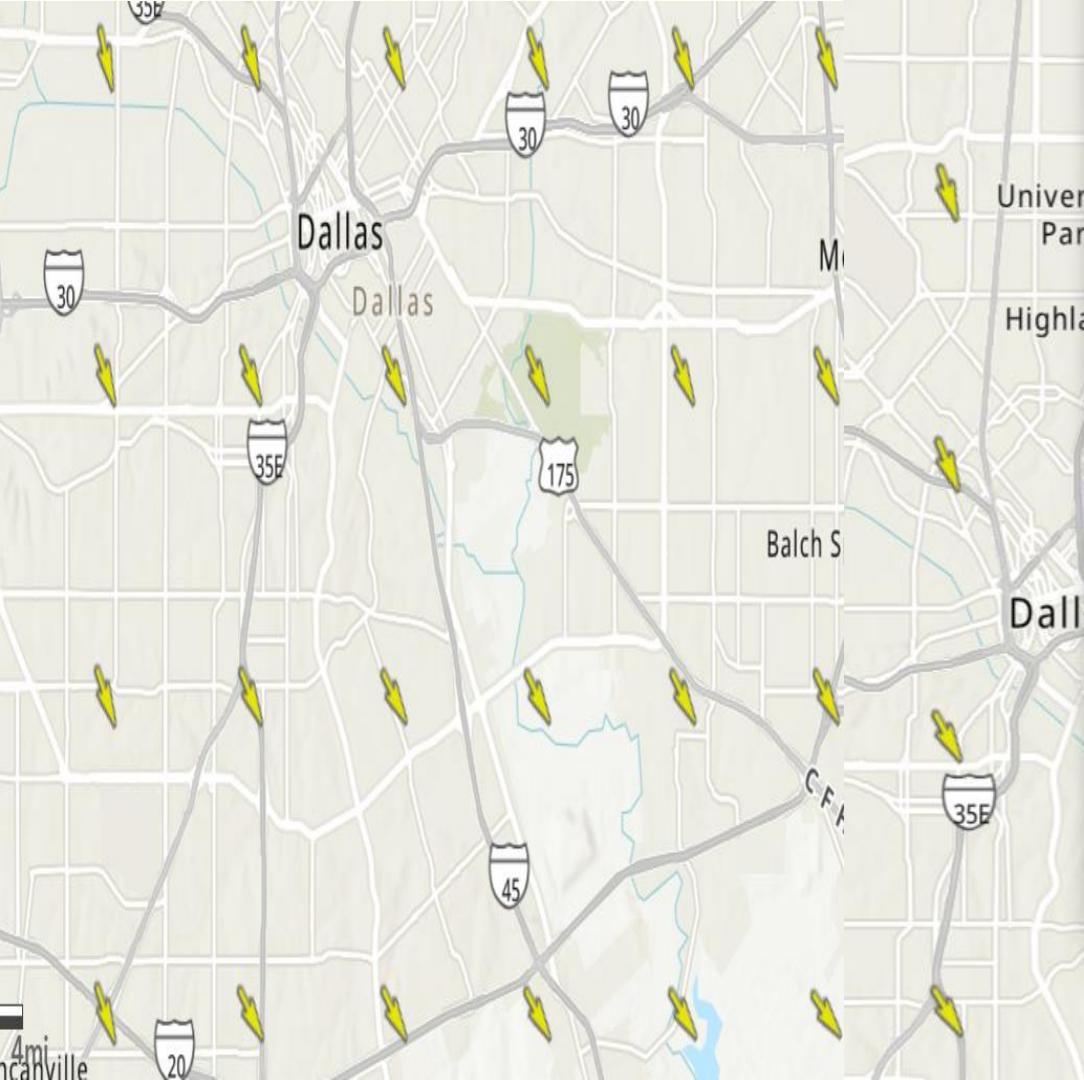


One of the effects of air pollution
on health is high blood pressure

PLACES LocalData for BetterHealth - Tracts

High blood pressure crude prevalence (%)





Wind Speed

9 mph

with gusts to 16 mph

The wind will blow from 319° ([NW](#))

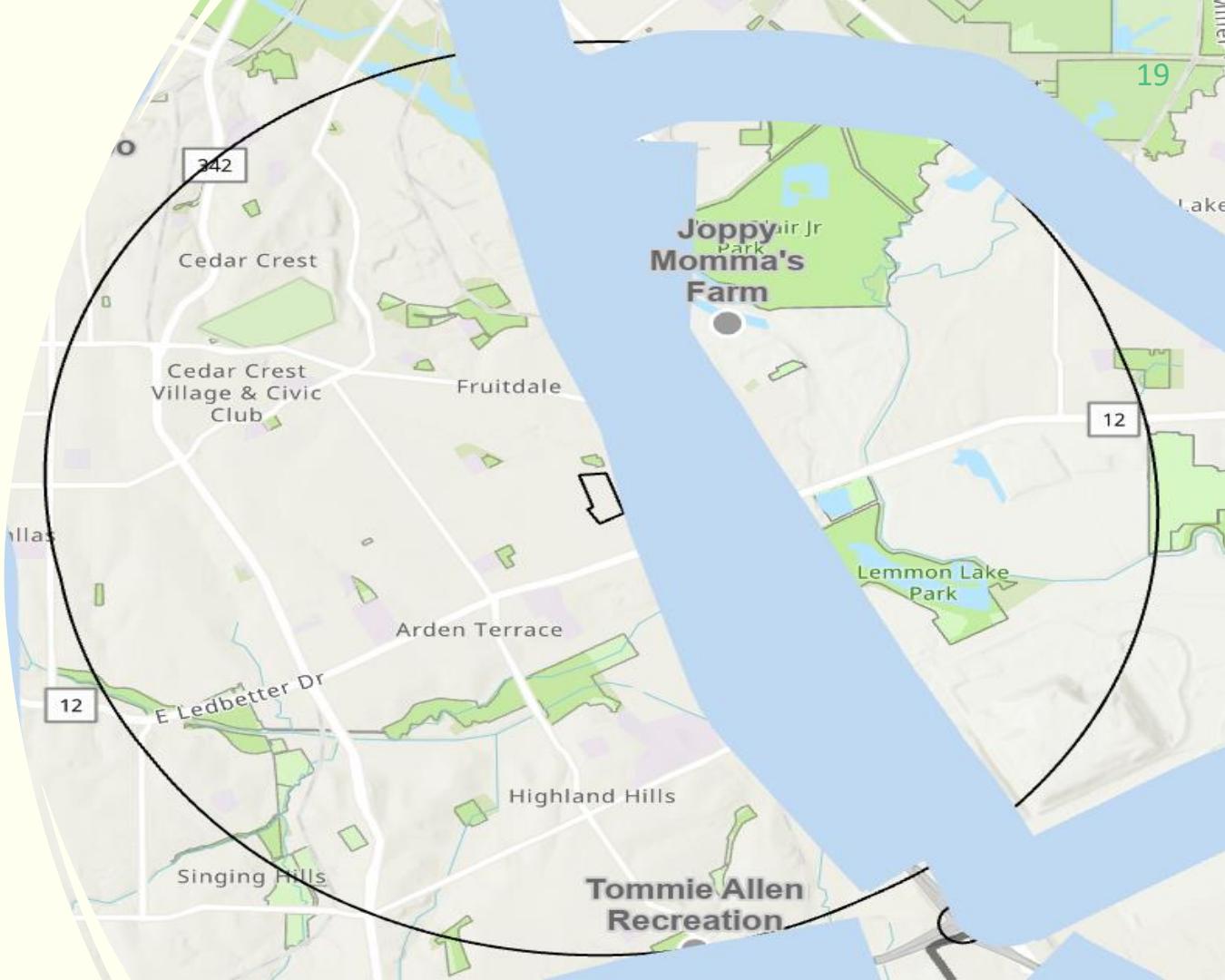
This forecast is for:
11/25/2024 6:00 AM

Wind Speed is the expected sustained wind speed in miles per hour for the indicated 3 hour period at a height of 10 meters.

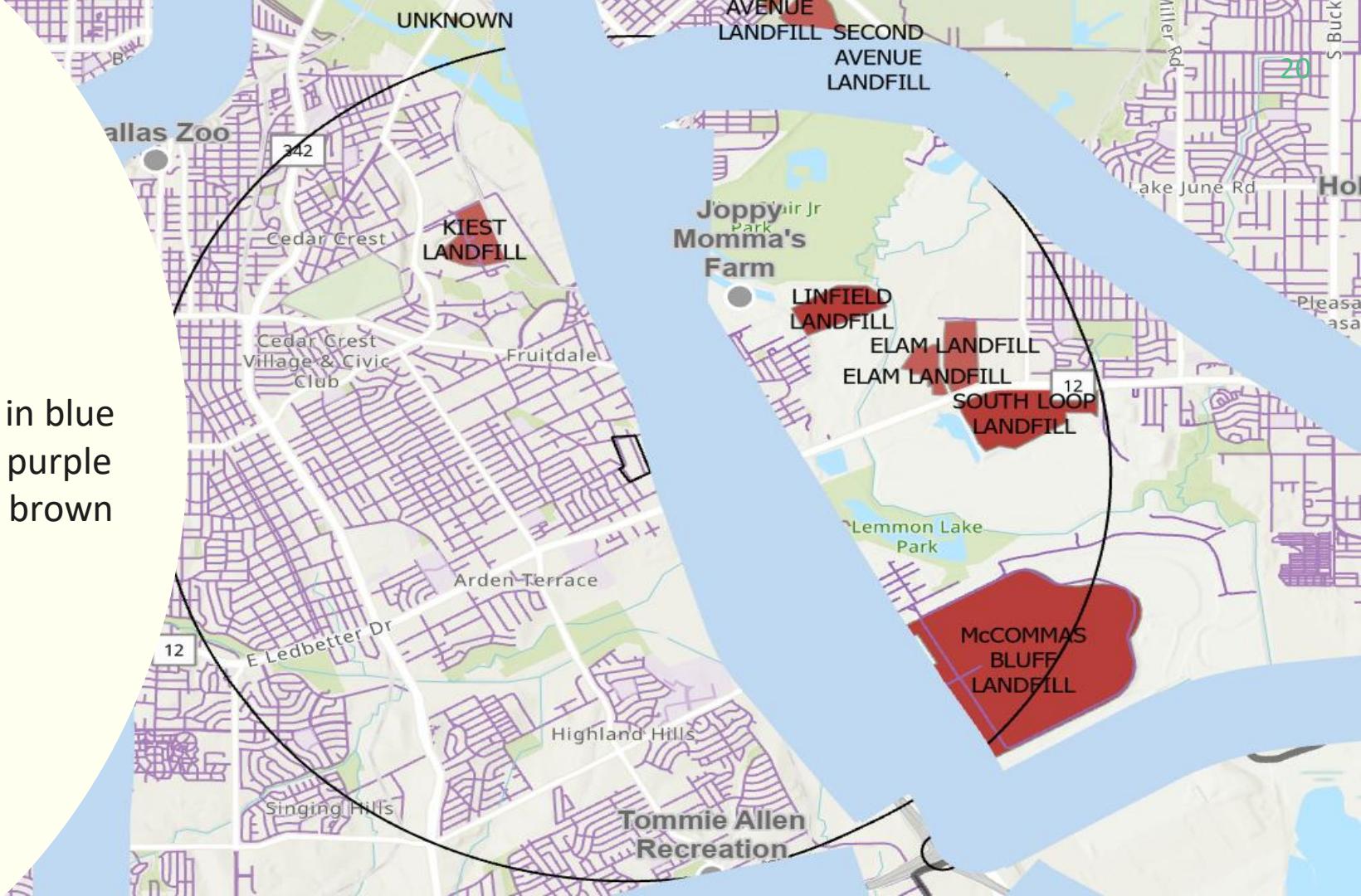
Data updated hourly

[Zoom to](#) [Get Directions](#)

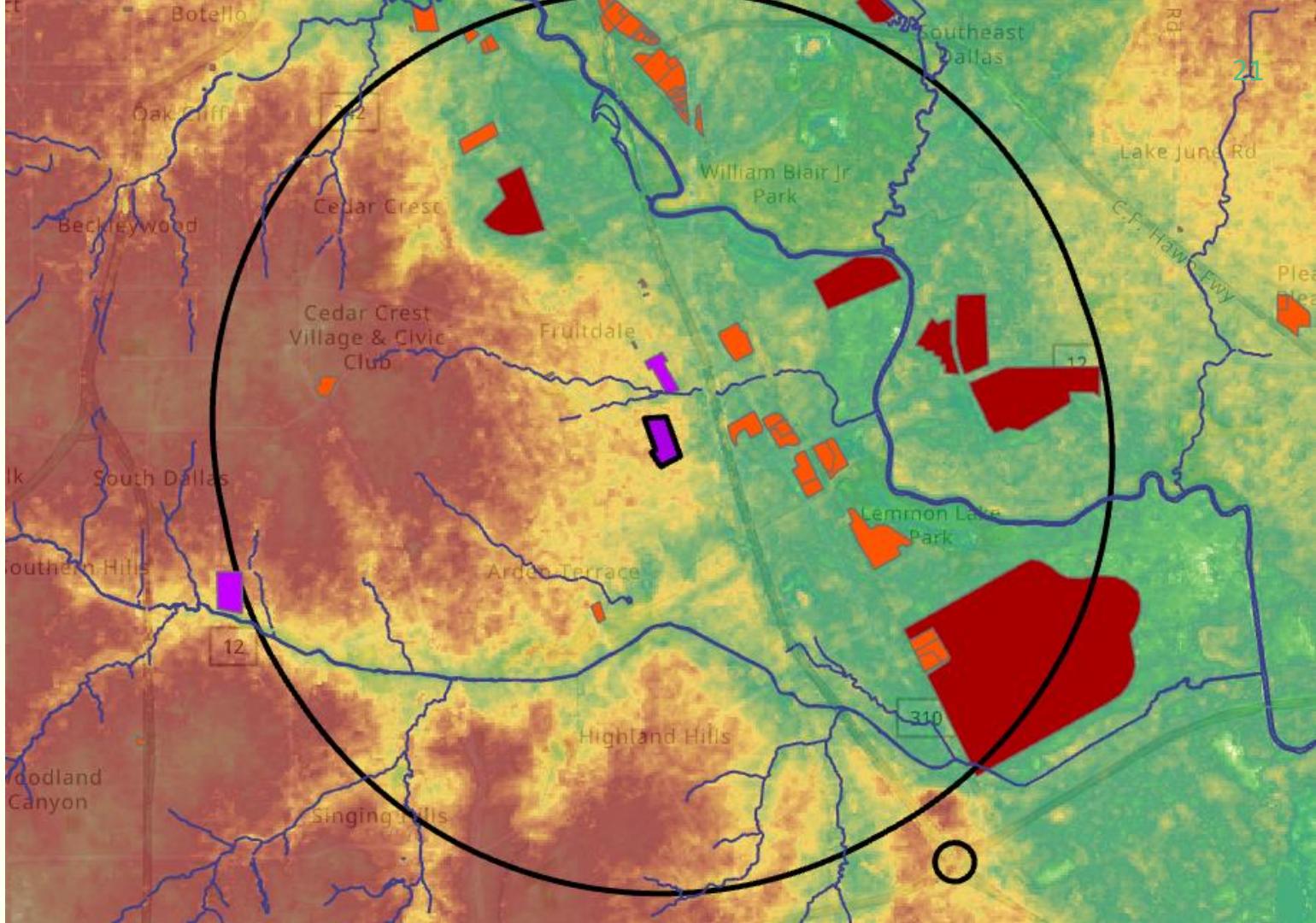
Current Infrastructure and Its Impact Solutions and Benefits of Green Infrastructure

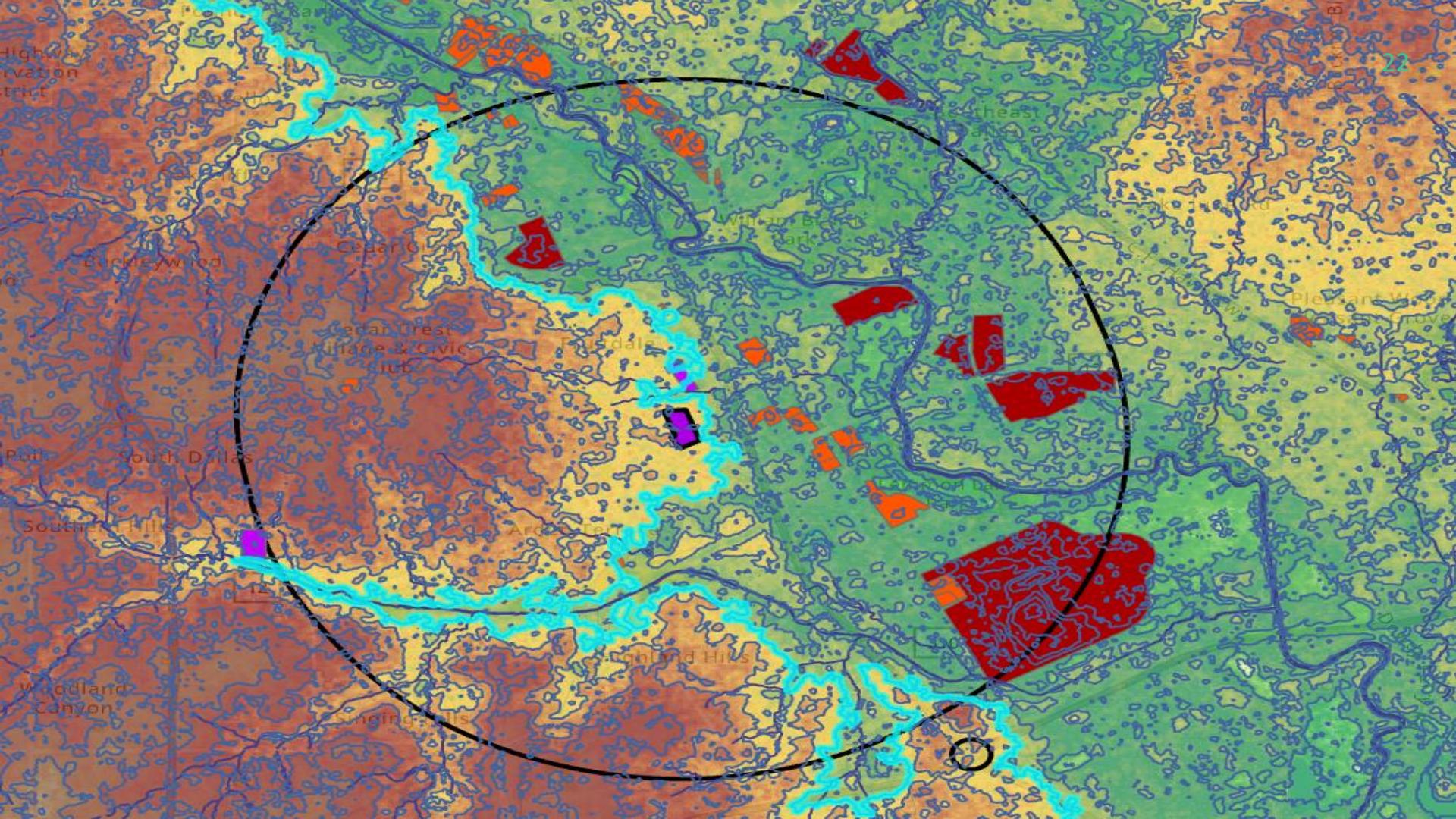


- Highways in blue
- Streets in purple
- Landfill in brown

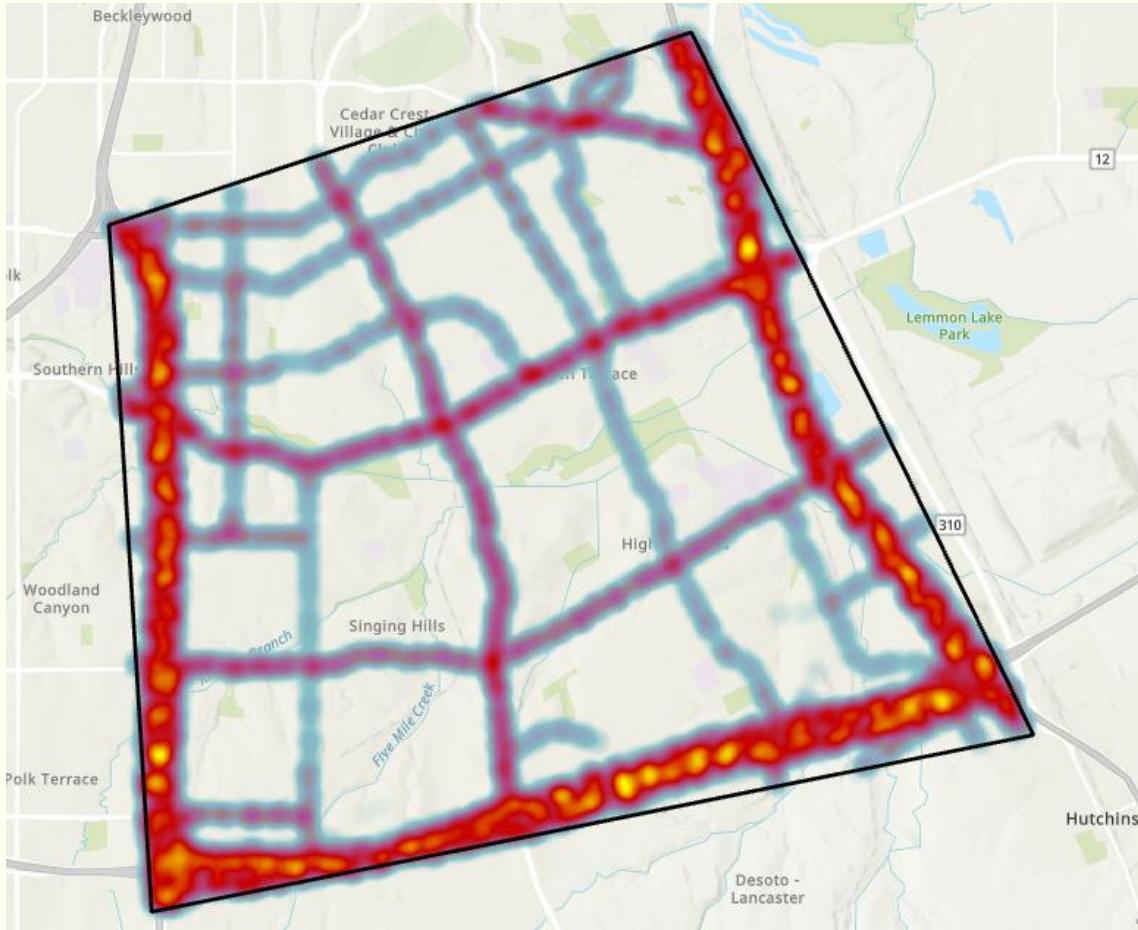


**The direction of
water flow and
where the
pollution can go
in the DEM**





Heat map of Noise data in the area



Heuristic TOOL 5

PERCEPTION

map the invisible site

mapping heuristic

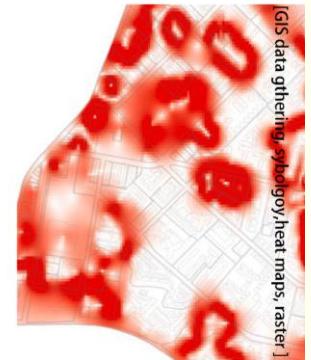
- map an aspect of the site which is perceived but not seen
- observe and annotate user perceptions through ways of acting and knowing

examples

- perceptions of incongruity between structure & difference of quality
- wind, sunshine, soil types, noise levels
- sensation of safety, warmth

engineering idea

product develops from observation & careful annotation of user engagement planning description



Feeling of Safety



Interviews and
public opinion

Key words and Phrases

25

Process:



Themes around housing qualities

- Income Levels
- Fences/Bars
- No.of cars owned
- Maintenance of lawns
- Abandoned houses and Infrastructure

Themes around streets & walkability

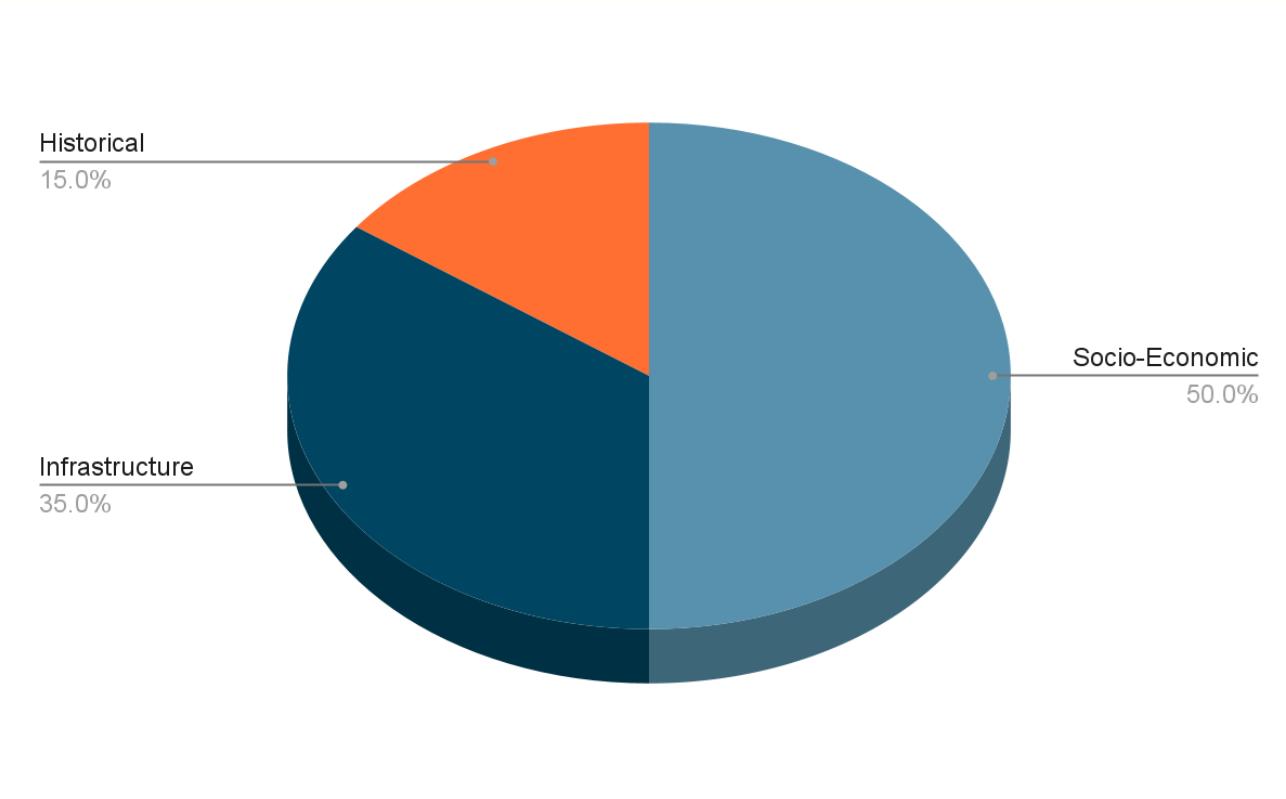
- Sidewalks
- Tree Shade
- DART connectivity
- Uniformity in design

Theme about the people

- Change over time
- Crime rate
- Noise levels and air pollution
- Business of human activity

How they affect

26



Idaho Avenue

27

Housing Quality

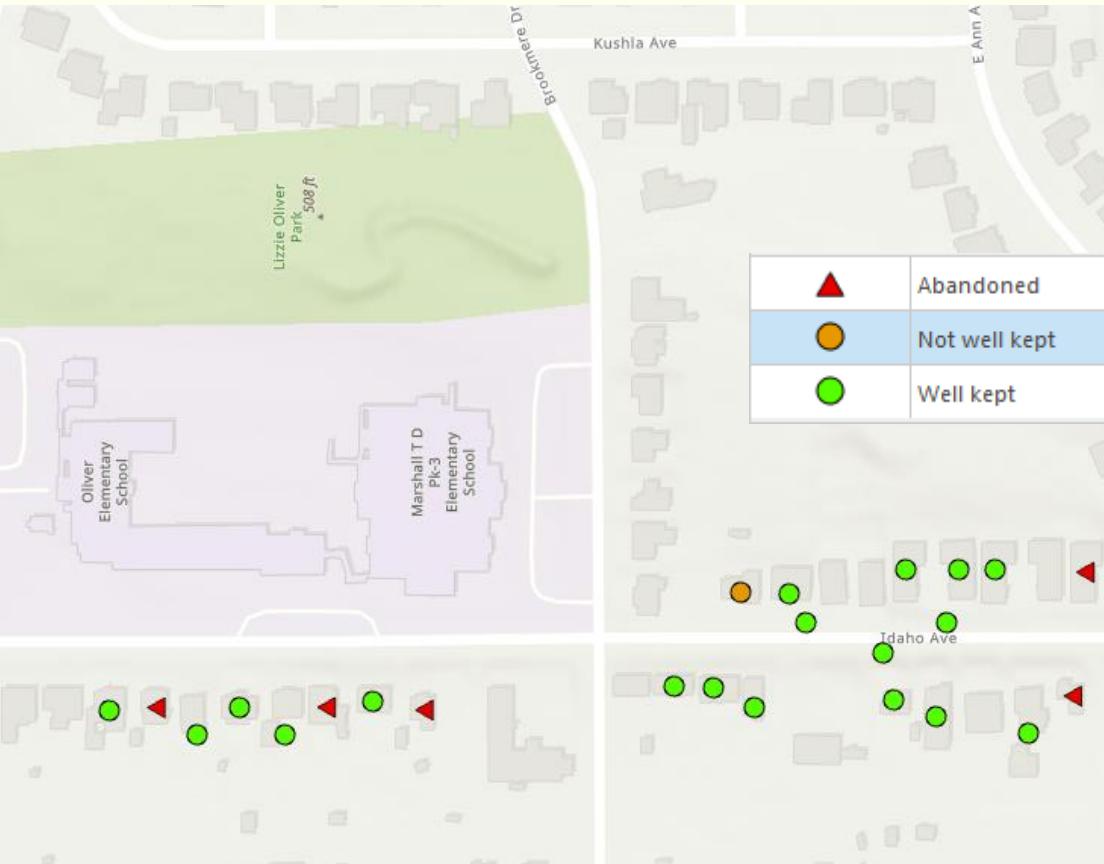
- Open Layout
- Barely fenced/low fences
- Scruffy looking houses

Infrastructure

- Discontinuous sidewalks
- Lot of abandoned houses

Themes around People

- Most number of Homicides in Dallas
- Avg \$36,000 house income



Cinnamon Drive

Housing Quality

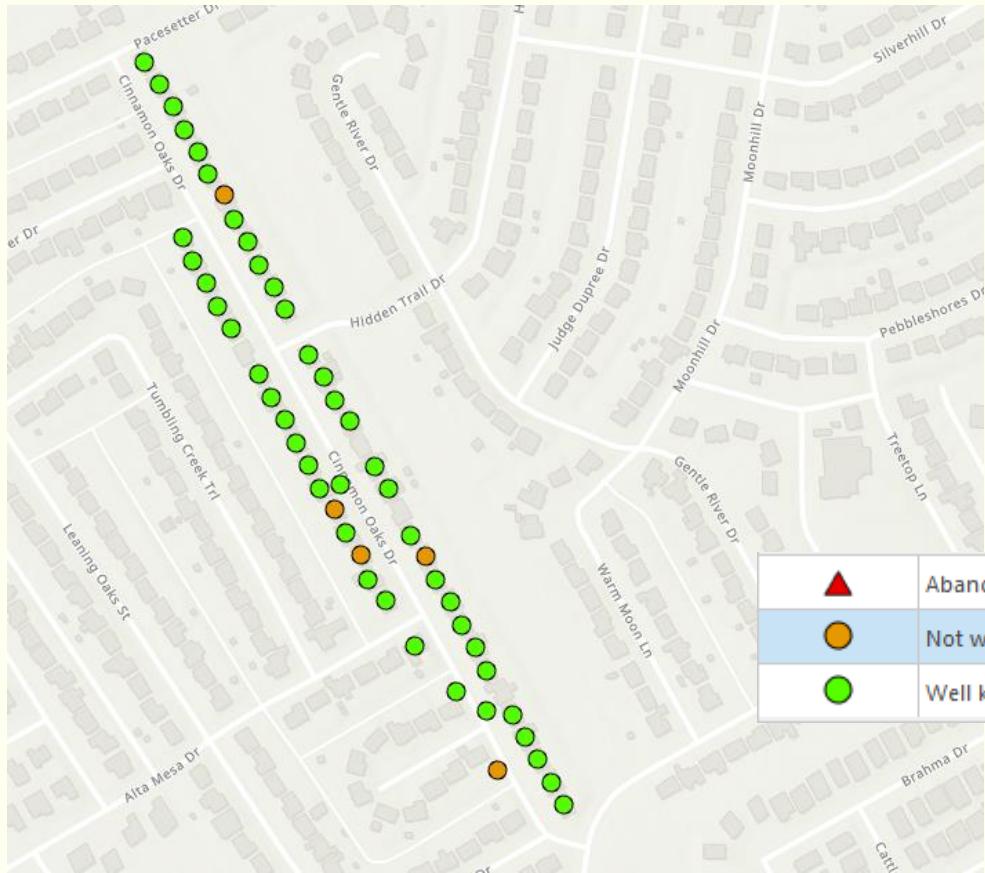
- Much better looked after housing
- Low fences

Infrastructure

- Walkable sidewalks
- DART Connectivity
- Lots of trees

Public Opinion

- Lot of development of sidewalks and trails according to local residents



Seaton Drive-Seay Drive

Housing Factors

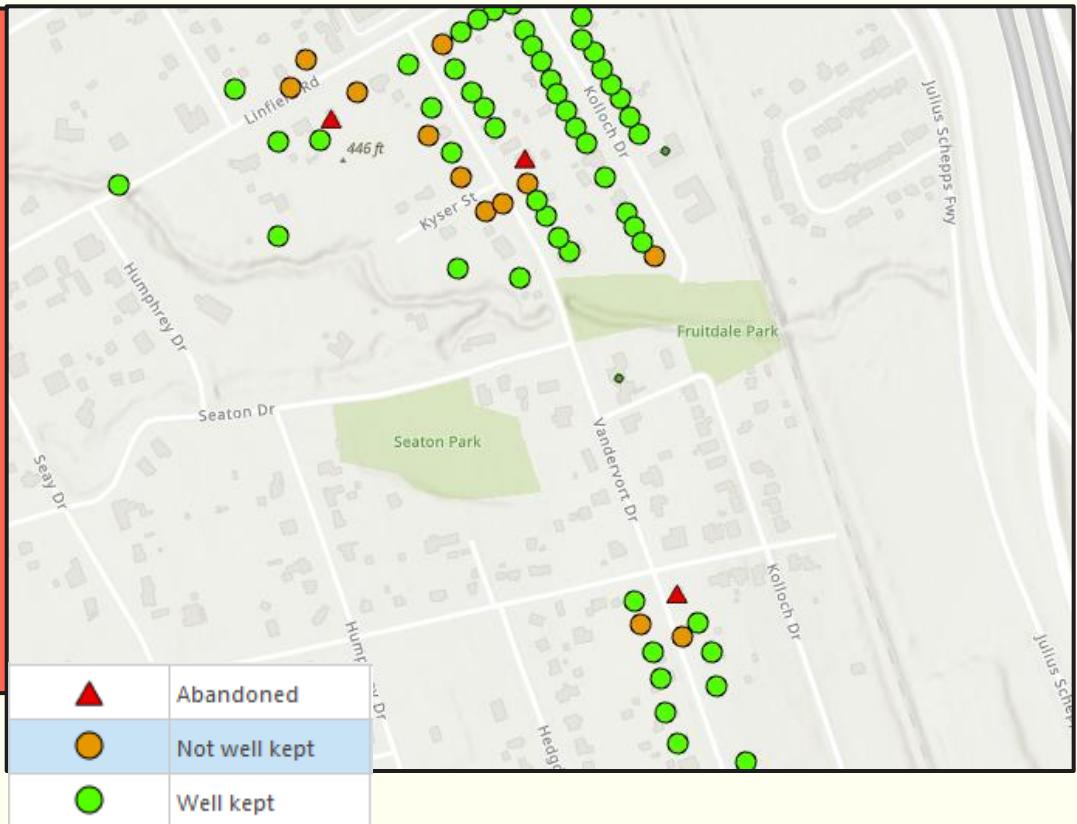
- Open
- Barely fenced
- spread out

Infrastructure

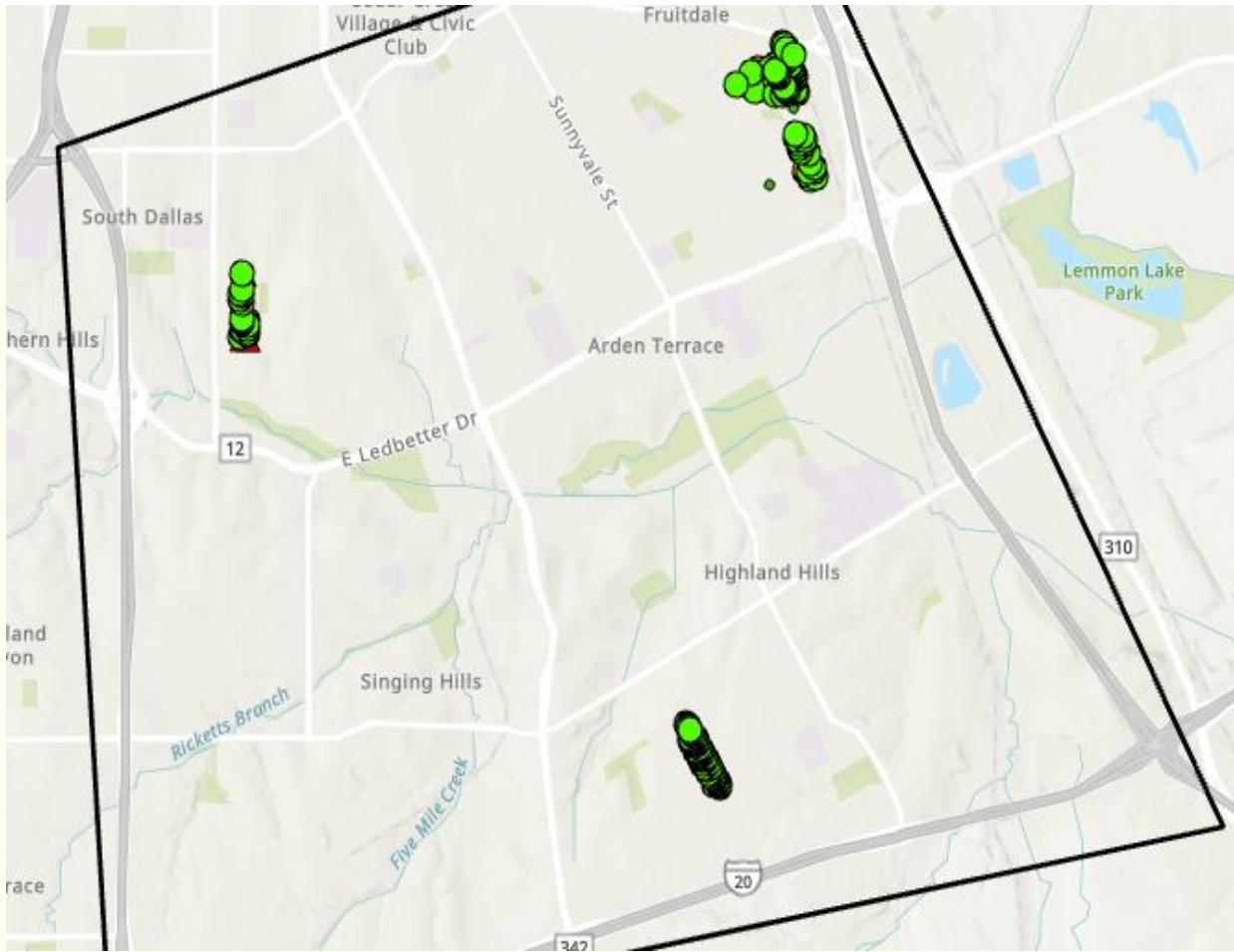
- Walkable
- Wild and not manicured

Historical Factors

- Most number of Homicides in Dallas per zip code
- Most houses built in 1950s



2024 Average Household Income	2024 Median Household Income	2024 HH Income \$15000-24999	2024 Renter Occupied HUs	2024 Owner Occupied HUs
51275	33813		2877	11133
				13023





Well-maintained



Not Well-maintained



Abandoned House

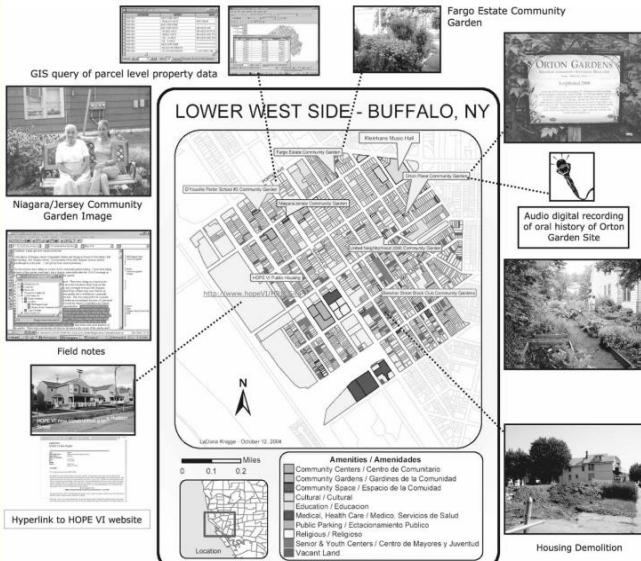
Rebecca Pearce

Grounded Visualization Exploring Fence Heights

Grounded visualization: integrating the analysis of qualitative and quantitative data through grounded theory and visualization

LaDona Knigge[¶], Meghan Cope[§]

Department of Geography, State University of New York at Buffalo, Buffalo, NY 14261, USA
Received 28 September 2004; in revised form 12 August 2005



Grounded theory

Grounded theory involves the collection, coding, and categorization of qualitative data (transcribed text from interviews, focus groups, and researchers' notes, photographs, and other images, etc) toward enabling themes to emerge through iterations of 'constant comparison'. Geographers have recently begun to pay more attention to grounded theory as a qualitative methodology, adopting it from its roots in sociology (for a review see Strauss and Corbin, 1998).

The purpose of grounded theory is to build theories from data about the social world such that theories are 'grounded' in people's everyday experiences and actions. The methods of grounded theory are iterative, reflexive, and inductive; that is, they involve multiple stages of collecting data, coding and analyzing them, reflecting on

Visualization

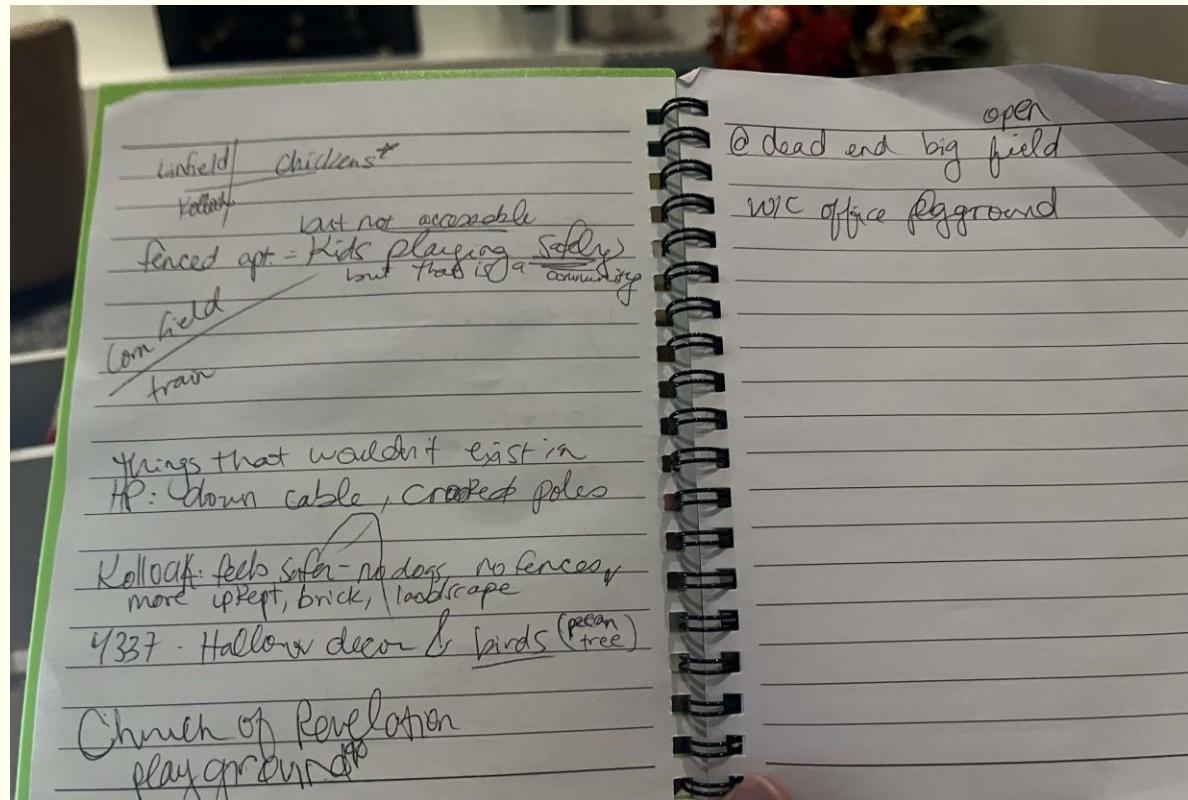
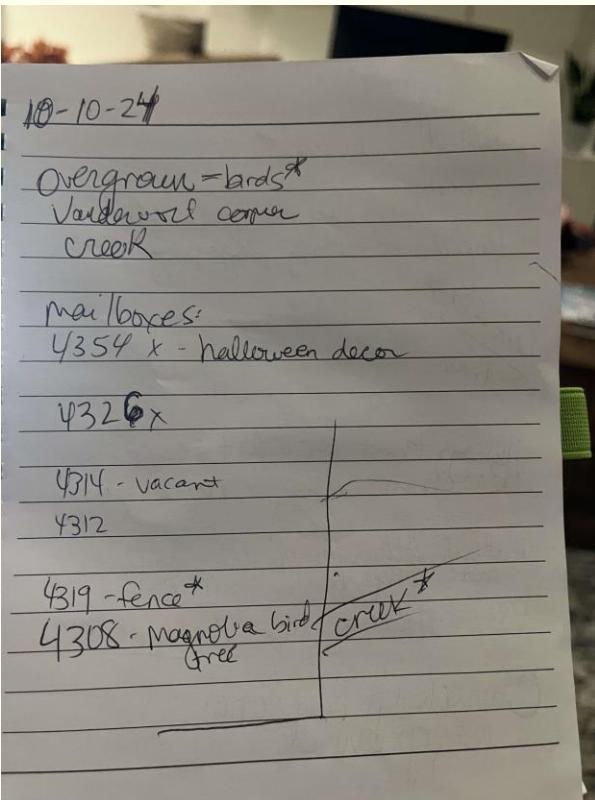
'Visualization' is a broad term that refers to an array of methods that are used to provide insight into data through visual representations and includes the areas of geographic, information, and scientific visualization, which refer to the visual representation and exploration of geographic data, of nonnumeric datasets, and of large, multivariate datasets that use high-end computing, respectively. While maps have been used in understanding, visualizing, and communicating spatial data for centuries by cartographies and geographers who relied on the power of the human eye to detect patterns and concepts, GIS and other technological developments in data exploration have changed the way that we store, analyze, and display spatial data and have generated new methods for exploring and visualizing data that were never before possible.

Exploratory Walk Searching for Glimmers

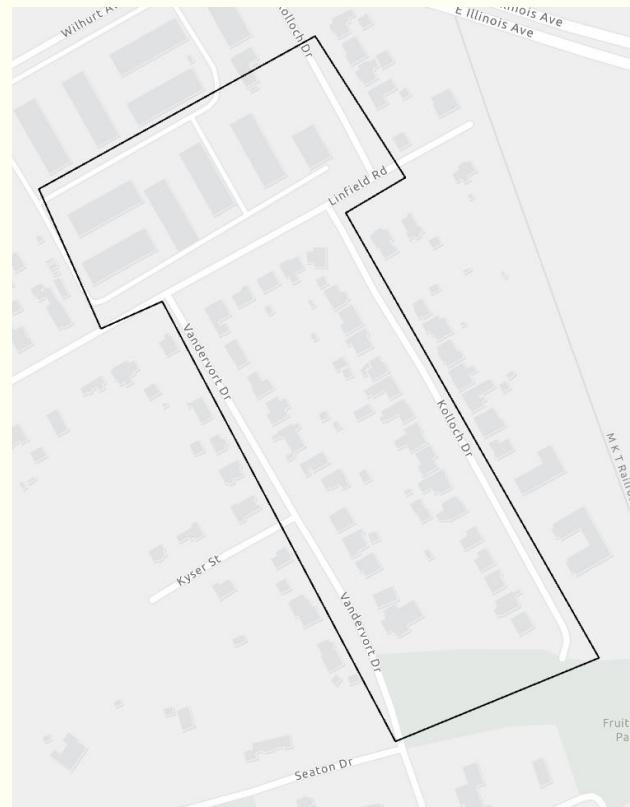


Notes from walk

35



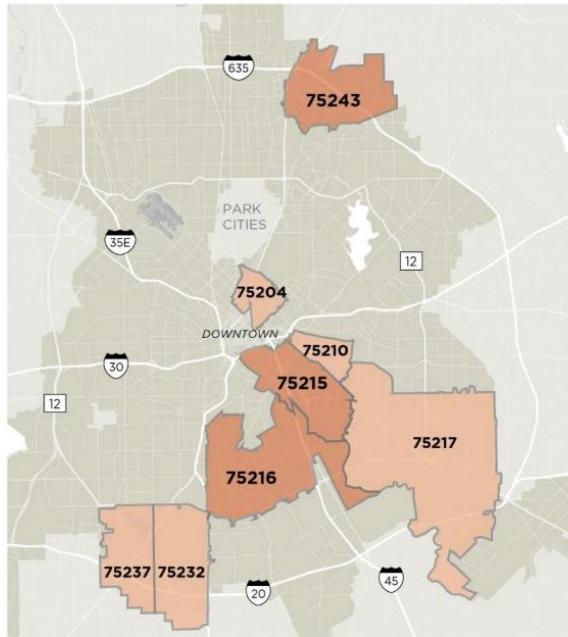
Sketchmap



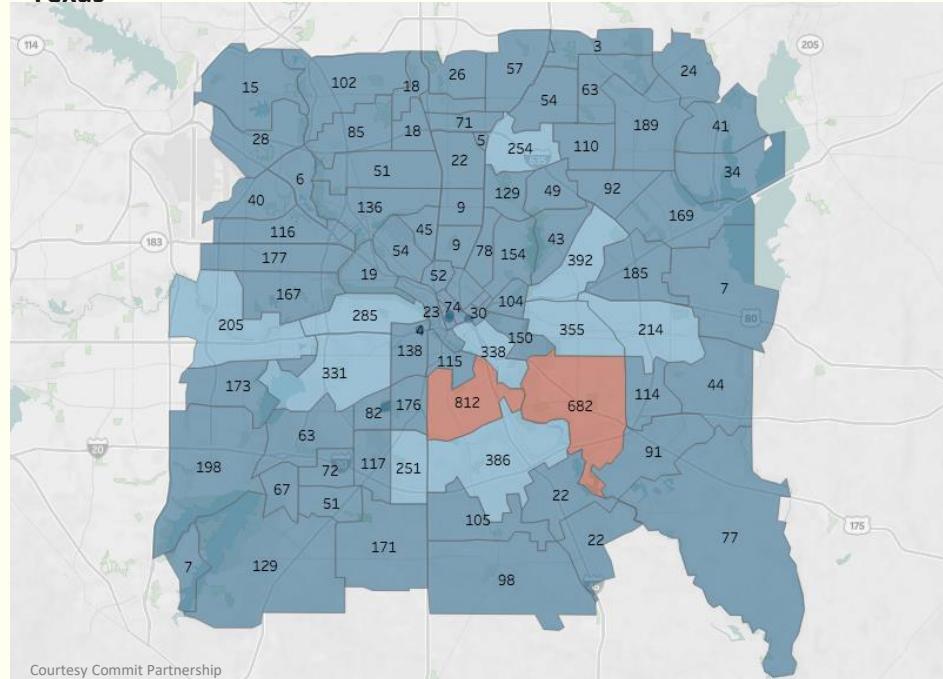
75216 Crime and Incarceration Data

Dallas ZIPs with the most homicides

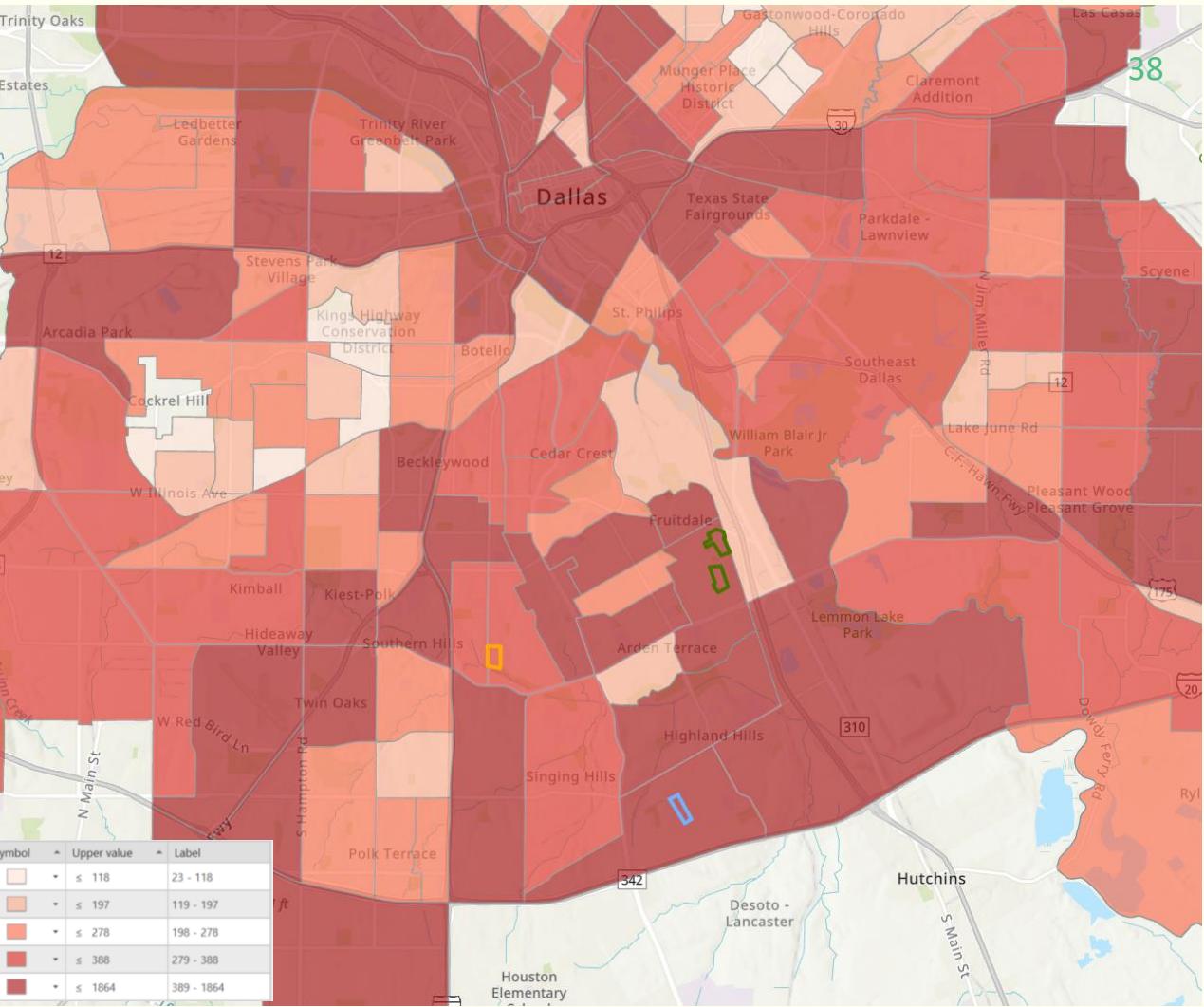
- 10 or more recorded this year (three times the average)
- 7 or more recorded this year (double the average)



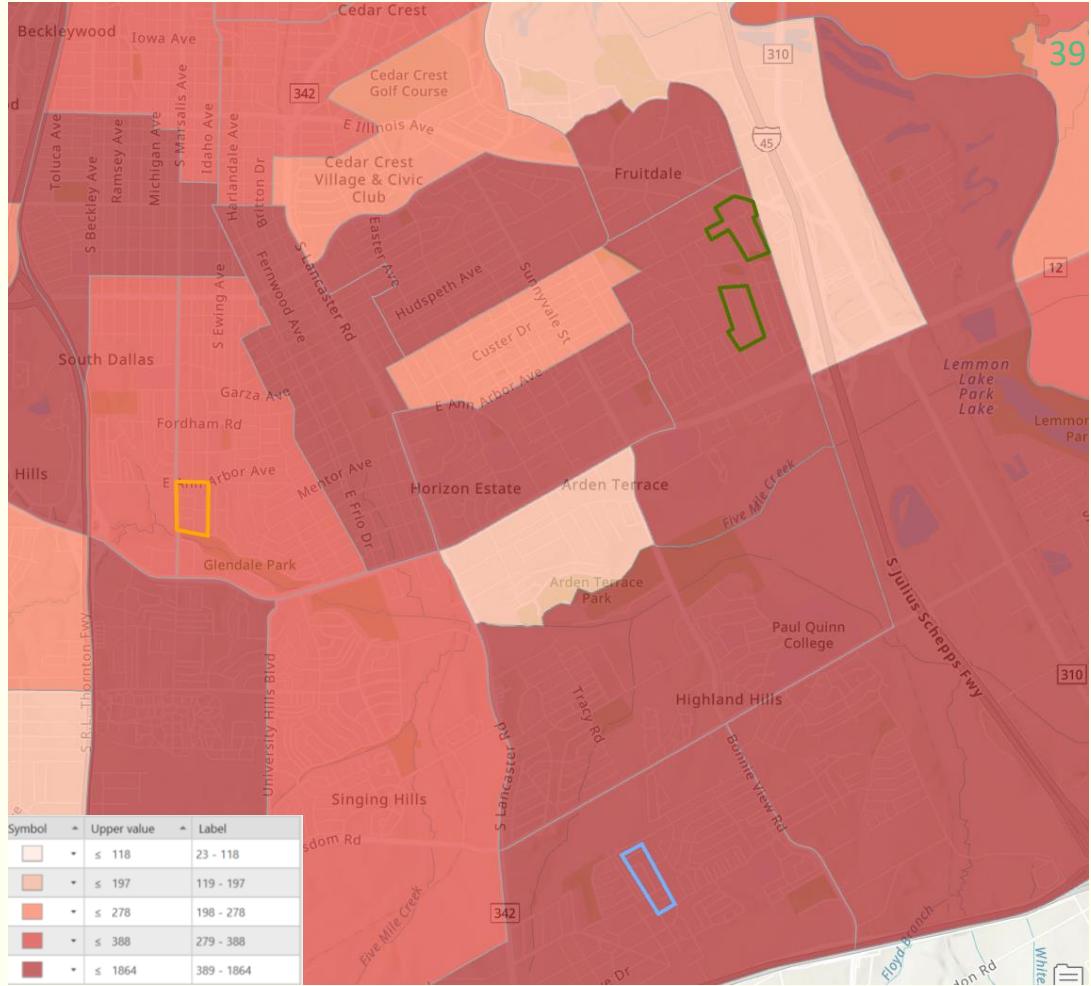
Two Dallas ZIP Codes Produce More Inmates Than Any Others in Texas



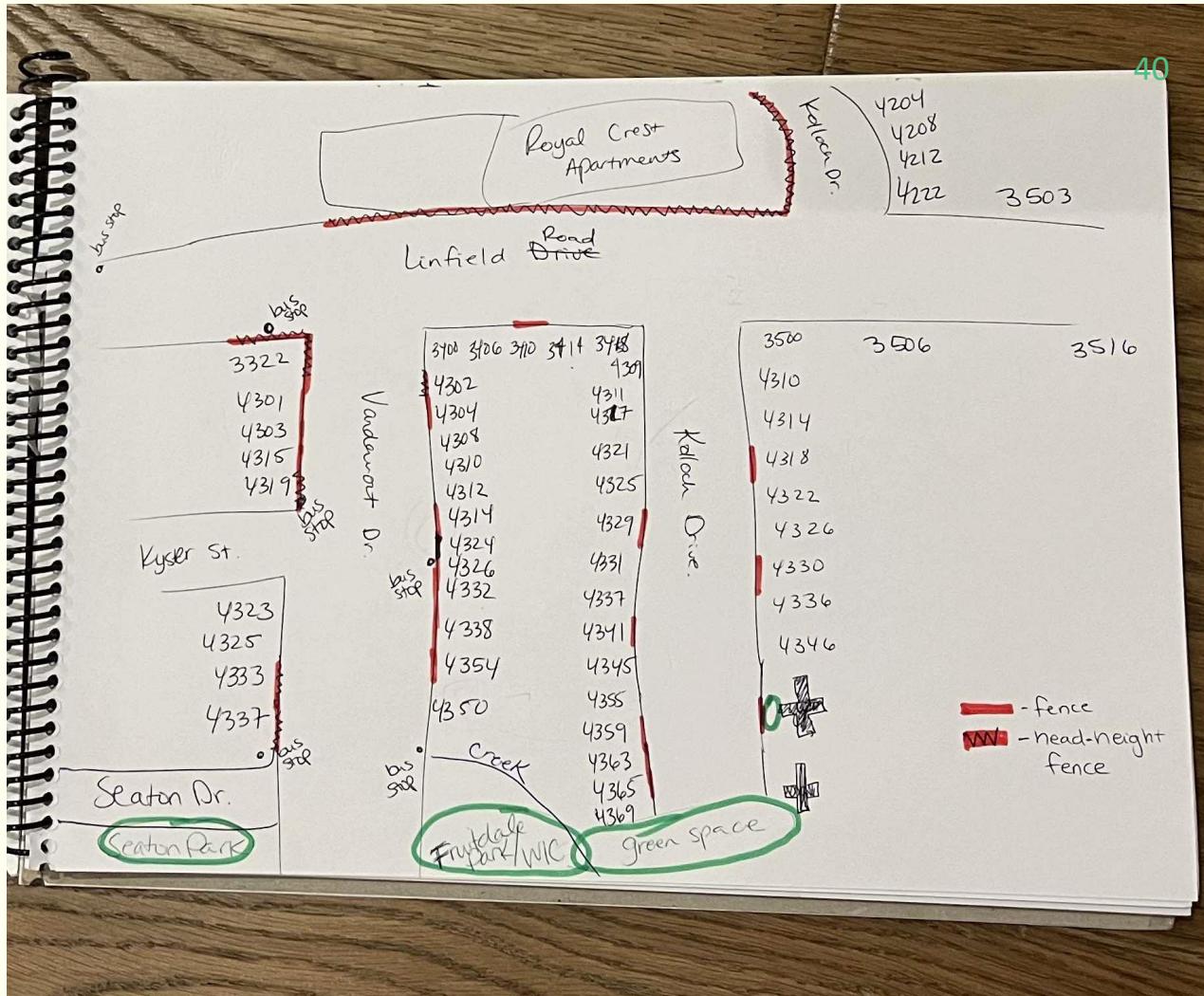
Service Area Command Crime Breakdown, All Crime

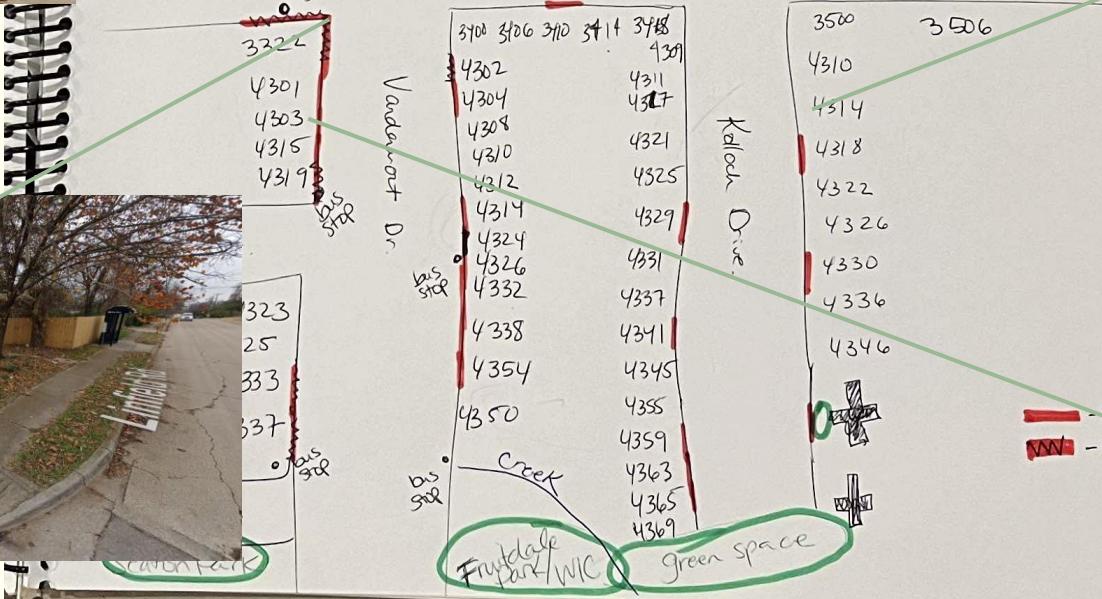
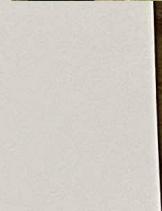


Service Area Command Crime Breakdown, All Crime

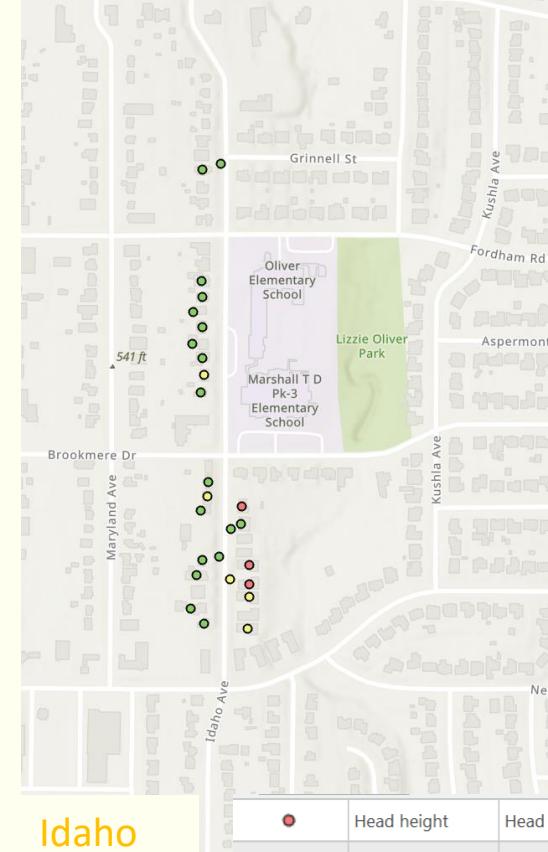
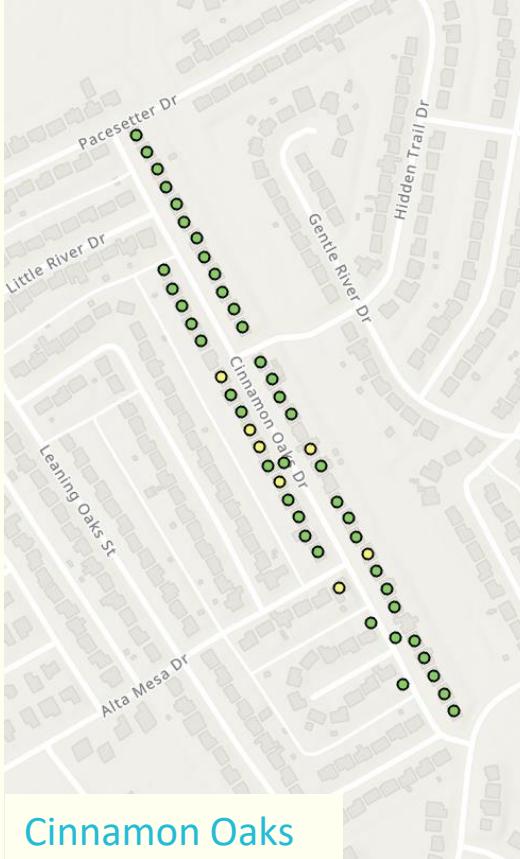
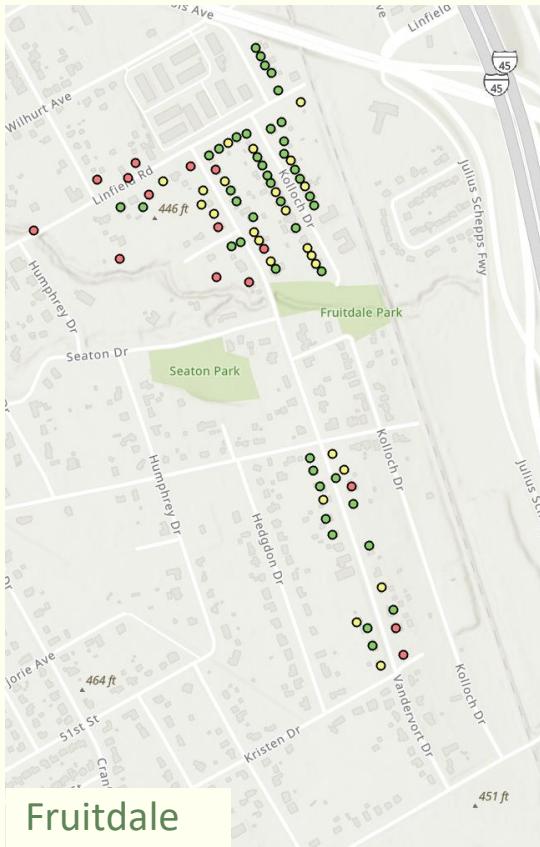


Sketchmap of fences and bus routes



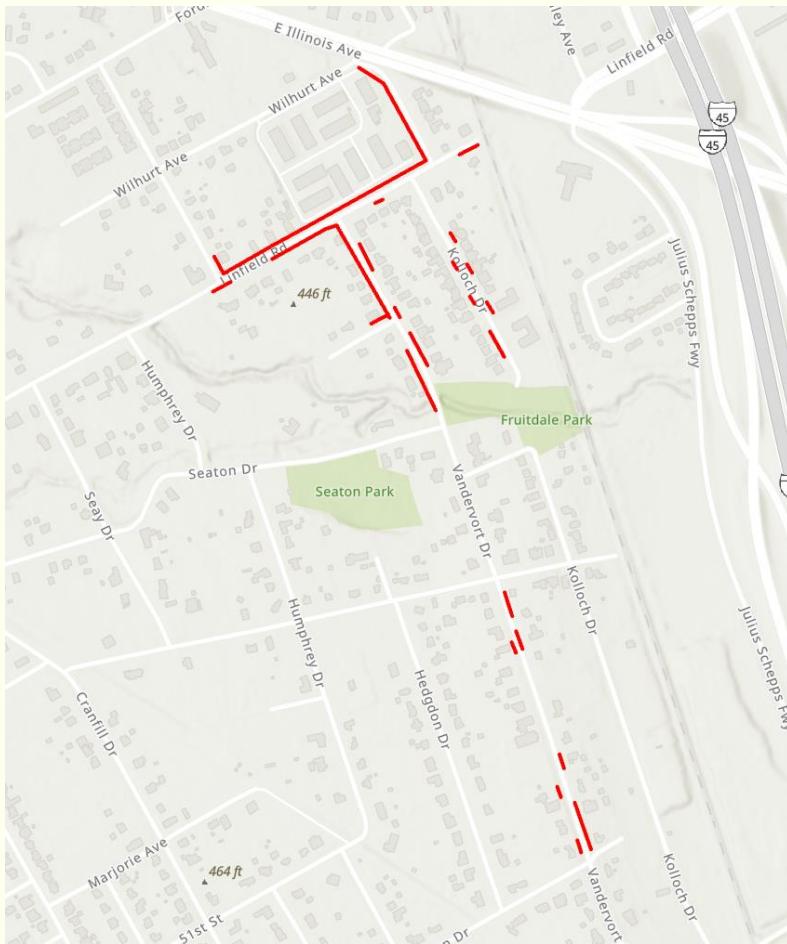


Fence Heights for Boundary Areas

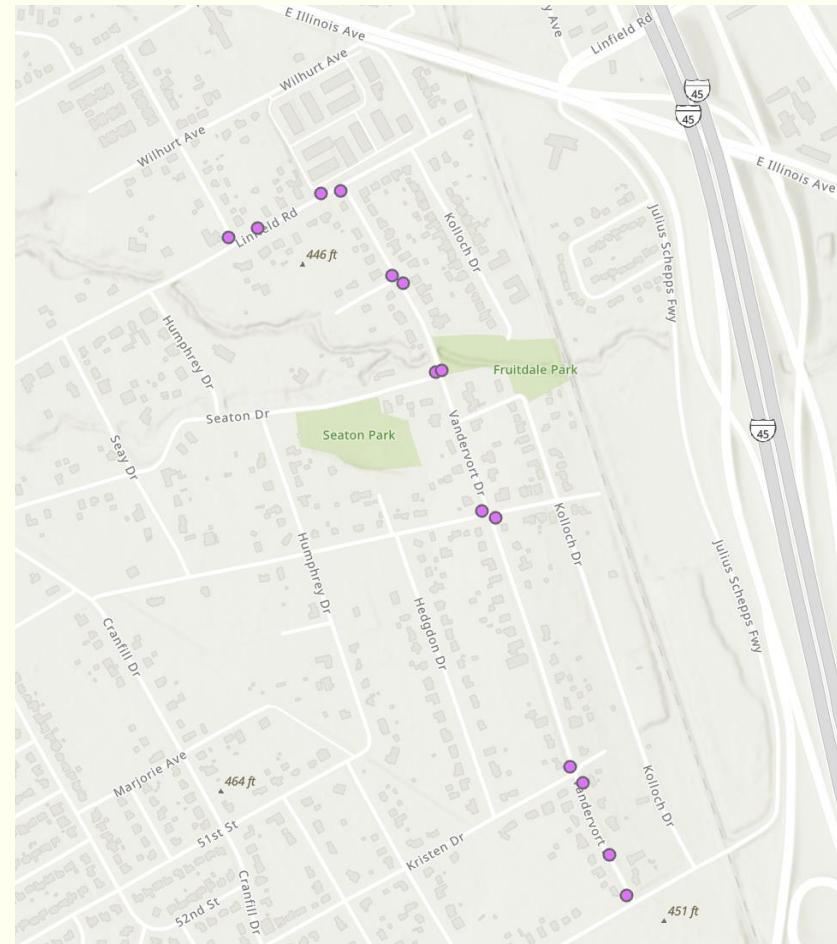


●	Head height	Head height
●	No fence	No fence
●	Waist high	Waist high

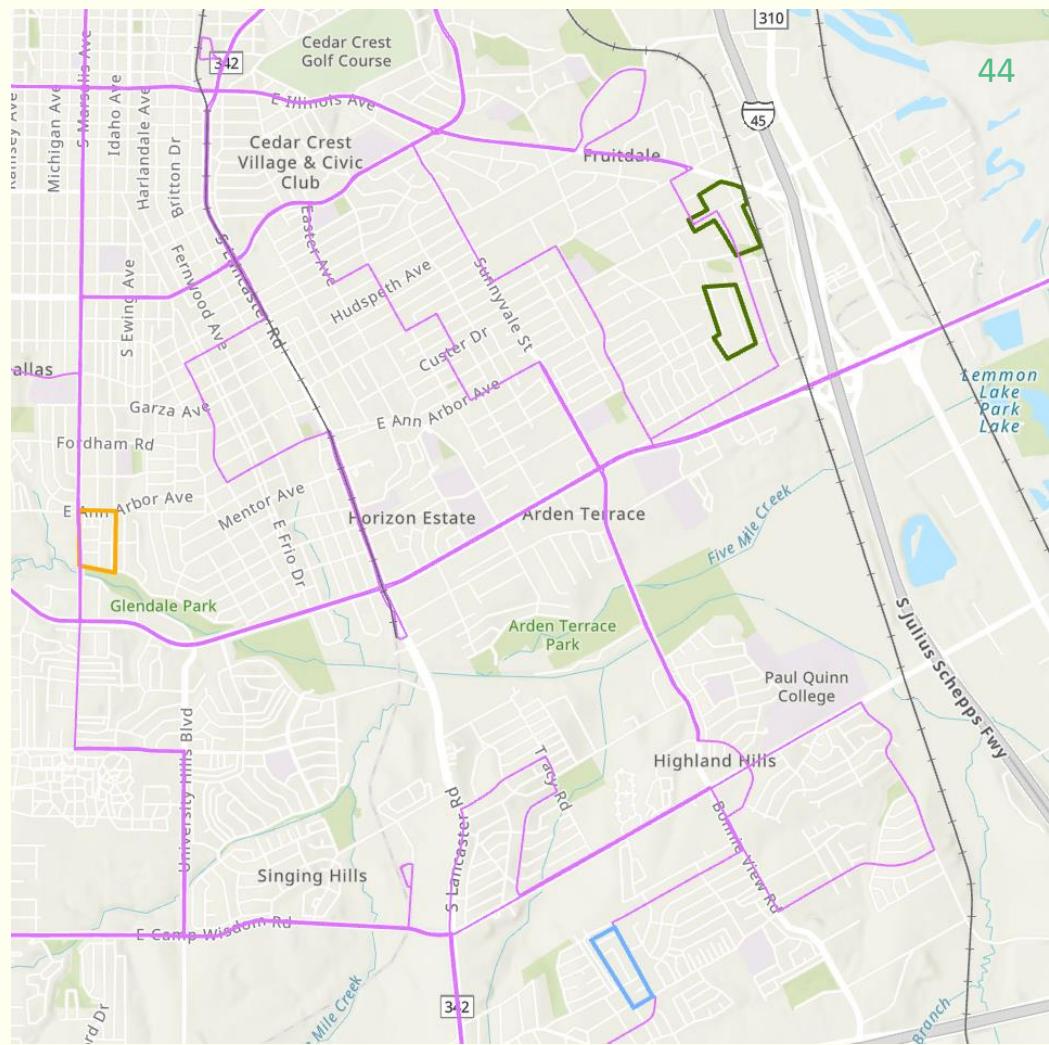
Fences in Fruitdale



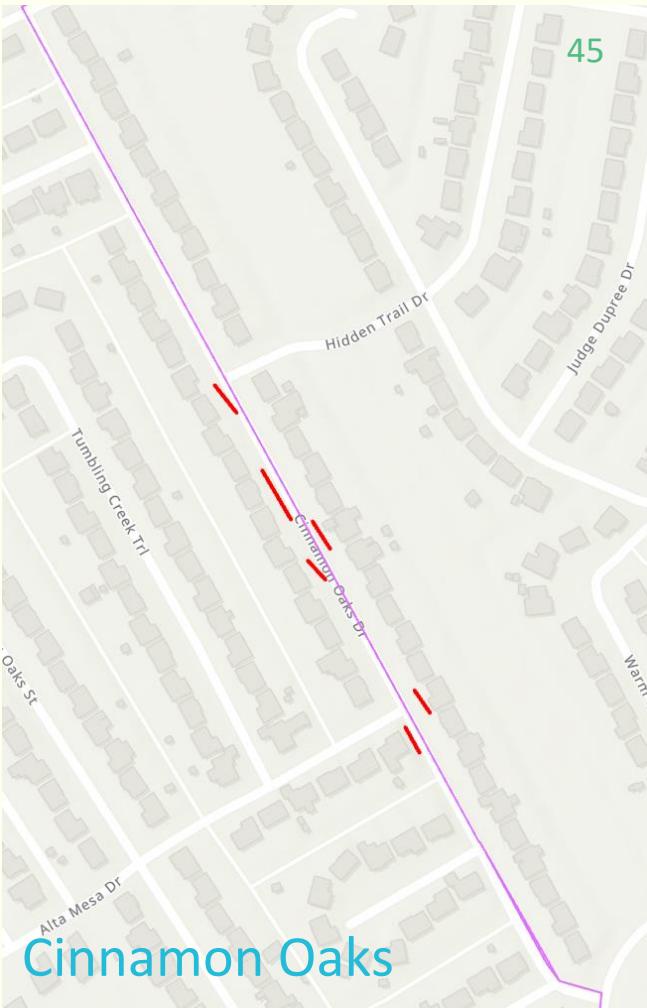
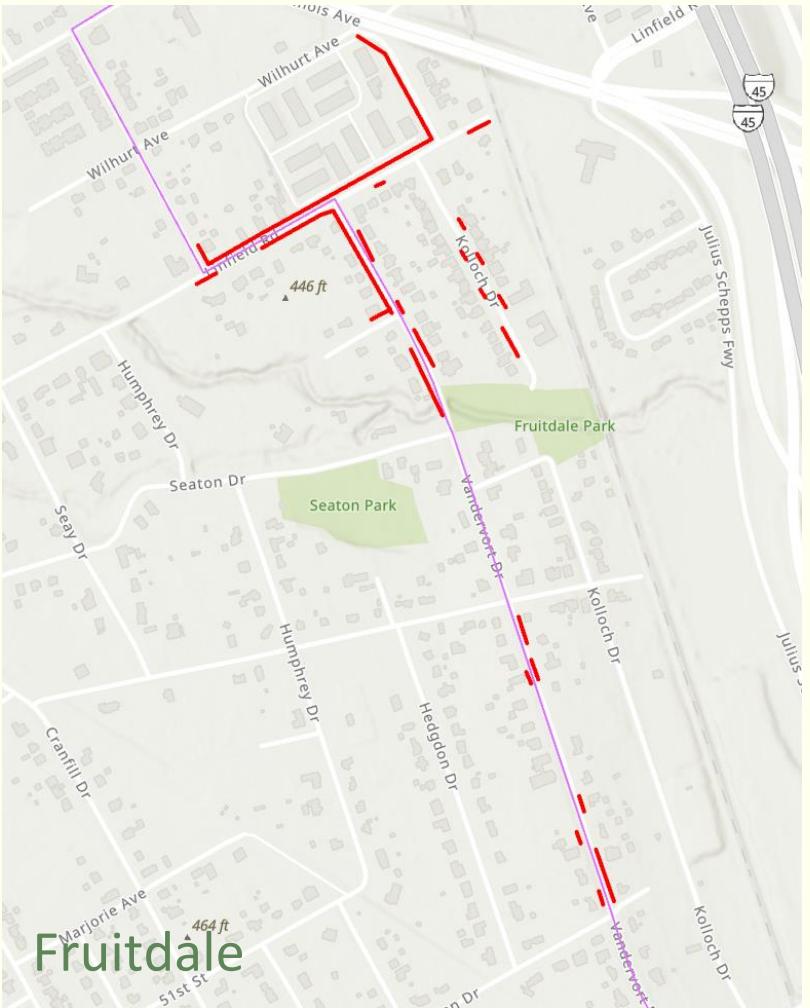
Bus stops in Fruitdale



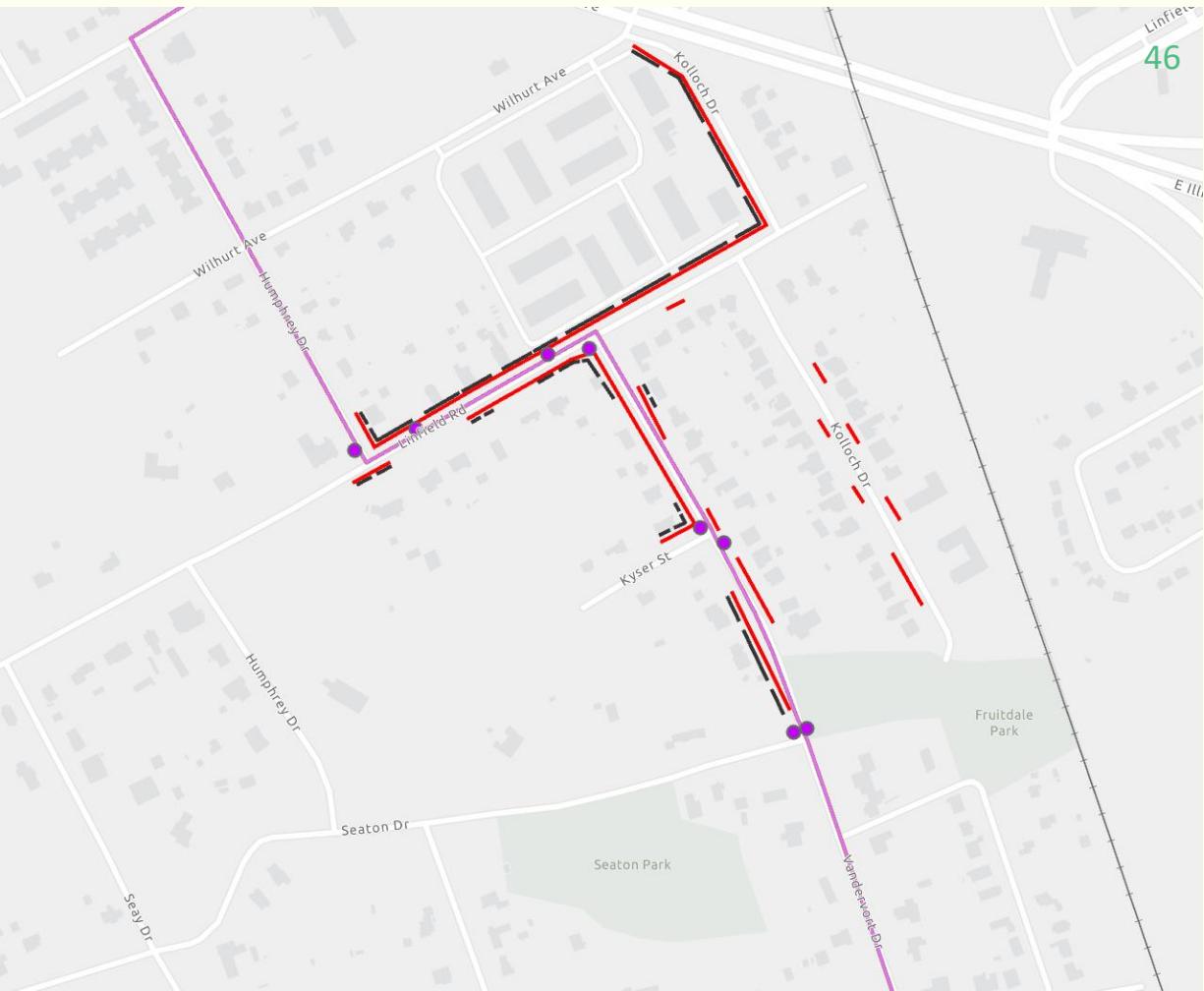
Parks & Rec, DART Bus Route 114, Railway Line



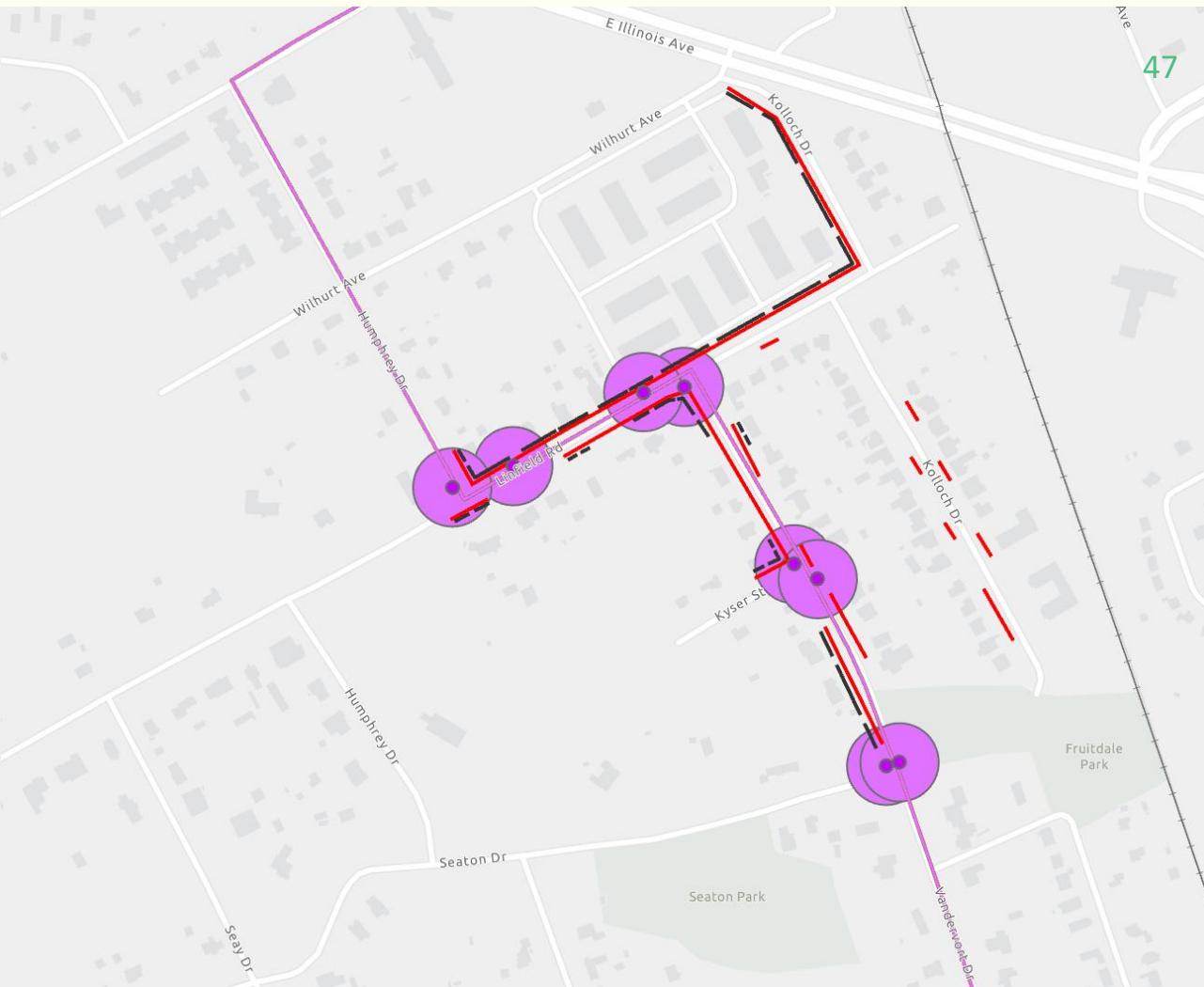
DART and front yard fences



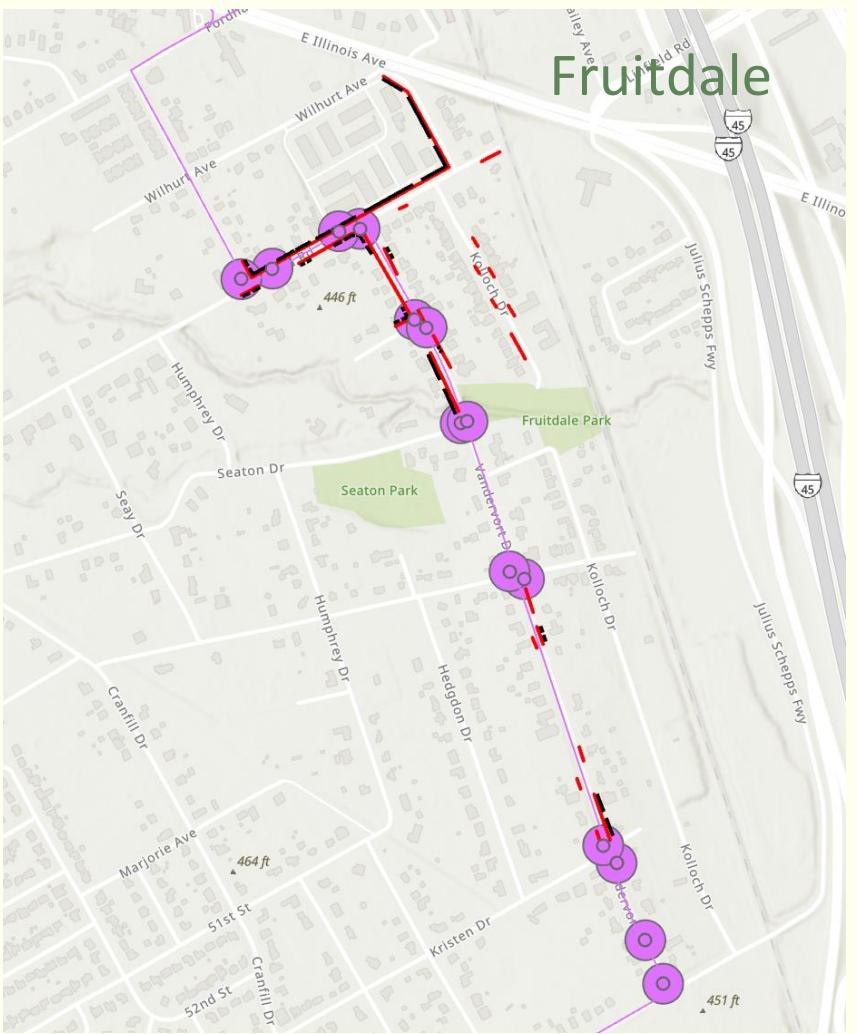
Tall fences compared to
bus stops



100 ft buffer of bus stops compared to high fences,
Fruitdale

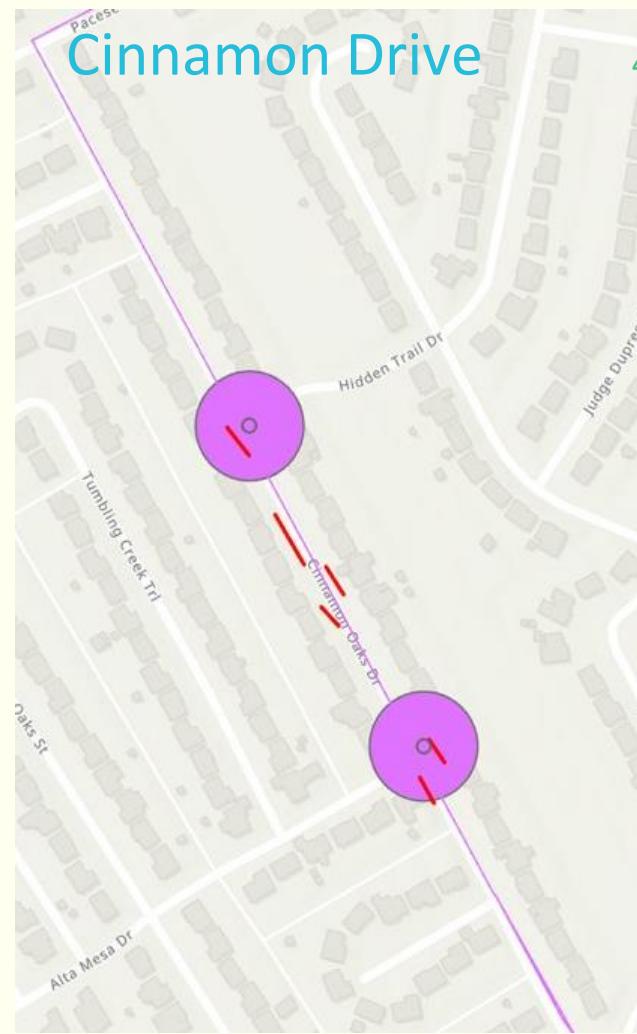


Fruitdale



Cinnamon Drive

48



Heuristic TOOL 3

OVERLAP & CONNECT

bring together & connect different flows, explore sites of overlap in space

mapping heuristic

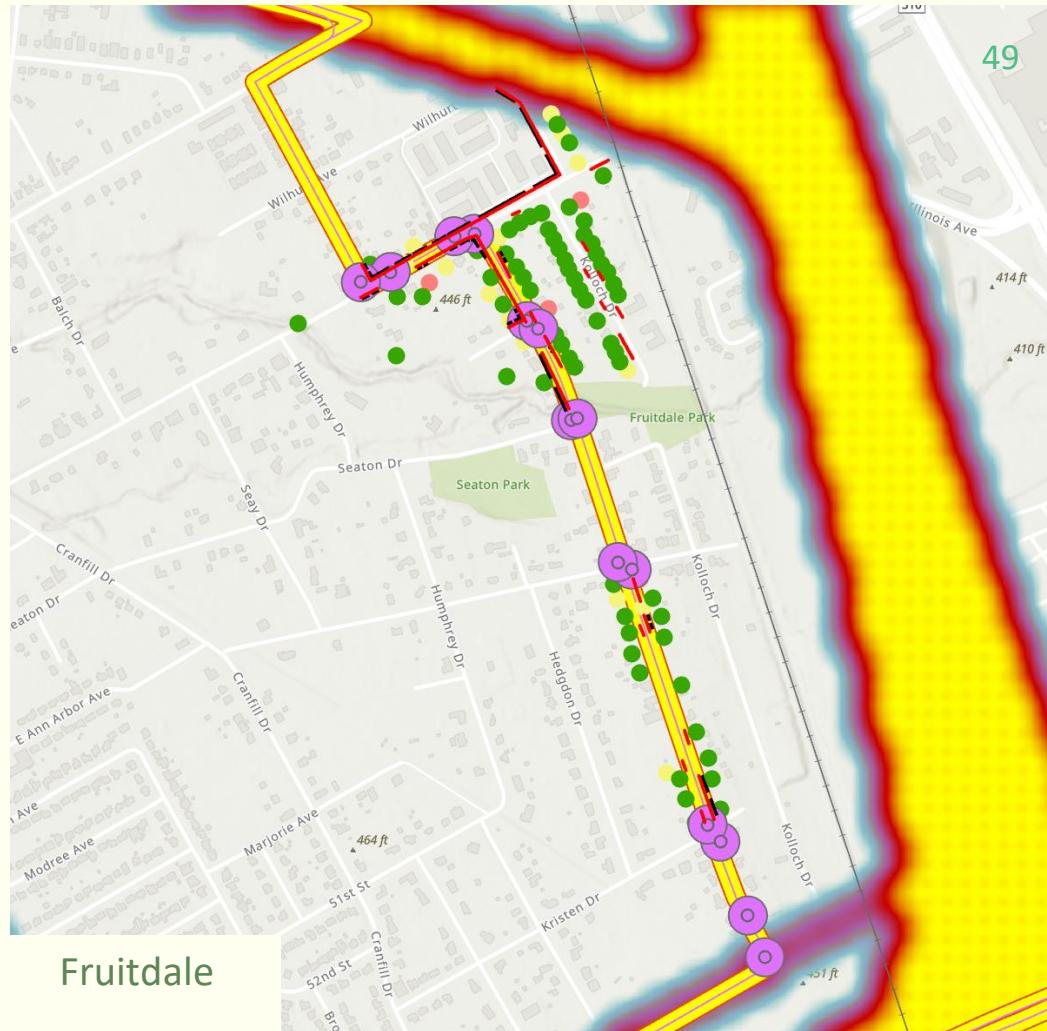
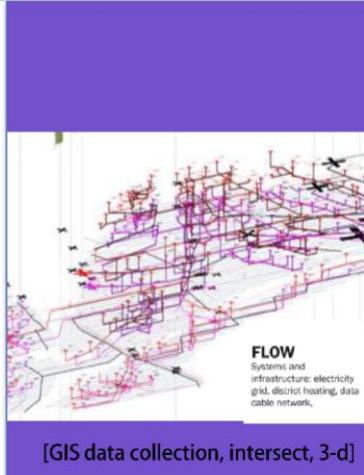
- generate questions from the overlaps
- flows of the city alter the patterns
- investigate sites of overlapped systems

examples

- infrastructures, cable network, electric grid as model for plan structure
- overlap between dynamic maps of heat island effect & transportation system

engineering idea

product has physical connections between components that serve distinct functions

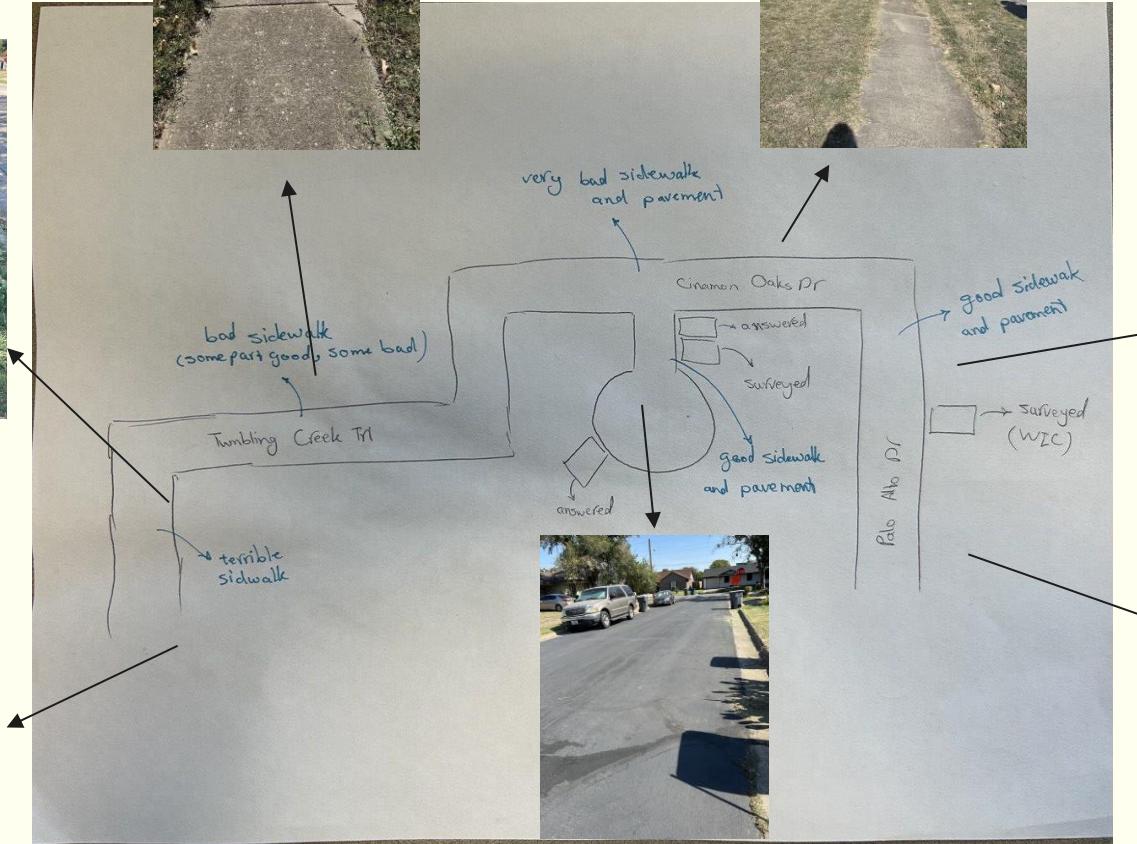
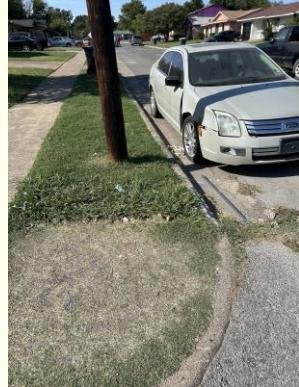


Fruitdale

Q: Is noise level a key indicator of feelings of safety for residents and visitors?

Ehsan Poorvahedi

Perceived walkability, sidewalks, and responsiveness



National Walkability Index DFW and Studied Areas

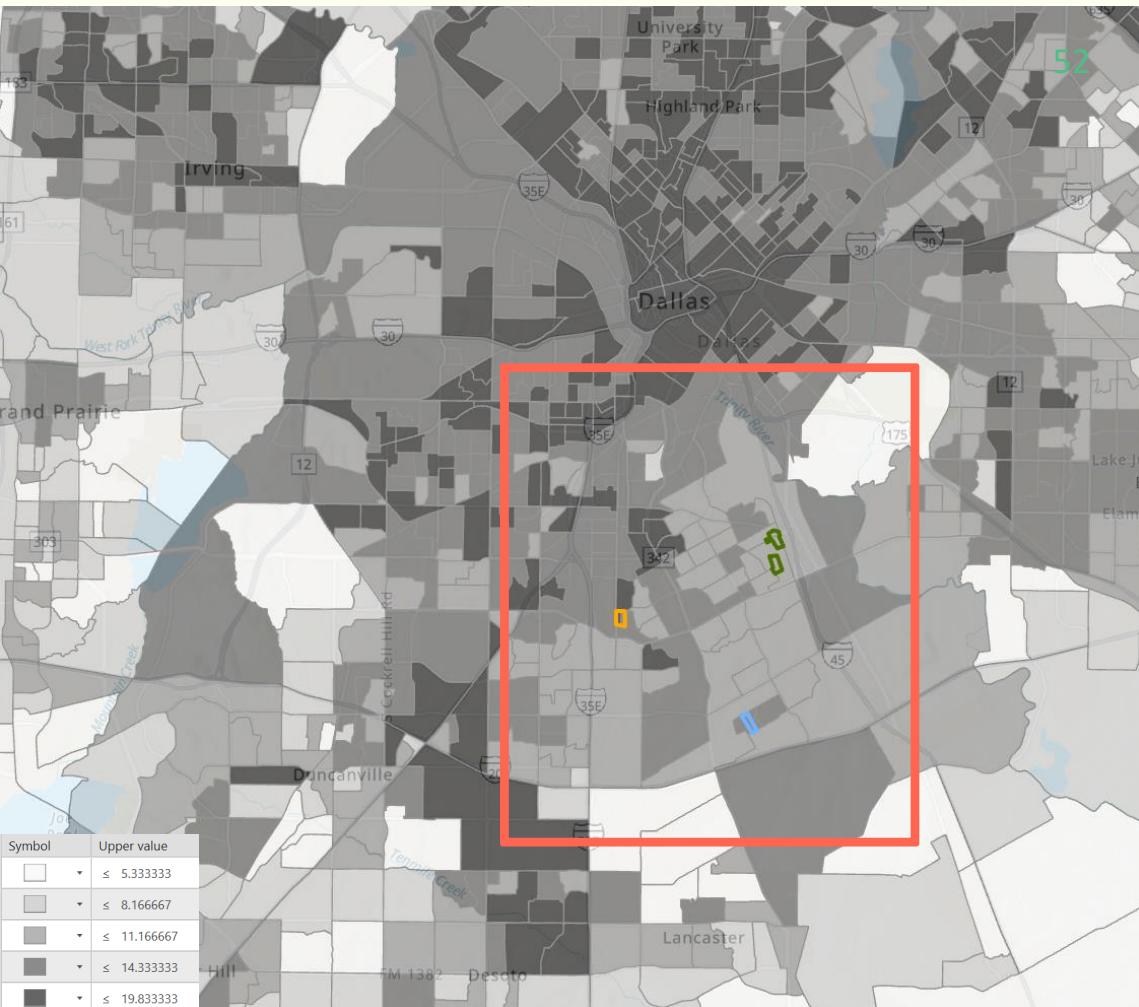
$$\text{Final National Walkability Index score} = (w/3) + (x/3) + (y/6) + (z/6)$$

Where w = block group's ranked score for intersection density

x = block group's ranked score for proximity to transit stops

y = block group's ranked score for employment mix

z = block group's ranked score for employment and household mix



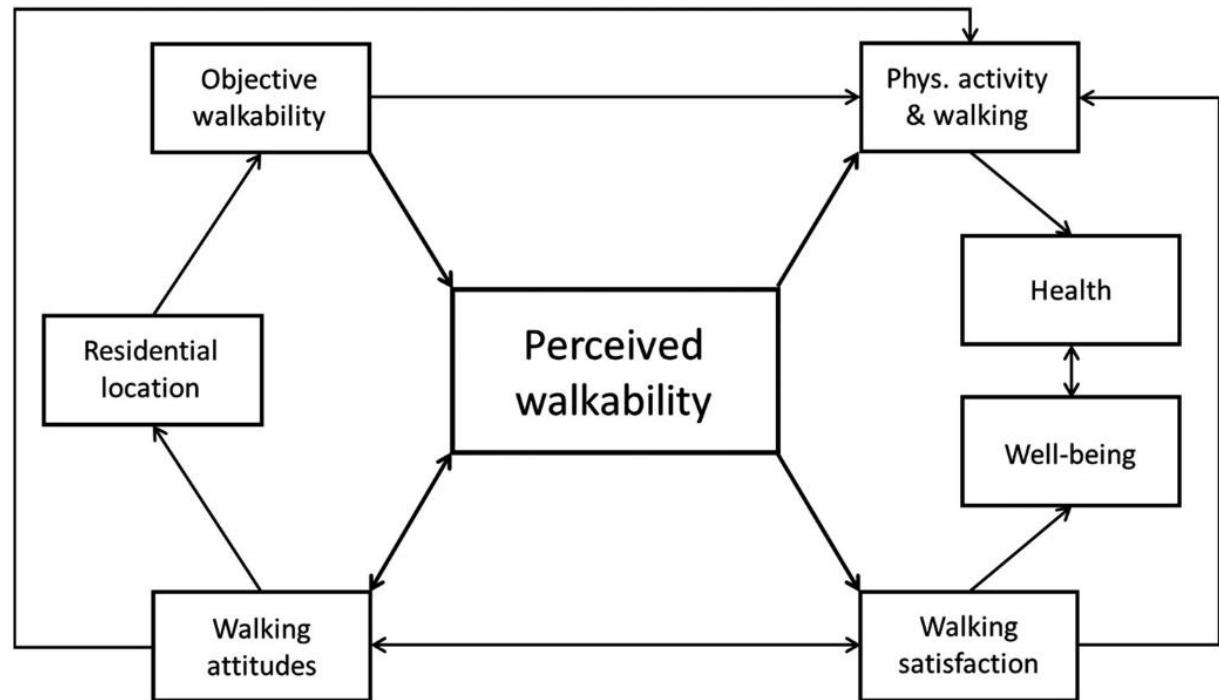
National Walkability Index for 75216 and 75241



Objective Walkability vs. Perceived Walkability

54

- Objective walkability: Objective elements of accessibility (such as built environment characteristics)
- Perceived walkability: how easy people find it to walk (in an area or to destinations)



Conceptual model of the determinants and outcomes of perceived walkability (De Vos et al 2023)

The relation between perceived walkability of neighborhoods with their responsiveness

Indicators

Sidewalk existence and its condition

Pavement condition

Bus stops

Vegetation

The number of houses responded

The number of interviews

Sidewalk Categorization



Good Sidewalk



No Sidewalk

Bad Sidewalk

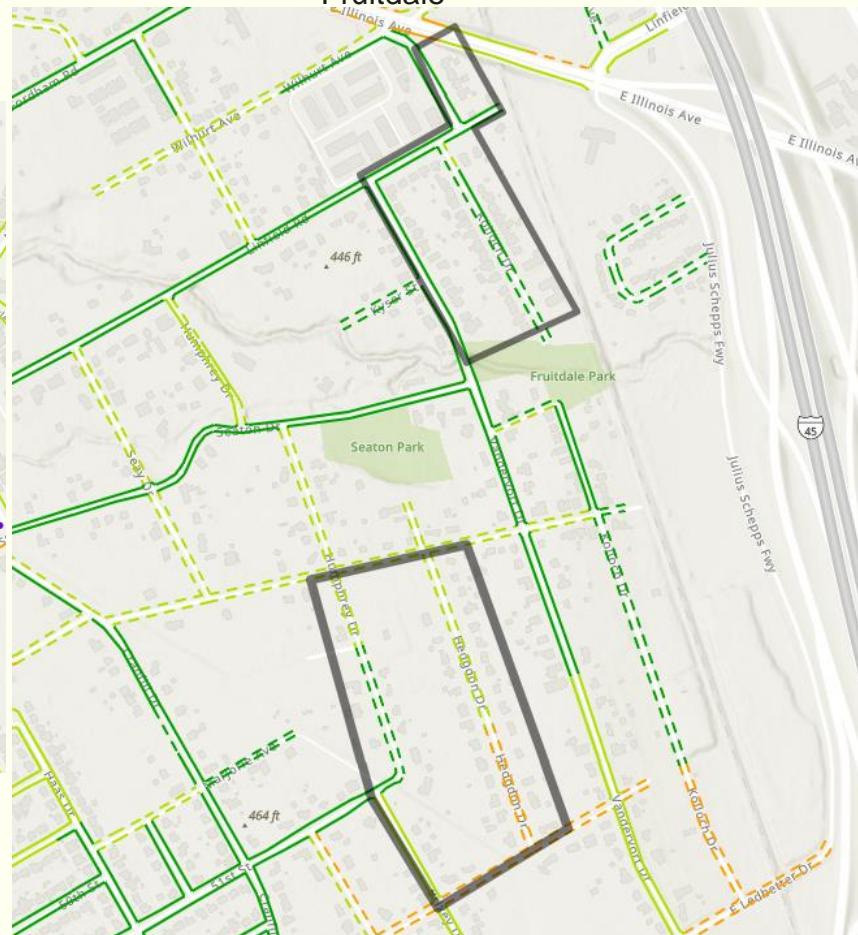


Sidewalk Existence and Condition

Cinnamon Oaks Dr



Fruitdale



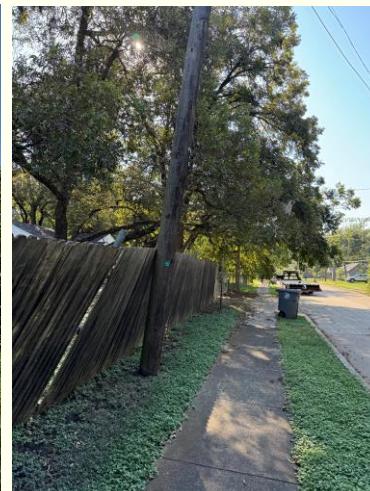
Sidewalk Observation



Hodgdon and
Humphrey Dr



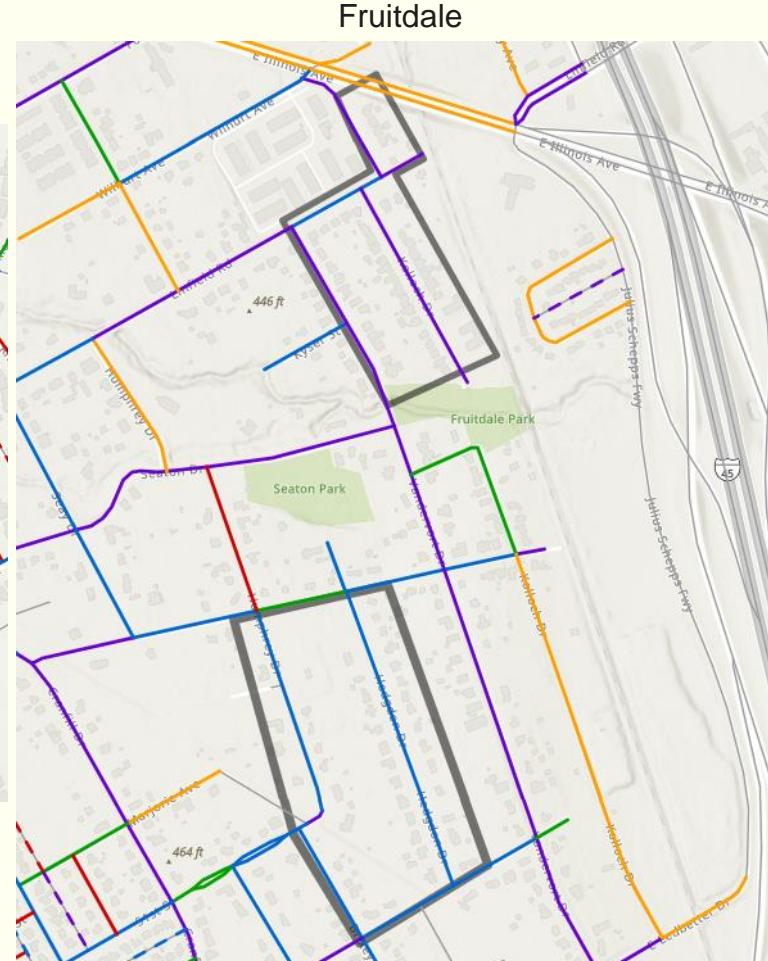
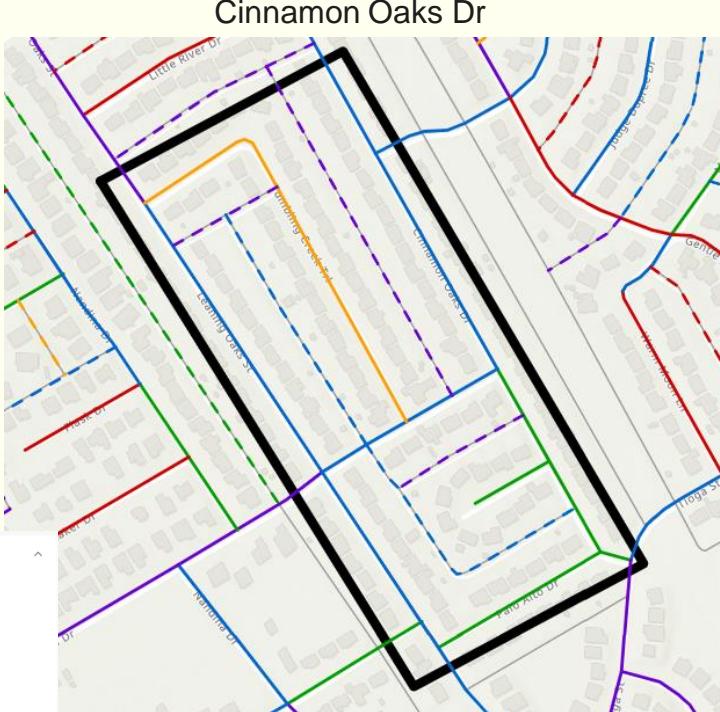
Cinnamon Oaks Dr



Kolloch and Vandervort Dr



Pavement Condition

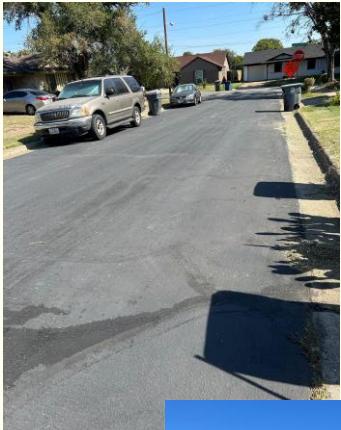


Symbology

Supersegment

- A - Street - Excellent
- B - Street - Good
- C - Street - Fair
- D - Street - Poor
- E - Street - Failed
- A - Alley - Excellent
- B - Alley - Good
- C - Alley - Fair
- D - Alley - Poor
- E - Alley - Failed

Pavement Observation



Cinnamon Oaks Dr



Hodgdon and
Humphrey Dr



Kolloch and Vandervort Dr

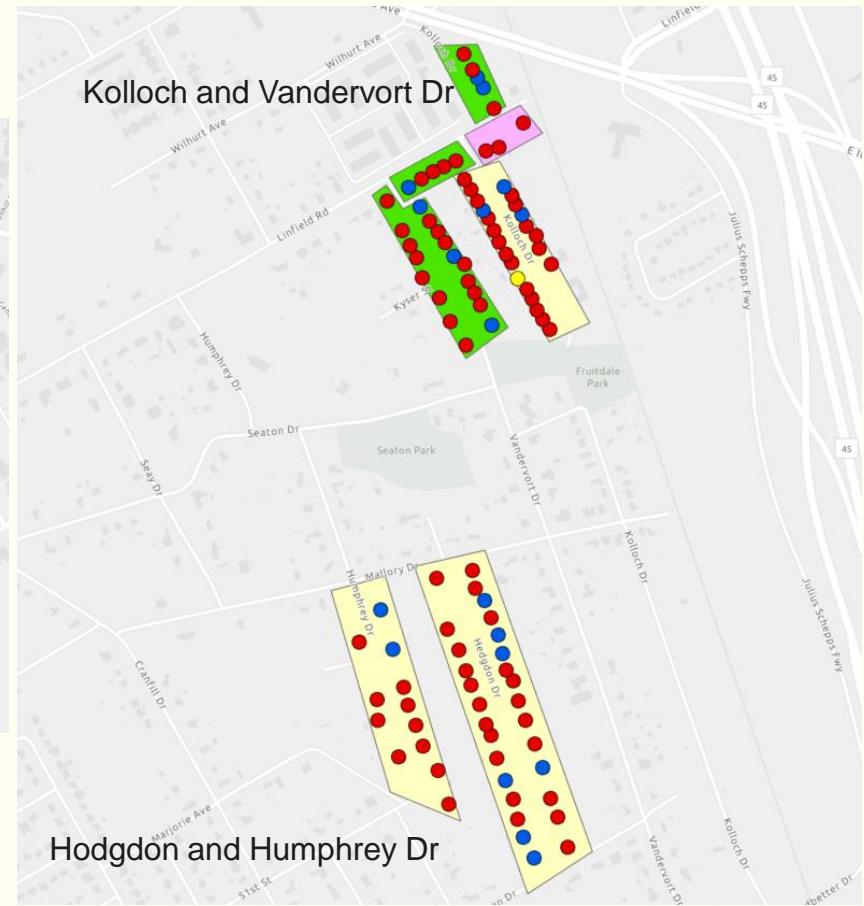


Neighborhood categorization and responsiveness

Cinnamon Oaks Dr



Kolloch and Vandervort Dr

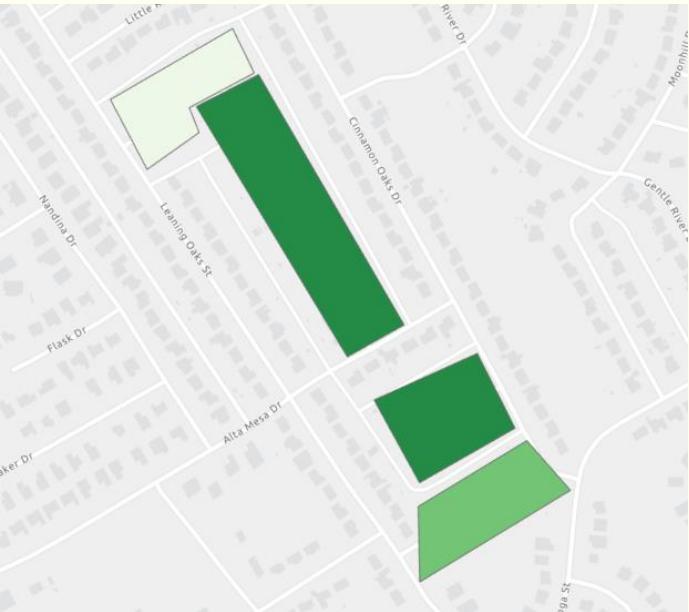


Neighborhood categorization and responsiveness

Fruitdale



Cinnamon Oaks Dr

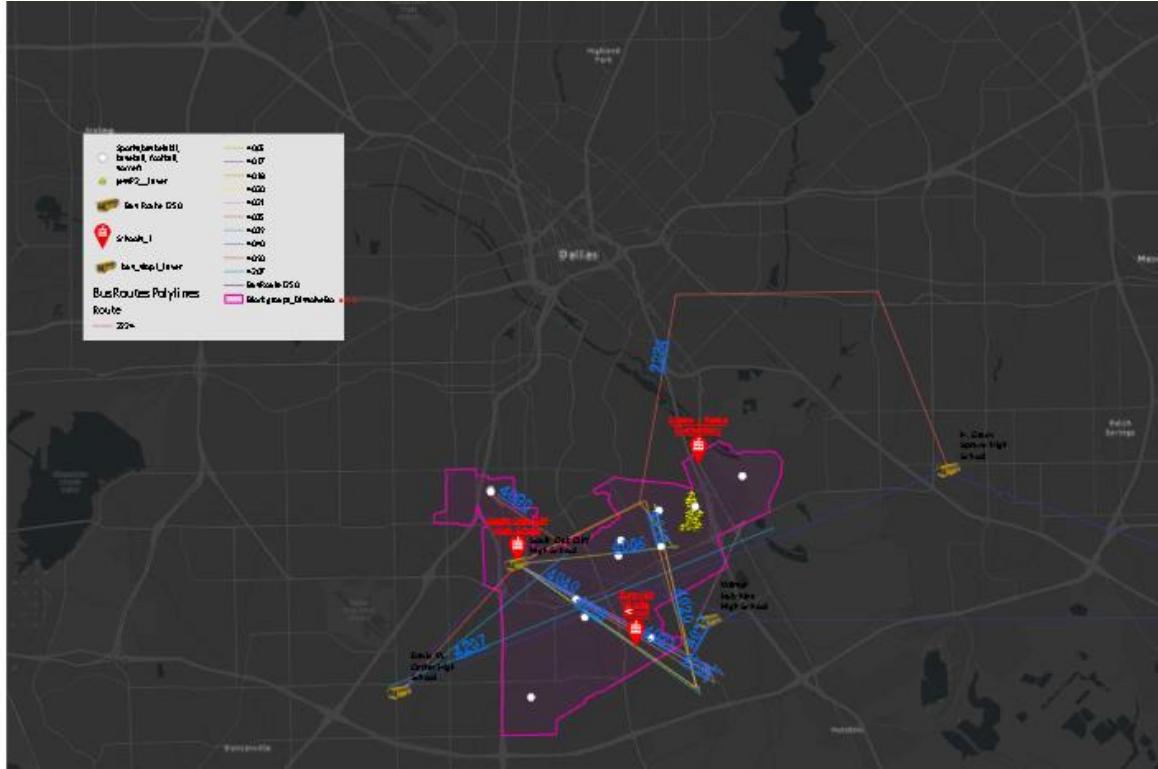


Symbol	Upper value	Label
■	≤ 0	0.000000
■	≤ 0.16	0.000001 - 0.160000
■	≤ 0.24	0.160001 - 0.240000
■	≤ 0.54	0.240001 - 0.540000

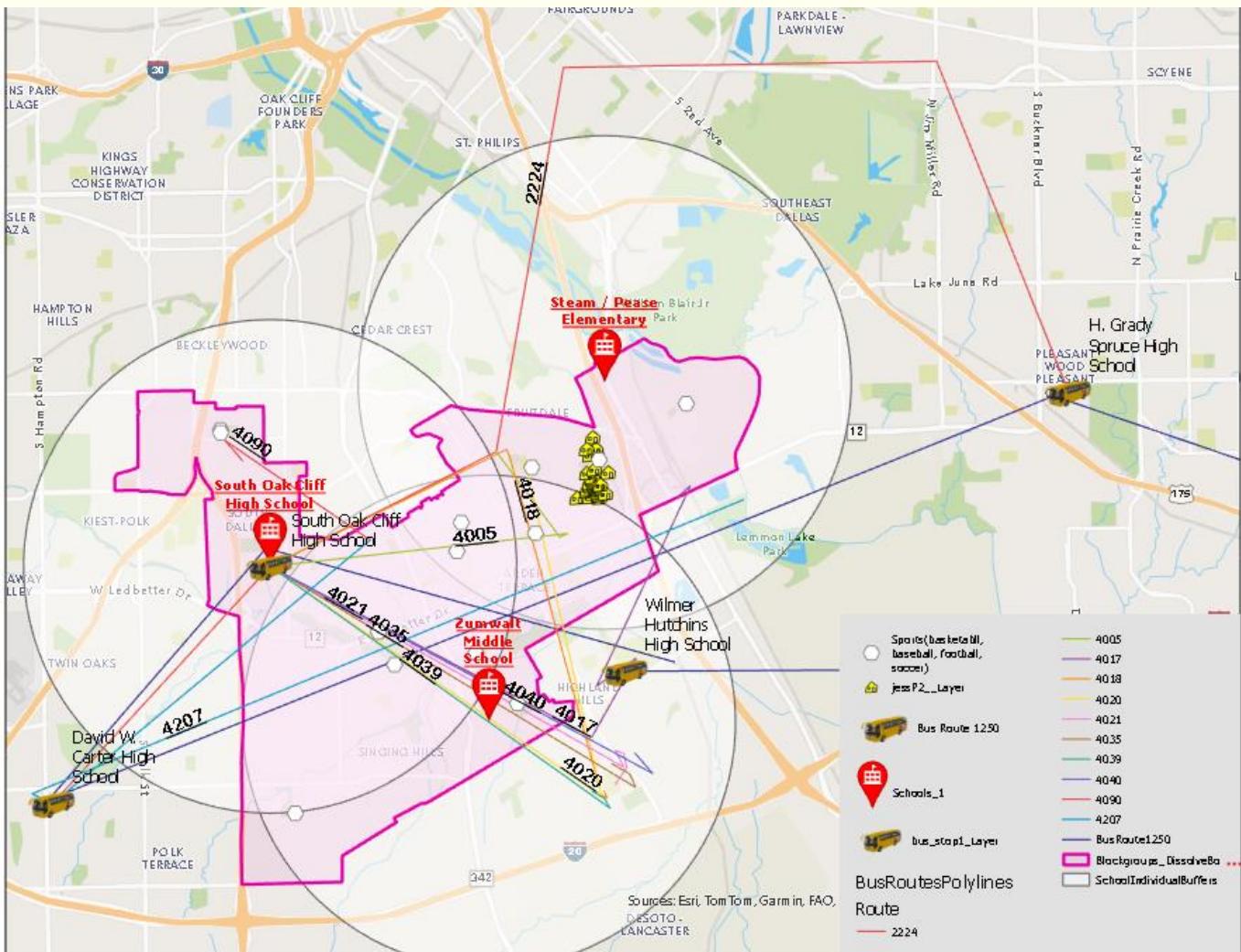
Jessica

Enrichment & Development
According to Accessibility

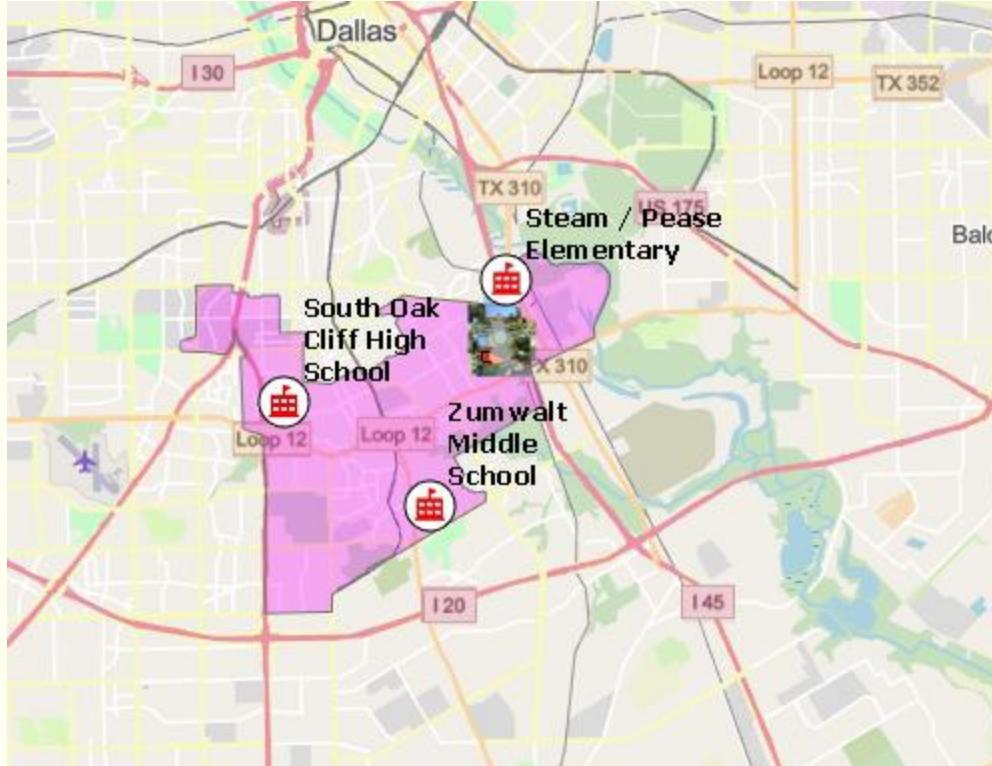
The logo consists of the word "Dallas" stacked vertically with "GIS" and "Fruitdale". The "D" and "G" are black, while "I", "S", and the bottom part of "Fruitdale" are white. The "I", "S", and the top part of "Fruitdale" are set against a yellow square. The "Fruitdale" text is partially cut off by a vertical black bar on the right.



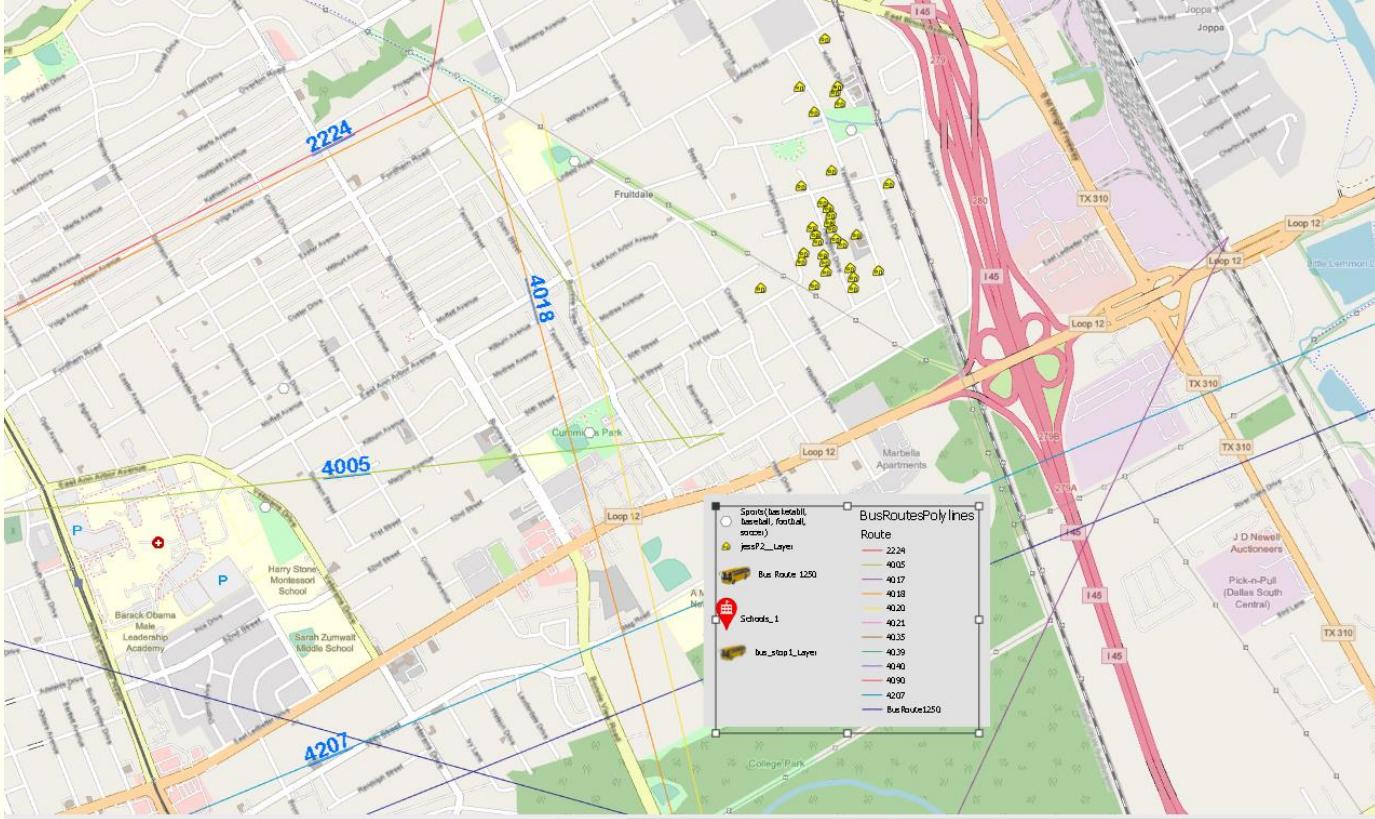
SOC feeder zone for site-visit houses. School buffer - 3 miles from each school. Bus routes to high school. Route 1250 is the DISD recommended bus for everyone residing in the area I visited.



Defining SOC
boundaries
from DISD and
site visit

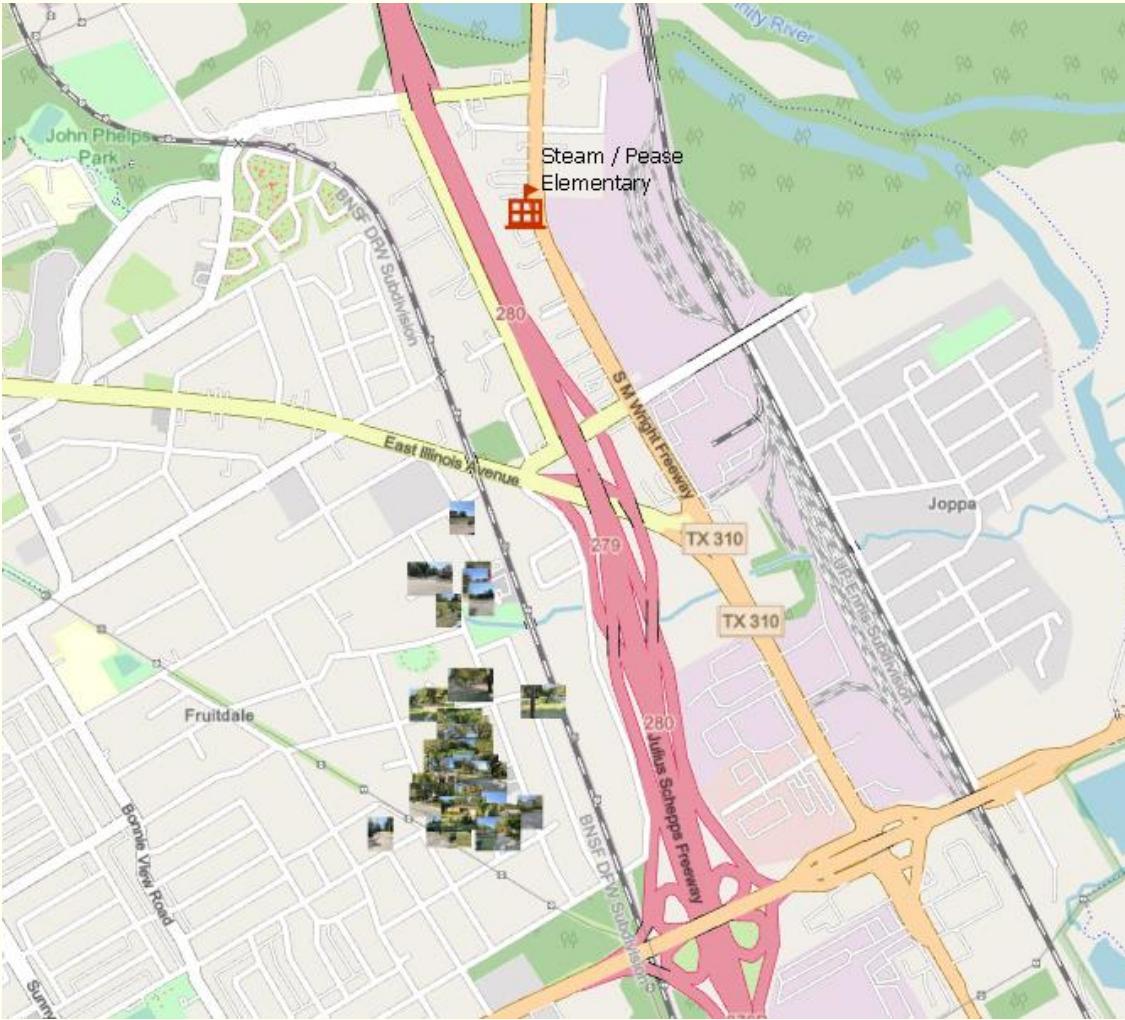


Bus Lines



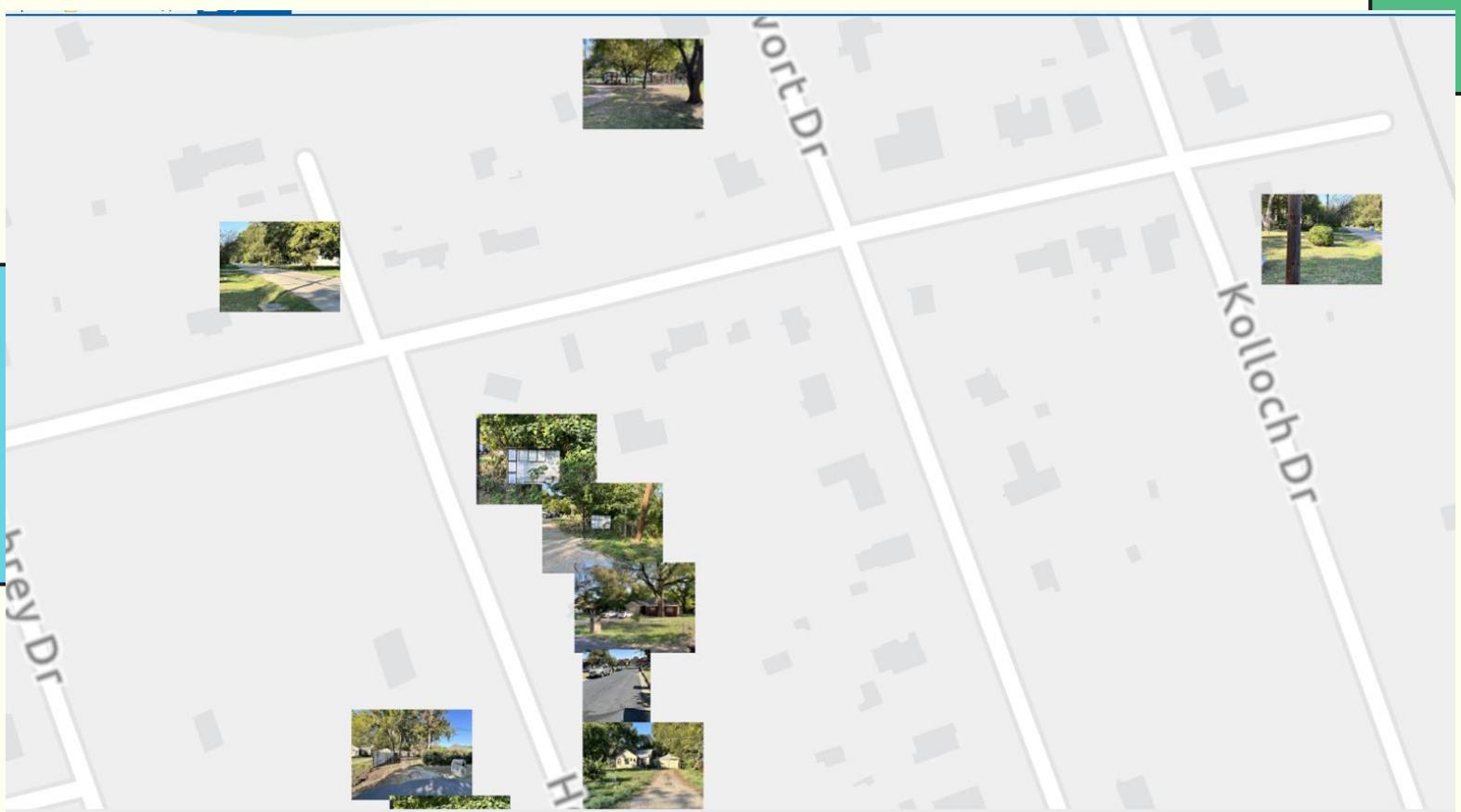
SOC feeder zone for site-visit houses. School buffer - 3 miles from each school. Bus routes to high school. Route 1250 is the DISD recommended bus for everyone residing in the area I visited.

Houses in relation to Pease Elementary

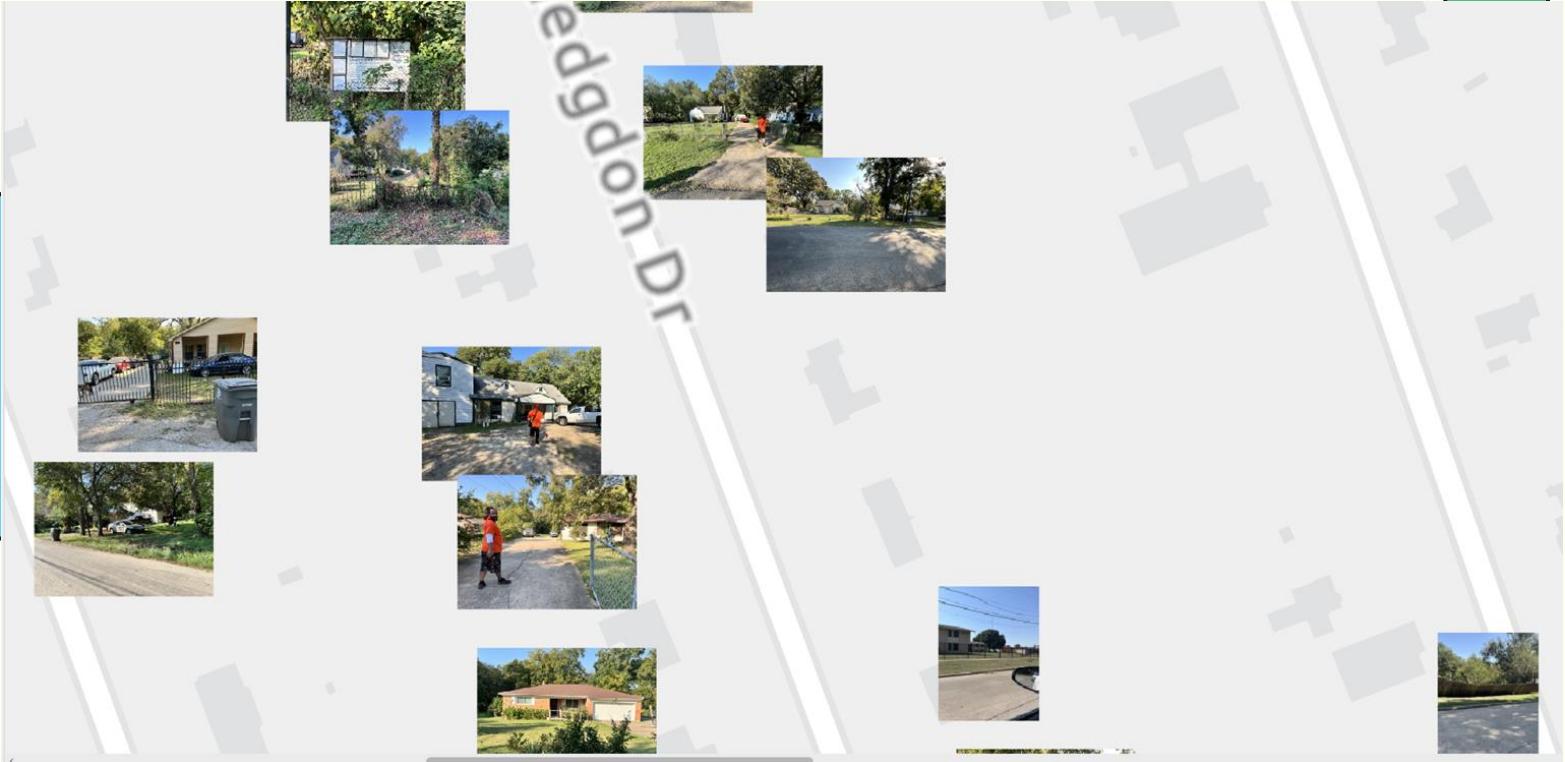


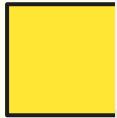


Houses visited
1 of 3



Houses visited
2 of 3





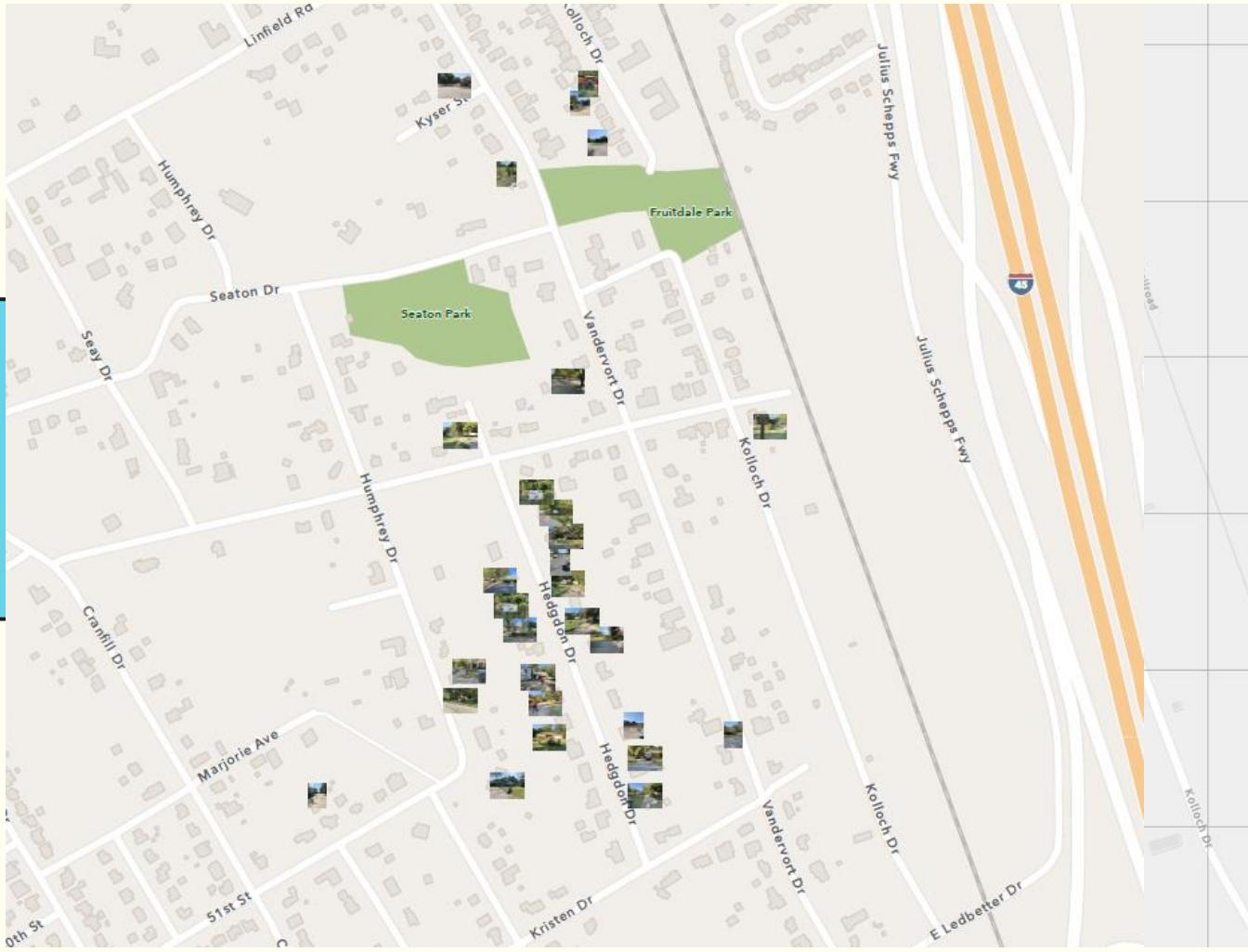
Houses visited
3 of 3



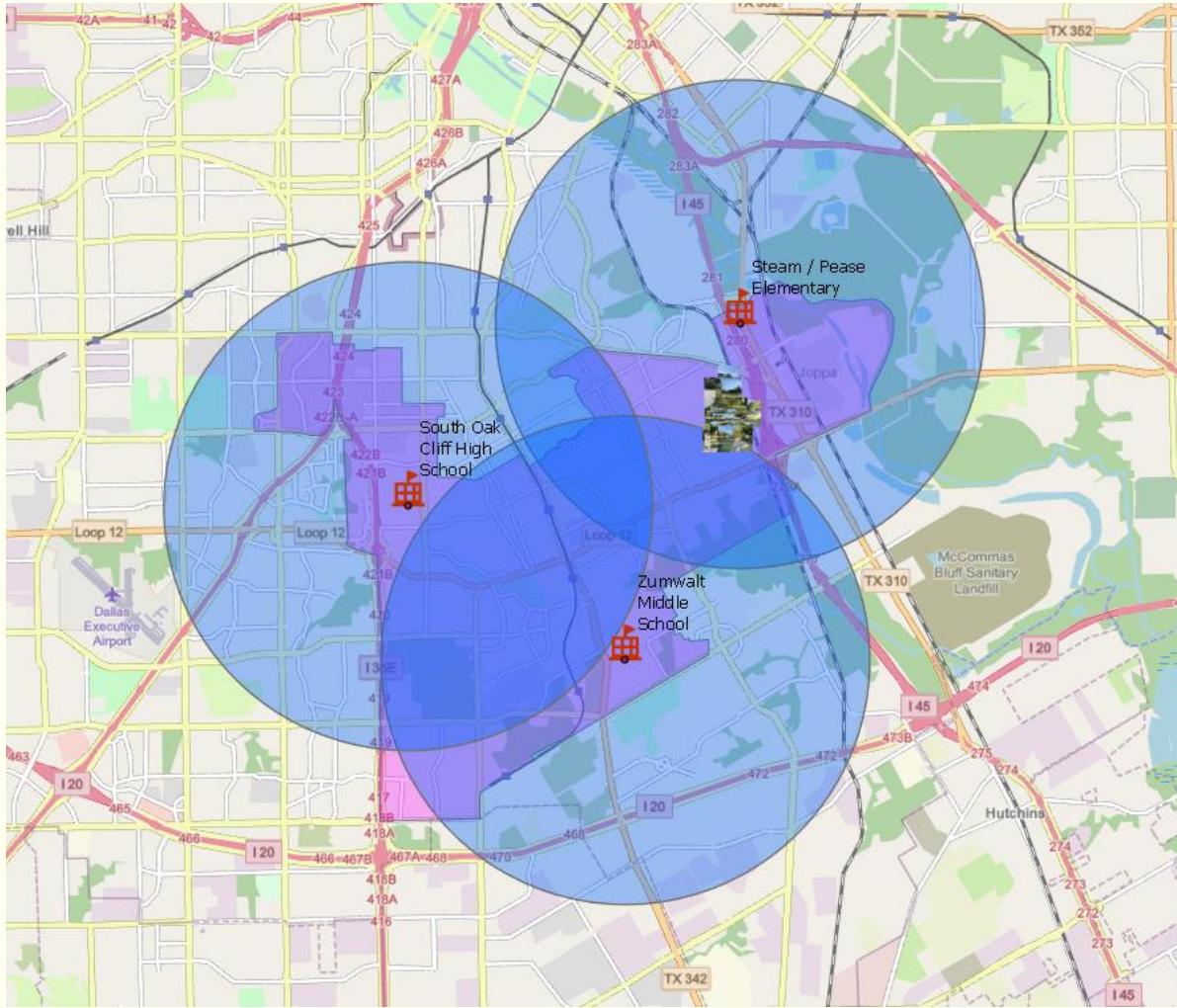
Vander

Hedgdon-Dr

Houses visited
Overview with
all.



3 Mile Buffer



Distance Classification & Interpretation

1. Distance Classes (Natural Breaks - Jenks):

Class 1 (≤ 0.06944 miles)
Closest to SOC; smallest symbols.

Class 2 (0.06945 – 0.07576 miles)

Intermediate distances;
medium symbols.

Class 3 (> 0.07576 miles)
Farthest from SOC; largest symbols.

Symbol sizes emphasize proximity trends, aiding spatial interpretation.

2. Key Insights

Proximity:

Smaller symbols = better access, larger = limited.

Transit Normalization:

Accounts for transit availability, not just physical distance.

Spatial Trends:

Dense clusters (nearby) reflect likely high interaction with SOC.

Sparse far points indicate potential access challenges.

3. Applications

Planning:

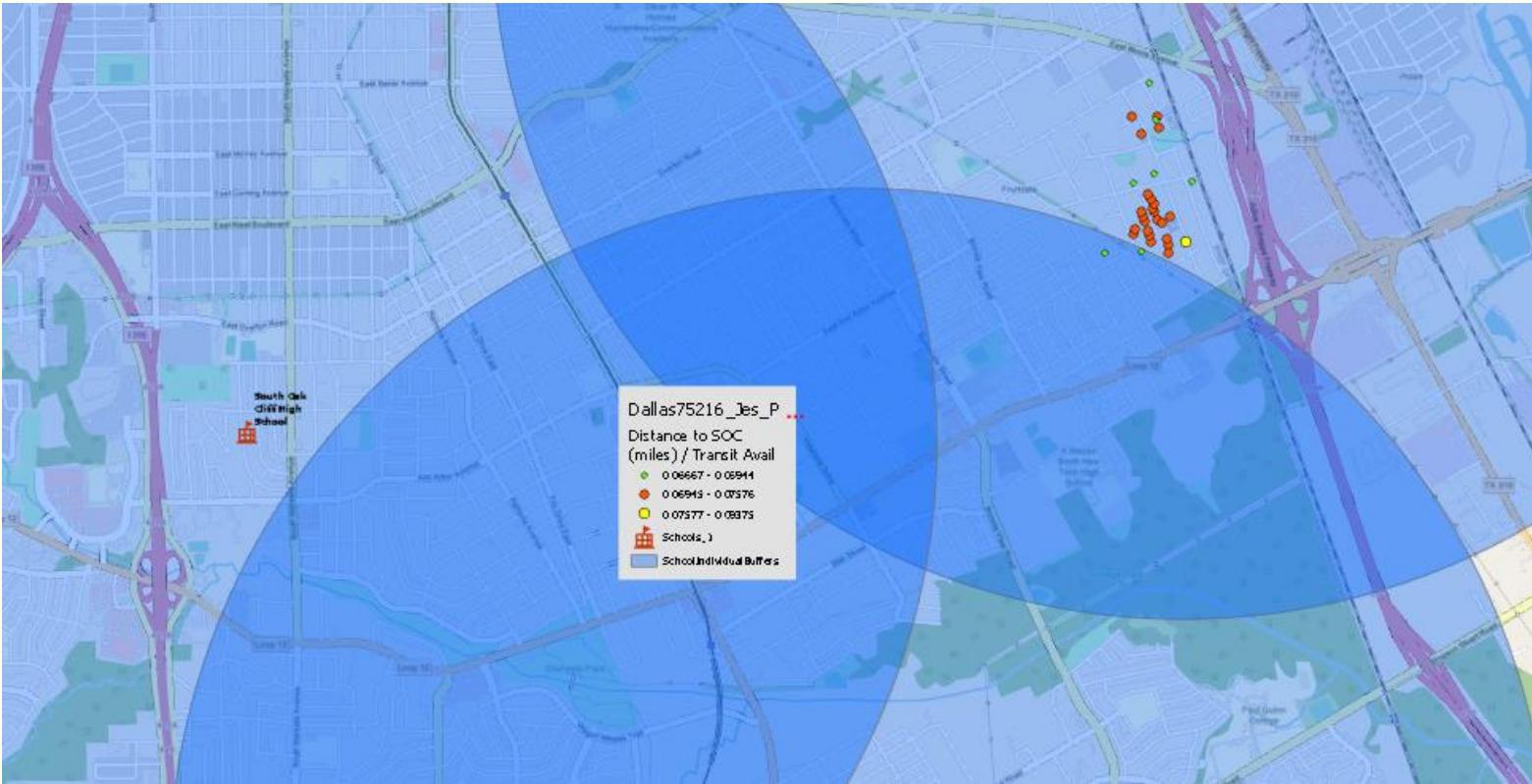
Guide improvement of transit routes or stops.

Equity:

Identify underserved regions lacking accessibility.

Decision Making:

Prioritize investments in transit infrastructure or services.



FROM LAST SLIDE:

Graduated Symbols: Visual emphasis on distance trends.

Smaller symbols = Closer proximity.

Larger symbols = Greater distance.

Impact of Transit Availability:

Normalization by "Transit Avail":

Accounts for transportation accessibility.

Highlights areas where proximity doesn't equal accessibility due to transit gaps.

Spatial Trends:

Clusters in Class 1:

Indicate regions with better access.

Potentially higher student attendance or transit stops.

Sparse Points in Class 3:

Signal areas with limited access.

May face transportation challenges.

Applications and Insights

Urban & School District Planning:

Transit Improvements:

Identify where new routes or stops are needed.

Accessibility Equity:

Assess if certain communities lack access to SOC.

Resource Allocation:

Focus Areas:

Direct efforts toward improving transport in underserved regions.

Consider new facilities or services where needed.

Further Analysis Possibilities

Demographic Overlay:

Correlation Discovery:

Analyze relationships between distance to SOC and socioeconomic factors.

Priority Investment:

Address needs in underserved communities based on identified trends.

By classifying distances into meaningful groups, this analysis aids in understanding and improving geographical accessibility to South Oak Cliff High School, highlighting the interplay between distance, transportation infrastructure, and community needs.

Access Index: This is the overall accessibility score for each location. Higher values mean better access to resources, services, or opportunities.



Access Index

Accessibility Score

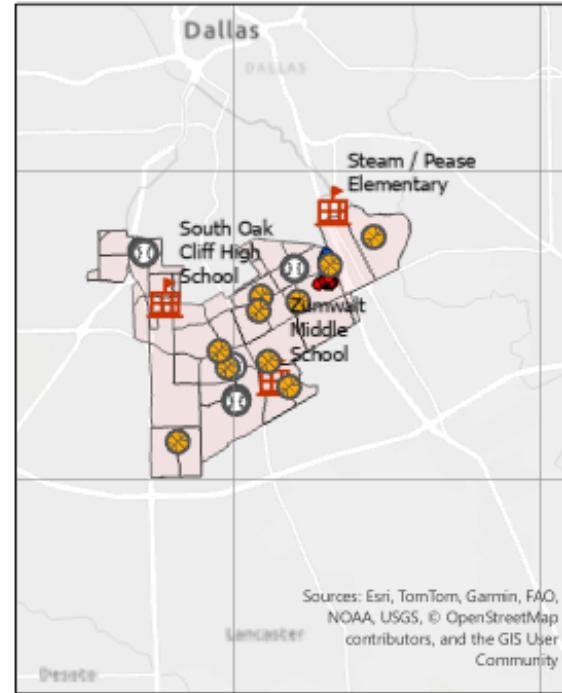
- Strongest Coldspot
- Strong Coldspot
- Not Significant
- Moderate Hotspot
- Strong Hotspot
- Strongest Hotspot

Access_Hotspots

Gi_Bin

- Cold Spot with 99% Confidence
- Cold Spot with 95% Confidence
- Cold Spot with 90% Confidence
- Not Significant
- Hot Spot with 90% Confidence
- Hot Spot with 95% Confidence
- Hot Spot with 99% Confidence

SOC



Access Index Hotspots Analysis:

Key Metrics

Access Index: Measures overall accessibility.

Higher values indicate better access to resources and services.

GiZScore (z-score):

- Positive: Higher-than-average access (**hotspots**).
- Negative: Lower-than-average access (**cold spots**).

GiPValue: Probability of results occurring by chance. **Significant if < 0.05.**

• **Gi_Bin:** Categorizes statistical **significance**:

- 3, 2, 1: Hotspots (99%, 95%, 90% confidence).
- 3, -2, -1: Cold spots (low access, same confidence levels).
- 0: Not significant.

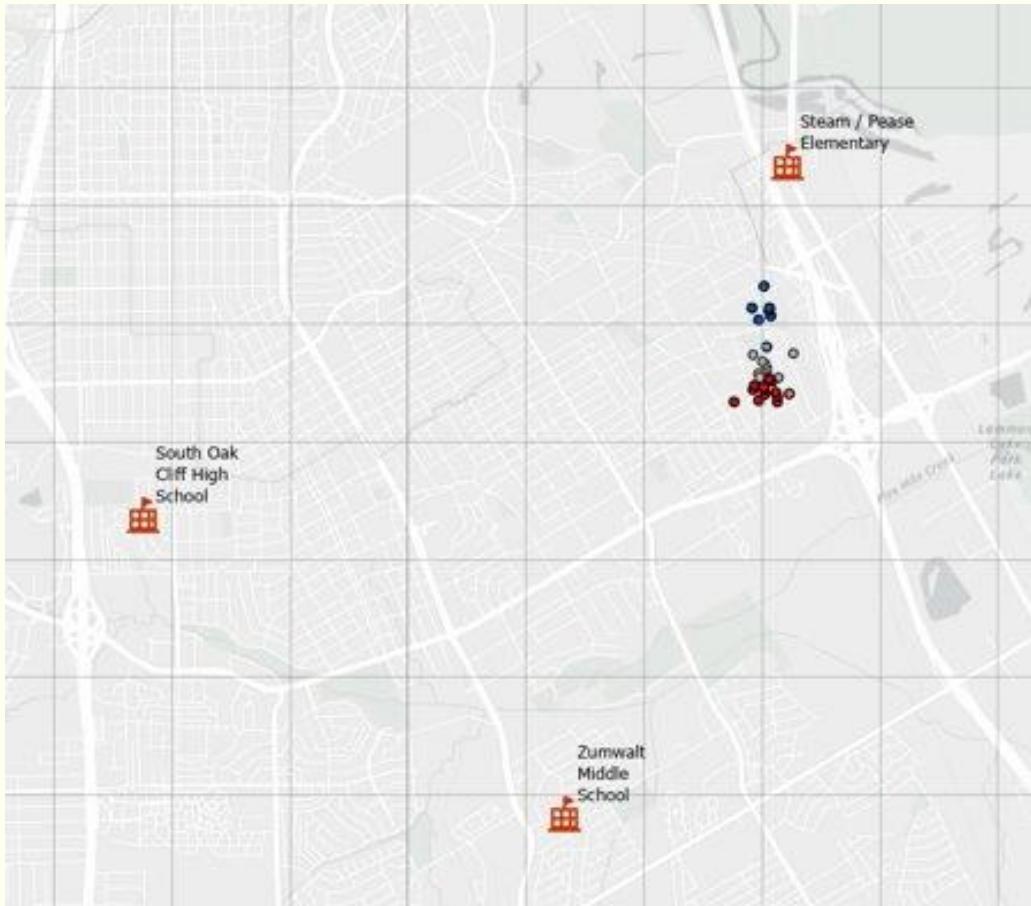
NNeighbors: Number of neighboring points considered for spatial clustering.

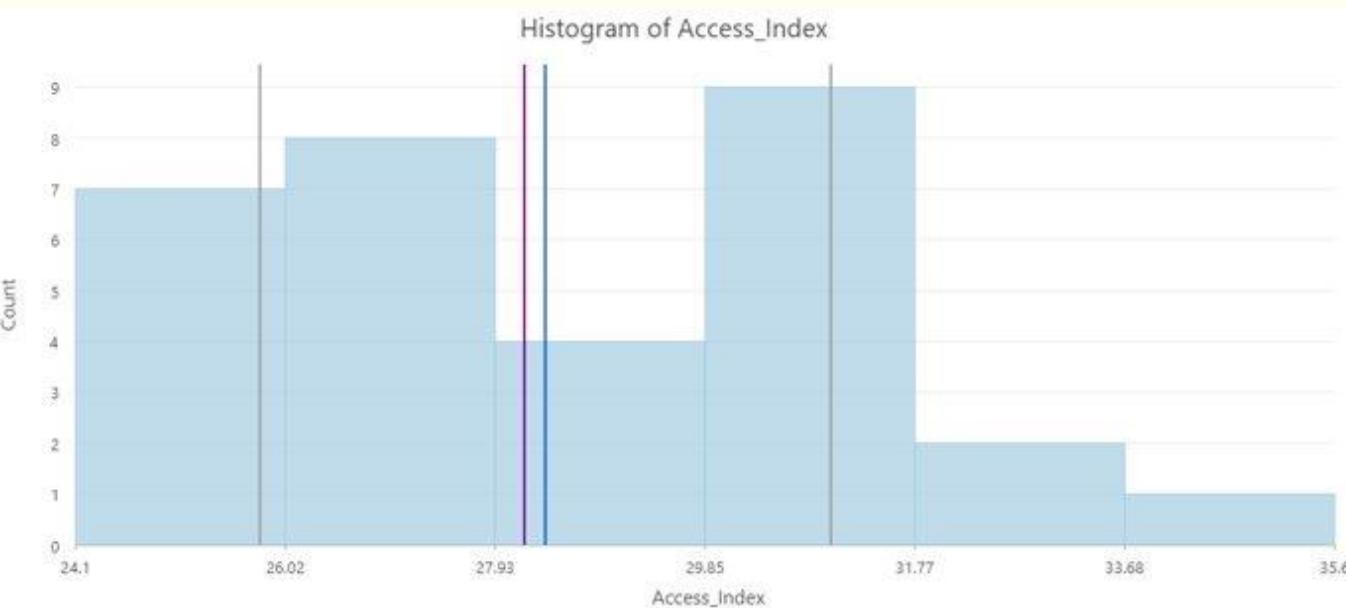
Results Summary

- Hotspots** (e.g., Points 2, 3, 4, 8; **Access Index: 31.8–35.6**, Gi_Bin = 3):
High-access areas near key resources like schools and transit.
- Cold Spots** (e.g., Points 23, 24, 25; **Access Index: 24.1–24.9**, Gi_Bin = -3):
Low-access areas, likely due to limited resources or isolation.
- Neutral Areas** (e.g., Points 17–19; **Access Index: 27.5**, Gi_Bin = 0):
Neither high nor low access; no significant clustering.

Takeaways

- Focus improvements on **cold spots** to enhance access.
- Use **hotspots** as models for future planning.

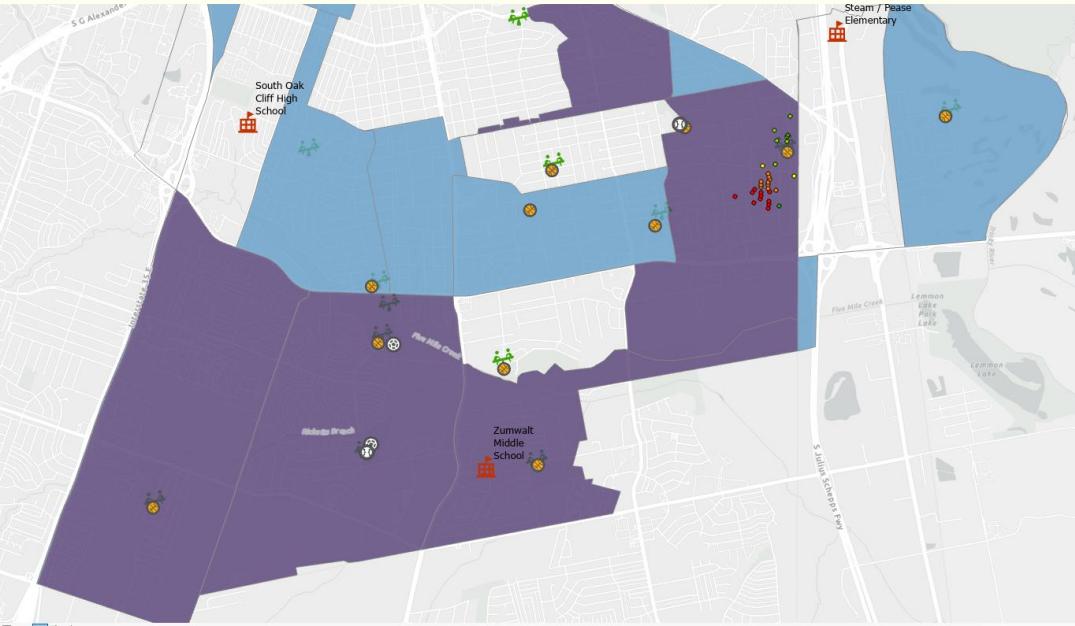




Histogram Insight

The histogram provides a visual representation of the **Access Index distribution:**

- **Clusters around 27.5–28.2** (neutral or moderately accessible areas).
- Significant hotspots are outliers on the higher end (e.g., 31.8–35.6).
- Cold spots are visible on the lower end (24.1–24.9).



Map Analysis and Insights

Observations:

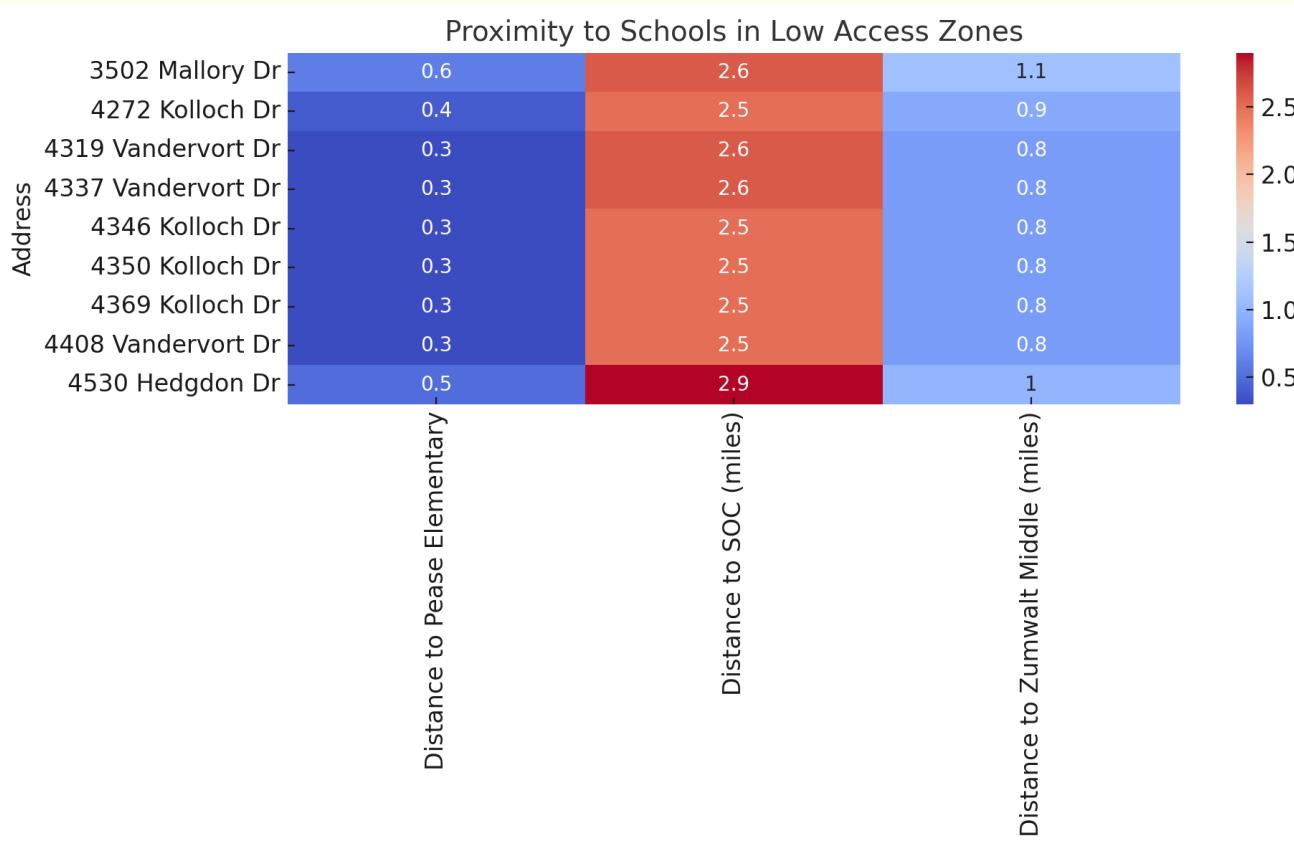
- **Purple Zones:**
 - Indicate low/no internet connectivity.
 - Highlight infrastructure gaps affecting educational and economic opportunities.
 - Align with low General Access Index scores in the spreadsheet.
- **Surveyed Houses:**
 - Represent properties assessed during site visits.
 - Capture insights on housing conditions and access to amenities.
 - Correlate with spreadsheet data on walkability, bikeability, and proximity to schools.
- **Community Features:**
 - Icons represent recreational amenities (basketball courts, playgrounds).
 - Enhance walkability and access to leisure, reflected in General Access Index scores.
- **Proximity to Schools:**
 - South Oak Cliff High School, Zumwalt Middle School, and Pease Elementary are key landmarks.
 - Spreadsheet data includes distances, vital for assessing walkability for families.

Insights and Relationships:

- **Internet Access vs. General Access Index:**
 - Purple zones correlate with lower access scores, indicating limited infrastructure.
 - Homes in these areas may have reduced property values due to lack of connectivity.
- **Community Amenities and Property Values:**
 - Proximity to recreational facilities boosts accessibility and may enhance property values.
- **Educational Accessibility:**
 - Examining distances to schools can reveal areas with lower walkability and access issues.

Recommendations:

- **Address Internet Gaps:**
 - Prioritize infrastructure in purple zones to enhance connectivity and opportunities.
- **Expand Amenities:**
 - Increase recreational facilities in underserved areas to improve livability and access.
- **Improve School Access:**
 - Enhance transit routes to schools, focusing on areas lacking accessibility.
- **Cross-Validation with Survey Data:**
 - Use survey insights to validate and address discrepancies in walkability and internet connectivity.

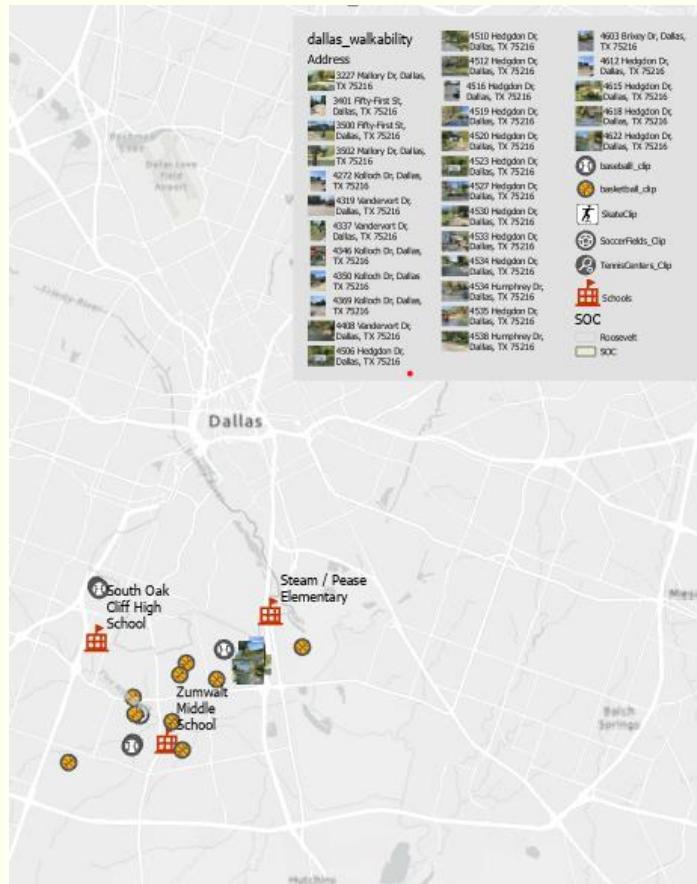


Proximity to Schools in Low Access Zones:

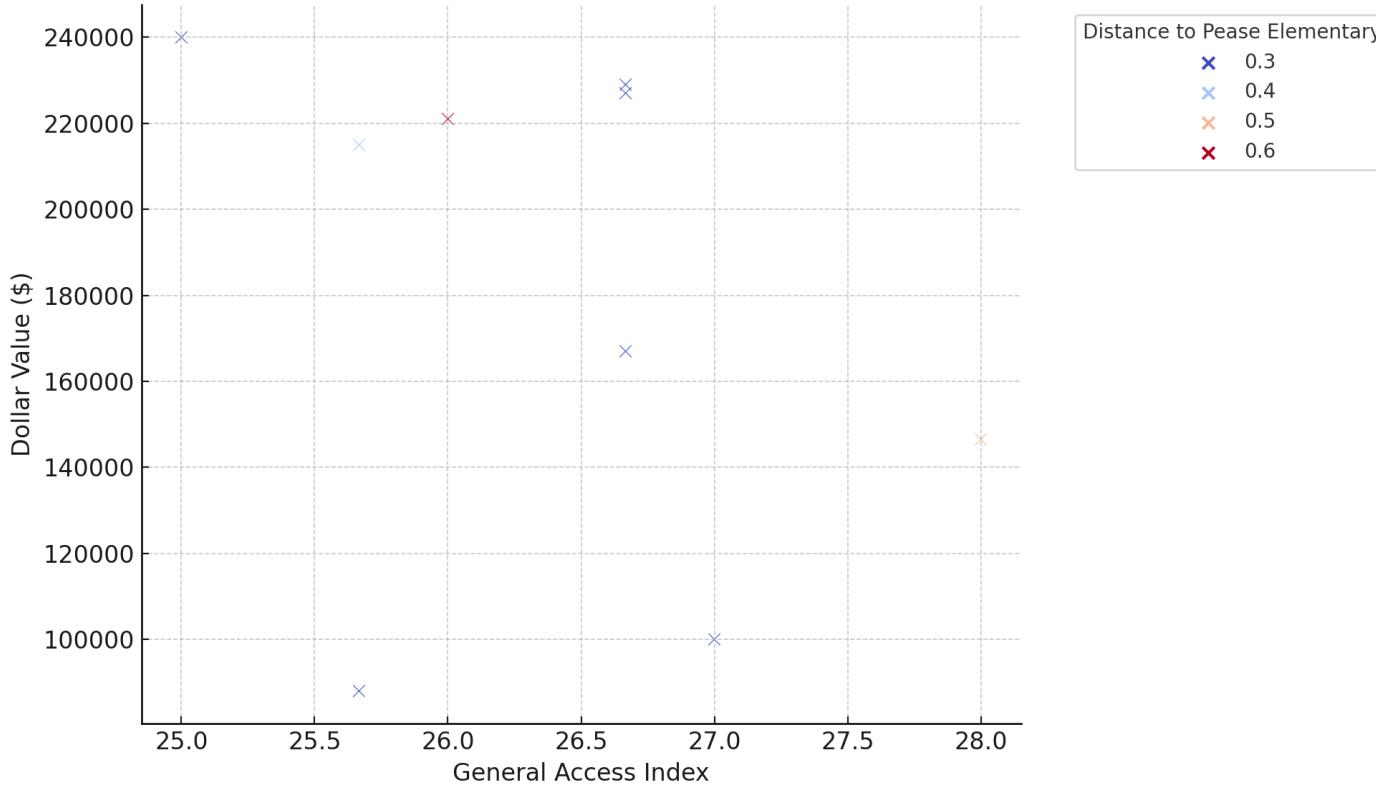
- **Heatmap Analysis:**
- Addresses farther from schools, such as 4530 Hedgdon Dr., show lower access due to greater distances to SOC High School and Zumwalt Middle.
- Homes within 0.3 miles of Pease Elementary are better situated for elementary-aged children but still lack proximity to middle and high schools.

• **Insight:** Improving public transit or walkability to schools, especially SOC High School and Zumwalt Middle, could address accessibility disparities for low-access areas.

Different zoom layers to show relative location from houses. On map layer, zoom and click.



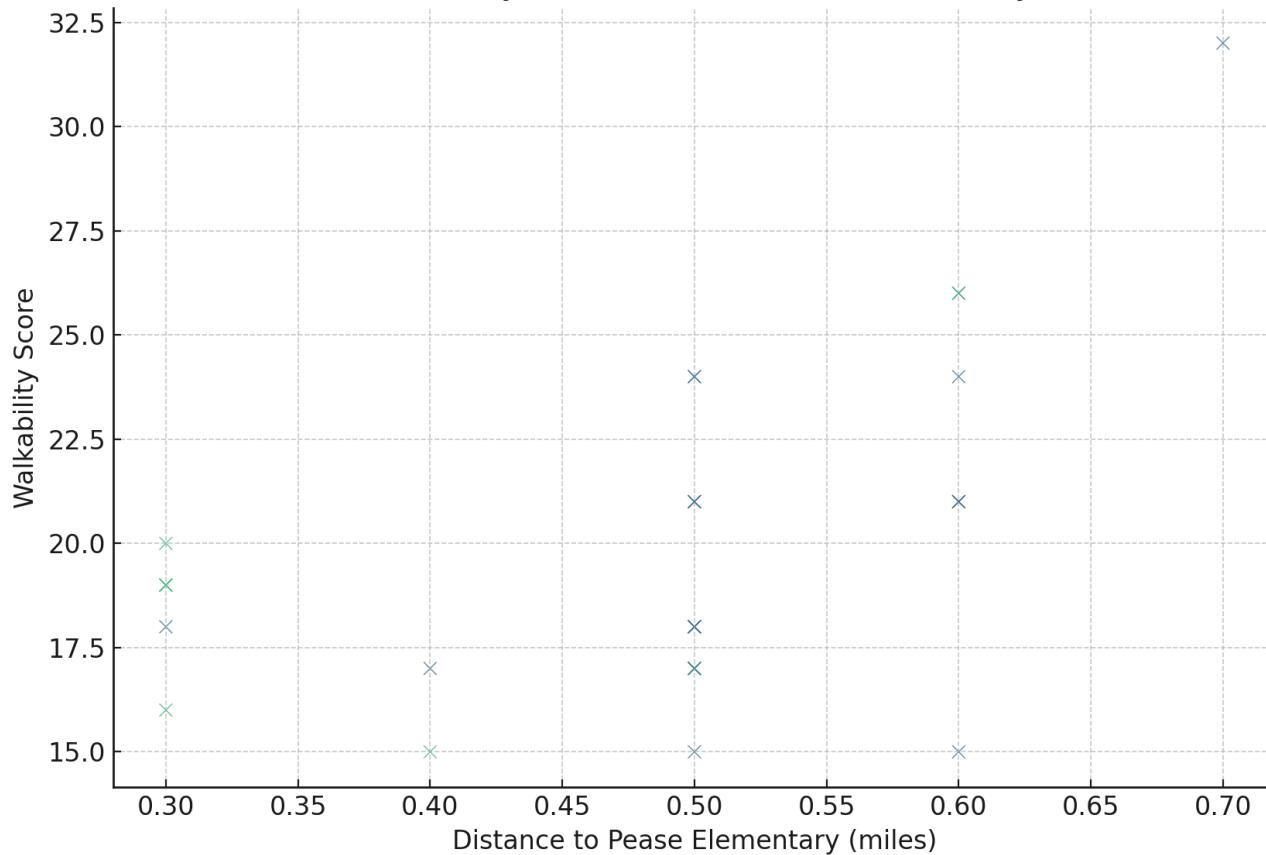
Low General Access Index Zones vs. Property Values



Low General Access Index Zones vs. Property Values:

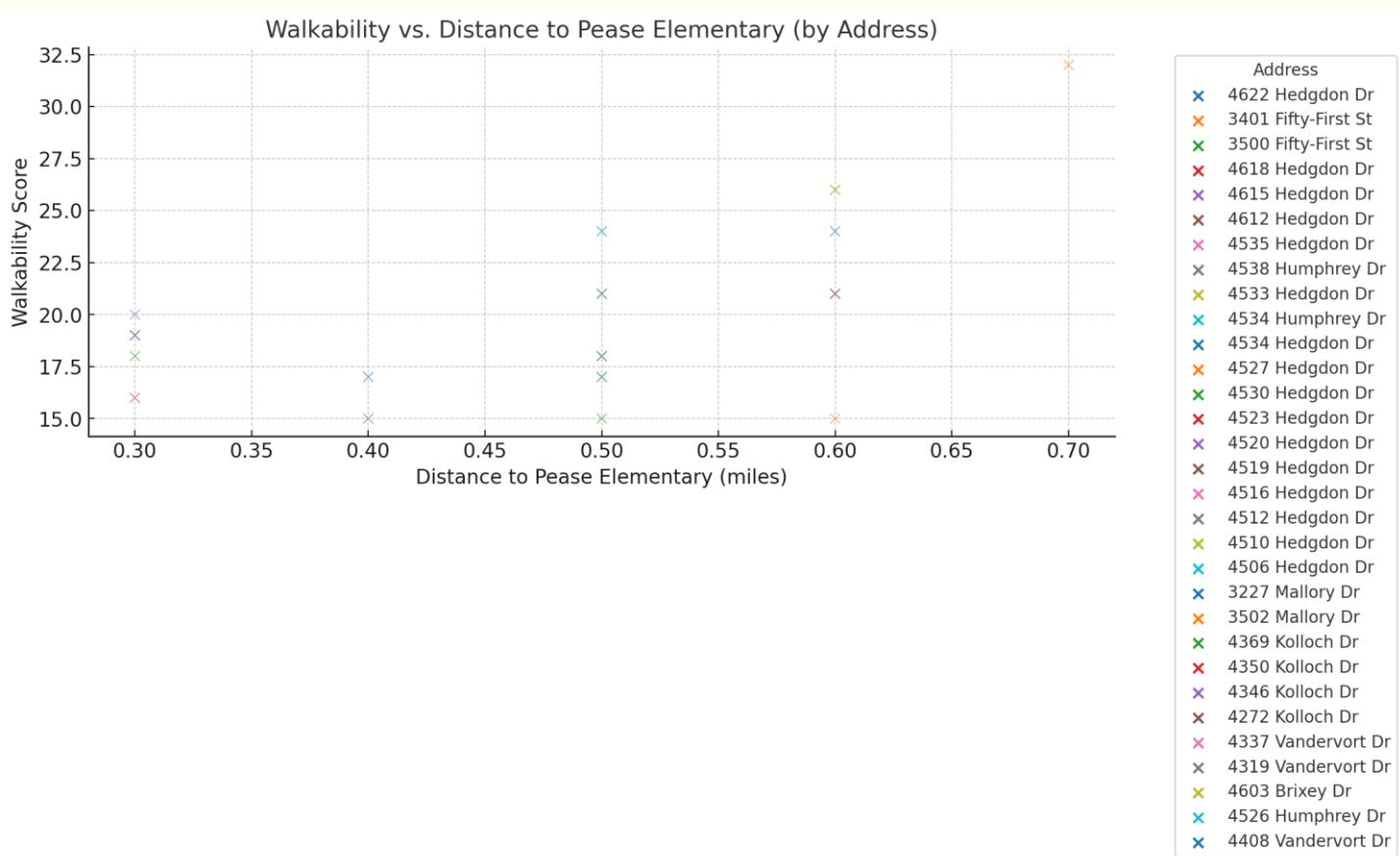
- **Observation:** Property values are generally lower in zones with a General Access Index of 25–28, particularly for homes farther from Pease Elementary.
- **Insight:** Limited accessibility to essential infrastructure, such as internet and schools, could negatively affect property values in these areas.

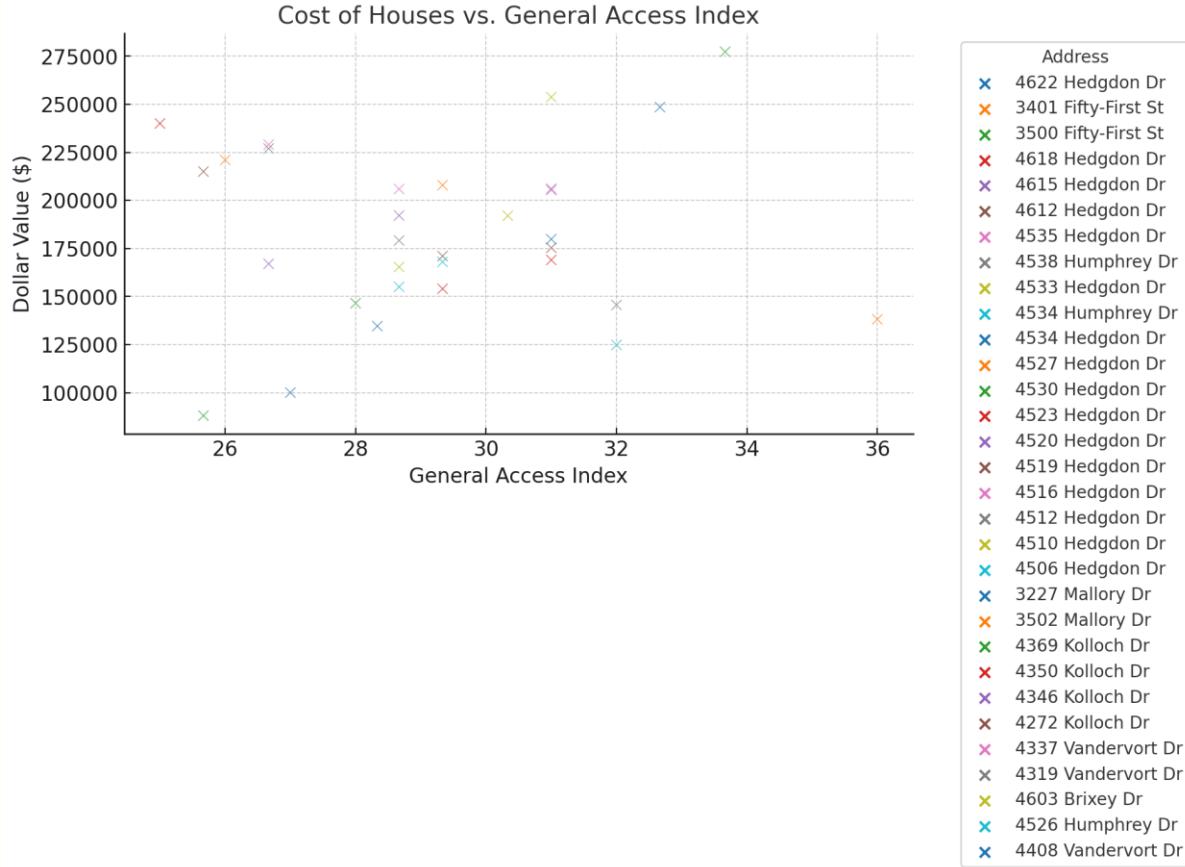
Walkability vs. Distance to Pease Elementary



Walkability vs. Distance to Pease Elementary (by Address):

- Each point represents an address, showing its specific walkability score relative to the distance from Pease Elementary. Addresses closer to the school generally have higher walkability, though some outliers exist.

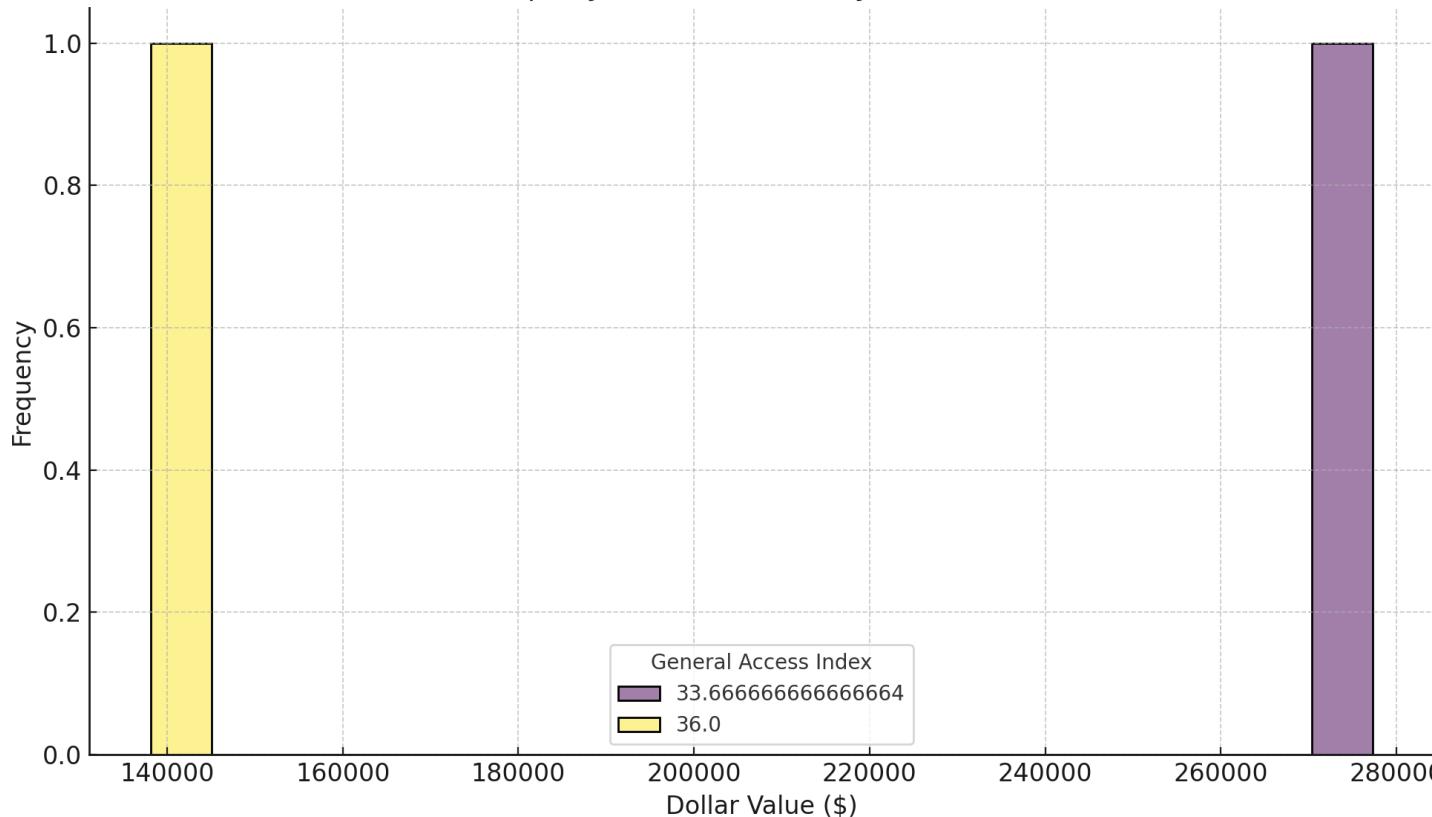




Cost of Houses vs. General Access Index:

- The scatter plot reveals a moderate positive relationship between property values and the General Access Index. Properties with higher accessibility (better walkability, bikeability, and transit availability) tend to have higher dollar values.

Property Values in Amenity-Rich Zones

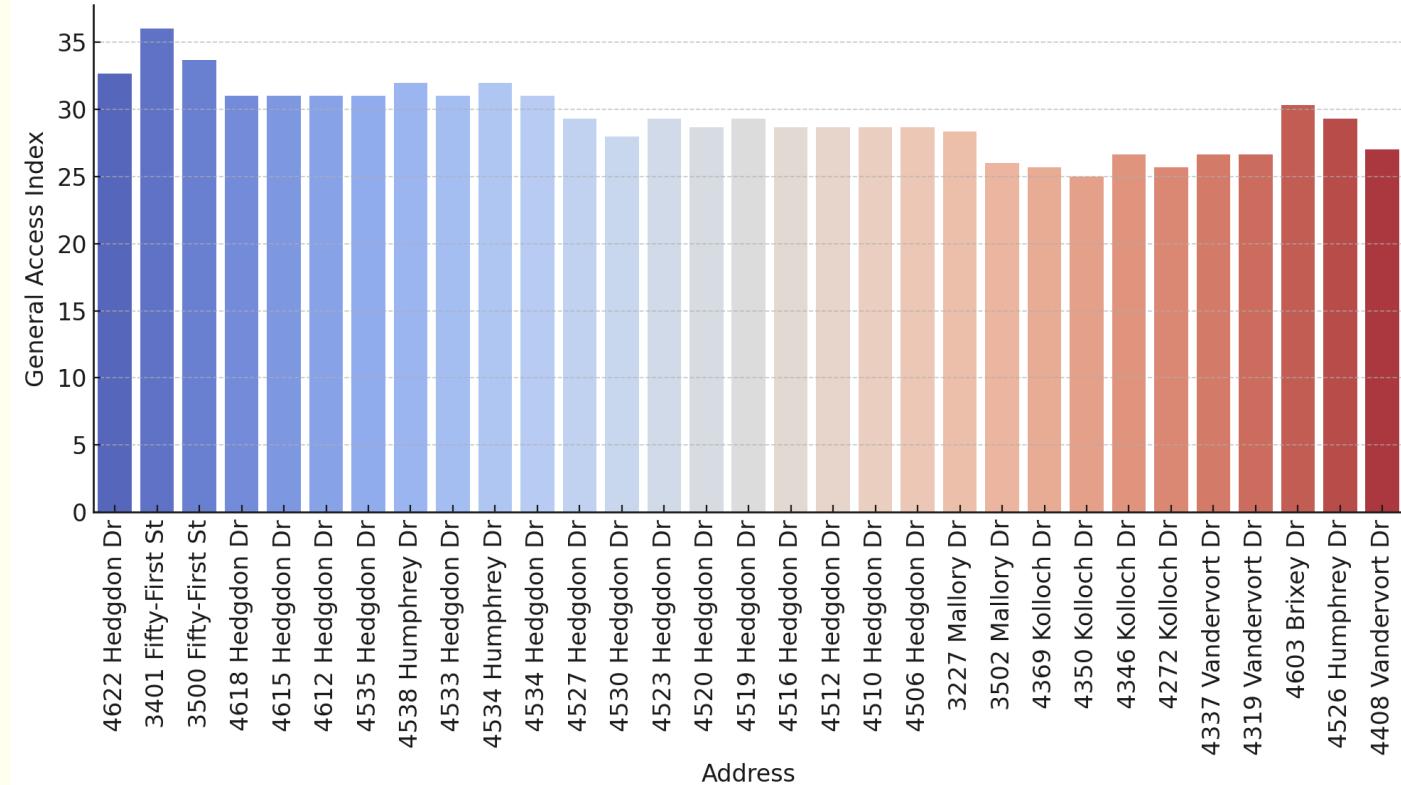


Property Values in Amenity-Rich Zones:

- Observation:** Properties with higher General Access Index (33–36) are located closer to basketball courts, playgrounds, or baseball fields, and show significantly higher property values.

- Insight:** Proximity to recreational facilities adds tangible value to properties. Investing in similar amenities in low-access areas could boost property demand and values.

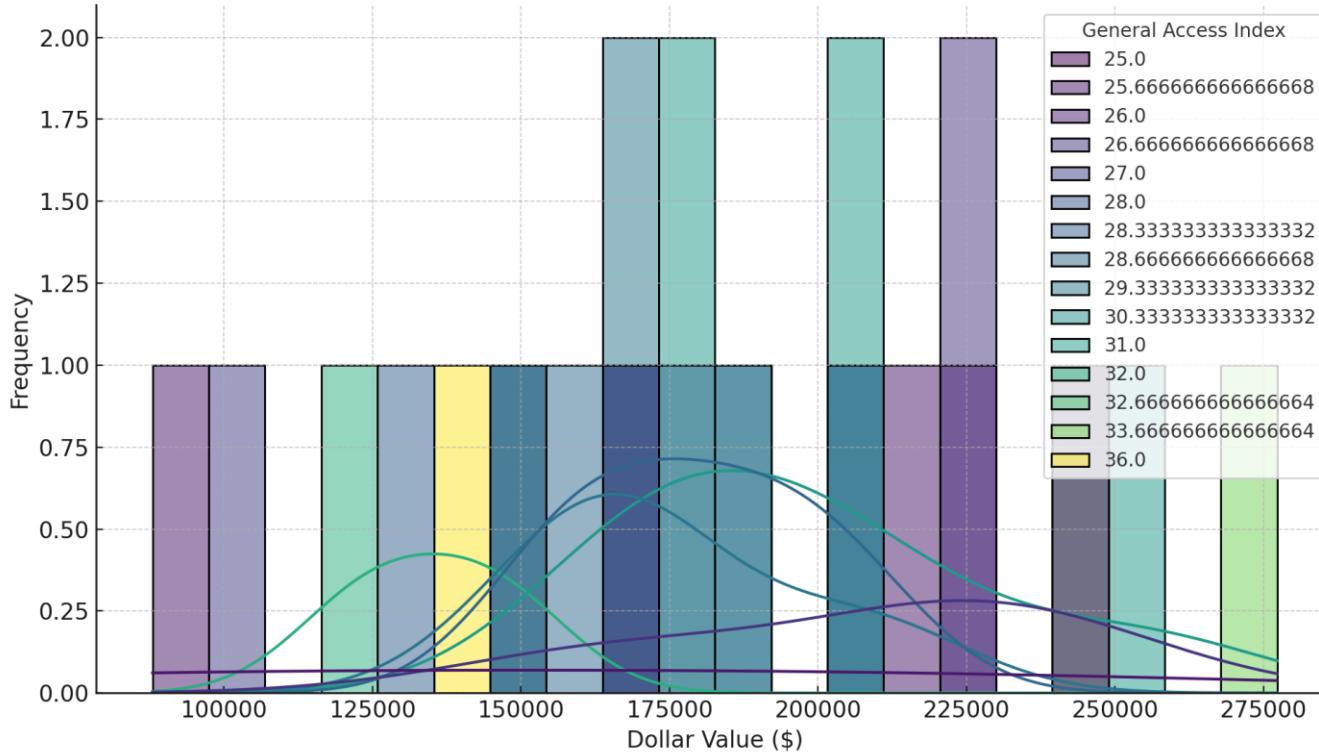
General Access Index by Address



General Access Index by Address:

•A bar chart displaying the General Access Index for each address, averaged from walkability, bikeability, and transit availability. This helps identify which addresses are better suited for infrastructure and community enhancements.

Distribution of Property Values



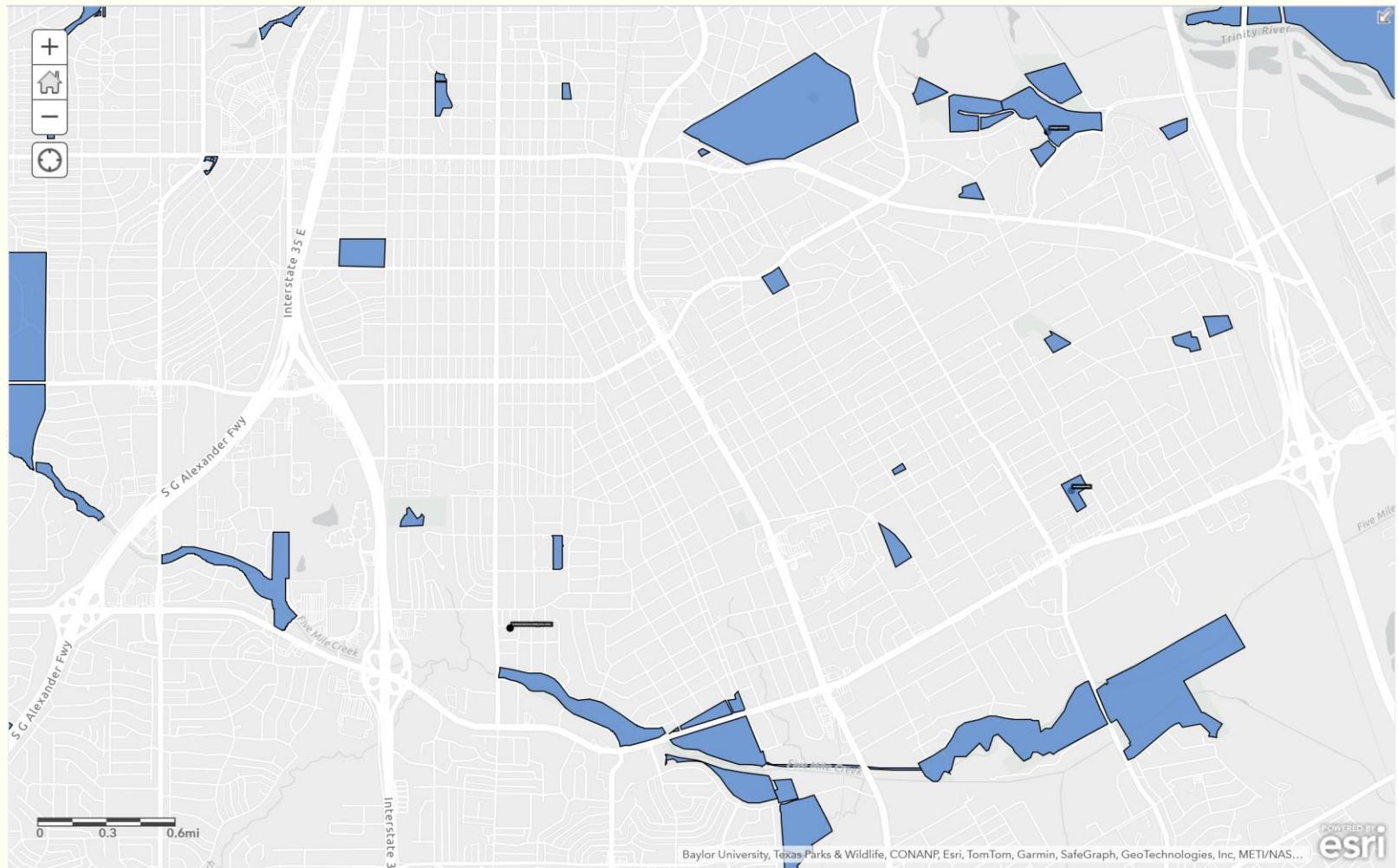
Distribution of Property Values:

- The histogram shows the spread of property values, with peaks indicating common price ranges.
- The distribution aligns with accessibility levels, suggesting that homes in accessible areas are often priced higher, reflecting the value of infrastructure and connectivity.

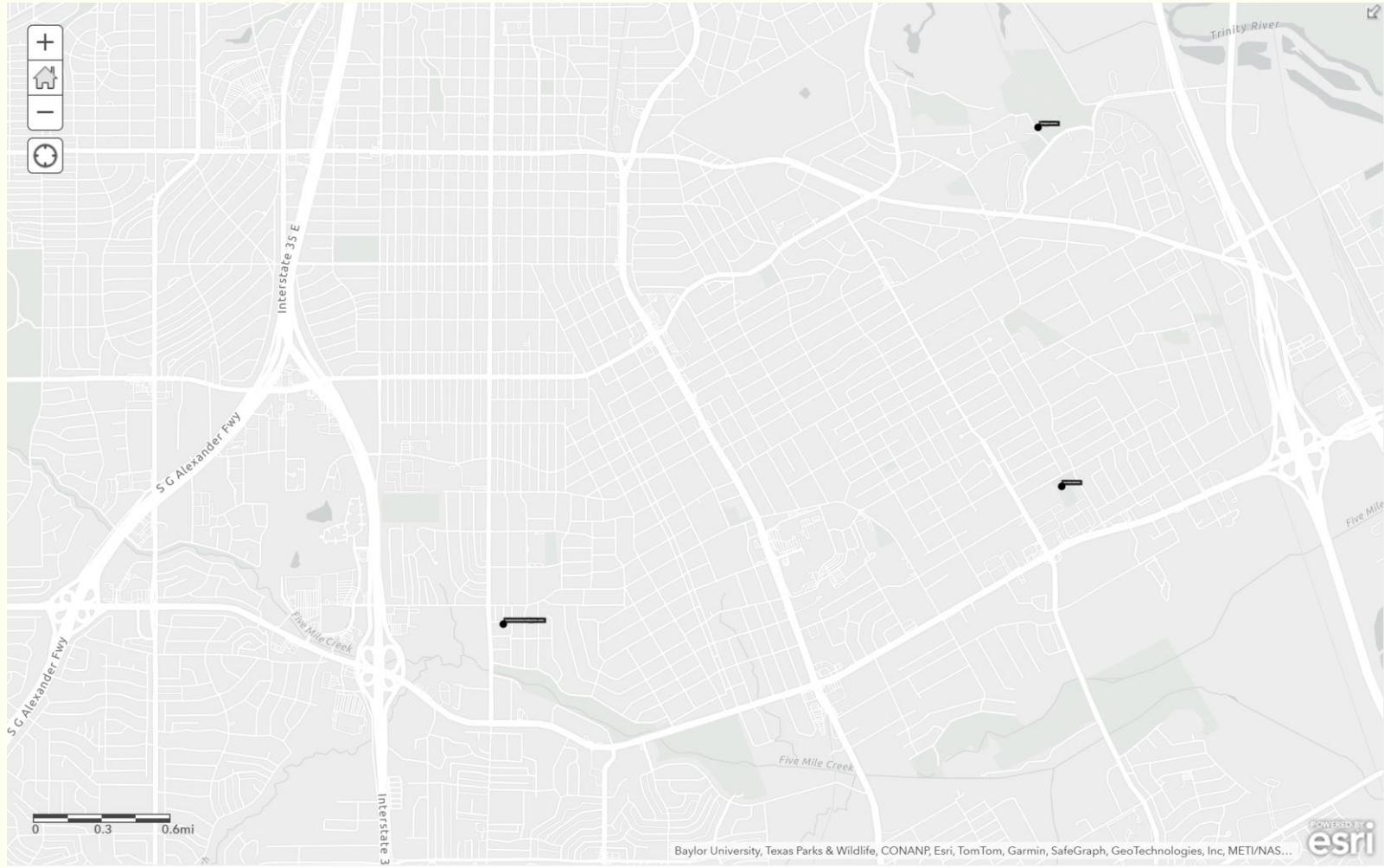
Helen-Anne S. Gable

Places for potential enrichment walkability

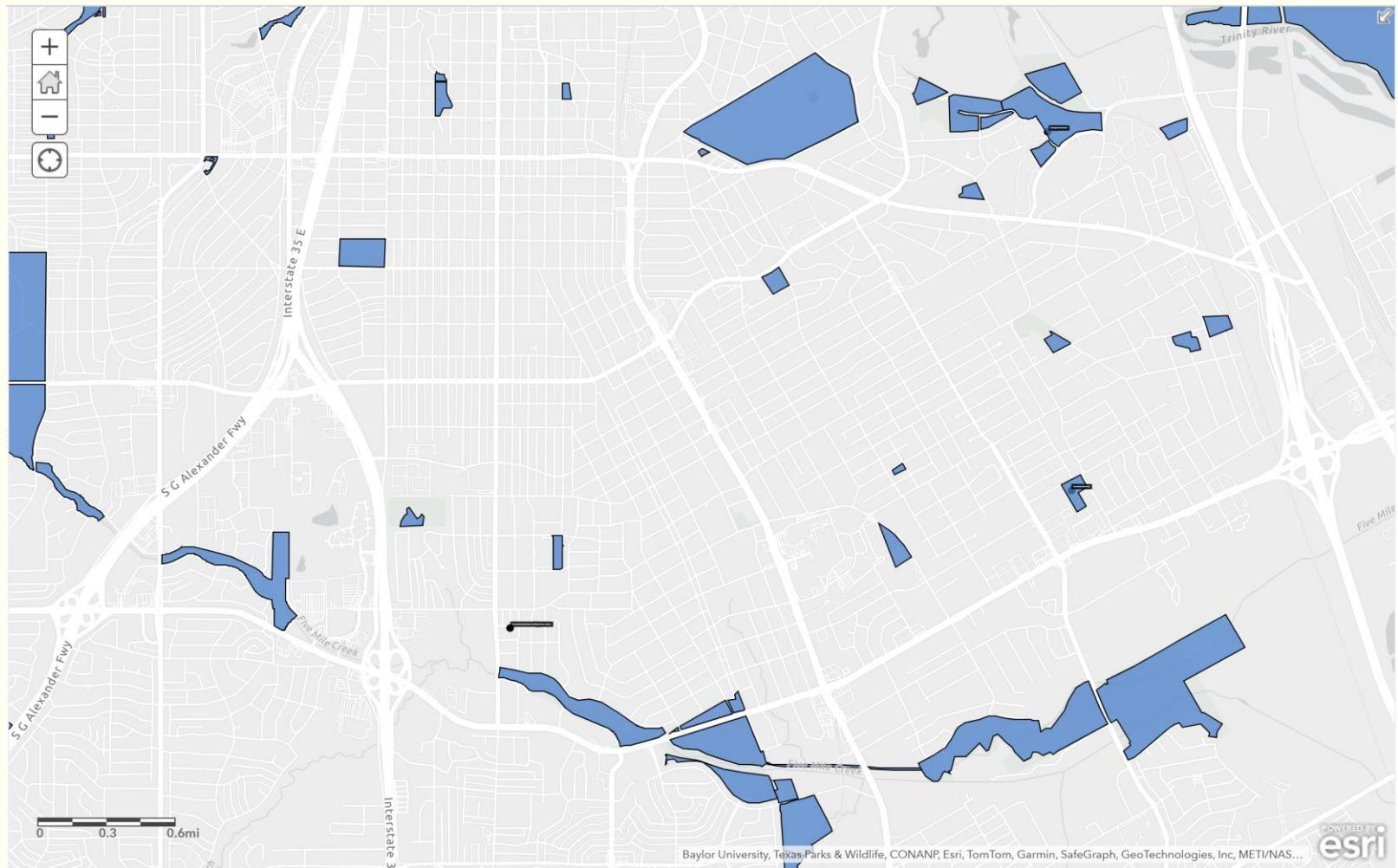
"Visible" Community Gatherings: Parks



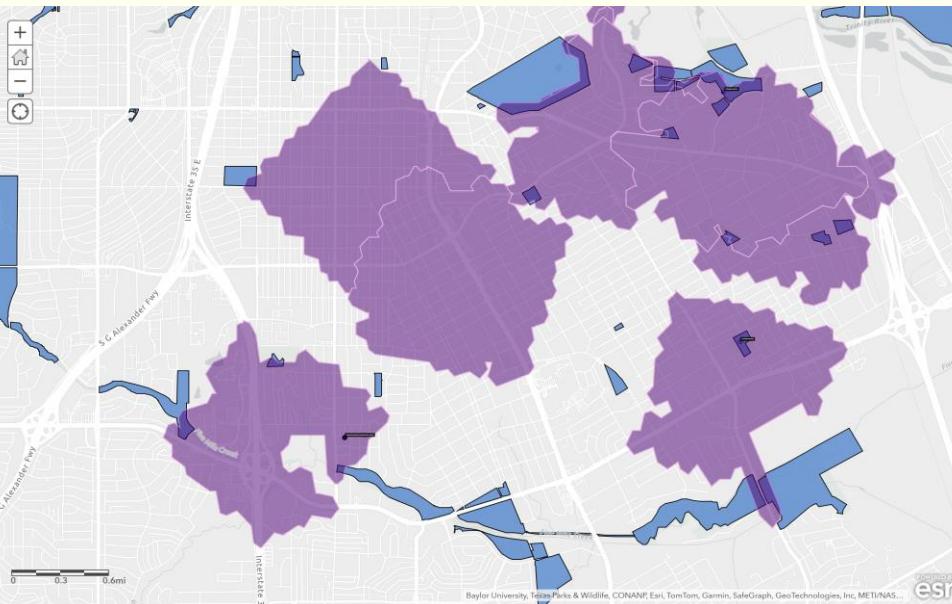
"Invisible" Community Centers & Gatherings



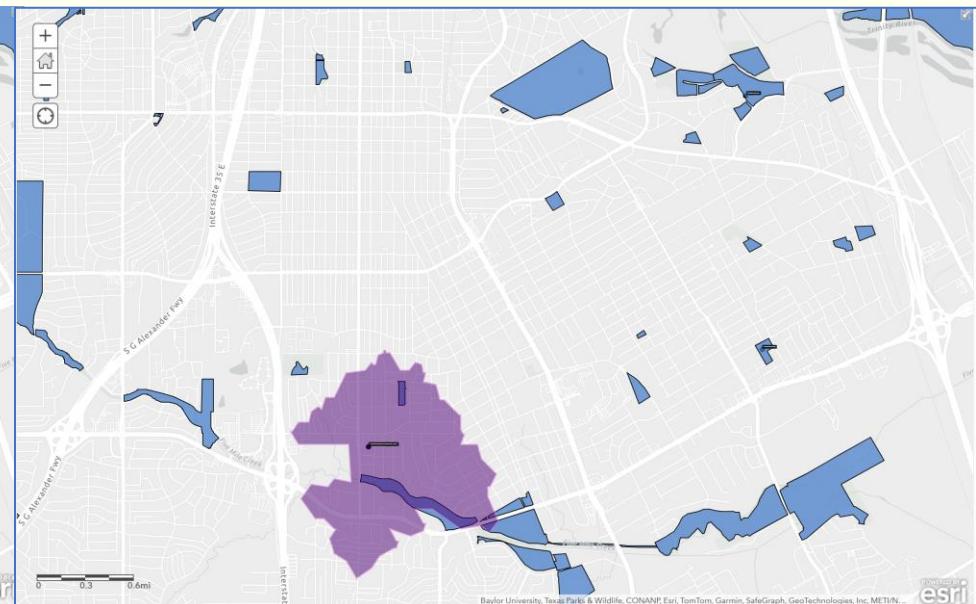
"Visible" Community Gatherings: Parks



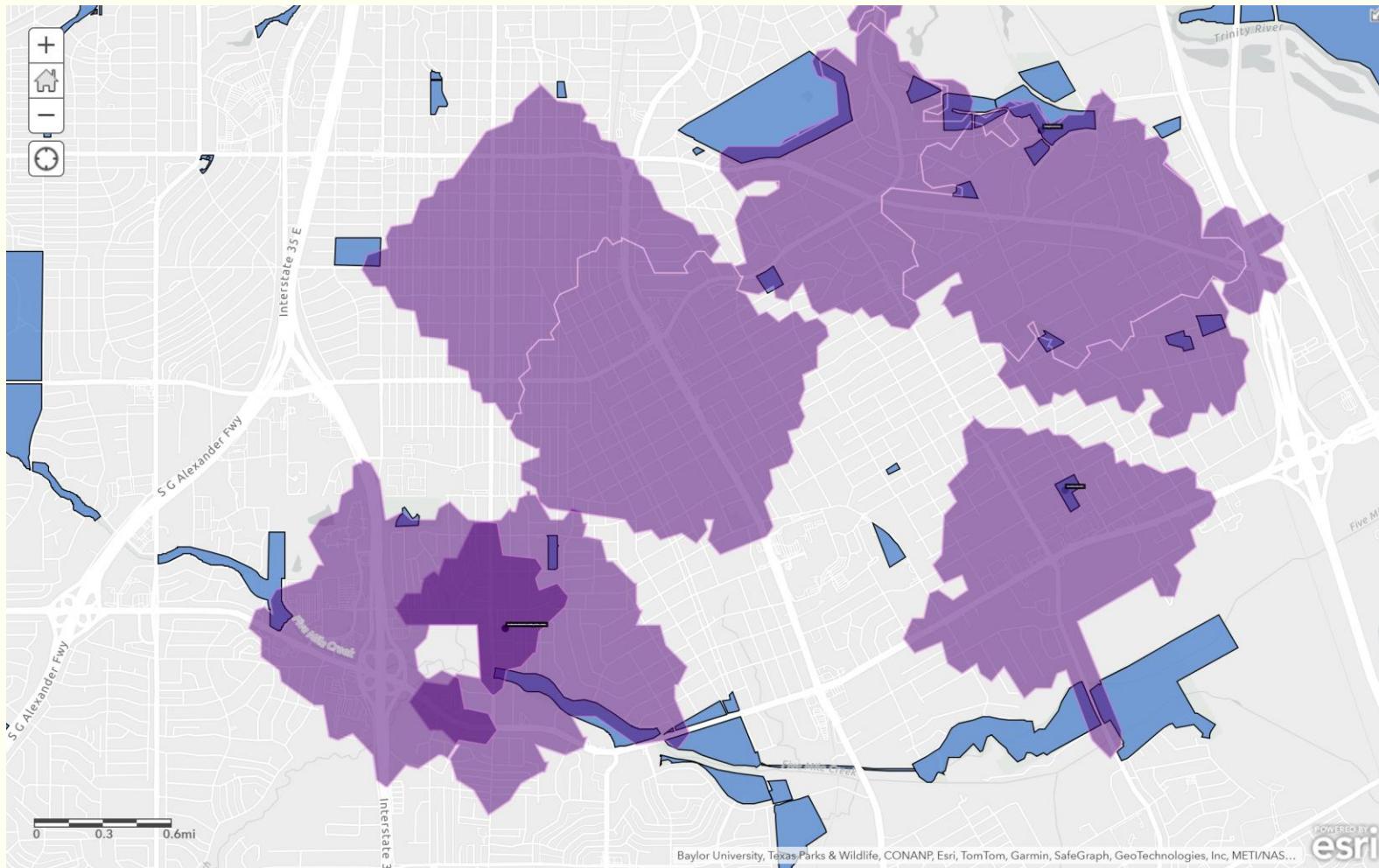
"Invisible" Community Center Walkability
(15 minutes)



"Visible" Community Center (Parks)
Walkability
(15 minutes)

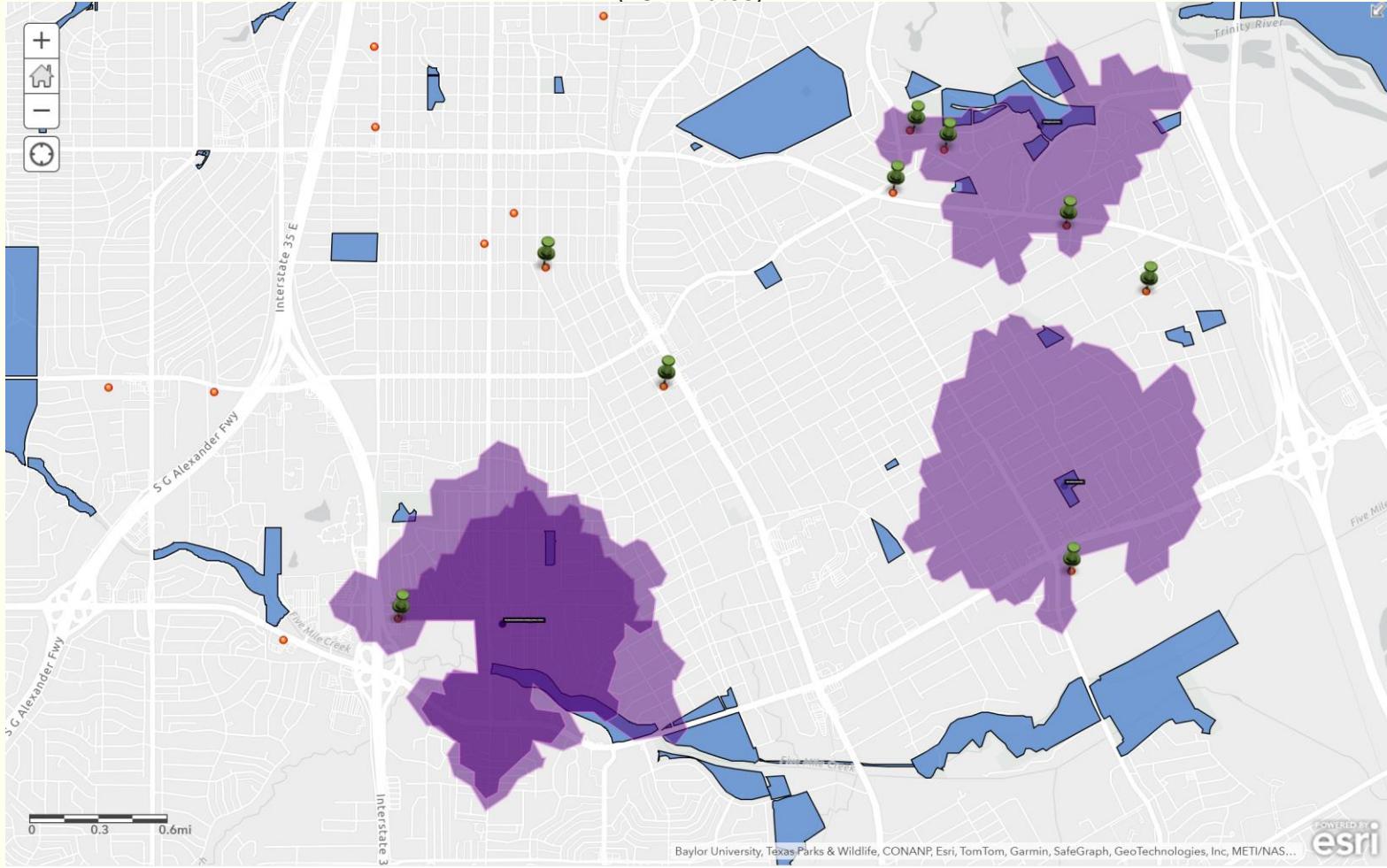


"Invisible" Community Center Walkability Overlapped with "Visible" Community Centers (Parks)
(15 minutes)



Church Locations (Walkability Not Shown)

Overlapped with "Invisible" Community Center Walkability Overlapped with "Visible" Community Centers (Parks)
(15 minutes)

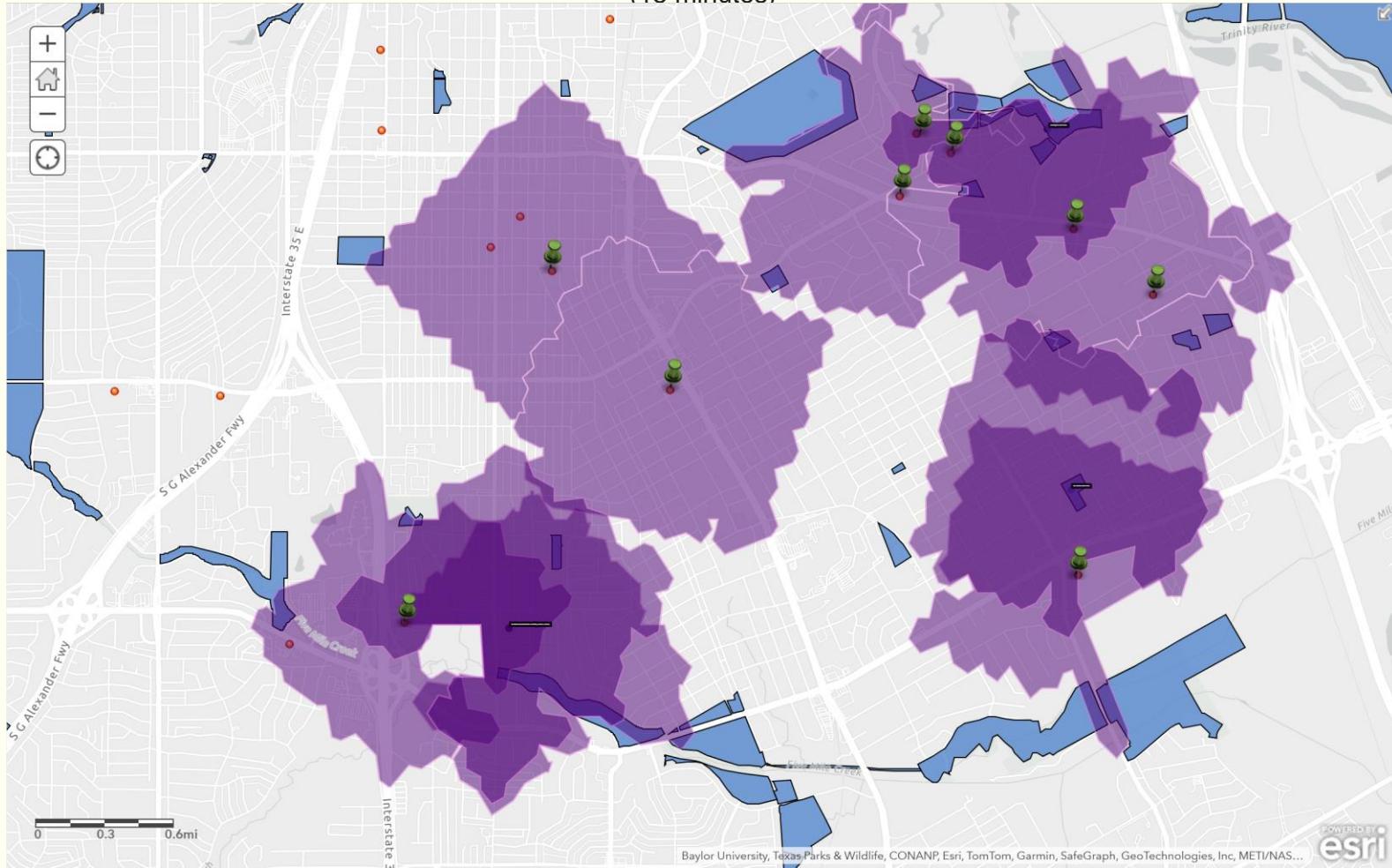


0 0.3 0.6mi

Baylor University, Texas Parks & Wildlife, CONANP, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NAS...

POWERED BY
esri

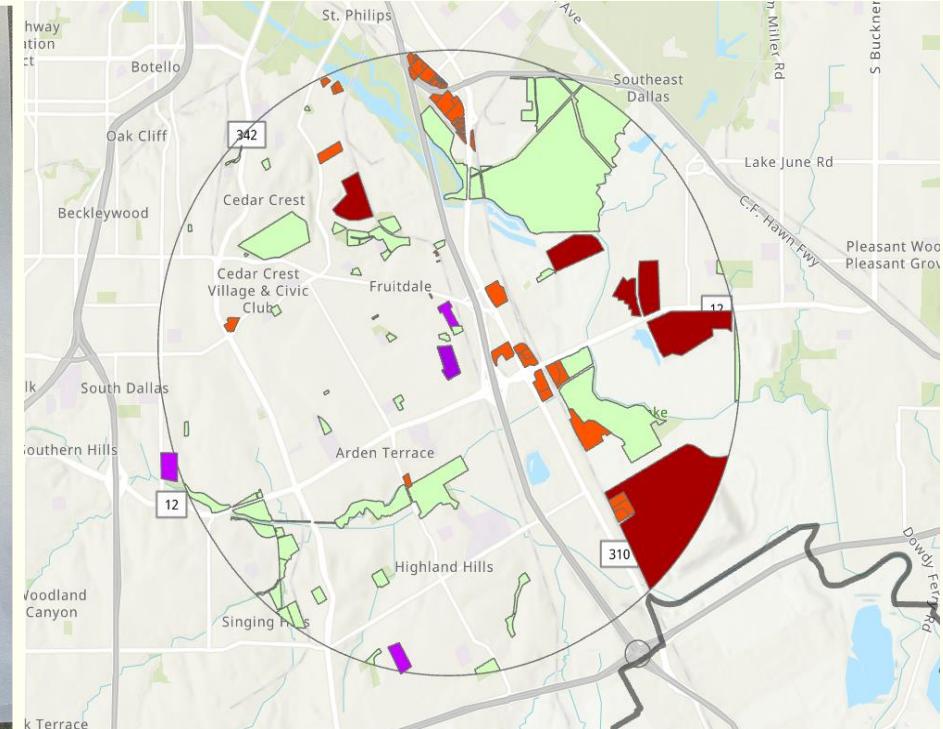
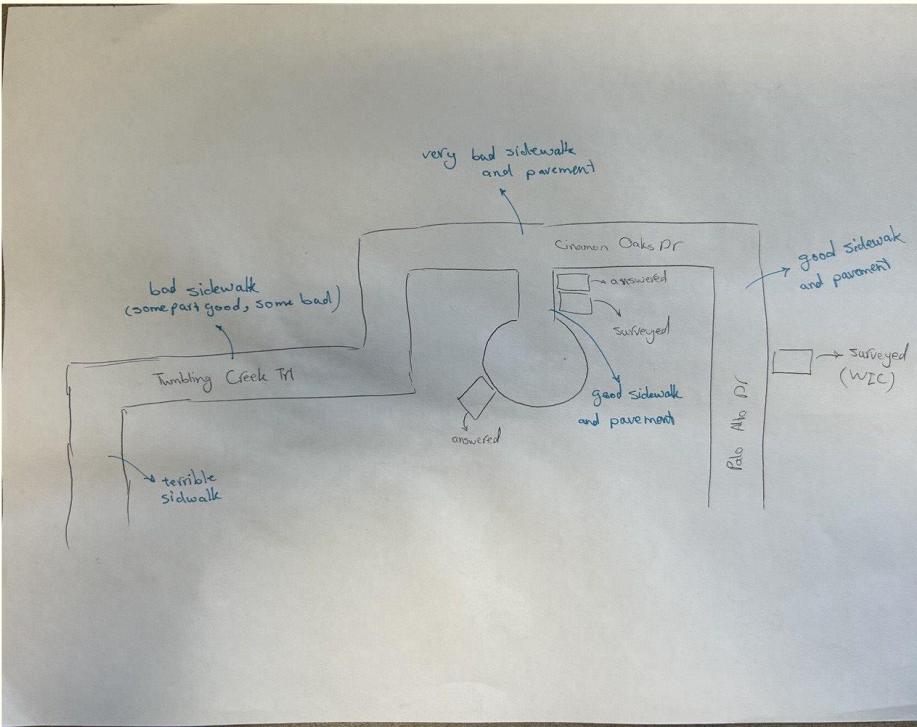
"Invisible" Community Center Walkability Overlapped with "Visible" Community Center (Parks) Walkability and Church Walkability (15 minutes)



Conclusion

97

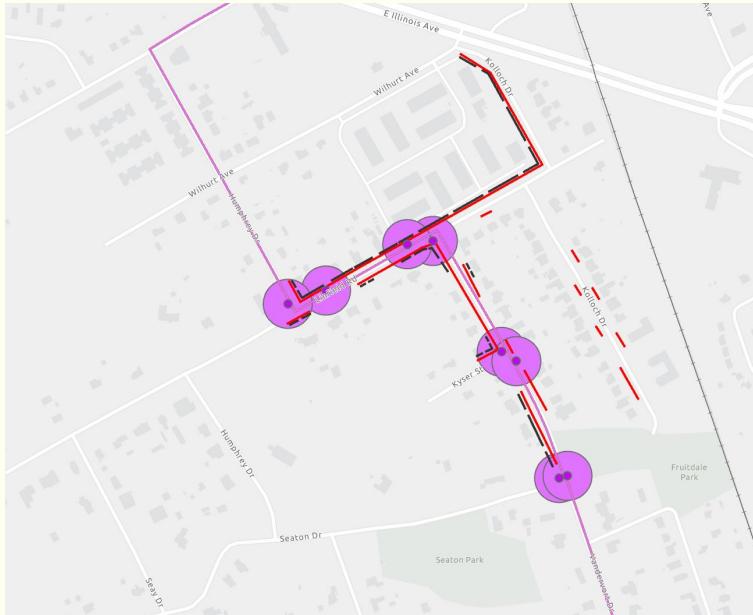
- Studied several infrastructure and indicators
- Neighborhoods with better infrastructure seemed to be more resilient.
- Industrial activities effect people well-being.



Conclusion

98

- Noise level is a key indicator of the feeling of safety
- There are some factors influencing walkability other than factors mentioned on the National Walkability Index.
- Perceived walkability is different from person to person and place to place.



References

- Li, Z., Wang, X., Zarazaga, J., Smith-Colin, J., & Minsker, B. (2022). Do infrastructure deserts exist? Measuring and mapping infrastructure equity: A case study in Dallas, Texas, USA. *Cities*, 130, 103927. <https://doi.org/10.1016/j.cities.2022.103927>
- De Vos, J., Lättman, K., Van Der Vlugt, A.-L., Welsch, J., & Otsuka, N. (2023). Determinants and effects of perceived walkability: A literature review, conceptual model and research agenda. *Transport Reviews*, 43(2), 303–324. <https://doi.org/10.1080/01441647.2022.2101072>
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