

Envisioning Future Multimodal Transportation Opportunities in Madison

Examining the roles of a proposed Bus Rapid Transit line and bike share in redefining transit in Wisconsin's capital

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Introduction

Madison is hoping to introduce a new west-to-east bus rapid transit line in the city in 2024. Bus Rapid Transit (BRT) is a special form of bus transit designed to create faster travel times than those of typical local bus lines. A north-to-south line is also being considered, but its adoption is likely contingent on the success of the west-east line.

Madison B-Cycle is a local public bicycle share program owned by Trek Bicycle. In 2019, the program switched over from traditional bicycles to a fleet of electrified bicycles (e-bikes), which led to significant ridership increase.

Smart integration of the bike share and bus rapid transit systems would make car-less commuting in Madison a more viable option.

Data

The City of Madison is committed to providing open public access to many different kinds of city-related data, including transportation data.

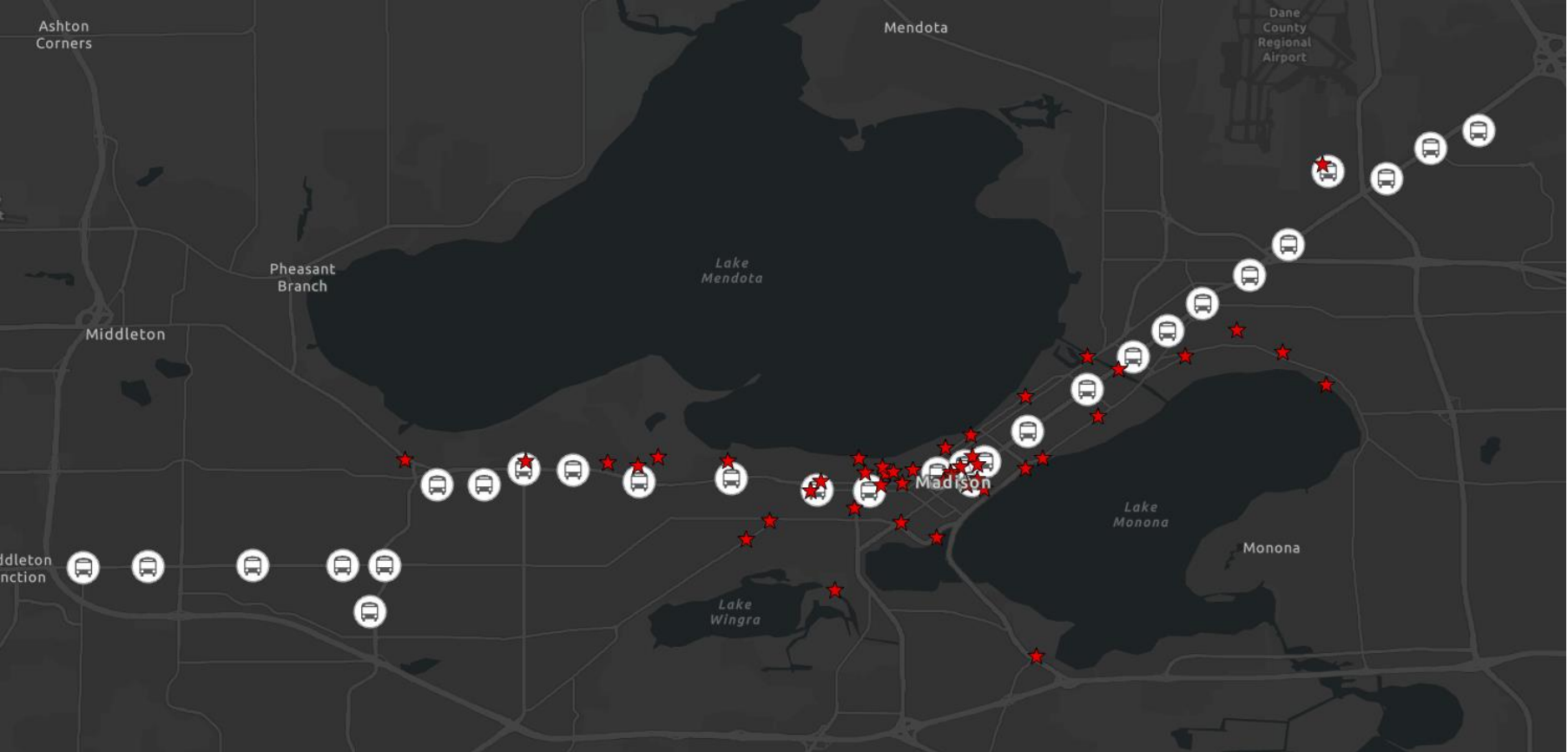
Datasets containing the proposed locations of stops for a west-east BRT line as well as a north-south line are available, as well as a dataset containing the current locations of Madison B-cycle bike share stations.

Methods

Station and stop data can be downloaded in .geojson format. A text editor was used to make minor adjustments to the B-cycle station data, which included the removal of a handful of bike share stations that no longer exist and the addition of a recently constructed station.

The bus rapid transit line data included stops for both the proposed West-East and North-South lines, and stops for a variety of proposed alternatives for route alignments in both downtown and the west side. Geopandas in Jupyter Notebook was used to filter out only the West-East stops from the preferred alignments that were selected by the Madison Transportation Policy and Planning Board at a February 2020 meeting.

Proposed BRT Stations and Current B-Cycle Stations



Methods (Cont.)

The .geojson formatted data files were converted to a shapefile format using Geopandas to perform additional analysis and visualization in ArcGIS Pro, including the creation of service area polygons (also known as isochrone maps) to analyze the pedestrian-time footprints around proposed BRT stations and bike share locations. The CARTOframes package was also utilized within Jupyter Notebook for spatial data analysis and visualization.

Additional .geojson files with proposed locations for new bike share stations were created for additional analysis and visualization purposes.

Findings

Outside of a large clusters of stations downtown and on the UW campus, most existing bike share stations are organized as lines extending out of downtown alongside bike paths.

The footprints of the proposed West-East BRT Line and existing B-cycle stations are similar, which is partially due to the constrained nature of Madison's isthmus. Seven locations were identified as possible hubs to serve as quick transfers between the BRT line and bikeshare. Most of these locations have an existing B-Cycle within a block or two, but relocation of many of these stops to a location even closer to BRT boarding areas would allow for quicker bike-to-bus "transfers".

Suggested Locations for BRT/B-Cycle Station Hubs

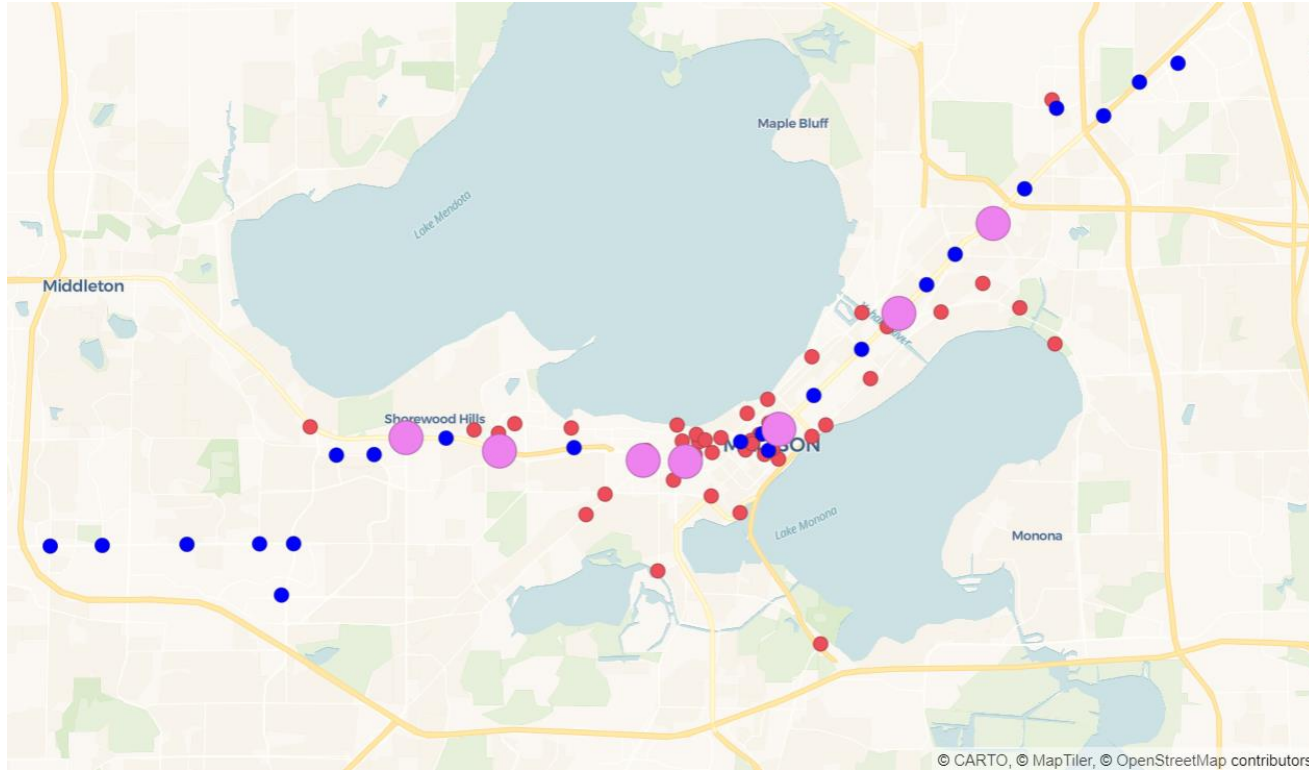
- University and Midvale
- University and University Bay
- University/Johnson and Orchard
- University/Johnson and East Campus
- East Washington and Webster
- East Washington and First
- East Washington and Marquette

These locations would serve as “transfer points” between bike share and BRT by having stations for both at the same location. Only the East Washington and Marquette location does not currently have a B-Cycle station nearby.

Factors in selecting these specific BRT stop locations to serve as direct connections to the bike share system:

Easy access to bike paths and other “low-stress” bicycle routes, intersections with “low-stress” pedestrian and bicycle street crossings, proximity to other bike share stations, and geographically logical locations for people to switch from bike-to-bus and vice versa.

Suggested BRT/B-Cycle Hub Locations



Large purple dots:
Suggested locations
of BRT/B-Cycle
connection hubs

Blue dots: Proposed
West-East BRT Line
station locations

Red dots: Existing B-
Cycle station
locations

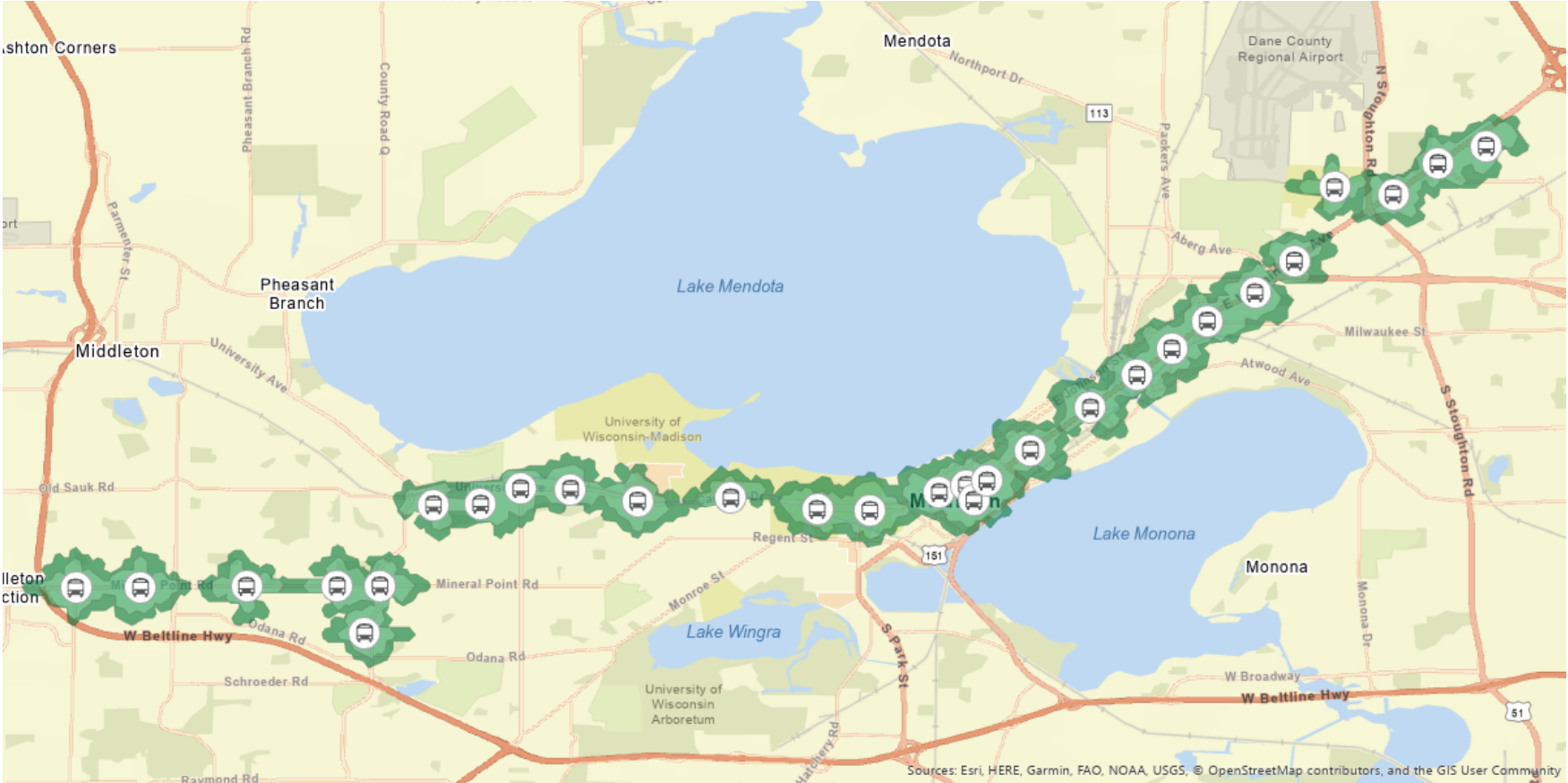
Findings (Cont.)

Areas in Madison with a longer than 7-minute walk to reach a BRT station were identified. Even some parts of the isthmus require a significant walk to reach the closest proposed BRT station.

Some of these areas that do not already have a bike share station nearby were identified as candidates for further bike share station expansion.

Unfortunately, some neighborhoods in Madison that would benefit from the availability of a short bike share ride to a BRT station lack a safe and stress-free bike route option at this time.

Walking isochrones for BRT stations (5 and 7 minutes)



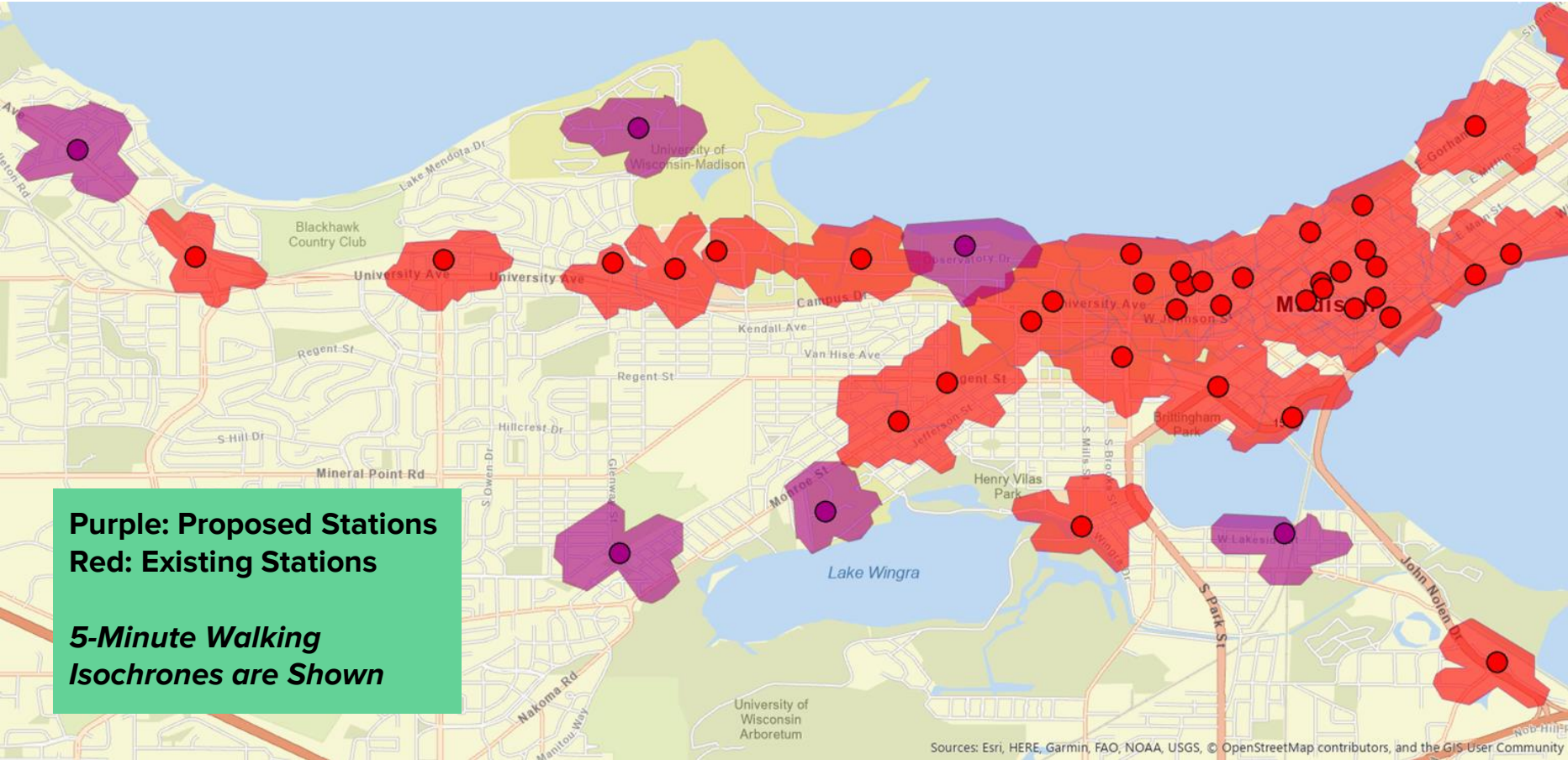
Suggested Locations for New B-Cycle Stations

- University Av./Capital Av. (Spring Harbor)
- Southwest Commuter Path at Glenway
- Edgewood College
- Eagle Heights
- UW-Madison Lakeshore Dorms
- Bernie's Beach Park (Bay Creek)
- Yahara Place Park
- Hudson Park
- Burrows Park
- Eken Park
- E Washington Av./N. Marquette St.
- Capital City Trail at Dempsey

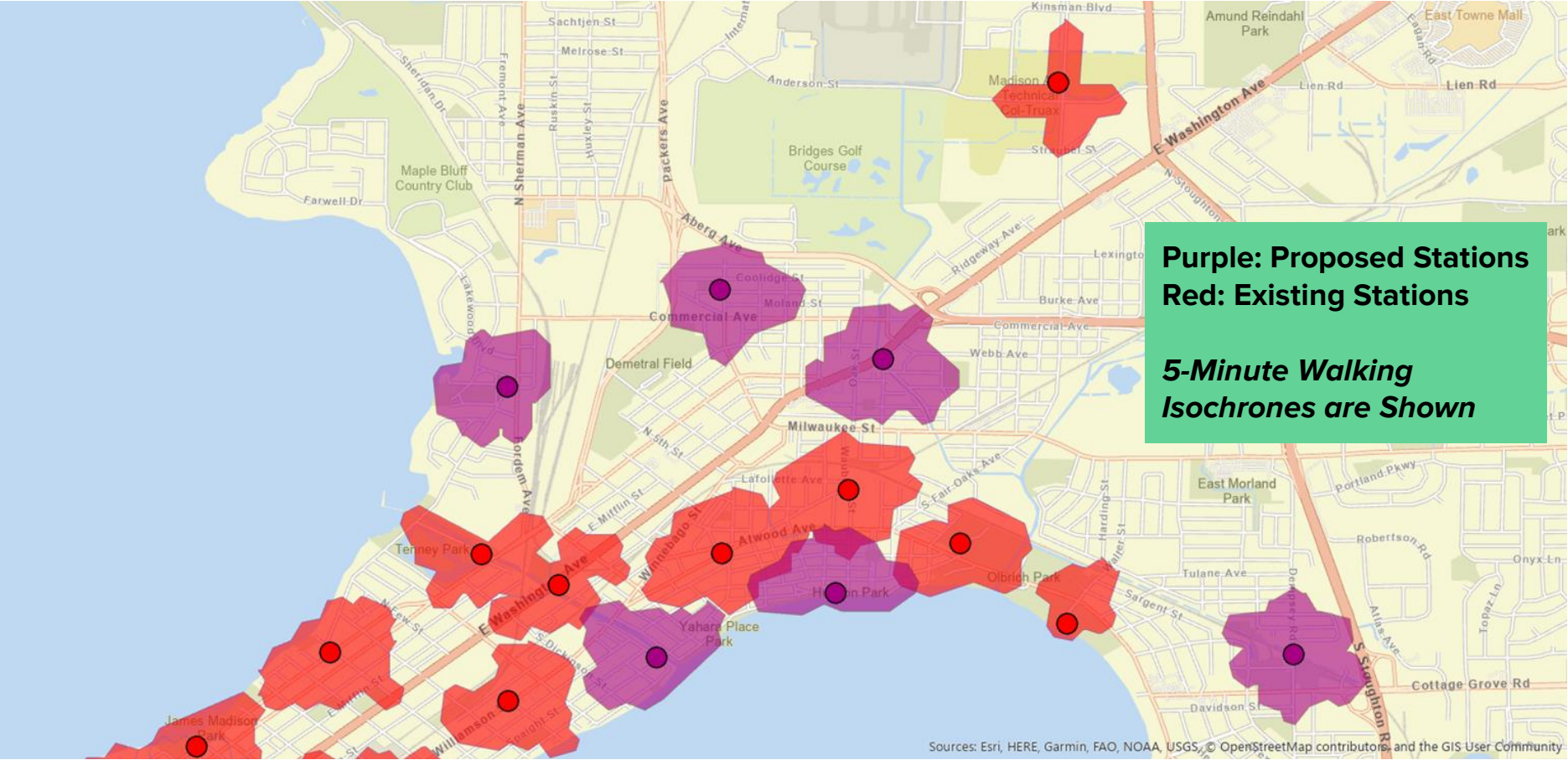
Factors in selecting these locations as possible candidates for bikeshare station expansion:

Locations along bike paths or at parks in bike-friendly neighborhoods, proximity to existing B-Cycle stations, locations with sufficient residential and/or commercial density, locations not within 7-minute walking distance of a proposed BRT stop.

Suggested B-Cycle Station Expansion (West and South)



Suggested B-Cycle Station Expansion (East and North)



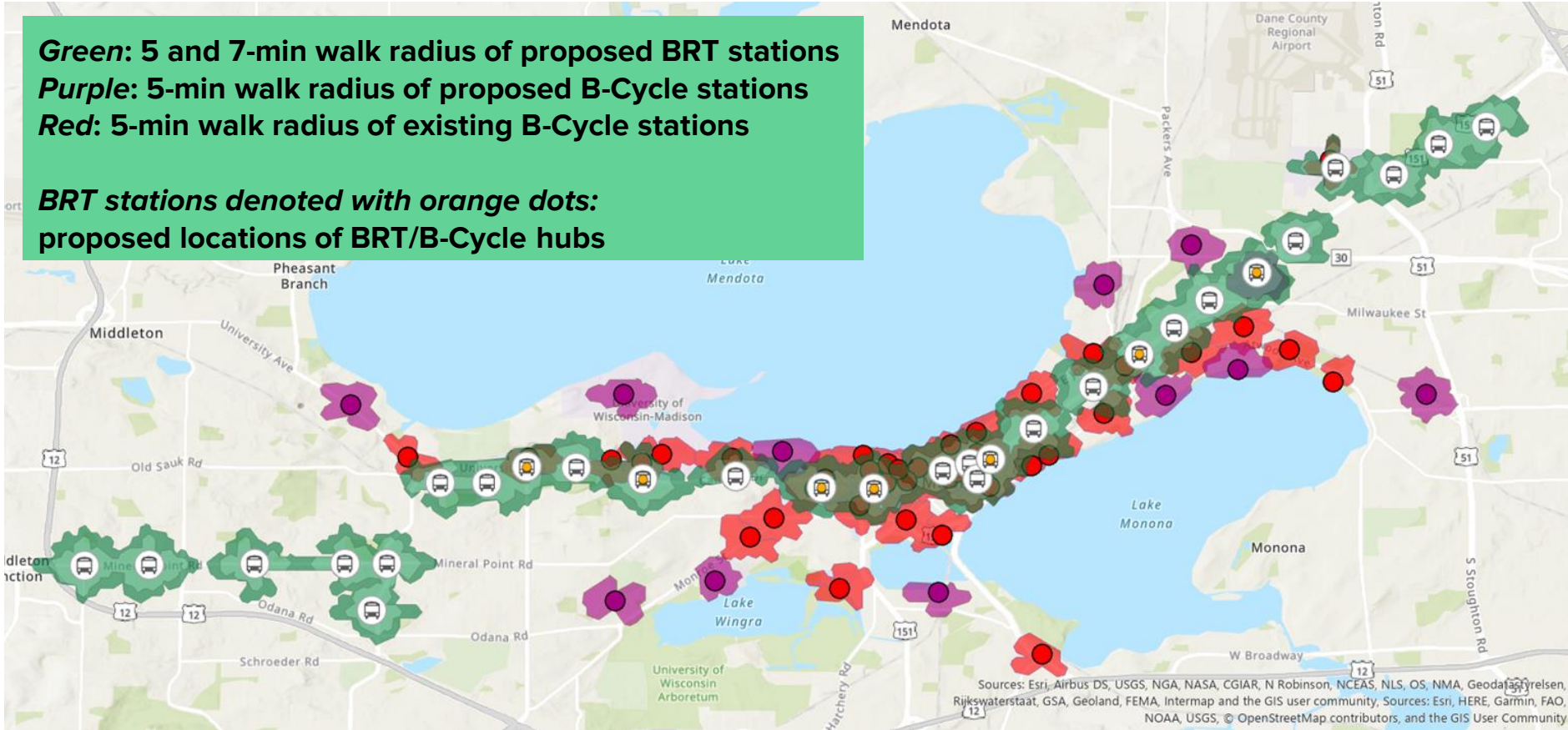
Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Adding new bike share stations would be great, but Madison needs to continue becoming more bike-friendly to support that expansion.

Proposed BRT and Bike Share Network in Madison

Green: 5 and 7-min walk radius of proposed BRT stations
Purple: 5-min walk radius of proposed B-Cycle stations
Red: 5-min walk radius of existing B-Cycle stations

BRT stations denoted with orange dots:
proposed locations of BRT/B-Cycle hubs



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodata, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Future Possibilities for Bike Share in Madison

Reduced membership fees and reduced penalties for late bike returns for lower-income individuals would ensure that all members of the Madison community can enjoy the health benefits and convenience of bike share.

Full integration of the bike share and BRT payment systems would be a logical step to increase ease of access to Madison's multimodal transportation network.

Madison has worked in recent years to make the city more bicycle-friendly with new protected bike lanes and bike paths, but many opportunities to improve the area's bicycle infrastructure are still available.

References

[Electric bikes supercharge BCycle program; ridership doubled in 2019 with electrified fleet](#) - Chris Hubbuch, Wisconsin State Journal, Mar. 15, 2020

[Madison transportation board selects preferred Bus Rapid Transit routes](#) - A. J. Bayatpour, WKOW, Feb. 17, 2020