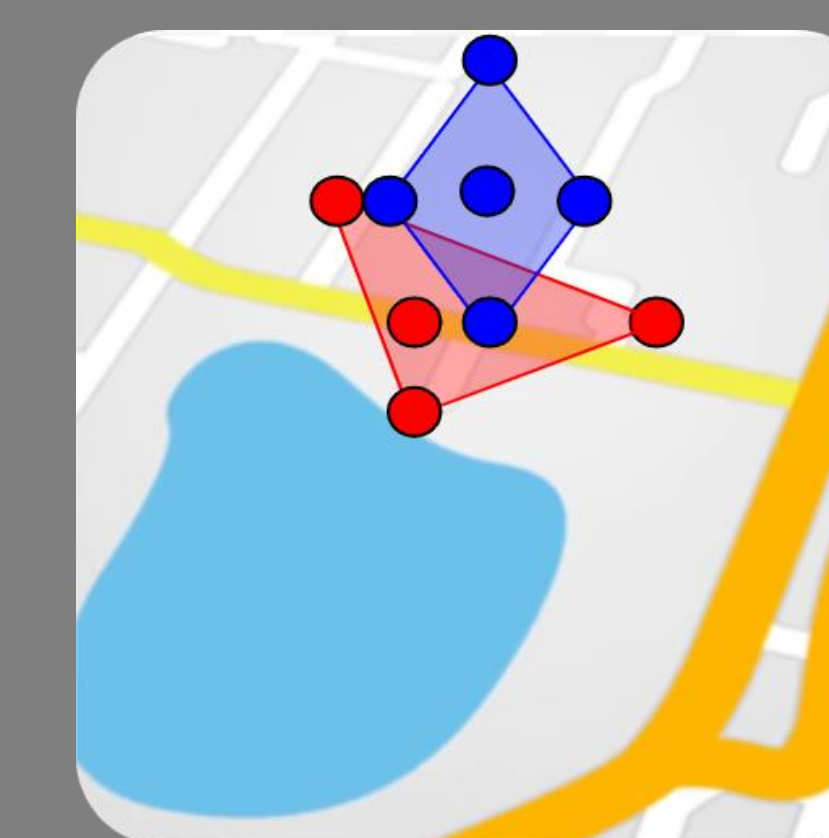


Visualizing Convex Hulls

Michael Schirger, Dr. Bonnie McVey, Dr. Dave Pankratz
St. Norbert College Computer Science



CAPTURE THE COORDINATES

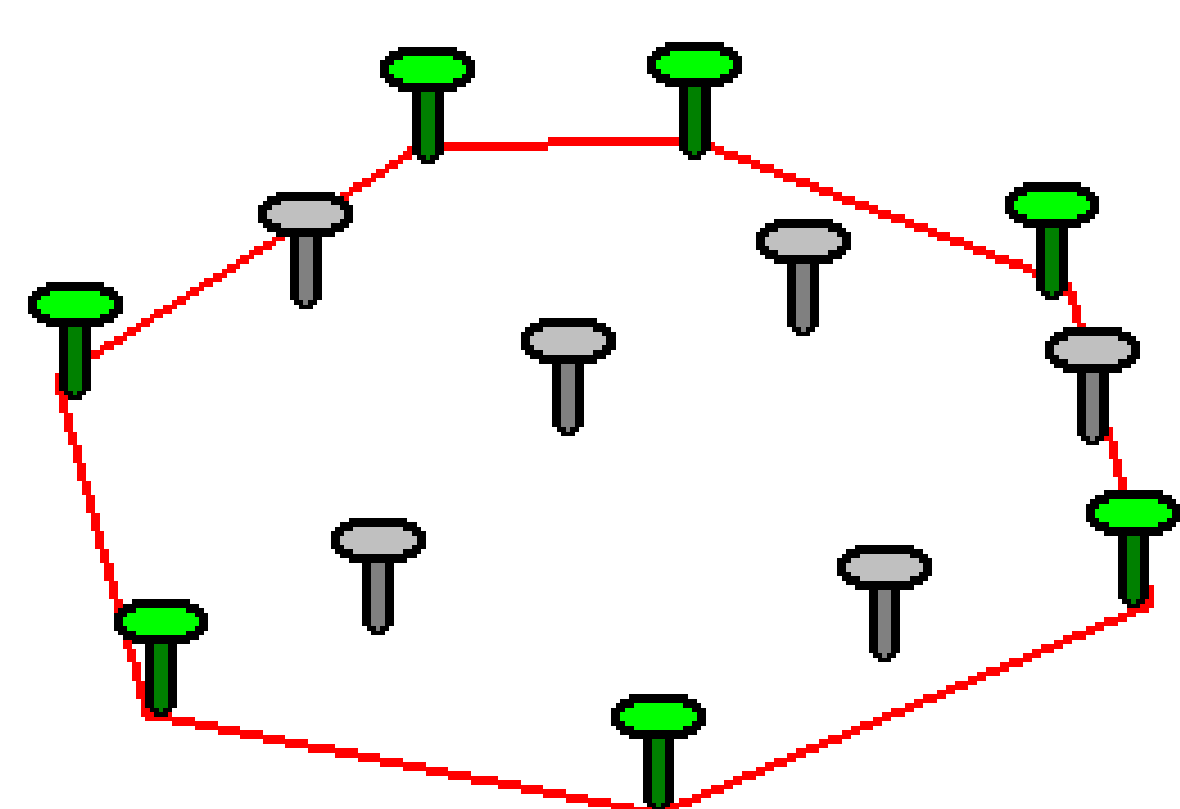
- Capture GPS Coordinates in timed intervals (for example every 15 minutes).
- Store the latitude and longitude from the location capture in a data file.
- GPS coordinates continue to capture in the background even if app is closed.

HOW TO THINK OF GPS COORDINATES

- Consider a Cartesian Coordinate (x,y)
 - Longitude is the x value.
 - Latitude is the y value.

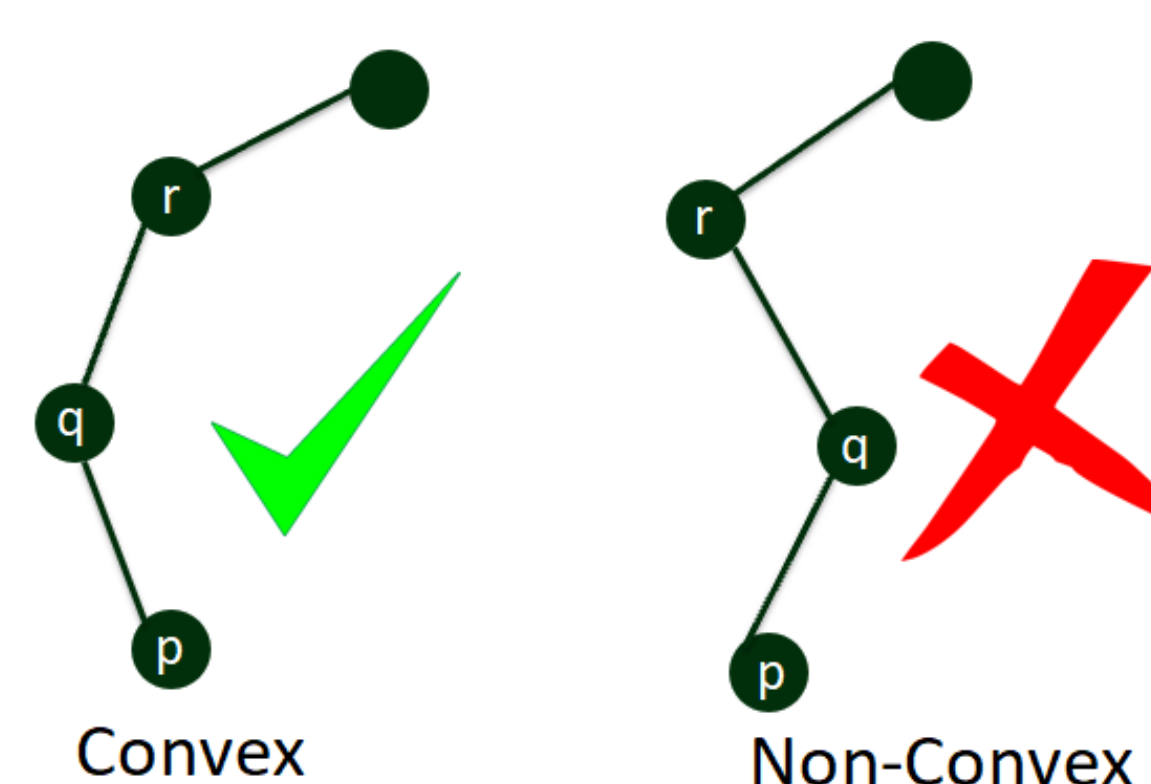
WHAT IS A CONVEX HULL?

- The convex hull for a set of points is the smallest convex polygon that contains all the points.
- Any line drawn between two points must remain within the convex hull.
- Easiest way to think of convex hulls:
 - We have several bulletin board tacks placed randomly on a bulletin board.
 - We take a rubber band and wrap it around all the bulletin board tacks.

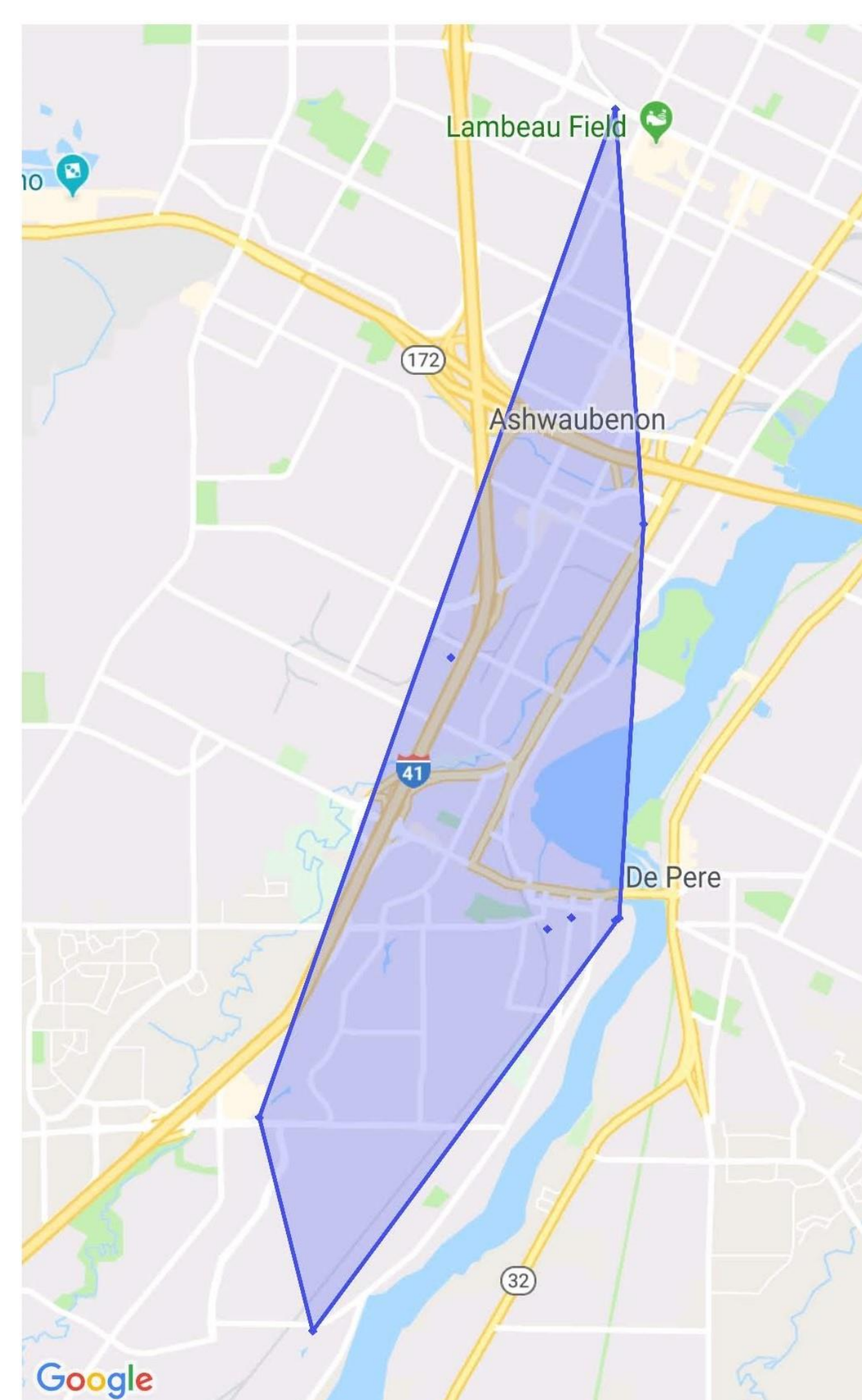


ALGORITHM TO CONSTRUCT A CONVEX HULL

- *Andrew's Monotone Chain Convex Hull Algorithm.*
- This algorithm constructs an upper convex hull and a lower convex hull.
- Algorithm works in this way:
 - Order the coordinates in ascending order by longitude.
 - A point is a vertex of the convex hull if for points p, q, r
 $[(q.x - r.x) * (p.y - r.y)] \geq [(q.y - r.y) * (p.x - r.x)]$.

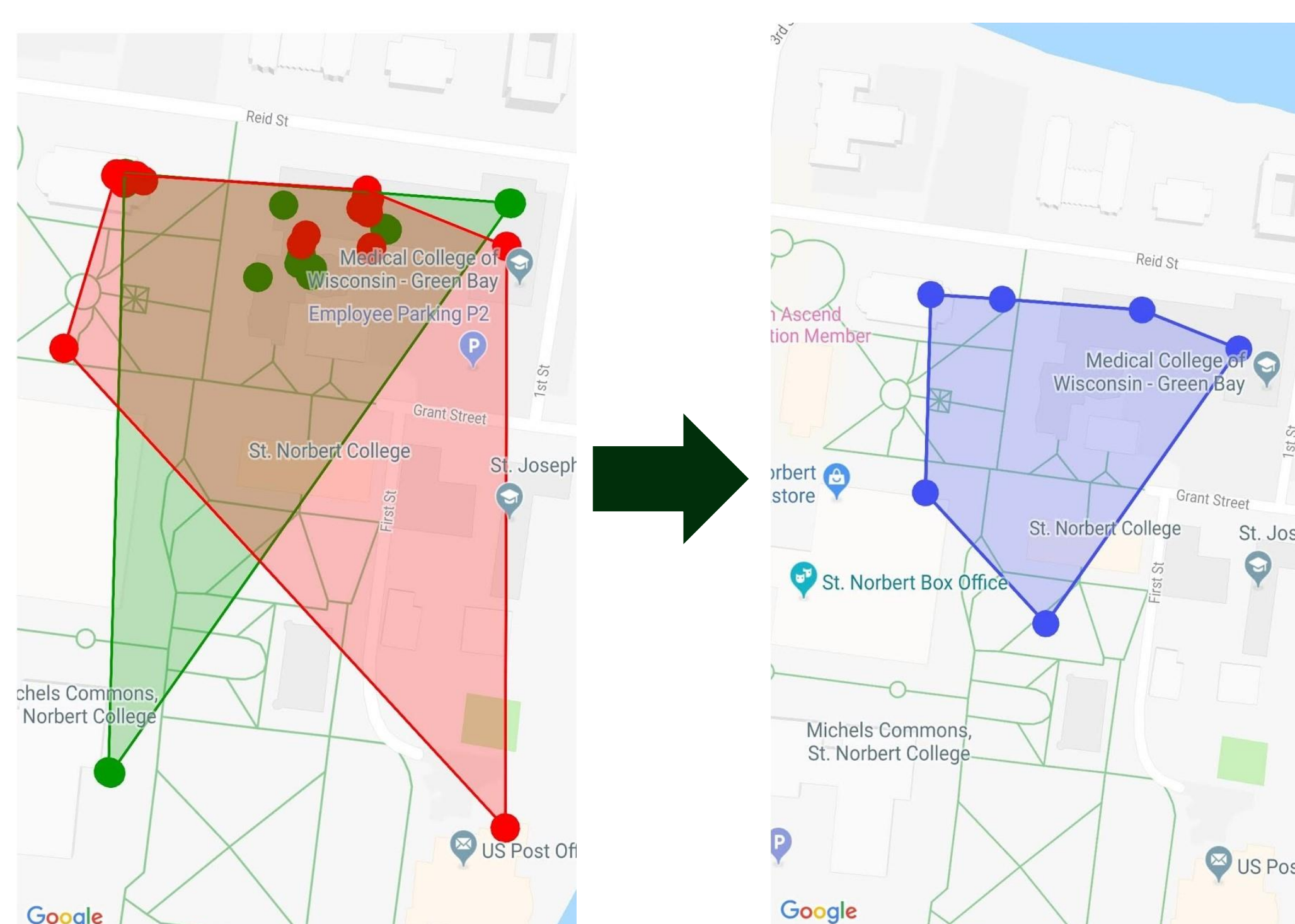


Example Convex Hull



INTERSECTION OF CONVEX HULLS

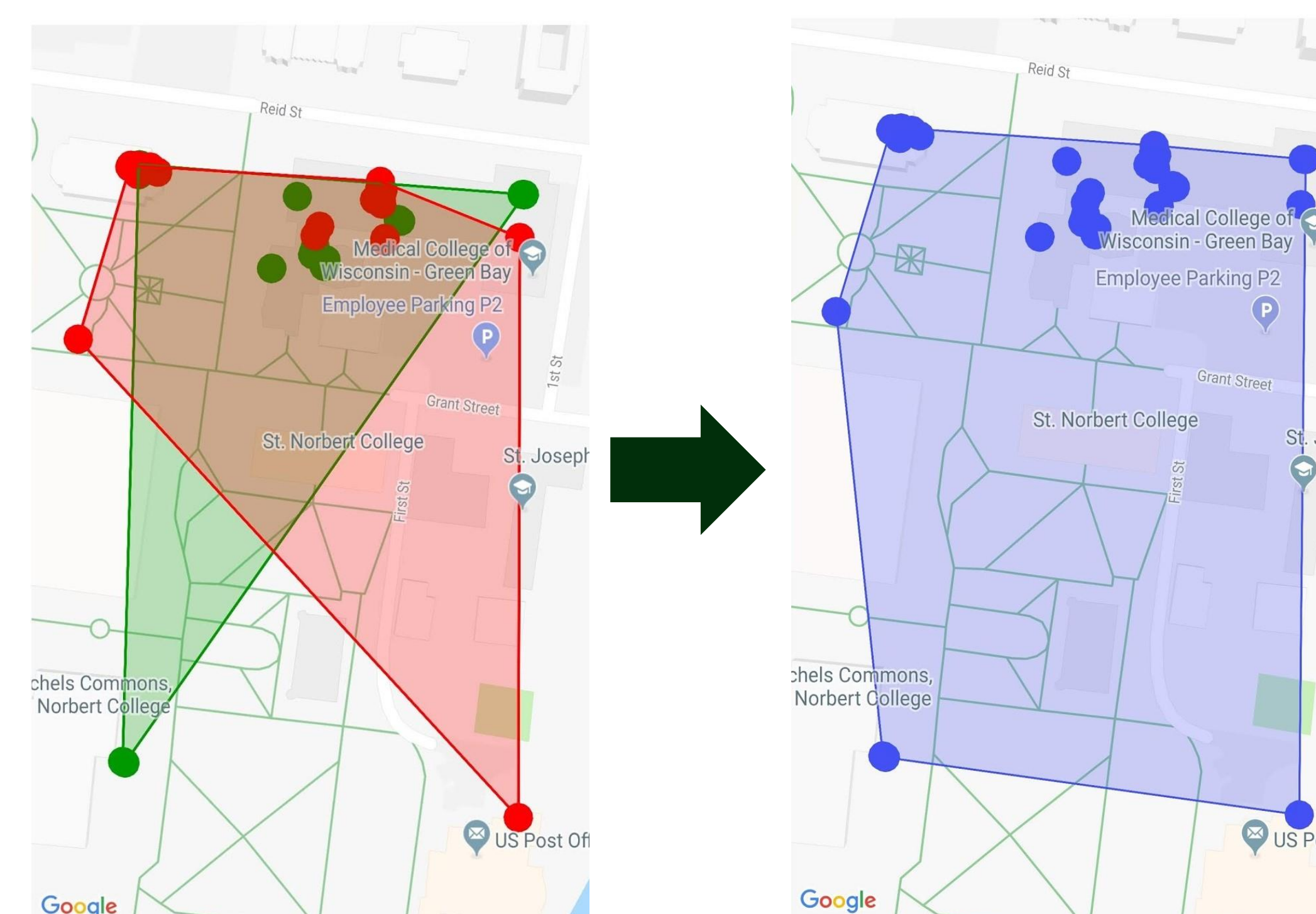
Intersection is the overlapping region of N convex hulls.



UNION OF CONVEX HULLS

Union of Convex Hulls is common points.

- The union of convex hulls is not convex.
- It is then necessary to recompute the convex hull after finding the union of the coordinates.



APPLICATION FOR GPS BASED CONVEX HULLS

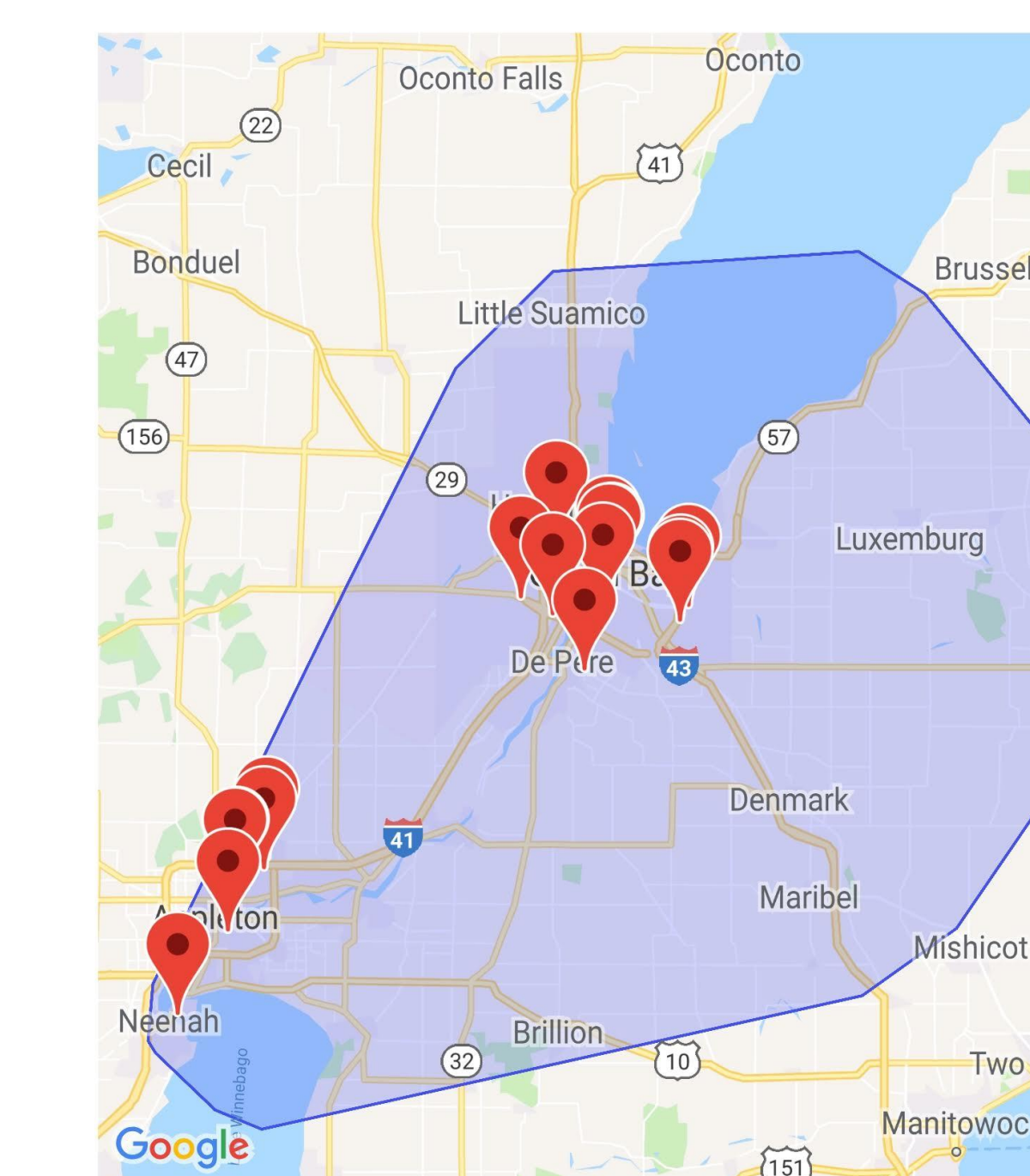
Say we have a hypothetical disease outbreak. With a convex hull we can:

- Take the locations of infected persons and build a containment area (the convex hull).
- Within the containment area, we can find all the hospitals and clinics.
- Having found the hospitals, we can calculate which are more likely to get an increase in the number of patients.

10:53

Application

Disease Data Set: celiac



Clinics

- **Aurora BayCare Medical Center**
2845 Greenbrier Road, Green Bay
3.08 miles
- **Aurora Baycare Orthopedic & Sports Medicine Center**
1160 Kepler Drive, Green Bay
3.28 miles
- **Bellin Health De Pere East Pediatrics**
556 Redbird Circle Ste. 200, De Pere

ACKNOWLEDGEMENTS

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