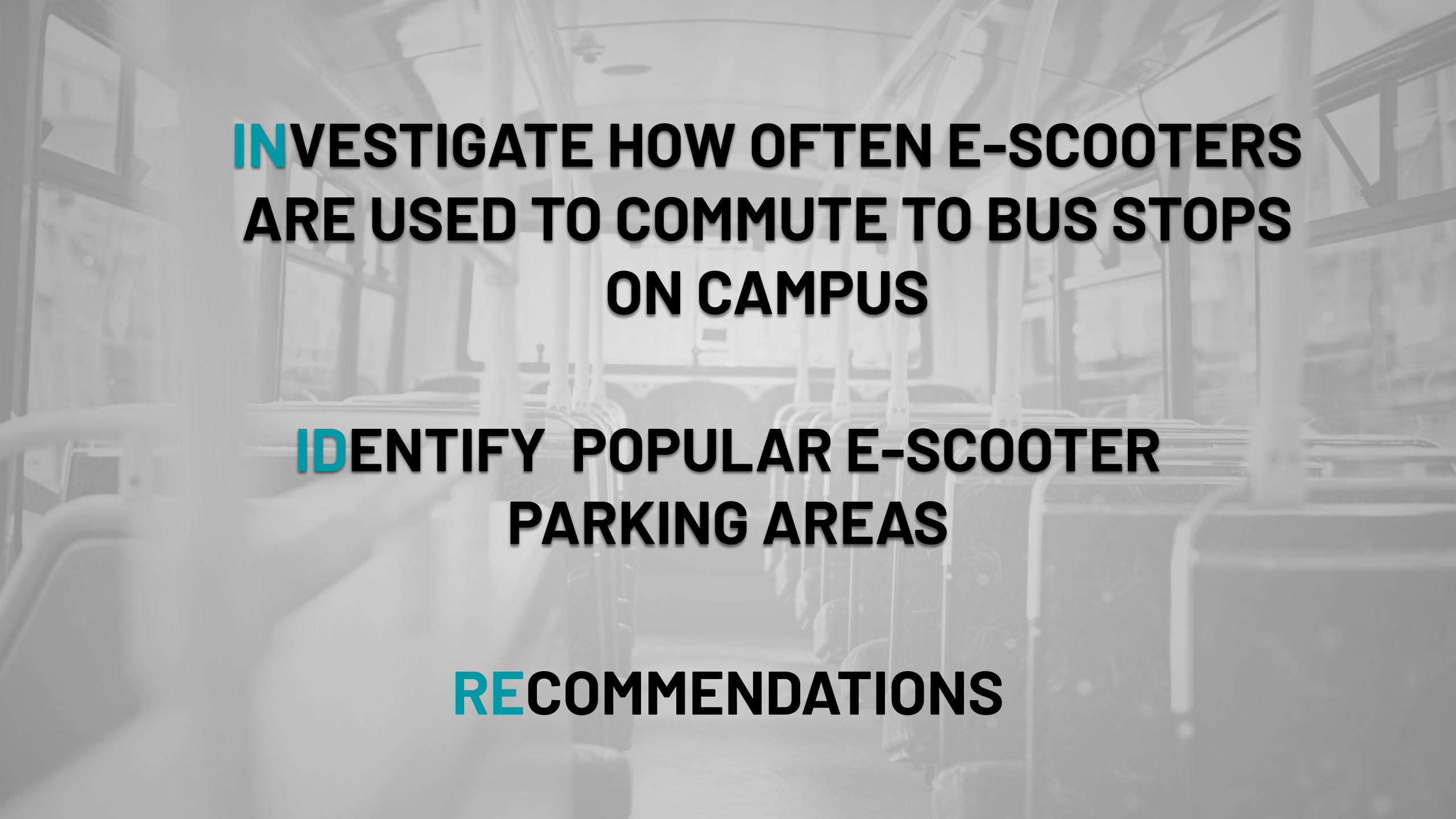


Veoride Scooters

Usage & The UMD Bus Transportation System

Mikpongbeho Antoine Vignon, Marwa Mansour



**INVESTIGATE HOW OFTEN E-SCOOTERS
ARE USED TO COMMUTE TO BUS STOPS
ON CAMPUS**

**IDENTIFY POPULAR E-SCOOTER
PARKING AREAS**

RECOMMENDATIONS

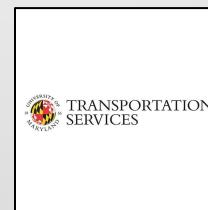
DATASETS

- **VeoRide data generated from individual rides (CSV)**
 - The dataset comprises 62 days (October 2020 and October 2019) of historical data
 - Includes: *RIDE ID, CUSTOMER ID, CREATED (time), START (time), END (time), DISTANCE, MINUTES, VEHICLE TYPE, PATH (json dict), TIMESTAMP (list), START POINT, END POINT*
 - The dataset is an anonymized dataset.
- **Additional datasets kindly provided by DOTS (through UMD GIS dept.)**
 - UMD Campus map
 - UMD VeoParking Areas
 - Shuttle-UM Bus stop locations
 - WMATA bus stop locations on campus

We only used End Points from each ride for our analysis

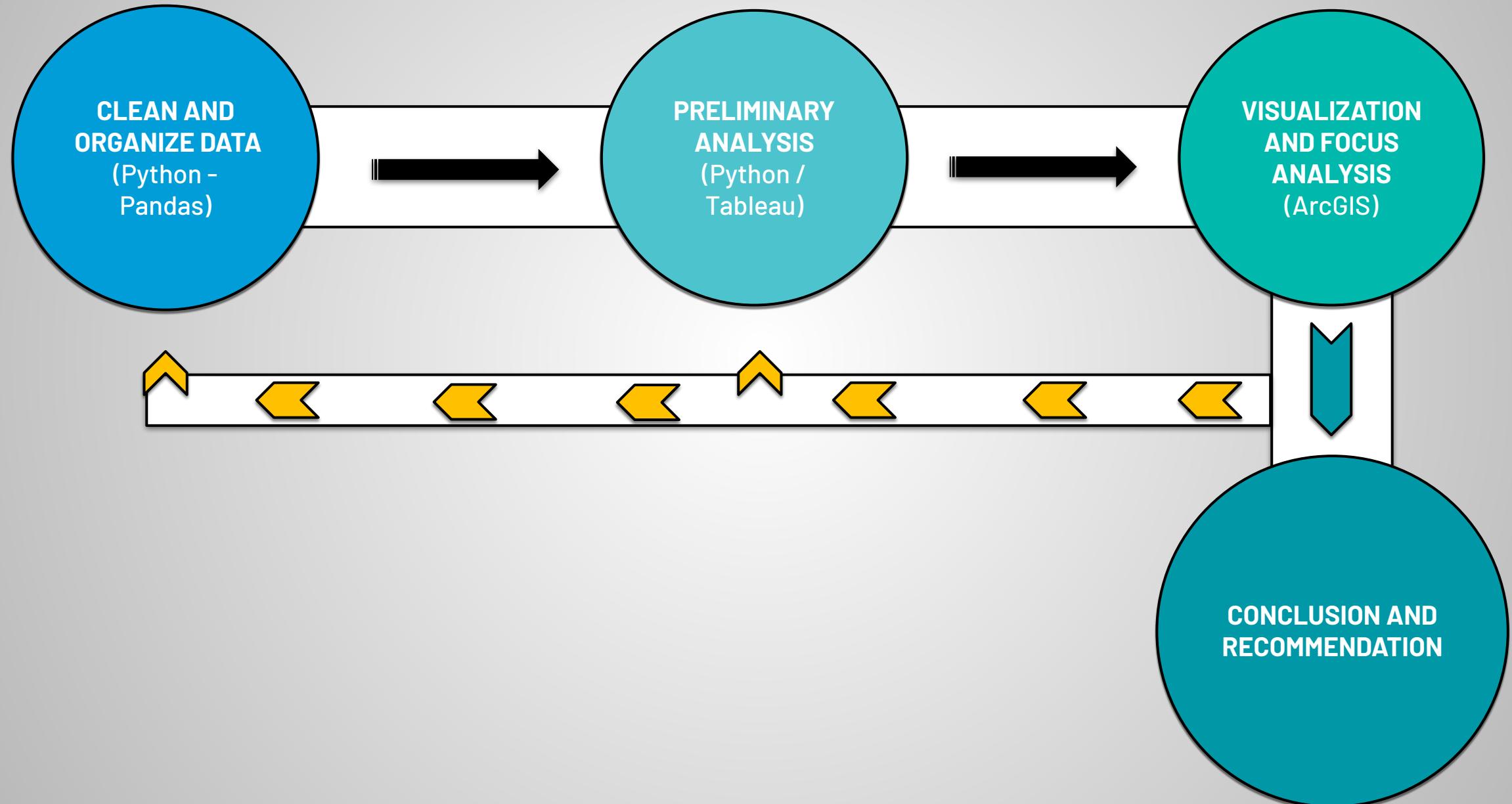


VeoRide Inc., is a mobility service provider that manages their micro mobility fleet through the use of the [Mobility Data Standard \(MDS\)](#)



The University of Maryland Department of Transportation Services (DOTS) provides a full range of parking and transportation services to a diverse community of more than 50,000 students, faculty and staff in the City of College Park

PROCEDURE



DATA CLEANING AND ORGANIZATION

Cleaning & Organization Process

- **Cleaning**
 - Removed E-Bike rides from dataset.
 - Removed missing values (from distance variable).
 - Removed rides with distances less than 0.08 miles.
 - Removed unnamed columns.
- **Dataset before cleaning:** (40325 rows , 16 columns)
- **Dataset after cleaning:** (34555 rows, 14 columns)
- **Organization**
 - Used *CREATED* column to create a *YEAR* column.
 - Separated rides by year 2019 and 2020
 - Dropped *PATH* and *TIMESTAMP* columns to facilitate analysis.
- **Clean datasets after organization:**
 - 2019: (14391 rows, 15 columns)
 - 2020: (20164 rows, 15 columns)

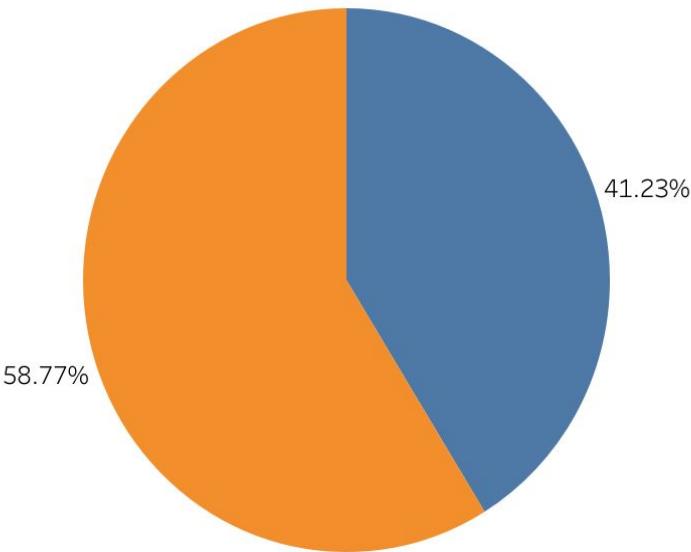
PRELIMINARY ANALYSIS

Distribution

Distribution: 2019/2020

Count of E-scooters Rides Data
36,607

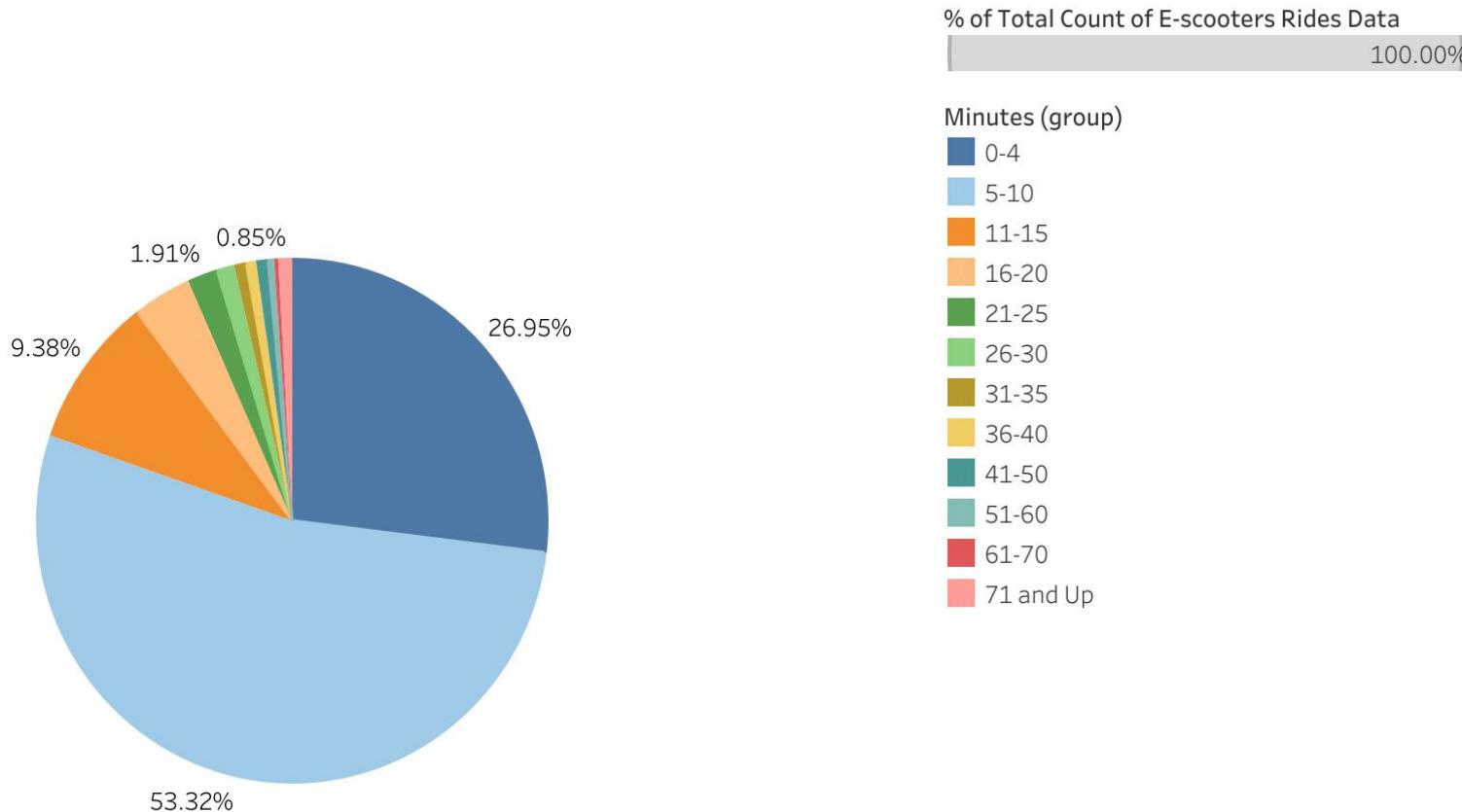
YearSeparation
2019
2020



This chart shows the distribution of scooter rides between the two time periods (Oct. 2019 & Oct. 2020).

Time

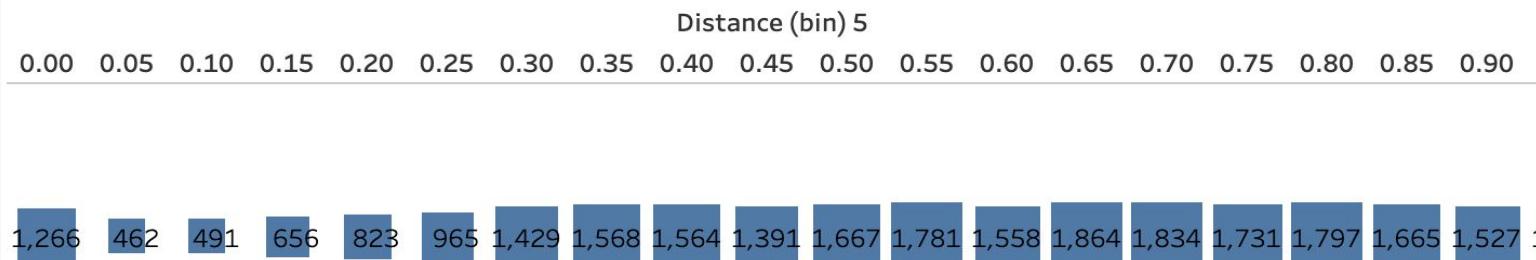
Distribution: Time



This chart shows the distribution of scooter ride Time (Minutes) among the dataset by color.

Distance

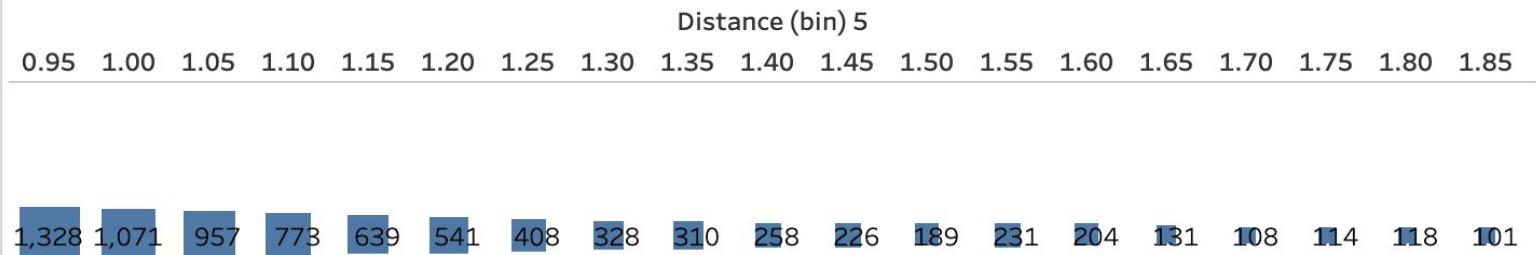
Distribution: Distance



Count of E-scooters Ride...

■	1
■	500
■	1,000
■	1,500
■	1,864

Distribution: Distance



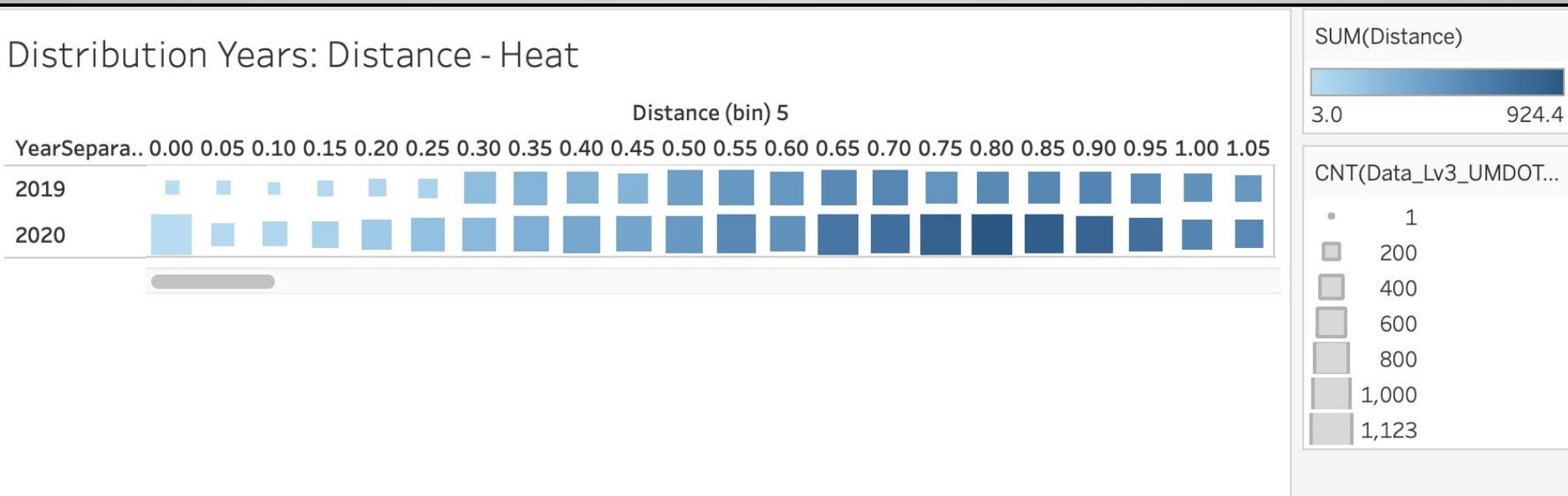
Count of E-scooters Ride...

■	1
■	500
■	1,000
■	1,500
■	1,864

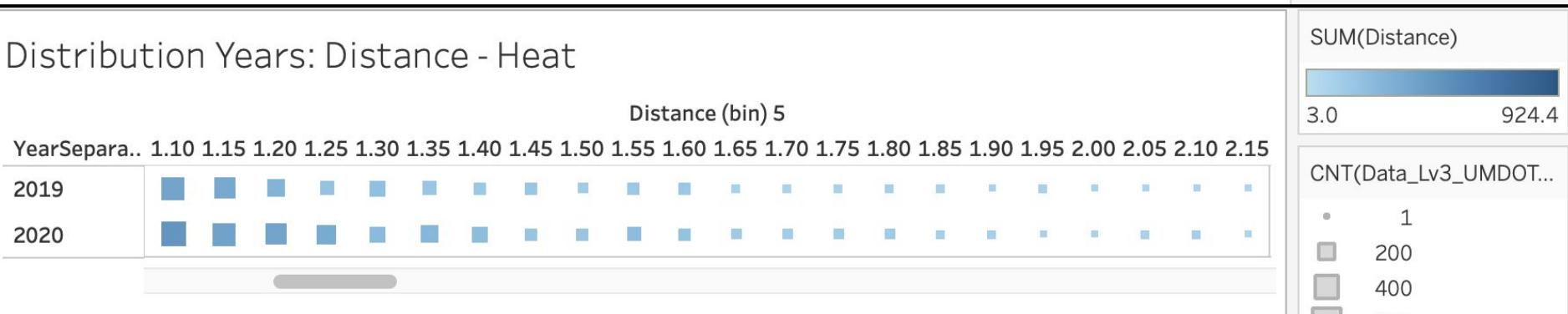
Count of scooter rides (size) broken down by *Distance (bin)* 5. The data is filtered on *Distance (bin)*. The *Distance (bin)* filter keeps 14 members.

Distance/Years

Distribution Years: Distance - Heat



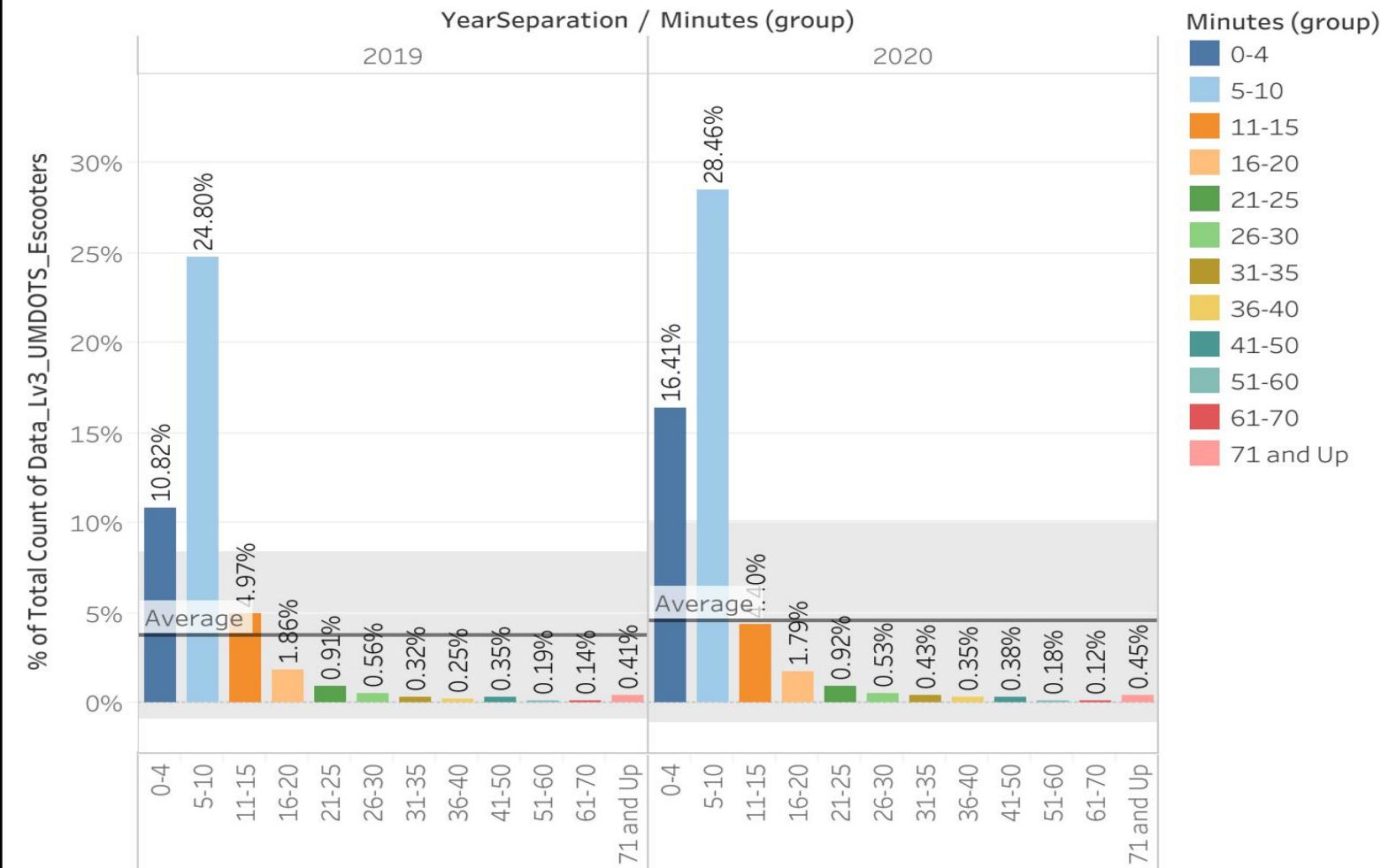
Distribution Years: Distance - Heat



Sum of Distance (color) and count of E-scooters Ride Data (size) broken down by Distance (bin) 5 vs. YearSeparation. The data is filtered on Distance (bin) which keeps 14 members.

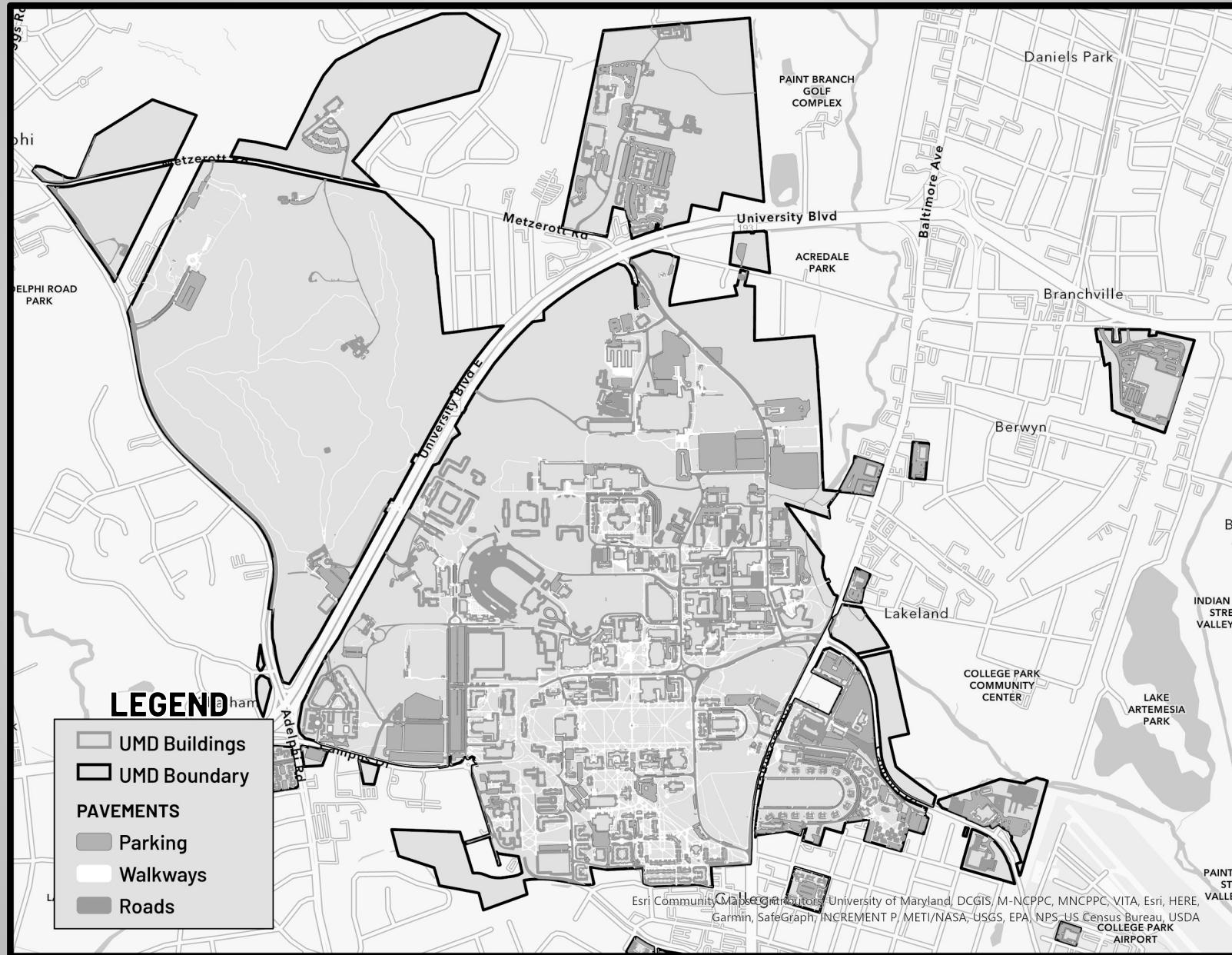
Time/Years

Distribution Years: Time%

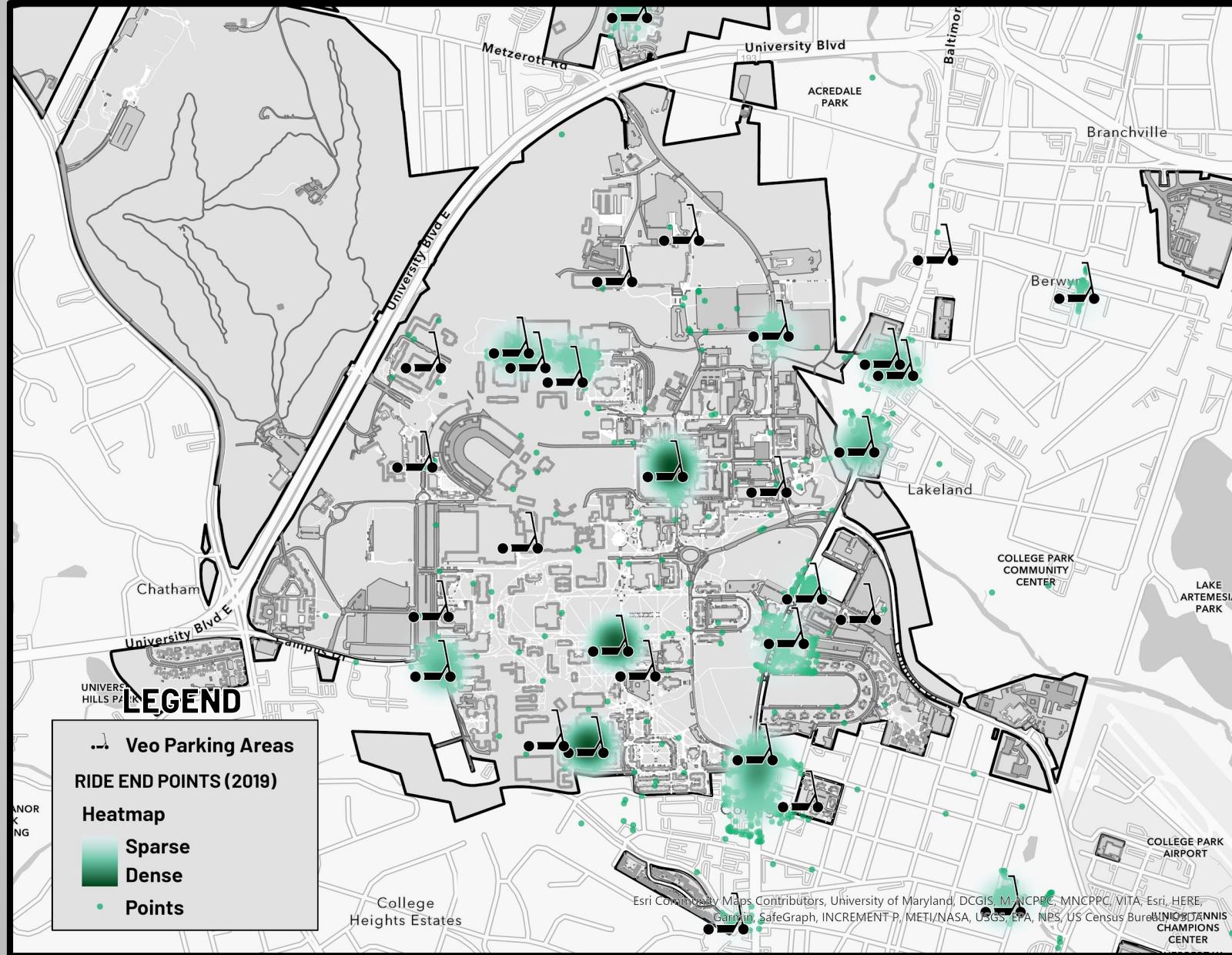


% of Total Count of E-scooters Ride Data for each Minutes (group) broken down by Year. Color shows details about Minutes (group).

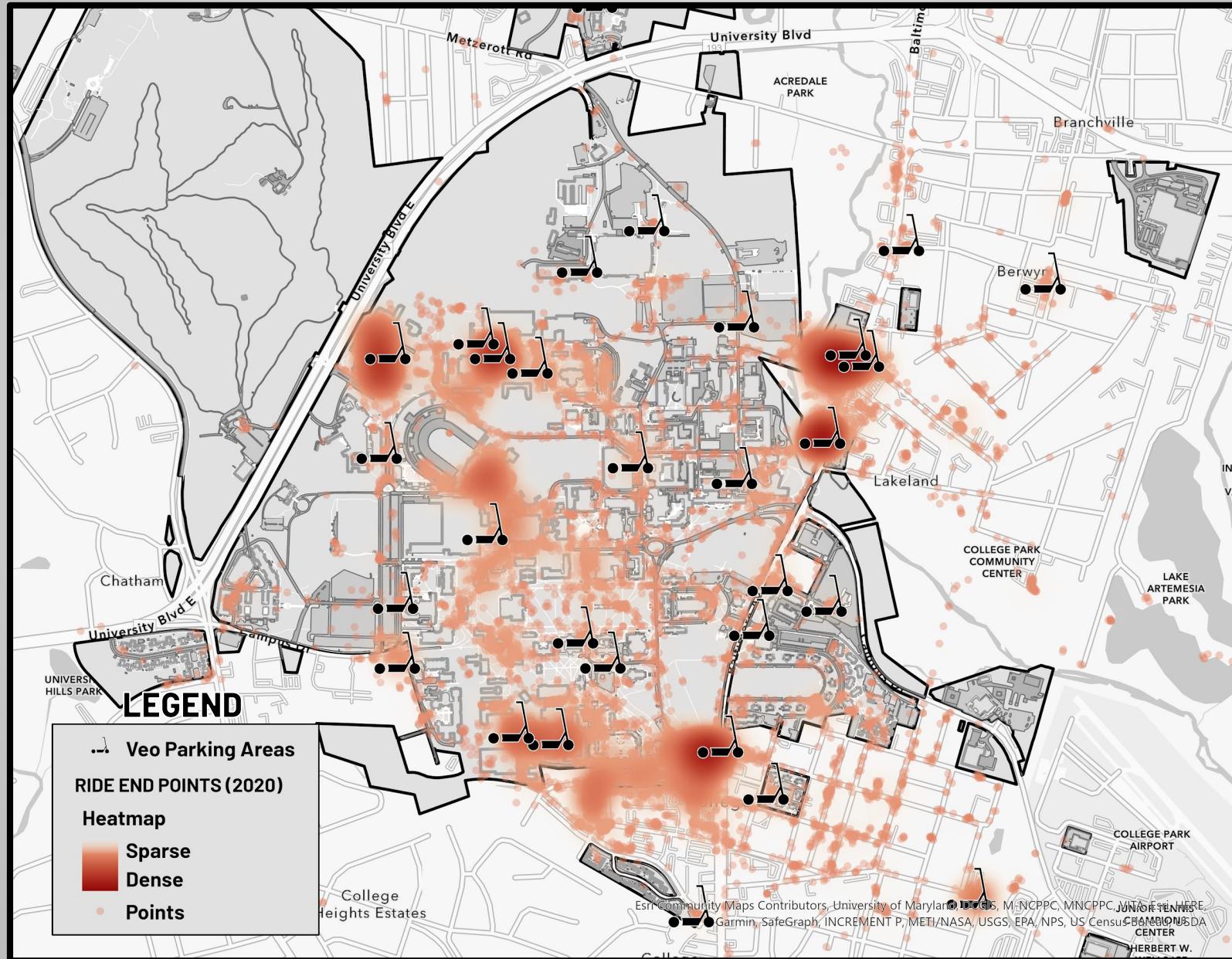
Campus Map



Heatmap (2019)



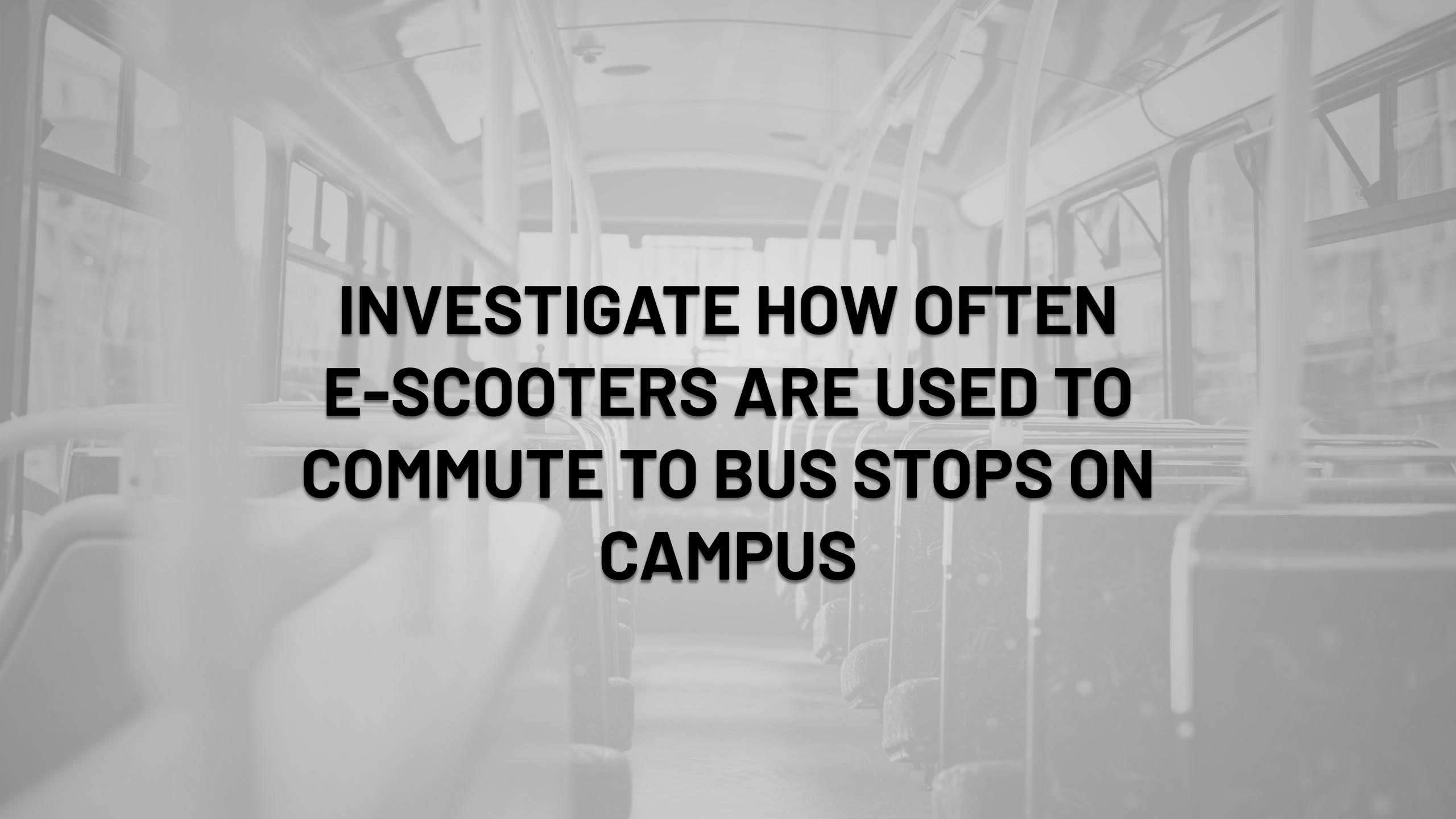
Heatmap (2020)



VISUALIZATION & FOCUS ANALYSIS

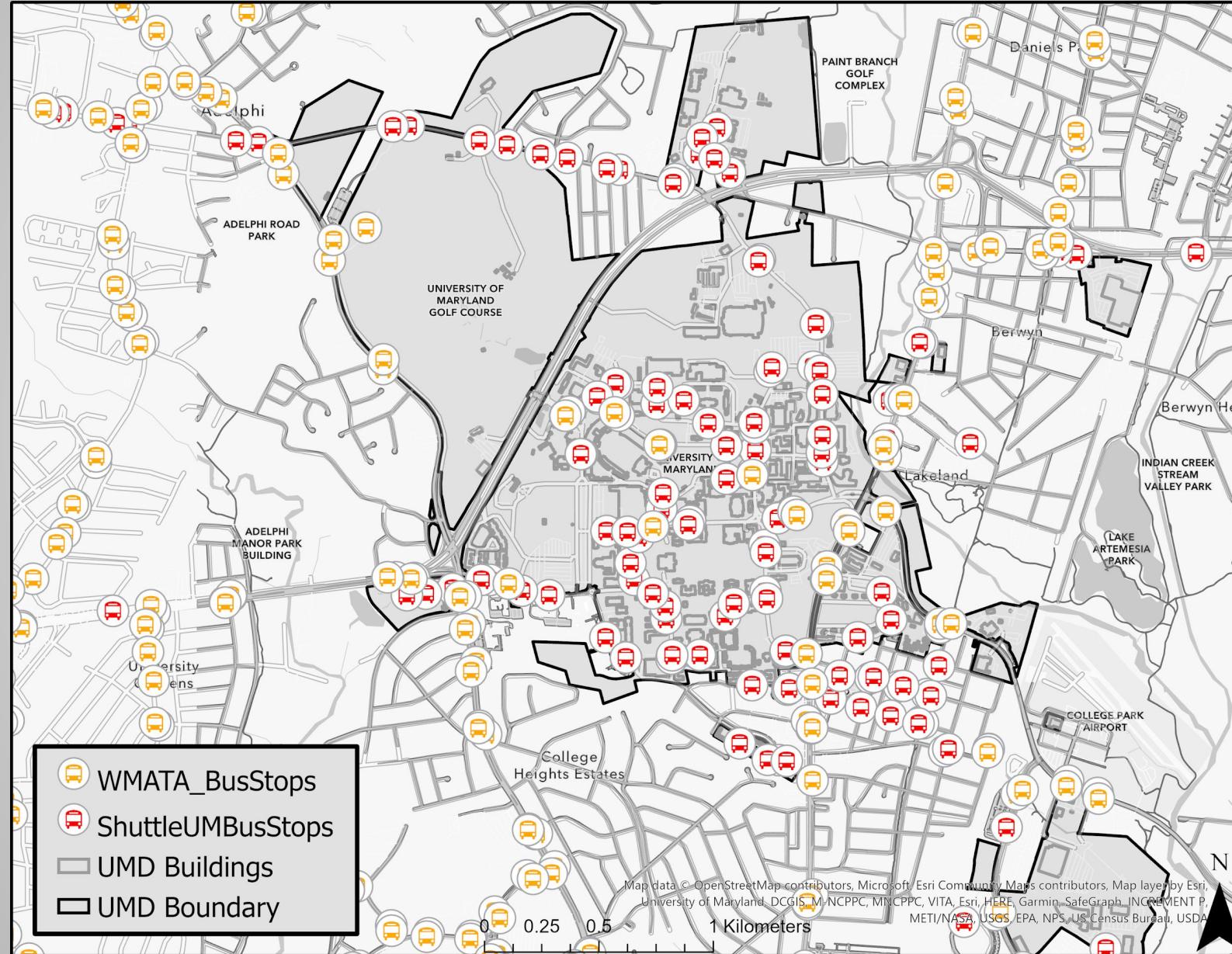
ArcGIS

- UMD Campus map
 - Our datasets:
 - UMD VeoParking Areas
 - Shuttle-UM Bus stop locations
 - WMATA bus stop locations on campus

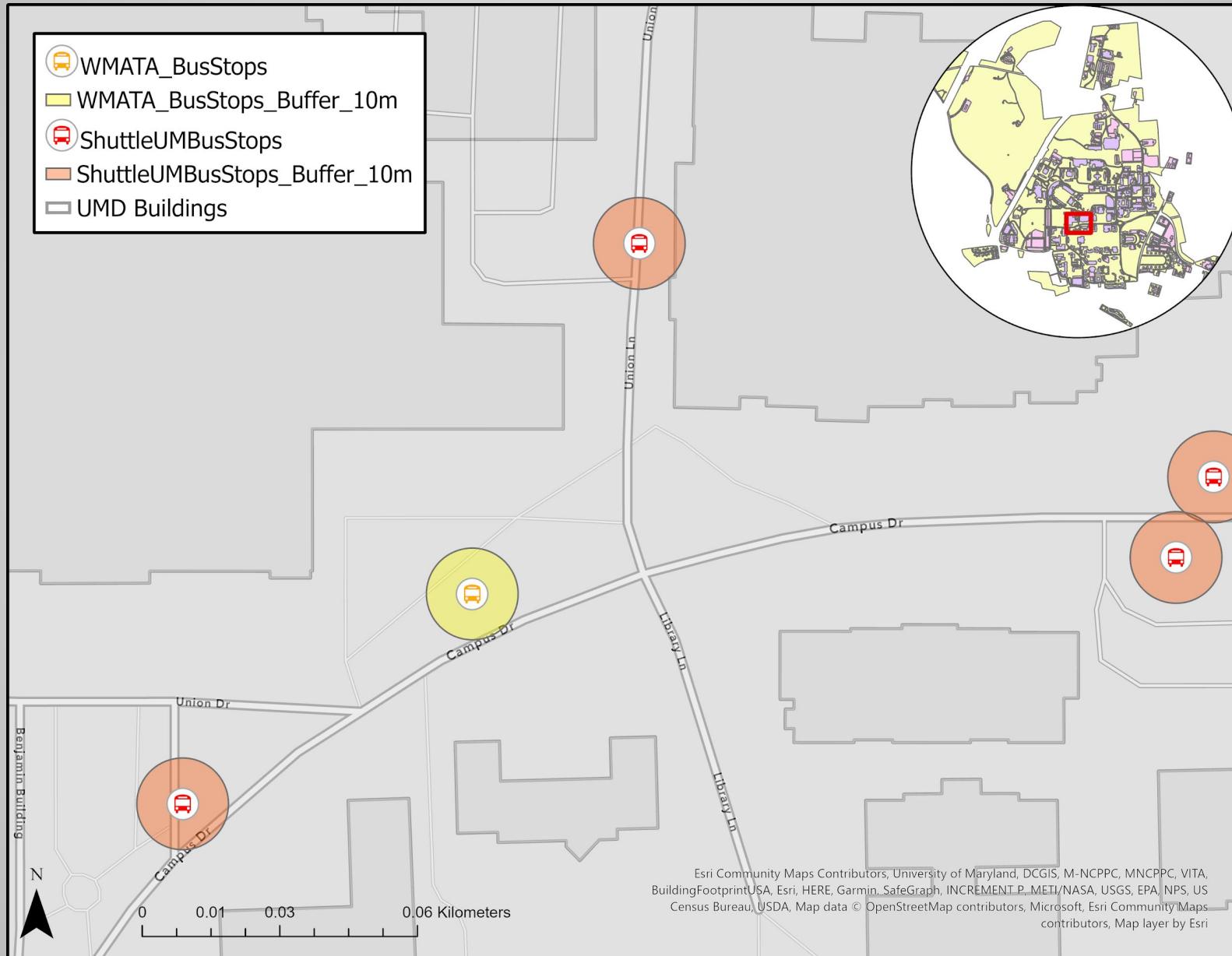


**INVESTIGATE HOW OFTEN
E-SCOOTERS ARE USED TO
COMMUTE TO BUS STOPS ON
CAMPUS**

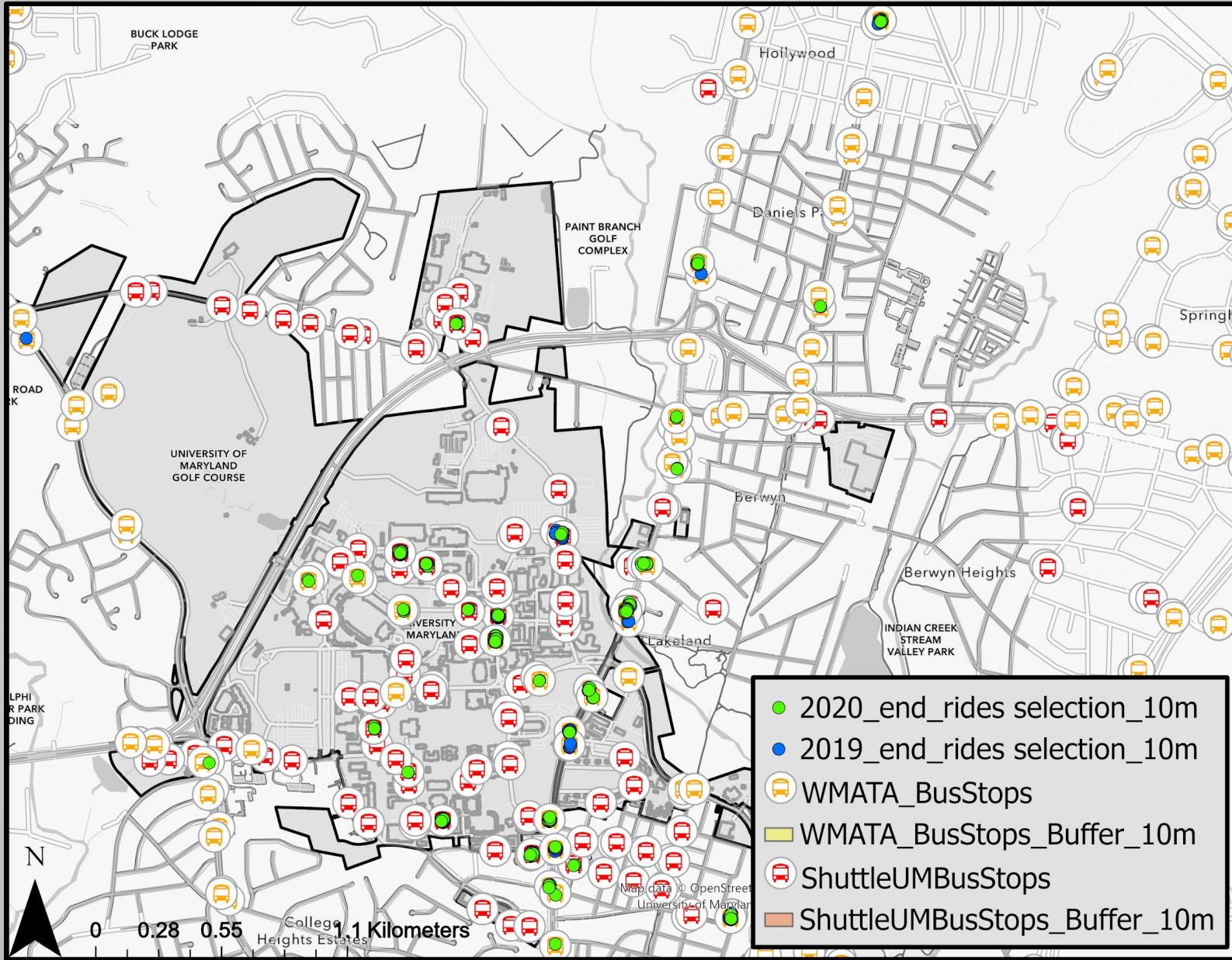
Shuttle-UM & WMATA Bus Stops



10 Meters Buffer Around Stops



Rides Taken to Bus Stops



Example Bus Stops with End Rides



Findings

Total Rides: 34555

2019 Total Rides: 14391

2020 Total Rides: 20164

Total Rides to Bus Stops: 1666 / 4.8% of total rides

2019 Total Rides to Bus Stops: 793 / 5.5% of 2019 total rides

2020 Total Rides to Bus Stops: 873 / 4.3% of 2020 total rides

Findings

2019

WMATA Bus Stops:

Total Rides: 544 / 69% of 2019 rides to bus stops

271 Rides to "Baltimore AVE + Lakeland"

99 Rides to "Baltimore AVE + Knox RD"

47 Rides to "Baltimore AVE + Regent DR"

Shuttle-UM Bus Stops:

Total Rides: 249 / 31% of 2019 rides to bus stops

145 Rides to "South Campus Commons 1 & 2"

19 Rides to "Regent Drive + Stadium DR"

2020

WMATA Bus Stops:

Total Rides: 511 / 59% of 2020 rides to bus stops

351 Rides to "Baltimore AVE + Lakeland RD"

73 Rides to "Baltimore AVE + Regent DR"

Shuttle-UM Bus Stops:

Total Rides: 362 / 41% of 2020 rides to bus stops

248 Rides to "La Plata-Hall"

51 Rides to "University View"

28 Rides to "College Park Shopping Center"

Conclusion: Bus Stop Usage

Total Rides to Bus Stops: 1666

2019 Total Rides to Bus Stops: 793

2020 Total Rides to Bus Stops: 873

WMATA Bus Stops Combined Rides:

Total Rides: 1055 / 63% of All rides to bus stops

UMD Shuttle Bus Stops Combined Rides:

Total Rides: 611 / 37% of All rides to bus stops

Conclusion: Bus Stop Usage

Total Rides to Bus Stops: 1666

2019 Total Rides to Bus Stops: 793

2020 Total Rides to Bus Stops: 873

WMATA Bus Stops Combined Rides:

Popular Stops

622 Rides to "Baltimore AVE + Lakeland"

120 Rides to "Baltimore AVE + Regent DR"

Shuttle-UM Bus Stops Combined Rides:

Popular Stops

248 Rides to "La Plata-Hall"

145 Rides to "South Campus Commons 1 & 2"

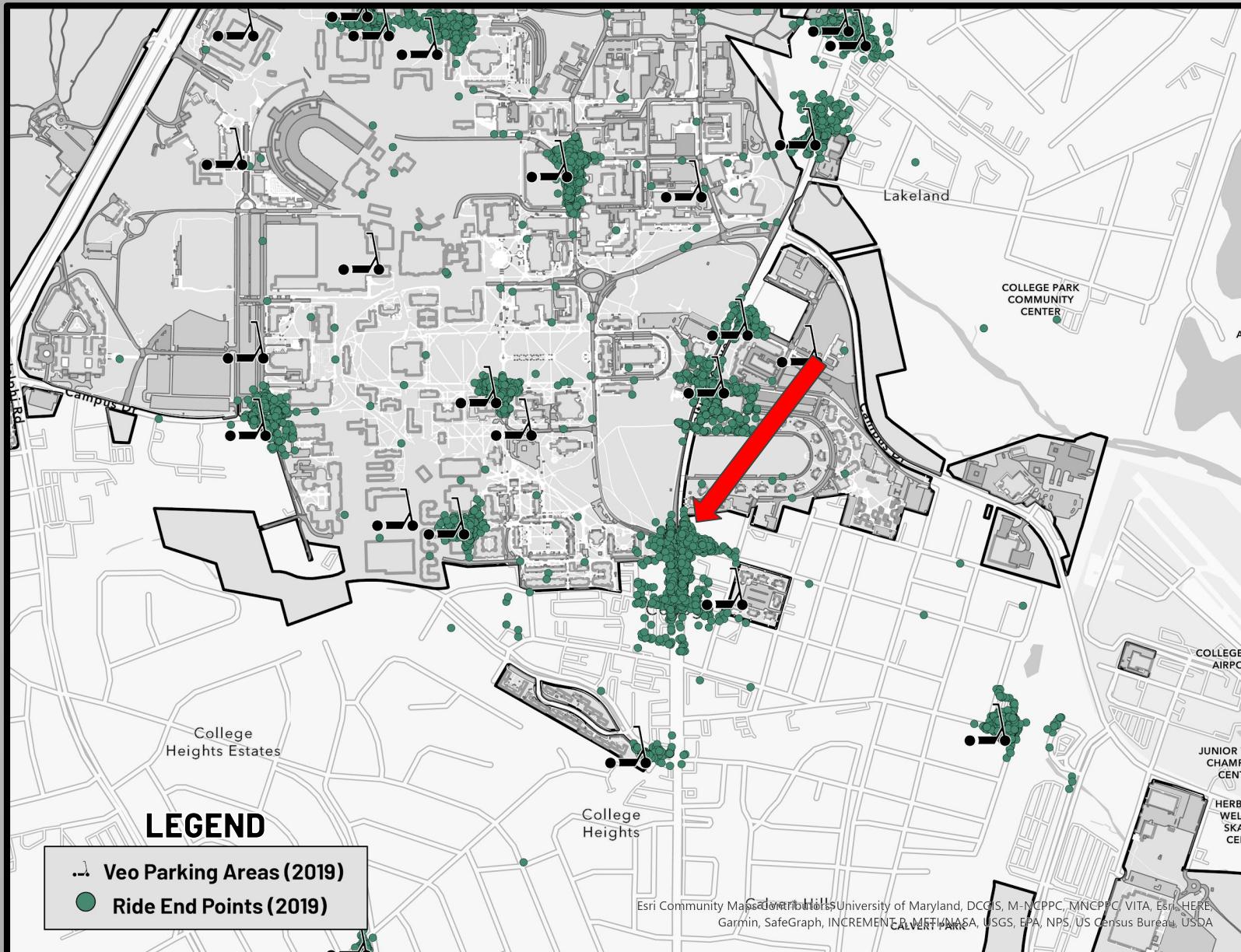
51 Rides to "University View"

28 Rides to "College Park Shopping Center"



INVESTIGATE POPULAR E-SCOOTER PARKING AREAS

Target Location (2019)



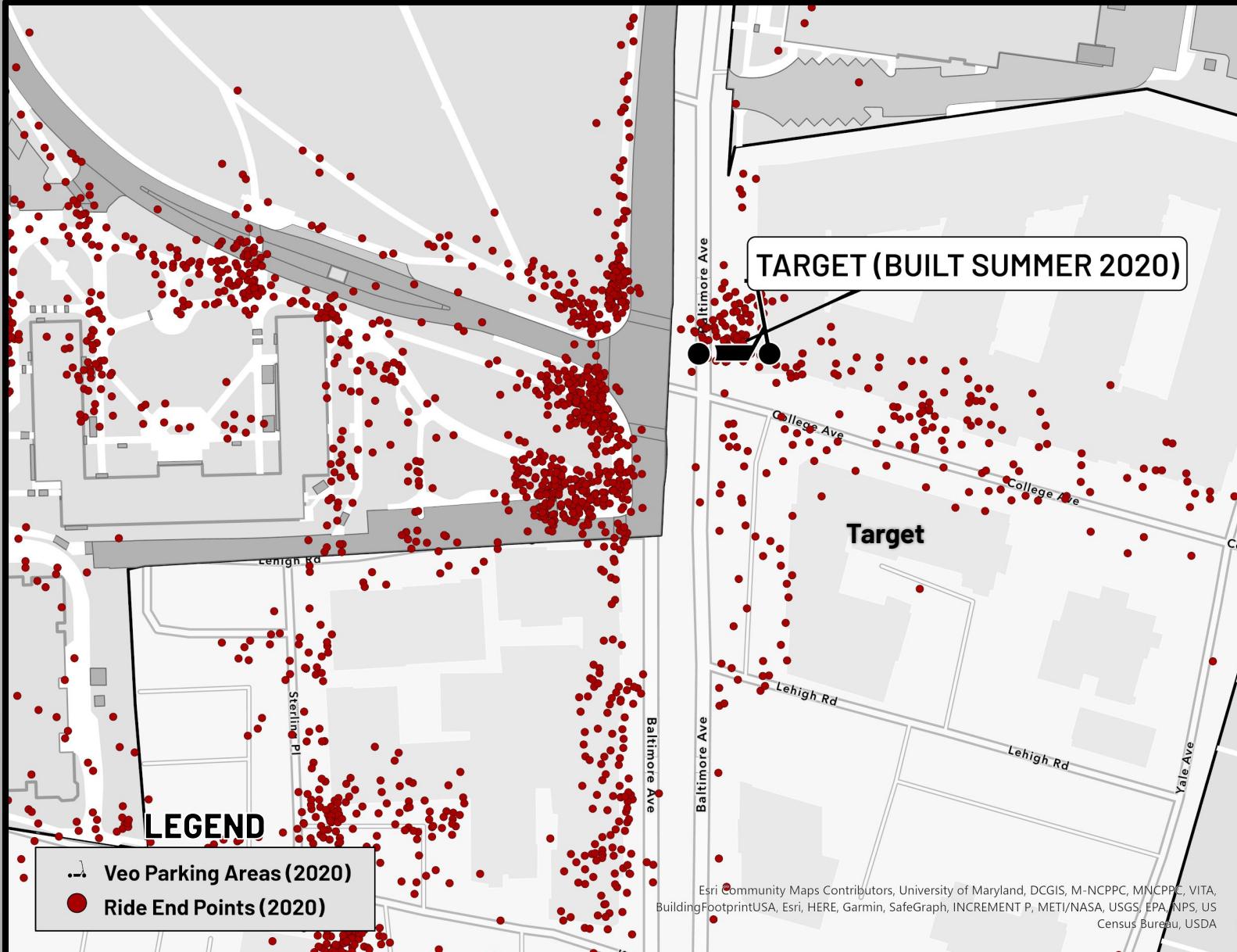
The Target on Baltimore Ave. in College Park had a high concentration of rides in 2019, but there was no scooter station (at the time).

Target Location (2019)



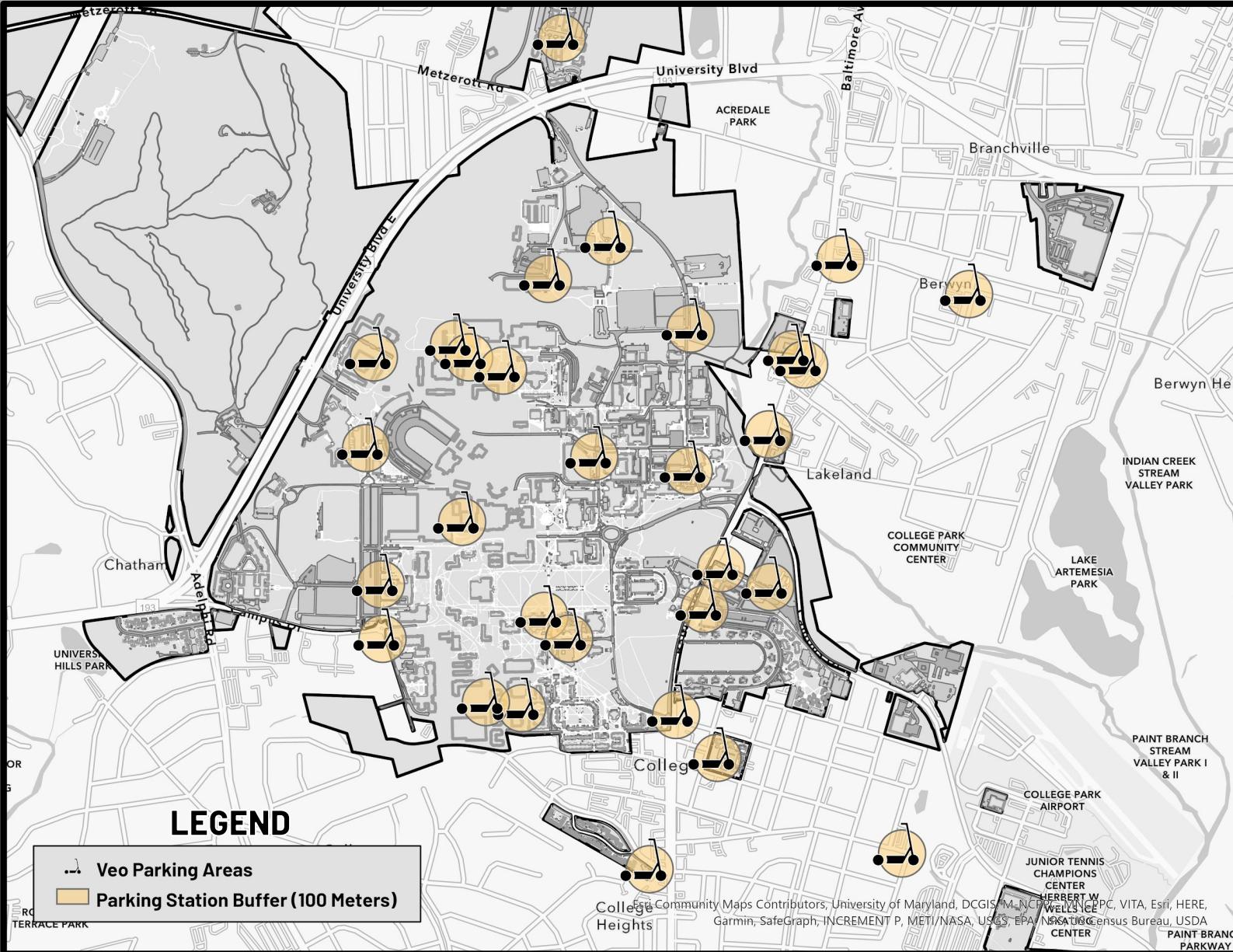
The Target on Baltimore Ave. in College Park had a high concentration of rides in 2019, but there was no scooter station (at the time).

Target Location (2020)



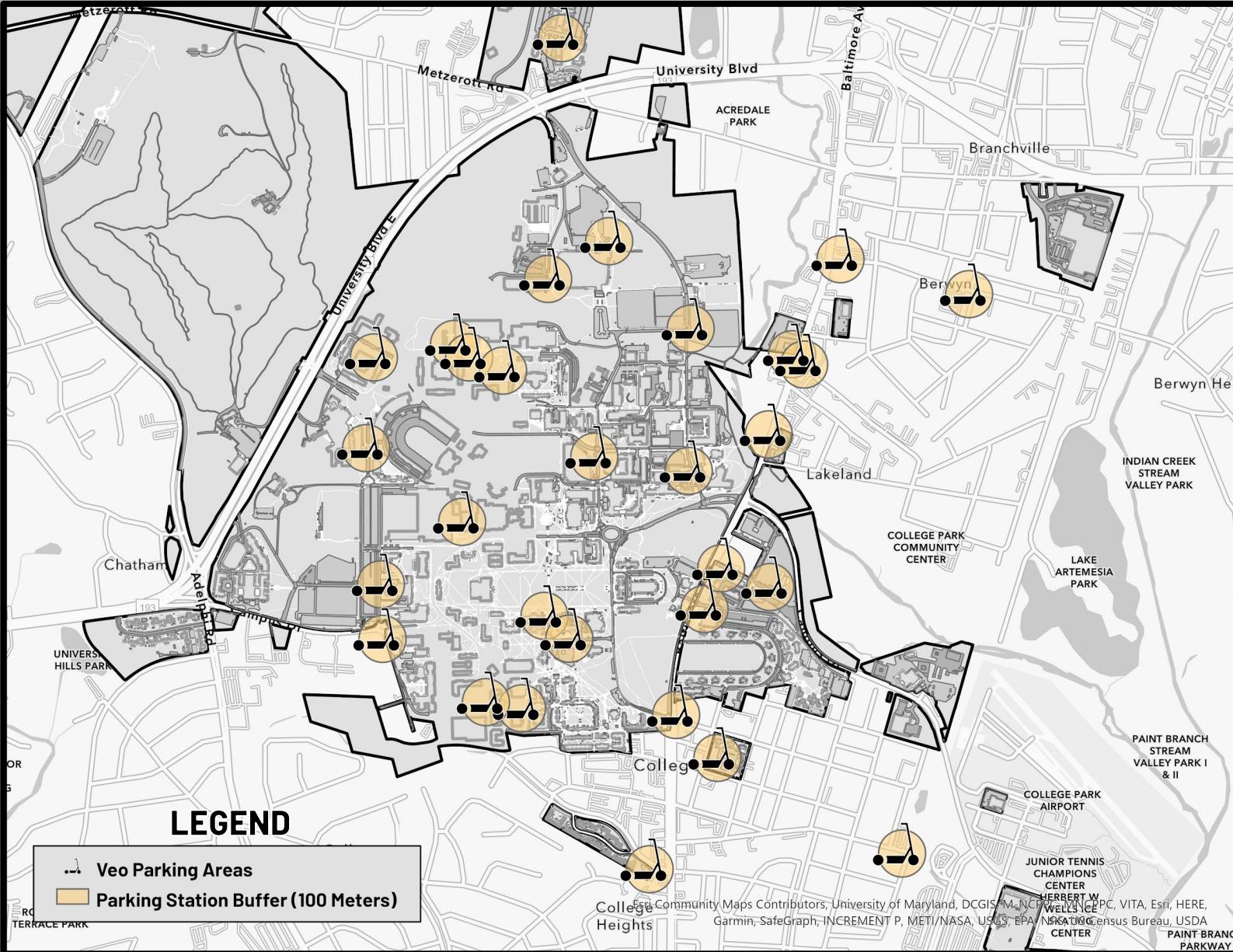
VeoRide added a “Target” scooter station to this location in Summer 2020. After finding this in the data, we wanted to investigate what other areas need a Veo Parking area added based on their popularity among E-scooter riders.

Distance Buffers



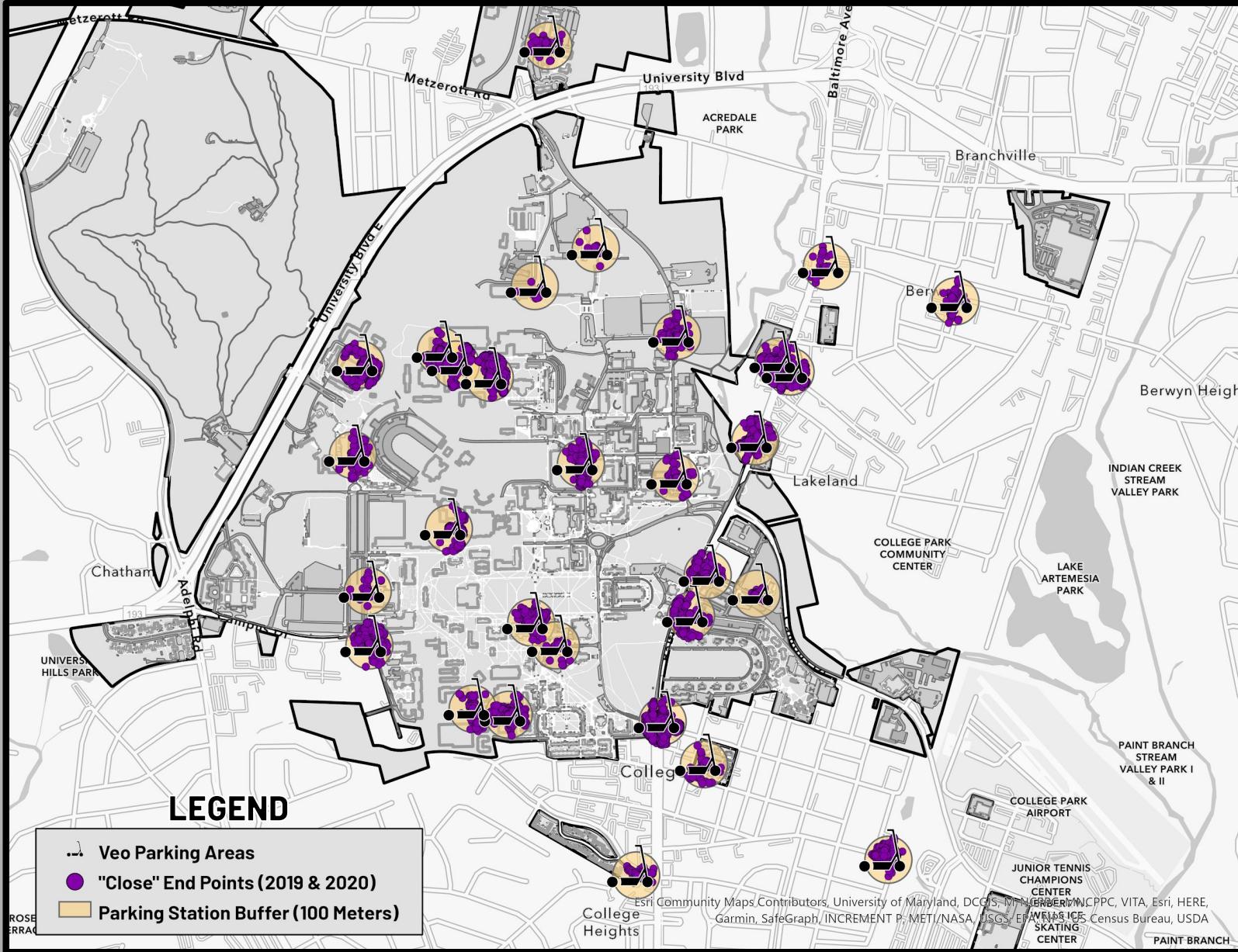
We created **buffers** of 100 meters for all the Veo Parking Areas. This creates a circle of 100 meters around each station, so we could filter points based on this distance.

Distance Buffers



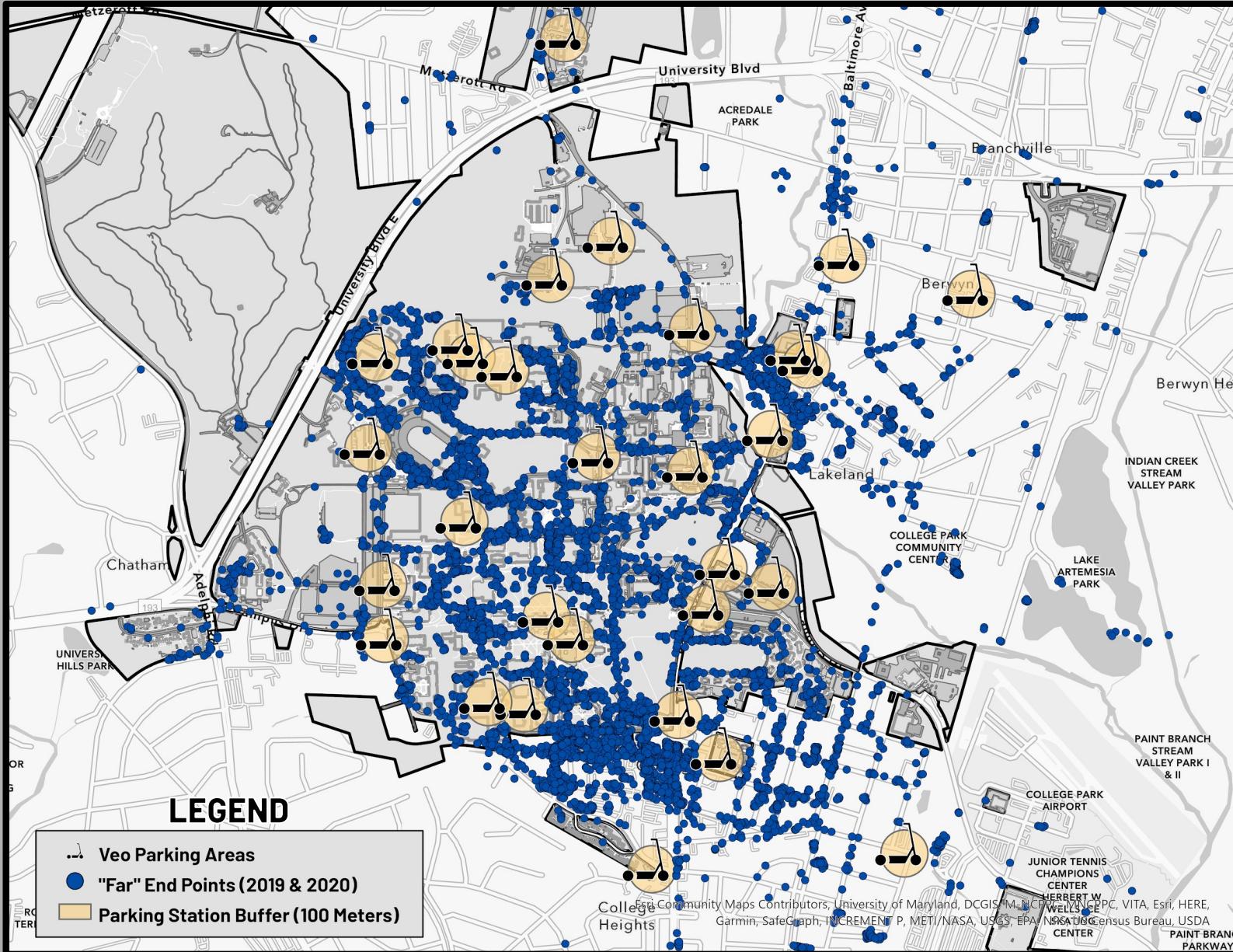
Using the buffers, we found end points (from both 2019 & 2020) that did and did not fall within this 100 meter distance.

Close End Points



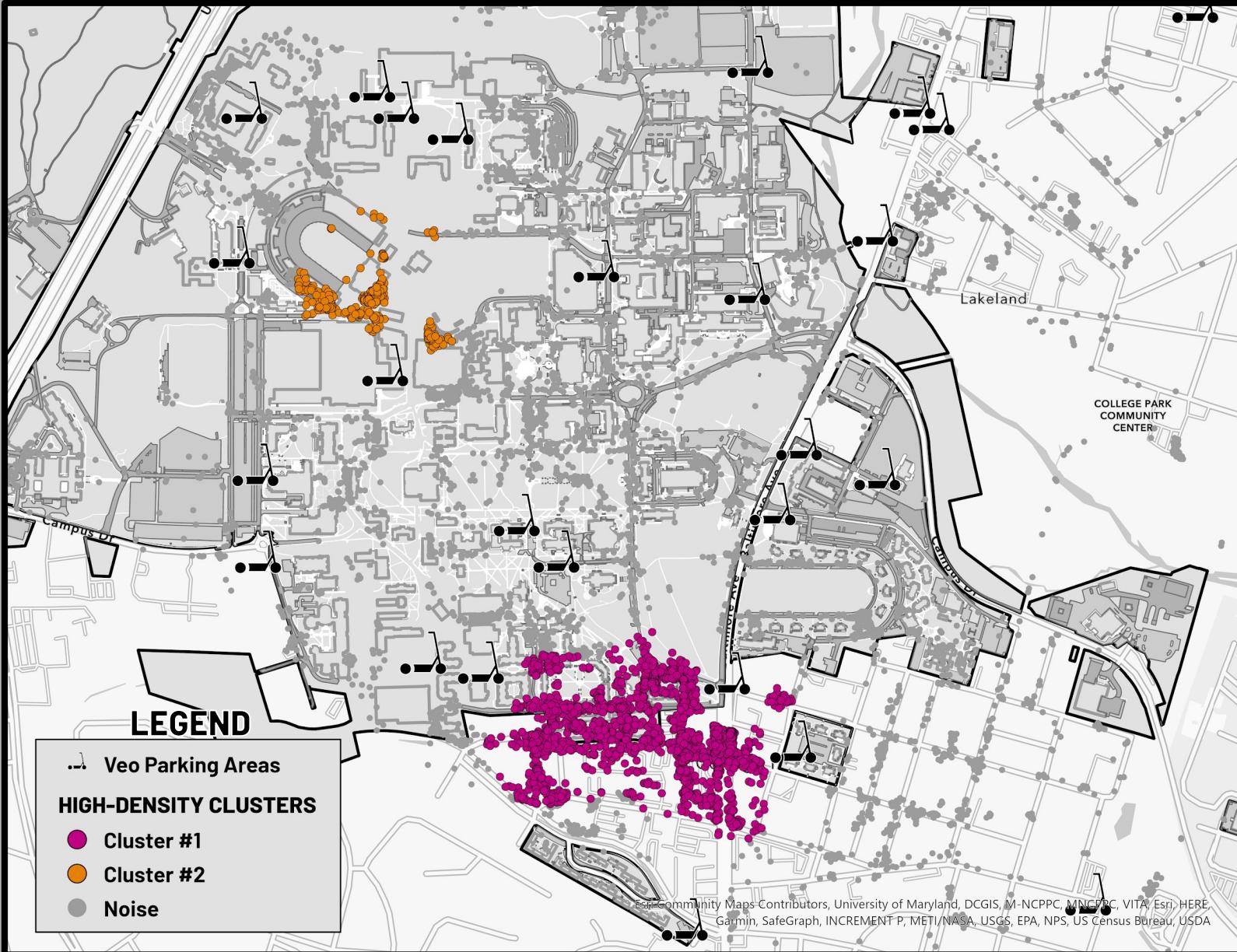
- Total count of "close" scooter rides: 20,193.
- The total amount of UMD scooter stations: 37
- Average amount of rides that are close to a scooter parking area: 546

Far End Points



- These points are more than 100 meters away from a Veo Parking station. They are the "far" ride end points.
- We used these far end points to conduct density-based clustering to find popular areas.

Density-Based Clustering



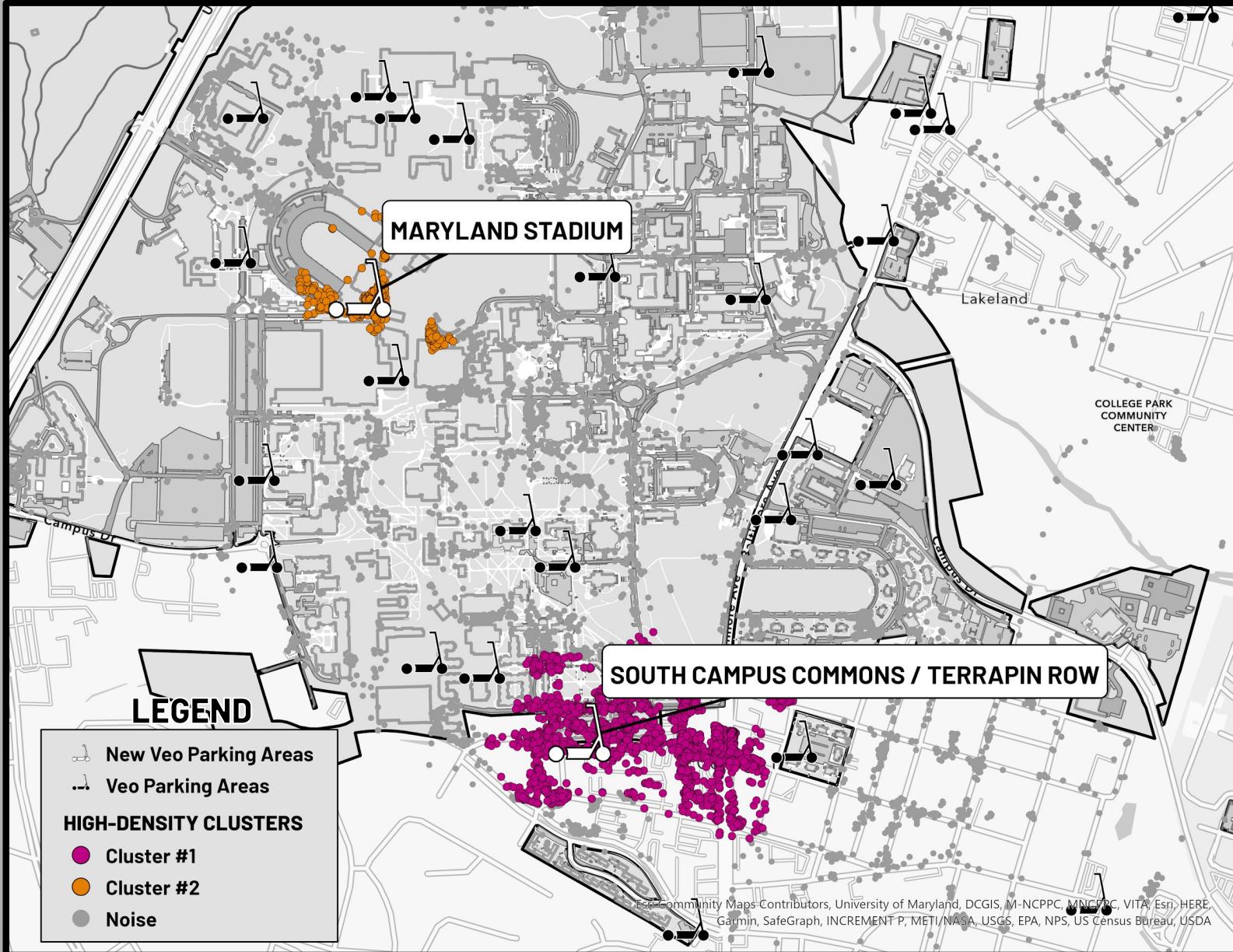
We used the average close rides, 546, and our chosen distance, 100 meters, to run a density-based clustering tool and find high-density areas that are far from existing scooter parking.

The tool returned two popular areas that are far from a Veo Parking area:

Cluster #1: Maryland Stadium
Cluster #2: T-Row / South Campus Commons

RECOMMENDATION

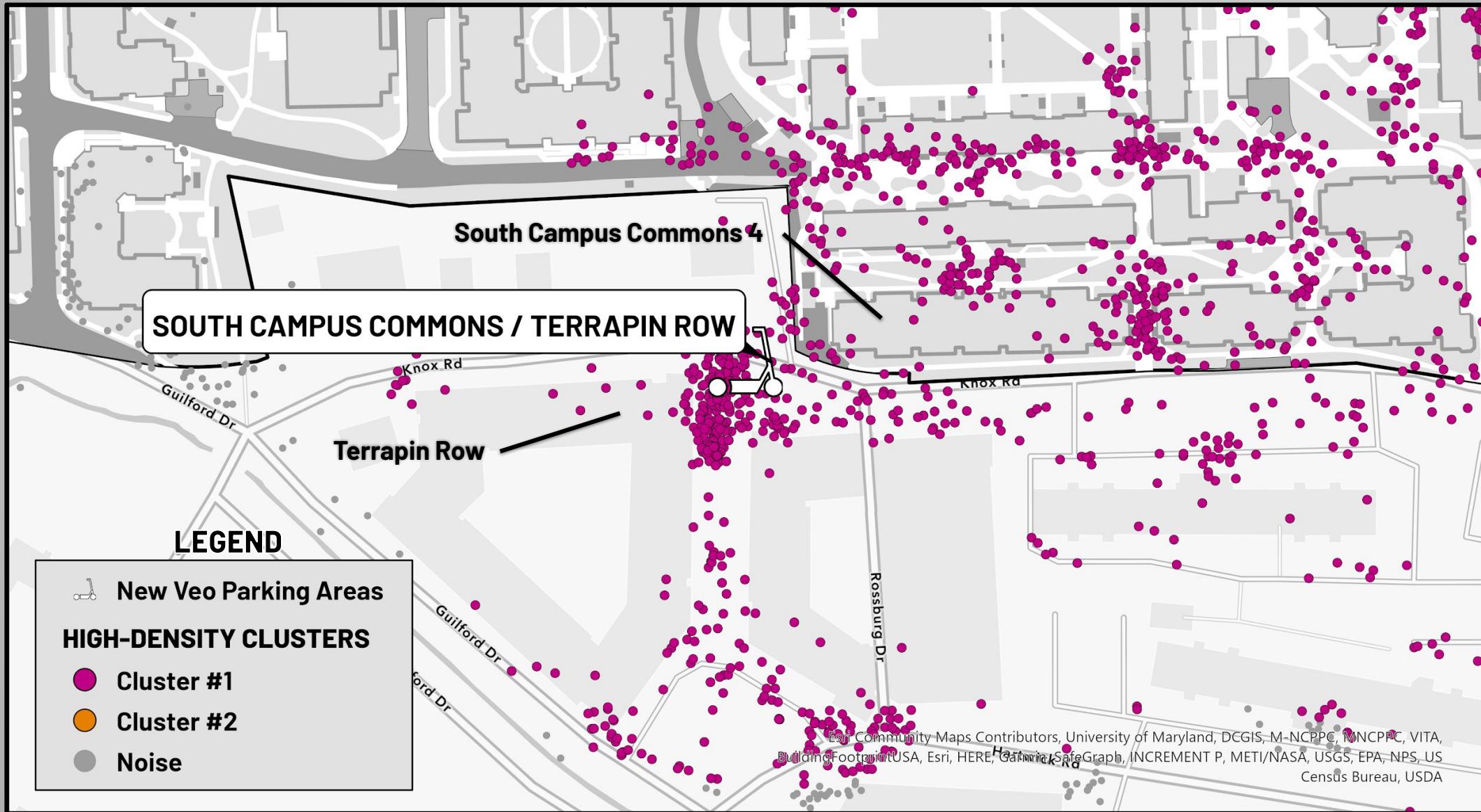
Recommendation: New Veo Parking Areas



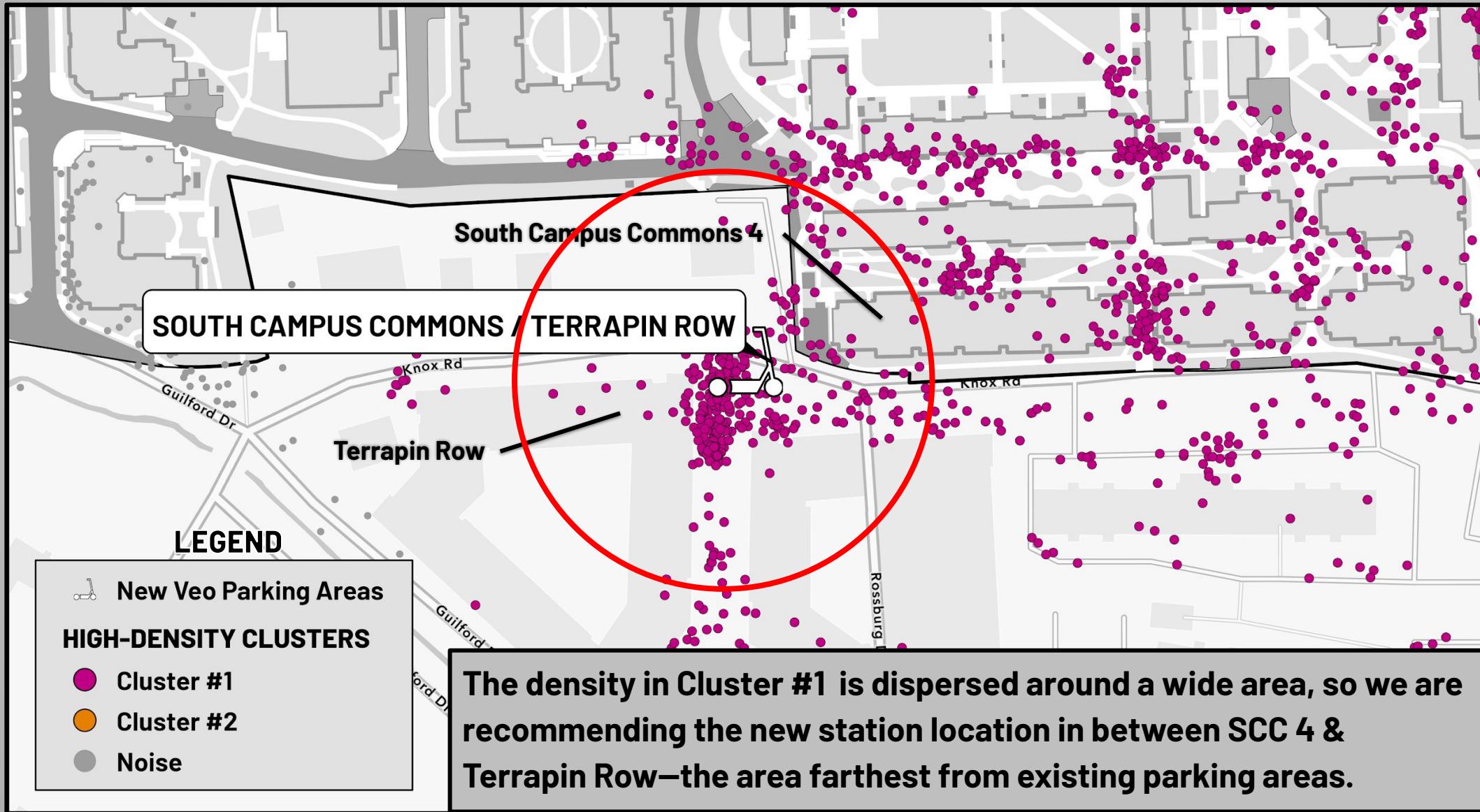
We recommend that Veo adds two new parking stations in these high-density areas:

1. Maryland Stadium
2. Terrapin Row / South Campus Commons

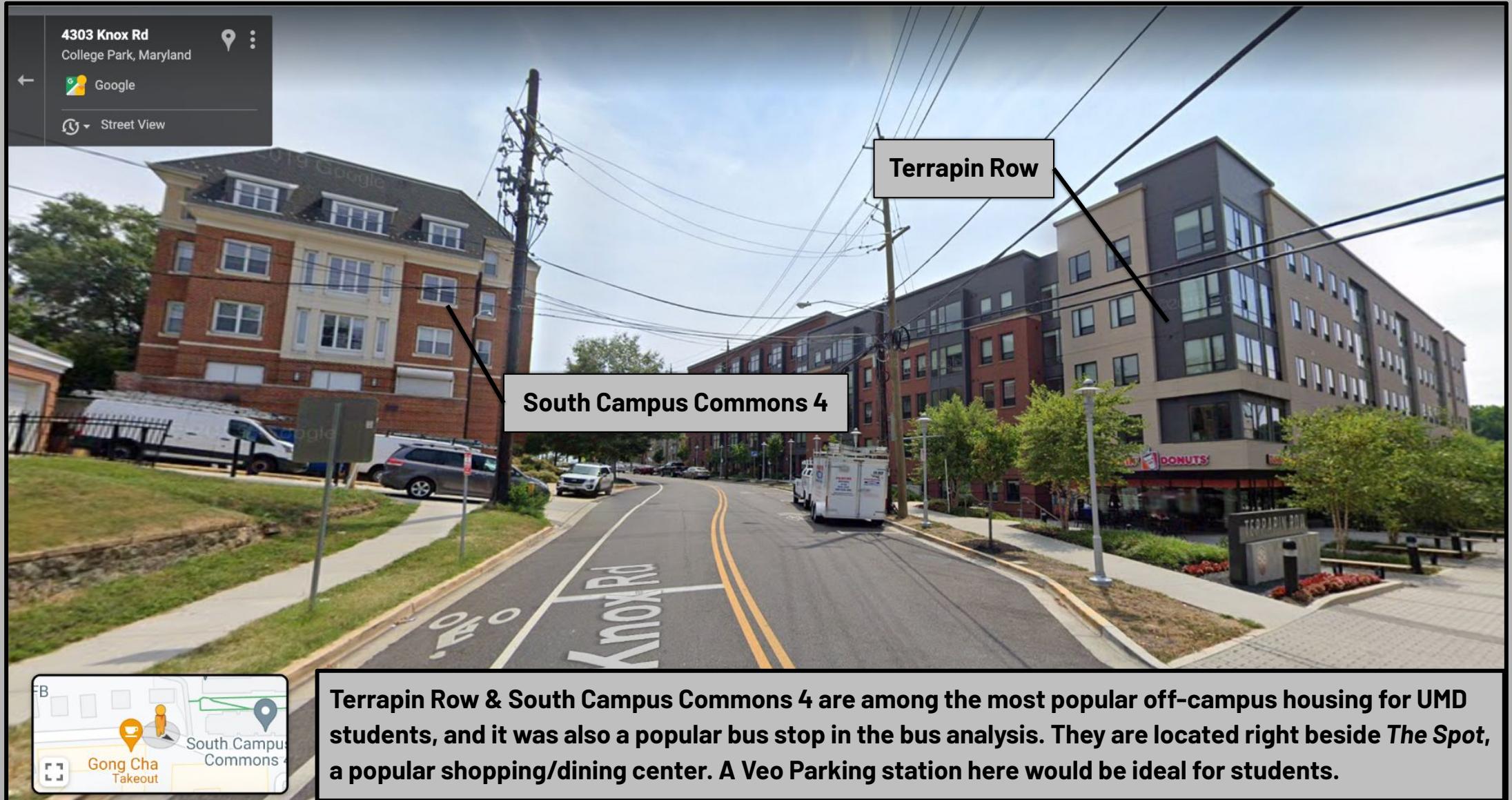
1. Terrapin Row / South Campus Commons



1. Terrapin Row / South Campus Commons



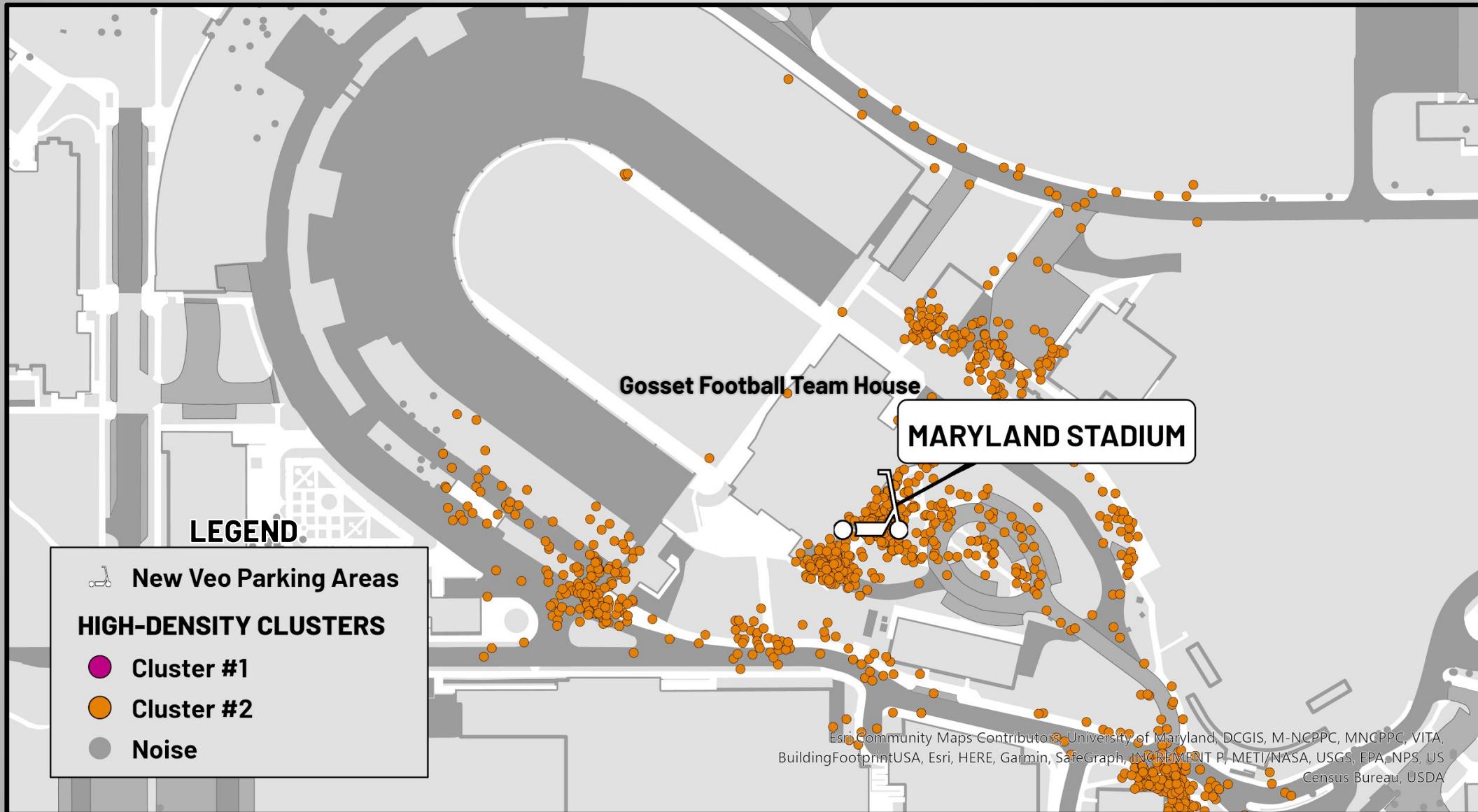
1. Terrapin Row / South Campus Commons - Street View



1. Terrapin Row / South Campus Commons - Street View

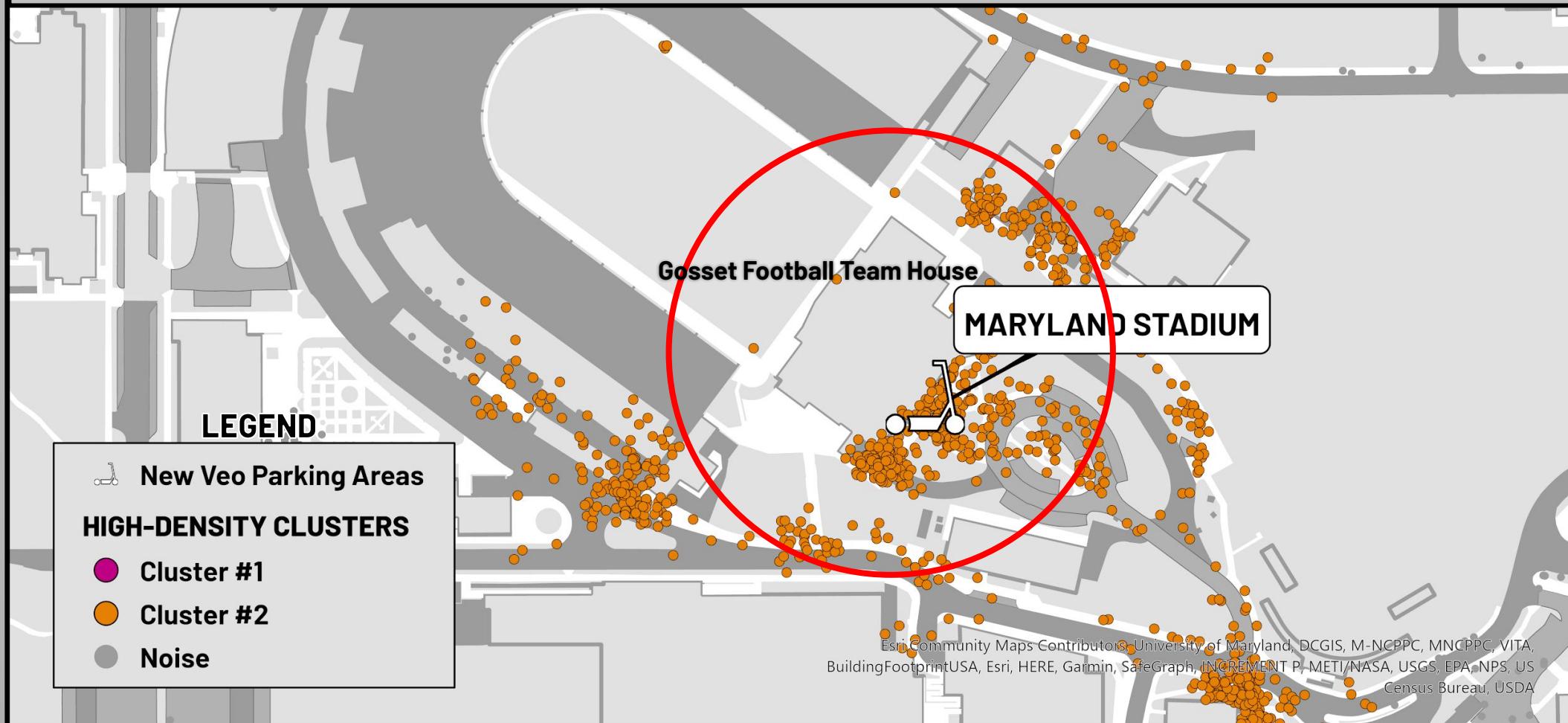


2. Maryland Stadium



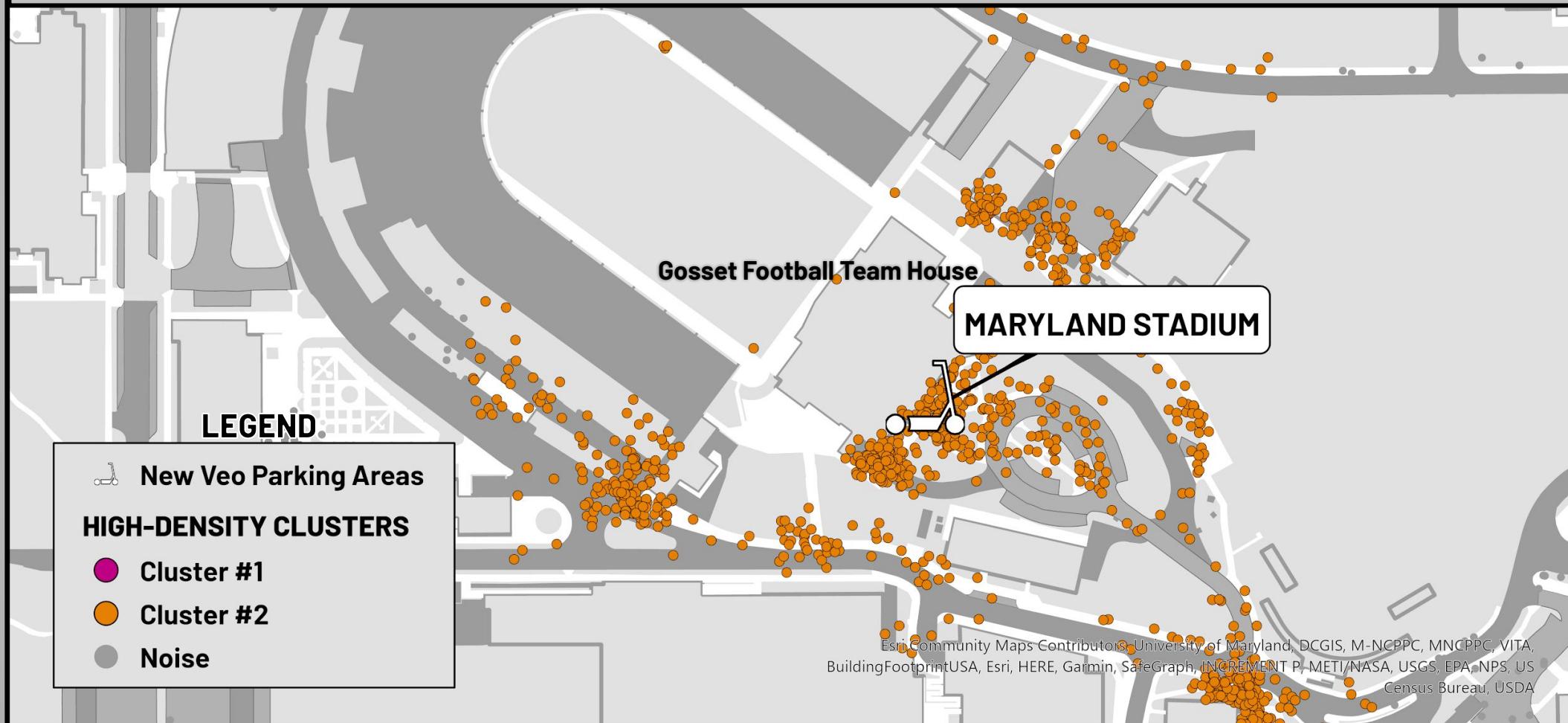
2. Maryland Stadium

The points in Cluster #1 are highly concentrated around the Gosset Football Team House in front of the MD Stadium



2. Maryland Stadium

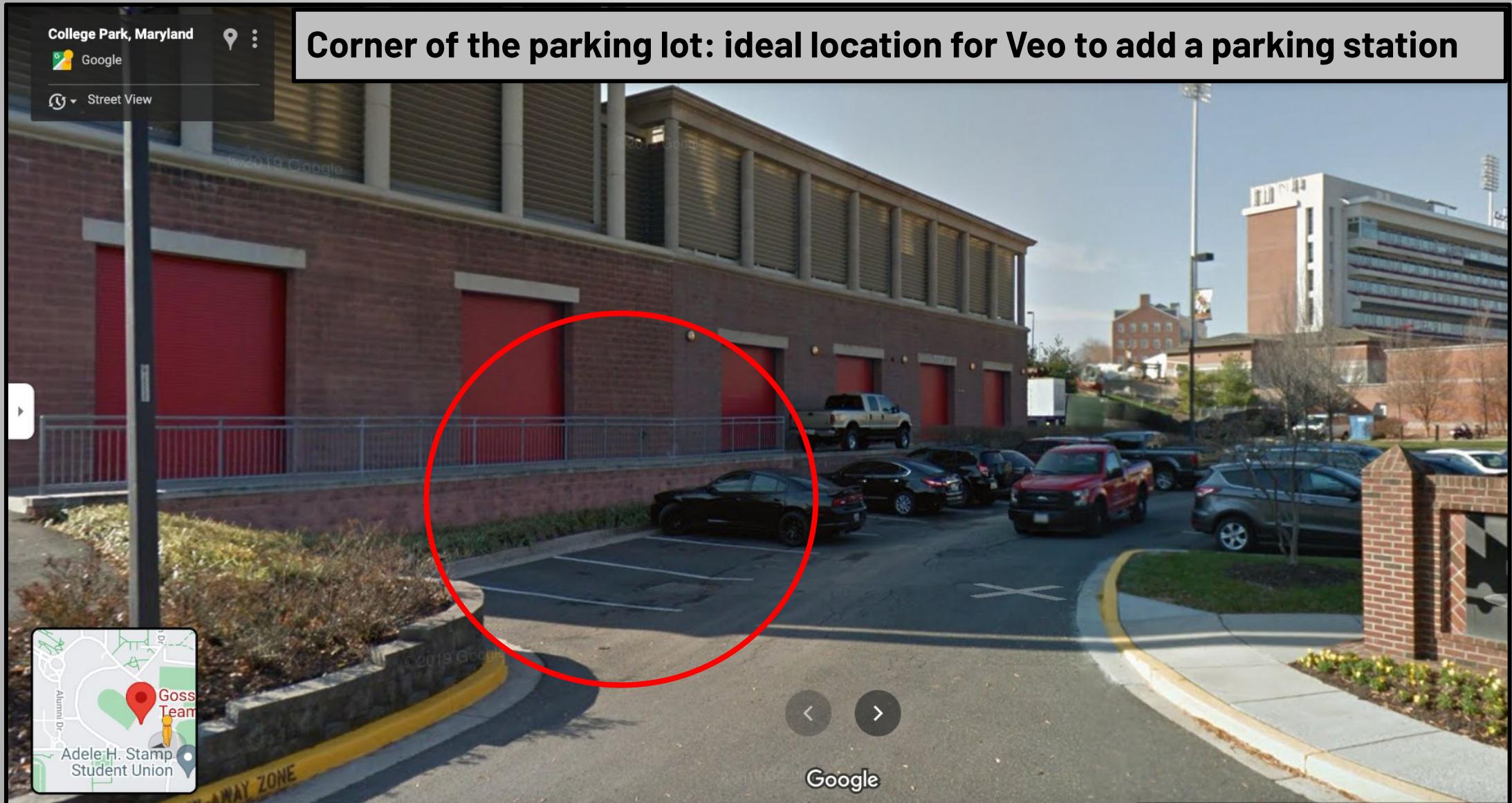
Gosset Football Team House is home to UMD's football team where they train, and is located right in front of the MD Stadium where they hold their games.



2. Gosset Football Team House (MD Stadium) - Street View



2. Gosset Football Team House (MD Stadium) - Street View





Thank you for listening!
Questions/Comments?