North Kansas City Bicycle Master Plan

Appendices

North Kansas City Bicycle Master Plan Appendices

# **Network Details**

## **Network Details**

## **Existing and Planned Projects**



#### **Burlington Street**

North Kansas City has secured federal grant funding to improve Burlington Street, including a two-way protected cycle track on the east side of the street. Design and engineering will continue through 2019 with potential construction in 2020.



#### **Heart of America Bridge**

A barrier-protected bicycle and pedestrian path on the Heart of America Bridge connects Downtown KCMO to North Kansas City across the Missouri River. Today, most cyclists transition to Swift Street through North Kansas City. With future improvements to Burlington and North Oak, the HOA bridge connection is poised to be a critical link for a regional bicycle corridor.



#### **Diamond Parkway**

Completed in Summer 2018, the two-way protected cycle track along Diamond Parkway in North Kansas City's redevelopment area is the first facility of its kind in the region. The new facility connects 16th Avenue to Armour Road east of Interstate 29/35.



#### **Armour Road**

Building on the recommendations of the 2017 Armour Road Complete Street Plan, North Kansas City installed protected bike lanes on Armour Road between Fayette and Ozark Streets in 2019. The project includes a "road diet" and reconfiguration of travel lanes to make Armour Road safer, more inviting, and more business-friendly.



### **Chouteau Trafficway**

With bike lanes and a wide shared use path, Chouteau connects North Kansas City to large parts of the Northland. Chouteau also provides a comfortable crossing of the Missouri River. Today, Chouteau Trafficway is disconnected from the rest of North Kansas City by major natural and infrastructure barriers, limiting its usefulness.

## **Regional Connections**





#### Briarcliff, Riverside, Parkville

Route 9 is already a regional connection from Briarcliff, Riverside, Parkville, and other areas of the Northland, with convenient access to the Line Creek Trail, Missouri Riverfront Trail, and Fairfax bridge. Highway conditions and pinch points like the rail bridge near Water Works Road make this connection uncomfortable for most people riding bikes. The City of Kansas City, Missouri has developed concept plans for a trail connection along Route 9 that would comfortably cross Hwy 169 and link to the Waterwell Athletic Complex. This trail would tie directly into North Kansas City's planned cycle track on Burlington Street at 32nd Ave.



#### Buck O'Neil Bridge

The Mid-America Regional Council recently completed its "Beyond the Loop" study which explored the future of the Buck O'Neil Bridge and surrounding highway connections. Among the bridge connections considered, Kansas City, Missouri supports a new bridge that would directly connect U.S. 169 to I-35. Any new bridge is envisioned to include bicycle and pedestrian connections across the Missouri River. This new regional connection would link the Downtown Airport, Harlem, and potentially provide access to a new trail along the north side of the Missouri River.



#### Heart of America Bridge

The Heart of America Bridge provides a direct connection that brings visitors and employees into North Kansas City, and provides North Kansas City residents with convenient access to all of the jobs, services, and amenities in Downtown Kansas City. While the river crossing is very well used today, North Kansas City's planned cycle track on Burlington and ongoing improvements to North Oak will increase the importance of the HOA bridge as part of a high quality north-south bike corridor linking many regional destinations.



#### Prather Road / Vernon Street

Designated as a connecting route in Kansas City, Missouri's draft Bike Master Plan, Prather Road has wide shoulders for most of its length that could accommodate future bike lanes. Regional connections to Prather Road could link to North Kansas City Hospital and other destinations in North Kansas City along the new Diamond Parkway cycle track.



#### **Chouteau Trafficway**

With bike lanes and a wide shared use path, Chouteau connects North Kansas City to large parts of the Northland. A comfortable, separated crossing of the Missouri River provides an important connection to Kansas City, Missouri's historic Northeast neighborhoods. In the future, Chouteau could provide access to riverfront trail systems on both sides of the Missouri River.



#### North Oak / Cherry

North Oak is an important north/south corridor for all modes of transportation. The City of Kansas City, Missouri has begun construction on bicycle and pedestrian improvements north of 32nd Avenue that would extend the connectivity of the planned Burlington cycle track. North Oak is also designated as a future high frequency transit corridor, and bike connectivity to proposed transit facilities will increase the usability of that transit service. With gentler grades and less traffic than North Oak, Cherry Street is an important alternative route for people on bikes.

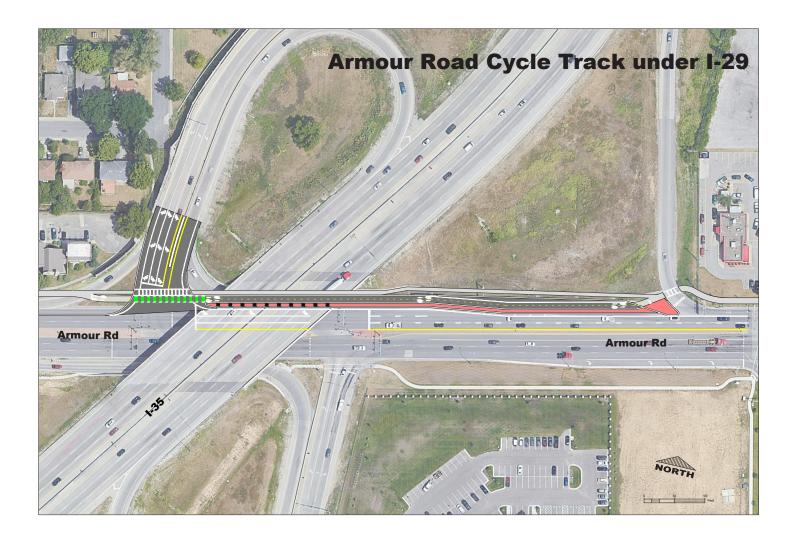


Buckeye Greenway / Searcy Creek / Hidden Valley Park

Improved east-west connections within North Kansas City could provide access to a variety of existing and future recreational amenities to the east, including the Buckeye greenway, Searcy Creek greenway, and Hidden Valley Park. Improvements by the City of Kansas City, Missouri are planned for North Brighton Avenue and Searcy Creek Parkway that would improve access for people on bikes from North Kansas City to other parts of the Northland.

### **Armour Road Under I-35**

Armour Road under I-35 was identified in community feedback as one of the most dangerous and uncomfortable locations for cyclists. At the same time, a direct connection along Armour Road is among the most desired connections. Any connections along a MoDOT route crossing an Interstate highway face special challenges, but it is physically possible to provide a wider, safer bicycle and pedestrian connection under the highway on the north side of Armour without impacting the flow of traffic. This can be achieved by reconfiguring the west-bound Armour to southbound I-35 on-ramp and taking advantage of the extra westbound travel lane that is introduced just east of I-35.

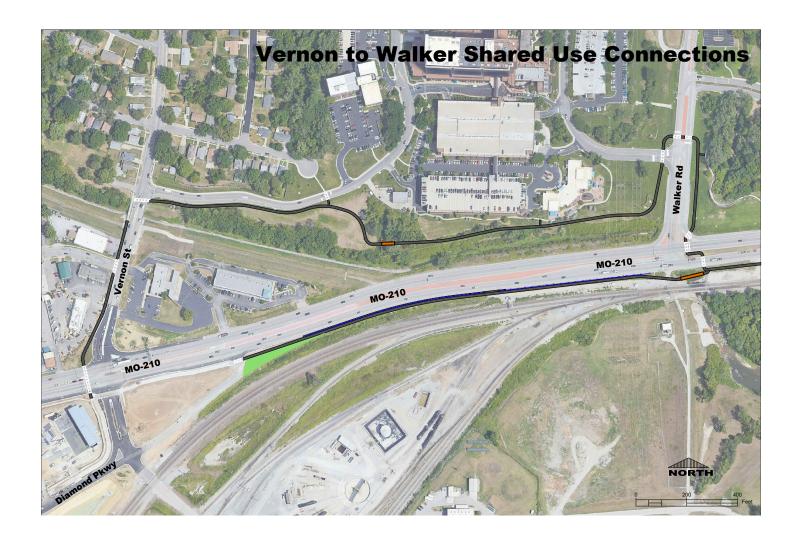


## **Hospital & Cerner Campus**

There is continuous right of way on the south side of Armour Road where the existing Diamond Parkway cycle track could connect in a short, direct path to Birmingham Road and continue further east to Harrah's Casino, Chouteau Parkway, and beyond. There is space for this connection within the existing right of way with no impacts on the adjacent railroad property to the south. This route requires a new bridge structure to traverse a wide creek near Walker Road. East of Walker Road, this route can cross Armour Road to connect to the Cerner and Hospital campuses in coordination with the existing traffic signal.

Direct connection to the Hospital and Cerner campuses can also be provided via a new path south of the North Kansas City Hospital. This connection would require some new construction on Clay Edwards Drive, Vernon Street, and Walker Road. The route identified minimizes elevation changes while providing direct access to the hospital campus. The route identified does not require any changes to the existing walking path that circles the hospital. The hospital connection is able to cross Armour Road in coordination with the existing traffic signal, which means it can function as an alternative route to link destinations further east.

Both of the identified connections help to link three of North Kansas City's largest employers to existing bicycle infrastructure and eventually to Downtown North Kansas City.



### **Chouteau Connection**

East of Walker Road, Birmingham Road is a gravel path with limited access to cars. This path provides a straight, flat, low-stress connection east. A new trail connection is needed to connect Birmingham Road to Riverboat Drive and Chouteau Trafficway. The entirety of this connection can be located in public right of way or North Kansas City property. By linking Birmingham Road with Riverboat Drive, a convenient connection is established between Harrah's Casino and other major North Kansas City destinations.



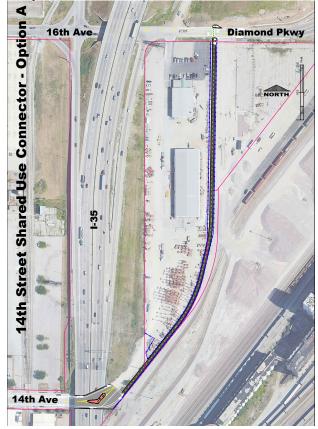
## Diamond Parkway / 14th **Avenue Connector**

To provide a safe connection under I-29/35 and divert cyclists away from the truck route on 16th Avenue, a new trail is needed to connect 14th Avenue to the existing cycle track on Diamond Parkway. Locating this connection on the east side I-29/35 ensures that people on bikes using this connection do not have to interact with the busy highway interchange at 16th Avenue. There are three options for a new trail connection. One option is to locate the trail in an unused rail spur. The second option is to work in partnership with existing property owners to purchase additional right of way. The third option is to locate the trail connection in MoDOT right of way, with minor modifiations to the existing drainage channel. All options are feasible but additional analysis and engagement will be necessary to work through design challenges and identify a preferred

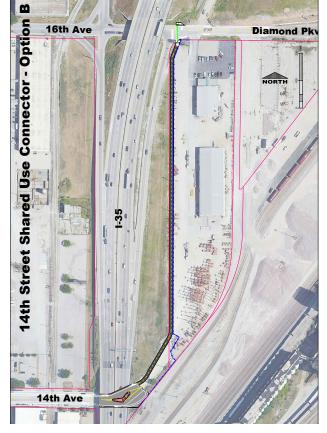
MoDOT Right of Way Connection Requires Coordination With MoDOT



Rail Spur Connection Requires Coordination with Railroad



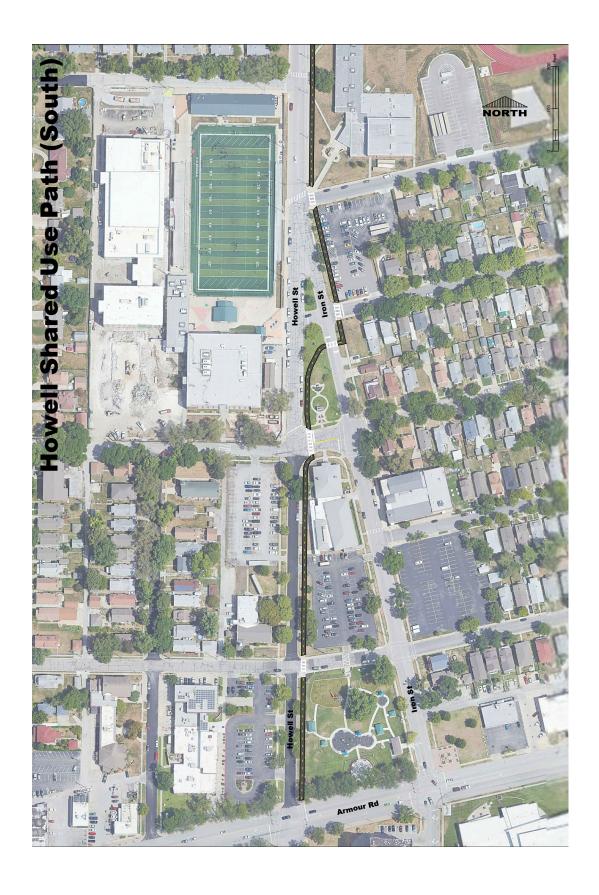
New Right of Way Connection **Requires Coordination Property Owners** 



## **Howell Shared Use Path**

Howell Street is an important community connector that links several popular destinations including Macken Park, North Kansas City High School, the North Kansas City Library, City Hall, and Dagg Park. Narrow travel lanes and intermittent one-way traffic limit options for dedicated bicycle facilities, but there is room for a wide shared path behind the curb that enhances mobility for both pedestrians and people on bikes. A shared path linking these many destinations can be further enhanced with wayfinding signs and other amenities that establish it as a gate way to adjacent neighborhoods.





## 32nd Avenue Shared Use Path

32nd Avenue is an important local and regional connection. It connects cyclists from Route 9, North Oak, Cherry, and Holmes to North Kansas routes, and links many routes within North Kansas City. There is room to expand the sidewalk toward the street on the south side of 32nd Avenue to function as a shared path.



## Ozark Street & 23rd Avenue **Shared Use Streets**

23rd Avenue provides an alternative route for people on bikes to Downtown destinations via Burlington, Swift, and Howell. East of Swift, there is not space for dedicated bicycle facilities, but traffic calming, pavement markings, and signage can make the corridor comfortable for most people on bikes. Similar improvements are possible on Ozark Street to help slow traffic and increase awareness of cyclists on the street. Sometimes called a "bike boulevard" or "neighborhood greenway" this mix of improvements would still require people on bikes to ride mixed with car traffic, but in a calmer and more comfortable environment.









### **Riverfront Trails**

#### Floodplan Construction Considerations

Any construction that is proposed within the Levee limits will need to undergo a series of reviews. Levees ultimately fall under the responsibility of the Corps of Engineers; however, the Corp usually gives the responsibility /ownership to a local Levee district that is governed by a Levee board. The trail corridor runs through two Levee Districts. The Kansas City Missouri Levee District that manages the section of the levee west of the Buck O'Neil Bridge and the North Kansas City Levee District that manages the levee east of the Buck O'Neil Bridge. Both Districts will need to be coordinated with as the project progresses.

The local Levee Districts manage, maintain and make decisions regarding anything that might impact the levee. The Trail project plan will need to be reviewed and approved by the Levee board before clearance of the trail project can be given by the Corp of Engineers. To obtain Levee Board approval the following Items will need to be addressed. Even if these items are satisfactorily met it is up to the boards discretion as whether to grant approval or not.

Trail Location: The alignment of the trail must minimally or not increase the overall fill within the levee boundary. The trail should follow the existing ground line as closely as possible so that the surface elevation of the trail matches the surrounding ground. It is important to reduce the amount of fill needed for trail construction as too much added fill could trigger a rise in water surface elevation and produce the need for CLOMR/LOMR (Conditional Letter Of Map Revision/Letter Of Map Revision) from the Corps of Engineers. A hydraulic study of the river area with the proposed trail will need to be conducted to ascertain the impact the new trail system has on the Missouri River and Levee area. This includes modifying an existing or creating a new floodplain model with the Hec-Ras modeling software with pre- and post-construction conditions to determine if a "No Rise" in water surface elevation has been achieved (i.e., the water surface elevation during a given flood event is modeled to be the same elevation preand post-construction). Another consideration to the trail alignment that need to be taken into account is that there are several pumping stations along the trail corridor that pump water back into the river system. These stations occasionally pump enormous quantities of water at a velocity such that a trail running across its path could be potentially destroyed. Coordination with these pump stations along to configure the best trail route is ncessary to achieve the best success. Likely, the best alignment for the trail at these locations is along the foot of the levee above the pump outlets.

**Trail Access:** Access to the trail at key points is extremely important to the Levee District as they will have certain access requirements for maintenance and operations. Coordination with the Levee Districts will be necessary to determine the most strategic access points to minimize Levee exposure and create a safe transition for pedestrians. Ramps leading down to the trail will need to point downstream to minimize erosion.

**Trail Maintenance:** Any proposed trail should be a minimum of 8 feet wide to allow maintenance vehicles to access the trail and preform maintenance duties along the corridor. A maintenance agreement will need to be established with the Levee Districts in order to determine who is responsible for what and to establish levee access.

Supporting Documents: Along with the design elements mentioned above the Levee District will require documentation showing that the project cut & fill areas proposed will not compromise the integrity of the levee. Also, the Levee District will require supporting hydraulic documentation that "No Rise" was achieved of the Missouri River through the project corridor. Depending upon the extent of construction of the trail additional geotechnical information may also need to be included.







#### Floodplan Construction Permitting

If the trail plan is approved by the Levee district and they are satisfied with the project, then the process of obtaining a 408 clearance by the Corps of Engineers can begin. A letter from the Levee District giving approval of the project must be provided to the Corp before they can process the project 408 clearance request. Along with a letter of approval by the Levee District, the Corps will need the following:

- A location map showing the where the project is and the project footprint.
- Details outlining the trail plan including any construction details about the plan that shows the impacts the project will have along the levee (i.e. pedestrian bridge details, grading details etc.)
- 3. Supporting documentation; Hydraulic Study, Geotechnical report (if needed), etc.
- 4. Missouri Wildlife clearance (what endangered species are present if any)
- 5. Historical Society clearance (what historical markers are present if any)
- 6. US Fish & Wildlife Clearance (Need Federal Clearance)

Once these Items are received by the Corps they in turn go through a series of internal reviews that if everything is in order will take from 4 to 6 weeks to process. Once the Corps have reviewed and given 408 clearance the project can now apply for a 404 permit from the Corps. The 404 permit cannot be officially obtained before a 408 clearance is given. In some instances, the 404 permit can be processed along with the 408 as much of the same information given for the 408 is the same for the 404 however, until the 408 is approved a 404 permit will not be provided. The 404 permitting process can take an additional 4 to 6 weeks to process.

Along with the Corps permitting there are Local drainage & construction permits that will be required as well.

#### **Summary**

- Coordination with and approval of the Levee Districts is key for the trail project to move forward
- 2. Obtain Corps of Engineers 408 clearance, it must happen prior to obtaining 404 Permit (4 to 6 weeks)
  - a) Missouri Wildlife Clearance (30 days)
  - b) Historical Society clearance (30days)
  - c) U.S. Fish & Wildlife Clearance (30 days)
- 3. Obtain Corps of Engineers 404 Permit, can only get after 408 clearance (4 to 6 weeks)
- 4. Obtain Local Permitting (30 days)

Many of these permitting exercises can happen in conjunction with one another however none of these can happen without Levee District coordination and approval.

North Kansas City Bicycle Master Plan Appendices

# **Traffic Observations**

#### **North Kansas City Walking and Biking Observations**

Prepared by BikeWalkKC for the City of North Kansas City July 24, 2019

#### **INTRODUCTION**

Traffic observations were conducted at seven sites in North Kansas City to determine volumes and movement patterns for a typical weekday and typical weekend. Observations included throughmovements and turn-movements for cars, trucks, buses, bicycles on the road, bicycles on the sidewalk and pedestrians on the sidewalk.

These observations may be used for long term planning of transportation networks or prioritization of potential infrastructure improvements. These observations may also be useful for the design and planning of specific projects to better understand the behavior of different transportation modes in corridors where projects are planned, completed, or under consideration. Finally, these observations will be useful as North Kansas City evaluates the performance of its infrastructure over time. In combination with future data collection these traffic observations can establish a baseline for multimodal travel on specific streets and across the community. This baseline will help the City understand the effectiveness and cost-efficiency of infrastructure projects.

#### **Observation Locations**



- 26<sup>th</sup> Avenue & Burlington Street: Thursday, April 25, 2019; Saturday, April 27, 2019
- Heart of America Bridge Path: Thursday, April 25, 2019; Saturday, April 27, 2019
- Armour Road & Swift Street: Saturday, May 4, 2019; Thursday, May 9, 2019
- 16<sup>th</sup> Avenue & Swift Street: Saturday, May 4, 2019; Thursday, May 9, 2019
- Armour Road & Iron Street: Friday, May 31, 2019; Sunday, June 2, 2019
- 16<sup>th</sup> Avenue & Swift Street: Friday, May 31, 2019; Sunday, June 2, 2019
- Diamond Parkway Cycle Track: Thursday, June 13, 2019; Sunday, June 16, 2019

#### Observation Methodology

Data was collected with traffic observation cameras placed at selected locations throughout North Kansas City. Cameras were positioned at intersections to capture all modes of transportation and all direction of travel with two exceptions. The Heart of America Bridge observations captured only bikes and pedestrians on the shared use path, and Diamond Parkway cycle track observations captured only bikes on a segment of the cycle track. Observation days were selected to ensure no rain and typical temperature conditions.

Camera footage was evaluated by a third-party analyst to document volumes and movements in 15-minute intervals from 6am to 8pm. For bicycle and pedestrian trips, BikeWalkKC applied industry standard adjustment factors to extrapolate 14 hour counts to full 24 hour counts, including guidance from the National Bicycle and Pedestrian Documentation Project (<a href="http://bikepeddocumentation.org/">http://bikepeddocumentation.org/</a>) For automobile trips, BikeWalkKC applied adjustment factors based on MoDOT's hourly estimates for various North Kansas City streets (<a href="https://www.modot.org/traffic-volume-maps">https://www.modot.org/traffic-volume-maps</a>).

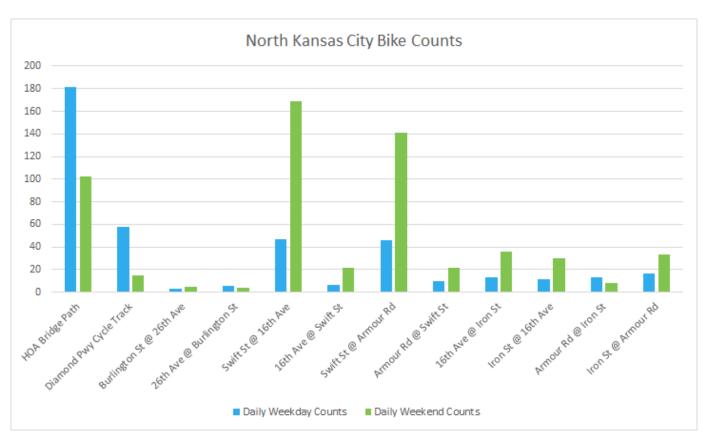
Accuracy for vehicle counts: For volumes of up to 100 vehicles in any given classification over a 15-minute period, counts are guaranteed accurate within 5 vehicles. For volumes greater than 100 vehicles in the same class and period, counts will be at least 95% accurate.

Accuracy for bicycle and pedestrian counts: For volumes of up to 50 bicycles or pedestrians in a 15-minute period, counts are guaranteed accurate within 5 pedestrians or bicycles. A minimum of 95% accuracy is guaranteed for volumes above 50 per 15-minute segment. When pedestrians are grouped in clusters, volumes are accurate to within +/- 25% per unique cluster.

#### **OBSERVATIONS SUMMARY**

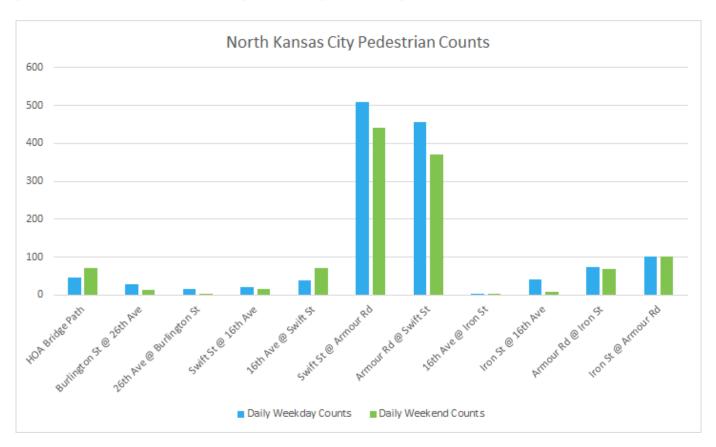
#### **North Kansas City Bike Counts**

Location	Daily Weekday Counts	Daily Weekend Counts
HOA Bridge Shared Use Path	181	103
Diamond Parkway Cycle Track	58	14
Burlington St @ 26th Ave	3	5
26th Ave @ Burlington St	6	4
Swift St @ 16th Ave	47	169
16th Ave @ Swift St	7	22
Swift St @ Armour Rd	46	141
Armour Rd @ Swift St	10	22
16th Ave @ Iron St	13	36
Iron St @ 16th Ave	11	30
Armour Rd @ Iron St	13	8
Iron St @ Armour Rd	17	34



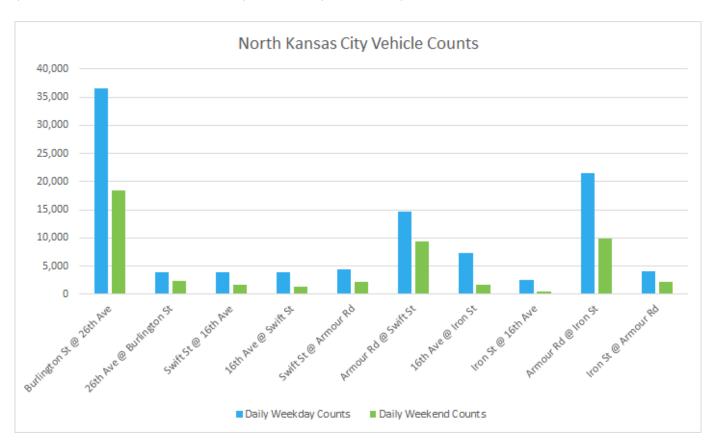
#### **North Kansas City Pedestrian Counts**

Location	Daily Weekday Counts	Daily Weekend Counts
HOA Bridge Shared Use Path	45	70
Burlington St @ 26th Ave	28	14
26th Ave @ Burlington St	16	4
Swift St @ 16th Ave	20	16
16th Ave @ Swift St	38	71
Swift St @ Armour Rd	508	442
Armour Rd @ Swift St	457	371
16th Ave @ Iron St	1	4
Iron St @ 16th Ave	40	7
Armour Rd @ Iron St	75	69
Iron St @ Armour Rd	101	103



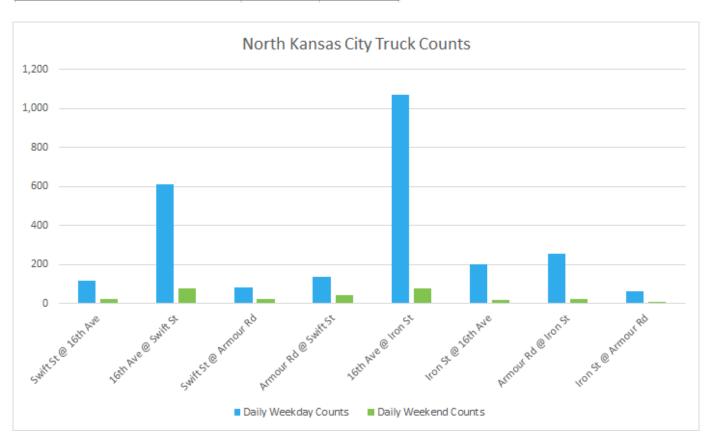
#### **North Kansas City Vehicle Counts**

Location	Daily Weekday	Daily Weekend
	Counts	Counts
Burlington St @ 26th Ave	36,601	18,401
26th Ave @ Burlington St	3,975	2,393
Swift St @ 16th Ave	3,957	1,632
16th Ave @ Swift St	3,912	1,398
Swift St @ Armour Rd	4,457	2,188
Armour Rd @ Swift St	14,723	9,425
16th Ave @ Iron St	7,325	1,628
Iron St @ 16th Ave	2,613	450
Armour Rd @ Iron St	21,477	9,860
Iron St @ Armour Rd	4,024	2,271



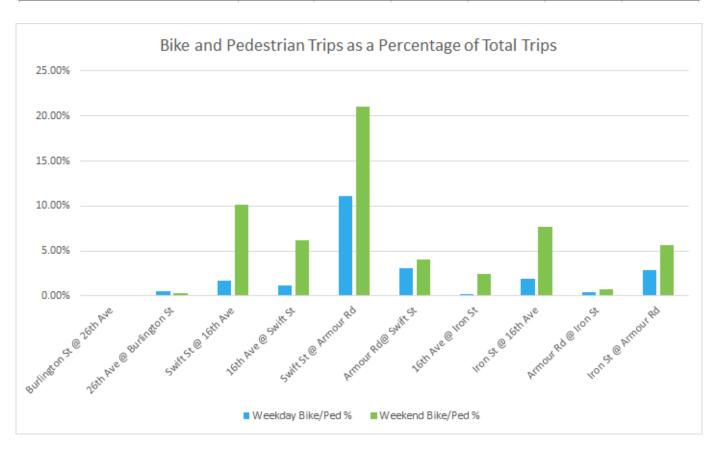
#### **North Kansas City Truck Counts**

Location	Daily Weekday	Daily Weekend
	Counts	Counts
Swift St @ 16th Ave	119	25
16th Ave @ Swift St	612	77
Swift St @ Armour Rd	84	24
Armour Rd @ Swift St	138	46
16th Ave @ Iron St	1,071	76
Iron St @ 16th Ave	201	17
Armour Rd @ Iron St	258	24
Iron St @ Armour Rd	64	8



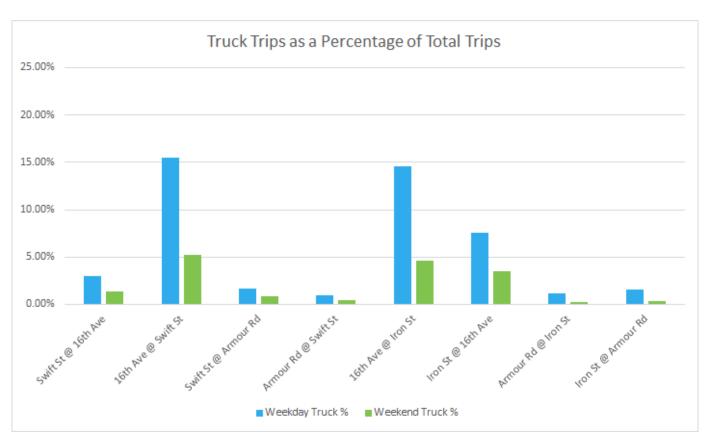
## North Kansas City Bike and Pedestrian Trips as a Percentage of Total Trips (Bike/Ped Mode Split)

Location	Total	Total	Bike/Ped	Bike/Ped	Bike/Ped	Bike/Ped
	Trips	Trips	Trips	Trips	%	%
	Weekday	Weekend	Weekday	Weekend	Weekday	Weekend
Burlington St @ 26th Ave	36,633	18,420	31	19	0.09%	0.10%
26th Ave @ Burlington St	3,996	2,400	21	7	0.53%	0.30%
Swift St @ 16th Ave	4,024	1,816	67	185	1.67%	10.17%
16th Ave @ Swift St	3,957	1,491	45	93	1.13%	6.23%
Swift St @ Armour Rd	5,011	2,771	554	583	11.06%	21.03%
Armour Rd @ Swift St	15,190	9,817	467	392	3.07%	4.00%
16th Ave @ Iron St	7,340	1,668	15	40	0.20%	2.39%
Iron St @ 16th Ave	2,665	488	51	37	1.93%	7.67%
Armour Rd @ Iron St	21,565	9,937	88	77	0.41%	0.78%
Iron St @ Armour Rd	4,142	2,407	117	136	2.83%	5.67%



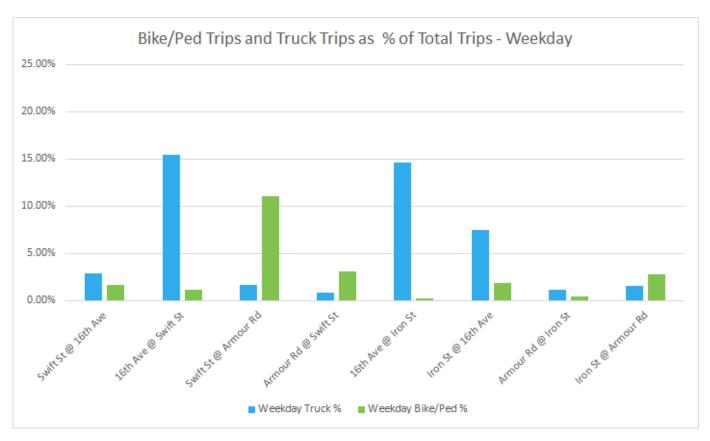
#### North Kansas City Truck Trips as a Percentage of Total Trips

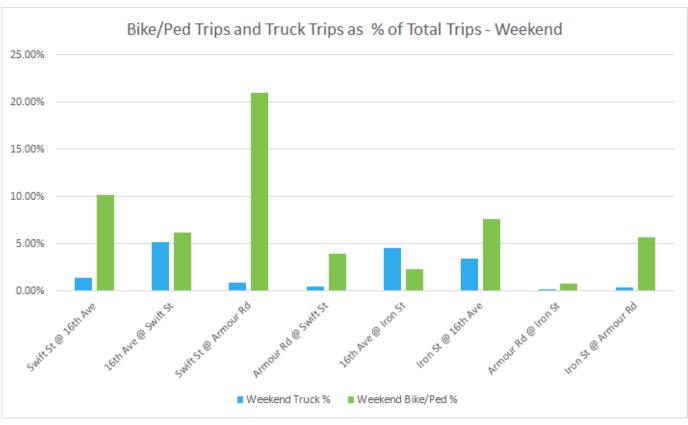
Location	Total Trips	Total Trips	Truck Trips	Truck Trips	Truck %	Truck % Weekend
			Weekday		Weekday	Weekend
Swift St @ 16th Ave	4,024	1,816	119	25	2.95%	1.40%
16th Ave @ Swift St	3,957	1,491	612	77	15.48%	5.20%
Swift St @ Armour Rd	5,011	2,771	84	24	1.67%	0.87%
Armour Rd @ Swift St	15,190	9,817	138	46	0.91%	0.47%
16th Ave @ Iron St	7,340	1,668	1,071	76	14.59%	4.57%
Iron St @ 16th Ave	2,665	488	201	17	7.54%	3.47%
Armour Rd @ Iron St	21,565	9,937	258	24	1.20%	0.24%
Iron St @ Armour Rd	4,142	2,407	64	8	1.55%	0.35%



#### North Kansas City Bicycle, Pedestrian, and Truck Trips as a Percentage of Total Trips

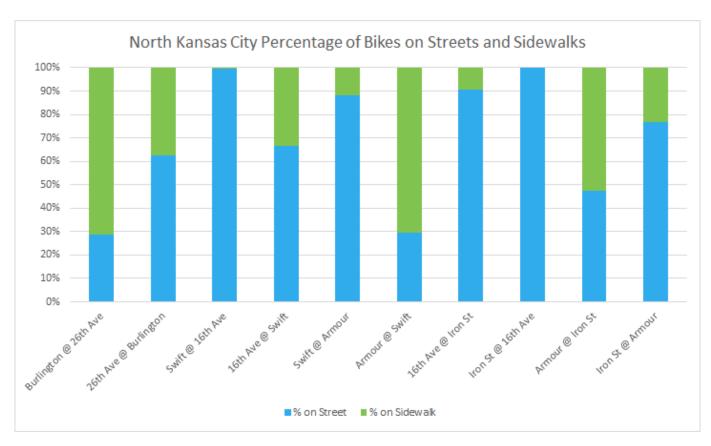
Location	Total Trips	Total Trips	Truck % Weekday	Truck % Weekend	Bike/Ped %	Bike/Ped %
		Weekend			Weekday	Weekend
Swift St @ 16th Ave	4,024	1,816	2.95%	1.40%	1.67%	10.17%
16th Ave @ Swift St	3,957	1,491	15.48%	5.20%	1.13%	6.23%
Swift St @ Armour Rd	5,011	2,771	1.67%	0.87%	11.06%	21.03%
Armour Rd @ Swift St	15,190	9,817	0.91%	0.47%	3.07%	4.00%
16th Ave @ Iron St	7,340	1,668	14.59%	4.57%	0.20%	2.39%
Iron St @ 16th Ave	2,665	488	7.54%	3.47%	1.93%	7.67%
Armour Rd @ Iron St	21,565	9,937	1.20%	0.24%	0.41%	0.78%
Iron St @ Armour Rd	4,142	2,407	1.55%	0.35%	2.83%	5.67%





#### North Kansas City Percentage of Bike Trips on the Street and Sidewalk

Location	Bikes On Street	Bikes on Sidewalk	% Bikes on Street	% Bikes on
				Sidewalk
Burlington St @ 26th Ave	2	5	29%	71%
26th Ave @ Burlington St	5	3	63%	38%
Swift St @ 16th Ave	181	1	99%	1%
16th Ave @ Swift St	16	8	67%	33%
Swift St @ Armour Rd	139	19	88%	12%
Armour Rd @ Swift St	8	19	30%	70%
16th Ave @ Iron St	38	4	90%	10%
Iron St @ 16th Ave	34	0	100%	0%
Armour Rd @ Iron St	9	10	47%	53%
Iron St @ Armour Rd	33	10	77%	23%



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# **Mode Shift Analysis**

#### Mode Share Potential

Two methods were used to determine the potential number of cyclists in North Kansas City and the mode share percentage potential. The first method relied on traffic counts conducted with this plan which included bicycle counts in addition to pedestrian and vehicle counts. The second method relied on US Census Bureau data collected with the 2017 American Community Survey. US Census Bureau data shows that approximately 0.60% of North Kansas City residents commute to work by bicycle. These methods produced very similar results in terms of existing bicycle mode share (as compared to a total number of bicycle & car drivers—transit riders and walking was not included with the analysis) and future mode share potential. A description of these methodologies follows.

#### Projections Based on Traffic Counts

Traffic counts were conducted in the summer of 2019 at 11 locations throughout North Kansas City on the major streets. To determine the mode share, the weekday morning and afternoon peak hours were analyzed along with the total daily volumes. The weekday counts were a mixture of counts on Monday through Thursday. Additionally, the weekend peak hour and total daily volumes were analyzed. The weekend volumes were collected on Sunday.

For weekday PM peak hour and weekday totals at each intersection, the existing vehicle volumes and bicycle volumes are shown in the tables below. The tables show total number of vehicles, total number of bicycles, and percentage of bicycle mode share. During the PM peak hour, the bicycle mode share was calculated to be 0.64%. This would correspond to the number of bicycle commuters currently in North Kansas City. This corresponds very closely to the 0.6% bicycle commuters reported in the ACS data. The total weekday mode share was calculated to be 0.28% bicycles.

Weekday PM Peak Hour Volumes				Weekday Daily Volumes			
Intersection	Cars	Bikes	% Bikes	Intersection	Cars	Bikes	% Bikes
Swift @ Armour	494	5	1.00%	Swift @ Armour	3717	41	1.09%
Armour @ Swift	1345	0	0.00%	Armour @ Swift	12167	9	0.07%
Swift @ 16th	532	7	1.30%	Swift @ 16th	3311	42	1.25%
16th @ Swift	308	0	0.00%	16th @ Swift	3235	6	0.19%
Iron @ Armour	318	0	0.00%	Iron @ Armour	3335	15	0.45%
Armour @ Iron	1797	0	0.00%	Armour @ Iron	17746	12	0.07%
Iron @ 16th	250	0	0.00%	Iron @ 16th	2168	10	0.46%
16th @ Iron	500	1	0.20%	16th @ Iron	5123	12	0.23%
HOA Bridge	3560	73	2.01%	HOA Bridge	28480	160	0.56%
Burlington @ 26th	3951	0	0.00%	Burlington @ 26th	30240	3	0.01%
26th @ Burlington	302	0	0.00%	26th @ Burlington	3286	5	0.15%
Total	13357	86	0.64%	Total	112808	315	0.28%

For weekend PM peak hour and weekday totals at each intersection, the existing vehicle volumes and bicycle volumes are shown in the tables below. The peak hour total bicycle mode share on the weekend was calculated to be 0.94%. The total daily bicycle mode share was calculated to be 0.85%. The relatively higher numbers of bicycles on the weekend corresponds with research that points to the fact that people tend to ride bicycles more often for trips that are not commuting trips for work.

Weekend PM Peak Hour Volumes				Weeken	d Daily Vo	lumes	
	Cars	Bikes	% Bikes		Cars	Bikes	% Bikes
Swift @ Armour	205	11	5.09%	Swift @ Armour	1912	117	5.77%
Armour @ Swift	721	0	0.00%	Armour @ Swift	7792	18	0.23%
Swift @ 16th	171	15	8.06%	Swift @ 16th	1487	140	8.60%
16th @ Swift	134	4	2.90%	16th @ Swift	1184	18	1.50%
Iron @ Armour	202	2	0.98%	Iron @ Armour	1899	28	1.45%
Armour @ Iron	874	2	0.23%	Armour @ Iron	8153	7	0.09%
Iron @ 16th	46	1	2.13%	Iron @ 16th	397	25	5.92%
16th @ Iron	145	2	1.36%	16th @ Iron	1372	30	2.14%
HOA Bridge	1564	14	0.89%	HOA Bridge	14320	85	0.59%
Burlington @ 26th	1451	1	0.07%	Burlington @ 26th	15205	4	0.03%
26th @ Burlington	191	2	1.04%	26th @ Burlington	1980	3	0.15%
Total	5704	54	0.94%	Total	55701	475	0.85%

To do a full weekly comparison, the weekday volumes and weekend volumes were blended together based on the weekday accounting for 77% of the total weekly traffic and the weekend accounting for 23% of the total weekly traffic. The blended total traffic volumes are shown in the tables below. The total peak hour bicycle share throughout the week was calculated to be 0.66%. The total daily bicycle share throughout the week was calculated to be 0.35%.

Blended Weekly PM Peak Hour Volumes			ımes	Blended We	ekly Total [	Daily Volun	nes
	Cars	Bikes	% Bikes		Cars	Bikes	% Bikes
Swift @ Armour	428	6	1.40%	Swift @ Armour	3302	58	1.76%
Armour @ Swift	1201	0	0.00%	Armour @ Swift	11161	11	0.10%
Swift @ 16th	449	9	2.00%	Swift @ 16th	2891	65	2.25%
16th @ Swift	268	1	0.37%	16th @ Swift	2763	9	0.33%
Iron @ Armour	291	0	0.00%	Iron @ Armour	3005	18	0.60%
Armour @ Iron	1585	0	0.00%	Armour @ Iron	15540	11	0.07%
Iron @ 16th	203	0	0.00%	Iron @ 16th	1761	13	0.74%
16th @ Iron	418	1	0.24%	16th @ Iron	4260	16	0.38%
HOA Bridge	3101	59	1.90%	HOA Bridge	25223	143	0.57%
Burlington @ 26th	3376	0	0.00%	Burlington @ 26th	26782	3	0.01%
26th @ Burlington	276	0	0.00%	26th @ Burlington	2986	5	0.17%
Total	11596	76	0.66%	Total	99674	352	0.35%

With this baseline bicycle share calculated, each of the intersections was measured using the Bicycle Level of Stress methodology. This methodology helps to determine what percentage of bicycle riders would feel comfortable using a particular facility. A street with a high level of stress (LTS 4) will only see a small percentage of total potential riders using that street. A street with a low level of stress (LTS 1) is usable by all potential bicycle riders and will thus attract many more cyclists.

Each of the intersections counted was evaluated for the existing level of traffic stress, and compared to the proposed level of traffic stress based on this plan's recommendations. Based on the change in LTS and the potential associated existing riders and projected riders, an expansion factor was determined. So if an existing facility had an LTS of 4, which serves only about 1% of riders, and will be an LTS of 1 in

the future, which serves 100% of cyclists, the expansion factor was calculated to be 100. This expansion factor was multiplied by the existing number of cyclists to determine the potential total number of cyclists. The table below shows this calculation.

The total number of cyclists estimated in the peak hour with this analysis was about 750 cyclists per hour. For the full day, this number was calculated to be about 5,400 cyclists per day. This corresponded to a 6.4% bicycle mode share in the peak hour and a 5.3% mode share across the full day.

		Peak	Hour Cycling	z ivioue sitare	Potential			
		% Cyclist		% Cyclist		Average Peak	Bike	
	LTS	Served	LTS	Served	Expansion	Hour Vehicle	Volume	% Bikes
Intersection	Existing	Existing	Proposed	Proposed	Factor	Volume	Potential	Proposed
Swift @ Armour	3	10%	1	100%	10	428	60	14.02%
Armour @ Swift	4	1%	1	100%	100	1201	100	8.33%
Swift @ 16th	3	10%	1	100%	10	449	90	20.04%
16th @ Swift*	3	10%	1	100%	10	268	10	3.73%
Iron @ Armour**	3	10%	1	100%	10	291	10	3.44%
Armour @ Iron	4	1%	1	100%	100	1585	100	6.31%
Iron @ 16th	2	60%	2	60%	1	203	1	0.49%
16th @ Iron	3	10%	1	100%	10	418	10	2.39%
HOA Bridge***	1	100%	1	100%	1	3101	249	8.03%
Burlington @ 26th****	4	1%	1	100%	100	3376	100	2.96%
26th @ Burlington***	3	10%	1	100%	10	276	10	3.62%
Total					Total	11596	740	6.38%
			ily Cycling N	lode Share Po	otential			
		% Cyclist		% Cyclist		Average Peak	Bike	
	LTS	Served	LTS	Served	Expansion	Hour Vehicle	Volume	% Bikes
	C: - 4:	F						
	Existing	Existing	Proposed	Proposed	Factor	Volume	Potential	Proposed
Swift @ Armour	Existing 3	10%	Proposed 1		Factor 10		Potential 580	· ·
Swift @ Armour Armour @ Swift				100%		3302		17.57%
	3	10%	1	100% 100%	10	3302 11161	580	17.57% 9.86%
Armour @ Swift Swift @ 16th* 16th @ Swift	3	10% 1%	1	100% 100%	10 100	3302 11161	580 1100	17.57% 9.86% 22.48%
Armour @ Swift Swift @ 16th*	3 4 3	10% 1% 10%	1 1 1	100% 100% 100% 100%	10 100 10	3302 11161 2891 2763	580 1100 650	17.57% 9.86% 22.48% 3.26%
Armour @ Swift Swift @ 16th* 16th @ Swift	3 4 3 3	10% 1% 10% 10%	1 1 1 1	100% 100% 100% 100% 100%	10 100 10 10	3302 11161 2891 2763 3005	580 1100 650 90	17.57% 9.86% 22.48% 3.26% 5.99%
Armour @ Swift Swift @ 16th* 16th @ Swift Iron @ Armour**	3 4 3 3 3	10% 1% 10% 10% 10% 10% 1% 60%	1 1 1 1 1	100% 100% 100% 100% 100% 100% 60%	10 100 10 10 10 10 100	3302 11161 2891 2763 3005 15540	580 1100 650 90 180 1100	17.57% 9.86% 22.48% 3.26% 5.99% 7.08% 0.74%
Armour @ Swift Swift @ 16th* 16th @ Swift Iron @ Armour** Armour @ Iron Iron @ 16th 16th @ Iron	3 4 3 3 3 4	10% 1% 10% 10% 10% 10%	1 1 1 1 1	100% 100% 100% 100% 100% 100%	10 100 10 10 10 10	3302 11161 2891 2763 3005 15540	580 1100 650 90 180 1100	17.57% 9.86% 22.48% 3.26% 5.99% 7.08% 0.74%
Armour @ Swift Swift @ 16th* 16th @ Swift Iron @ Armour** Armour @ Iron Iron @ 16th 16th @ Iron HOA Bridge***	3 4 3 3 3 4 4 2	10% 1% 10% 10% 10% 10% 10% 10% 10%	1 1 1 1 1 1 1 2	100% 100% 100% 100% 100% 100% 60% 100%	10 100 10 10 10 10 100 1 100 10	3302 11161 2891 2763 3005 15540 1761 4260 25223	580 1100 650 90 180 1100	17.57% 9.86% 22.48% 3.26% 5.99% 7.08% 0.74%
Armour @ Swift Swift @ 16th* 16th @ Swift Iron @ Armour** Armour @ Iron Iron @ 16th 16th @ Iron HOA Bridge*** Burlington @ 26th****	3 4 3 3 3 4 2 3	10% 1% 10% 10% 10% 10% 60% 10%	1 1 1 1 1 1 2	100% 100% 100% 100% 100% 100% 60% 100%	10 100 10 10 10 10 100 1	3302 11161 2891 2763 3005 15540 1761 4260 25223	580 1100 650 90 180 1100 13	17.57% 9.86% 22.48% 3.26% 5.99% 7.08% 0.74% 3.76% 4.33%
Armour @ Swift Swift @ 16th* 16th @ Swift Iron @ Armour** Armour @ Iron Iron @ 16th 16th @ Iron HOA Bridge***	3 4 3 3 3 4 2 2 3	10% 1% 10% 10% 10% 10% 10% 10% 10%	1 1 1 1 1 1 2 1 1	100% 100% 100% 100% 100% 100% 60% 100%	10 100 10 10 10 10 100 1 100 10	3302 11161 2891 2763 3005 15540 1761 4260 25223 26782	580 1100 650 90 180 1100 13 160	17.57% 9.86% 22.48% 3.26% 5.99% 7.08% 0.74% 3.76% 4.33% 1.12%

<sup>\*16</sup>th Swapped with LTS1 14th assuming bike rerouting onto 14th

Based on the relatively higher existing bicycle mode share on the weekend, the same calculation was performed for the weekend alone. This calculation is displayed in the table below. The total number of cyclists estimated in the peak hour on the weekend with this analysis was about 775 cyclists per hour. For the full day, this number was calculated to be about 6,400 cyclists per day. This corresponded to a 13.6% bicycle mode share in the peak hour and a 11.4% mode share across the full day.

<sup>\*\*</sup>Iron swapped with LTS1 Howell assuming bike rerouting

<sup>\*\*\*26</sup>th swapped for LTS1 Burlington assuming these trips are from Burlington via Design Dr

<sup>\*\*\*\*</sup>Added trips from Burlington @ 26th and Swift to account for overall increased area ridership considering HOA bridge is currently LTS 1 and analysis shows no increase in bike traffic which is not probable

Weekend Peak Hour Cycling Mode Share Potential											
		% Cyclist		% Cyclist		Peak Hour	Bike				
		Served	LTS	Served	Expansion	Vehicle	Volume	% Bikes			
Intersection	LTS Existing	Existing	Proposed	Proposed	Factor	Volume	Potential	Proposed			
Swift @ Armour	3	10%	1	100%	10	205	110	53.7%			
Armour @ Swift	4	1%	1	100%	100	721	100	13.9%			
Swift @ 16th	3	10%	1	100%	10	171	150	87.7%			
16th @ Swift*	3	10%	1	100%	10	134	40	29.9%			
Iron @ Armour**	3	10%	1	100%	10	202	20	9.9%			
Armour @ Iron	4	1%	1	100%	100	874	200	22.9%			
Iron @ 16th	2	60%	2	60%	1	46	1	2.2%			
16th @ Iron	3	10%	1	100%	10	145	20	13.8%			
HOA Bridge***	1	100%	1	100%	1	1564	14	0.9%			
Burlington @ 26th****	4	1%	1	100%	100	1451	100	6.9%			
26th @ Burlington***	3	10%	1	100%	10	191	20	10.5%			
Total					Total	5704	775	13.6%			
Weekend Daily Cycling Mode Share Potential											
		% Cyclist		% Cyclist		Peak Hour	Bike				
		Served	LTS	Served	Expansion	Vehicle	Volume	% Bikes			
	LTS Existing	Existing	Proposed	Proposed	Factor	Volume	Potential	Proposed			
Swift @ Armour	3	10%	1	100%	10	1912	1170	61.2%			
Armour @ Swift	4	1%	1	100%	100	7792	1800	23.1%			
Swift @ 16th*	3	10%	1	100%	10	1487	1400	94.1%			
16th @ Swift	3	10%	1	100%	10	1184	180	15.2%			
Iron @ Armour**	3	10%	1	100%	10	1899	280	14.7%			
Armour @ Iron	4	1%	1	100%	100	8153	700	8.6%			
Iron @ 16th	2	60%	2	60%	1	397	25	6.3%			
	3	10%	1	100%	10	1372	300	21.9%			
16th @ Iron	3	1070									
HOA Bridge***	1	100%	1	100%	1	14320	85	0.6%			
		100%	1	100% 100%	1 100	14320 15205	85 400	0.6% 2.6%			
HOA Bridge***	1	100% 1%									

<sup>\*16</sup>th Swapped with LTS1 14th assuming bike rerouting onto 14th

It should also be noted that the projected estimates are predicated on the assumption that the full bicycle plan network is built out. All facilities planned with the bicycle plan would be required before the mode share potential could be realized. By that time, land use changes, higher residential density, demographic changes, and shifting preferences in North Kansas City and downtown Kansas City, Missouri may lead to even higher cycling numbers in the city.

#### Projections Based on US Census Bureau Data

The US Census Bureau collects data on census tracts every year as part of the American Community Survey (ACS). This survey collects a vast amount of commuter data, and estimates exact numbers of commuters by census tract, county, and state. One factor collected with the commuter data is the average travel time of the commute. This method primarily equates commute travel time to potential

<sup>\*\*</sup>Iron swapped with LTS1 Howell assuming bike rerouting

<sup>\*\*\*26</sup>th swapped for LTS1 Burlington assuming these trips are from Burlington via Design Dr

<sup>\*\*\*\*</sup>Added trips from Burlington @ 26th and Swift to account for overall increased area ridership considering HOA bridge is currently LTS 1 and analysis shows no increase in bike traffic which is not probable

bicycle users and compares this to available facility types based on the bicycle level of traffic stress methodology.

A baseline scenario was created so that the results could be compared to the actual traffic counts collected. The commuter patterns were first determined for North Kansas City. Currently, North Kansas City has a residential population of about 4,270 people. The city has a large influx of workers during the day, when the daytime city population grows to about 22,930 people. Based on the commuter values, approximately 2,380 North Kansas City residents have a commute time of greater than 10 minutes, which would generally correspond to people who live in North Kansas City and work outside the city limits. This means that approximately 20,550 people commute into North Kansas City every day to work or attend school.

The table below shows the features of commuters in North Kansas City. The ACS commuter data was used for the census tract that covers North Kansas City, and it was assumed that the commuters coming into North Kansas City every day generally correspond with the ACS data aggregated for Clay County, where North Kansas City is located. The number of commuters reported by the ACS is tabulated as it corresponds to the travel time that those user groups experience in their daily commute.

North Kansas City Commuting Features										
	NKC Cor	nmuters	Regional Commuters							
					Number of					
Car					Clay County					
Commute	NKC		Clay County	% of Clay	Residents					
Travel Time	Commuters	% of NKC	Commuters	County	Commuting					
(Minutes)	(ACS)	Commuters	(ACS)	Commuters	into NKC					
5	168	6%	2373	2%	437					
10	328	11%	11280	10%	2078					
15	621	22%	16026	14%	2952					
20	852	30%	19670	18%	3623					
25	259	9%	20035	18%	3690					
30	76	3%	9611	9%	1770					
35	326	11%	15388	14%	2834					
40 20		1%	4071	4%	750					
45	66	2%	4333	4%	798					
60	159	6%	8788	8%	1619					
Total	2875	100%	111575	100%	20551					

To determine how many of these commuters are potential bicycle commuters, the travel time was converted from vehicle travel time to bicycle travel time. In the Kansas City Metro area, it is assumed that cars typically achieve an average speed of about three times faster than cyclists. So a five minute car ride would correspond to a fifteen minute bicycle ride; a ten minute drive would correspond to a thirty minute ride. It should be noted that in more congested urban areas, bicycling is often as fast or faster than driving for short trips. But based on the large amounts of excess motor vehicle capacity on the area roads and relatively little amount of traffic congestion in Kansas City, it is often quicker to drive in a car than use any other mode of transportation.

The amount of bicycle riding time was then compared to bicycle level of stress users. It was assumed that bicycle riders that will typically ride on higher stress routes are also more likely to ride for much longer distances. The assumption was made that an LTS 1 user would not ride further than a 15 minute commute, an LTS 2 user wouldn't ride further than a 30 minute commute, and an LTS 3 user would not ride further than a 45 minute commute. Beyond that, a smaller and smaller percentage of LTS 4 users was assumed for longer and longer distances.

By comparing the percentage of cyclists that will ride a certain distance to the number of commuters who drive a certain distance, and the available bicycling facilities, it was possible to determine how many of those drivers could be converted to bicycle commuters if the facilities existed for them to feel comfortable. Then, to determine the number of cyclists, this percentage was multiplied by the number of North Kansas City riders and regional riders to determine an absolute number of cyclists and overall percentage of bicycle share.

To test this methodology, a baseline scenario was created to test existing conditions. The table below shows the result of this analysis. By utilizing this methodology, it was determined that the total bicycle share of the commuter population should be approximately 0.65%. This is nearly identical to the number determined using the traffic counts of 0.64% and the ACS data reporting that 0.6% of North Kansas City commuters are cyclists.

	Existing Conditions										
Bike Commute Equivalencies			NKC Riders				Regional Riders to NKC				All Riders
Minutes for	of Traffic	Commuters		% NKC Bike	Approx			% Regional	Approx.		
Bike	Stress User	Served	BLTS Type	Commuters	Number of			Bike	Regional	Bike % of	
Commute	Group	Based on	Facilities	at BLTS	NKC Bike	Bike % of	Facilities	Commuters	Bike	Regional	Bike % of
Travel Time	Correspondi	BLTS Users	Exist in	Level	Commuters	NKC	Existing in	to NKC	Commuters	Commuters	Total
(Minutes)	ng to Travel	vs Travel	NKC?	Served	Served	Commuters	Region?	Served	to NKC	to NKC	Commuters
15	1	60.0%	No	0.0%	0	0.0%	No	0.0%	0	0.0%	0.00%
30	2	30.0%	No	0.0%	0	0.0%	No	0.0%	0	0.0%	0.00%
45	3	6.0%	No	0.0%	0	0.0%	No	0.0%	0	0.0%	0.00%
60	4	2.0%	Yes	2.0%	17	2.0%	Yes	2.0%	72	2.0%	2.00%
75	4	1.0%	Yes	1.0%	3	1.0%	Yes	1.0%	37	1.0%	1.00%
90	4	0.5%	Yes	0.5%	0	0.5%	Yes	0.5%	9	0.5%	0.50%
105	4	0.3%	Yes	0.3%	1	0.3%	Yes	0.3%	9	0.3%	0.30%
120	4	0.3%	Yes	0.3%	0	0.3%	Yes	0.3%	2	0.3%	0.30%
135	4	0.1%	Yes	0.1%	0	0.1%	Yes	0.1%	1	0.1%	0.10%
180	4	0.1%	Yes	0.1%	0	0.1%	Yes	0.1%	2	0.1%	0.10%
Total		100%	Total	4.3%	21	0.7%	Total	4.3%	131	0.6%	0.65%

With a baseline scenario and methodology developed, two scenarios were tested for bicycle ridership. Because many of the North Kansas City workers are commuting in from outside the city, the actual bicycle facility construction in North Kansas City can have only a metered impact on bicycle mode share. Because of this, the first scenario assumed that all of the facilities contained within this plan were constructed, and there is only limited implementation of the proposed Kansas City, Missouri Bicycle Master Plan facilities surrounding North Kansas City. The table below shows this impact.

It can be seen that the increase in bicycle share among North Kansas City riders is dramatically increased from 4.3% of cyclists served to 100.0% of cyclists served. However, the regional rider share is only improved from 4.3% of cyclists served to 10% of cyclists served. Because the regional commuters make up a much greater absolute number of commuters in North Kansas City, this improvement only has a measured impact. With this implementation scenario, the total bicycle share is increased from the existing 0.65% bicycle share to 2.42% bicycle share.

Proposed Build Out of NKC Bike Master Plan & Limited KCMO Bike Master Plan Implementation											
Bike Commute Equivalencies				NKC Riders			Regional Riders to NKC				All Riders
Minutes for	Traffic Stress	Commuters						% Regional	Approx.		Bike % of
Bike	User Group	Served						Bike	Regional	Bike % of	Total
Commute	Correspondi	Based on		% NKC Bike	Approx. NKC	Bike % of	Facilities	Commuters	Bike	Regional	Commuters
Travel Time	ng to Travel	BLTS Users vs	Facilities	Commuters	Bike	NKC	Existing in	to NKC	Commuters	Commuters	at Travel
(Minutes)	Time	Travel Time	Exist in NKC?	Served	Commuters	Commuters	Region?	Served	to NKC	to NKC	Time Level
15	1	60.0%	Yes	60.0%	101	60.0%	No	0.0%	0	0.0%	16.66%
30	2	30.0%	Yes	30.0%	98	30.0%	No	0.0%	0	0.0%	4.09%
45	3	6.0%	Yes	6.0%	37	6.0%	Yes	6.0%	177	6.0%	6.00%
60	4	2.0%	Yes	2.0%	17	2.0%	Yes	2.0%	72	2.0%	2.00%
75	4	1.0%	Yes	1.0%	3	1.0%	Yes	1.0%	37	1.0%	1.00%
90	4	0.5%	Yes	0.5%	0	0.5%	Yes	0.5%	9	0.5%	0.50%
105	4	0.3%	Yes	0.3%	1	0.3%	Yes	0.3%	9	0.3%	0.30%
120	4	0.3%	Yes	0.3%	0	0.3%	Yes	0.3%	2	0.3%	0.30%
135	4	0.1%	Yes	0.1%	0	0.1%	Yes	0.1%	1	0.1%	0.10%
180	4	0.1%	Yes	0.1%	0	0.1%	Yes	0.1%	2	0.1%	0.10%
Total		100%	Total	100%	258	9.0%	Total	10%	308	1.5%	2.42%

To determine a maximum potential for bicycle mode share, a second scenario was explored where the recommendations in this plan are fully implemented, and the recommendations in the draft Kansas City, Missouri Bicycle Master Plan are also implemented. This would result in a network of LTS 1 facilities throughout the city serving nearly 100% of potential cyclists. The results of this analysis are shown in the table below.

This implementation scenario has a greater impact on the total commuting bicycle share in North Kansas City, raising the bicycle share to a potential 6.2%. It should be noted that this projection is nearly identical to the 6.4% bicycle mode share predicted for peak hour traffic utilizing the traffic count methodology.

Proposed Build Out of NKC Bike Master Plan & Full KCMO Bike Master Plan											
Bike Commute Equivalencies			NKC Riders				Regional Riders to NKC				All Riders
Minutes for	Traffic Stress	Commuters						% Regional	Approx.		Bike % of
Bike	User Group	Served						Bike	Regional	Bike % of	Total
Commute	Correspondi	Based on		% NKC Bike	Approx. NKC	Bike % of	Facilities	Commuters	Bike	Regional	Commuters
Travel Time	ng to Travel	BLTS Users	Facilities	Commuters	Bike	NKC	Existing in	to NKC	Commuters	Commuters	at Travel
(Minutes)	Time	vs Travel	Exist in NKC?	Served	Commuters	Commuters	Region?	Served	to NKC	to NKC	Time Level
15	1	60.0%	Yes	60.0%	101	60.0%	Yes	60.0%	262	60.0%	60.00%
30	2	30.0%	Yes	30.0%	98	30.0%	Yes	30.0%	623	30.0%	30.00%
45	3	6.0%	Yes	6.0%	37	6.0%	Yes	6.0%	177	6.0%	6.00%
60	4	2.0%	Yes	2.0%	17	2.0%	Yes	2.0%	72	2.0%	2.00%
75	4	1.0%	Yes	1.0%	3	1.0%	Yes	1.0%	37	1.0%	1.00%
90	4	0.5%	Yes	0.5%	0	0.5%	Yes	0.5%	9	0.5%	0.50%
105	4	0.3%	Yes	0.3%	1	0.3%	Yes	0.3%	9	0.3%	0.30%
120	4	0.3%	Yes	0.3%	0	0.3%	Yes	0.3%	2	0.3%	0.30%
135	4	0.1%	Yes	0.1%	0	0.1%	Yes	0.1%	1	0.1%	0.10%
180	4	0.1%	Yes	0.1%	0	0.1%	Yes	0.1%	2	0.1%	0.10%
Total		100%	Total	100%	258	9.0%	Total	100%	1194	5.8%	6.20%

#### Summary and Recommendation

Both methodologies explored in this analysis predicted that the existing mode share of bicycles (as compared with cars—transit use and walking was not included in this analysis) is about 0.65% in North Kansas City today. The analysis showed higher mode share on the weekends, with this reaching about 0.85% bicycle share.

The methodology was used to predict future bicycle use in the city. Both methods predicted that with a full build-out of the facilities recommended in this plan and full build-out of facilities recommended in the Kansas City, Missouri Bicycle Master Plan, that there is a potential for an approximate bicycle share

of 6.2%. This project was extended to the weekend, where it was predicted that the bicycle mode share could reach 11%.

A mixed implementation scenario was also explored where North Kansas City implements the recommendations in this plan, but there is limited implementation of the draft Kansas City, Missouri Bicycle Master Plan. Because many workers in North Kansas City live outside the city, what happens outside the city limits has a major impact on cycling potential inside the city limits. In this mixed implementation scenario, it was predicted that a 2.4% bicycle share could likely be achieved.

This bicycle mode share analysis likely underestimates the potential for bicycling in North Kansas City. It is noted that these predictions are based on a static commuter population and a static land use. North Kansas City is amid a transition from an industrial and typical suburban commuter community to a dense, urban, mixed use community. Residential land use changes are underway and anticipated which will bring more and higher density housing. Land use changes are also underway and anticipated in the historically industrial/warehousing areas where more entertainment, office, residential, and other non-industrial/warehousing are appearing.

Macro demographic trends are also occurring. The Baby Boomer generation is approaching retirement, which will bring much less long-distance driving for work and a greater focus on shorter local trips for services and entertainment. The Millennial generation has now predominantly entered the workforce, but has a stronger preference for shorter commute times and alternate modes of transportation than cars than any other living generation. These demographic changes, along with many other forces at work, will likely have profound impacts on commuter patterns and bicycle mode share.

Although the potential for cycling is likely greater than what is predicted in this analysis, it is recommended that this plan maintain achievable goals. For this reason, it is recommended that the short term (5-year) ridership goal be set at 1%, the mid-term (10-year) ridership goal be set at 2.5%, and the long-term (20-year) ridership goal be set at 6%.

North Kansas City Bicycle Master Plan Appendices

# **Economic Impact Analysis**

#### **Economic Impact Analysis**

Investments in active transportation provide a range of social benefits for the direct users of the facility and the larger regional economy. This economic impact analysis quantifies the benefits of active transportation investments proposed with he North Kansas City Bicycle master Plan in terms of dollar values. The economic analysis has been evaluated under conventional benefit-cost analysis methods consistent with FHWA guidance on federal grant programs including BUILD and INFRA. Dollar values for benefits not specified in FHWA guidance including health and mobility have utilize NCHRP reporting guidelines and values from the Victoria Transport Policy Institute Guide to Walking and Cycling Improvements.

The project team used a benefit-cost analysis framework to quantify benefits based on projected usage of the facilities in the plan and the corresponding mode shift predicted in the short, medium, and long-term scenarios. Facility usage projections and reduced vehicle-miles travelled (VMT) informed projections on improved health and safety, reduced environmental impacts from emissions and noise, reduced operating and maintenance costs for vehicles and roadways, reduced fuel costs, and changes in trip travel times.

The economic analysis was calculated using several inflationary discount rates of future dollars. The results of the analysis are shown with an undiscounted rate, a 3% discount rate consistent with typical inflationary assumptions used for municipal budgeting purposes, and a 7% discount rate. The 7% discount rate correlates to the typical discount rate used by the FHWA in evaluating BUILD and INFRA grant benefit-to-cost analyses and is higher than the typical 3% discount rate as an attempt to model the public's preference for near-term savings over long-term savings.

#### North Kansas City Bicycle Master Plan Economic Impact Analysis

#### **VMT Bike Benefit Calc**

Benefit (2018\$s discounted to 2019)	Undiscounted	Discounted at 3%	Discounted at 7%
Travel Time Savings - Auto	\$24,922,313	\$15,715,178	\$8,867,654
Travel Time Savings - Bicyclists	-\$62,305,783	-\$39,287,946	-\$22,169,136
Sub-Total Travel Time Changes	-\$37,383,470	-\$23,572,768	-\$13,301,482
Vehicle O&M Costs - Auto	\$15,696,553	\$9,897,722	\$5,585,020
Emissions - NOX	\$6,428	\$4,261	\$2,574
Emissions - PM2.5	\$35,102	\$22,477	\$12,960
Emissions - PM10	\$39,661	\$25,396	\$14,643
Emissions - SOX	\$3,451	\$2,195	\$1,254
Emissions - VOC	\$362	\$236	\$140
Emissions - CO2	\$14,575	\$8,960	\$4,885
Safety - Fatal Crashes	-	-	-
Safety - Injury Crashes	-	-	-
Safety - Property Damage Only (PDO) Crashes	-	-	-
Pavement Damage - Auto	\$66,748	\$42,089	\$23,750
Noise - Auto	\$49,080	\$30,948	\$17,463
Annual Health Benefit	\$57,438,917	\$36,219,062	\$20,437,447
Commuter Mobility Benefit - Bicyclists	\$208,162,601	\$131,260,384	\$74,066,720
Recreation Benefits - Bicyclists	\$2,695,645	\$1,699,784	\$959,142
Total Benefits	\$246,825,653	\$155,640,747	\$87,824,516

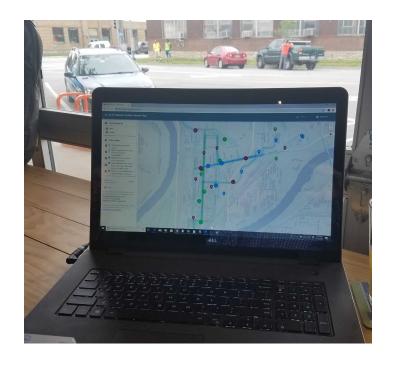
North Kansas City Bicycle Master Plan Appendices

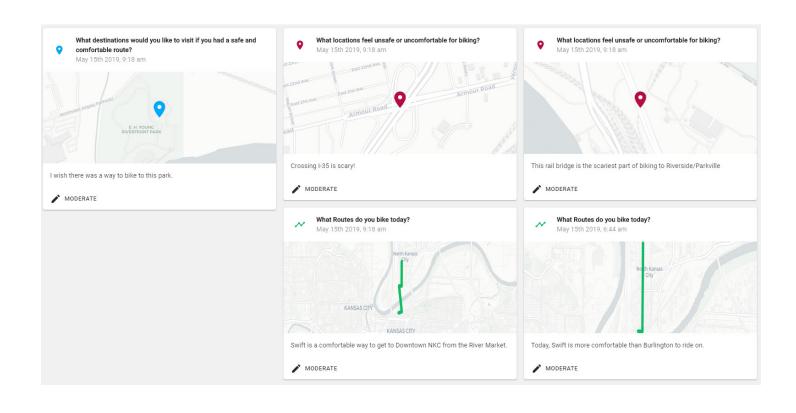
## Routes, Destinations, and Barriers

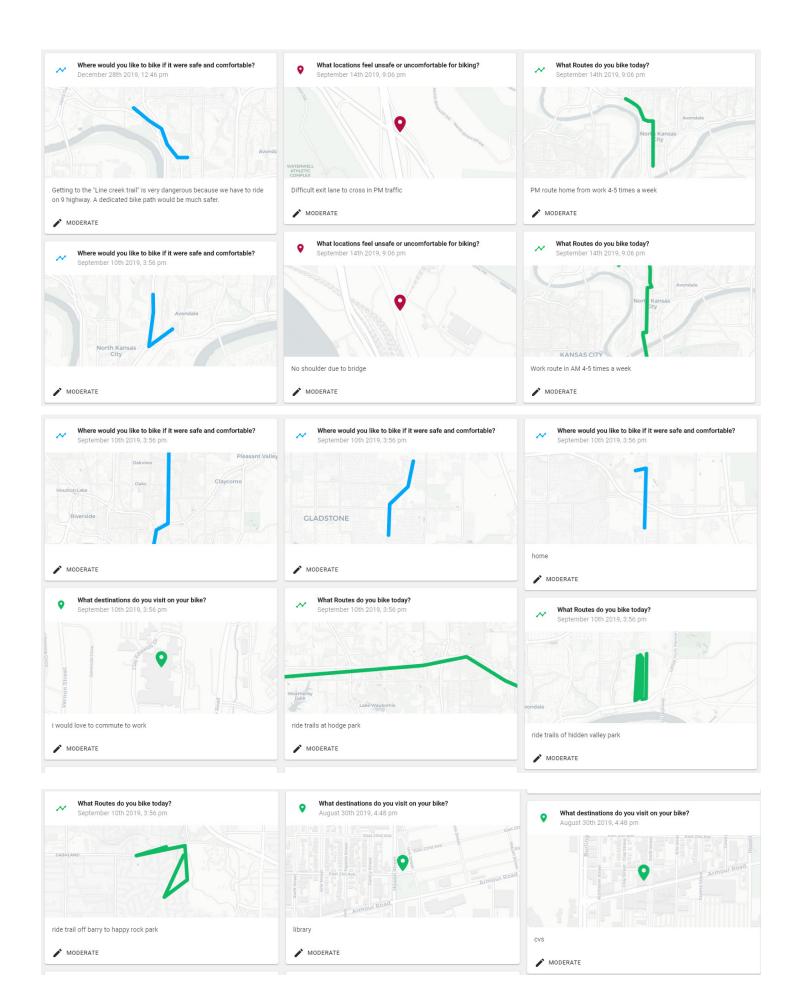
### Routes, Destinations, and Barriers

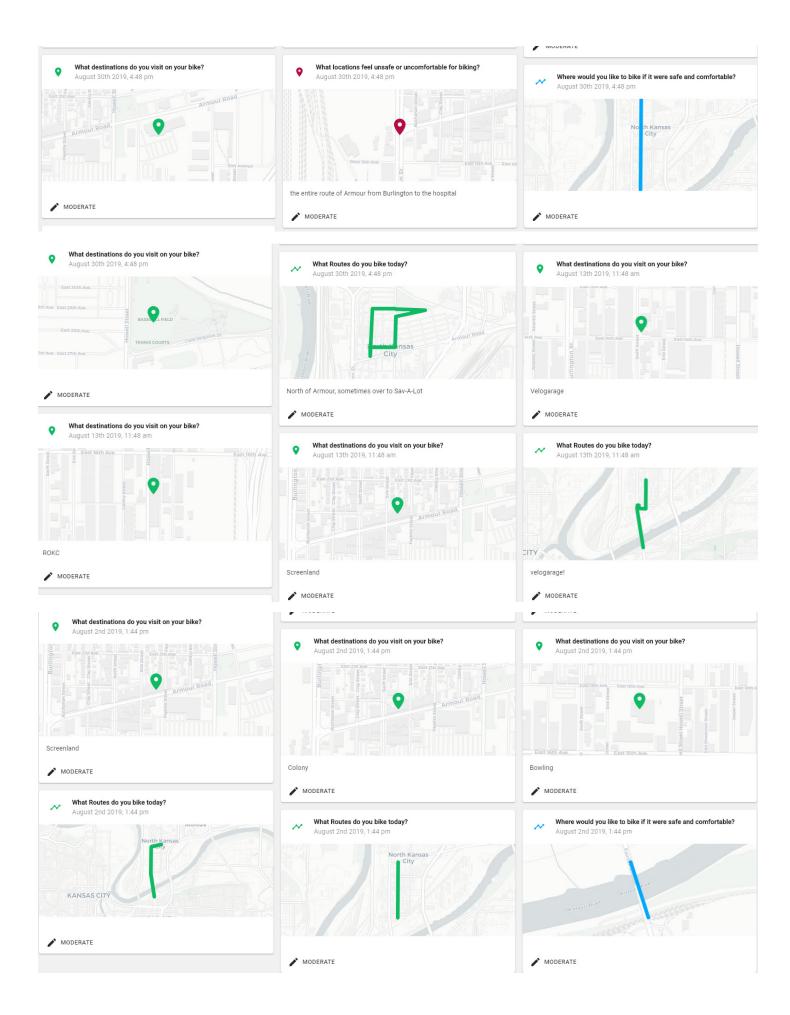
During the Bicycle Master Plan process participiants were asked what routes they biked today and what routes they would like to bike if it was safe and comfortable. Participants were also asked about popular destinations and locations where barriers made biking unsafe or uncomfortable.

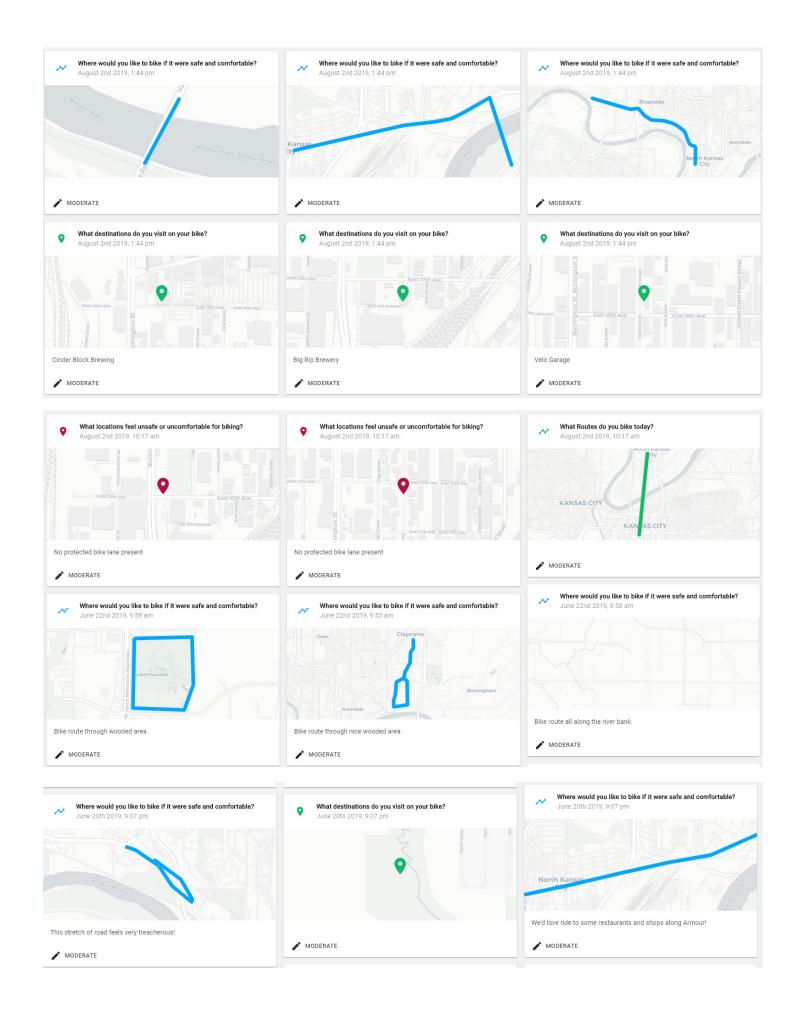
Feedback included many face to face conversations and public meeting discussions using maps to guide feedback. An online mapping tool was also available to collect data. This mapping tool collected and aggregated roughly one thousand contributions on routes, destinations, and barriers. Together, this feedback provides clear guidance on where people are biking and want to bike. The tiles on the following pages include the individual locations and details of community feedback that informed the Bicycle Mastere Plan.

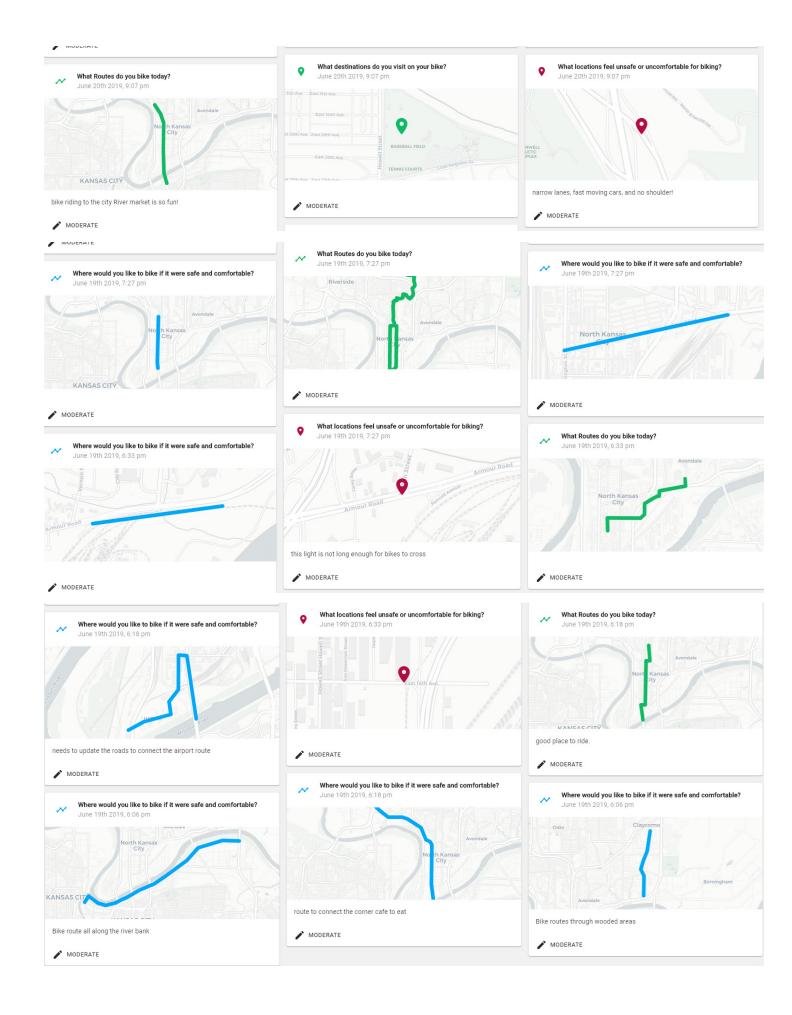


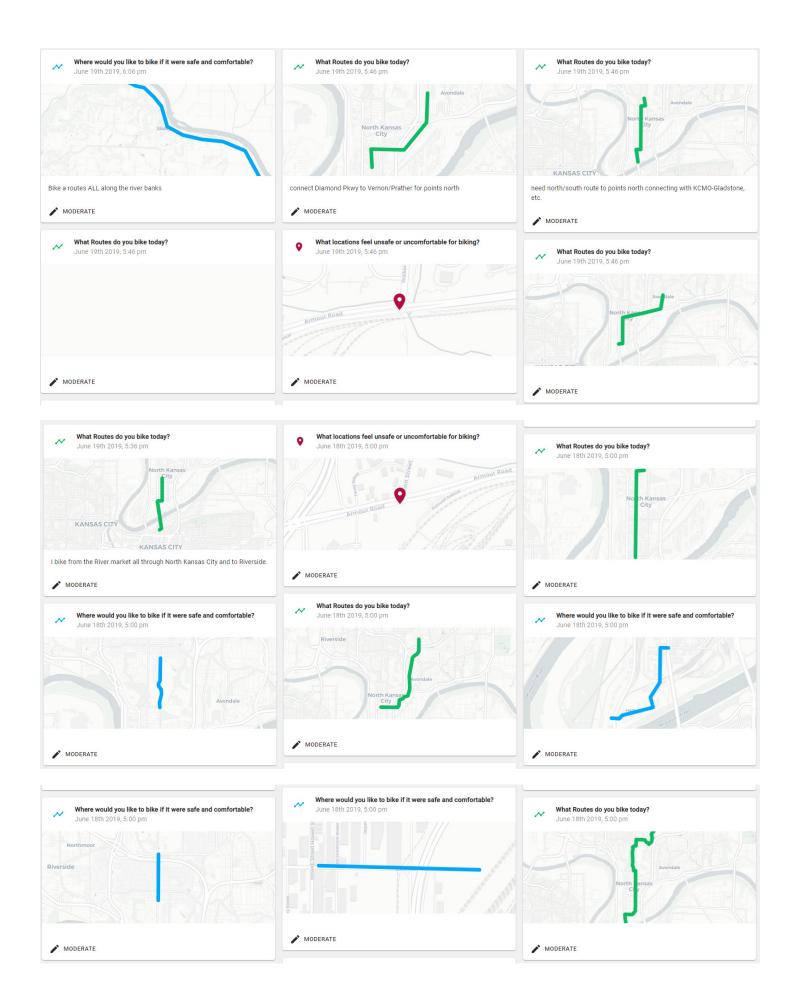


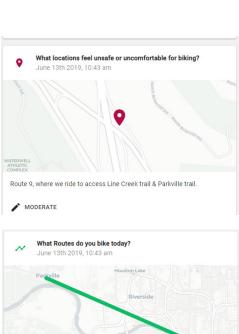




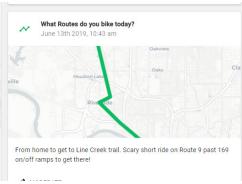


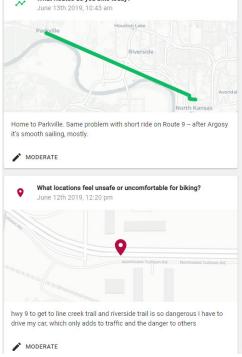


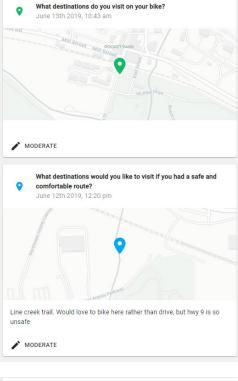


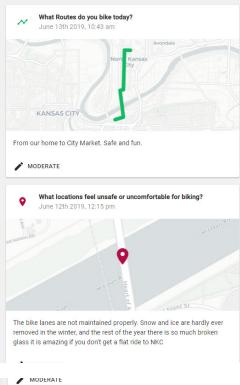


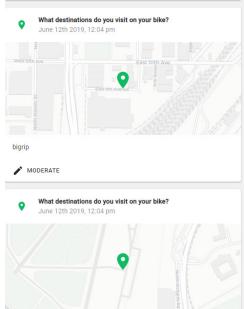


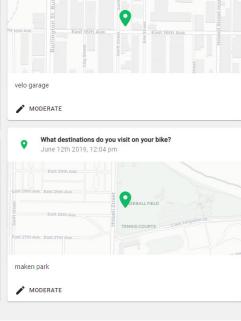






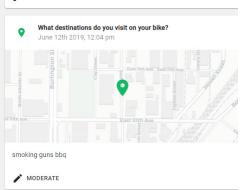


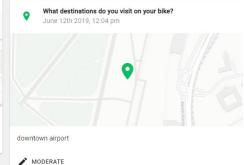




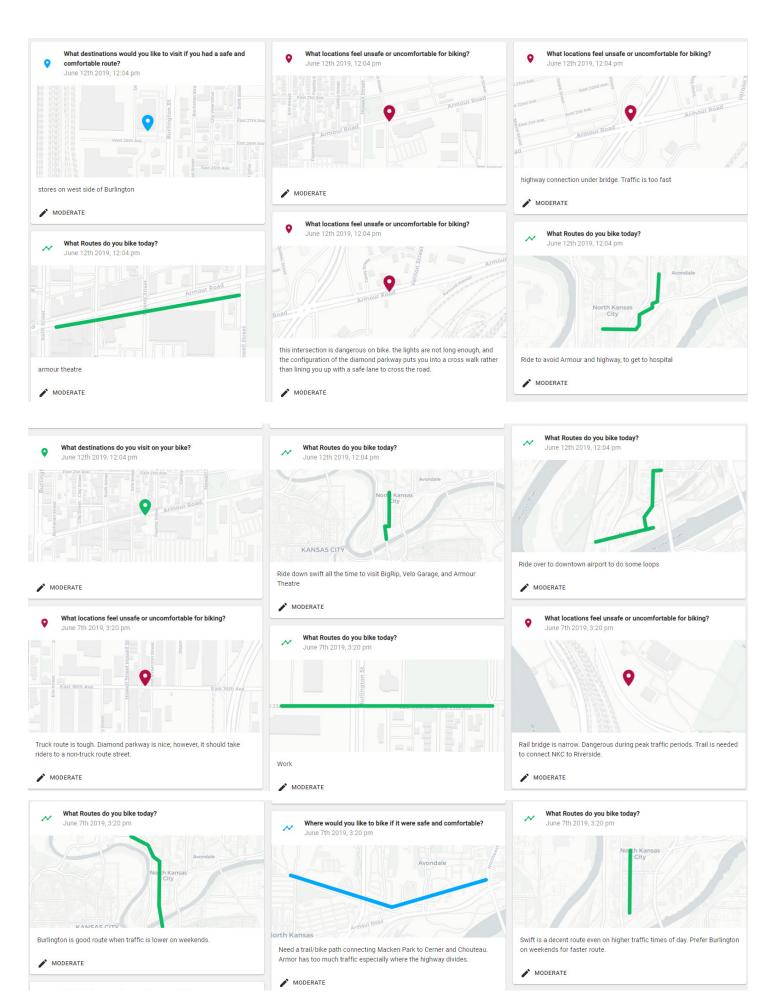
What destinations do you visit on your bike?

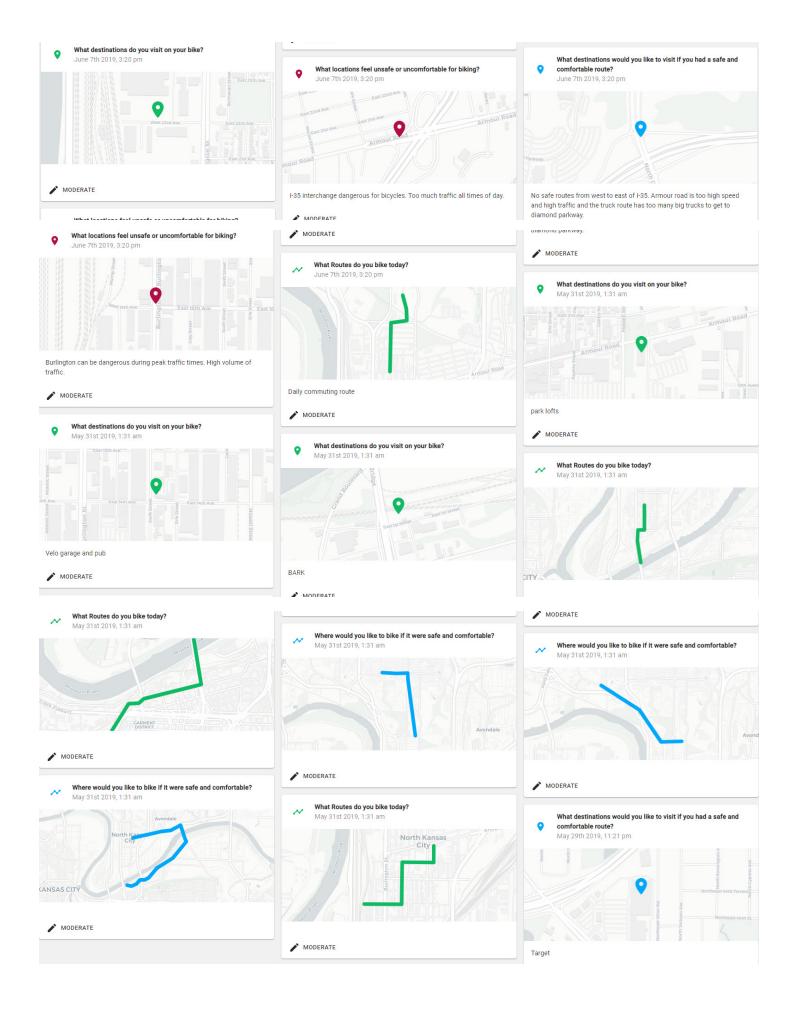
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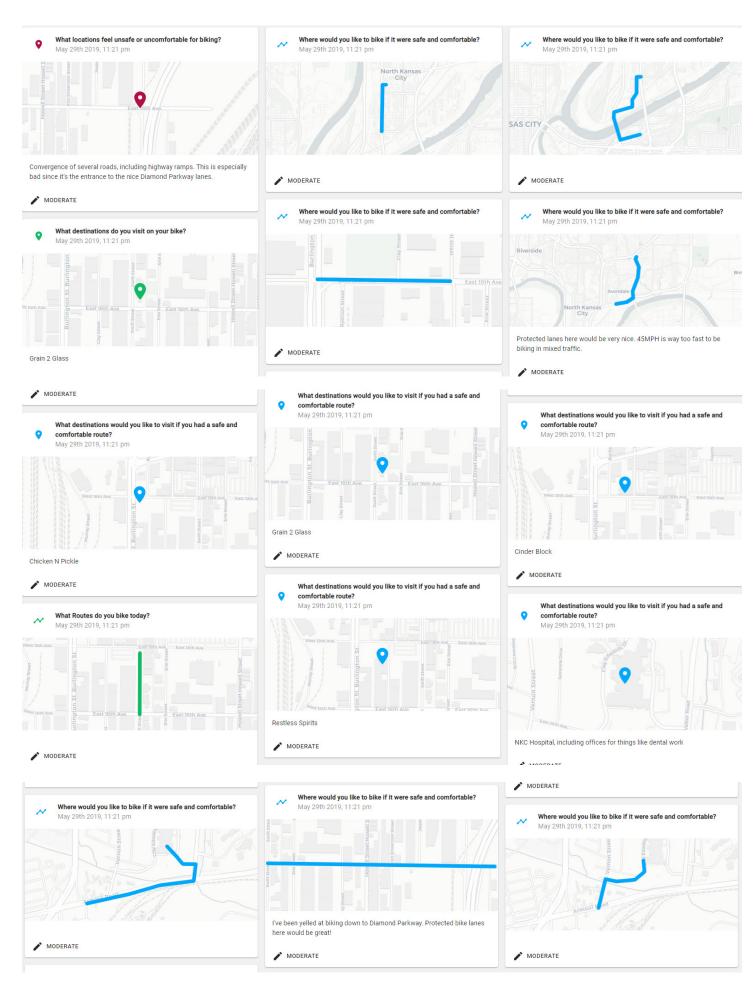


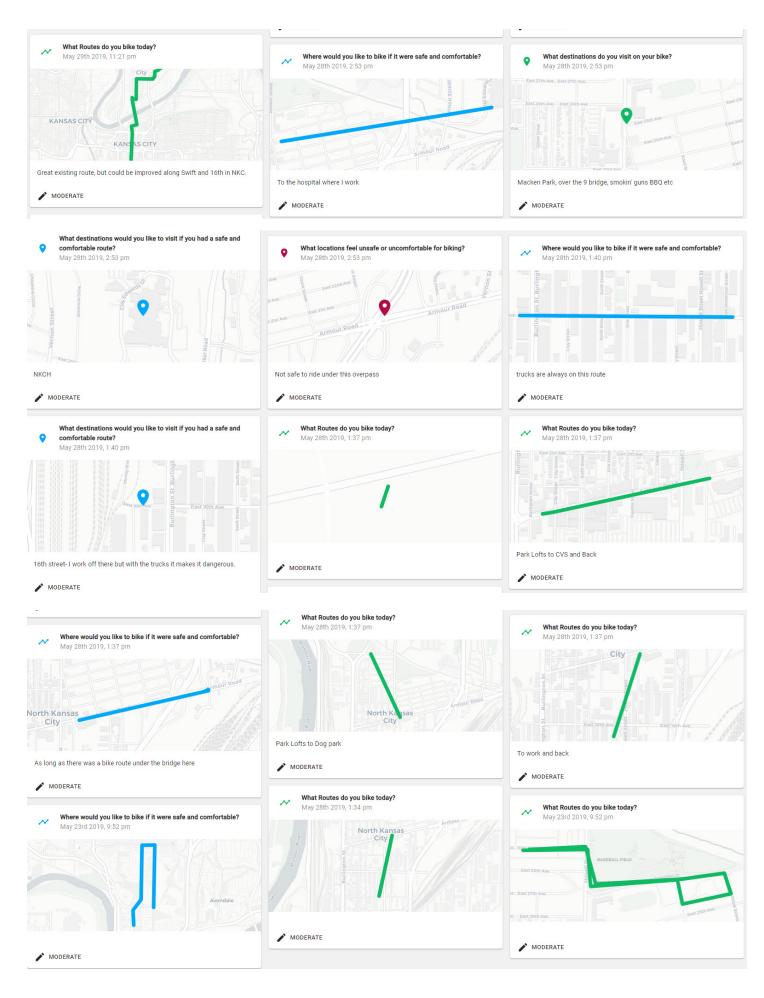


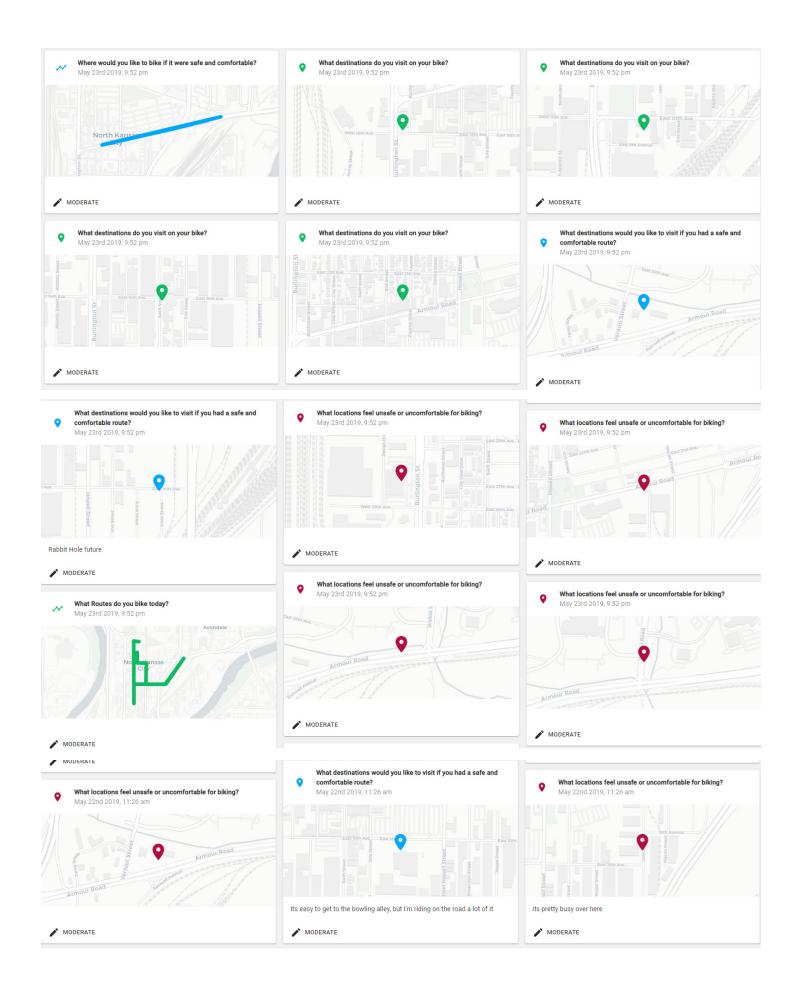
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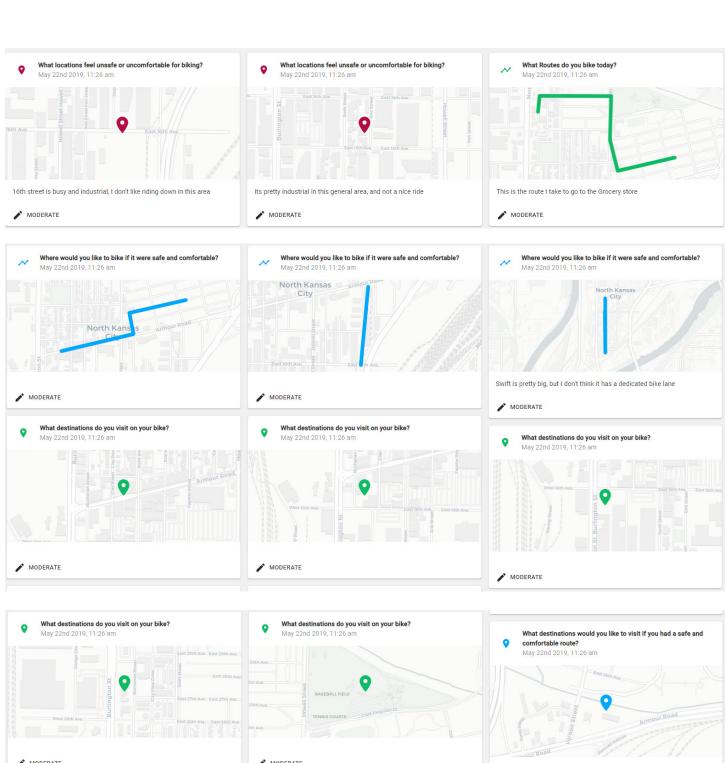


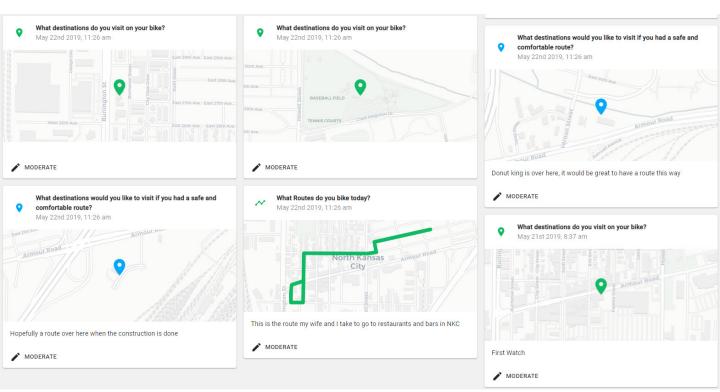


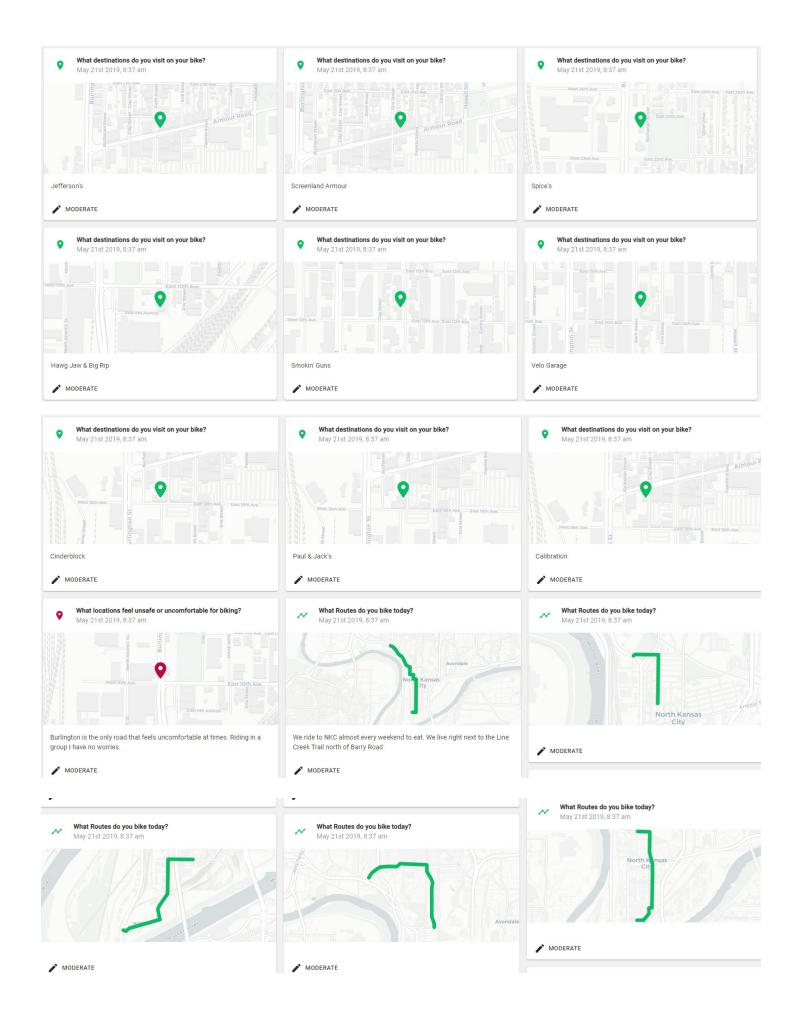


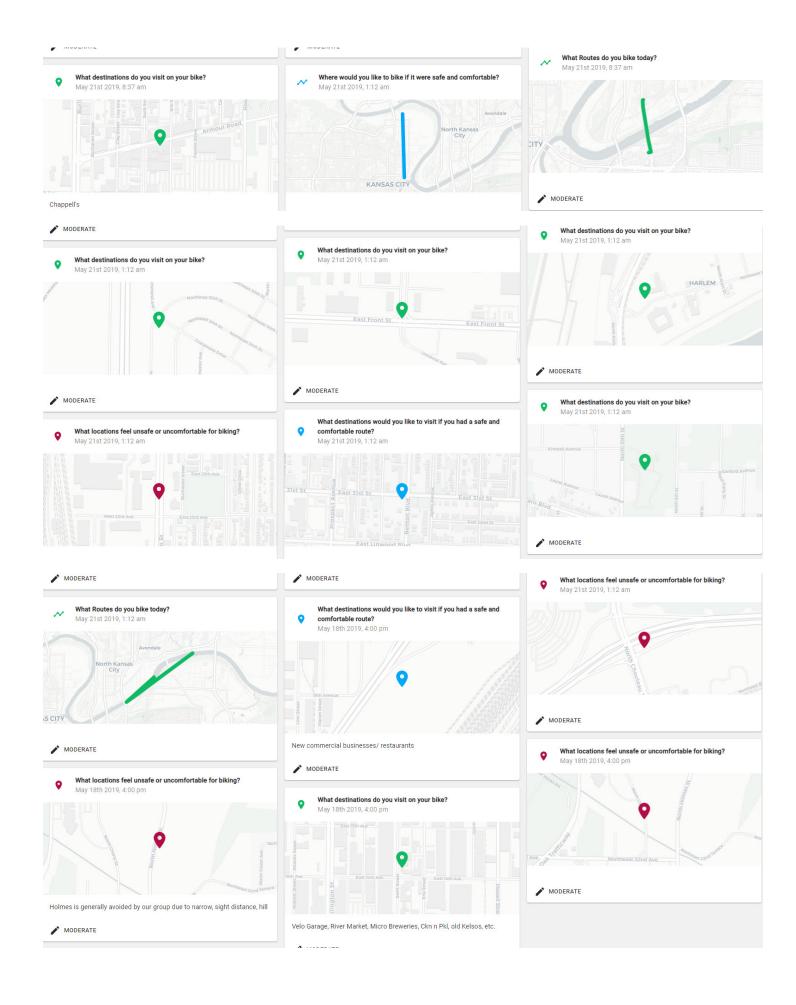


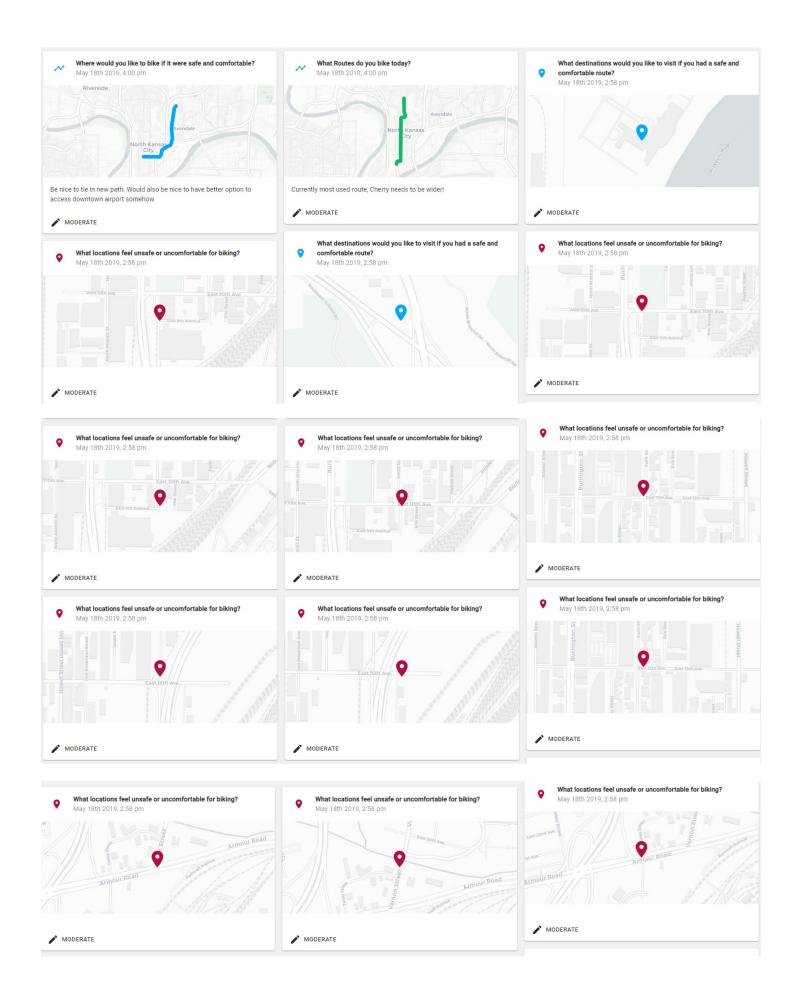


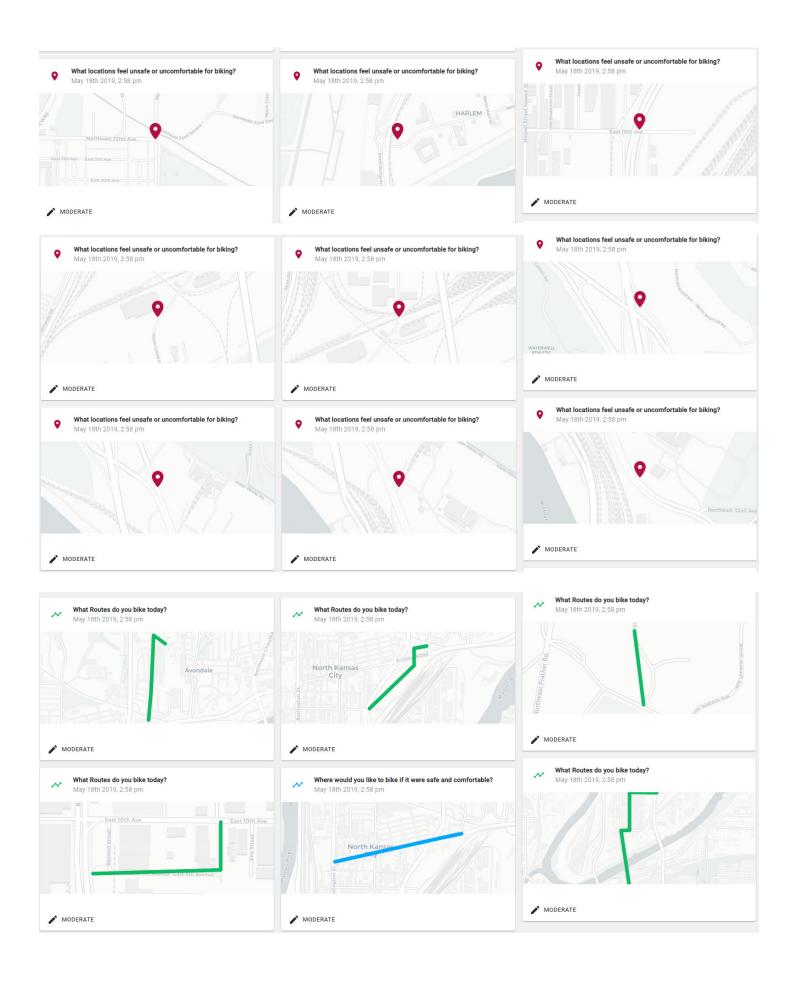


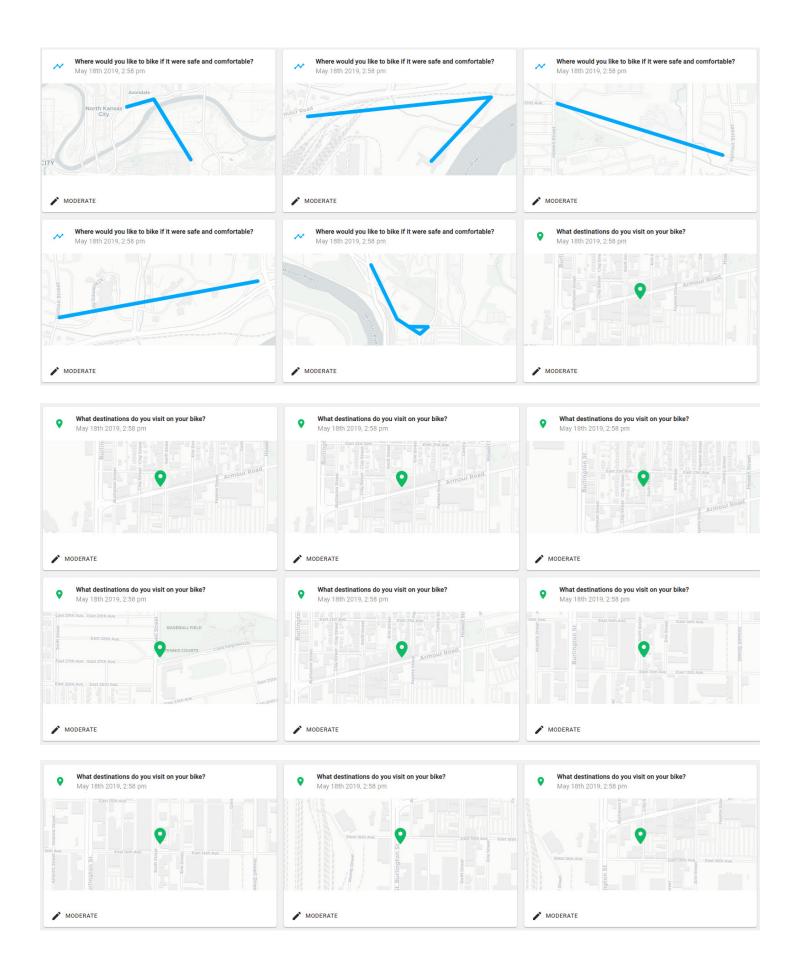


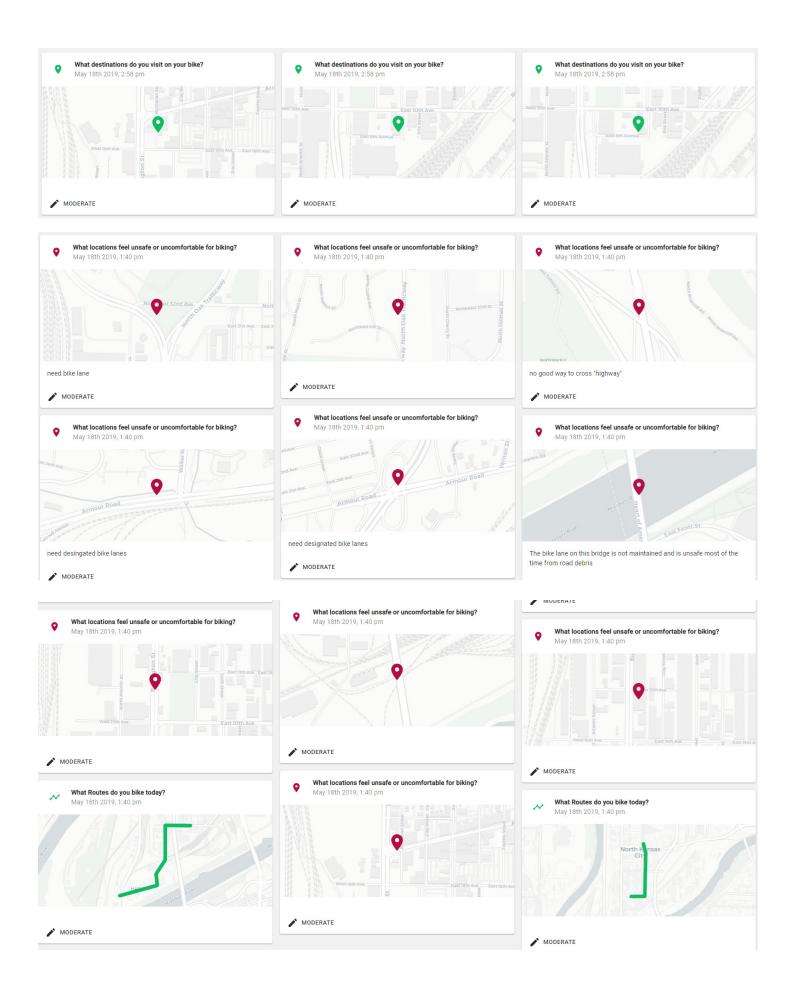


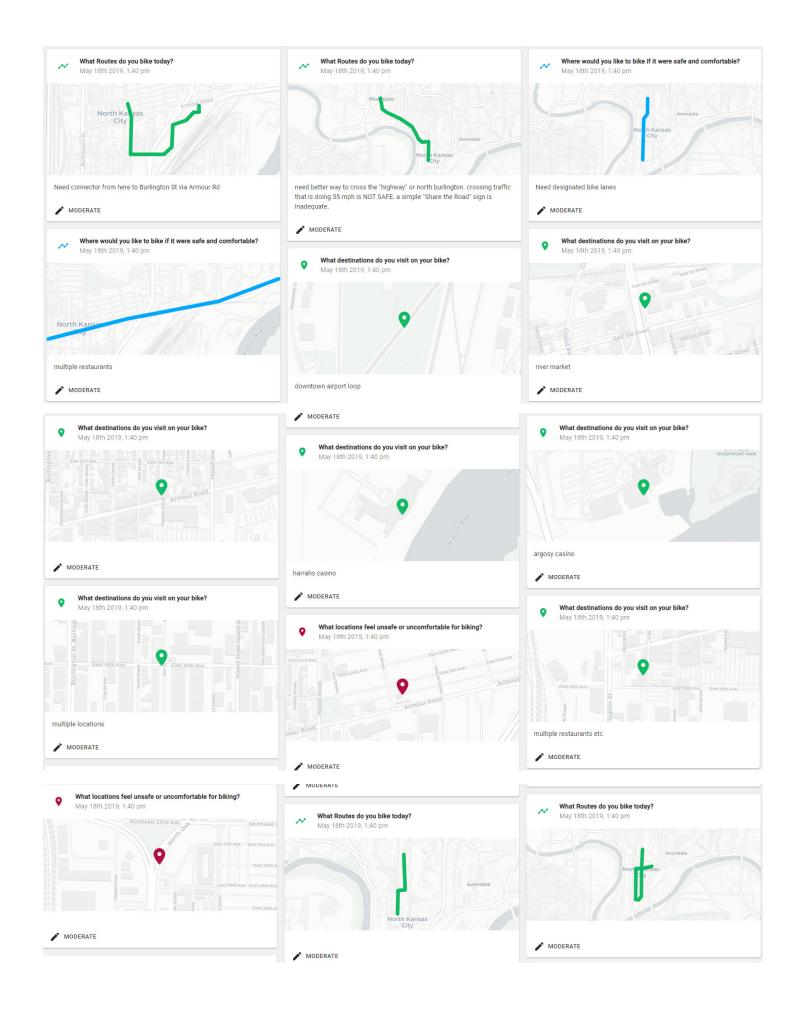


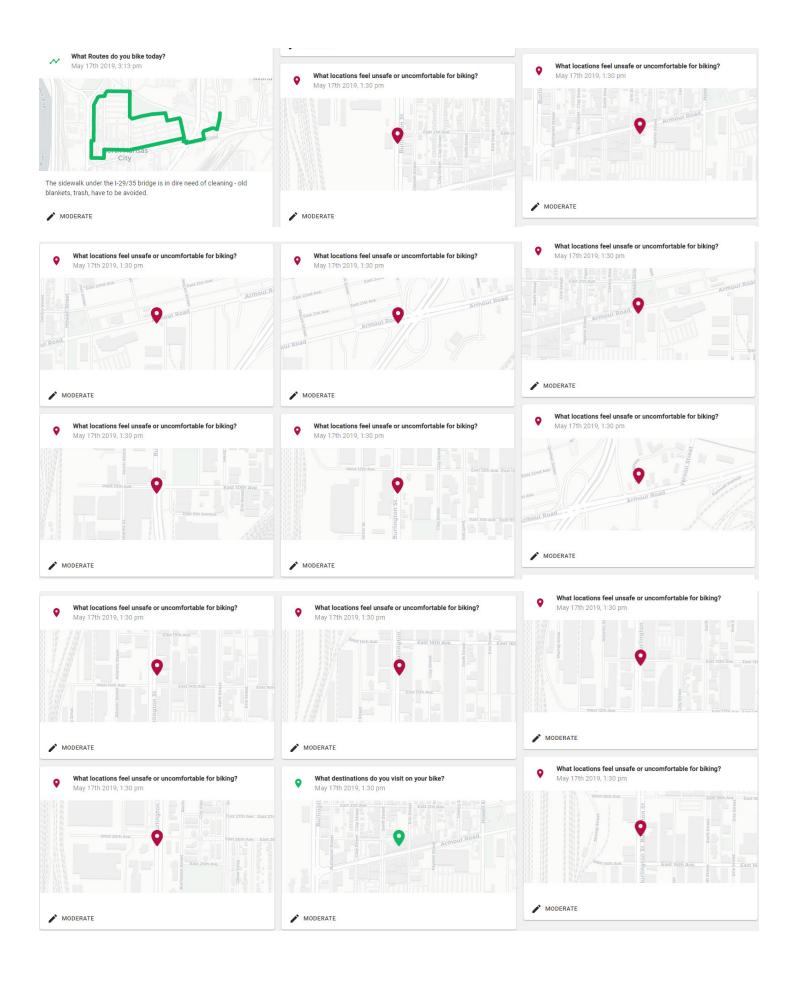


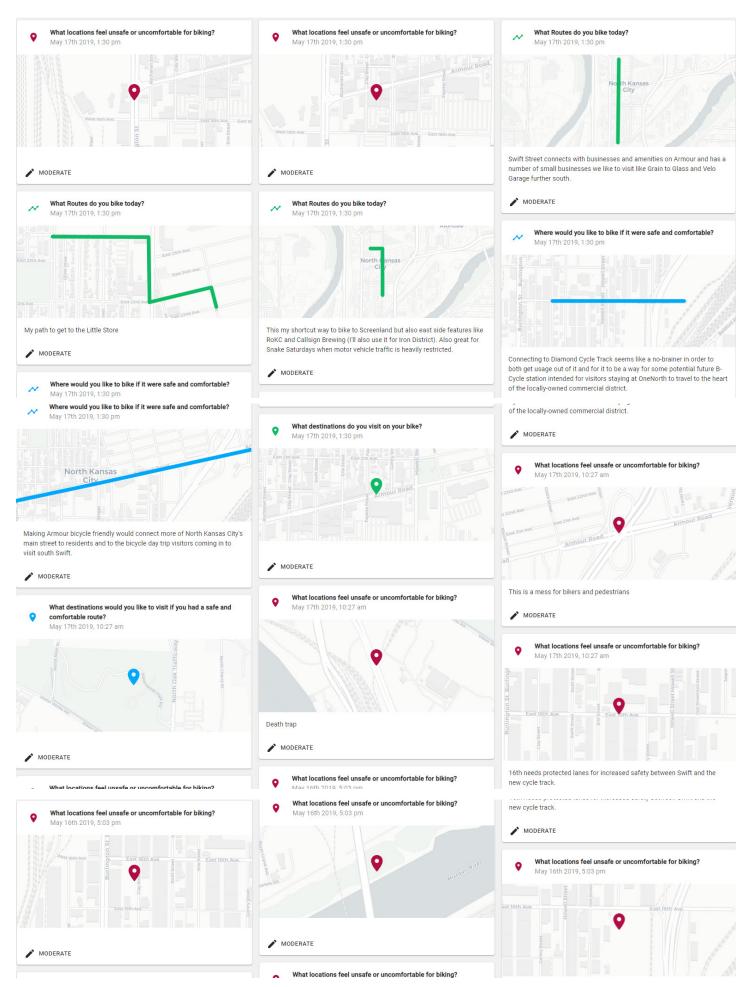


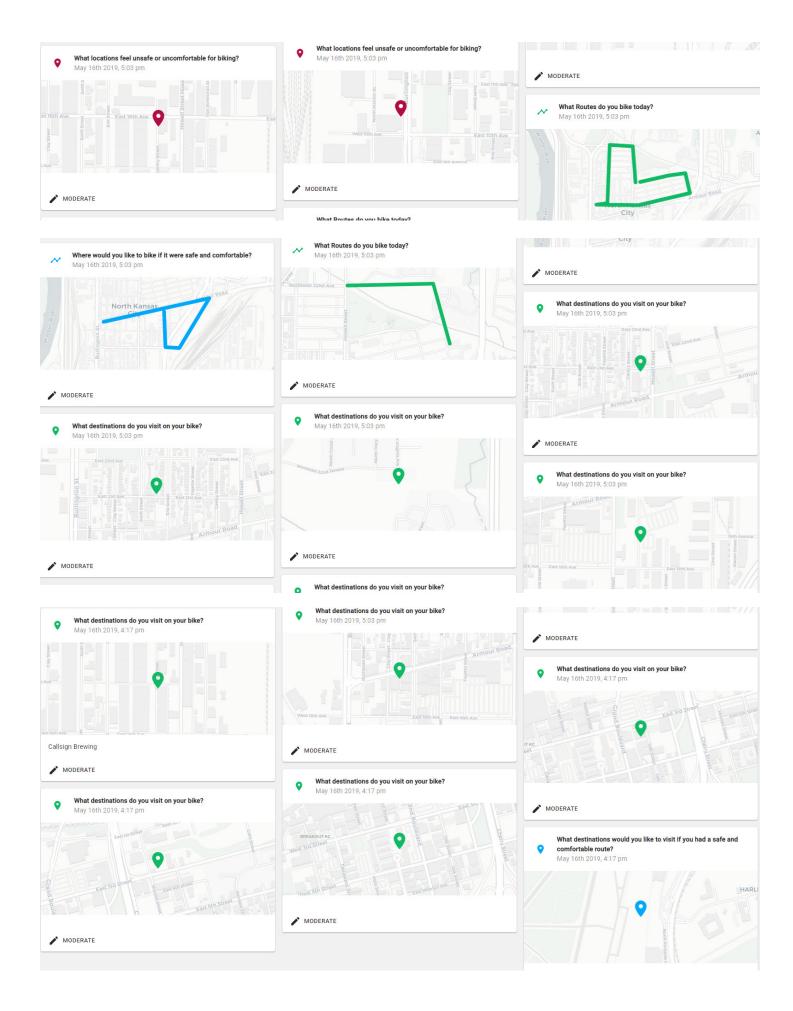


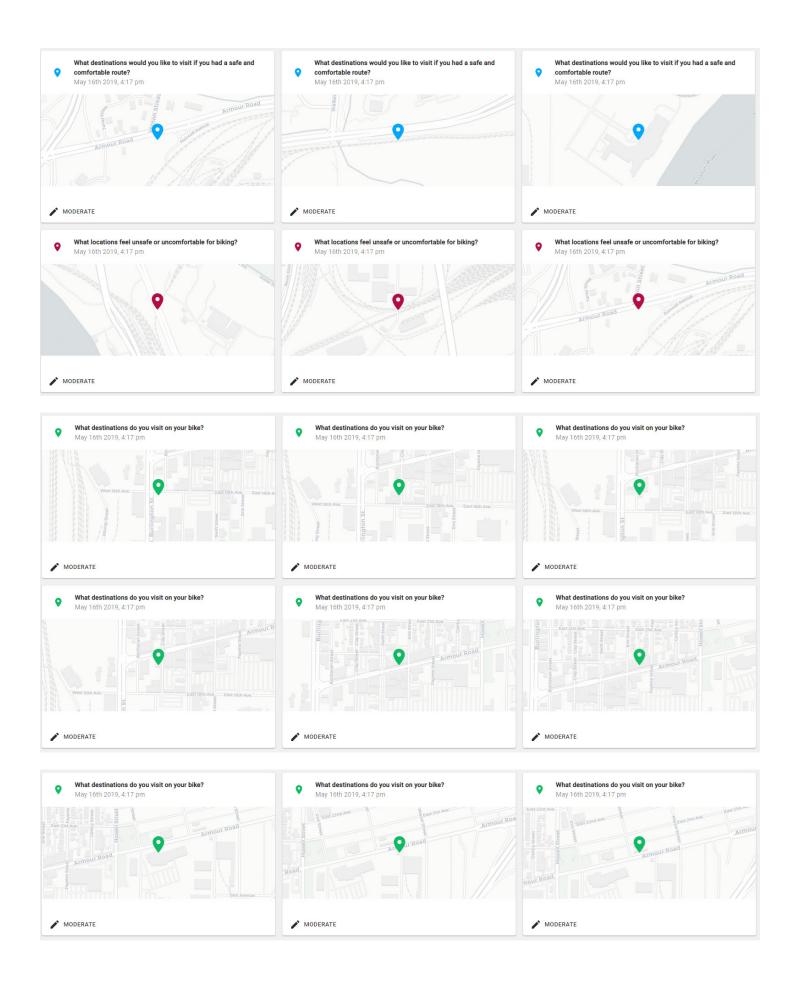


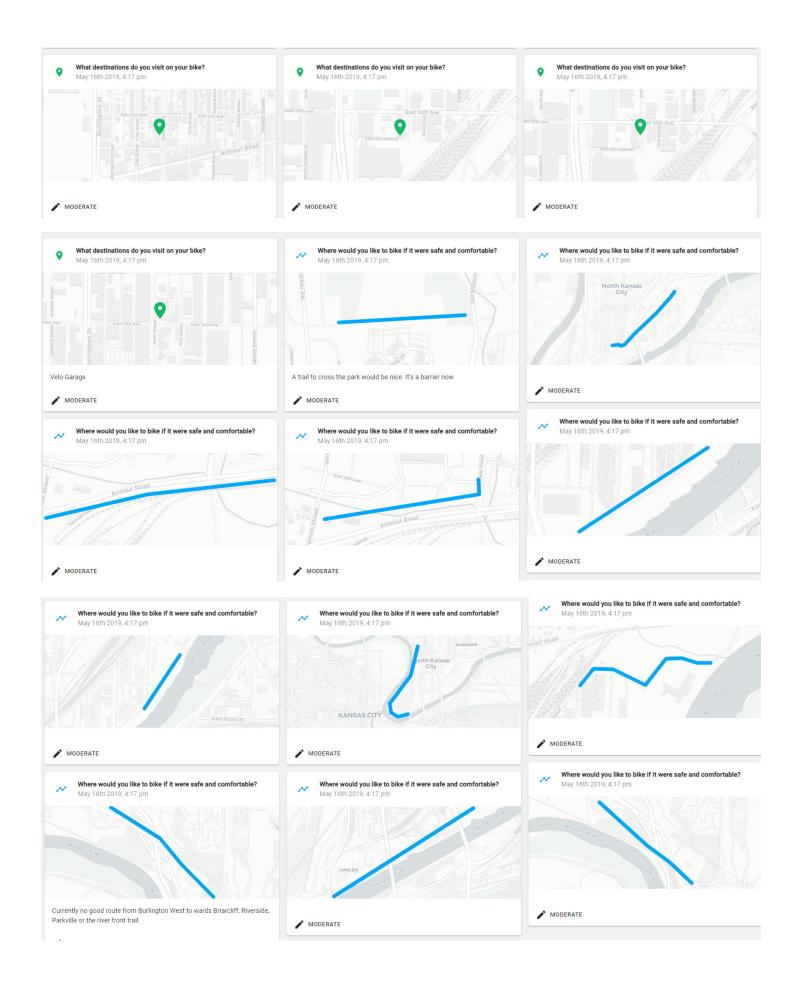


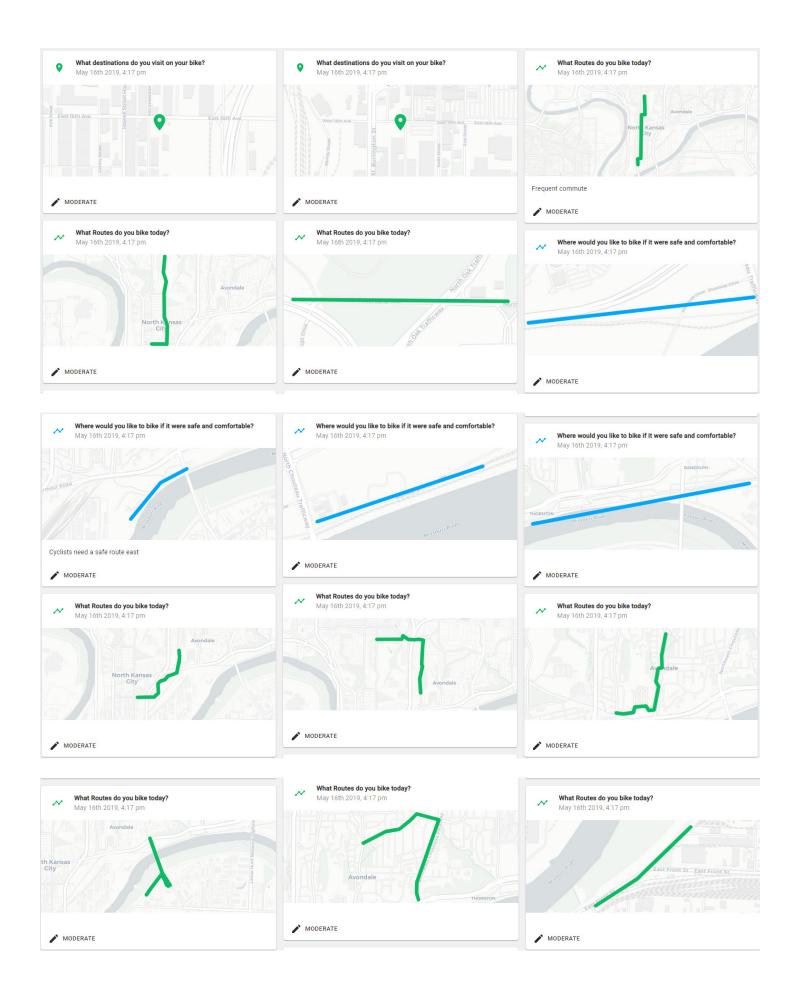


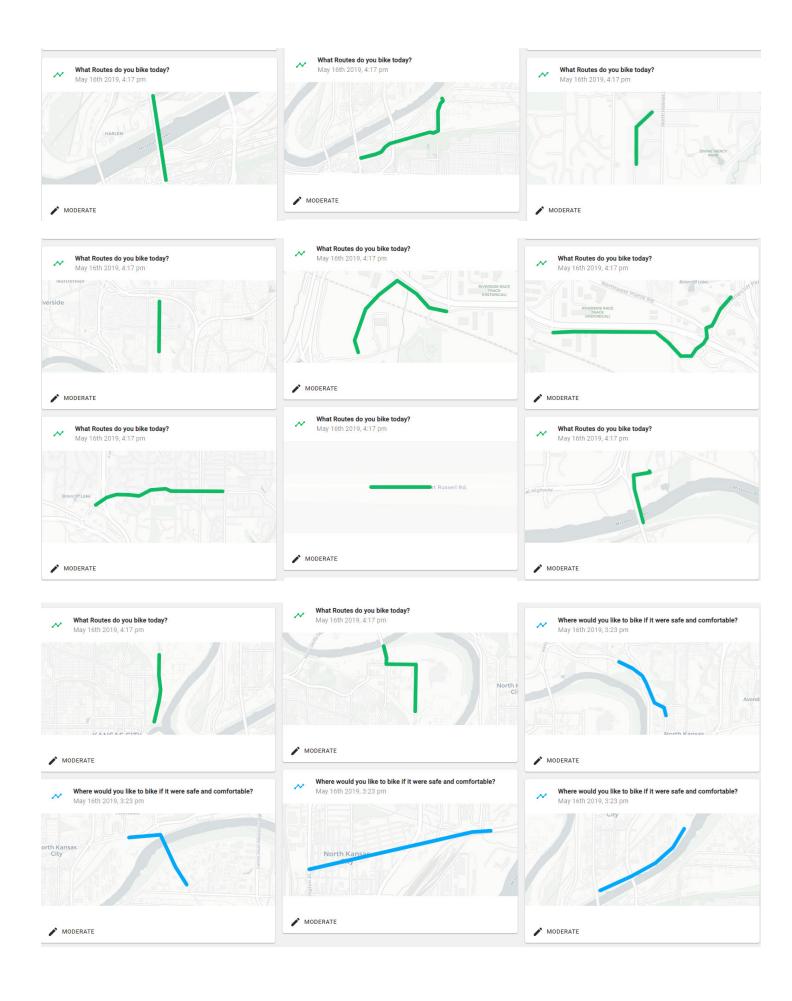


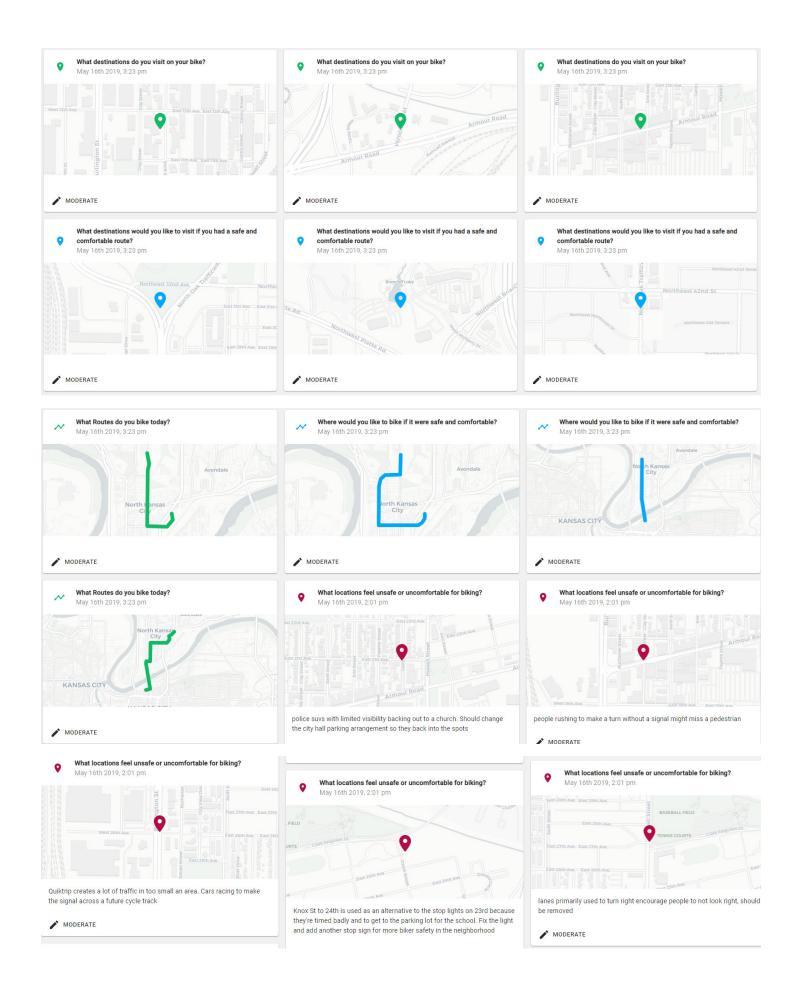


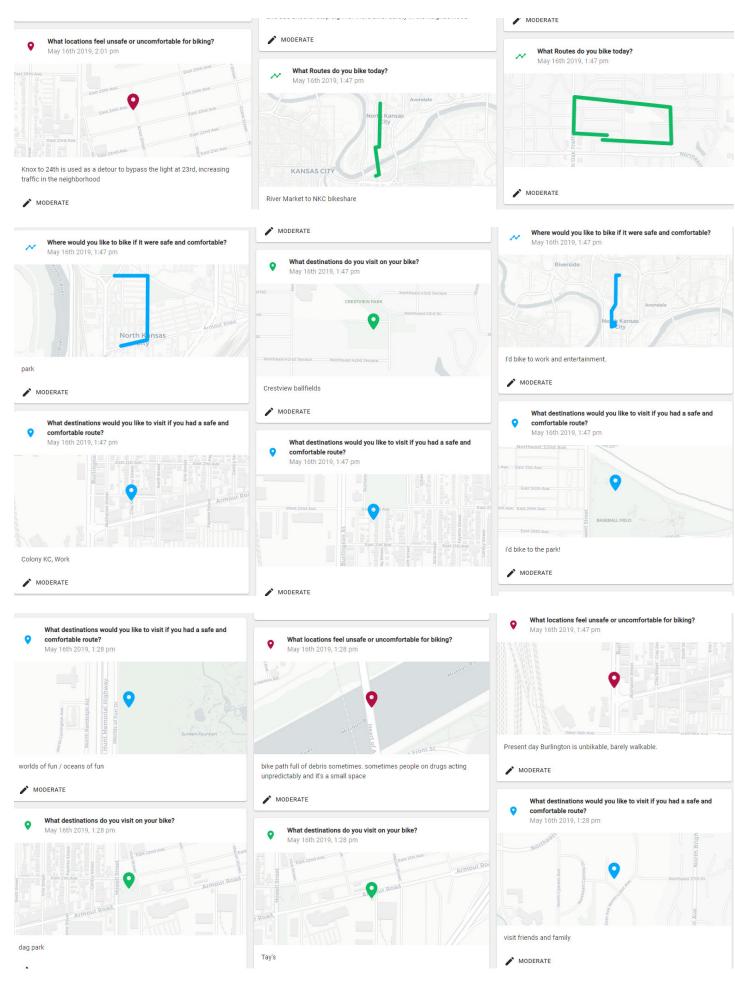


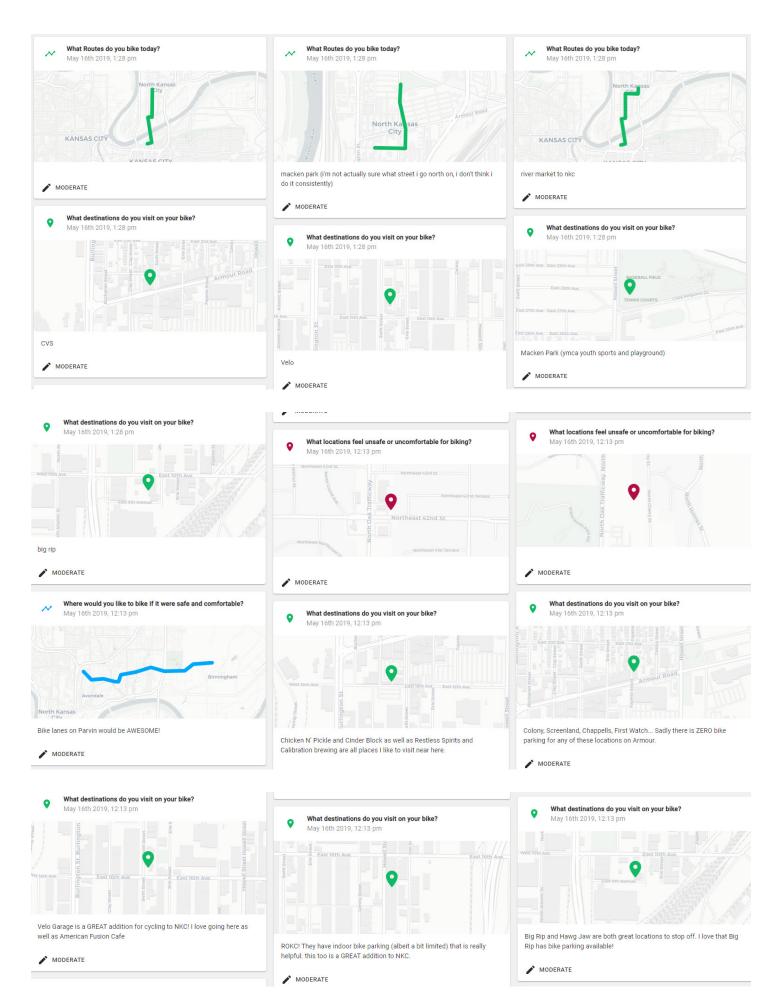


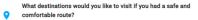








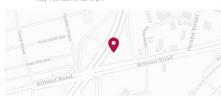






I would love Access to Riverside and Parkville by bike. I think there is great potential to have some sort of a river trail that enables you to get from downtown KC, into NKC and all of it's great places and then on to other parts of the northland. Right now NKC seems to be on an island with no way to really get in or out of it without risk of traveling on very un-safe routes... except the bridge to downtown and River Market. That is pretty great.

What locations feel unsafe or uncomfortable for biking?



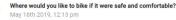
I know MANY cyclists who state this as the most dangerous spot in NKC This entire corridor of Armour and I-29 has a lot of cars changing lanes, a physical barrier that is intended to force cars onto i-29N and enable cars to then later merge onto i-29S makes a tight choke point that a cyclist simply cannot navigate without again, going onto a sidewalk meant for pedestrians walking. And even then, the sidewalks are narrow, full of broken glass and other trash/debris and difficult to navigate on a bike.

## *▶* MODERATE

What Routes do you bike today? May 16th 2019, 12:13 pm



Velo Garage is the best addition to this street!





I would like to see a bike lane on the UP HILL side of N. Oak. If this could extend all the way to Vivion (or further) that would be ideal and it would open up access to a lot of places by bike.

# *▶* MODERATE

Where would you like to bike if it were safe and comfortable?



I'd like to see a bike path option allowing access to Riverside and Parkville. There is a pretty established bike trail in Riverside that currently does not connect down into NKC. This is preventative of riding the route safely.

*▶* MODERATE

### What destinations would you like to visit if you had a safe and comfortable route?



I would like to have a safe route up to chouteau. There are safe bike lanes on chouteau that are relatively inaccessible from any of the feeder roads to

### *▶* MODERATE

What locations feel unsafe or uncomfortable for biking? May 16th 2019, 12:13 pm



The bike lanes on Chouteau end short of the multi-use trail that runs on the north side of i-29. I ride this section frequently and this is where I fear death every time, it is the 2nd worst choke-point I've found as there is no place to ride other than jumping on a sidewalk which, again is technically illegal.

### *▶* MODERATE

What Routes do you bike today?



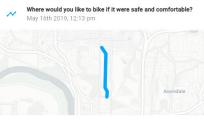
I like to be able to bike to Velo Garage and ROKC as well as some of the Breweries along swift. I love that there are bike lanes for the most part, or traffic is slow/quiet enough that being on a bike is not too concerning.

Where would you like to bike if it were safe and comfortable?



I would love if Armour had a bike lane. OR at a minimum, if there was a safe route for bikes on either the road or a multi-use path through the corridor of i-29. There are sidewalks in very sporadic places and it's technically illegal to ride a bike on a sidewalk anyway.

## *▶* MODERATE



This too would be a viable alternative if there was a shoulder on the road o bike lanes available. I have run this w/ the NKC run group on a number of occasions and have been forced into the ditch due to cars traveling at VERY high speeds around curvy sections. If I was on a bike, I could not safely enter the ditch along this road or Howell... Either way, a shoulder OR a sidewalk/multi-use pedestrian path would be a huge improvement.

# What destinations would you like to visit if you had a safe and

May 16th 2019, 12:13 pm



I would like to be able to easily get up to Vivion Road and access the stores/restaurants along that corridor.

### What destinations would you like to visit if you had a safe and comfortable route?



### 

What locations feel unsafe or uncomfortable for biking?



*▶* MODERATE



I am able to use this corridor since it is not too heavily driven on by cars

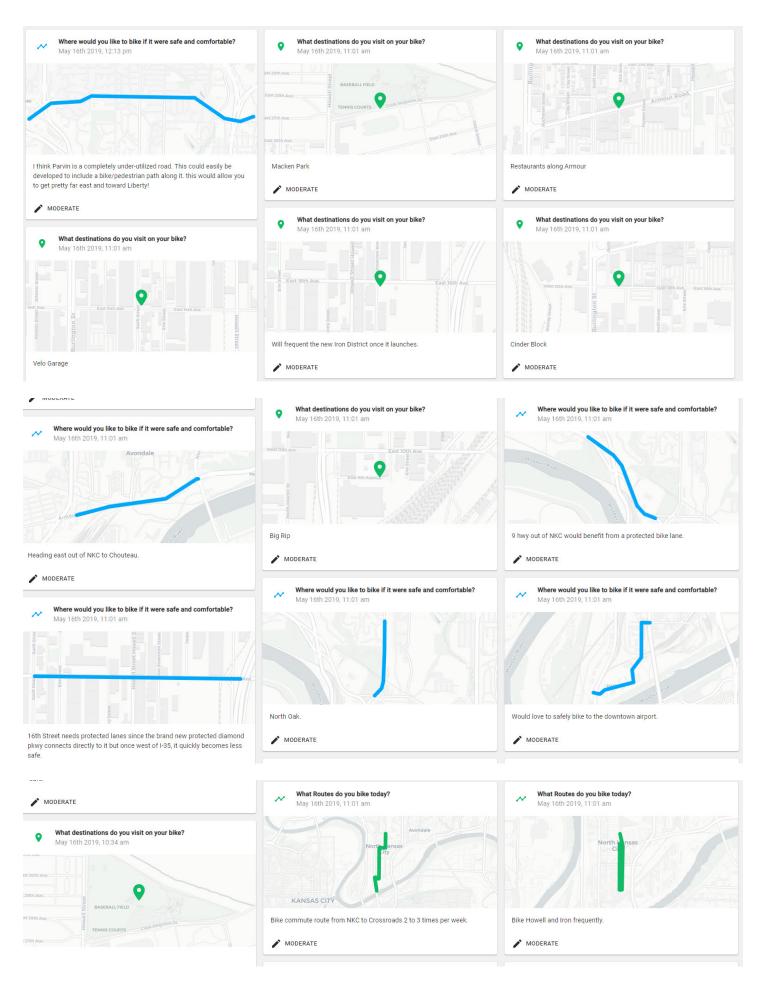
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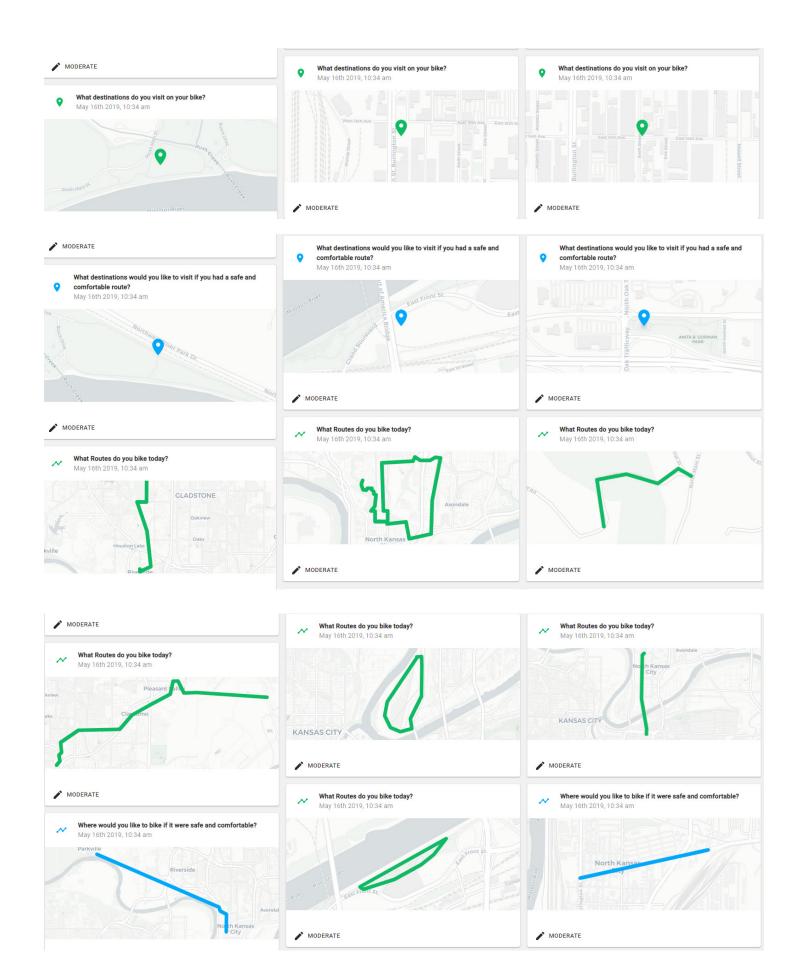
Where would you like to bike if it were safe and comfortable?

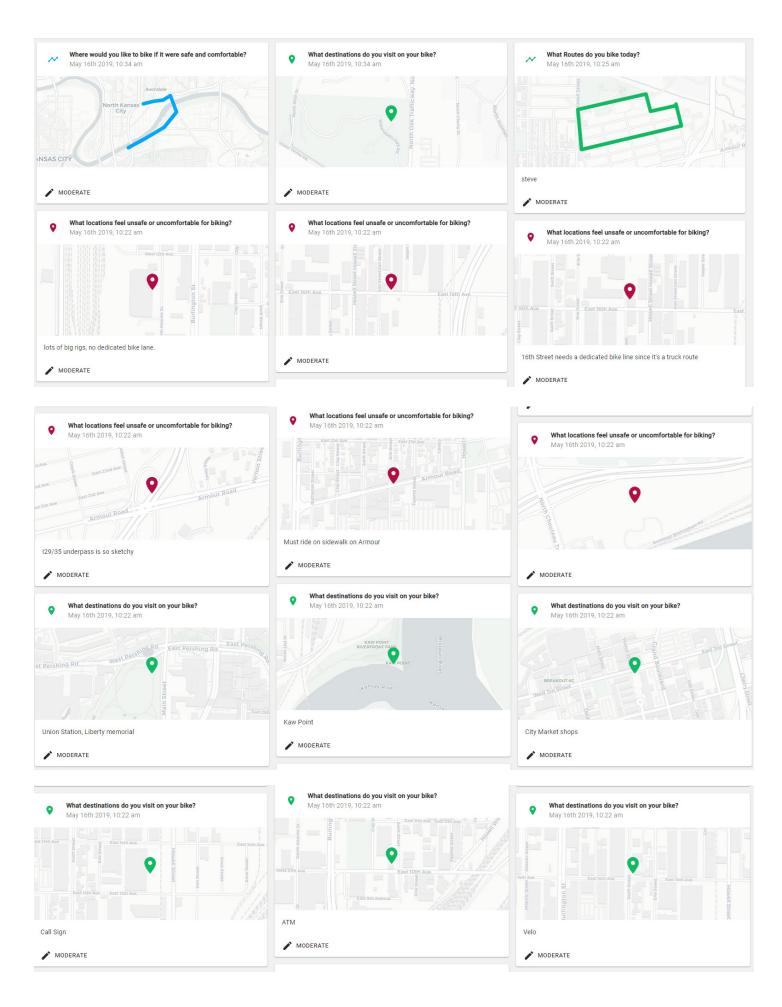


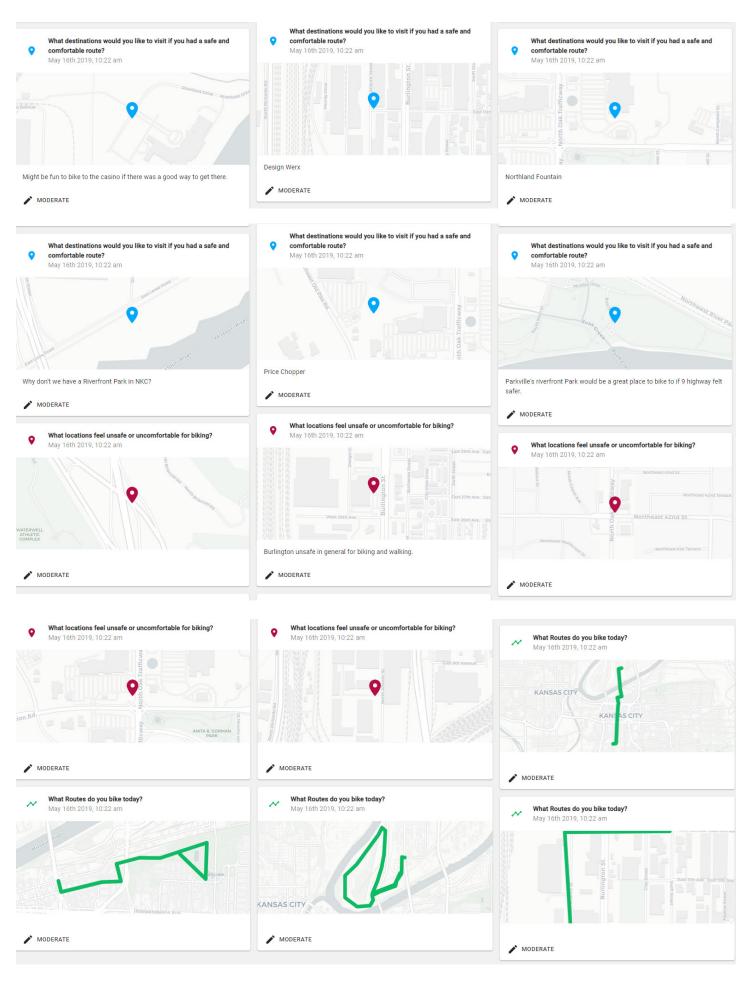
This would be an OK alternative route if N. Oak was not a viable option for bike lanes.

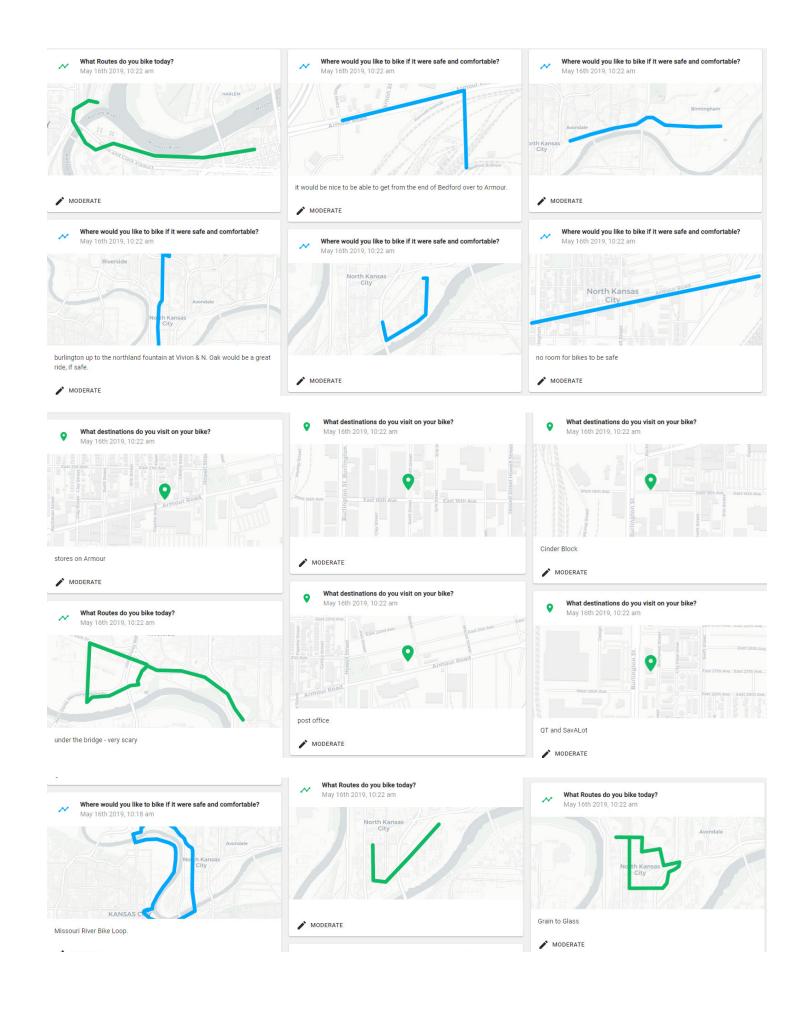
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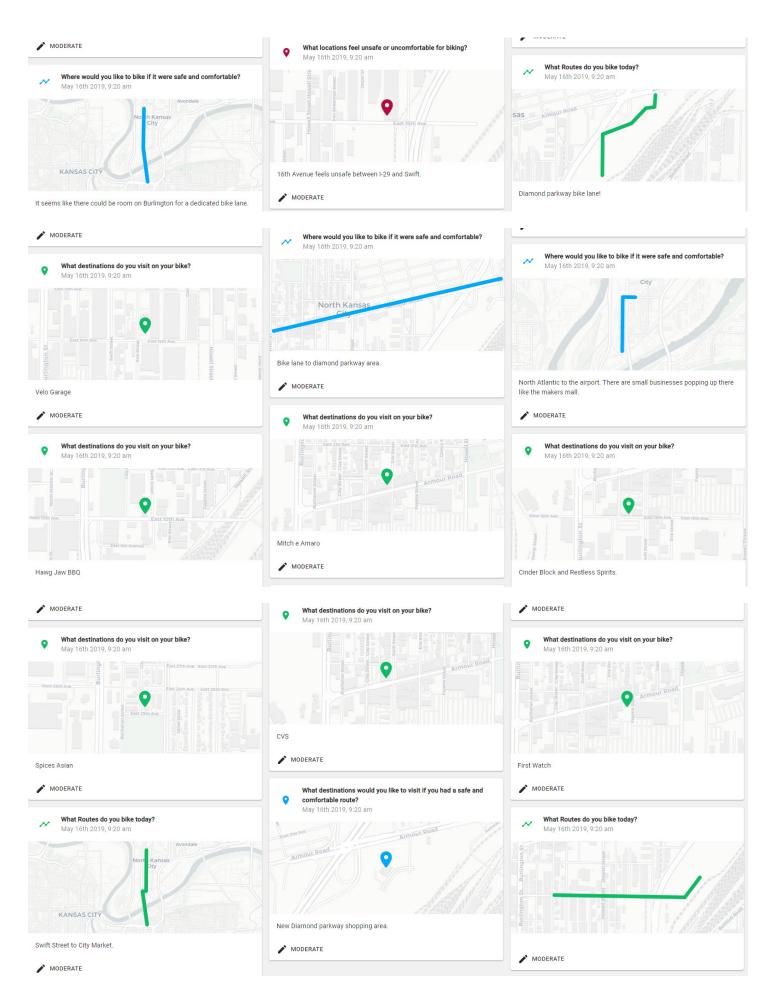


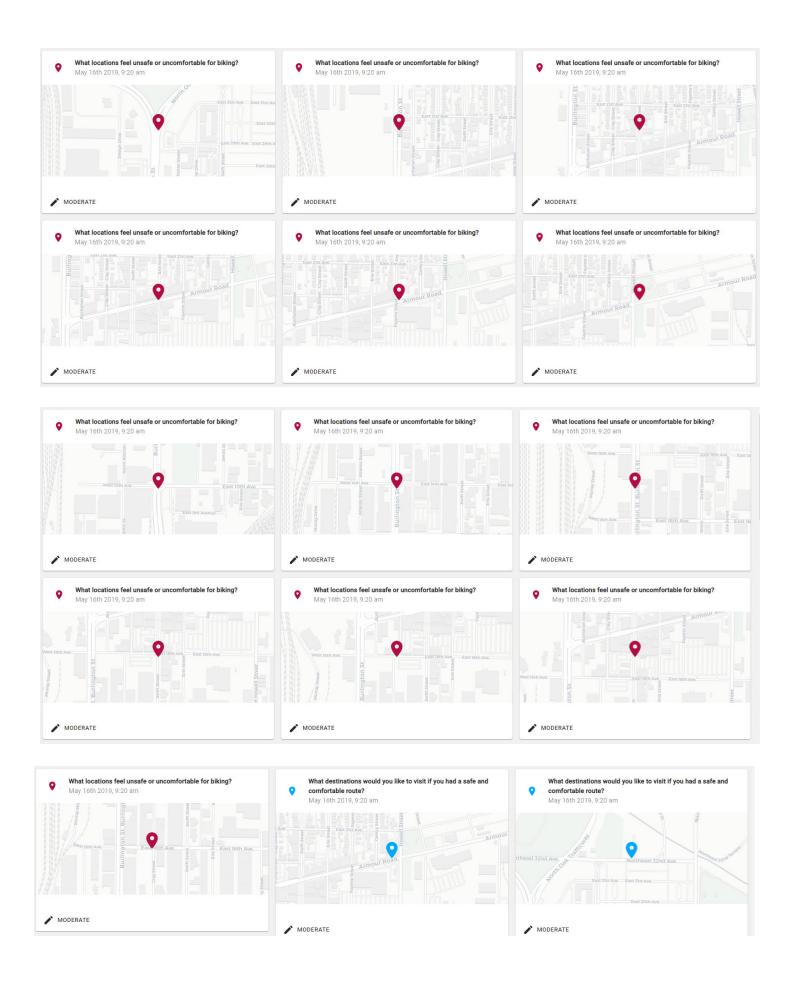


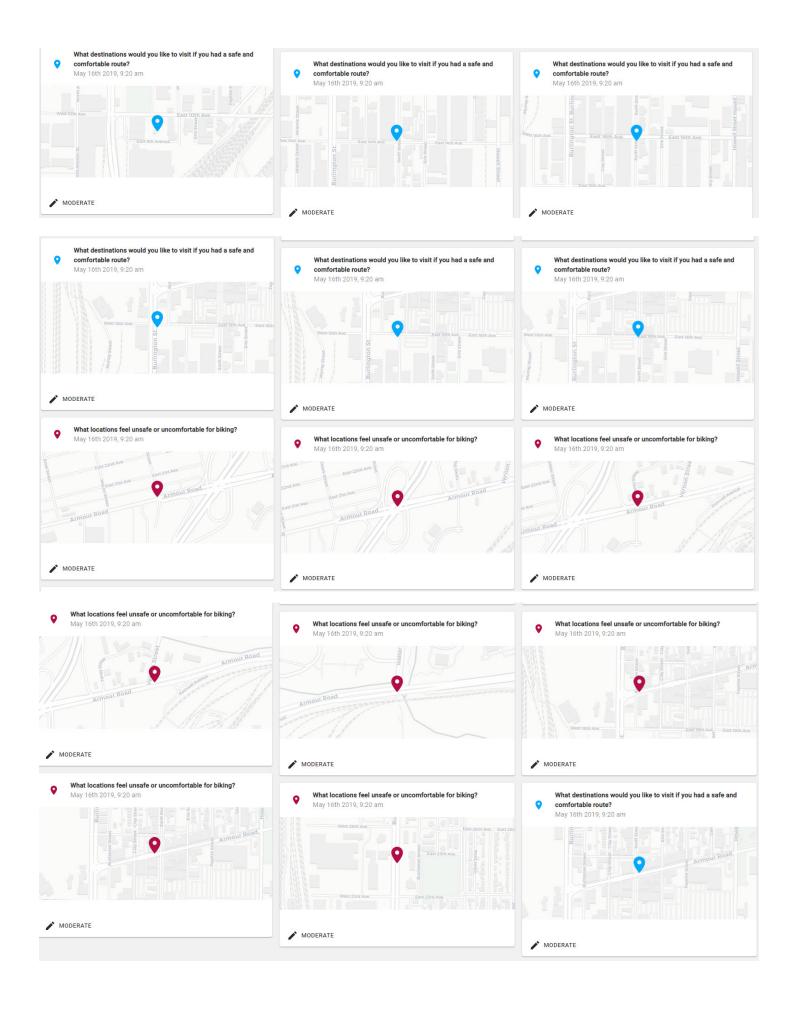


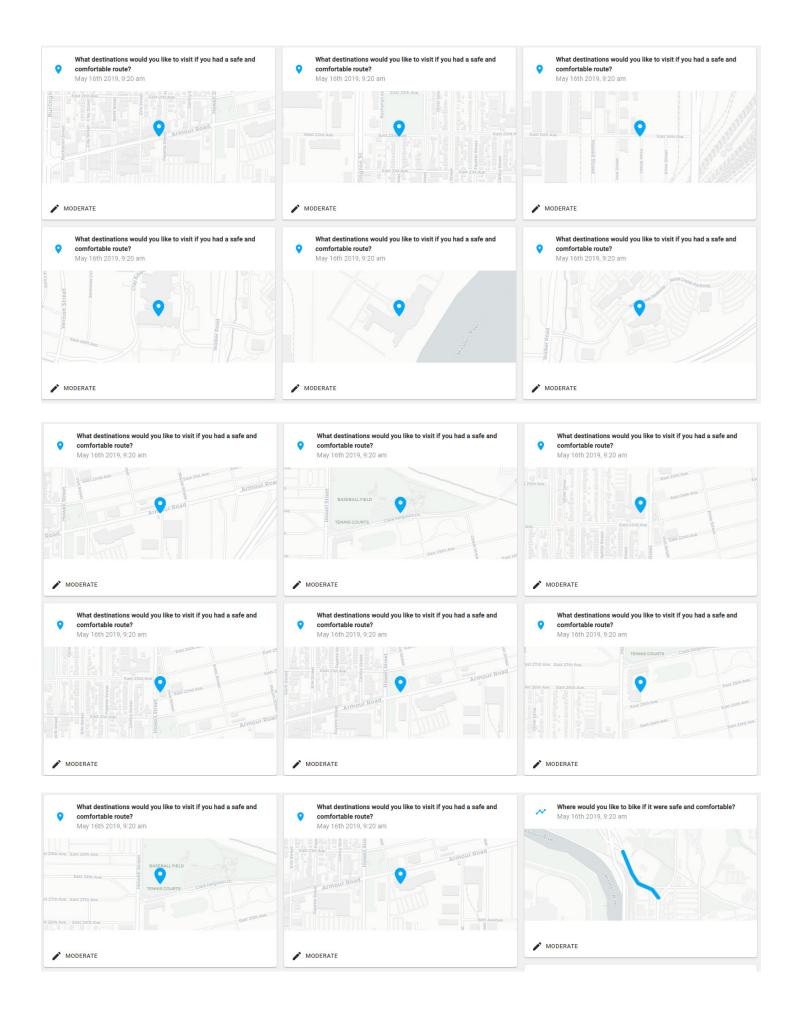


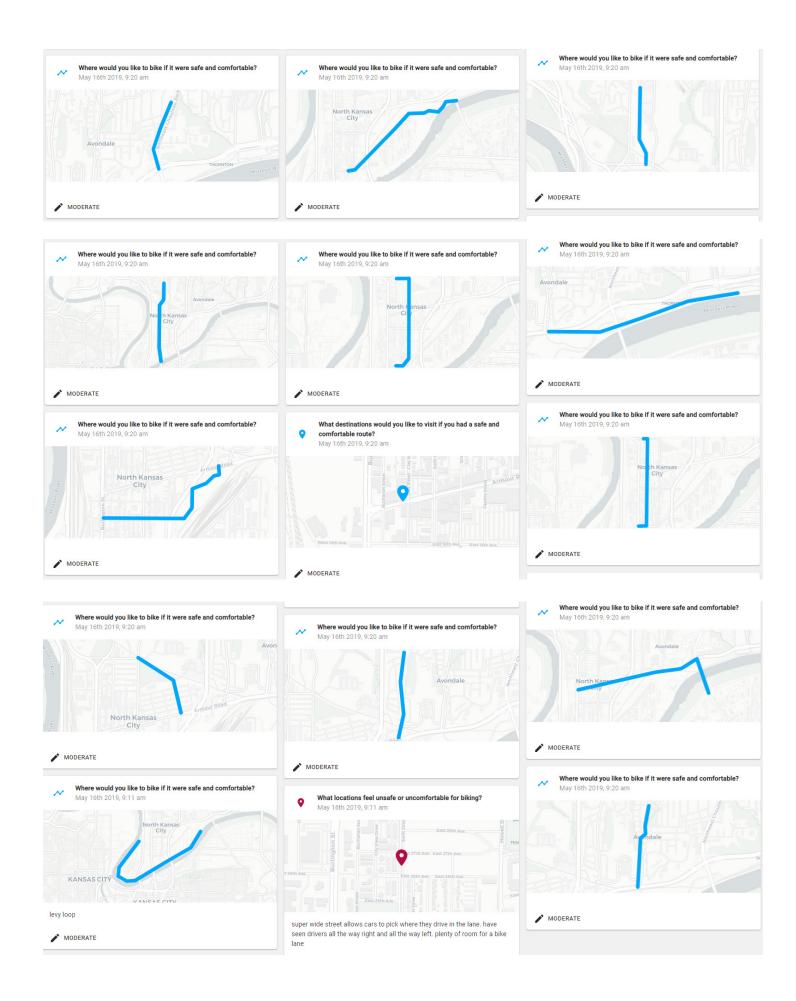


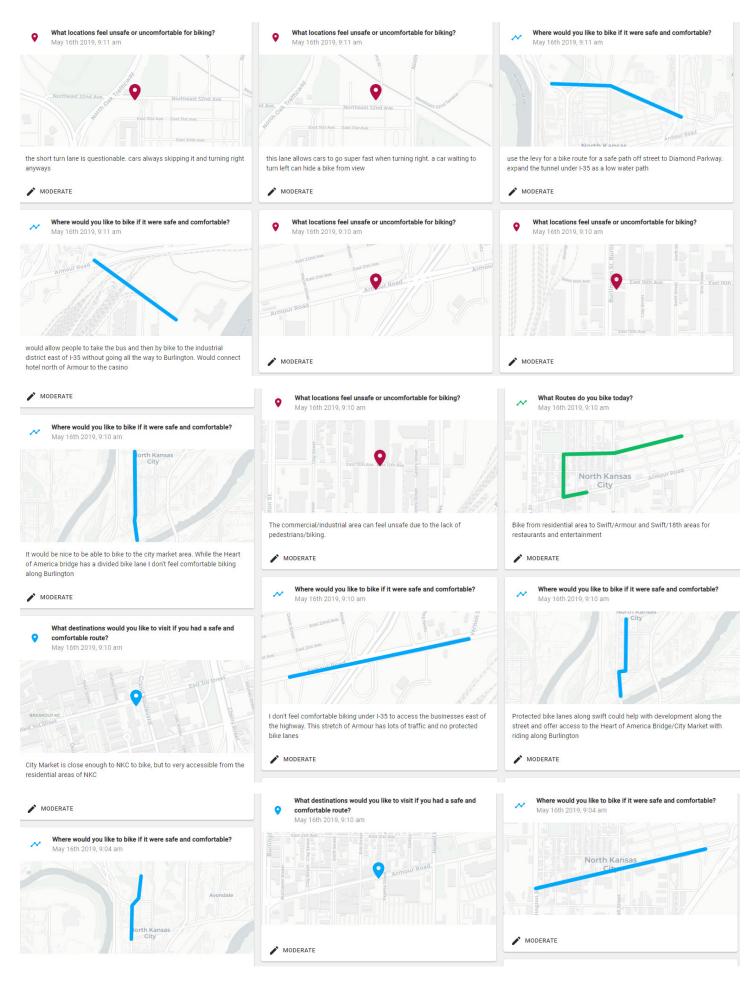


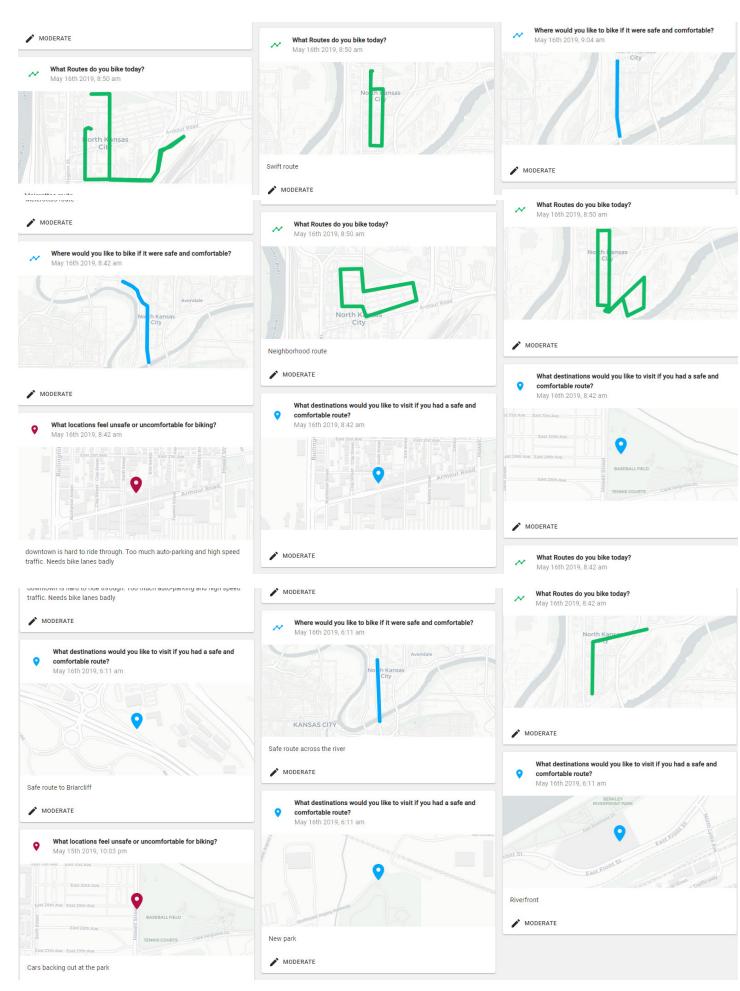


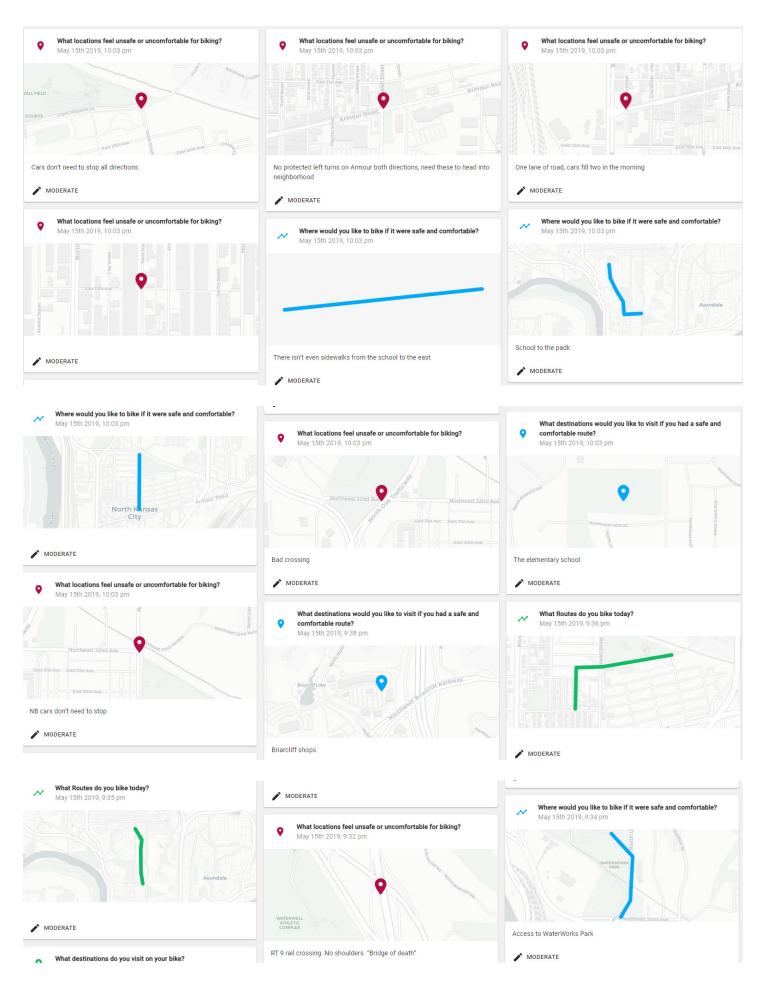


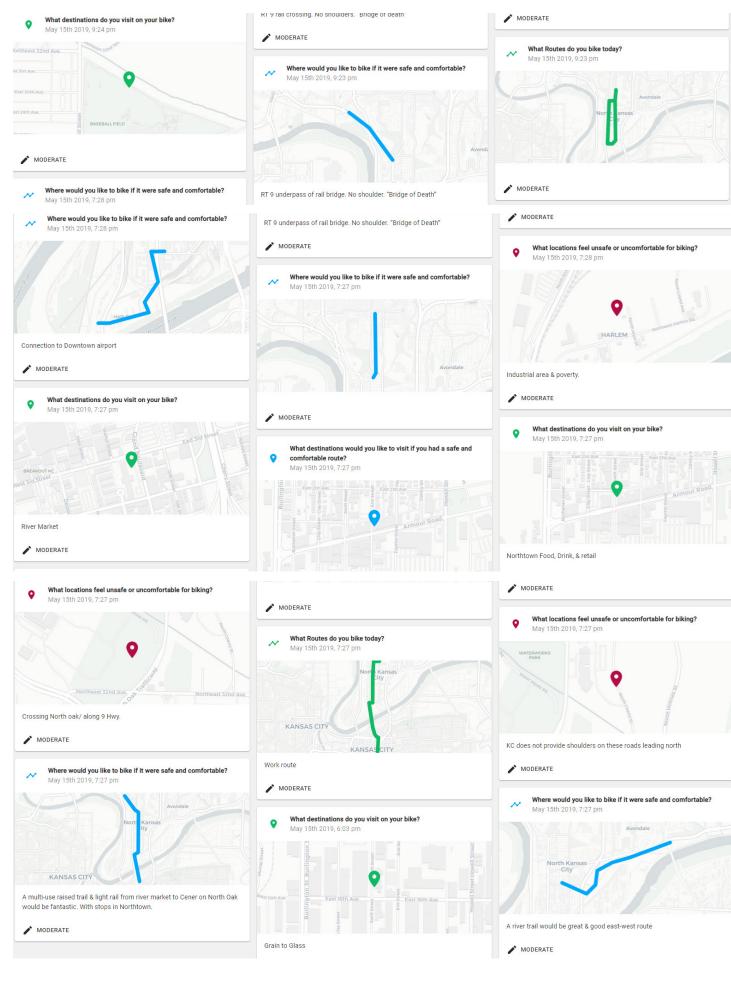


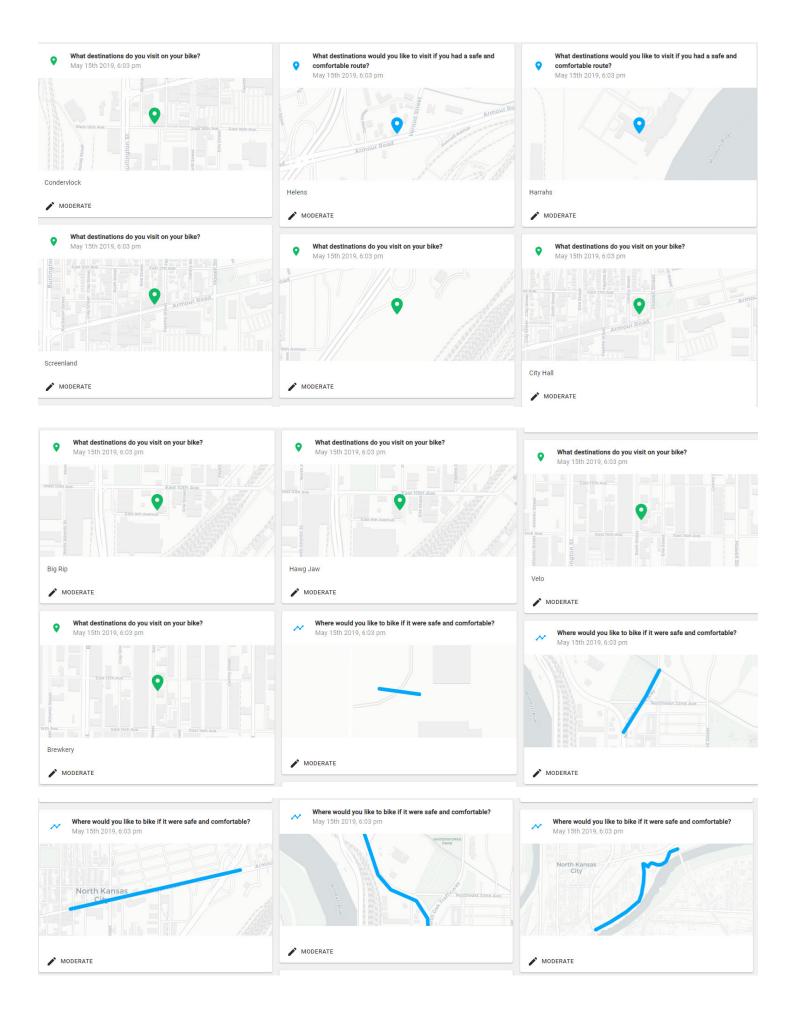


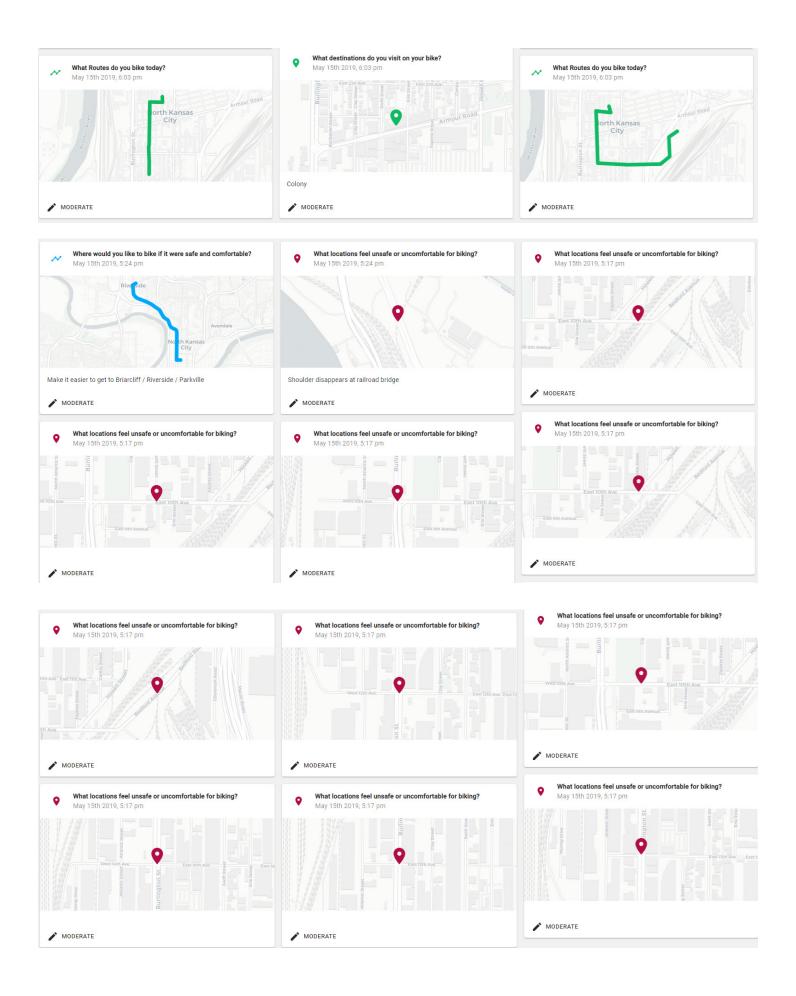


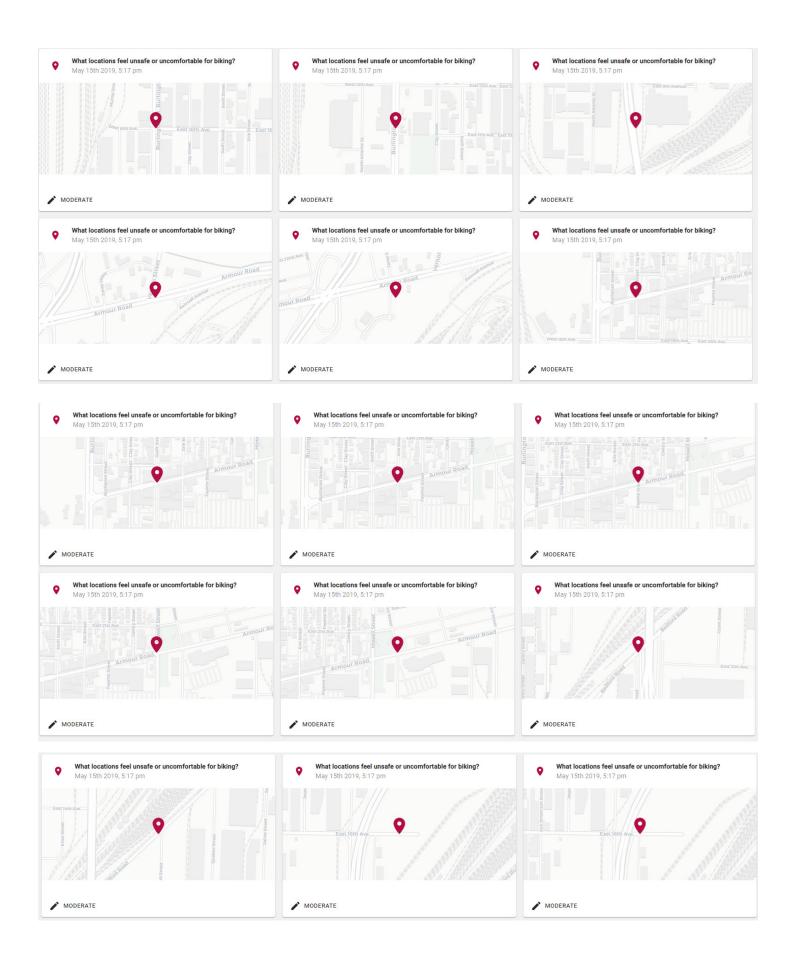


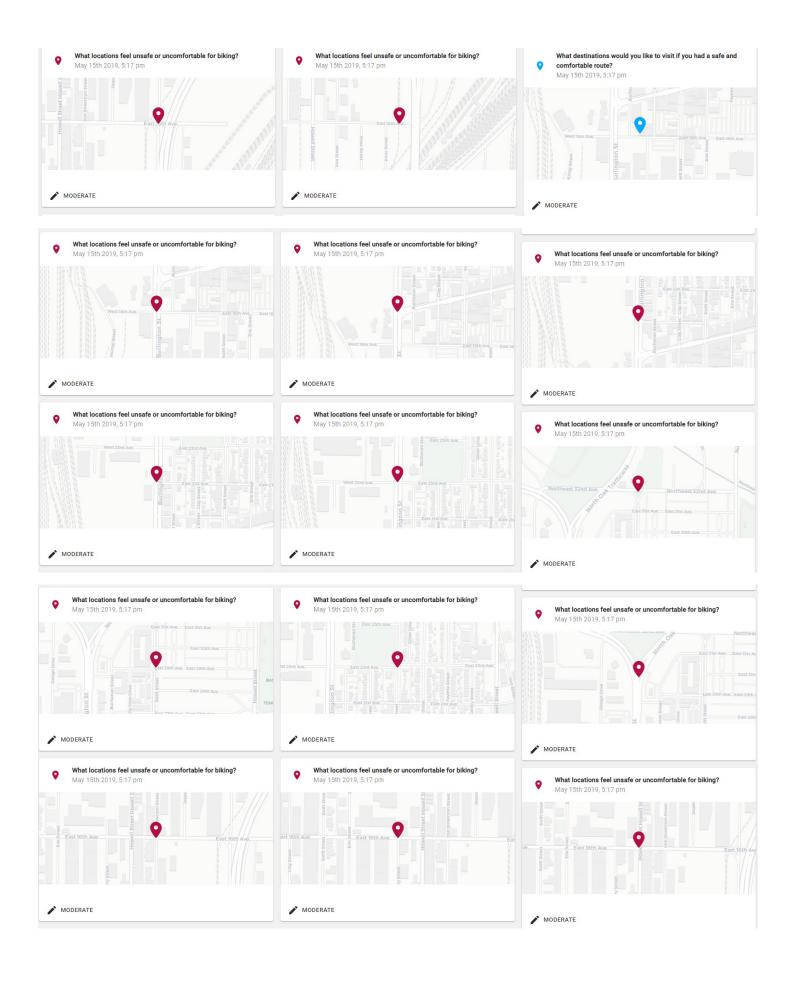


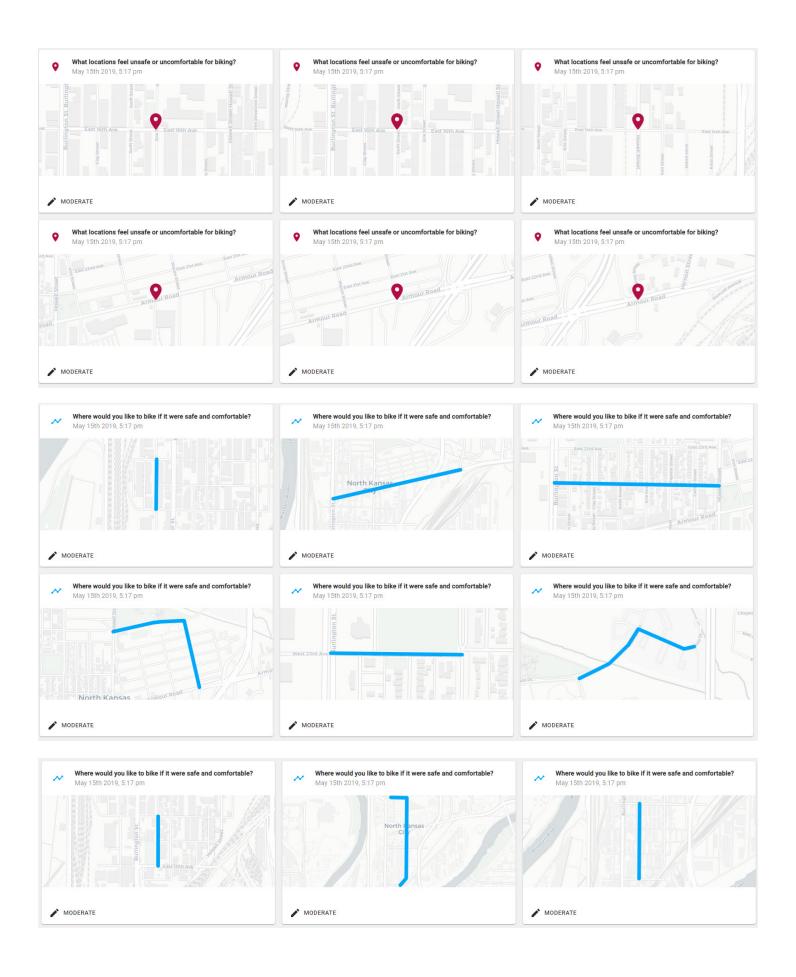


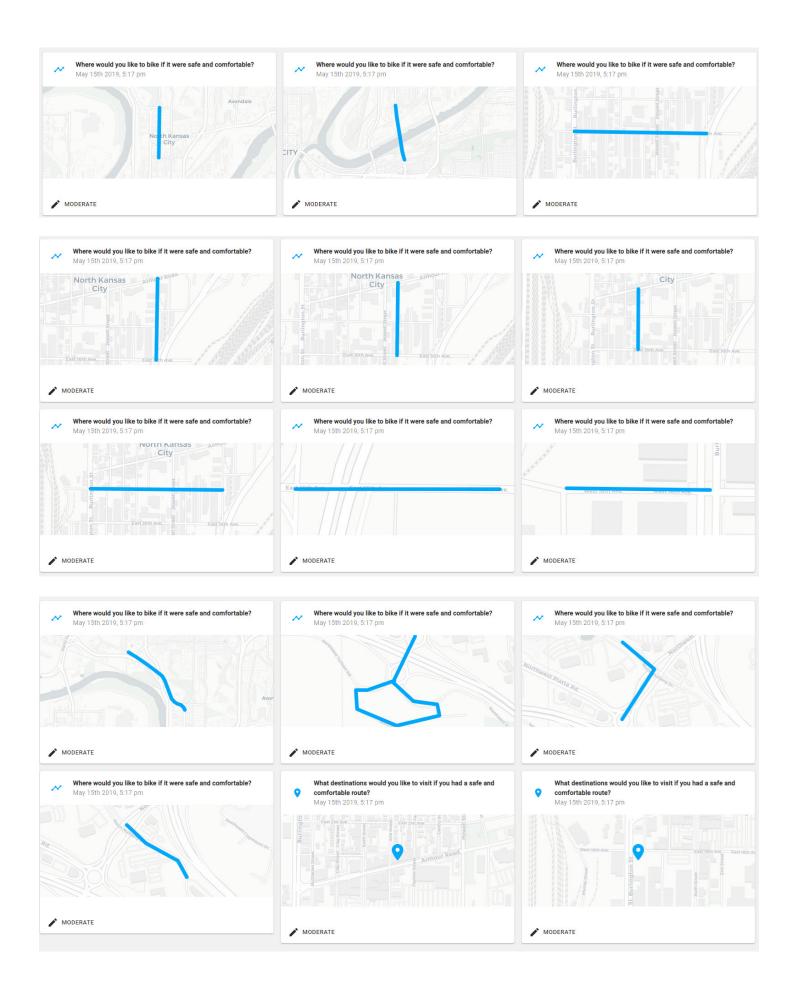


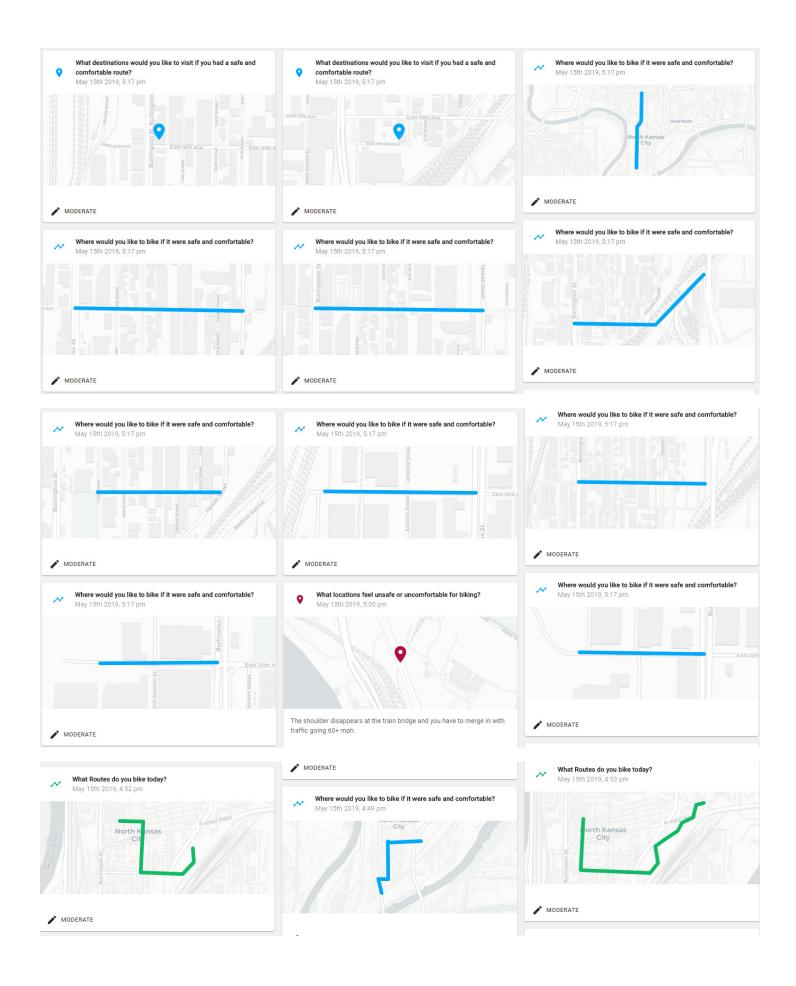


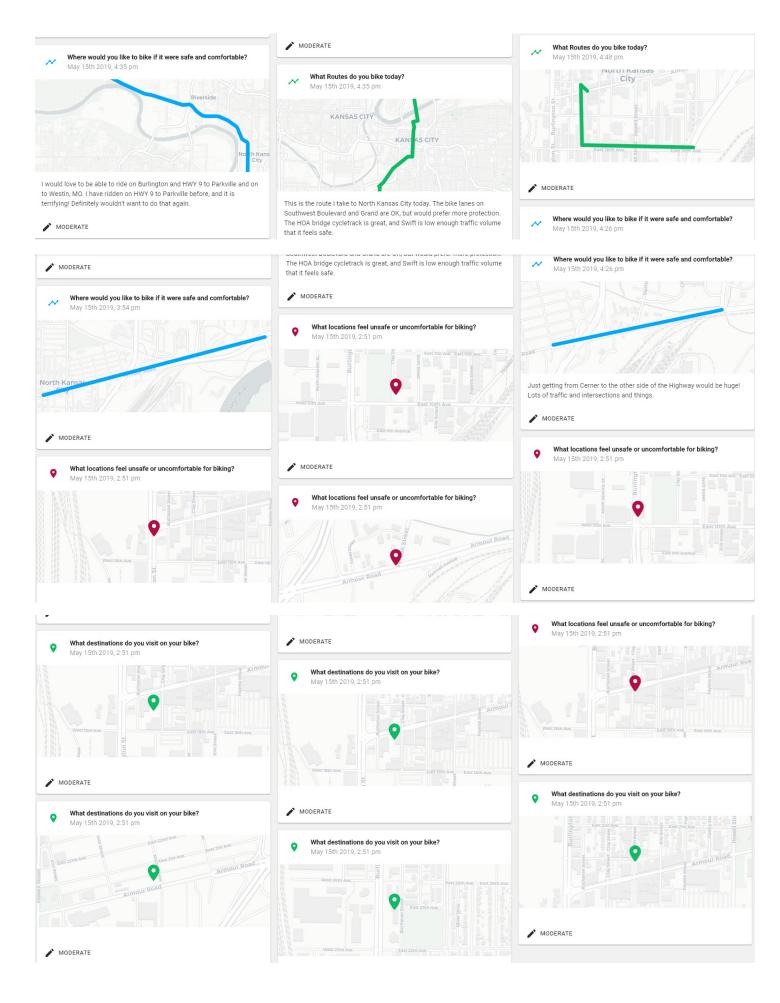


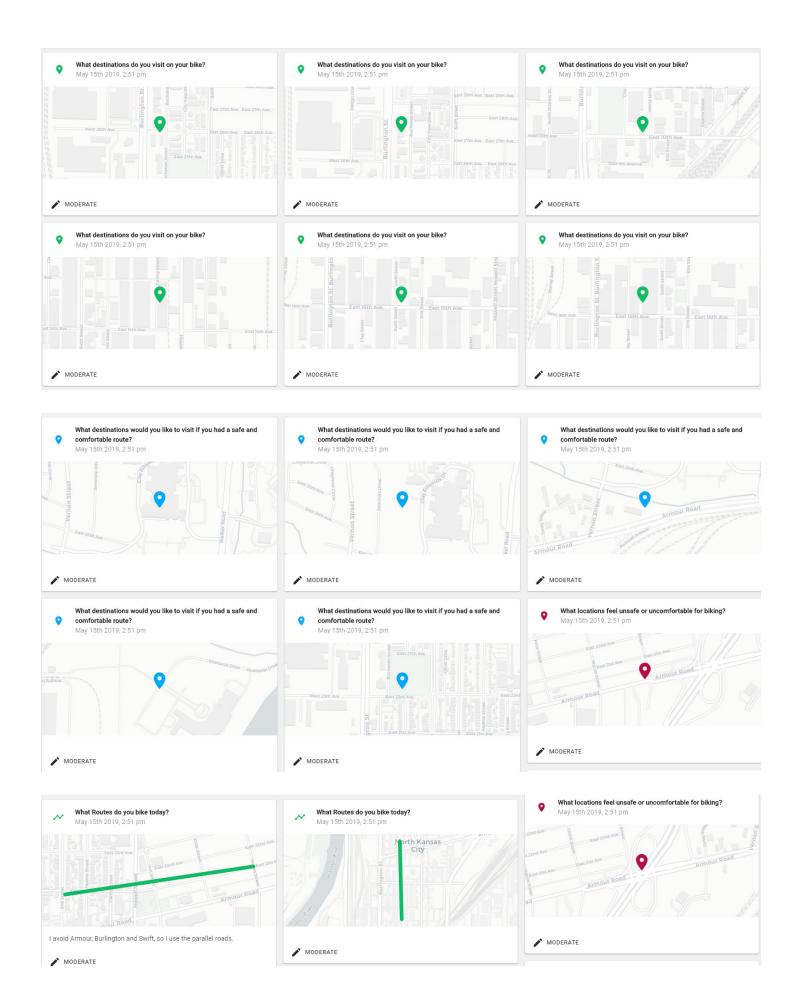


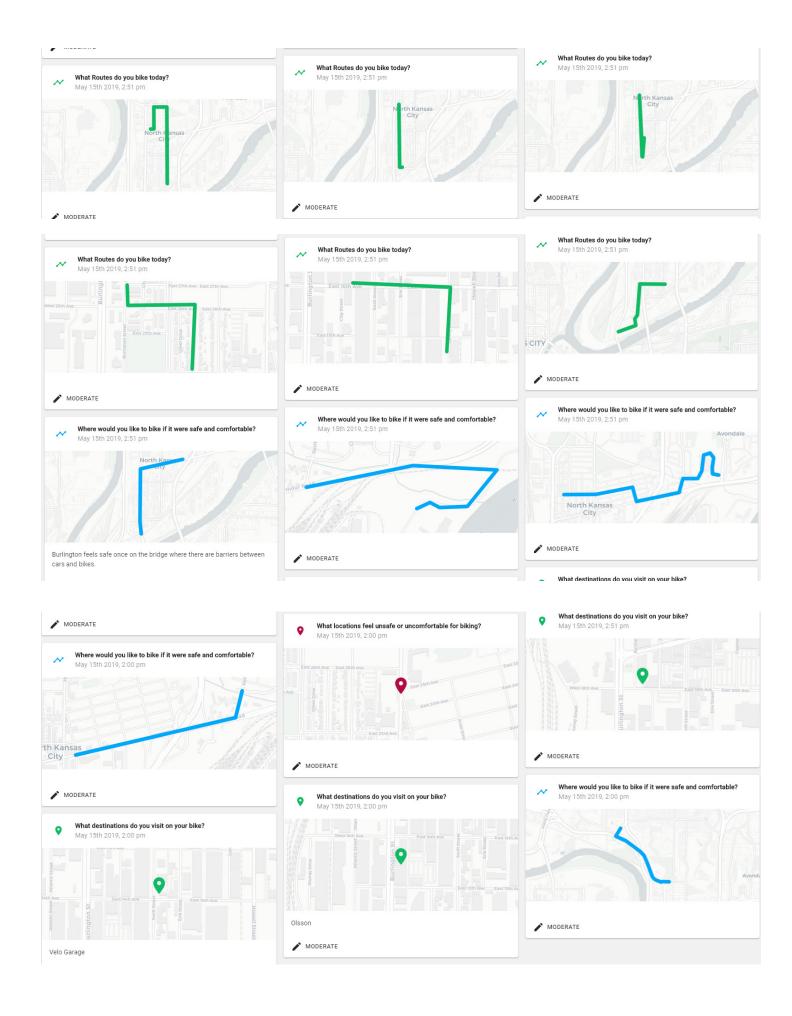


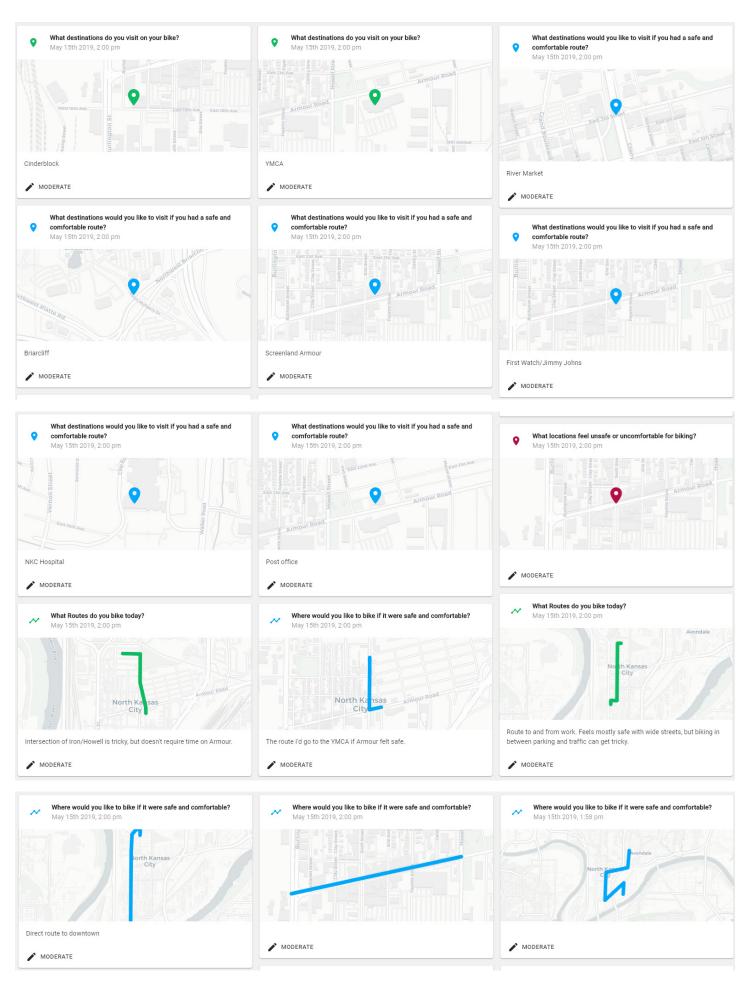


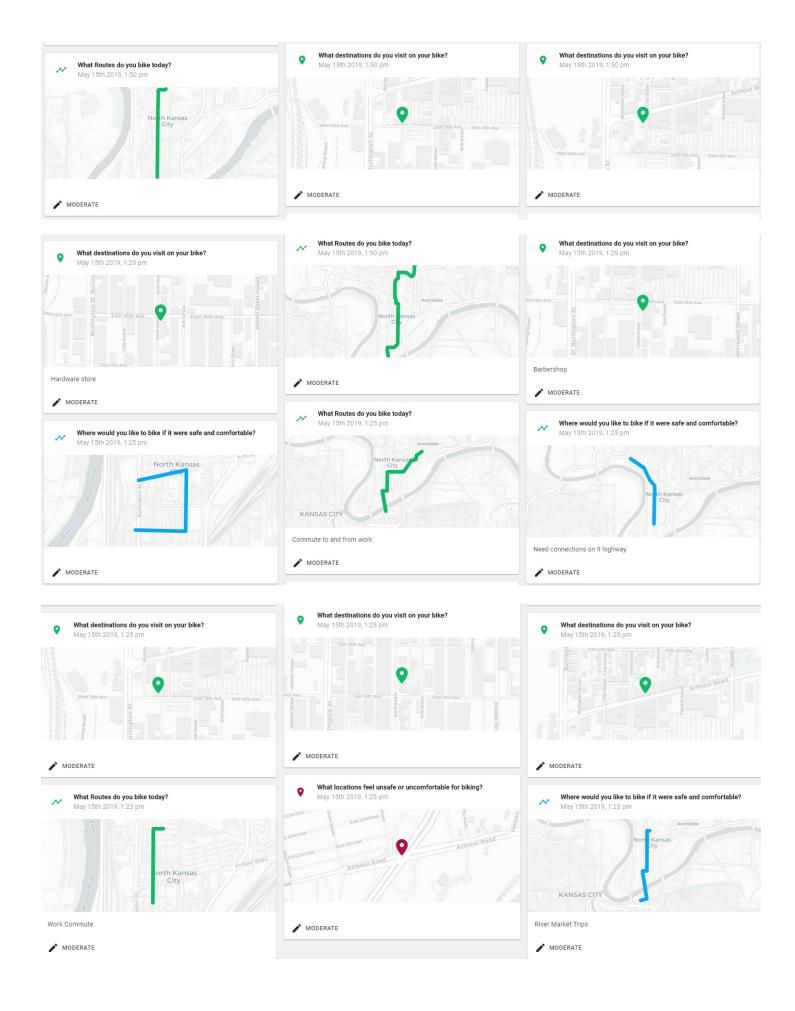


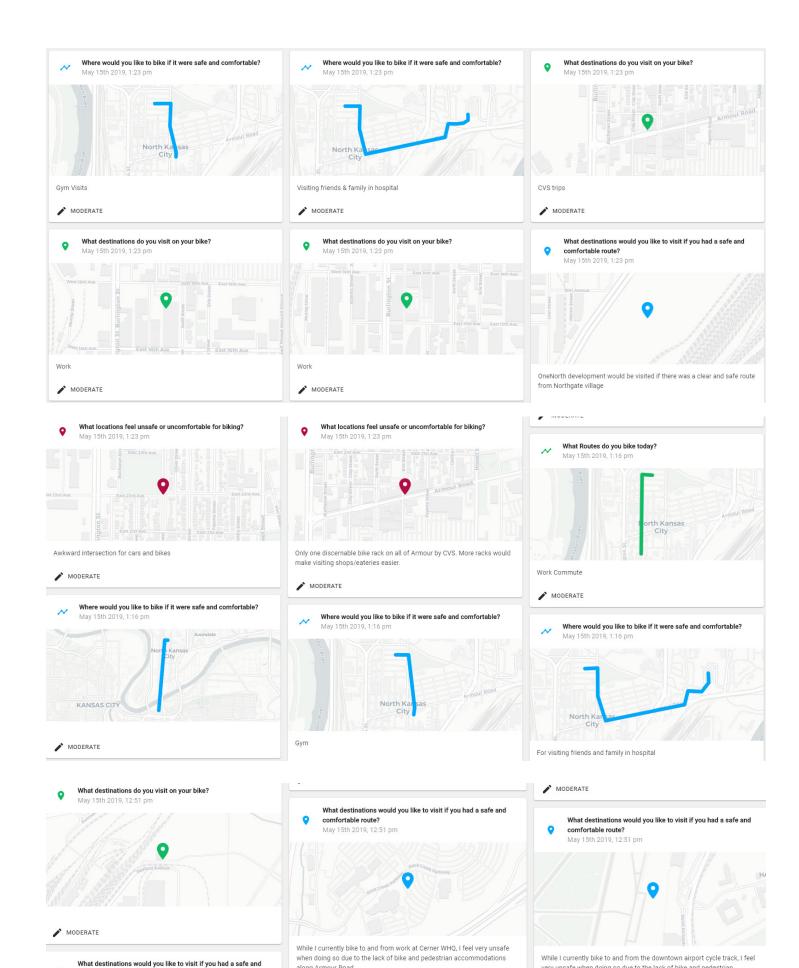












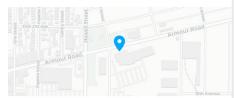
comfortable route?

May 15th 2019, 12:51 nm

very unsafe when doing so due to the lack of bike and pedestrian

accommodations along Swift and Burlington.

What destinations would you like to visit if you had a safe and comfortable route?



While I currently bike to and from the NKC YMCA, I feel very unsafe when doing so due to the lack of bike and pedestrian accommodations along Armour Road.

What locations feel unsafe or uncomfortable for biking?



This intersection is difficult to navigate on a bike when cycling to/from the downtown airport cycle track, over the hearth of America bridge and along

What locations feel unsafe or uncomfortable for biking? May 15th 2019, 12:51 pm



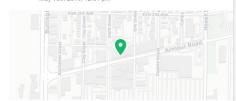
*▶* MODERATE

What locations feel unsafe or uncomfortable for biking?



This intersection is difficult to navigate on a bike when cycling to/from the downtown airport cycle track, over the hearth of America bridge and along burlington

What destinations do you visit on your bike?



Beerded Man Kitchen

*▶* MODERATE

when doing so due to the lack of bike and pedestrian accommodations

What destinations would you like to visit if you had a safe and comfortable route?



While I currently bike to and from the Line creek trail connector and Riverfront trall in Riverside, I feel very unsafe when doing so due to the lack of bike and pedestrian accommodations along Burlington/Highway 9 north

*▶* MODERATE

May 15th 2019, 12:51 pm



This intersection is difficult to navigate on a bike when cycling to/from

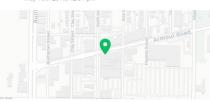
What locations feel unsafe or uncomfortable for biking? May 15th 2019, 12:51 pm



This intersection is difficult to navigate on a bike when cycling to/from Cerner WHQ. It's very dangerous and has no bike or pedestrian accommodations at all.

*▶* MODERATE

What destinations do you visit on your bike?



Aunt Mary's Cookies

What destinations do you visit on your bike?



While I currently bike to and from the downtown airport cycle track, I feel very unsafe when doing so due to the lack of bike and pedestrian accommodations along Swift and Burlington.

*▶* MODERATE

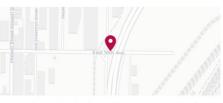
What locations feel unsafe or uncomfortable for biking?



This intersection is difficult to navigate on a bike when cycling to/from the downtown airport cycle track, over the hearth of America bridge and along burlington

*▶* MODERATE

What locations feel unsafe or uncomfortable for biking?



I love cycling on Diamond Parkway and then connecting to Swift and Burlington along 16th but this section of 16th through Swift can be tricky to

*▶* MODERATE

What locations feel unsafe or uncomfortable for biking? May 15th 2019, 12:51 pm



This intersection is difficult to navigate on a bike when cycling to/from Cerner WHQ. It's very dangerous and has no bike or pedestrian accommodations at all.

*▶* MODERATE

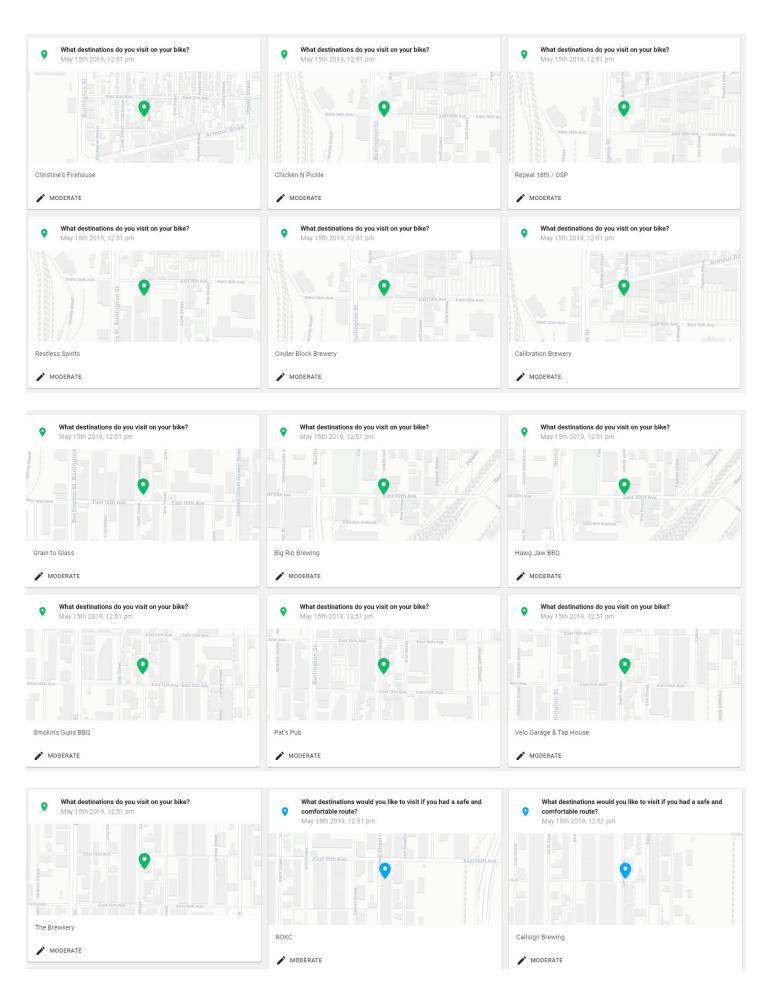
What destinations do you visit on your bike?

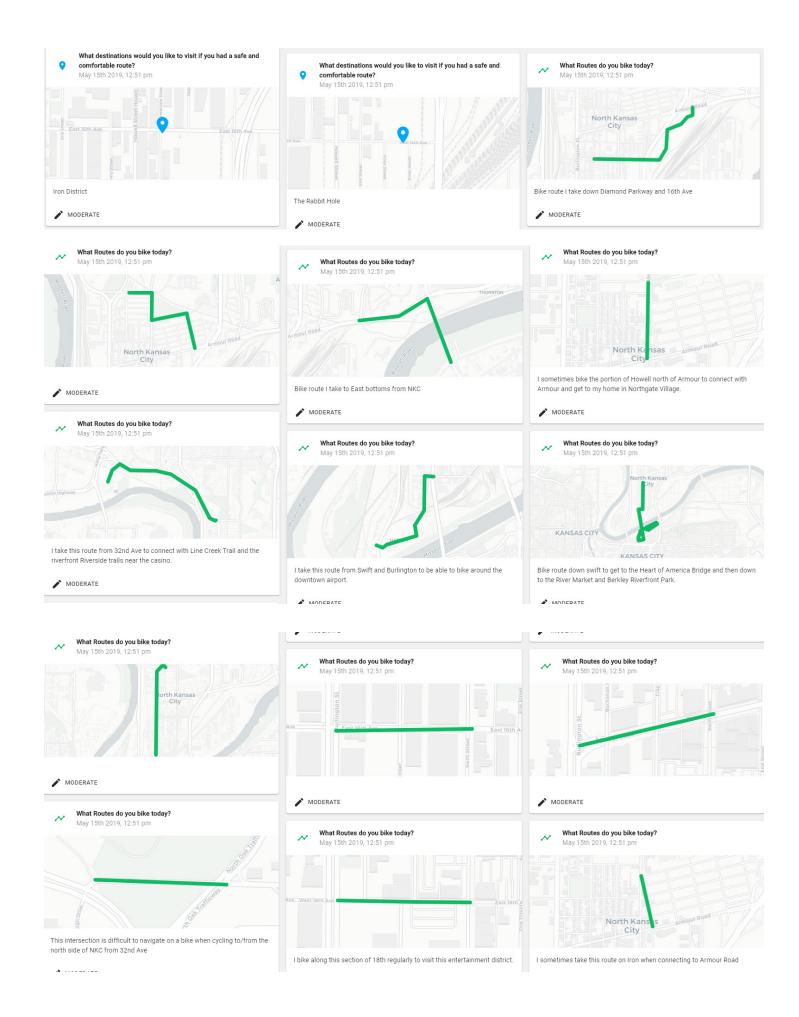


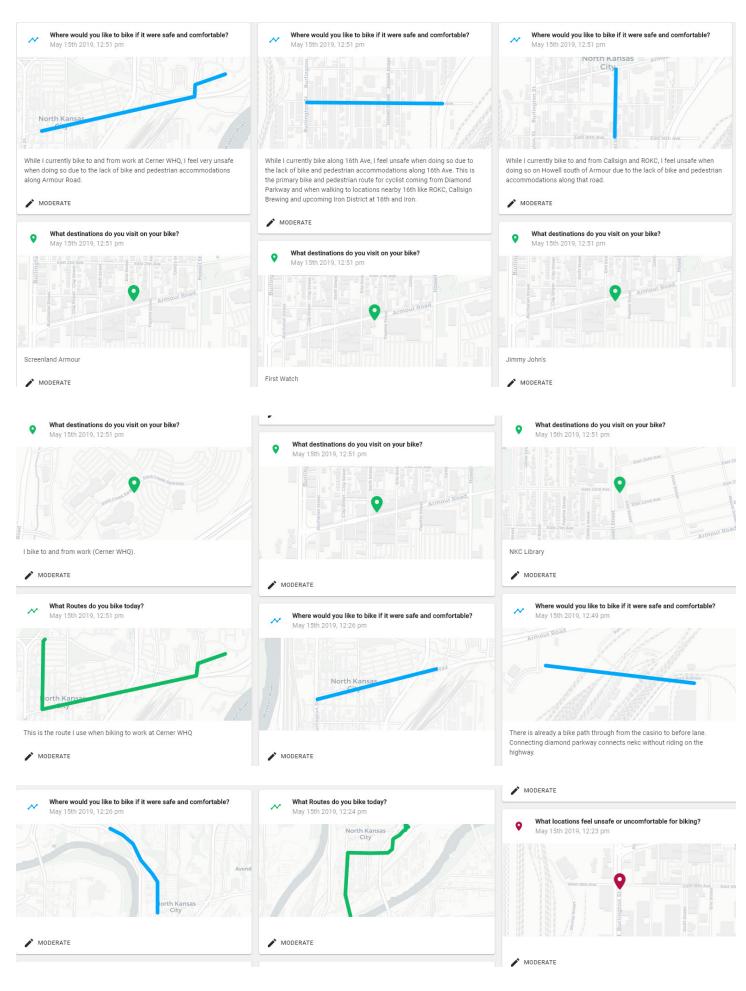
Mitch e Amaro

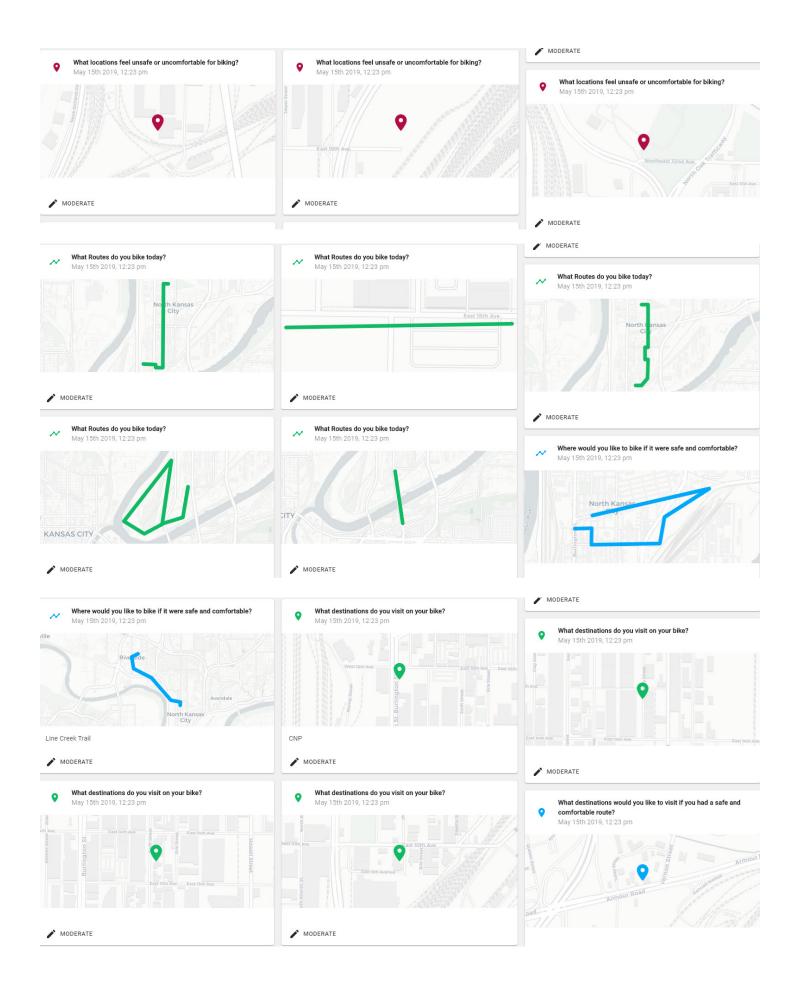
What destinations do you visit on your bike?

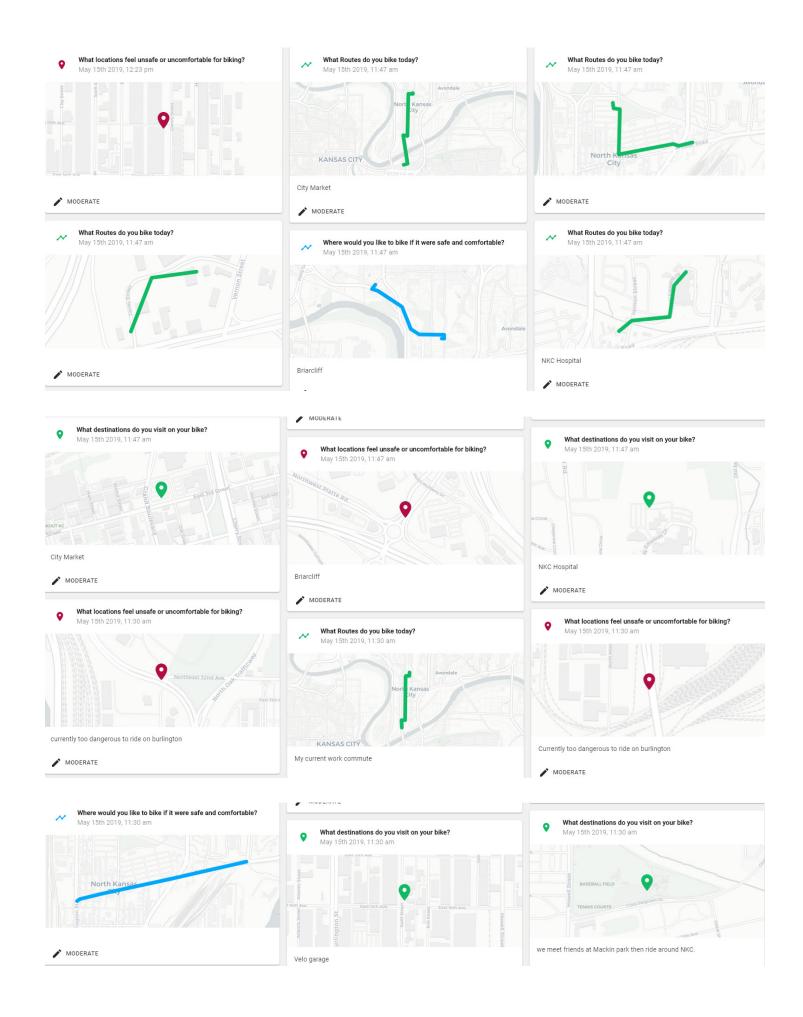


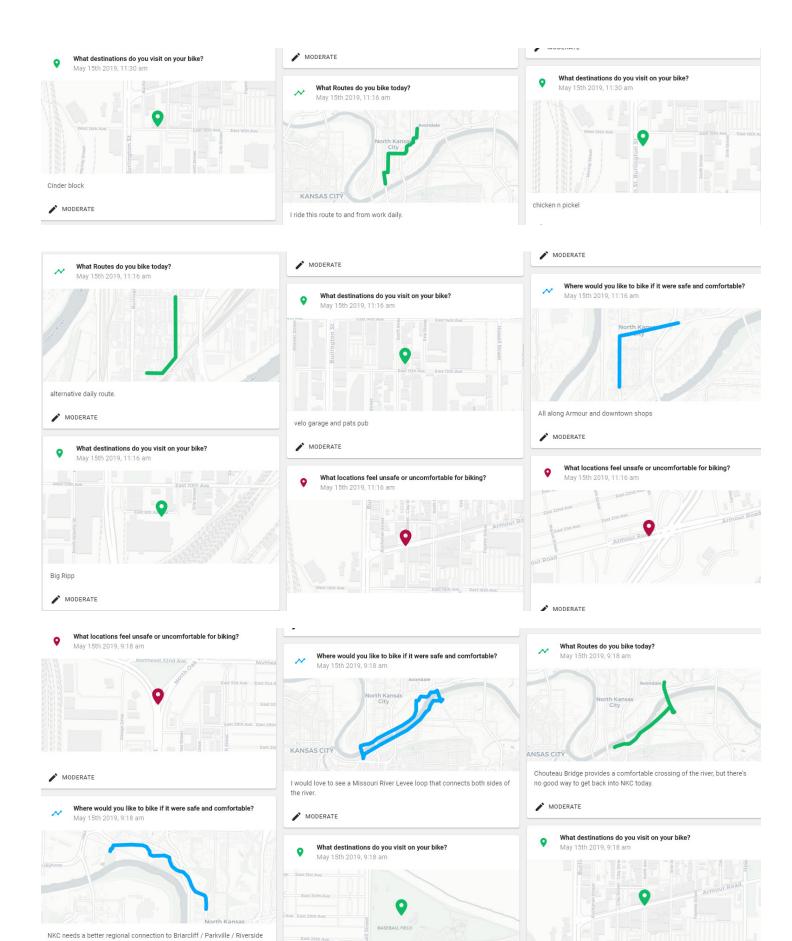












*▶* MODERATE

