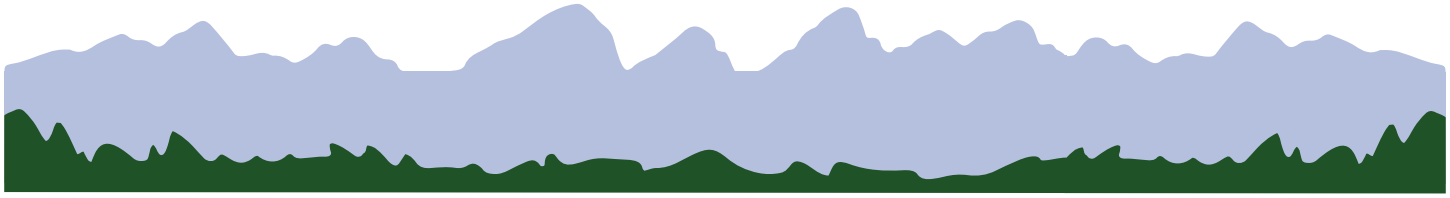

APPENDIX G:

[MONITORING ACTIVE TRANSPORTATION SYSTEM DEMAND & PERFORMANCE]

Overview

While walking and bicycling are clearly a unique and important part of the future transportation program in Jackson Hole, little accurate data is available for tracking demand and performance of the system. The transportation partners will work together to improve the quality of analytical data available for analysis of active transportation trends and needs in Jackson Hole.

This Appendix is focused primarily on the subject of measuring bicycling, even though pedestrian activity is equally important and the data sources covered below apply to both. The emphasis on bicycling makes sense because data about demand and performance may be more essential in that arena, not something driven by volume data. To some degree, the need to improve accommodation for pedestrians is a basic policy choice. Data on pedestrian activity levels may be less important in planning and design than deciding to make a place walkable.

Active transportation demand and performance data falls into four categories:

- Demand at Facility Level
- Demand at Population Level
- Facility Data
- Environment Data

Demand at Facility Level

These are counts of activity levels at specific points in a network using one of several technologies available for the purpose. Technologies in current use rely on various remote sensing tools – inductive loop detectors in the pavement, infrared detectors, and so forth. Many cities have begun to install these systems at a few key points in their local networks to provide system-wide volume data. Loop detectors do not sense pedestrians and infrared systems may count wildlife as facility users, so there are some limitations with these tools.

However, local monitoring systems are moving away from physical counters as a source of data about specific facility usage because physical counting systems can be expensive to install and maintain, which limits how many local entities can afford to buy. As a result, specific-facility-level data from counters tends to be thin and not detailed enough support network planning.

Increasingly, "big data" from various fitness device data clouds – anonymized and aggregated – is being packaged and sold to cities and transportation agencies for use in planning and design. The best known and most mature of these is *Strava*, a San Francisco-based company that has developed an app that is designed specifically for bicyclists but serves pedestrians and runners as well. While other similar systems are available (discussed below), *Strava* can serve as an example of how data might be obtained from such a data cloud source.

People opt into *Strava* by downloading the app onto their smart phones (required) and then turning the app on before a ride or a stroll. Data is aggregated and anonymized and made available for purchase. Data pricing is based on the number of local users – at about 80¢ per licensed user. For example, Oregon Department of Transportation recently spent $20,000 for 12 months of statewide *Strava* data. Clearly, the costs for Jackson Hole would be much lower. *Strava* will provide price quotes for specific data requests.

Specific data outputs for a defined study area can include number of trips by facility, origin and destination data, delay at nodes (intersections), and custom-tailored "heat maps." The Strava website provides heat maps of bicycling and running activity nationwide, including in Jackson Hole. Visiting the *Strava* website can provide a useful introduction into how useful this data would or would not be. (https://www.strava.com/)

Other potential facility demand "big data" sources include:

Airsage. This Atlanta-based company buys and prepares data from cell phone providers for use in transportation planning and design. Most of the company's business is oriented to traffic analysis, modeling and forecasting, but their algorithms also are also capable of identifying bicycle and pedestrian movements based on speed and facility location. One interesting feature of *AirSage*'s system is that data can be ordered for time periods going back several years as well as for recent and current months. (http://www.airsage.com/)

CycleTracks. This bicycle tracking app was developed by the San Francisco County Transportation Authority (SFCTA) in 2010. SFCTA has since updated and added features to its software. *CycleTracks* has had a significant impact on bicycle planning and design in the Bay Area. For example, data clearly showed how important bike lanes are in that region by showing how the concentration of bike trips on streets with bike lanes contrasted with the absence of bike trips on streets without lanes, and by exposing how much out-of-distance travel was being caused by discontinuities in the bike lane network. SFCTA makes its source code available for developers. (http://www.sfcta.org/modeling-and-travel-forecasting/cycletracks-iphone-and-android/cycletracks-smartphone-application)

Others. A number of other companies are collecting and are expected to begin selling data from fitness devices and apps. These include *FitBit, MapMyFitness*, *MapMyRun*, and Apple's *Health* app, among many others. This is a rapidly expanding business model world-wide and new opportunities for data sources will emerge in the coming years.

Regardless of the specific app, there are concerns about "big data" sources that should be kept in mind. First, while the population of smart phone owners and the population of bicyclists do overlap, a certain amount of demand data will be lost because there are bicyclists who are not active on the web or don't own smart phones. As a result, some bias can be present in the data. Second, cell phone locational accuracy can vary up to a few hundred feet. Certain parts of a network with closely-spaced parallel routes could be misrepresented in the data due to locational inaccuracy. Finally, the security of personal data should always be suspect in any such data system. No doubt, hackers are already working hard to break into these databases.

But, if those issues can be tolerated, the "big data" approach could prove useful. For example Jackson and Teton County could initiate an outreach process encouraging people to sign up for one of the fitness tracking/data apps. Then, the resulting, fairly high-quality data could be purchased to guide route and network planning, including priorities for on-street lanes and bike routes to connect to the regional pathway network.

A key to success would be to address missing parts of the data stream – children, lower income service workers, people who are interested in bicycling but are not avid bicyclists, and people

with language barriers. A concerted outreach to these groups would help bring into focus the utilitarian needs people have to connect home to work or school. This approach might also build community support and advocacy for bicycling system improvements by increasing participation levels and rewarding involvement. It might also be possible to pull visitors into the mix by marketing a particular tracking app as part of the vacation experience. Ski resorts have had good luck with a similar approach using rentable, on-slope GPS transponders.

Demand at Population Level

This measures the total amount of active transportation within Jackson Hole – per capita walking trips, per capita bicycling trips, mode shares, etc. This kind of data is useful for analysis of travel behavior trends and higher order demand estimates. The traditional sources of data for these purposes are travel surveys and travel diaries.

Survey data provides information not only about number of trips made, but also trip purpose, which can be useful for planning level analysis. Surveys also provide information about travelers – normally they include questions about household characteristics, gender of the traveler, auto ownership and income, which can be cross-tabbed and correlated with behavioral data. By contrast, cell phone and fitness device data streams are anonymized and silent on trip purpose.

Weaknesses in survey data can include:

- misrepresentation of behavior by survey respondents;
- self-selection bias;
- difficulty obtaining adequate sample sizes due to low response rates; and,
- cost.

A diary-based survey was completed as part of development of the original Jackson Hole Transportation Plan. Today that kind of survey with enough responses to achieve statistical accuracy at the regional level would cost about $50,000 to $70,000 to complete.

In recent years, the US Census Bureau has improved the American Community Survey system to provide annual “journey to work” data. Although ACS doesn’t provide data on all trip purposes, it can be used to calibrate changes in local travel for all purposes in between local survey projects. Teton County is published as three-year and five-year averages, updated annually.

Facility Data
This category includes data about the amount and location of existing facilities. A significant amount of supply-side data about existing facilities is readily available in Jackson Hole from the Town and County GIS system. The Pathway network has been mapped for example. Improving and expanding the GIS database could entail mapping bike lanes, sidewalks, and smaller pathways and use paths, as well as other locational features such as pedestrian crossing types.

Analytical systems are also available for evaluating the quality or serviceability of existing bicycling infrastructure, including bicycle suitability indices. Recently some jurisdictions have developed similar indices for pedestrian facilities. (For example, see the St. Louis MPO's version at http://www.ewgateway.org/pdffiles/library/trans/Bike-Ped/BikePlan-05/BP-Memo8.pdf.) These can be useful in evaluating facility-level needs and in setting priorities for localized improvements.

Finally number of states and localities have developed "multimodal level of service" evaluation systems that rate how well-served different areas of a city or region are based on facility-level data (usually from GIS systems). Florida DOT's Quality/Level of Service is one example. (http://www.dot.state.fl.us/planning/systems/programs/SM/los/pdfs/2013%20QLOS%20Handbook.pdf)

Environment Data
The quality and character of the walking and bicycling environments have major influences on the amount of actual activity that occurs. Many variables can be considered here, including speeds of adjacent traffic, urban design characteristics, land use mix, availability of transit service, and so forth. For some years, there was a trend toward mapping and analyzing this kind of data. For example, Portland Metro studied the relationships between environmental factors and pedestrian activity in that region, arriving at a "pedestrian environment factor" (PEF) that demonstrated a significant statistical (negative) correlation between PEF and SOV mode share.

The most widely-used environment data sources today are WalkScore and BikeScore. (https://www.walkscore.com/) WalkScore is a mature system that has become an important tool for the real estate industry because of strong consumer interest in this information and positive correlations with property values. WalkScore ratings are based primarily on land use mix and street grid connectivity. Efforts are underway to upgrade the algorithm to include actual data on the presence and condition of pedestrian facilities. WalkScore makes its algorithm available as an open source development tool, but WalkScores can already be obtained for almost any address in Jackson Hole. For example the WalkScore at the St. Johns Hospital is 37 ("car dependent") and at the Wort Hotel is 78 ("very walkable"). BikeScore methodology is still under development as are some related tools such as "BikeLaneScore," which can be explored at the web site cited above.