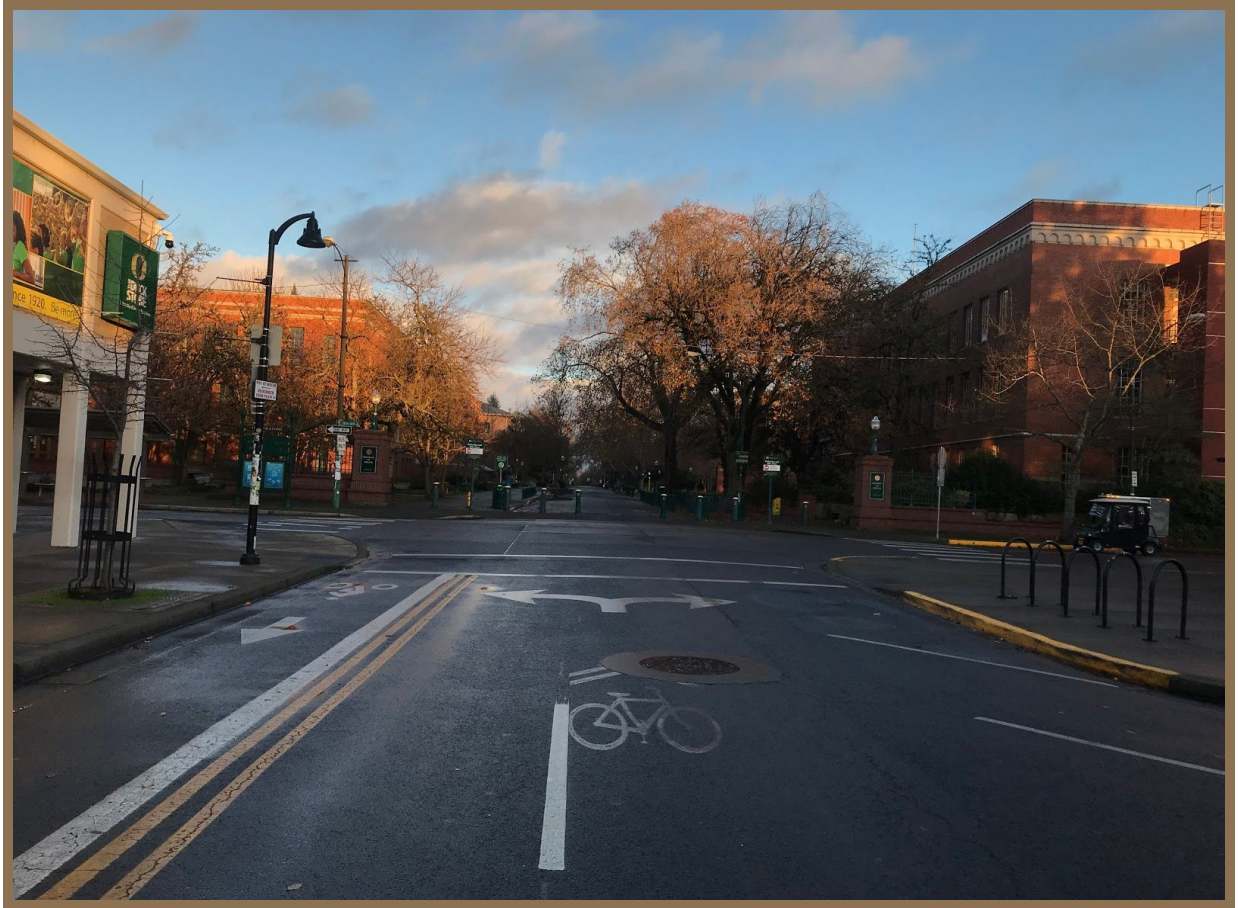


Real World Eugene 2020

# Tactical Urbanism

## PRIORITIZATION MATRIX

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BY: HAYDEN DENTINGER, GRACE HARDY, ANN MOORHEAD & CARSON STATES

### **Summary:**

This report aims to inform groups on what to consider when creating a prioritization matrix for redesigning intersections using tactical urbanism techniques. We focus on five categories: equity, safety, geographical and financial considerations, and existing conditions. Each section is designed to ask questions that incite discussion and push a project team to create a more thoughtful matrix. This report also discusses considerations for public involvement and the trade-offs that feed into prioritization and action.

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## Acknowledgments

We would like to thank the following people for their support and input throughout this process.

- ❖ Bethany Steiner — University of Oregon
- ❖ Stephanie Scaffa — City of Eugene
- ❖ Ellen Currier — Lane Council of Governments
- ❖ Andy Kading — City of Eugene
- ❖ Sarah Mazze — Eugene-Springfield Safe Routes to School
- ❖ Jamie Jeffreys — Portland Bureau of Transportation
- ❖ Nick Meltzer — Corvallis Area Metropolitan Planning Organization

## Background

The Lane Council of Governments (*LCOG*) and the City of Eugene Public Works Engineering Department have the funding to use tactical urbanism to make changes to intersections in Eugene and Springfield that increase safety and meet other city transportation goals. Our community partners asked us to create the basis for a matrix that will help decision-makers decide how to prioritize these projects.

This report aims to inform decision-makers on questions they should consider when creating a prioritization matrix. Through analysis of similar matrices, interviews with professionals, and review of industry standards we have identified five areas of focus when beginning discussions about prioritizing intersection improvements.

- ❖ Equity — Who is impacted by infrastructure improvements, and how can we ensure we address equity concerns?
- ❖ Safety — How do we balance the different safety needs of different modes of transportation when making infrastructure improvements?
- ❖ Geographical Considerations — How does the geographic location of the project site affect access to important infrastructures?
- ❖ Financial Considerations — Is the project affordable?

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- ❖ Existing Conditions — Do existing conditions at the intersection significantly impede the feasibility of infrastructure improvements?

This document should act as a starting point for stakeholders to begin having discussions about what categories are most valuable for their community. We encourage any users of this document to also review the prioritization matrix created by the Eugene-Springfield Safe Routes to School Program, the Minnesota Department of Transportation Project Implementation Guide<sup>1</sup>, or any of the other resources listed in the appendices of this document.

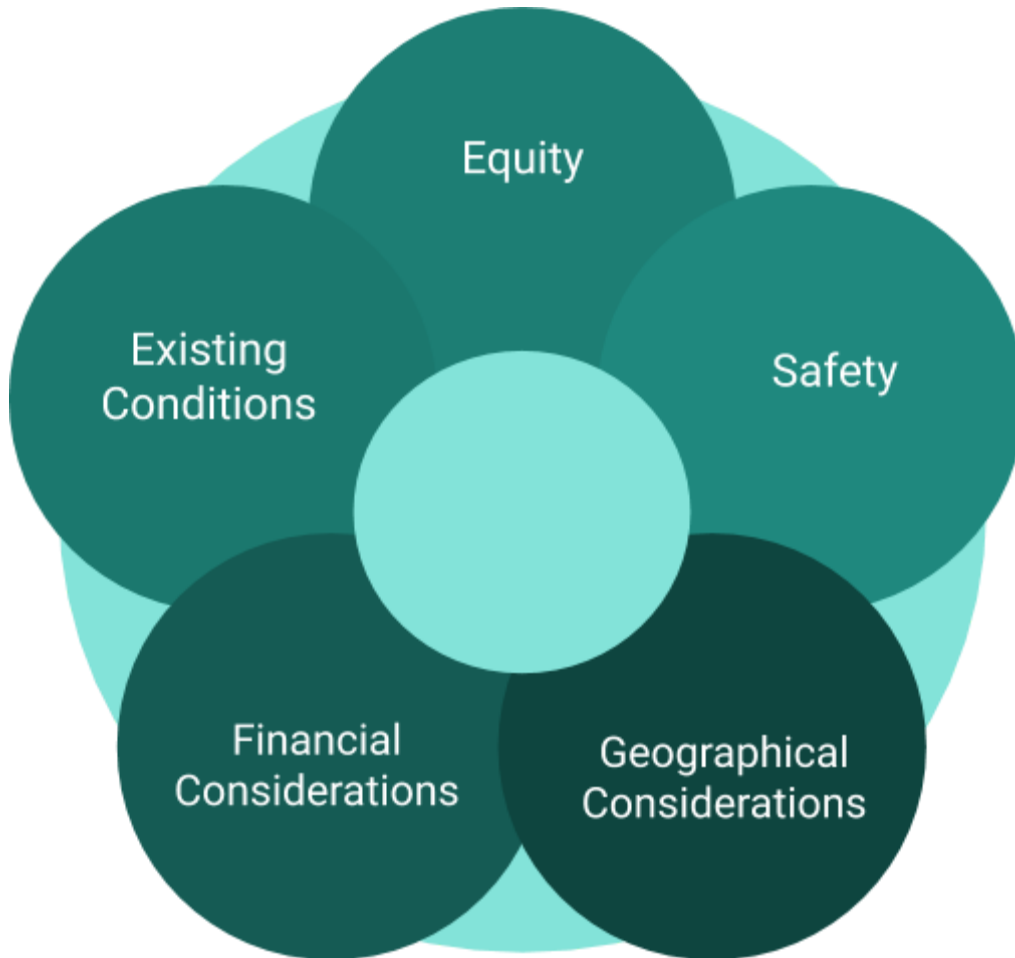
## Research Question

What questions need to be discussed when prioritizing intersections for tactical urbanism improvements to ensure equity, safety, and efficiency?

## Methodology

- ❖ Used resources provided by our community partners to understand the proper background for prioritization, how it is used, and what it may include.
- ❖ Used interviews to get expert opinions and more resources for our project. Interviews aimed at allowing us to learn more about what our matrix could look like and feedback about our current progress.
  - Conducted two interviews with Nick Meltzer with the Corvallis Area Metropolitan Planning Organization (CAMPO).
  - interviewed Jamie Jeffreys, Traffic Design Section Manager, Portland BOT.
  - Interviewed Sarah Mazzi, Program Manager Safe Routes for Schools.
- ❖ Looked at other prioritization matrices and current City of Eugene and Lane County plans to narrow down our categories.
  - Reviewed the Lane County Safe Routes to School matrix<sup>2</sup> provided by LCOG.
  - Reviewed the Transportation System Plan<sup>3</sup>, the Diversity and Equity Strategic Plan<sup>4</sup>, and the VisionZero plan.
- ❖ Looked at data sets available to understand what measurements could be feasibly used in our matrix.
  - Looked at Social Explorer for demographic data.

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- Looked at the Transportation System Plan data.
  - ❖ Decided on the categories
    - Used case studies and interviews to continuously review, expand upon, and change our categories throughout the project.



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# Equity

## Why does equity matter?

Transportation planning has far-reaching effects in terms of equity. Simply improving an intersection can make a neighborhood more appealing to developers, bringing jobs and essential services nearby. Additionally, it can impact residents' ability to access jobs, education, and essential services quickly and safely.

Historically, these benefits of development have not been fairly distributed throughout a city. Neighborhoods that were whiter and wealthier were more likely to receive improvements. Many communities of color and low-income communities were, and still are, both purposefully and unintentionally overlooked. To correct this imbalance, we have to proactively make equity the priority when determining how to fund projects throughout a city.

## How might we measure equity?

There are many ways to measure equity, making it a difficult concept to quantify. Based on a paper about transportation equity from the Victoria Transport Policy Institute,<sup>5</sup> this report will break up the possible measurements into two sections: demographics of residents near the intersection and demographics of people using the intersection. More details on each section are provided below.

### Demographics of residents near the intersection

When thinking about equity, one must consider who is being impacted by improvements. One way to look at this "who" is to understand the demographic makeup of residents near the intersection. Higher priority would be given to intersections in more diverse or underserved communities.

To measure this, one would draw a circle around the intersection, and take demographic data from within the circle. The length of the radius of this circle is up for consideration, but it should be small enough that all the residents in that circle will be impacted by the improvements and large enough that it encapsulates the demographics of the

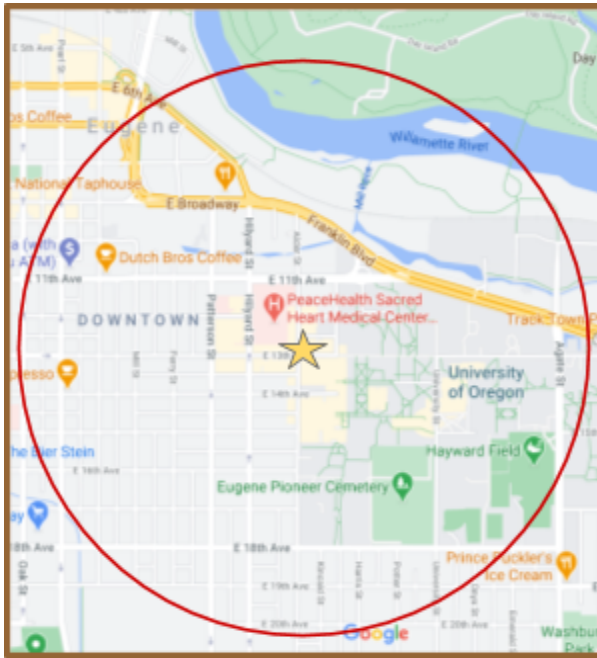


Image source: Google Maps

neighborhood. Once this circle is drawn, the planning team can compare demographic data from within the circle (such as race, English as a Second Language (ESL), age, income level, disability, or ownership of a car) to the demographics of the larger population. This control data could either be from census data or school district data. The case for school district data is that it more accurately depicts undocumented communities. However, school district data will be less useful for variables such as age or disability. Once the data is collected and compared, intersections with more equity

measurements that are above the control group will gain points for prioritization. For example, if a city is 17% non-white, an intersection in a neighborhood that is 43% non-white will be prioritized.

## Equity variables

The variables for equity are complex and intersecting. Each variable is indicative of a different facet of diversity within the community. Below are some equity variables that could be used, and why they are important.

- ❖ *Race* - Cities in the United States have a long history of racism and exclusion. It is important to correct this historic trend by providing extra support to underserved communities of color.
- ❖ *ESL* - This is often linked to race, but can exist across different races. People whose second language is English may find it more difficult to participate in the planning process or may have their voices ignored. Because of this, extra outreach and communication are needed to include these communities.
- ❖ *Age* - Individuals at varying ranges of the age spectrum may require different levels of accessibility to feel confident moving throughout an area. For example, some

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elderly individuals may have special needs such as more crossing time, more visibility, or sloped crosswalks. Additionally, children may require clearly marked crosswalks and more visibility.

- ❖ *Disability* - People with disabilities have specific transportation needs that need to be addressed such as more crossing time, sloped crosswalks, and talking crosswalk signals.
- ❖ *Income level* - Lower-income communities are often overlooked because residents do not have the same time and money to influence local government.
- ❖ *Ownership of a personal vehicle* - Strongly related to income level, ownership of a personal vehicle plays into equity. Transportation planning in the United States has often focused on the automobile. However, this hinders accessibility for lower-income individuals who are less likely to own cars. Intersection safety and usability are important to address with regards to all modes of transportation, not just cars.

These variables are only examples of what could be considered regarding equity. Of course, there are many more. The planning team should think about what aspects of equity need to be addressed most urgently, and focus on measuring those variables. This should be an inclusive and thorough discussion, as the decision of what marginalized groups to prioritize has large impacts. Should the weight of a demographic variable be based on historical marginalization, current marginalization, or predicted impact? If a demographic variable is given less weight, how does that impact the community? These questions must be discussed with the community.

### **Demographics of people using the intersection**

The other way to think about “who” is impacted by improvements is to look at who uses the intersection. This is more difficult to measure accurately because this group is not stationary. However, there are some ways to estimate the demographics of those using an intersection.

The first is to measure how many services or organizations are nearby that serve minority or disadvantaged populations. This might be low-income jobs, racially or economically diverse schools, subsidized daycares, Veterans centers, or elderly centers. The more of these services near an intersection, the more likely people are using that intersection to



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access those services. When taking this measurement, the radius around the intersection should be larger than the radius for residents. This is because services tend to be more spread out in a neighborhood.

In this model, the planning team must discuss how to weigh the importance of different essential services. For example, should each service hold the same weight, or should diverse schools be prioritized due to a city's focus on education? Additionally, how should "diverse schools" be measured? These are important questions to ask when quantifying equity.

Another way to measure who is using an intersection is to look at modes of transportation. Pedestrian, bike, and public transit usage in intersections should be prioritized. This can either mean improving existing active and public transportation infrastructure, or updating an intersection to include active and public transportation infrastructure. This aligns with the goal of equity because lower-income individuals are more likely to rely on active or public transportation.

## Key Questions

Who is impacted by the intersection improvement?

- ❖ Residents nearby
  - How would the residents be impacted by intersection improvements or lack thereof?
  - What is the demographic makeup of residents nearby? How do these percentages compare to the larger population?
  - Do you measure population data using census data or school district data? How does this change the results for each variable?
  - When collecting demographic data on residents, what variables do you include (i.e. race, ESL, age, income, disability, ownership of a car)?
  - Out of the variables you choose, which ones do you give more weight, if any?
  - Should the weight of a demographic variable be based on historical marginalization, current marginalization, or predicted impact? If a demographic variable is given less weight, how does that impact the community?

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- When collecting data on residents, what radius around the intersection do you use? How does this affect your data?
  - Are there any circumstances where using a circle would not be appropriate? What other methods could be used?
  - ❖ People using the intersection
    - How are the people using the intersection impacted by the intersection improvement or lack thereof?
    - How many services or organizations are nearby that serve minority or disadvantaged populations?
    - When collecting data on services and organizations nearby, what do you include (i.e. low-income jobs, racially or economically diverse schools, subsidized daycares, Veteran resources, or elderly centers)? How do you identify these services?
    - Out of the services and organizations you choose, which ones are given more weight, if any? Why and what are the effects of this?
    - When collecting data on services and organizations nearby, what radius around the intersection do you use? How does this affect your data?
    - What modes of transportation are people using to pass through the intersection? How do you measure this?
    - What modes of transportation do you want to prioritize? What is the effect of this?

## Safety

### How do we measure safety?

Transportation safety has been measured historically using a high-crash approach. This approach involves analyzing crash data to determine the areas with the highest number of incidents or most injuries. The high-crash approach was used to identify the Eugene Vision Zero High Crash Network — a selection of 9% of local streets that account for 70% of fatal or life-changing accidents in Eugene.<sup>6</sup> The high-crash approach, however, is reactive, requiring fatal or life-changing accidents to occur before they can be addressed. Further,

the high-crash approach neglects 'near-miss' incidents, where an accident that could have caused severe injuries was narrowly avoided.

An alternative to the high-crash approach is a systematic approach. A systematic approach uses variables that lessen or heighten the risk to users, like posted speed limit, street width, lighting, or road classification to determine high-risk areas. Combining these system variables with the number of traffic accidents in the area presents a much more complete picture of safety than we can get from only looking at one variable.

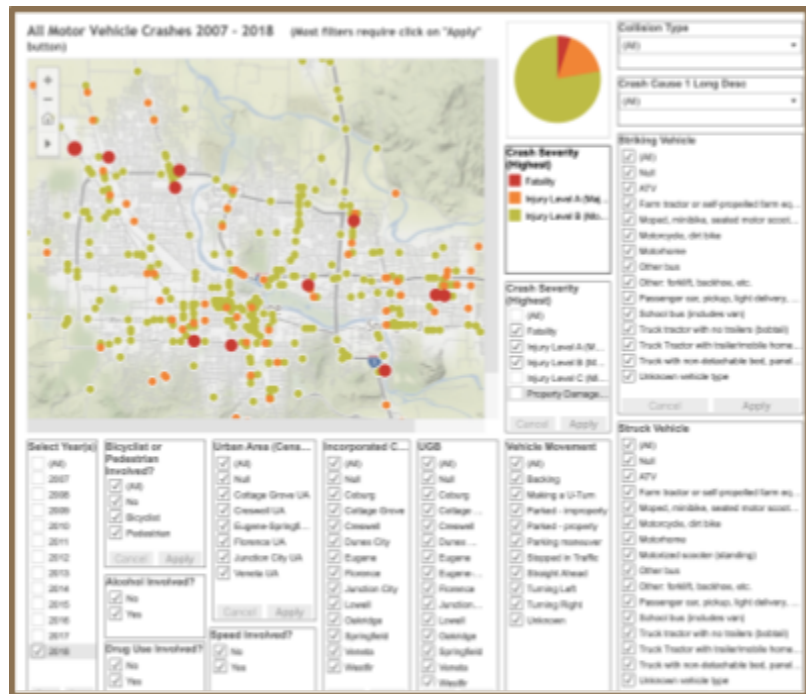


Image Source: <https://www.lcog.org/913/Advanced-User-Data>

## Systemic Safety Variables

A broad outline of potential safety variables was created by the Eugene-Springfield Safe Routes to School (SRTS) program in their Infrastructure Prioritization Tool.<sup>7</sup> While this tool was designed specifically with pedestrian and active transportation users in mind, it provides a useful framework for assessing traffic safety variables that impact all infrastructure users. Some variables that should be considered are:

- ❖ *Posted Speed Limit* — Higher posted speed limits are associated with exponentially higher rates of severe injuries or fatalities for all users, whether it be pedestrians, drivers, or cyclists. The National Complete Streets Coalition found that a 45 mph speed is associated with a ten-fold increase in pedestrian fatalities when compared to 20 mph speed.<sup>8</sup>

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- ❖ *Street Lighting* — Adequate street lighting is important for the safety of pedestrian users who will be using the intersection after dark. A study by the University of Chicago determined that increased lighting reduced crime in New York City neighborhoods by as much as 36%.<sup>9</sup> Additionally, adequate lighting provides increased visibility for drivers to see pedestrians, active transportation users, or other potential hazards.
  - ❖ *Road Classification* — The City of Eugene Metropolitan Policy Committee classifies roads into one of six categories based on federal criteria and definitions for urban roads. In 2018 every fatal accident in the Eugene-Springfield Urban Area occurred on principal or minor arterials, highlighting the increased danger on these roads compared to collector roads.
  - ❖ *Street Width* — Wider streets are correlated with a higher level of safety risk to both pedestrian and active transportation users of the intersections. Another associated variable is the number of traffic lanes on the street, which is also correlated with a higher risk to pedestrian and active transportation users.
  - ❖ *Accidents in the Area* — The number of accidents in the area reflects areas that have been historically dangerous to users. The Lane Council of Government crash data portal lists all reported accidents in the area, with the option to filter them by severity.<sup>10</sup> Special attention should be given to areas with multiple crashes, as this may indicate a design flaw, and accidents involving pedestrians and active transportation users as these users are at a much higher risk in motor vehicle crashes due to their lack of protection.

These variables are not an exhaustive list of everything that may be considered in a systematic approach, but they do highlight a few ways in which infrastructure may put users at risk.

### **Specific Modal Safety Concerns**

Different modes of transportation also present individual needs and safety concerns. For this report, we've defined three categories of transportation, pedestrians, active transportation users, and personal vehicles. Electric bikes and scooters are included in the active transportation category, as they tend to use similar infrastructure.

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- ❖ *Pedestrians* — Pedestrian users statistically experience much more safety risks than other infrastructure users, with more than 4,500 pedestrians killed annually in the United States. Tens of thousands more are injured each year, with people of color, seniors, and children making up a disproportionate amount of the victims.
  - ❖ *Active Transportation Users* — Active transportation users include cyclists, and skateboarders, and electric bicycle/scooter users. While these transportation modes have fewer accidents, the risk of injury is greater than that of motorists due to a lack of physical protection.
  - ❖ *Motorists* — Motorists are involved in the broad majority of traffic accidents both in Lane County and nationally. The increased speeds of motorists and the sheer mass of vehicles create conditions that cause more frequent and severe injury when there is an accident, particularly with non-motorists.

### **Hierarchy of Modality**

Safety considerations and improvements may require tradeoffs between different modes of transportation. For example, increasing the number of crosswalks or protected bike lanes may create an environment that is confusing and consequently dangerous for motorists. Because of the potentially competing nature of safety improvements, it is prudent to designate a hierarchy of modality. A hierarchy of modality establishes which modes of transportation will be prioritized, either when selecting areas of improvement, or when improvements will have conflicting impacts. We propose a hierarchy that places pedestrians at the top, followed by active transportation users, and then motorists.

Placing pedestrians at the top of the hierarchy reflects the significantly higher danger they experience when using infrastructure. This also addresses equitable concerns, as a much more complete segment of the population acts as pedestrians in some capacity rather than motorists. Active transportation users experience increased danger when compared to motorists, making it appropriate to prioritize their safety concerns over motorists. Similar to pedestrian use, active transportation is accessible to a greater percentage of the population, addressing equity concerns. If establishing their own hierarchy of modality, decision-makers should be sure to consider the following:

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## Key Questions

- ❖ Questions regarding pedestrian users:
  - Are there easily accessible crosswalks or throughways for pedestrians to use the intersection?
  - Do community members feel comfortable using the intersection as pedestrians?
  - Does the intersection encourage safe behavior in pedestrians?
  - Is there enough visibility that pedestrians can clearly see oncoming traffic?
  - Is there adequate lighting for nighttime users?
- ❖ Questions regarding active transportation users:
  - Are there protected bike lanes to separate active transportation users from motor vehicles?
  - Do active transportation users feel comfortable sharing the intersection with vehicles and pedestrians?
  - Is there existing infrastructure to improve the experience of active transportation users (i.e. bicycle traffic signals, or designated cyclist areas)?
  - Does active transportation infrastructure in the area increase community accessibility for users who may not have access to vehicles?
- ❖ Questions regarding motorists:
  - Does the area provide adequate visibility for motorists to see each other as well as other modes of transportation in the area?
  - Does the area have adequate markings to encourage safe and easy use?
  - Does the posted speed limit present an unnecessary hazard to users in the intersection?
  - Does the infrastructure encourage motorists to share the road responsibly with pedestrians and active transportation users?
- ❖ Questions for modal hierarchy:
  - Does the hierarchy address the difference in safety risks for different types of users?
  - Does the hierarchy address equity surrounding the accessibility of these transportation modes?

- Does the hierarchy consider the land use and typical use patterns of the region?
- Does the hierarchy address historical favoritism in the transportation planning process in such a way that it increases safety for the greatest number of users?

## Geographical Considerations

### What are the geographic considerations and why do they matter?

The attributes that fall under the scope of this category address the distribution of populations and resources, land use, and industries. Primarily, we want to consider the proximity to essential infrastructures such as schools, food access, healthcare, bike & pedestrian traffic lanes, and public transit connections. These are all locations that can substantially increase an individual's quality of life and can also be easily viewed through an equity-focused lens.

The ideal project would have multiple mutually beneficial locations that would most equitably impact the surrounding community. Depending on the current goals of the organization this could fit a variety of different metrics and weight distributions for the various attributes. For example, a neighborhood with a high concentration of schools and youth activities that also has heavy pedestrian flow may be given more priority than a low pedestrian traffic industrial area. The opposite could be true for another organization with different priorities, but the attributes will remain the same.

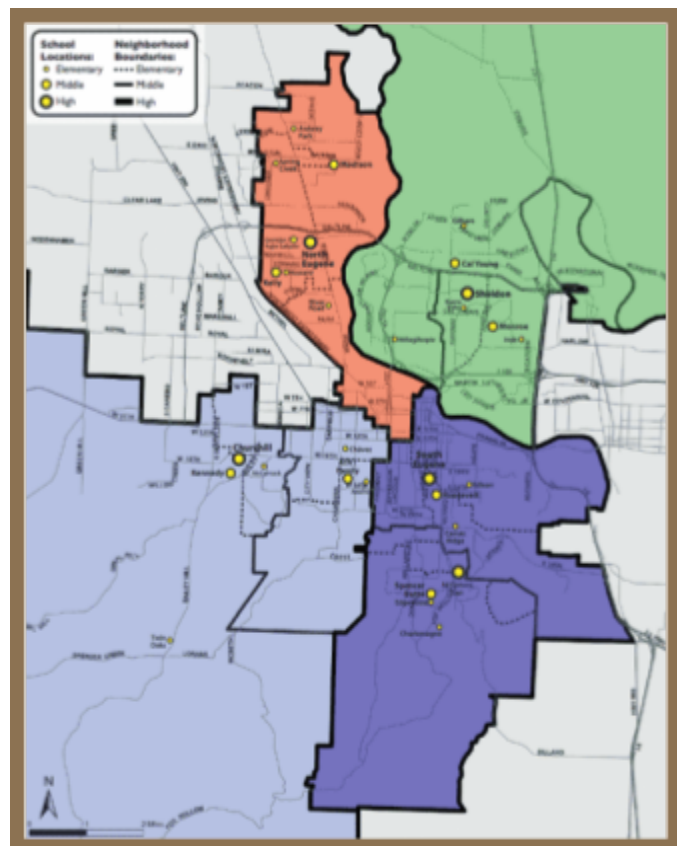


Image Source: <https://www.4j.lane.edu/communications/about/maps/>

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## How to collect data

Land use and traffic flow data can be retrieved through physical and digital canvassing with a combination of on-foot site visits & observations along with cartographic and GIS analysis.<sup>11</sup> Quantitative data can be gathered through intercept surveys and public engagement to determine common stakeholder use of the area in order to include distances traveled and mode of transport to essential infrastructure.

### Key Questions:

*What essential infrastructure is located near the intersection?*

- ❖ Educational Institutions (K-12 & Higher Ed)
  - Will there be high amounts of pedestrian traffic?
  - Is there heavy vehicle congestion around the time school starts and ends?
  - Can a school bus navigate through the proposed project?
- ❖ Healthy Food Access
  - Can this project increase food access for individuals who rely on pedestrian or public transit for transportation options or are in the 20% of Americans who live more than a mile away from a supermarket?<sup>12</sup>
- ❖ Community Non-Profits (YMCA, Boys & Girls Club, Afterschool care)
  - Will there be adequate access to these facilities?
- ❖ Healthcare
  - Can emergency vehicles navigate through the proposed project?
  - Can this project allow greater ease of access to healthcare resources?
- ❖ Spiritual and/or religious centers
  - Will there be adequate access to these facilities?
- ❖ Public Transit Connections
  - Can a city bus navigate through the proposed project?
  - Will the public transit authority approve of the project?
  - Will the project impact individuals who rely on public transit?
- ❖ Bike & Pedestrian Accommodations



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- Will the project impact existing bike and/or pedestrian traffic infrastructure?
  - Can the project be used to influence increased use of non-vehicular modes of transport for the intersection in the future?

### **How can these data and questions be used?**

These questions can be deliberated with different weights being up to the discretion of LCOG or the City of Eugene. If a project will improve public transit access but decrease bike lanes, does that align with the proposed goals and outcomes? Locations like schools can have multi-faceted benefits. For example, if a transportation project near an educational institution can increase pedestrian safety while also making healthy food access easier for students it could be given a heavier weight than an endeavor that might do one or the other.

## **Financial Considerations**

### **What are financial considerations in a prioritization context?**

Cost and financial limitations are inherent barriers for any project regardless of industry. In this section, we address both financial limitations and budgets as well as the potential project site's financial considerations. Limitations can include adhering to any performance measurements or project benefits that were stipulated in funding/grant applications. An example of a contextual budget was provided by LCOG for the purpose of this project:

### **Why does cost matter in the prioritization process?**

Our primary consideration is time and personnel hours & wages. If a project is labor and time-intensive but doesn't equitably serve the area or population, the prioritization of the project can be adjusted accordingly. It would also be prudent to determine if it is more attractive to do multiple low impact, low cost projects or fewer more expensive, higher impact projects.

Public involvement is also connected to the overall cost considerations. If a project is in a neighborhood that is willing to participate in a manner that would offset financial costs the

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priority should be adjusted. The potential for project delay if the stakeholders are hostile towards the proposal is an additional cost concern, because those financial resources might have been more effectively used elsewhere in a more timely manner.

Another financial consideration for prioritization is the static installation and continued maintenance costs. If a project is inexpensive on the front-end but has high maintenance and upkeep costs, that would have to be taken into consideration. Projects that are in locations with high vandalism or are along a busy thoroughfare may be damaged on purpose or by accident, and those costs need to be integrated into the overall financial consideration process.

### **How might we measure costs?**

One method to establish a good financial foundation is to examine the past years' project costs and compare them to the projected budget. An example that was provided to us by LCOG shows what project funding looks like for the next three fiscal years: 2022- \$40,000, 2023- \$50,000, and 2024 - \$60,000<sup>13</sup>. We can use this budget as a metric to determine if a project will be feasible or not. A technique to weigh costs is to analyze historical financial data from similar projects. These can be from internal or external sources and organizations depending on need and accessibility.

Along with the previous years' data, a ranking system with different tactical urbanism projects and their estimated costs can be utilized. This analysis would be a combination of material and personnel costs; for example, a low-cost project would be a temporary passive traffic cone installation compared to a higher cost semi-permanent active feature.

### **Key Questions:**

- ❖ How much will the project cost?
  - Has there been a similar installation to compare end costs to?
  - If the project has already been decided on, is it a low-cost temporary installation or a high-cost static endeavor?
  - Can multiple smaller projects be accomplished for the cost of a single large installation?
  - Is there the potential for unintentional and/or intentional damage?

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- What will the initial installation cost be?
  - What will the maintenance cost be?
  - What will the personnel cost be?
  - ❖ Can public involvement offset costs?
    - Will the community members be amicable to providing volunteer hours to augment the project and possibly mitigate financial costs?
    - Are there possibilities for community involvement? For example, having stakeholders design and produce any street artwork for the project.
    - Is there expected community pushback that might delay the process which could tie up funds?



Image source: <https://ymcasatx.org/programs/community/siclovvia/siclovvia-volunteer>

## Existing Conditions

### What are existing conditions?

Existing conditions are any significant conditions within an intersection that need to be addressed or considered when thinking about developing the intersection. The existing conditions are important to consider because they dictate what can or needs to be done in the intersection, the difficulty, and the costs.

These conditions can be very different and cause different constraints. They could be features that are expensive or impossible to move within the intersection such as railroads, space constraints where the intersection's infrastructure or surroundings create a small

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space, shape restraints such as severely angled intersections that create visibility issues, or other difficult conditions such as an intersection with five inputs.

The current set up of the intersection and its general use also have strong connections with the treatment used in the intersection. The types of traffic, for example, will not change much due to any proposed treatments, so if there is a bike lane feeding into the intersection then the intersection must be designed to incorporate bicycle traffic and connect to the surrounding infrastructure. This could prevent treatments that block bicyclists or could require that paint or signage be in place to help different modes of traffic travel through the intersection. Some treatments and intersection conditions can be incompatible. For example, traffic circles are difficult to use in areas of high bus traffic because buses need a lot of room to allow them to go through a roundabout, which would not work in a narrow intersection.

### **Why do existing conditions matter in the prioritization process?**

Existing conditions are not necessarily about choosing intersections with need. In some cases, the existing conditions may require attention and fixing, but a majority of the time, need is established through other means such as safety and equity concerns or community feedback.

Instead, existing conditions mostly factor into the resources needed and difficulty of a project. Since this project will have limited funding, this becomes an important factor in spending that funding efficiently and to the greatest expected impact.

We should seek to get the most done with what we have. Therefore, barring other circumstances that indicate priorities should be placed on an intersection, it would be better to finish two intersections rather than one. By acknowledging the difficulties of certain intersections, this section aims at focusing on certain projects that have demonstrated need and do not have significant construction barriers that limit the efficacy of our funding.

Tactical Urbanism projects focus on being fast and relatively inexpensive. Due to this, these projects are less likely to include major reconstruction. In effect, most of these projects are somewhat limited by the existing space available and current infrastructure. For example,

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the square footage of an intersection is likely to remain the same. Also, if sewers or railroads are in place, they probably will remain where they are as it is relatively expensive to move them. Additionally, the context of the intersection (the traffic types/levels) is reliant on the network around the intersection as well and unlikely to change, so any treatments to the intersection need to fit within the larger context. Therefore, this section aims to address these constraints when prioritizing intersections.

### **Existing Conditions Variables**

Existing Conditions can be considered to have two main attributes.

First is the level of constraint or difficulty of obstacles in the intersection that complicate tactical urbanism projects. These are likely highly variable across different intersections and should be rated by expected impact instead of the exact condition. Intersections, in this case, would be rated on a scale from minimal/none to severe. Inputs into this variable may include the presence of difficult-to-move infrastructure within the intersection or space constraints that make fixing the intersection more expensive or more difficult to achieve within the scope of tactical urbanism.

Second is the current set up of the intersection. As mentioned earlier, the current conditions of the intersection (ex. presence and location of bike lanes, current pedestrian space, current intersection type, etc) have impacts on what changes can and should be done to an intersection. The current intersection type and size will impact how much room there is for treatments and how resource-costly it will be. The current use volume and modal use statistics (i.e. what types of transportation is being used in the intersection) of an intersection can also have impacts on construction costs and serve as a way to distinguish intersections more frequently used by populations of interest such as pedestrians or cyclists. Similarly, connecting back to the previous categories, the outside context of an intersection (the neighborhood/ connecting roads/ intersections, etc.) should be facilitated by the changes made and not hindered.

### **Case Example for Analyzing Existing Conditions**

Look at this example which is in the middle of a commercial area of downtown Beaverton, OR, and three blocks from Beaverton High School. This intersection is typically very busy

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during peak hours. Note the difficult-to-move existing conditions (the proximity of Farmington and Broadway, the angle of the intersection, the railroad, etc.). While not in Eugene, this intersection provides a clear example of multiple obstacles that may come up when using tactical urbanism techniques to redesign an intersection. This case example aims to incite discussion about how the project could work within or overcome these obstacles.



Image of Watson Ave. (one way) crossing Farmington Rd. (upper) and Broadway St. (lower)

*Image Source: Google Maps*

- ❖ What constraints do you see in this intersection?
- ❖ What obstacles within the existing conditions would need to be dealt with when redesigning this intersection?
  - What could be moved or changed?
  - What would need to remain where it is?
- ❖ What changes would you focus on to make this a better intersection and how would the existing condition limit or affect your changes?
- ❖ Note that tactical urbanism often focuses on being quick and relatively inexpensive. To what extent can tactical urbanism techniques help this intersection?
  - Which changes fall within the scope of this project? Which do not?

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- ❖ Considering only the existing conditions and the little context above, what importance would you place on fixing this intersection?
    - How does its importance differ from the scope of the project? (i.e. does the importance fall with the realm of tactical urbanism)
    - How much of the project resources would you be willing to spend on this intersection?
    - To what extent could you remedy the intersection with the amount you would be willing to spend?
    - How would this level of investment into this intersection impact your ability to work on other intersections with demonstrated need?

### Key Questions

- ❖ What are examples of significant obstacles that could impair your ability to easily redesign an intersection?
- ❖ How much of your resources would you be willing to spend to offset these obstacles?
  - How does the established need impact this?
- ❖ At what point do obstacles or costs cause redevelopment designs to fall outside the purview of tactical urbanism?
  - How does that impact how the project prioritizes or includes intersections past that point?
- ❖ Which is more important:
  - A highly used intersection with moderate need (as determined by other categories within the matrix) or a rarely used intersection with large need?
  - An intersection with a lot of vehicle traffic and very little bike/pedestrian traffic or an intersection with low traffic but more significant numbers of cyclists/ pedestrians if both show the same need?
- ❖ Consider the total space of an intersection to be invariable in this case. How do you allocate the space to meet the different needs of those using it?

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# Community Engagement

## Engaging with a diverse range of communities

When engaging with the community, it is important to hear a diverse set of voices. One way to do this is to look at census data and proportionally engage the communities and identities found in the city. However, it is important to take into account how historic exclusionary policies have impacted the demographics of cities, particularly Eugene. Many minority groups have been — and often still are — overlooked and oppressed. To correct for this, an extra effort needs to be put into reaching the voices of minority and marginalized communities. In this way, community engagement should both reflect the city's demographics and acknowledge the historic oppression of marginalized folks by uplifting their voices in the present.

## Reaching marginalized communities

Often, the voices most heard in local government are those with the most privilege. Because of this, equitable community engagement requires specific focus on engaging marginalized communities. To do this, one should first determine what communities are marginalized or less often heard. Based on this list, one can create ways to reach these communities.

For example, to reach a broad range of ages, information should be released through various avenues, both digital and non-digital. This also makes the information accessible for people with lower-incomes who may not have access to the internet or smart devices. Thought should also be put into where and when you are holding meetings. Are they during the workday or in the evenings? Are they during the week or on the weekends? Are they online or in-person? And if in-person, can the location be easily reached by the group you wish to engage? The answers to these questions will determine who is able to attend the meeting and voice their opinions. People with full-time jobs may only be available in the evenings or on the weekend. If the meeting is online, it may be easier for people with access to technology to attend. However, it excludes those without access to technology. Varying the meeting types can allow more people to come to meetings that suit their



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needs. Finally, any information released and all meetings should be accessible to people with disabilities and people who may not speak English.

### **Communicating with stakeholders**

Along with residents, stakeholders such as businesses and organizations should be involved in the conversation. Businesses near the intersections are affected by changes made to that intersection and so should have some input. The planning team must determine how much weight to give the opinions of business owners in comparison to residents. Additionally, the planning team must determine the best method to communicate with businesses. Is it by mail, email, or on-line postings? The mode of communication will determine how many responses you get back.

Finally, organizations such as Lane Transit District (LTD), the University of Oregon, the City of Eugene, the City of Springfield, and Lane Council of Governments (LCOG) should all communicate with each other to answer the questions posed in this document. Each of these organizations has a different perspective that is important in the prioritization process. The planning team could collect the opinions of these organizations in a couple of different ways. First, they could hold meetings with representatives from these organizations to talk through tradeoffs. Or, if the planning team wants feedback on more specific ideas, they could send out an online survey to representatives at these organizations. Finally, the planning team could offer a grant application that would allow each organization to request some of the funds be used in a way that serves their goals. However, this begs the question, how much influence should these organizations have versus the community?

### **Key questions**

- ❖ Are you engaging with a diverse range of communities?
  - Do the communities you are engaging with reflect the demographics of the broader population?
  - Should they reflect the demographics of the broader population, or should more emphasis be put on engaging marginalized communities?
  - What groups have been or are marginalized in the community?
- ❖ How are you reaching marginalized communities?

- 
- Are you releasing information to the public both digitally and non-digitally?
  - Where and when are you holding meetings?
    - Are they during the workday or in the evenings? Are they during the week or on the weekends? How does this determine who is able to attend?
    - Are they online or in-person? If in-person, can the location be easily reached by the group you wish to engage?
  - Are you holding discussions in multiple languages? Are you holding discussions that are accessible to people with hearing or sight disabilities?
  - ❖ How are you communicating with key stakeholders?
    - How are you engaging nearby businesses in the conversation? How does the mode of communication affect the response rate?
    - How much weight do you give to the opinion of business owners versus residents?
    - How are you engaging with key organizations such as the City of Eugene, the City of Springfield, the University of Oregon, LTD, and LCOG?
    - How much influence do you give organizations versus the public?

## Trade-Offs

While each of the categories and attributes discussed may be important considerations when creating a matrix, you must determine where your priorities fall. In the best case, there will be situations that require you to creatively and carefully make designs that encapsulate all of your goals. However, there are likely going to be cases where trade-offs must be made and you must decide what you are willing to give up and to what extent to follow your goals.

Below is an example of a matrix. It contains each of the categories discussed, the attributes, and specific indicators of each category. The scores of all the attributes and their indicators in each category add up to a score out of 100. A modifier is then multiplied against each category score so that certain categories can hold more emphasis than others to create a

final score out of 100. This final score is determined for each prospective intersection and then compared and used to determine how to prioritize projects.

Categories	Equity	Safety	Geo. C.	Cost	Existing C.
<b>Attributes</b>	?	?	?	?	?
Indicators	?	?	?	?	?
<b>SUBTOTAL</b>	<b>XX/100</b>	<b>XX/100</b>	<b>XX/100</b>	<b>XX/100</b>	<b>XX/100</b>
Modifier	<b>x0.2</b>	<b>x0.2</b>	<b>x0.2</b>	<b>x0.2</b>	<b>x0.2</b>
				<b>TOTAL</b>	<b>XX/100</b>

### Initial Prioritization of the Matrix

Many of the trade-offs will occur while creating a matrix as values are assigned to each category, attribute, and indicator as this allows you to weigh each section by importance. Creating a well-weighted matrix will require the project team to determine their goals and priorities and to define the scope of the project.

For example, if the goal of the project is to increase safety and decrease incident rates then you can weigh attributes related to safety more. Furthermore, you may need to further analyze what the most important indicators of need are regarding safety, whether it is incident rates, traffic volumes, number of complaints from the community, or something else.

Categories can be equally weighted, but it is more likely that each category will be weighted differently depending on the goals and priorities of the project. It is important to understand that when giving one category more weight, there will then be less emphasis on the other. If you were to focus heavily on safety as indicating need, it will decrease the impact of demonstrated need from other categories. Ergo, an intersection rated with high safety needs will outrank an intersection with high equity needs.

It is imperative that when making decisions about how to weigh different sections and where to put your priorities, you recognize what you are devaluing in the process. This is relevant both for overarching categories as well as

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## Prioritization within the intersection

The needs and conditions of a specific intersection may bring up specific issues and limitations that need to be addressed. In the case that these needs and limitations are not compatible, the project team will need to look at the intersection's context and their priorities to determine the direction and extent of redevelopment. Ergo, if an intersection's existing conditions make it difficult or impossible to make the desired fixes within the scope of the project, then the team will either have to find creative ways to make it work or give up some of the desired changes to complete what is feasible.

This becomes more significant under the “quick and relatively inexpensive” constraints of tactical urbanism techniques. As a project team, it will be necessary to discuss and determine to what extent cost and time frame limit what projects can be done. If there is not a specific limitation, then this may be unnecessary. However, if there are limitations to the projects, then prioritizing what needs to be fixed in an intersection may become an issue of making decisions about which issues can be addressed and which cannot or should fall within a project whose scope includes the changes necessary.

## Key Questions

Discuss your priorities about the trade-offs below. Note that the trade-offs are not mutually exclusive and your answers may fall somewhere along a spectrum rather than any one answer.

- ❖ How would you weight the five categories (Equity, Safety, Geographical Considerations, Cost, and Existing Conditions) if giving each one a value to add to 100?
- ❖ What do you see as being more important indicators within each section?
  - How would you deal with conflicting indicators that indicate significantly different results? For example, if different measures of equity gave dramatically different results?
- ❖ Who are you prioritizing within the intersection? Pedestrians? Cyclist? Motorists?
  - Are you focusing on one group? Or is there a sort of hierarchy?

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Discuss the tradeoffs that may be taken to achieve the goals below. Do you prioritize one over the other?

- ❖ Safety or efficiency?
- ❖ Aesthetics or function?
- ❖ Minimizing cost or maximizing the result?
- ❖ Established need or ease of redevelopment?

## Conclusions

Throughout this document, we examined the different categories and attributes of a proposed infrastructure project that should be scrutinized for prioritization. These were determined through a variety of qualitative and quantitative data gathering methods such as professional interviews and analysis of existing data sets & plans. Although our categories were not ranked in any order of precedence, we did feel strongly that addressing equity impacts should be first and foremost in considering a project. Safety, Geography, Finances, Existing Conditions, and Community Engagement all have specific attributes to address, but we found that equity issues came up in all of the categories.

This document is intended to be used as a conversation starter or brainstorming foundation for any organization that wants to utilize it. Our intent is for this to be a living document that can be changed and updated depending on the specific needs & wants of the organization.

The organization that will be using this document will need to decide what their priorities and goals are for the matrix. We did not include hard metrics because we have realized how fluid and dynamic the planning process can be. Financial information and specific hard data will have to be provided by the organization for the projects in question.

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# Appendices

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## Appendix 1:

### Prioritization Matrix Interview Notes: Nick Meltzer with the Corvallis Area Metropolitan Planning Organization (CAMPO)

#### DATA

- ❖ What data is accessible?
  - What data do we want / what data do we have?
  - If certain data isn't available, what are other ways we can measure the same thing?
  - Ask Ellen / Andy what data we have access to, so we can better understand what measurements to put in the matrix
- ❖ Possible places to find data
  - Social Explorer - demographic data
    - <https://www.socialexplorer.com/>
  - Transportation System Plan (TSP)
    - <https://www.eugene-or.gov/624/Traffic-Related-Data>
    - <https://www.eugene-or.gov/DocumentCenter/View/3426/TrafficFlowMap2013?bidId>
- ❖ Measurement considerations
  - Is the matrix for one-time use, or will it be used repeatedly over time?
    - Do data inputs need to be available over time as well?
  - How far away from the intersection do you measure? One mile? Two?
  - Use city average as a baseline for analyzing data
    - I.e. if the percentage of non-white residents near an intersection is above the city average, that intersection gets +1 point on the equity section of the matrix

#### CATEGORIES

- ❖ Equity
- ❖ Safety
- ❖ Cost
  - Need a solution to determine this

- 
- Could come up with a vague ranking system based on a list of tactical urbanism methods and the estimated cost of each one. Then, look at the intersection and gauge how costly the improvement might be.
    - high/medium/low, or minor/medium/major
  - ❖ Traffic volume
    - Low traffic = more feasible
    - High traffic = higher impact
  - ❖ Proximity to destinations
    - Schools, parks, grocery stores, businesses
  - ❖ Bike routes
    - Prioritize intersections that have bike routes running through them

#### OTHER SUGGESTIONS

- ❖ Look at TSP goals and vision
  - Already been vetted by the public and elected officials
  - Possibly -- criteria for each goal (weighted equally)
  - <https://www.eugene-or.gov/3941/Transportation-System-Plan>

## Appendix 2:

### **Prioritization Matrix Interview Notes: Jamie Jeffery, Traffic Design Section Manager, Portland BOT**

Current matrix

- ❖ Add Climate Change/ Sustainability category?

What measurements do you think are important for us to use?

- ❖ Talk to different groups within equity to determine what the community really wants

What are some areas of data collection you use in Portland that might be useful in Eugene?

- ❖ Safe Routes to schools did a lot of equity studies
- ❖ Notes the space-specific needs
- ❖ Walking routes
- ❖ Senior citizens



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How do you include community involvement in your projects?

- ❖ Rely on project manager to bring in community involvement
- ❖ Feedback: questions and understanding, they know the situation best so they can be a valuable source of input and have more information about the problem (not necessarily the solution). Opposed to change. People who do not perceive the scope of change.

How do you deal with the inevitability of community involvement (white, middle-class women are more likely to participate in community involvement)?

- ❖ Access to internet/ computer services, thinking it doesn't matter, unsure how to get to us.
- ❖ Unknown whether we are looking at demographics when taking community involvement.

Other thoughts?

- ❖ Intersection Repair: communities come and say they want to paint an intersection, we allowed people to create a design and repair it, but the paint was really slippery. So the city needs to be aware of safety and other issues to facilitate this process. Also consider duration with cost, maintenance.

## **Appendix 3:**

### **Prioritization Matrix Interview Notes: Sarah Mazze, Safe Routes to School Program Manager**

Safe Routes To School Rubric Tool:

[Safe Routes To School Rubric Tool](#)

[Rubric Guide](#)

- ❖ Tool came about through conversations with traffic engineers leading Vision Zero effort, and Eugene 4J School District
- ❖ Citizen areas of concern are not objective, and result in a skewed image of the most dangerous intersections

- 
- ❖ Input from city staff in creating the data-driven aspect of the tool
  - ❖ Tool is not proprietary, feel free to use whatever chunks are most valuable for the product

Is there greater value to using either the data-centric approach versus a community-feedback approach?

- ❖ While community input is valuable, it is much less objective than a data-driven approach
- ❖ Both high-crash approach and feedback approach are lacking in areas
  - One potential issue is areas known as dangerous by community members may not be reflected in the crash statistics for the intersection
    - Especially with bicycle and pedestrian accidents being typically underreported
- ❖ If we are going to use community input, it is vital that we have an equity plan to ensure the loudest voices don't have an unequal impact
  - Mutual benefit locations improve equity concerns

Is there anything you wish you could change about this tool based on your experiences using it for real intersections?

- ❖ The tool is complicated and consequently can be hard to use
  - Measurements like the passability of different routes can neglect factors like passability for disabled persons
  - Pedestrian cross button (beg button) is unreachable at some intersections
- ❖ While the tool is 'objective', different people who complete the tool can get different for the same intersection
  - Reflects that the tool can't be completely objective
  - Score is usually pretty close between different users
- ❖ Tool requires collecting a lot of data before one is able to get a score
  - Lots of data results in better results

How would you modify this tool to address all transportation in Eugene versus focusing on school-aged users?

- ❖ Some intersections were not considered by SRTS because they weren't routes to schools

- 
- ❖ SRTS only considered pedestrians/active transportation (no vehicles)

Other Resources:

- ❖ Complete Lane County Crash Data:
  - <https://www.lcog.org/913/Advanced-User-Data>
  - For cyclist and pedestrian crashes, be sure to include both minor and major crashes — takes very small changes to make cyclist/ped incidents much more serious (5 mph increase)
- ❖ Eugene Vision Zero Document:
  - <https://www.eugene-or.gov/DocumentCenter/View/52323/Vision-Zero-Action-Plan>

## Appendix 4:

### Story of Our Project

Mid-October: Received initial task to create an intersection redesign by using a temporary traffic circle treatment in the intersection of 13th Ave. and Kincaid St., Eugene, OR.

*Example: [Appendix 8](#)*

During this time, we created Appendixes 5, 6, 7, and 8 as we found case studies on tactical urbanism and traffic circles

11/6: Received news from LTD that due to the limited space of the intersection and heavy bus traffic, our plans were not going to be possible and a new project needed to be chosen.

11/9: Decided new project to create foundations of a matrix that would help community partners judge how to prioritize intersection redesigns for future projects.

11/23: Shared our current project with our community partners and shifted direction slightly to make the project a discussion starter and inform readers about the process of making a matrix rather than to create the matrix ourselves.

12/7: Presented our project to peers, community partners, and other guests.

12/10: Submitted the final report.

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## Appendix 5:

### Case Study: 26th & Olive Mural

By: Grace Hardy



Image source:

<http://sworegonarchitect.blogspot.com/2016/06/tactical-urbanism-26th-olive.html#.X9KUwtHYrq8>

One form of tactical urbanism that is currently gaining popularity is street murals. These memorable intersection installations gained traction in Portland, OR, in the 1990s, but have only begun popping up in other cities more recently<sup>14</sup>.

Four years ago, the residents of the College Hill neighborhood in Eugene, OR decided to use this traffic-controlling solution to address concerns at the intersection of 26th and Olive. Previously, this was the only four-way intersection in the College Hill neighborhood without any traffic control. Despite requests from residents, the City was unable to install stop-signs, causing neighbors to take the issue into their own hands. Erik Steiner, a College Hill resident, partnered with the University of Oregon's Real World Eugene class, taught by his wife Bethany Steiner, to organize this project. They received a Neighborhood Matching Grant from the City of Eugene to cover the cost of paint and got the Public Works/Engineering Department to repair the asphalt in the intersection. Then, they organized 150 neighbors to spend 8 hours using 28 gallons of paint to create a mural in the center of the intersection<sup>15</sup>.

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The goal of street murals, such as the one on 26th and Olive, is to slow drivers down and make them more aware of the intersection. Additionally, these installations build a sense of community and place, especially when the neighbors themselves come together to install them. The main downside to murals as a form of traffic control is that paint wears down quickly, requiring repainting every few years. However, the cost of installation is low in the first place and repainting can easily be made into a community-building block party, making this a small negative.

While the 13th and Kincaid intersection does have stop signs, the safety of this intersection is still questionable. Additionally, its placement at the entrance to University of Oregon's campus makes it a prime location for place-making. For these reasons, a mural could be an interesting option to explore when considering improvements to this intersection.

## **Appendix 6:**

### **Case Study: 900 South Reconstruction Project, Salt Lake City, Utah**

By: Carson States



*Aerial view of the roundabout pop-up intersection in Spring 2018<sup>16</sup>*

Pop-up installations are an increasingly attractive option for testing out the feasibility for different modes of traffic flow control. The benefits include their relatively low cost for materials & personnel hours, temporary impact, and ease of installation. In 2018 the City

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of Salt Lake City<sup>17</sup> began civic engagement efforts regarding a proposed renovation of 900 South; a badly deteriorated street. Feedback received from this process revealed that community members and stakeholders were interested in seeing how a 5-leg roundabout would impact a problem intersection located in the 900 South area. When asked about the issues with the intersection, a community member responded "I don't remember ever seeing people dead in the road or anything. So I think it's a fairly safe intersection. It's just confusing because it's a five-way"<sup>18</sup>.

Planners and engineers determined that a pop-up roundabout using temporary traffic cones would be the most efficient way to determine the viability of a permanent traffic circle. City employees shut down turn lanes and installed the traffic circle for the duration of a week, all while collecting data and community opinions on the change. One of the main benefits of tactical urbanism is the ability for community members to physically see a proposed change instead of relying on concepts or illustrations. Following the pop-up roundabout, the City also installed a redesigned 4-way intersection and performed the same retrieval and analysis. Tim Millar, an SLC Transportation Planner reports that although the feedback was mixed: "It engaged the community. They got to try out some things that would have cost however many hundreds of thousands of dollars to try out and it's nice to be able to let it kind of suss itself out"<sup>19</sup>.

Tactical urbanism is a concept that is easily scalable depending on the context and location of a project. Although our intersection at 13th and Kincade is physically smaller and has a different traffic dynamic, we will be implementing a similar installation execution and data collection process as the project team for 900 South.

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## Appendix 7:

### Case Study: Mill Ends Park

By: Ann Moorhead



*The Original Mill Ends Park<sup>20</sup>*



*Mill Ends Park<sup>21</sup>*

Tactical Urbanism has been a growing phenomenon in the past couple of decades. Over time, the aggressive pursuit of change has even begun to become a tool for cities to test out new and different ideas on a fairly large, organizational level. But tactical urbanism was not always so mainstream. Most examples of tactical urbanism are stories of concerned citizens starting change. Mill Ends Park is an interesting example of just how small these changes can be.

Mill Ends Park is credited as being the smallest park in the world and was first recognized by the Guinness Book of World Records in 1971. It is two feet in diameter and contains a single tree and a sign with its name and origin. Mill Ends Park is positioned in the middle of SW Naito Parkway in Portland, Oregon.

Anyone hearing about Mill Ends Park would wonder why a space no larger than a moderate size planter in the middle of the street came to be a city park, and its origins are just as strange as its concept.

In 1954, an Irish journalist named Dick Fagan ran a column named Mills End out of the second floor of the building next to what is now known as Mill End Park. At the time, the

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two-foot hole was meant for a streetlight. As time passed, the light never came, and weeds grew in. Fagan decided to take matters into his own hand, and planted flowers in the road. Over the next 21 years until his death, Fagan wrote stories about the unusual events of the park in his column, led by Patrick O'Toole, the head leprechaun of the only leprechaun colony west of Ireland.

This is an interesting example of citizen-led tactical urbanism happening in even the smallest spaces, but it is not the only point of note. Mill End Park likely would not have lasted long if it were not for the story behind it. The park draws support from being special and unique.

Tactical Urbanism from a city standpoint is often a matter of ease of use or safety, but the community roots cannot be forgotten. Without community support, these tactical urbanism examples will not last long. Mill End is an example of how important personality and individualism is to projects of tactical urbanism because it garners attention and support and creates a much bigger impact. Where Mill End Park could have been a temporary planter, it is instead a lasting true fairy tale.

*Park Information Source<sup>22</sup>*

## **Appendix 8:**

### **Case Study: North Adams and Clark St. Intersection Redesign**

By: Hayden Dentinger



*Aerial views of the intersection of N. Clark and Adams St before (left) and after (right) treatment*



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In November of 2019, a group of University of Oregon students worked in conjunction with the City of Eugene and Lane County Council of Governments to construct a temporary roundabout at the intersection of North Adams and Clark streets in Eugene, OR. This intersection was selected due to dangerous conditions including long pedestrian crossings, poor visibility, and fast car traffic. A type of tactical urbanism called 'Pop-up Urbanism' was used to test a solution for the intersection, as traditional infrastructure improvements happen very slowly, are expensive, and require lengthy community outreach processes that can delay or halt projects.<sup>23</sup>

The team surveyed 34 members of the local community before implementing their project to assess stakeholders' concerns. Nearly all respondents agreed that they felt unsafe due to fast car traffic, and wanted to see traffic changes to improve safety. Further, many respondents expressed heavy interest in reclaiming the public space generated by the traffic installation via planters, greenery, murals, and other forms of public art. Survey respondents also specifically wanted to see traffic circles, crosswalks markings, or more signals to improve visibility and safety at the intersection.

The traffic circle was installed for a period of 4 hours on a Saturday afternoon. The group used a combination of traffic cones and traffic engineers to direct vehicular, bicycle, and pedestrian traffic around the roundabout. Feedback from the event itself was largely centered around the safety improvements and art incorporation at the installation site. Further, the team used traffic cameras to collect data surrounding the use of the intersection during the installation. Based on community feedback and traffic flow data, the installation positively affected safety at the intersection, meaning a permanent roundabout may be a viable long-term solution for the intersection.

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