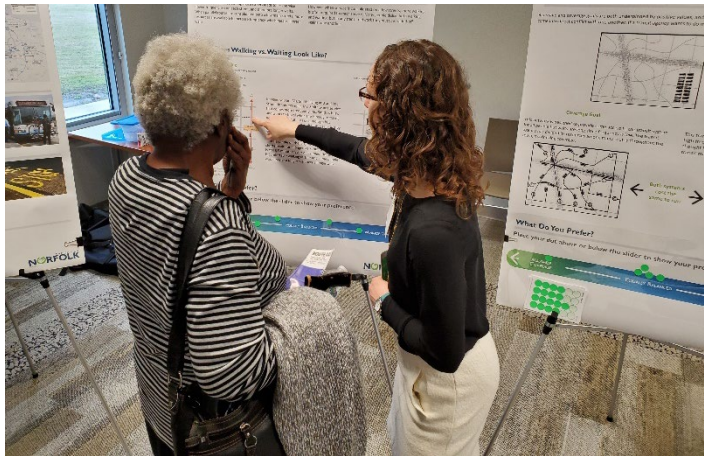
Chapter 8: Multimodal Project Evaluation

The previous two chapters introduced and explained the Multimodal Project Design Framework – a process for designing projects on multimodal corridors so that they work collectively towards building out the future vision of the Multimodal System Plan.

The third step in the Multimodal Project Design Framework – Step 3: *Evaluating Design Concepts* – is the focus of this chapter. This chapter describes a process for evaluating projects in the concept phase to reflect the goals of the Multimodal Master Plan. It outlines a process the city can use to evaluate potential concepts to determine how well they work towards the city's goals for multimodal transportation.



Overview

Evaluating potential design concepts on multimodal corridors is an important step in developing a safe, comfortable, multimodal transportation system through a systematic and transparent decision-making process.

Design concepts should be evaluated before a change is made to help decision makers and the public understand the costs and benefits of taking an action before a project is implemented.

The reason for evaluating a design concept before it proceeds to final design is to help answer the question "Should we make this change?"

Projects can also be evaluated after they are implemented to determine if they had the desired benefit. Evaluation is an important tool at various stages of the decision-making process to understand anticipated and actual progress towards the vision and goals.

Evaluation metrics help answer the question "Should we make this change?" and can be used after implementation to determine if a project had the desired benefit.

Why Multimodal Evaluation Metrics Are Needed

The metrics that we use to evaluate a design concept should be consistent with the plan goals and should help explain and communicate the potential outcomes of making a change.

To be effective, consistent, and transparent, the metrics the City of Norfolk uses to evaluate and communicate the potential outcomes of a multimodal corridor design concept should be closely related to its multimodal transportation vision and goals.

Level of Service (LOS) Evaluation Metrics

Vehicular Level of Service (LOS) has become the most commonly accepted and widely used metric used to evaluate vehicular transportation performance in the United States. Its translation to letter grades A through F has made it very intuitive to understand at a cursory level, and the methods for computing it use widely available data.

There is not a single way to compute LOS, and there are various ways to compute vehicular LOS in different situations, including at specific intersections, along different types of roadway segments, and more generally for longer corridor extents based on volume-to-capacity ratios and average assumptions.

Although vehicular LOS is compellingly simple as it produces a simple A to F letter grade, it has some limitations as an evaluation metric. For example, vehicular LOS only accounts for vehicle delay and does not factor in mobility of other modes, such as transit riders, bike riders, and pedestrians. Nor does it account for other key goals that are part of Norfolk's vision for its multimodal transportation system, including safety, freedom of travel choice, access to opportunities, overall quality of life, environmental sustainability, and resilience.

A fundamental principle of this master plan is that design concepts on multimodal corridors should be evaluated based on how they contribute to Norfolk's vision and goals for its multimodal transportation system. Vehicular LOS has a role to play in project evaluation, but additional metrics are needed to guide the implementation of the Multimodal Plan.

This road appears to have good vehicular level of service but lacks facilities for other modes. Image credit: EPR

Common misconceptions about vehicular LOS:

- *LOS A is the most desirable outcome.*
- *LOS F is always considered unacceptable.*

Neither of these statements are exactly accurate.

LOS A can reflect a roadway with excess vehicular capacity. Roadways operating at LOS A and B are typically over-designed, which may not be the best use of limited transportation improvement funds.

LOS F may not represent an unacceptable level of service in all cases. There are varying degrees of LOS F depending on the surrounding context, and vehicle delays that are at the level of LOS F may be acceptable given land use context and availability of multimodal options if other goals are being met.

Multimodal Person Capacity Metrics

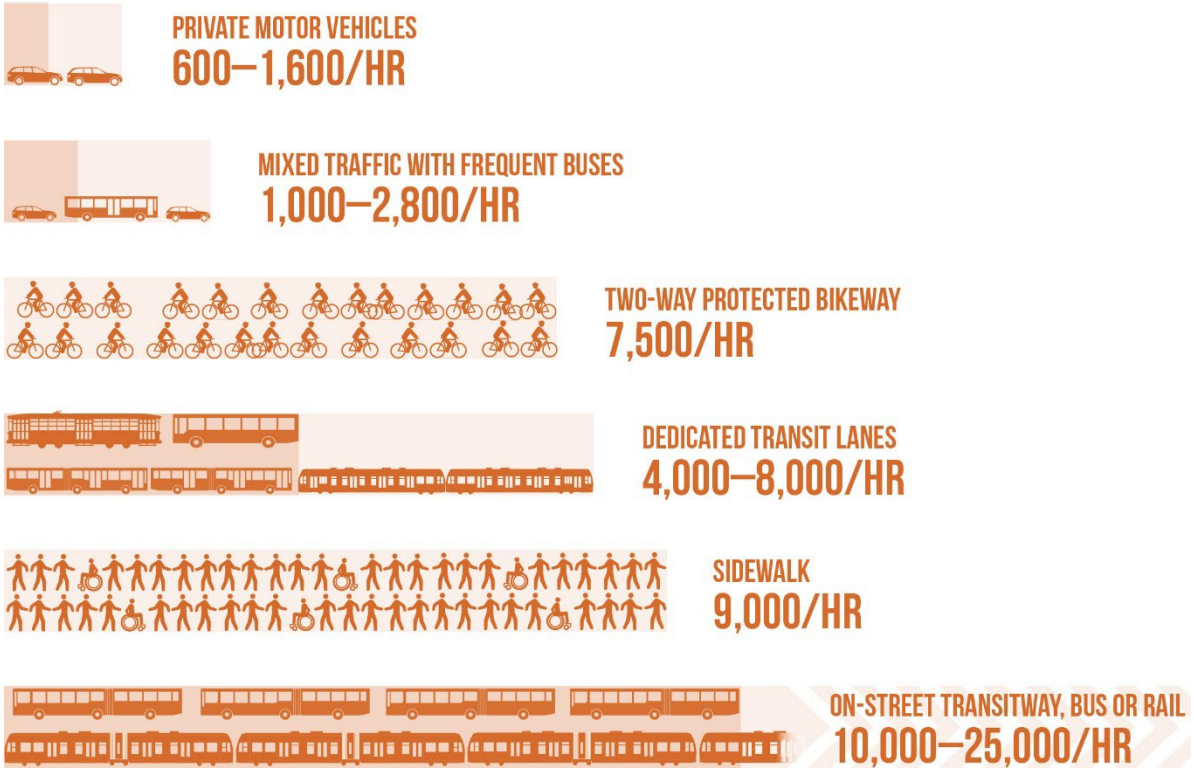
To facilitate a true shift from focusing on moving vehicles to focusing on moving people, metrics beyond vehicular LOS are needed.

The transportation planning profession has grappled for several years with the question of what metrics can supplement vehicular LOS to account for non-auto modes and a broadening array of other economic, social, environmental, and cultural values. As perspectives broaden, so do the possibilities for metrics. Nearly 10 years ago, the Florida Department of Transportation synthesized over 200 metrics to supplement vehicle LOS for growth management and transportation impact analysis to support a transition toward multimodal transportation systems.[i]

One of the more useful metrics that several industry leading organizations have explored is *multimodal person capacity*, as it is closely related to the concept of vehicular LOS but broadened to incorporate a variety of modes. It illustrates that by including more multimodal options, a street can move more people.

Multimodal person capacity is one potential metric that Norfolk can use to evaluate a potential multimodal project to determine the degree to which it will improve the ability to move people.

FIGURE 8-1: NACTO'S MULTIMODAL PERSON CAPACITY ILLUSTRATION



This illustration from NACTO's Transit Street Design Guide shows the multimodal person capacity of a single 10-foot lane (or facility of equivalent width) by mode at peak conditions with normal operations. Image Source: NACTO

This concept is important because Norfolk's long-term vision is to continue to grow. To enable this long-term growth, the transportation system needs to be evaluated on its ability to move people, not just moving cars.

A New Framework for Evaluating Multimodal Design Concepts

As described in Chapter 2: Vision and Values, the Multimodal Norfolk transportation master plan establishes goals and objectives for the City's multimodal transportation system.

The three goals correspond to three vision themes:

- Connect (Freedom and Connectivity)
- Protect (Safety)
- Prosper (Equitable Prosperity)

This chapter describes a basic framework for how to evaluate a design concept for a project on a multimodal corridor based on how it would contribute to the vision themes and goals.

As mentioned previously, one reason to evaluate a design concept is to answer the question "How does this change relate to our overall vision and goals?" Alternatively, a multimodal corridor may have multiple potential design concepts that need to be compared. Evaluating the design concepts can answer the question "How much does each design concept get us closer to achieving our multimodal transportation goals?"

To answer these questions, the framework poses a series of evaluation questions related to the three goals. The framework also includes a list of potential quantitative and qualitative evaluation metrics to be used when considering one or more design concepts. These evaluation metrics are grouped under the categories of the vision themes.

The potential evaluation metrics proposed in this framework may require data collection and analysis to varying degrees of complexity and cost and will depend on available city resources. Bicycle counts are one example of data that can be collected. One of the recommendations from the League of American Bicyclists' key steps to the Silver Award is to develop a bicycle count program that utilizes several methods of data collection including automated bicycle counters to provide long-term data on bicycle use at fixed points and mobile counters. This data could provide periodic before-and-after data related to changes in Norfolk's bicycle network.

Three vision themes represent the three goals of the Multimodal Norfolk transportation master plan.

Connect (Vision Theme #1)

Connect people and places with a choice of affordable and accessible travel options.

This vision theme addresses a variety of affordable travel options connecting people to the things that they need.

Norfolk's population is diverse, and there is no one-size-fits-all solution to mobility within the City that will work for everyone. This vision theme recognizes that a transportation system that provides a range of options is needed to provide equitable access to Norfolk residents, workers, and visitors.

Norfolk is also a mature city with built-out streets. Accommodating travel demand growth and maintaining a range of travel options will require making efficient use of existing street rights of way.

Connections between modes is part of the Connect vision theme.

Evaluation Questions for the "Connect" Vision Theme

Does the potential design concept:	Yes	No
Increase overall person-throughput of the street?	☐	☐
Increase modal options or create dedicated space in the right of way for a new mode?	☐	☐
Form, enhance, or strengthen a link in a non-automobile modal network?	☐	☐
Provide non-automobile access to new parts of the city?	☐	☐
Introduce low-cost mobility options?	☐	☐
Increase the efficiency of the public right of way?	☐	☐

Evaluation Metrics for the "Connect" Vision Theme

The following are potential evaluation metrics for measuring how a potential design concept would contribute to the Connect vision theme and goal.

- Multimodal Person capacity
- Multimodal level of service
- Bicycle, transit, and pedestrian access sheds

Protect (Vision Theme #2)

Protect all who travel on our City's streets.

This vision theme addresses the safety of all citizens who travel on Norfolk's streets. As mentioned in prior chapters, Norfolk's adopted Vision Zero policy sets a goal of zero fatal crashes on the City's streets. Transportation networks that prioritize vehicle speed and capacity over safe and convenient travel for people outside of cars may create conditions where traffic injuries and deaths are more common.

This vision theme envisions a city where the safety of all who travel on Norfolk's streets is prioritized. Achieving this vision will require a shift in priorities for transportation projects and new metrics for considering design concepts.

In recent years, the transportation profession has given increasing emphasis to safety for all road users and not just drivers of vehicles. However, robust quantitative metrics for evaluating the multimodal safety are still somewhat lacking. Recent research using crash data, though, has confirmed that certain street designs reduce traffic injuries and fatalities, and these types of safer street design elements are built into the multimodal design approaches in this Master Plan.

In addition, Norfolk, as one of the most vulnerable cities in the nation with respect to recurrent flooding events, has a special policy focus on resilience. For this reason, evaluation questions and metrics that address resilience have been included in the "Protect" theme.

Evaluation Questions for the "Protect" Vision Theme

Does the potential design concept:	Yes	No
Slow down vehicle traffic?	☐	☐
Provide physical protection to vulnerable road users?	☐	☐
Shorten pedestrian crossings?	☐	☐
Decrease over-designed curb radii?	☐	☐
Provide refuge islands?	☐	☐
Facilitate low or no carbon emission travel?	☐	☐
Accommodate sea-level rise and flooding events?	☐	☐
Include green infrastructure to improve resilience?	☐	☐

Evaluation Metrics for the "Protect" Vision Theme

The following are potential evaluation metrics for measuring how a potential design concept would contribute to the Protect vision theme and goal.

- Number of safety treatments (curb extensions, refuge islands, etc.)
- Number of green infrastructure elements
- Miles of protected bike lanes

Depending on the context, some projects on multimodal corridors may improve safety for all road users including slowing down vehicles and improving facilities for non-auto modes. Some projects may require a careful examination of how improving safety for one mode may affect the safety and accessibility of other modes. This balance varies depending on the function of the street road, the characteristics of the surrounding neighborhood and land uses, and network connectivity. This balance needs to be carefully considered when developing design approaches and refining design concepts.

Prosper (Vision Theme #3)

Create a prosperous multimodal future for all.

This vision theme fosters a future transportation system that supports a resilient, equitable, and strong Norfolk economy. This theme fosters connecting citizens to jobs, education, and other opportunities for personal prosperity regardless of their economic means. It also fosters connecting Norfolk's businesses to a large and diverse talent pool and making the City a more attractive place for businesses and workers to locate. Further, it supports efficient freight deliveries, appropriately accommodating them within the broader multimodal transportation system.

Historically, transportation projects' impacts on a local economy have been evaluated based on reductions in vehicle congestion, travel time, and delay. This approach has been based on the relative ease of calculating vehicular LOS, but it is too limited in accounting for a number of other ways in which a project could impact overall economic prosperity. The following evaluation questions and evaluation metrics provide a broader picture of how a potential project could contribute to overall prosperity.

Evaluation Questions for the "Prosper" Vision Theme

Does the potential design concept:	Yes	No
Increase travel choice for residents and workers?	☐	☐
Add new options for accessing business locations?	☐	☐
Enhance a local sense of place?	☐	☐
Contribute to an attractive public realm?	☐	☐
Support the economic viability of adjacent land uses and the city as a whole?	☐	☐
Include green infrastructure or recreational opportunities, or improve access to parks or open spaces?	☐	☐

Evaluation Metrics for the "Prosper" Vision Theme

The following are potential evaluation metrics for evaluating how a potential design concept could support a resilient, equitable, and prosperous Norfolk:

- Change in the number of jobs accessible by non-automobile modes
- Number of new street trees
- Number of new public amenities added to the street
- Increase in access to parks, recreational opportunities, or open spaces

Assessing and Communicating Tradeoffs

Norfolk is a mature city with well-established street and building frontages. Widening streets is either physically impossible or very expensive in most cases due to the built-up nature of the City's neighborhoods and commercial areas. At the same time, Norfolk envisions new growth and prosperity with increasing travel demands over time. How can these constrained rights of way accommodate increased trips safely and efficiently in the future? The answer is to gradually reconfigure streets to move more people safely and efficiently.

As shown in Figure 8-1 previously, the number of people that can be moved in a street can be greatly increased by including more multimodal options.

Making Norfolk's streets friendlier for bicycles, pedestrians, transit, and future transportation modes is not just an issue of safety and equity but can position the city for accommodating more growth and prosperity in the future.

In the near term, this implies balancing the needs of different modes to achieve the right mix of accommodations for all modes on the street.

The hypothetical example of designing a multimodal project in Chapter 7 illustrates this type of balancing of travel modes. In this example, both the short-term and long-term design concepts involve repurposing one of the two general travel lanes in both directions for use by other modes. While the design concepts in this hypothetical example reduce the vehicular capacity of the corridor, they further all of the city's multimodal transportation goals. Chapter 7 also explains the general process used in this example to identify and assess tradeoffs.

The next section contains a second hypothetical example that illustrates the project evaluation process and how the proposed framework for evaluating multimodal design concepts could be used.

Evaluating a Multimodal Corridor Design Concept – A Hypothetical Example

The following hypothetical example demonstrates how to use the evaluation framework presented in this chapter to assess how a proposed design concept would meet the city's goals for multimodal transportation.

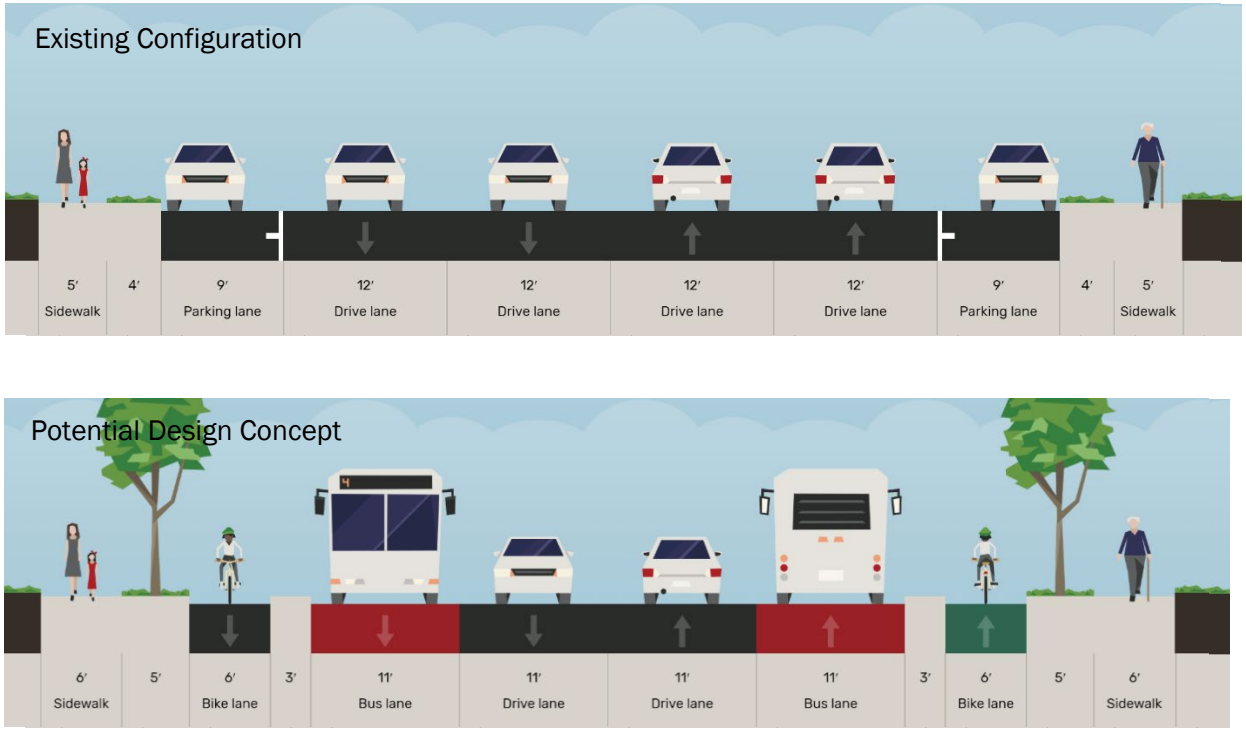
This existing configuration of the hypothetical street (Figure 8-2, top) looks like several corridors in Norfolk that have been designed primarily to optimize circulation for cars. The street has two travel lanes in each direction, curbside parking, and 5-ft wide sidewalks on both sides.

The hypothetical design concept (Figure 8-2, bottom) reimagines the street cross section to better meet the multimodal goals in this Master Plan.

The key additions of this hypothetical design concept are:

- dedicated bus-only lanes in each direction,
- separated bicycle lanes in each direction,
- widening of the planted buffer and addition of street trees, and
- widening of the sidewalks.

FIGURE 8-2: MULTIMODAL CORRIDOR DESIGN CONCEPT EVALUATION EXAMPLE – CROSS-SECTION ILLUSTRATION



This hypothetical example demonstrates how a proposed design concept could be evaluated using the evaluation questions in the proposed framework.

To accommodate these new facilities for bus passengers, bicycle riders, and pedestrians, the project would remove curbside parking and one travel lane in each direction. It is important to note that in this hypothetical example, the overall cross-section width was expanded from 60 feet in the existing configuration to 84 feet in the potential design concept.

The hypothetical design concept was generally evaluated through the lens of the three Multimodal Norfolk vision themes using the evaluation questions, as shown in **Table 8-1** on the next page.

TABLE 8-1: EVALUATION QUESTIONS FOR THE HYPOTHETICAL EXAMPLE

	Does the potential design concept:	Yes	No
Connect	Increase overall person-throughput of the street?	☑	☐
	Increase modal options or create dedicated space in the right of way for a new mode?	☑	☐
	Form, enhance, or strengthen a link in a non-automobile modal network?	☑	☐
	Provide non-automobile access to new parts of the city?	☑	☐
	Introduce low-cost mobility options?	☑	☐
	Increase the efficiency of the public right of way?	☑	☐
Protect	Slow down vehicle traffic?	☑	☐
	Provide physical protection to vulnerable road users?	☑	☐
	Shorten pedestrian crossings?	☐	☑
	Decrease curb radii?	☐	☑
	Provide refuge islands?	☐	☑
	Facilitate low or no carbon emission travel?	☑	☐
	Accommodate sea-level rise and flooding events?	☐	☑
	Include green infrastructure to improve resilience?	☐	☑
Prosper	Increase travel choice for residents and workers?	☑	☐
	Add new options for accessing business locations?	☐	☑
	Enhance a local sense of place?	☑	☐
	Contribute to an attractive public realm?	☑	☐
	Support the economic viability of adjacent land uses and the city as a whole?	☑	☐
	Include green infrastructure or recreational opportunities, or improve access to parks or open spaces?	☑	☐

When evaluating real projects, it would be possible to do more detailed quantitative analysis of some metrics, including multimodal capacity, access, and travel time.

The overall evaluation results are also summarized in **Figure 8-3**, which lists the ways in which the hypothetical design concept contributes to the goals Norfolk established in the Multimodal Plan.

In some instances, the City may prepare multiple design concepts, and each one would undergo an evaluation to illuminate the extent to which it contributes to the City's goals for its streets.

A Note on Tradeoffs and Multimodal Person Capacity
In this example, vehicular capacity is reduced somewhat due to the reduction in travel lanes.

On the other hand, transit, bicycling, and walking can ultimately move more people in the same space than driving in a car. This means street space can be used by more people in the hypothetical example through expanding the capacity for buses, bikes, and pedestrians.

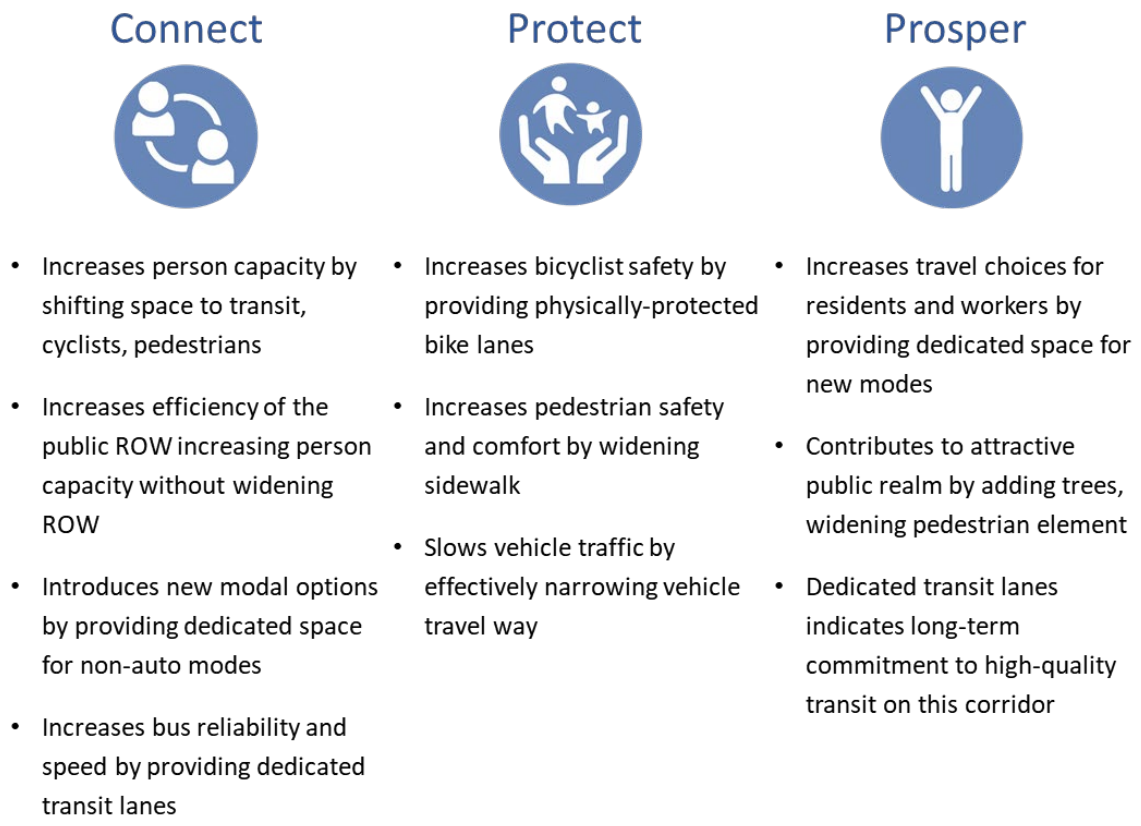
It should be noted that the person-capacity of a bus-only lane is dependent on bus frequency and bicycle lane use is affected by the availability of a complete network of bike facilities. It is difficult to compare the precise person capacity of corridor alternatives, but Norfolk has set a long-term goal of shifting travel to efficient modes so future projects should emphasize non-automobile modes in the public right of way.

Summary of the Evaluation Framework

Multimodal Norfolk establishes a vision and goals for the City's multimodal transportation system. The evaluation framework presented in this chapter allows decision makers, stakeholders, and the public to understand the extent to which a potential project on a multimodal corridor would contribute to the vision and goals before making any changes to the City's streets.

This framework is envisioned to be a tool that city staff, including planners and engineers can use to communicate the benefits and tradeoffs of a multimodal project or design concept to the public and elected officials.

FIGURE 8-3: MULTIMODAL CORRIDOR DESIGN CONCEPT EVALUATION EXAMPLE – EVALUATION RESULTS



This graphic summarizes the results of the qualitative evaluation of the hypothetical example.

[i] Elefteriadou, L., et. al. 2012. *Expanded Transportation Performance Measures to Supplement Level of Service (LOS) for Growth Management and Transportation Impact Analysis.* Retrieved on Jan 20, 2021 from https://trid.trb.org/view/1223021.