Agenda

Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Meeting: **Technical Work Group Meeting**
Designing Livable Streets and Trails

Date: Monday, March 18, 2019

Time: 1 to 4 p.m.

Place: Metro Regional Center, Council Chamber

Purpose: Review and provide input on Chapter 6

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1 p.m.	**Welcome & introductions** • Meeting purpose and desired outcomes • Name and organization	Tom Kloster, Metro
1:20 p.m.	**Project update** • Metro Council work session on March 12 • JPACT update March 21 • TPAC/MTAC workshop on April 17 • Design forum and technical workshop on April 22	Lake McTighe, Metro
1:30 p.m.	**Chapter 6 presentation and discussion** • Overview of framework • Steps 1-8	Karla Kingsley, KAI
2:30	**Break**	
2:45	**Continue Chapter 6 presentation and discussion**	Karla Kingsley, KAI
3:55 p.m.	**Next steps and adjourn** • Additional comments on Ch. 6 due April 1	Lake McTighe, Metro

Meeting Packet	Next Meeting
• Agenda • Draft Chapter 6 • Summary comments from Jan. 25th meeting	**Monday, May 20, 2019** 1-4 p.m. Metro, Council Chamber *Review and provide input on Draft guidelines*

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Metro

August 2016

Meeting minutes

Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Meeting:	**Technical Work Group Meeting** **Designing Livable Streets and Trails**
Date:	Monday, January 28, 2019
Time:	1 to 4 p.m.
Place:	Metro Regional Center, Council Chamber
Purpose:	Review and provide input on approach to nine of the design elements in Chapter 4 of the Designing Livable Streets and Trails Guide

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Work Group Attendees
Stacy Revay, Beaverton
Richard Blackmun, Forest Grove
Jeannine Rustad, Tualatin Hills Parks and Recreation Dept.
Scott Hoelscher, Clackamas County
Rob Saxton, LUT, Washington County
Dyami Valentine, Washington County
Scott Adams, Multnomah County
Brendon Haggerty, Multnomah County Public Health
Lidwien Rahman, ODOT (project team)
Rich Crossler-Laird, ODOT
Zachary Horowitz, ODOT
Nick Fortey, FHWA
Grant McConnell, TriMet
Scott Batson, PBOT
Denver Igarta, PBOT
Zef Wagner, PBOT
Maya Agarwal, Portland Parks and Recreation
Julia Hajduk, Sherwood
Mike McCarthy, Tualatin
Rich Mueller, Tualatin
Carol Chesarek, MTAC alternate
Zach Weigel, Wilsonville
Kari Schlosshauer, Safe Routes to School National Partnership
Jillian Detwieller, The Street Trust
Claire Vach, Oregon Walks
Bob Sallinger, Audubon Society of Portland
Karla Kingsley, Kittelson and Associates (project consultant)
Hermanus Steyn, Kittelson and Associates (project consultant)
Mike Faha, Greenworks (project consultant)
Anthony Buczek, Metro
Lake McTighe, Metro (project manager)
Robert Spurlock, Metro
Tom Kloster, Metro

Work Group Members Unable to Attend
Tim Kurtz, BES, Portland

Robert Galati, Sherwood
Rick Nys, Clackamas County
James Reitz, Forest Grove
Ryan Guy Hashagen, Better Blocks PDX
Chris Strong, Gresham
John Boren, Hillsboro

Interested Parties/ Metro Staff Attendees
Heidi Guenin, ODOT
Tim Collins, Metro
Jamie Snook, Metro
Lori Hennings, Metro
Rebecca Hamilton, Metro
John Mermin, Metro
Derek Abe, Alta Planning and Design
Matt Berkow, PBOT

Action items
- ✓ TWG members and interested parties asked to submit additional comments by Feb 4

Summary of comments with staff/ consultant response

NOTE: The following summary includes comments provided at the meeting, and comments provided after the meeting via email. Metro staff and consultant responses to comments are in **BOLD.**

Lake McTighe of Metro provided an overview of the project timeline and work completed to date. She provided an overview of the street functions graphic, the land use and transportation transect graphic, the regional design classifications map and the template for the design elements.

General comments

1. Section 2.3 (in the Annotated Outline) introduces the performance based design concept. Admittedly this is just an outline but we would encourage the discussion to look beyond practical design (in some readings of practical design, decisions made under that approach, e.g. cost savings, might not be compatible with the intended broader focus of performance based design to look more completely at life cycle costs and intended outcomes from the project)t. In Oregon and Washington there was a substantial discussion around "least cost planning" and that provides a different context than elsewhere in the Nation which might also be informative. **Agreed. Chapter 6 will provide a Performance-Based Design framework. This framework incorporates practical design, along with other strategies such as least-cost planning, value engineering, context sensitive solutions and tactical design, but it is more than that. While practical design can help agencies**

realize cost savings by utilizing flexibility that exists in current design guidance and regulations, performance-based design considers cost savings with the understanding of how those decisions could impact other objectives such as safety for all modes, context sensitivity, life-cycle costs, long-range corridor goals, livability and sustainability.

2. Currently, under 2.2 (Social Equity – in the Annotated Outline) there is the anticipated coverage of "streets are intuitive and easy to use regardless of age, ability, cultural background, language." There is value of replicating and extending this concept and embracing the "self-enforcing" roadway or perhaps slightly more eloquently the "self -explaining" roadway wherein the roadway and roadside features See: https://ec.europa.eu/transport/road_safety/specialist/knowledge/road/designing_for_road_function/self_explaining_roads_en A lot of the original focus was on speed control or speed harmonization but I think the concept has merit for this effort yet does not need to lead to a "uniformity or standardization" of design but can still allow appropriate placemaking but provide a consistent set of cues to all users. **This is an interesting concept which is inherent in the guide. There are a few different places we can reflect this concept a bit more explicitly, including the design principles, design outcomes and in the description of the street design classifications. The idea that less traffic control devices would be needed is worth looking at from a safety perspective.**

3. The Safe Systems approach, again to the extent this is a Metro policy, serves as a useful frame for consideration of competing priorities either in the design discussion or in the decision chapter under preparation. **Agreed. It will be reflected in the discussions around safety.**

4. Having an Intersection Control Evaluation policy (renamed as needed) would be definite benefit as it forces an assessment of form and function. Examples abound but California and Washington and Georgia all deserve a look (latter noteworthy as they have used the policy to use low cost, quick delivery roundabouts on their state highway network). **Agreed. We will reference examples to illustrate its usefulness.**

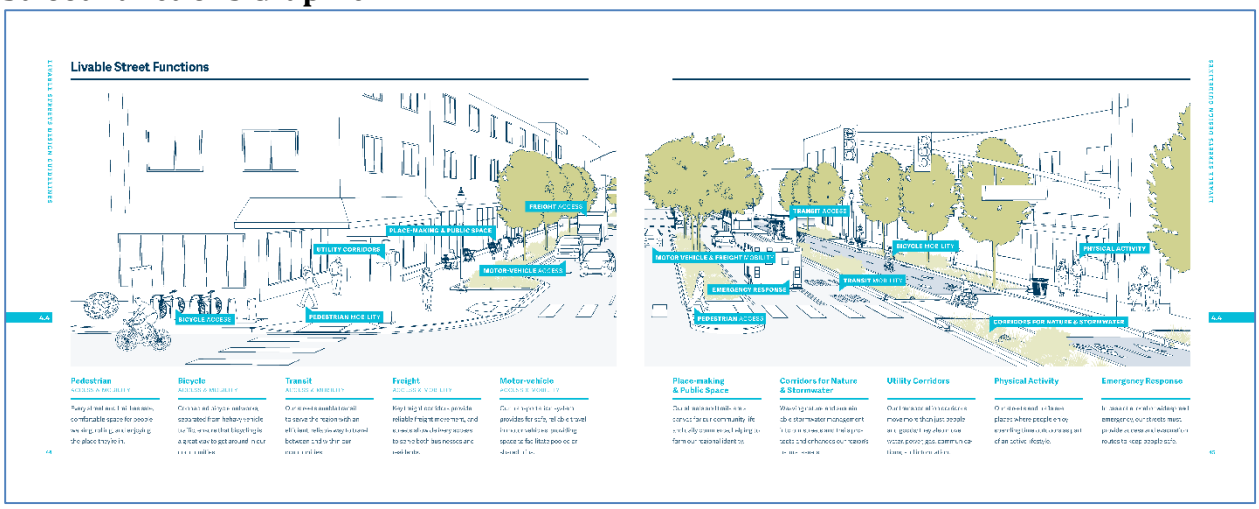
5. Thanks for the well conducted meeting Monday. I was thinking about the usability of this type of design guide, which works really well for policy folks and elected officials to garner support for what could be done. I was wondering how it could be more informational for our engineers, helping them realize resources for design that they can reference when they are asked to do it. You guys have already identified lots of best practices in NACTO and AASHTO. Are those references/resources captured in the guide somewhere? I couldn't tell from the design layout example if that is included. Or maybe a resource section for the technical follow up when a

designer is asked to build it? **The goal is that the guide is useful for engineers. There will be a list of best practice resources at the end of chapter 4 that will provide access to more details.**

6. In general, regarding the presented materials, so far, so good. **Good!**

7. Will the guide address alternative pedestrian walkways, i.e., things that can be used in locations where a full sidewalk on both sides of the street is infeasible due to either space or monetary considerations? I know that PBOT is working on this too. **Yes the guide will reference this type of approach.**

Street Functions Graphic

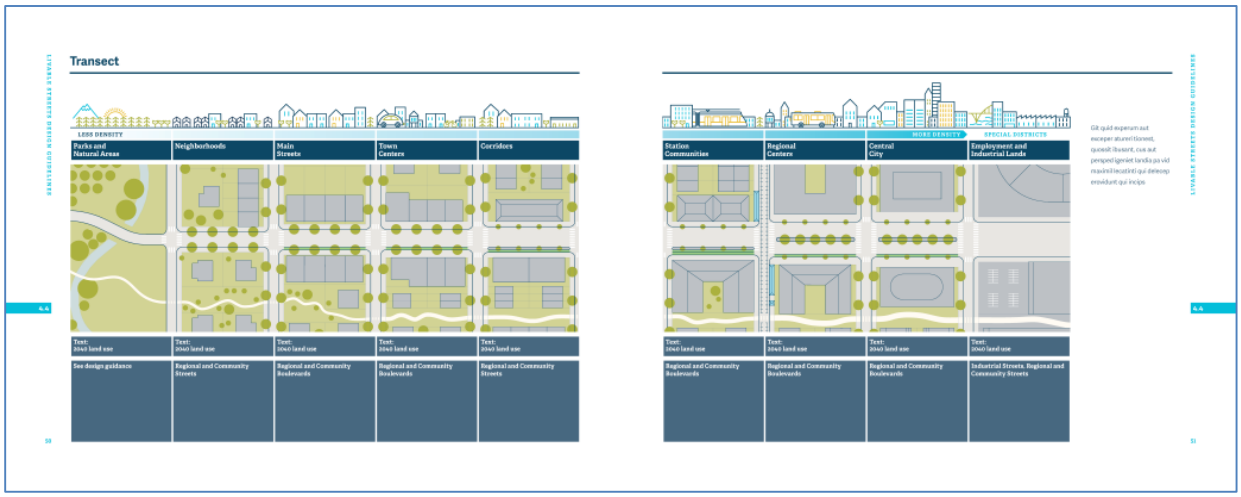


1. "Corridors for Nature and Stormwater" Consider removing the word "corridors?" Corridors would be ideal for linear transportation elements, but they don't truly need to be contiguous. Areas for stormwater management, trees, and landscaping often stop and start along the street alignment. This is in service to all the space needs of the right-of-way for sidewalk width, freight movement, parking areas, etc. Consider "Stormwater & Landscaping" for the function title? Or "Stormwater, Trees, & Landscaping?" Bringing vegetation into the streetscape does serve as a natural resource, but I'm not sure Nature is the right word for an urban / suburban context. **Noted and good points.**
2. "Corridors for Nature and Stormwater". We can't capture everything in a quick blurb for this context, but while it's certainly true this space "protects and enhances our region's natural assets," it also does much more. The current wording makes it sound a little more "feel good" - and potentially disposable given competition for space - than it really is. It improves localized air pollution, reduces peak temperatures, and provides micro-habitat for birds and pollinators. Stormwater management is required by local, state, and federal regulations, and protects public

health and safety (flooding, sewer backups, etc). **Good points. Noted. We will work on the definition.**

3. Remove soccer ball art in left-had corner. Is a walk signal missing on one side of the street? Heavy is misspelled under Bicycle. **Noted**

Land Use/Transportation Transect graphic



1. "Transportation routes are designed ..." might be better than "should be designed...." I believe all jurisdictions in the Metro area will require at least protection of natural features for all street classifications and all land uses. Also, having this in just the Parks / Natural areas column may make it seem like this is the only one where it applies. **Noted, good point.**
2. If possible add a "hiker icon" to the top strip at the mountain. Adding a pedestrian in the urban part of the strip could be good too. **Noted.**
3. Some of the densities on the Land Use and Transportation Transect seem low. In our growing region, with the traffic problems we are facing, one to three stories around light rail and high capacity transit stations doesn't sound right. Even along corridors, which are described as "major streets linking centers, serving as key transportation routes... and served extensively by transit," one to three stories seems low. As a region, we should not be aiming for one story buildings along streets extensively served by transit, and should encourage buildings over 3 stories where appropriate. More density in transit-rich areas absolutely needs to be a part of this plan. **We are updating as follows:**

Parks and Natural Areas
Current - Undeveloped lands inside and outside the urban growth boundary including rural reserves, parks, stream and trail corridors, wetlands and floodplains.
Updated - Undeveloped land inside the urban growth boundary including parks and open spaces, trail corridors, streams, wetlands and floodplains. *(Took out the outside the*

UGB and rural reserves references as the land is not undeveloped, just developed with rural uses)

Neighborhoods

Current - Smaller single-family lots, mixed uses and a mix of housing types including row houses and accessory dwelling units. Most neighborhoods are slightly more compact, while some have slightly larger lots and fewer street connections.

Updated - Single-family and multi-family residences incorporating a mix of housing types including row houses, duplexes and accessory dwelling units. Newer neighborhoods are slightly more compact while some older neighborhoods have larger lots and fewer street connections. *(The current language is from the inner and outer neighborhood designations on the 2040 map that are no longer relevant)*

Main Streets

Current – Commercial strips along major streets with one to three-story buildings for employment and housing with good access to transit.

Updated – Neighborhood scale commercial retail and housing in one to three-story buildings along multi-modal streets with good transit service. *(Tried to relate it more to Hawthorne or Belmont)*

Town Centers

Current – Commercial areas with one to three-story buildings for employment and housing and well served by transit.

Updated – Two to five-story mixed use buildings with professional services and commercial retail outlets complimenting housing that is well served by transit. *(Attempted to reflect the buildings that are being built in the town centers such as Orenco and Lake Oswego)*

Corridors

Current – One to three-story buildings along major streets linking centers, serving as key transportation routes for people and goods and served extensively by transit.

Updated – One to three-story buildings containing commercial retail, small scale employment or housing along major transportation routes that link centers together and are well served by transit. *(Added uses)*

Station Communities

Current – Areas around light-rail or high capacity transit stations with one to three story housing and employment.

Updated – Areas around light-rail or high capacity transit stations outside of centers with significant employment development and/or numerous housing types. *(Added outside of centers and highlighted the amount of employment that is around the stations)*

Regional Centers

Current – Two to four-story compact employment and housing development served by frequent transit.

Updated – Two to six-story compact employment and housing development with large format commercial retail served by high capacity transit. *(Added larger buildings and the large scale commercial retail that is in every regional center)*

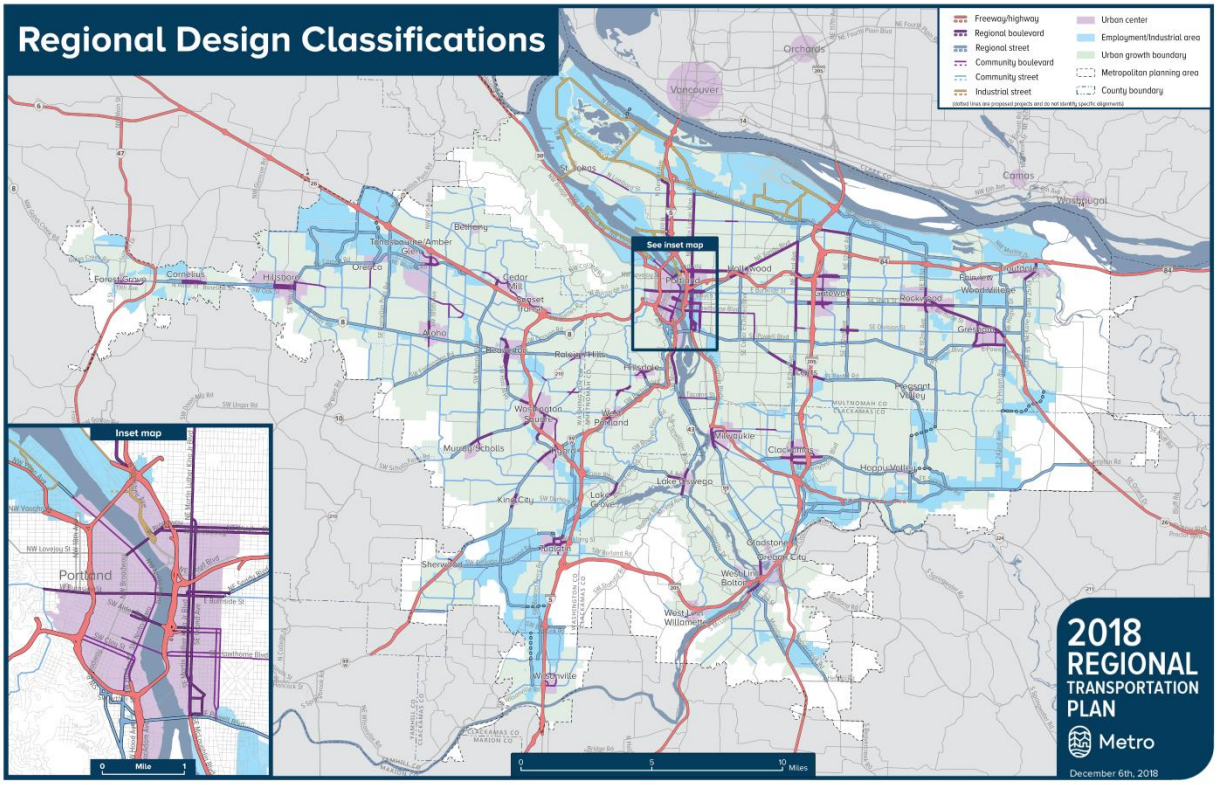
Central City

Current – Intensive housing and employment development with high rises well served by transit.
Updated – Center of business and cultural activities for the region with intensive employment and housing in high-rises served by numerous transit options. *(Minor adjustment including the business and cultural activities)*

Employment and Industrial Lands

Current – Industrial land and freight facilities for trucks, marine, air and rail cargo.
Updated – A mix of large scale employment and industrial uses that include office parks, manufacturing, distribution centers, marine and airport facilities and railroad switching yards.

Regional Design Classifications



1. Will there be an opportunity to review the design classifications and the design classifications policy map? Some of the design classifications assigned to arterials on the network do not seem feasible on those roadways. **Yes. The TWG will have an opportunity to review and provide input at the May 20 meeting. Members of TPAC and MTAC will be reviewing the design classifications and map at a workshop on April 17. TWG members are welcome to attend.**

2. Regional Design Classifications: consider showing a map of what has changed. **The following changes were made from the 2014 to 2018 map:**

Update to Design Classification Map: The 2018 RTP Motor Vehicle System map was updated based on local jurisdiction changes – some arterials were changed to collector and removed; some arterials were added; some arterials changed functional classification (e.g. from major to minor arterial). The RTP Design Classification map identifies street design classifications for arterials on the Motor Vehicle System map (and for a few 2040 Growth Concept Corridors and Main Streets that are not on the Motor Vehicle System map). Updates to the 2018 RTP Design Classification Map was done using the following approach to be consistent with regional design classification policy:

- Any street removed from the Motor Vehicle System map will also be removed from the regional design classification map.

- All other street design classifications on the Regional Design Classification Map will remain as shown on the 2014 RTP map, with the exception of streets identified as an Intermodal Connector on the Regional Freight System map – these facilities will be designated as an Industrial Street.

For arterials added to the Motor Vehicle System map in the 2018 RTP update:

- Any arterial on the Motor Vehicle System map that is in a 2040 center, station community or main street land use type is designated as a Boulevard.

- Any arterial that is in a 2040 corridor or in a 2040 neighborhood, industrial or employment land use type is designated as a Street.

- Any Boulevard or Street that is on a street classified as a Major Arterial on the Motor Vehicle System map is identified as a Regional Boulevard or a Regional Street.

- Any Boulevard or Street that is on a street classified as a Minor Arterial on the Motor Vehicle System map is identified as a Community Boulevard or a Community Street.

- All 2040 Corridors and 2040 Main Street land use types are shown on the Design Classification map. For 2040 Corridor or Main Street land use types that are not on the RTP Motor Vehicle System map, the Regional or Community designation is determined by the number of lanes on the existing or planned facility. Community = 2 lanes, Regional = 4 lanes.

It is anticipated that this approach will generally be appropriate, but that local jurisdictions may need to request some changes to the map prior to the next update of the RTP in 2023.

Nine Design Elements Presentation and Discussion
Karla Kingsley, of Kittelson and Associates, walked through each of the design elements presented in the power point presentation. Mike Faha presented on the Green Streets design elements. Each of the nine design elements was discussed in turn. Work group members also submitted comments via email after the meeting. The number in parentheses after each of the design elements refers to the number in the annotated table of contents.

Flex Zone – On-street parking and other uses (design element #6 in the annotated outline)

1. It would be helpful if you could address access for garbage cans and mail delivery/pick-up, two uses that sometimes use the flex zone and can conflict with other uses such as bikeways. **Will address.**
2. Please address TNC pick up and drop off use of flex zone and provide guidance. **Will address.**
3. Please address issues around pricing and time of day considerations. **Will note.**
4. Spell out BAT and define in glossary. **Will do.**
5. Please address shoulder considerations on higher speed arterials. **Typically shoulders are not a design element on an urban arterial.**
6. Flex zone term is good and illustrates that it applies to other areas in addition to next to the curb. **Noted.**
7. Please provide guidance on whether or not to provide a flex zone depending on roadway width. **Will address.**
8. Please address how the flex zone impacts pedestrian crossing safety at intersections, and any trade-offs. **This will be covered in the intersection design element section.**
9. Include guidance to determine if and when there should be a flex zone or if flex zone uses should be provided for elsewhere. **Noted.**
10. Slide #10 – include trees, they provide additional benefit. It is important to separate out trees from stormwater because they provide benefits beyond stormwater management. **Rather than adding a new column suggest changing title to something more encompassing such as green infrastructure.**
11. Consider leaving freeways/highways off of the table (slide #10) they do not have flex zones. **Recommend leaving on. BAT lane and stormwater/green infrastructure are important elements for consideration of the shoulder/flex zone.**

12. For some highways, for example, bike facilities could be included if there is a barrier. **Noted.**
13. Slide #10, parking is not currently provided on many boulevards, nor is there much room for parking or any other flex zone uses. **Noted.**
14. Slide #6, like how distinct land uses are considered. Most projects are only built to existing land uses, not planned. It would be good to include language/policy guidance for areas in transition from current to planned land use so as not to preclude the ultimate design. **Noted.**
15. It would be helpful to include guidance on the appropriate width for auto parking. **Will include.**
16. Please address flex zone use at corners and day lighting intersections for safety. **This will be covered in intersections design element.**
17. Please address how the nature of the street, such as traffic speeds, influences design decisions. **Will address.**
18. Slide #10 – make loading and unloading a key consideration for boulevards and separated bike facilities a key consideration for streets. **Will update as recommended.**
19. Slide #10, Transit/BAT: might this be more flexible as HOV/BAT? I know of a city in Washington that adopted a standard that requires added auto lanes after a 4 or 5-lane section to be HOV. HOV would include Transit, but would not be exclusive, downside? HOV also usually permits motorcycles. Alternatively, I don't recall seeing Transit+bike lanes mentioned. **Noted.**
20. Chapter 4 Design Elements: consider including any project examples completed in the Metro region related to flex zones, BAT, etc. More examples the better especially projects that have been implemented in a constrained ROW. **Noted.**
21. Flex Zones: Is traffic volume considered here? Guidelines specifically for where these types of treatments can be implemented? The more examples the better
22. Not sure where this should go but it is compatible with discussions in the outline about flexibility and transition zones and flex streets ("dynamically allowing different uses at different times of the day per slide #9) and that is the concept of design "over the day" and "over the life of" the facility which would explicitly recognize changes in expectation during peak periods and would encourage incremental improvements as well as strategies and design elements that might have "transitory life" yet provide reasonable return on investment. A particular emphasis we support is the inclusion of safety investments which may be short lived yet deliver sizeable returns. **The guidelines will reference pilot projects and tactical design. In regards to safety, an approach to implement safety projects quickly, without necessarily waiting for a big project will be included. We will be adding overall design principles to chapter 4 so we may also reflect this**

approach in the Safety principle.

23. Slide #10 - Great that all classifications are at least TYPICAL (for stormwater treatment). I might suggest 'Community Boulevard' could be KEY rather than TYPICAL. **Noted.**

24. Slide #8 – add consideration of freight corridors and freight mobility. **Noted.**

Green Streets (design elements #5 and #7 in annotated outline)

1. If we are going to call this section Green Streets, which makes sense, need to address more than just stormwater. Like the idea of having a Green Streets design element – but there is more to Green Streets than stormwater management (though this is undoubtedly a huge element). Street trees in particular seem to be getting short shrift. On Slide #11 the definition of Green Streets needs to be expanded….address air quality, noise mitigation, habitat, shade (cooling for extreme heat), shelter in extreme weather events, green parking, green bus stops…the EPA link at the bottom of the slide lists a whole bunch more. **Noted. Benefits of street trees will also be discussed within pedestrian realm and median.**
2. Also some of the design considerations in the current guide (e.g. maintenance, depth of groundwater, etc) are not being addressed. **Noted.**
3. Slide #18 – sumps – these are not green and are limited to certain localities. If included should be very clear on the pros and the cons. Think carefully if it is ok to use/include qualifications on safety and appropriateness. **Noted. Guidance will prioritize vegetated facilities and include conditions/caveats related to use of sumps.**
4. Slide #20 - there is a reference to pervious pavement in Gresham. I attended a presentation about this project, which was great, and I'm delighted that it is working there. But there are characteristics of that project that aren't true in other places (not a lot of trees/leaf debris), and it also isn't clear whether the reduction in pollutant levels will hold true over time (vs tailing off if pavement's ability to absorb them diminishes). I love pervious pavement, just cautioning that a balanced story needs to be told.
5. How are we doing on stormwater management? Is it still a problem? What percent of the public ROW is being treated? Do we need more detention? **Including this specific information is not within the scope of the guide. We will include some general statements about how there has been a lot of progress made in the past decades and how regulations and best practices continue to evolve as we learn more.** Please include flexibility in the design approach in how we work towards goals; for instance we do not want to demolish buildings to put in rain gardens. **Agreed.**

6. I wanted to add onto the discussion from the Livable Streets meeting on Monday. I know that someone had recommended separating the storm water treatment and street trees/landscaping into separate considerations, and Wilsonville strongly encourages this recommendation. We and a number of other cities are finding that street trees placed within storm water facilities are not working out as well as we had hoped and are creating root intrusion problems and are having to be removed after 10 years when the storm water facility filter media is replaced. In order to establish a street tree canopy, we are starting to develop standards to require separation of street trees and storm water facilities. Both are important in the development of a livable streets system, but we support making street trees and water quality facilities separate considerations when evaluating livable streets design. **Noted.**
7. Placement of water quality facilities within the right-of-way has become more challenging over time as more needs are competing for space. As a result, Wilsonville would request that placement of these water quality facilities not be too prescriptive and allow for flexibility. **Flexibility is a core part of the design approach for the guidance and the guide will not prescribe specific placement or locations for treatment.**
8. Add lined facilities. We definitely want to infiltrate when we can, but higher classification streets will often have utilities or adjacent structures that may limit infiltration opportunities even if the soils are appropriate. Partial infiltration and lined facilities still accomplish many of our regulatory requirements and regional objectives. They don't remove as much volume, but they are generally equivalent for WQ treatment and peak flow reduction. **Noted.**
9. The bundled *Nature & Stormwater* function doesn't feel quite right. They do more than just protect / enhance natural areas. Stormwater facilities are a formal part of the stormwater system just like pipes, and they protect public health and safety (localized flooding, basement sewer backups, etc), clean the air, and so on. It would be great for the guidelines to help those less familiar with why those precious square feet in the ROW are important, to have more of that context. **Noted.**
10. Depending upon site conditions and land availability, we will occasionally move towards regional green street facilities adjacent to, or a short distance from, the transportation corridor. Sometimes the economy of scale, and configuration of the ROW make it the most cost effective solution. The regional facilities are essentially large basins or large planters, with runoff piped to them from the ROW. Perhaps not a nuance that needs to be included here. **Noted.**
11. Slide #1 - Instead of "store water volumes" maybe: "... to reduce roadway pollutants, and to retain and slow street runoff during rain events." Gets all three primary goals - WQ, peak flow, and volume. **Noted.**
12. Slide #18 - The City of Portland generally doesn't allow them (UICs) on arterials due to their higher pollutant loads and water quality concerns, but perhaps that's

covered under "environmental concern." **Noted. Will clarify, if this treatment is retained in the design elements.**

13. Slide # 20 - Infiltration is always preferred, but often not possible / practical given urban site constraints. Lined facilities don't remove as much volume (they do some), but are still very effective at WQ treatment and peak flow reduction. They're not mentioned other than in the presentation notes for slide 19. Incorporate a discussion on the relative merits of infiltration, partial infiltration, and lined facilities? **Noted.**

Motor vehicle travel lanes (design element #9 in the annotated outline)

1. Please include a table with guidance on recommended widths based on the table in slide #24. **Will be included.**
2. Adding a turn lane can help leverage doing a 4 to 3 conversion for safety. **Agreed. This will be reflected in the design approach.**
3. Will you address intersections, turn lanes, signalization, and timing? **Yes in the intersections design elements.**
4. Consider adding recommendations for road reallocations that transform the entire street to a completely different use. **We will provide some guidance in Chapter 6 on when to consider reallocation of space. We will likely not cover every potential conversion option, but will focus on those likely for regional streets. However, the guidance is designed to be flexible and lead practitioners to make decisions about allocation of space based on the functions and outcomes they are trying to serve, and some guidance on where certain functions should be prioritized.**
5. Please provide guidance on the process to choose different functions and uses for lane reallocation and balance trade-offs with vehicular access and mobility. **Yes will be added to the motor vehicle travel lanes design element and is included in the decision making framework in Ch 6.**
6. Lane reallocation provides a lot of opportunity for increasing safety. Please mention opportunities with road resurfacing, narrowing lanes, parallel facilities for some functions considering the throughput and resiliency of the overall network. **We will provide some guidance in Chapter 6 on when to consider reallocation of space. We will likely not cover every potential conversion option, but will focus on those likely for regional streets. However, the guidance is designed to be flexible and lead practitioners to make decisions about allocation of space based on the functions and outcomes they are trying to serve, and some guidance on where certain functions should be prioritized.**
7. Will you address how to choose design speed? **The topic of speeds generally will be addressed in the design principles.**

8. Slide # 23—Motor vehicle travel lanes: Please include any research pertaining to the width of lanes for a freight/truck route and best width for buses. **Will be included.**
9. Where will the importance of street connectivity be addressed? **It will be addressed in the design principles which will be added at the beginning of Chapter 4.**

Bicycle facilities (design element #14 in annotated outline)

1. 'Protected Bike Lanes' keeps getting used interchangeably with buffered bike lanes, which have essentially zero protection. Mixing terms will only confuse practitioners and the public. **We will make sure to clearly define, with pictures, and use terms in alignment with national guidance.**
2. Should be bicycles plus – there are so many new technologies, scooters, e-bikes. **Will address in this section.**
3. Call separated bike lanes protected bike lanes. Not sure why Buffered Bike Lanes are referred to as On-street – aren't all of these facility types on-street? **Will change.**
4. Slide #32 do the widths measure from face of curb to edge of pavement? **No, will clarify.**
5. In more suburban areas wider bicycle facilities can be mistaken for parking. Please provide guidance on how to prevent this from happening. **Noted.**
6. Regarding air pollution, parallel route makes more sense for kids, they are at higher risk in polluted corridors. **Noted.**
7. Regarding high level of pollution – impacts all modes, not just people bicycling. Provide design approach to reducing pollution levels not just moving modes off of the street. **Noted. Additional input from the work group will be sought on design approach that will reduce pollution, e.g. increase non-motorized travel options.**
8. Please provide design guidance that addresses grade, whether bike facility travels uphill or down (safety issues) and density of driveways. **Yes, will add.**
9. Slide #31 - Need to define equally direct. Look at how much further people are willing to travel to use better quality and safer facility, but also address access to destinations when a protected facility is not provided. **Noted. Additional input from the work group will be sought.**
10. Not sure where this might belong…some research related to maintaining separated and/or buffered bike lanes (over and beyond paint of course) would be helpful as well. Local examples to be included. **Noted. We can mention in resources and add to list of future case studies to be considered. Not currently in the scope of the project.**

Transit stops (design element #16 in annotated outline)

1. The Transit Stops section talks about access to stops across the street (ie, crosswalks) but doesn't talk about access along the street, ie, sidewalks! It's so basic, but should still be mentioned. **Yes! Will be included in the Design Elements for the Pedestrian Realm, including Pedestrian Through Zone (sidewalk) and Street Corners.**

2. Please define/include guidance on how close safe, enhanced crossings need to be near transit stops. PBOT provides guidance of 100' from transit stop. **Will refer to the PBOT guidance and the Regional Transportation Functional Plan, Section 3.08.120, which "Provide safe, direct and logical pedestrian crossings at all transit stops where practicable;"** **https://www.oregonmetro.gov/sites/default/files/2015/02/03/chap308_regional_transportation_functional_plan.pdf**
3. It would be helpful to include best practice guidance for pedestrian access to transit that would prohibit closing crossings at intersections. **Noted.**
4. Please make sure not to sacrifice pedestrian safety and comfort when designing better alternatives for bike/bus interactions. Bike up and over is not ideal for pedestrians. **Will clarify in the design approach; the intent is safety for all.**
5. Please provide guidance on reducing pedestrian delay at signalized intersections near transit stops. It is a safety issue. **Will include design approach to address this.**
6. Include stormwater management and trees in transit stop considerations. Example of a green bus curb extension, at SE Washington west of 86th. **Will integrate. Note, SE Washington at this location is a Regional Street design classification.**

7. TriMet is cautious about using a floating bus stop on higher speed roadways. It is possible to get the design to work if there are enough design elements to protect pedestrians. **Noted. Project team will seek input from TriMet and SMART to identify preferred design approaches on higher speed roadways.**

8. One possible idea for making "floating bus stops" and other "floating" streetscape features safer for pedestrians could be in the use of pavement markings such as UK-style zig-zag fog lines. Virginia DOT did some research in 2008-2009. **Noted**

https://usa.streetsblog.org/2015/11/20/zig-zag-road-striping-calms-traffic-in-virginia/

https://mutcd.fhwa.dot.gov/reqdetails.asp?id=520

http://www.virginiadot.org/vtrc/main/online_reports/pdf/11-r9.pdf

9. Please note the ways to mitigate the conflicts with the bike up and over design. **Noted, also this design is for constrained ROW; floating bus stop with bike behind is preferred design.**
10. Please include best practices on things to include at transit stops – seating, shelter, lighting, information, trash receptacles, art, etc. **Will include.**
11. Slide #44 The up and over design solution should be used in a constrained environment – make a note. Change floating bus stop to referred design. **Yes.**
12. Slide #44 – mid-block bus stops seem like they would be preferable on long blocks with enhanced crossings intersections more 500' apart. Can some guidance be given here? **Yes, agreed, will make that change with note.**
13. I appreciated your comment about pedestrians as "honored travelers"! **Yes, designs that prioritize transit riders as they access transit is an important factor in increasing safety and use of transit.**

Roundabouts/mini-roundabouts (design element #22 in annotated outline)

1. Please address the potential for roundabouts to increase crossing distance and out of direction travel for pedestrians. **Roundabouts do not typically increase crossing distance for pedestrians, but may increase out of direction travel.**
2. The role of land use/urban design influences whether a roundabout is preferable in an urban setting where placemaking is important. **Noted.**

3. Roundabouts increase safety, including for bike and ped. It might be helpful to note life-cycle cost savings from safety. **Noted. Practical solutions/ practical design is a core element of performance-based design. Identifying projects and project elements that support desired outcomes, such as safety while also being cost effective are part of the design process outlined in chapter 6.**
4. Please include information on landscaping, greening the center of the roundabout, also a place for art. **Will include.**
5. It would be helpful to include information on retrofits, an urban case study. **Noted**
6. Roundabouts. The slides mention safety benefits, and I like roundabouts and believe in general they are safer, but I have a question. A roundabout was proposed for a large intersection near my neighborhood that has a lot of fast moving semi truck traffic, including double and even triple trailers. We were told that the trucks would take up both lanes of the roundabout. This struck me as being unsafe for cars who might be trying to pass or maneuver around a large truck (who might be in the other lane the truck might unexpectedly move into), so I wondered if there were safety studies about two lane roundabouts with a mix of trucks and cars where trucks would need to use both lanes. **Noted. Yes there are safety studies on this topic.**

Regional Trails: multi-use paths and on-street connections (design elements #24, #25 in annotated outline)

1. Need to explicitly that motorized users – electric bikes, e-scooters use trails might also use trails. **True. Trails need to be designed to accommodate a wide range of users traveling at different speeds and using the trails and different ways. This is included in slide 65 and will be carried into the guidance.**
2. Need to include recommendations for when to include a parallel on-street protected bikeway, when trail is heavily used, a lot of pedestrians and not good for a bike commuter route. **Using the chart on slides 71-72 would lead to this conclusion, the explanatory text will note this.**
3. Slide # 56 May not want to refer to trails as "corridors for nature" as trails can be disruptive to wildlife. **Replace the term "Corridors for nature" with: "Enhance degraded habitat" and "remove barriers to wildlife connectivity"**
4. With the Moody Ave example it begins to be a bit muddy, what is a trail, what is not, and starts to move into the protected bikeway intersection. **Noted.**
5. The Multi-Use Path section talks about design speed for bikes. How would this work? Can the guide give examples/ideas of how to do this? **Noted. We are considering eliminating reference to design speed for multi-use paths - – it gets into more technical design that is better covered by AASHTO. This guidance can be more general – to consider speeds and speed differentials**

(and speed reduction) in determining width and alignments (and provide typical speeds of different users).

6. Slide # 72—Design Speed: Consider adding information here related to, near playgrounds and schools, senior centers, etc. **see above.**
7. Surprised to see 18 mph as a design speed for bikes, seems unlikely. Also peds travel 0-3 miles, lots of stopping. Perhaps provide guidance on when to provide more stopping space – near schools, playgrounds, etc. **see above.**
8. It would be helpful to include guidance on the minimum width when to separate modes. Stripping can encourage people to go faster. Include guidance on elements that calm speeds, rather than stripping and signage which can be ignored. **Will do.**
9. Please provide guidance on when to stop autos vs. trail users for different types of crossings – signalized intersections, driveway, low volume street. **Yes, will be included in the design elements for intersections, signalized and unsignalized.**
10. When there is space include soft surface jogging/walking trail. **Will include recommendation.**
11. Wider is not always better in trail design. **Will be reflected in the design approach to context sensitive design.**
12. If trail only floods once a year may be ok to build in floodplain; floodplain should not be reason to build a trail. **Yes, this is reflected. If there is another route may be preferable. But if not other route, an alternate route should be determined ahead of flood event to provide continued connectivity.**
13. Slide #66, there are reasons not to light trails – create shadows that can be unsafe, impact on wildlife. Please provide guidance on when to light trails or not. **See response to comment #18 below.**
14. Lighting trails that are used as bike commuter routes is important, if we want people to bike more. **See response to comment #18 below.**
15. Add guidance on maintenance, designing for maintenance access. **Designing for maintenance access is something we can mention in general terms, but how to do maintenance is outside the scope of content we intend to cover.**
16. Slide #75, first point: mixing different uses and speeds is not comfortable. Use a different phrase here, or address pedestrian comfort more specifically. **Will be reflected in design approach about separating users.**
17. Regarding multi-use path widths (the width selection table on Slide 71) – Perhaps a good complement to this table in the guide would be a few case studies (or a simple table) illustrating the peak hour volumes from a selection of locations in the Regional Trail Count Program. I think it is hard for people to estimate use on a facility that does not exist. In my experience, many places fail to anticipate the popularity of trails and build them too narrow. Given the anticipated growth in our

region, an extra few feet can go a long way. **Will include some general ranges of volumes… but in general a methodology for estimating volumes is outside the scope of this guide. Resources will be included in the chapter.**

18. Slide # 66—Lighting along transportation facilities is VERY important. Someone had mentioned taking this out of the plan, please do not. Regional trails should be lighted if we want people to use them as a transportation facility. **The guide will provide a design approach that seeks to protect habitat and avoid ecological impacts from lighting while also addressing safety, security and access for users on trails as well as streets. The guide will recommend avoiding lighting in sensitive habitat areas. If lighting cannot be avoided (the trail crosses a street; underpasses; conflict points) the guide will recommend using dark skies compliant lighting. For all facilities, trails and streets, the guide will recommend the following framework to mitigate the adverse effects of light pollution: 1) determine if light is needed – consider safety (especially for people walking and biking at intersections). 2)spectrum – recommend avoiding ultraviolet or blue light, and considering different habitat when choosing light color. 3) Intensity – reduce the intensity of lights when possible; this can also increase security by reducing shadows. 4) direction – lights should be shielded such that they only case light where it is needed, and never directed upwards. 5) duration – motion detectors and timers reduce light pollution and save energy.**
19. There was some discussion about removing the fifth design principle (Slide #64) and covering "respecting the natural context" under the fourth principle. We do not agree with this approach – in the fourth principle "Natural Areas" is a specific type of land use as identified in the 2040 Growth Concept; the fifth design principle covers much more than just parks and natural areas – it covers the natural landscape features whether they be in a center (e.g. the Willamette River in downtown Portland) a corridor (e.g. high value habitat in Clackamas County) a neighborhood (e.g. wooded areas along West Burnside). We recommend that the trail design principle "respecting the natural context" be retained. **Thank you for the clarification. These are very good points. We will retain the fifth trail design principle, changing the title to "Respecting the natural landscape context." We will be adding design principles for all of the design elements and will consider including this as one of the key design elements for streets as well as trails. We will also update Natural Areas (slide #68) under "Fitting the Land-Use Context" to Parks and Natural Areas.**
20. Slide # 66 –change "lighting on transportation facilities" to "Dark skies compliant lighting in tunnels and overpasses and as need to enhance security." Lighting should also minimize shadows, low shadow lighting. Under safety, add lighting to the last bullet about crossing streets. **Will change as recommended.**

21. Slide # 66 – security, add something about mile markers so that people can easily relay their location to police or emergency responders. **Will change as recommended.**
22. Slide # 68 – In Natural Areas – Reword the first bullet to say: Avoid lighting. If unavoidable, use dark skies compliant lighting. Add "dark skies compliant lighting" to glossary. Second bullet add "Avoid, minimize or mitigate..". **Will change and add to glossary.**
23. Slide # 68. The last section talks about Natural Areas – this is really about limiting harm to Natural Areas and should really apply to all new or redesigned transportation facilities, not just trails. It would be helpful to provide more details/examples. What is a sensitive area? What are potential impacts on wildlife, habitat, and water quality and how would you minimize them (for example minimizing stream crossings and crossing wildlife corridors). **Noted. There will be a set of design principles for all projects.**
24. On Slide # 72, should there be a definition somewhere of sensitive environments (aka sensitive areas)? Thank you for mentioning Lori Henning's work, those are great resources. **Noted.**
25. Please add this resource to the list of resources in Chapter 4: Artificial Night Lighting and Protected Lands: Ecological Effects and Management Approaches. https://irma.nps.gov/DataStore/DownloadFile/582058 recommend using the guidance on page viii for the lighting design element referred to in the outline. **Will add to list of resources and use the five steps in the guidance as the framework/design approach for determining when and where to add light. Need will include safety considerations among other factors.**

Policy Guides Decision-Making

This chapter ties together the guidance from prior chapters in a performance-based design decision-making framework. Our region has agreed on systemwide outcomes we are seeking to achieve, as described in Chapter 2. Achieving these outcomes means serving specific functions on our transportation corridors; these functions are described in Chapter 3. Supporting these functions relies on selecting the Design Elements, described in Chapter 4, and designing them to maximize key functions and systemwide outcomes.

This chapter describes a decision-making process that allows practitioners the flexibility to develop solutions that will serve the key functions and lead greater Portland to these systemwide outcomes.

What types of project does this guidance apply to?

The performance-based design decision-making framework is most focused on established street corridors and intersections. It acknowledges and considers that the majority of transportation investments occur within our existing system – one in which there are a variety of real constraints, including funding, competing objectives, existing infrastructure, physical constraints, and traditional standards.

While the details included in this chapter primarily address streets, trails and intersections, the overarching process and framework should also be applied to new roadway alignments, interchanges, bridges or other transportation projects[1] under consideration within greater Portland.

[1] More detail on applying performance-based design can be found in *NCHRP Report 785: Performance-Based Analysis of Geometric Design of Highways and Streets.*

Performance-Based Design Decision-Making

Performance-based design can be described as an evoluation away from a traditional standards-based design approach to a flexible and context sensitive approach.

Performance-based design starts with a well-defined project need and related objectives, and then works to align design decisions with achieving the project objectives and furthering systemwide outcomes.

This approach relies on development and comparison of design alternatives, employing performance measures and analysis to assess progress towards objectives, and using engineering judgement to reach a preferred design.

Other key features and benefits of a performance-based design decision-making approach include:

- Promotes responsible use of public resources to get to the outcomes that are most important and avoid the unnecessary expense of a "one-size-fits-all" approach.
- Meaningfully engages communities in project decision-making
- Provides transparency in decisions through data-driven performance measurement and documenting design decisions, especially as trade-offs are considered.
- Holistically considers implications for systemwide outcomes to work towards the lowest cost action that will adequately address the project need.
- Supports developing connected networks of streets and trails that serve all types of travel and support other community functions.

With performance-based design, each investment in the regional transportation system is carefully planned and designed to ensure projects support systemwide outcomes described in Chapter 2.

Decision-making Framework

From the outset, a performance-based design approach clearly articulates and documents the following:

- What is the "catalyst" for an investment – the highest need – the "problem" we are trying to solve? In National Environmental Policy Act documentation, this is referred to as the "purpose and need."[2]
- Who will the project serve and who will be impacted by the project?
- What are the more detailed goals or objectives of this specific project? Some of these objectives relate directly to the project functions described in Chapter 3.
- Finally, there's a vision of what the project can do for the whole region. How will this project address the "problem" and also contribute to systemwide outcomes described in Chapter 2?

A multi-discipline project team improves decision-making.

Agencies should strive to create multi-disciplinary project teams or advisory bodies for each project. This approach has the following advantages:

- Involving individuals with engineering skills early in the project, particularly in developing and evaluating alternatives, can allow teams to identify and address feasibility or implementation challenges early on in the process.
- Involving individuals with policy and community engagement skills throughout the development of the final design can help ensure that later design decisions continue to align with policy goals and community needs and priorities.
- Individuals on multi-discipline teams will broaden their own capabilities, leading to efficient project development processes.

[2] AASHTO Practitioners' Handbook. https://environment.transportation.org/pdf/programs/ph07-2.pdf

The following page illustrates an overarching performance-based design decision-making framework. Each of the eight steps in this decision-making framework is then expanded in the following sections, with the following elements also included:

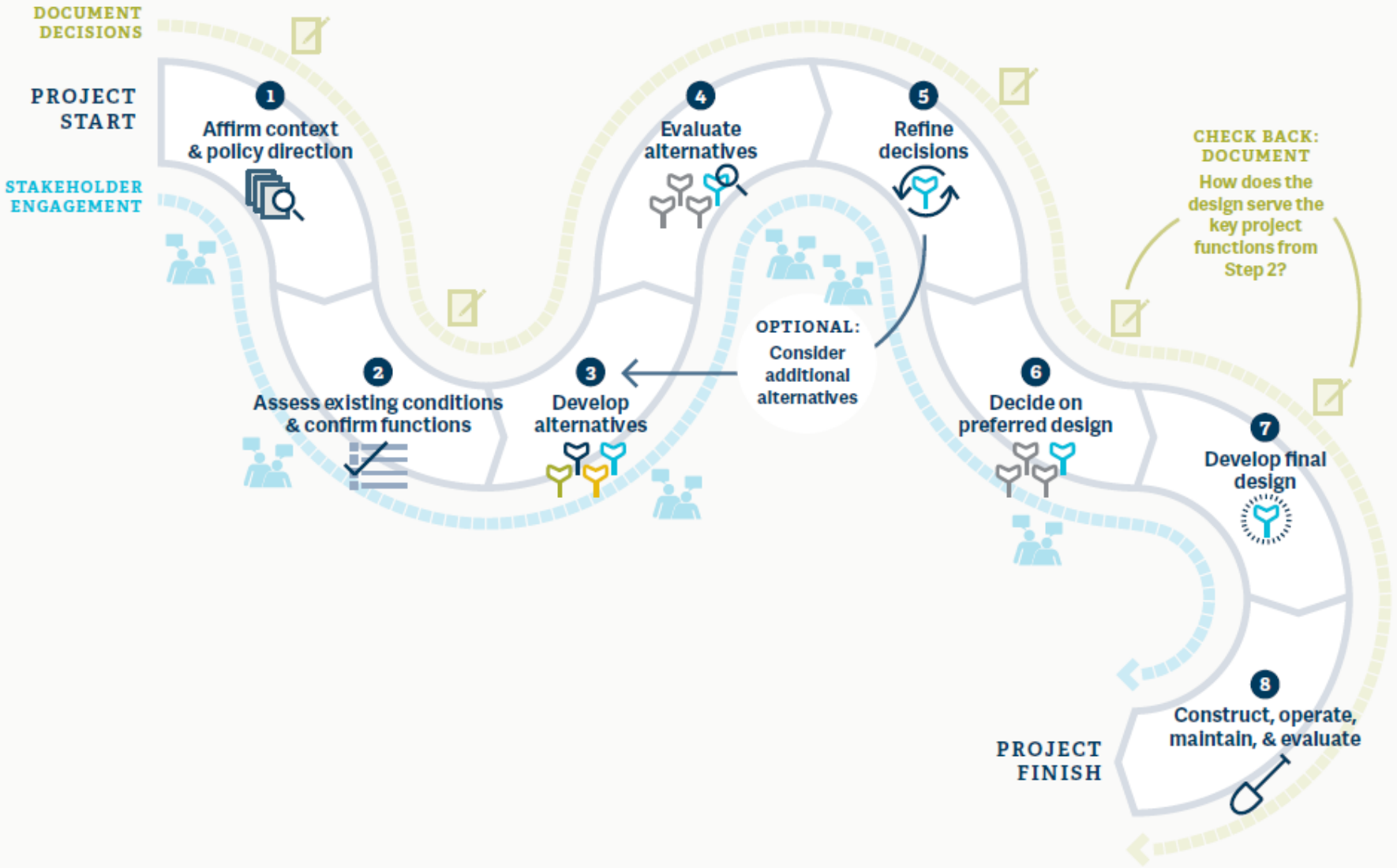
Stakeholder Engagement Key to transparent performance-based decision-making is engaging diverse, multi-disciplinary viewpoints and impacted communities to make sure the design represents community goals. Stakeholder engagment opportunities are included in each step, where applicable.

Document Documenting planning and design decisions, along with the reasoning behind the decision, will tell the story to stakeholders and the public and will also reduce legal risk for the implementing agency. Suggested documentation is included in each step, where applicable.

Existing Tools or Examples Various agencies have already developed tools or practices to accomplish each of these steps. These tools can provide useful insights or a potential starting point for agencies within the Portland metropolitan area.

A performance-based design decision-making framework contributes to systemwide networks and regional outcomes.

It starts with a well-defined project need and clear objectives.



Step 1 Affirm Context and Policy Direction

Following the identification of a project need, initiate the performance-based design framework by affirming the project context and the applicable policy direction. This step lays the framework to ensure the design is staying true to existing systemwide plans, true to adopted policies, true to stakeholder engagement and true to decisions made in the funding process.

If a project has been funded at this stage, it has been identified and prioritized through a prior process. Ideally this selection has occurred in recognition of the project's potential to contribute to regional outcomes.

In some cases, the performance-based design framework starts before a project has been fully funded. However, in nearly all cases, the need being addressed has been identified in an existing plan or is in alignment with completing the systemwide networks and achieving regional outcomes.

In this step, practitioners should review and affirm:

- Project need and objectives and how it will contribute to systemwide outcomes.
- Land use context(s) within the study area, including regional land use types described in Chapter 2 as well as any additional guidance from a local jurisdiction code or plan that is likely to shape future land use.
- Regional design classification of the streets, as described in Chapter 3, within the study area.
- Local and regional modal network maps adopted in the Regional Transportation Plan, local transportation system plans or area plans to determine the envisioned role of the streets within each modal network.
- Relevant local, regional, and state policies and guidance related to the study area. Affirm which policies create definitive requirements, and which provide more general direction.
- Understanding of current applicable stormwater regulations and standards
- Who the project is serving and who may be impacted by the project to identify stakeholders to engage throughout the process.

Document Prepare documentation and affirm the context and policy direction outlined above. Documentation at this step is often in the form of an Intergovernmental Agreement, a project agreement of charter or a project scope. Having key stakeholders sign-on to these documents can increase accountability and commitment to project outcomes.

Stakeholder Engagement Develop a plan for engaging project stakeholders. For each, determine whether their final approval is needed to move design forward.

- Members of the public
- Local jurisdiction(s) elected officials and staff
- Community representatives from project area
- Business representatives from project area
- Owner of the street right of way
- Operators (e.g. transit, mobility services, emergency services, utility services)
- Others

Existing Tools or Examples The cities of Portland and Seattle use Complete Streets project check-lists to ensure that all agency partners and all key policies have been identified at the start of the project.

Step 2 Assess Existing Conditions and Confirm Functions

Step 2 prepares practitioners for the development and evaluation of project alternatives in Steps 3 and 4. Step 2 is focused on collecting information related to the existing conditions, identifying which functions (described in Chapter 3) are currently served, determining which functions should be served with completion of the project and selecting performance measures.

Stakeholder Engagement If there have not been prior conversations or engagement with the local community and stakeholders to understand general priorities, this is a good time to get input: discuss stakeholder priorities to influence the prioritization of functions on the street. Local stakeholder knowledge can also inform the existing conditions assessment.

Document

- Document existing conditions, existing functions and desired functions.
- Document the reasons for the desired functions where they differ from existing functions.
- Document the performance measures that will be used to evaluate project alternatives.

Assess Existing Conditions

Collecting data about existing conditions prior to a new investment provides an important benchmark – the "before" data. After a project is completed, additional data is collected to provide a "before and after" study, which contributes to industry best practices. The level of data collection and documentation may vary depending on the specifics of each project or study; however, assessing existing conditions typically includes an evaluation of the following:

- Surrounding transportation networks and the extent to which they are serving walking, bicycling, transit, freight, and vehicle travel.
- History, socio-demographics, land-use patterns and cultural context of the project area, including whether the community has been disproportionately impacted in the past.
- Physical and operational characteristics of the street in question, organized by realm (as described in Chapter 4), including:
    - Stormwater and Green Streets
    - Transit Facilities
    - Bicycle Facilities
    - Pedestrian Realm
    - Flex Zone
    - Center Travelway

Further guidance on questions to address during the existing conditions assessment is provided on the following page in *Questions/Considerations to Document in Step 2.*

Confirm functions

Next, assess the level at which each function is being currently served on the street. Then, confirm which functions should be served on the street. Functions are based on the regional street design classifications (described in Chapter 3), the project need, project objectives and other guidance documented in Step 1.

Table 1 provides guidance on the typical functions for each regional design classification. Regional trails are also included to provide guidance on the typical functions that these facilities provide.

For each function, determine whether it should be:

- Prioritized – function is typically prioritized in the design classification and should be served to the highest level of quality possible on the street.
- Accommodated – function is typically accommodated in the design classification at a basic level. Accommodated functions are typically prioritized at a higher level on a parallel facility or elsewhere on the network.
- Served on parallel facility – function is typically is served on a parallel facility or elsewhere on the network in adherence with regional and local modal plans and polices.

Table 2 can be used to document the existing and desired functions.

Select Performance Measures

In conjunction with the confirmation of functions, select performance measures to evaluate each alternative in Step 4. In selecting performance measures, consider:

- Measures that evaluate how well a project supports systemwide outcomes (e.g. safety, access, mobility, reliability, efficiency, affordability, equity, environmental and public health). The Regional Transportation Plan includes systemwide measures for each of these outcomes. In some cases, a variation on these systemwide measures can be used to evaluate project alternatives.
- Measures that evaluate whether and to what extent prioritized and accommodated functions are served.
- Measures to align with any additional project objectives. For example, if a project has an objective to minimize impacts on local properties, a measure could be "right of way acquisition required".
- Measures specifically related to intersections, if applicable (further described in Step 4, Evaluate Alternatives).

The set of performance measures ultimately must:

- Reflect the project need and objectives, system outcomes and street functions
- Be understandable and communicable
- Be consistently, objectively measurable
- Differentiate between alternatives
- Be specific to the study area in question

Also consider whether to weight particular performance measures more heavily than others within the evaluation. Weighting can be adjusted based on public input and should also take into account whether there is more than one measure capturing the same benefit of a design.

Questions/Considerations to Document in Step 2

This section includes specific questions for the various street realms and other functions to consider in Step 2, when documenting existing conditions. The information collected in this step will be used to inform the development of alternatives in Step 3.

Stormwater and Green Streets

- What type of stormwater system currently exists in this location?
- What is the size of the catchment area?
- Are there parking lanes that can accommodate curb extensions?
- Is the street/trail identified in a stormwater management plan?
- What right of way constraints exist in this location that could influence green streets infrastructure (overall width, presence of driveways, overhead or underground utilities)?
- What are the key physical characteristics in this location (such as slopes, soil infiltration rates, existing waterways)?
- Is it included in an urban forestry plan?
- Additional questions from GW

Transit Facilities

- What type and frequency of transit is serving this street now and in future plans?
- What types of transit facilities exist on the street (stops, lanes, other priority treatments)?
- Is transit currently experiencing high levels of delay during peak hours?
- Low levels of reliability (poor on-time performance)?

Bicycle Facilities

- What is the existing bicycle facility?
- What type of bicyclist is currently served?
- What are current and forecast bicycle volumes?
- Is there a parallel route that is equally direct/accessible and/or that has been identified in a local jurisdiction plan?

Pedestrian Realm

- What are the existing pedestrian facilities (sidewalk width, condition, street trees, street furniture, other amenities, crossings)?

- ☐ Is there access for people with disabilities along the sidewalk and at crossings?
- ☐ What level of pedestrian activity is occurring today? Is there a desire or potential for higher pedestrian activity?

Flex Zone

- ☐ Collect information on what types of "flex zone uses" are occurring now, and where are they occurring?
  - o Loading/unloading
  - o Parking utilization
  - o Mail delivery
  - o Garbage and recycling collection
  - o Pick-up/drop-off
  - o Bicycle/scooter/motorcycle parking
  - o Green streets treatments
  - o Bicycle mobility
  - o Transit lanes and stops
  - o Parklets / expanded sidewalk
- ☐ To what extent are these uses occurring (e.g. what is the parking utilization, how often is the loading zone in use)?
- ☐ What is the availability of off-street parking in the vicinity? What about parking availability on side-streets?

Center Travelway

- ☐ What is the existing configuration and lane widths?
- ☐ What are the volumes of motor vehicles, transit and freight vehicles using the street?
- ☐ What portion of existing vehicular capacity is used during the peak hour?
- ☐ If applicable, how many hours of the day experience near, at or over-capacity vehicle demand?
- ☐ What are the crash patterns on this street, in terms of severity, cause, modes involved, location and other factors?

Intersections

- ☐ What is the existing intersection configuration?
- ☐ What are the volumes of people traversing the intersection by each of the various modes?
- ☐ What are the crash patterns at each intersection and what movements are they associated with?
- ☐ How well is the intersection serving the current and forecast users traveling through it, considering all modes?
  - o In developing future volumes, travel demand model forecast volumes should be considered only the starting point, since travel patterns are likely to be impacted by factors not accounted for within travel demand models.
- ☐ What vehicle turning movements are accommodated/allowed at each intersection?
- ☐ How many crossings are marked? In Oregon, if it is not marked otherwise, every intersection is a legal pedestrian crossing. Are any crossings closed?
- ☐ Does the intersection currently have any specific treatments designed to better serve bicyclists, pedestrians, transit, or freight?

Existing Tools or Examples Existing conditions documentation will vary depending on the complexity of the project. Many new and developing data sources are available to support understanding of the existing system. Portal contains a variety of transportation data for greater Portland. A variety of companies are offering data related to travel patterns based on mobile location or app-based data collection.

Table 1: Regional Design Classifications and Typical Functions

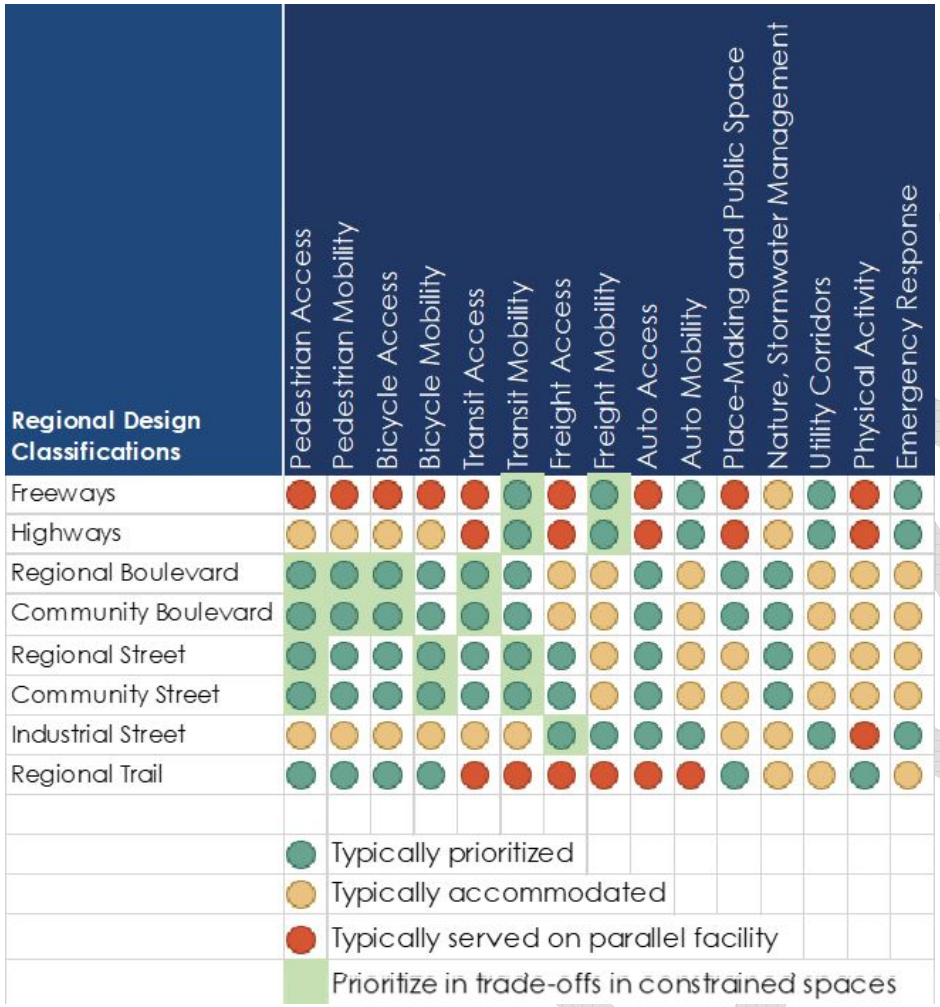


Table 2: Existing and Future Functions Documentation Table

Street Functions	Existing			Desired		
	Priority	Accommodated	Served on parallel facility	Priority	Accommodated	Served on parallel facility
Pedestrian Access	☐	☐	☐	☐	☐	☐
Pedestrian Mobility	☐	☐	☐	☐	☐	☐
Bicycle Access	☐	☐	☐	☐	☐	☐
Bicycle Mobility	☐	☐	☐	☐	☐	☐
Transit Access	☐	☐	☐	☐	☐	☐
Transit Mobility	☐	☐	☐	☐	☐	☐
Freight Access	☐	☐	☐	☐	☐	☐
Freight Mobility	☐	☐	☐	☐	☐	☐
Auto Access	☐	☐	☐	☐	☐	☐
Auto Mobility	☐	☐	☐	☐	☐	☐
Place-Making and Public Space	☐	☐	☐	☐	☐	☐
Nature, Stormwater Management	☐	☐	☐	☐	☐	☐
Utility Corridors	☐	☐	☐	☐	☐	☐
Physical Activity	☐	☐	☐	☐	☐	☐
Emergency Response	☐	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐	☐

Step 3 Develop Alternatives

In Step 3, practitioners initiate the development of design alternatives to address the project need, contribute to systemwide outcomes and serve the functions confirmed in Step 2.

Development of alternatives should be guided by a safe systems approach and following the other design principles described in Section 4. Alternatives may range significantly in the level of investment required and may include low-cost, interim solutions and programmatic aspects.

Stakeholder Engagement Stakeholders and members of the public at large contribute to the development of alternatives. Public engagement methods that allow individuals to generate cross section ideas both provide input on people's priorities and help to educate people about the challenges, opportunities and trade-offs of creating multimodal streets.

Document Prepare documentation of the alternatives developed as part of Step 3. Ultimately, this documentation can be combined with documentation from Steps 4, 5 and 6 to describe the flow of the alternatives evaluation. Documenting alternatives visually can be helpful in communications with stakeholders.

Street Segments or Corridor Alternatives:

In developing design alternatives, start by selecting design elements to serve the prioritized and accommodated street functions for the street's design classification. Elements should be designed in alignment with the approach provided in Chapter 4 for each element.

The initial development of alternatives does not need to include specific design details but should consider the cross-sectional elements to be included and their widths. Guidance for each element, by street design classification, is included in Chapter 4. Elements serving "priority" functions should be prioritized over elements serving "accommodated" functions.

Some alternatives are likely to exceed the available right of way. Depending on the likelihood and impacts of right of way expansion (see sidebar), practitioners may determine that one or more alternatives should be developed to stay within the existing right of way or existing curb location.

Each alternative should define the following, consistent with the design classification and functions:

- ☐ Number and width of motor vehicle travel lanes
- ☐ Presence and width of exclusive transit right-of-way, if applicable.
- ☐ Stormwater management approach
- ☐ Width / use of flex zone, if applicable
- ☐ Width / type of median
- ☐ Width / type of bicycle facility
- ☐ Width of sidewalk / pedestrian realm
- ☐ Width of any other cross-sectional elements, if applicable
- ☐ Intersection control type (see next section)

What about right of way?

Many of the corridors within greater Portland have established rights of way, in some cases surrounded by developed land uses. Whether or not to consider alternatives beyond the existing right of way is a project-specific decision. In determining whether to think beyond the existing right of way, consider:

- What are the existing building footprints and setbacks along the corridor?
- How would existing land uses be impacted?
- How many property owners would be impacted if right of way is acquired?
- Is the corridor likely to undergo significant redevelopment?
- What is the anticipated funding source for this project?

Even if right of way acquisition is deemed to be infeasible, in some cases, it can be helpful to include an alternative that requires it, for purposes of comparison.

In some cases, it is helpful to include an alternative that is not fully aligned with the prioritized functions, particularly if a stakeholder group advocates for it. In this case, include the alternative alongside others and carry it forward to the evaluation in Step 4. This can contribute to learning and understanding among members of the project team and other stakeholders. It may lead to a more refined articulation of priorities.

Intersection Alternatives:

The development of intersection alternatives should consider all potential intersection control types and designs, including:

- Two-way stop control
- All-way stop control
- Roundabout (mini, single-lane, and multi-lane)
- Signalized intersection
- Midblock crossing

Practitioners may also consider more than one intersection design alternative with the same control type, if applicable. In Step 5, Refine Decisions, intersection design will be refined further to include elements that serve specific needs of pedestrians, bicyclists and freight.

Questions/Considerations for Developing Alternatives in Step 3

This section includes specific considerations for the various street realms and other functions to help inform the development of alternatives.

Stormwater and Green Streets

- What types of green streets treatments are suitable for this street location, given its characteristics? (Guidance provided in Green Streets design element in Chapter 4)
- Identify placement options for green streets treatments within the right of way.
- If possible, identify right of way remnants (e.g. small publicly-owned parcels adjacent to the street, but not part of the street) or other locations adjacent to existing right of way that could be used to develop green streets treatments, such as rain gardens.
- Look for opportunities to reduce impermeable surface and run-off volumes. Use vegetated green streets treatments as buffers where possible.

Transit Facilities

- Is the street part of the regional transit network? Is transit access or mobility a priority function in the design classification?
  - If so, include alternatives that prioritize serving transit functions.
- Determine what treatments that would provide highest levels of operational benefits for transit, given the existing conditions.

Bicycle Facilities

- Is the street part of the regional bicycle network? Is bicycle access or mobility a priority function in the design classification?
  - If so, include alternatives that prioritize serving bicycle functions.
  - If not, consider alternatives that include a parallel bicycle facility.
- Determine what width and type of facility is needed to serve anticipated volumes of bicyclists, and riders of all ages and

Other Project Types

Other unique projects, such as bridges, interchanges or new trails should generally follow a similar approach to alternatives development: consider regional and local policy guidance, consider functions to be served, and develop alternatives in alignment with documented best practices. Resources listed at the end of Chapter 4 can be used to supplement the information provided within this guide.

abilities (given existing conditions and other components of each alternative).

- Can buffer widths be minimized by providing greater physical protection?
- Determine whether anticipated volumes of bicyclists and pedestrians can be served with a multi-use path on one or both sides of the street, particularly if space is constrained.

Pedestrian Realm

- Is the street part of the regional pedestrian network? Is pedestrian access or mobility a priority function in the design classification?
  - If so, include alternatives that prioritize pedestrian functions.
- Determine what width is needed to serve anticipated activity, including both pedestrian movement, places to linger (e.g. resting, waiting for transit, sidewalk cafes), and other functions served in this realm (e.g. bicycle parking, utilities, street trees).
- People walking need to be buffered from motor vehicle movement. Determine what options can be considered for a buffer within the pedestrian realm or flex zone (e.g. street trees, landscaping, on-street parking).

Flex Zone

- Determine what types of uses in the flex zone best serve the priority functions for this street, based on guidance from Chapter 4.
- What flex zone uses can be served on adjacent streets?
- Is there space for bicycle parking, green streets treatments, or other flex zone uses within the street furniture zone of the sidewalk, on curb extensions, or even within the adjacent properties? (Adjacent properties often can accommodate bicycle parking, green streets treatments, or sidewalk cafes).
- Select flex zone designs that would mitigate predominant crash types identified in the existing conditions assessment, if applicable.

Center Travelway

- Is the street part of the regional freight network? Is freight access or mobility a priority function in the design classification?
  - If so, include alternatives that preserve freight functions.
- If the street is part of the frequent bus network (or any rail or High Capacity Transit), prioritize designs that prioritize transit ("transit stops" and "transit priority treatments" in Chapter 4).
- If street has two through lanes per direction and less than 25,000 vehicles per day, include an alternative that reallocates travel lane space to other functions.
- If lanes are wider than 10 feet, consider opportunities to "gain" space through narrowing lanes.
- Can design elements be introduced to decrease operating speeds, which may reduce widths needed for buffers and/or shy distance?
- If street is located within a relatively connected street grid, consider whether turning movement restrictions are feasible to minimize the need for left-turn lanes.

Intersections

- Are there existing buildings close to the street corners?
- Are there intersection designs that would mitigate predominant crash types identified in the existing conditions assessment?
- Ensure that alternatives provide opportunities for "day lighting" at intersections – a practice that removes visual barriers (such as parked cars) between pedestrian crossings and oncoming vehicles.

Existing Tools or Examples

- Streetmix is an online tool for visualizing cross sections that can be helpful for developing alternatives.
- There are a variety of decision-making flow chart tools that can inform development of alternatives for specific elements:
    - City of Portland and City of Seattle have decision flow charts for considering a vehicle travel lane reduction.
    - Washington County's Bicycle Facility Design Toolkit and the FHWA's Bikeway Selection Guide provide guidance on how to select a low stress bicycle facility and when and whether to consider parallel networks.

Step 4 Evaluate Alternatives

In Step 4, practitioners use a performance-based analysis to evaluate the alternatives developed in Step 3 and using the performance measures selected in Step 2.

Stakeholder Engagement: What do stakeholders/communities think? Do they agree with the evaluation?

The evaluation of alternatives may result in differing opinions from various stakeholders. A goal of the whole process outlined in this chapter is to ensure stakeholders have a common understanding of the project and design decisions, even if they do not agree with each decision.

Using easy-to-understand measures and summarizing the evaluation in a table or matrix can help communicate to stakeholders with varying degrees of technical experience.

Document Develop documentation of alternatives evaluation, including an explanation of how performance measures were evaluated. This will ensure the evaluation can be verified and repeated if new alternatives are introduced. Using an evaluation matrix can be helpful for visually comparing alternatives.

Evaluating Corridor Alternatives

At the outset, determine whether there is sufficient data/information to evaluate each of the alternatives for the systemwide outcomes, project objectives and functions. Are other measures needed?

At least, the evaluation (based on the performance measures) should answer:

- How well does this project contribute to our systemwide outcomes?
  - For example, the evaluation could use predicted safety performance to measure the anticipated crash reductions resulting from cross sectional or intersection design elements.
- How well are the prioritized and accommodated functions served by each alternative?
  - For example, the evaluation could use sidewalk width to measure pedestrian access and mobility or level of traffic stress to measure bicycle access and mobility.
- What functions are served elsewhere?

Weighting and Trade-offs In some cases, the alternatives evaluation in Step 4 may not immediately lead to a clear answer, but will instead reveal a number of shortcomings for specific functions or outcomes – potential trade-offs in each alternative. It can be helpful, as noted in Step 2, to consider weighting some measures more heavily than others. For example, if a project is being designed on a high-crash corridor with funding specifically allocated to improve safety, the evaluation should consider weighting safety-related measures above other measures.

Weighting the various functions relative to each other depends in part on the regional design classifications. Performance of "prioritized" functions should be weighted above "accommodated" functions for the design classification (refer to Table 1).

Sometimes, the evaluation will lead to a new alternative being developed. In that case, practitioners should develop and evaluate the alternative in alignment with Steps 3 and 4.

Cost is another metric often considered in the evaluation of alternatives. All else being equal, a lower cost alternative is a better use of public funds – since there are always more needs to be addressed. At this stage of the process, alternatives may not have the level of detail required to develop a cost estimate. However, identification of an "order-of-magnitude" cost can help inform a cost comparison of alternatives relative to each other.

If different intersection control types and configurations are considered distinctly from segment alternatives, they should also be evaluated.

Evaluating Intersection Alternatives

An intersection control evaluation may require more in-depth technical evaluation than cross-sectional alternatives to determine how well functions are being served. The intersection control evaluation should use performance measures to assess the following:

- Alignment with the prioritized and accommodated street functions
- Predicted safety performance
  - Consider using safety performance functions from the Highway Safety Manual
  - To evaluate design aspects not covered by safety performance functions, consider an assessment of potential conflict points between various users presented by each design alternative.
- Multimodal operations
  - Note: there is not currently a single metric available for assessing operations for level-of-service for all modes. Practitioners may need to select a set of measures to evaluate operations.
  - Consider operations based on existing volumes of users, as well as anticipated future volumes. In developing future volumes, travel demand model forecast volumes should be considered only the starting point, since travel patterns are likely to be impacted by factors not accounted for within travel demand models.
- Design feasibility
  - Consider available right of way, adjacent properties, existing placement of accesses, slopes, natural resources, and roadway alignments.
- Life-cycle costs, considering both capital costs and maintenance/operations.

For intersections, the evaluation should lead to the selection of a preferred intersection control type. Further design details are then considered within Step 5 Refine Decisions.

Existing Tools or Examples:

A variety of agencies have introduced **intersection control evaluation** procedures into their standard practice:

- Georgia Department of Transportation has an excel-based tool to support their Intersection Control Evaluation policy – the purpose of which is to "provide traceability, transparency, consistency and accountability when identifying and selecting an intersection control solution that both meets the project purpose and reflects the overall best value in terms of specific performance-based criteria."
- CalTrans also has an intersection control evaluation policy

Step 5 Refine Design Decisions

Step 5 provides guidance on how to refine design decisions for one or more alternatives to lead to selection and development of a preferred design concept in Step 6. In Step 5, practitioners draw on the alternatives evaluation from Step 4 to further refine the design of one or more alternative. In a highly complex project, or if several alternatives are still under consideration, Step 5 may include significant additional analysis and/or stakeholder outreach to inform refinements that improve the performance of the alternative. In some cases, Step 5 may be minimal.

Stakeholder Engagement Agency staff representing all agencies involved in decision-making should be part of Step 5. Depending on the magnitude of the project and the amount of iteration and changes between Steps 3, 4, and 5, additional stakeholders and/or members of the public should be included in the discussion and consulted on decisions.

Document Develop documentation of the alternatives considered (including additional alternatives introduced during or after the evaluation); a summary of the evaluation; and any additional analysis supporting the refinement of design decisions. This documentation can be summarized and combined with the preferred design concept (Step 6).

Street Segment or Corridor Design Decisions

Refinements to corridor design alternatives should consider the following:

- Sensitivity testing for increased volumes of users in the future (e.g. how long will this design serve the community in a changing future?)
- Which or whether some design elements should be (or can be) designed for relatively easy change/re-design in the future, to respond to changing demand, use patterns, and/or technologies
- Project transitions at each end of the study area
- Opportunities for low-cost, interim improvements that only partially meet the project need, objectives, and functions – as long as they do not preclude future investments to fully serve the needs.
- Implementation strategies, including opportunities for phasing.

Sometimes, the process of refining the design alternatives will lead to the consideration of a new alternative. In that case, practitioners should develop and evaluate the alternative in alignment with Steps 3 and 4.

Intersection Design Decisions

Refinements to intersection design may include the following approaches.

- Develop lane configurations, including presence of turn lanes, considering the trade-offs inherent in this decision (as discussed in Chapter 4 on Intersections)
- Select "design users" to inform the development of the intersection geometry, including pedestrians, bicyclists, and various vehicle types (as discussed in Chapter 4).
    - Two-wheelchair users side-by-side at all locations.
    - Cargo bicycle or bicycle with trailer (~9 feet) for turning movements and at queuing locations
    - Standard TriMet bus where turning movements are applicable
    - Select design vehicle (for motor vehicles) depending on anticipated normal daily turning movements
    - Accommodate occasional larger vehicle turning movements by using opposing lanes, if needed.

Existing Tools or Examples:

FHWA's Incorporating On-Road Bicycle Networks into Resurfacing Projects provides guidance on low-cost interim or incremental solutions associated with repaving projects.

"Tactical urbanism" is a flexible, often community-driven implementation strategy that uses low-cost, inexpensive materials to pilot test urban projects. A variety of guidance is available.

Step 6 Decide on Preferred Design Concept

Following the additional refinement in Step 5, practitioners and stakeholders should have adequate information to decide which design alternative to move forward. If more than one alternative was carried through Step 5, the evaluation can be updated to fully reflect these refinements.

Ultimately, the preferred design concept selected in Step 6 should reflect a performance-based approach to serving the prioritized functions and contributing to systemwide outcomes.

The development of the design concept can be done prior to a topographic survey and other full engineering feasibility assessments. Involvement of practitioners with engineering knowledge through Steps 3, 4, 5 and 6 is helpful to develop feasible alternatives and ensure identification of engineering-related issues to address as alternatives are being refined.

Stakeholder Engagement Share the preferred design with the community along with a clear evaluation of how this design aligns with the prioritized functions and delivers on the envisioned outcomes.

Engage agency stakeholders to gain concurrence with the design concept (as discussed under "document").

In this step, practitioners develop a design concept that can communicate the following information:

- Overall footprint of proposed design
- Configuration and width of proposed design elements within the design
- Areas of potential right of way impact
- Approach to stormwater management, including type of facilities and general locations.

Document In documenting the preferred design and preparing to move into final design, address each of the following steps:

- ☐ Develop a design concept drawing to clearly communicate with stakeholders, members of the public, and the final design project team (see example).
- ☐ Review and verify that the preferred design concept serves the project functions identified in Step 2. If it does not, return to Step 3 of the process.
    - If, during the development of the design concept drawing, there are any refinements that result in changes to functions served or to anticipated performance of the street, this should be clearly documented with reasons justifying the change.
- ☐ Gain documented agency concurrence on the preferred design concept, both from the lead agency and from other involved agencies.
    - Engage a variety of disciplines within the lead agency to further understand design implications and confirm design decisions. Include individuals involved in construction, signal operation (if applicable) and maintenance.
    - If applicable, document any design agreements with partner agencies (e.g. design exception or concurrence when applicable) and/or identify the need for future design exception documentation.

Vetting the Preferred Design Concept

- Conduct additional technical evaluation and develop additional design details related to:
  - Horizontal and vertical alignment design
  - Grading
  - Signing and striping
  - Illumination
  - Stormwater needs
  - Utilities
- Consider constructability of preferred design in how various modes will be accommodated during construction. Sometimes, it may be necessary to change the location and/or alignment to maintain access during construction.
- Identify key design details yet to be resolved and assess potential risk associated with outstanding items. For example, there may still be significant unknowns (e.g. whether utilities will need to be relocated) that can affect project cost and timeline.
- Identify the need for an environmental review process.
  - Previous design decision documentation can help support potential future environmental documentation.
- Identify operational and maintenance needs and responsibilities. In many cases, the regionally classified streets are ones that affect and involve more than one entity in operation and maintenance. Understanding these responsibilities at this stage allows those organizations to weigh in as the final design details are developed to ensure they are able to operate and maintain the facilities as intended. For example, some separated bicycle facility designs cannot be swept with a standard street sweeper due to their width. In these cases, agencies need to consider other maintenance solutions (e.g. purchase a specialized narrow sweeper, partner with an agency that does own one or consider a different maintenance method).
- Prepare (or refine) a cost estimate for the preferred design.
  - Confirm/identify funding sources.
  - What can be designed/ constructed within the available funding sources?
  - Are there other funding sources that may contribute to specific aspects of the project?

Existing Tools or Examples:

In its Design Documentation, Approval,and Process Review chapter, Washington State Department of Transportation has guidance for documenting decisions throughout the timeline of project development, including prior to the full design.

Figure 1: *This figure illustrates a concept design. It effectively conveys the overall footprint of the design and the configuration and width of the various components of the design*.

Step 7 Finalize Design

The final design is developed based on the preferred design concept. The final design and implementation should serve the identified functions, contribute to systemwide networks and further regional outcomes.

Often, the individuals on a project team may change between the development of the preferred design and the final design. This naturally occurs as different areas of expertise are required at each stage of the project delivery process. However, it is critical to maintain some continuity to ensure that the project ultimately delivers what it was intended to deliver. Clear and ongoing documentation, along with frequent check-backs to earlier stages of the project can ensure this continuity. Prior to embarking on final design, project teams should:

- ☐ Determine how long ago the preferred design was developed. If greater than three years, verify project context and need, objectives, functions, and performance measures used to arrive at the preferred design (Steps 1 & 2). If any of these have changed, revisit Steps 3 through 6.
- ☐ Review and understand the overarching project purpose and any other documented goals.
- ☐ Review and understand key project functions identified in Step 2.
- ☐ Review design decision documentation from Steps 3, 4, 5, and 6 that led to the selection and development of the preferred design.

Stakeholder Engagement: If faced with design challenges during the final design stage, project teams should involve stakeholders from earlier project stages to further understand key priorities and preferred design decisions. Agencies who will be involved with future maintenance or operation should also have opportunities to provide input on final design decisions.

Document Any deviations from the preferred design concepts and provide justification.

- Review and verify that the design with deviations will still serve the key project functions identified in Step 2.
- If it does not, consult stakeholders and community members to determine next steps:
  - Agreement (documented) on deviations in order to move the project forward, or,
  - If consensus cannot be reached, it may be necessary, and ultimately less costly, to stop the development of the final design and return to Step 2 or 3 of the process.

Develop Final Design

The development of the final design and construction bid documents typically occurs in several stages. These may vary by agency and by project but often follow a process of developing a 30-percent design, 60-percent design, 90-percent design and 100-percent final design. At the conclusion of this step, the project team will release "plans, specifications, and estimates," which are the basis for collecting bids from contractors for construction.

As the final design progresses, the project team will need to:

- ☐ Seek permits from various agencies, as required
- ☐ Acquire right of way, if needed
- ☐ Continue to confirm and evaluate funding sources and opportunities
- ☐ Outline future operations and maintenance activities
- ☐ Document whether the final design contributes to desired outcomes, serves identified functions and aligns with the preferred design?
  - If not, is the final design a low-cost incremental improvement that does not preclude serving those functions in the future?
- ☐ Collect "before" data as a basis for comparison.
- ☐ Develop a process for monitoring the project after construction and measuring how well it is serving the key functions

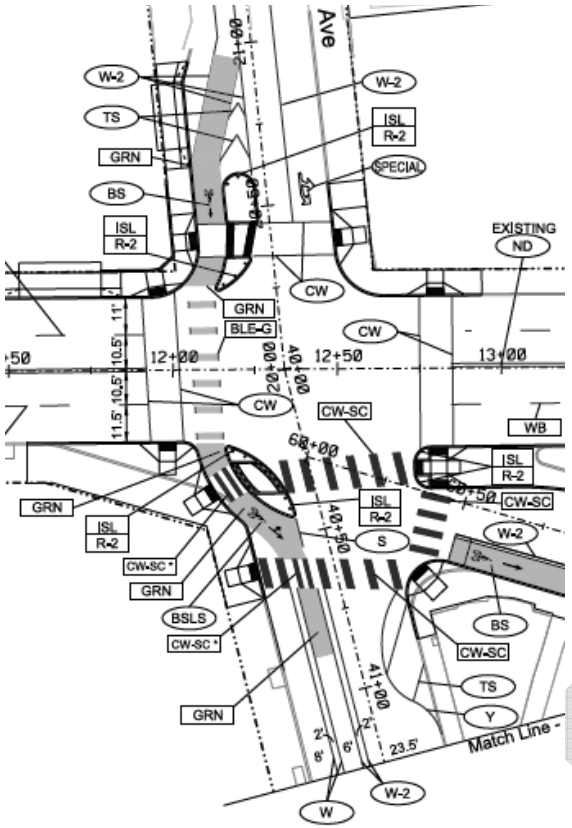


Figure 2: *A final design drawing has full detail on specific aspects of the design to be able to communicate the level of detail needed for construction.*

Existing Tools or Examples:

Step 8 Construct, Operate, Maintain, and Evaluate

In Step 8, the project is constructed and becomes part of the transportation system. Operations and maintenance are key aspects of ensuring that the street serves the intended functions. A performance evaluation and ongoing monitoring following construction can help contribute to best practices for future projects.

Construction

Construction of the final design should maintain alignment with key priority functions. Prior to construction, especially if there is a significant time between final design and construction, the project team should:

- Review and understand the priority project functions documented in Step 2.
- Review design decision documentation that led to the development of the final design.

During construction, provide clear, safe routes for all modes of travel, including detours if necessary. In designing detours, limit out-of-direction travel as much as possible for pedestrians and bicyclists.

Document Any minor design adjustments made during construction.

Stakeholder Engagement Discuss construction sequencing with public, because it is sometimes preferred to have major impact over a short period compared to smaller impacts over an extended construction period. Notify adjacent property owners of the construction schedule and any anticipated impacts during the construction period. Construction and completion of the project is also a time to celebrate with stakeholders and the community. Ribbon-cuttings or public events are an opportunity to share the story of the project and its anticipated contributions.

Existing Tools or Examples:

Example Tools: Portland Bureau of Transportation has developed the Traffic Design Manual Volume 2: Temporary Traffic Control. This manual provides guidance on methods for providing access for all modes during construction.

Operations and Maintenance

As an agency operates and maintains the roadway, it may find other opportunities for smaller changes or investments that could further enhance the alignment with the key priority functions and overall outcomes.

As maintenance occurs and as repaving projects are done on a roadway, the project team should review any previously documented key priority functions before making any alterations to the streetscape.

Identify the need for specialized equipment or personnel training due to complex designs or specific design features. For example, busy urban roadways are often more difficult to maintain and operate than rural highways. Urban roadway design features are more likely to include elements like street trees, vegetated stormwater management solutions, separated bicycle facilities, complex multimodal signal operations, busy transit stops, and pedestrian crossing treatments. Agencies need to equip staff responsible for maintenance with the resources (training and funding) to properly maintain the roadway investments.

Evaluation

After a project is constructed, agencies can use project performance measures (or variations of them) for evaluation and to inform design details of specific elements to better serve key functions in future designs.

- For example: If travel time reliability for any mode was used as a performance metric, travel times should be monitored and compared to the goal. This monitoring can help the agency evaluate whether or to what extent selected designs are helping to fulfill the project intent.

For projects that include "new" practices or design exceptions, the project should be reviewed and evaluated approximately three to five years after construction to document performance impacts and contribute to the refinement of industry best practices.

Before and after evaluations can provide quantitative data that agencies can use for future justification of design decisions and project alternative evaluations.

- Collect data before you implement a new design (much is readily available).
- Collect data afterwards and compare back to previous design.

Document: At 3-5 years after construction, conduct a thorough evaluation and report how well the project is performing, in alignment with the original project objectives and priority functions.

Existing Tools or Examples:

The San Francisco Municipal Transportation Agency has a Safe Streets Evaluation Handbook to guide practitioners in evaluating projects that are being implemented, including guidance on measures, data collection, evaluation and reporting back.

Some funding sources, including the Regional Flexible Fund Allocation, have specific requirements associated with evaluation after the project is constructed and after it has been in operation for a period of time.

Materials following this page were distributed at the meeting.

Metro

Designing Livable Streets and Trails

March 18, 2019

Meeting purpose

Review and provide input on Chapter 6 – performance-based decision-making framework

Introductions

- Your name
- Agency or organization
- Your favorite intersection in the region

Jan 28 meeting summary

Any clarifications, questions or comments?

Metro Council work session take-aways

- Highlight the connection between slowing speeds and design
- Address designing for emerging technologies
- Need process and designs that support moving people and goods in variety of safe ways
- Need to lead with outcomes we want for people

Key dates moving forward

- JPACT update March 21
- Additional comments due April 1
- TPAC/MTAC design classifications workshop April 17
- Policymaker's forum and technical workshop April 22.
- Work Group meeting May 20

Next steps

- Additional comments April 1
- Next meeting May 20, same time and place
- Final questions or comments

oregonmetro.gov

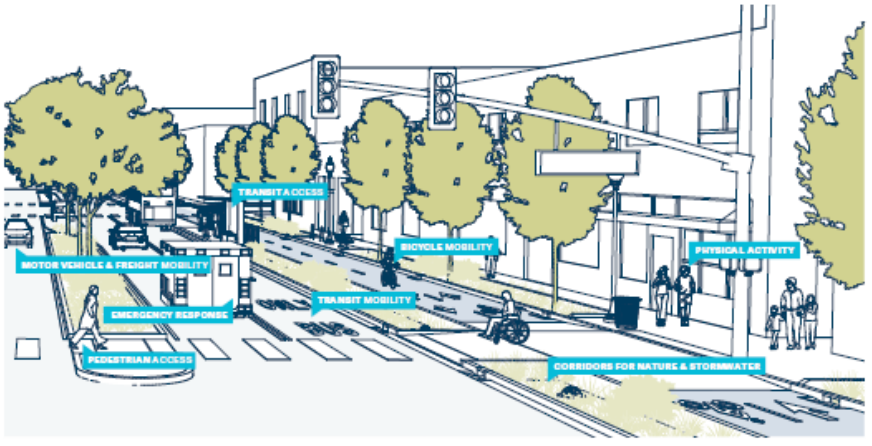
DESIGNING LIVABLE STREETS AND TRAILS – CHAPTERS

1. Introduction and How to Use
2. Regional Policy and Desired Outcomes
3. Street Functions and Design Classifications
4. Design Principles and Elements
5. Visualizing Design Classifications
6. Performance-Based Decision-making Framework
7. Implementation Strategies and Examples

REGIONAL SYSTEMWIDE OUTCOMES (CHAPTER 2)

STREET FUNCTIONS (CHAPTER 3)

Livable Street Functions



Pedestrian
ACCESS & MOBILITY

Every street and trail has safe, comfortable space for people walking, rolling, and enjoying the place they're in.

Bicycle
ACCESS & MOBILITY

Connected bicycle networks, separated from heavy vehicle traffic, ensure that bicycling is a great way to get around in our communities.

Transit
ACCESS & MOBILITY

Our streets enable transit to serve the region with an efficient, reliable way to travel between and within our communities.

Freight
ACCESS & MOBILITY

Key freight corridors provide reliable freight movement, and streets allow delivery access to serve both businesses and residents.

Motor-vehicle
ACCESS & MOBILITY

Our transportation system provides for safe, reliable travel in motor vehicles, providing space to facilitate pooled or shared trips.

Place-making & Public Space

Our streets and trails are a canvas for our community life and daily commerce, helping to form our regional identity.

Corridors for Nature & Stormwater

Weaving nature and sustainable stormwater management into our streets and trails protects and enhances our region's natural assets.

Utility Corridors

Our transportation corridors move more than just people and goods; they also move water, power, gas, communications, and information.

Physical Activity

Our streets and trails are places where people enjoy spending time outdoors as part of an active lifestyle.

Emergency Response

In case of a local or widespread emergency, our streets must provide access and evacuation routes to keep people safe.

Livable Street Functions

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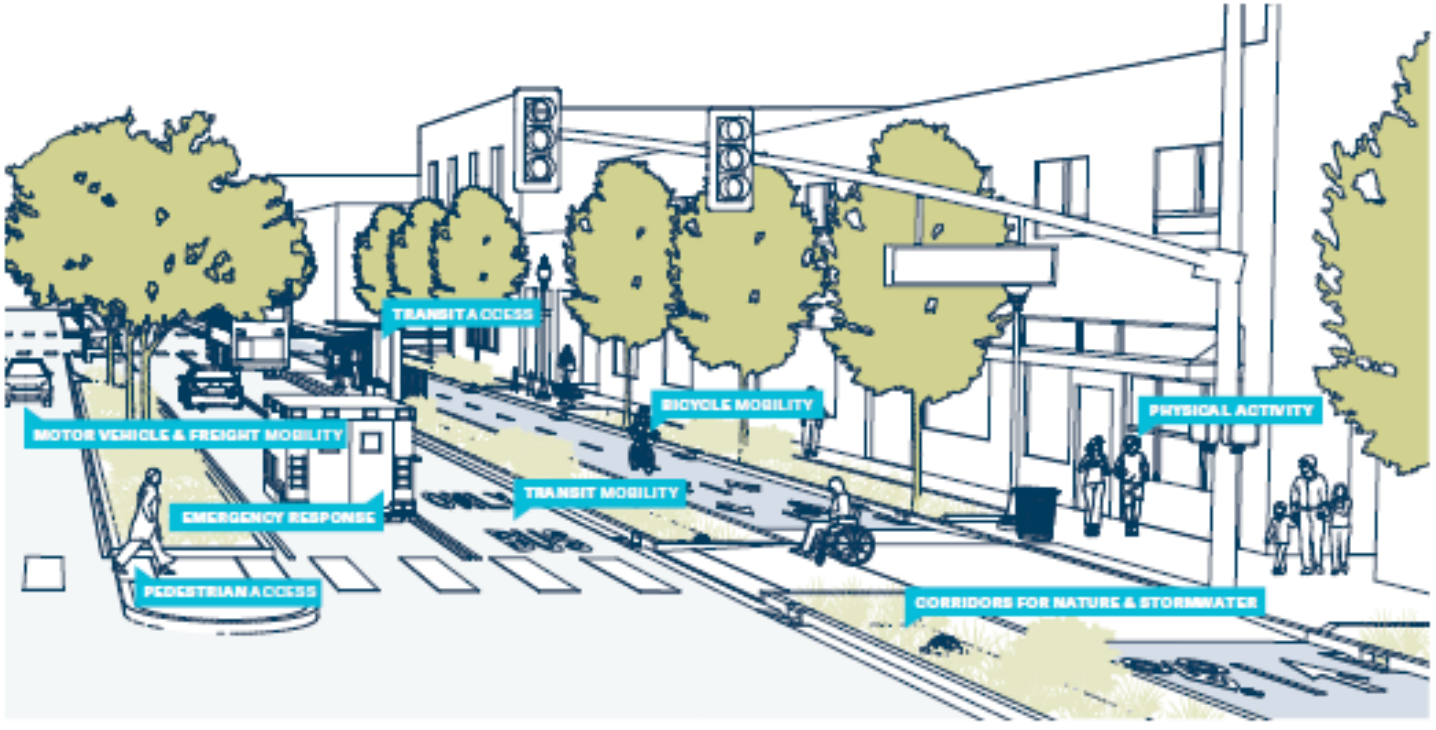

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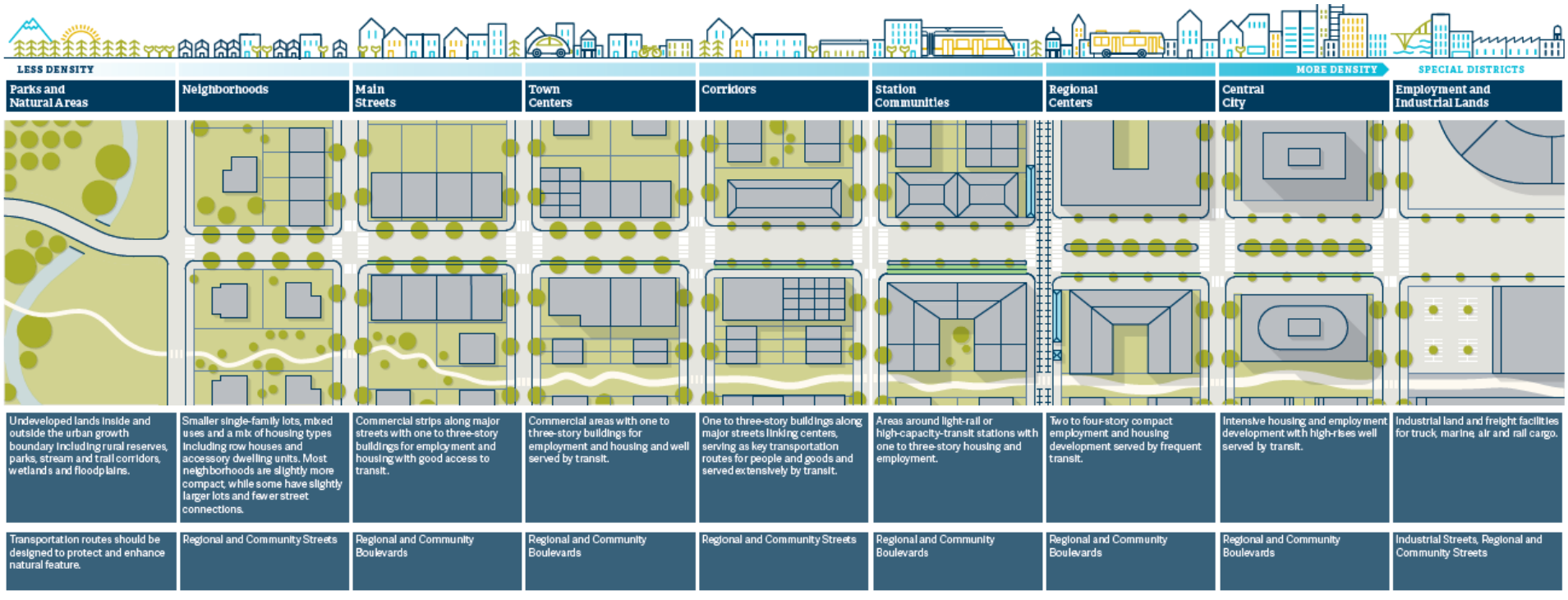
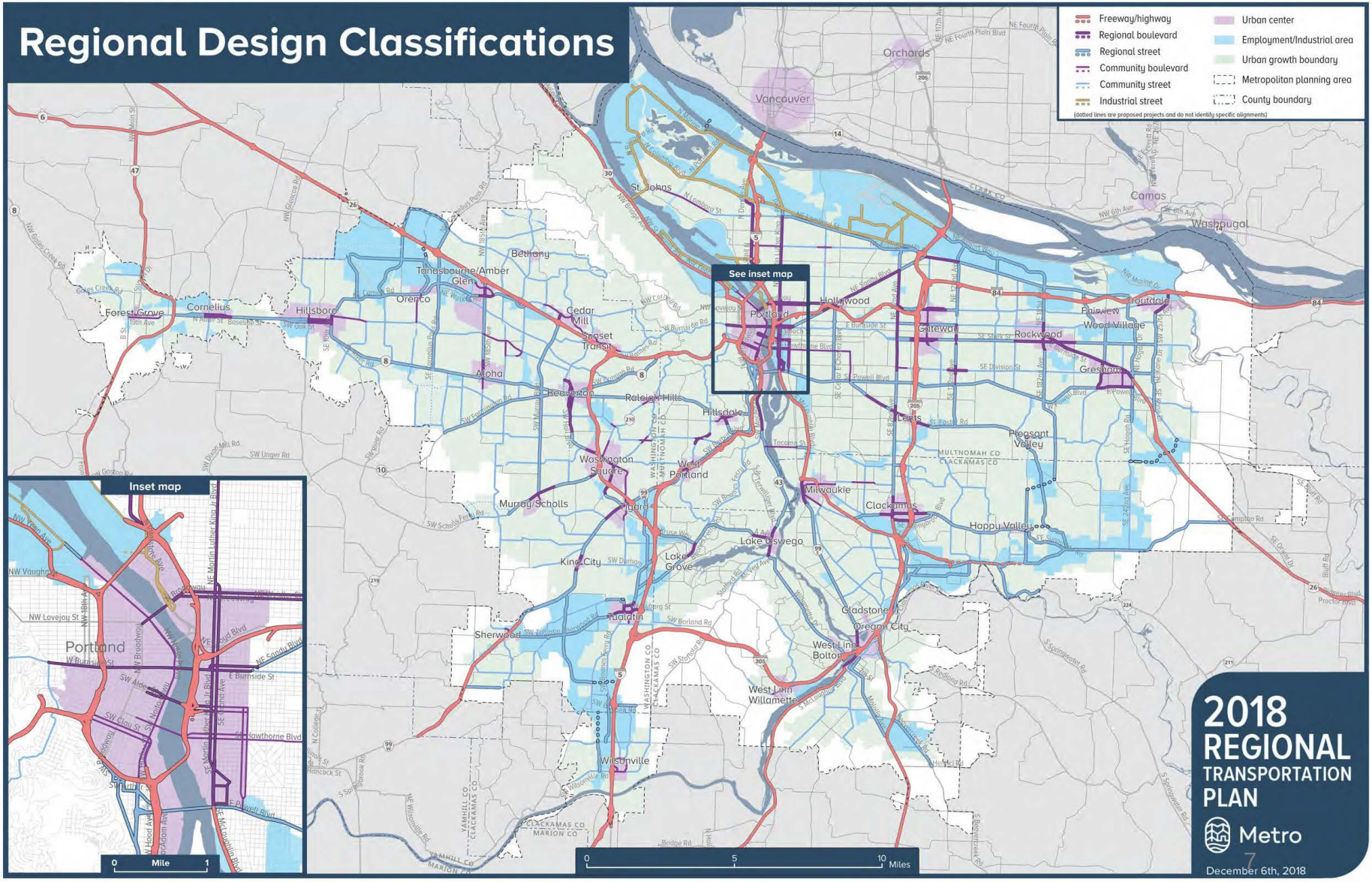
DESIGN CLASSIFICATIONS (CHAPTER 3)

Linked to land use (2040 Growth Concept)



Regional Design Classifications



EXAMPLE OF REGIONAL DESIGN CLASSIFICATIONS

Regional Boulevard:
Tualatin Valley Highway – (downtown Hillsboro)

Image: Google Earth

EXAMPLE OF REGIONAL DESIGN CLASSIFICATIONS

Regional Street:
Tualatin Valley Highway – (near Aloha)

Image: Google Earth

EXAMPLE OF REGIONAL DESIGN CLASSIFICATIONS

Regional Boulevard:
Stark Street in Gresham

Image: Google Earth

EXAMPLE OF REGIONAL DESIGN CLASSIFICATIONS

Regional Street:
Stark Street in East Portland

Image: Google Earth

EXAMPLE OF REGIONAL DESIGN CLASSIFICATIONS

Community Boulevard:
Hawthorne Boulevard in Southeast Portland

Image: Google Earth

EXAMPLE OF REGIONAL DESIGN CLASSIFICATIONS

Community Street:
Oatfield Road in Gladstone

Image: Google Earth

DESIGN ELEMENTS (CHAPTER 4)

Street Corners

Every intersection in the transportation system creates street corners – the space where sidewalks come together.

Pedestrians leave the sidewalk to cross the street at street corners, and vehicles and trucks make turns around them. Transit stops are often located at or near them. Street corners, in conjunction with adjacent land uses, can also serve as a place for entertainment, gathering, speaking, or other activities – serving a placemaking function.

Figure 37 The bulb-outs at NW Couch and NW 11th in downtown Portland ensure that people crossing the street are visible to people driving. The bulb-outs also provide space for benches, pedestrian scale lighting, newspaper boxes and planters. The perpendicular curb cuts make it easier for people using mobility devices to cross. The tight corner is appropriate for this downtown setting and keeps turning movements of motor-vehicles slow. Large trucks making deliveries take the whole intersection to make a turn.

Best Practices

✔ **Safety:** To increase safety, corner radii and the configuration of medians should be designed to shorten pedestrian crossing width. Minimizing corner radii creates compact intersections with safe turning speeds. Avoid design of channelized right-turn islands (pork chops), these decrease pedestrian safety.

✔ **Vibrant communities:** Bulb outs not only enhance safety, they support vibrant communities by providing valuable space for stormwater planters, art elements, benches, street lighting, way-finding and other place-making activities.

✔ **Sustainable economic prosperity:** In industrial areas and on industrial streets, wider curb radii support freight movement. On major freight routes that are also regional boulevards and streets, truck aprons paired with bollards can be used to allow for wide truck turns while maintaining livability and safety.

✔ **Social equity:** Street corners must be designed in alignment with Americans with Disabilities Act (ADA) guidance to ensure that people of all abilities can safely navigate crossings at intersections. Perpendicular curb cuts are the preferred design.

Chapter 4 Chapter 3 Chapter 2

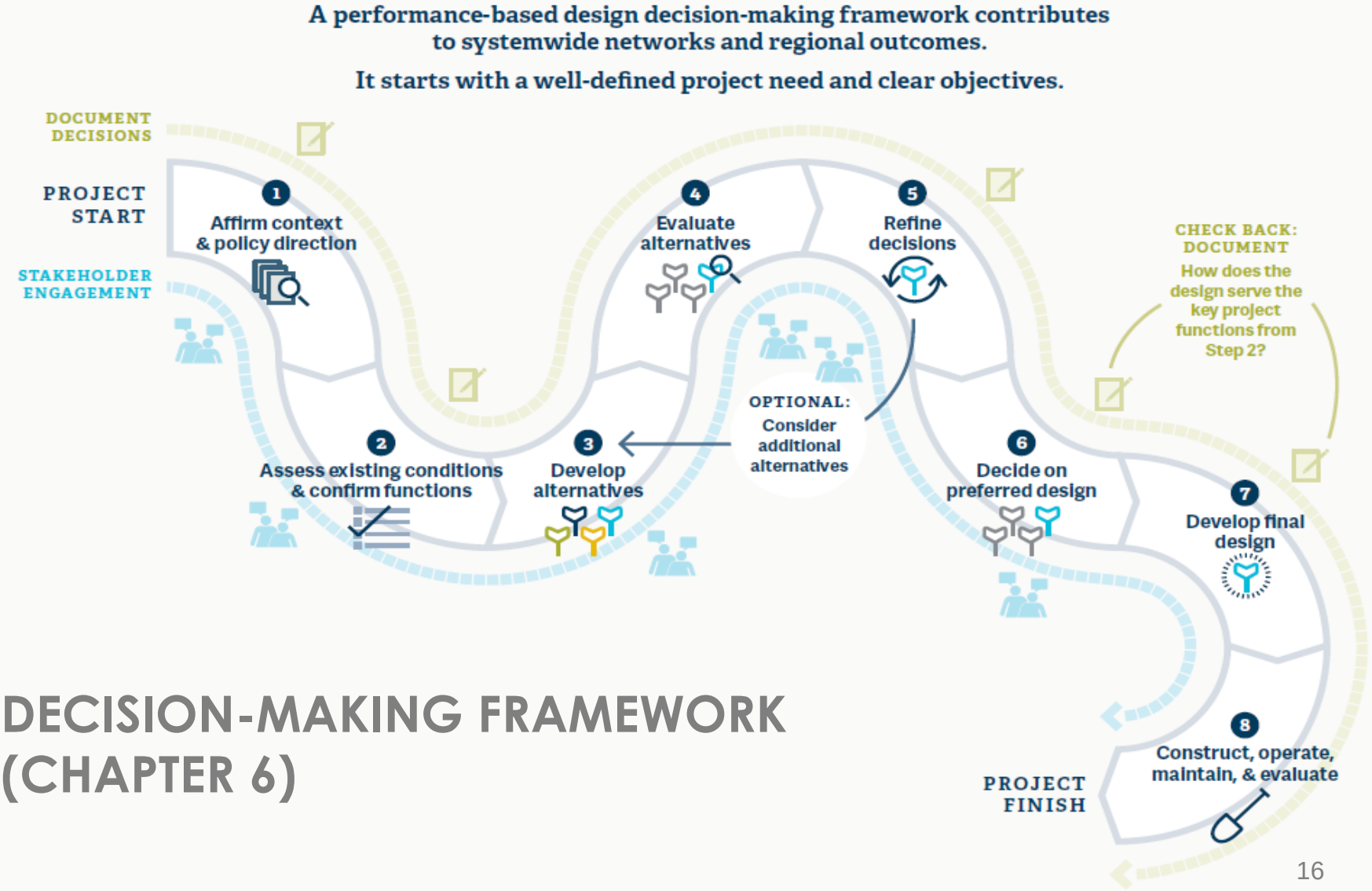


Design elements support functions to achieve outcomes.

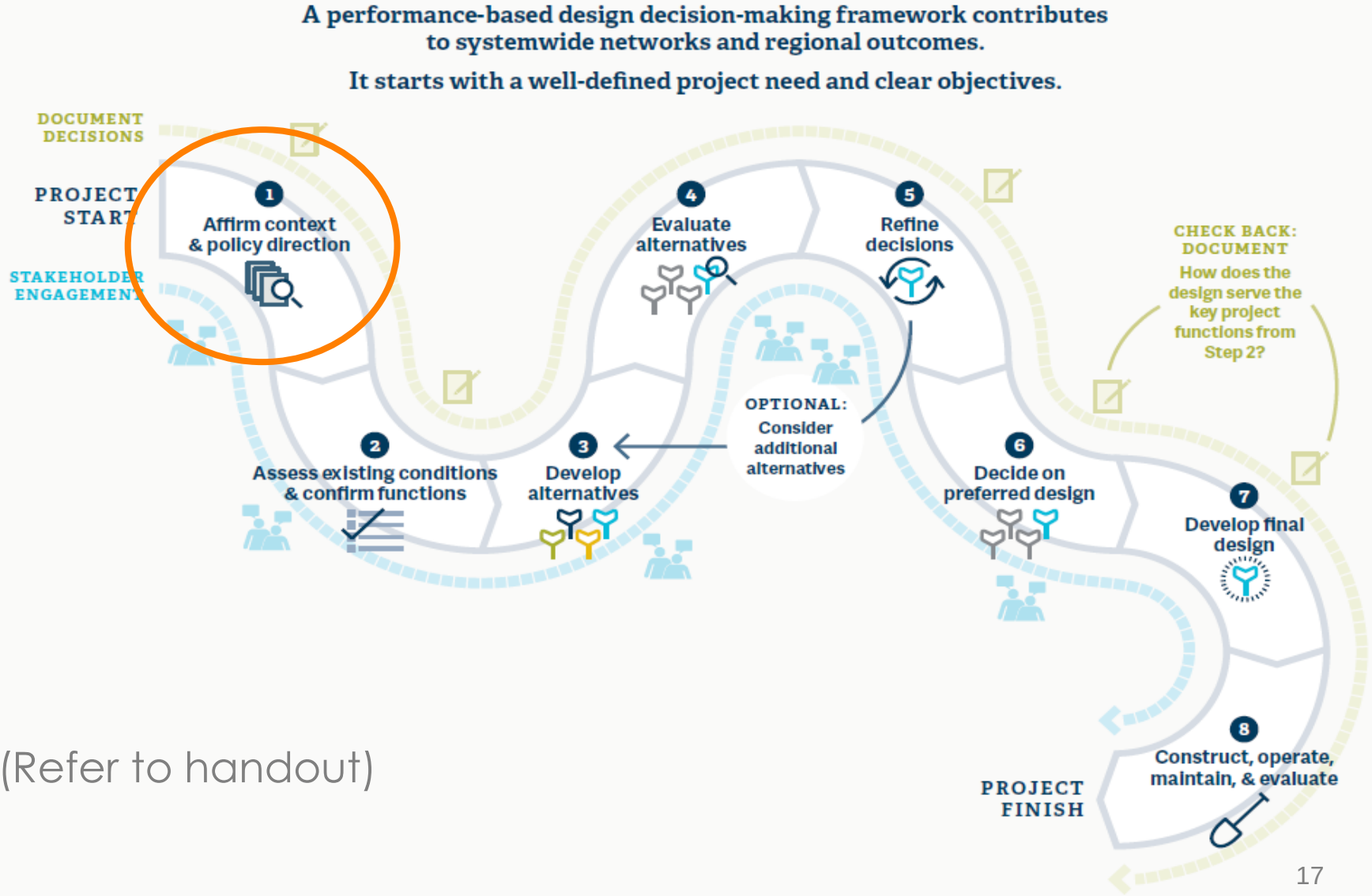
Frontage zone
Pedestrian through zone
Street furniture zone
Street corners
Planters, swales, & basins for stormwater
Flex zone: On-street parking & other uses
Surface stormwater conveyance & detention
Other buffer elements
Motor-vehicle travel lanes
Medians
Traffic calming
Access management/driveways
Shared streets & spaces
Dedicated bicycle facilities
Transit stops
Transit priority treatments
Transit in travelways
Midblock crossings
Un-signalized intersections
Signalized intersections
Roundabouts & mini-roundabouts
Unique & gateway & transition contexts
Multi-use paths on independent alignment
Multi-use paths in roadway right-of-way
Trail connections to other facilities
Trail bridges, boardwalks & structures
Trail crossings
Street & trail surfaces

Pedestrian Access & Mobility
Bicycle Access & Mobility
Transit Access & Mobility
Truck Freight Access & Mobility
Auto Access & Mobility
Place-Making & Public Space
Corridors for Nature & Stormwater
Utility Corridors
Physical Activity
Emergency Response

Safety
Healthy People
Healthy Environment
Social Equity
Reduced Green House Gas Emissions
Vibrant Communities
Transportation Choices
Sustainable Economic Prosperity
Efficient & Reliable Travel
Resiliency
Security
Fiscal Stewardship



DECISION-MAKING FRAMEWORK (CHAPTER 6)



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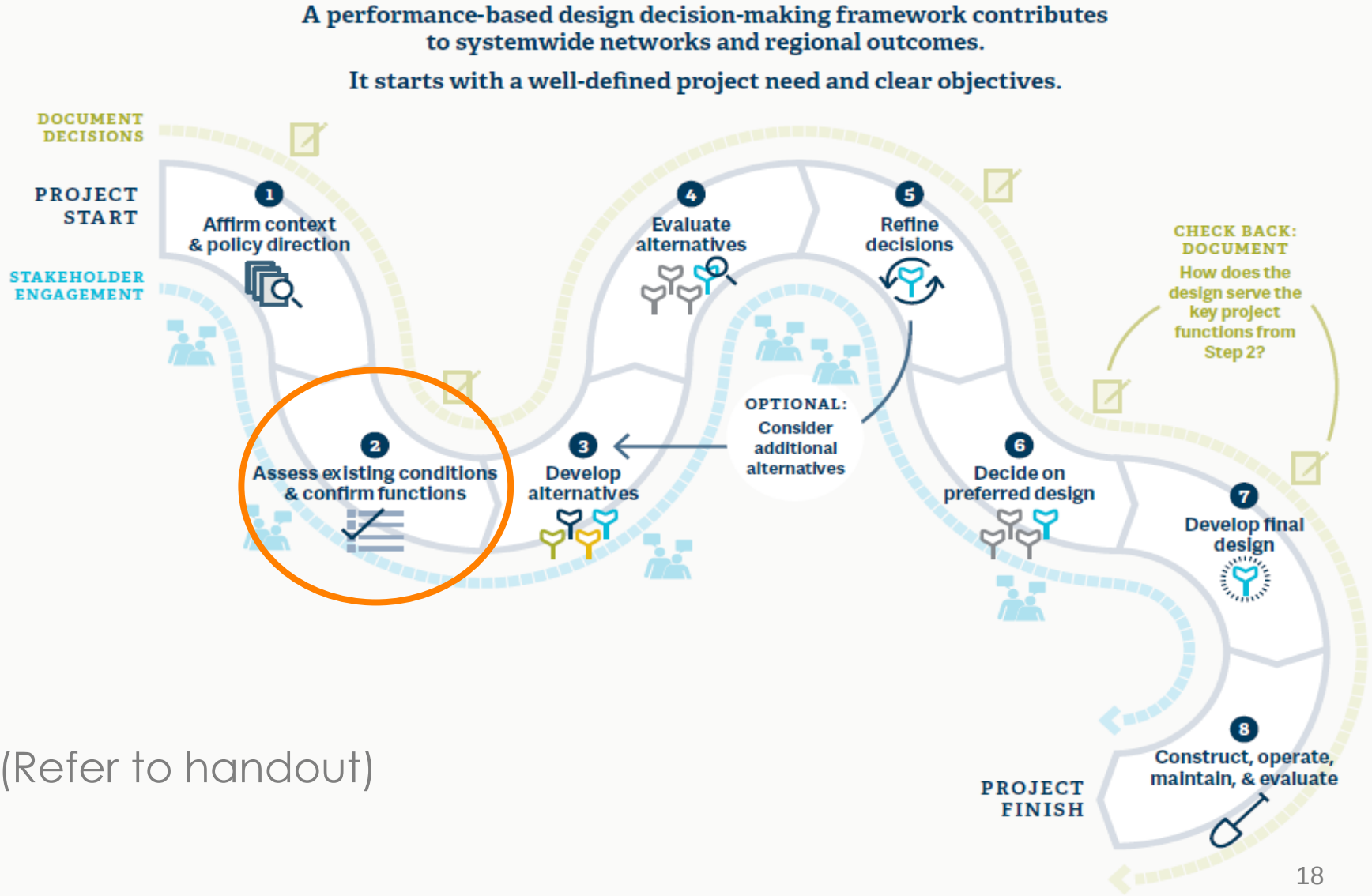

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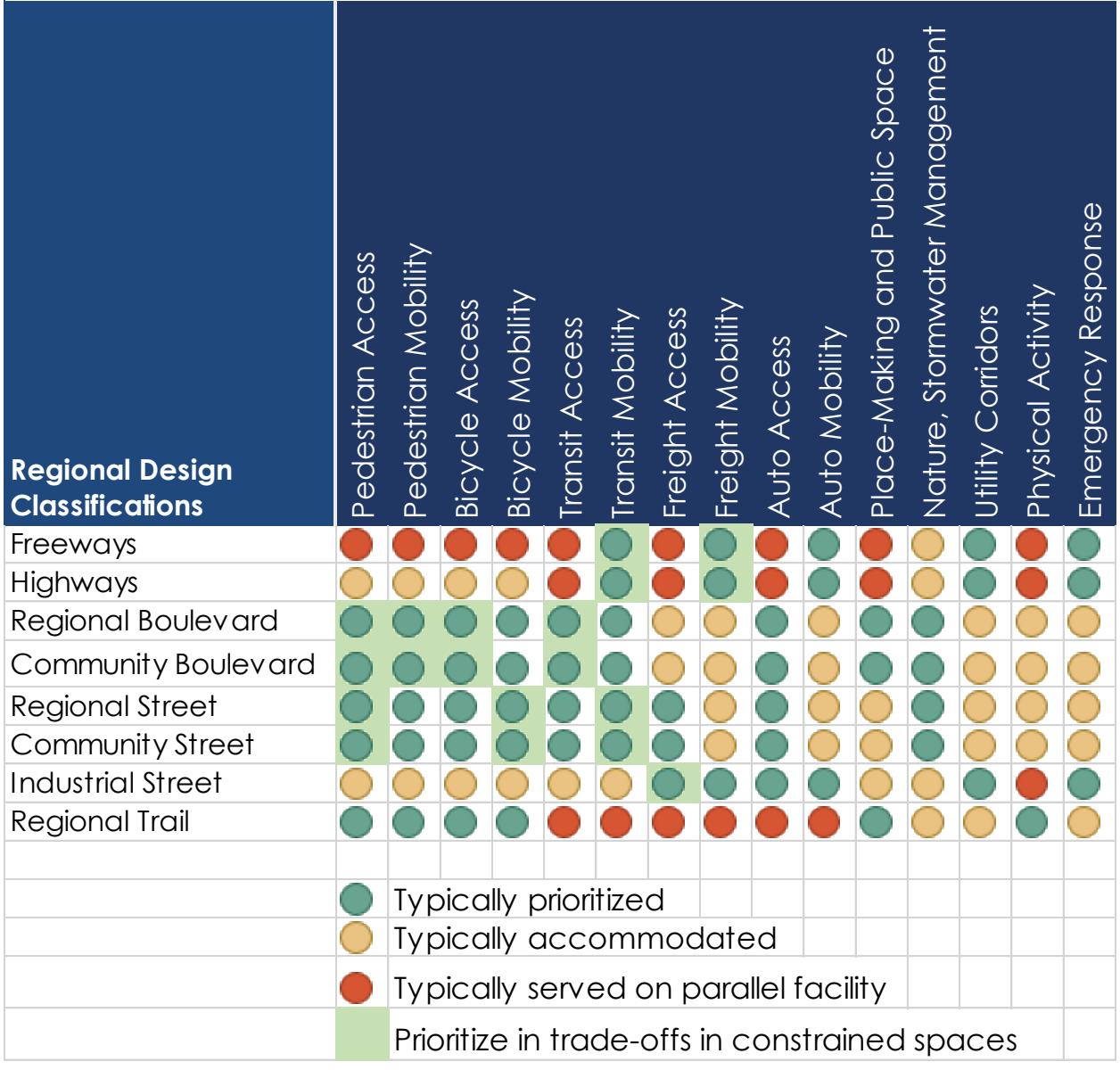
Regional Design Classifications
Pedestrian Access
Pedestrian Mobility
Bicycle Access
Bicycle Mobility
Transit Access
Transit Mobility
Freight Access
Freight Mobility
Auto Access
Auto Mobility
Place-Making and Public Space
Nature, Stormwater Management
Utility Corridors
Physical Activity
Emergency Response
Freeways
Highways
Regional Boulevard
Community Boulevard
Regional Street
Community Street
Industrial Street
Regional Trail
Typically prioritized
Typically accommodated
Typically served on parallel facility
Prioritize in trade-offs in constrained spaces

Table 2: Existing and Future Functions Documentation Table

Street Functions	Existing			Desired		
	Priority	Accommodated	Served on parallel facility	Priority	Accommodated	Served on parallel facility
Pedestrian Access	☐	☐	☐	☐	☐	☐
Pedestrian Mobility	☐	☐	☐	☐	☐	☐
Bicycle Access	☐	☐	☐	☐	☐	☐
Bicycle Mobility	☐	☐	☐	☐	☐	☐
Transit Access	☐	☐	☐	☐	☐	☐
Transit Mobility	☐	☐	☐	☐	☐	☐
Freight Access	☐	☐	☐	☐	☐	☐
Freight Mobility	☐	☐	☐	☐	☐	☐
Auto Access	☐	☐	☐	☐	☐	☐
Auto Mobility	☐	☐	☐	☐	☐	☐
Place-Making and Public Space	☐	☐	☐	☐	☐	☐
Nature, Stormwater Management	☐	☐	☐	☐	☐	☐
Utility Corridors	☐	☐	☐	☐	☐	☐
Physical Activity	☐	☐	☐	☐	☐	☐
Emergency Response	☐	☐	☐	☐	☐	☐
Other _____	☐	☐	☐	☐	☐	☐

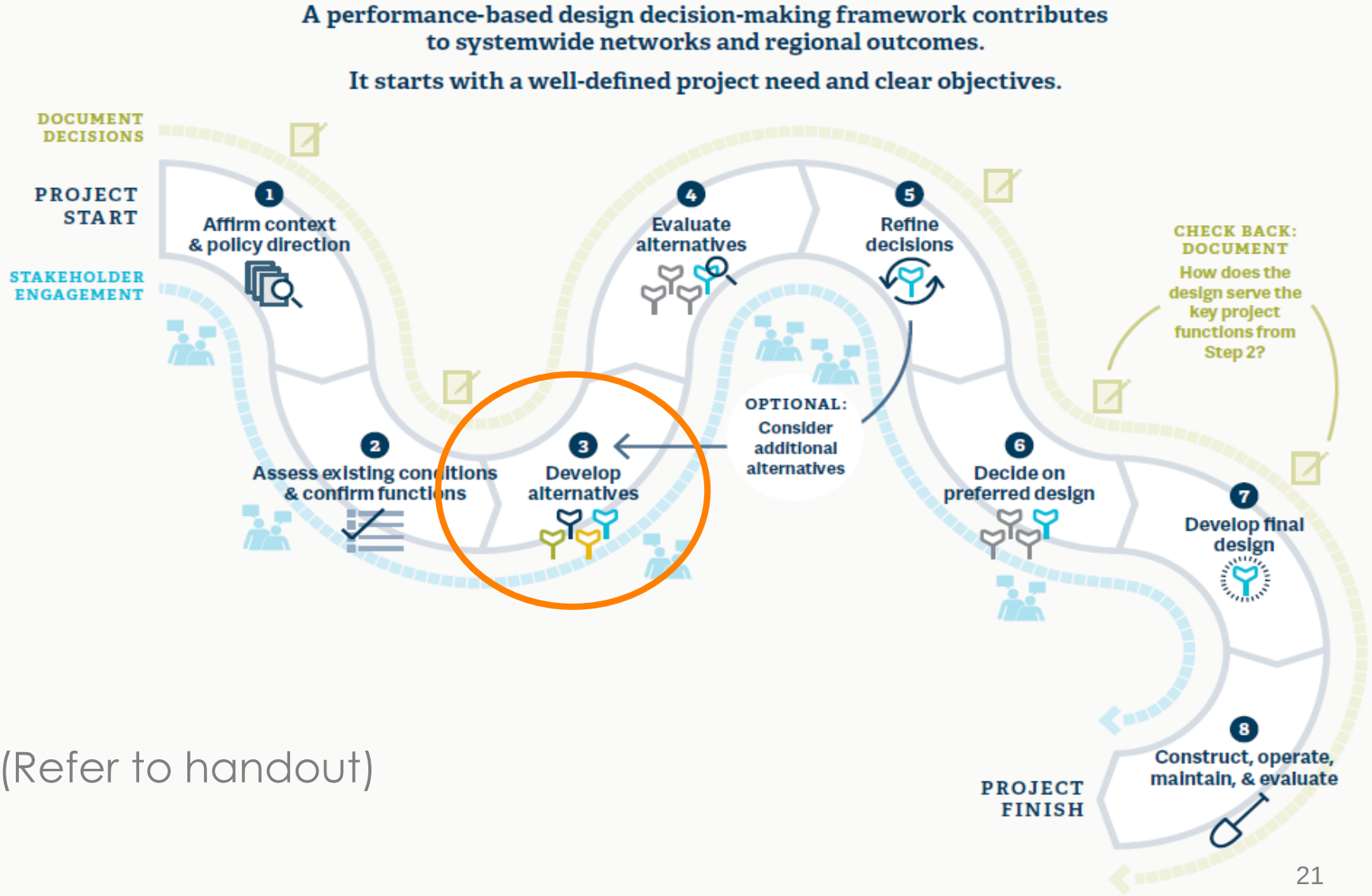

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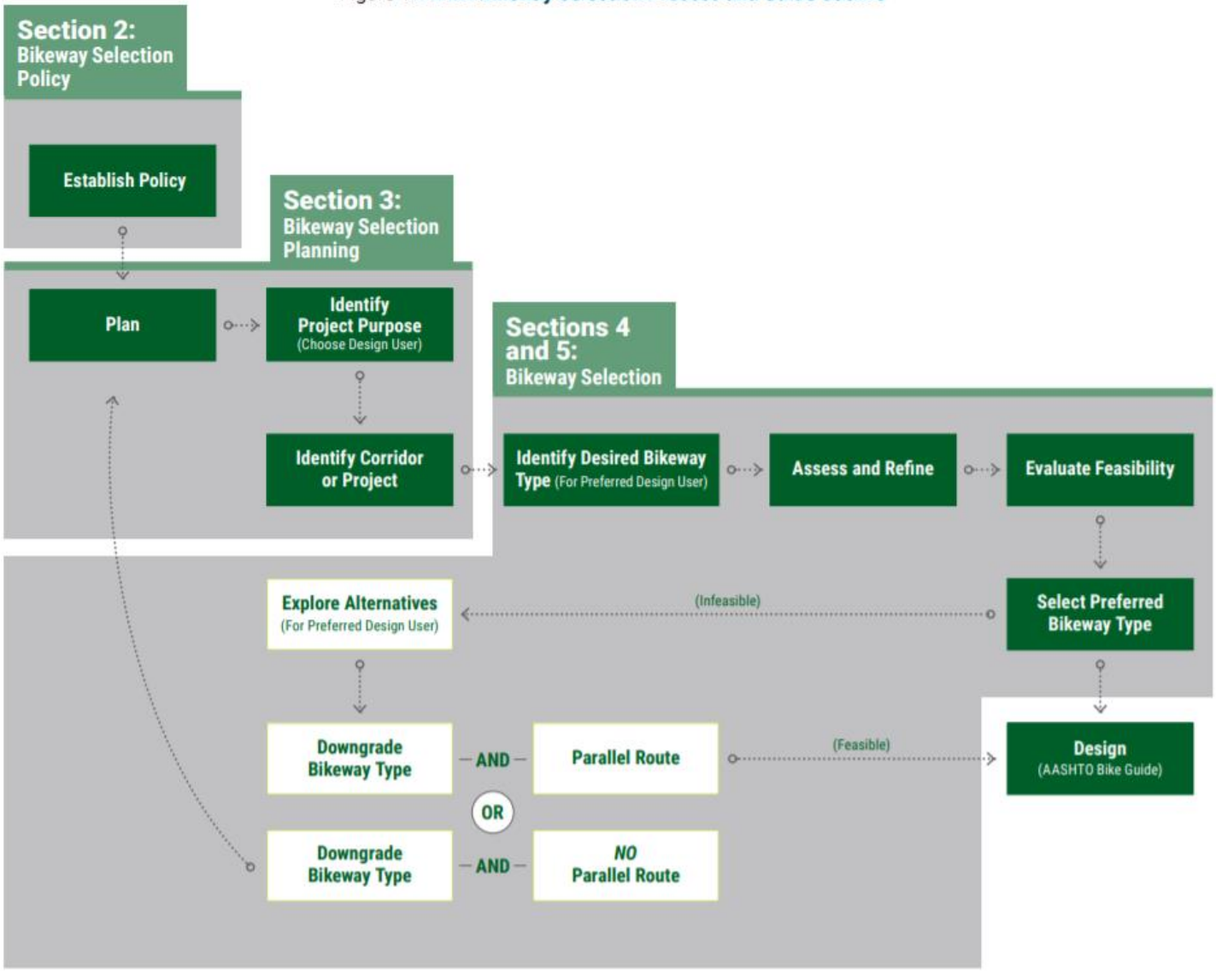
Figure 1: **FHWA Bikeway Selection Process and Guide Outline**



CHAPTER 4 EXAMPLE DESIGN ELEMENT: FLEX ZONE

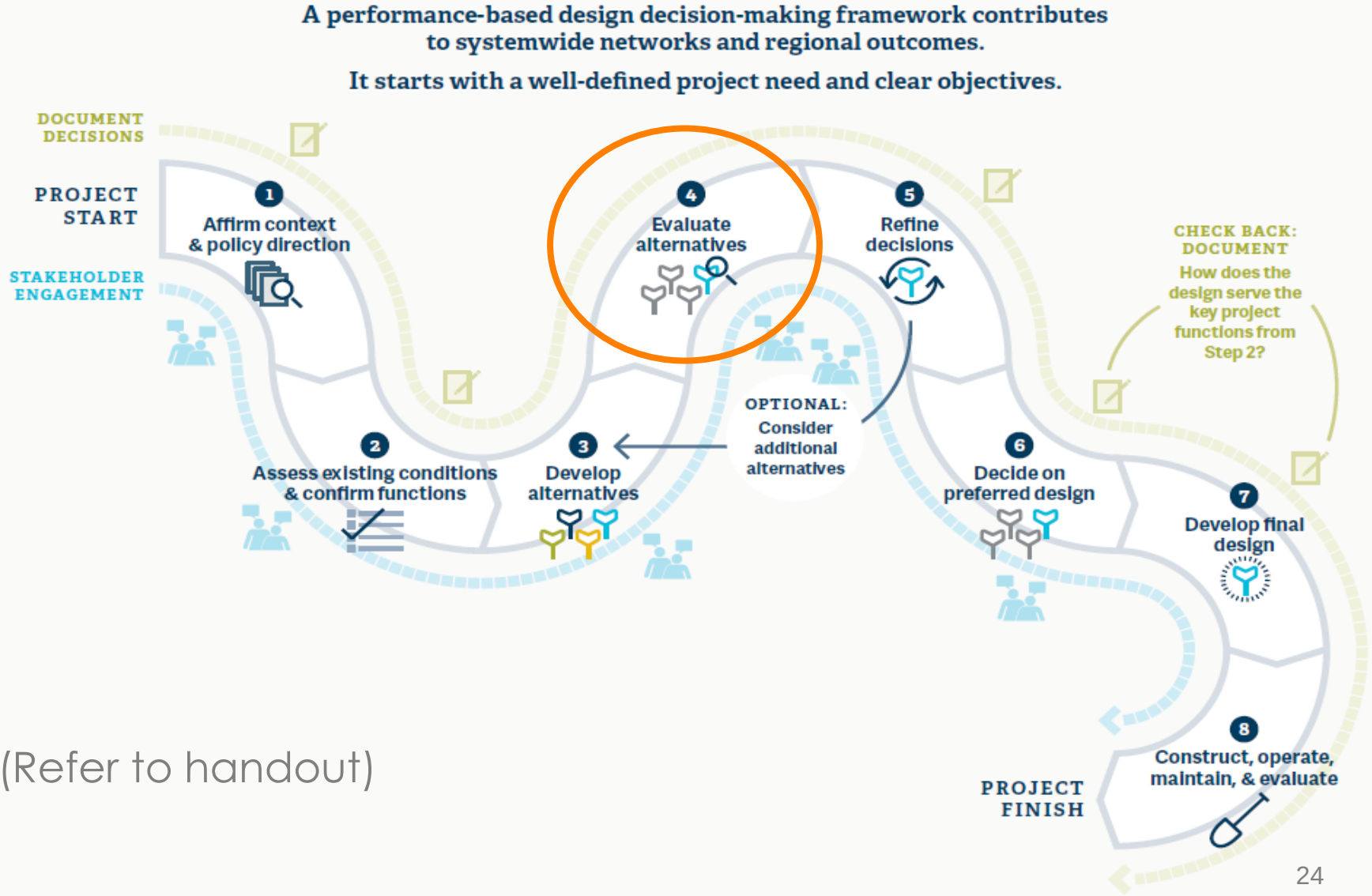
What flex zone uses are suited for the designated regional design classifications, to best serve our desired system outcomes?

Regional Design Classifications	Flex Zone Uses											
	Car Parking	Bike Parking	Other parking (scooter, motorcycle)	Loading/ unloading	Pickup / dropoff	Parklets and sidewalk cafes	Transit or Business Access/ Transit Lanes	Transit stops / amenities	Separated bike facilities	Wider Sidewalk	Green streets treatments	Shoulder
Freeways	🔴	🔴	🔴	🔴	🔴	🔴	🟡	🔴	🔴	🔴	🟡	🟢
Highways	🔴	🔴	🔴	🔴	🔴	🔴	🟡	🔴	🟡	🔴	🟡	🟢
Regional Boulevard	🟡	🟢	🟡	🟡	🟡	🟡	🟡	🟢	🟡	🟢	🟡	🔴
Community Boulevard	🟢	🟢	🟢	🟡	🟡	🟡	🟡	🟡	🟡	🟢	🟢	🔴
Regional Street	🟡	🟡	🟡	🟡	🟡	🔴	🟡	🟢	🟡	🟡	🟢	🟡
Community Street	🟡	🟡	🟡	🟡	🟡	🔴	🟡	🟡	🟡	🟡	🟢	🟡
Industrial Street	🟡	🟡	🟡	🟢	🟡	🔴	🟡	🟡	🟡	🟡	🟡	🟡

🟢 Preferred use within the flex zone

🟡 Typical/potential use within the flex zone

🔴 Not a typical use within the flex zone



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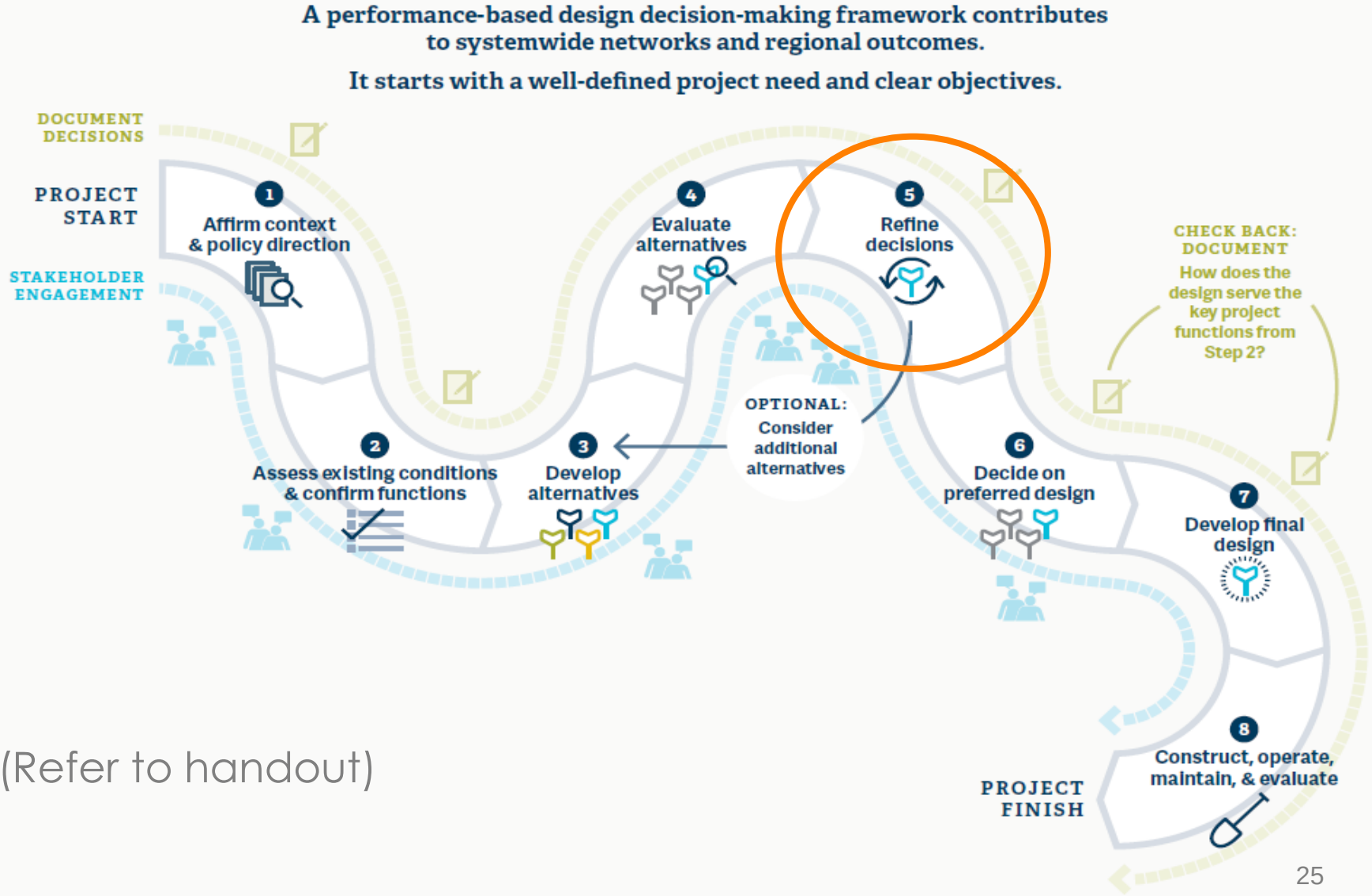

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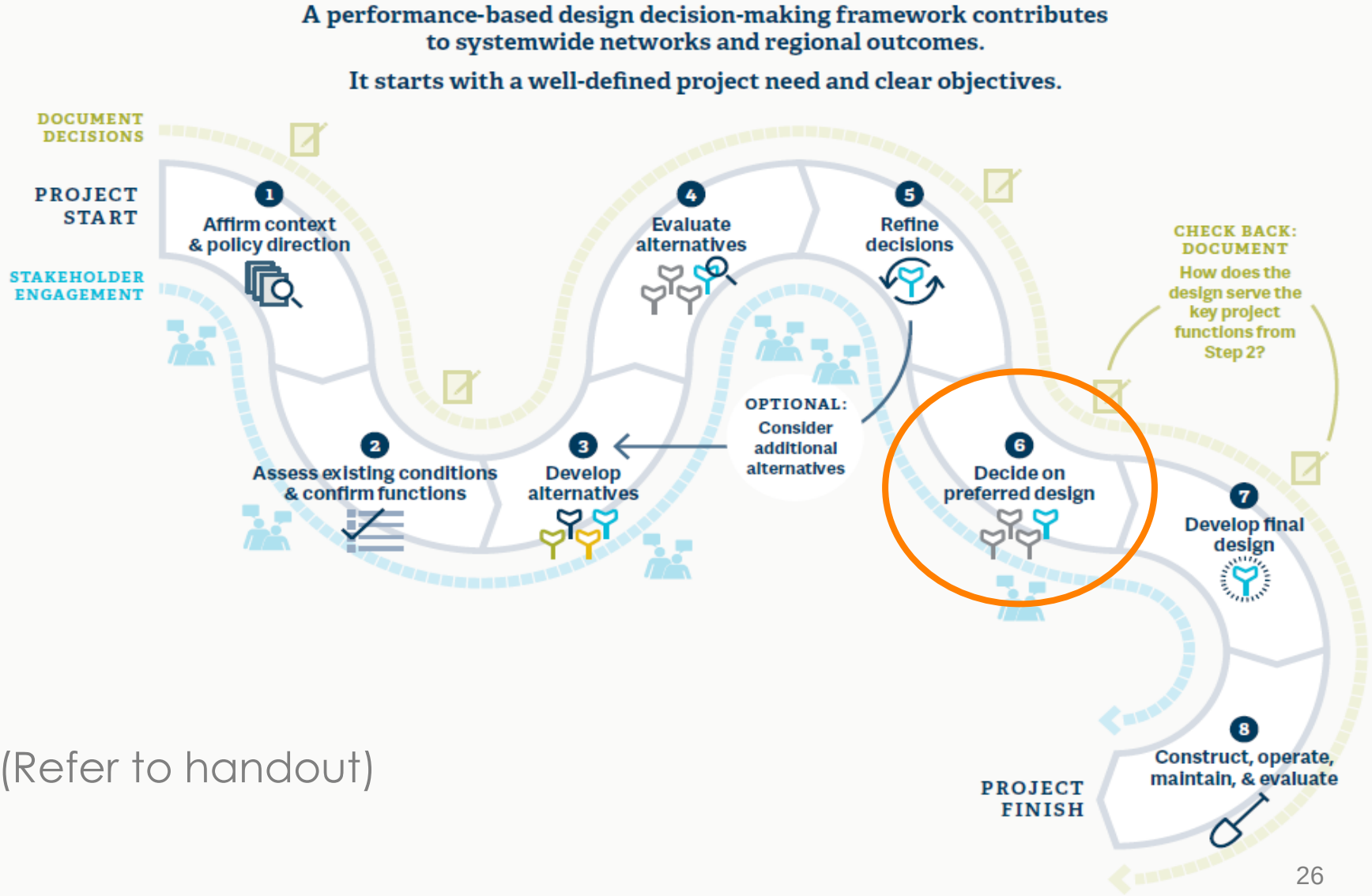

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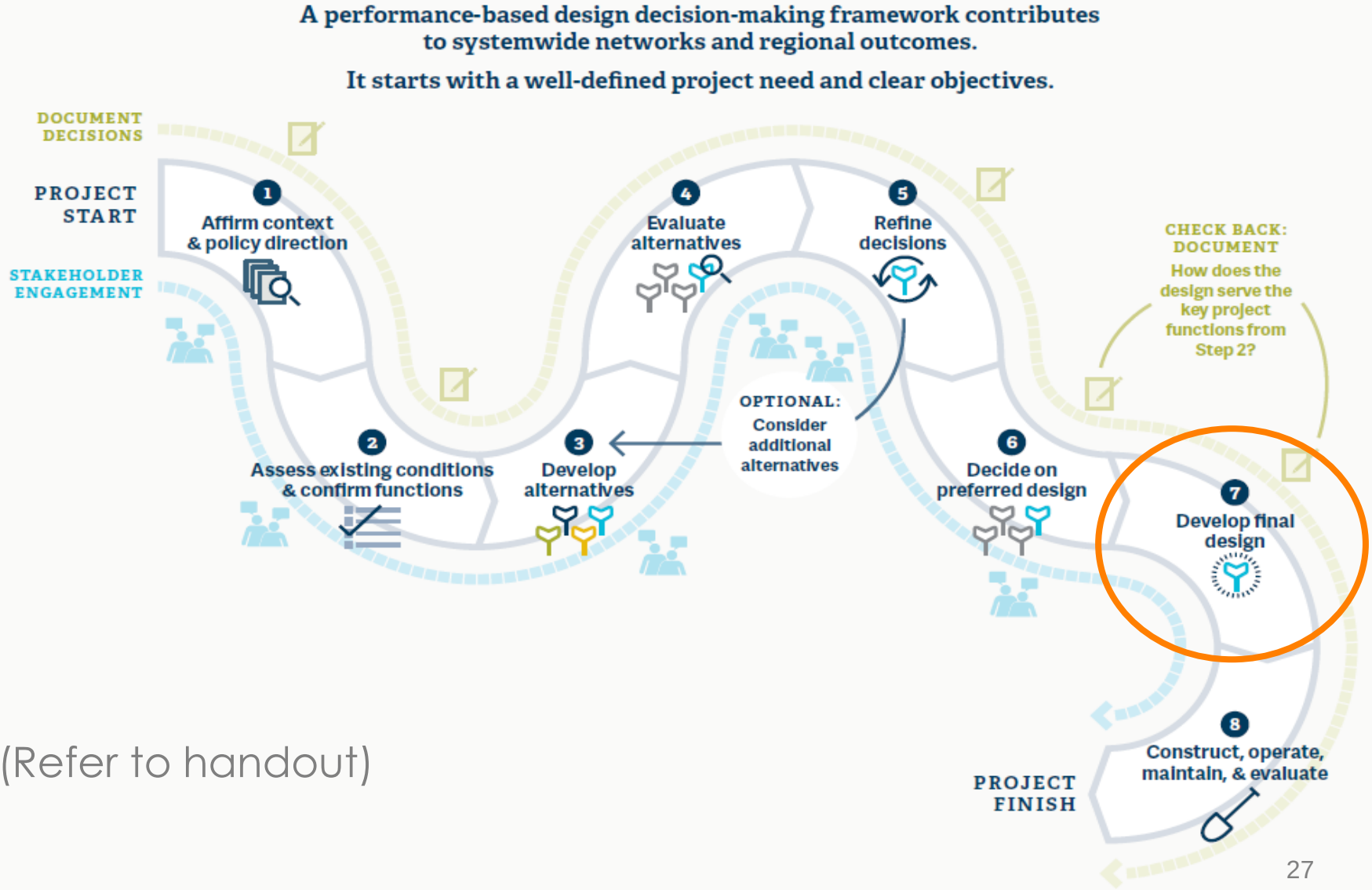

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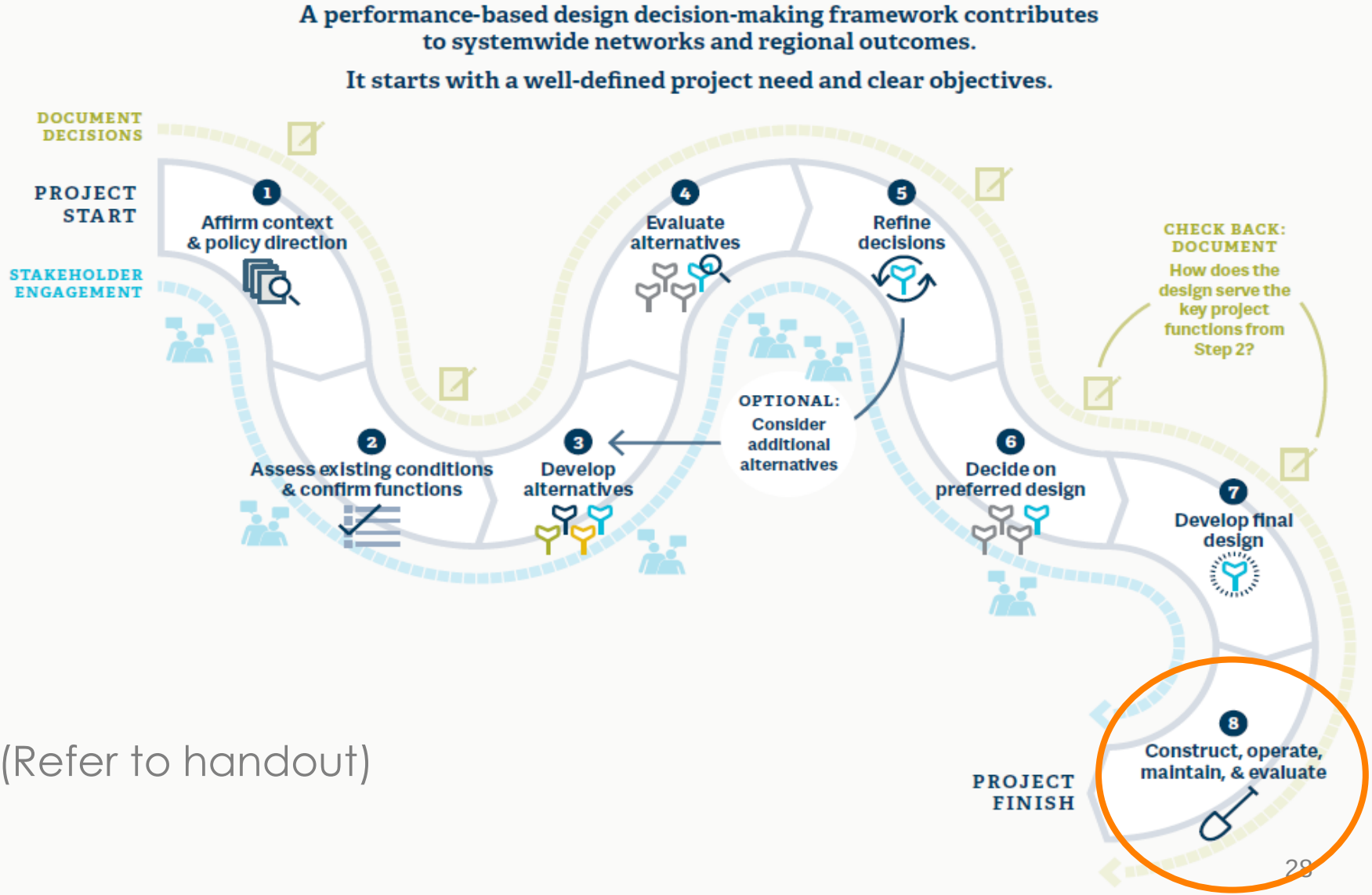

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EVALUATION – EXAMPLE