

Final Technical Memorandum

June 3, 2024

Project# 27003.014

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From: John McPherson and Rachel Barksdale

RE: Task 5.1.3.2 Concept Level Environmental Screening

INTRODUCTION

The Oregon Department of Transportation (ODOT) is preparing a Facility Plan to evaluate potential transportation improvements across Interstate 5 (I-5) between the Phoenix Interchange (at Exit 24) and South Medford Interchange (at Exit 27) in South Medford, Oregon (see Figure 1). The purpose of this memo is to provide an initial environmental analysis of the South Stage Road Extension concept-level alternatives to identify potential environmental constraints (i.e., environmental factors that make the alternatives unable to be permitted or otherwise selected and thereby infeasible or unreasonable). Based on Technical Memorandum (TM) #3.1.2: Environmental Setting Report and TM #2.1.3: Goals, Objectives, Evaluation Criteria, and Performance Measures, the analysis identifies resources that may present fatal flaws for the conceptual alternatives. (See the section below, "Environmental Resources used for Concept Level Environmental Screening.")

In the section "Environmental Fatal Flaw Analysis," of this TM, the environmental screening metrics for the conceptual alternatives are presented for those alternatives that satisfy the project's Purpose and Need and are technically and economically feasible¹. Four Overpass alternatives and four Interchange alternatives were analyzed as technically and economically feasible. The four Overpass alternatives (O-1, O-2, O-3, and O-4) do not have connections to I-5, while the four Interchange alternatives (I-1, I-2, I-3, and I-4) have access ramps onto and off of I-5. After public input, ODOT and the Federal Highway Administration (FHWA) will decide which

¹ ODOT's PEL Guidance and the National Environmental Policy Act require consideration of a No Action Alternative. The purpose of this memo is to provide environmental screening analysis of conceptual build alternatives that satisfy the purpose and are technically feasible. The reader should be aware that not building any improvements will remain an alternative throughout the PEL and NEPA process. Additional evaluation of the No Action Alternative will be presented in future analysis in the PEL and NEPA processes.

The environmental screening evaluation was completed in accord with the ODOT Guide to Linking Planning and National Environmental Policy Act (NEPA), which states:

Evaluation criteria are used to screen alternatives and compare them against each other. Evaluation criteria should be comprehensive enough to address all of the factors that are relevant to evaluating the reasonableness of alternative[s], including the ability of the alternatives to meet the Purpose and Need. The evaluation criteria will change based on the level of detail that the alternative evaluation process is in. The “fatal flaw” analysis is a first step that eliminates alternatives that do not meet the Purpose and Need or have fatal flaws. These criteria are usually described as pass/fail measures rather than quantitative measures. Later levels of evaluation are also rooted in the Purpose and Need, but are more precise and quantitative and could include criteria based on public input, environmental impacts, or be operational based. Evaluation criteria should be readily explainable, quantifiable, and data driven (TPAU, 2020).²

The guidance further identifies considerations for screening out alternatives:

An alternative that does not meet the Purpose and Need is, by definition, unreasonable, and for that reason, it can be eliminated from detailed analysis in the NEPA process, as long as the rationale for doing so is documented. Other valid reasons for eliminating an alternative include, but are not limited to: a major land use goal exception that cannot be achieved, and/or having insurmountable impacts that cannot be mitigated. The main point is that there should be documented reasoning, based on the evaluation criteria, why alternatives identified in the PEL process are not to be carried forward into NEPA for future consideration.³

Each of the conceptual alternatives is analyzed in accordance with screening criteria approved for the project which are summarized in the next section. For additional information on the criteria, see the *Goals, Objectives, Evaluation Criteria, and Performance Measures Technical Memorandum*.

ENVIRONMENTAL RESOURCES USED FOR CONCEPT LEVEL ENVIRONMENTAL SCREENING

Earlier in the project’s development, existing environmental resources in the project study area that could be impacted by the project were identified in TM #3.1.2: Environmental Setting

² ODOT. 2021. “ODOT Guide to Linking Planning and NEPA Using the ODOT PEL Questionnaire.”

³ Ibid.

Report. The Environmental Setting Report includes information on current land uses, socioeconomic conditions, water resources and wetlands, biological resources, cultural resources, parks, air quality and noise issues, and hazardous materials.⁴ Resources identified for consideration at this level of screening were based on (1) laws, regulations, and executive orders, and (2) project’s goals and objectives which were based on the goals and objectives from Medford’s Transportation System Plan (TSP). Resources with the most stringent requirements and those proposed for the fatal flaw level of screening include the following:

- Public parks and historic sites protected by the U.S. Department of Transportation (USDOT) Act of 1966, Section 4(f)
- Wetlands and waters of the United States protected by the Clean Water Act
- Historic properties protected by the National Historic Preservation Act (NHPA), Section 106
- Floodplain management in accordance with Executive Order 11988
- Environmental justice communities per Executive Order 12898 and Executive Order 14096

The project team considered these laws, regulations, and Executive Orders and the City of Medford’s TSP to develop evaluation criteria and performance measures. The criteria and measures are documented in TM #2.1.3: Goals, Objectives, Evaluation Criteria, and Performance Measures. The applicable environmental criteria and performance measures from the memo are presented below in Table 1.

Table 1. 2018 TSP Goals and Objectives Evaluation Criteria Used for Environmental Screening

Objective	Evaluation Criteria	Performance Measure
Goal 3 – Livability: Design and construct transportation facilities to enhance the livability of the City’s neighborhoods and business centers		
Objective 9: The City will balance transportation system objectives to improve mobility against objectives to avoid disruption of existing neighborhoods and nonresidential districts and minimize impacts to individual properties.	Does the alternative avoid impacts to developed properties? If so, by how much?	Number of developed parcels with potential right-of-way takes Number of undeveloped parcels with potential right-of-way takes Number of structures requiring removal

⁴ Environmental resources were identified from existing available data. Field investigations have not yet been completed for any resource and may result in changes to the resources presented in this memo.

Goal 5 – Financing: Optimize funding resources so that transportation investments are fiscally sound and economically sustainable		
Objective 14: Systematically and regularly plan and predict the need for the acquisition of needed public right-of-way in order to implement the adopted Functional Classification Map.	Does the alternative avoid impacts to developed properties? If so, by how much?	Number of developed parcels with potential right-of-way takes Number of undeveloped parcels with potential right-of-way takes Number of structures requiring removal
Goal 6 – Environment: Reduce environmental impacts from transportation		
Objective 19: Reduce environmental impacts of the transportation infrastructure.	Does the alternative avoid or minimize environmental impacts comparatively? If so, by how much?	Acreage or number of impacts to environmental resources U.S. Department of Transportation Act Section 4(f) Wetlands and waters Environmental justice Floodplains Community cohesion National Historic Preservation Act Section 106 resources

Each measure used for Level 1 screening is further discussed below.

Parks - Section 4(f) Resources

Section 4(f) of the US DOT Act protects parks, recreation areas, wildlife and waterfowl refuges, and historic sites from transportation impacts (uses). Historic sites are also protected by the NHPA, which is discussed further in this memorandum. Impacts to Section 4(f) properties are defined as a “use” and can include permanent right-of-way (ROW) acquisition that transfers land as part of a transportation process; a temporary occupancy that is adverse in terms of the Section 4(f) statute’s preservation purposes; or a constructive use. Use of a Section 4(f) property may be approved only if there is no prudent and feasible alternative to using the Section 4(f) resource or if the use is determined to be *de minimis*. A *de minimis* impact involves a determination of no adverse effect resulting from the use of Section 4(f) property. Within the API, the Medford Sports Park and the Lithia & Driveway Fields, Bear Creek Park, Bear Creek Greenway, and Blue Heron Park are protected Section 4(f) resources (see Figure 2).

Figure 2 Parks - Section 4(f)

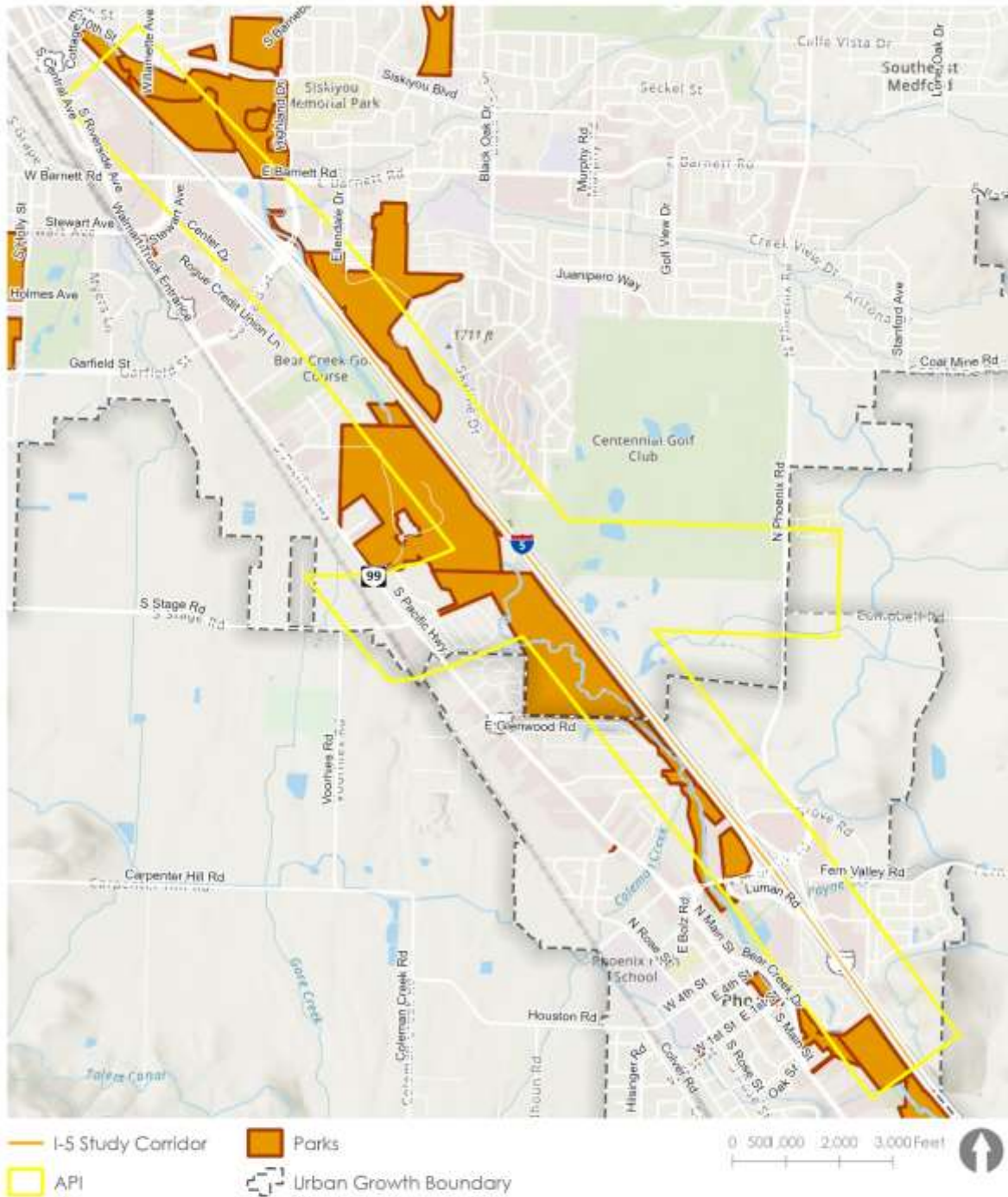


Figure 2

Parks - Section 4(f)
Existing Environmental Constraints



Wetlands and Waters

Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials into U.S. wetlands or other waters. Authorization is needed from the U.S. Army Corps of Engineers (USACE) if a project requires these activities. Similarly, the Oregon Department of State Lands (DSL) requires a Removal-Fill permit under Oregon's Removal-Fill Law (ORS 196.795-990) for removal or fill in wetlands and waterways.

Project designs must attempt to avoid impacts to jurisdictional waters. If impacts are unavoidable, a finding must be made that there is no practicable alternative to impacting the wetland or water. Project alternatives selected for advancement and permitting with USACE should align with the USACE requirement to select the least environmentally damaging practicable alternative.

Wetlands, as well as several named waterbodies are within the API (see Figure 3), including Coleman Creek, Larson Creek, Lazy Creek, Payne Creek, Crooked Creek, and Bear Creek, all of which are perennial streams. Gore Creek, an intermittent stream, is also present, as well as several unnamed intermittent streams. The Medford Irrigation Canal is also within the API.

Figure 3 Water Resources and Wetlands

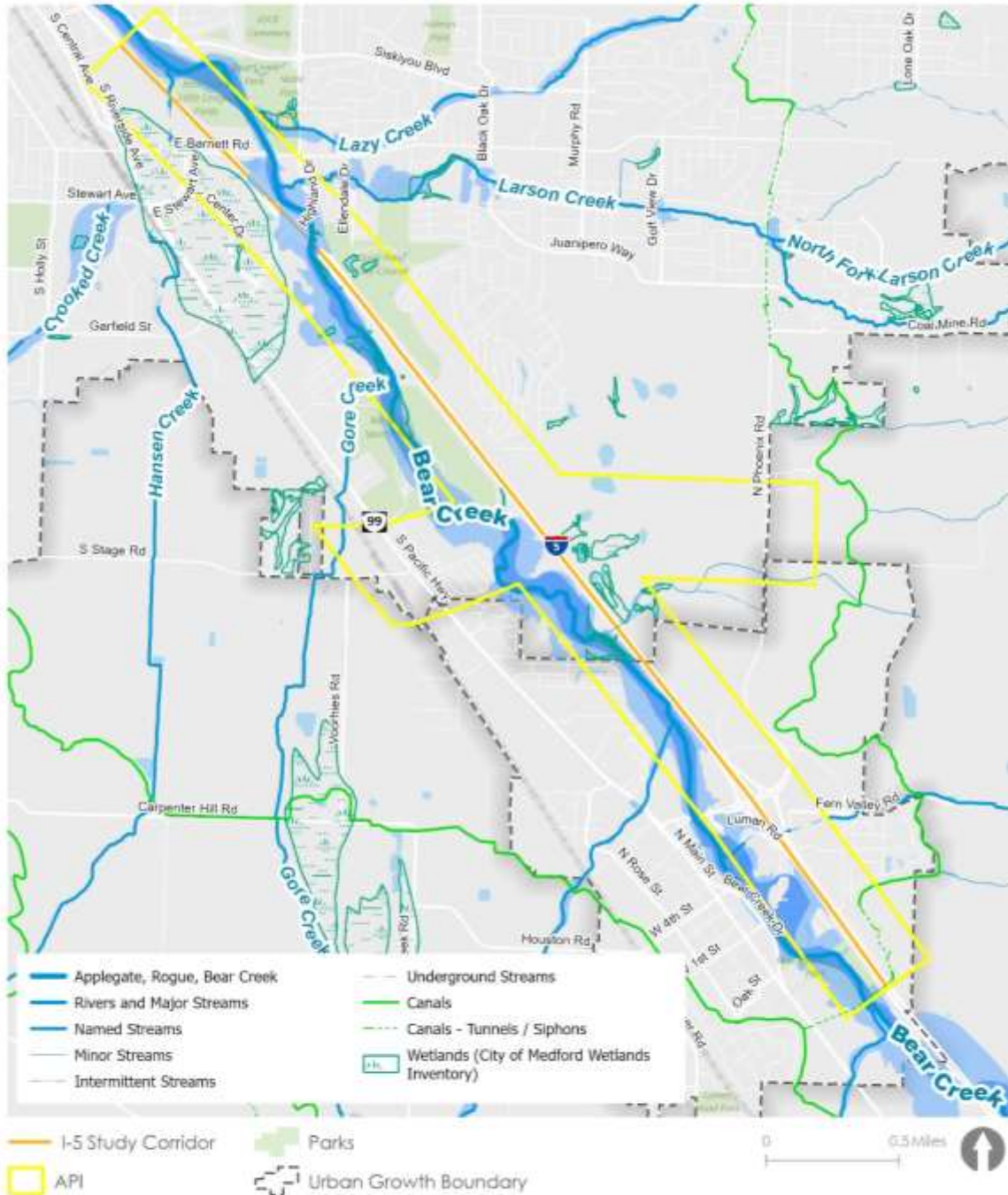


Figure 3

Water Resources and Wetlands Existing Environmental Constraints



Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was signed February 11, 1994. This Executive Order was supplemented by Executive Order 14096, "Revitalizing Our Nation's Commitment to Environmental Justice for All," on April 26, 2023. Executive Order 14096 directs federal agencies, as appropriate and consistent with applicable law, to identify, analyze, and address disproportionate and adverse human health and environmental effects (including risks) and hazards of federal activities. These activities include those related to climate change and cumulative impacts of environmental and other burdens on communities with environmental justice concerns.

FHWA Order 6640.23A establishes policies and procedures for FHWA to use in complying with Executive Order 12898. The FHWA has identified environmental justice as "...identifying and addressing disproportionately high and adverse effects of the agency's programs, policies, and activities on minority and low-income populations to achieve an equitable distribution of benefits and burdens."

All practicable means to avoid or minimize disproportionately high and adverse human health or environmental effects on an environmental justice population must be considered and documented. Mitigation strategies, monitoring needs, and preferences expressed by the affected population should be identified.

As part of the analysis in TM #3.1.2: Environmental Setting Report, the project team analyzed available U.S. Census information. There are census block groups with populations that exceed the percentages of reference communities, and some have a considerably higher percentage of minority and low-income populations compared to their reference communities. Additionally, several mobile home parks have been identified that may also be environmental justice communities (Figure 4).

Figure 4 Environmental Justice Populations

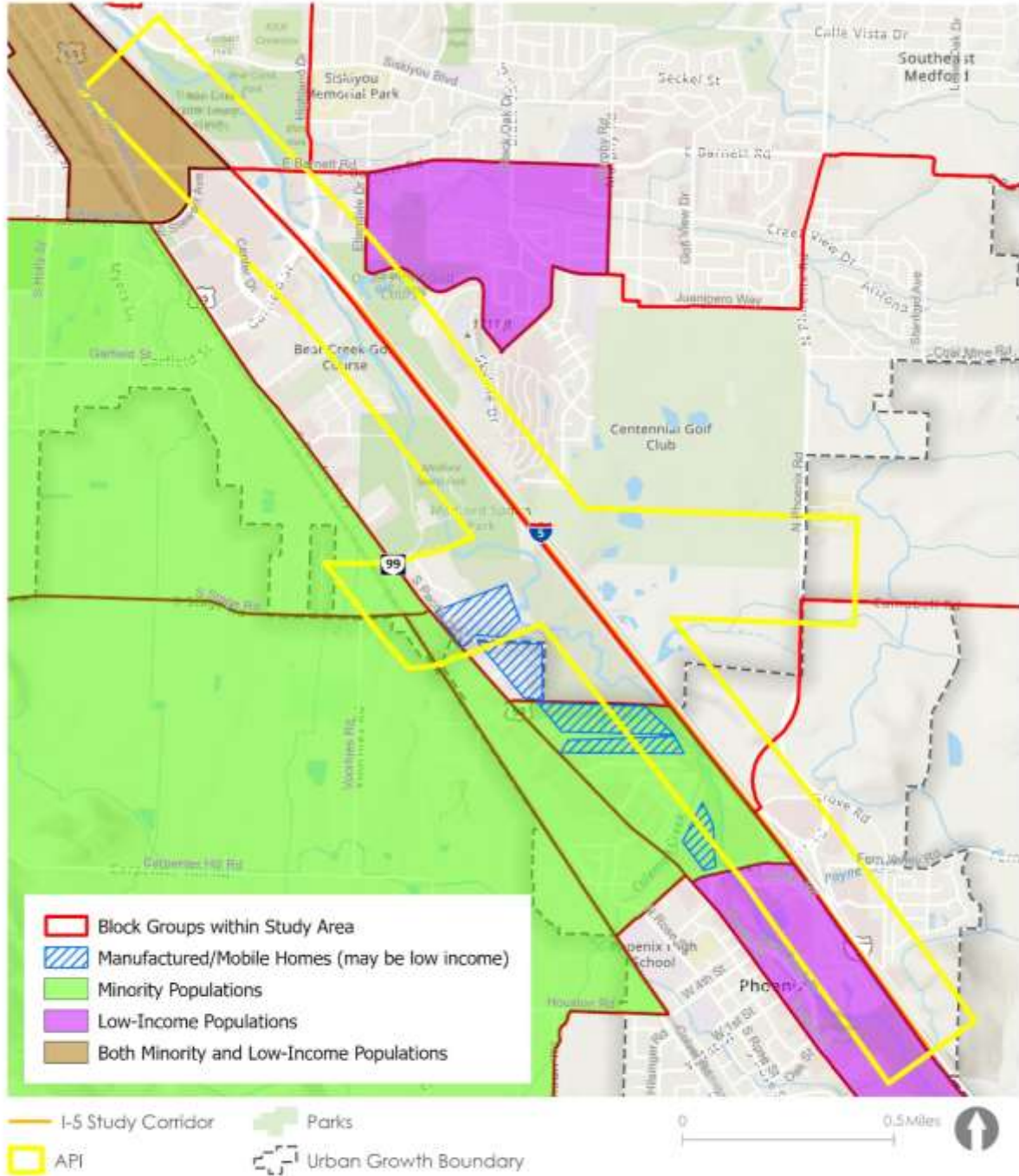


Figure 4

Floodplains

Executive Order 11988 (Floodplain Management) directs federal agencies to avoid to the extent possible adverse impacts associated with floodplain development under NEPA. Federal agencies are required to determine whether a proposed action will occur in a floodplain, and if so, consider alternatives to avoid adverse effects within the floodplain. If an alternative would result in unavoidable floodplain impacts, then modifications must be documented to minimize potential harm to or within the floodplain. The Executive Order specifically requires federal agencies to do the following:

If an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains. If the head of the agency finds that the only practicable alternative consistent with the law and with the policy set forth in this Order requires siting in a floodplain, the agency shall, prior to taking action, (i) design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations issued in accord with Section 2(d) of this Order, and (ii) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain.

The API is within the Federal Emergency Management Agency regulated floodway and floodplain of Bear Creek (Figure 5). The map depicts three flood hazard designations the regulatory floodway, the 100-year flood elevation, and the 500-year flood elevation. FHWA's NEPA guidance in TA 6640.8A indicates that National Flood Insurance Program (NFIP) maps should be consulted to determine if an alternative will encroach on the base (100-year) floodplain and if so, to assess the risks. If an encroachment to the 100-year floodplain is identified, the roadway should be designed to be consistent with the NFIP standards which provide for a 1-foot rise in the water surface elevation of the 100-year flood. For any alternative encroaching on a designated regulatory floodway, the NEPA document should provide a preliminary indication of whether the encroachment would be consistent with or require a revision to the regulatory floodway. Engineering and environmental analyses should be undertaken, commensurate with the level of encroachment, to permit the consistency evaluation and identify impacts.

Figure 5 Floodplains

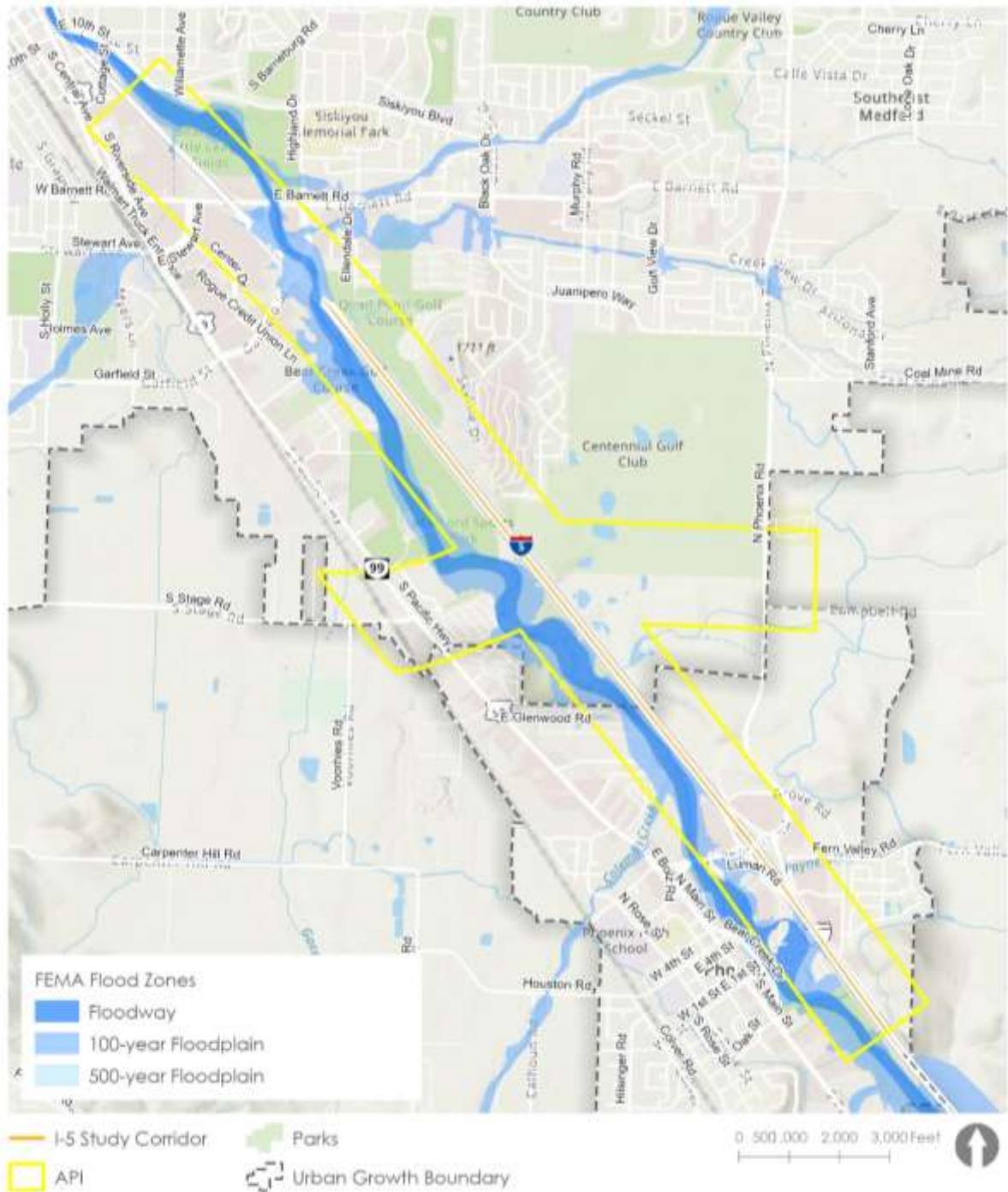


Figure 5
Floodplains
Existing Environmental Constraints



Historic Properties

Section 106 of the NHPA protects significant historic properties by requiring federal agencies to consider the effects of their actions on properties listed in or eligible for listing in the National Register of Historic Places (NRHP) and provide the Advisory Council on Historic Preservation an opportunity to comment on the agency's actions. Potential adverse effects for each alternative must be identified, followed by documentation of avoidance, minimization, or mitigation measures. An alternative that would result in adverse effects would be eliminated if another alternative exists that would not result in adverse effects.

Historic properties eligible for listing on the NRHP, which can include specific types of archaeological sites, are also Section 4(f) resources. Impacts to NRHP-eligible resources that result in an adverse effect would require a Section 4(f) evaluation. Section 4(f) evaluations analyze avoidance and minimization measures; if there is a feasible and prudent avoidance alternative, it must be selected, unless the use is *de minimis*.

There are many previously recorded archaeological sites/isolates within the API and several more within 1 mile of the API. Previously undisturbed lands are within the API, creating a high probability of containing archaeological resources. An archaeological survey would be required to understand if and how resources may be impacted by the project in compliance with Section 106. Public disclosure of the locations of archaeological resources is prohibited, and therefore no mapping is provided in this memo.

The Oregon State Historic Preservation Office Historic Sites Database shows four resources within the API (Figure 4), two of which are listed as not eligible/non-contributing, and one that is demolished. One resource, the June Earhart House, is listed as eligible/contributing to the NRHP.

Figure 6 Historic Resources

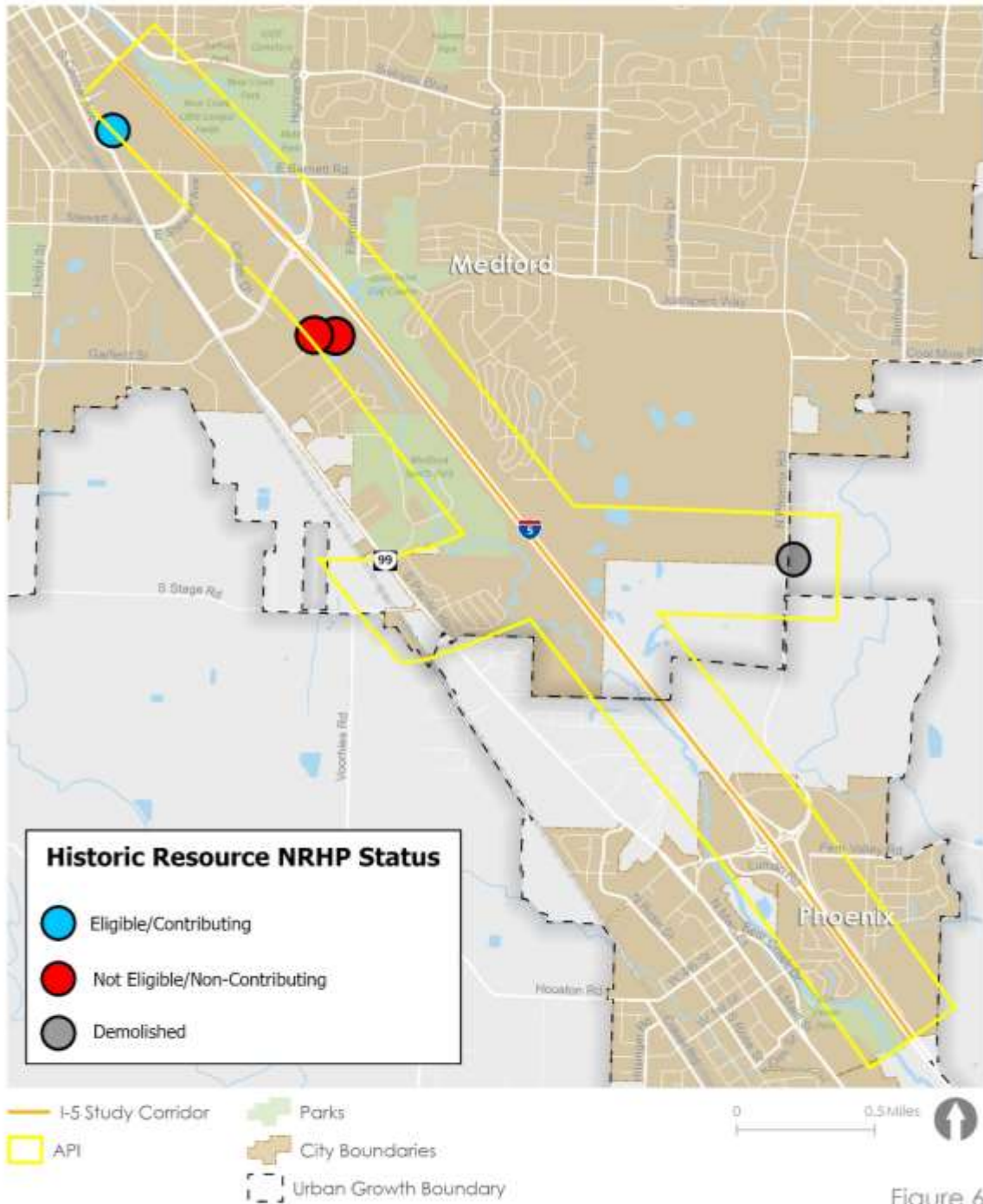


Figure 6

Right-of-Way and Community Cohesion

Based on Medford's TSP goals and objectives, impacts to community cohesion were evaluated, including changes such as splitting or isolating portions of neighborhoods, for disproportionately high and adverse effects on social groups (see Environmental Justice in the preceding section) and ROW impacts. Alternatives that result in disproportionate ROW⁵ or community cohesion impacts would not be selected as a recommended alternative if there are reasonable alternatives that avoid those impacts.

East of I-5, the land use designations potentially affected by the South Stage Road alignment include Urban Residential, Commercial, Service Commercial, General Industrial, and Urban High-Density Residential. Additionally, east of I-5, the alignment traverses along the southern edge of a planned development known as Centennial. North of the alignment, Centennial includes use designations of Commercial, Service Commercial, and Urban High-Density Residential. Along I-5 in the study area, the designations include Urban Residential, Urban High-Density Residential, Service Commercial, Commercial, General Industrial, and Parks and Schools. See Figure 7.

It is important to note that the land use in around a potential overpass or interchange at I-5 may develop differently depending on what is built. The potential for such land use changes will need to be discussed in future NEPA documents as the type of development and rate of development will be influenced by the project. It will also be important to consider whether or not the build alternatives might delay development in some of areas while accelerating it in others. Future traffic modeling and land use analysis will need to consider these changes during NEPA.

⁵ Under Title 49 of the Code of Federal Regulations, Part 24 (49 CFR 24), the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 regulates property acquisition and relocation and provides protection for people affected by federally funded transportation projects. Property owners whose property is impacted by a project must be treated fairly, consistently, and equitably and receive just compensation for their property. Right-of-way impacts cannot result in disproportionate effects to persons protected under Title VI of the Civil Rights Act of 1964.

Figure 7 General Land Use Plan

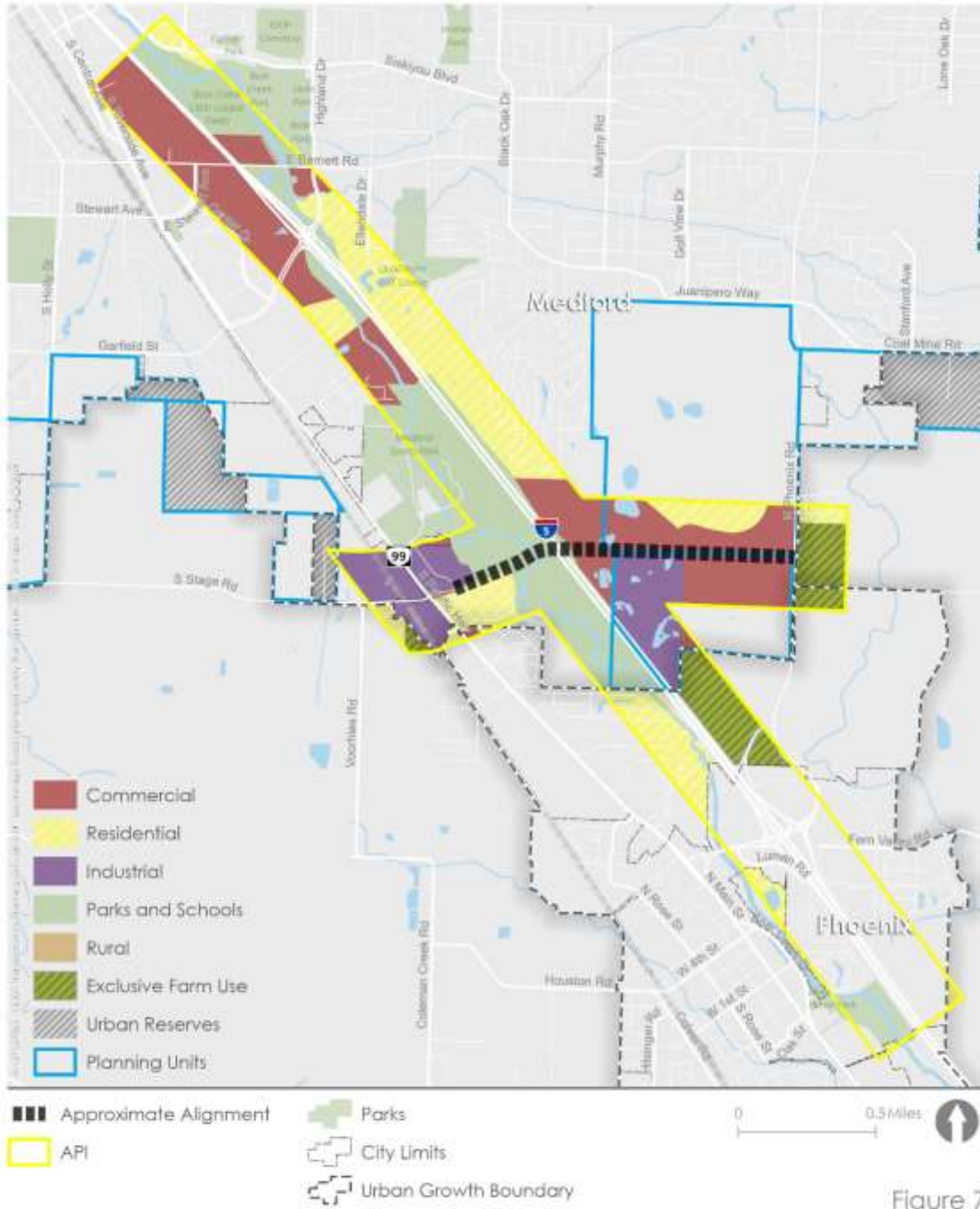


Figure 7

KITTELSON & ASSOCIATES

Data Source: Medford GIS, Jackson County GIS

**General Land Use Plan
Jackson County, OR**

Composite Constraints

Figure 8 presents a composite constraint map. The reasonableness of interchange types and alignments of the conceptual alternatives are affected by existing conditions, including topography, environmental resources, land uses, and compatibility with existing plans. Existing resources such as Section 4(f) protected parks (e.g., Bear Creek Greenway), environmental justice communities (e.g., San George Estates), jurisdictional wetlands and waters, and floodplains on the west side of I-5 constrain potential alternative development and will be evaluated to identify whether conceptual alternatives are reasonable.

Notably, none of the alternatives were able to avoid the Section 4(f) protected greenway and flood hazards completely due to the greenway/creek's long, linear alignment. The project team has used bridges where possible to minimize use of the park property. As engineering moves forward, bridge pier designs will avoid developed park facilities. Trails may need to be rerouted. The hydrologic opening of the bridge over the creek will be designed to meet flood passage standards.

Figure 8 Environmental Resources

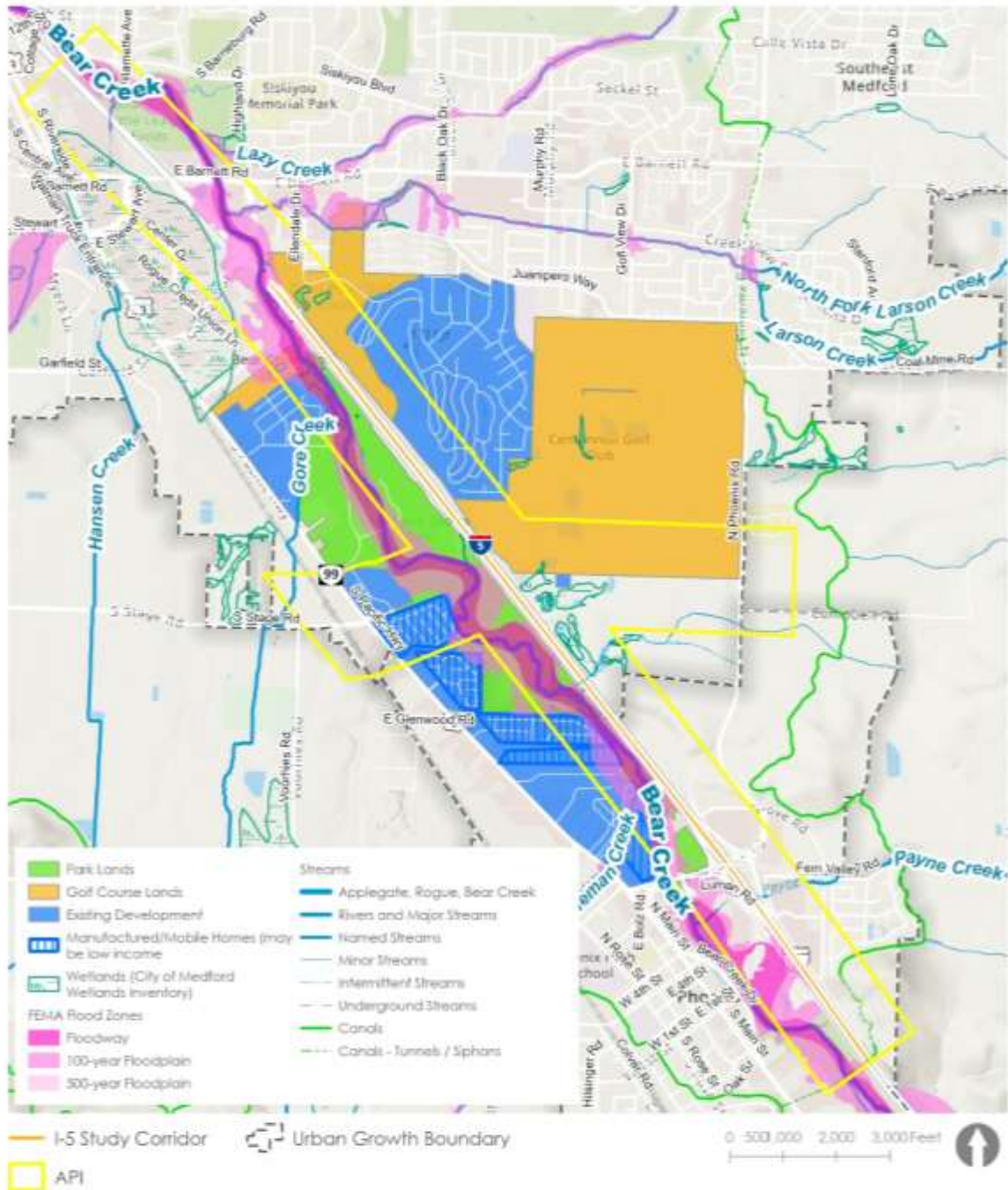


Figure 8
Environmental Resources
Jackson County, Oregon



ENVIRONMENTAL SCREENING ANALYSIS

South Stage Alignment Alternative O-1

This alternative is a single curved segment crossing over Bear Creek and I-5 that generally follows the South Stage corridor alignment identified in the Medford TSP. The crossing profile rises over Bear Creek and both travel directions of I-5 to avoid vertical clearance impacts and to meet the top of hill elevation on the east side of the freeway, then returns to the existing grade north of the Pacific Power & Light (PPL) substation (Figure 9). The alignment crosses perpendicular to the Bear Creek Greenway and the associated floodway, which helps to minimize impacts to those resources.

Table 2. Alternative O-1 Environmental Screening

Measure	Results
Park - Section 4(f)	146,000 sf
Wetlands and waters	3,170 SF
Environmental justice	No acquisitions. Noise and air quality effects on San George Estates.
Floodplains	34,600 sf
Historic resources*	None
Community cohesion	Does not split a neighborhood
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	6 undeveloped parcels
Number of structures requiring removal	0 structures
Total right-of-way acreage	609,400 sf

* A detailed survey has not been completed and archaeological resources are not included.

sf = square feet.

- Lowest Section 4(f) park impacts (tied with O-4).
- Lowest wetland and water impacts (tied with O-4)
- Similar flood hazard impacts as other overpass alternatives
- Lowest total ROW acreage needed (tied with O-4)
- All Overpass alternatives have similar ROW effects: needing to acquire one to two developed parcels affecting four structures.

Figure 9 Alternative O-1 Environmental Constraints

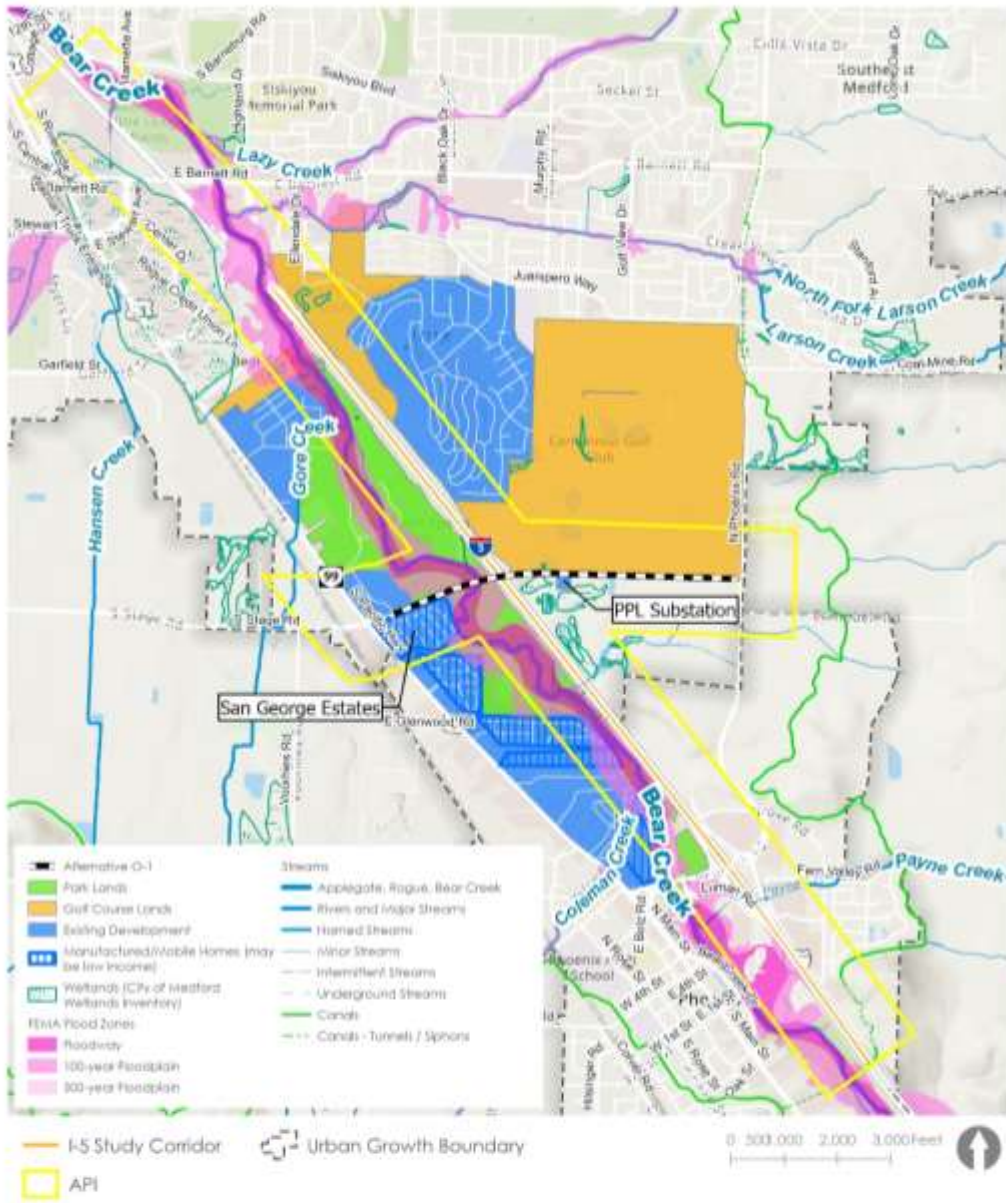


Figure 9



Alternative O-1 Environmental Constraints

South Stage Alignment Alternative O-2

This alternative curves to the south at the northeast corner of the San George Estates property and crosses I-5 with an approximate 53-degree skew. It runs south of the PPL substation on the east side of I-5 (Figure 10). The crossing profile rises over Bear Creek and I-5 to avoid vertical clearance impacts before sloping back to the existing grade. The alignment continues east until passing the PPL substation, then follows a reverse curve to meet the South Stage Road alignment further east.

Table 3. Alternative O-2 Environmental Screening

Measure	Results
Park - Section 4(f)	172,400 sf
Wetlands and waters	46,260 sf
Environmental justice	No acquisitions. Noise and air quality effects on San George Estates.
Floodplains	32,200 sf
Historic resources*	None identified
Community cohesion	Does not split a neighborhood.
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	5 undeveloped parcels
Number of structures requiring removal	0 structures
Total right-of-way acreage	611,800 sf

* A detailed survey has not been completed and archaeological resources are not included.
sf = square feet.

- Highest Section 4(f) park use of the Overpass alternatives (tied with O-3) but more than half as much park use as even the lowest of the Interchange alternatives (I-2).
- Highest wetland and waters impact of the Overpass alternatives (nearly two times more than O-3 and more than 14 times greater than O-1 and O-4). However, it is lower than all the Interchange alternatives.
- Lowest flood hazard impacts (tied with O-3, I-2, and I-3).
- Similar ROW need as other Overpass alternatives, but considerably lower than all of the Interchange alternatives.
- All Overpass alternatives have similar ROW effects: needing to acquire one to two developed parcels affecting four structures.

Figure 10 Alternative O-2 Environmental Constraints

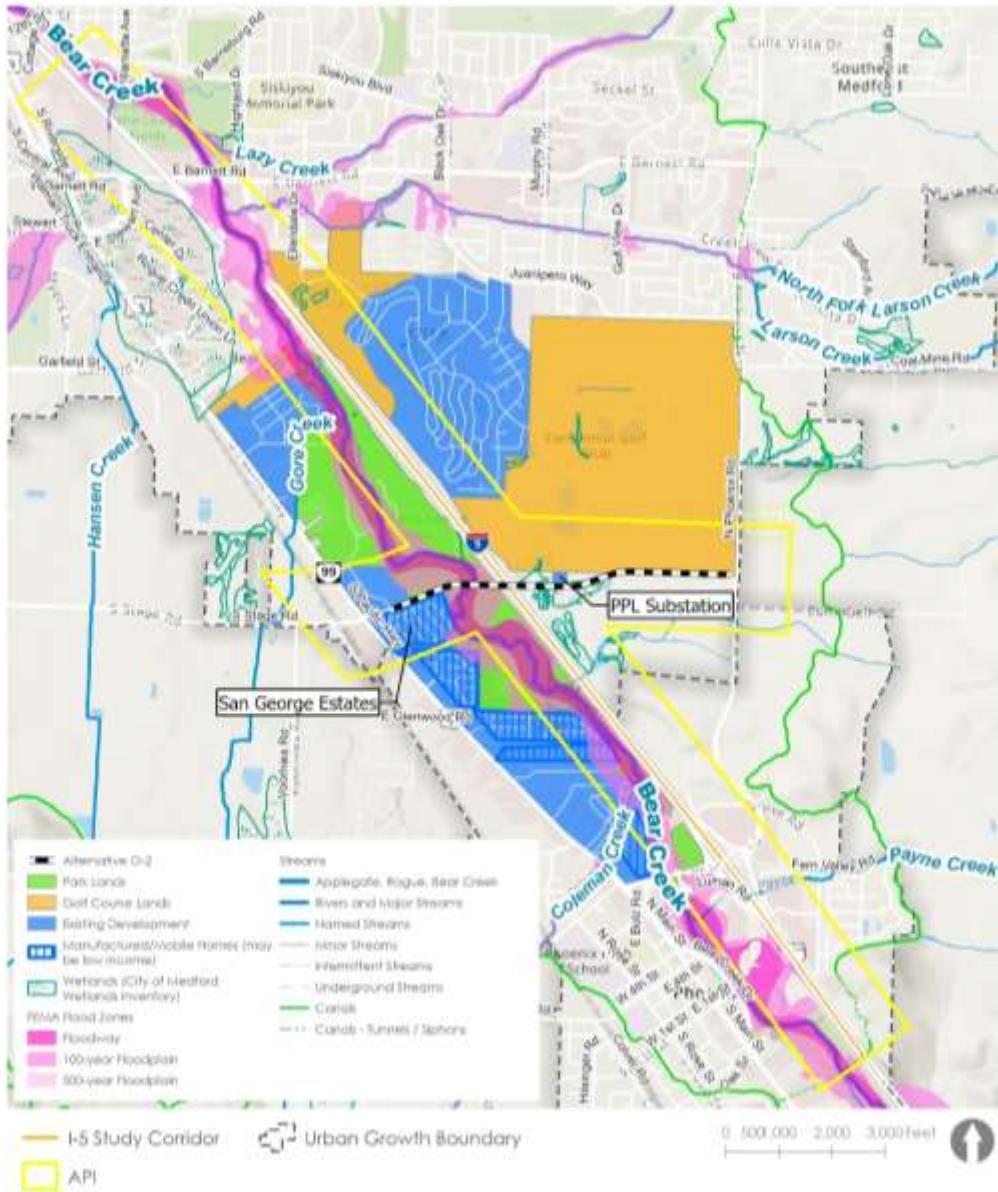


Figure 10



Alternative O-2 Environmental Constraints

South Stage Alignment Alternative O-3

Similar to Alternative O-2, this alternative curves at the northeast corner of the San George Estates property and runs east, crossing I-5 with an approximate 53-degree skew (Figure 11). The alignment then goes through a series of curves passing north of the PPL substation on the east side of I-5. The crossing profile rises over Bear Creek and both travel directions of I-5 to avoid vertical clearance impacts before sloping back to the existing grade north of the substation and continuing to the east.

Table 4. Alternative O-3 Environmental Screening

Measure	Results
Park - Section 4(f)	172,400 sf
Wetlands and waters	24,110 sf
Environmental justice	No acquisitions. Noise and air quality effects on San George Estates.
Floodplains	32,200 sf
Historic resources*	None identified
Community cohesion	Does not split a neighborhood
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	5 undeveloped parcels
Number of structures requiring removal	0 structures
Total right-of-way acreage	620,500 sf

* A detailed survey has not been completed and archaeological resources are not included.
sf = square feet.

- Highest Section 4(f) park use of the Overpass alternatives (tied with O-2) but more than half as much park use as the lowest of the Interchange option (I-2).
- Lower wetland and waters impacts compared to all but Alternative O-1 and O-4. However, it does have more than seven times more wetland impacts than those two alternatives.
- Lowest flood hazard impacts (tied with O-2, I-2, and I-3).
- It does have the highest ROW need as other overpass alternatives (although it is in a similar range) and its ROW needs are considerably lower than all of the interchange alternatives.
- All overpass alternatives have similar ROW effects: needing to acquire one to two developed parcels affecting four structures.

Figure 11 Alternative O-3 Environmental Constraints

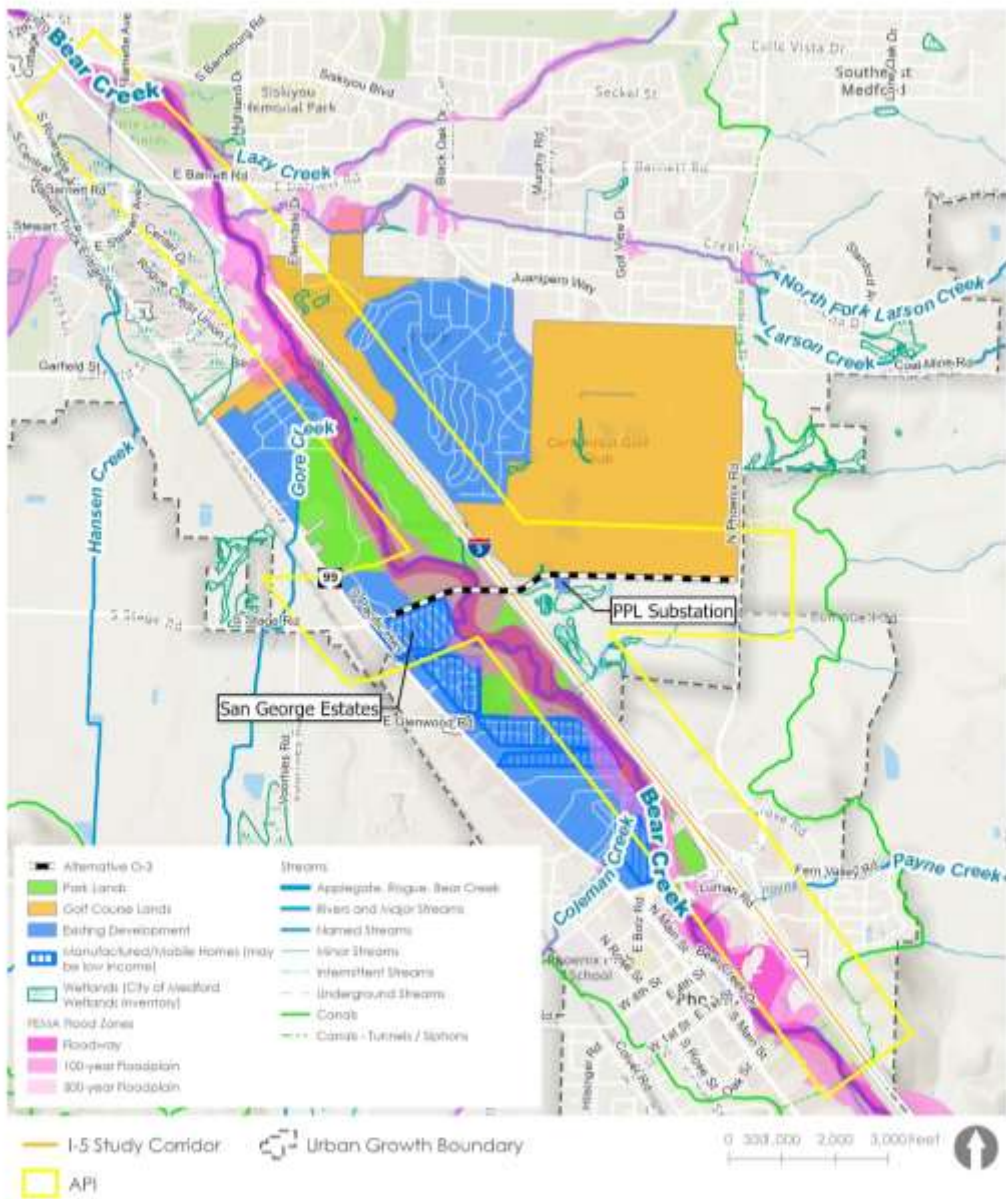


Figure 11



Alternative O-3 Environmental Constraints

South Stage Alignment Alternative O-4

This alternative follows the same alignment as Alternative O-1 but crosses under I-5 instead of over. The roadway would cross over Bear Creek and then cross I-5 either through a tunnel or under new I-5 bridges and transition through deep cuts on the east side of I-5.

Table 5. Alternative O-4 Environmental Screening

Measure	Results
Park - Section 4(f)	172,400 SF
Wetlands and waters	46,260 sf
Environmental justice	No acquisitions. Noise and air quality effects to San George Estates. At grade proximity to property
Floodplains	32,200 SF
Historic resources*	None identified
Community cohesion	Does not split a neighborhood
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	5 undeveloped parcels
Number of structures requiring removal	0 structures
Total right-of-way acreage	611,800 SF

* A detailed survey has not been completed and archaeological resources are not included.
 sf = square feet.

- Lowest Section 4(f) park impacts (tied with O-1).
- Lowest wetland and waters impacts (tied with O-1).
- Similar flood hazard impacts as other Overpass alternatives.
- Lowest total ROW acreage needed (tied with O-1)
- All Overpass alternatives have similar ROW effects: needing to acquire one to two developed parcels affecting four structures.

Figure 12 Alternative O-4 Environmental Constraints

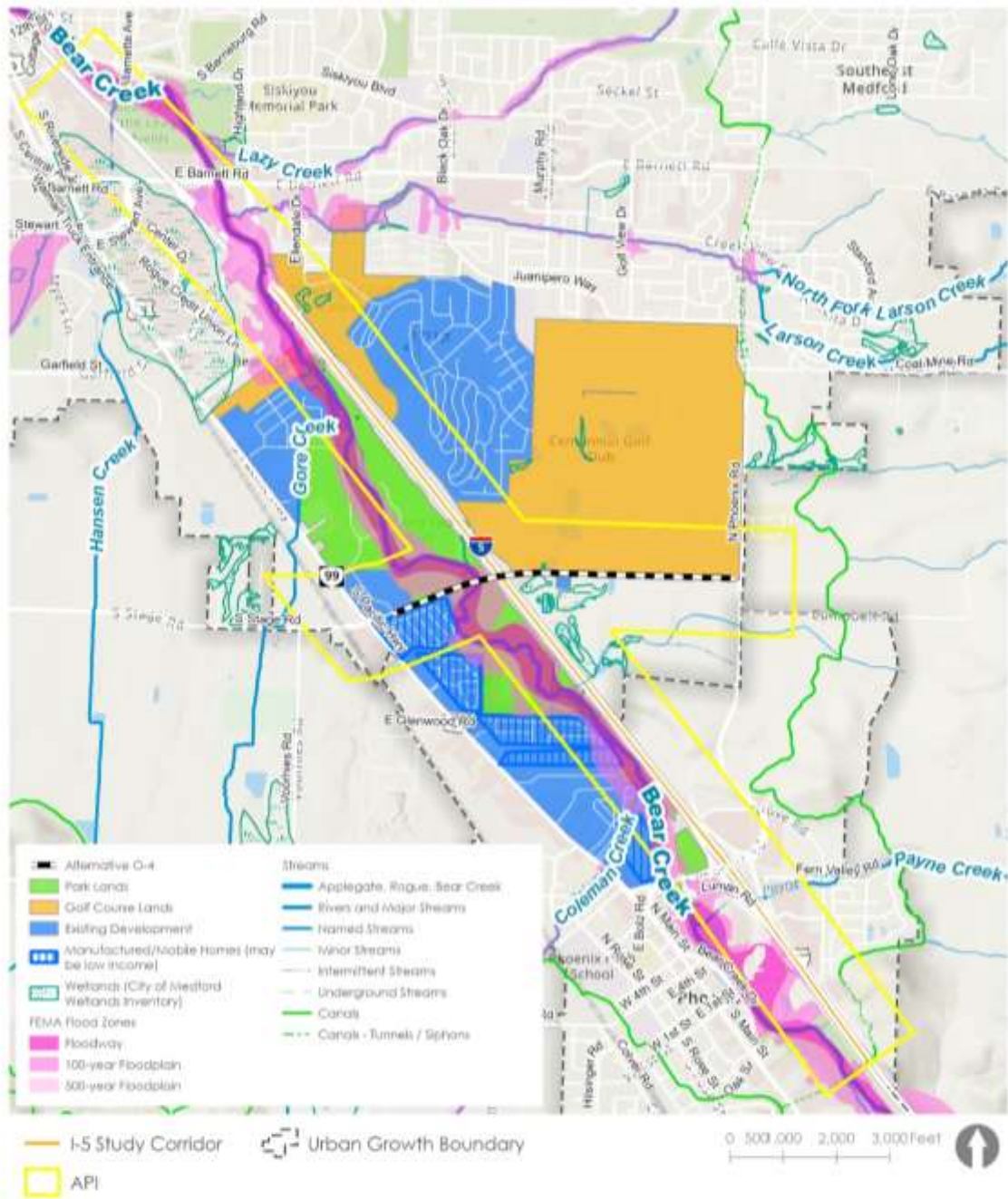


Figure 12



Alternative O-4 Environmental Constraints

I-5/South Stage Interchange Alignment Alternative I-1

Interchange Alternative I-1 utilizes the overcrossing alignment of Alternative O-1 with a partially folded diamond interchange, which reduces impacts to the hill on the east side of I-5 and the golf course northeast of the overcrossing (Figure 13). The northbound exit ramp follows the existing grade to meet the existing South Stage Road alignment with a T-intersection west of the PPL substation. The northbound entrance ramp is a loop, curving around and under the overcrossing to merge with the northbound lanes. The southbound entrance and exit ramps follow a standard diamond layout.

Table 6. Alternative I-1 Environmental Screening

Measure	Results
Park - Section 4(f)	488,000 sf
Wetlands and waters	58,450 SF
Environmental justice	No acquisitions. Noise and air quality effects on San George Estates.
Floodplains	137,400 sf
Historic resources*	None identified
Community cohesion	Does not split a neighborhood
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	8 undeveloped parcels
Number of structures requiring removal	0 structures
Total right-of-way acreage	1,437,300 sf

* A detailed survey has not been completed and archaeological resources are not included.

sf = square feet.

- Highest Section 4(f) park use of all the alternatives (tied with I-4)
- Higher wetland impacts than all the Overpass alternatives, but lowest of the Interchange alternatives (tied with I-4).
- Highest flood hazard impact (tied with I-4).
- Has the greatest ROW need (slightly more than I-4) and would acquire six structures.

Figure 13 Alternative I-1 Environmental Constraints

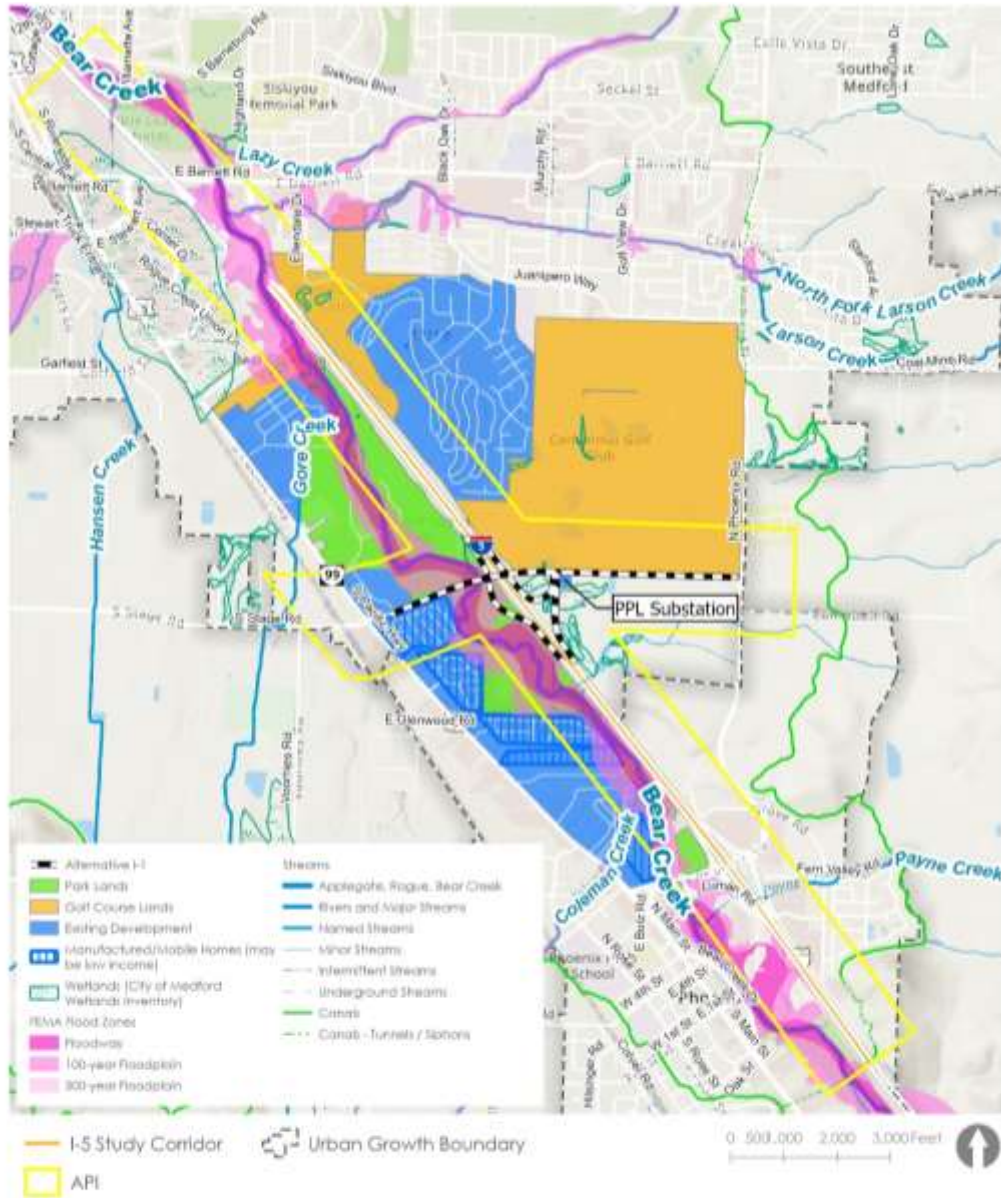


Figure 13



Alternative I-1 Environmental Constraints

I-5/South Stage Interchange Alignment Alternative I-2

This Interchange alternative utilizes the overcrossing alignment of Alternative O-2 with a partially folded diamond interchange. The overcrossing alignment is south of the large hill on the east side of I-5, reducing impacts to the hill. The northbound exit ramp follows the existing grade and passes through a series of curves intended to reduce impacts to structures. The northbound I-5 ramp terminals meet at the T-intersection south of the PPL substation (Figure 14). The northbound entrance is a loop, curving around and under the overcrossing to merge with the northbound lanes. The southbound entrance and exit ramps follow a standard diamond layout.

Table 7. Alternative I-2 Environmental Screening

Measure	Results
Park - Section 4(f)	369,200 sf
Wetlands and waters	101,540 sf
Environmental justice	No acquisitions. Noise and air quality effects on San George Estates.
Floodplains	32,200 sf
Historic resources*	None identified
Community cohesion	Does not split a neighborhood
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	7 undeveloped parcels
Number of structures requiring removal	2 structures
Total right-of-way acreage	1,176,300 sf

* A detailed survey has not been completed and archaeological resources are not included.

sf = square feet.

- Higher Section 4(f) park use than all of the Overpass alternatives but lowest of all the Interchange alternatives
- Highest wetland impact of all the alternatives: over 22,000 square feet (28%) more than the next highest alternative (I-3).
- Lowest flood hazard impact (tied with O-2, O-3, and I-3).
- Lowest ROW need of the Interchange alternatives, but considerably higher than all of the Overpass alternatives.

Figure 14 Alternative I-2 Environmental Constraints

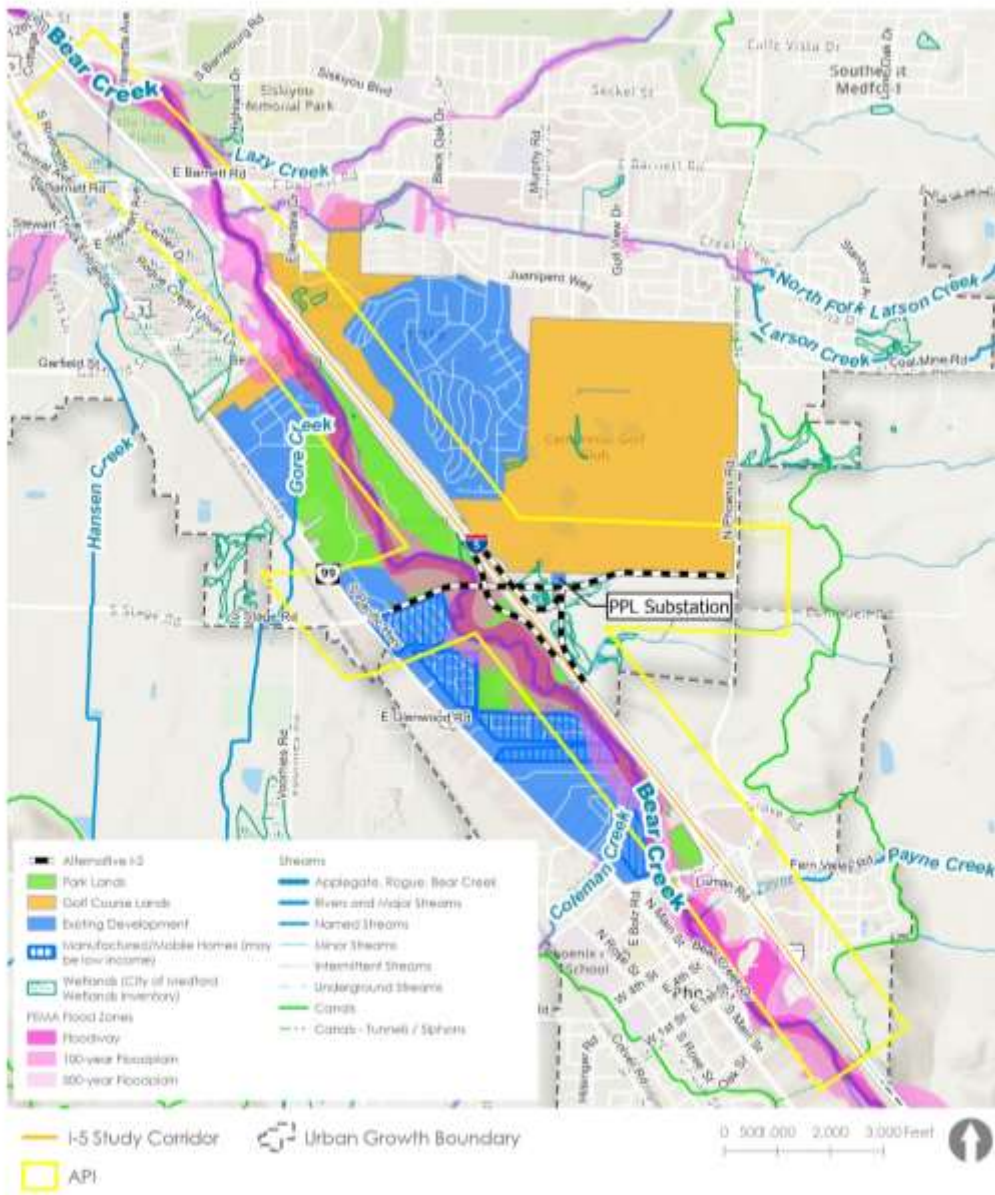


Figure 14



Alternative I-2 Environmental Constraints

I-5/South Stage Interchange Alignment Alternative I-3

This Interchange alternative utilizes the overcrossing alignment of Alternative O-3 with a partially folded diamond interchange. The overcrossing alignment is south of the large hill on the east side of I-5, reducing impacts to the hill, and passes through a series of curves north of the PPL substation. The northbound exit ramp follows the existing grade and passes through a series of curves intended to reduce impacts to structures. The northbound I-5 ramp terminals meet at the T-intersection west of the PPL substation (Figure 15). The northbound entrance is a loop, curving around and under the overcrossing to merge with the northbound lanes. The southbound entrance and exit ramps follow a standard diamond layout.

Table 8. Alternative I-3 Environmental Screening

Measure	Results
Park - Section 4(f)	421,200 sf
Wetlands and waters	79,390 sf
Environmental justice	No acquisitions. Noise and air quality effects on San George Estates.
Floodplains	32,200 sf
Historic resources*	None identified
Community cohesion	Does not split a neighborhood
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	7 undeveloped parcels
Number of structures requiring removal	0 structures
Total right-of-way acreage	1,259,600 sf

* A detailed survey has not been completed and archaeological resources are not included.

sf = square feet.

- Higher Section 4(f) park use than all of the Overpass alternatives. I-1 and I-4 have greater Section 4(f) park use, but I-2 is lowest of the Interchange alternatives.
- Higher wetland impact than all of the Overpass alternatives. I-2 has higher wetland impacts, but I-1 and I-4 have lower wetland impacts.
- Lowest flood hazard impact (tied with O-2, O-3, and I-2).
- Higher ROW need than all of the Overpass alternatives, but I-1 and I-4 have higher ROW needs of the Interchange alternatives.

Figure 15 Alternative I-3 Environmental Constraints

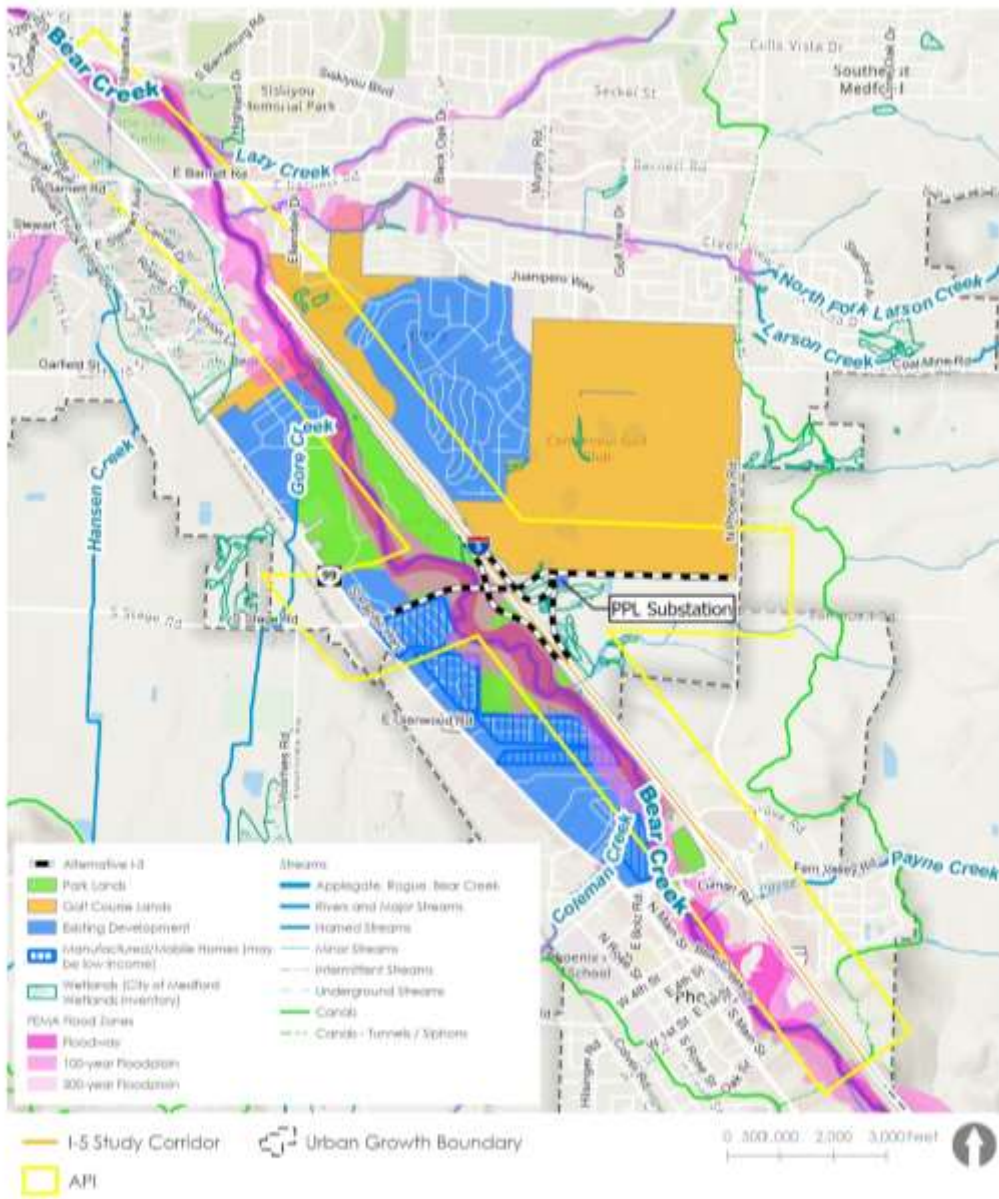


Figure 15



Alternative I-3 Environmental Constraints

I-5/South Stage Interchange Alignment Alternative I-4

This Interchange alternative utilizes the crossing alignment of Alternative O-4 with a partially folded diamond interchange similar to Alternative I-1. The roadway profile of this alternative passes over Bear Creek and under I-5 either through a tunnel or under new I-5 bridges and transitions through deep cuts on the east side of I-5. The northbound exit ramp passes through a series of curves intended to reduce impacts to structures. The northbound I-5 ramp terminals meet at the T-intersection west of the PPL substation. The northbound entrance is a loop, curving around and over the overcrossing roadway to merge with the northbound lanes. The southbound entrance and exit ramps follow a standard diamond layout.

Table 9. Alternative I-4 Environmental Screening

Measure	Results
Park - Section 4(f)	514,400 SF
Wetlands and waters	101,540 SF
Environmental justice	No acquisitions. Noise and air quality effects to San George Estates. At grade proximity to property.
Floodplains	135,000 SF
Historic resources*	None identified
Community cohesion	Does not split a neighborhood
Number of developed parcels with potential right-of-way takes	3 developed parcels
Number of undeveloped parcels with potential right-of-way takes	7 undeveloped parcels
Number of structures requiring removal	2 structures
Total right-of-way acreage	1,176,300 SF

* A detailed survey has not been completed and archaeological resources are not included.

sf = square feet.

- Highest Section 4(f) park use of all the alternatives (tied with I-1).
- Higher wetland impacts than all the Overpass alternatives, but lowest of the Interchange alternatives (tied with I-1).
- Most flood hazard impact (tied with I-1).
- Has the second highest ROW need (slightly less than I-1) but would need to acquire the greatest number of structures (six).

Figure 16 Alternative I-4 Environmental Constraints

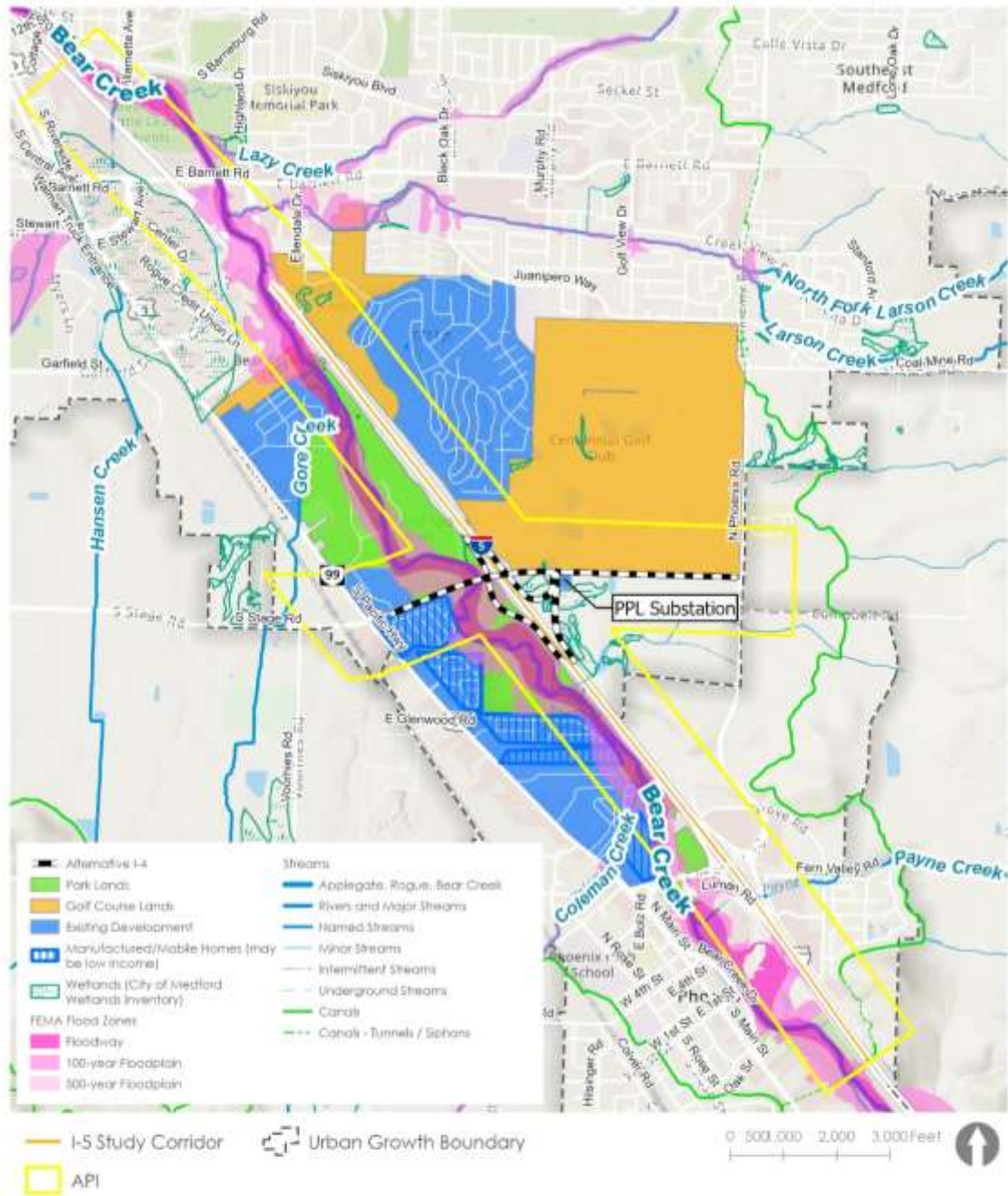


Figure 16

Alternative I-4 Environmental Constraints



Final Technical Memorandum

SUMMARY

Table 10. Potential Environmental Impacts of the Proposed Technically and Economically Feasible Alternatives

Measure	Alternative O-1	Alternative O-2	Alternative O-3	Alternative O-4	Alternative I-1	Alternative I-2	Alternative I-3	Alternative I-4
Park - Section 4(f) ¹	146,000 SF	172,400 SF	172,400 SF	172,400 SF	488,000 SF	369,200 SF	421,200 SF	514,400 SF
Rank	1	2	2	2	5	3	4	6
Wetlands and Waters ¹	3,170 SF	46,260 SF	24,110 SF	46,260 SF	58,450 SF	101,540 SF	79,390 SF	101,540 SF
Rank	1	3	2	3	4	6	5	6
Environmental Justice	No acquisitions. Noise and air quality effects to San George Estates	No acquisitions. Noise and air quality effects to San George Estates	No acquisitions. Noise and air quality effects to San George Estates	No acquisitions. Noise and air quality effects to San George Estates. At grade proximity to property	No acquisitions. Noise and air quality effects to San George Estates	No acquisitions. Noise and air quality effects to San George Estates	No acquisitions. Noise and air quality effects to San George Estates	No acquisitions. Noise and air quality effects to San George Estates. At grade proximity to property
Rank	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)
Floodplains ¹	34,600 SF	32,200 SF	32,200 SF	32,200 SF	137,400 SF	32,200 SF	32,200 SF	135,000 SF
Rank	2	1	1	1	4	1	1	3
Historic Resources ²	None identified	None identified	None identified	None identified	None identified	None identified	None identified	None identified
Rank	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)
Community Cohesion	Does not split a neighborhood.	Does not split a neighborhood.	Does not split a neighborhood.	Does not split a neighborhood.	Does not split a neighborhood.	Does not split a neighborhood.	Does not split a neighborhood.	Does not split a neighborhood.
Rank	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)
Number of developed parcels with potential ROW takes	3 developed parcels	3 developed parcels	3 developed parcels	3 developed parcels	3 developed parcels	3 developed parcels	3 developed parcels	3 developed parcels
Rank	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)	0 (Same)
Number of undeveloped parcels with potential ROW takes	6 undeveloped parcels	5 undeveloped parcels	5 undeveloped parcels	5 undeveloped parcels	8 undeveloped parcels	7 undeveloped parcels	7 undeveloped parcels	7 undeveloped parcels
Rank	2	1	1	1	4	3	3	3
Number of structures requiring removal	-	-	-	-	-	2 structures	-	2 structures
Rank	1	1	1	1	1	2	1	2
Total ROW acreage	609,400 SF	611,800 SF	620,500 SF	611,800 SF	1,437,300 SF	1,176,300 SF	1,259,600 SF	1,176,300 SF
Rank	1	2	3	2	6	4	5	4

¹ Impacts for parks, wetlands, and floodplains is based on worst case for fill. These impacts will be refined based on assumptions for columns.

² Detailed survey has not been completed

1 – Lowest impact; 6 = Highest impact > Colors are used to visually compare alternatives (Dark Green, Light Green, Yellow, Orange, and Red to highlight lowest to highest impact and denote similar impact levels)

Green Text > Indicated potential opportunity for less EJ noise and visual impacts due to South Stage being at-grade adjacent to the subject properties.