

# CLATSOP COUNTY

# SEISMIC LIFELINE ROUTES

*JUNE 2020*

Submitted By  
Clatsop County Public Works to  
Oregon Department of Transportation

## **INTRODUCTION**

“We cannot avoid the future earthquake, but we can choose either a future in which the earthquake results in grim damage and losses and a society diminished for a generation, or a future in which the earthquake is a manageable disaster without lasting impact. We need to start preparing now by assessing the vulnerability of our buildings, lifelines, and social systems, and then developing and implementing a sustained program of replacement, retrofit, and redesign to make Oregon resilient to the next great earthquake. We know how to engineer buildings, roads, and power lines to withstand this earthquake; the hard part will be to find the will, commitment, and persistence needed to transform our state.”

*The Oregon Resilience Plan – Cascadia: Oregon’s Greatest Natural Threat – February 2013*

Being in a geologically active region requires us to plan accordingly, and rings even more resoundingly true on the northern Oregon coast. With catastrophic seismic events in Thailand and Japan in recent memory, Clatsop County recognizes its immediate susceptibility. The County understands that we must make effort to plan for the devastating effects of a tsunami coupled with an earthquake.

## **PROJECT BACKGROUND**

To aid in planning and mitigation efforts, Oregon Department of Transportation (ODOT) and Association of Oregon Counties (AOC) are collaborating with county jurisdictions, providing support in evaluating seismic lifeline routes. For this project, ODOT and AOC are working with a few counties each calendar year.

## **PROJECT OBJECTIVE**

This project includes two (2) main objectives:

1. Evaluate the county’s Seismic Lifeline Routes by considering and establishing connections from critical facilities to the county’s populated areas, and to ODOT’s designated lifeline routes.
  - Prioritize findings for a seismic bridge retrofit or replacement, taking into consideration unstable slopes, landslides and other data available.
2. Review ODOT’s lifeline routes and locations of vulnerable or potentially vulnerable bridges.
  - Identify alternative routes on local roads that may be more cost effective to seismically retrofit or replace local bridges, taking into consideration things like unstable slopes and landslides, and other information as it becomes available.

## **COUNTY CHARACTERISTICS**

Clatsop County has approximately 830 miles<sup>2</sup> extending from the Columbia County line just east of Westport all the way to the mouth of the Columbia River, running southerly along the coast to Falcon Cove area at the Tillamook County boundary. As of July 1, 2017, there are an estimated 39,182<sup>1</sup> individuals residing in Clatsop County

The owner-occupied housing unit rate, 2013-2017 is at 61.1%, giving the County a relatively common dilemma of “snowbirds”, people who spend their winters in warmer, drier, sunnier places, only returning for our milder northwest summers; whereas some homeowners rent out their domiciles to some of the many visitors that visit the coast. This is worthy of mention because of the ample supply of tourists and visitors due to the proximity of Clatsop County to Oregon’s largest metropolitan area (Portland); and is only about a two (2) hour drive via Highway 30 (to Astoria), and an hour and half using Highway 26, to Seaside.

Over the last decade, the Port of Astoria continues to cultivate a successful cruise ship industry; they see an average of about 20 ships a year making it their port of call. In 2019, there was a day where there were three (3) cruise ships visiting our community on the same day, meaning that the number of tourists outnumbered Astoria residents. In 2020 there will be 35 ships docking within Astoria’s city limits, with another 13 confirmed for 2021.

Over the years, people have been both discovering and rediscovering the beauty found on the northern Oregon coast. Some activities drawing large crowds are recreational opportunities such as: fishing, clamming and camping. In addition to these there are numerous events taking place scattered around the County throughout the summer. These activities, events, and their visitors all contribute to a swelling of the county’s population during busy a summer days and holiday weekends.

## **PROJECT OUTREACH**

For this project, Clatsop County served as the liaison between local jurisdictions, ODOT, and AOC reached out to and local jurisdictions in November of 2018. The following jurisdictions were invited:

- Association of Oregon Counties (AOC)
- Oregon Department of Transportation (ODOT)
- Clatsop County
- City of Astoria
- City of Cannon Beach
- City of Gearhart
- City of Seaside
- City of Warrenton

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<sup>1</sup> <https://www.census.gov/quickfacts/clatsopcountyoregon>.

## **SEISMIC LIFELINE ROUTES**

Seismic lifelines are roadways and bridges, which are both most critical for use as transportation facilities after a major seismic event and most-easily made acceptably resilient. Meeting the criteria is imperative, as these routes will serve vital roles in emergency evacuation and response. After a catastrophic event, a resilient transportation network will be critical to re-establishing other lifelines (e.g. water, electricity, fuel, communication, natural gas, etc.). A prioritized seismic lifeline system should attempt to deliver the following functions:

1. Provide access to and through the state, allowing access to seismically vulnerable areas for emergency responders, and economic recovery.
2. Attempt to provide access into each region of the state.
3. Serve as a transportation network that provides redundant access throughout the state.

A main consideration during this planning process is the need to develop a system of interdependent routes providing accessibility to all areas of Clatsop County, and ultimately, to the rest of the state, where critical supplies will be delivered and/or stored. Clatsop County's seismic lifelines will serve as one more of the links establishing interdependent roadway networks and utility corridors. The three (3) main goals identified for Oregon seismic lifeline routes are:

1. Support survivability and emergency response efforts immediately following the event
  - a. Refers to immediate and short-term needs after an event.
2. Provide transportation facilities that are critical to life support functions for an interim period following the event
  - a. Refers to midterm needs after an event.
3. Support statewide economic recovery.
  - a. Refers to long-term needs after an event.

## ROADWAY PRIORITIZATION

Having a tiered approach for seismic lifeline routes helps establish guidelines when prioritizing seismic retrofits of infrastructure. Roadways with a higher priority are those that will provide the most critical linkages serving the greatest number of individuals within an area, while also maintaining the lowest investment of resources.

There are three (3) tier designations:

- TIER 1 - A system that provides access to and through the study area from Central Oregon, Washington, and California, and provides access to each region within the study area
- TIER 2 - Additional roadway segments that extend the reach of the Tier 1 system throughout seismically vulnerable areas of the state and providing lifeline route redundancy in the Portland Metro Area and Willamette Valley
- TIER 3 - Roadway segments that, together with Tier 1 and Tier 2, provide an interconnected network (with redundant paths).

Priorities are on bridges along seismic lifeline routes in need of retrofiting or replacement, with some of these costly bridges on the state highway system. This report examines avoided bridges on the state system, using alternate routes utilizing County infrastructure, thereby saving money for bridges where there is no detour available. In Clatsop County, US Highway 30 is designated as Tier 1, US Highway 26 is Tier 2, and US Highway 101 (Figure 1). From Astoria to Seaside is designated as Tier 3 having significant vulnerabilities, particularly at the Youngs Bay crossing in Astoria and the low-lying area in downtown Seaside.

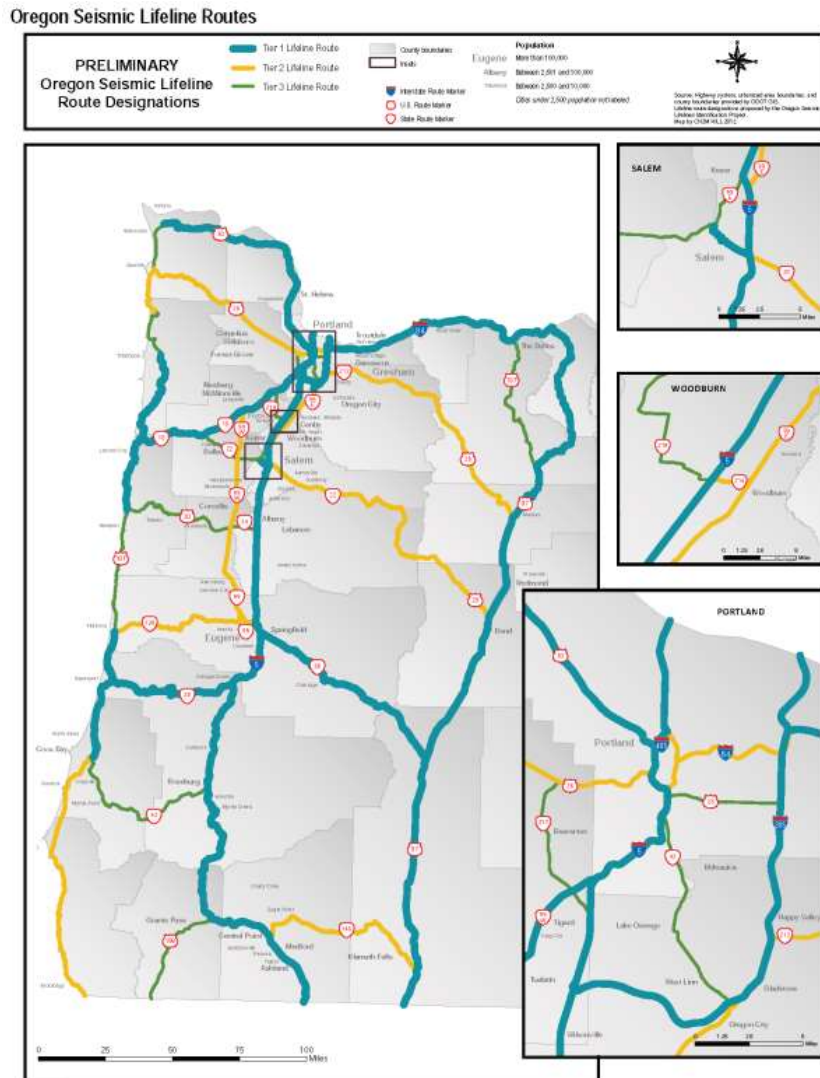


Figure 1 – ODOT Map of Oregon Seismic Lifeline Routes

Credit: ODOT

## CITY OF SEASIDE

County staff made a trip to meet with the City of Seaside staff members from their emergency management, planning, and public works departments. At the meeting, staff communicated that the Tier III designation of Highway 101 severely limits their ability to leverage funding. While the City of Seaside understands that it is necessary to have seismic lifeline routes for recovery; Seaside is focusing on seismically enhancing or replacing their bridges, helping the most vulnerable escape the areas that will receive the greatest impact.

They recognize that they are the most susceptible community on the Oregon coast; while also playing host to throngs of tourists, especially during events like the 4<sup>th</sup> of July, Hood to Coast relay race, etc. The City would like to establish routes for residents and visitors to quickly and safely evacuate from inundation areas.

The following are excerpts from an article found in the Seaside Signal article published on August 20, 2018, Bridge needs trump all others in Seaside ([https://www.seasidesignal.com/opinion/bridge-needs-trump-all-others-in-seaside/article\\_f8f87872-4d0e-5586-8af2-83bda5c16dbe.html](https://www.seasidesignal.com/opinion/bridge-needs-trump-all-others-in-seaside/article_f8f87872-4d0e-5586-8af2-83bda5c16dbe.html)) and accessed in January 2020:

“New, resilient bridges, he hopes, will help residents and visitors survive the wave from an even medium-sized tsunami, a Cascadia Subduction Zone event in which thousands may perish.”

“But Seaside “often falls through the cracks” when applying for grant money, City Manager Winstanley told the Signal’s Brenna Visser in a July interview. The city is either too small to compete for projects or has too healthy of a budget to qualify for need-based grants intended for smaller, rural communities.”

“The extra minutes to find another bridge — there are none considered able to withstand the impacts of a predicted 9.0 Cascadia earthquake south of Broadway — could be a matter of life and death.” “If we fix the bridges, we reduce the fatality rate from a high number to a low number,” Horning said. “That’s the bottom line.”

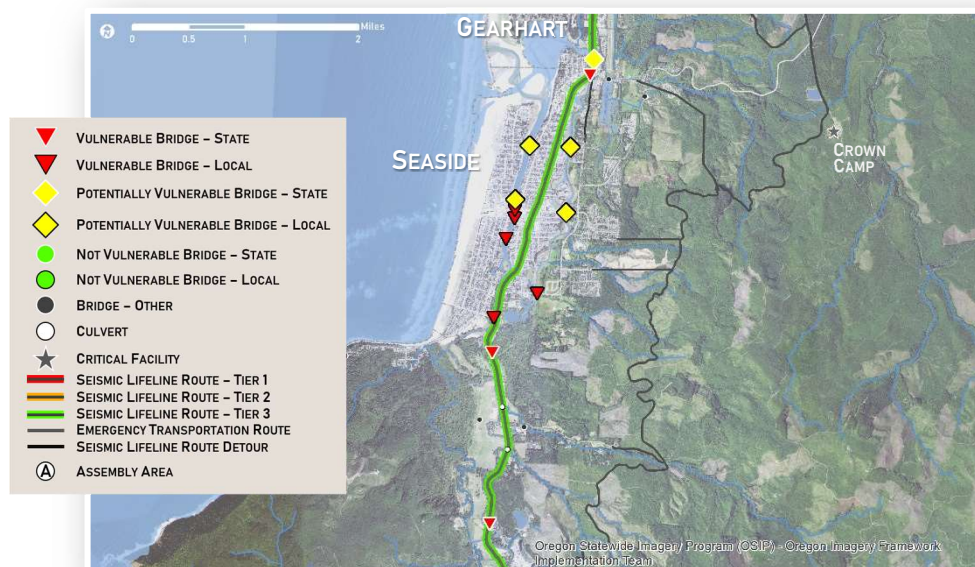


Figure 2 – Seaside Area with vulnerable and potentially vulnerable bridges shown.

## CITY OF ASTORIA CHAIRWALL SYSTEM

US Highway 30 and US Highway 26 are designated freight routes serving Clatsop County and the greater lower Columbia River region of both Oregon and Washington. Highway 30 runs through downtown (see attached diagram) on the couplet of Marine Drive (westbound) and Commercial Street (eastbound); this is also an ODOT designated Tier I seismic lifeline route.

In 1915 and 1922 a “chairwall” was built to support the couplet through downtown Astoria. The first phase used a simple, straight, concrete wall below the curb; and the second phase used a concrete wall in the shape of an “h” or “chair” below the curb. The interior of City blocks remained at original tidal flat level, facilitating full basements for the commercial structures, with utilities placed below the seat of the chair in a separate chamber. Astoria was one of the first downtowns in the nation to underground its utilities.

Due to the age of the structures and the deterioration of the supporting timber pile system, it is likely that the walls would not stand under seismic loadings, especially a Cascadia Subduction Zone (CSZ) event; although, a seismic assessment of the structures has yet to be completed to substantiate this claim. In 2013, ODOT initiated, but failed to gain traction for a research project to evaluate the chairwall’s existing conditions and develop a plan to address damage following a seismic event. Since then, ODOT attempted, and subsequently was denied, having the chairwall added to the National Bridge Inventory (NBI). Its addition to the NBI would have made it eligible for State Transportation Improvement Program (STIP) funding.

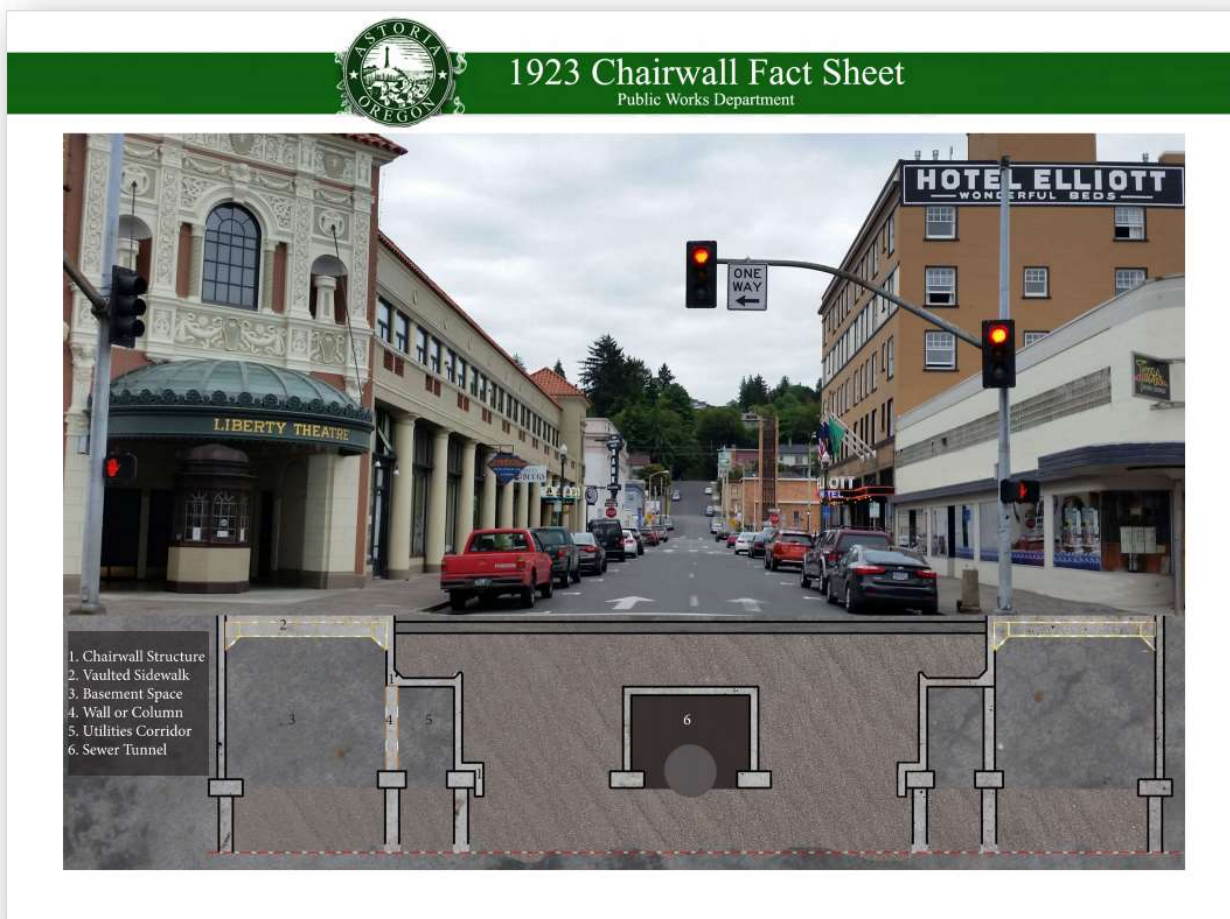


Figure 3 – Chairwall Diagram

Credit: City of Astoria

## **EMERGENCY TRANSPORTATION ROUTE (ETR)**

At present, Clatsop County has not officially adopted emergency transportation routes (ETRs), but recently, the County has identified those routes that will serve our area in the face of an emergency. The routes were identified through an internal vetting process, and presented to the Clatsop County Board of Commissioners at a work session in February 2019.

A primary objective of the ETRs is to be able to access and serve as broad a geographic area as possible during and after an emergency. These ETRs were also developed with the relocation of the County public works facility in mind, but the routes identified would still also serve those affected, irrespective of public works location. Moving the public works facility is important because currently it is in the tsunami inundation zone and, putting heavy equipment and materials in peril, vital for recovery. Relocating the main facility out of the tsunami inundation zone will help secure equipment so it is available for immediate post recovery efforts.

Of the proposed routes, two (2) stood out that were able to minimize hazards, such as stream crossings, that will serve greater portions of the population, they are Pipeline Road and the Lewis and Clark Mainline. Figure 4 below highlights the bridges, ODOT's lifeline designations, County emergency routes, bridges, culverts, and lifeline detours.

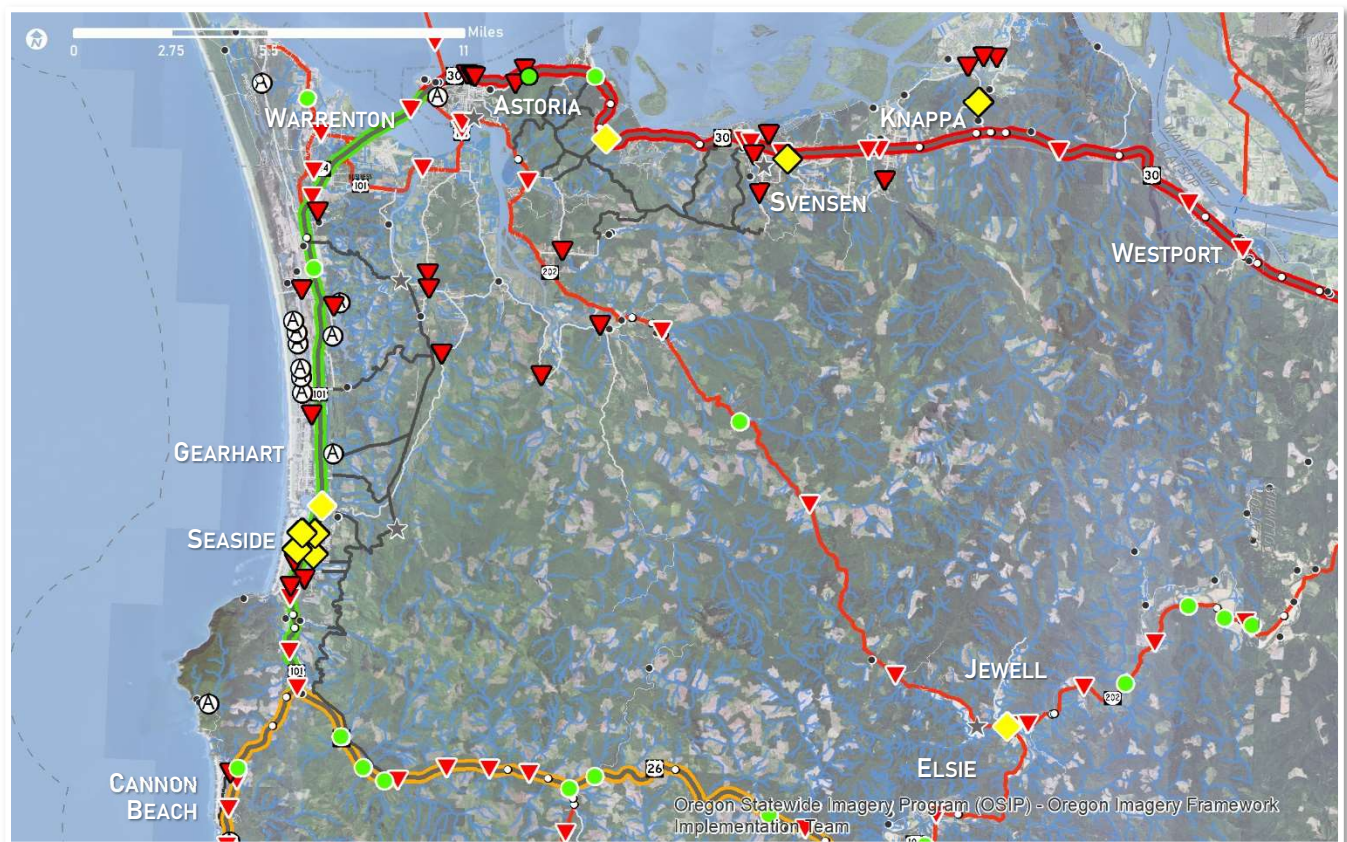


Figure 4 – Bridges, ODOT's lifeline designations, County emergency routes, bridges, culverts, and lifeline detours.

## PIPELINE ROAD

Pipeline, is a graveled surface, county owned, right of way, running along a ridgeline from Astoria to Svensen Market Road in Svensen. This road also serves as a maintenance route for the large diameter natural gas pipeline, and waterline that feeds the Astoria and surrounding area. The detour would begin at the Twilight Creek Mainline entrance at mile post 86 on Highway 30, continue until it intersects with Pipeline, heading west towards the County Fairgrounds, or further on to the City of Astoria. This link will connect one of our area's larger pockets of population of residents in the County with our largest city, Astoria.

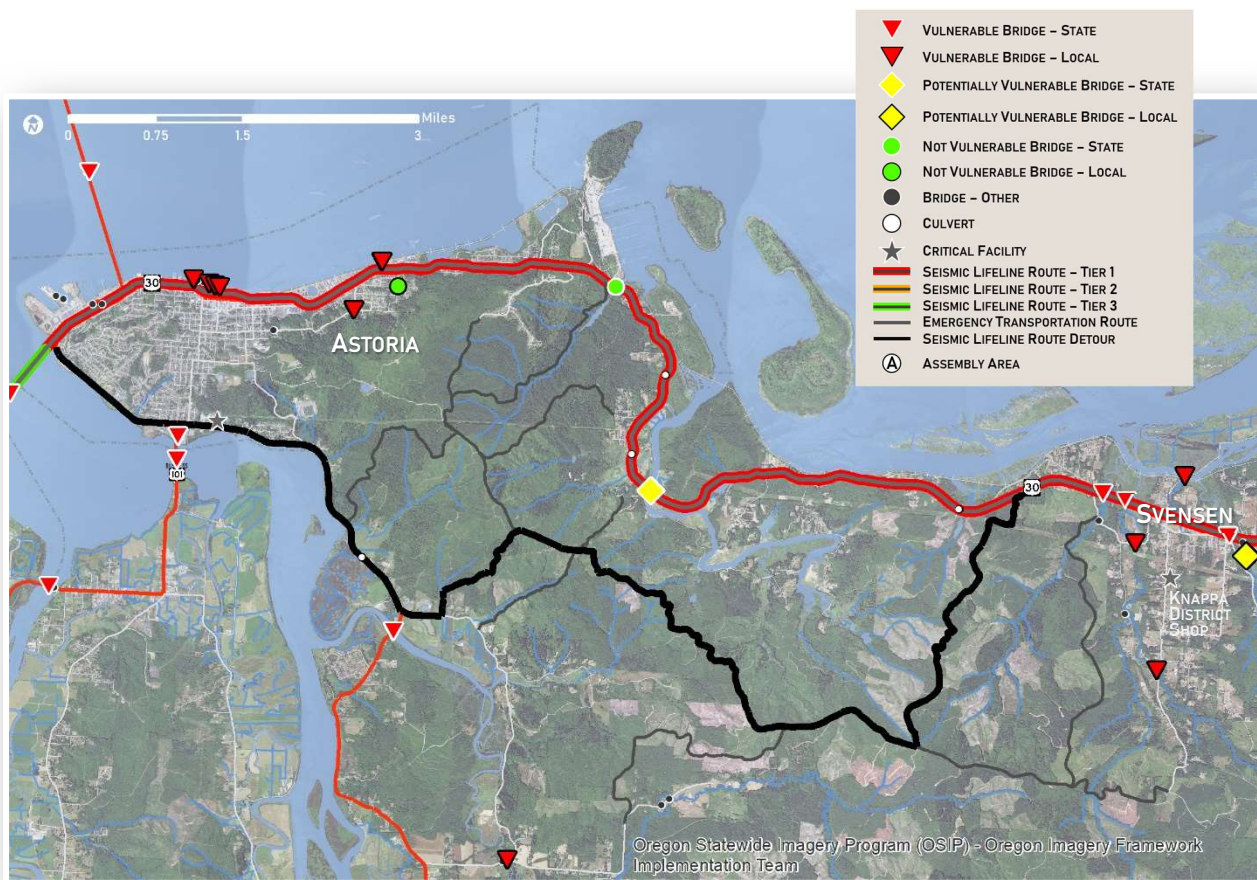


Figure 5 – Pipeline Road and Twilight Creek Mainline route is highlighted in black.

## LEWIS AND CLARK MAINLINE

This mainline resource logging road begins near the intersection of Loukas Lane and Fort Clatsop Road, continuing on to the old Crown Logging Camp just outside of Seaside (eastern city limits), is the portion that the County is focusing on since the mainline actually continues through the mountains, eventually meeting up with Saddle Mountain State Park Road.

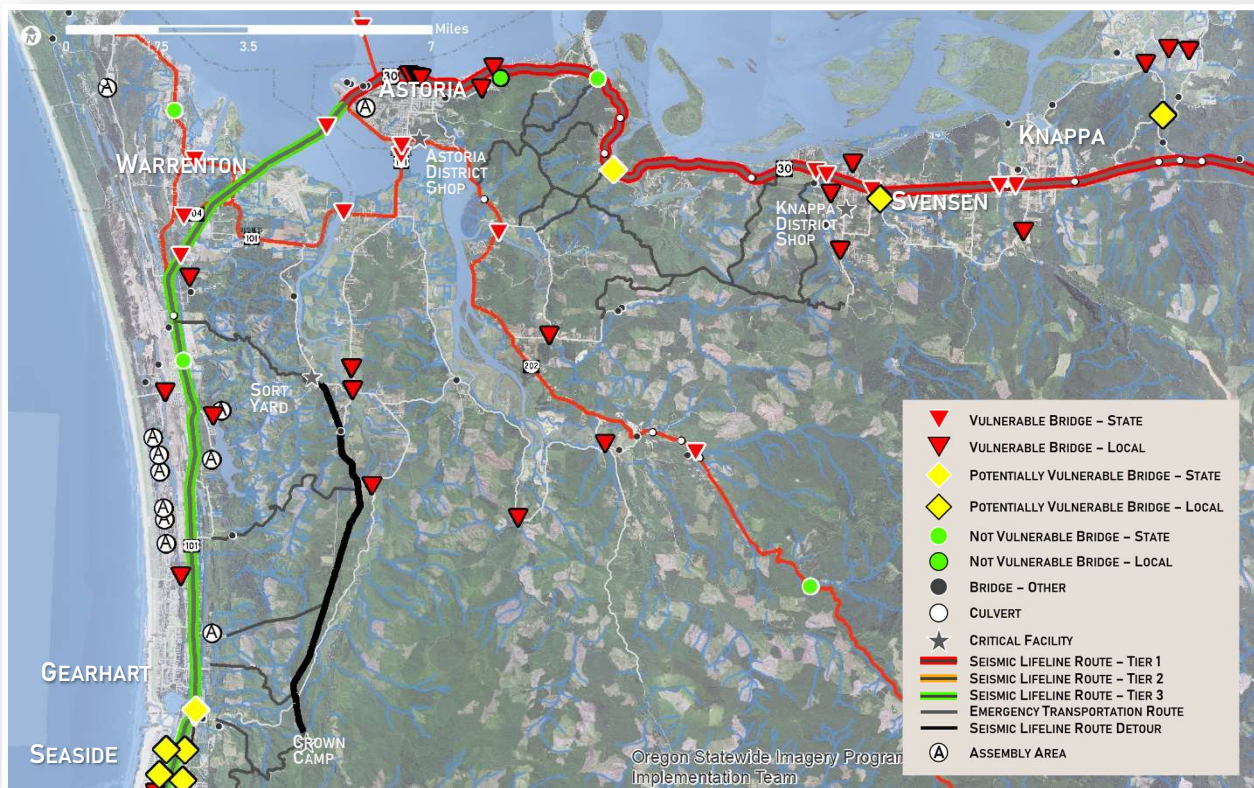


Figure 6 – Lewis and Clark Mainline highlighted in black.

## ANALYSIS

This study identifies and examines possible detours that are cost effective routing traffic around seismically vulnerable bridges on the State Highway System. Clatsop County's point of contact was the ODOT Seismic Standards Engineer, who served as our main resource. Clatsop County staff began this analysis by obtaining priority lifeline routes from ODOT, as well as information regarding vulnerability and mitigation costs of bridges in the county, regardless of owner (state, city, or county).

The data provided was created using Peak Ground Acceleration (PGA) from the Cascadia Subduction Zone Earthquake (CSZE) and important bridge characteristics (e.g. year built, number of spans, maximum span length, superstructure type, substructure type, etc.) to provide cost estimates for seismic retrofits or replacements to State and County bridges; as well as the State and national bridge inventory (NBI). The data provided did not include all bridges in the state; instead, it focused on the seismic performance of those state highways determined to be of highest priority for emergency response and economic recovery after a major event. County staff used the data to identify, mostly County right-of-way and County bridges that do not have vehicle restrictions that can serve as alternative routes, ultimately supporting the “survivability and emergency response efforts immediately following the event”.

Prior to engaging ODOT and AOC, County staff was actively working to identify potential alternate routes in anticipation of a seismic event. These efforts resulted in the identification of Lewis and Clark Mainline and Pipeline Road, of which the Lewis and Clark Mainline is currently under private ownership. The County is actively working towards its acquisition, allowing for its upgrade to County road standards, serving as an alternate route accessing the Warrenton area, as well as all the way down the coast to Seaside.

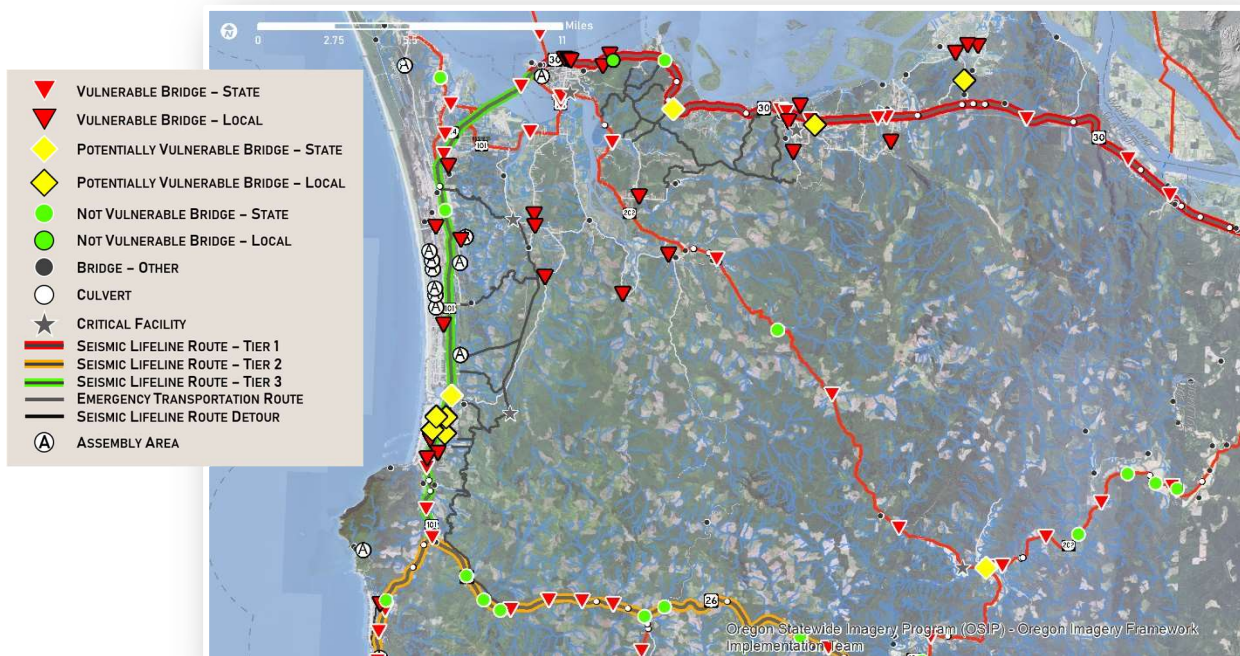


Figure 7 – Overall county with lifelines, emergency routes, and bridges.

## WESTPORT

In this area, it appears that there are no available detours around the evaluated structures. Although, it should be mentioned that for 09598, which is a vulnerable overpass, there are the on- and off-ramps that could potentially be use as a detour. Another possible detour around Gnat Creek would be to utilize private timber roads, but these are privately owned. To make this section resialiant, it is estimated to cost about \$6,970,895.

BRIDGE ID	YEAR BUILT	ROADWAY NAME	CARRIES	CROSSES	SEISMIC VULNERABILITY	SEISMIC RETROFIT WORK TYPE	TOTAL COST (ESTIMATED)
LIFELINE ROUTE							
0P151	1900	092	US 30 (HWY 2W)	Dave West Creek	n/a	n/a	-
<u>00185A</u>	1958	092	US 30 (HWY 2W)	Plympton Creek	Vulnerable	Retrofit	\$400,000. <sup>00</sup>
0P152	1958	092	US 30 (HWY 2W)	Hanson Slough	n/a	n/a	-
<u>09598</u>	1967	092BE	HWY 2W CONN	US 30 (HWY 2W)	Vulnerable	Rehab+	\$1,381,747. <sup>23</sup>
07581	1953	092	US 30 (HWY 2W)	Hunt Creek	n/a	n/a	-
<u>00921</u>	1929	092	US 30 (HWY 2W)	Gnat Creek	Vulnerable	Reconstruct	\$5,189,148. <sup>00</sup>
01275	1927	092	US 30 (HWY 2W)	Big Noise Cr	n/a	n/a	-
01274	1927	092	US 30 (HWY 2W)	Rock Creek	n/a	n/a	-
ODOT IMPROVEMENTS TOTAL COST							<b>\$6,970,895.<sup>23</sup></b>
No DETOUR							

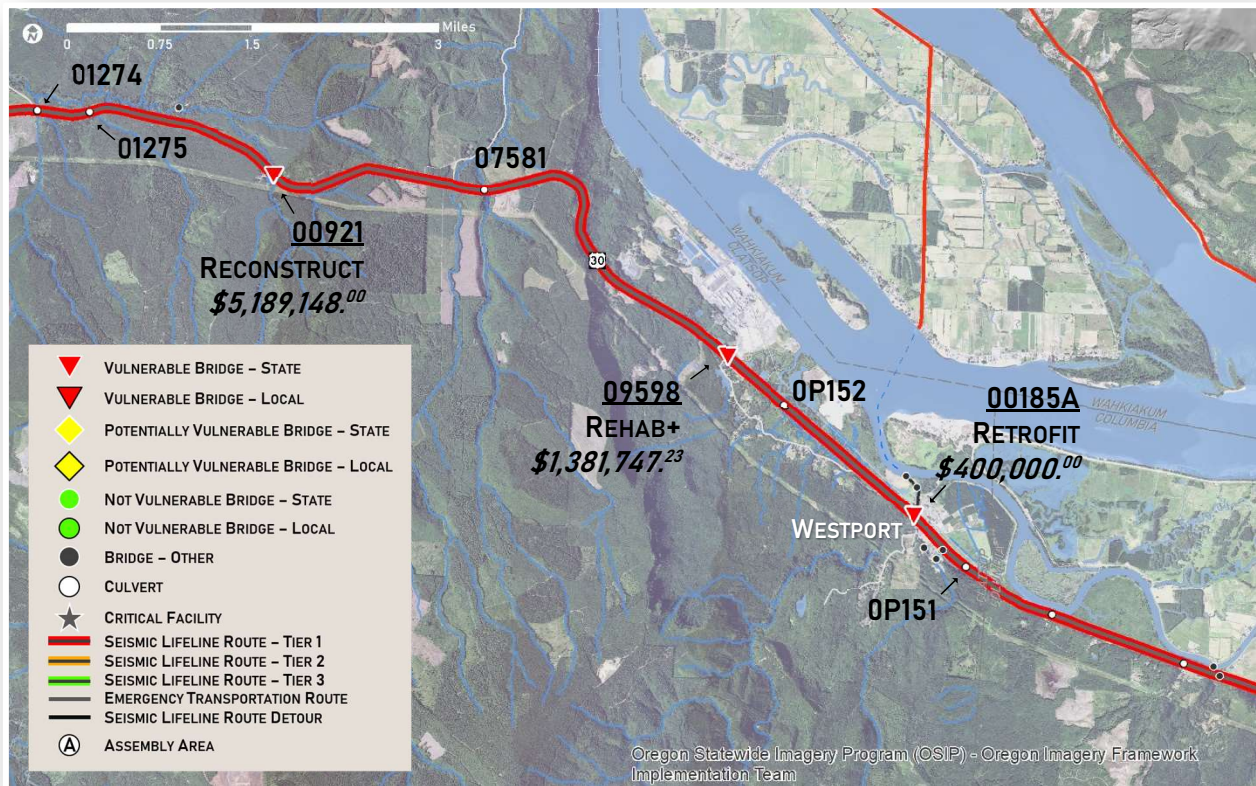


Figure 8 – Westport area detour.

## OLD HIGHWAY 30-KNAPPA

This detour takes off from US Highway 30 at MP 82.0, avoiding Bridges 07417 and 07418. While travelling west, take a right onto Old Highway 30, then continue following until the road reconnects with US Highway 30. On this detour there is one bridge on this route that was not evaluated, or evaluated and deemed 'Not Vulnerable'. If this detour is used, it could save ODOT about \$431,781.

BRIDGE ID	YEAR BUILT	ROADWAY NAME	CARRIES	CROSSES	SEISMIC VULNERABILITY	SEISMIC RETROFIT WORK TYPE	TOTAL COST (ESTIMATED)
LIFELINE ROUTE							
<u>07417</u>	1951	092	US 30 (HWY 2W)	Big Creek	Vulnerable	Retrofit	\$431,780. <sup>83</sup>
<u>07475</u>	1951	092	US 30 (HWY 2W)	Little Cr	n/a	n/a	-
<u>07418</u>	1951	C0000	Private Road	US 30 (HWY 2W)	Vulnerable	No	\$0. <sup>00</sup>
ODOT IMPROVEMENTS TOTAL COST							\$431,780. <sup>83</sup>
DETOUR							
<u>07C04</u>	1972	000314	Old Highway 30-Knappa	Big Creek	n/a	n/a	-
COUNTY IMPROVEMENTS TOTAL COST							\$0. <sup>00</sup>

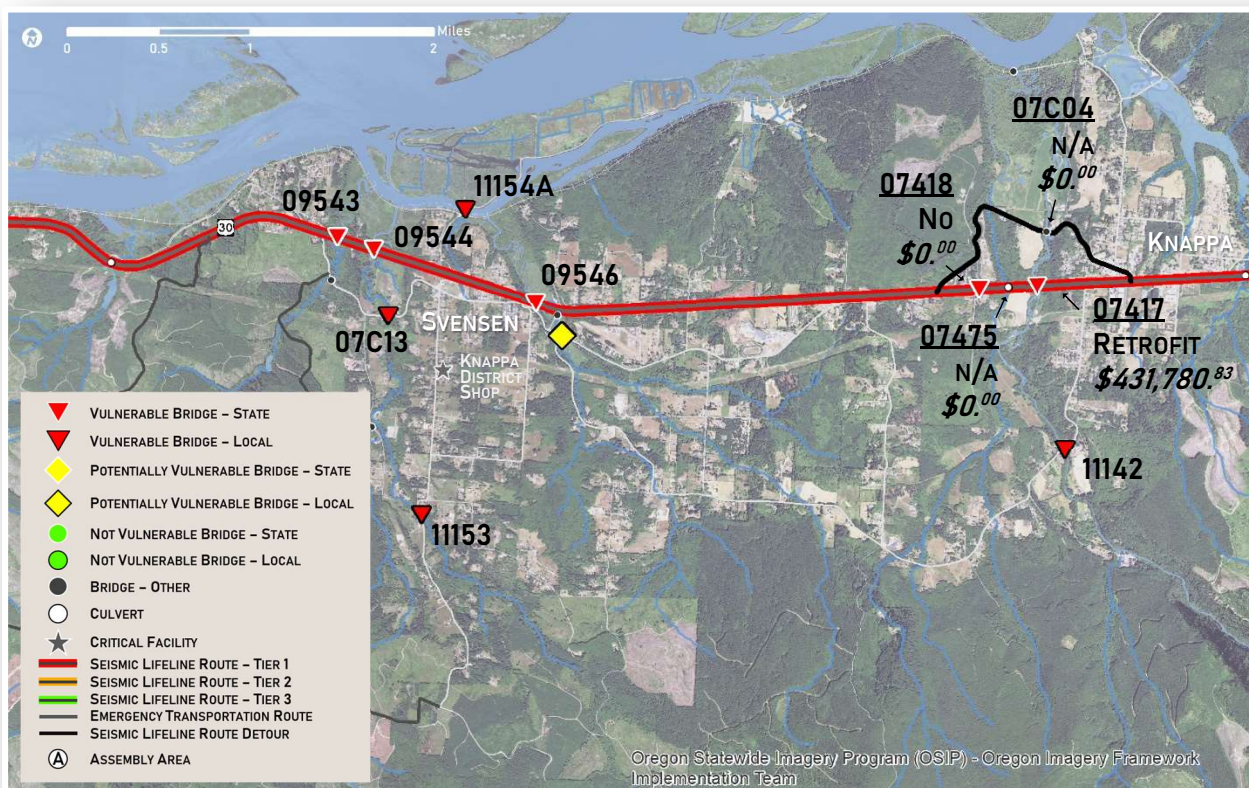


Figure 9 – Old Highway 30-Knappa detour.

## HILLCREST LOOP

Below you will see that there is a second option to bypass Bridges 07417, 07418, and 09546. While heading west on Highway 30, turn left at MP 82.00 onto Hillcrest Loop. Follow the road until you arrive at the intersection of Hillcrest and Old Highway 30 – Svensen. Turn left onto Old Highway 30, where you will turn left to continue west on Highway 30. To perform ODOT infrastructure improvements will cost about \$5,800,341, as oppose to the \$600,000 that is needed to update County facilities, or a 9.6 cost benefit ratio.

BRIDGE ID	YEAR BUILT	ROADWAY NAME	CARRIES	CROSSES	SEISMIC VULNERABILITY	SEISMIC RETROFIT WORK TYPE	TOTAL COST (ESTIMATED)
LIFELINE ROUTE							
<u>07417</u>	1951	092	US 30 (HWY 2W)	Big Creek	Vulnerable	Retrofit	\$431,780. <sup>83</sup>
<u>07475</u>	1951	092	US 30 (HWY 2W)	Little Cr	n/a	n/a	-
<u>07418</u>	1951	C0000	Private Road	US 30 (HWY 2W)	Vulnerable	No	\$0. <sup>00</sup>
<u>09546</u>	1967	092	US 30 (HWY 2W)	Ferris Creek	Vulnerable	Retrofit	\$5,368,560. <sup>29</sup>
ODOT IMPROVEMENTS TOTAL COST							\$5,800,341. <sup>12</sup>
DETOUR							
<u>11142</u>	1957	000303	Hillcrest Loop	Big Creek	Vulnerable	Retrofit	\$600,000. <sup>00</sup>
COUNTY IMPROVEMENTS TOTAL COST							\$600,000. <sup>00</sup>

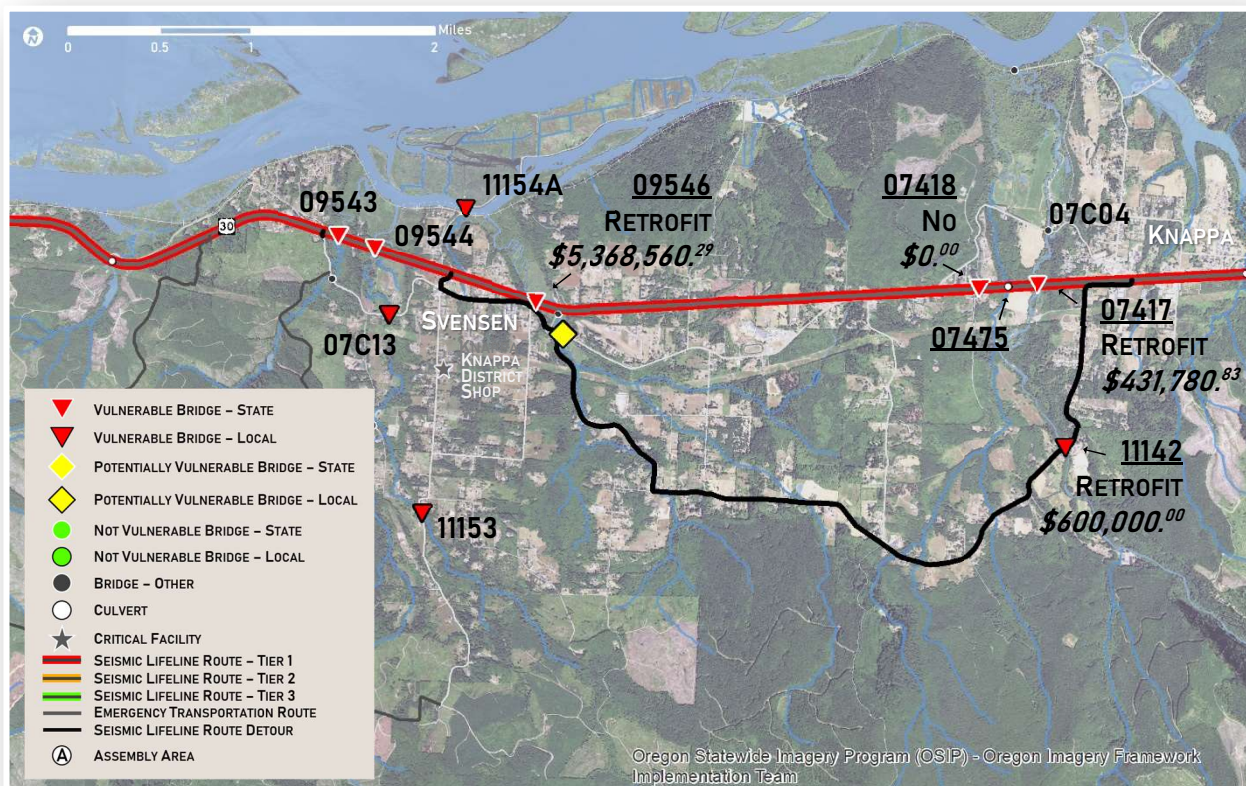


Figure 10 – Hillcrest Loop detour.

## OLD HIGHWAY 30-SVENSEN – MARKET

This detour will begin when you take a left at MP 83.5 from US Highway 30 onto Old Highway 30, continuing until Svensen Market Road, then take a right until you arrive at the road/highway intersection. Using this section of detour bypasses only the Ferris Creek bridge, which is estimated to cost about \$5,368,560 to upgrade, as opposed to the \$250,000 it will take to use Old Highway 30, coupled with Svensen Market to avoid this bridge, also represented as a 21.47 cost benefit ratio.

BRIDGE ID	YEAR BUILT	ROADWAY NAME	CARRIES	CROSSES	SEISMIC VULNERABILITY	SEISMIC RETROFIT WORK TYPE	TOTAL COST (ESTIMATED)
LIFELINE ROUTE							
<u>09546</u>	1967	092	US 30 (HWY 2W)	Ferris Creek	Vulnerable	Retrofit	\$5,368,560. <sup>29</sup>
						ODOT IMPROVEMENTS TOTAL COST	\$5,368,560. <sup>29</sup>
DETOUR							
<u>07C21</u>	1934	-	Old Highway 30-Svensen	Ferris Creek	Potentially Vulnerable	Retrofit	\$250,000. <sup>00</sup>
						COUNTY IMPROVEMENTS TOTAL COST	\$250,000. <sup>00</sup>

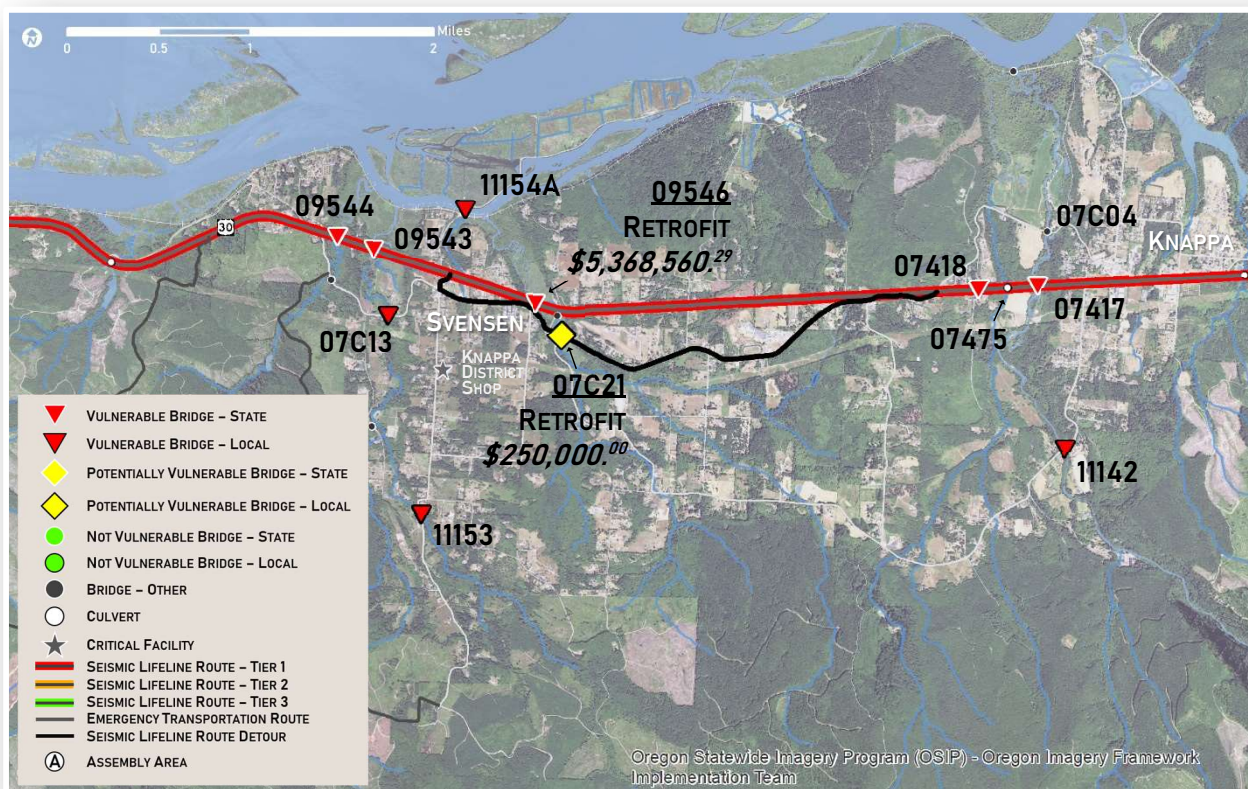


Figure 11 – Old Highway 30 Svensen Market Road detour.

## OLD HIGHWAY 30-SVENSEN

Here, this detour begins by taking a left from US Highway 30 at MP 83.5 onto Old Highway 30, continuing until you arrive at the road/highway intersection. There is a vulnerable structure located towards the end of this detour, 07C13, but bypasses three (3) other vulnerable structures identified on US Highway 30, that all together would cost \$9,553,816, versus the \$800,000 estimated cost of upgrading County infrastructure, and a cost benefit ratio of 9.10.

BRIDGE ID	YEAR BUILT	ROADWAY NAME	CARRIES	CROSSES	SEISMIC VULNERABILITY	SEISMIC RETROFIT WORK TYPE	TOTAL COST (ESTIMATED)
LIFELINE ROUTE							
<u>09546</u>	1967	092	US 30 (HWY 2W)	Ferris Creek	Vulnerable	Retrofit	\$5,368,560. <sup>29</sup>
<u>09544</u>	1967	092	US 30 (HWY 2W)	Bear Creek	Vulnerable	Retrofit	\$1,153,707. <sup>85</sup>
<u>09543</u>	1967	092	US 30 (HWY 2W)	Marys Creek	Vulnerable	Retrofit	\$3,031,548. <sup>29</sup>
ODOT IMPROVEMENTS TOTAL COST							\$9,553,816. <sup>43</sup>
DETOUR							
<u>07C13</u>	1923	000417	Old 30-Svensen	Bear Creek	Vulnerable	Retrofit	\$800,000. <sup>00</sup>
<u>07C14</u>	1924	000417	Marys Creek, Old Hwy 30-Svensen	Marys Creek	n/a	n/a	-
<u>07C21</u>	1934	-	Old Highway 30-Svensen	Ferris Creek	Potentially Vulnerable	Retrofit	\$250,000. <sup>00</sup>
COUNTY IMPROVEMENTS TOTAL COST							\$1,050,000. <sup>00</sup>

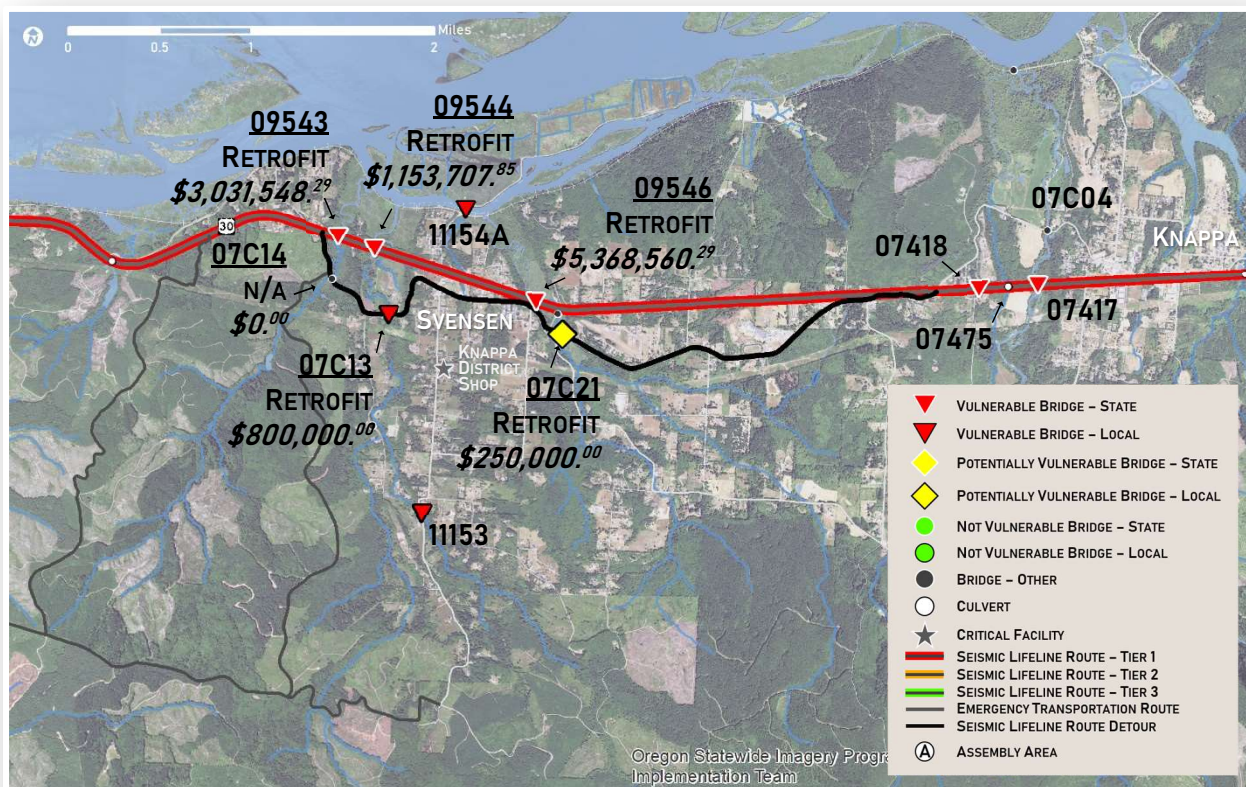


Figure 12 – Old Highway 30-Svensen detour.

## KNAPPA-SVENSEN

Using this detour avoids all five (5) structures identified as vulnerable along US Highway 30 (07417, 07418, 09546, 09544, and 09543), using a combination of Hillcrest Loop and Old Highway 30 – Svensen. If this detour were used, then it should be noted that there are two (2) vulnerable structures on the County road system, 11142 and 07C13. These structures are, together, estimated to cost almost \$10,000,000. To improve County infrastructure will cost about \$1,400,000, just 14% of the cost, or a 7.13 cost benefit ratio.

BRIDGE ID	YEAR BUILT	ROADWAY NAME	CARRIES	CROSSES	SEISMIC VULNERABILITY	SEISMIC RETROFIT WORK TYPE	TOTAL COST (ESTIMATED)
LIFELINE ROUTE							
<u>07417</u>	1951	092	US 30 (HWY 2W)	Big Creek	Vulnerable	Retrofit	\$431,780. <sup>83</sup>
<u>07475</u>	1951	092	US 30 (HWY 2W)	Little Cr	n/a	n/a	-
<u>07418</u>	1951	C0000	Private Road	US 30 (HWY 2W)	Vulnerable	No	\$0. <sup>00</sup>
<u>09546</u>	1967	092	US 30 (HWY 2W)	Ferris Creek	Vulnerable	Retrofit	\$5,368,560. <sup>29</sup>
<u>09544</u>	1967	092	US 30 (HWY 2W)	Bear Creek	Vulnerable	Retrofit	\$1,153,707. <sup>85</sup>
<u>09543</u>	1967	092	US 30 (HWY 2W)	Marys Creek	Vulnerable	Retrofit	\$3,031,548. <sup>29</sup>
ODOT IMPROVEMENTS TOTAL COST							\$9,985,597. <sup>26</sup>
DETOUR							
<u>11142</u>	1957	000303	Hillcrest Loop	Big Creek	Vulnerable	Retrofit	\$600,000. <sup>00</sup>
<u>07C13</u>	1923	000417	Old 30-Svensen	Bear Creek	Vulnerable	Retrofit	\$800,000. <sup>00</sup>
<u>07C14</u>	1924	000417	Marys Creek, Old Hwy 30-Svensen	Marys Creek	n/a	n/a	-
COUNTY IMPROVEMENTS TOTAL COST							\$1,400,000. <sup>00</sup>

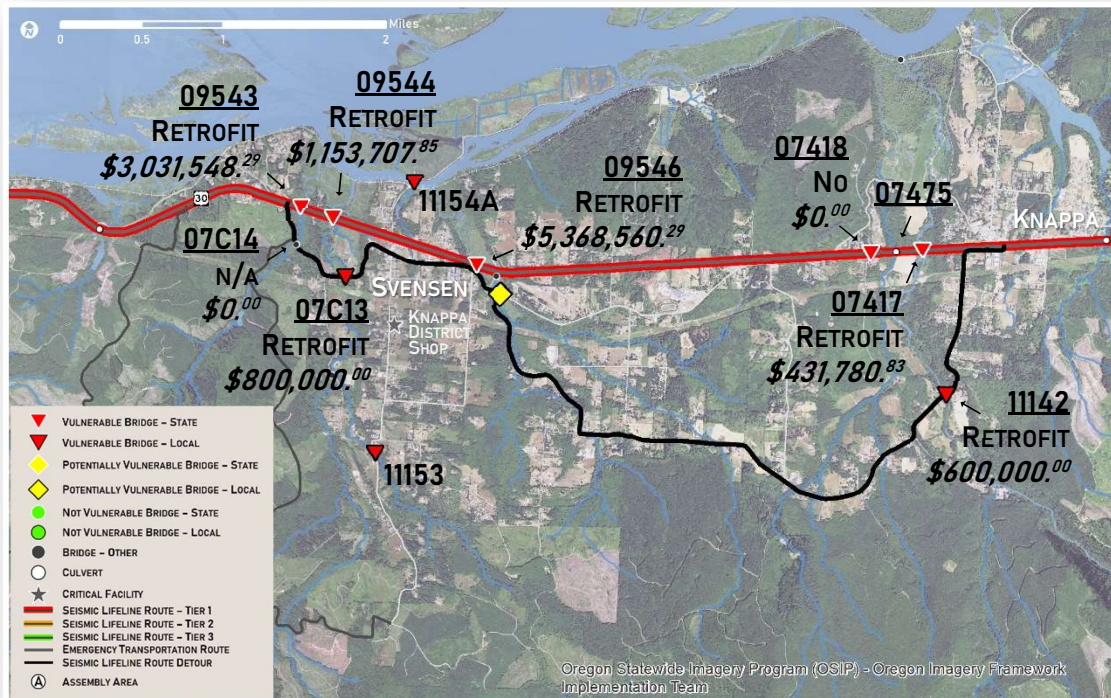


Figure 13 – Hillcrest Loop-Old Highway 30 detour.

## PIPELINE

This detour combines a privately owned right-of-way, the Twilight Creek Mainline, which serves as a road to transport timber to market, with Pipeline Road. Pipeline is a County owned public right-of-way, that continues all the way into the City of Astoria. Clatsop County is diligently working to upgrade this route so that it may serve regularly as an alternate route to access the City of Astoria, creating redundancy in the system. The John Day bridge is an important piece of infrastructure, and will take significant investment of just over \$15,000,000 to seismically rehabilitate. Pipeline is a valid alternative that has engineering challenges, but should further explored. Even though this may be costlier, it does not cross any significant waterbodies, that could more easily be repaired with culvert pipes. This is a 0.77 cost benefit ratio.

BRIDGE ID	YEAR BUILT	ROADWAY NAME	CARRIES	CROSSES	SEISMIC VULNERABILITY	SEISMIC RETROFIT WORK TYPE	TOTAL COST (ESTIMATED)
LIFELINE ROUTE							
0P411	1973	092	US 30 (HWY 2W)	Twilight Creek	n/a	n/a	-
<u>01827B</u>	1990	092	US 30 (HWY 2W)	John Day River	Potentially Vulnerable	Rehab+	\$15,346,621. <sup>10</sup>
22613	2016 ???	092	US 30 (HWY 2W)	Jack Creek	n/a	n/a	-
03075	2016	092	US 30 (HWY 2W)	Jack Creek	n/a	n/a	-
<u>21357</u>	2014	092	US 30 (HWY 2W)	Mill Creek	n/a	n/a	-
ODOT IMPROVEMENTS TOTAL COST							\$15,346,621. <sup>10</sup>
DETOUR							
00000	0000	000	Pipeline Road	n/a	?	?	\$20,000,000. <sup>00</sup>
COUNTY IMPROVEMENTS TOTAL COST							\$20,000,000. <sup>00</sup>

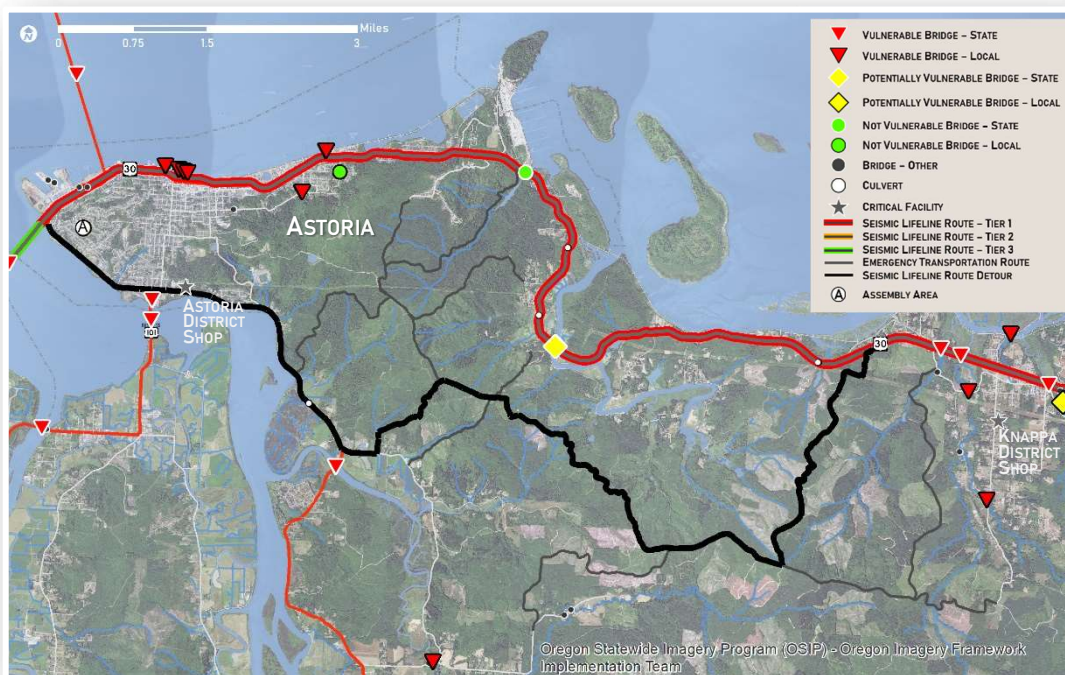


Figure 14 – Pipeline Road and Twilight Creek Mainline detour.

## RECOMMENDATIONS

There must be continued discussion about how the Port of Astoria will be accessed, since it is possible that the Tier I designated route along Astoria's downtown chairwall system may fail, rendering it impossible to link the port with recovery efforts, but without further study this is difficult to determine.

While it is important to invest in vital post disaster recovery efforts, investments must also be made to improve infrastructure, helping people quickly and safely evacuate from vulnerable areas, such as the City of Seaside. Seaside continues to focus efforts on securing funding to construct and reinforce routes that will help individuals evacuate from inundation zones. The City of Seaside supports efforts for post recovery, but needs more investment and resources to evacuate people out of the danger zone. As for remainder of the County, there is no county owned right of way that can be used as a detour around the Westport area.

The table below displays the lifeline routes identified in this report, as well as estimated costs to improve ODOT and County facilities to effectively serve the region. The Knappa-Svensen area has several options with different combinations. Old Highway 30-Svensen route seems to make the most sense, as it does not cross significant waterbodies, and would take less money for improvement. The Old Highway 30-Svensen is shown in the table below ranked with the other routes identified.

Table 1- Seismic Lifeline Route Priorities w/ Costs

PRIORITY	LIFELINE ROUTE	ODOT COST	COUNTY COST	SAVINGS RATIO
1	Old Highway 30 - Svensen	\$ 9,553,816	\$ 1,050,000	9.10
2	Knappa-Svensen	\$ 9,985,597	\$ 1,400,000	7.13
3	Hillcrest Loop	\$ 5,800,341	\$ 600,000	9.67
4	Old Highway 30 - Svensen-Market	\$ 5,368,560	\$ 250,000	21.47
5	Old Highway 30 - Knappa	\$ 431,781	\$ 0	
6	Pipeline	\$ 15,346,621	\$ 20,000,000	0.77
7	Westport	\$ 6,970,895	\$ -	-

Another route to strongly consider is that of the Twilight Mainline / Pipeline. These routes complement interests in the northern portion of the County, with Highway 30 and its Tier I Route status, as well as the County and its roads running parallel to it. This would allow for County infrastructure to be upgraded for a portion of the cost it would take to reinforce ODOT facilities. There appears to be significant cost savings by utilizing County infrastructure, that being to the tune of just over \$10,000,000, which even includes the upgrading of Pipeline Road, resulting in a cost benefit ratio of 1.45 (\$32.3 million / \$22.3 million). Clatsop County applauds, any and all efforts to protect life and property.

# ***APPENDIX***

## CITY OF SEASIDE

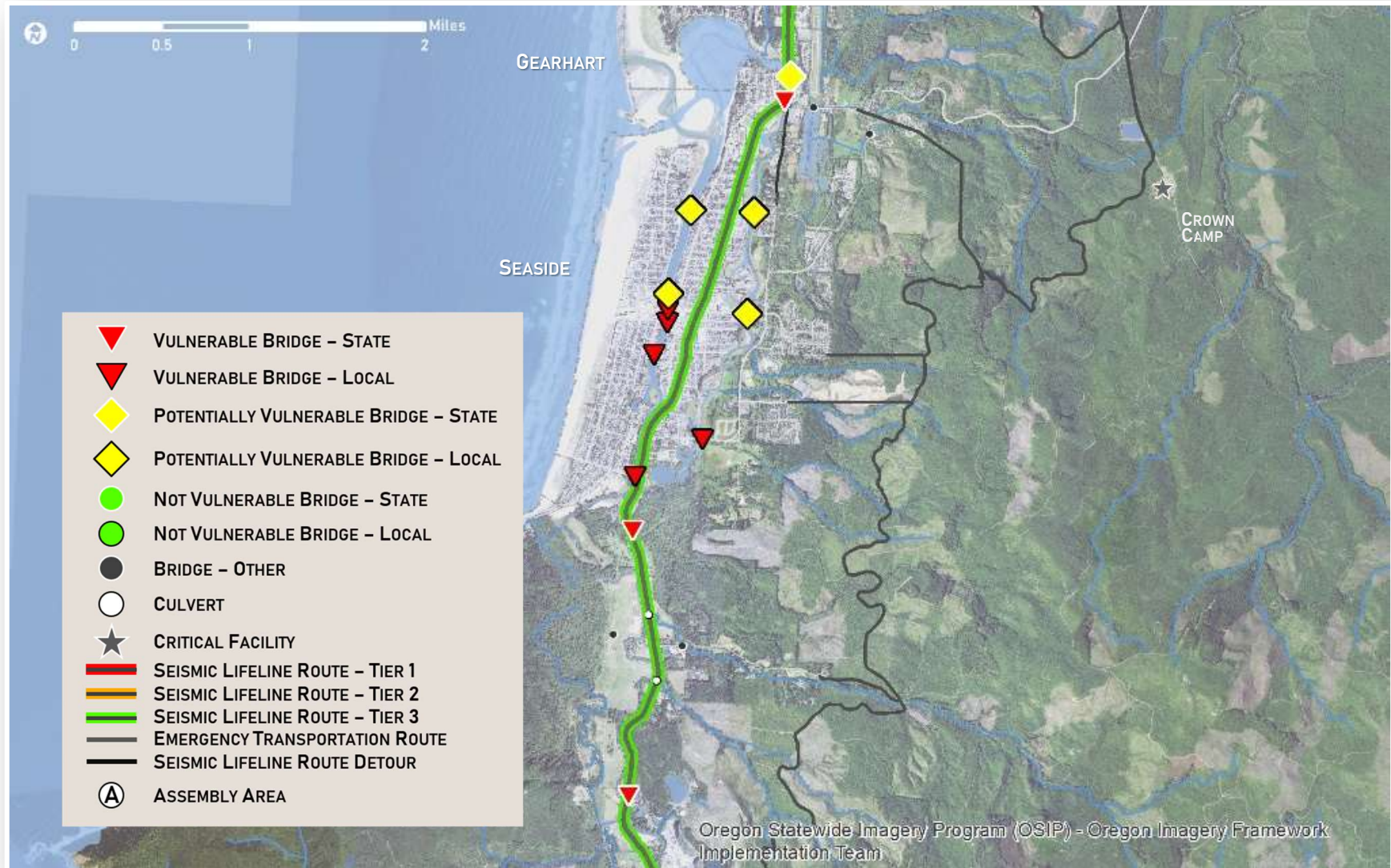


Figure 1 – Seaside Area with vulnerable and potentially vulnerable bridges shown.

## EMERGENCY TRANSPORTATION ROUTE (ETR)

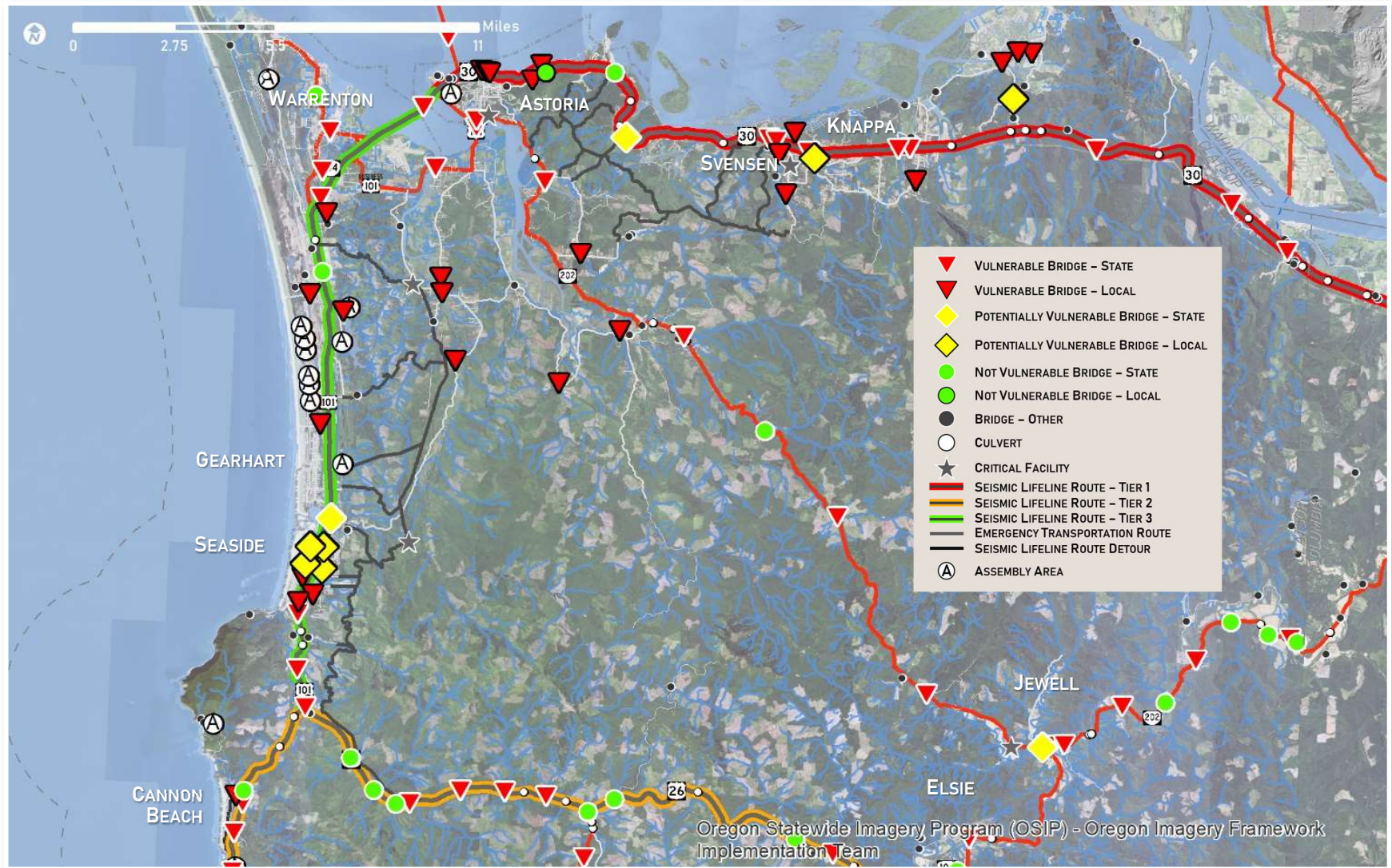


Figure 2 – Bridges, ODOT's lifeline designations, County emergency routes, bridges, culverts, and lifeline detours.

## PIPELINE ROAD

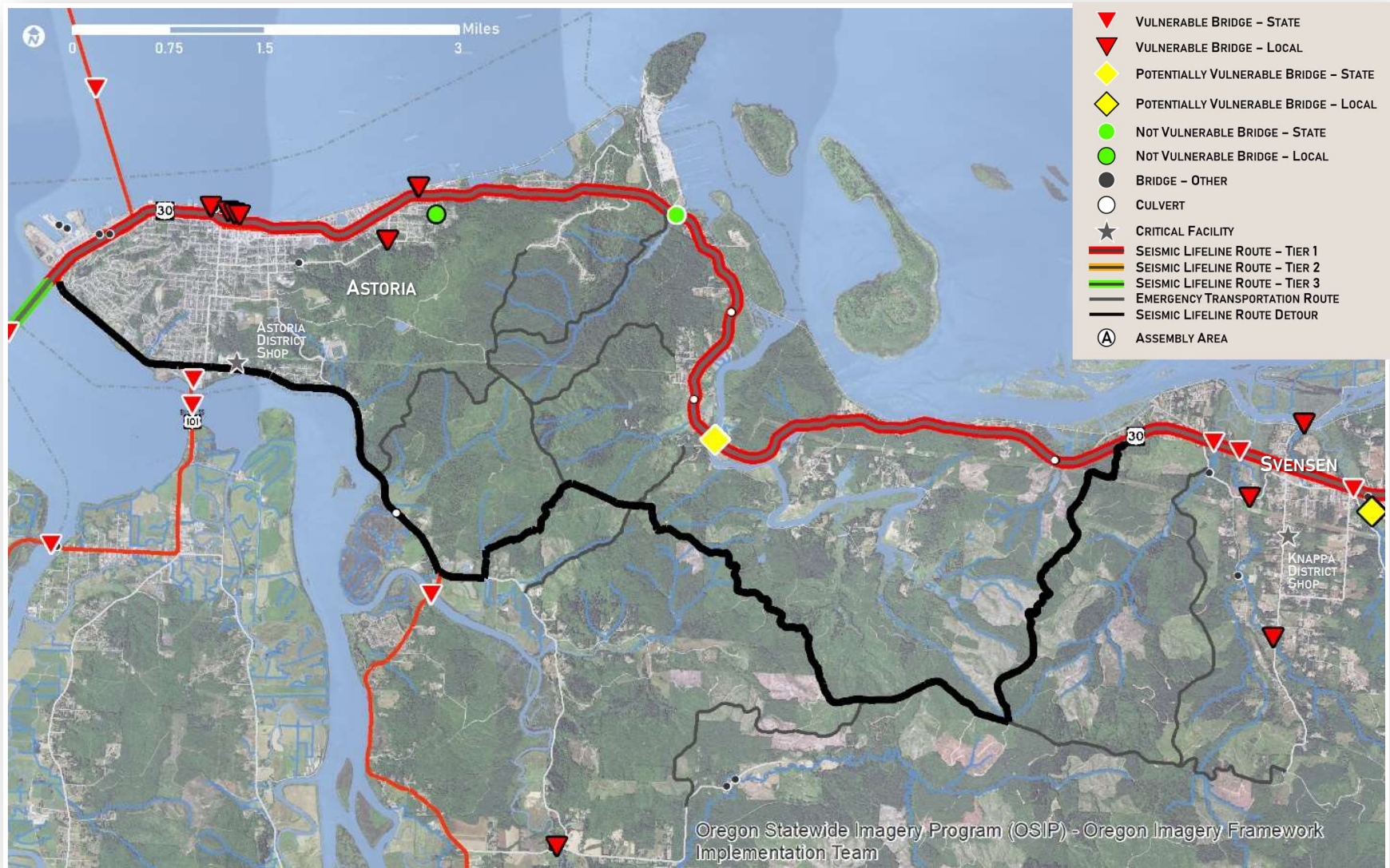


Figure 3 – Pipeline Road and Twilight Creek Mainline route is highlighted in black.

## LEWIS AND CLARK MAINLINE

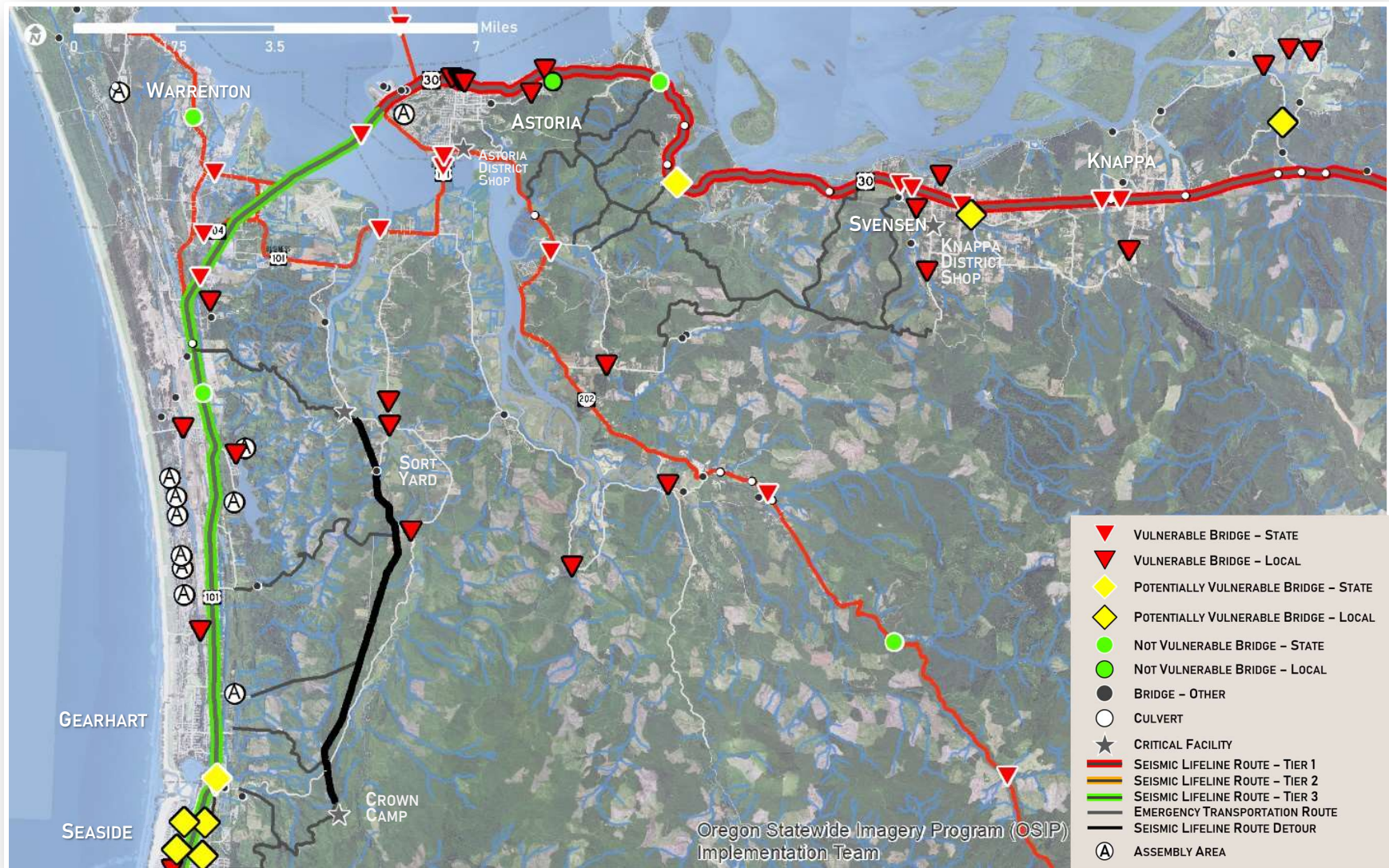


Figure 4 - Lewis and Clark Mainline highlighted in black.

## ANALYSIS

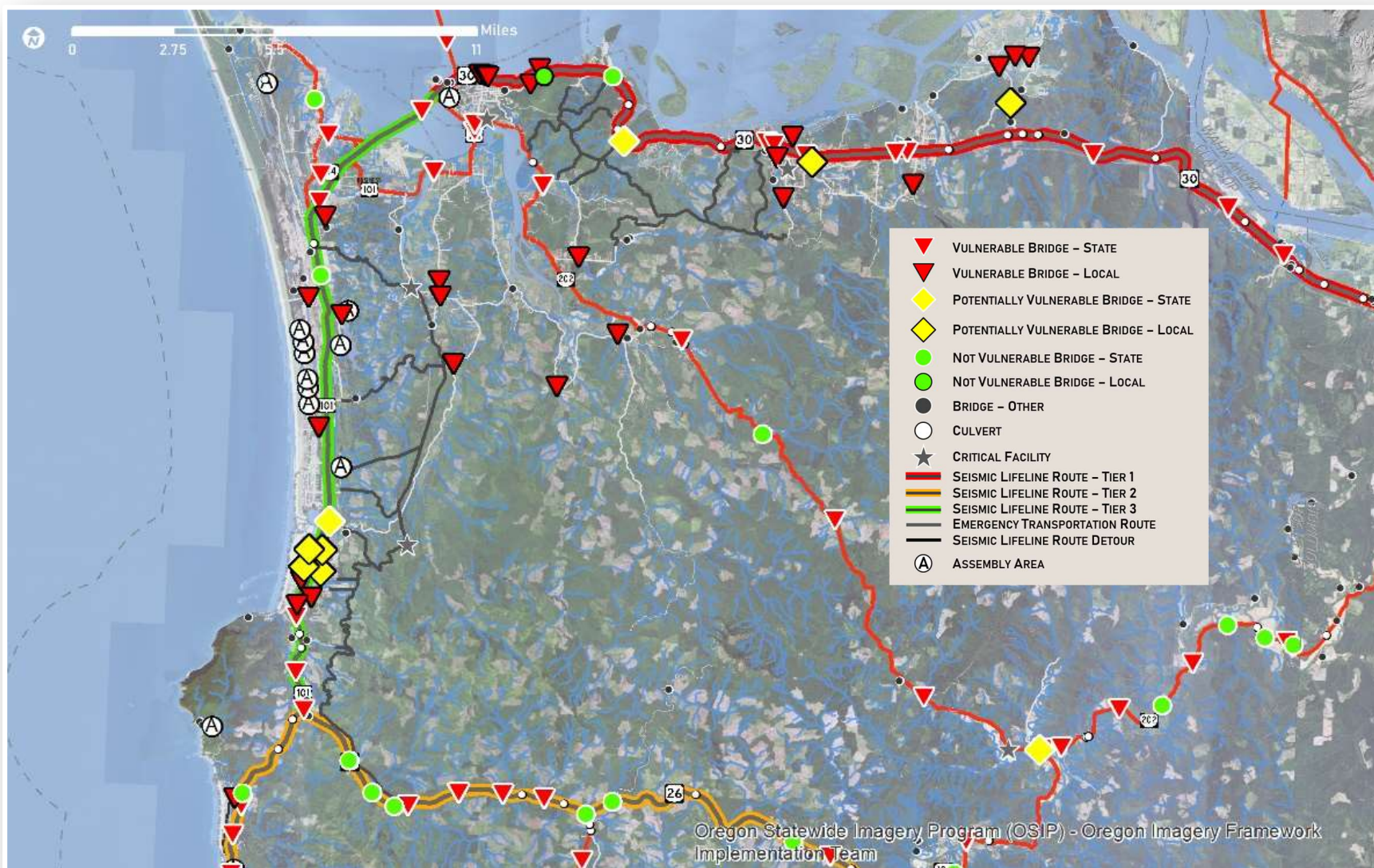


Figure 5 – Overall county with lifelines, emergency routes, and bridges.

## WESTPORT

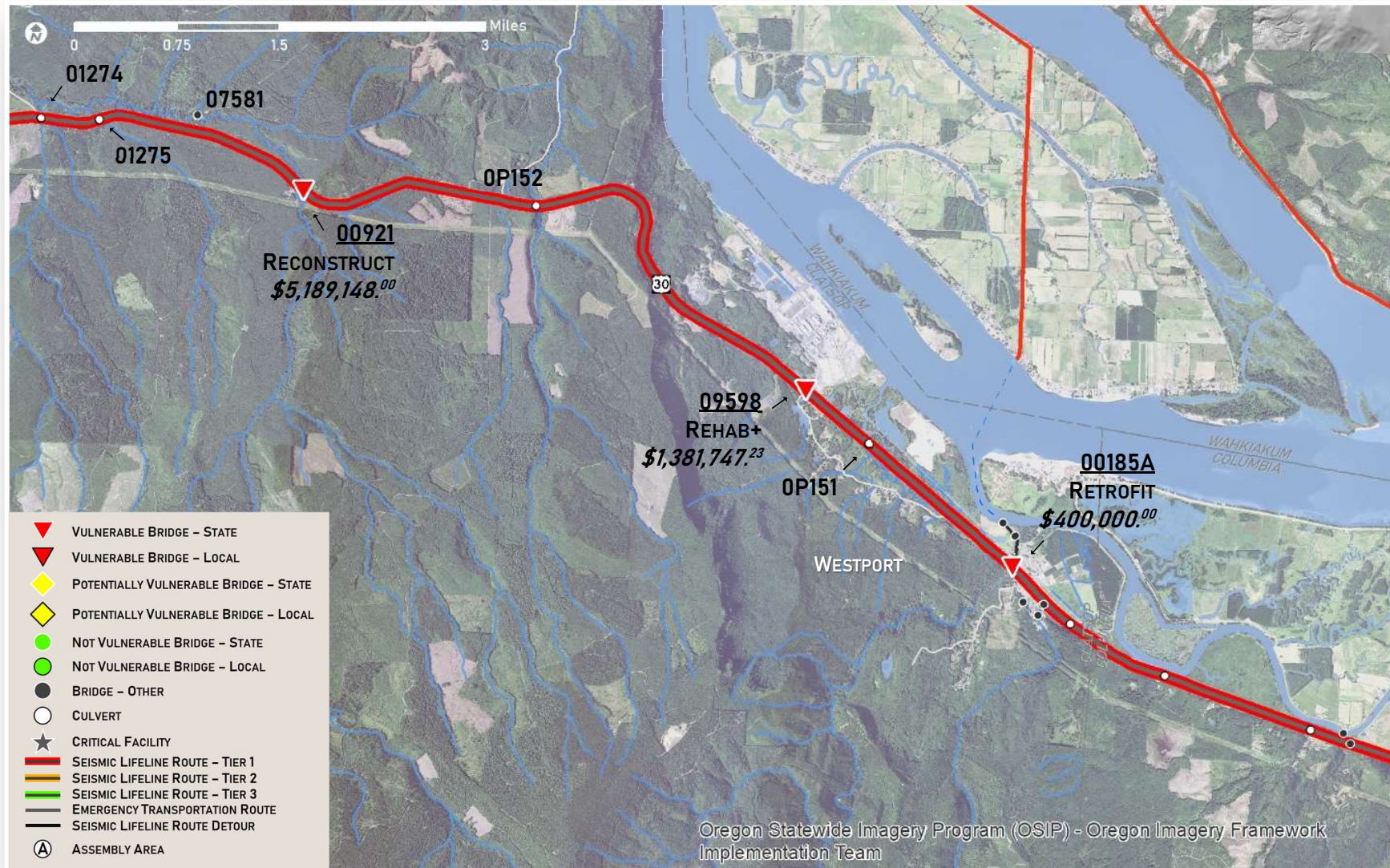


Figure 6 – Westport area detour.

## OLD HIGHWAY 30-KNAPPA

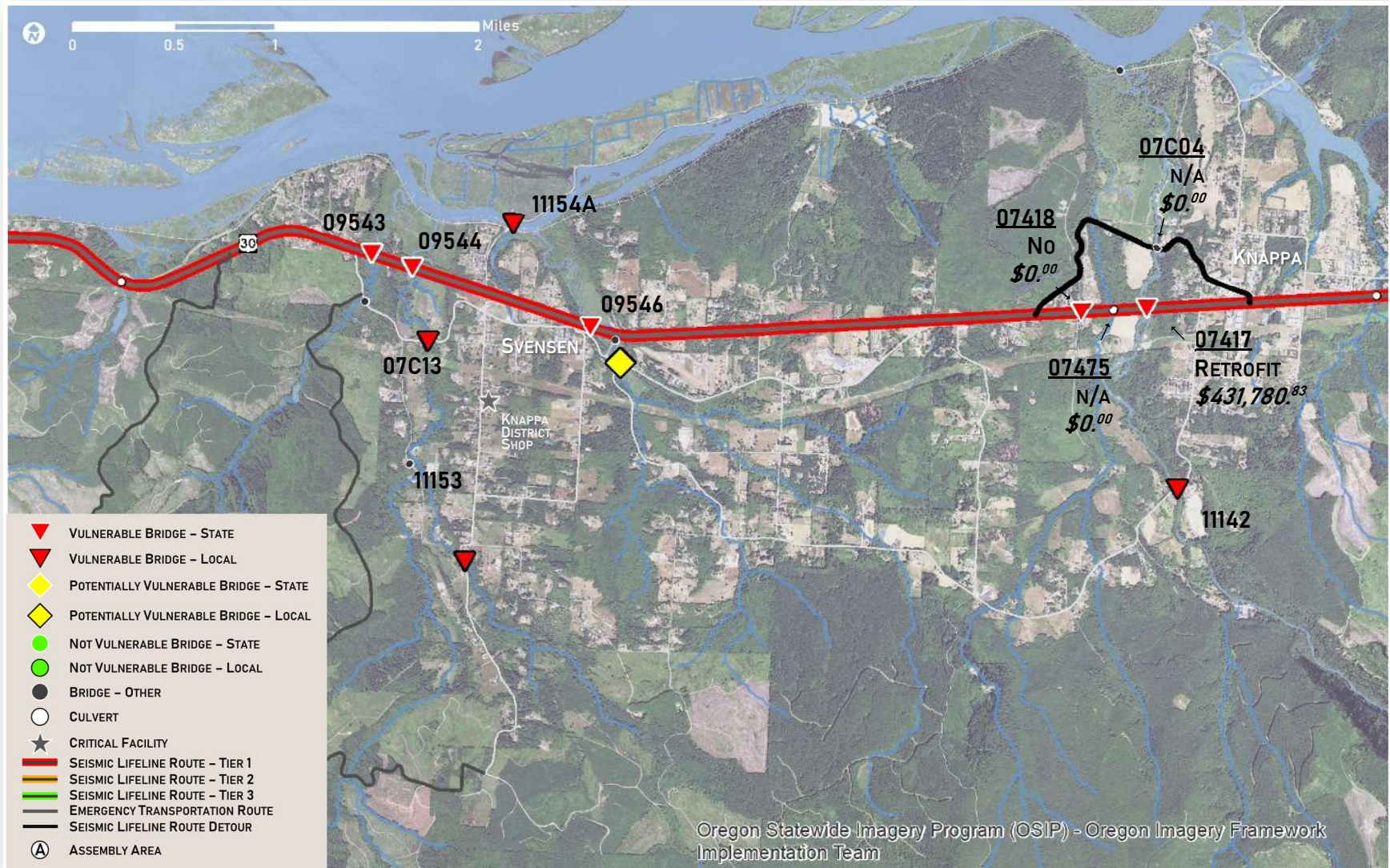


Figure 7 - Old Highway 30-Knappa detour.

## HILLCREST LOOP

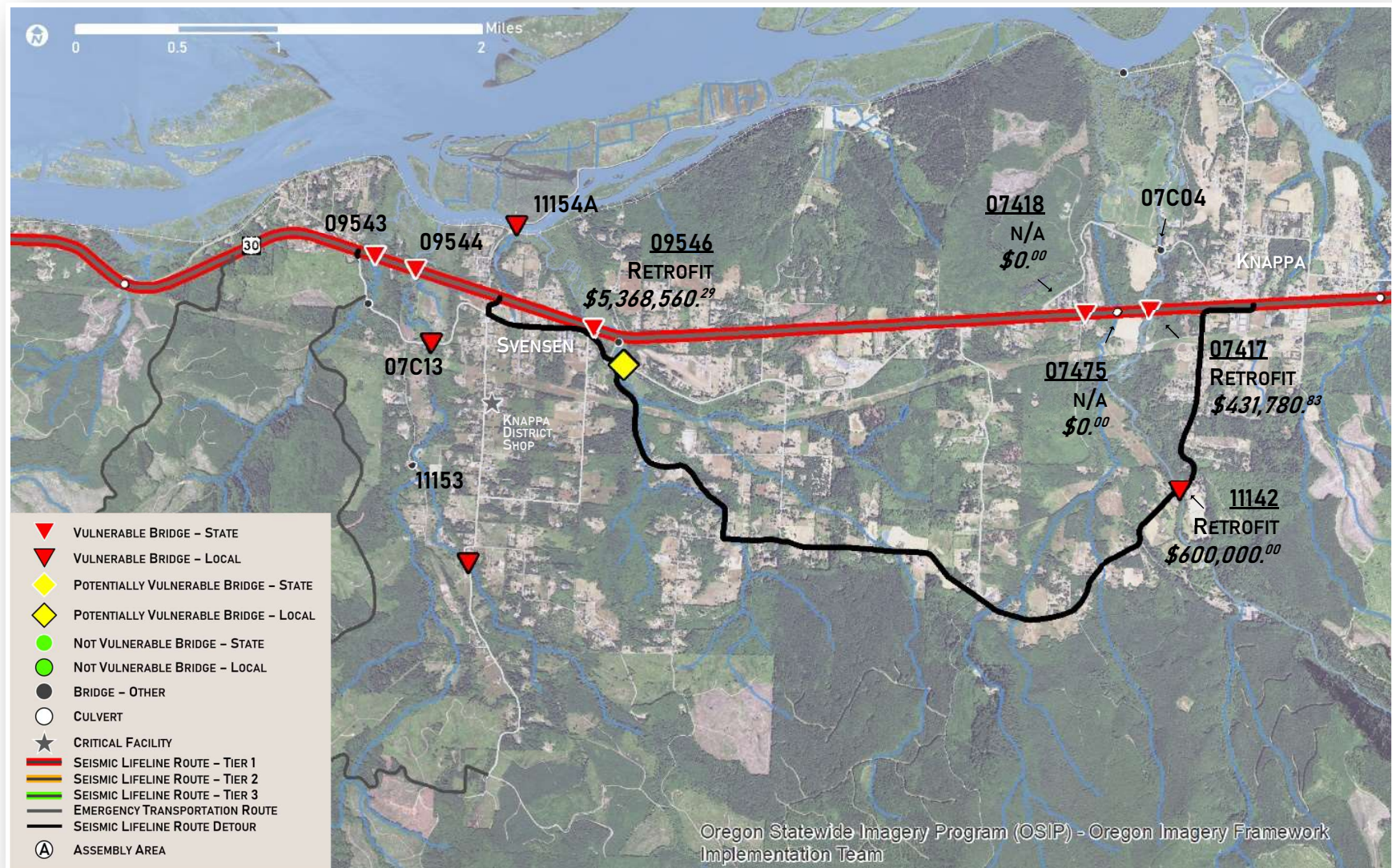


Figure 8 – Hillcrest Loop detour.

## OLD HIGHWAY 30-SVENSEN - MARKET

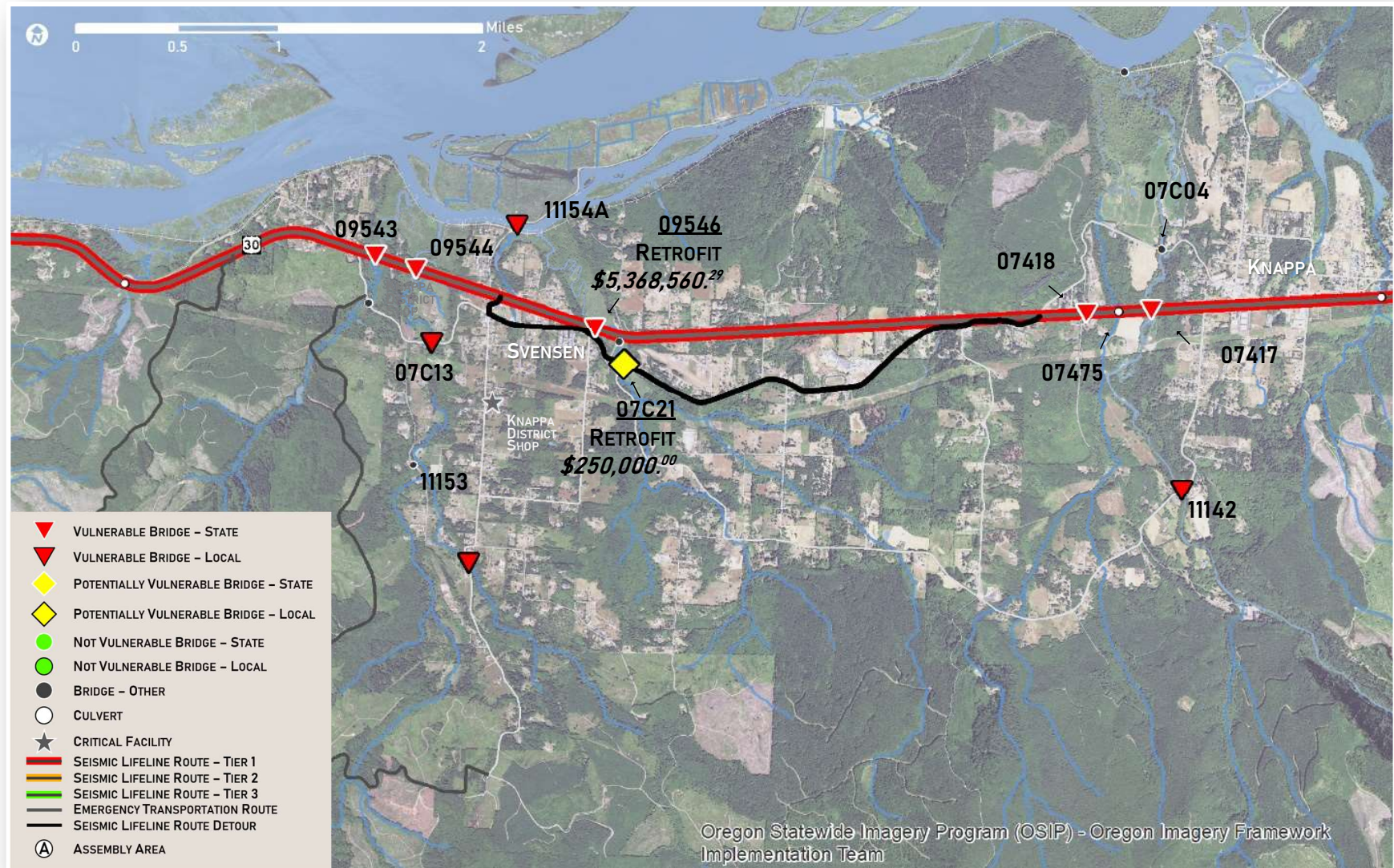


Figure 9 – Old Highway 30 Svensen Market Road detour.

## OLD HIGHWAY 30-SVENSEN

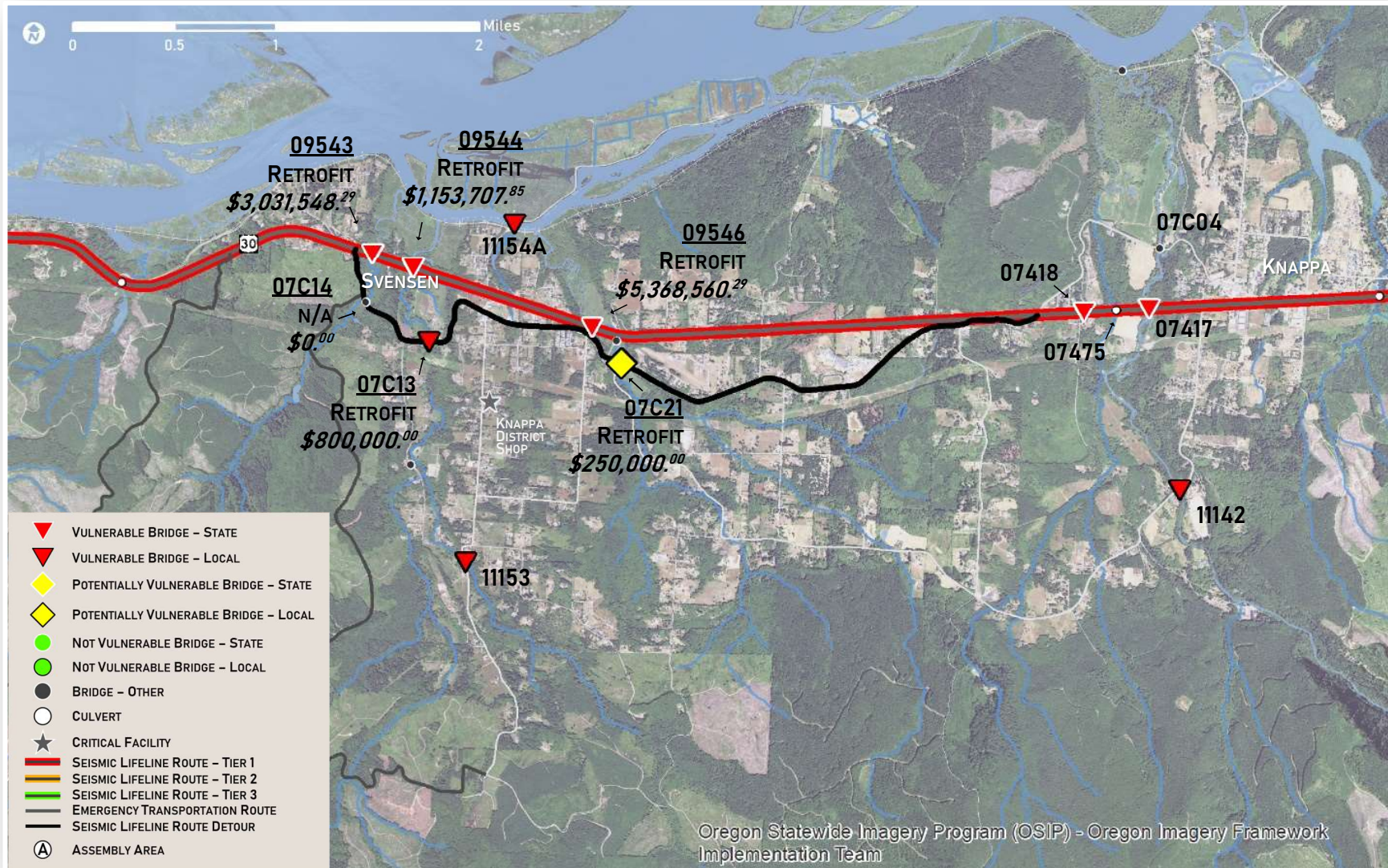


Figure 10 – Old Highway 30-Svensen detour.

## KNAPPA-SVENSEN

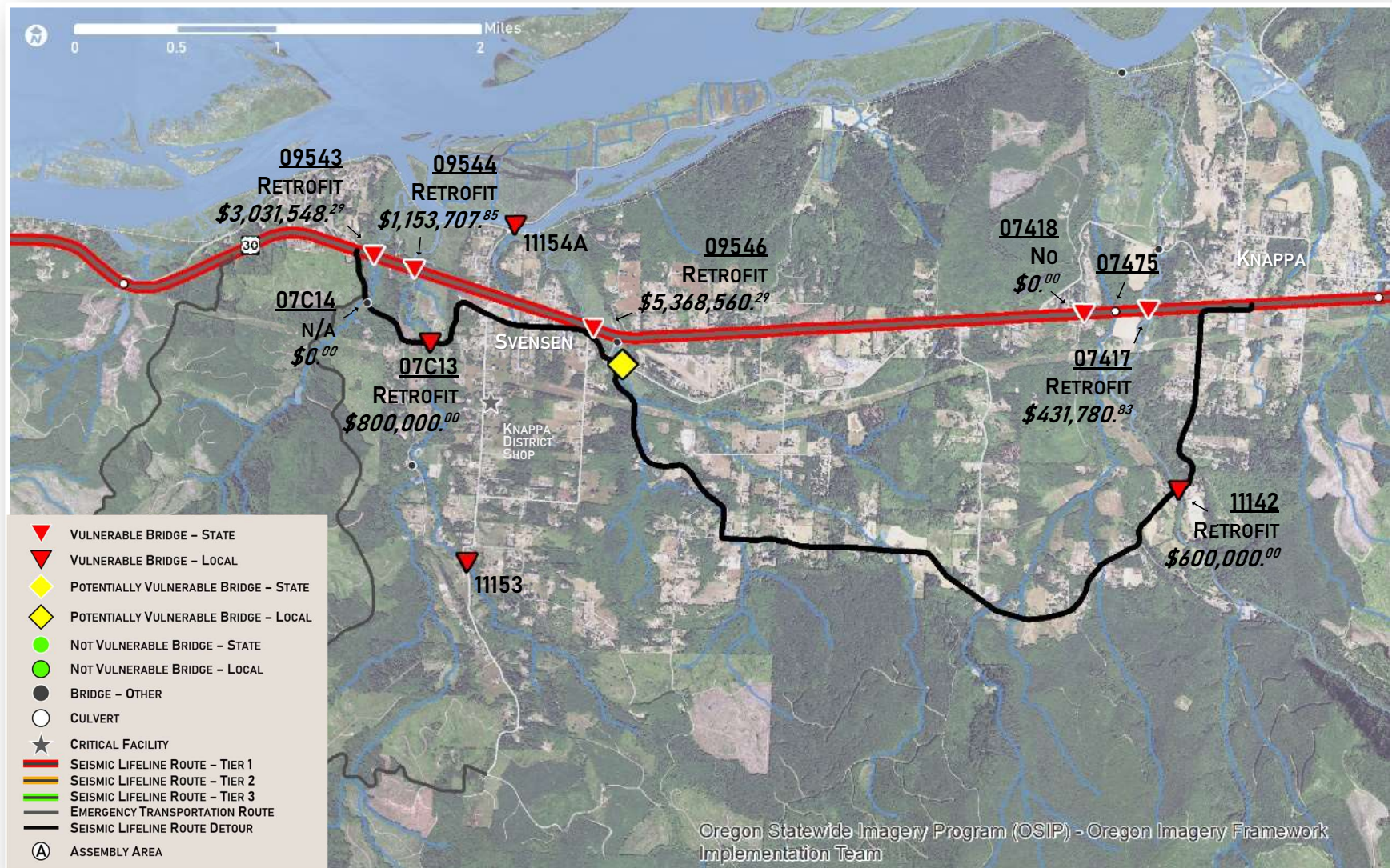


Figure 11 – Hillcrest Loop-Old Highway 30 detour.

## PIPELINE

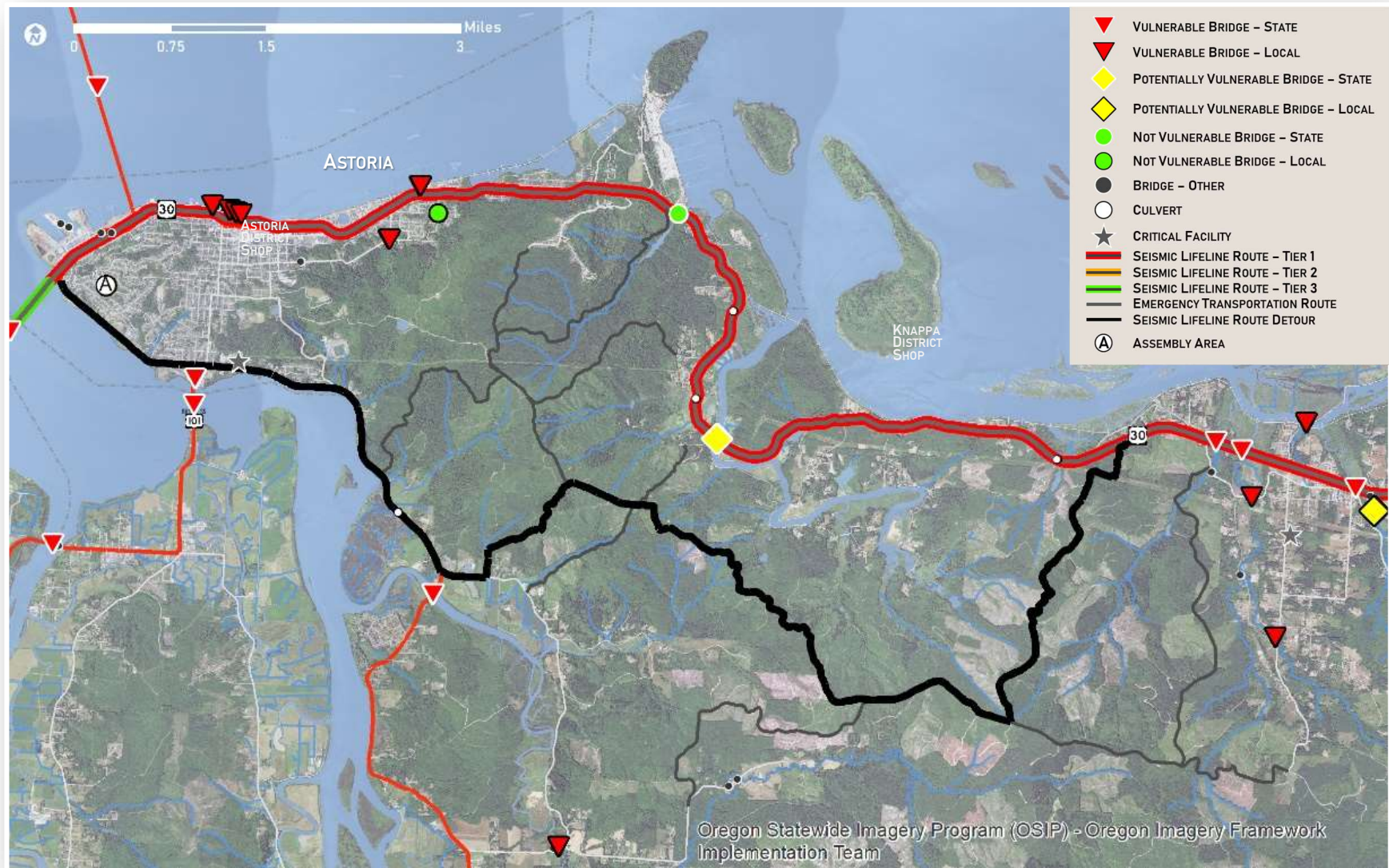


Figure 12 – Pipeline Road and Twilight Creek Mainline detour.