An aerial photograph of a river delta, likely the Skagit River delta in Clallam County, Washington. The image shows a wide, branching river system with vibrant blue water flowing through lush green agricultural fields. The terrain is a mix of flat plains and rolling hills, with some rocky outcrops visible. The overall scene is bright and clear, suggesting a sunny day.

Predicted Effects of the Cascadia Earthquake Clallam County

by
Jim Buck

CASCADIA SUBDUCTION ZONE

Plate Tectonic Setting

Subduction zone: Juan de Fuca and Gorda plate subducting beneath North American plate

Rate: ~3 cm/year

Dip of interface: ~12°

PACIFIC PLATE

JUAN DE FUCA PLATE

NORTH AMERICAN PLATE

GORDA PLATE

Most Recent Great Earthquake

Date: January 26, 1700

Magnitude: ~9.0

Rupture length: ~1000 km

Rupture width: ~80 km

Recurrence interval: 500 years

1000 km

PACIFIC PLATE

Tsunami Characteristics

(rough estimate from Native American oral history and written records in Japan)

Peak tsunami height in the near-source area: ~60 ft at mouth of Redwood Creek, Northern California (from Yurok stories)

Peak tsunami height in Japan (9 hours travel time and 3900 miles away): ~15 ft

THE 9.2 QUAKE

Location: 130 miles off coast

Length of Rupture: 600 miles

Width of Rupture: 50 miles

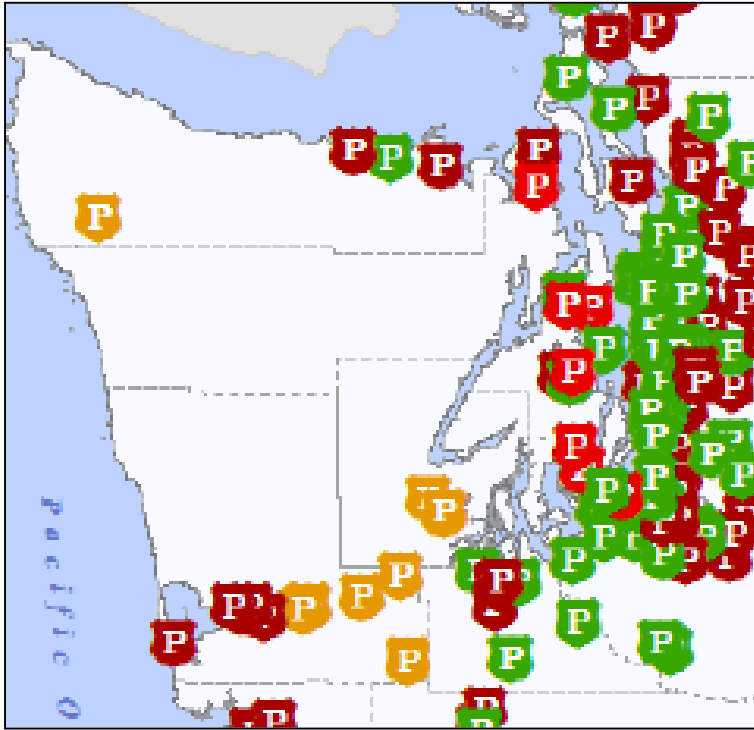
Duration: 6.5 minutes

Magnitude at rupture: 9.2

PGA on Oly Pen: 25 to 50% G

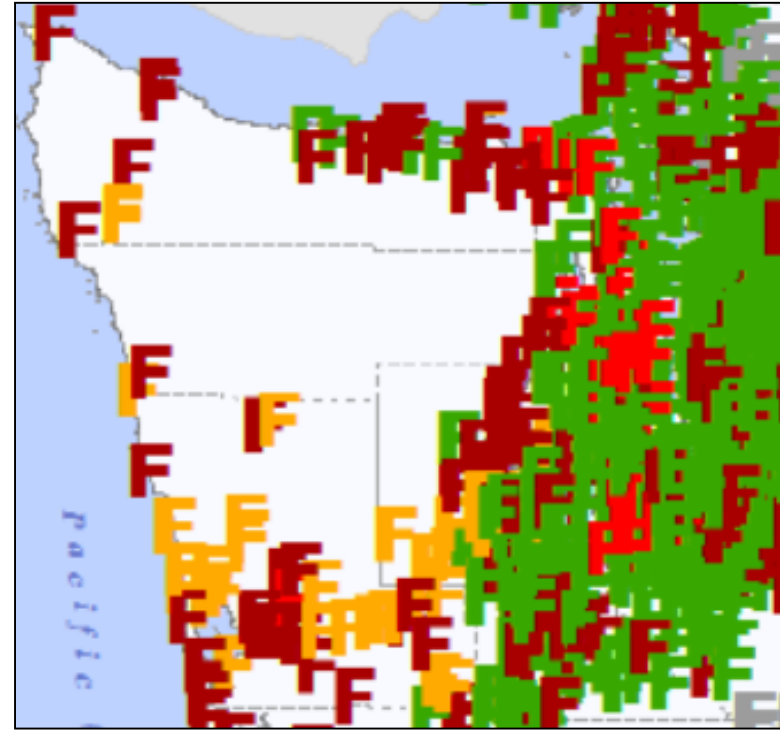
PGA near I-5: 30 to 40% G

LAW ENFORCEMENT AND FIRE SERVICES



48% of police facilities will be unusable.

5% will be capable of 50% capacity.

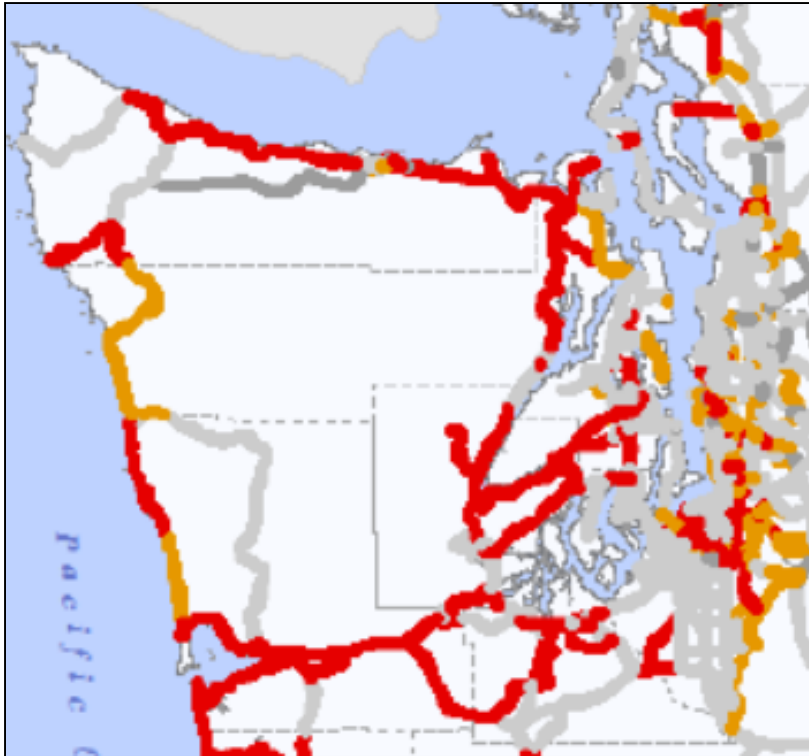


Significantly reduced fire fighting capability west of Shelton.

Damage to highways, bridges, and communications renders mutual aid agreements impractical.

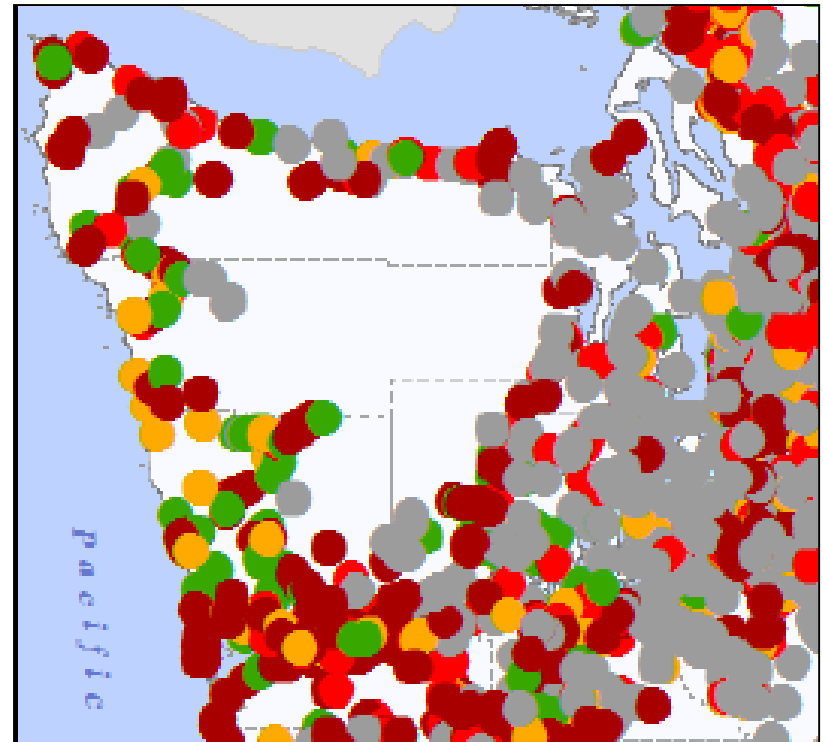
no damage      *completely destroyed*

HIGHWAYS AND BRIDGES



There will be no surviving ground routes to the county.

80 % of the roads will suffer pavement failures over 3"

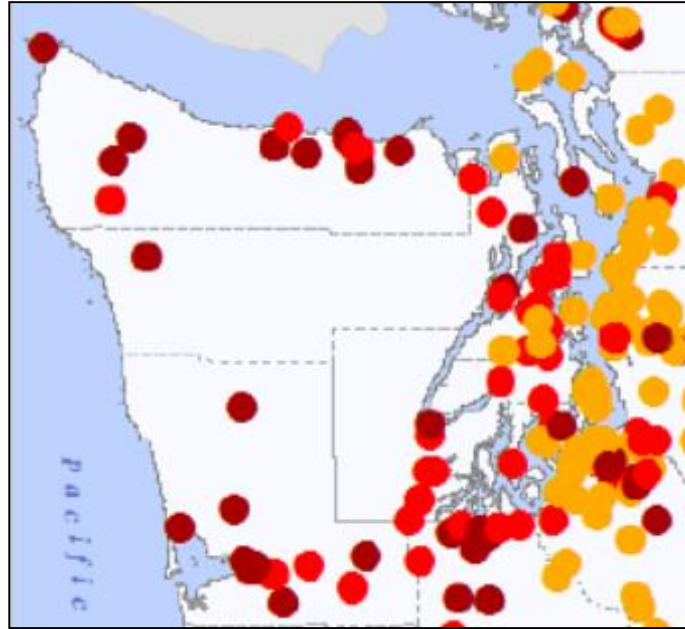


23% of coastal area bridges will be out of service for days.

50 % of Coastal bridges will be damaged and unusable.

no damage      *completely destroyed*

COMMUNICATIONS



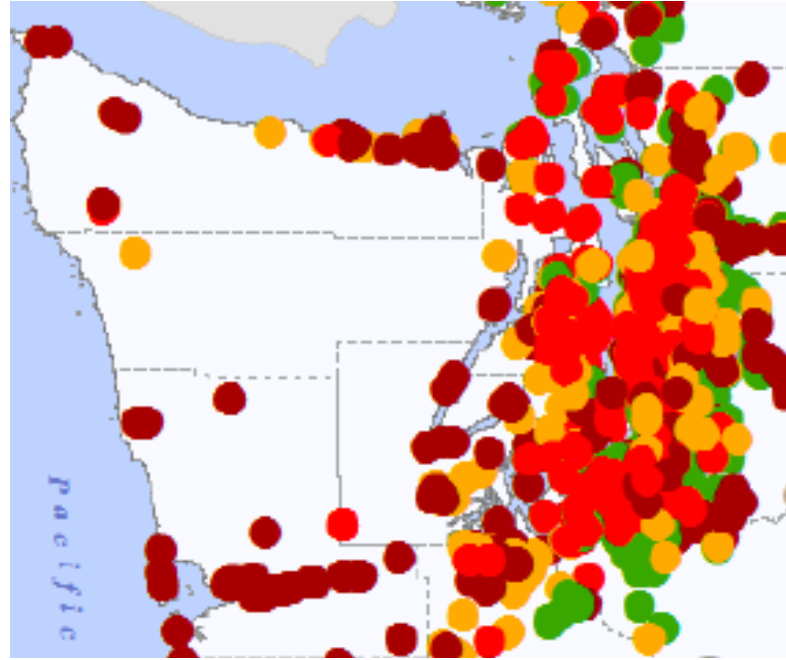
After the CSZE, the county will experience phone, cell phone, internet, radio and TV outages lasting for months.

It may take days or weeks to restore 33% of coastal communications facilities.

67% may need to be replaced.

no damage ● ● ● ● ● *completely destroyed*

SCHOOLS



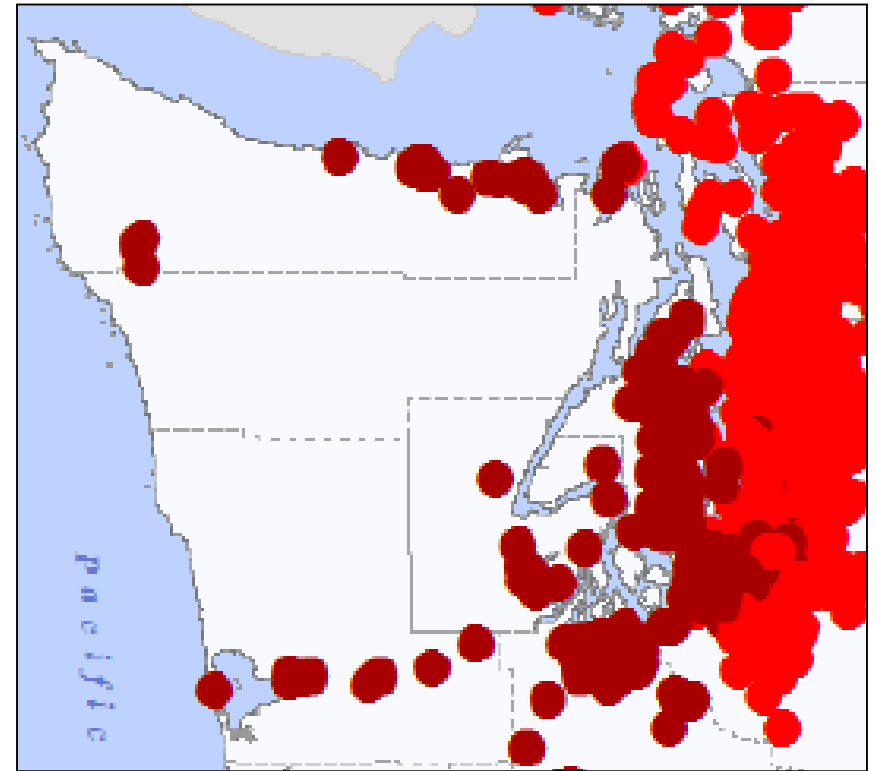
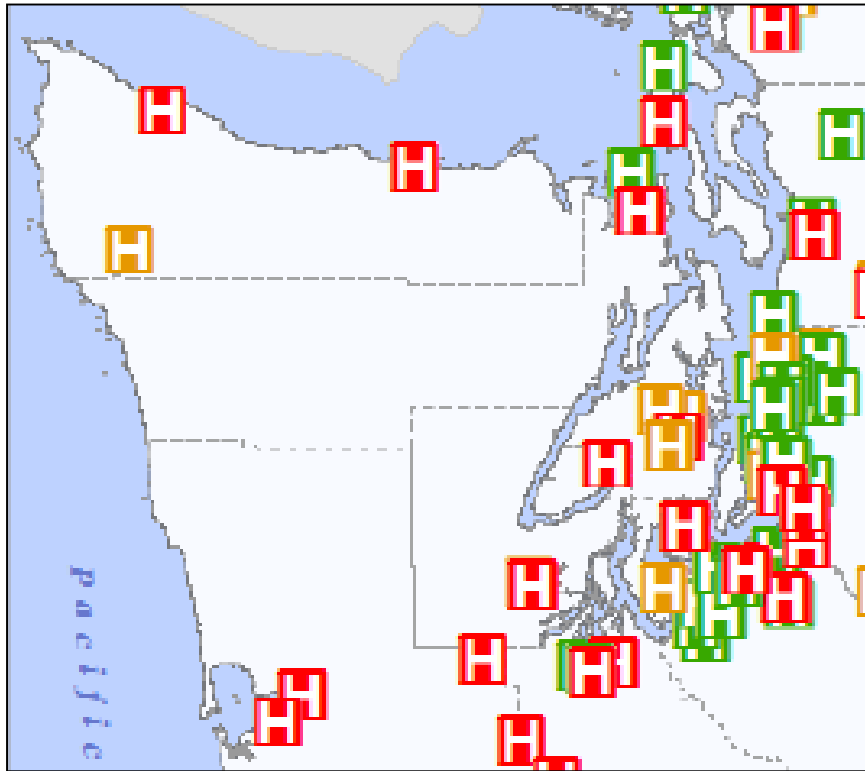
Nearly 100% of schools west of I-5 corridor will suffer complete or severe damage and will be unusable.

Students in class at the time of the event will be at risk.

NOTE: All of these schools are part of the National Sheltering System. Their loss indicates a corresponding reduction in sheltering capacity.

no damage ● ● ● ● ● *completely destroyed*

HOSPITALS & NURSING HOMES

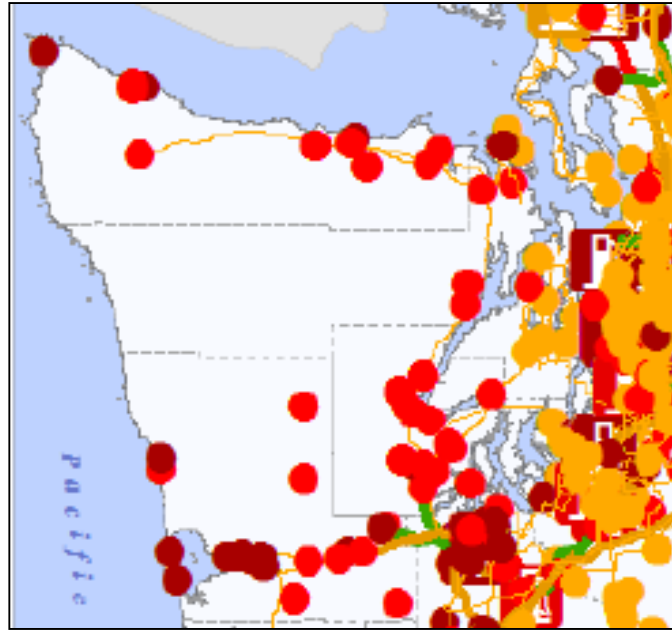


93% of hospital capacity west of I-5 will require full or partial evacuation.

No senior/DD living facility capacity remains west of the I-5 corridor.

no damage ● ● ● ● ● *completely destroyed*

UTILITIES



ELECTRICAL GRID

100% will be severely damaged or destroyed.

It may take up to 1 year to restore service to 90 % of the current demand.

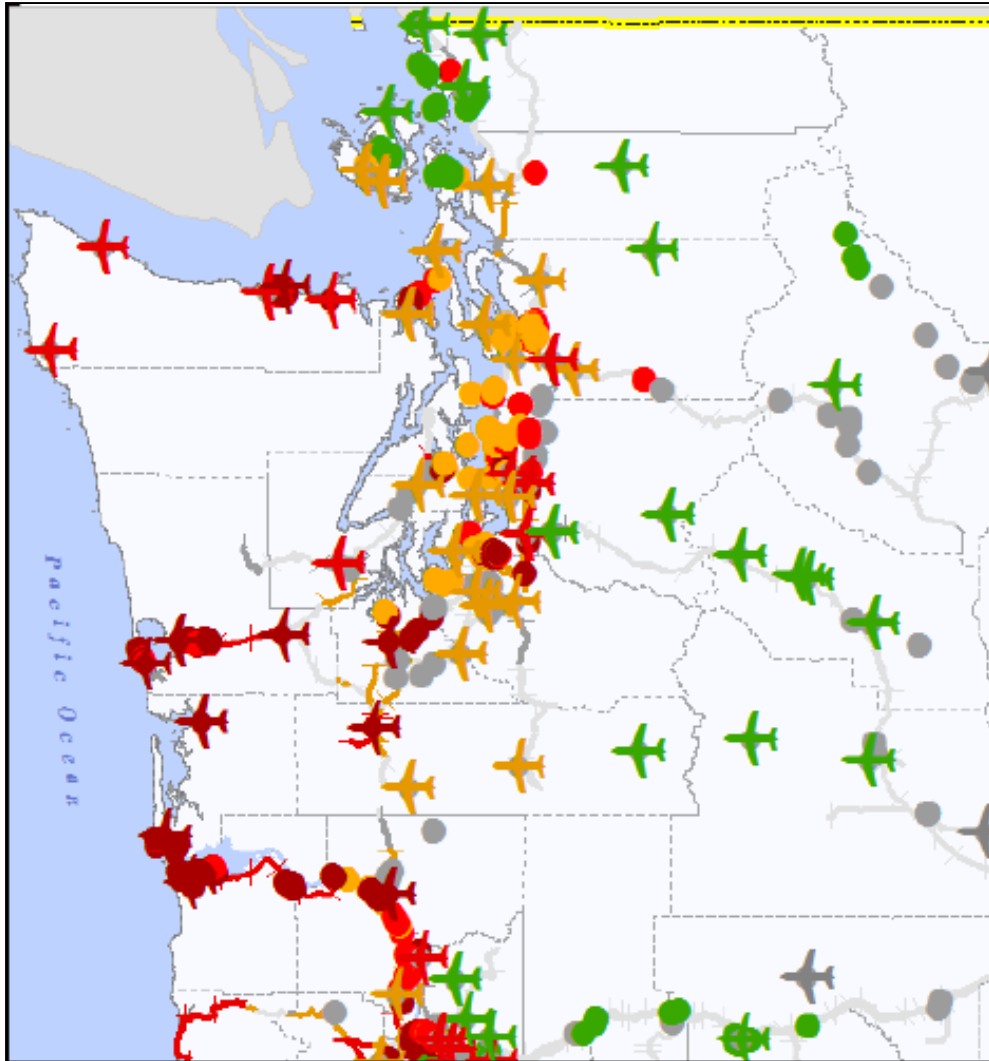
WATER AND SANITARY SEWER

100% of water systems will be severely damaged or destroyed. 67% of water may be restored as power is repaired. 33% must be rebuilt.

44% of sewer systems may be restored as power is repaired. 56% must be rebuilt.

no damage ● ● ● ● ● *completely destroyed*

AIR TRANSPORTATION



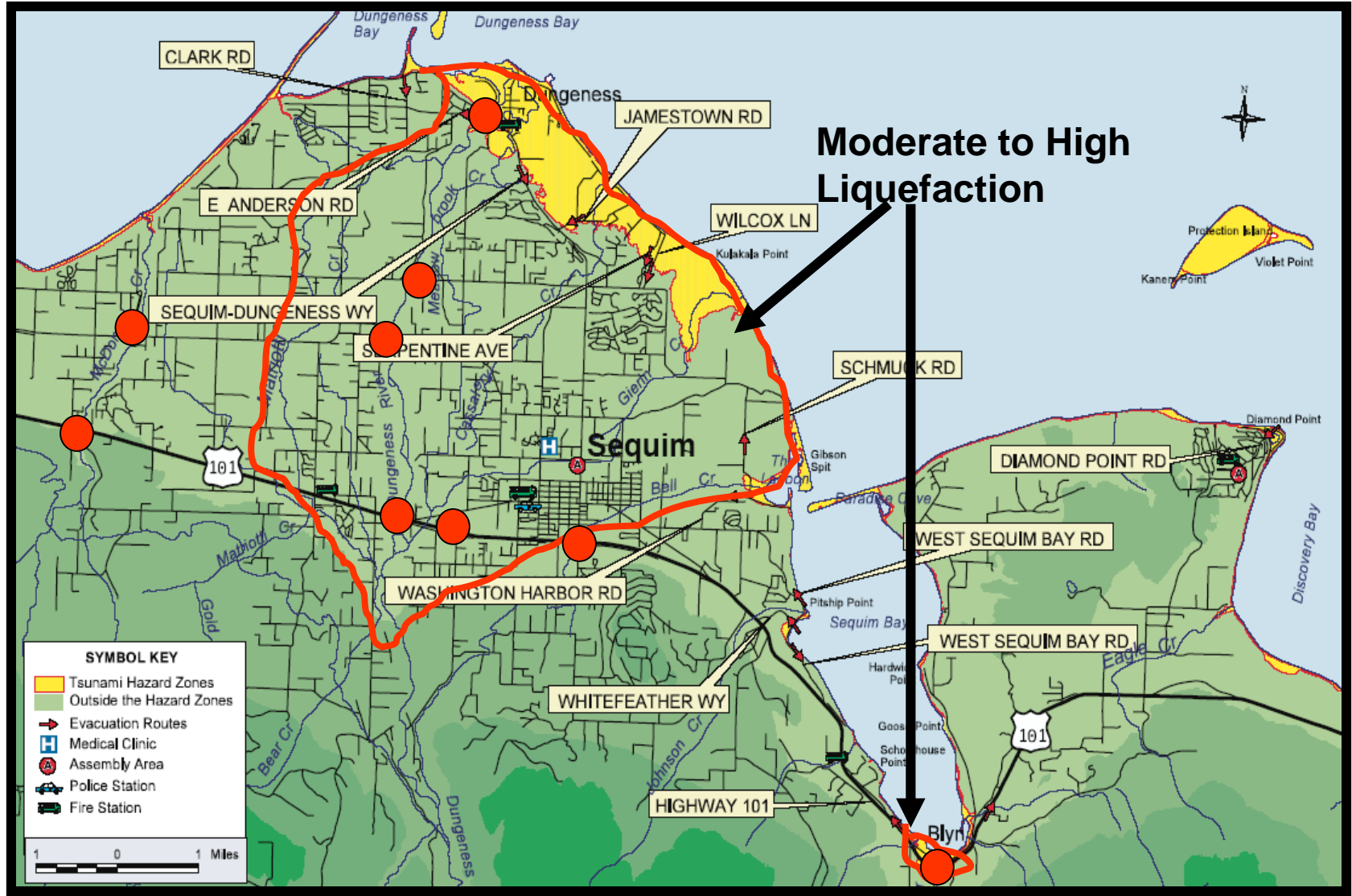
Most airport structures* west of the I-5 corridor suffer complete to severe damage.

Most airport structures* along the I-5 corridor suffer severe to moderate damage.

*high probability runways intact

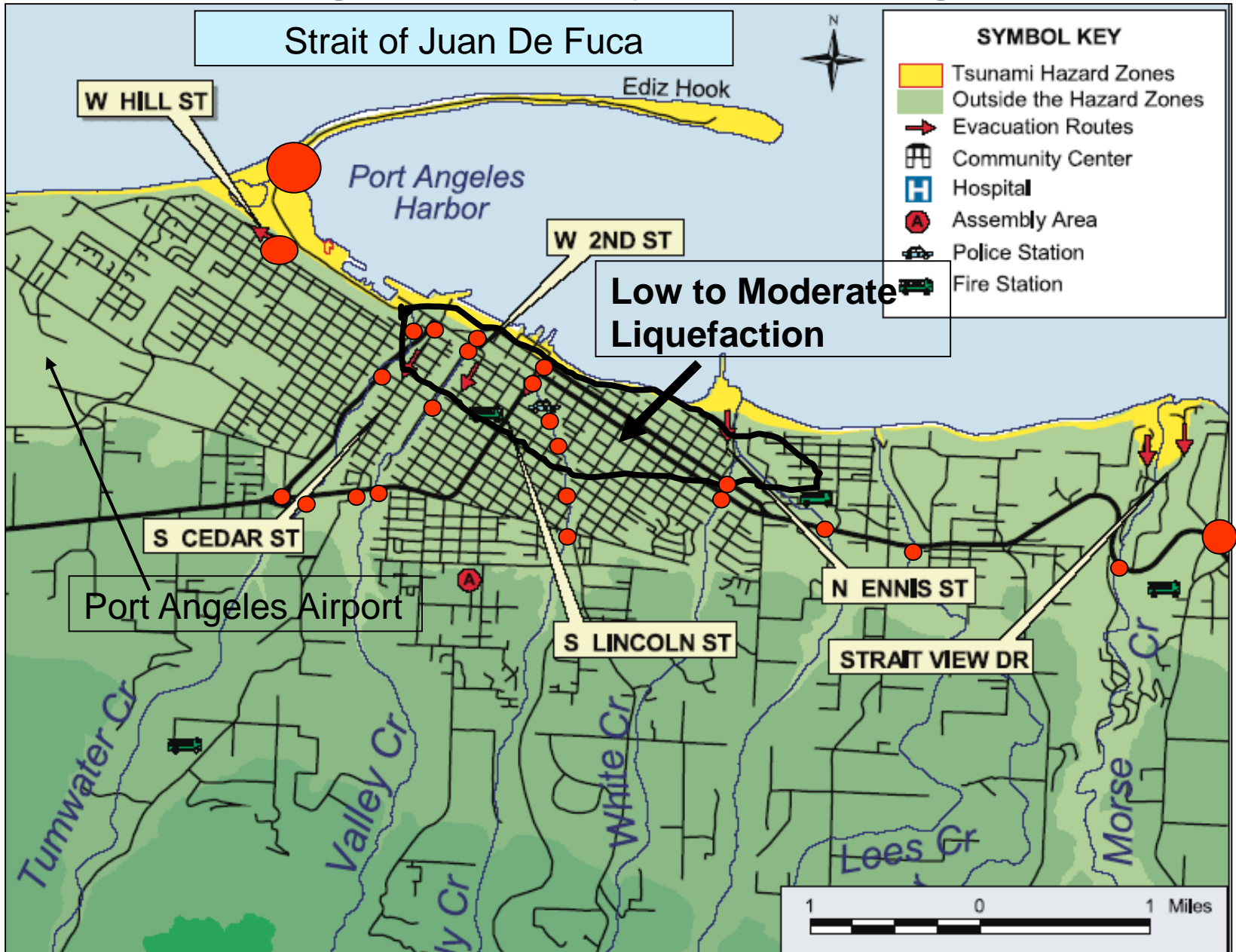
no damage ● *severe damage* ● *moderate damage* ● *severe damage* ● *completely destroyed*

Damage Summary – East Clallam



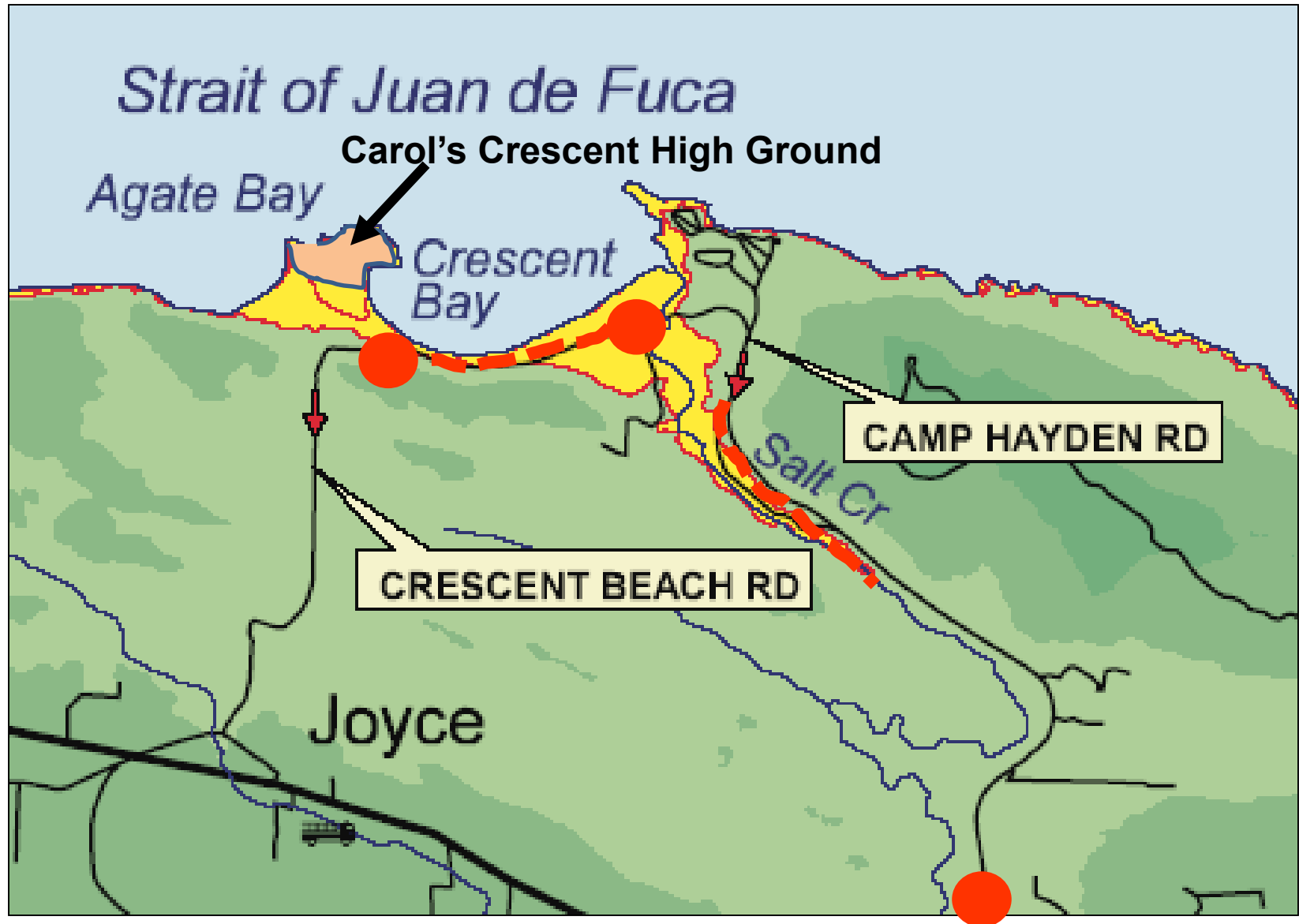
● Red Dots = Destroyed/damaged Bridges

Damage Summary – Port Angeles



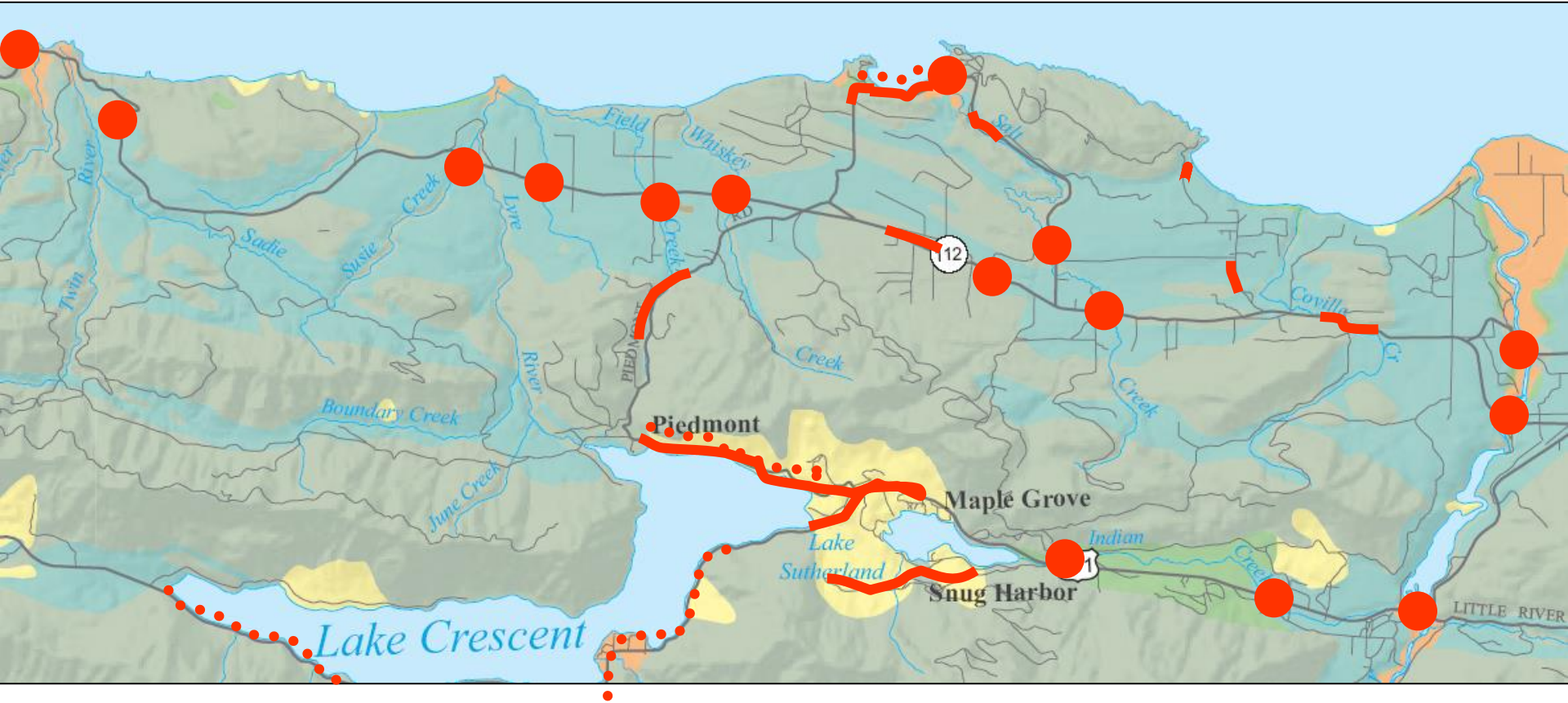
● Red Dots = Destroyed/damaged Bridges

Damage Summary – Salt Creek



● Red Dots = Destroyed/damaged Bridges

Damage Summary – Elwha to Twin



● Red Dots = Destroyed/damaged Bridges

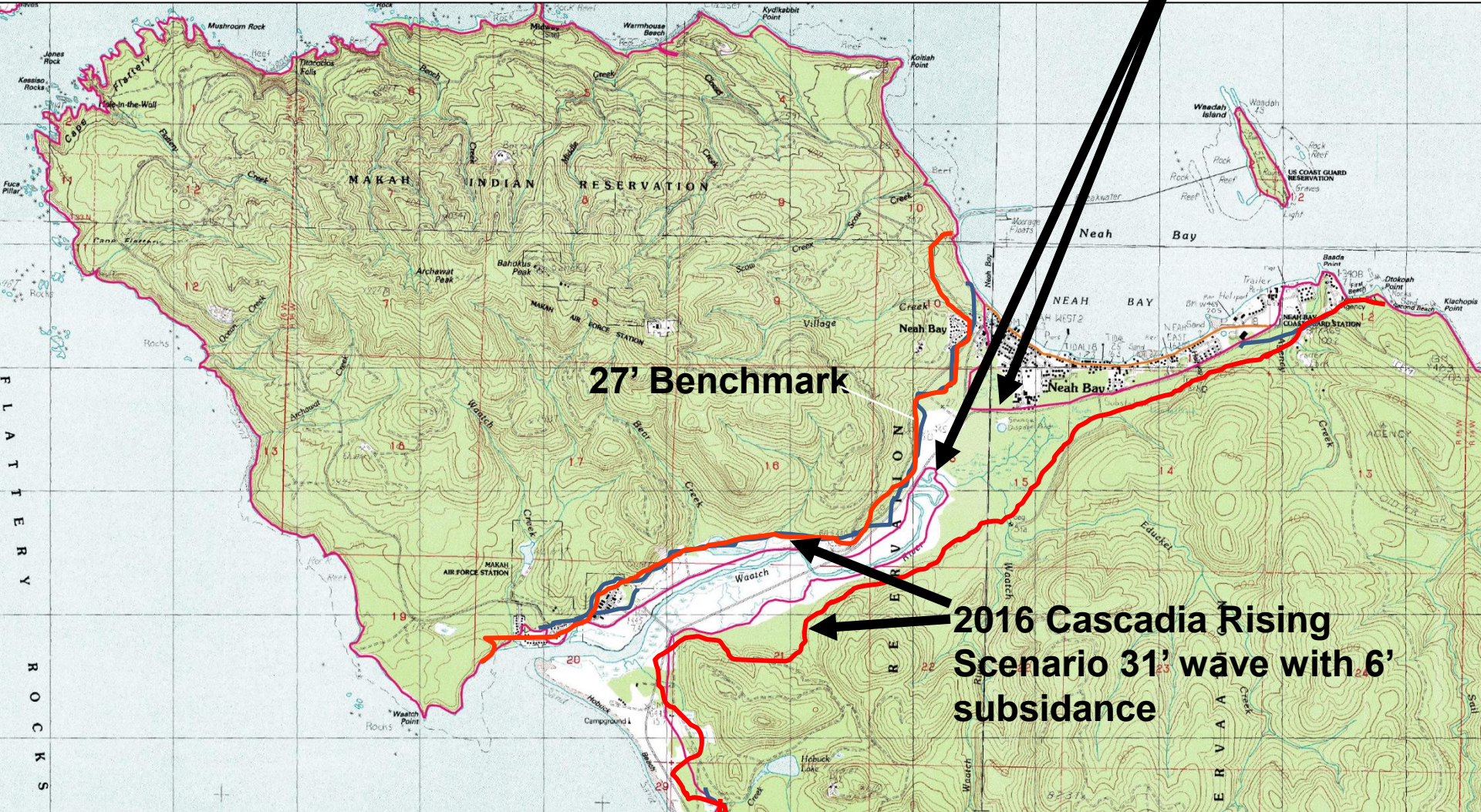
Damage Summary – Clallam Bay/Sekiu



● Red Dots = Destroyed/damaged Bridges

Damage Summary – Neah Bay

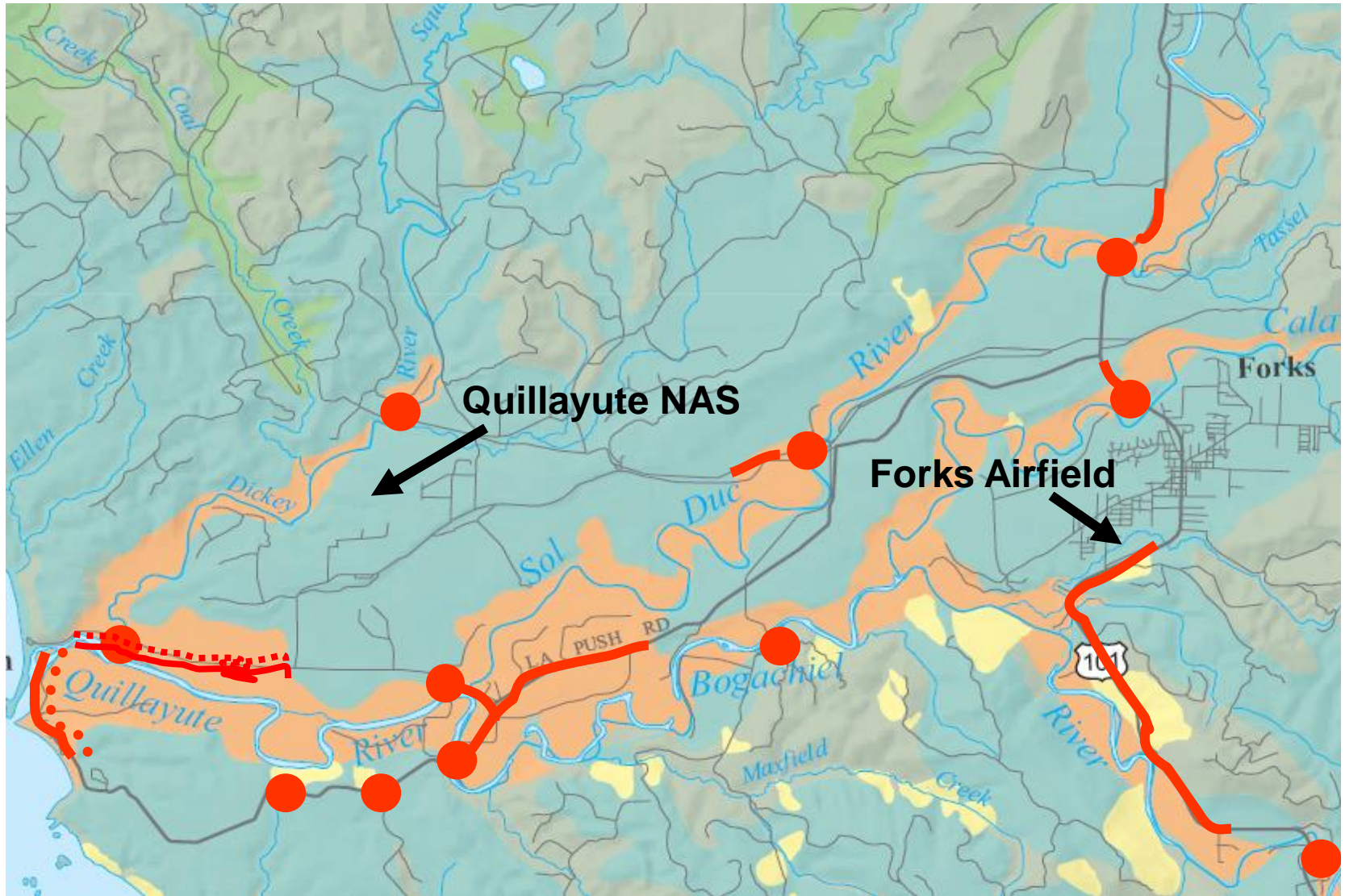
2006 Animation of Predicted 10' tsunami and wave runup



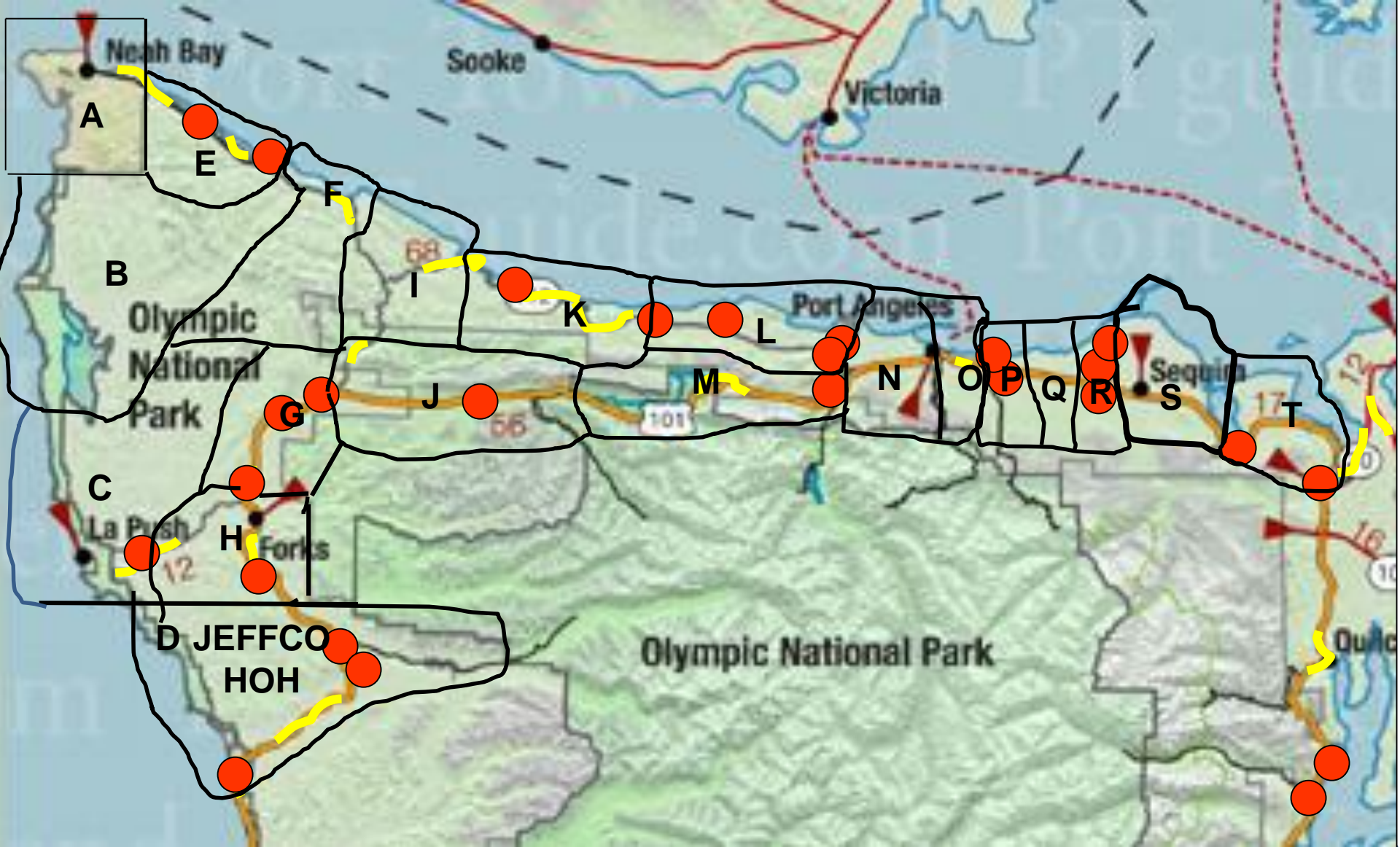
27' Benchmark

2016 Cascadia Rising Scenario 31' wave with 6' subsidence

Damage Summary – Forks/La Push



● Red Dots = Destroyed/damaged Bridges



Damaged roads and bridges divide the county into at least 20 micro-islands.



IS HELP COMING?

How soon will help come?

When will it get here?

Who will it be?

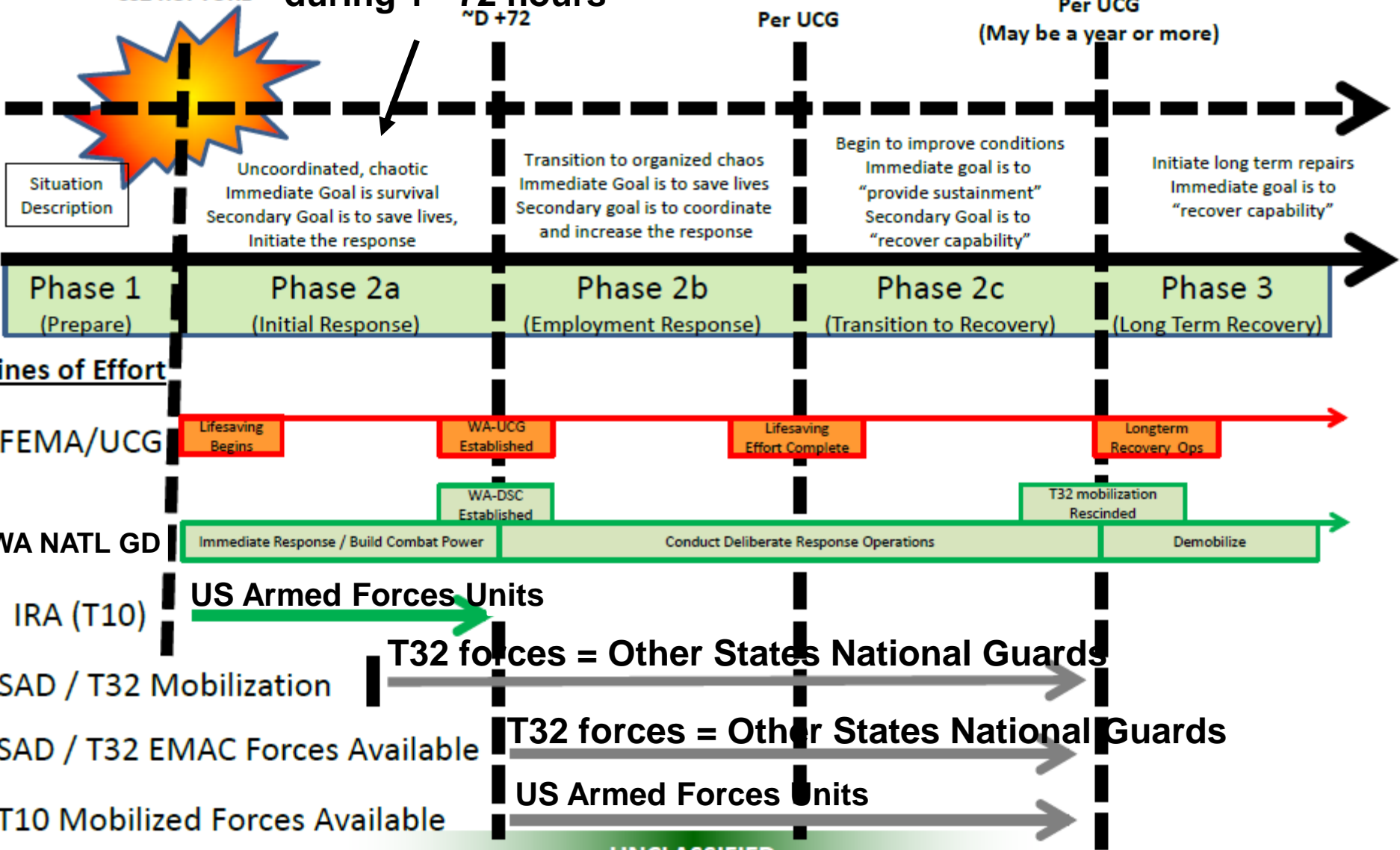




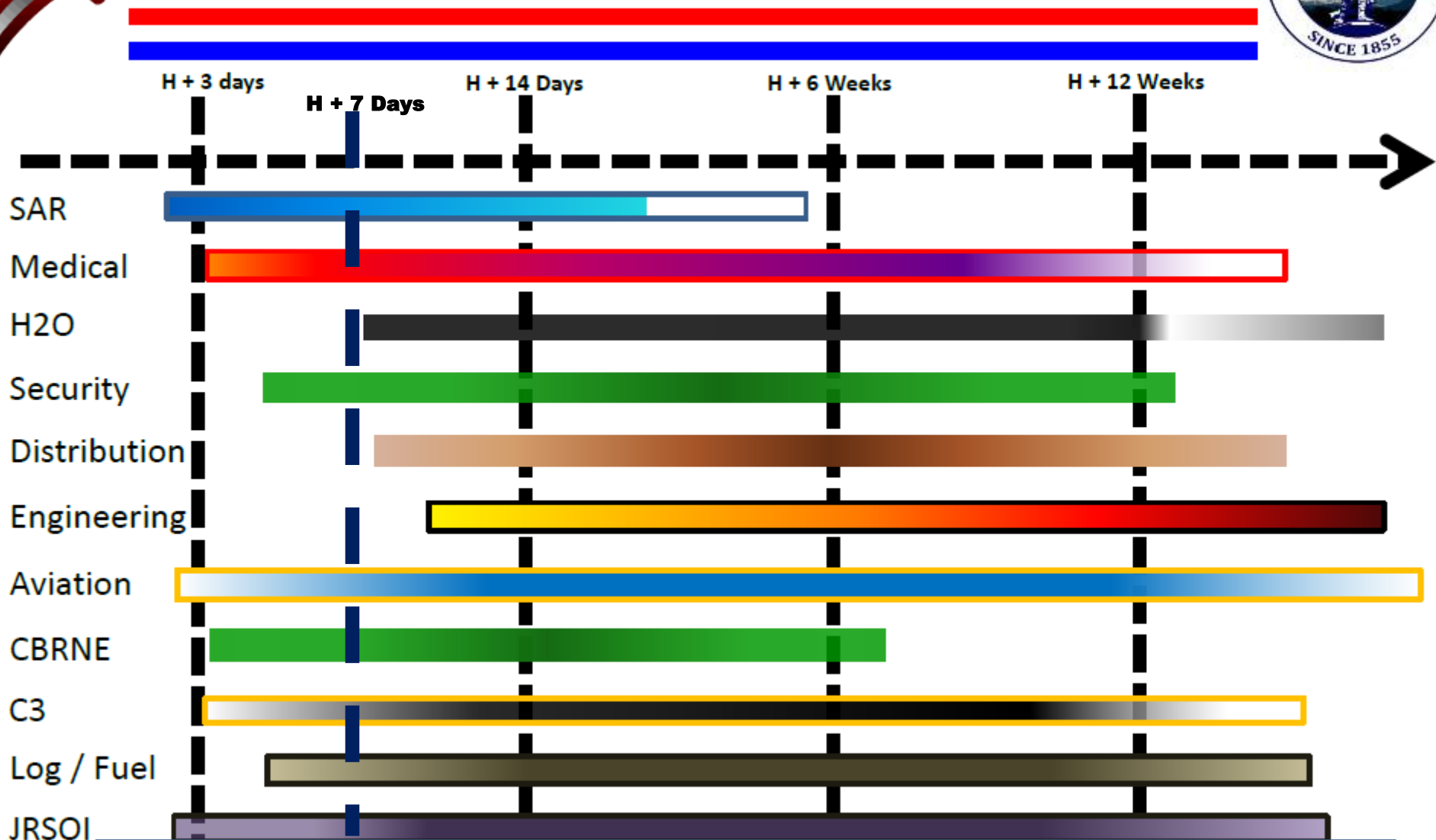
FEMA Phases

CSZ RUPTURE
Not much help during 1st 72 hours
~D +72

Per UCG
Per UCG (May be a year or more)



Lines Of Effort



Clallam County efforts must focus on the first 4 weeks of the emergency. Consideration of seasonal weather is essential to rescue and shelter.

Given the loss of roads/bridges, an air-bridge is the fastest way to bring help

The Tiered Air Base Concept

Tier 1 Airbase – 747/C-5A capable with ground support and logistics facilities (SEATAC)



Tier 2 Airbase – C17/C130 capable with ground support and logistics facilities (Fairchild and Quillayute NAS)



Tier 3 Airbase – Small plane and helicopter capable (Sekiu, Sequim, Forks, Port Townsend and Diamond Point)

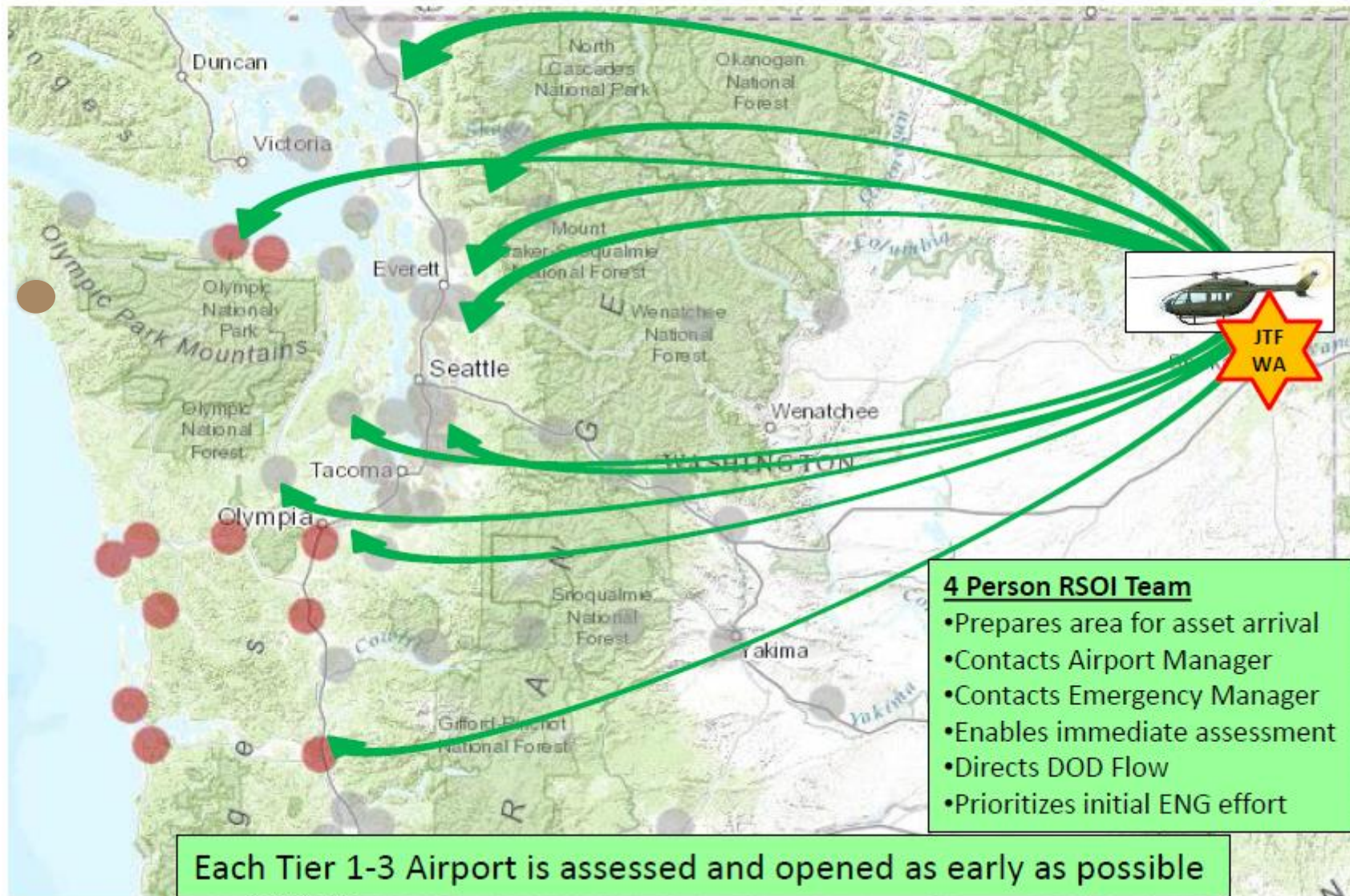


Tier 4 – Helicopter capable (a helicopter landing zone)





Rapid Assessment / Early Opening



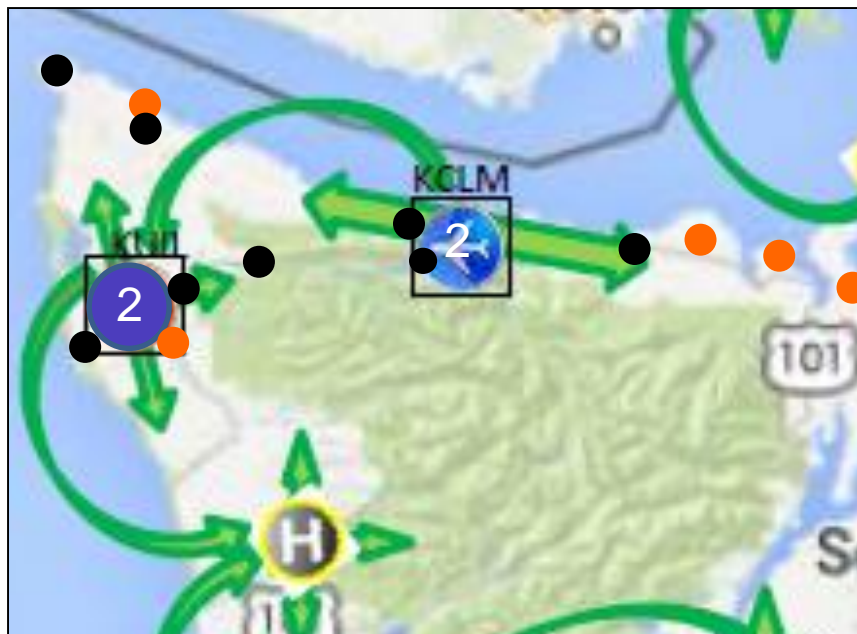
Establish Tier 2 Bases



● Green dots = Tier 1 Airfields

● Blue dots = Tier 2 Airfields

Establish Tier 3 and 4 Bases



Tier 3 bases (Orange dots ●) at Sekiu, City of Forks, Sequim and Diamond Point

Tier 4 heliports (Black dots ●) at Neah Bay, LaPush, Beaver, Hungry Bear, Shadow Mtn Store and Voice of America

Distribution from these bases to Tier 5 Community Points of Distribution (CPODs) will be by ground or boat transport with locations determined daily by the EOC.

Clallam County Responsibility to Prepare for Tiered Bases

National Level
"Point of Origin"

The county's EMD Plan is addressing how to meet our responsibility to support the tiered bases.



Tier 2

- Based on existing airports
- 2nd largest capability (C17/C130)
- Identified now
- Preplan usage
- Pre-coordinate design
- Serves as log base and RBC
- Provides distribution to local communities



RBC – Responder Base Camp – Third level of FEMA basing. This is where out-of-state responders are based upon arrival. These are the State's responsibility to manage.

CPOD – Community Point of Distribution - This is the final step in the logistical distribution. It is the responsibility of the local EM / IC to coordinate.

Tier 3

- Based on existing airports
- 3rd largest capability (<C130)
- Identified now
- Preplan usage
- Pre-coordinate design
- Serves as log base and RBC
- Provides distribution to local communities



Tier 4

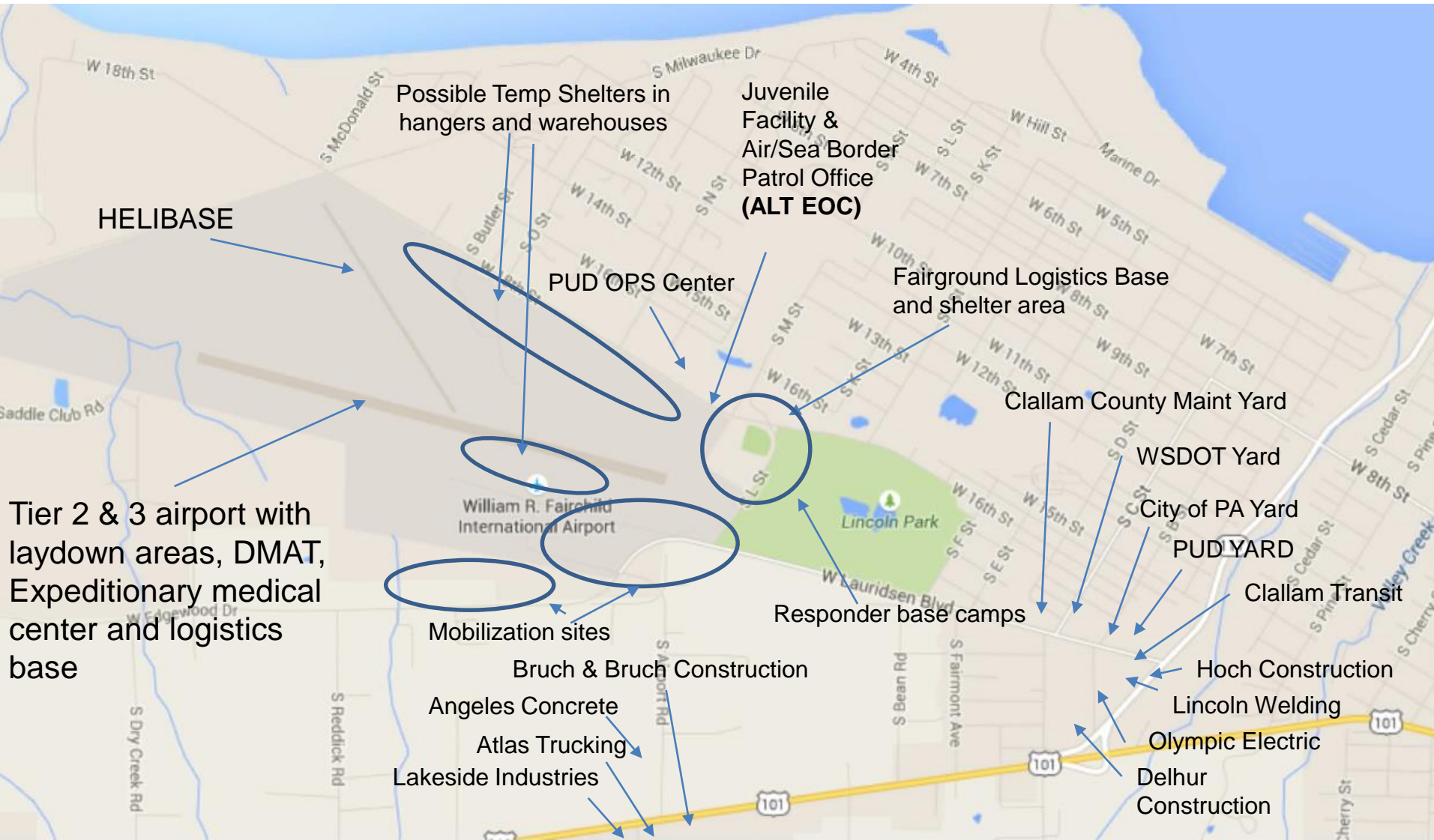
- Rotary Wing / Vertical Lift
- Same capabilities, less capacity
- Location selected ICW local EM
- Template now, confirm later



Tier 5

- Final Point of Distribution
- Identified by Local EM
- Established daily

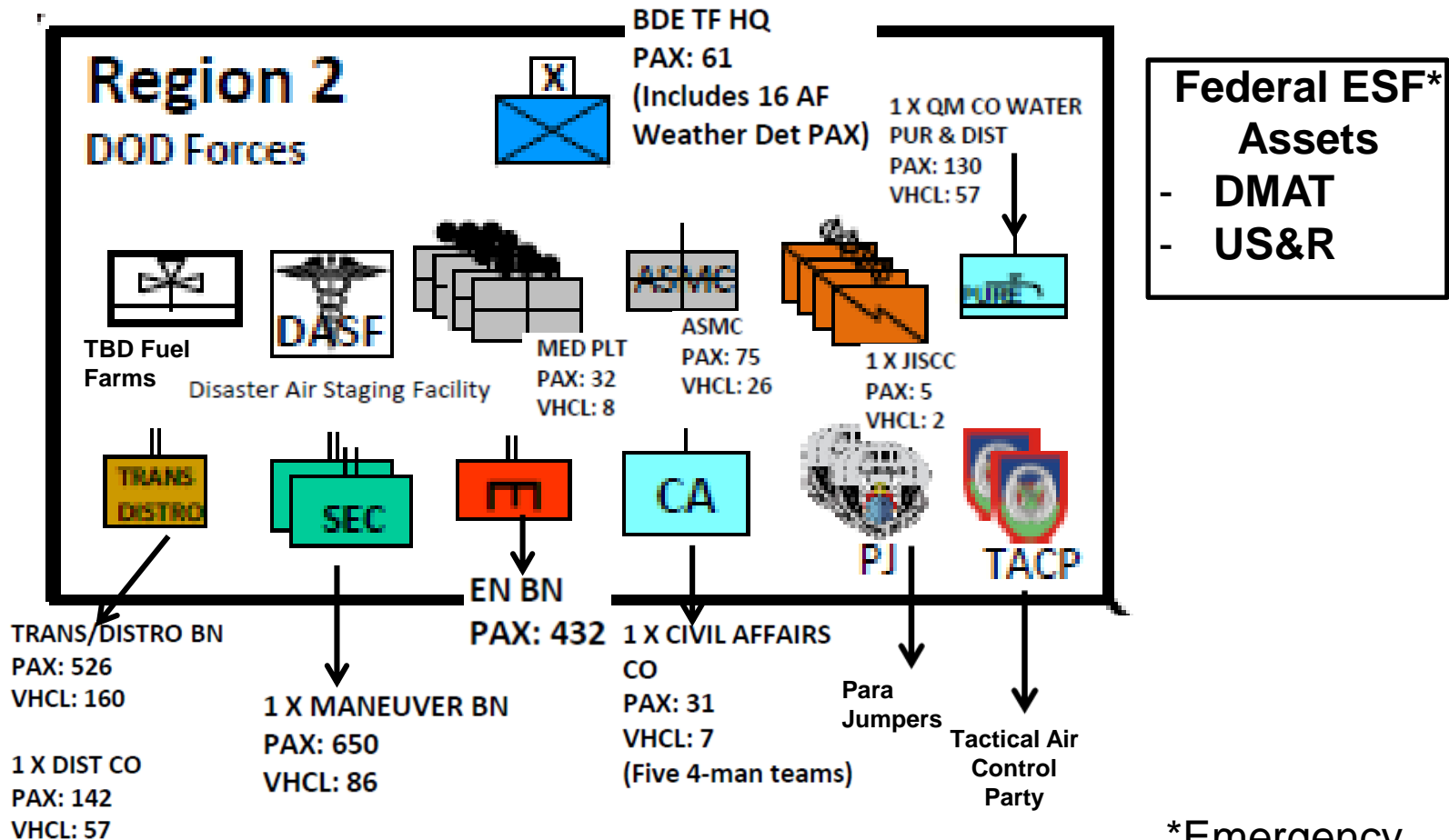
EMD Plan for William F. Fairchild Tiered Airbase



The airfield is on good ground above the tsunami zone. It's proximity to government facilities and businesses along with ample fenced areas make it the logical choice for the county logistics base.

WHO IS COMING TO HELP???

DOD TASK FORCE COMPOSITION FOR REGION 2



*Emergency Support Functions

Maritime Response (1st MEF)

Washington's Plan for Maritime Support

1. Will land at Two locations

1. The force landing at Grays Harbor will support the local community. Route Clearance operations will focus on opening land lines of communication in the area.
2. The force landing at Port Angeles will support the population. Route Clearance operations will focus on opening land lines of communication in the area.

2. Each location will require

1. Medical
2. Motor Transport
3. Bulk Fuel
4. Route Clearance
5. Water Purification





Does Clallam County have a plan?

YES

CASCADIA SUBDUCTION ZONE (CSZ)

- Creates detailed maps showing community “ground truth” assessments
- Proposes a novel approach that allows faster emergency response in each island with accessible resources.
- Uses Clallam County Emergency Management Department ground truth documents to brief the state/federal advance teams
- Complies with National Incident Management System (NIMS)

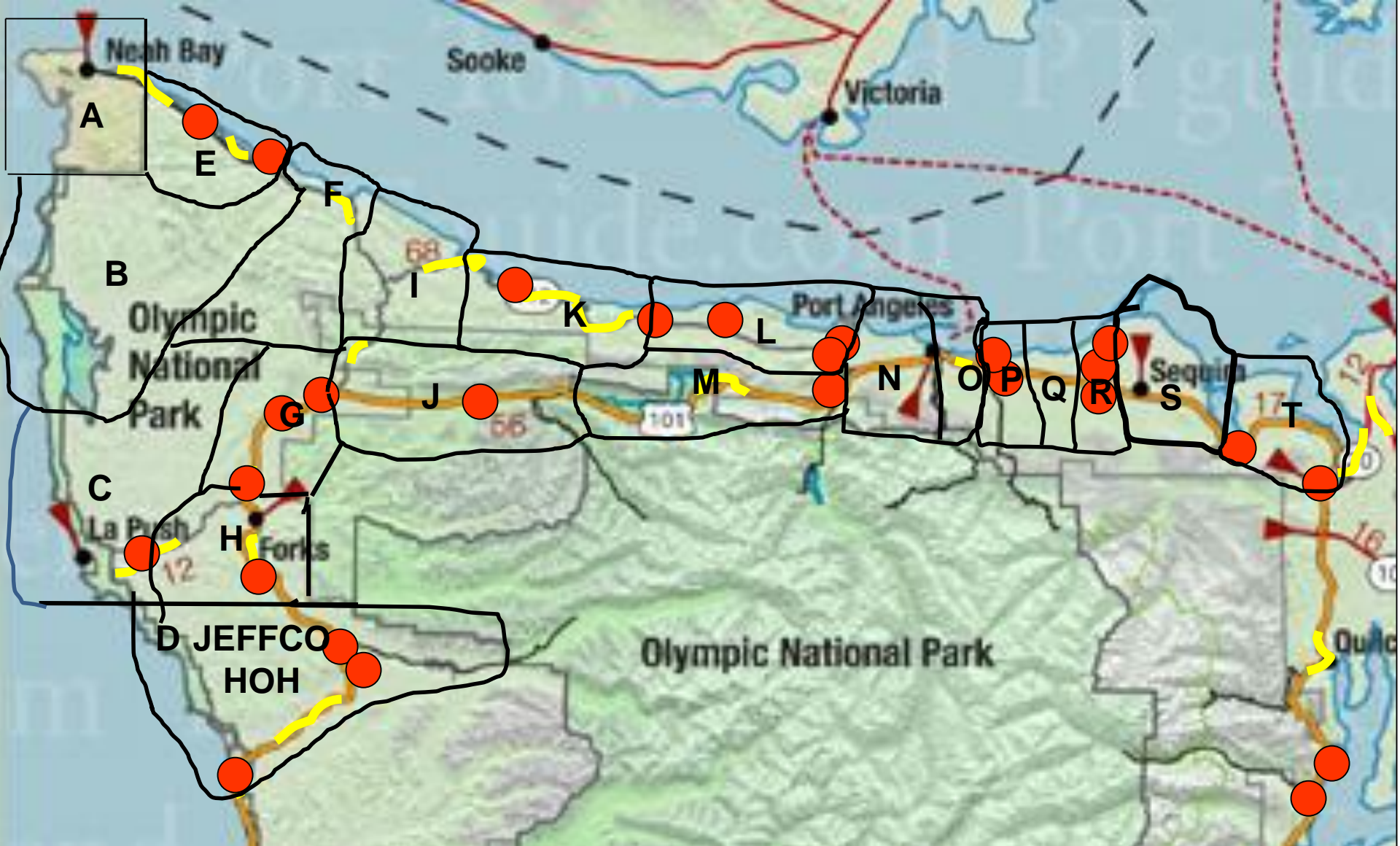
Sample Page from Clallam Bay Micro-island Ground Truth and CSZE Response Plan

MP 17.208 (Peterson Road) to MP 15.582 (Breakwater Inn) Sections of HWY 112 are subject to liquefaction in the river bottom. A tsunami in the 30' range is expected within forty minutes of the earthquake. HTRAC study predicts most of roadway will fissured or displaced from 3" or more. Closest high ground is south of Seventh Street and the main building of the Clallam Bay School. Landslides are possible between MP 16.571 to MP 15.800.



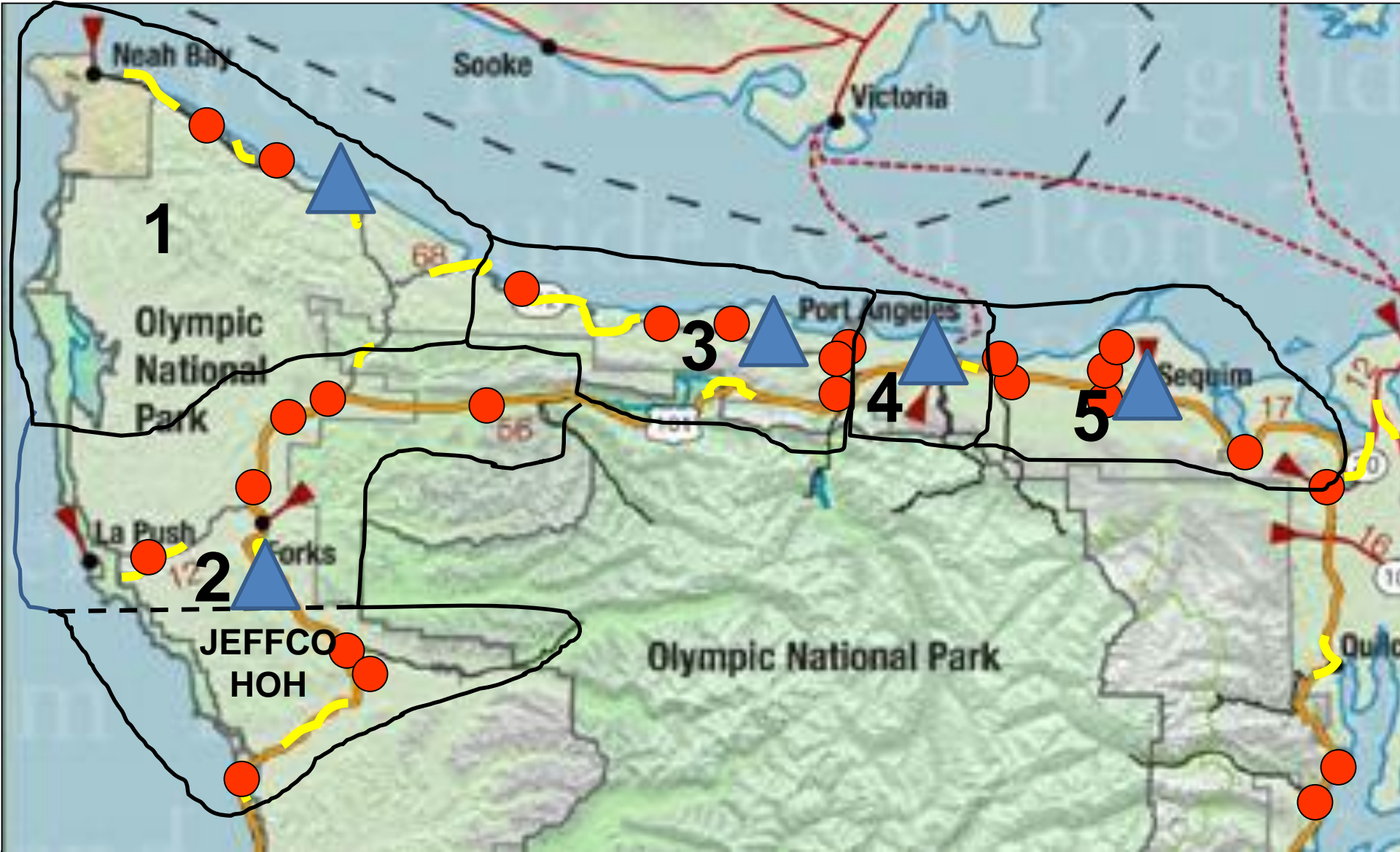
 = Tsunami Inundation

 = Landslide Hazard



Damaged roads and bridges divide county communities into at least 20 micro-islands.

(Divisions in our Incident Command System).



The EMD plan organizes the micro-islands into 5 Area Commands. Area Command Centers in Clallam Bay, Forks, Joyce, Port Angeles and Sequim manage rescue and response and report to the county EOC.

AREAS OF COMMAND for CLALLAM COUNTY, WA

COMMAND AREA 1 5 islands	COMMAND AREA 2 5 islands	COMMAND AREA 3 3 islands	COMMAND AREA 4 2 islands	COMMAND AREA 5 5 islands
DIV ALPHA - Neah Bay/Makah Nation DIV BRAVO - Ozette DIV ECHO - Shipwreck Point DIV FOXTROT - Clallam Bay DIV INDIA - Pysht	DIV CHARLIE - La Push / Quileutte Nation DIV DELTA - East Jeffco/Hoh Tribe DIV GOLF - Beaver DIV HOTEL - Forks DIV JULIET - Bear Creek	DIV KILO - Pillar Point DIV LIMA - Joyce DIV MIKE - Indian Valley	DIV NOVEMBER - Port Angeles West / Lower Elwha Klallam Tribe DIV OSCAR - Port Angeles East	DIV PAPA - Deerpark* DIV QUEBEC - R Corner DIV ROMEO - Carlsborg DIV SIERRA - Sequim DIV TANGO - Diamond Point, Gardiner, Blyn, Jamestown S'Klallam Tribe
FD#5, NEAH BAY TRIBAL POLICE, CCSO, CBP	FD#1, FD #6 FORKS PD, CCSO, CBP	FD#4 CCSO, CBP	FD#2, PAFD PAPD, CCSO, CBP	FD#3 SEQUIM PD, CCSO, CBP
** 1,770	** 4,777	** 3,649	** 23,368	** 33,558

Concept: "Areas of Command" are created after CSZ earthquake occurs divid-ing county into "micro-islands" of response because of highway/bridge damage, landslides & soil lique-faction. Concept based on FEMA HITRAC (Homeland Infrastructure Threat & Risk Analysis Center) Study completed 2011.

*Mutual Aid Area with FD#2
**population impacted



20 islands total

EMD and Washington National Guard Tour of Clallam County Dec 14-17, 2015

Abbreviated Notes:



- Clallam Bay Prison: Security concern (800+ inmates), limited resources (2 days food supply), would be in need of immediate SECFOR, has adequate space for HLZ and tent area, small air strip in Seiku for HLZ and small fixed wing

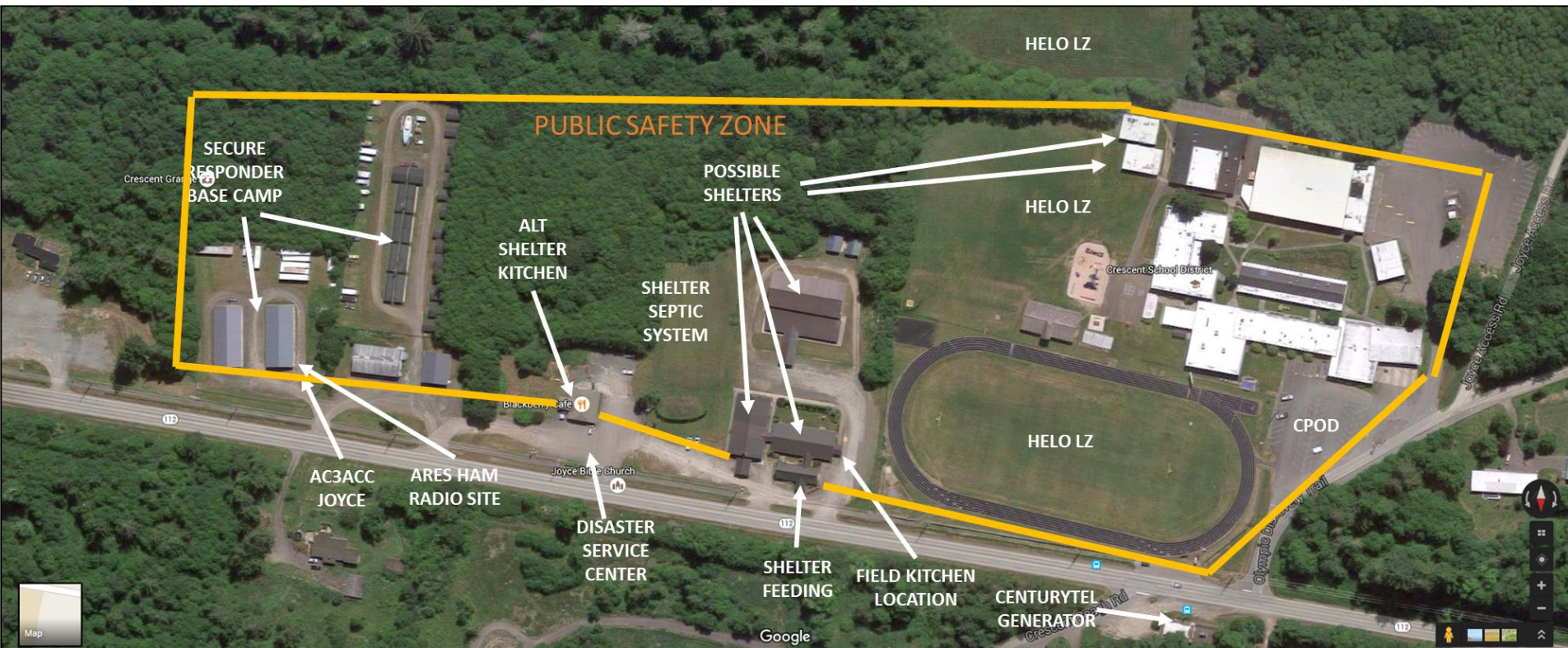
- Meeting with Makah Tribe: Sovereign Nation, discussed MOU/MOA, Tribe is planning and preparing for CRZ event, Tribe initially hesitant about military LNO, has area for HLZ



- Clallam Bay meeting: DOC, Fire, School Dist., Public Health; Sanitation concerns, Prison SAR, Community Education

- Joyce Area, a small community making preparations locally, doing well on education and community involvement, in initial phase of acquiring storage for supplies and emergency equipment

Area Command 3 Joyce – ACC* and Service Area



Above “bird eye” view shows key facilities located in Joyce ACC & Service Area

- Detailed Shelter, Feeding, Kitchen, CPOD and Responder Base Plans are being assembly and reviewed with the community and civic groups

In Summary



How Can you help?

- Provide recognition and approval of this EMD plan approach
- Direct county departments to align with this plan
- Direct EMD to work in partnership with our local communities in developing detailed operational plans for Area Commands
- Support our continued efforts to liaison with State, Federal and Tribal Agencies
- Schedule further updates on the plan's progress by islands and Area Commands