Cascadia Subduction Zone Earthquakes:

A Magnitude 9.0 Earthquake Scenario

Clallam County and City of Port Angeles Assessment

Source – Ed Taylor – Sep 2015 Governor's Safety Conference

CASCADIA RISING

Ring of Fire

The Ring of Fire accounts for 90% of all earthquakes, and 81% of the world's largest earthquakes

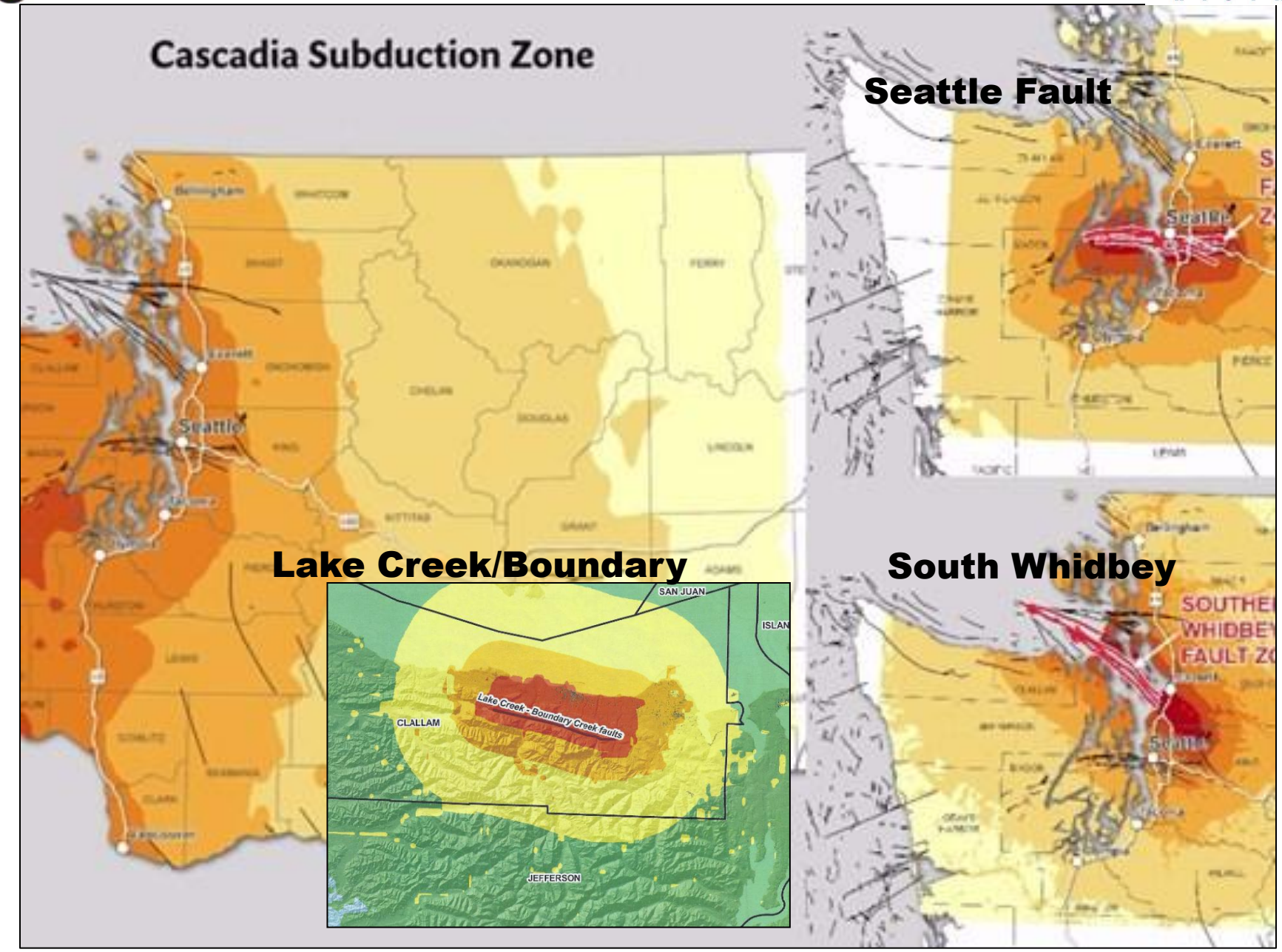
Subduction zones are shown in red

The CSZ fault line is part of the Ring of Fire

The CSZ is the only significant fault line on the Ring of Fire <u>without a major quake in the last 50 years</u> (see blue stars)

The last event on the CSZ was Jan. 26, 1700 -- over 317 years ago.

4 Key Earthquake Faults for Clallam



Cascadia Rising 2016 Exercise

HITRAC*

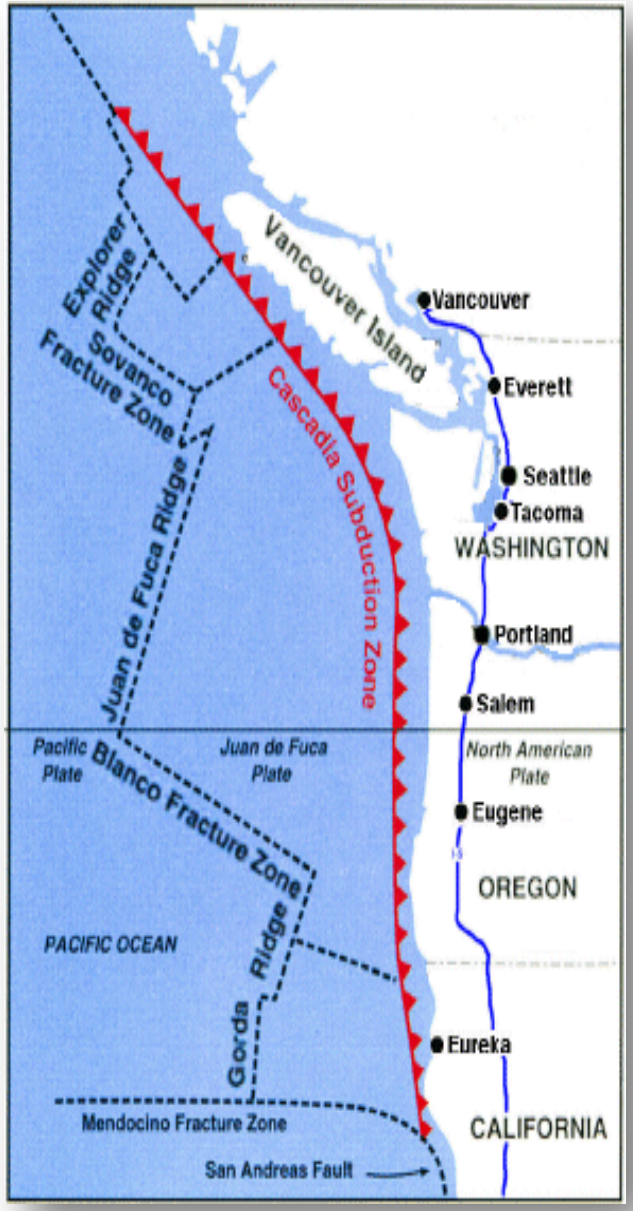
Based on FEMA modeling studies the exercise used the following assumptions:

CSZ **9.0 Richter M** Earthquake & Tsunami

Modelled impacts:

- Direct Impact to 3 States and British Columbia
- Complete rupture of the 800-mile Fault Line
- Impacts affecting over 140,000 square miles
- **Ground shaking lasts up to 5 minutes**
- Numerous **aftershocks** with several of **M7.0**+
- Modelled estimates: 1,000 fatalities from earthquake; 12,000 fatalities from tsunami; 30,000 injured.

*DHS 's Homeland Infrastructure Threat and Risk Analysis Center



What it Didn't Address

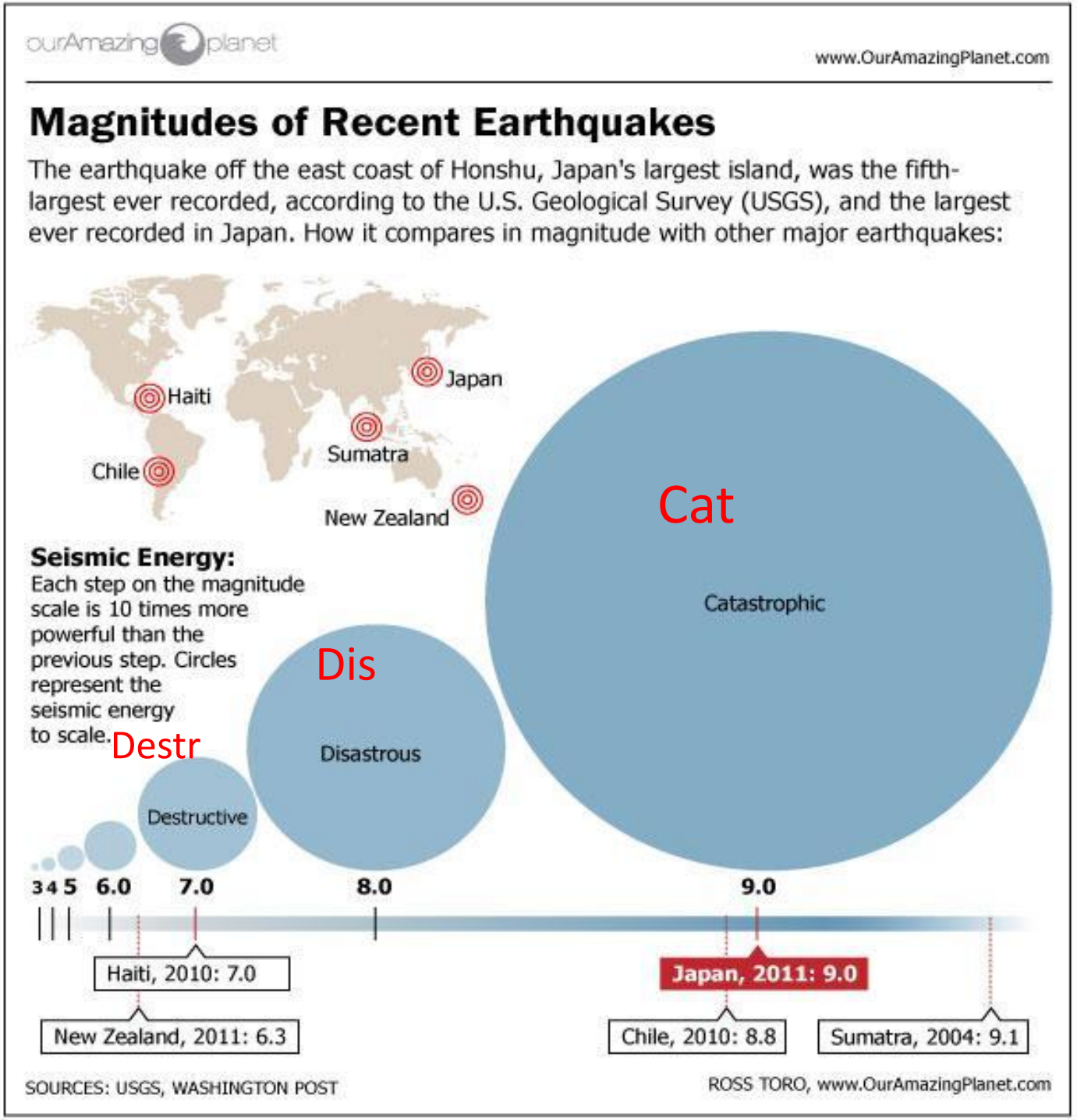
- Landslides
- Avalanches
- Aftershocks
- Aftershock Tsunamis
- Propane Leaks
- Fires
- River Flooding
- Hazardous Materials
- Contamination
- Lack of Food & Water
- Disease
- Exposure

Source – Ed Taylor – Sep 2015 Governor's Safety Conference

CASCADIA RISING

CASCADIA SUBDUCTION ZONE (CSZ)

9.0 Richter Magnitude Quake will be 100 times more powerful than the 6.8 Nisqually earthquake in 2001.



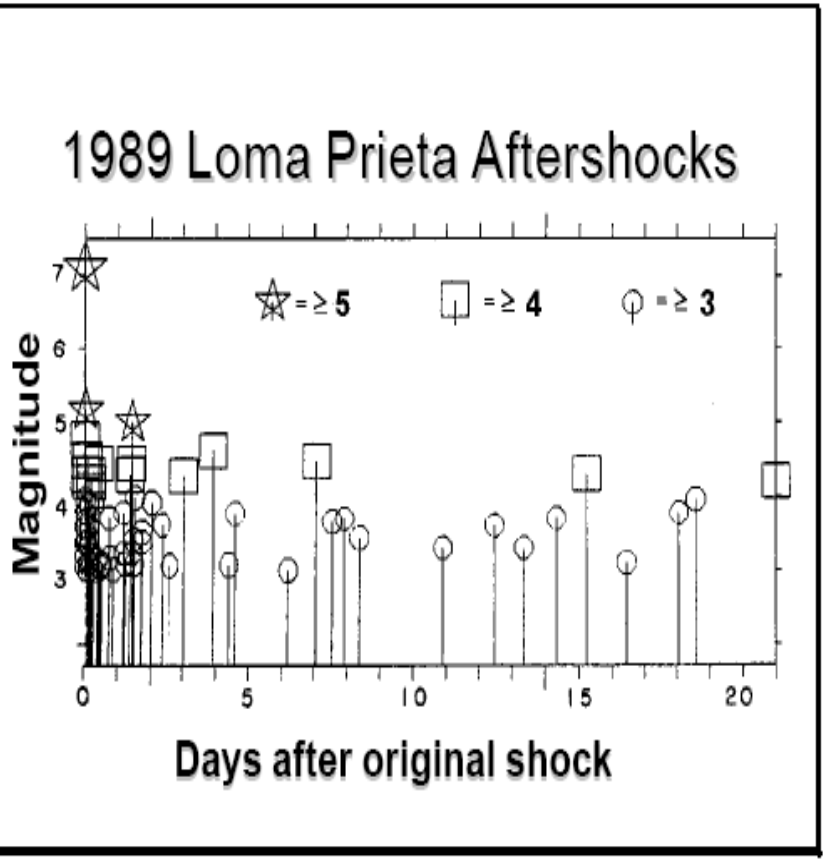
Earthquake Aftershocks

CASCADIA RISING
CASCADIA SUBDUCTION ZONE (CSZ)

In the first week of a 9.0 Richter Scale Earthquake there will be one 8.0+ and ten 7.0+ Aftershocks

How Many Aftershocks ?

- USGS - Rule of Thumb
  - For every single decrease in magnitude, get 10 fold increase in number
- If original quake is M 7
  - 1 or so aftershock in range of M 6
  - 10 " " " " 5
  - 100 " " " " 4
  - 1000 " " " " 3



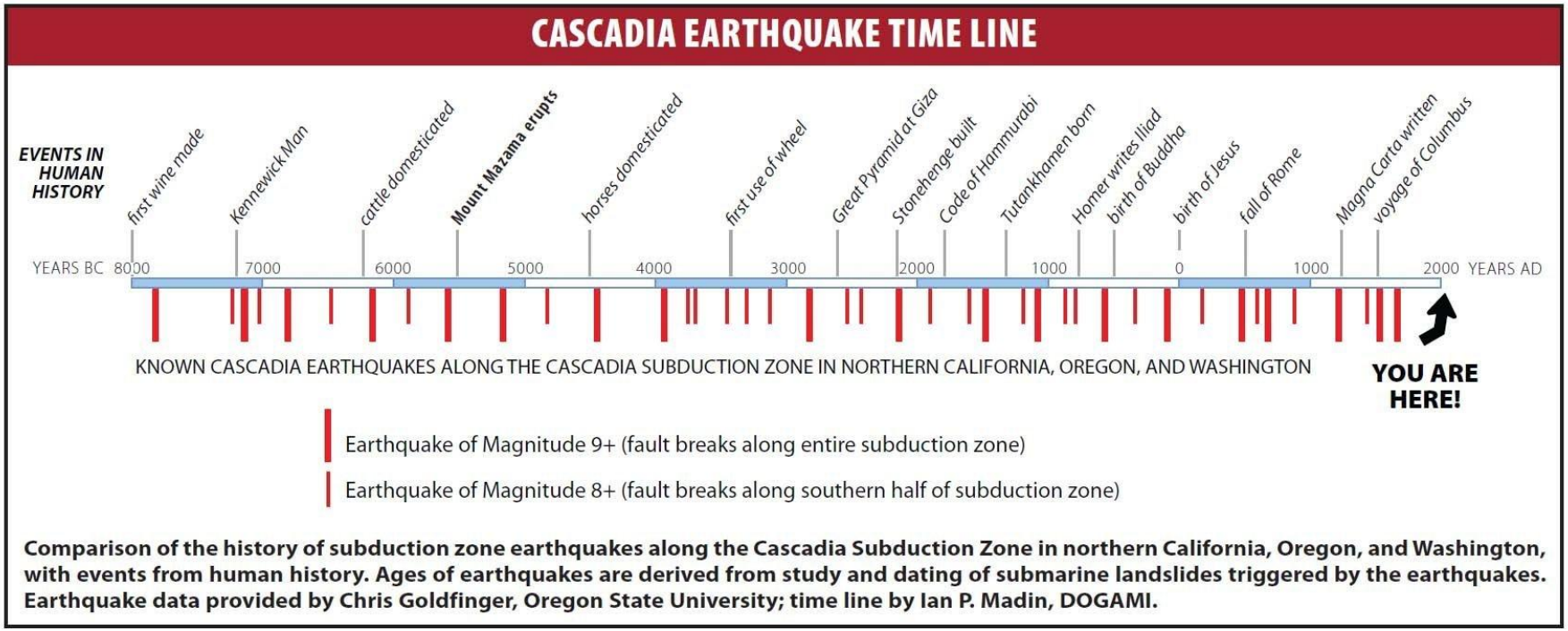
CITY OF SEQUIM

Source: USGS

Emergency Management

Chance of Earthquake

- There is a 33% chance of Casadia Subduction Zone (CSZ) Quake of 8.0 in the next 50 years (HiTrac 2013) and 10% chance of 9.0 or greater Quake (total risk 43% in 50 years, starting in 2016).
- There have been 19 Quakes of 9+; 22 Quakes of 8+ over last 10,000 years (average every 200 years)
- The chance of earthquake increases as other faults are considered particularly Lake Creek Boundary.
- Combining the risk of either Lake Creek Boundary Fault or a CSZ event raises Clallam County risk to higher than 50% in the next 50 years.



CASCADIA RISING

CASCADIA SUBDUCTION ZONE (CSZ)

CITY OF SEQUIM

Nisqually versus Cascadia

MAGNITUDE:

Nisqually quake: 6.8

Energy release equivalent to 17.6 million tons of TNT

Cascadia megaquake: 9.0*

Energy release equivalent to 35.2 billion tons of TNT.

* Cascadia figures are estimates from the Cascadia Rising scenario

	Nisqually	Cascadia
DURATION:	30-40 seconds	4-5 minutes*
	0 1 2 3 4 5 6 minutes	0 1 2 3 4 5 6
DEATHS:	1	13,000*
INJURIES:	400	30,000*
DAMAGES:	$2 billion	Over $80 billion*
BRIDGES DAMAGED:	66	7,000*
DISPLACED PERSONS:	120	915,000*

Sources: Cascadia Rising Scenario; Nisqually Earthquake Clearinghouse Group

MARK NOWLIN / THE SEATTLE TIMES

Latest Research and Lessons Learned from the Cascadia Rising Exercise indicated the assumptions used in the Cascadia Rising Scenario (left) under-estimated: shake time; level of casualties; monetary damage; bridges damaged and number of displaced persons by a 9.0 Richter scale event.

Megaquake closer to Seattle?

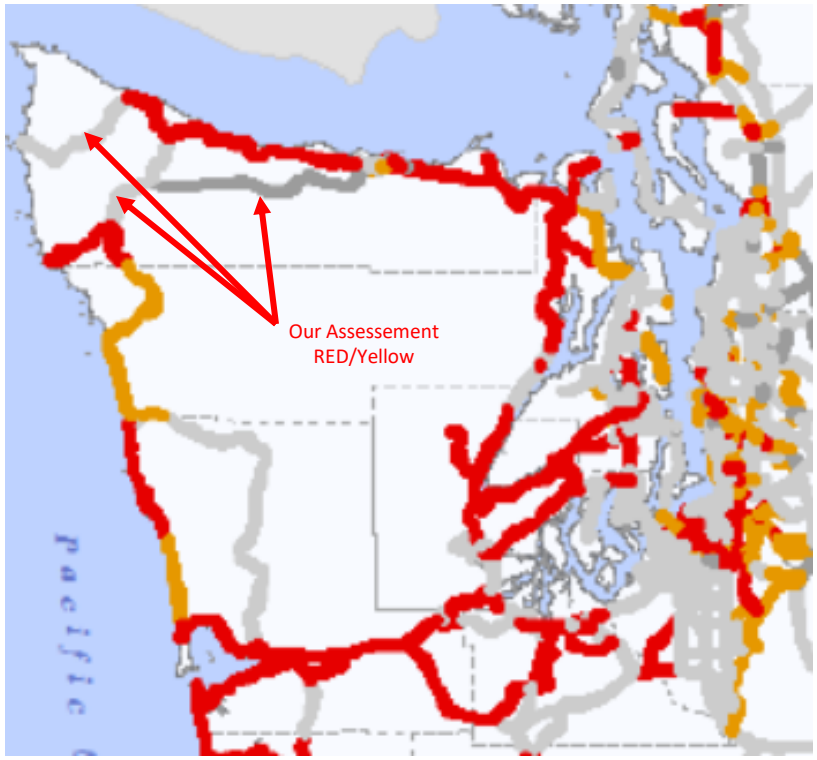
Early studies suggested the Cascadia Subduction Zone would rupture no closer to Seattle than line **"A."** But new research suggests the rupture could extend to line **"B,"** which would mean more shaking and destruction in urban areas.

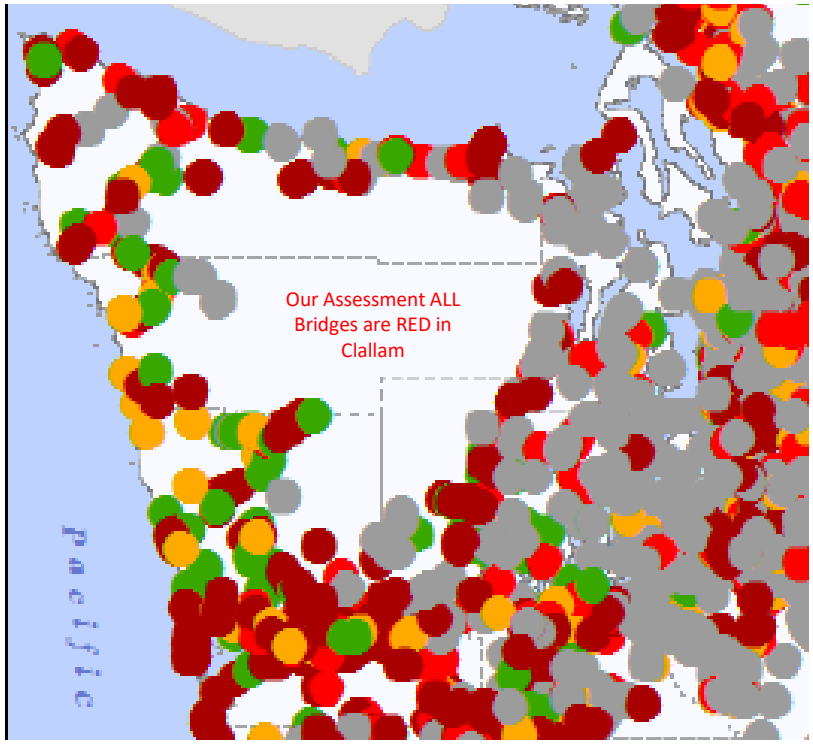
More information: *www.panga.org*

Source: Tim Melbourne, Central Washington University

Reporting by SANDI DOUGHTON
Graphic by MARK NOWLIN / THE SEATTLE TIMES

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.

unknown *completely destroyed*

HITRAC STUDY FEMA

HIGHWAY IMPACT
Damage Caused by Earthquakes

Christchurch New Zealand
November 14, 2016 7.8 Magnitude Quake

24” Displacement Vertical with 4-6 foot separation of the roadway

12” Displacement Vertical with 1-2 foot separation of the roadway

HIGHWAY IMPACT

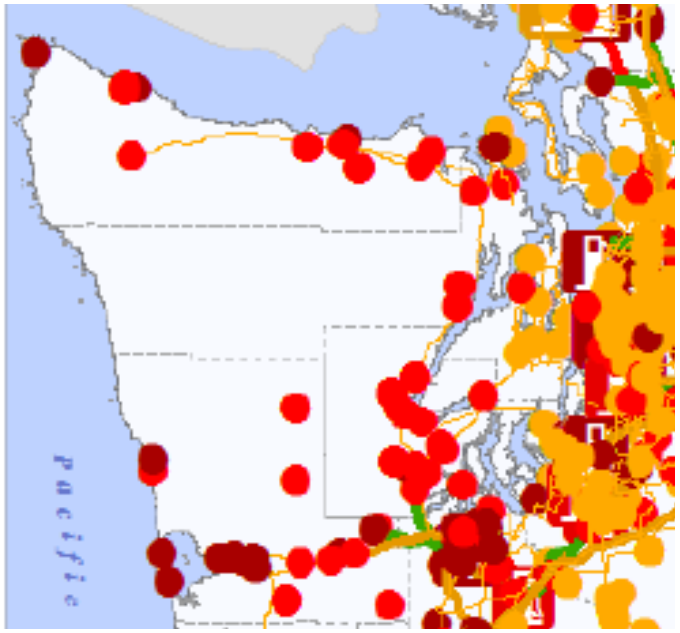
Landslides Caused by Earthquakes

Hwy 112 - 2009

Some Areas at Risk:

- Morse Creek
- Highway 112
- Highway 113
- Lake Crescent
- Lake Sutherland
- 101 East of Gardiner
- Blyn
- Black Diamond
- Tumwater Truck
- Hill Street
- South Valley St
- Lee Creek
- Peabody Creek
- Ennis Creek
- Elwha River Valley
- Hoko-Ozette Road

UTILITIES



ELECTRICAL GRID

100% will be severely damaged or destroyed.

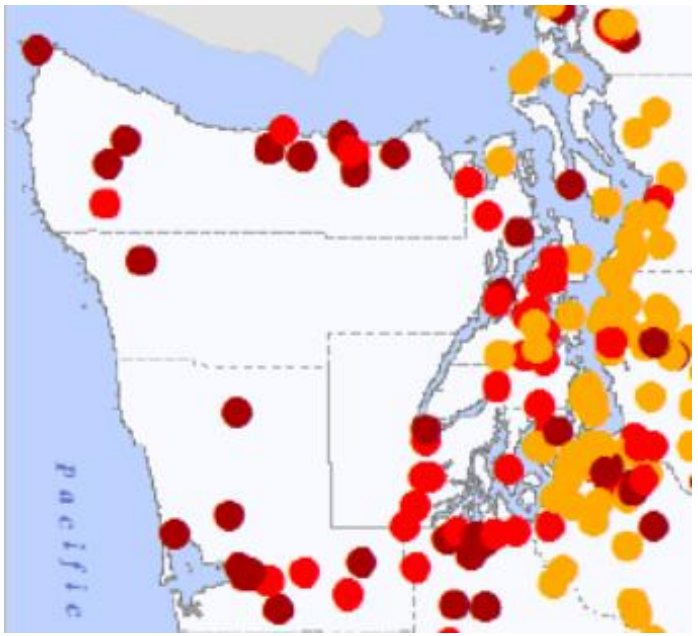
It may take up to 1 year to restore service to 90 % of the current demand.

WATER AND SANITARY SEWER

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

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

COMMUNICATIONS



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

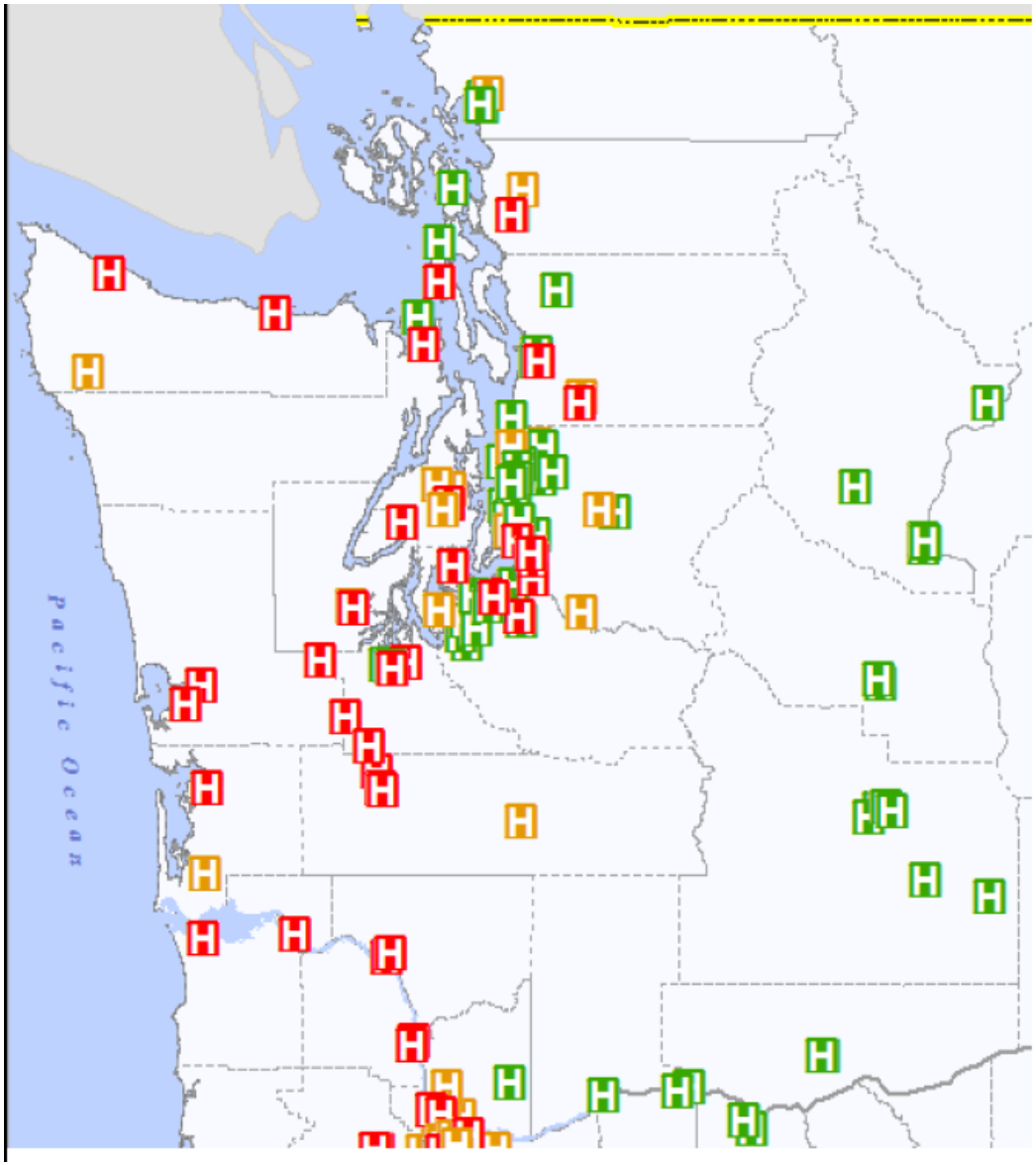
It may take days or weeks to restore 33% of coastal communications facilities.

67% may need to be replaced.

unknown *completely destroyed*

HITRAC STUDY FEMA

HOSPITALS



These are general locations and forecast status of the known Hospitals.

There are 112 Hospitals in the affected area.

36% suffer severe damage, are unusable, and will likely be completely offline.

17% suffer moderate damage and are only assumed capable of 50% normal capacity.

Total reduction is assumed to be 45% of total hospital capacity.

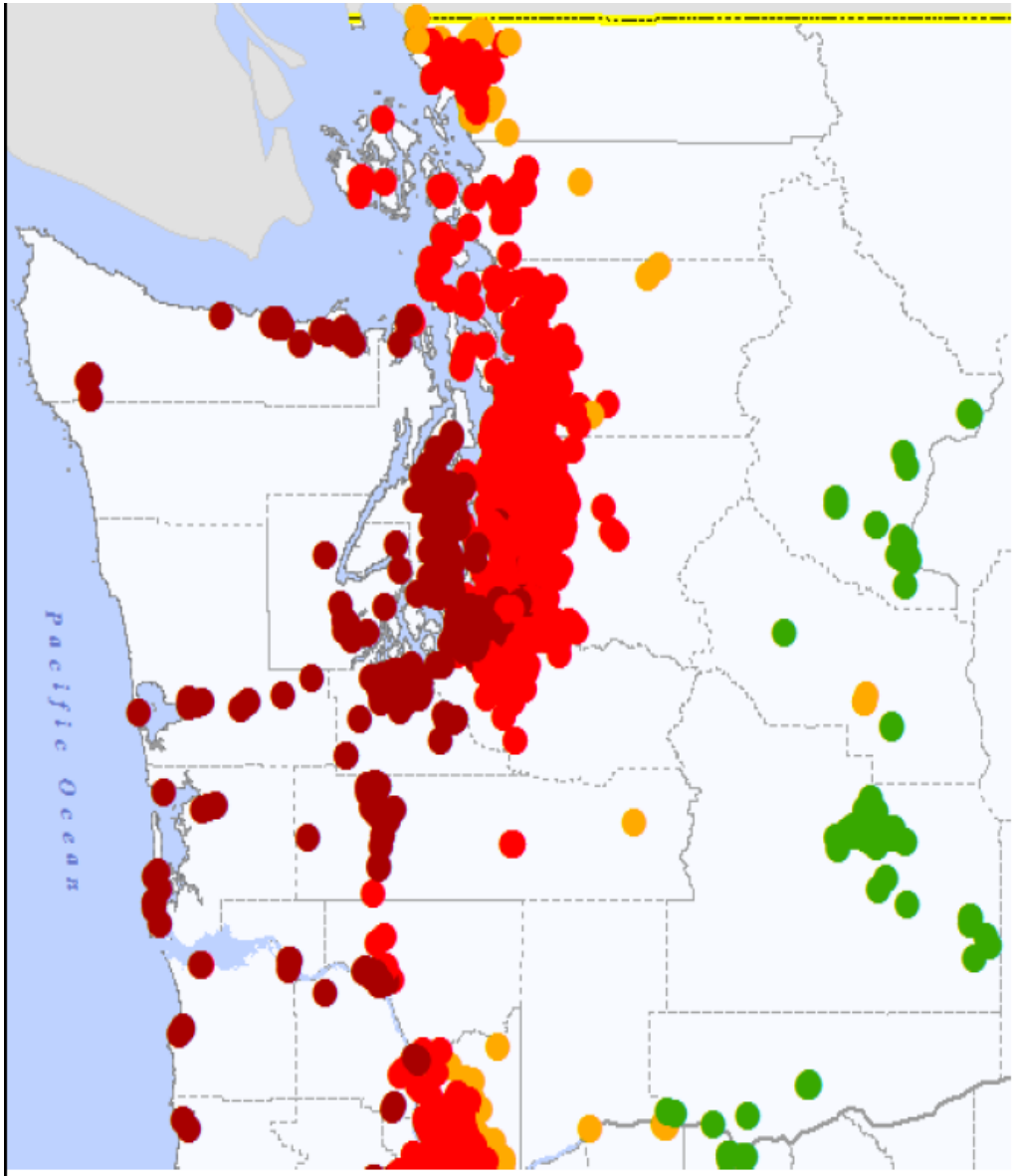
47% suffer slight damage and are able to continue to operate at capacity.

The facilities nearer to the epicenter suffer most significant damage resulting in **virtually no Hospital capacity west of the I5 corridor.**

These numbers discuss **STRUCTURAL** capacity, not patient capacity, which is further reduced due to lack of electricity, potable water, sanitation, etc.

unknown *completely destroyed*

SENIOR LIVING FACILITY



There are approximately 2,156 senior living facilities in the affected area.

Significant numbers (approaching 100%) of facilities West of the I-5 corridor suffer extensive damage, and are likely unusable.

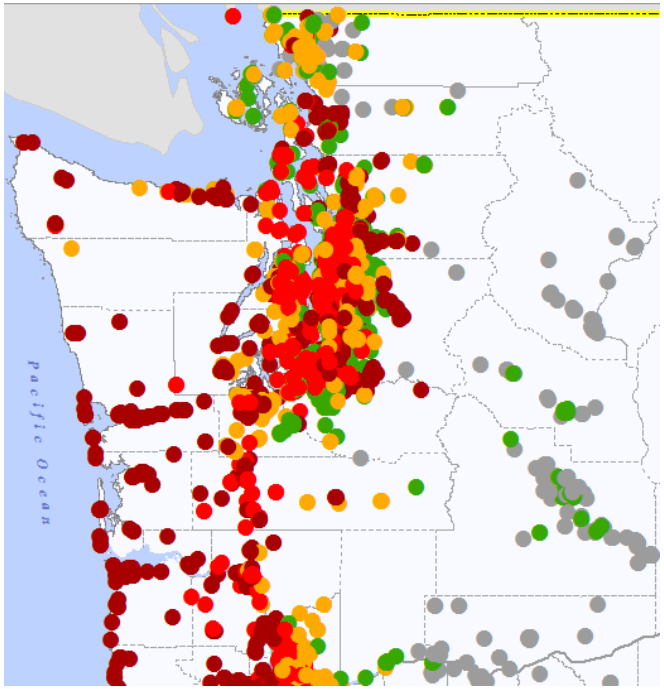
The vast majority of facilities along the I-5 corridor suffer complete to severe damage and are likely unusable, or are significantly degraded.

The facilities nearest the epicenter suffer most significant damage resulting in **virtually no senior living facility capacity West of the I-5 corridor.**

unknown *completely destroyed*

HITRAC STUDY FEMA

SCHOOLS



unknown *completely destroyed*

HITRAC STUDY FEMA

There are approximately 2,286 schools in the affected area.

<u>Nearly 100% of schools West of the I-5 corridor suffer complete or severe damage, and are likely unusable.</u>

Schools along the I-5 corridor suffer a wide range of damage from complete to slight.

Schools nearest the epicenter generally suffer the most significant damage resulting in <u>limited shelter capacity West of the I-5 corridor.</u>

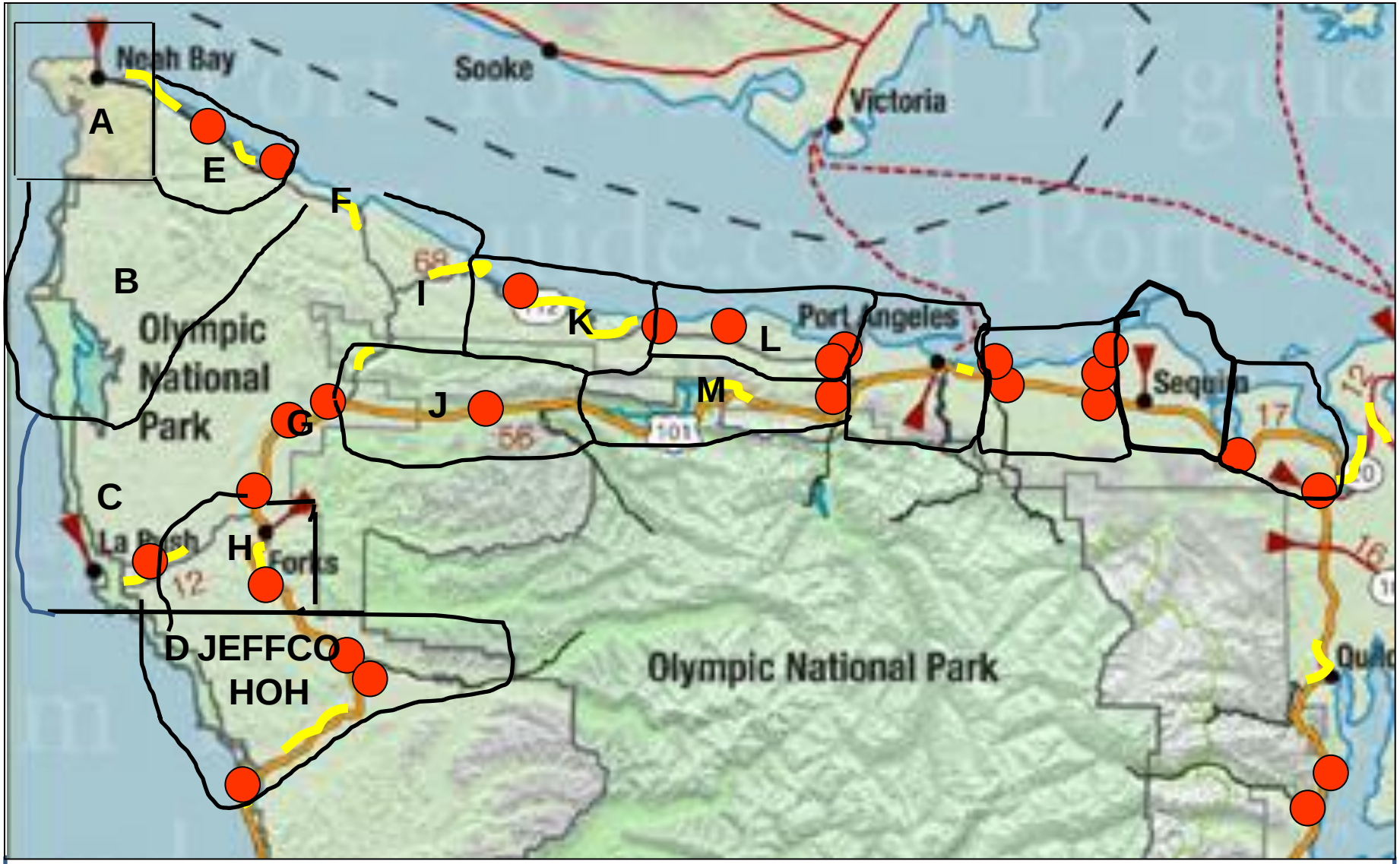
Seismic safety report card

Washington scores poorly compared to other West Coast governments, where retrofits of dangerous school buildings are a priority.

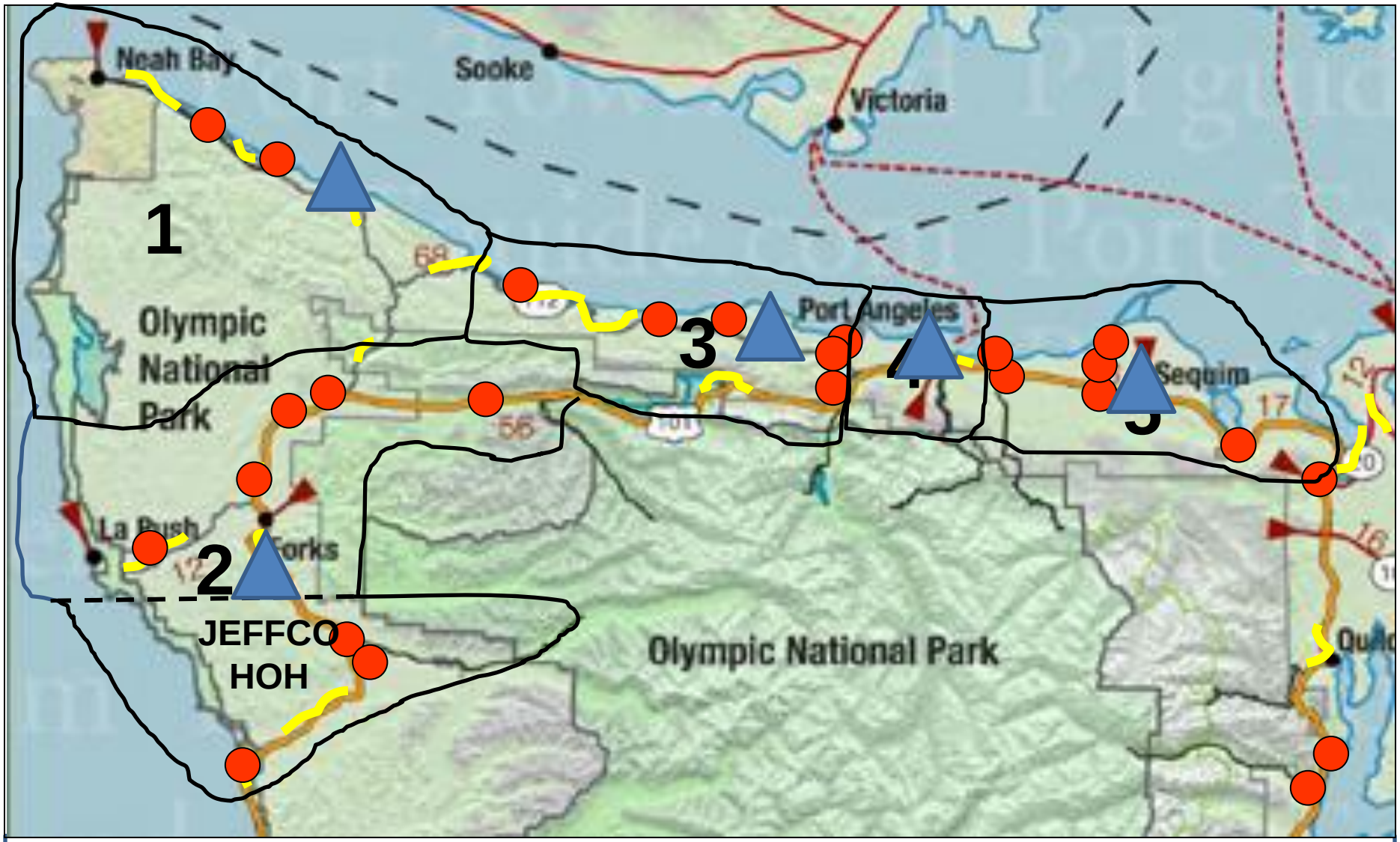
	Law or policy on school seismic upgrades	Structural surveys of all at-risk schools	Dedicated funding for school seismic retrofits
British Columbia	YES	YES	$1.7 billion *(2004-2016)*
Oregon	YES	YES	$210 million *(2009-2016)*
California	YES	YES	$700 million *(1972-2016)*
Washington	**NO**	**NO**	**NONE**

Sources: Seattle Times reporting

FRANK MINA / THE SEATTLE TIMES



Communities become micro-islands (Divisions) due to the loss of bridges, roads and tsunami zones.



County's Strategy: Micro-islands (Divisions) are grouped into Command Areas based on the following hubs: Forks, Clallam Bay/Neah Bay, Joyce, Port Angeles, & Sequim

Washington State Emergency Management Division

AREA COMMANDS 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 CHARLIE** - La Push / Quileutte Nation	**DIV KILO** - Pillar Point	**DIV NOVEMBER** - Port Angeles West / Lower Elwha Klallam Tribe; SubDIV 01, SubDIV 02, SubDIV 03, SubDIV 04	**DIV PAPA** - Deerpark*
DIV BRAVO - Ozette	**DIV DELTA** - West Jeffco/Hoh Tribe	**DIV LIMA** - Joyce	**DIV OSCAR** - Port Angeles East; SubDIV 01, SubDIV 02, SubDIV 03, SubDIV 04,	**DIV QUEBEC** - R Corner
DIV ECHO - Shipwreck Point	**DIV GOLF** - Beaver	**DIV MIKE** - Indian Valley		**DIV ROMEO** - Carlsborg
DIV FOXTROT - Clallam Bay	**DIV HOTEL** - Forks			**DIV SIERRA** - Sequim
DIV INDIA - Pysht	**DIV JULIET** - Bear Creek			**DIV TANGO** - Diamond Point, Gardiner, Blyn, Jamestown S'Klallam Tribe
FD#5, NEAH BAY TRIBAL POLICE, CCSO, CBP, USCG, NPS	**FD#1, FD #6** FORKS PD, CCSO, CBP, USCG, NPS	**FD#4** CCSO, CBP	**FD#2, PAFD** PAPD, CCSO, CBP, USCG, NPS	**FD#3** SEQUIM PD, CCSO, CBP
** 1,770	** 4,777	** 3,649	** 23,368	** 36,558

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

CASCADIA RISING

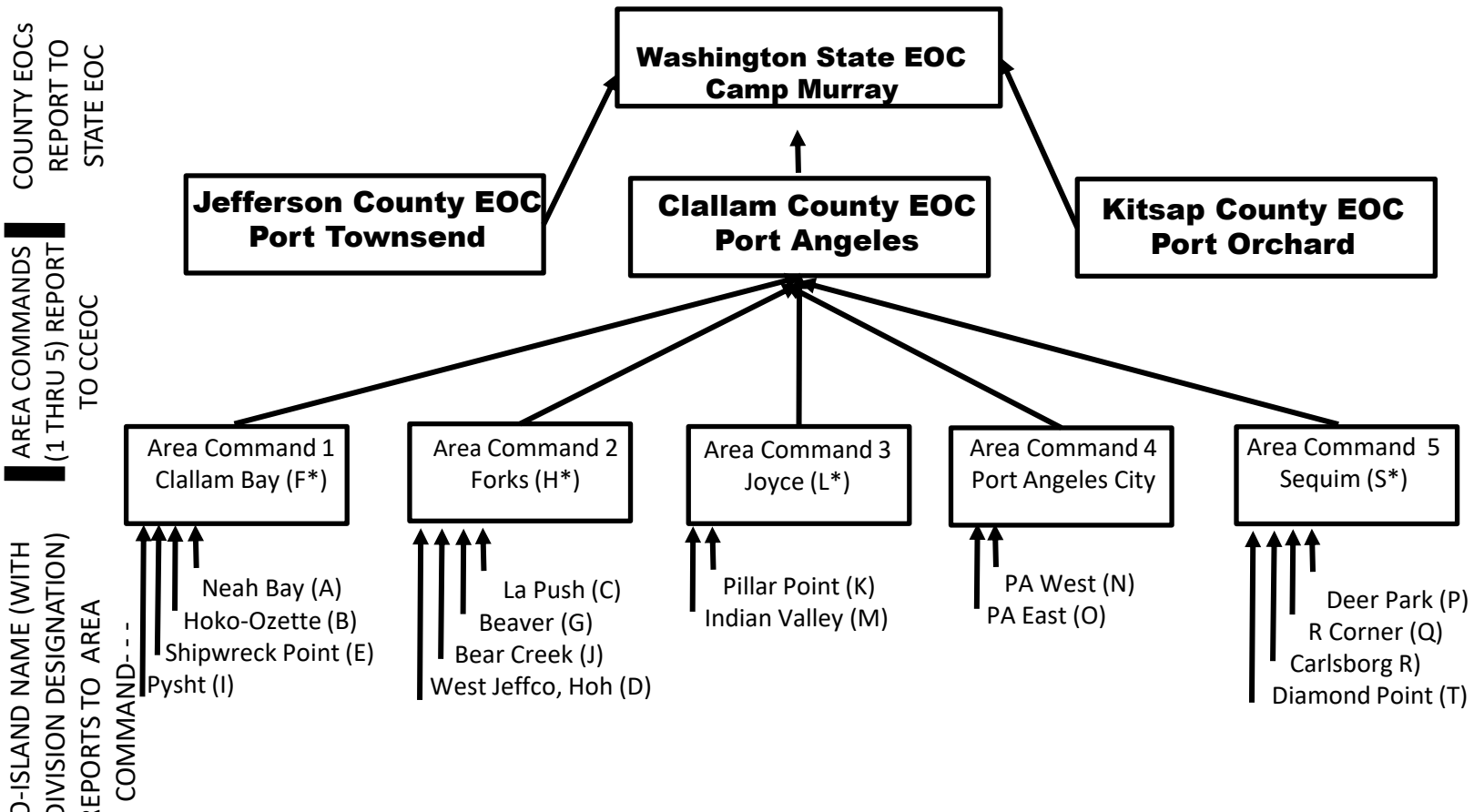
20 islands total

Note: There is another 4K from Jefferson Co. supported by Fire Districts 1/6 (1K) and 3 (3K) and any tourists in the county

Updated 7/31/17 by PLinterman

Washington State Emergency Management Division

CLALLAM COUNTY EMERGENCY MANAGEMENT AREA COMMAND CONCEPT

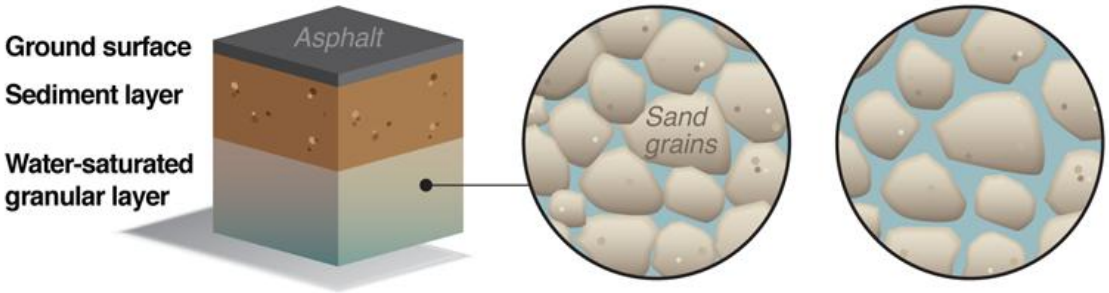


NOTE: NAMED AREA COMMANDS WITH AN ALPHA DESIGNATION AND ASTERISK (i.e., “Clallam Bay (F*)” = A STAND ALONE MICRO-ISLAND THAT IS ALSO DESIGNATED AS AN AREA COMMAND CENTER).

AREA COMMAND 4: Port Angeles

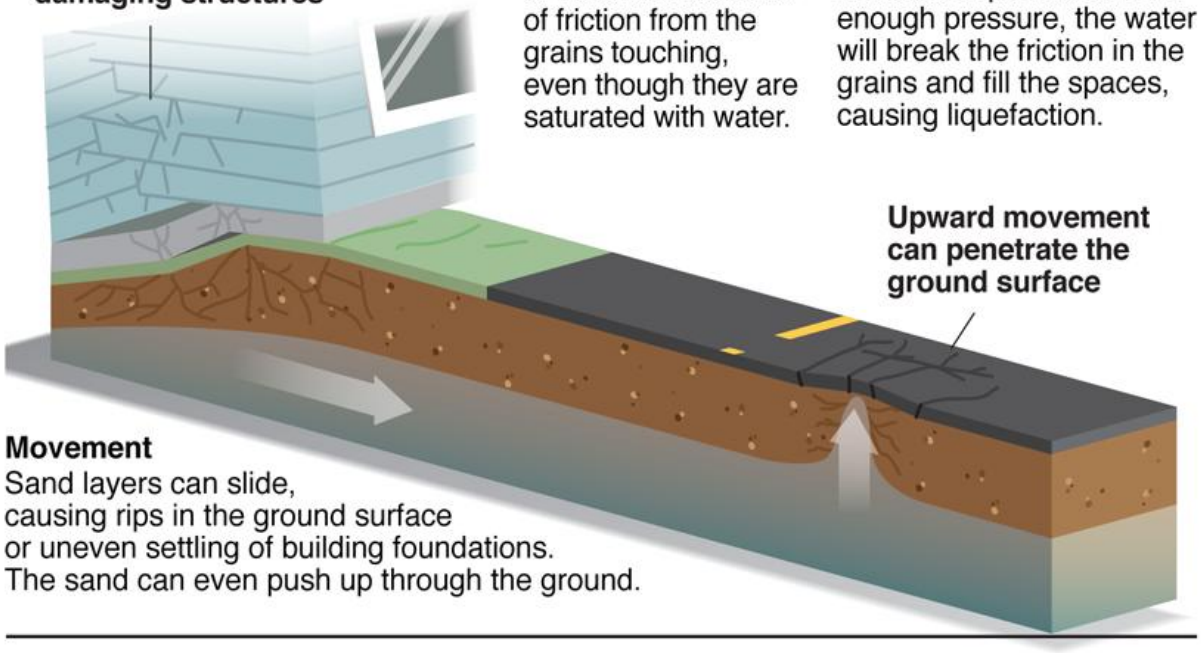
Soil liquefaction

Liquefaction is a phenomenon in which water-saturated sandy layers of earth act like liquids due to the pressure created by earthquakes.



Normal pressure
Soft sands can maintain strength or hardness because of friction from the grains touching, even though they are saturated with water.

Intense pressure
Force from an earthquake causes the water to increase in pressure. With enough pressure, the water will break the friction in the grains and fill the spaces, causing liquefaction.



Movement
Sand layers can slide, causing rips in the ground surface or uneven settling of building foundations. The sand can even push up through the ground.

Source: California Watch research

BRIAN CRAGIN / CALIFORNIA WATCH

Preliminary Estimate of Loss of Life in Clallam County

The Need for Volunteer teams (SAR, Shelter, CPOD, Communication) is critical to reduce loss of life

Loss of Life Scenario Ranges

Cascadian Subduction Zone event will create three waves of losses

		Low HiTrac*
1st 24 Hours	• Earthquake itself – structural and debris strikes	800-3000
	• Tsunami - Wave impact on coastal areas	1000-5000
1st Week	• Entrapment & Isolation (1.5x-3x initial deaths)	2700-5500
	• Fragile Population or Special Needs (Oxygen etc.)	200-4000
	(Kitsap Public Health Study Medical Dependent15.4K - May 2015 25% High End Loss)	
Weeks 2-8	• Food, Water, Exposure (range of 2%-9% of population)	1400-6500
	Includes Disease and Medical Injured that die	
	Range of Losses	6100-24000

*Consistent w/10K dead scenario region wide

Losses would be from 6% to near 33% of population of Clallam County depending upon effective mitigation

Above % could and probably would be impacted by high tourist events such as festivals & assumes base population of 72,000

The Golden Day

Entrapped Victim Survival Rate

Creation and deployment of Mission Ready CERT units will be critical in saving lives.* CERTs *primary mission* after an earthquake will be Damage Assessment & SAR.

Time Until Rescue	*Survival Rate*
30 Minutes	99.3%
1 Day	81.0%
2 Days	36.7%
3 Days	33.7%
4 Days	19.0%
5 Days	7.4%

The Rule of 3's

- You can survive:
  - 3 *minutes* without **AIR**
  - 3 *hours* without **SHELTER** from extreme weather
  - 3 *days* without **WATER**
  - 3 *weeks* without **FOOD**

*Will impact entrapment, isolation, and fragile population numbers

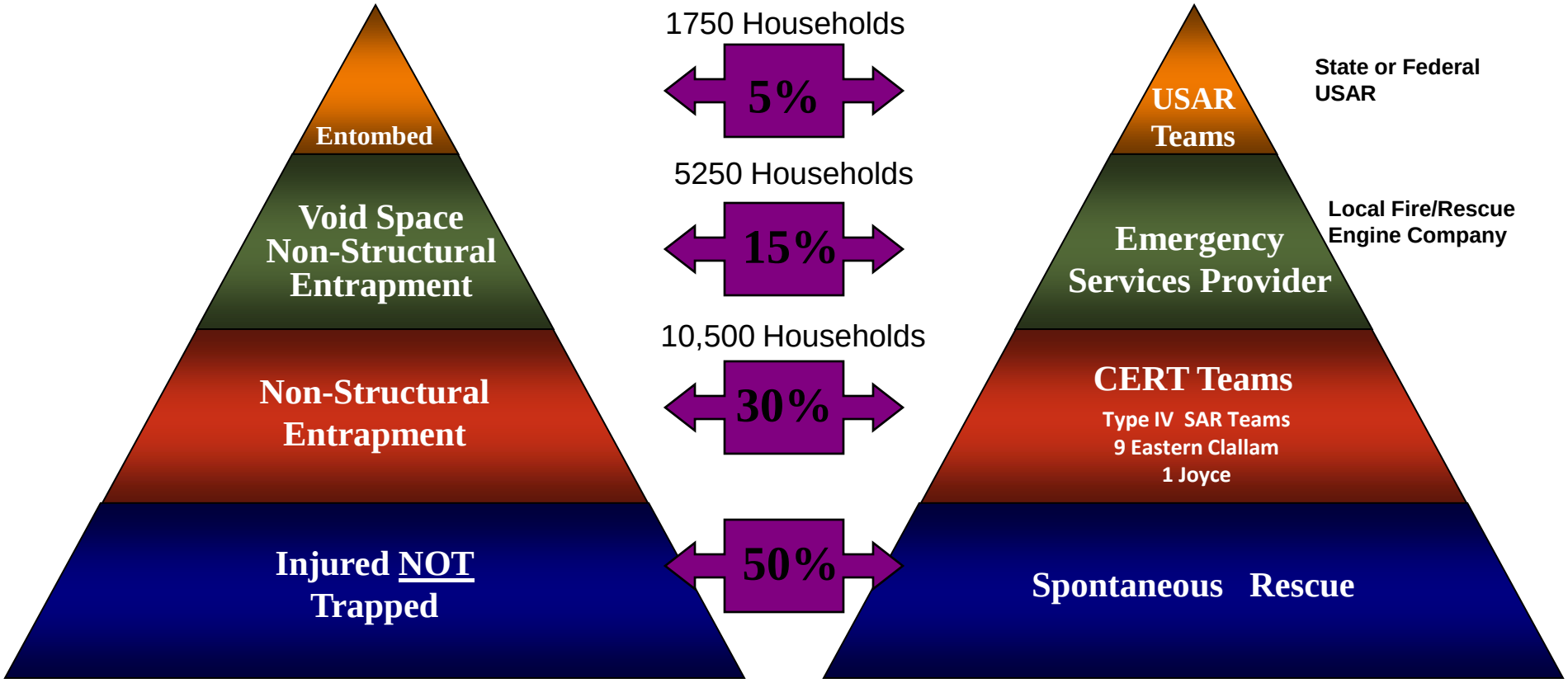
CITY OF SEQUIM

Emergency Management

Example of Loss of Life Challenge
Search and Rescue Starting on Day 1

Challenge for Clallam County is over 35,000 Households and all commercial and public buildings will need to be searched for survivors

Rescue Skills Needed

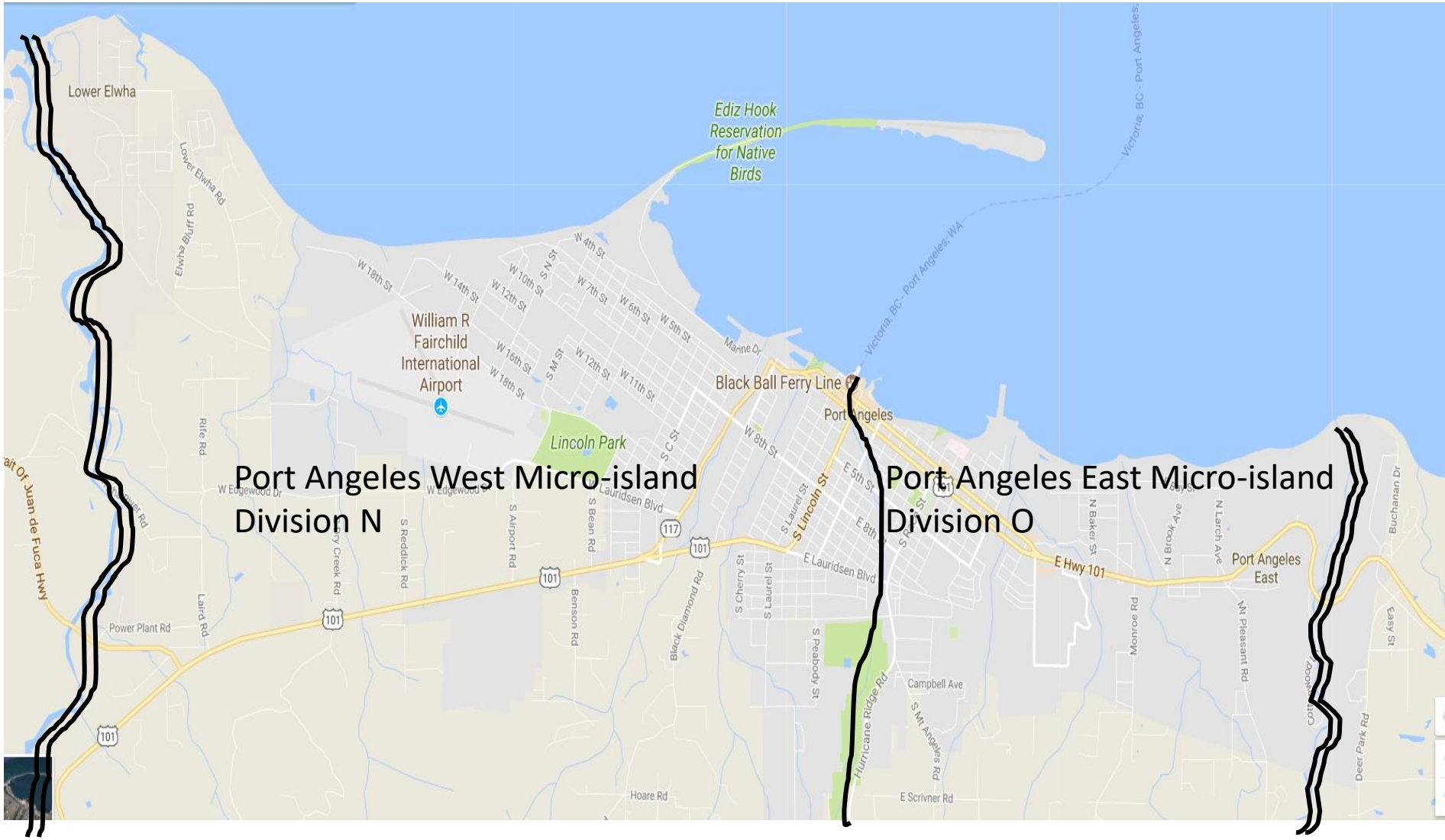


CITY OF SEQUIM

Emergency Management

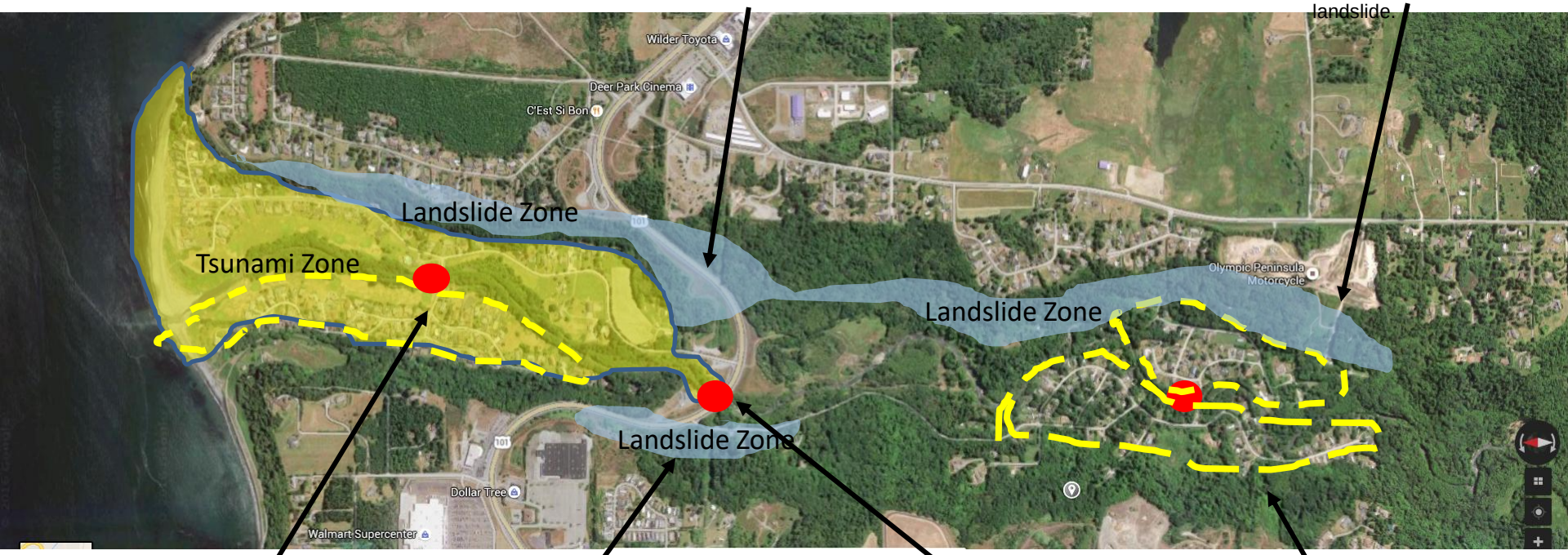
Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Covering the Area from Elwha River to Morse Creek
With Potentially 8 Sub-Micro Islands in the two divisions



Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Detail View of Morse Creek
Boundary between Port Angeles East and Deer Park Micro-islands



Tsunami Zone
Landslide Zone

RED dots represent fill failures over culverts or damaged bridges

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Detail View of Morse Creek

Cottonwood Lane Landslide and HWY 101 Morse Creek Bridge

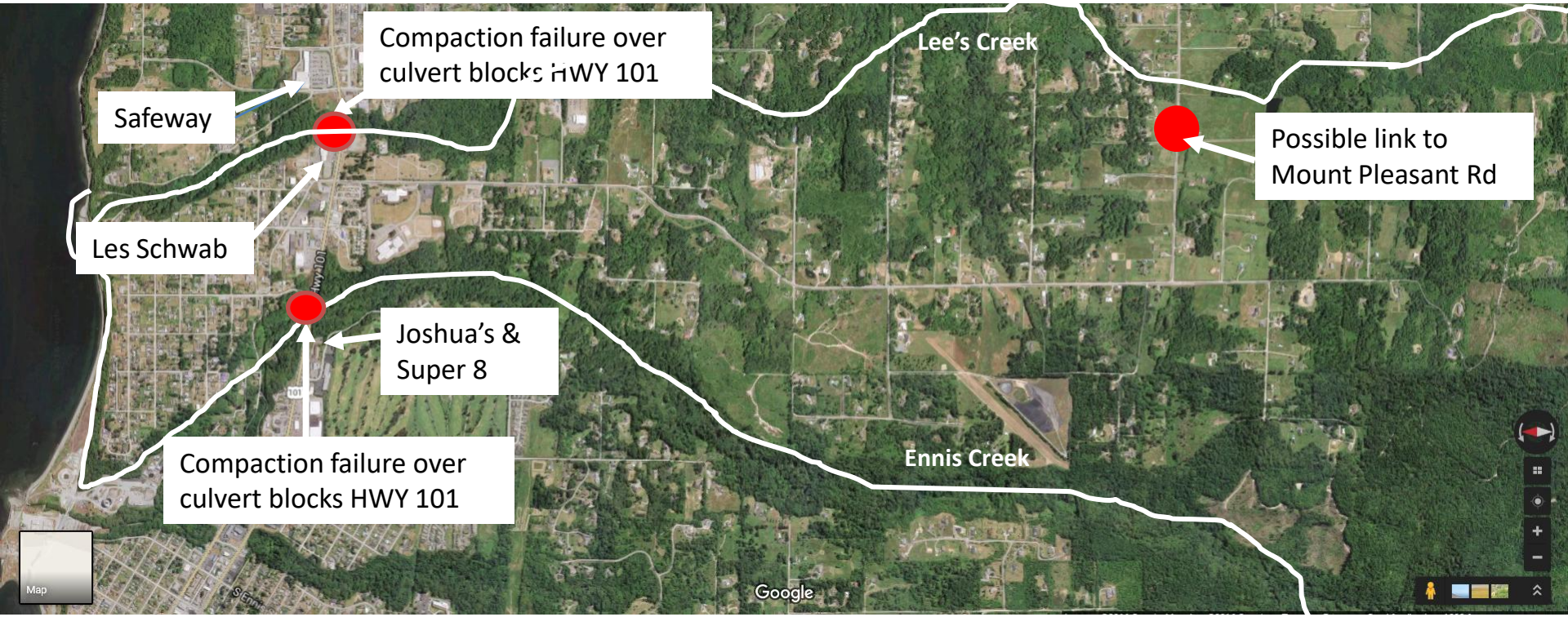
Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Detail View of Morse Creek

HIGHWAY 101 MORSE CREEK LANDSLIDE ZONE

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

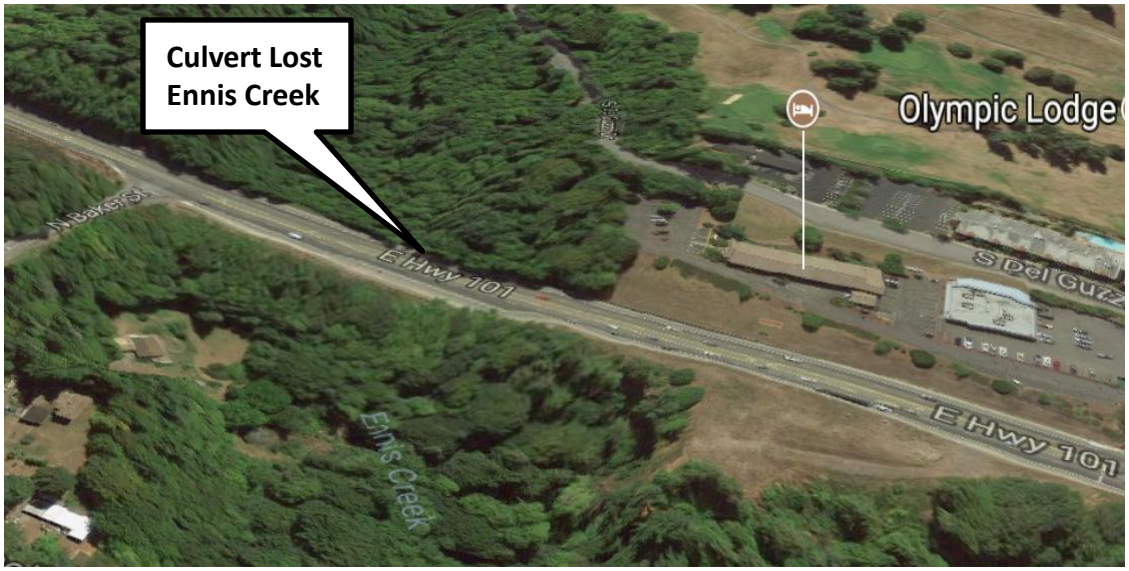
Port Angeles East Micro-island - Division O, Sub-division 2
Monroe Road Community – Lee's Creek to Ennis Creek



RED dots represent fill failures over culverts or damaged bridges

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Only one other route connects Mt. Pleasant with Port Angeles beside US 101



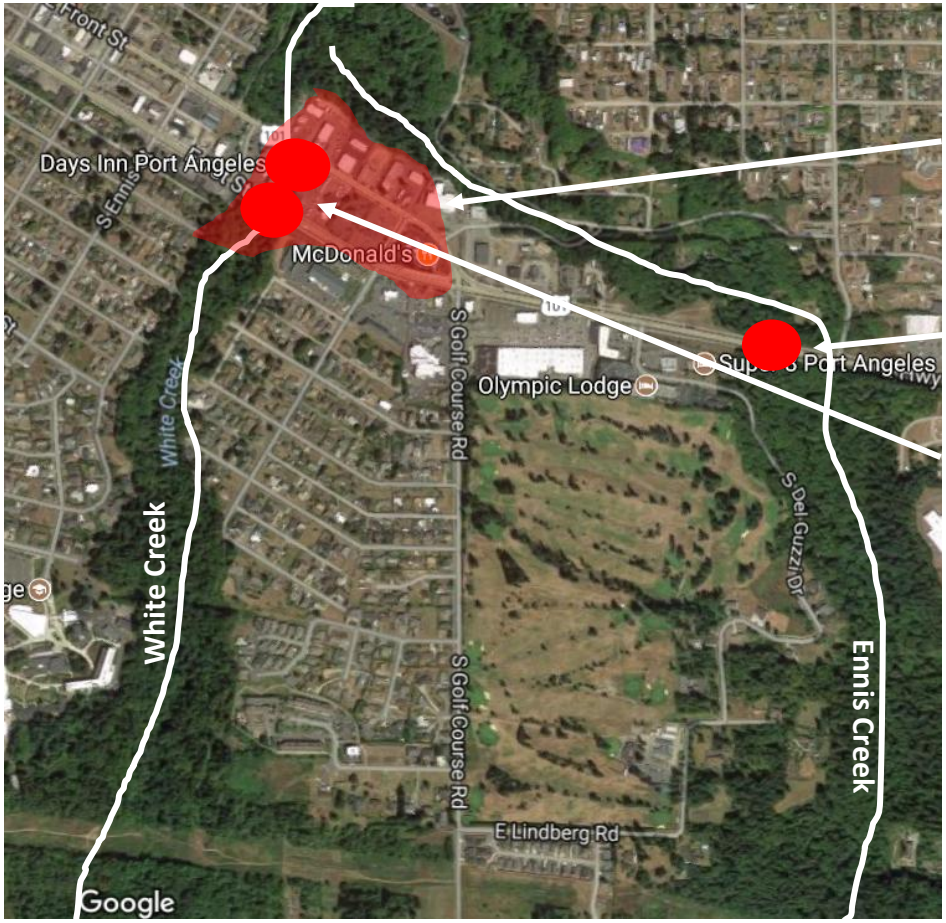
HIGHWAY 101 CULVERT OVER ENNIS CREEK

HIGHWAY 101 LEE'S CREEK CROSSING

Port Angeles East Micro-island - Division O, Sub-division 2 Monroe Road Community – Lee's Creek to Ennis Creek

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Port Angeles East Micro-island – Division O, Sub-division 3
Golf Course Community – Ennis Creek to White Creek



Expect severe liquefaction and compaction failure in fill over White Creek Valley.

Expect culvert failures over Ennis Creek

Expect culvert failures over White Creek

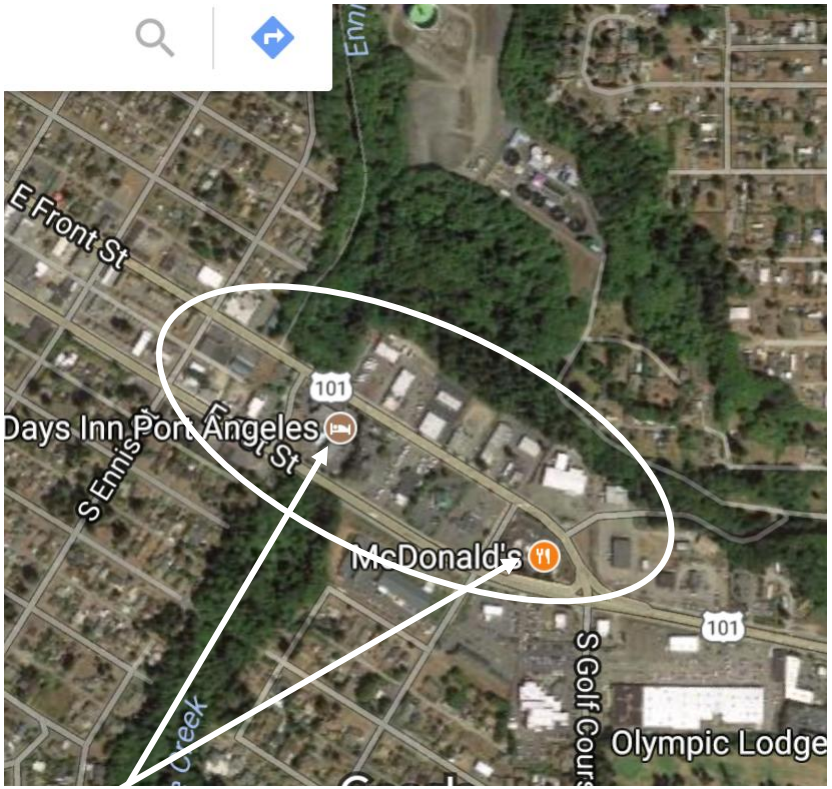
Liquefaction zone

RED dots represent fill failures over culverts or damaged bridges

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Port Angeles East Micro-island - Division O, Sub-division 2
Monroe Road Community – Lee's Creek to Ennis Creek

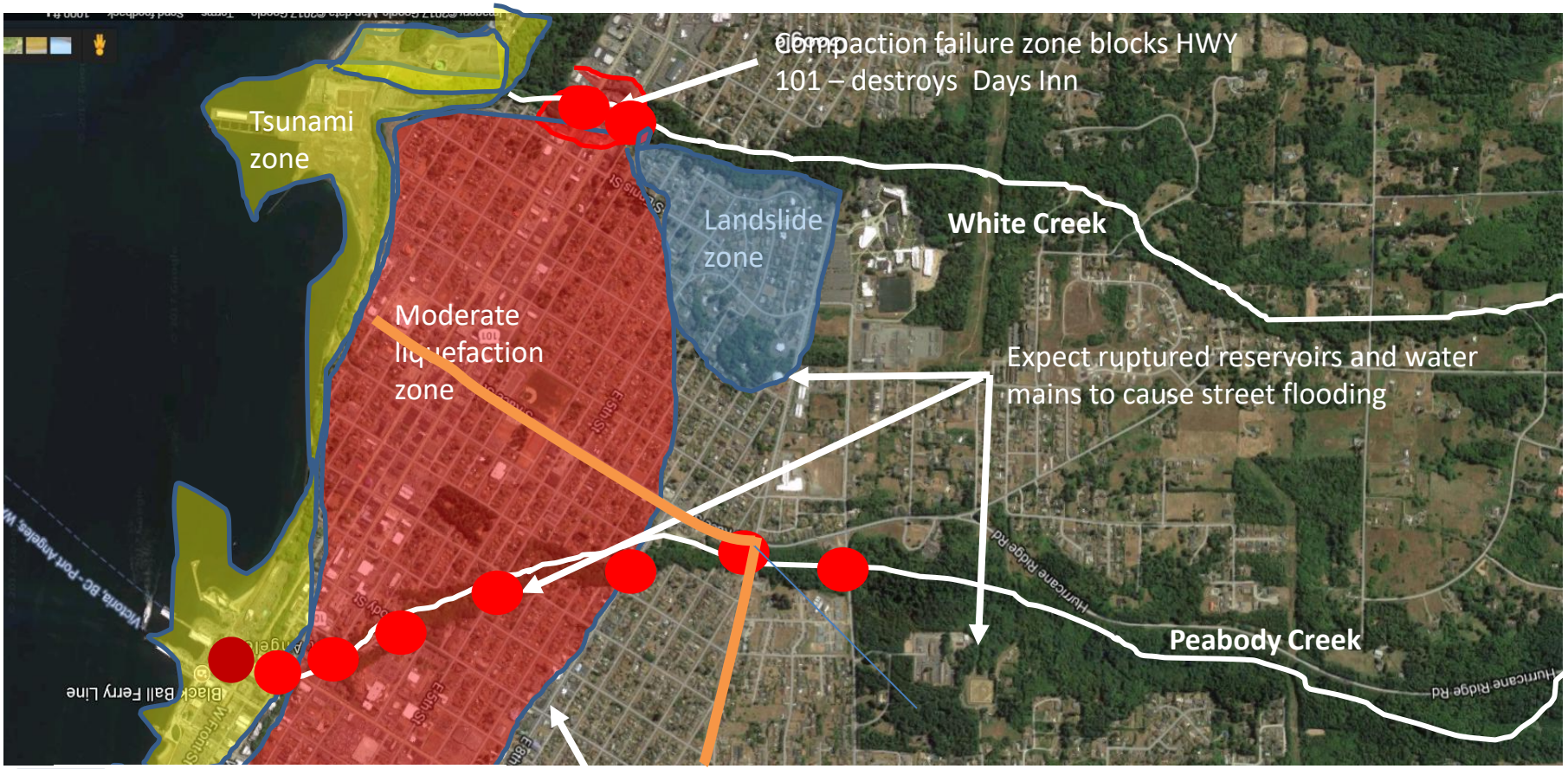
Earlier Photo shows the amount of fill over White Creek Area



DAYS INN, McDONALD's and the adjacent roads may suffer significant damage due to compacting and liquefaction

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Port Angeles East Micro-island - Division O, Sub-division 4
Olympic Medical Center Community – White Creek to Peabody Creek



Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Peabody Creek from East Park Street to the Harbor failure of culverts and bridges

Destroyed by earthquake and tsunami

Life Line Route for Emergency supplies

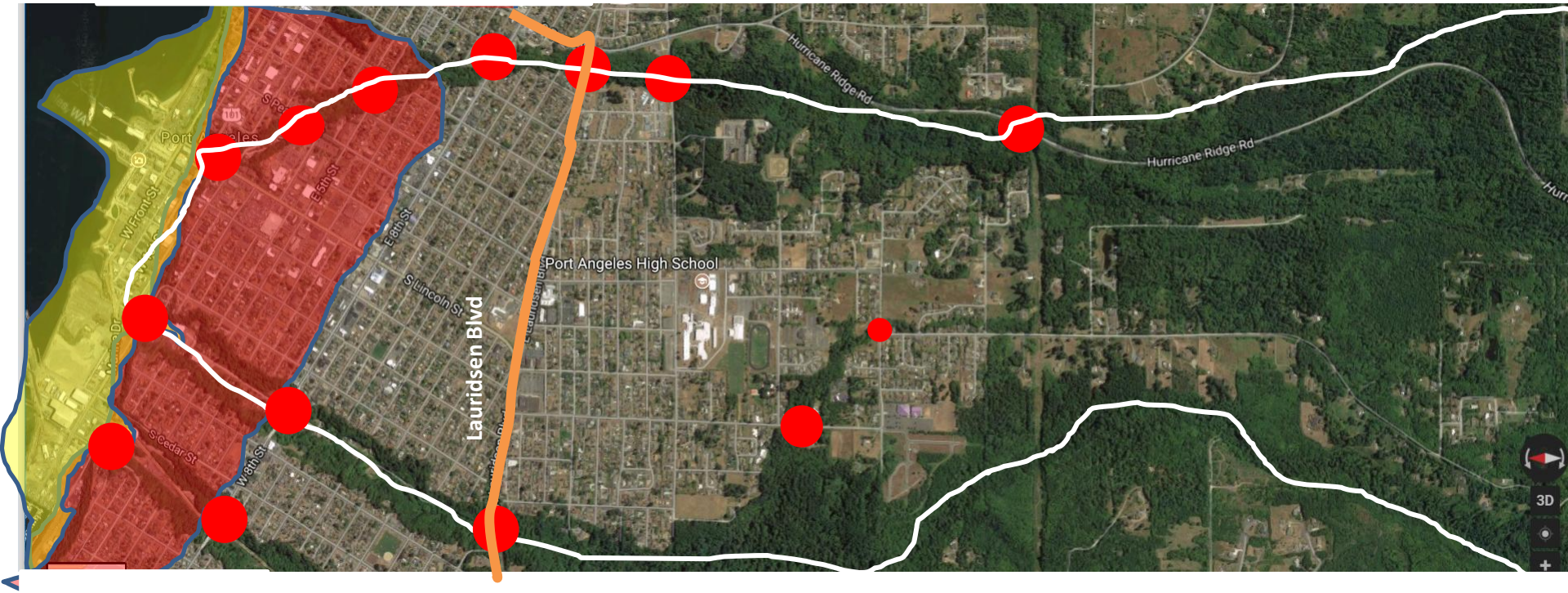
Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Front Street from South Peabody to South Albert Street

The following 5 slides (2 Pages) are source slides showing the condition of Front Street between Peabody and Albert Street. The circles show 3 views of First Congregational Church around 1897. This series of slides is intended to show the ground conditions before the area was developed. Note the logging debris, vegetation and the lack of standardized clearing, grubbing and compaction standards for the neighborhood.

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Port Angeles West Micro-island – Division N, Sub-division 1
PAHS Community - Peabody Creek to Valley Creek



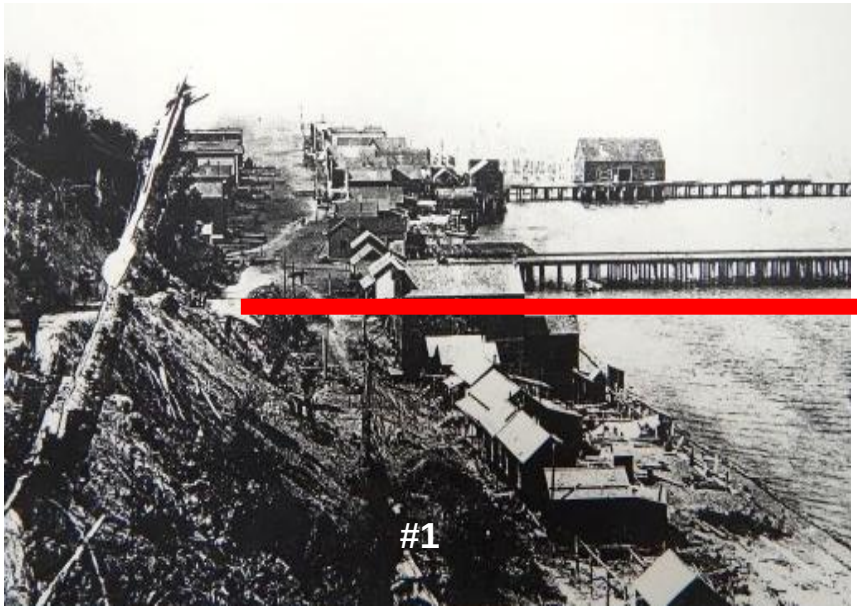
Tsunami Zone
Landslide Zone
Liquefaction Zone
RED dots represent fill failures over culverts or damaged bridges

All Bridges and Culverts on Peabody Creek and Valley Creek expected to fail

Life Line Route for Emergency supplies

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Front Street 1891 - 1892



This slide shows 2 views of Front Street in downtown Port Angeles circa 1891. Please note the location of the shoreline.

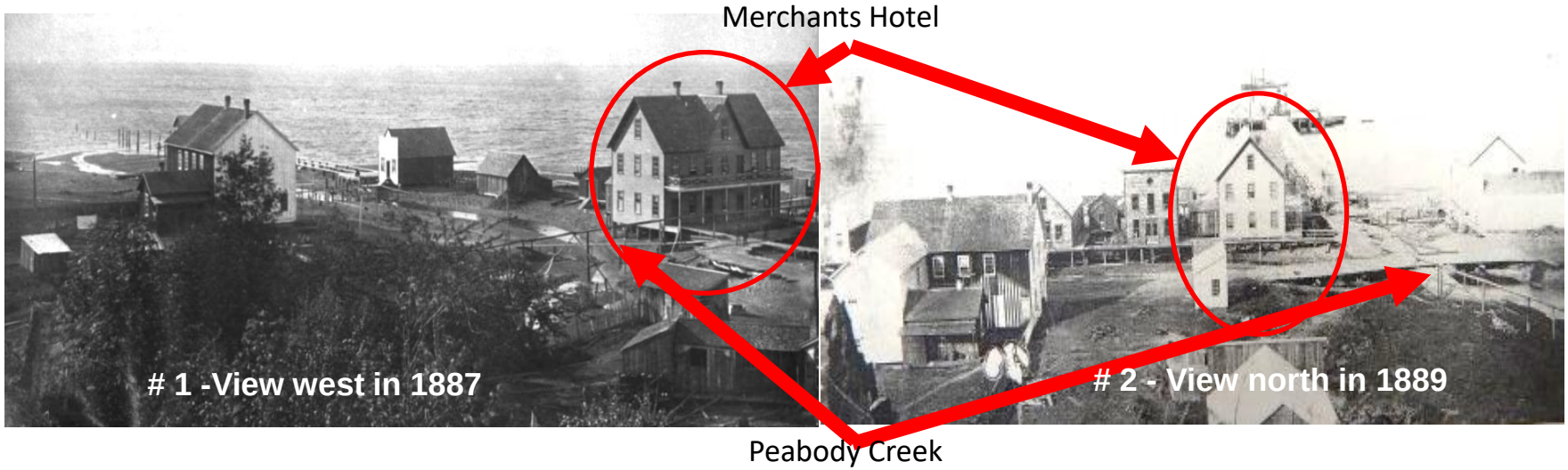
Photo #1 looks west from the vicinity of today's Renaissance Bistro.

Photo #2 looks east from the vicinity of Laurel Street. It shows Peabody Creek flooded, frozen and flowing west along Front Street.

This shows a severe liquefaction hazard for all land between the bluff and the harbor.

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

The Intersection of Front and Lincoln Streets 1887 - 1889



This slide shows a different view of the severe liquefaction conditions near the corner of Front and Lincoln between 1887 and 1889. The common identifying landmark in the 2 photos is the Merchants Hotel.

Peabody Creek flowed out of the uplands down Lincoln Street and turned west on Front Street. It followed Front Street until it entered the harbor near the Coho Ferry Dock.

Photo # 1 looks west from vicinity of Matthews Glass towards the corner where the Transit Center is today. Photo # 2 looks north from the vicinity of the Elk's Naval lodge towards the Transit Center and today's Peabody Creek outlet.

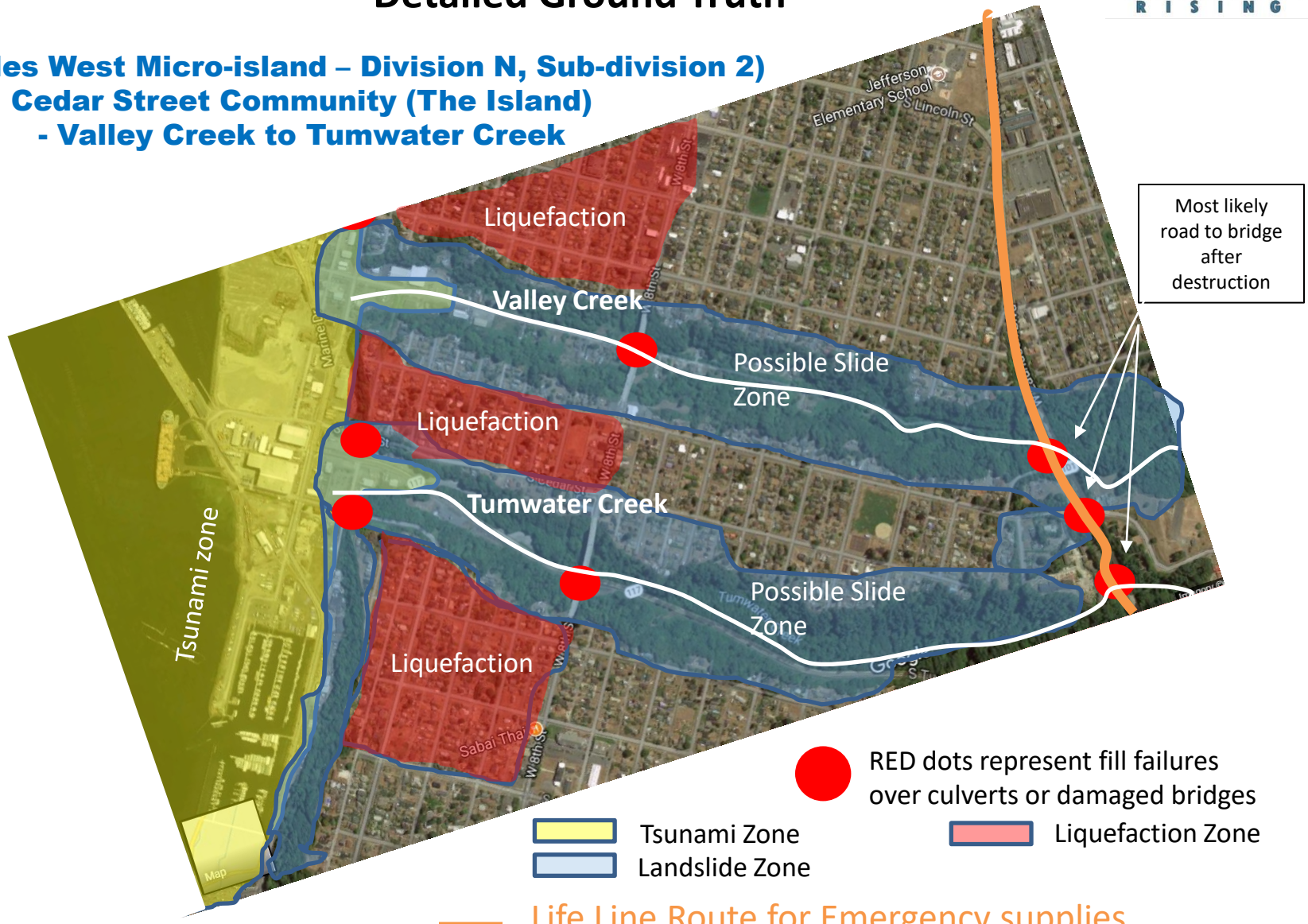
Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Lincoln Street Landfill

This slide shows the condition of Lincoln Street between 1914 and 1916. The void under this trestle was never cleared and grubbed. It was filled via railroad dump cars. The timbers were not removed and the fill was not compacted. Please note that the canyon proceeds south under today's William Shore Pool, Goodwill, and possible City Hall.

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

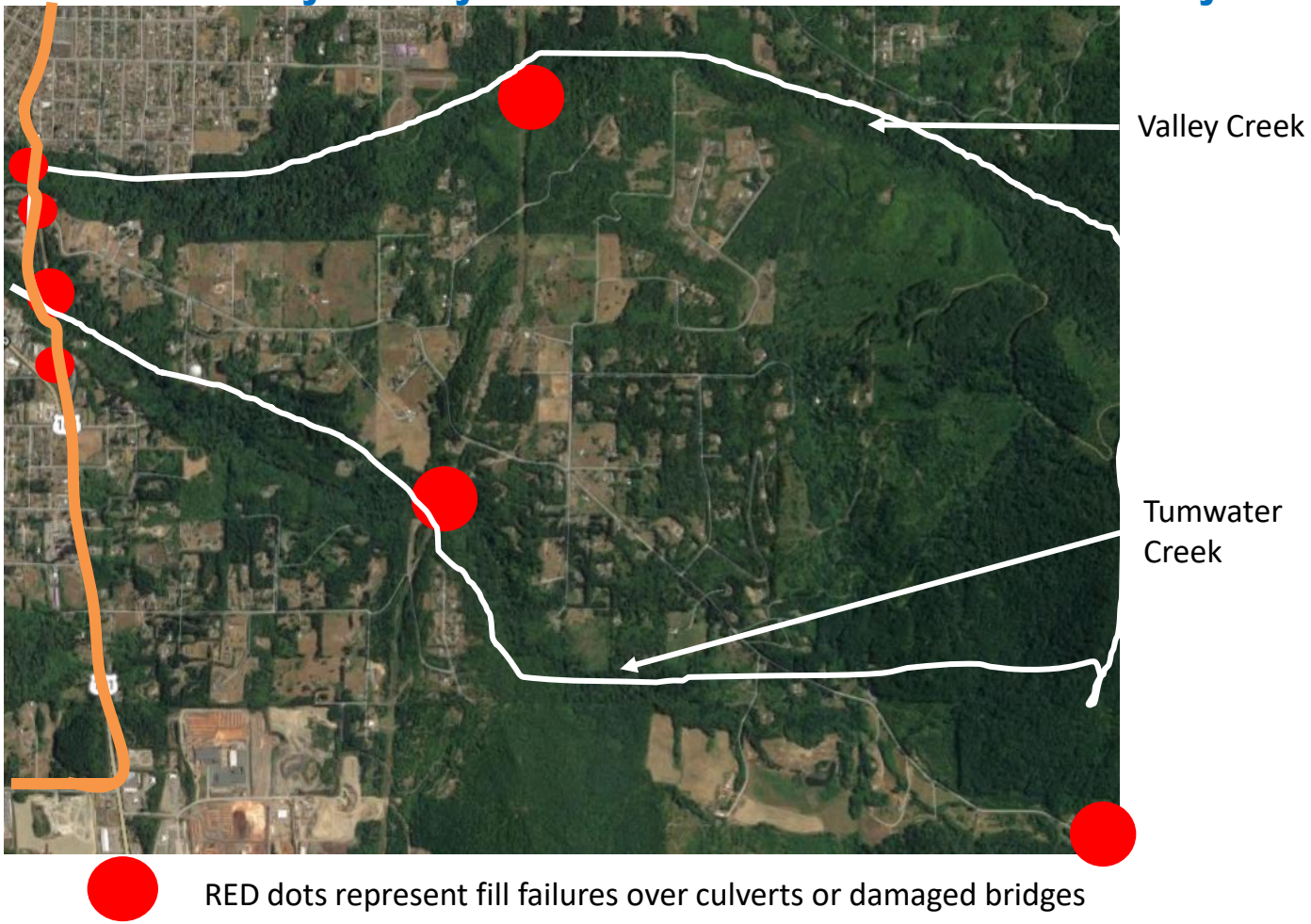
Port Angeles West Micro-island – Division N, Sub-division 2)
Cedar Street Community (The Island)
- Valley Creek to Tumwater Creek



Besides Morse Creek Area the Tumwater/Valley Creek Area poses the next most difficult area to traverse

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Port Angeles West Micro-island, Division N, Sub-division 3
Black Diamond Community – Valley Creek to Tumwater Creek south of Hwy 101



RED dots represent fill failures over culverts or damaged bridges

Life Line Route for Emergency supplies

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Port Angeles West Micro-island - Division N, Sub-division 4
Airport Community -Tumwater Creek to Elwha River

RED dots represent fill failures over culverts or damaged bridges

Tsunami Zone

Landslide Zone

Life Line Route for Emergency supplies

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Port Angeles Severe Liquefaction and Tsunami Zone with Escape Routes

Escape routes are dependent on survivors ability to walk in the liquefaction zone. If survivors can not reach a safe elevation on an escape route in 60 minutes they must climb the bluff until they can look down on the roof of a standing 3 story building.

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

Resources Available in the Sub-Micro Islands

Micro-island	Sub-division	Medical	Fire	Police	Food	Water	Heavy Equip
O - PA East	Mount Pleasant	NO	NO	NO	YES	YES	YES
	Monroe	NO	YES	NO	NO	YES	YES
	Golf Course	NO	NO	YES	NO	YES	NO
	Olympic Medical CTR	YES	NO	YES	NO	NO	NO
N - PA West	PAHS	YES	YES	NO	YES	NO	YES
	Cedar Street	NO	NO	NO	NO	NO	NO
	Black Diamond	NO	YES	NO	NO	YES	YES
	Airport	YES	YES	YES	NO	YES	YES

Definitions: Medical = Clinic or Hospital
Fire = Fire Station PA and District 2
Police = Police Station/CBP/Fed/NP
Food = Major Grocery
Water = Body of Water to Draw
Heavy Equip = Business or Contractor Yard

Clallam County Area Command 4 Port Angeles
Detailed Ground Truth

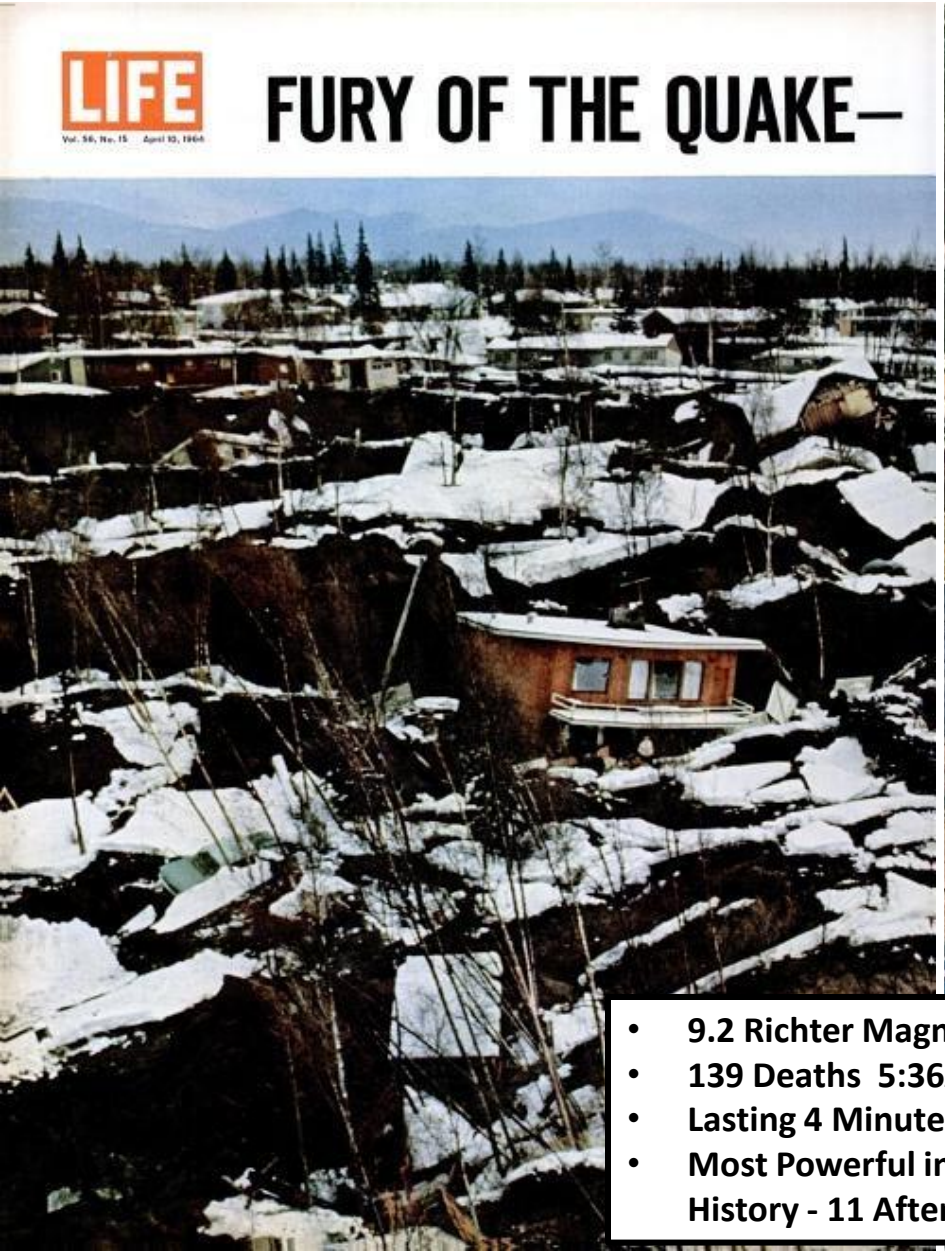
The Key for Port Angeles's citizens survival is the airport which can land large cargo planes as road re-supply is virtually impossible for at least 90-180 days*

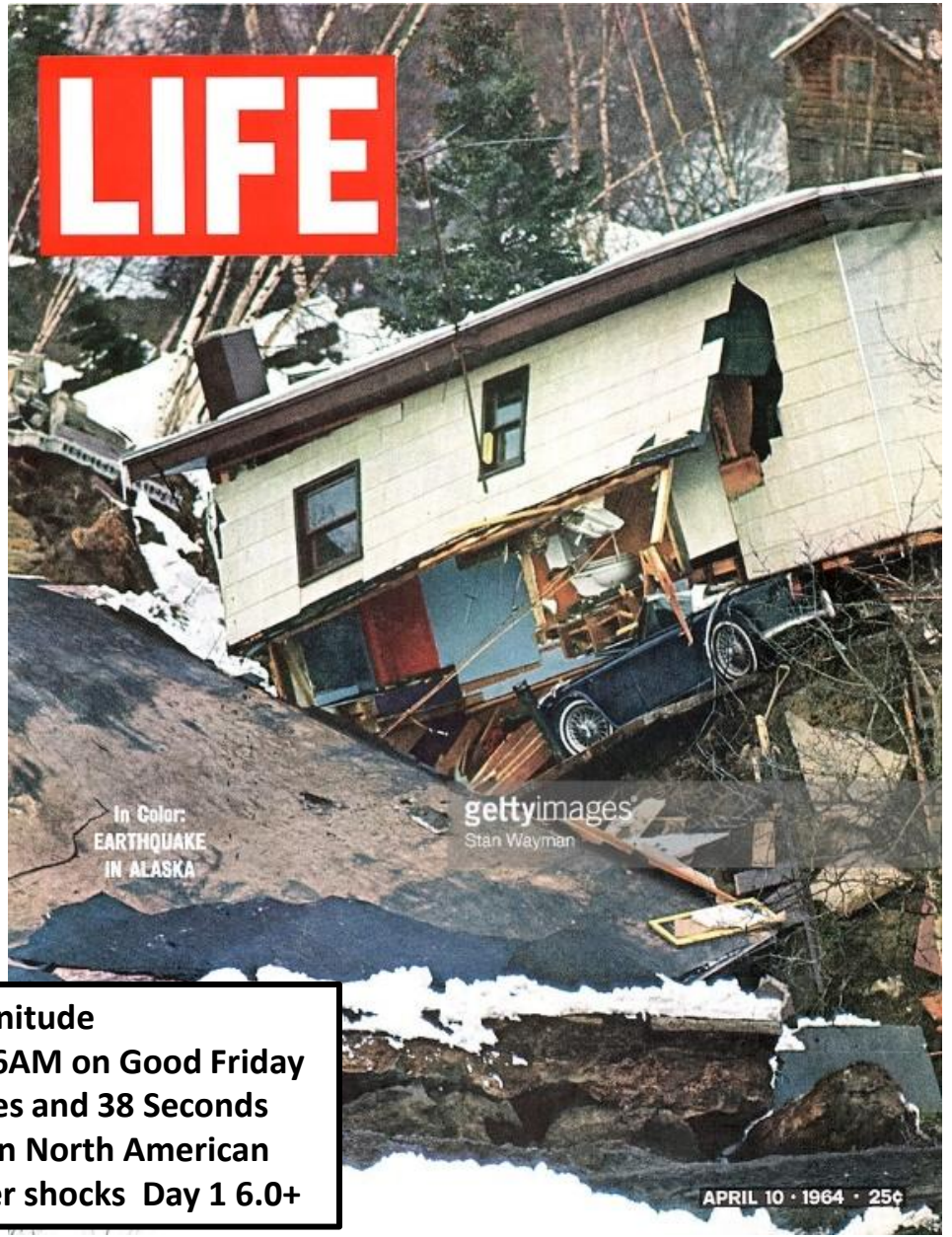
William F. Fairchild Airport as Emergency Operations Base makes good sense based on the number of assets around the airport and soil quality in the area.

***Marine Re-supply more likely sooner after air than roads**

Alaska Quake of 1964

The 1964 Quake is the only event we have to compare the damage expected in 9.0 Cascadia

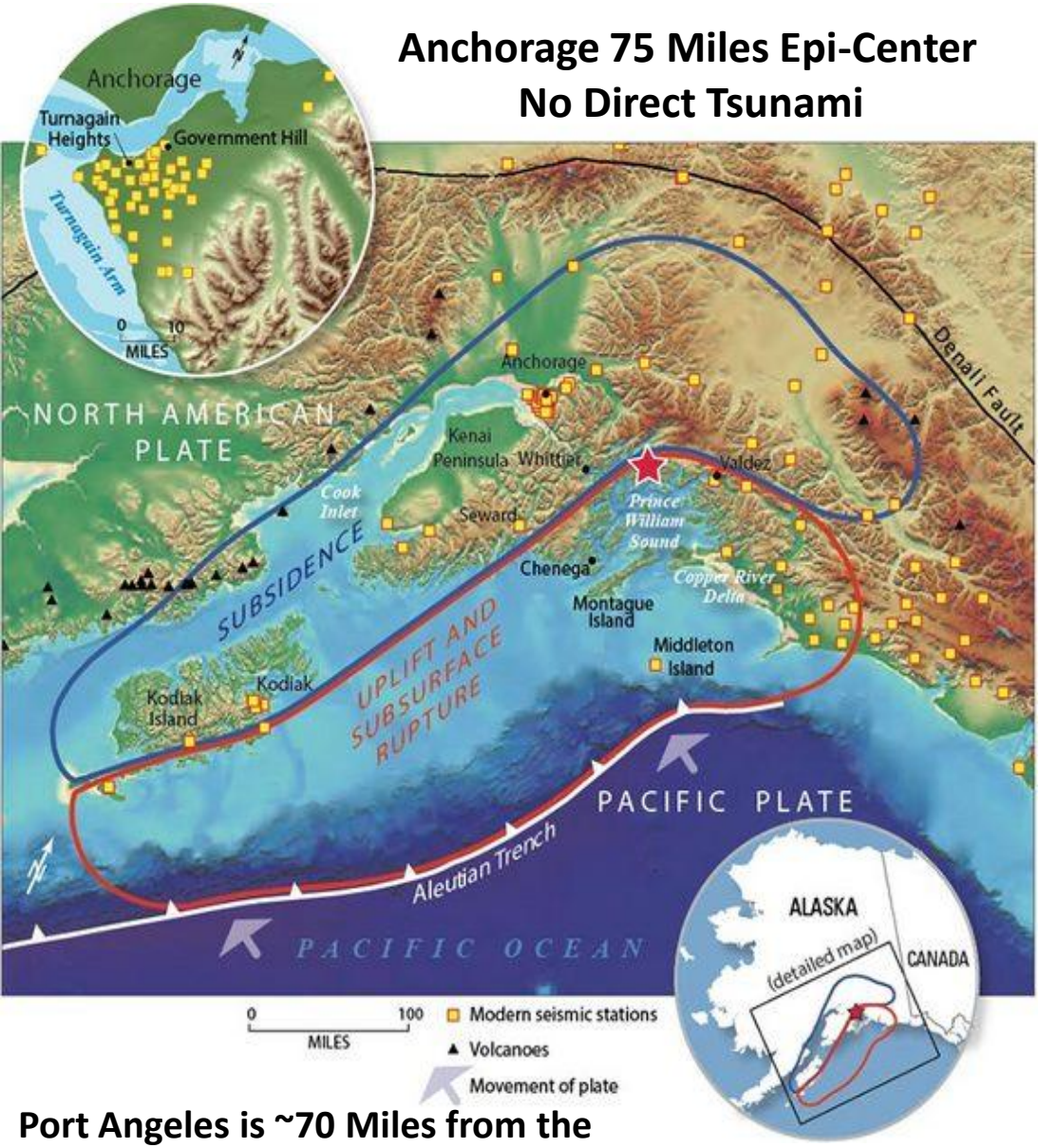




- 9.2 Richter Magnitude
- 139 Deaths 5:36AM on Good Friday
- Lasting 4 Minutes and 38 Seconds
- Most Powerful in North American History - 11 After shocks Day 1 6.0+

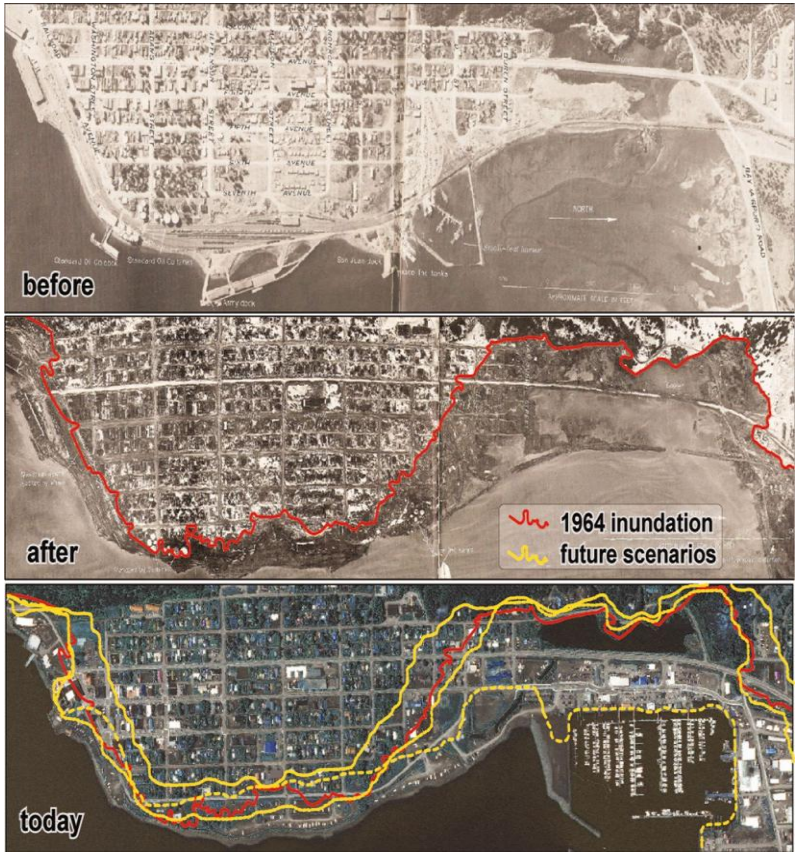
Alaska Quake of 1964

Anchorage 75 Miles Epi-Center
No Direct Tsunami



Port Angeles is ~70 Miles from the Coast ~120-130 miles from Fault Line A

Seiche Tsunami



No Direct Tsunami; the tsunami was caused by the sloshing of water due to shaking in Cook Inlet

Alaska Quake of 1964

Tsunami Action Pushed Material Inland & Fire Breaks Out

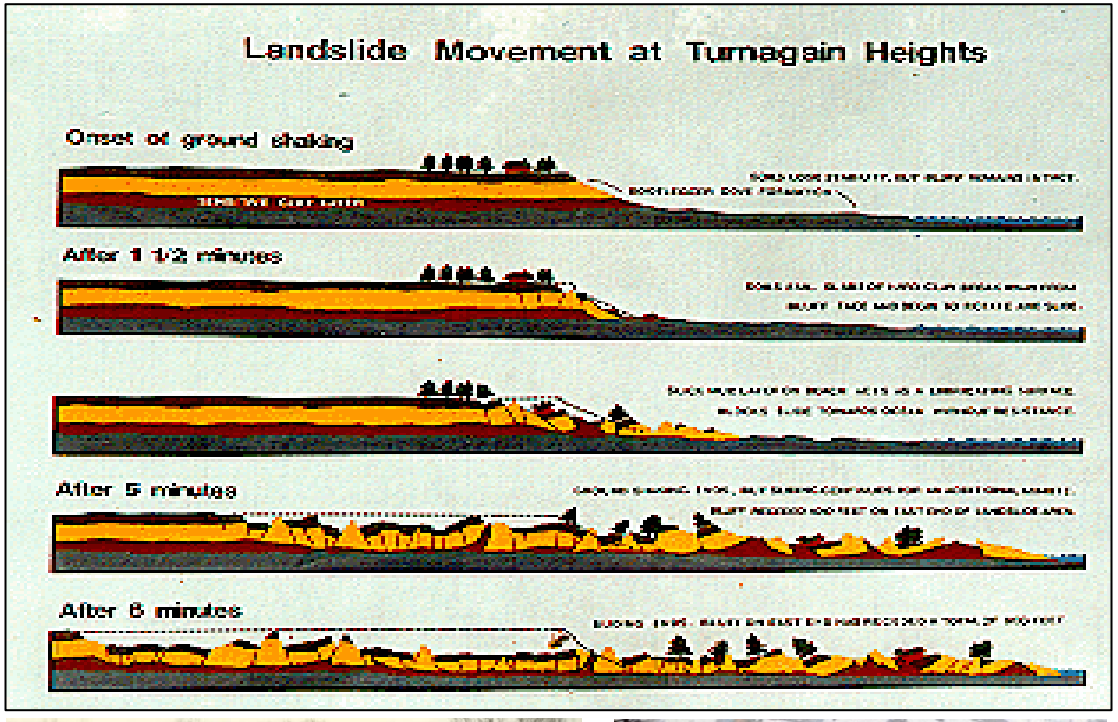
Alaska Quake of 1964

- Shops Dropped 8 Feet
- Hillside Behind Hospital Collapsed
- Downtown homes & business knocked off foundations

Alaska Quake of 1964

Commercial Damage
Left : 4 Seasons Apartments
Right : McKinley Tower
Bottom : Roads Collasped

Alaska Quake of 1964



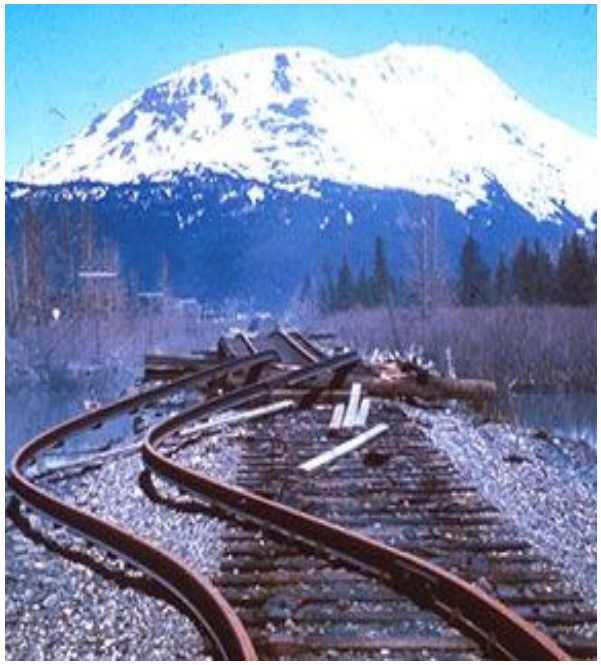
Turnagain Neighborhood Suffers a Landslide

Alaska Quake of 1964

Earthquake damage at Turnagain, Anchorage, Alaska 1964

Road through the center of Turnagain Neighborhood
Note the Fire Hydrant at the side of the road 3” or greater road displacement

Alaska Quake of 1964



Bridge & Rail System Suffer Displacement

Alaska Quake of 1964

Copalis River, WA 2,000+ miles away

Road System Suffer Displacement

IS HELP COMING?

How soon will help come?

When will it get here?

Who will it be?

The State & County Plan

The Air Bridge: Our Lifeline to feed 8 Million Northwesterners

Given the loss of roads/bridges, an air-bridge is the fastest way to bring help. It is *our job* to have the airfields ready to receive aircraft and *distribute* the materials

The Tiered Air Base Concept

Supplies will flow through a Tiered Airbase Distribution System

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

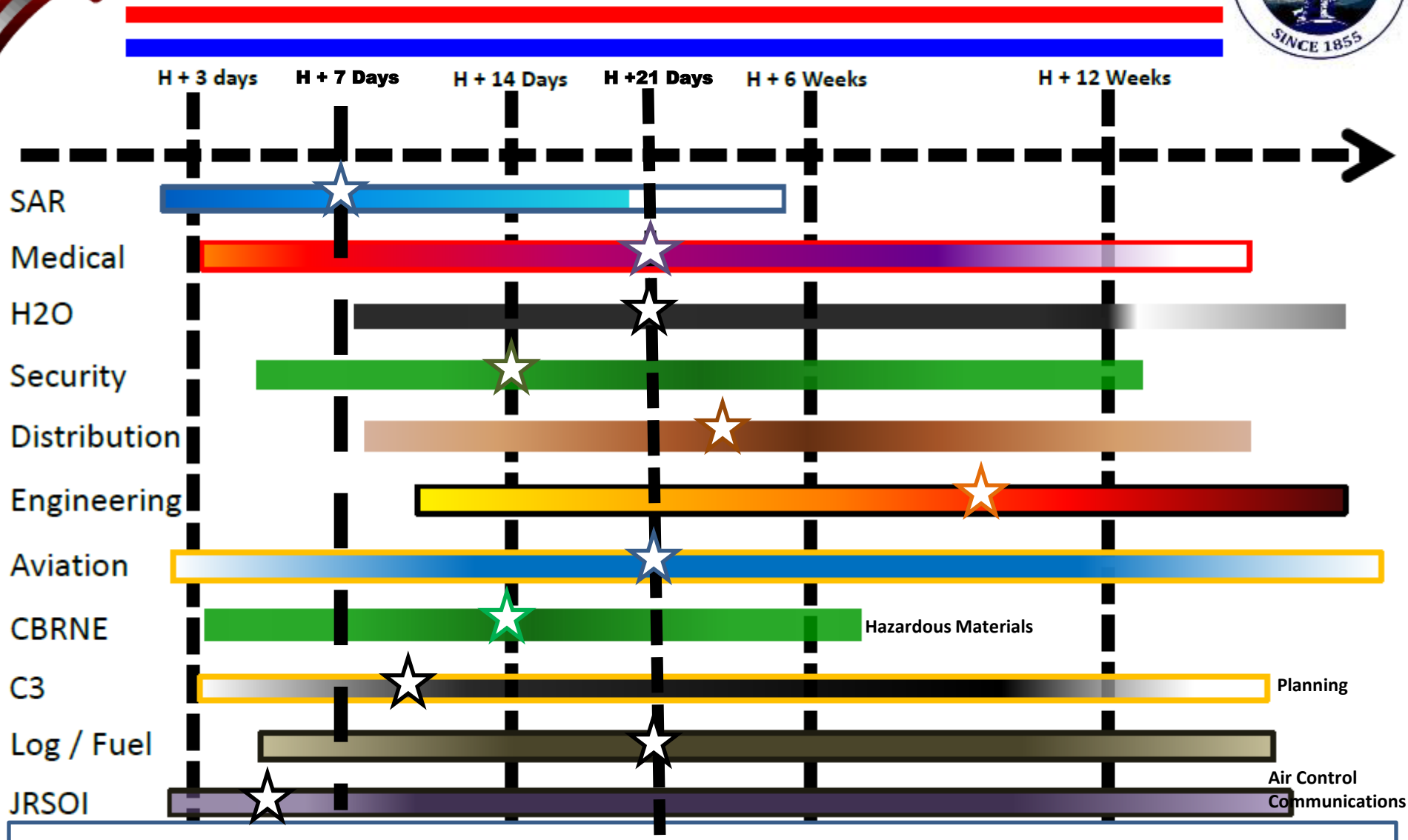

Tier 2 Airbase – C17/C130 capable with ground support and logistics facilities (Fairchild and Quillayute NAS)


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


Tier 4 – Helicopter capable (a helicopter landing zone)


= Arrival Sufficent Outside Resources

Lines Of Effort



Clallam County efforts must focus on the first 4 weeks of the emergency. Consideration of seasonal weather is also essential for SAR, timing and shelter.

Government Playbook for Disaster Response

Time Line

Port Angeles

Final Thoughts

CASCADIA RISING

- This briefing you received is based on the work of the best minds in this country addressing this problem (private, local, state, and federal)
  - **We work continuously to incorporate the best and latest knowledge into the response plan.**

- We are not here to be alarmists, but as realists
  - **We have begun this difficult conversation with the community in Eastern Clallam, Joyce, Sequim and Forks**
    - **Over 3,500 citizens have attended presentations of Cascadia and preparedness in theses areas by the three of us in the last 18 months**
    - **Their *overwhelming response* to us was "tell us the whole truth no matter how bad and we will figure out how to solve it"**
    - **Our communities are finding solutions which we can share with you at a later briefing**
  - **We have waited until this time to insure we present a solid and realistic picture**
  - **The material presented is based on well vetted science not available even 5 years ago**
  - **This information dramatically changes our threat profile from a "2" on a scale of 10, to a "10+"**
  - **Cascadia is the 2nd greatest concern for the Federal Government, exceeding anything associated with California Earthquakes or Gulf Hurricanes**
  - **Cascadia requires a "Call to Action" as this *will* happen – "It's Just a Matter of Time"**

- Everyone will be looking to *us* to solve their issues
- Everyone (*All public employees*) will need to assume leadership roles
- Citizens will also *need to respond* to "Call to Actions" and *volunteer*
- We all need to think outside of the box to minimize casualties and loss of property

Emergency Management Division

CITY OF SEQUIM

CITY OF FORKS

FEMA

PNSN

Emergency Management

Makah

Quileute

JAMESTOWN S'KLALLAM TRIBE

Earthquake Faults in Washington State

CITY OF SEQUIM

Emergency Management

The Air Bridge: Our Lifeline to feed 8 Million Northwesterners

Given the loss of roads/bridges, an air-bridge is the fastest way to bring help. It is *our job* to have the airfields ready to receive aircraft

The Tiered Air Base Concept

Supplies will flow through a Tier Airbase Distribution System

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)


Tiered Base Concept

National Level "Point of Origin"

FEMA Basing Terms:

ISB – Incident Support Base – First level of logistical distribution. Provides distribution to FSAs. All handled commodities belong to FEMA until assigned to an FSA. One ISB is tentatively allocated to Wash State in CSZ.

FSA – Forward Staging Area – Second level of distribution, provides distribution to State Staging Areas. Doctrine is changing to create three sub-types of FSA (Type, 1, 2, 3, based on capacity). Two FEMA FSAs are tentatively allocated to Wash State in the CSZ.

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.

Flow of Logistics and Inbound Resources

Tier 1

Based on existing airports
- Largest capability (747/C5)
- Identified now
- Preplan usage now
- Pre-coordinate design now
- Acts as all Tiers
- Provides distribution to local communities

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

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

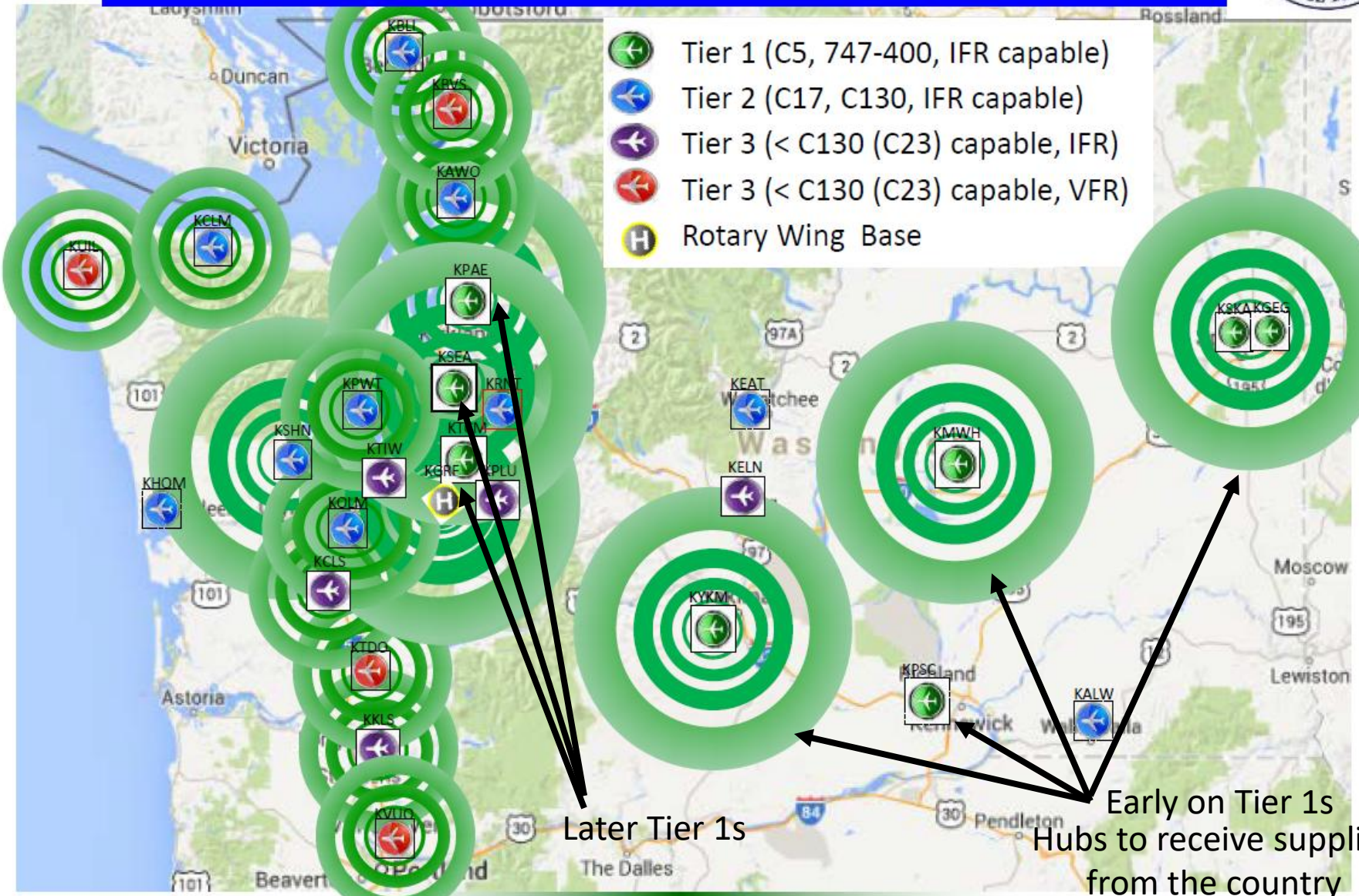
Tier 4

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

Basing Concept



Establish Tier 3 and 4 Bases

These are the key airfields we need to make ready to receive help and supplies

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

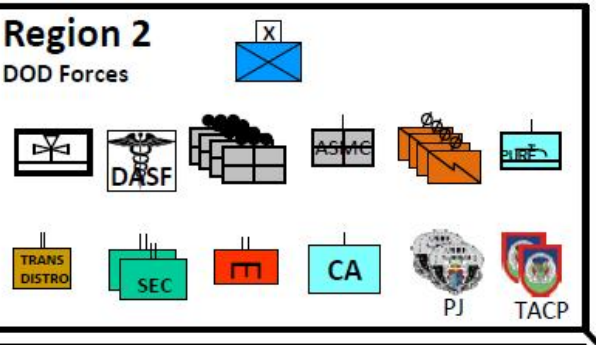
Tier 4 heliports (Black dots ●) at Neah Bay, LaPush, Beaver, Hungry Bear, Shadow Mtn Store and Voice of America

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

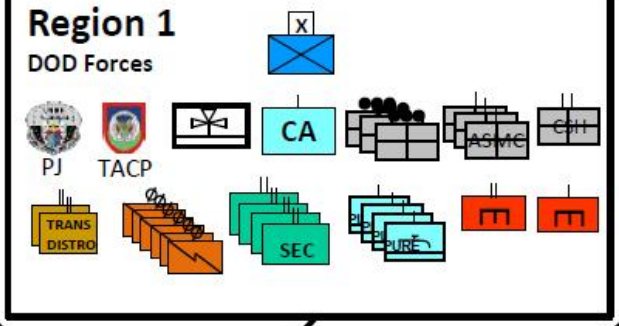
Washington , Idaho, Montana, other State's National Guard and Federal Forces

Resources are NOT based on *Seattle First*, they are pre-allocated to regions

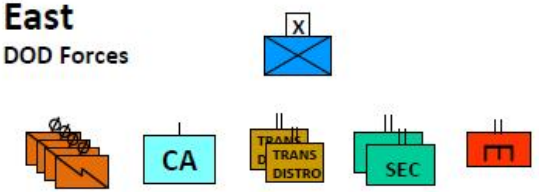
Region 2
DOD Forces



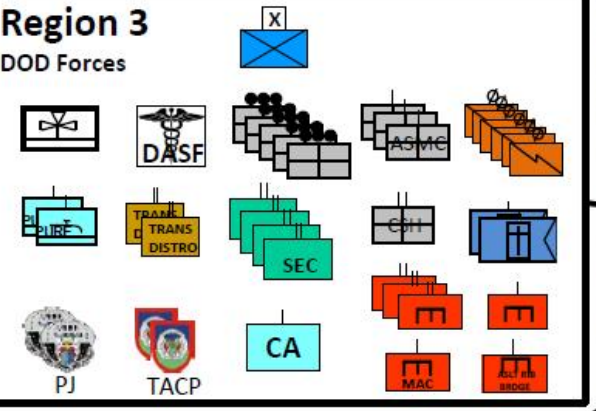
Region 1
DOD Forces

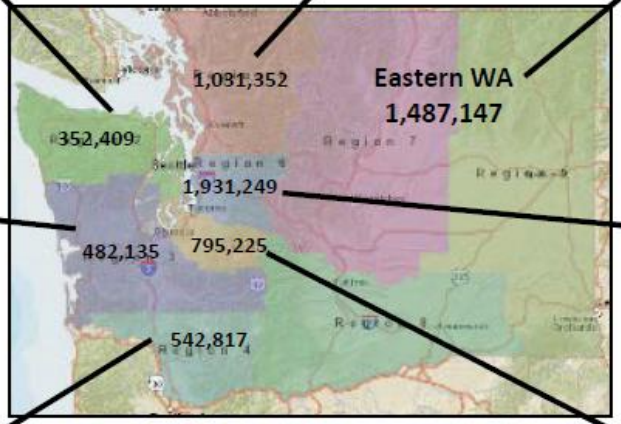


East
DOD Forces

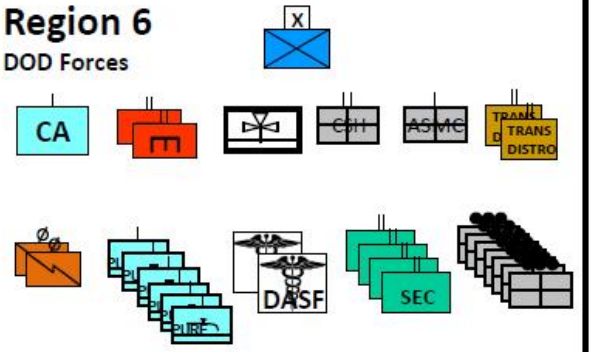


Region 3
DOD Forces

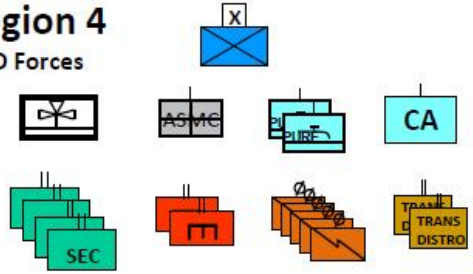




Region 6
DOD Forces



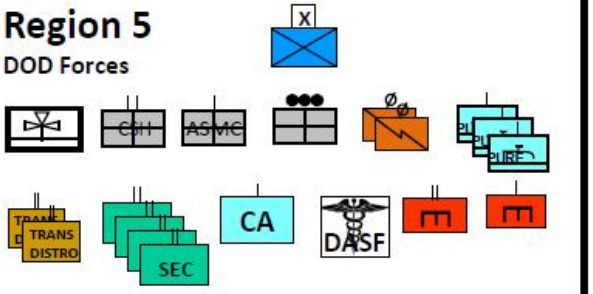
Region 4
DOD Forces



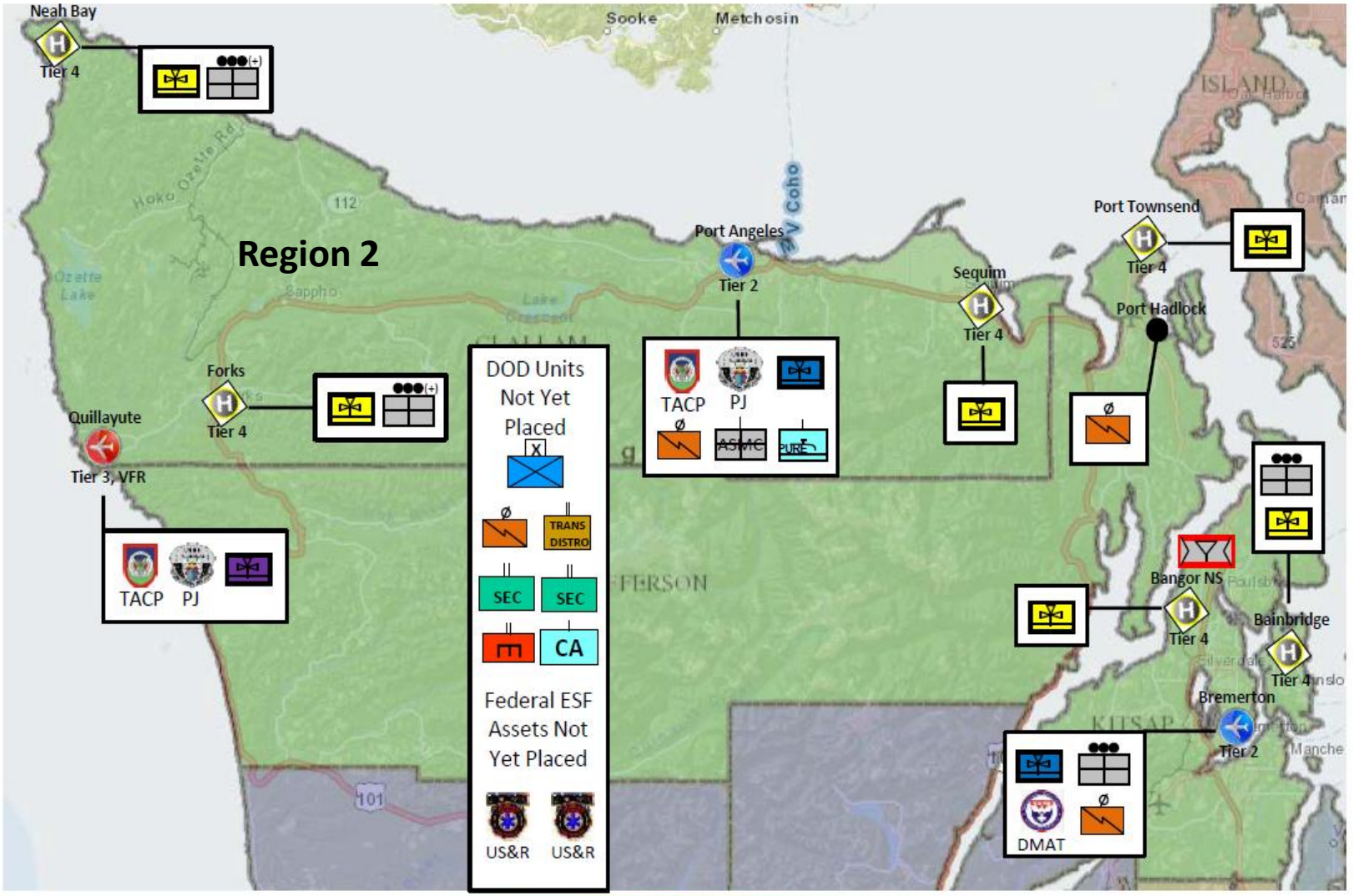
DOD Personnel Requirement

Region 1: 5,637	Region 6: 6,260
Region 2: 2,881	East: 2,896
Region 3: 6,891	TF Aviation: 2,689
Region 4: 3,610	TF CBRNE: 4,152
Region 5: 5,059	**Total: 40,075**

Region 5
DOD Forces

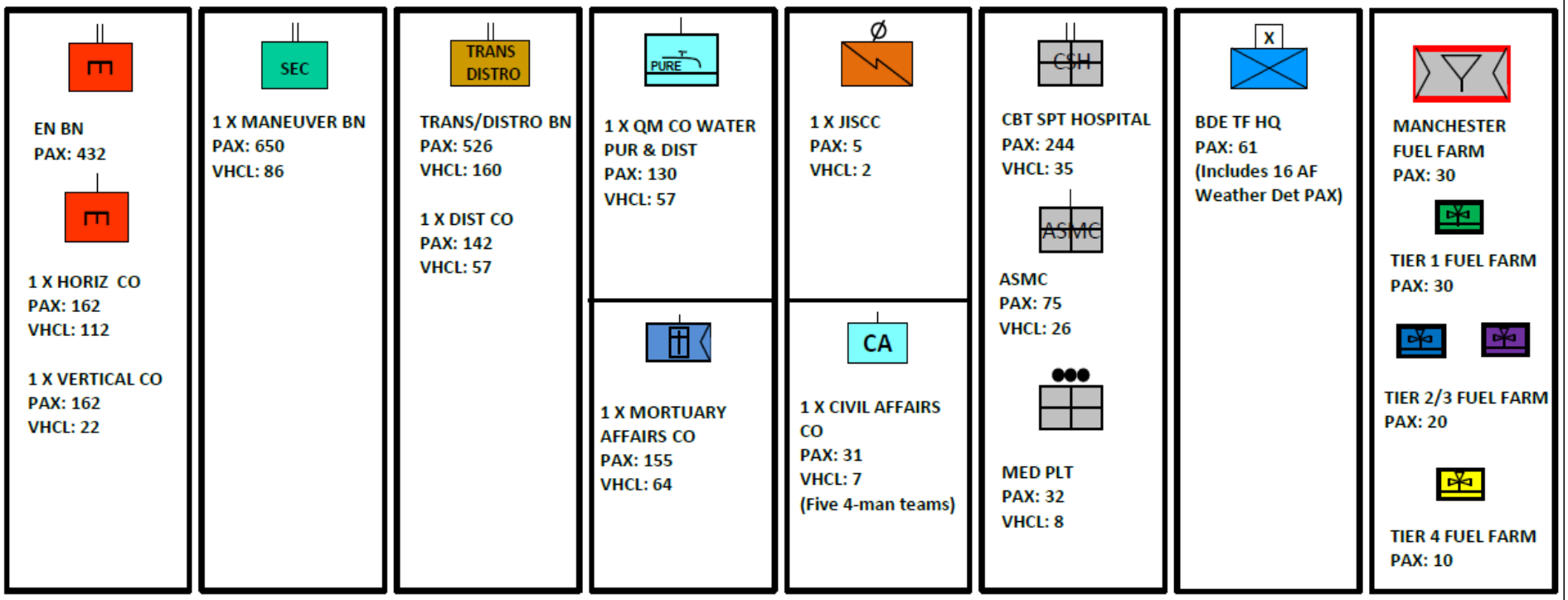


Special Operations Brigade Pacific - Rangers, Airborne and Special Forces



Special Operations Brigade Pacific - Rangers, Airborne and Special Forces

The icons below are not necessarily Service Component specific. In some cases these resources are only available in one Service Component. A typical configuration was used to perform calculations. In most cases Army organizational structure was used as the default.



Maritime Response

U.S. Marine Expeditionary Force (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

We will be working with Third Fleet to assess beachheads & pushing to move their landing site to Sequim Bay out of the debris zone and closer to where the population is (75K between Eastern Clallam & Jefferson) until Port Angeles harbor can be cleared and road out can be established to Eastern Clallam and Jefferson.

Special Operations Brigade Pacific – Fuel Response

DLA Fuel Farm at Manchester
~25 Million gallons of Diesel
~50 Million Gallons of Jet Fuel

This fuel is used early in PH2A/B to sustain the response as infrastructure is emplaced that will enable long term sustainment. Distribution is via fuel barge on waterways, and heavy lift helicopter and fuel bladders to response critical need.

Tier 1 **40K gallon fuel farm** (minimum) established via above ground fuel bladders (2x 20K bladders minimum), fueled from fixed wing download.

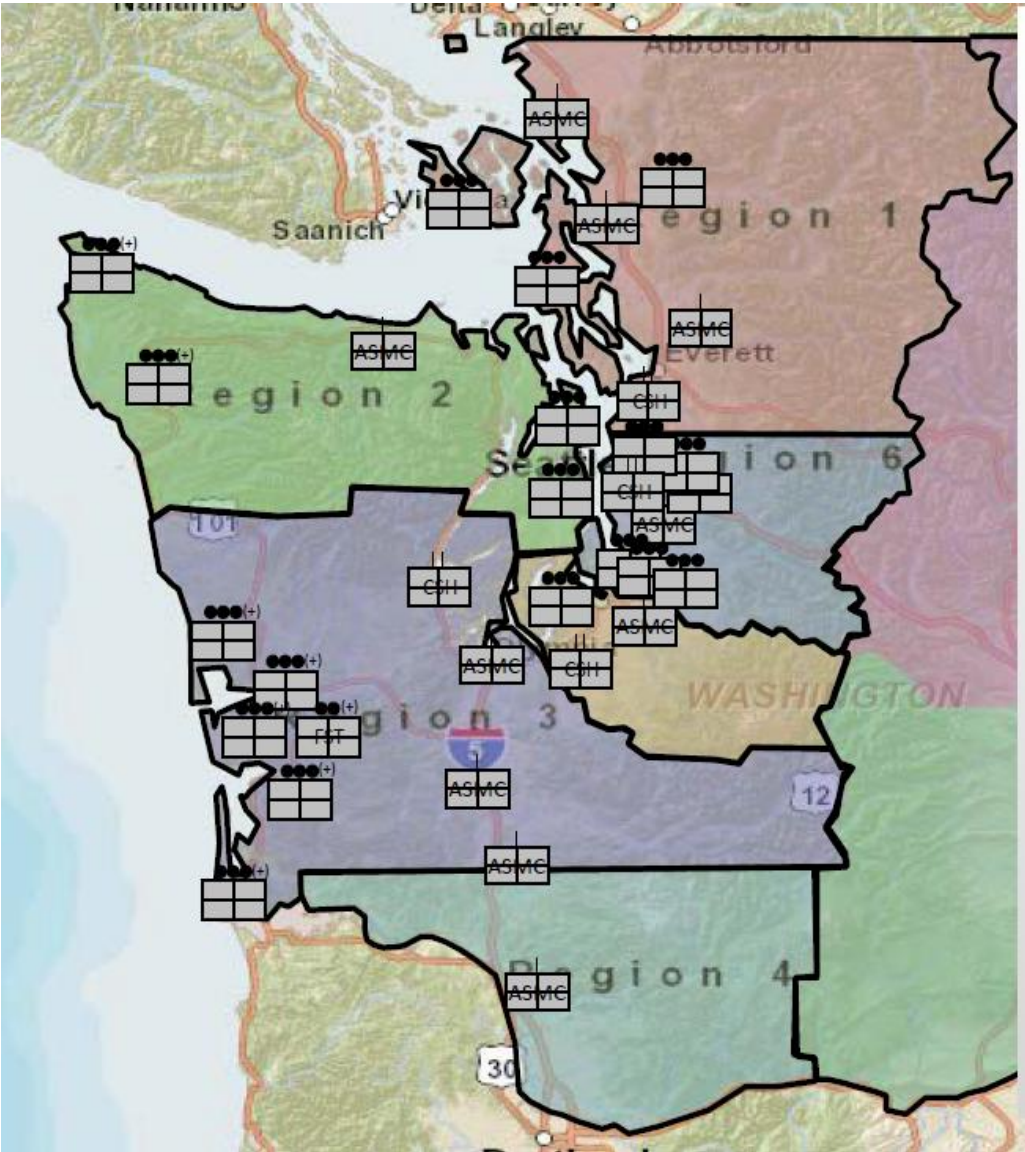
Tier 2 **20K Gallon fuel farm** (minimum) established via above ground fuel bladders (1x 20K bladders minimum), fueled from fixed wing download.

Tier 3 **20K Gallon fuel farm** (minimum) established via above ground fuel bladders (1x 20K bladders minimum), fueled from fixed wing download.

Tier 4 **10K Gallon Fuel farm**, based on need, established via above ground fuel bladders, fueled by rotary wing or over-the-ground when available.

NOTE: There is virtually no DOD capacity for storage, transfer, or distribution of bulk MOGAS or LPG.

Special Operations Brigade Pacific – Medical Response



Mission

Establish Level I, II, and III aid stations throughout the State in order to provide emergent life saving services for any injured persons and to evacuate to higher echelons of care.

Treatment

Triage, treat, return to duty, or coordinate evacuation of injured survivors through necessary echelons of care.

Evacuation

Air evacuation is preferred but ground evacuation will be utilized where feasible. Level I facilities will evacuate patients to level II or III facilities. Level II will evacuate patients to level III facilities, and Level III will evacuate patients out of theater.

Aid Station Locations

- Level I: Co-located with Tier 4 Bases
- Level I augmented with Civilian Doctors & Nurses
- Level II: Co-located with Tier 2 & 3 Bases
- Level III: Co-located with Tier 1 Bases

Acronyms

ASMC: Area Support Medical Company
CSH: Combat Support Hospital
FST: Field Surgical Team

Tiered Base Concept

- **Tier 1** (BSI/ISB/SSA)
  - JRSOI/RIP **(Air Control/Communications)**
  - Equipment staging & bed down
  - Resource transfer (H2O, CL I-IX)
  - Refuel (Ground & Rotary Wing)
  - Medical triage / treatment / transfer (Level III)
  - Limited human & pet sheltering
  - Responder sustainment
  - Distribution LOD for local area
  - 747/C5 capable
  - Possible Railhead / Trucking depot
- **Tier 2** (BSI/FSA/SSA)
  - JRSOI/RIP
  - Equipment staging & bed down
  - Resource transfer (H2O, CL I-IX)
  - Refuel (Ground & Rotary Wing)
  - Medical triage / treatment / transfer (Level II)
  - Limited human & pet sheltering
  - Distribution LOD for local area
  - Responder sustainment
  - C17 / C130 capable
  - Possible railhead / truck depot
- **Tier 3** (FSA/SSA)
  - JRSOI/RIP (Limited)
  - Equipment staging & bed down
  - Resource transfer (H2O, CL I-IX)
  - Refuel (Ground & Rotary Wing)
  - Medical triage / treatment / transfer (Level II)
  - Limited human & pet sheltering
  - Distribution LOD for local area
  - Responder sustainment
  - Less than C130 capable (C23)
  - NOT rail or truck capable (Isolated)
- **Tier 4** (SSA/RBC)
  - Equipment staging & bed down
  - Resource transfer (H2O, CL I-IX)
  - Refuel (Ground & Rotary Wing)
  - Medical triage / treatment / transfer (Level I)
  - Limited human & pet sheltering
  - Responder sustainment
  - Distribution LOD for local area
  - Rotary Wing / vertical lift capable
- **Tier 5** (CPOD)
  - Community Points of Distribution
  - Medical CCPs (Basic First Aid)
  - Hasty Collection Points (SAR)