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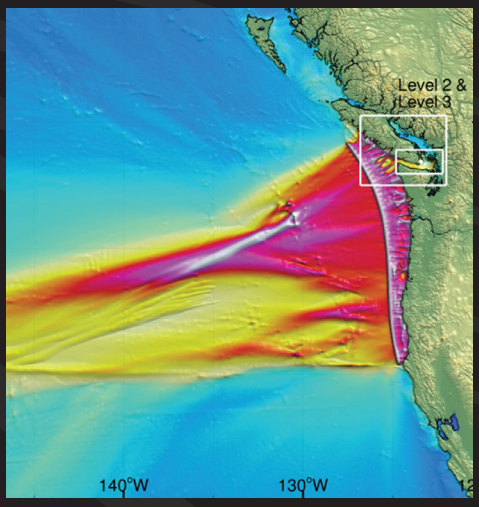
AWARDS 2014: SPECIAL PROJECTS

AECOM

POTENTIAL TSUNAMI INUNDATION LIMITS AND RUN-UP MODELING



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CRD
Making a difference...together

75 WORD SUMMARY

SECTION 1

75 WORD SUMMARY

The Capital Regional District (CRD) needed to better understand tsunami risk in the Capital Region. AECOM, with Dr. K. F. Cheung, used a state-of-the-art non-hydrostatic model to analyze a magnitude 9.0 megathrust earthquake and the effects from a resulting tsunami. The products - consisting of computer animations, colour-scaled figures and a Tsunami Hazard Line - helped to develop emergency preparation, planning, evacuation, and awareness programs.

Tsunami Hazard Line - Victoria Harbour

PROJECT HIGHLIGHTS

SECTION 2

PROJECT HIGHLIGHTS

2.1 INNOVATION

This project delivered a more detailed and accurate model and representation of the tsunami impacts than was available for previous mapping of the region. This was made possible by the intensive model compilation and analysis completed by the AECOM team. The CRD includes a coastline several hundred kilometres long around the southern tip of Vancouver Island, near to the Cascadia Subduction Zone (CSZ). A CSZ earthquake has a strong potential to occur sometime within this or the next generation.

Ogden Point - with Tsunami Hazard Line

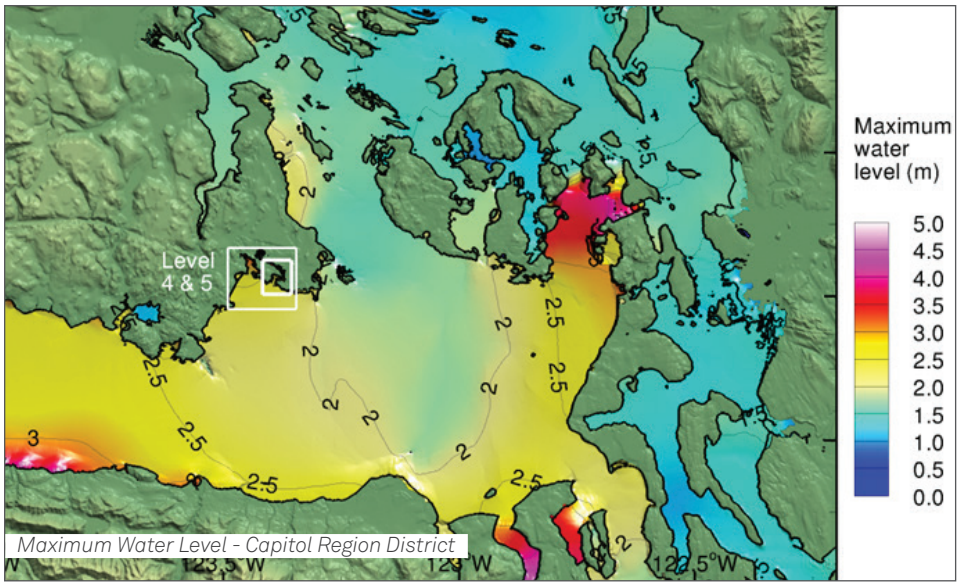
The AECOM team undertook detailed modeling of the effects of a magnitude 9.0 CSZ megathrust earthquake that could occur off the west coast of Vancouver Island and the resulting impacts of tsunami inundation limits and run-up elevations throughout the region, including the Strait of Juan de Fuca, Gulf Islands, US San Juan Islands, and Puget Sound. The analysis used a state-of-the-art hydro-dynamic computer simulation model, NEOWAVE, developed by Dr. Cheung, to determine shoreline impacts and develop a Tsunami Hazard Line (THL). The model has won in competition against seven other tsunami numerical models and has been validated against data obtained from a number of recent tsunami events, including the 2011 Tohoku tsunami in Japan. It is the official model for tsunami inundation mapping in Hawaii, American Samoa, and the US Gulf of Mexico coastal states.

SECTION 2

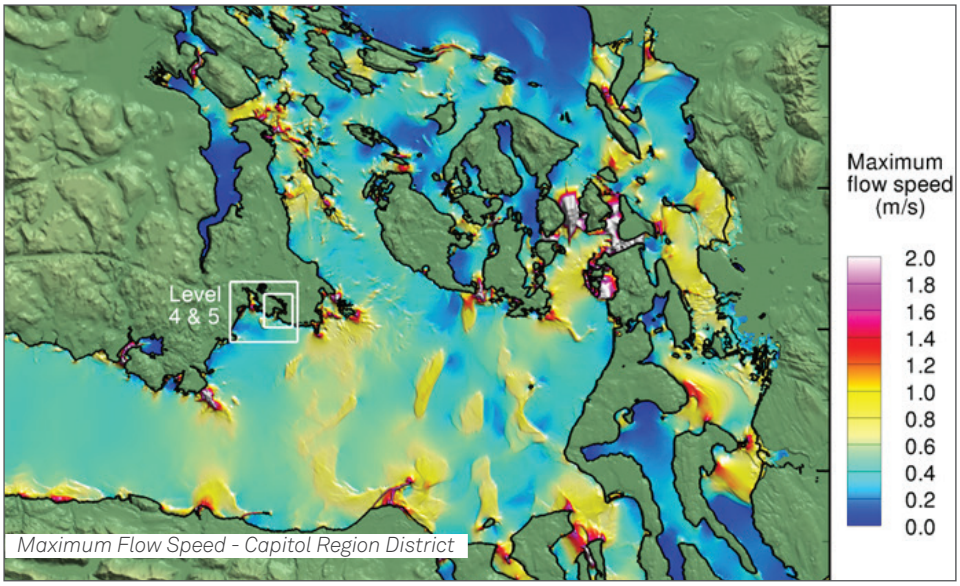
PROJECT HIGHLIGHTS CONT'D

NEOWAVE was used to analyze each of five nested grids, ranging from the North Pacific Ocean to Victoria Harbour, with increasing accuracy required and applied to the smaller grid areas. The model simulates a period of approximately eight hours after the onset of the CSZ earthquake for each of the grid sizes and generates results for the following parameters:

- maximum water elevation (based upon a starting water level of Higher High Water Mean Tide (HHWMT) as recommended by the National Tsunami Hazard Mitigation Program (NTHMP)
- maximum water level drawdown
- maximum water flow velocities
- time to tsunami arrival
- time to maximum water level (including water level resonance effects)



Maximum Water Level - Capitol Region District



Maximum Flow Speed - Capitol Region District

The results provided CRD with valuable tools to assist in development of emergency preparation, planning, evacuation and awareness programs, and communicate warning signs to the public and stakeholders. They also inform CRD's public outreach and education programs including tsunami FAQs, information cards, public service announcements, pamphlets with local evacuation planning maps, and powerpoint presentation for community workshops.

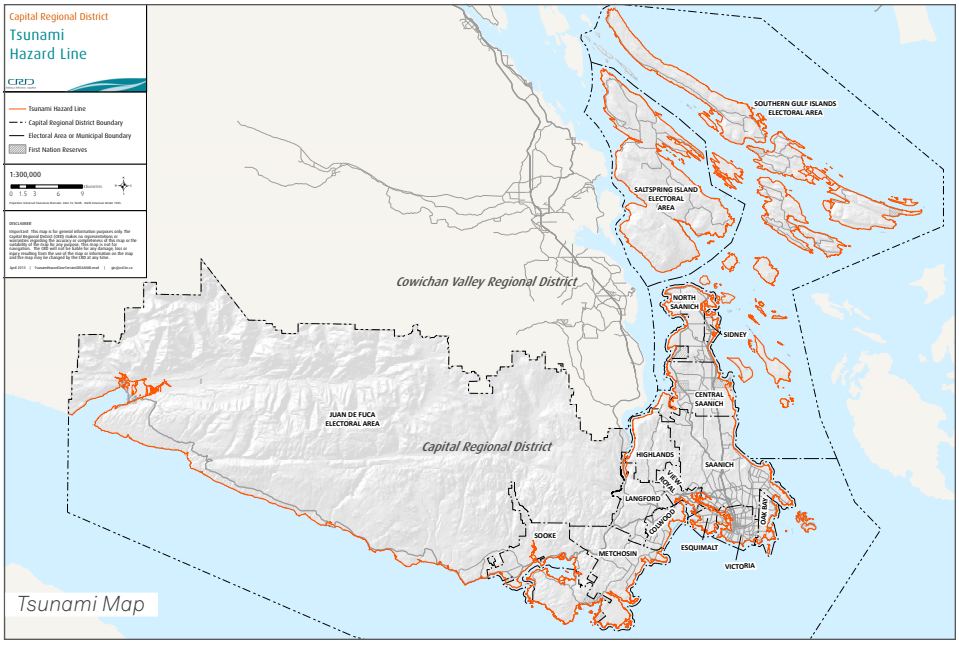
SECTION 2

PROJECT HIGHLIGHTS CONT'D

2.2 SOCIAL AND/ OR ECONOMIC BENEFITS

Emergency preparation plans, public awareness and proper training are instrumental in keeping the public safe when disaster strikes. Just as important, is the information that these plans are built upon. Previous maps were built upon simplistic assumptions and did not account for the entire area within the region or the many factors likely to influence the potential impacts of a tsunami. The new tsunami hazard line and supporting maps, simulations and colour-scaled figures provide easily understood information to explain the potential effects not only to the CRD, but also to policy-makers and residents. The more that people understand the warning signs and what to do, the better prepared they are to survive and address emergency events.

AECOM undertook intensive preparatory work to develop a seamless topographic and bathymetric Digital Elevation Model (DEM) drawn from multiple data sources of varying accuracy, age and reliability. The results provided CRD with valuable tools to assist in development of emergency preparation, planning, evacuation and awareness programs, and communicate warning signs to the public and stakeholders. They also informed CRD's public outreach and education programs including tsunami FAQs, information cards, public service announcements, pamphlets with local evacuation planning maps, and powerpoint presentation for community workshops.



SECTION 2

PROJECT HIGHLIGHTS CONT'D

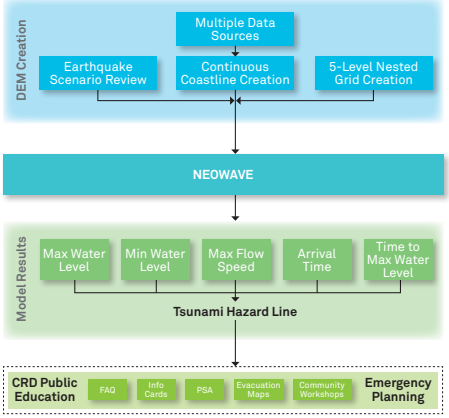
2.3 ENVIRONMENTAL BENEFITS

Emergency preparation and planning is critical to the safety of people and also plays a significant role in sustainable planning and development of the environment and infrastructure. Even regions previously thought to be the most tsunami aware and prepared have been devastated by the unanticipated affects of a tsunami, as evidenced by the 2011 Tohoku earthquake and tsunami in Japan.

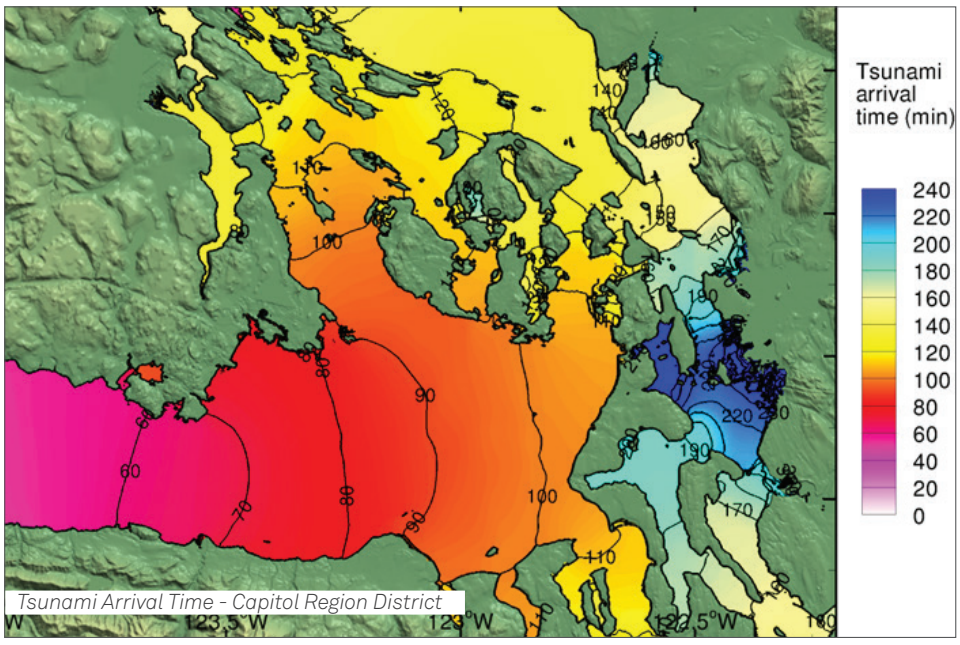
The AECOM team's work as part of an intensive data compilation and model analysis included:

- Earthquake Scenario review which determined the most likely 1-in-500 year CSZ event
- Seamless topographic and bathymetric digital elevation model creation including data assembly from multiple sources having varying accuracies, ages and reliabilities, using multiple datums and overcoming trans-boundary differences in data and nomenclature
- DEM resolution and interpretation to provide a continuous coastline throughout the entire CRD using a consistent datum
- Nested grid creation for increasing detail and accuracy of analysis varying from the scale of the North Pacific Ocean down to Victoria Harbour.
- Model simulation of CSZ earthquake occurrence and analysis of tsunami effects on each of the nested grids over a period of approximately eight hours following the event.

The analysis helped the CRD to improve and increase the sustainability of its emergency planning, evacuation, and awareness programs for the safety of its citizens.



Model Development, Analysis, Results



Tsunami Arrival Time - Capitol Region District

SECTION 2

PROJECT HIGHLIGHTS CONT'D

2.4 MEETING CLIENT'S NEEDS

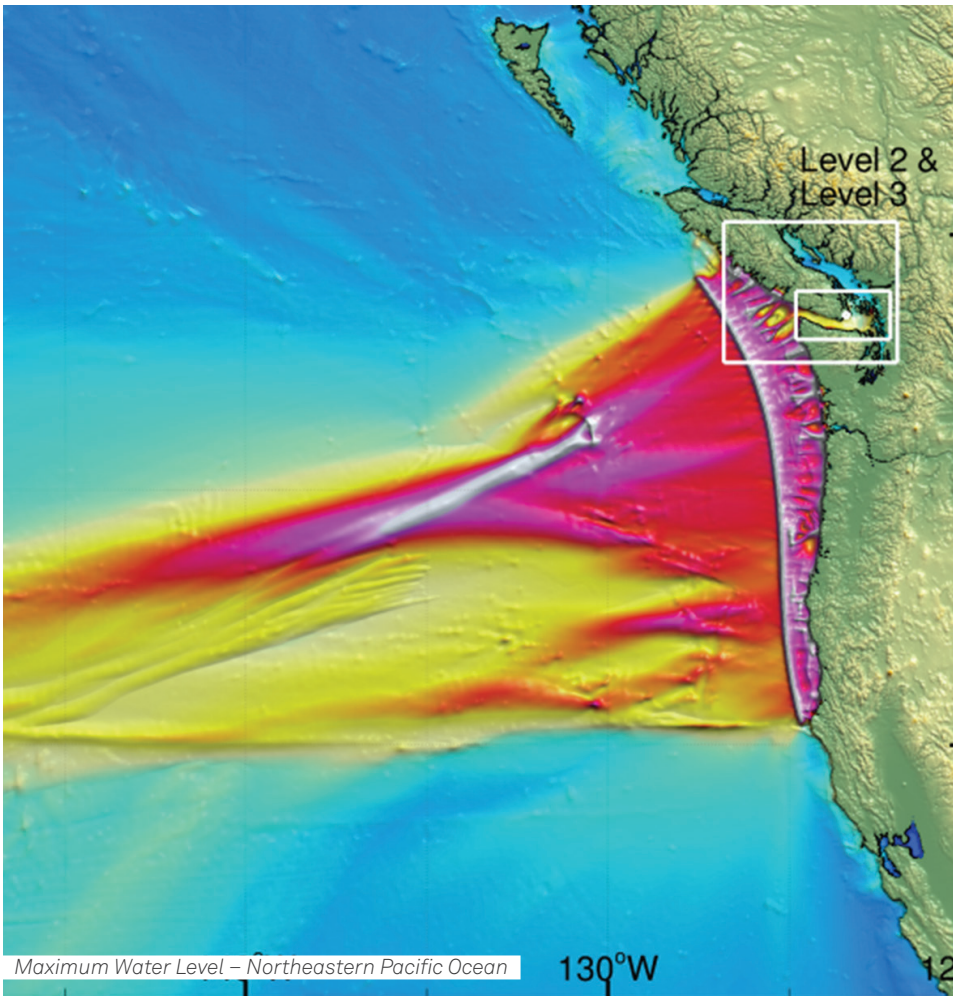
AECOM supported the CRD in achieving its objectives to guide emergency preparedness public education outreach programs by:

I. delivering results summaries in a series of computer animations and colour-scaled figures showing maximum and minimum water levels, maximum flows speeds, tsunami arrival time and time to maximum water level;

II. defining the tsunami hazard line, which took into account ground subsidence following the CSZ, maximum water level and a factor for public safety, and application of the THL to CRD publicly-accessible GIS mapping;

III. presenting results and summary report to CRD staff, stakeholders, and elected politicians;

IV. achieving savings in time and money for the wastewater treatment program by adding the needed additional analysis onto the original assignment.



Maximum Water Level – Northeastern Pacific Ocean

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