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DATE: August 18, 2014  
FOR: Washington State Interoperability Executive Committee (SIEC)  
FROM: Bill Schrier, Chair  
SUBJECT: DRAFT Interoperable Communications Lessons Learned from the SR 530 Landslide (V7)

This is a draft report regarding the use of radio communications during the response and recovery phases following the State Route 530 Landslide in Snohomish County.

Additional information, questions and comments to this draft report are welcome. Please send such information to Bill Schrier, [bill.schrier@ocio.wa.gov](mailto:bill.schrier@ocio.wa.gov) 360-902-3574 or Shelley Westall, [shelley.westall@ocio.wa.gov](mailto:shelley.westall@ocio.wa.gov) 360-902-9841.

## Executive Summary

On Saturday, March 22 at 10:37 AM Pacific Time, a hillside near the village of Oso in Snohomish County, Washington, liquefied, sending a wall of mud and debris down into the North Fork Stillaguamish River valley. The slide inundated state highway 530, closing it, and isolating the community of Darrington from the remainder of the county. Forty-three residents of that valley died and 49 homes were destroyed<sup>1</sup>. The debris field covered over one square mile. In the ensuing six weeks, public safety agencies and volunteers mounted a major rescue and recovery operation which involved, at some points, up to 700 responders. This event is known in Washington as the State Route 530 (SR530) Landslide<sup>2</sup>.

As with any major disaster, wired and wireless communications are critical to response and recovery. The primary wireless interoperability lessons learned from this event are:

- The area of the event was well-covered by the Snohomish Emergency Radio Systems (SERS), a trunked public safety radio system used by most responders in the County for day-to-day operations.
- The Snohomish Division of Emergency Management (DEM) had acquired two communications vehicles which were well-used in the event. Having two vehicles allowed one to be deployed to each end of the slide area.
- Interoperability can be improved by increasing the number of handheld radios available in caches throughout the Puget Sound region (King, Snohomish and Pierce Counties and the Port of Seattle).
- All radios in the region should be reprogrammed in a common fashion (with incident operations “zones”) to facilitate communications between responders to a disaster or incident anywhere in the region.
- More training on radio communications is needed for responders, communications leaders, communications technicians and the telecommunicators who staff 911 centers. State government should take a lead in training and certification of some of these responders.
- The State government could also foster better cooperation between responder agencies across the state by creation of a field operations guide (FOG) of radio frequencies, plus inventories of communications equipment and trained communications leaders.

Other lessons learned are in the body of the report.

## Interoperable Communications Lessons from the SR530 Landslide

By Bill Schrier, Chair, Washington State Interoperability Executive Committee (SIEC) in collaboration with Crystal Ayco, Anton Damm, Keith Flewelling, Scott Honaker, Terry Knight, Chris Lombard, Tom Mahon, Michael Marusich, Mark McDermott, Missy Parker, Bob Schwent, Dick Whitaker, Karl Wright and Jose Zuniga.

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On Saturday, March 22 at 10:37 AM Pacific Time, a hillside near the village of Oso in Snohomish County, Washington, liquefied, sending a wall of mud and debris down into the North Fork Stillaguamish River valley. The slide inundated state highway 530, closing it, and isolating the community of Darrington from the remainder of the county. Forty-three residents of that valley died and 49 homes were destroyed<sup>3</sup>. The debris field covered over one square mile. In the ensuing six weeks, public safety agencies and volunteers mounted a major rescue and recovery operation which involved, at some points, up to 700 responders. This event is known in Washington as the State Route 530 (SR530) Landslide<sup>4</sup>.

As with any major disaster, wired and wireless communications are critical to response and recovery.

Some communications capabilities fell into place by both design and luck:

- The slide area is well-covered by the Snohomish Emergency Radio System (SERS), a countywide 800 MHz trunked radio network used by all in-county first responders<sup>5</sup>. An earlier mudslide had occurred in the area in 2006, with poor coverage from SERS. But system enhancements between 2006 and 2014 immensely improved coverage.
- The Snohomish County Division of Emergency Management (DEM) had used grant funds to acquire two communications vehicles. DEM acquired two vehicles in anticipation of a major earthquake which might damage or destroy bridges crossing the Snohomish River running from east to west through the center of the county. Such an event would geographically split the county into two parts. But, by having two such resources, the County was able to deploy one vehicle to each of two incident command centers: one in isolated Darrington on the east side of the slide, and another in Arlington on the west side.
- The SNOPAC (**S**nohomish County **P**olice Staff and **A**uxiliary Services **C**enter) is a 9-1-1 Public Safety Answering Point (PSAP) supporting residents in the slide area<sup>6</sup>. SNOPAC staffed field dispatch centers in communications vehicles and trailers to provide on-scene dispatch and coordination of responders in the slide area. Some of the individuals involved had training as
- 800 MHz ICall was used throughout the event as a command network. Technically ICall should be used for units initially responding the scene. But SERS had built an extensive ICall simulcast network of five sites which covered the slide area well. Because ICall was in almost all 800 MHz-capable radios anyway, the incident commanders decided to use it for command and control. One small issue discovered early in the response was heterodyning between two ICall sites covering the slide area. This was quickly fixed by SERS technical staff. Tactical trunked talk groups were used by field operational units.
- Karl Wright, a SERS radio technician, lives in Darrington, and was able to respond and support the incident command post in that community. He was constantly on duty to handle communications training and issues during the event. For example, he reprogrammed responders radios including cache radios shipped in from outside the county.

- A system-key-sharing agreement exists between Snohomish, King (Seattle) and Pierce (Tacoma) counties and the Port of Seattle. These agencies operate five compatible 700/800 trunked radio networks. (These five will be reduced to four in the near future as the Tacoma and Pierce County trunked systems are merged). The System key-sharing agreement allowed Karl Wright and other technicians to rapidly reprogram radios as they were shipped to SR530 slide incident.
- The Snohomish County Emergency Operations Center (EOC) was also staffed by Snohomish County Auxiliary Communications Services (ACS) volunteer emergency telecommunicators (hams). The radio room has six radio stations in cubicles, staffed one of the County's communications' vehicles (COM1) in Darrington. Other Amateur Radio volunteers provided communication support for the Incident Management Team in Arlington<sup>7</sup>. ACS worked 160 shifts in the EOC and COM1<sup>8</sup>. This supported ended on April 30<sup>th</sup>. Officials overseeing this work included Amateur Radio Relay League (ARRL) Western Washington Section Manager Monte Simpson, K2MLS and ACS Radio Officer Scott Honaker, N7SS.
- The Alaska Shield Exercise was scheduled to start on March 27<sup>th</sup>, timed to coincide with the 50<sup>th</sup> anniversary of the 1964 Alaska earthquake<sup>9</sup>. The area's Urban Search and Rescue (USAR) team<sup>10</sup>, the type III Northwest Washington Incident Management Team (NWIMT)<sup>11</sup> and the FEMA Mobile Emergency Response Support (MERS)<sup>12</sup> Team based in FEMA Region 10 were already preparing to deploy for this exercise. Once authorized, they quickly redirected their mobilization to the SR530 slide.
- FEMA and its MERS team is a major disaster resource. The MERS team deployed to incident command posts on both sides of the slide and provided significant capabilities, for example, several daily video conferences between incident commanders on each side. FEMA provided 200 cache radios – 800Mhz – to support field operations. While FEMA uses some encrypted channels for its internal use, these radios were open and field-programmable. FEMA itself was mobilized on Tuesday morning, March 25.
- The Department of Natural Resources' (DNR) Type II Incident Management Team (IMT) was activated on Thursday, March 27<sup>th</sup>, shadowed the Type III IMT on Friday and took over the incident after that. DNR IMT's are quite experienced with wildfire activations, There are five Type II IMTs in Washington, staffed interagency by DNR, National Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service and Washington Fire services. Staffing for the teams transitioned in-and-out during the incident. The COML and COMT in these teams are quite experienced with transitions between teams and such transitions went smoothly.
- Search-and-rescue communications. Three statewide SAR frequencies are available for use by search-and-rescue teams and volunteers<sup>13</sup>. Snohomish County Volunteer Search and Rescue (SCVSAR) supported search efforts throughout the incident. SCVSAR used their own standard, assigned, VHF radio frequencies. K9 units were a primary SAR resource deployed. While the K9 units used the SAR VHF for communications, each K9 unit was attached to a USAR, fire or another similar unit for field operations. The USAR or Fire team leader reported to the incident commander and managed the assigned K9 unit using their indigenous 800 MHz network (either the USAR/FEMA 800MHz or SERS).
- Cross-band Aircraft Link. The incident initially used 123.1 AM for both air-to-air and air-to-ground operations, but this proved problematic. A crew of radio technicians from the Port of

Seattle obtained an additional frequency, programmed it into both sites and radios, fixing this problem.

- The incident command post (ICP) was staffed by communications leaders from the City of Seattle and Tukwila Fire on a rotating basis. This staffing helped with day-to-day communications chores such as creating a daily communications plan, and served as a “glue” calling in additional resources to solve problems.
- Both the Washington State Patrol (WSP) and Washington Department of Transportation (WSDOT) radio systems provided good coverage and functioned normally providing communications for their staff on the incident.

But some communications problems invariably occurred. These were largely overcome by the training and diligence of the communications leaders responding to the event. However these are also lessons learned for both Washington State and Statewide Interoperability Coordinators (SWICs) nationwide:

- Coverage. SERS had the foresight to build public safety radio coverage for all significant areas of the County, including the very rural state highway 530 connecting Arlington and Darrington. There are few calls in this area, but the well-planned radio coverage was key to successful rescue and recovery operations after the slide.
- All regional radios should be programmed with an incident operations zone, and every radio in the region needs to be programmed with every such zone. Snohomish, King, and Pierce County, plus the Port of Seattle each need such a zone for major incident operations. And each of these four zones should be in all of the 20,000+ radios in the region, plus radios owned by the Washington State Patrol, so the need for reprogramming during future incidents will be minimal.
- Use of multiple radio systems and training. The Department of Natural Resources operates the type II IMT, which is typically deployed for wild land firefighting. Wild land fire radio systems have generally use, nationally, Relm Bendix King (BK) radios as a *de facto* standard. DNR staff and responders are quite familiar with these VHF systems and the BK radio itself. The National Interagency Fire Center (NIFC) maintains a National Incident Radio Support Cache (NIRSC) of such radio systems for rapid deployment during wild land fires<sup>14</sup>. The BK Radios have a number of useful features such as simple-to-program scanning of frequencies and the ability to program one radio and then using it to “clone” the same programming into other radios rapidly. However this incident was largely conducted using SERS and FEMA/USAR 800 MHz Motorola systems. Therefore the DNR incident management team ordered 800 MHz radios from the FEMA cache. DNR staff needed to learn the programming and use of these radios, which presented a learning curve.
- A comprehensive list of Communications Leaders (COML) and Technicians (COMT) is needed. Communications in the incident area were initially set up by Snohomish County DEM. As the type III Incident Management Team (NWIMT) mobilized, it took over responsibility. Later, a type II Incident Management Team from the State Department of Natural Resources (DNR) was mobilized and assumed responsibility. While, in general, the transitions went well (see above), there were some difficulties because no comprehensive lists are maintained due to lack of funding for the State SWIC’s office. The first meeting of all the COMLs on site did not occur until Sunday, March 30<sup>th</sup>, 8 days after the slide. These lists are available in various online locations such as PublicSafetyTools<sup>15</sup>, but are not necessarily current. The SWIC should be funded and staffed to maintain lists, as well as to train and certify all-hazards COML.

- COML, COMT and AUXCOM training, certification and statewide meetings are all needed. The Washington State SWIC Bob Schwent needs staffing support to schedule and manage training for communications leaders, technicians and auxiliaries. The SWIC needs staffing to support field certification of trained all-hazards<sup>16</sup> COML, COMT and AUXCOM individuals using their task books<sup>17</sup>, a process well-established in most states. Finally such individual should meet once or twice a year for refresher training and exercises. Such a meeting could be at a time and location adjacent to, say, the annual meeting of Incident Management Teams (IMTs) for Washington and Oregon<sup>18</sup> which occurs in the spring.
- COML “Wildfire” and “All-Hazards”. There is a comprehensive system in place to certify COMLs for wildfires, and there are many wildfire incidents each year. However some wildfire-certified COMLs do not have all-hazard COML training or experience. All wildfire-certified COMLs who need all-hazard training should receive it.
- Dispatch and coordination of on-scene responders in a disaster area can be managed by both resources in an incident management team (IMT) but also by a field dispatch center staffed by Telecommunicator Emergency Response Task<sup>19</sup> (TERT) Force certified individuals. State government and 911/PSAP Managers should encourage further development of TERT in Washington.
- Loss of land-line fiber. Darrington’s land-line telephone and Internet connections, access to 911 as well as backhaul for cellular telephone sites in the Darrington area were almost entirely served by a single fiber optic cable running through the river valley. This cable was severed during the slide. The public safety answering point (PSAP) which served the area, SnoPAC, immediately contacted the local telephone company, Frontier Communications. Frontier technicians responded and re-routed 911 calls directly to a police substation in Darrington. By 5:00 AM Tuesday morning Frontier had a fiber cable running through the area to re-establish connectivity. Verizon deployed a cell-on-wheels (COW) to Darrington and also added frequencies to its cell site there (which never lost connectivity as it had microwave backhaul). AT&T’s cell site in Darrington was off the air until a COW was deployed somewhat later. Backhaul SERS sites is via microwave and was not affected.
- Mobilization of the necessary teams took time. The USAR team, for example, was activated on Monday evening, almost 60 hours after the slide. The USAR team is a federal asset. It was initially mobilized as a Pierce County asset, then, later, as a State asset. The delay was due to quirks in State Law which only allowed mobilization of such assets during wildfires, not during other disasters. While this is not, technically, a communications issue, it needs to be addressed by revisions to Washington State Law and its emergency management planning.
- The power of radio caches. Some of the first responders to the event were fire units from Skagit County, which uses VHF communications. The Seattle Urban Area has, through UASI grants, funded small caches of radios (about fifty 800 MHz trunked plus UHF and VHF caches) which were airlifted to Darrington early in the event and distributed to the Skagit County and other responders. Other jurisdictions contributed a few spare radios, as did Motorola. This was a relatively “small” incident compared to potential regional disasters. It covered about a square mile and involved 750 personnel. But it taxed the use of regional radio caches to the limit. More extensive radio caches are required.
- Cache Radio Programming. As stated elsewhere, small caches of 800 MHz radios from the City of Seattle (held in reserve for the entire region), Port of Seattle, Tukwila Fire and Snohomish

County were deployed early in the incident. However every cache was programmed differently. Some had ICALL8 in one zone and FIRETAC7 in another. Some radios wouldn't scan. No radios came with clamshell-type "AA" battery holders, necessitating a system for nightly recharging as well as switching batteries during the day. Programming these radios required a radio technician with special fob and laptop (plus the shared system key – see above). Some of these issues may be inherent to the use of these caches and the 800 MHz system. Others would be resolved by preprogramming operational zones (see recommendations above). In this incident the use of the FEMA cache radios (see above) significantly mitigated some of these issues.

- Inventory communications vehicles. A number of agencies have obtained communications vehicles which include interoperability capabilities such as ACS-1000 and ACS-5000 devices. The deployment of Snohomish County vehicles is noted elsewhere in this report. The State Department of Corrections offered to deploy its communications vehicle but it was not required during the event. Nevertheless the SIEC should consider publishing an inventory of all such vehicles in the State which might potentially be deployed during such disasters. The Federal Department of Homeland Security Office Of Emergency Communications (DHS/OEC) has technical assistance resources which can be used to build such an inventory.
- Create a Field Operations Guide (FOG) for tactical interoperable communications. The FOG would contain frequencies, talk groups, points of contact, radio regulations, tables of radio channels, and technical reference information. This guide is ideal for those establishing or repairing emergency communications in a disaster area or during a major incident<sup>20</sup>.
- Prepare for volunteers. Volunteer workers were absolutely important to the SR530 response. The Oso-Darrington area is logging country. It is composed of close-knit families and neighbors. They demanded to be part of the recovery operation. They brought logging equipment which was essential to remove the logs and debris clogging the area. Responders embraced them, but had to place team members with the volunteers both for safety and radio communications. Communications plans must include volunteer management.
- Train, exercise, train, exercise, train. Many communications problems can be mitigated by training. Incident management teams can practice taking over command of an incident, with seamless communications transition<sup>21</sup>. Responders and others need training on the use of their radios. There is no substitute for COMLs and all responders knowing each other and learning to work together, all gained by practice.

The loss of life and damage to property from the SR530 slide is monumental, matched only by the tireless efforts of the community and responders to rescue survivors and recover those who perished. Washington State undoubtedly faces future disasters, potentially including devastating earthquakes, volcanic eruptions, and lahars. With diligence and practice, the State's communications capabilities will be ready.

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<sup>1</sup> Background on the SR530/Oso slide: [http://en.wikipedia.org/wiki/2014\\_Oso\\_mudslide](http://en.wikipedia.org/wiki/2014_Oso_mudslide)

<sup>2</sup> The official State of Washington page for the slide is at <http://www.governor.wa.gov/news/landslide/>

<sup>3</sup> Background on the SR530/Oso slide: [http://en.wikipedia.org/wiki/2014\\_Oso\\_mudslide](http://en.wikipedia.org/wiki/2014_Oso_mudslide)

<sup>4</sup> The official State of Washington page for the slide is at <http://www.governor.wa.gov/news/landslide/>

<sup>5</sup> Snohomish County Emergency Radio System (SERS): <http://www.sers800.org/>

<sup>6</sup> SNOPAC: <http://www.snopac911.us/index.html>

<sup>7</sup> Amateur/Ham support: <http://www.arrl.org/arrlletter?issue=2014-04-03#toc02>

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- <sup>8</sup> Amateur/Ham support metrics and results: <http://www.arrl.org/news/washington-landslide-ares-races-activation-ends>
- <sup>9</sup> Alaska Shield Exercise: [http://www.pnwbha.org/wp-content/uploads/2013/05/Alaska-Shield-2014-Department-Overview-2\\_13.pdf](http://www.pnwbha.org/wp-content/uploads/2013/05/Alaska-Shield-2014-Department-Overview-2_13.pdf)
- <sup>10</sup> Washington Task Force 1 sponsored by the Pierce County Emergency Management:
- <sup>11</sup> Northwest Washington Incident Management Team (NWIMT): <http://www.nwimt.org/>
- <sup>12</sup> FEMA MERS: <http://www.fema.gov/mobile-emergency-response-support>
- <sup>13</sup> Statewide SAR frequencies: [http://www.emd.wa.gov/telcom/documents/SAR\\_Authorization\\_Statewide\\_Nov2012.pdf](http://www.emd.wa.gov/telcom/documents/SAR_Authorization_Statewide_Nov2012.pdf)
- <sup>14</sup> NIFC and NIRSC are described here: <http://www.nwcg.gov/pms/pubs/catalog/commo.pdf>
- <sup>15</sup> PublicSafetyTools is maintained by DHS/OEC: [http://www.publicsafetytools.info/start\\_index\\_v2.php](http://www.publicsafetytools.info/start_index_v2.php)
- <sup>16</sup> This need is for certification of “all-hazards” communications leaders and technicians. “Wildland Fire” certification is handled by the National Wildfire Coordinating Group NWCG: <http://training.nwcg.gov/>
- <sup>17</sup> Example COML task book: [http://www.firstresponder.gov/Lists/Safecom/All%20Hazards%20ICS%20Communications%20Unit%20Leader%20Task%20Book%20V03\\_08.pdf](http://www.firstresponder.gov/Lists/Safecom/All%20Hazards%20ICS%20Communications%20Unit%20Leader%20Task%20Book%20V03_08.pdf)
- <sup>18</sup> Oregon Incident Management Teams website: [http://www.oregon.gov/osp/SFM/pages/eru\\_imteams.aspx](http://www.oregon.gov/osp/SFM/pages/eru_imteams.aspx)
- <sup>19</sup> TERT: <http://www.njti-tert.org/index.php>
- <sup>20</sup> The National template for a FOG is here: <http://www.dhs.gov/national-interoperability-field-operations-guide>. Oregon has a eFOG as a downloadable app. More information here: [http://www.oregon.gov/SIEC/Docs/SCIP/2012.012\\_Oregon.eFOG.User.Guide.pdf](http://www.oregon.gov/SIEC/Docs/SCIP/2012.012_Oregon.eFOG.User.Guide.pdf)
- <sup>21</sup> A list of all the IMT’s in the state is in the fire mobilization plan here: [http://www.wsp.wa.gov/fire/docs/mobilization/mobeplan\\_cover\\_allsections.pdf](http://www.wsp.wa.gov/fire/docs/mobilization/mobeplan_cover_allsections.pdf)