STATEMENT OF
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U.S. DEPARTMENT OF THE INTERIOR
BEFORE THE
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES
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Chairman Hall, Congresswoman Johnson, thank you for inviting me to this hearing. My name is Dave Applegate. I am the Associate Director for Natural Hazards at the U.S. Geological Survey (USGS). The USGS is the science agency for the Department of the Interior (DOI).

As you already know, the Department has significant concerns about the proposal for a satellite communications system being developed by the firm LightSquared. The proposed system could have negative impacts on the reception of Global Positioning System signals, or GPS. The USGS and our colleagues across DOI make extensive use of GPS technology—some of our work is entirely dependent upon it. Testing performed this year on LightSquared's original deployment plan has failed to demonstrate the satisfactory effectiveness of mitigation techniques. Proposed alternatives, meanwhile, require further testing to be fairly judged. The Department of the Interior feels that the proposal should not be approved at this time and has expressed this position to the National Telecommunications and Information Administration, which represents the spectrum interests of the Federal agencies before the Federal Communications Commission.

I am, of course, most familiar with the uses of high-precision GPS technology in the fields related to my charge of natural hazards research and monitoring. However, DOI, the USGS, and our sister bureaus have identified a wide range of impacts of potential GPS interference to capabilities used for mapping, navigation, and timing. Many Interior bureaus have law enforcement and public safety missions, including a significant role in wildfire response nationwide. Law enforcement officers and fire crews use GPS for navigation in both remote backcountry and urban areas. Any degradation of GPS signal could make it more difficult for personnel to navigate. They would have to revert to navigating by "pencil-and-map." Miscommunication and delays also would be a life-safety risk for personnel and the public. It is even possible that investigations by Department law-enforcement agents could be called into doubt due to the greater inaccuracy of manual geolocation techniques.

For our part at the USGS, GPS technology is an essential tool for many of our mission responsibilities. Some examples include streamgaging, mapping and surveying, and in my area of expertise, geologic hazards.

Streamgages and water quality monitors operated by the USGS and its partners provide data used to manage water resources, forecast floods and droughts, inform the design and operation of dams, levees, water- and wastewater treatment plants, and irrigation systems, and the regulation and monitoring of water pollution and its impacts. GPS signals in mobile applications are used to accurately position flow-measuring equipment and obtain data needed to calibrate streamgages. In addition, modern streamgages have radios that use the GPS timing signal to make near real-time transmission of data possible. There are about 9,000 of these radios in use and without them the quality of data from the streamgages would be diminished. The impact of losing the capabilities of these radios is varied and significant. For example, it would reduce the accuracy of National Weather Service flood forecasts and would likely diminish the ability of flood-fighting agencies such as the Corps of Engineers to minimize flood damage. The confidence and timeliness of water-management decisions made by states, the Bureau of Reclamation, and the Army Corps of Engineers could also be impacted. Since 2009, the USGS has invested $11.5 million in GPS-based satellite radios and 91 acoustic doppler current profilers. Without the GPS-driven streamgage satellite radios, the increase in costs will approach $6.6 million per year based on the expense of periodically resetting physical clocks at each streamgage.

As with our work to better understand water resources, the USGS relies on strong partnerships to fulfill our mapping missions. The science and craft of mappinghave come a long way since this USGS mission began in the late 19th Century. Today, nearly all of the data collected involves the use of GPS. All modern airborne or satellite-based systems are dependent on GPS for navigation, positioning and geolocation of the data. Ortho-rectified imageryneeds GPS to reliably determine the location of each image. LiDAR technology, meanwhile, can determine elevation to within centimeters, but requires equally precise GPS positioning data to validate it. High-precision LiDAR data are also useful in my field because the technology can reveal hidden faults, map out ancient landslides, and determine the shape of volcanoes in unprecedented detail. Since 2008, USGS has made between $18 million and $20 million in lidar acquisition purchases per year. The 2010 total was over $40 million, including a substantial investment of Recovery Act funds.

Nowhere is our stake in this issue more significant than in our mission responsibilities for natural hazards. Under the Stafford Act, the USGS issues warnings and forecasts for a variety of geologic hazards, and we support other agencies for a host of other threats. All of these responsibilities depend on reliable, redundant monitoring infrastructures, like networks of seismometers or streamgages.

For rapid reporting of earthquakes and their impacts, the USGS relies on our Advanced National Seismic System (ANSS) here in the US and the Global Seismographic Network (GSN) worldwide, in cooperation with the National Science Foundation and IRIS Consortium of universities. The 2,500 seismic sensors in these networks use GPS for precise timing, and a small change in the timing signal at even just a few seismic stations can degrade the accuracy of earthquake's location, and hence all downstream response products.

Our ability to monitor deformation of the Earth's crust requires the most precise, accurate, and reliable GPS signals. We and our university cooperators, along with the National Science Foundation and UNAVCO consortium, maintain and use over 1,000 permanent continuously operating GPS stations to track plate motions and monitor ground deformation due to earthquakes along faults like the San Andreas and hundreds of others nationwide. Dense networks of high data rate, high-precision GPS stations are particularly important for earthquake monitoring for at-risk urban areas in southern California, the San Francisco Bay Area, and the Pacific Northwest. The estimated capital cost of the USGS investment in these geodetic networks is $26 million, including $6 million in Recovery Act funds used to upgrade existing networks. For the NSF Earthscope project alone, GPS network capital costs are about $100 million and current operation and maintenance costs are $11 million yearly. UNAVCO expert analysis shows that this NSF investment would be put in jeopardy if the LightSquared Network is given approval to proceed.

Our network of volcano observatories relies on real-time data from 220 continuously reporting GPS stations in order to forecast and detect eruptions for volcanically active areas around the western United States. These GPS instruments provide unique information on the location of magma and the size of an impending eruption, which seismic or other types of data do not. The impact of interference of GPS signals on the monitoring of US volcanoes would be substantial. The three-dimensional deformation data gathered from continuously recording GPS stations are often not available from any other monitoring method, and almost never with the near-real-time availability provided by the GPS networks. We now rely on our GPS monitoring capabilities, and losing these would result in a severely decreased ability to perform our duties in providing earliest possible warning of volcanic unrest. This would be a significant public safety concern for communities near volcanoes, such as those in the Pacific Northwest and Alaska. It is also a concern for air traffic in the northern Pacific Ocean due to the hazard of volcanic ash, a hazard that was recently demonstrated by the eruption of Icelandic volcanoes. Similar technology is used to monitor 16 potential landslide sites. The USGS capital investment in GPS receivers currently used for volcano monitoring is $3.5 million of which $1.5 million came from Recovery Act funds.

Recent testing has demonstrated that reception of the L1 signal, the civilian-use band of frequencies, by high-precision receivers used by DOI is significantly degraded when exposed to the proposed LightSquared signals tested thus far (recently proposed alternatives will require further testing to be sufficiently understood and fairly judged). Given the wide use of such receivers and the uncertainty of technical fixes, it is impossible to predict exactly how much it would cost to replace these receivers. The Department estimates that it has invested about $100 million in the technology and it could cost as much as $500 million to replace it. Also, there could be a cost in lost situational awareness and on-going scientific research.

GPS is vitally important in acquiring virtually every type of spatially referenced data in use today. It has become so pervasive that it is taken for granted. Many of these applications are critical—even fundamental—to the missions of the USGS and the Department of the Interior. A short-term requirement for replacement or modification would be chaotic and expensive; a gradual upgrade would require adequate funding, careful planning, and several years.

The Department fully supports the national economic and security goals of the President's 500 MHz initiative and is committed to the implementation of more effective and efficient use of the finite radiofrequency spectrum and the development of solutions that ensure no loss of critical National Security capabilities, to include GPS. The Department will continue to work with its Administration partners and NTIA, as well as with Congress, to address long-term solutions regarding a balance between Federal spectrum requirements and the expanding demand for mobile broadband services

Thank you again for inviting me today and for your attention to this important matter. I would be happy to answer any questions you may have.