Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of:	)	
	)	
LightSquared Technical Working Group Report	)	IB Docket No. 11-109
	)	
	)	

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COMMENTS OF
THE WASHINGTON STATE REFERENCE NETWORK

The Washington State Reference Network (WSRN) submits these Comments in response to the Commission's Public Notice in the above-captioned proceeding.[1] In these comments, the WSRN addresses issues surrounding potential interference to High Precision Real-Time Networks (RTN), in particular several misconceptions about the nature of how potential interference could affect the WSRN and other RTN in the United States, and provides recommendations for additional testing under the modified deployment approach LightSquared proposed in its recommendations submitted June 30, 2011.

[1] *Public Notice: Comment Deadlines Established Regarding the LightSquared Technical Working Group Report, DA 11-1133, released June 30, 2011.*

The Washington State Reference Network and Real-Time Networks

Real-Time Networks are arrays, over broad geographic areas like cities, counties, and states of continuously operating reference stations (CORS; fixed high precision GPS receivers) from which GPS observations are processed together; in part or in whole to produce correctors that can be applied to mobile high precision GPS units (aka "rovers") to yield sub-centimeter positions in real-time. There are over 100 of these RTN in the continental United States in regions representing over 90% of the population. Uses for these real-time correctors include precision agriculture, machine control (heavy construction), land surveying, science (e.g. plate tectonics), structural integrity monitoring, public safety, intelligent transportation, mapping, asset management, and environmental sciences. These networks also serve as the default "active" geodetic reference framework for much of the country because legacy "passive" (i.e. physical survey monument systems) reference framework elements are now cost prohibitive to maintain and are mostly no longer budgeted for by federal, state and local entities. These RTN networks have been developed, implemented, funded and operated by public sector entities (federal, state, local, public utilities, academia), private enterprises, and public-private cooperatives such as the WSRN that serves the entire state of Washington.

The infrastructure elements of RTN are high precision GPS and GNSS (multi-constellation) receivers, network servers, and power, communications (satellite, landline, and wireless), and geodetic antenna mounts. A typical continuously operating reference station

(CORS) may cost between $35,000 and $60,000 to build, and the 100 plus RTN in the U.S. range in size from 3 CORS to 200 CORS. Over half of all RTN infrastructure costs are the high precision receivers and antennas.

WSRN Comments

There are several misconceptions about RTN that have been circulating in the course of the debate over the LightSquared proposal. Unfortunately it may be the informal statements (media statements, public appearances, webinars, etc) for and against the proposal that may be shaping the opinions of the policy makers involved in this issue. Having operated, for nearly a decade, one of the first RTN in the United States, the WSRN offers comment on several of these key misconceptions:

- **RTN can be worked around because they are at fixed locations?** If proposed LightSquared transmission towers were placed to avoid RTN sites, the RTN would still not be able to deliver clean correctors to the end users; the end users are mostly mobile ("rovers"), and may be anywhere within the affected areas. This misconception illustrates a much broader problem with this debate; a complete lack of understanding of the end-user systems, operations, and challenges should the proposal be approved.
- **Enhanced Broadband could replace RTN?** There has been no clear demonstration to date of any technology that can provide correctors for GPS operations that are not derived from arrays of ground-based GPS sensors. A GPS corrector cannot be developed without GPS observations, or high precision clock and orbit data (also derived from ground tracking of GPS satellites). LightSquared has not proposed the placement of GPS ground sensors at their transmission sites for such purposes. And

even if high precision GPS sensors were placed at every site, the interference clearly demonstrated by the testing to date would render said sensors useless.

- **RTN and other high precision applications utilize legacy equipment with insufficient filtering?** All units deployed by RTN, including new and older units were designed with sufficient filtering for the L-Band and adjacent spectrum as currently allocated and deployed. Proposals for terrestrial applications in the adjacent bands allocated for MSS are simply that; proposals; much more modest and potentially less harmful to high precision GPS and RTN than the current LightSquared proposal. RTN users and operators bought high-precision receivers in good faith and with the full expectation that the FCC would not allow any further terrestrial applications in the adjacent MSS band than the modest proposals of 2003-2004. The units deployed in RTN are not "legacy" (with implied obsolescence), they are state of the art and are not currently obsolete; they may only become obsolete if the proposal is approved.
- **End users of RTN could simply go back to legacy methods?** After nearly a decade of RTN implementation in the U.S. the cost-benefits continue to be realized by these end use segments to the point that some legacy systems are no longer manufactured, kept in inventory, maintained, and are no longer budgeted for. Public and private entities have realized cost savings from RTN and other GPS applications for operations and capital improvement projects to the point that these cost savings have become fully programmed into ongoing budget cycles. The costs to end users of RTN if this proposal were to be approved would be far greater than the simple cost of receiver replacement.
- **RTN users could simply switch to other satellite systems?** Testing to date does not sufficiently address the potential interference issues to other Global Navigation

Satellite Systems (GNSS) constellations. No RTN in the world at this time can operate without a core of U.S. GPS satellites in the mix. There are, at this time no alternate-constellation-only real-time network applications commercially available (or even in the laboratory). It could take up to seven years to fully develop and deploy any as-yet-to-be-proposed alternate-constellation-only RTN application; many costly years of lost productivity.

- **RTN could add receivers with better filtering?** No filters were tested to date that could counter the interference levels recorded. If such filtering were to exist it should have been included in the tests.
- **RTN would not be affected if the lower band only were utilized?** There was no specific testing of the lower band with regards to high precision GPS equipment or RTN. There is no basis for evaluation of such a proposition without specific testing.

Conclusion

It is clear that the testing done to date confirms significant interference problems will occur if LightSquared's upper channel is deployed. No specific testing of high precision GPS equipment has been done with regards to the modified proposal of only lower channel deployment. End users need equal assurance that interference problems will not occur when only the lower channel is deployed: additional testing and analysis of the results is needed under a rational schedule to include specifically both RTN fixed and RTN mobile ("rover") equipment under normal field conditions. RTN could benefit greatly from enhanced broadband services as the transmission of observations from the CORS and correctors to mobile devices is currently generally wireless or cellular, but not if said enhanced broadband cripples the underlying high precision GPS technologies. This is a decision that should not be rushed.

Respectfully submitted,

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