IN THE OFFICE OF THE STATE ENGINEER
OF THE STATE OF NEVADA

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IN THE MATTER OF APPLICATIONS 53987 THROUGH 53992, INCLUSIVE, AND 54003 THROUGH 54021, INCLUSIVE, FILED TO APPROPRIATE THE UNDERGROUND WATERS OF CAVE VALLEY, DRY LAKE VALLEY, DELAMAR VALLEY AND SPRING VALLEY (HYDROGRAPHIC BASINS 180, 181, 182, AND 184), LINCOLN COUNTY AND WHITE PINE COUNTY, NEVADA.	**DECLARATION OF JUSTIN HUNTINGTON**

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I, Justin L. Huntington, do hereby declare under penalty of perjury that the following is true and correct:

1. I am over the age of 18, and not a party within this administrative hearing. I am submitting this declaration for the purpose of documenting my anticipated testimony that might be considered to be expert opinions, within the applicable statutes, rules and regulations, and which may be expressed during hearing testimony. This declaration and the related and referenced documents also provide a summary of the basis for those opinions and a summary of the data and information I considered in forming my opinions.

2. I am the principal of Huntington Hydrologic and I have a doctorate in Hydrology. A copy of my curriculum vitae is a Southern Nevada Water Authority ("SNWA") exhibit for these proceedings.

3. I employ remote sensing methods to monitor and predict ecohydrologic states and fluxes at local to regional scales.

4. I am the author of an article titled "Assessing the role of climate and resource management on groundwater dependent ecosystem changes in arid environments with the Landsat archive," which was published in 2016 in the peer-reviewed journal Remote Sensing of Environment.

5. I created a Power Point presentation that demonstrates my use of remote sensing in relation to this hearing. My Power Point presentation is a SNWA exhibit for these proceedings.

6. SNWA is using remote sensing in the Spring Valley Hydrographic Area to monitor shrubland habitat vegetation cover as part of its Clark, Lincoln, and White Pine Counties Groundwater Development Project (GDP) monitoring, management and mitigation (3M) program.

7. SNWA is using data derived from Landsat satellite imagery to quantify changes over time in shrubland habitat vegetation cover for the purpose of establishing baseline conditions and conducting long-term monitoring for its Spring Valley GDP 3M program.

8. Landsat satellite imagery is widely used for long-term vegetation monitoring, and is free to the public.

9. Atmospheric correction of Landsat imagery was completed by Huntington Hydrologic to account for attenuation and scattering of light in the atmosphere between the satellite sensor and vegetation on the land surface, as is required to compute accurate at-surface reflectance.

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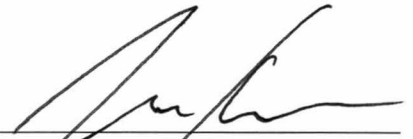11
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10. Cross-sensor correction was completed by Huntington Hydrologic to account for differences in Landsat satellite bandwidths over time, as is recommended by the remote sensing community for long-term monitoring.

11. Landsat images can contain clouds. Huntington Hydrologic developed cloud mask and cloud score images that SNWA used to identify clouds.

12. Normalized Difference Vegetation Index ("NDVI") data were derived by Huntington Hydrologic using at-surface reflectance and cross-sensor calibrated Landsat images from 1985-2015.

13. NDVI is one of the most widely-used remote sensing indices for monitoring vegetation, and is commonly used as a proxy for vegetation cover.

14. SNWA is using other data derived from spatial meteorologic datasets to quantify changes in precipitation over time in order to establish baseline conditions and conduct long-term monitoring for shrubland habitat vegetation cover in the Spring Valley GDP 3M program.

15. GridMET is a commonly used gridded meteorologic dataset for ecological applications and modeling.

16. Monthly gridded precipitation data were derived by Huntington Hydrologic from the gridMET dataset for 1985-2015.

17. Huntington Hydrologic provided SNWA the following datasets for the Spring Valley Hydrographic Area for 1985-2015: Landsat composites, cloud masks and cloud score images, cross-sensor calibrated at-surface reflectance derived NDVI, and gridMET precipitation datasets.

18. Huntington Hydrologic developed and provided Python software scripts for SNWA to produce NDVI and precipitation zonal statistics for analysis areas.

19. SNWA applied the Python scripts and produced NDVI and precipitation zonal statistics correctly for analysis areas.

20. SNWA used cloud mask and cloud score images appropriately to identify and omit cloud cover data.

21. NDVI and precipitation datasets used by SNWA for remote sensing of shrubland habitat vegetation cover adheres to scientifically accepted standards.

22. The use of NDVI and precipitation data is an appropriate method for monitoring shrubland habitat vegetation cover in the Great Basin.

23. This work, data and resulting opinions have been incorporated into the Remote Sensing Analysis portion of the report entitled *Technical Analysis Report Supporting the Spring Valley and Delamar, Dry Lake, and Cave Valleys, Nevada, 3M Plans*. The portions authored by me can be found in Appendix "D" to that report.

24. I am prepared to testify and respond to any questions or examination within the scope of the work as described herein.

FURTHER YOUR DECLARANT SAYETH NAUGHT

Dated this 26th day of June, 2017 in Reno, Nevada.

Justin L. Huntington

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