

Exhibit A

Scope of Work

HDR Churchill County Physical Map Revision Project

CWSD is working with Churchill County, NV to remap FEMA regulatory special Flood Hazard Zones for the Carson River downstream of Lahontan Dam. There are approximately 29 river miles proposed to be updated. It is anticipated that the following 13 map panels will be modified: 32001C1368F, 32001C1375, 32001C1394F, 32001C1411F, 32001C1413F, 32001C1700F, 32001C1706F, 32001C1707F, 32001C1725F, 32001C1726F, 32001C1727F, 32001C1731F, and 32001C1732F. Revision to multiple map panels classifies this effort as a Physical Map Revision (PMR).

1. Project Management:

- a. **Project Setup:** The Contractor will conduct management activities related to the initiation of the project. These activities will include contract initiation, preliminary project review, and project document setup.
- b. **Invoicing & Progress Reports:** Schedule and budget progress will be reported through submission of monthly invoices. Invoices will be accompanied by brief progress reports.
- c. **Coordination:** The Contractor's Project Manager will work with CWSD to facilitate regular communication and transfer of information with the project team. Churchill County Staff will be included in these team meetings as the local community member.
- d. **QA/QC:** Contractor will conduct internal QA/QC tasks to ensure quality products are being delivered.

2. Data Collection:

- a. **FEMA Data:** The Contractor's Staff will collect the most current effective FEMA information including the Flood Insurance Studies (FIS), Flood Insurance Rate Maps (FIRM), Letters of Map Revision (LOMR) in the Study Area, Digital National Flood Hazard Layers (NFHL, and the backup data and work maps for the current FIS).
- b. **Hydraulic Structure Record Data:** Contractor personnel will collect available as-built drawings and record, as a record drawing, data for hydraulically significant structures including bridges, roadways, and inline structures for the study area.

3. Field Reconnaissance and Survey:

- a. **Field Reconnaissance:** In order to better parameterize the hydraulic model, Contractor will conduct a site visit to take photos, make basic structure measurements, and develop field sketches per FEMA guidance.
- b. **Survey:** Contractor will subcontract with a local surveyor to survey significant hydraulic structures and channel cross sections where bathymetric data is not included in the LiDAR information. There are 16 hydraulically significant structures in the study reach. Survey methods and accuracy will comply with FEMA *Guidance for Flood Risk Analysis and Mapping Data Capture – Workflow Details* (Dated February 2018) and *Guidance for Flood Risk Analysis and Mapping - Elevation Guidance* (Dated May 2016).
- c. **Assumption:** Since all the field survey need are not able to be determined at the time of the development for this scope of services, a Time and Materials estimated budget has

not been established for the field survey tasks. Rather, an overall budget reserve has been established to cover field surveying needs. Specific field survey tasks will be identified by CONSULTANT and task requests will be submitted in writing.

4. **Terrain Refinement:** Bathymetric Survey data collected in Task 3b will be used with the most up to date LiDAR data available to create a defensible digital terrain model (DTM) for hydraulic modeling and mapping purposes.
5. **Hydraulics:** A defensible hydraulic model will be developed by the Contractor using the most up to date versions of the US Army Corps of Engineers' HEC-RAS software. This model will be used to establish new base flood elevations (BFEs), floodplain and floodway mapping, and main channel water surface profiles for the 10-, 2-, 1- and 0.2-percent-annual-chance (%) events (10-, 50-, 100-, and 500-year events). It is anticipated that a basic 2D model will be developed to assess preliminary floodplain hydrodynamics. This 2D model will then be used to inform a 1D model of the study reach. Because the study reach is relatively confined and a new floodway delineation is desired, a 1D model is more conducive to this effort.
6. **Mapping:**
 - a. **Data Development:** Once the modeling is completed in HEC-RAS, the 1% and 0.2% chance water surface elevations will be post-processed in GIS and RAS Mapper to develop the digital floodplain and floodway boundaries, and water surface contours. Floodplain/floodways will then be edited as necessary to correct typical post-processing anomalies. All data will be in NAD 83, State Plane Feet, Nevada West (FIPS 2703) horizontal datum and NAVD 88 vertical datum.
 - b. **Work Maps:** A set of work maps will be developed to accompany the Technical Data Notebook (TDN) for submission to FEMA. These maps will be at a scale of 1" =500' to be consistent with the current FEMA Flood Insurance Rate Maps and will include the following information to comply with FEMA's requirements for a PMR Work Map.
 - Aerial photo background
 - Two-foot contours
 - River centerline alignment
 - Model cross sections with cross section number labeling
 - Effective Flood Hazard Zones
 - Proposed Flood Hazard Zones and Floodway
 - Tie-in locations to existing FEMA mapping
 - Base Flood Elevations
 - c. **Annotated FIRMs:** Annotated FIRMs will be produced for submission to FEMA per LOMR requirements. These maps will be reproductions of the effective Flood Insurance Rate Maps with the proposed map changes shown. These changes would include: 1% annual chance flood boundaries, BFEs, floodway boundaries, flood zone designations, and modified corporate limits.
7. **Public Outreach:**
 - a. **Public Notification:** To comply with federal regulations, it is necessary to inform all landowners who will be affected by the proposed map revisions. Those properties that

