EXHIBIT A

This scope of services is intended to provide a description of the tasks anticipated with preparing an Emergency Action Plan (EAP) for the Sidehill Detention Basin (detention basin) based on a breach and overtopping failure of the dam embankment. EAPs are needed to provide early warning and notification of a dam breach or overtopping to reduce loss of life and property damage downstream of a dam. Included in an EAP are evacuation and inundation maps, and contact information for local emergency managers.

The Sidehill Detention Basin is located in the southwest quadrant of West 7th Avenue and Sun Valley Boulevard in Washoe County, NV, within the Sun Valley Park. The basin is a multi-use recreational and flood control facility. The detention basin includes a BMX track, skate park, roller hockey rink, and other miscellaneous recreational facilities located in the impoundment area; and a baseball field, parking lot, and recreational center building are located on an upper terrace to the immediate west of the basin. The upper terrace is higher than the detention basin embankment and spillway. The majority of the basin's volume lies below grade, however a low embankment is present along the south side of the basin. The emergency spillway for the basin is a concrete weir structure that will discharge flows exceeding the basin's capacity onto Sun Valley Boulevard. The drainage report for the Side Hill Detention Basin states that this spillway was sized to only pass 55% of the Probable Maximum Flood event due to the fact that the majority of the basin's storage capacity is below grade. Based on discussion with Nevada Division of Water Resources staff, the ½ PMF storm will be used for the overtopping and overtopping breach inundation mapping. Please see Figure 1 for the location of the basin. An overtopping or breach event of this embankment will result in flooding of downstream structures.

The detention basin is considered to be "high hazard" by the State of Nevada Division of Water Resources (DWR), and therefore EAPs are required. The EAPs will be prepared using guidance from *FEMA Federal Guidelines for Dam Safety, Emergency Action Planning for Dams (FEMA 64)*, dated July 2013, as well as input from the DWR.

The following tasks are anticipated for the preparation of an EAP for the Sidehill Detention Basin:

1. **Project Management, Coordination, Meetings**

This task includes administrative and project management tasks, invoicing, monthly coordination meetings. Any proposed changes in or departures from this scope proposed by the County or initiated by HDR will be provided to the County in writing.

2. **Data Collection and Field Review**

HDR personnel will collect digital and paper data relevant to hydrologic and hydraulic analyses for the dam and surrounding areas, hazard mapping for the project area, inspection reports, design

SIDEHILL DETENTION BASIN

Figure 1

drawings, as-built drawings, available topographic and survey date, and etc. The data collected will be used for the analysis, model construction, and GIS mapping.

Hydrologic Information: The County has provided HDR with pertinent drainage reports, design reports, and record drawings. for the detention basin. HDR staff will review the hydrologic analyses prepared for the sediment basin to verify that the hydrologic analyses were performed in keeping with proper hydrologic criteria and modeling methods. This scope assumes that no changes will need to be made to the hydrologic analyses. If updates to the hydrologic modeling are required additional fee will be required.

Terrain Data: The County will provide HDR with the most current LiDAR and rectified ortho aerial photo mapping for the project area and water course at no cost to HDR. HDR will provide the County with GIS shape files of the LiDAR tiles needed. The LiDAR data will be used to create a terrain that will be the basis for the hydraulic models.

Supplemental survey data may be required to verify that key features of the dam are coded into the hydraulic model correctly (i.e. top of embankment elevations, spillway elevations, low level outlet configuration, down stream bridges/culverts, etc.). Any supplemental survey requirements identified by HDR will be provided by HDR by a subconsultant surveyor.

Soil Data: HDR will collect soils data from the Natural Resource Conservation Service's Soil Survey Geographic Database. This data will be used to verify the inputs to the hydrologic model.

Land Use: The County will provide HDR with the most current land use planning data for the project watershed in GIS format.

Record Information: HDR will collect record/design information for the detention basin and downstream roadway, culvert, and residential developments from the County as necessary.

3. Identify Trigger Events

HDR will review reservoir as-builts if available, geotechnical reports, hydrological and hydraulic/drainage reports, permits, dam inspection reports and other pertinent material available to be provided by Washoe County. HDR will visit each site to observe the potential for a failure mechanism. HDR will determine the most likely failure mechanism that would result in the most critical breech for any given area downstream of each referenced facility.

4. Identification of Jurisdictions, Agencies and Individuals Requiring Notification

HDR will work with staff from Washoe County to identify affected jurisdictions, agencies and individuals requiring notification in the event of occurrence of a rupture of the dam referenced in this Scope of Work.

5. Determine the Appropriate Procedures to be Used Prior to an Emergency

HDR will work with Washoe County personnel to document appropriate inspection and surveillance procedures to be followed prior to an emergency. HDR will work with and recommend any alterations to current schedule for site inspections to the reservoir. HDR will document existing operation and maintenance procedures.

6. Determine the Appropriate Procedures to be Used During an Emergency

HDR will work with Washoe County personnel to document appropriate communications and procedures to be followed during an emergency with respect to rupture of the referenced dam structure. This includes evacuation and recovery procedures.

7. Perform a Dam Inspection and Develop Annual Inspection Procedures

HDR will inspect the existing dam embankment. HDR will work with County personnel to develop appropriate inspection procedures and frequencies to be followed regularly.

8. Terrain Development

It is anticipated that the US Army Corps of Engineers' HEC-RAS V5.0.4 Beta (or the latest available version) hydraulic model will be used to develop breach hydrographs and for hydraulic routing of those flows. It will therefore be necessary to develop a digital terrain model as the geometric foundation for the hydraulic model.

Digital Terrain development will be conducted using ESRI's ArcMap capabilities using the latest Washoe County LiDAR data. It is assumed that Washoe County will provide the 2013 1 meter resolution "ground" data for the study area which is the Central Truckee Meadows LiDAR tile. These data are assumed to be in NAD83 State Plane Feet projection with a vertical datum of NAVD88. HDR staff will use the ground classified LiDAR points to create a Triangular Irregular Network (TIN) which will then be converted to a raster dataset at a 1-2 ft. resolution for ingestion to HEC-RAS. It is assumed that channel bathymetry and any supplemental topographic data is not required for the level of detail required by the EAP. The terrain dataset will represent the existing conditions in 2013 as captured by the processed Ground Points. Minimal terrain corrections or processing will be conducted. The terrain will be an "as is" condition.

If data is readily available, building footprints will be added to the terrain as elevated features to simulate the behavior of the blocked obstructions in the model.

9. Hydraulic Model Development

Given the urban nature of the consequence area for the Sidehill detention basin areas, an unsteady-state two dimensional (2D) model has been chosen for analysis. The US Army Corps of Engineers' HEC-RAS hydraulic model has the capability to model 2D flow in a structured/unstructured mesh and provide detailed mapping and hydraulic output information. This version of HEC-RAS also has the capability to simulate dam breach progressions and route the resulting breach hydrograph through the model domain, allowing better characterization of unpredictable divided flow.

a. Model development

The modeling domain for the Sidehill detention basin dam and consequence area will begin at the upstream extent of the respective reservoirs and terminate at the Truckee River. The reservoir volume will be captured by the 2D modeling domain.

It is anticipated that the Breach Models will be full 2D models for ease of run, stability, connectivity and consistency of approach for all 3 areas. The model domain will be developed in GIS as a polygon layer capturing the largest potential consequence area. The model domain will incorporate breakline data as appropriate to capture hydraulically relevant high points in the terrain such as roadway crowns or structure overtopping sections. An appropriate downstream boundary condition will be determined such that the PMF or breach event poses little to no threat to life or property.

Manning's n values will be developed for the modeling area using aerial photos, field photos and GIS capabilities. Areas of homogeneous land use will be digitized as a land use layer for inclusion into the 2D modeling area. Once land use zones have been digitized, the methods described in USGS Water-Supply Paper 2933, HDR developed Manning's roughness ("n") values for the channel and overbank regions (Arcement & Schneider, 1989) will be used to estimate roughness values.

It is anticipated that the model will be run in Full Momentum computation mode with default options and tolerances. The model will be run for both the "Sunny Day" and "PMF" events. It is anticipated that the Sunny Day event will be run with a piping breach scenario only and the PMF event will be run with both overtopping and piping scenarios to determine worse case impacts.

b. Dam Breach Parameterization

One of the most crucial elements of Dam Breach modeling and hazard identification is the selection of dam breach parameters. There are several different failure models and many different methodologies for estimating physical breach characteristics and breach progression timing. The embankment material, failure location and failure mode all play crucial roles in determining the ultimate breach and resulting hydrograph impacting the consequence area.

The two main failure modes for breach analyses are overtopping and piping failure. Both of these modes will be investigated for this study. Empirical relationships have been developed for a variety of dam types relating dam breach parameters, including timing, with physical characteristics of the embankment and relative water levels. These methods are all described in the US Army Corps of Engineers' guidance document *Using HEC-RAS for Dam Break Studies* (2014). This document will be used for general guidance along with other appropriate dam breach publications from sources like the US Bureau of Reclamation (US BoR), USDA Natural Resource Conservation Service (NRCS), and the Federal Emergence Management Agency (FEMA).

It is anticipated that the primary regulatory guidance will be FEMA 64 (July 2013) Federal guidelines for Dam Safety. Breach modeling will also be subject to State of Nevada Divisions of Water Resources guidelines and dam safety regulations outlined in Nevada Revise Statute (NRS) 535.

10. Inundation Mapping

Following breach hydrograph development and associated flood routing, the results of the hydraulic modeling will be processed in HEC-RAS Mapper for incorporation into hazard maps. Inundation mapping shall include the following elements:

- North arrow and bar scale
- Clearly labeled inundation areas
- Qualification stating that the hazard areas may differ during an actual dam failure event
- Roads drainages and other landmarks are clearly displayed
- Critical faculties identified
- Logical downstream limits
- "Cross sections" taken at critical locations (for 2D modeling the use of a flux line will replace traditional cross sections).

- Flood inundation information includes; peak flood stage, flood wave arrival time, maximum water surface elevation, peak discharge, and depth times velocity.

11. EAP Preparation

FEMA 64 has guidelines and suggestions for the development of EAPs. The suggested outline for an EAP includes two parts, Part I "EAP Information and Appendices. Within Part I there are eight subsections recommendations. The EAP will follow this format as summarized below:

Part I: EAP Information

I. Summary of EAP Responsibilities
II. Notification Flowcharts
III. Statement of Purpose
IV. Project Description
V. EAP Response Process
    Step 1: Incident Detection, Evaluation, and Emergency Level Determination
    Step 2: Notification and Communication
    Step 3: Emergency Actions
    Step 4: Termination and Follow-up
VI. General Responsibilities
    Dam Owner Responsibilities
    Notification and Communication Responsibilities
    Evacuation Responsibilities
    Monitoring, Security, Termination, and Follow-up Responsibilities
    EAP Coordinator Responsibilities
VII. Preparedness
    Surveillance and Monitoring
    Evaluation of Detection and Response Timing
    Access to the Site
    Response during Periods of Darkness
    Response during Weekends and Holidays
    Response during Adverse Weather
    Alternative Sources of Power
    Emergency Supplies and Information
    Stockpiling Materials and Equipment
    Coordination of Information
    Training and Exercise
    Alternative Systems of Communication
    Public Awareness and Communication

VIII. Inundation Maps

Part II: Appendices

Contents within each of these Sections will follow guidance provided in chapter II of the FEMA 64 guidelines.

Washoe County

Sidehill Dam Emergency Action Plan

Task No.	Task Description	R. Edgington Project Principal Engineer	L. Kubiak Accountant Sr	N. Laughlin Project Manager General	M. Forest Quality Control Reviewer	K. Weaver Engineer Water Resources	M. Blum Engineer Water Resources Sr	G. Burst Engineer Water Resources	S. Lewis EIT Water Resources	Total HDR Labor Hours	Total HDR Labor ($)	Total HDR Expenses ($)	Subs ($)	Total Cost ($)
	Rates	**$ 314.80**	**$ 157.16**	**$ 267.91**	**$ 316.12**	**$ 142.33**	**$ 190.45**	**$ 162.11**	**$ 78.74**					
Task 1 - Project Management														
1.1	Project Initiation	2	4	4						10	$2,330	$0		$2,330
1.2	Invoicing and Progress Tracking		4	4						8	$1,700			$1,700
1.3	Client Coordination			8						8	$2,143			$2,143
	Subtotal Task 1	**2**	**8**	**16**	**0**	**0**	**0**	**0**	**0**	**26**	**$6,173**	**$0**	**$0**	**$6,173**
Task 2 - Data Collection														
2.1	Data Collection			4		4			8	16	$2,271	$0	$4,200	$6,471
	Subtotal Task 2	**0**	**0**	**4**	**0**	**4**	**0**	**0**	**8**	**16**	**$2,271**	**$0**	**$4,200**	**$6,471**
Task 3 -Identify Triggering Events														
3.1	Identify Triggering Events			2		2	4			8	$1,582	$0	$0	$1,582
	Subtotal Task 3	**0**	**0**	**2**	**0**	**2**	**4**	**0**	**0**	**8**	**$1,582**	**$0**	**$0**	**$1,582**
Task 4 - ID Notification														
4.1	Identlfy Jurisdictions, Agencies, and Individuals			1		4				5	$837	$0		$837
										0	$0			$0
	Subtotal Task 4	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**5**	**$837**	**$0**	**$0**	**$837**
Task 5 - 5. Determine the Appropriate Procedures to be Used Prior to an Emergency														
5.1	Determine Procedures			2				4	4	10	$1,499	$0		$1,499
	Subtotal Task 5	**0**	**0**	**2**	**0**	**0**	**0**	**4**	**4**	**10**	**$1,499**	**$0**	**$0**	**$1,499**
Task 6 - Determine the Appropriate Procedures to be Used During an Emergency														
6.1	Determine Procedures			2				4	4	10	$1,499			$1,499
	Subtotal Task 6	**0**	**0**	**2**	**0**	**0**	**0**	**4**	**4**	**10**	**$1,499**	**$0**	**$0**	**$1,499**
Task 7 - Terrain Development														
7.1	Terrain Development				2	20	4			26	$4,241	$0		$4,241
	Subtotal Task 7	**0**	**0**	**0**	**2**	**20**	**4**	**0**	**0**	**26**	**$4,241**	**$0**	**$0**	**$4,241**
Task 8 - Hydraulic Model Development														
8.1	Model Development			2	4	24	8		8	46	$7,370		$0	$7,370
8.2	Dam Breach Parameterization			1	1	4	4			10	$1,915	$0		$1,915
	Subtotal Task 8	**0**	**0**	**3**	**5**	**28**	**12**	**0**	**8**	**56**	**$9,285**	**$0**	**$0**	**$9,285**
Task 9 - Inundation Mapping														
9.1	Inundation Mapping				2	16	4			22	$3,671	$0		$3,671
	Subtotal Task 9	**0**	**0**	**0**	**2**	**16**	**4**	**0**	**0**	**22**	**$3,671**	**$0**	**$0**	**$3,671**
Task 10 - EAP Preparation														
10.1	EAP Preparation			4				12	24	40	$4,907	$30		$4,937
	Subtotal Task 10	**0**	**0**	**4**	**0**	**0**	**0**	**12**	**24**	**40**	**$4,907**	**$30**	**$0**	**$4,937**
COLUMN TOTALS		**2**	**8**	**34**	**9**	**74**	**24**	**20**	**48**	**219**	**$ 35,966**	**$30**	**$ 4,200**	**$ 40,196**