Lahontan Basins SWRP

Storm Water Resources Plan

Technical Memorandum - Task 4.4.2

Tools and Approach Methodology

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HONEY LAKE VALLEY RESOURCE
CONSERVATION DISTRICT

Technical Memorandum
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1.0 INTRODUCTION

The Honey Lake Valley Resource Conservation District (HLVRCD) Storm Water Resource Plan (SWRP) is being developed to improve water quality and meet objectives as outlined in the SWRP guidelines.

Section VI of the California State Regional Water Resources Control Board (CWRCB) SWRP Guidelines outlines the need for a quantitative analysis of proposed projects and the need for "appropriate quantitative methods for identifying and prioritizing opportunities for stormwater and dry weather runoff capture projects." In addition, the 2015 CWRCP guidelines state that "Plans shall include a metrics-based and integrated evaluation and analysis of multiple benefits to maximize water supply, water quality, flood management, environmental, and other community benefits within the watershed."

This technical memorandum outlines the selected modeling tools and metrics based approach to quantify multiple benefits from the proposed projects.

2.0 PROPOSED APPROACH

The Lahontan Basins SWRP has followed guidance given through the SWRP program to establish a quantitative method for assessing benefits to the region from potential projects. The benefits have been separated into benefit categories as outlined in SWRP guidelines Section C, Table 3. The benefit categories are as follows:

- Water Quality
- Water Supply
- Flood Management
- Environmental
- Community

As a part of the SWRP each project sponsor was interviewed and all proposed project sites were visited by the SWRP team. The project sponsors were asked for relevant data beyond that which was collected in the project application to aid the SWRP team. The quantification methods proposed herein have been created as a direct result of the projects that have been proposed for the SWRP.

2.1 Tools

Tools identifies for the analysis of benefits are anticipated to include but are not limited to the following:

Microsoft Excel – is a spreadsheet database and calculation program that will be used in portions of the calculations as outlined in the quantifications methods proposed below. In addition, outputs from various other software applications can be transferred to the program. Calculations and numerical models can be created as part of the quantification process.

ESRI ArcGIS – is a spatially based Geographical Information System (GIS) program that has powerful spatial analyst tools that allow for various spatial qualification and mapping of collected and generated data. The mapping and area qualifications for the SWRP will generally be generated in ArcGIS. Data inputs for other modeling tools such as HEC-HMS and HEC-RAS can be gathered and handled more succinctly with the ArcGIS program.

AutoCAD Civil 3D – is a drafting tool with additional 3D and hydrologic calculation capabilities. Within the system various modules are used to calculated open channel flow rates, culvert flows, and other water related calculations. The program will also be used in the preliminary design of the selected projects. In the design documents there will be essential data needed for inputs and iterations of the design process.

HEC-HMS – is designed to simulate the complete hydrologic processes of watershed systems. HEC-HMS will be used for water flow quantification. This can apply to multiple parts of the study including watershed peak flows, stream flows, and some elements of sedimentation. HEC-HMS computes watershed sediment yield using the Modified Universal Soil Loss Equation (MUSLE) and includes several empirical assumptions that translate a total event load into a sediment time-series by grain class (USACE 2017).

HEC-RAS – is a river modeling tool, and could be used in channel flow computations, and more detailed sedimentation calculations. However, with the currently submitted projects it is not anticipated that HEC-RAS will be required. HEC-RAS is a tool relevant to the project and may be used depending on the design produced for the proposed improvement projects.

SWMM – EPA's Storm Water Management Model (SWMM) is used for planning, analysis, and design related to stormwater runoff, combined and sanitary sewers, and other drainage systems in urban areas. There are many applications for drainage systems in non-urban areas as well.

The EPA created the following description for the SWMM program (EPA 2017) https://www.epa.gov/water-research/storm-water-management-model-swmm:

SWMM is a dynamic hydrology-hydraulic water quality simulation model. It is used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas. The runoff component operates on a collection of sub-catchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators.

SWMM tracks the quantity and quality of runoff made within each sub-catchment. It tracks the flow rate, flow depth, and quality of water in each pipe and channel during a simulation period made up of multiple time steps. SWMM 5 has been extended to model the hydrologic performance of specific types of low impact development (LID) controls. The LID controls that the user can choose to include the following green infrastructure practices:

- *Rain gardens*
- *Bioretention cells (or bioswales)*
- *Vegetative swales*
- *Infiltration trenches*
- *Green roofs*
- *Rooftop (downspout) disconnection*
- *Rain barrels or cisterns (rainwater harvesting)*
- *Continuous permeable pavement systems*

EPA-SWMM can be used to evaluate proposed improvements on projects including if necessary. BMP performance Data and water quality loading rates will rely on local or regional data where available, and otherwise will rely on state or national data or estimates. Total pollutant load removal estimates will rely on both volume capture and treatment quantification.

The EPA Simplified GHG Emissions Calculator is designed as a simplified calculation tool to help low emitter estimates and inventories of annual greenhouse gas (GHG) emissions. The calculator can determine the direct and indirect emissions from sources for one annual period. This tool is a simple effective way to estimate changes due to an individual project. (EPA 2017)

2.2 Benefit Metrics

The following Table 1 - Benefit Methods and Quantification follows the guidelines outlined in SWRP guidelines Section VI, C.

The table outlines:

- Potential benefits from proposed projects
- Proposed methods for achieving identified benefits
- The units of measurement to quantify the benefits

Quantification methods are further outlined in Section 3.0 of this memorandum.

Table 1 – Benefit Metric and Quantification

Benefits	Metric	Units or Rating
Water Quality - 303d pollutant load reduction, improved groundwater quality, improved surface water quality, reduce non-point sources, sediment load reduced, reestablish natural drainage and waterways, incorporates strategies from existing plans.	Pollutant Load Reduction (Filtration/Treatment)	lb/year, MPN/Year
	Pollutant Load Reduction (Non-point Source Control)	lb/year, MPN/Year
	Sediment Load Reduction	lb/year
	Stormwater diverted through infiltration or evapotranspiration	acre-feet/year
Water Supply - increased reliability, further conjunctive use, incorporates strategies from existing plans.	Conjunctive Use - Volume of Stormwater Collected/Reused	acre-feet/year
	Volume of Stormwater Infiltrated	acre-feet/year
	Increased Efficiency, Volume of Water Conserved	acre-feet/year
Flood Management - Reduce known flooding and risk, reduce anticipated flooding and risk, reduce damage & costs, incorporates strategies form existing plans, improve water quality during flooding events.	Peak Flow Reduction	cfs
	Flood Volume Reduced	acre-feet
Environmental - Wetlands enhancement, increased urban greenspace, re-establishment of natural hydrograph, improved habitat, reduction in energy consumption and GHG emissions Incorporates strategies from existing plans.	Area of wetlands and/or riparian habitat created or enhanced	acres
	Increased urban green space	acres
	Slowing peak flow - (Restore Natural Hydrograph)	Degrade, No Change, or Restore
	Water Temperature Improvement	Increase, No Change, or Decrease
	Energy use, or greenhouse emissions	Increase, No change, Decrease
C**ommunity** - Job Creation, increased public awareness, increased community	Employment Opportunities Created	None, Low, Medium, or High

involvement, improving DAC communities, incorporates strategies from existing plan.	Public Education	None, Low, Medium, or High
	Community involvement	None, Low, Medium, or High
	Enhance and/or create recreational and public use area	acres

3.0 QUANTIFICATION METHODS

For all proposed quantification methods; calculations and scientific background data will be required as part of the project ranking process. The follow sections outline identified methods for calculating and quantifying the benefits from proposed projects.

Each proposed project will be assessed for multiple applicable benefits under the categories listed below. Projects with multiple benefits will rank higher on project prioritizations.

3.1 Water Quality

3.1.1 Pollutant Load Reduction (Filtration/Treatment) & Non-point Source Control

To quantify pollutant load reduction the project must have a pre-and post-condition for the pollutant load. Pollutant loads can be calculated with EPA-SWMM. The Initial condition will be examined, and post project condition will be deducted from the initial condition to obtain a delta and the quantifiable benefit in lb/year or MPN/Year.

3.1.2 Sediment Load Reduction

Sediment loading will be calculated by HEC-HMS or equivalent methods. Reduction in sediment load will be a pre-and post-sediment load calculation. Units for Sediment loads will be in lb/year.

3.1.3 Stormwater diverted through infiltration or evapotranspiration

Infiltration totals will be calculated by using infiltration rates applied over project areas. Evapotranspiration will be calculated by using locally developed evapotranspiration rates. The total quantifiable metric will be measured in acre-feet/year.

3.2 Water Supply

3.2.1 Conjunctive Use - Volume of Stormwater Collected/Reused

Conjunctive use or the reuse of water will be calculated on an annual basis. This calculation will require an estimation of the total precipitation and/or flow values for the year with a calculation of the collected amount using industry standard calculations for the various methods of collection, such as runoff calculations using HEC-HMS. The total quantifiable metric will be measured in acre-feet/year.

3.2.2 Volume of Stormwater Infiltrated

Infiltration totals will be calculated by using infiltration rates applied over project areas. Infiltration rates should be obtained from site soils investigations or from soil type and related infiltration rates for the soil type. The total quantifiable metric will be measured in acre-feet/year.

3.2.3 Increased Efficiency, Volume of Water Conserved

Increased efficiency will be calculated on an annual basis using pre-and post-infiltration rates or scientifically based efficacy rates for the proposed project. The total water conserved will require a pre-and post-flow loss and should be reported in acre-feet/year.

3.3 Flood Management

3.3.1 Peak Flow Reduction

Peak flow reductions should utilize industry acceptable hydrology methods such as rational method or computer based programs such as HEC-HMS or USDA's TR-55 for small watershed hydrology. The calculation will be a pre-and post-peak flow calculation. The total quantifiable metric will be measured in cubic feet per second (cfs).

3.3.2 Flood Volume Reduced

Peak volume reductions should utilize industry acceptable hydrology methods such as rational method or computer based programs such as HEC-HMS or USDA's TR-55 for small watershed hydrology. The calculation will be a pre-and post-peak flow calculation. The total quantifiable metric will be measured in acre-feet/year.

3.4 Environmental

3.4.1 Area of Wetlands and/or Riparian Habitat Created or Enhanced

Areas of wetland habitat and/or riparian habit created or enhanced will require area calculations using spatially based software's such ArcGIS or AutoCAD. The total quantifiable metric will be measured in acres.

3.4.2 Increased urban green space

Areas of increased urban green space will require area calculations using spatially based software programs such as ArcGIS or AutoCAD. The total quantifiable metric will be measured in acres.

3.4.3 Slowing peak flow - (Restore Natural Hydrograph)

Demonstrating the slowing of peak flow should utilize industry acceptable hydrology methods such as rational method or computer based programs such as HEC-HMS or USDA's TR-55 for small watershed hydrology. The calculation will be a pre-and post-peak flow calculation. The total quantifiable metric will be demonstrated by the anticipated reduction in peak flow rate in cfs.

3.4.4 Water Temperature Improvement

Water temperature improvements can be performed utilizing ongoing empirical measurements with a temperature gage at the site for baseline conditions and modeling future conditions using EPA SWMM or other industry accepted water temperature models. The total quantifiable metric will be measured in anticipated temperature reduction in Degrees (Fahrenheit or Celsius). For preliminary ranking, the anticipated temperature change will be described qualitatively as "increase, no change, or decrease."

3.4.5 Energy use, or greenhouse emissions

Reduced Energy use and/or greenhouse gas emissions will consist of pre- and post-emission calculations. Industry standard EPA emission rates should be used in the calculations. The EPA Simplified GHG Emissions Calculator may be acceptable for use depending on the proposed project. The total quantifiable metric will be measured in pounds of emission reduced per year. For preliminary ranking, the anticipated Energy use, or greenhouse gas emissions will be described qualitatively as "increase, no change, or decrease."

3.5 Community

3.5.1 Employment Opportunities Created

Employment opportunities created will be based on actual jobs created from the proposed project. This benefit is an intangible and a narrative will be provided describing how the improvements associated with the project will likely increase the vibrancy and sustainability of the associated business that in the long run will be able to add and/or retain jobs. Anticipated Employment Opportunities will be qualitatively described as "none, low, medium, or high."

3.5.2 Public Education

Public education will be based on number of people reached and the effectiveness of the methods used to communicate the education efforts. Enhanced public education opportunities will be measured with a narrative of the program implemented and the anticipated intangible benefit it will provide to the community. Anticipated success of the Public Education element will be qualitatively described as "none, low, medium, or high."

3.5.3 Community involvement

Community Involvement will be based on number of people attending community involvement events or directly engaged in activities determined to increase community involvement. The metric will be measured as an intangible benefit that can be described by observation of successful event organization and execution at the local level. Anticipated success of the Community Involvement element will be qualitatively described as “none, low, medium, or high.”

3.5.4 Enhance and/or create recreational and public use area

Enhancement and/or creation of recreational and public use be will require area calculations using spatially based software’s such ArcGIS or AutoCAD. The total quantifiable metric will be measured in acres.

4.0 REFERENCES

California State Regional Water Resources Control Board. “Storm Water Resource Plan guidelines, December 15, 2015.

United States Army Corp of Engineers, Hydraulic Engineering Center, HEC HMS Accessed December 2017(USACE 2017) http://www.hec.usace.army.mil/software/hec-hms/

United States Environmental Protection Agency, EPA center for Corporate Leadership Simplified GHG Emissions Calculator, Accessed December 2017 (EPA 2017) https://www.epa.gov/water-research/storm-water-management-model-swmm: