Appendix G

Estimating Regional Water Supply and Water Quality Benefits Methodology

The following two sections present the methodology employed to estimate the water supply and water quality benefits that could be achieved through meeting the habitat and recreation targets presented in the main section of this report. The assumption is that with a multi-benefit approach, creation or enhancement of habitat and recreation areas would incorporate stormwater best management practices (BMPs) which have the potential to both recharge aquifers and improvement stormwater quality.

While it is straightforward to estimate infiltration or pollution removal potential for a given BMP in a particular site, determining this capacity over a region with no specific BMPs planned requires a taking a generalized approach based on the overarching characteristics of the region, BMP performance data studies, and best professional judgment.

The benefits for water supply and water quality are calculated in similar, but distinct methods, because water supply targets are rate based (acre-ft per year), and water quality targets are volume based (acre-ft). Therefore water supply benefits are estimated by determining the annual average stormwater volume entering the BMP multiplied by an efficiency factor, while water quality benefits are estimated by multiplying a design storm over the contributing area. It should be noted that many projects will have both water supply and water quality benefits.

Water Supply

Only open space areas with high potential for aquifer recharge were considered to contribute to aquifer recharge. For an area to be considered a high recharge potential area, two general qualities must be met:

1. The open space locations are situated above unconfined aquifers. Though groundwater recharge may also serve to support plant life and river flow, this analysis specifically looks at benefits of groundwater recharge to water supply;

2. The open space areas are situated above geologic sedimentary deposits most conducive to percolating infiltrated water to the aquifer. Recent studies, such as the one being undertaken by the Water Replenishment District of Southern California (in progress) indicate that these include the following:

- Younger Quaternary from the Holocene age made up of medium grained material (sand),
- Younger Quaternary from the Holocene age made up of coarse grained material (gravel),

- Younger Quaternary from the Holocene age made up of very coarse grained material (boulders),
- Older Quaternary from the Pleistocene age made up of course grained material (gravel), or
- Older Quaternary from the Pleistocene age made up of very course grained material (boulders).

The areas where these two criteria are met are considered "Areas of High Recharge Potential". There are shown in Figures 15 and 16 of main report.

Habitat

The estimation of potential benefits of habitat projects is applied to the creation and enhancement targets for freshwater wetlands and riverine wetlands (HCTfw, HETfw, HCTrw, and HETrw) which occur within the Areas of High Recharge Potential. The entirety of these areas will not be suitable for infiltration BMPs. Therefore, the target habitat area is multiplied by the estimated percent of the area that will be suitable for an infiltration BMP (SAh) (Green Solutions, 2008). This returns a reduced area where infiltration and potential recharge may occur.

$$Total\ Treatment\ Area = (HCTfw + HETft + HCTrw + HETrw) * SAh$$

Treatment BMPs have capacities to treat certain tributary areas that are a function of their size the character of their tributary areas. One study evaluated BMPs in recreation and habitat areas and presented generalized ratios for tributary area to treatment area for BMPs in these settings. The ratio for habitat areas (TARh) can be applied to the total treatment area, to give an estimate of contributing area (Green Solutions, 2008). The tributary area is capped at either the total treatment area multiplied by the TARh, or the tributary area to the site, whichever is less.

The total annual average volume of water the tributary area contributes is calculated multiplying the tributary area by the average annual precipitation in the subregion (Pavg) where the project is located.

Finally, two factors are applied to this value. The first factor is the guideline for the percent capture (C) of the annual average precipitation for *flow based* stormwater best BMPs (which is consistent with the current Los Angeles County MS4 permit, Orange County Technical Guidance, the CASQA BMP Handbook, and even the Newhall Ranch Specific Plan, among many other MS4 permits across the state) and the second is an expected efficiency for these systems in habitat areas (Eh). When the average precipitation is input in feet per year, the output from this method is in acre feet per year.

Recreation

The method for estimating potential recharge from recreation lands is similar when applied to recreation and greenway creation and enhancement targets (RCTrg, RETrg). Different factors are used for recreation lands as opposed to habitat lands for the estimated percent recreation area that will be suitable for an infiltration BMP (SAr) and the estimated treatment area ratio for recreation (TARr), and the expected efficiency of these systems in recreation areas (Er).

The factors used and their sources are as follows:

Variables Used For Estimation of Stormwater Infiltration and Potential Recharge				
	Item	**Habitat**	**Recreation**	**Source**
HCTfw, HCTrw, HETfw, HCTrw	Habitat Creation and Enhancement Targets for Freshwater Wetlands and Riverine Wetlands	various	N/A	Draft OSHARP
RCTrg, RETrg	Recreation Creation and Enhancement Targets for Recreation and Greenways	N/A	various	Draft OSHARP
C	Percent Capture of Annual Average Precipitation for flow-based stormwater BMPs	75%		Stormwater Guidelines
Eh, Erg	Expected Capture Efficiencies for flow-based stormwater BMPs	0.25	0.25	Estimates
SAh, SAr	Estimated % Suitable Area for Habitat and Recreation	45%	50%	Green Solutions
TARh, TARr	Estimated Treatment Area Ratio for Habitat and Recreation	45	30	Green Solutions
Pavg	Annual Average Precipitation (in feet)	Subregionally specific		N/A

Stormwater Quality

The benefits of open space projects to stormwater quality can be estimated in a manner similar to estimating water supply benefits, using generalized factors for the region.

Habitat

The estimation of potential benefits of habitat projects is applied to the creation and enhancement targets for freshwater wetlands and riverine wetlands (HCTfw, HETfw, HCTrw, and HETrw). While water supply benefits were attributed only to open space projects within High Recharge Potential Areas, water quality benefits are counted for all open space areas.

The entirety of these areas will not be suitable for water quality BMPs. Therefore, the target habitat area is multiplied by the estimated percent of the area that will be suitable for a BMP (SAh) (Green Solutions, 2008). This returns a reduced area where water quality capacity may exist.

$$Total\ Treatment\ Area = (HCTfw + HETft + HCTrw + HETrw) * SAh$$

As described in the methodology for calculating infiltration benefits, a tributary area to treatment area ratio for habitat areas (TARh) is applied to determine the area that can be treated by the total treatment area (Green Solutions, 2008). This tributary area is capped at either the total treatment area multiplied by the TARh, or the actual tributary area to the site, whichever is less.

The total capacity is calculated multiplying the tributary area by the selected design storm event (D). When the design storm event is input in feet, the output from this method is in acre feet.

Recreation

The method for estimating water quality capacity from recreation lands is similar when applied to recreation and greenway creation and enhancement targets (RCTrg, RETrg). Different factors are used for recreation lands as opposed to habitat lands for the estimated percent recreation area that will be suitable for an infiltration BMP (SAr) and the estimated treatment area ratio for recreation (TARr).

The values used in the above equations are as follows:

Variables Used For Estimation of Stormwater Quality Capture Volumes				
	Item	**Habitat**	**Recreation**	**Source**
HCTfw, HCTrw, HETfw, HCTrw	Habitat Creation and Enhancement Targets for Freshwater Wetlands and Riverine Wetlands	various	N/A	Draft OSHARP
RCTrg, RETrg	Recreation Creation and Enhancement Targets for Recreation and Greenways	N/A	various	Draft OSHARP
D	Design Storm for Volume Based BMPs (in feet)	0.0625 ft (0.75“)		LID Manuals, MS4
SAh, SAr	Estimated % Suitable Area for Habitat and Recreation	45%	50%	Green Solutions
TARh, TARr	Estimated Treatment Area Ratio for Habitat and Recreation	45	30	Green Solutions