

memorandum

date October 25, 2017

to Stephanie Gaines, County of San Diego

cc

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subject San Diego Stormwater Capture and Beneficial Use Feasibility Study - Analysis Methodology

Introduction

The San Diego Stormwater Capture and Beneficial Use Feasibility Study (SWCUFS) is designed to provide a regional analysis of the feasibility of planning, constructing, operating, and managing facilities that capture and use stormwater beneficially. This memo documents the analysis methodology.

The SWCUFS will be conducted based on a framework that considers each step of the stormwater capture and beneficial use process. **Figure 1** presents the conceptual model, which starts with stormwater collection and distribution to a retention or storage site/facility. Because stormwater is delivered in variable and sometimes large volumes during a short timeframe, stormwater collection and storage is needed prior to distribution to a beneficial use. Stormwater runoff in Southern California is also generated when the demand for water (including irrigation) is lowest, as shown on **Figure 2**. Conveyance of stormwater for advanced treatment using sanitary sewer lines is also constrained during storm events, since increased infiltration to the system results in reduced sewer line capacity. Furthermore, subsurface soils may limit the rate of stormwater infiltration to recharge groundwater basins and restore natural hydrology, requiring temporary storage of collected stormwater.

Another consideration is that the volume of stormwater generated per area is much greater in urbanized areas due to larger areas of impervious surfaces, compared to undeveloped areas (see **Figure 3**), and urban areas are designed to efficiently direct these larger runoff volumes to storm drain systems to address potential flooding and public safety concerns. Storage of stormwater in these urbanized areas is often limited; however, current new- and re-development regulations encourage the use of low impact development (LID) to increase retention time of stormwater and allow for filtration and infiltration to reduce the impacts of pollutants and peak flows on receiving waters. These approaches provide opportunities for greater storage and infiltration to restore natural hydrology.



LID decreases runoff volumes and increases infiltration, restoring natural hydrology

Figure 1: Conceptual Model



Figure 2: Conceptual Irrigation Demand and Average Rainfall in Southern California over One Water Year

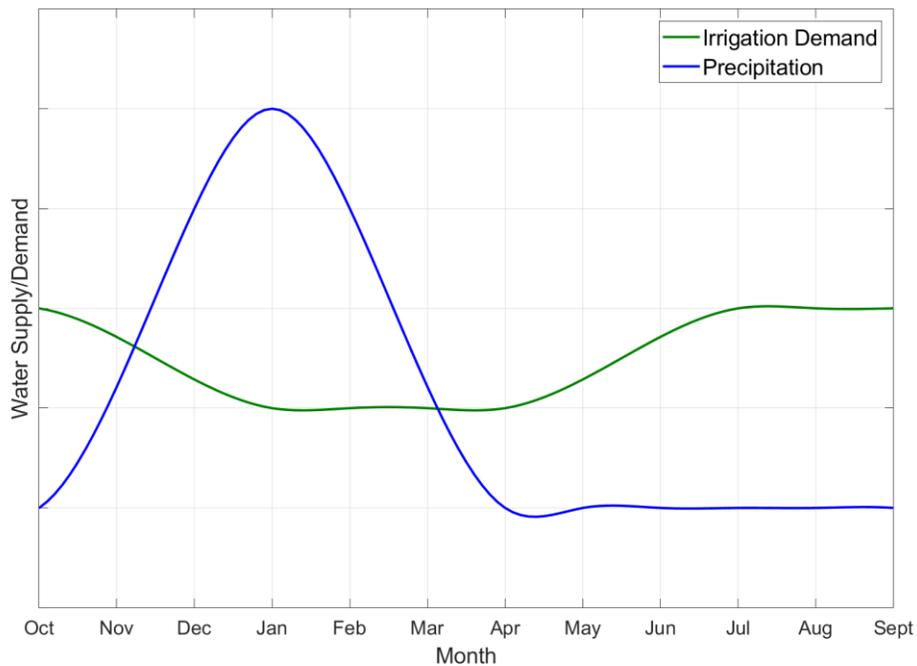
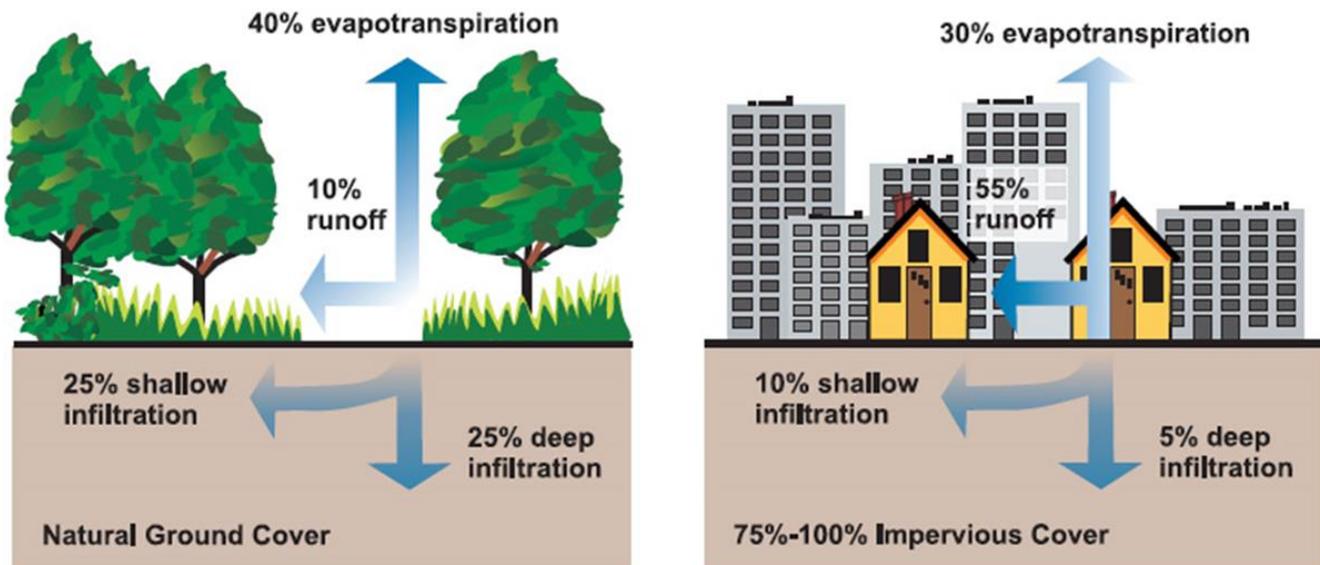


Figure 3: Runoff as a Percentage of Rainfall, Undeveloped vs. Urban Setting

Urban stormwater runoff collects and transports numerous constituents from roadways, landscaped areas, and various commercial, industrial, and residential land uses and activities. These constituents include indicator bacteria, metals, pesticides, sediment, nutrients and trash. Treatment to address these constituents may be required prior to beneficial use or conveyance to further treatment at a wastewater treatment facility depending on the end use and established water quality standards, treatment facility requirements, and water quality of the stormwater.

The availability and capacity of stormwater storage is often the limiting factor for beneficial use, and must be assessed prior to identifying and quantifying potential beneficial uses, particularly in urban settings. As shown on **Figure 1**, the first two components of the conceptual model are collection and storage of stormwater, followed by conveyance under flow and water quality control to treatment and final end use. This assessment builds on the preliminary evaluation of potential storage sites that were identified in the Storm Water Resource Plan (SWRP). This approach, therefore, begins with the identification of potential storage sites, followed by an assessment of the potential beneficial use of this stored stormwater. This model approach was selected over the alternative, modeling total runoff volumes by drainage areas, due to the stormwater-specific challenges outlined above, i.e. storage is the limiting factor when assessing beneficial uses. Potential storage sites were first identified in the SWRP using GIS data for public parcels within the County that are designated as open space, park, or vacant, and are at least an acre in size. After an initial analysis, smaller parcels were also considered, due to the limited number of viable large parcels and the high value of land. These public parcels were then assessed for the potential for above-ground and on-site stormwater storage. The resulting preliminary, high-level estimate of total storage potential is

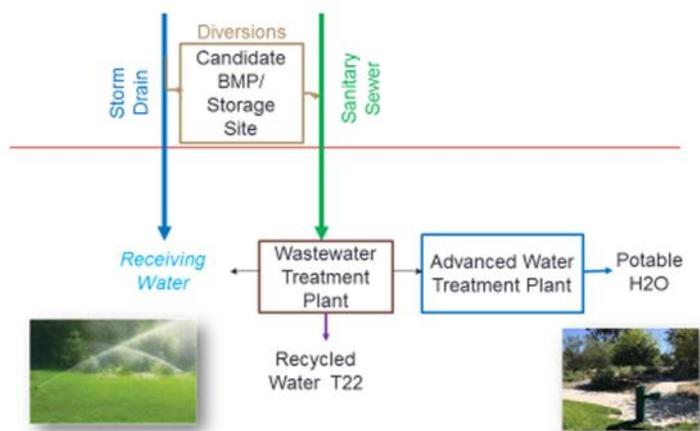


High-Level Potential Storage of Stormwater at Public Parcels based on SWRP

approximately 92,000 acre-feet per year (ac-ft/yr). For reference, the San Diego region’s annual potable water demand is on the order of 450,000 ac-ft/yr, so this estimate represents about 20% of total regional demand. This high-level estimate will be refined as part of this study.

The storage and beneficial use of stormwater in the San Diego region is being effectively implemented in the upper watersheds, where urbanization is limited and reservoirs have been constructed as regional stormwater collection and storage facilities. This system of reservoirs and treatment facilities is shown on **Figure 4**. As such, the opportunity for future local water supply augmentation is likely to come from stormwater capture and use in the more-urbanized, western portions of the watersheds, where capture and use is not already implemented effectively. In addition, urban areas have a larger runoff percentage for a given rainfall area, and multi-benefits can be achieved by addressing water quality, flood risk, and community and environmental benefits. The assessment of these opportunities and the associated constraints is the focus of this study. While this study focuses on existing public parcels, recent and planned expansion of existing reservoirs may provide an opportunity to move storage capacity between reservoirs, providing the potential for greater stormwater collection and storage in existing reservoirs close to urban areas.

Beneficial Uses – Recycled Water and Indirect Potable Use – Process Diagram

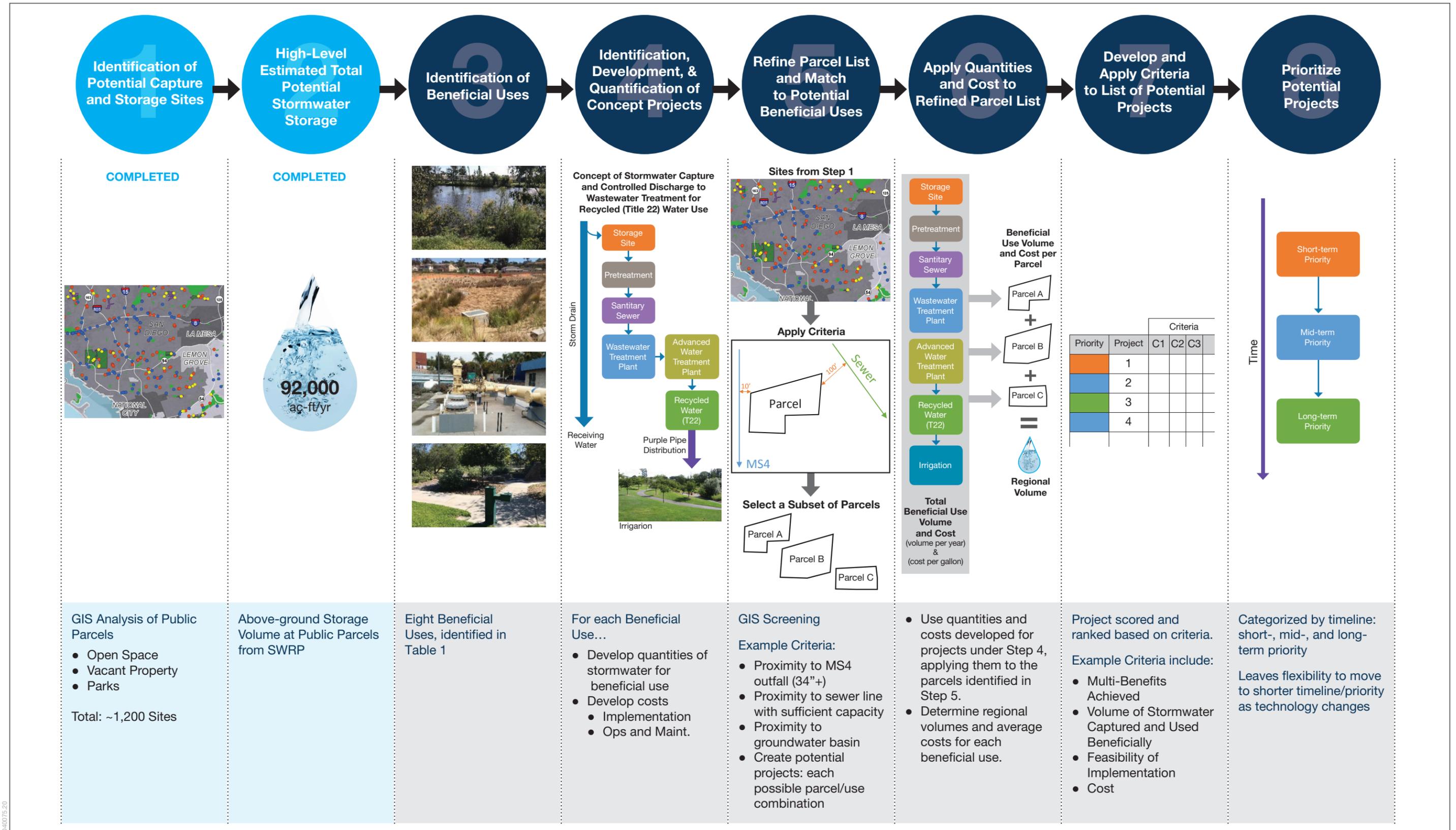


The third component of the conceptual model is the designated beneficial use of the captured and stored stormwater. The beneficial uses that will be evaluated for the San Diego region are presented and described in this memorandum and include eight different uses – for example, recharge to a designated groundwater basin, recharge to restore natural hydrology, on-site irrigation, and advanced treatment at an existing wastewater treatment plant (WWTP) for recycled or potable water use. Depending on the designated beneficial use of the stored runoff, the fourth component of the conceptual model is directing the stored stormwater to a groundwater basin; to pre-

treatment facility prior to use on-site for irrigation, groundwater recharge, or advanced treatment at a WWTP; or to a sanitary sewer line for advanced treatment. This component is important in refining the public parcel list for any off-site beneficial uses, which depend on the location of existing distribution systems to treatment and/or final end use. For example, parcels that are close to an existing sanitary sewer line would be considered for beneficial uses that require advanced treatment at a WWTP, as shown in the graphic insert of the process diagram for recycled and potable water beneficial uses. As another example, parcels that are close to a park or recreational facility that could use an augmented irrigation and gray-water supply would be favorable to parcels farther from this end use, which would require an extensive new distribution system. Screening criteria will be developed for each beneficial use and will be applied to refine the parcel list.

The analysis methodology documented in this memo is based on the six components of the conceptual model on **Figure 1**. As presented on **Figure 5**, the analysis methodology, or model approach, consists of eight steps that essentially quantify each step of the conceptual model using example projects or “case studies” and then apply these quantities to applicable public parcels. These projects include already-implemented projects, projects in the planning phase, and concept projects. The quantities of stormwater and dry-weather flows captured and stored, treated where applicable, distributed, and beneficially used will be determined along with estimated costs. By using case studies as the basis for the quantification and cost determination, project sponsors/leads can develop stormwater capture using these concepts or add these elements to planned projects to achieve multi-benefits and to obtain grant funding. Opportunities and constraints associated with these case studies will be identified to provide further planning information.

The potential storage sites that were identified in the SWRP will be refined using screening criteria that assesses each site, determining its applicability and feasibility for the eight beneficial uses. The example projects will then be scaled to potential storage sites from the refined list to develop regional estimated volumes of potential stormwater capture and beneficial use, and average cost per gallon used beneficially. The example projects that are in planning and concept phases will then be prioritized based on a set of criteria that includes volume of stormwater beneficially used, multi-benefits achieved, cost per gallon, and technical feasibility. The refined parcels list for each applicable beneficial use will also be ranked using similar criteria to identify parcels that should be prioritized for potential stormwater capture projects. The sections below describe each step of the model approach and provide examples as a guide.



SOURCE: ESA, 2017

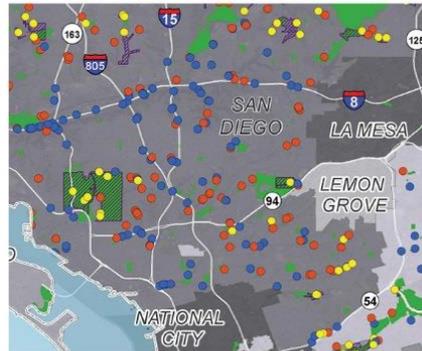
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Figure 5
Model Approach

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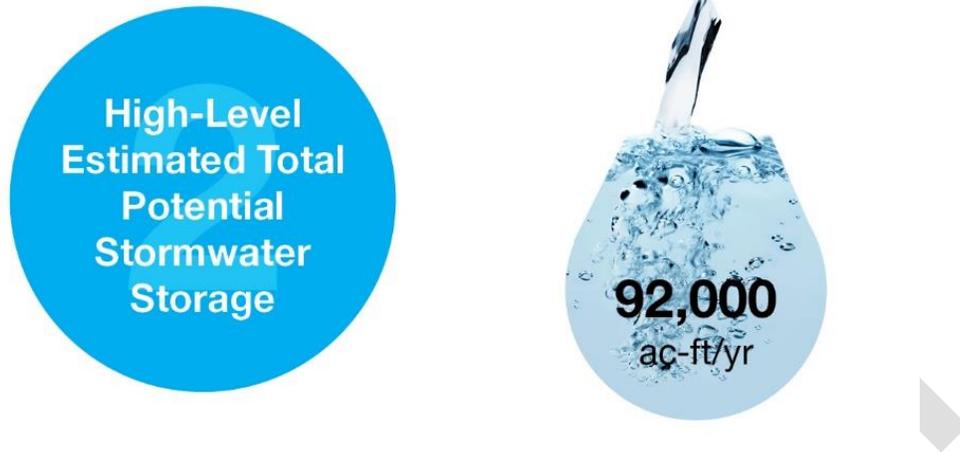
Step 1. Identification of Potential Capture and Storage Sites



This first step was completed as part of the development of the San Diego Stormwater Resource Management Plan (SWRP) (ESA, 2017a). The first step in determining the feasibility of beneficial use of stormwater in San Diego County is identification of potential capture and storage sites. While stormwater can be captured on both private and public lands, this study focuses on public lands. Private residential and commercial properties provide a tremendous opportunity for additional stormwater capture and beneficial use. Example projects such as on-site stormwater capture via rain barrels and cisterns for on-site irrigation and larger capture and use projects for new and re-development will be highlighted in this report, but prioritization and regional quantifications will focus on public parcels and projects. The identification and prioritization of opportunities for stormwater capture and use at private sites is left to the site owners and managers; however, collaboration between public and private partners to develop these projects is encouraged, and these potential opportunities will be discussed in the Feasibility Study Report.

The SWRP identified approximately 1,200 feasible public parcels for stormwater capture and storage based on land use, and further analyzed about 920 of those parcels based on size (ESA 2017a). These parcels were selected for potential capture and storage based on land use, focusing on open-space areas, vacant properties, parks, and a variety of other city- or county-owned parcels. Additional characteristics of the parcels were obtained and added to the GIS dataset for further refinement of the parcel list under Step 6.

Step 2. High-level Estimated Total Potential Stormwater Storage



The second step in the model approach is to develop a rough estimate of the potential stormwater storage volume at each of the parcels identified in Step 1. This step was also completed as part of the development of the SWRP (ESA, 2017a). The SWRP includes a preliminary estimate of potential storage at public parcels in the San Diego region of 92,000 acre-feet per year (ac-ft/yr). This total regional volume was determined by estimating the storage potential of a representative number of public parcels and then applying these estimates to the 920 parcels identified in Step 1. The area available for storage on selected representative parcels was estimated from GIS data and the San Diego Hydrology Model (SDHM3.0). This process is detailed in Appendix H of the SWRP (ESA 2017a).

This analysis will be refined in Step 6 of the model approach as better estimates of capture and storage quantities are developed in Step 4.

Step 3. Identification of Beneficial Uses



As presented in **Table 1**, eight beneficial uses have been identified for captured stormwater. These beneficial uses have been developed based on the review of existing plans developed in the San Diego County region and others developed in Southern California. The parcels identified in Step 1 will be assigned possible beneficial uses from the list presented in **Table 1**. A graphical presentation further explaining each of these beneficial uses is given in the following section.

San Diego County is unique from other counties in Southern California in its geology, topography and micro-climates. The San Diego region has been successful in capturing stormwater in the upper portions of the

watershed near the mountains where higher rainfalls are captured and stored in reservoirs used for water supply. This is however a limited percentage of the total stormwater that could be captured and used beneficially. San Diego County is dominated by canyon lands with developed mesas that drain to often steep sloped and narrow canyons. Soils in the County are predominately low permeability clays and silts and isolated groundwater basins along the larger river systems and in several inland valleys. The opportunity for direct infiltration to groundwater basis is therefore limited in this region compared to Los Angeles that has a large groundwater basin with higher permeable soils that extend to coastal urbanized areas. In San Diego, more urbanized areas dominate the coastal areas where highly percentage of the developed land is impervious and urban runoff is directed to the Municipal Separate Storm Sewer System (MS4) to address flood risk and potential property damage and public safety, and directed to flood channels that discharge to estuaries and the ocean. New and redevelopment along with targeted retro-fits (e.g. green streets) are using low impact development that to increase the retention and infiltration, where possible, in these urban areas to improve water quality, decrease flood risk and increase subsurface infiltration to restore natural hydrology. The constraints and opportunities associated with each of the beneficial uses presented in **Table 1** are identified and assessed using the example projects or case studies discussed in Step 4. Opportunities and constraints associated with each beneficial use will also be a focus at the Technical Advisory Committee (TAC) #2 meeting. Input from the TAC #2 will be incorporated into the next steps and overall Feasibility Study.

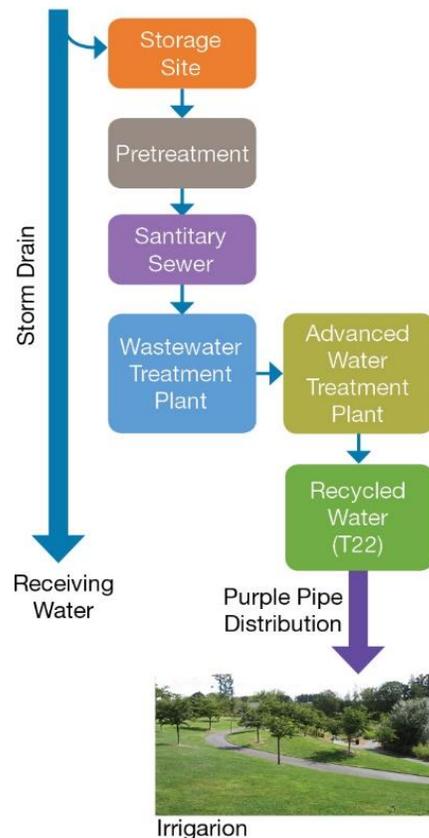
TABLE 1. LIST OF BENEFICIAL USES

	Beneficial Use
A	Direct discharge to designated groundwater aquifers to be extracted for potable use
B	Discharge to groundwater to reestablish natural hydrology and, by extension, to restore biological beneficial uses
C	Irrigation to be used on site or at nearby parks, golf courses, or recreational areas on public parcels
D	Small scale on-site use for irrigation and other private use on private parcels
E	Flow-through to sustain vegetation in natural treatment system (wetland treatment) and/or restoration sites
F	Controlled discharge to waste water treatment plants for solids management during low flows
G	Controlled discharge to waste water treatment plants for indirect potable use
H	Controlled discharge to waste water treatment plants for recycled water use

Step 4. Identification, Development, and Quantification of Concept Projects



Concept of Stormwater Capture and Controlled Discharge to Wastewater Treatment for Recycled (Title 22) Water Use



The fourth step includes the identification and quantification of example projects or “case studies” that will be used to first quantify the volume of stormwater that could be captured and used beneficially and the associated costs as a basis to identify the opportunities and constraint for these projects in the San Diego County region. These case studies will be used to scale the quantities and costs to the refined parcel lists (Step 5) to develop regional totals for stormwater capture and use in Step 6. Through the TAC and the data collection process (ESA 2017b), example projects have been, and continue to be, identified for the different beneficial uses. Example

projects include already implemented projects, project undergoing planning that may include initial design and environmental assessment, and concept projects not fully developed at this time.

From this suite of projects, the project components will be identified, capture and use capacity (rates in ac-ft/yr) will be quantified, and the estimated costs determined for implementation, operations, and management. Opportunities and constraints associated with each example project will also be identified and presented. The quantities, costs and opportunities and constraints for these example projects can be used as a planning tool for project sponsors/lead that may be considering or developing a similar project or adding stormwater capture and use elements to their project. Example projects are also expected to provide a sense of the scalability of different beneficial uses, with the aim of identifying any economies of scale that could be leveraged to efficiently increase beneficial use of stormwater across the region.

The following sections outline the type of projects that fit within each of the eight beneficial uses identified in Step 3 and the important elements of quantifying these projects. The last section (Section 4.9) presents a preliminary table of example projects that will be the basis for Step 5. A summary of data needs for each beneficial use is also provided in this section.

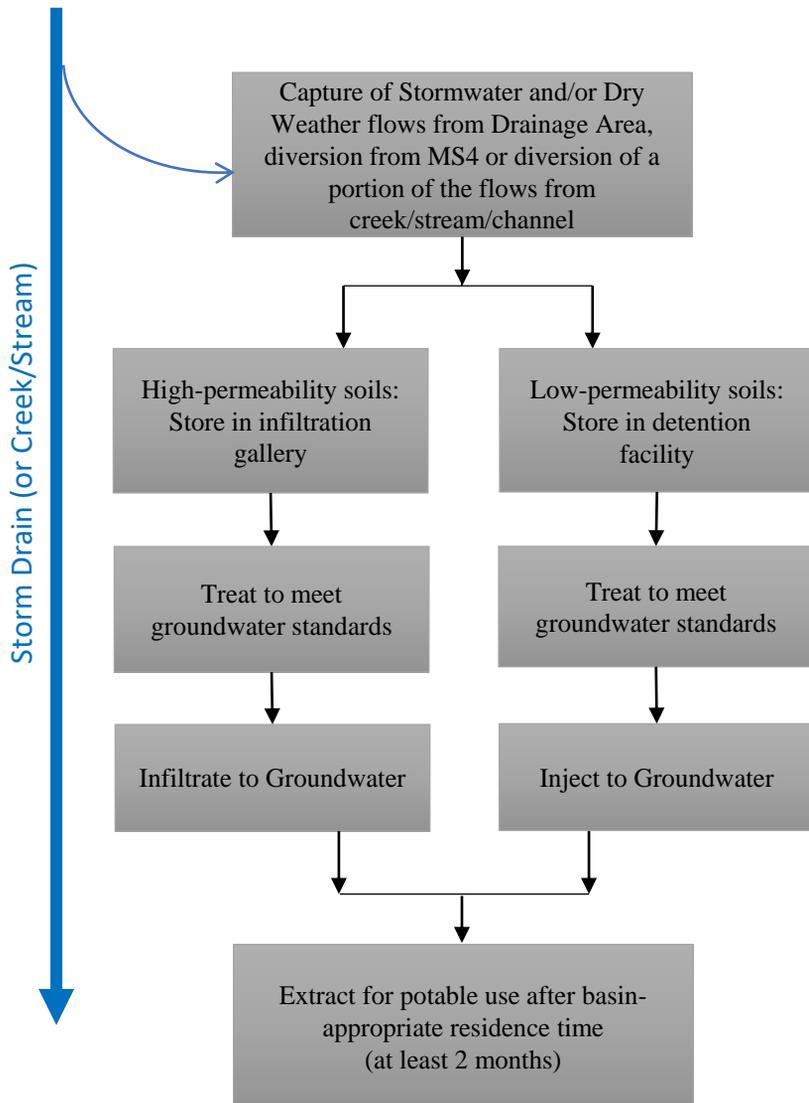
4.1 Direct Discharge to Designated Groundwater Aquifer and Extraction for Potable Use

Projects for this beneficial use category that consist of direct discharge to designated groundwater aquifers and extraction for potable use will be developed using example or case study projects that have been implemented, planned or developed as a concept in San Diego County. Example projects from outside the region may be used, where applicable, to provide additional quantification and cost information for this study due to the more limited opportunities in San Diego County. As shown on **Figure 4** the number of designated groundwater basins is limited in the San Diego Region. These unique regional characteristics are important in the assessment of the opportunities and constraints associated with this beneficial use category.

Figure 6 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. This beneficial use consists of first directing stormwater (both dry- and wet-weather flows) to an above ground detention or below ground storage vault/gallery, and then either allowing for direct infiltration, if located above a groundwater basin, or directing stored stormwater at a control rate to an injection well system or recharge area at the designated groundwater basin. Stormwater can also be diverted from MS4 systems and flood channels into storage facilities. Pre-treatment of these flows may be needed to meet groundwater injection/recharge requirements. Stormwater that is infiltrated or injected into the groundwater aquifer can then be withdrawn using extraction wells for further treatment for potable use.

Beneficial Use A

Direct Discharge to Designated Groundwater Aquifer and Extraction for Potable Use



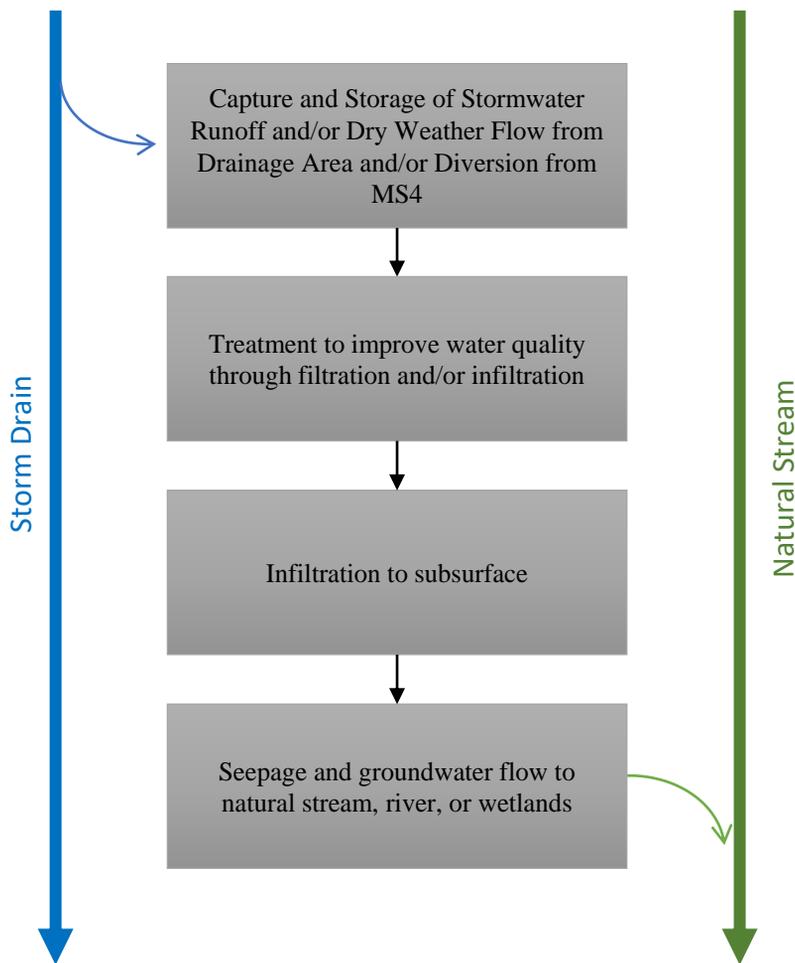
4.2 Water Quality Project with Infiltration to groundwater to reestablish natural hydrology and, by extension, to restore biological beneficial uses

While direct discharge to a potable groundwater basin is preferable, designated groundwater basins are limited in the San Diego Region as shown on **Figure 4**. Infiltration to subsurface flows outside of these designated groundwater basins still provides a beneficial use toward restoring natural hydrology. The natural hydrology has been altered in urbanized areas through increased runoff and lower seepage volumes that replenish subsurface flows that contribute to base flows in dry periods in local creeks, river and wetlands. Reducing surface runoff and increasing subsurface flows reduces the impacts of hydromodification in local streams. This restored hydrology, in turn, is expected to improve biological systems that have been disturbed by the altered subsurface flow system.

Figure 7 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. This beneficial use can be achieved through first capturing stormwater or dry-weather flows in above-ground basins or subsurface vaults/galleries, or in Low Impact Design (LID) best management practices (BMPs) such as Green Streets; Stormwater and dry weather flows that are captured and stored in these facilities can then be infiltrated and filtered through subsurface soils where geotechnical conditions are suitable. San Diego is predominated by low permeability soils with low seepage rates that can limit subsurface seepage rates. It is also possible to divert water from an existing storm sewer system (MS4) if the site is not large enough to capture stormwater or dry-weather flows up to its beneficial use capacity. The capture volume will be determined based on site size and access to existing stormwater will be inferred from distance to an MS4 outfall. The capacity for storage and infiltration will be estimated from parcel size. The infiltration rates will depend on the subsurface soil conditions.

Beneficial Use B

Water Quality Project with Infiltration to groundwater to reestablish natural hydrology and, by extension, to restore biological beneficial uses



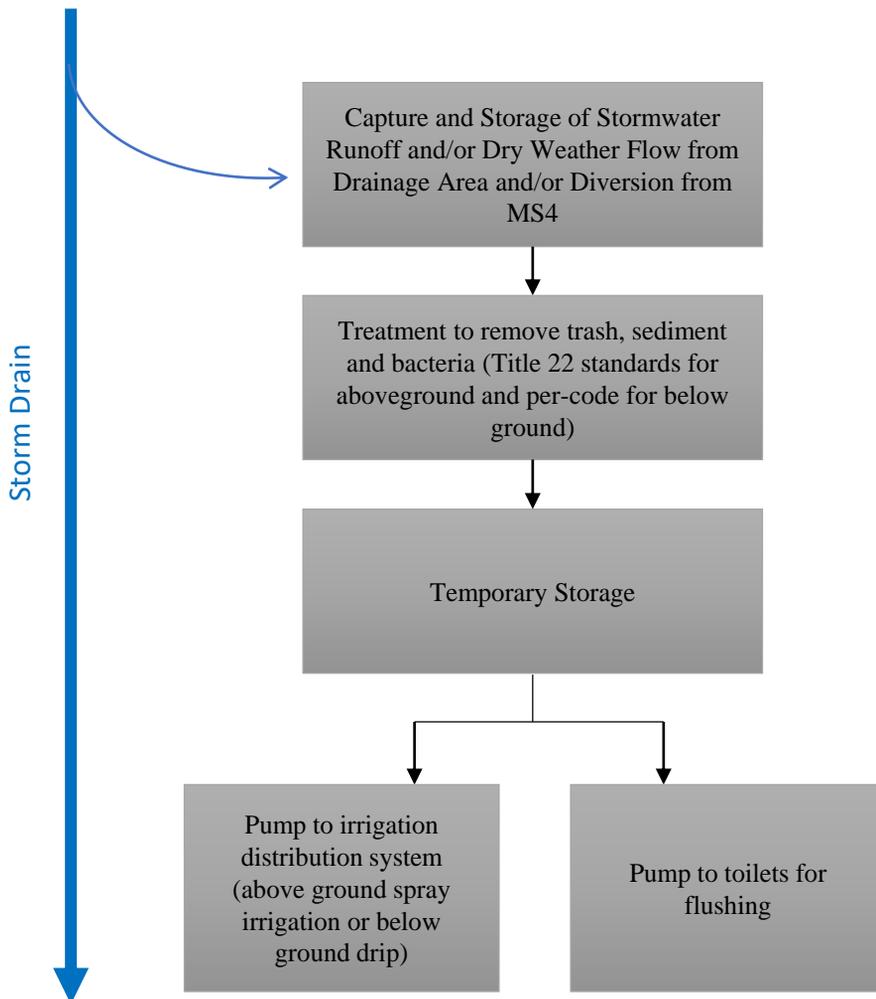
4.3 Irrigation to be used on site or at nearby parks, golf courses, or recreational areas on public parcels

Figure 8 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. This beneficial use is achieved by first capturing stormwater or dry-weather flows on a site, or diverting water from an existing storm sewer system (MS4), and then temporarily stored on-site in an above ground or underground vault system to then be used to supplement irrigation and/or grey water needs at an adjacent or on-site park, recreation facility or other landscaped areas. The capture volume will be determined based on site size and access to existing stormwater. The feasibility of this beneficial use will be determined by available stormwater, proximity to irrigation needs, and the estimated required irrigation volumes at those sites. Stored stormwater is then treated to remove trash, sediment, and bacteria by processes meeting Title 22 standards (for aboveground use, i.e. spray systems) or applicable codes (for below ground use, i.e. drip systems), so applicability of a parcel for this beneficial use will also consider whether the parcel is large enough to support treatment at this scale. The treated water is placed into temporary storage before being distributed to final beneficial use for irrigation (aboveground spray systems or below ground drip systems) or for toilet flushing at the site.

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Beneficial Use C

Irrigation to be used on site or at nearby parks, golf courses, or recreational areas on public parcels



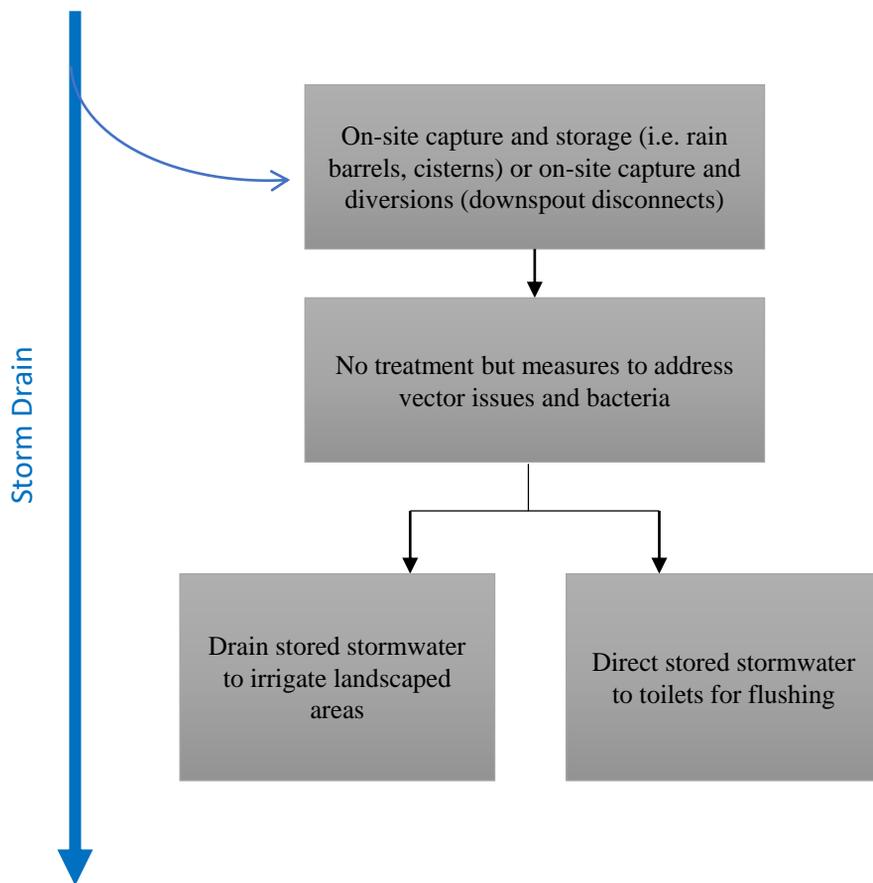
4.4 Small-scale on-site (private) use for irrigation and other beneficial uses on private parcels

Figure 9 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. This beneficial use focuses on stormwater and dry weather flow captured and used on private parcels. Although at a smaller scale than the previous beneficial use on public lands, this category includes capture and use for irrigation of landscaped areas or as gray water on smaller private parcels. Although smaller in scale, the opportunities for this beneficial use are much larger, as they can be applied to single- and multi-family residences and commercial parcels. Stormwater from the site is collected and stored in rain-barrels or cistern storage systems and released into landscaped areas to supplement irrigation. Runoff from building roofs can also be directly diverted to more pervious areas for irrigation and infiltration into subsurface soils. Stored stormwater could also be used as grey water for toilet flushing. For these smaller systems, treatment is typically not required, however, measures should be taken to address vector issues (i.e. mosquitos) and bacteria growth in the storage systems.

This beneficial use category also includes other beneficial uses of collected and stored stormwater and dry weather flows on private parcels. Although this study focuses on public parcel opportunities, examples and case studies of stormwater beneficial uses on private parcels will be included along with a discussion of opportunities and constraints associated with these examples.

Beneficial Use D

Small-scale on-site (public or private) use for irrigation and other private use on private parcels

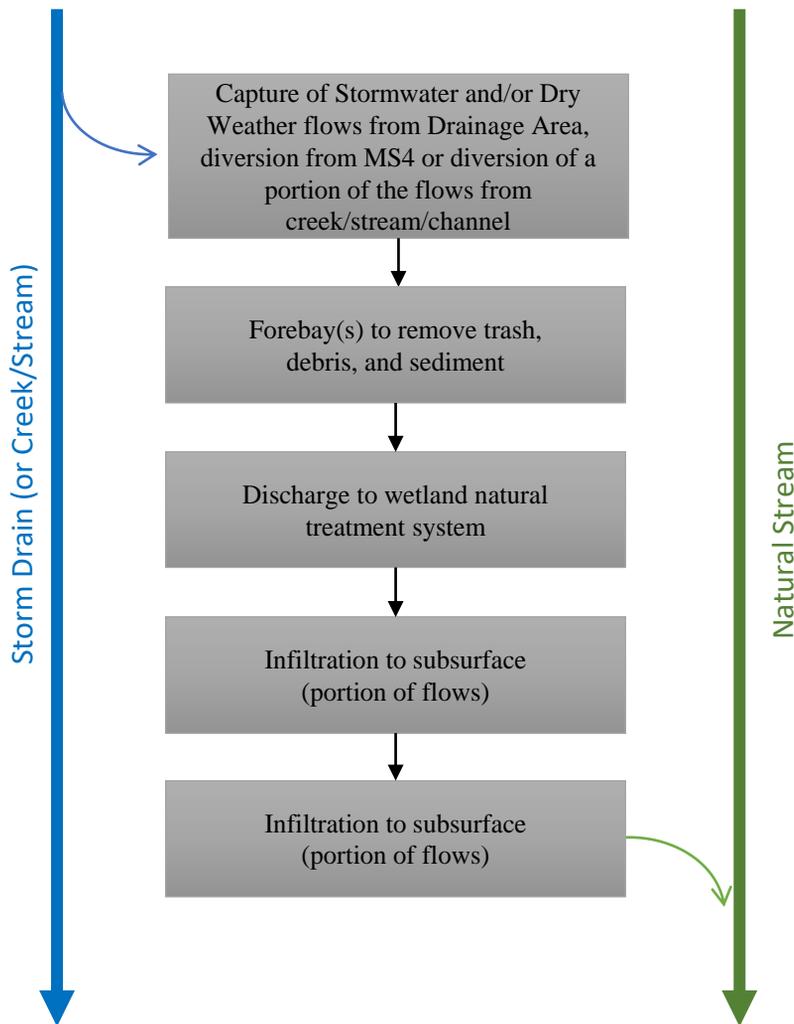


4.5 Flow-through to sustain vegetation in natural treatment system (wetland treatment) and/or restoration sites

Figure 10 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. This beneficial use is achieved by first capturing stormwater or dry-weather flows on a site from surface runoff from the site, diverting water from an existing storm sewer system (MS4), or diverting water from a nearby creek, stream, or other channel. Captured stormwater and/or dry weather flows are then temporarily stored and discharged under controlled flows to a natural treatment (wetland) system or restoration site. The capture volume will be determined based on site size, and access to existing stormwater and dry weather flows. Captured or diverted water is generally then detained in a forebay to remove trash, sediment, and other debris, and then discharged at a controlled rate into a wetland natural treatment system. Sites will be screened to select only those with enough area to detain inflows for controlled release. Water that cannot be discharged through the treatment system (due to the controlled rate) is infiltrated into the subsurface to restore natural hydrology in the area (see Section 4.2). Finally, water exiting the treatment system is discharged into a receiving water body. These natural treatment systems can be used to reduce constituents such as nutrients to improve water quality in the receiving waters. These captured flows can also be directed through restored wetlands after necessary treatment to provide flows that sustain restored habitats.

Beneficial Use E

Flow-through to sustain vegetation in natural treatment system (wetland treatment) and/or restoration sites



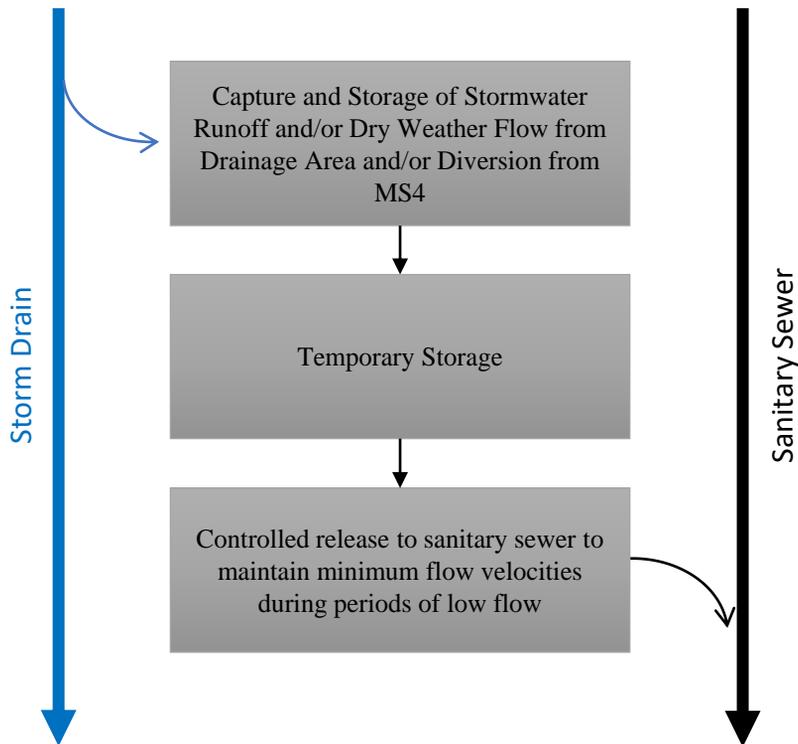
4.6 Controlled discharge to waste water treatment plants for solids management during low flows

Figure 11 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. This beneficial use category includes the diversion of dry weather flows from adjacent MS4 or from storm flow conveyance channels that carry urban runoff to an existing sanitary sewer to improve solids management. These sanitary flows may then be used after advanced treatment for recycled water or indirect potable use. Providing solids management in conveyance systems requires ensuring that a minimum sewer velocity is met. This velocity requirement is based on assumptions on the characteristics of settled solids in sewers. It will also require sewer line size, geometry, slope, and estimated or measured average flow under low flow conditions. Assumptions will be made based on previous experience and literature on solids settling characteristics. Sewershed data provided as part of the data request under Task 1 will be used to extract sewer line information for those lines that are identified for controlled discharge from a relevant parcel. These data will be used to determine minimum velocity requirements for solids resuspension. Using these velocities and assumed flow depth, the minimum total flow required for solids management downstream of each relevant parcel may be determined. Combined with estimated pre-discharge flows, the minimum discharge flow can be calculated. This minimum discharge flow for each site can serve as the quantification result for this benefit. If this minimum flow is less than or equal to the previously determined flow available at each parcel, the project may be considered for implementation.

It must be noted that resuspension of solids in sewer lines may temporarily exacerbate odor issues, but may provide odor control in the long term. Due to the unpredictability in assessing odor potential at each potential location, this aspect of solids management will not be addressed in this evaluation.

Beneficial Use F

Controlled discharge to waste water treatment plants for solids management during low flows



4.7 Controlled discharge to waste water treatment plants for indirect potable use

Figure 12 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. This beneficial use category includes the diversion of stormwater and dry weather flows from adjacent MS4 and/or site drainage to be temporarily stored, pre-treated and then diverted to a sanitary sewer for conveyance to a waste water treatment facility for advanced treatment and use as recycled or indirect potable use. As part of the evaluation of the example or case study projects will be to determine what volume of controlled discharge to sanitary sewers will serve to provide additional volume for beneficial use without affecting treatment at the downstream wastewater treatment plant. There are two parts to this evaluation. First, the capacity of the sewershed will need to be evaluated. Second, the treatment and hydraulic capacity of downstream wastewater treatment plants will also need to be evaluated. This evaluation will define the need for pre-treatment and controlled flow discharged from the stormwater and dry weather flows storage facilities located on public parcels.

The capacity of the sewershed will be determined based on sewer line size and flow data for each relevant sewershed provided as part of the data request under Task 1. Assumptions will be made for maximum depth requirements in each sewer line above 36 inches in size downstream of all relevant controlled discharges. This will help quantify the maximum flow allowable for controlled discharge.

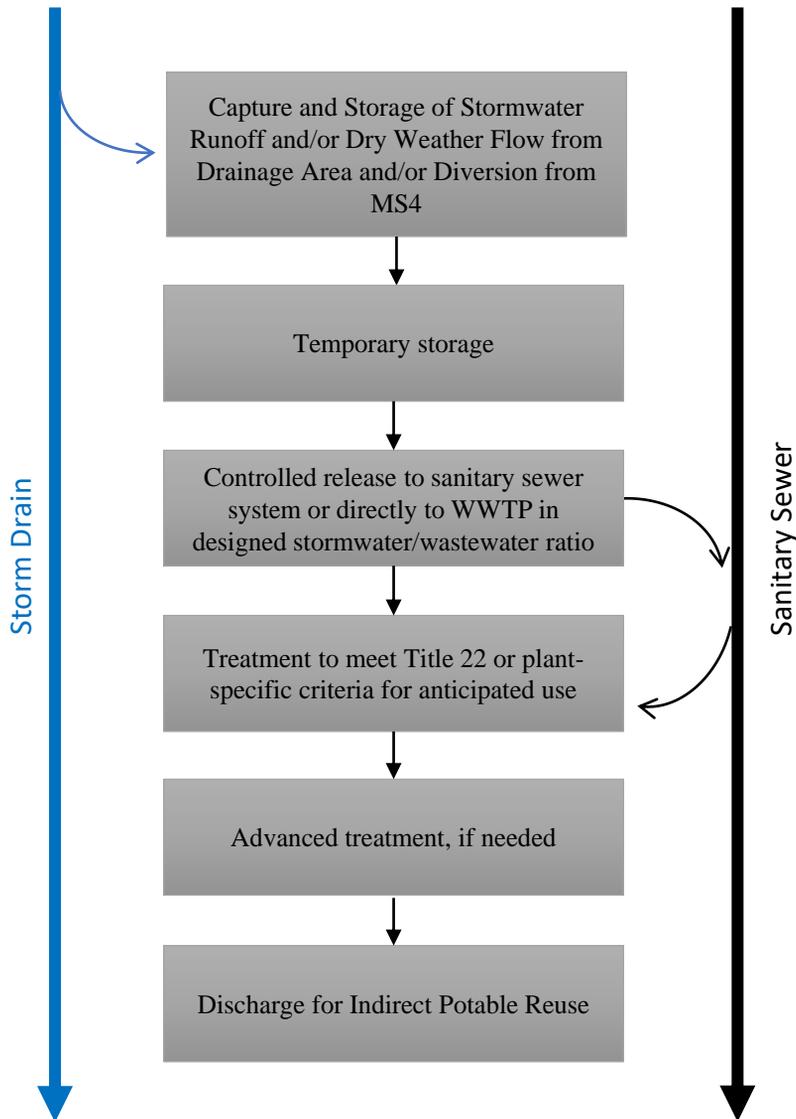
The capacity of a downstream wastewater treatment plant for controlled discharge will be determined based on the revised influent water quality. Stormwater quality data, combined with normal influent wastewater quality data for each relevant plant that are provided as part of the data request under Task 1 will be used. Combined water qualities will be determined based on assumed volumetric blends of stormwater and wastewater, and these combined water qualities will be modeled in primary and secondary treatment to evaluate any potential impacts on biochemical oxygen demand (BOD), total suspended solids (TSS), and nitrogen and phosphorus removal occurring at the plant. Tertiary treatment will be modeled based on available capacity and hydraulic and solids loading to each filter as a result of the secondary effluent from the stormwater blend. The resulting simulated tertiary effluent will be considered based on Title 22 requirements for the reuse options being implemented or considered by each plant. The stormwater-wastewater blend that is able to continue meeting effluent targets for reuse will help determine the permissible volume and flow of stormwater that can be blended into wastewater and applied to the plant. If advanced treatment is involved, a further evaluation can be conducted of the impact on total dissolved solids (TDS) removal and solids flux on microfiltration and reverse osmosis membranes as a result of stormwater blending. However, it is unlikely that there will be impacts to advanced treatment from controlled stormwater discharge upstream.

Two flows will be quantified as a result of the evaluation from this benefit. The first will be the minimum allowable sewer flow, and the second will be the minimum allowable stormwater-wastewater blend to the downstream wastewater treatment plant. The lower of these flows will govern the volume of controlled discharge at each location.

Note that this benefit may be combined with the above solids management benefit. The additional pulse solids loads that may be brought into the plant as a result of resuspension in sewers is likely to be negligible compared to baseline influent solids loadings to the plant. Therefore, this additional load may not be quantified for each location.

Beneficial Use G

Controlled discharge to waste water treatment plants for indirect potable use



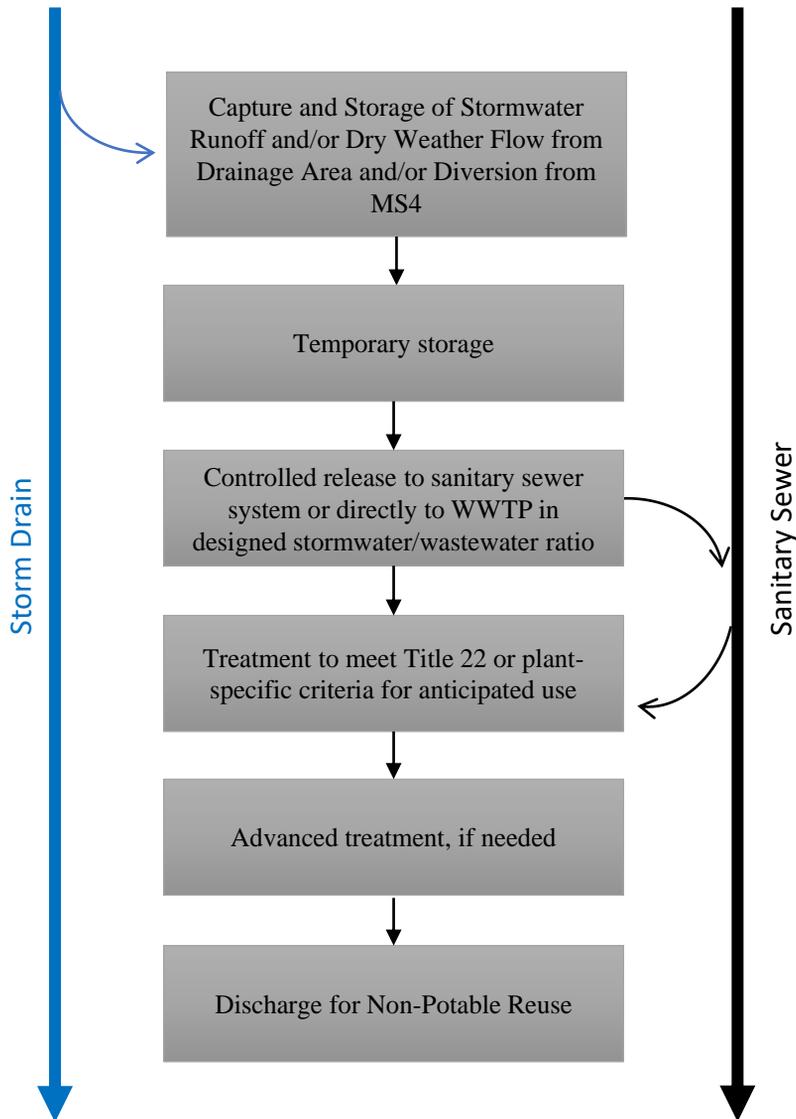
4.8 Controlled discharge to waste water treatment plants for recycled water use

Figure 13 presents the general process diagram for this beneficial use category based on the components of the Conceptual Model. The assessment of this beneficial use is almost identical to that described in Section 4.7 for potable water use. The main difference lies the water quality standards to which effluent will be held during the modeling process, which is expected to yield different minimum allowable sewer flow and minimum allowable stormwater-wastewater blend values.

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Beneficial Use H

Controlled discharge to waste water treatment plants for recycled water use



4.9 Preliminary Potential Example Project (“Case Study”) List

A preliminary list of potential example projects has been developed based on the data collection activities as a starting point to the feasibility analysis. These potential projects represent implemented, planned and conceptual example or “case study” projects. The quantification of stormwater stored, treated, distributed and beneficially will be determined for these potential project as part of Step 4 of the Model Approach as presented on **Figure 5**. **Table 2** presents these preliminary potential example projects listed by associated beneficial use. This list of example projects was compiled based on the data request, input from the TAC, and meetings scheduled with TAC members and local agencies. **Table 2** identifies if the project is implemented, in the planning phase or conceptual. Additional example projects may be added with input from the TAC during the review and comment period of this memo. As shown in **Table 2**, each beneficial use category is represented and therefore this preliminary list provides a basis for the feasibility analysis to be conducted in the next task. **Table 3** presents the list of data that is needed for each of these projects to determine the quantities and costs for the next steps. These data have been requested from project sponsors for implemented and project in the planning phase. Where data is available for concept projects, data has been requested. Assumptions to develop quantifies will be provided in the Feasibility Report. These case studies/projects provide the basis for determining the regional totals in Step 6 (see **Figure 5**) and will undergo prioritization assessment in later steps.

Table 2. Example Projects for Beneficial Use of Stormwater

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
1	Low Impact Development Urban Runoff Control Projects for the Tijuana Estuary	Imperial Beach		LID projects to improve water quality for stormwater entering the estuary	SWRP		1						
2	Safari Park Storm Water Capture and Reuse Project	San Diego		LID approaches to capture water on over two parking lots, treat it, and put it to beneficial use for irrigation	SWRP		1	1					
3	Storm water Capture off San Diego River along Alvarado Canyon and Fairmont Canyon to Fish and Wildlife site	San Diego		Capture and pretreat water flowing into the San Diego River, potentially holding high runoff flows for other uses	SWRP		1					1	
4	Safari Park Water Reuse Sustainability and Watershed Protection Project	San Diego		Improvements to capture and filtration systems at the facility to improve runoff quality	SWRP		1	1					
5	Sweetwater River Park Bioretention	National City		Establishment of an open-space park to act as bioretention and filtration before release to natural hydrology	SWRP		1	1		1			
6	Leucadia Roadside Park Stormwater Capture/Reuse Project	Encinitas		Creation of a detention facility to capture stormwater and store it in an underground system (vault or cistern) for irrigation use	SWRP			1					
7	Alternative Compliance Retrofit Project Mountain View Park, Escondido	Escondido	Concept	Green street to restore natural hydrology	SWRP			1					
8	Alternative Compliance Retrofit Project El Norte Parkway and Rincon Villa Drive, Escondido	Escondido	Concept	Green street to restore natural hydrology	SWRP			1					
9	Alternative Compliance Retrofit Project Avenida Del Diablo Park, Escondido	Escondido	Concept	Green street to restore natural hydrology	SWRP			1					
10	City of Oceanside Loma Alta Slough Restoration Project	Oceanside		Restoration project to improve treatment and restore natural hydrology, following the scheduled decommissioning of the La Salina Wastewater Treatment Plant	SWRP					1			
11	Telegraph Canyon Channel Improvement Project	Chula Vista		Improvements to earthen channel to improve infiltration and restore natural hydrology	SWRP		1						
12	Broadway/Federal Blvd Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
13	Mapleview Street - Green Infrastructure and Stormwater Quality Improvement Project	San Diego	Planning	Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
14	Lemon Grove Avenue Green Streets	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
15	South Santa Fe Green Street Project	Vista		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
16	Skyline Dr and Kempt St Green Streets	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
17	Massachusetts Blvd Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
18	North Ave and Grove Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
19	Woodside Avenue Complete Green Street	San Diego	Planning	Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
20	San Miguel Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
21	Central Avenue Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
22	Mt. Vernon St Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
23	Palm St Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
24	Storm Water Management Phase I: Feasibility Study and Conceptual Design for the Capture and Beneficial Use of Storm Water on the Rincon Band of Luiseno Indians Reservation	Valley Center		Study of locations in the reservation of the Rincon Band of Luiseno Indians to identify appropriate locations for stormwater capture and groundwater recharge	SWRP	1	1						
25	San Marino Drive Green Street and Dry Weather Flow Management	San Diego		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
26	69th St Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
27	Madera St Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
28	Paradise Creek Restoration Phase II	National City		Restoration project to convert parts of the concrete channel to natural channel and revegetate with natural species.	SWRP		1						
29	Canton Dr Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
30	Golden Ave Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
31	Sweetwater Rd Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
32	Lincoln St Green Street	Lemon Grove		Green street, using low impact development techniques that include porous pavement and bioretention to reduce pollutants from stormwater runoff through retention filtration and infiltration	SWRP		1						
33	Federal Blvd Channel	Lemon Grove		Channel improvements to restore natural hydrology	SWRP		1						
34	Spruce Street Channel Improvement Project	Escondido		Restoration of creek and revegetation with native species to restore natural hydrology	SWRP		1						
35	Paradise Valley Creek Water Quality and Community Enhancement	National City		Construction of a treatment system (biofiltration or infiltration) and detention basin to pre-treat and store stormwater before release, improving water quality	SWRP		1			1			

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
36	City of San Diego Public Utilities Department Rain Barrel Incentives Program	San Diego	Existing	Reimbursement program for rain barrels installed on private property	WQIP				1				
37	Chollas Creek Enhancement Program	San Diego	Existing	Creek restoration project to restore natural hydrology	Program Report, City of San Diego		1	1		1			
38	Escondido Creek Watershed Restoration Action Strategy	Escondido	Existing	Primarily a restoration plan, this strategy covers methods and locations to improve natural capture and conveyance via riparian restoration	Program Report, City of San Elijo		1						
39	National City, A Avenue Green Street	National City	Existing	Green street, with storage vault to irrigate adjacent park and slowly discharge excess	Project Report, National City		1	1		1			
40	Kaiser Permanente San Diego Medical Center	San Diego	Existing	Construction included pervious pavement and decomposed granite pathways to improve infiltration and reduce runoff, and landscaping was designed to capture and retain stormwater through infiltration and biofiltration BMPs. The collected water supports irrigation and water features fed with recycled water.	Kaiser, EIR & Drainage Study		1	1		1			
41	Stone Brewing World Bistro and Gardens	Escondido	Existing	Facility recycles water from the brewing process and acts as a detention basin for stormwater runoff. The gardens act as a biofiltration system for this runoff.	Stone, ASLA Case Study	1				1			
42	Coco Palms Flood Improvement Project	Oceanside	In Progress	Flood control improvement and improved infiltration along Coco Palms Drive	City of Oceanside		1						
43	Rancho Del Oro Detention Basins at Loma Alta Creek	Oceanside	In Progress	Detention basins for flood control and improved infiltration	City of Oceanside		1	1					

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
44	Dry Weather Flow Diversion at Los Cochis Creek Outfall	Lakeside	Concept	This project will collect dry weather flows and divert these flows to an existing sanitary sewer that has recently been upgraded to a 18 inch trunk line. Dry weather flows are then conveyed to the Padre Dam treatment plant. Plans are for future upgrade of this plant to tertiary treatment and conveyance to Lake Jennings reservoir that is then used by the Helix Water District for potable water. An assessment of on-site storage, treatment and use for irrigation was studied. The analysis of this option will also be included under the on-site beneficial use project concepts.	County of San Diego			1			1	1	
45	Gold Top Forest Run Trash Capture and Dry Weather Flow Management		Concept	This project, under the current concept, includes a centralized trash capture and flow-through treatment device for stormwater flows from an industrial and commercial land use drainage area. The drainage area also has dry weather flows that enter Forest Run that have encouraged the establishment of riparian habitat in this historically intermittent creek. Measures to divert these dry weather flows are being assessed with regard to potential impact to the established riparian habitat. The constraints that are being investigated by SCCWRP need to be considered in other stormwater and dry weather capture projects with regard to impact to sensitive habitat and fauna that have been established from these urban flows.	County of San Diego						1		
46	San Luis Rey Treatment Wetland	Oceanside	Planning	This project will include the construction of treatment wetlands in a former golf course to reduce nutrients in flows diverted from San Luis Rey River through retention, filtration and infiltration within the treatment wetlands and return higher water quality flows to the river.	County of San Diego						1		

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
47	Sorrento Valley/Los Penasquitos and Carrol Canyon Creek Dry Weather Flow Diversion and Lagoon Restoration	San Diego	Planning	This concept project includes the collection and diversion of dry weather flows at from Carrol Canyon and Los Penasquitos Creek at the base of the watershed in Sorrento Valley to a sanitary sewer line to the North City Water Reclamation Facility. This facility is planned to be upgraded with advanced tertiary treatment that includes reverse osmosis. Advanced treated water is then pumped to the Miramar Reservoir that is used to store water that is treated for potable use. The Reclamation facility also treats wastewater for recycled water use that is distributed through the purple pipe system. Water quality of dry weather flows and need for pre-treatment will be evaluated. The diversion of these urban flows is necessary to the success of planned restoration of salt marsh in the upper lagoon that has been converted to a brackish and freshwater system due the increase on fresh water flows during dry weather that historically were not present before urbanization of the watershed occurred.	City of San Diego						1	1	1
48	San Elijo Joint Powers Authority Stormwater Beneficial Use Project	Escondido	Concept	This project is a concept that includes expanded the capacity of an existing flood channel that contains a sediment capture area for additional stormwater capture, storage and infiltration. The sediment capture and removal function could be moved upstream and the area downstream expanded to allow for a portion of stormwater flows to be temporary retained and infiltrated. Conceptually, a withdraw well would be installed further downstream to collect the infiltrated stormwater and pumped the adjacent treatment facility for recycled water.			1						1

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
49	Franklin D. Roosevelt Park (LA)	Los Angeles	In Progress	Improvements to the park to improve stormwater capture and use, including two in-park infiltration galleries and one green street. Captured water will be infiltrated from the underground galleries or directly injected.	San Diego Regional Chamber of Commerce (whitepaper)		1						
50	Santa Monica Sustainable Water Infrastructure Project	Santa Monica	In Progress	This project will increase existing capacity at the SMURFF and add another recycled water facility with capture and conveyance infrastructure. Initially, treatment will be for recycled water, seeking potable water permits in the future.	San Diego Regional Chamber of Commerce (whitepaper)	1						1	1
51	Lindbergh Field Terminal 2 Parking Plaza	San Diego	Planning	The project will capture all stormwater falling on the plaza, retain it, and use it for evaporative cooling as part of the HVAC system for the airport	San Diego Regional Chamber of Commerce (whitepaper)		1		1				
52	Mission Valley Stormwater Capture Project	San Diego	Concept	A candidate site was selected in the San Diego River Valley, at which a system for stormwater detention and infiltration would be installed.	City of San Diego PUD		1						
53	Murray Ridge Reservoir Dry Weather Flow and Low Stormwater Flow Diversion	San Diego	Concept	This concept project includes diverting dry weather and a portion of the stormwater flows from existing channels that surround the reservoir to supplement the reservoir supply, pending further assessment of water quality of these flows to determine if pretreatment is needed and overall feasibility. Murray Ridge Reservoir is used for water supply for the City of San Diego.	City of San Diego PUD		1					1	1

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
54	San Pascal and Lake Hodges Stormwater Capture and Use	San Diego	Concept	This concept includes using public parcels to capture, store and infiltrate stormwater for groundwater basin augmentation. This concept needs further assessment of feasibility and consistency with the salt and nutrient management plan for this groundwater basin. Groundwater from the San Pascal Valley flows into Lake Hodges, and improvement in the quality of Lake Hodges water inputs could augment water supply.	City of San Diego PUD		1					1	1
55	Capture, Conveyance and Flow Augmentation to the South Bay Water Reclamation Plant (SBWRP)	San Diego	Concept	SBWRP is expected to produce up to 9 MGD of recycled water for NPR per agreement with Otay, Caltrans and other related miscellaneous demand. The plant currently does not receive enough flow to meet this target. If appropriate stormwater storage parcels can be identified within SBWRP's sewershed, storage, flow augmentation and treatability can be evaluated.	BC							1	1
56	Flow augmentation to Ray Stoyer Water Reclamation Facility (RSWRF) for NPR and subsequent IPR.	Padre Dam MWD	Concept	The RSWRF plant, operated by Padre Dam MWD, is planning an expansion from 2 MGD to 6 MGD (Phase 1) for NPR and IPR production. Phases 2 and 3 of the program are expected to eventually bring 16 and 22 MGD respectively to the plant for IPR production. The potential for stormwater capture, storage and controlled discharge for flow augmentation will be considered here, to augment wastewater flows in Phases 1, 2 and 3, with the identification of potential storage parcels in PDMWD's sewershed.	BC							1	1

Table 2. Example Projects for Beneficial Use of Stormwater (continued)

Project Info						Beneficial Use							
ID	Name	Location	Status	Description	Source	A	B	C	D	E	F	G	H
57	Flow augmentation to North City Water Reclamation Plant for NPR and subsequent IPR	San Diego	Concept	In conjunction with dry weather flow capture under project 47, this concept will also investigate the potential for storage at parcels within NCWRP's watershed to augment flow for Phase 1 of the Pure Water Program. The plant is currently undergoing an expansion from 15 to about 52 MGD, and several new sewers will be used to bring additional wastewater to the plant, to facilitate downstream IPR production. The potential for stormwater capture to augment this flow will be evaluated, with the potential identification of parcels in NCWRP's watershed.								1	1
58	Flow augmentation at the Hale Avenue Resource Recovery Facility (HARRF)	Escondido	Concept	The HARRF has the capacity to produce approximately 9 MGD of tertiary-treated water for NPR use. The City has plans to expand this recycled water production for agricultural use. The potential for stormwater capture and controlled discharge to augment flows for recycled water production will be investigated.									1

TABLE 3. DATA NEEDS BY BENEFICIAL USE

Beneficial Use Category – Sources of Data	Example Projects Identified	Data and Quantification Needed for Analysis
<p>A. Direct Discharge to designated Groundwater Aquifer and extraction for potable use</p> <p>Sources: CA Groundwater Bulletin¹ Urban Water Management Plans¹ SDIRWM¹ LA Stormwater Capture Master Plan¹ SWMP¹</p>	<p>See Table 2</p>	<ul style="list-style-type: none"> -What is capacity of groundwater basin and existing well system to extract and use additional infiltration -What volume can be stored and conveyed to groundwater basin -Rate of conveyance that can be allowed to groundwater basin -Monitoring and Pre-treatment requirements -total annual volume of stormwater infiltrated and augmented to local water supply - Identify what parcels this beneficial use applies and use quantities from planned and concept projects to determine regional quantities for Task 2 -All quantities needed for project cost estimate under Task 4
<p>B. Discharge to groundwater to reestablish natural hydrology – to restore biological beneficial uses</p> <p>Sources: WQIPs¹ SWMP¹</p>	<p>See Table 2</p>	<ul style="list-style-type: none"> -What volume can be stored and infiltrated to groundwater - What is the volume of runoff converted from direct runoff to groundwater infiltration - What are hydromod benefits and benefit to restoring natural hydrology – how can this be quantified – can this be shown with hydrographs and changes in peak flows and peak flow duration - Identify what parcels this beneficial use applies and use quantities from planned and concept projects to determine regional quantities for Task 2 -All quantities needed for project cost estimate under Task 4
<p>C. Irrigation for On-site or nearby Park, Golf Course, Recreational Area</p> <p>Sources: LA Stormwater Capture Master Plan¹ WQIPs¹ SWMP¹ Rob Field Study²</p>	<p>See Table 2</p>	<ul style="list-style-type: none"> -What volume can be stored on-site and for how long that addresses vector issues - Expected irrigation/gray water use per day and likely stormwater and dry weather flow supply - Expected volume of stormwater that can be actually used beneficially - Treatment requirement for above and below ground irrigation - Identify what parcels this beneficial use applies and use quantities from planned and concept projects to determine regional quantities for Task 2 -All quantities needed for project cost estimate under Task 4

TABLE 3. DATA NEEDS BY BENEFICIAL USE (CONTINUED)

<p>D. Small scale on-site use for irrigation and other private use Sources: See above Rain Barrel Studies in SD² Rain Barrels Studies in other Regions (EDMUD, others?)²</p>	<p>See Table 2</p>	<ul style="list-style-type: none"> -On region basis what volume can be stored on-site and for how long that addresses vector issues - Expected irrigation/gray water use per day and likely stormwater supply from rain barrels and cisterns - Expected volume of stormwater that can be actually used beneficially -All quantities needed for project cost estimate under Task 4
<p>E. Sustain Vegetation in Natural Treatment System (wetland treatment) and/or restoration site Sources:</p>	<p>See Table 2</p>	<ul style="list-style-type: none"> -What volume can be stored and conveyed through wetland treatment system and infiltration to groundwater -Rate of conveyance through the wetland system -Total annual volume of stormwater and dry weather flows captured, treated and infiltrated through example and concept projects - Identify what parcels this beneficial use applies and use quantities from planned and concept projects to determine regional quantities for Task 2 -All quantities needed for project cost estimate under Task 4
<p>F. Controlled discharge to Waste Water Treatment for Solids Management during Low Flows Sources: Input from TAC</p>	<p>See Table 2</p>	<ul style="list-style-type: none"> -What volume can be stored on-site and for how long that addresses vector issues - Pre-treatment requirements and range of rates that stormwater or dry weather flows that can be conveyed to sanitary sewer for concepts - Conditions where conveyance is not feasible and when flows would not be needed - Annual volume that can be conveyed - Identify what parcels this beneficial use applies and use quantities from planned and concept projects to determine regional quantities for Task 2 -All quantities needed for project cost estimate under Task 4
<p>G. Controlled discharge to Waste Water Treatment for Indirect Potable Use Sources:</p>	<p>See Table 2</p>	<ul style="list-style-type: none"> -What volume can be stored on-site and for how long that addresses vector issues - Pre-treatment requirements and range of flow rates that stormwater or dry weather flows that can be conveyed to sanitary sewer for concepts - Conditions where conveyance is not feasible - Annual volume that can be conveyed - Identify what parcels this beneficial use applies and use quantities from planned and concept projects to determine regional quantities for Task 2

TABLE 3. DATA NEEDS BY BENEFICIAL USE (CONTINUED)

IRWMP ¹ Urban Water Management Plan ¹ Input from TAC		-All quantities needed for project cost estimate under Task 4
H. Controlled discharge to Waste Water Treatment for Recycled Water Use Sources: IRWMP ¹ Input from TAC	See Table 2	<ul style="list-style-type: none"> -What volume can be stored on-site and for how long that addresses vector issues - Pre-treatment requirements and range of flow rates that stormwater or dry weather flows that can be conveyed to sanitary sewer for concepts - Conditions where conveyance is not feasible - Annual volume that can be conveyed - Identify what parcels this beneficial use applies and use quantities from planned and concept projects to determine regional quantities for Task 2 -All quantities needed for project cost estimate under Task 4

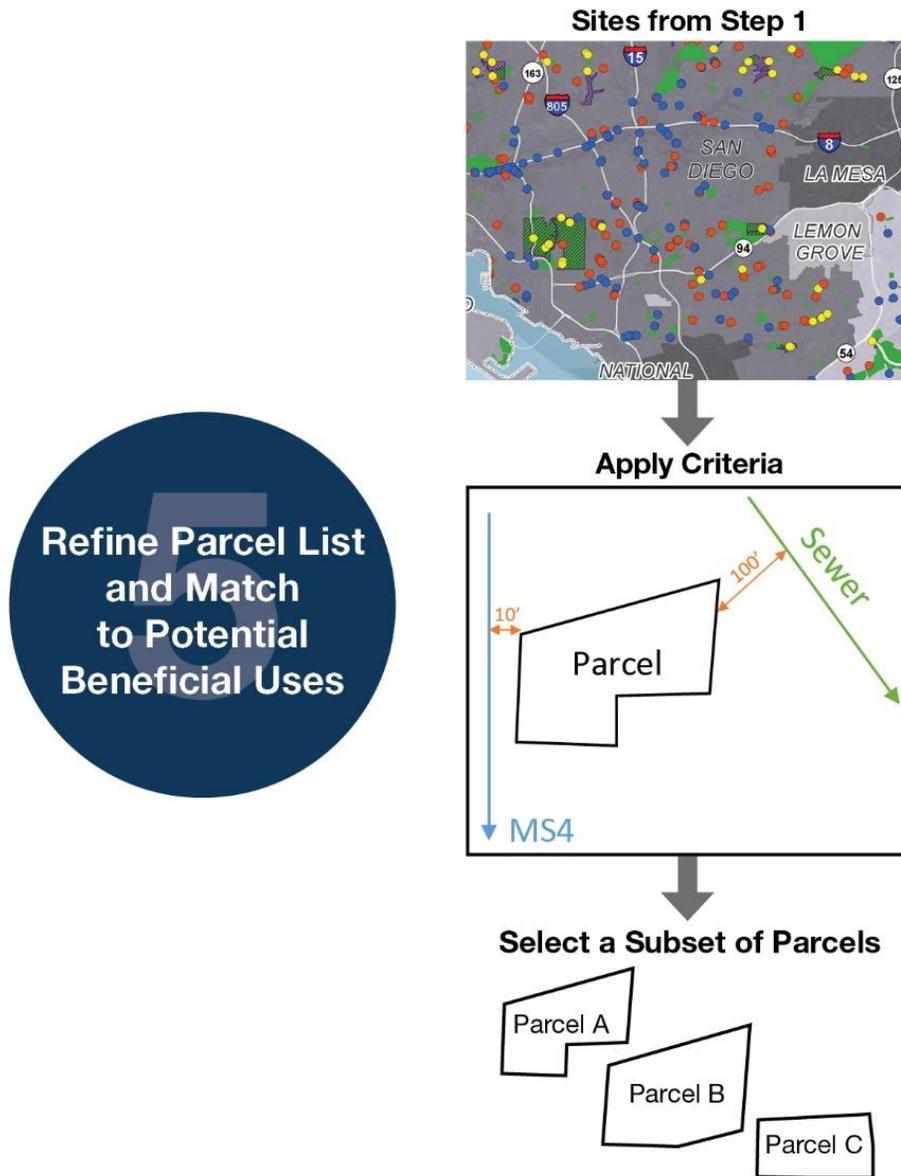
¹ Available on Project Team FTP site

² Needs to be obtained/researched

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Step 5. Refine Parcel List and Match to Potential Beneficial Uses

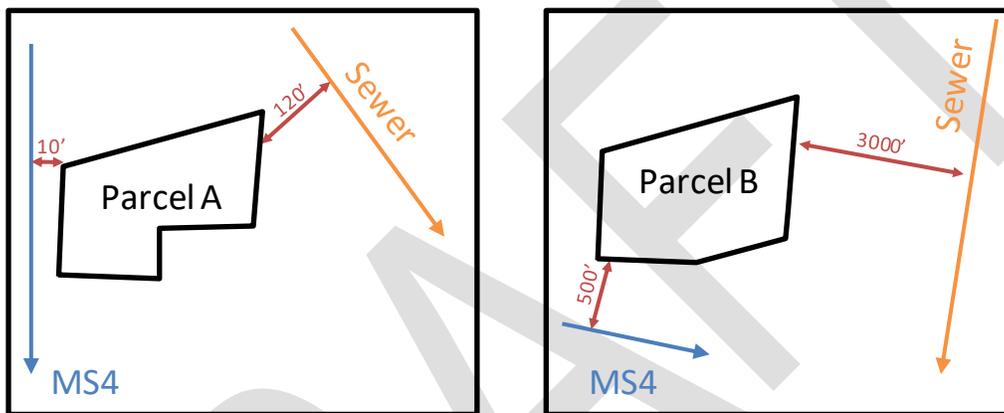


The fifth step is to review the list of public parcels generated in Step 1 and identify the beneficial uses that best apply to the list of public parcels. This will be conducted by applying specific screening criteria to the GIS listed parcels. This set of criteria will be specific for each beneficial use. The requirements for each beneficial use options will be inferred from the processes developed in Step 4. These criteria are expected to include factors like proximity to a MS4 outfall, ability of soils to infiltrate, on-site storage capacity, proximity to a park that can use captured stormwater for irrigation, and/or proximity to a sanitary sewer line. Using a GIS analysis, these criteria will be used to screen the potential parcels and develop a list of likely applicable parcels for each or multiple beneficial uses.

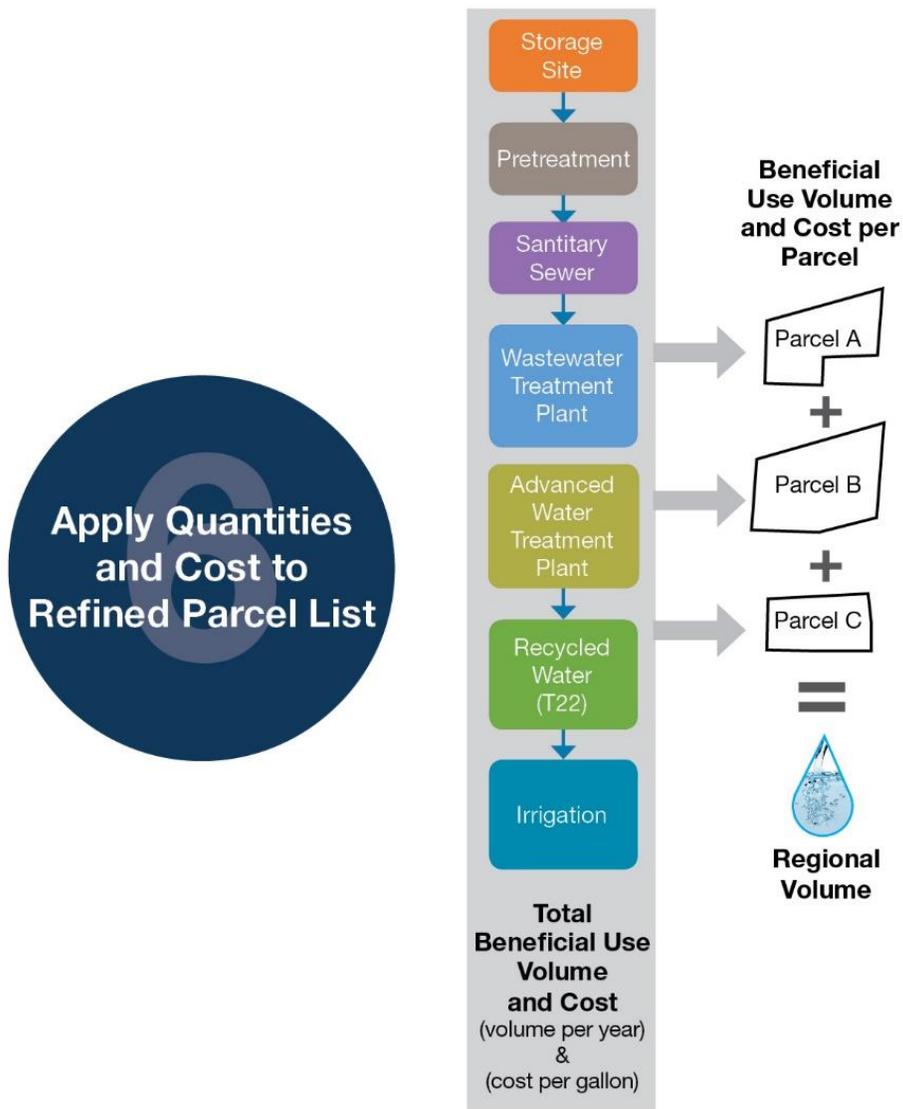
For example, **Figure 14** presents two fictitious parcels. When considering the applicability of beneficial use F, Controlled Discharge to Wastewater Treatment for Solids Management during Low Flows, it's important that the parcel be near a sanitary sewer line. The parcel on the left is 120 ft. from the nearest sanitary sewer, while that on the right is over half a mile from the nearest sanitary sewer line. If Step 4 indicates that a distance of 150 ft. is acceptable, the parcel on the left would be retained as a candidate for beneficial use F, while the parcel on the right would be rejected.

The refined list of parcels will be used to scale the quantifies and costs developed for the example project in Step 4 to these parcels to develop regional estimated of potential volume that can be captured and used beneficially in Step 6.

Figure 14. Example parcels with distance to nearest sanitary sewer line (not to scale)



Step 6. Apply Quantities and Cost to Refined Parcel List



The sixth step is to scale the quantities and costs determined in Step 4 from the listed example projects to the refined parcel list generated in Step 5 for each of the eight beneficial use categories to develop a regional estimate of these volumes and average cost per gallon. Based on parcel size, catchment potential, and identified potential applicable beneficial use based on the refined parcel screening process in Step 5, the capture and use quantities and costs for each potential project (a parcel/use combination) will be estimated using a scaling factor applied to the quantities and costs from applicable example projects that is listed for the applicable beneficial use. The total potential capture and beneficial use volumes and the cost will then be calculated for the entire region. An important element of this analysis is capturing economies of scale. The relationship between parcel size and the

resulting cost and use volume may not be linear (e.g. a parcel twice as large might produce 75% more volume, but cost only 50% more), and advantages of scale would inform project prioritization.

As an example, two parcels have been identified as applicable for use in providing dry weather flows and controlled stormwater flows to a natural treatment system. The first parcel has 25 acres of potential storage and treatment and the second parcel has 5 acres of potential storage and treatment. Both parcels have similar size drainage areas. Parcels for this beneficial use need to have sufficient area to capture, detain and pre-treat stormwater flows prior discharging under controlled flow conditions to the natural treatment system that has defined retention time and therefore flow-through rates to achieve design constituent reductions. On a volume captured per areas basis, the first parcel can store and detain twice the volume of the second site. Assume that from example projects it has been determined that the unit wetland treatment system averages \$100,000/acre with a maximum design flow-through rate of 2 cubic feet per second (CFS), and a required maximum retention time for stored storm flows of 72 hours to address vector issues. The example projects also have an average cost of the storage/detention area that includes trash and sediment removal of \$50,000/acre. When these quantification and costs from the example projects are applied to the two different applicable parcels, the results will indicate that due to the limits of the maximum flow-through capacity of the natural treatment system (this will be true for other beneficial uses that require controlled flows), the parcel that has five times the storage and treatment area will have a larger implementation and maintenance cost, but on a cost per volume of stormwater beneficially used basis will be much lower than the smaller parcel. These example highlights potential economies of scale and reveals how the unit cost on a volume of stormwater beneficially used could differ between parcels, guiding prioritization.

Step 7. Develop and Apply Criteria to List of Potential Projects



The seventh step is to develop a set of metrics and criteria in order to assess and prioritize the example projects or case studies that are in the planning or concept phase. This assessment and prioritization will identify the project’s opportunities and constraints. The criteria for assessment and prioritization of the projects include:

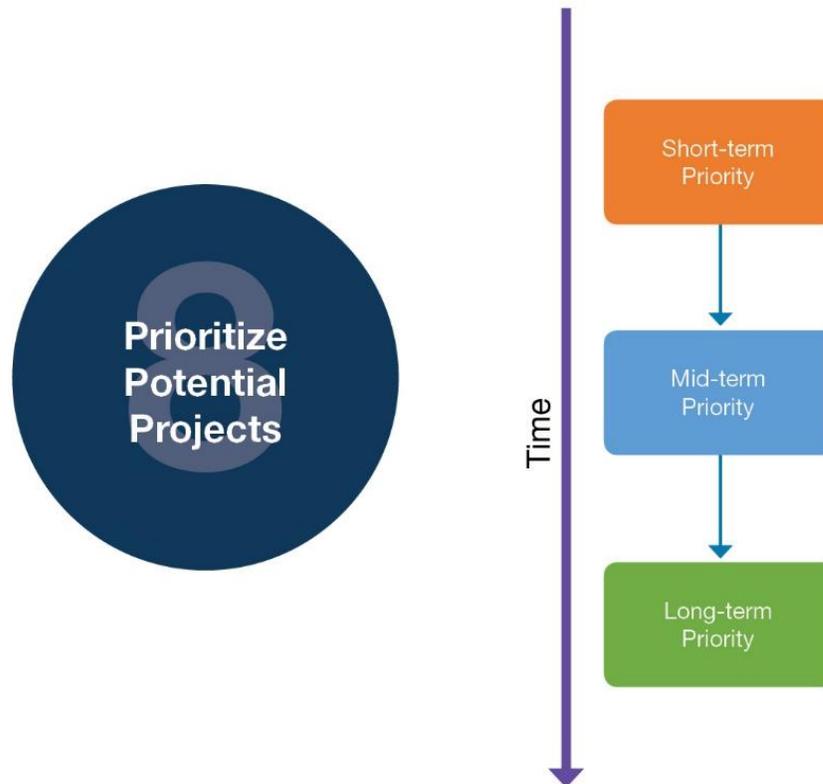
- Multi-benefits achieved
- Total volume annual produced for beneficial use
- Cost-volume ratio for beneficial use, comparing the cost of implementation, operations, and management to the volume for beneficial use
- Total Cost and cost sharing potential
- Inter-Agency Agreements
- Feasibility of Implementation (e.g. existing technology, existing infrastructure and facilities, interagency agreements)

The criteria will be scored for prioritization of the projects. As project costs may vary greatly between beneficial uses and size, additional metrics and criteria may be developed to normalize costs and account for multi-benefits achieved and demand for beneficial uses. Criteria may also be weighted to account for regional priorities.

In addition to the assessment and scoring of the projects, the scaled quantities and costs applied to the refined list of parcels will also be conducted using a more focused set of criteria applicable to the level of feasibility assessment planned for these parcels. Two criteria will be applied at this level: cost per volume and volume of beneficial use achieved. Analysis at the parcel or site level will provide a high-level planning tool to potentially identify high-priority parcels that can be considered for stormwater capture elements or focused projects. The resulting parcel ranking can be used to identify those that could be further investigated and assessed using the other criteria listed, which are used in assessing the specific projects for which a greater level of detail is available.

The example in Step 6 presents one of the metrics listed above: a cost per volume of stormwater used beneficially to compare and then prioritize projects and parcels. Step 7 involves a review of the site-specific and regional metrics calculated in Step 6, incorporating the opportunities provided by multi-benefit projects that may reduce the constraints to project implementation such as funding, community support, and inter-agency agreements. For example, if only unit cost per volume of stormwater beneficially used is considered, Project A in the preceding example is preferable to Project B (it provides beneficial use of stormwater at a lower unit cost). However, if the planned treatment wetland on Project B was an identified strategic watershed measure in a Water Quality Improvement Plan to address high nutrients in a nearby receiving water and provided flood risk reduction and habitat benefits, these multi-benefits would attract additional funding and resource agency support that would make it more feasible to pursue in a shorter timeline a project on Project B than on Project A. If this project also had a memorandum of understanding between the agency owning the property and the agency managing the natural treatment system to which it would discharge, the feasibility of this project being implemented would be greater. The project on Project B may then have a higher priority than a project on Project A, even though the cost per volume of beneficially used stormwater is lower for Project A.

Step 8. Prioritize Projects



After assessing the beneficial use options available in the San Diego region via the preceding seven steps, the final step in the model approach is to prioritize potential projects that have been scored and ranked using the criteria and assessment conducted in Step 7. The projects will be divided into three categories: short-term, mid-term, and long-term feasibility. Short-term-feasible projects may be those that are already in the planning stage and can be readily implemented. The short term projects may also be characterized by favorable cost-to-volume ratios or provide multiple benefits that include stormwater and dry weather flow capture using current technologies and existing conveyance and treatment infrastructure. Mid-term-feasible projects may have greater implementation and cost constraints under current conditions, but may become feasible with additional funding, advances in technology or infrastructure expansion that is either planned or under consideration. Long-term projects may be those project which have higher capital costs and require greater public investment, which could be implemented in phases as elements of the larger stormwater capture infrastructure network are implemented over time.

As an example, if a project with a larger stormwater capture and detention capacity is located near a sanitary sewer line that has existing conveyance capacity to a water treatment plant that has excess capacity and a current demand for advanced treated water for recycled water use, implementation of that project may be considered a Short-Term Priority project. Meanwhile, a second similar project that does not have a nearby sanitary sewer line with suitable capacity requiring an upgrade to the existing sewer trunk line would be deferred to a Mid-Term priority. For a project that would divert flows to a WWTP that is planning an expansion as part of a longer term

capital investment that could accommodate augmented stormwater flows, this project might be considered a Long-Term Priority project, to be pursued in conjunction with the future plant expansion. This prioritization may change and for this reason the planned prioritization represents a planning tool rather than a set plan or recommended project list. The objective of this plan is to provide a management tool that can be adaptive as conditions and circumstances of project and parcels change. Should for example, the plant expansion in the long-term priority project be moved to a shorter timeframe, the priority of this project would change based on the criteria.

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References

ESA. 2017a. Final San Diego Region Functionally Equivalent Storm Water Resource Plan. Prepared for San Diego Region Copermittees and County of San Diego Public Works. June 2017.

ESA. 2017b. San Diego Stormwater Capture Feasibility Study – Framework and Data. Submitted to Stephanie Gaines, County of San Diego. August 30, 2017.

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