APPENDIX N

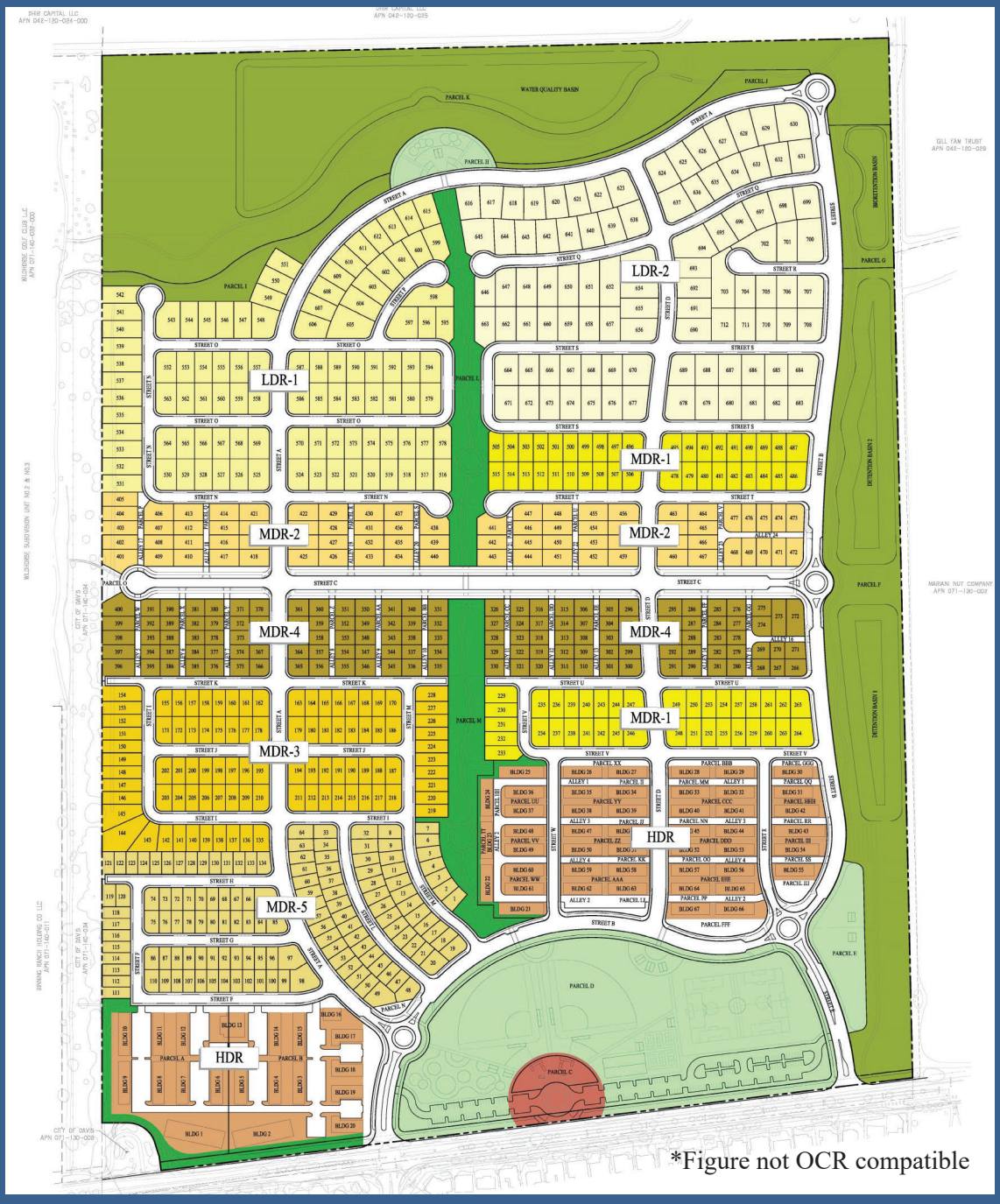


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Revised Preliminary Stormwater Control Plan
Willowgrove, City of Davis

Prepared for:

CARLSON, BARBEE & GIBSON, Inc.

CIVIL ENGINEERS • SURVEYORS • PLANNERS

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June 2025

June 17, 2025

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1 INTRODUCTION

This document represents the Revised Preliminary Stormwater Control Plan for the proposed Willowgrove Project ("Project") in the City of Davis, California and supersedes the earlier document prepared in October 2024 to include updated land use and soils data pertinent to managing stormwater at the site.

The Project is a proposed development that includes low-, medium-, and high-density residential areas, along with public park space, an agricultural buffer and a nature area (see **Appendix A** for the current land plan). The Project is located north of East Covell Boulevard and just east of the Wildhorse Golf Club and encompasses a total of approximately 232 acres (**Figure 1-1**). Currently, located in an unincorporated part of Yolo County, the site is proposed for annexation into the City of Davis.

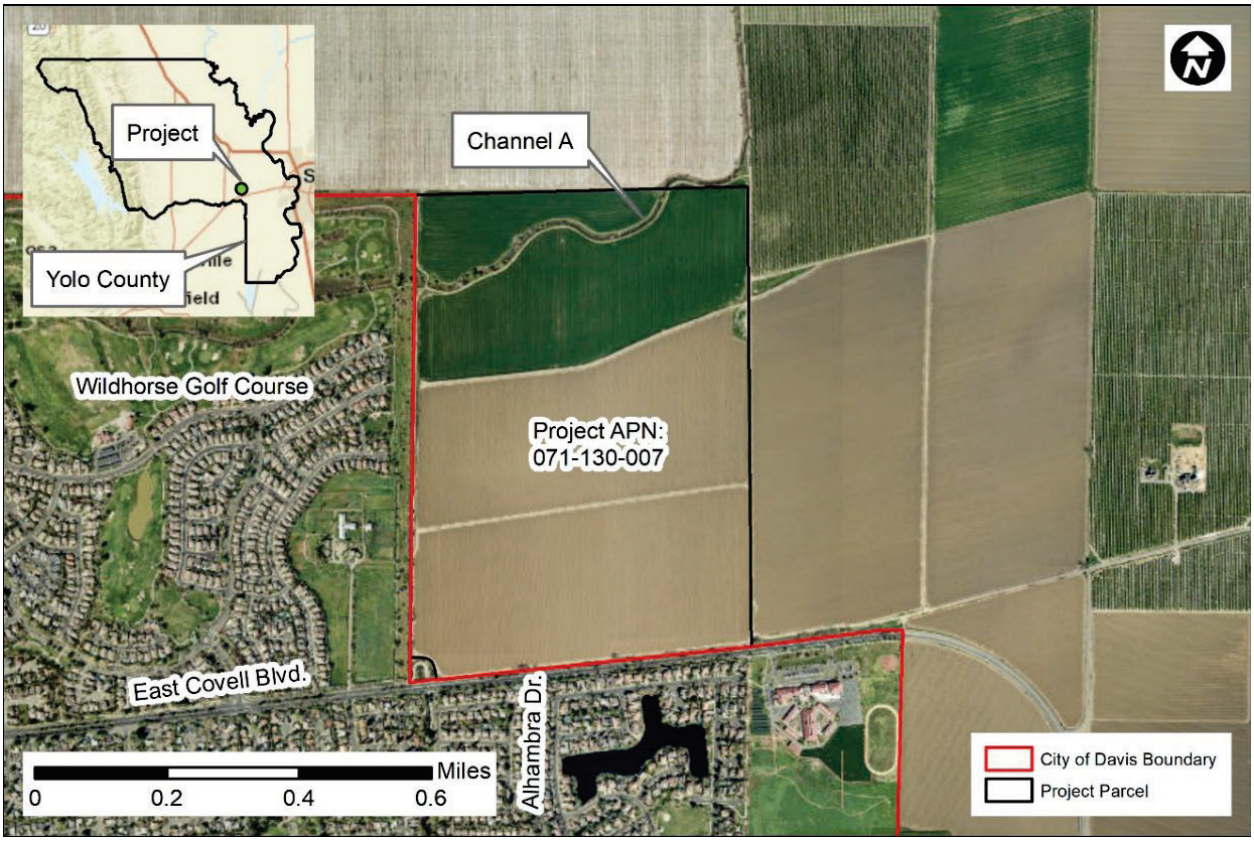


Figure 1-1 Vicinity Map, Willowgrove, City of Davis, Yolo County, California

1.1 Summary of Project Data

Pertinent information related to the Project and basis of design related to stormwater management is summarized in **Table 1-1** below. The Project is in the planning stage, but

the design has advanced enough that key aspects of the stormwater management approach have been identified and have been used to complete hydrologic modeling for sizing of the infrastructure necessary to avoid adverse impacts both on- and off-site.

Table 1-1 Summary of project data

Project Name	Willowgrove
Application Number	#23-22
Application Submittal Date	December, 2022
Project Location	APN: 071-130-007 City of Davis Yolo County, California
Name of Applicant	Davis Eastside LLC 2551 Fair Oaks Boulevard, Suite 200 Sacramento, CA 95825
Project Phase No.	N/A
Project Type and Description	Low to high density residential development with park, agricultural buffer area, and nature area
Total Project Site Area (acres)	232.4± acres (230.5 acres in DMAs)
Total New Impervious Surface Area	134.5 acres
Total Replaced Impervious Surface Area	0.0 acres
Total Pre-Project Impervious Surface Area	0.0 acres
Total Post-Project Impervious Surface Area	134.5 acres
Applicable Performance Requirements (PR):	
PR 1 – Site Assessment	Site assessment, See **Section 2**
PR 2 – Site Design Measures	LID site design, See **Section 4**
PR 3 – Source Control Measures	Source control measures, **Section 7**
PR 4 & 5 –Design Measures for 85th Percentile and Stormwater Treatment Design	Design Measures to 85th Percentile, See **Section 4** 85th Percentile = 0.65 in.
PR 6 – Stormwater Control Plan	This document constitutes the Preliminary Stormwater Control Plan for the project.
Hydromodification and Peak Flow Management	2-yr, 24-hour = 2.42 inches 10-yr, 24-hour = 3.39 inches 100-yr, 24-hour = 4.86 inches 200-yr, 24-hour = 5.27 inches 100-yr, 10-day = 12.87 inches 200-yr, 10-day = 13.96 inches

1.2 Purpose

As noted, this document represents the Revised Preliminary Storm Water Control Plan (SWCP) for Willowgrove. It explains anticipated hydrologic changes to the site and discusses the proposed strategy for addressing both stormwater quality and quantity issues. Appropriate best management practices (BMPs) are identified along with preliminary facility sizing and design parameters. Modeling and calculations presented herein are based on land use plans developed by Carlson, Barbee & Gibson, Inc. (**Appendix A**). The SWCP is meant to accompany other project submittals, as well as to support additional environmental documentation and permitting. As such, the SWCP should be viewed as a master planning document that details the stormwater management strategy for the Project and will be updated as needed to reflect the final design of the Project.

1.3 Objectives

The project will implement a comprehensive stormwater management strategy and will meet or exceed prevailing regulatory standards such as those in the City of Davis Stormwater Phase II General Permit Development Standards Guidance Document and the Yolo County City/County Drainage Manual. Stormwater management in the context of this report includes the requirement to assess, and if necessary, mitigate potential impacts, and to protect the functions and values of receiving waters. Potential hydrologic impacts addressed in this report include water quality management, hydromodification management, and peak flow control.

Objectives of the SWCP are summarized as follows:

- Characterize site-specific pre-project hydrologic conditions as a benchmark for selecting and designing stormwater management infrastructure.
- Develop a suite of BMPs consistent with the requirements of local and regional regulatory agencies.
- Provide stormwater facilities for infiltration and hydromodification management, and peak flow control to comply with requirements embodied in the pertinent state-wide stormwater permits.
- Design infrastructure to be self-maintaining to the highest degree possible.

1.4 Work Conducted

The following documents were reviewed to gain an understanding of the regulatory environment, pertinent performance criteria, and the physical and hydrologic characteristics of the project site:

- Stormwater Phase II General Permit Development Standards Guidance Document, City of Daivs (2015)
- City/County Drainage Manual Volumes 1 & 2, Yolo County (2010)
- Geotechnical Engineering Study for Shriners Property, prepared by Youngdahl Consulting Group, Inc. (November 2024)
- Shriners Property, Results of Percolation Testing – Revision 1, letter report prepared by Youngdahl Consulting Group, Inc. (dated November 14, 2024)
- Preliminary Landscape Plan, prepared by Fuhrman Leamy Land Group and Carlson, Barbee & Gibson (April 2025)

The stormwater management strategy starts with low-impact site design, focusing on directing runoff from impervious surfaces to BMPs. Water cycle sensitive design will be further enhanced by source control measures aimed at limiting, or eliminating, the loading of pollutants that can be mobilized in runoff.

With this strategy in mind, Balance developed hydrologic models of pre- and post-project conditions that serve as the basis for the stormwater design. The post-project model was used to understand potential runoff patterns and calculate the storage capacity and peak outflow rates from the proposed system of detention basins and bioretention facilities to mitigate for potential impacts.

2 SITE ASSESSMENT

2.1 Location

The Project occupies roughly 232.4 acres on one parcel (APN: 071-130-007) in a currently unincorporated area of Yolo County, California, bordering the City of Davis (see **Figure 1-1**) that is programmed for annexation into the City of Davis. The Project is bounded East Covell Boulevard to the south, Wildhorse Golf Course to the west, and agricultural fields to the north and east.

2.2 Land Use

2.2.1 Pre-project Topography and Land Use

The existing topography at the Project is relatively flat and generally slopes towards the east and then toward the northeast corner of the parcel. Topography at the site ranges from maximum elevations[1] of approximately 39 feet near the southwestern corner of the parcel to minimum elevations on the order of 32 feet in the northeastern portion of the parcel (excluding Channel A, see **Section 2.6**).

Pre-project land use is essentially entirely agricultural fields with no significant amount of impervious cover. Row crop agriculture appears to have been the sole land use over at least the last 40 years. There is essentially no existing impervious cover, with site access consisting of a limited system of dirt roads. A single farm road crossing over Channel A is located near the western boundary of the site.

2.2.2 Post-project Land Use

The proposed Project land plan and major stormwater management facilities are illustrated in **Figure 2-2**. Projected land use includes low-, medium-, and high-density residential areas, public park spaces, an agricultural buffer and a nature area located north of Channel A. The agricultural buffer extends along the northern and eastern property boundaries, though actual development is not proposed along the northern boundary. Key components of the proposed stormwater infrastructure (detention and bioretention facilities) needed to provide on-site retention of runoff, enhancement of

[1] All elevations are referenced to North American Vertical Datum of 1988 (NAVD 88) unless otherwise specified.

runoff water quality, and control of peak flow rates will be located within the agricultural buffer.

2.3 Climate

Climate at the site can be characterized as Mediterranean, with cool, wet winters and dry, hot summers typical of the Central Valley of California. Mean annual rainfall at the Project site is on the order of 19.5 inches per the statistical analysis of design storm events presented in the Yolo County Drainage Manual. It is important to note that 19.5 inches is a statistical mean, and actual annual precipitation varies substantially due to regional and global weather patterns. Evapotranspiration (ET) rates are much higher than annual rainfall over the course of a typical year and average 57.0 inches per year as reported by the California Irrigation Management Information System for the Davis monitoring station. Monthly evapotranspiration values exceeding monthly rainfall in all but the wettest winter months.

2.4 Soils

The earlier SWCP document prepared in October 2024 referenced soil mapping prepared by the Natural Resources Conservation Service (NRCS) pertinent to the site. That mapping shows that the property is underlain by eight different soil types with just over half the site underlain by Sycamore silt loam (33.6% of the area) and Sycamore silty clay loam (17.5% of the area). Subsequent to the October document, additional site work was carried out to directly measure infiltration rates (see the November 2024 report prepared by Youngdahl Consulting included as **Appendix B)**. The measured rates were generally low, showing the presence of more clay material than would be indicated by the NRCS mapping. Based on that test data, the underlying soils should be classified in Hydrologic Soil Group D, indicative of low infiltration rates and relatively high runoff rates, and that soil group classification has been used in the revised calculations and modeling discussed herein.

2.5 Groundwater

Extensive subsurface investigations were completed by the project geotechnical engineer including borings, cone penetration tests, and test pits. Per the summary report (Youngdahl Consulting, Inc., November 2024), ground water was typically encountered at approximately 40 feet below ground surface, which would correspond to an elevation of roughly 0 to -5 feet NAVD88 depending on location. This information is consistent with

spring groundwater contours depicted in the Yolo Subbasin Annual Report Water Year 2024 published by the Yolo Subbasin Groundwater Agency.

2.6 Drainage Areas and Patterns

2.6.1 Pre-project Conditions

Key aspects of the pre-project drainage patterns at the site based on topographic information provided by CBG are illustrated in **Figure 2-1** below, with a larger scale exhibit of the same information included as **Appendix C**. For the purposes of calculations and modeling, the overall property was divided into three drainage management areas reflecting points of flow concentration. The largest of these, DMA 1, occupies roughly the southern two-thirds of the site, with DMA 2 representing the remaining area south of Channel A and DMA 3 encompassing the area north of the channel.



Figure 2-1 Pre-project land use and drainage management areas, Willowgrove Project, City of Davis

Under pre-project conditions, a system of drainage ditches convey runoff to the markedly larger Channel A, which runs west to east across the northern portion of the site. DMAs 1 and 2, join in a ditch along the eastern boundary of the property and join Channel A from the south at a point approximately 200 feet north of the northern property line. DMA 3 joins Channel A via a culvert just upstream of the north property line.

Channel A is one of the principal drainage channels serving the City of Davis and adjacent County lands and receives runoff from all the major drainage basins defined within the City except for the Core Area, Mace Ranch, and South Davis basins (City of Davis Drainage Map, April 2007). Channel A flows generally northeasterly for 1.6 miles to an outfall into the Willow Slough Bypass (Slough) at County Route 29. There is also an associated stormwater lift station at this location to facilitate drainage when high water levels in the Slough prevent adequate gravity discharge.

Table 2-1 presents a summary of pre-project land use and drainage area.

Table 2-1 Pre-project land use type, area, and impervious cover

		Area			Impervious		
	Land Use	*(sq ft)*	*(acres)*	*(sq miles)*	*(%)*	*(sq ft)*	*(acres)*
DMA 1	Ag	6,502,108	149.27	0.2332	0	0	0.00
DMA 2	Ag	2,526,380	58.00	0.0906	0	0	0.00
DMA 3	Ag	1,014,052	23.28	0.0364	0	0	0.00
	Total	***10,042,540***	***230.54***	**0.3602**	***0***	***0***	**0.00**

2.6.2 POST-PROJECT CONDITIONS

Overall drainage patterns in the post-project condition will remain essentially unchanged even with the proposed changes in land use and construction of a full drainage and stormwater management system. Runoff from the proposed development will continue to drain to Channel A, and there will be no change in regional drainage patterns.

The site is also divided into three DMAs in the post-project condition as shown in **Figure 2-2** (with a larger format version included as **Appendix D**). DMAs 1 and 2 will include a conventional gravity-flow storm drain network that will convey runoff in excess of local infiltration generally easterly to a pair of detention basins located in the agricultural buffer along the east side of the property, identified herein as the North Basin and the South

Basin. These basins will be cross-connected to function as one large runoff management facility and will be unlined. This will allow the basins to contribute to runoff reduction via infiltration through the basin floors. Stored runoff above a pre-determined elevation will be pumped to a bioretention basin located to the north. The bioretention basin will provide runoff water-quality treatment via biofiltration and additional infiltration capacity from the bottom of a crushed rock layer underlying the basin. Any runoff in the bioretention basin that exceeds the infiltration capacity will be picked up in an underdrain system and then discharged to Channel A. For large storm events (i.e., 10-year and larger) excess runoff will be released from the detention basins in a controlled manner to an outlet pipe system that also discharges to Channel A.



Figure 2-2 Proposed land use, drainage management areas, and stormwater management facilities, Willowgrove Project, City of Davis

DMA 3, located to the north of Channel A, will be managed as a nature area and will include another detention basin (Channel A Basin) that will serve to regulate runoff rates and, most importantly, will provide additional runoff and flood flow storage. Located directly adjacent to Channel A, it will be configured to emulate floodplain functions that have been restricted elsewhere along the channel due to urbanization and agricultural activities.

Land use categorized by type, area, and overall impervious cover is summarized in **Table 2-2** below. Essentially all the impervious cover associated with the project will be located in DMAs 1 and 2, though it should be noted the floor areas of the three detention basins and the bioretention facility, all located in the agricultural buffer, are counted as impervious for the purposes of rainfall-runoff modeling.

Table 2-2 Post-project land use type, area, and impervious cover

		Area			Impervious		
	Land Use	*(sq ft)*	*(acres)*	*(sq miles)*	*(%)*	*(sq ft)*	*(acres)*
DMA 1	Ag Buffer	366,359	8.41	---	27	98,813	2.27
	Park	772,606	17.74	---	21	159,031	3.65
	Green Belt	183,127	4.20	---	12	22,429	0.51
	MDR	1,811,871	41.59	---	70	1,268,310	29.12
	HDR	636,220	14.61	---	80	508,976	11.68
	Commercial	57,071	1.31	---	90	51,364	1.18
	Streets	1,532,128	35.17	---	95	1,455,522	33.41
	DMA 1 Total	***5,359,382***	***123.03***	**0.1922**	***67***	***3,564,444***	***81.83***
DMA 2	Ag Buffer	524,346	12.04	---	32	169,609	3.89
	Park	43,742	1.00	---	14	5,964	0.14
	Green Belt	120,384	2.76	---	19	22,483	0.52
	LDR	1,603,779	36.82	---	50	801,890	18.41
	MDR	491,308	11.28	---	70	343,916	7.90
	Streets	872,955	20.04	---	95	829,307	19.04
	DMA 2 Total	***3,656,514***	***83.94***	**0.1312**	***59***	***2,173,168***	***49.89***
DMA 3	Ag Buffer	1,026,644	23.57	---	12	121,239	2.78
	DMA 3 Total	***1,026,644***	***23.57***	**0.0368**	***12***	***121,239***	***2.78***
	Site Total	***10,042,540***	***230.54***	**0.3602**	***58***	***5,858,852***	***134.50***

2.7 Flood Hazard and FEMA Mapping

Flood hazard mapping prepared by the Federal Emergency Management Agency (FEMA) is published on Flood Insurance Rate Maps (FIRMs) and also available through the National Flood Hazard Layer Viewer hosted by FEMA. The project site can be found on FIRM Panel 06113C0604G, that has an effective date of June 18, 2010. An excerpt from the NFHL View is included below as **Figure 2-3**. The FIRM panel shows that the northern portion of the proposed development area is in a Zone A Special Flood Hazard Area, defined as areas with a one-percent annual chance of flooding (also known as the "100-year floodplain"). The mapped flooding source in this case does not appear to be Channel A, but rather regional flooding from the Willow Slough Bypass and/or backwater flooding from the much larger Yolo Bypass located 3.5 miles east of the site. The off-site nature of the regional flooding source indicates that all or part of the site within the mapped floodplain can be elevated above base flood elevations if due consideration is given to overall floodplain storage so that fill placed within the Zone A area does not adversely displace flooding to adjoining properties.



Figure 2-3 Excerpt from the FEMA NFHL Viewer, showing the Zone A Special Flood Hazard Area in relation to the Project site.

3 LOW IMPACT DEVELOPMENT DESIGN STRATEGIES

The stormwater management strategy for Willowgrove is directly framed by the goals and requirements in the City of Davis Phase II General Permit Standards Guidance Document (July 2015). Reference to **Section 1** of the document shows that the Project is clearly classified as a Regulated Project given its size and the proposed increase in impervious area. As such, the Project must comply with Performance Requirements #1through #6, follow the pertinent Operations and Maintenance requirements, and comply with the Hydromodification Requirement. In total, these are considered Low Impact Development (LID) approaches, and they are foundational to the manner in which stormwater will be managed throughout the Project.

3.1 Performance Requirement Compliance Framework

As noted above, Regulated Projects such as Willowgrove need to demonstrate compliance with a range of defined performance requirements by providing measures to limit the quantity of potential non-point source pollutants, reduce runoff by preserving natural hydrologic processes to the extent practicable, and treat and control runoff leaving the site to reduce pollutant loadings and avoid adverse impacts from changes in runoff durations and rates.

Summaries of compliance with the six performance requirements can be found in the pertinent checklist that are included as **Appendix E**. Relevant additional context regarding how each requirement has been addressed includes:

- *Performance Requirement #1 – Site Assessment Checklist*. A baseline understanding of the characteristics that influence hydrologic processes at a site is fundamental in identifying and implementing an appropriate stormwater management strategy. Many, though not all, these factors were discussed in the earlier **Section 2**. The Project design reflects an explicit effort to maintain pre-project flow patterns, establish ample buffers around a reduced development footprint, directly measure soil properties that most influence runoff behavior, and set aside extensive areas for floodplain functions to operate along the Channel A corridor.
- *Performance Requirement #2 – Site Design Measures*. This performance requirement is integral to achieving the runoff reduction goals of Performance Requirement #4, and the two requirements are discussed in detail in **Section 4.2**

- *Performance Requirement #3 – Source Control Measures*. Environmentally sensitive stormwater management recognizes the importance of source control measures as a means to limit the types and quantities of potential pollutants that can be mobilized during storm events. The Project design allows for implementation of a full suite of these measures and recognizes the role of future site management practices as well. A tabulation of these measures is discussed in **Section 5.**

- *Performance Requirement #4 – Certification of Site Design Measures to the 85th Percentile 24 Hour Storm Event*. As noted above, this requirement is directly related to Performance Requirement #2, see the expanded discussion in **Section 3.2**.

- *Performance Requirement #5 – Baseline Hydromodification Management and Stormwater Treatment Design*. Even with extensive site design measures, the increase in overall impervious cover can lead to mobilization of potential pollutants and increases in the magnitude and duration of runoff rates unless appropriate treatment measures are implemented. The proposed stormwater infrastructure includes large components to provide runoff water-quality treatment and regulate runoff rates. The design characteristics and operation of the bioretention basin that is the key component of the treatment design is discussed in more detail in **Section 3.3** below. The manner in which the overall infrastructure design works to control runoff rates across the full range of design storms from the 2-year event that is the benchmark for compliance with the Phase II General Permit E.12 hydromodification management requirements up to and including the Yolo County 200-year design storms (consistent with California FloodSAFE guidelines) are described in **Section 4.**

- *Performance Requirement #6 – Stormwater Control Plan*. This document represents the preliminary SCP for Willowgrove and demonstrates compliance with Performance Requirement #6. That said, final compliance documentation and certification can only be completed as part of the final design review and approval process, requiring a future update to this document.

3.2 Site Design Measures and Runoff Reduction

An important aspect of maintaining natural hydrologic processes at any site is consideration of runoff potential from the relatively small storm events that constitute much of the annual rainfall. With respect to the Project, site design measures to limit runoff generation by promoting infiltration and evapotranspiration are the primary means of

addressing the goal of retaining the 85th percentile storm event on-site (Performance Requirement #4).[2] The Performance Requirement #2 checklist in **Appendix E** provides a comprehensive list of the site design measures included in the Project design.

The primary tool for assessing compliance with Performance Requirements #2 and #4 is the Post-Construction Stormwater Calculator compiled by the State Water Resources Control Board as part of the Stormwater Multiple Applications and Tracking System (SMARTS). Though the tool was designed for smaller projects that do not need to implement additional requirements beyond runoff reduction, it provides a convenient accounting framework for quantifying the impact of runoff reduction measures at the site. The SMARTS calculator allows for consideration of a number of distinct measures, but only a selected set of these were quantification of site runoff.[3] These include the following:

- *Tree Planting*. Given that essentially the entire pre-project site has been used for row crop agriculture, there are very few existing trees outside of the narrow riparian band along the banks of Channel A. Therefore, the Project has the opportunity to significantly increase the amount of tree cover, and this is reflected in the Preliminary Landscape Plan included as **Appendix F**. That plan includes a total of 694 evergreen trees and 1,813 deciduous trees, which can play a significant role in runoff reduction, particularly in DMAs 1 and 2 where many of the trees will be planted directly adjacent to areas of impervious cover.
- *Impervious Area Disconnection*. Disconnection of impervious areas will be implemented wherever possible throughout the project. For the purposes of preliminary runoff reduction accounting, the calculations conservatively only count paved walkways within the main park area, the green belt, and the agricultural buffer. There will be additional areas of disconnected impervious cover such as sidewalks separated from adjacent streets by landscaping in the

[2] Per the Standards Guidance Document, this storm event has a total rainfall of 0.65 inches for sites located in the City of Davis.

[3] The Project will implement most of the measures as shown in the Performance Requirement #2 checklist. However, not all are included in the runoff reduction accounting for various reasons. For example, stream buffers along Channel A are in important aspect of the land plan, but runoff from impervious areas will not be directed to the buffer areas to any significant degree (or is accounted for elsewhere as impervious area disconnection). Another example is downspout disconnection, which will be implemented to the maximum extent practical in the final design but is difficult to quantify at this stage.

portions of developed area, but these were not included in the runoff accounting at this time.

- *Soil Quality Enhancements*. Given the low measured permeability of soils at the site, there is a meaningful opportunity to enhance runoff retention through use of soil quality enhancement. Landscaped areas are particularly good candidates for soil reconditioning that can lead to both enhanced infiltration and the opportunity for more incoming rainfall to leave the site as evapotranspiration. Accounting of the potential benefits of soil quality at this stage of Project planning was limited to assessing the runoff reduction potential of incorporating 4.5 inches of silt or silt loam soils in the top 12 inches of landscaped areas in DMAs 1 and 2 only. Only anticipated landscaping in the main park, green belt, and buffer areas was included. Clearly, use of sandier material and/or inclusion of landscaping on individual lots would lead to additional runoff retention and can be investigated as the Project moves into final design.

- *Basin Infiltration and Evapotranspiration*. Calculation of anticipated infiltration and evapotranspiration from the floors of the three detention basins (North, South, and Channel A) and the bioretention basin is not part of the Post-Construction Stormwater Calculator framework, but was completed to recognize that those facilities will play a role in retention of runoff in addition to the roles of flow control and water-quality enhancement. The basins will be constructed per specifications that limit compaction of the basin floor areas to maximize this potential. In all cases the average measured infiltration rate at each basin location was the starting point, but this was reduced using a safety factor of 3 as a conservative assumption.[4] Evapotranspiration was also assessed in a conservative manner by using the January average monthly value as reported by CIMIS for the Davis monitoring site (converted to losses per 72 hours = 0.13 inches). Losses due to evapotranspiration earlier or later in the rainy season could be expected to be markedly higher.

Separate Calculator runoff retention accounting was completed for each of the three post-project Drainage Management Areas, and the spreadsheets for the summary Volume Calculator and those for the site design measures considered are included as **Appendix G**. A summary of the pre-project runoff, post-project runoff without mitigation,

[4] For the combined North and South Basins, the average measured rate of 0.048 inches/hour was reduced to 0.016 inches/hour. For the Bioretention Basin the average value of 0.015 inches/hour was reduced to 0.005 inches/hours. That for Channel A Basin was reduced to 0.022 inches/hour from the measured value of 0.067

and effectiveness of each measure is provided in **Table 3-1** below. Review of the values in the table shows that conversion of DMA 3 to a managed natural space environment is predicted to lower post-project runoff volume, with full on-site retention correspondingly easier to achieve. More widespread site design measures are needed in DMAs 1 and 2, and the calculations show that the largest share of volume reduction potential is through soil quality enhancements followed by managing the basins to promote infiltration and evapotranspiration. It is important to note that even though the measured infiltration rates at the location and anticipated excavation depth of the basins were quite low, the extensive basin floor areas provide enough surface area for effective on-site retention. The latter is true even when 72-hour retention limits are utilized in the infiltration and evapotranspiration calculations to account for the need to avoid vector control concerns.

Table 3-1 Summary of 85th percentile storm runoff reduction measures

	DMA 1	DMA 2	DMA 3
Pre-project runoff volume	53,192	36,292	10,191
Volume increase w/o mitigation	21,985	0	-9,095
Total post-project volume w/o mitigation	***75,177***	***36,292***	***1,096***
Post-project volume reductions:			
Tree-planting	2,609	1,263	38
Impervious area disconnection	1,485	722	27
Soil quality enhancements	62,517	29,429	0
Infiltration from basins	9,060	6,182	7,542
Evapotranspiration from basins	1,170	799	602
Sub-total volume reductions	***76,842***	***38,394***	***8,209***
Total post-project volume w/ mitigation	***-1,665***	***-2,102***	***-7,113***

Units are cubic feet in all cases.
All values from the Post-Construction Stormwater Calculator except for basin infiltration and evapotranspiration, which are based on measured infiltration rates at the location and depth of the proposed basins with an applied safety factor of 3 and on published average monthly ETo values for January for the Davis CIMIS site.
The values for runoff volume increase w/o mitigation for DMA 2 and DMA 3 reflect the Calculator output that shows post-project curve number is the same as pre-project for DMA 2 (no increase) and lower for DMA 3 (decrease in runoff without mitigation).

3.3 Treatment Measure Design and Performance

The Project stormwater management strategy also includes treatment measures to address water-quality and changes in flow rates (hydromodification) for runoff in excess of that retained on-site. The land use in DMA 3, namely conversion to a nature center

area, implies that it will be self-treating from the perspective of water-quality and peak flow control. However, treatment measures will be required for the developed DMAs 1 and 2 to meet the requirements stipulated in Section E.12 of the Statewide General Permit.

Treatment of runoff from DMAs 1 and 2 will utilize the detention capacity in the combined North and South Basins working in tandem with the Bioretention Basin. In addition to providing detention volume for very large storm events, the North and South Basins will retain runoff so that it can be pumped to the Bioretention Basin in a controlled manner. The basins will be interconnected by a large "equalizer" pipe so that they will function as one combined facility. The elevation-storage relationship for the basins is summarized in **Table 3-2**. The lower four feet of the basins will be used to store runoff for pumping to the Bioretention Basin. Above that elevation gravity flow outlets will regulate outflow directly to Channel A, and will only be engaged for large storm events that exceed the water-quality treatment volume requirements.

Table 3-2 Elevation-storage relationship for the North and South Basins

Elevation	North Basin			South Basin			Combined
	Area		Storage	Area		Storage	Storage
(feet)	*(ft^2)*	*(acres)*	*(ac-ft)*	*(ft^2)*	*(acres)*	*(ac-ft)*	*(ac-ft)*
22.00	62,240	1.43	0.00	56,550	1.30	0.00	0.00
23.00	72,150	1.66	1.55	62,580	1.44	1.37	2.92
24.00	80,240	1.84	3.30	68,710	1.58	2.87	6.18
25.00	88,390	2.03	5.24	75,180	1.73	4.53	9.76
26.00	96,640	2.22	7.36	81,580	1.87	6.33	13.69
27.00	105,000	2.41	9.68	88,080	2.02	8.27	17.95
27.50	109,210	2.51	10.91	91,370	2.10	9.30	20.21
28.00	113,450	2.60	12.18	94,680	2.17	10.37	22.55
29.00	122,010	2.80	14.89	101,390	2.33	12.62	27.51
30.00	130,660	3.00	17.79	108,190	2.48	15.03	32.81
31.00	139,420	3.20	20.89	115,100	2.64	17.59	38.48
32.00	148,270	3.40	24.19	122,100	2.80	20.31	44.50
33.00	157,230	3.61	27.70	129,210	2.97	23.20	50.89

The pump system that conveys runoff from the combined basins will be located at the northern end of the North Basin and will have a rated capacity of 1,750 gallons per minute (3.90 cfs). The pump on and off elevations will be set so that a small residual runoff volume will be retained in the basins for infiltration/evapotranspiration. The Bioretention Basin will be located in the agriculture buffer at the northeast corner of the development area.

Physical dimensions of the preliminary basin design are summarized in **Table 3-3**. The facility design follows standard guidelines with 2 feet of specially formulated biosoil over an underlying rock storage layer. The underlying rock layer thickness will be increased to 3 feet to provide storage for additional infiltration. An underdrain will be provided and set at the top of the rock layer, and an overflow riser will be included to accommodate the unlikely event of inflow exceeding the bioretention capacity. The underdrain and overflow riser will be connected directly to an outfall on the south bank of Channel A.

Table 3-3 Bioretention basin parameters

Elevation	Area		Storage
(ft)	*(ft2)*	*(acres)*	*(ac-ft)*
24.5	35,860	0.823	0.00
25.5	35,860	0.823	0.33
26.5	35,860	0.823	0.66
27.5 (top of rock)	35,860	0.823	0.99
28.5	35,860	0.823	1.32
29.5 (top of biosoil)	35,860	0.823	1.65
30.0	37,880	0.870	2.07
31.0	42,010	0.964	2.99
32.0	46,240	1.062	4.00

The anticipated performance of the treatment measures was assessed using a continuous simulation runoff model to verify that the combination of storage in the North and South Basins and pumping to the Bioretention Basin provides the required treatment capacity. The continuous simulation modelling shows that 94 percent of the long-term total runoff from DMAs 1 and 2 will be pumped to the Bioretention Basin, where 100 percent of the inflow will be treated.

4 MODELING OF PEAK FLOW CONTROL

In addition to the specific performance requirements related to runoff reduction and treatment, the stormwater facilities have also been designed to control peak flow rates from the Project to Channel A. The primary components with respect to peak flow control are stormwater basins, which will provide storage volume to detain runoff from large events and release it at a controlled rate.

Modeling of peak flow control performance was completed using the U.S. Army Corps of Engineers HEC-HMS platform (version 4.12) parameterized per the guidelines presented in the Yolo County City/County Drainage Manual (revised 2010). The model runs included design storms from the 2-year, 24-hour event up to the 200-year, 10-day event. The former design storm was included to demonstrate compliance with the hydromodification management requirement of the Statewide General Permit, while the latter was included to assess drainage system performance during very large and prolonged storm periods. Infiltration from the basins was not included in the peak flow modeling given the low overall infiltration rates compared to the magnitude of the larger design storms.

4.1 Model Parameters

Hydrologic model parameters were compiled from project information provided by Carlson, Barbee & Gibson and from the Drainage Manual using the synthetic hydrograph method. Key input parameters for the modeling include:

- *Design Storms*. Rainfall totals and distributions for the respective design storms were derived following guidance in the Drainage Manual. The calculator included as part of the technical guidance was used to identify the appropriate rainfall totals for each design event, based on a mean annual precipitation of 195. Inches and a coefficient of variance of 0.3713 from the associated GIS tool. Rainfall totals for the various design storms are summarized in **Table 4-1**. Rainfall distributions for the design storm utilized a balanced frequency storm for the 24-hour duration events. The distribution for the longer duration 10-day events was sourced from Appendix D of the Drainage Manual.

Table 4-1 Design storm events and rainfall depth

Design Storm	Depth *(inches)*
2-year, 24-hour	2.42
10-year, 24-hour	3.39
100-year, 24-hour	4.86
100-year, 10-day	12.87
200-year, 24-hour	5.27
200-year, 10-day	13.96

Notes: Storm rainfall totals and distribution used as per Yolo County Drainage Manual.

- *Land use and curve numbers*. The modeling for peak flow control used the same pre- and post-project DMAs identified previously in Section 2. Rainfall losses were simulated using the curve number methodology and values from Table 10 in the Drainage Manual. The pre-project curve number for all the DMAs and for antecedent moisture condition 2 (AMC2) was set to85 based on row crops grown in winter. Composite curve numbers were used in the post-project case, with 80 used for pervious areas and 98 for impervious cover. Curve numbers were adjusted for the 2- and 10-year design events per the antecedent moisture corrections presented in the drainage manual. The resulting curve numbers are summarized in **Table 4-2** below.

Table 4-2 Summary of hydrologic modeling curve numbers by DMA

	Design Storm Curve Number (24-hour duration)				
DMA	*2-year*	*10-year*	*100-year*	*200-year*	*10-day*
Pre-project					
All	70.0	71.5	85.0	85.0	72.0
Post-project					
1	81.2	82.3	92.1	92.1	84.2
2	79.2	80.3	90.6	90.6	81.6
3	66.2	67.8	82.2	82.2	68.2

Curve numbers for the 100- and 200-year events use AMC 2. The 2-year event is based on AMC 1 and that for the 10-year event is based on AMC 1.15. Values for the 100- and 200-year, 10-day event are converted from AMC 2 per Table 11 of the Drainage Manual.

- *Lag time*. DMA mapping information as provided in **Appendices C and D** was used to define the longest flow path lengths and length to centroid for each DMA, and that information was used along with the associated elevation data to calculate the lag time values, which are summarized in **Table 4-3.**

Table 4-3 Summary of Lag time parameters by drainage management area

		Flowpath				Elevation				
	n	Longest		Centroid		max	min	Slope	Lag Time	
DMA	*(unitless)*	*(feet)*	*(miles)*	*(feet)*	*(miles)*	*(feet)*	*(feet)*	*(ft/mi)*	*(min)*	*(hours)*
Pre-project										
1	0.115	5,435	1.029	3,685	0.698	38	28	9.7	110.5	1.84
2	0.115	3,948	0.748	2,000	0.379	35	28	9.4	81.8	1.36
3	0.115	2,120	0.402	1,155	0.219	36	34	5.0	61.7	1.03
Post-project										
1	0.035	4,060	0.769	2,955	0.560	38	24	18.2	25.6	0.43
2	0.04	4,180	0.792	2,000	0.379	38	24	17.7	26.1	0.44
3	0.115	1,560	0.295	630	0.119	36	25	37.2	32.7	0.55

4.2 Model Results

The HEC-HMS modeling results for pre- and post-project peak flow rate and maximum water surface elevation are summarized in **Table 4-4** and show reductions in predicted peak flow for all design storms.

Table 4-4 HEC-HMS Peak Flow and Volume Summary

	Peak Discharge (*cfs*)		Runoff Volume (ac-ft)		Dual Basin	
Design Storm	*Pre*	*Post*	*Pre*	*Post*	Max WSE *(feet)*	Freeboard *(feet)*
2-year, 24-hour	12.5	3.9	8.0	14.4	25.2	7.8
10-year, 24-hour	37.6	13.0	19.6	27.2	27.1	5.9
100-year, 24-hour	131.1	70.3	62.2	70.0	30.1	2.9
200-year, 24-hour	146.2	77.2	69.5	77.6	30.7	2.3
100-year, 10-day	124.6	84.6	173.7	192.4	31.1	1.9
200-year, 10-day	137.1	99.0	193.4	212.6	31.5	1.5

The "dual basin" in this case refers to the combined North and South Basins.

Important additional aspects of the HMs modeling include the following:

- *North Basin Gravity Flow Outlets*. As discussed previously, an interconnecting "equalizer" pipe will allow the North and South Basins to function as one large storage facility. The outlet infrastructure for the two basins will be located at the north end of the North Basin. Runoff from most storms will be drained via the pump system that will route flow to the Bioretention Basin in a regulated manner. However, large storms can be anticipated to generate more runoff than needs to be treated for water-quality objectives. Therefore, the North Basin will also have a gravity outflow connected directly to Channel A. Many configurations are possible for the outflow structure, and it was preliminarily modeled as having a 7-foot wide by 1-foot-high lower outlet orifice with a flowline elevation of 26.5 feet and an overflow weir with a crest elevation of 31.0 feet.

- *Hydromodification management*. Per the City's hydromodification management requirement, post-project peak flows from the 2-year, 24-hour storm must be reduced to below pre-project levels. As shown in **Table 4-4,** post-project peak flows are predicted to be markedly lower than pre-project peak flows for the 2-year design event. Therefore, the proposed Project stormwater infrastructure will comply with the requirement.

- *100-year peak flow and basin freeboard*. The HMS modeling also shows significant peak flow rate reductions for the two 100-year design storms, with the reduction in peak flow from a single 24-hour event being particularly large. In both cases, more than the required one foot of freeboard is provided.

- *200-year peak flow and basin freeboard*. Reductions in peak flow rates for the larger 200-year design events are of similar magnitude to those for the 100-year events. Freeboard for both 24-hour and 10-day design storms is predicted to be significantly higher than the minimum required value of 0.5 feet.

5 SOURCE CONTROL MEASURES

5.1 Site Activities and Potential Sources of Pollutants

As a low- to high-density residential development with extensive landscaped areas and very limited commercial activity, the Project is expected to have relatively few sources of stormwater pollutants. Anticipated potential sources of runoff pollutants and recommended source control BMPs are summarized in the **Table 5-1** below.

Table 5-1 Summary of Source Control BMPs

Potential Source of Runoff Pollutants	Permanent Source Control BMPs	Operational Source Control BMPs
Parking lot/Vehicle washing	• Driveways and parking areas drain to underground stormwater facilities	• Distribute stormwater pollution prevention information to Owner.
Dumpster/Refuse area	• Signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar. • Provide an adequate number of receptacles and trash enclosures will be covered. Inspect on a regular basis, repair, or replace leaky receptacles. • Inspect and pick up litter daily and clean up spills immediately. • Runoff from trash enclosures, recycling areas, and/or food compactor enclosures, or similar facilities shall not discharge to the storm drain system. • Trash enclosure areas shall be designed to avoid run-on to the trash enclosure area. If any drains are installed in or beneath dumpsters, the drains shall be connected to	• Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site.

Potential Source of Runoff Pollutants	Permanent Source Control BMPs	Operational Source Control BMPs
	a properly sized grease removal device and/or treatment devices prior to discharging to the sanitary sewer. • The area will be designed to prevent water run-on to the area and runoff from the area and to contain litter and trash, so that it is not dispersed by the wind or runoff during waste removal.	
Swimming pool/Spa/Fountain	• Water features of the apartment complex will have a sanitary sewer connection or accessible cleanout.	
Fire sprinklers	• Fire sprinklers and drain lines will drain to landscaped areas and/or plumbed to the sewer.	
Interior floor drains/boiler lines	• Interior floor drains and boiler lines are plumbed and connected to the sewer.	
On-site storm drain inlets	• Mark all inlets with the words "No Dumping!" or similar.	• Maintain and periodically repaint or replace inlet markings. • Distribute stormwater pollution prevention info to Owner
Beneficial Landscaping	• Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.	• Maintain landscaping using minimum or no pesticides. • Provide IPM information to new Owner.

Potential Source of Runoff Pollutants	Permanent Source Control BMPs	Operational Source Control BMPs
	• Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. • Consider using pest-resistant plants, especially adjacent to hardscape	
Maintenance	• Routine apartment complex maintenance such as pavement sweeping to minimize stormwater pollution.	• Routine and periodic maintenance as outlined by the O & M manual. • Distribute stormwater pollution prevention info to Owner

5.2 Features, Materials, and Methods of Construction of Source Control BMPs

No special features, materials, or construction methods are required for the source control BMPs listed above.

6 STORMWATER FACILITY MAINTENANCE

6.1 Ownership and Responsibility for Maintenance in Perpetuity

The applicant commits to execute any necessary agreements and/or annex into a fee mechanism in accordance with local requirements. The applicant will accept responsibility for the operation and maintenance of facilities until that responsibility is formally transferred. The applicant anticipates the City; Community Facilities District will take ownership of the stormwater facilities and will accept responsibility for the operation and maintenance of the facilities once ownership is formally transferred. Storm water treatment and flow-control facilities described in this report will be owned and maintained in perpetuity by the City. The applicant will accept responsibility for interim operation and maintenance of the facilities until such time as this responsibility is formally transferred to subsequent owners.

The operation and maintenance (O&M) agreement will be recorded with the Engineering Department, 1717 Fifth Street, Davis, prior to final approval of the project building permits. Any modifications made to the O&M Plan must be filed with and approved by the City of Davis, Director/City Engineer. The O&M agreement will transfer to subsequent owners of the property including annual reporting of the Project's post construction controls.

6.2 Maintenance Requirements

The maintenance requirements for the stormwater infrastructure related to the performance requirements identified in **Appendix E** will be identified and discussed in a separate Operations and Maintenance Manual that will be prepared and submitted along with the Final Storm Water Control Plan. The Manual will clearly identify the required maintenance activities, associated inspection schedules, and will include maintenance checklists to facilitate compliance recordkeeping.

7 CONSTRUCTION CHECKLIST

The Final Storm Water Control Plan will include a construction checklist to show the correlation between source control and treatment control measures discussed in the Storm Water Control Plan and where those items appear on the final project plans.

Storm Water Control Plan Page #	**Source Control or Treatment Control Measure**	**See Plan Sheet #s**
	Will be completed with final project plans	

8 CERTIFICATIONS

The design of stormwater treatment facilities and other stormwater pollution control measures in this plan are in accordance with the current edition of the *Yolo County City/County Drainage Manual (2010), and the City of Davis Stormwater Phase II General Permit Development Standards Guidance Document (2015).*

9 REFERENCES

City of Davis, 2015. Stormwater Phase II General Permit Development Standards Guidance Document.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture, Web Soil Survey, available online at http://websoilsurvey.nrcs.usda.gov/ Accessed February 28, 2024.

Wood Rodgers, 2010. Yolo County City/County Drainage Manual Volumes 1 & 2.

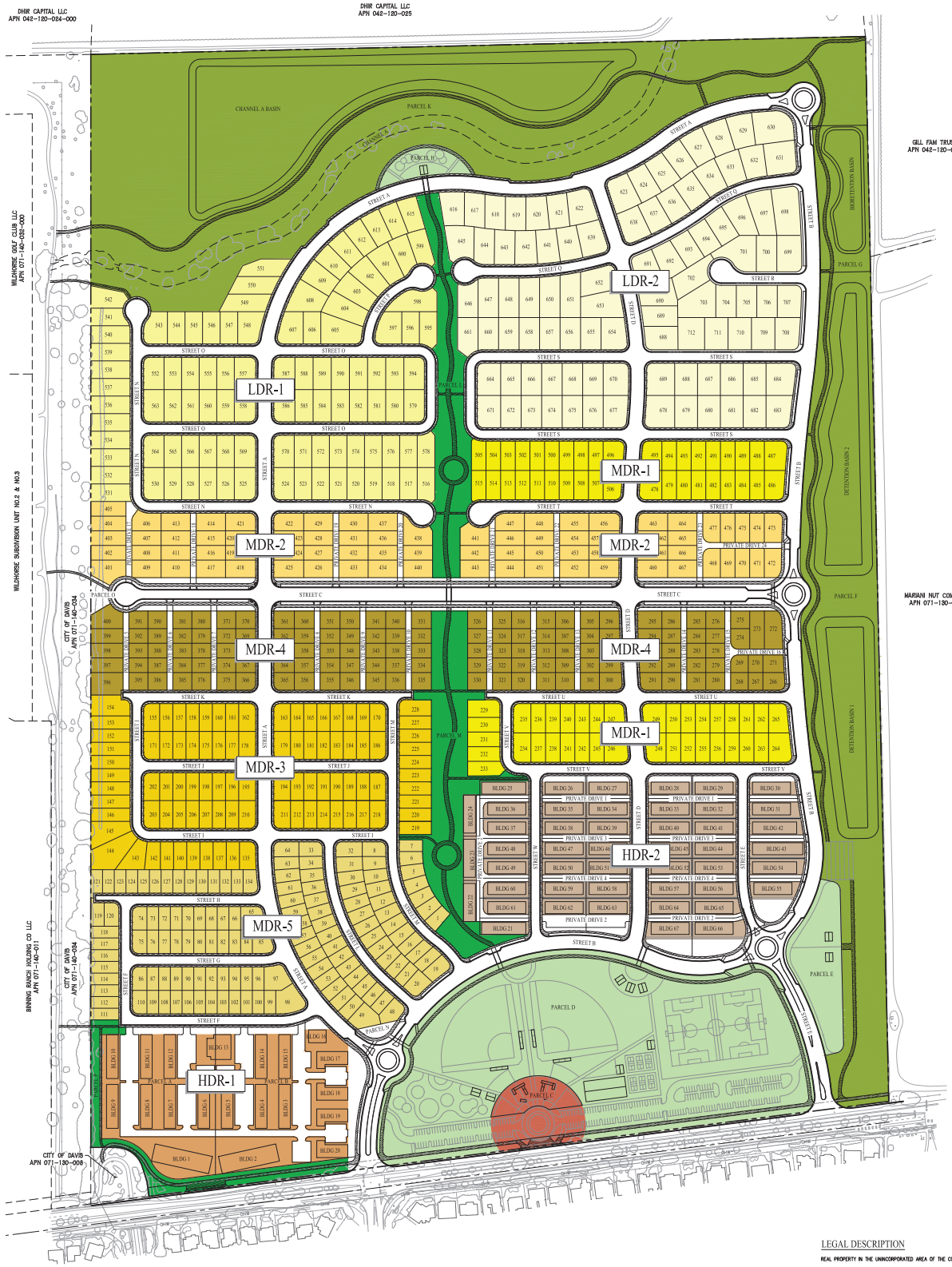
Youngdahl Consulting Group, Inc., November 2024). Geotechnical Engineering Study for Shriners Property.

Youngdahl Consulting Group, Inc., November 14, 2024. Shriners Property, Results of Percolation Testing – Revision 1.

APPENDICES

APPENDIX A

Land Use Plan



GENERAL NOTES

1. OWNER: DAVIS EASTSIDE LLC
   CONTACT: GARY PERRY/BREANN MOEBUS
   2551 FAIR OAKS BOULEVARD, #200
   SACRAMENTO, CA 95825
2. APPLICANT: CARLSON, BARBEE, & GIBSON, INC.
   2633 CAMINO RAMON, SUITE 350
   SAN RAMON, CA 94583
   DAVIS EASTSIDE LLC
   2551 FAIR OAKS BOULEVARD, #200
   SACRAMENTO, CA 9582
3. ENGINEER: CARLSON, BARBEE, & GIBSON, INC.
   2633 CAMINO RAMON, SUITE 350
   SAN RAMON, CA 94583
   ANDREA J. BELLANCA, R.C.E. NO. 61806
   PHONE: (925) 866-0322
4. SOILS ENGINEER: YOUNGDAHL CONSULTING GROUP
   1234 GLENHAVEN COURT
   EL DORADO HILLS, CA 95762
   PHONE: (916) 933-0633
5. SOILS REPORT: GEOTECHNICAL ENGINEERING STUDY
   FOR SHINNERS PROPERTY
   PROJECT NUMBER: E24278.000
   DATE: NOVEMBER 2024
6. LAND AREA: 232.4± ACRES
7. TOTAL NO. OF EX. LARGE LOT PARCELS: 1
   TOTAL NO. OF PR. LOTS: 712
   TOTAL NO. OF PR. PARCELS: 55
   TOTAL NO. OF LARGE LOT PARCELS: 26
8. RESIDENTIAL UNIT COUNT: 1,250
   COMMERCIAL SQUARE FOOTAGE: 66,093
9. EXISTING USE: AGRICULTURAL
   PROPOSED USE: PLANNED DEVELOPMENT (PD)
10. EXISTING GENERAL PLAN: RESIDENTIAL
    PROPOSED GENERAL PLAN: PD
11. UTILITIES
    SEWER: CITY OF DAVIS
    WATER: CITY OF DAVIS
    STORM DRAIN: CITY OF DAVIS
    GAS & ELECTRIC: PACIFIC GAS & ELECTRIC
    TELEPHONE: AT&T TELECOMMUNICATIONS
    CABLE TV: COMCAST CABLE SERVICES
12. APN: 071-130-007
13. MULTIPLE FINAL MAPS MAY BE FILED ON THE LANDS SHOWN ON THIS MAP PER SUBDIVISION MAP ACT 66456.
14. CONDOMINIUM MAP: ONE OR MORE CONDOMINIUM MAPS WILL BE RECORDED FOR THIS SUBDIVISION. THE SUBDIVISION HAS PARCELS THAT ARE CONDOMINIUM PROJECTS AS DEFINED IN SECTION 1350 ET. SEQ. OF THE CIVIL CODE OF THE STATE OF CALIFORNIA AND FILED PURSUANT TO THE SUBDIVISION MAP ACT.
15. FLOOD ZONES SHOWN ARE PER FLOOD INSURANCE RATE MAP NO. 06113C0604G, EFFECTIVE DATE: JUNE 16, 2012. ZONE A – 100 YEAR FLOOD PLAIN WITH NO BASE FLOOD ELEVATION DETERMINED. ZONE X – AREA DETERMINED TO BE OUTSIDE THE 100 YEAR FLOODPLAIN.
16. BASIS OF BEARINGS: THE BASIS OF BEARINGS FOR THIS MAP IS BETWEEN FOUND MONUMENTS IN WRIGHT BOULEVARD, THE BEARING BEING N25°59'42"W AS SHOWN ON THE MAP OF SUBDIVISION 4353 (1998 BM 31).
17. A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) WILL BE PREPARED FOR THE PROJECT. EROSION AND SEDIMENT CONTROL MEASURES FROM THE SWPPP SHALL BE IMPLEMENTED.
18. AERIAL TOPOGRAPHY WAS PREPARED BY GEOMAPS ON JANUARY 29, 2024 CONTOURS AT 1 FOOT INTERVAL.

SHEET INDEX

SHEET NO.	DESCRIPTION
1	SITEPLAN/GENERAL NOTES & PROJECT DATA
2	EXISTING CONDITIONS MAP
3	LARGE LOT MAPPING PLAN
4	DIMENSION PLAN–NW
5	DIMENSION PLAN–NE
6	DIMENSION PLAN–SE
7	DIMENSION PLAN–SW
8	STREET SECTIONS
9	PRELIMINARY GRADING & DRAINAGE PLAN –NW
10	PRELIMINARY GRADING & DRAINAGE PLAN –NE
11	PRELIMINARY GRADING & DRAINAGE PLAN –SE
12	PRELIMINARY GRADING & DRAINAGE PLAN –SW
13	PRELIMINARY GRADING SECTIONS
14	PRELIMINARY GRADING SECTIONS
15	UTILITY PHASING PLAN
16	UTILITY PHASING PLAN
17	PRELIMINARY SEWER PLAN
18	PRELIMINARY POTABLE WATER PLAN
19	PRELIMINARY STORMWATER CONTROL PLAN
20	PHASING PLAN
21	EXISTING TREE INVENTORY
22	EXISTING TREE INVENTORY

LEGEND

- EXISTING PROJECT BOUNDARY
- PROPOSED RIGHT OF WAY
- PROPOSED LOT LINE
- PROPOSED CURB LINE
- PROPOSED MEDIAN CURB LINE
- PROPOSED SIDEWALK/TRAIL

PRODUCT SUMMARY

TYPE	RESIDENTIAL UNITS	AREA (AC)
LDR–1 (80'x110')	100	37.2
LDR–2 (70'x100')	97	
MDR–1 (50'x100')	75	52.6
MDR–2 (50'x100')	77	
MDR–3 (45'x95')	94	
MDR–4 (50'x65')	135	
MDR–5 (40'x80')	134	
HDR–1 (AFFORDABLE HOUSING)	250	14.9
HDR–2 (CONDOMINIUMS)	288	
PARK		19.2
GREENBELT		7.6
URBAN AGRICULTURAL AREA		45.2
NEIGHBORHOOD RETAIL		1.5
STREET, PRIVATE DRIVE, LANDSCAPE CORRIDOR		54.2
TOTAL	1,250	232.4

NOTE:
ALL ZONING AND LAND USE INFORMATION IS FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO PLANNED DEVELOPMENT DOCUMENTS FOR ALL ZONING REQUIREMENTS.

LEGAL DESCRIPTION

REAL PROPERTY IN THE UNINCORPORATED AREA OF THE COUNTY OF YOLO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCEL 5 OF THE LANDS OF HENRY J. HAMEL, ET AL., LOCATED IN SECTION 1, T. 8N., R. 2E., AND SECTION 36, T. 9N., R. 2E., FILED MAY 29, 1928 IN BOOK 4 OF MAPS AND SURVEYS, AT PAGES 79 AND 80, YOLO COUNTY RECORDS.

EXCEPTING THEREFROM THAT PORTION AS DESCRIBED IN DEED TO THE COUNTY OF YOLO, A POLITICAL SUBDIVISION, RECORDED AUGUST 17, 1964 IN BOOK 769 OF OFFICIAL RECORDS AT PAGE 1, YOLO COUNTY RECORDS.

FURTHER EXCEPTING THEREFROM THAT PORTION THEREOF GRANTED TO THE CITY OF DAVIS IN DEED RECORDED JULY 23, 2007, INSTRUMENT NO. 2007-0025868, OFFICIAL RECORDS.

NOTE:
THIS LEGAL DESCRIPTION IS PRELIMINARY AND SUBJECT TO VERIFICATION BY TITLE REPORT AND/OR CHAIN OF TITLE.

VESTING TENTATIVE MAP

WILLOWGROVE

CITY OF DAVIS YOLO COUNTY CALIFORNIA

SCALE: 1" = 120' DATE: MAY 29, 2025

DRAFT

0 120 240 360

cbg CIVIL ENGINEERS ■ SURVEYORS ■ PLANNERS
SAN RAMON ■ (925) 866-0322
ROSEVILLE ■ (916) 788-4456
WWW.CBANDG.COM

JOB NO.: M086-010

SHEET NO. 1 OF X SHEETS

W:\M086-010\ACAD\TM\TM-V2.DWG

APPENDIX B

Infiltration Test Report

Davis Eastside LLC
2251 Fair Oaks Boulevard, Suite 200
Sacramento, California 95825

Project No. E24278.000
Revised 14 November 2024

Attention: Mr. Gary Perry

Subject: **SHRINERS PROPERTY**
East Covell Boulevard, Davis, California 95618
RESULTS OF PERCOLATION TESTING – REVISION 1

References:
1. Administrative Manual, Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration, prepared by County of Los Angeles Department of Public Works Geotechnical and Materials Engineering Division, dated 30 June 2017.
2. Proposal and Executed Contract for Shriners Property GES, prepared by Youngdahl Consulting Group, Inc., authorized 23 July 2024 (Project No. E24278.000).
3. Change Order No. 1 for Shriners Property GES, prepared by Youngdahl Consulting Group, Inc., authorized 4 October 2024 (Project No. E24278.000).

Dear Mr. Perry:

Per your authorization of the Reference 3 change order, this letter has been prepared to summarize the work performed, and to provide percolation test results for use in planning and development of the project located north of East Covell Boulevard in Davis, California. We understand that the proposed development will include stormwater management features as part of the project's Low Impact Development (LID) Best Management Practices (BMPs). The work was performed within the property as shown on the attached Vicinity Map (Figure 1) and Site Plan (Figure 2).

Scope of Services
The authorized scope of work included percolation testing and preparation of this document. This document is solely limited to providing percolation test results; it is not a design report. It is our intent that this document be used exclusively by the client or their representative for general assessment of the site. Application beyond this intent is strictly at the user's risk. This document is intended to comply with common geotechnical engineering practice in this area under similar conditions at this time. The test procedures were accomplished in general conformance with the guidelines outlined in the Reference 1 document.

Percolation Testing
On 12, 13, 16, and 17 September 2024, 16 cone penetration tests (CPTs) and 15 borings were pushed/drilled to depths between 15 feet to 50 below the existing ground surface (bgs) for the ongoing geotechnical engineering study in order to characterize the subsurface soils and observe if shallow groundwater was located beneath the site. Groundwater was encountered at 40 feet bgs. After coordinating locations with the project civil engineer, on 18 September 2024, nine percolation borings (IB-1 through IB-9) were drilled with a 6-inch diameter drill-rig mounted auger to depths of approximately 10½ to 11 feet bgs to reach potential invert depths for proposed stormwater infiltration facilities. The field exploration locations are shown on Figure 2.

After the drilling of the percolation borings was completed, a 2-inch diameter perforated PVC pipe was installed within the lower 12 inches of each of the test borings; above this elevation, solid PVC pipe was utilized. The annular spaces around the lower-most 12 inches of the pipes were then filled with pea gravel and a bentonite slurry plug, approximately 12 inches thick, was installed above the gravel.

Following the equipment setup, the borings were filled with a minimum of two feet of water and maintained by refilling for a minimum of one hour for a presoak before beginning the actual percolation test. Following the presoak period, the rate of fall of water was measured in each of the percolation borings, refilling as necessary. Times between readings was 30 minutes.

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Once a stabilized rate was achieved, the percolation rate was calculated as the average of the last three consecutive readings for each boring. The average percolation rates are summarized in the table below. No reduction factors have been applied to these values. The percolation test results are attached.

Table 1: Average Percolation Rates

Boring ID	Percolation Zone (ft)	Average Percolation Rate* (in/hr)
IB-1	10 - 11	0.01
IB-2	9½ - 10½	0.00
IB-3	9½ - 10½	0.01
IB-4	9½ - 10½	0.17
IB-5	9½ - 10½	0.01
IB-6	9½ - 10½	0.02
IB-7	9½ - 10½	0.15
IB-8	9½ - 10½	0.02
IB-9	9½ - 10½	0.03

*Design Infiltration = Percolation Rate/Reduction Factor (Reference 1)

The test results only indicate the measured percolation rates at the specific locations and under specific conditions. Sound engineering judgment should be exercised in extrapolating the test results for other conditions or locations. The Reference 1 guidelines includes reduction factors for several parameters including, but not limited to, size of the LID system relative to the test volume, number of tests conducted, variability in the soil profile, anticipated silt loading, anticipated biological buildup, anticipated long-term maintenance, and other factors. Typically, in total, these factors range from 2 to 18 for the Boring Percolation Test Procedure used for IB-1 through IB-9. The final determination of appropriate reduction factors and the means by which these data are used is left to the design engineer.

General Subsurface Profile

Generally, the percolation borings encountered stiff highly-plastic clays. Subsurface water was encountered at 40 feet bgs in CPTs CPT-1 and CPT-6 and Boring B-1.

Closure

This report has been prepared for the exclusive use of the addressee and their consultants for specific application to this project. Youngdahl Consulting Group, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Youngdahl Consulting Group, Inc. makes no other warranty, expressed or implied. Application beyond the stated intent is strictly at the user's risk. This report is valid for conditions as they exist at this time for the type of project described herein.

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We trust that this provides you with the information needed at this time. Should you have any questions or require additional information, please contact our office at your convenience.

Very truly yours,
Youngdahl Consulting Group, Inc.

Reviewed by:

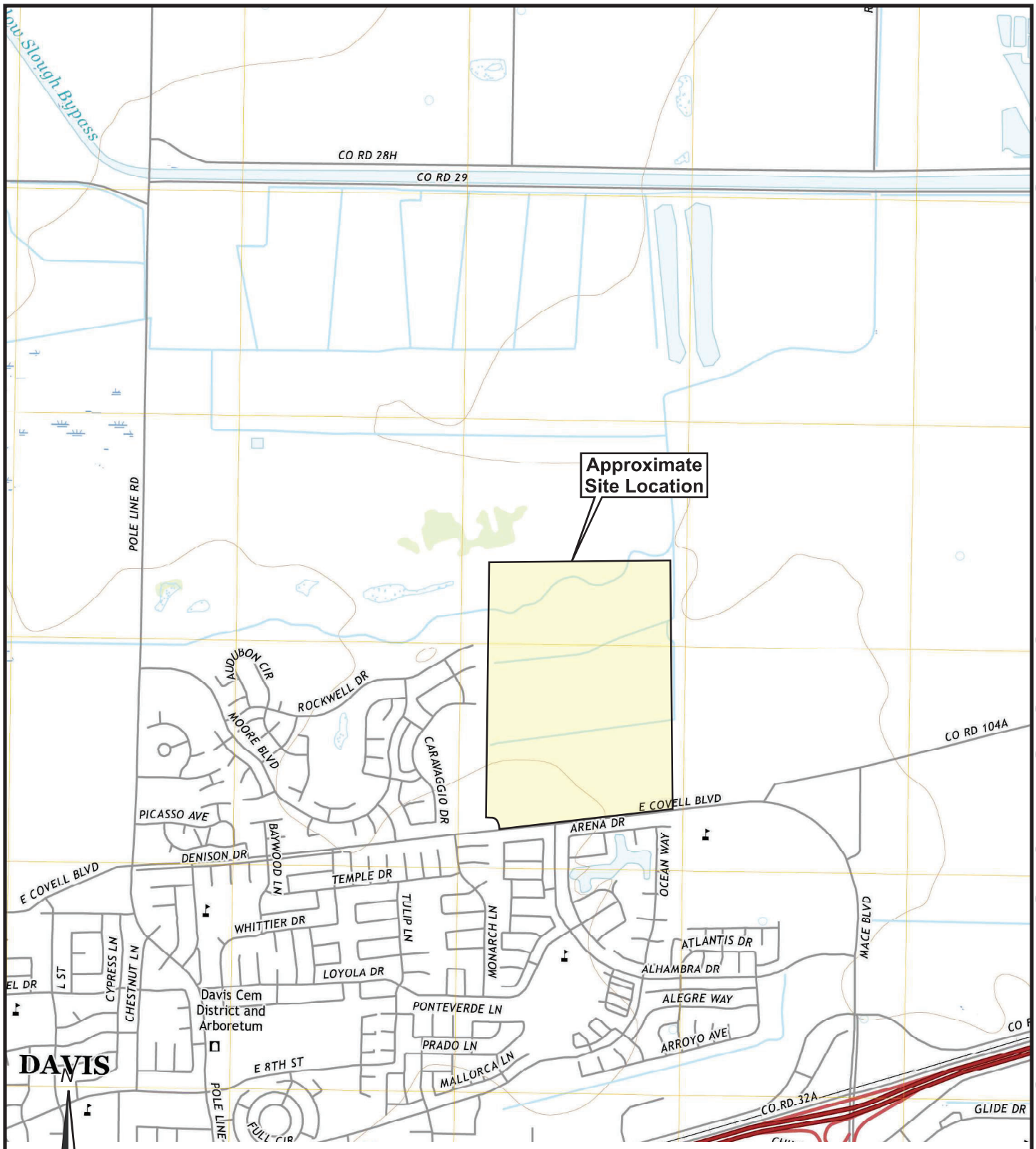
Ian T. Kitamura
Staff Engineer

Matthew J. Gross, P.E., G.E.
Senior Geotechnical Engineer/VP

Distribution: (1) PDF to Client

Attachments: Figures 1 and 2
Percolation Test Results

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Scale: 1:24,000

BASE MAP REFERENCE: *U.S.G.S. 7.5 Minute Topographic Series, Davis Quadrangle, Dated 2021*

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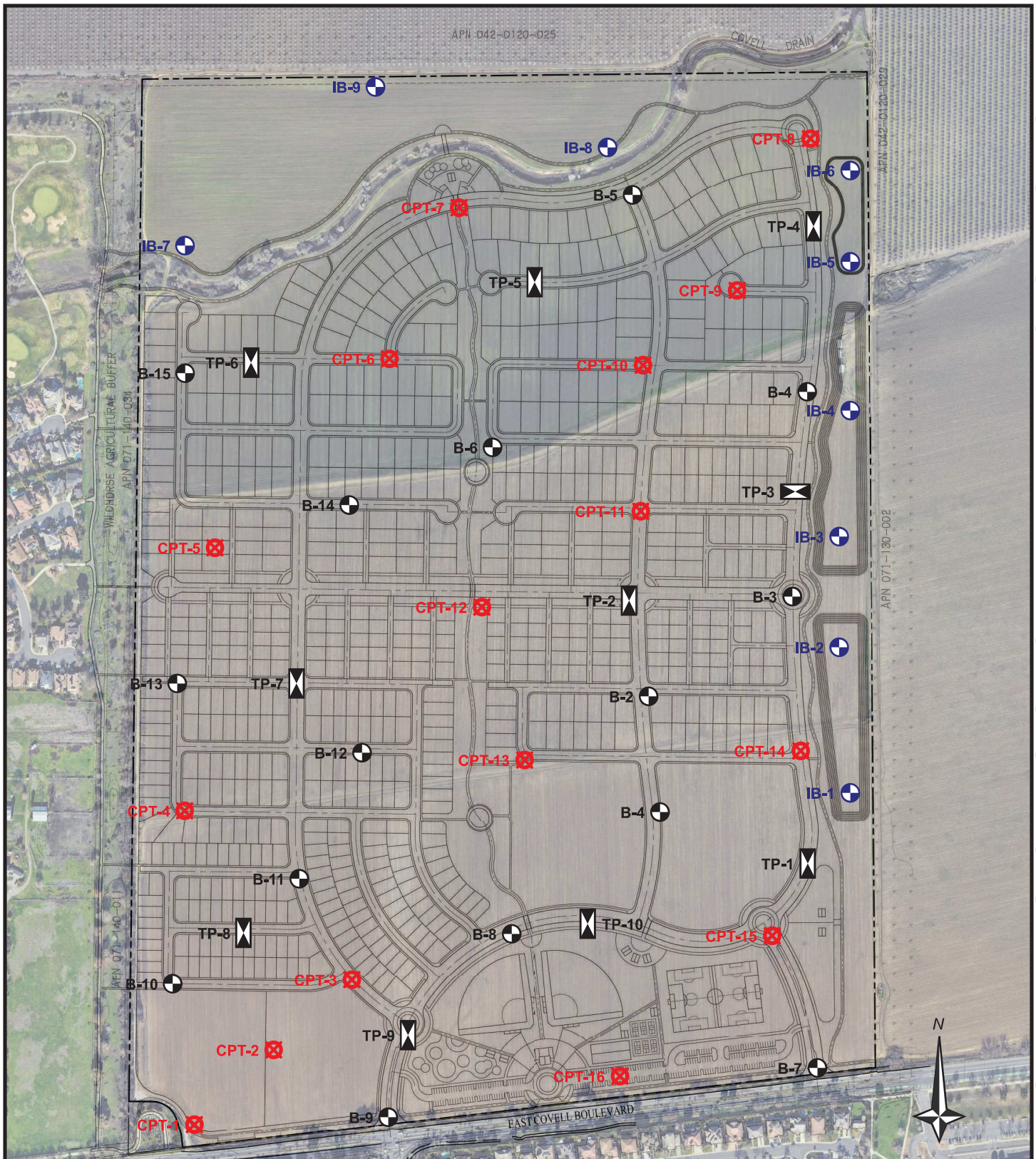
October 2024

VICINITY MAP

Shriner Property
Davis, California

FIGURE 1

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TP-1 = Approximate Test Pit Locations CPT-1 = Approximate Sample Locations

B-1 = Approximate Boring Locations IB-1 = Approximate Infiltration Boring Locations

0 250 500 1000

Approximate Scale: 1" = 500'

REFERENCE: *Site Plan, Shriners Property, CBG Engineering, Data 5/29/2024; Google Earth, Aerial Data Dated 1/7/2024*

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SITE PLAN

Shriner Property
Davis, California

FIGURE 2

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Project Name :	Shriners Property			**Project Number:**	E24278.000
Test Location:	IB-1			**Date:**	9/19/2024
Infiltration Zone (ft):	10-11'			**Tested By:**	ITK
Soil Description:	CLAY (CH)			**Tested on:**	9/19/2024
Perforated Casing Length (in):	12			**Boring Diameter (in):**	6
Casing Diameter (in):	2	**Base Plugged:**	Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	7:50 AM	0:30	S	3.495	0.01	3.39	**0.03**	Partly Cloudy, 80s
	E	8:20 AM		E	3.505				
2	S	8:20 AM	0:30	S	3.505	0.00	0.00	**0.00**	
	E	8:50 AM		E	3.505				
3	S	8:50 AM	0:30	S	3.505	0.00	0.00	**0.00**	
	E	9:20 AM		E	3.505				
4	S	9:20 AM	0:30	S	3.505	0.01	3.39	**0.03**	
	E	9:50 AM		E	3.515				
5	S	9:50 AM	0:30	S	3.515	0.00	0.00	**0.00**	
	E	10:20 AM		E	3.515				
6	S	10:20 AM	0:30	S	3.515	0.01	3.39	**0.03**	
	E	10:50 AM		E	3.525				
7	S	10:50 AM	0:30	S	3.525	0.00	0.00	**0.00**	
	E	11:20 AM		E	3.525				
8	S	11:20 AM	0:30	S	3.525	0.00	0.00	**0.00**	
	E	11:50 AM		E	3.525				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.01**

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YOUNGDAHL CONSULTING GROUP, INC.

Project Name :	Shriners Property			**Project Number:**	E24278.000
Test Location:	IB-2			**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'			**Tested By:**	ITK
Soil Description:	CLAY (CH)			**Tested on:**	9/19/2024
Perforated Casing Length (in):	12			**Boring Diameter (in):**	6
Casing Diameter (in):	2	**Base Plugged:**	Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	7:55 AM	0:30	S	4.274	0.00	0.00	**0.00**	Partly Cloudy, 80s
	E	8:25 AM		E	4.274				
2	S	8:25 AM	0:30	S	4.274	0.00	0.00	**0.00**	
	E	8:55 AM		E	4.274				
3	S	8:55 AM	0:30	S	4.274	0.00	0.00	**0.00**	
	E	9:25 AM		E	4.274				
4	S	9:25 AM	0:30	S	4.274	0.00	0.00	**0.00**	
	E	9:55 AM		E	4.274				
5	S	9:55 AM	0:30	S	4.274	0.01	3.39	**0.03**	
	E	10:25 AM		E	4.284				
6	S	10:25 AM	0:30	S	4.284	0.00	0.00	**0.00**	
	E	10:55 AM		E	4.284				
7	S	10:55 AM	0:30	S	4.284	0.00	0.00	**0.00**	
	E	11:25 AM		E	4.284				
8	S	11:25 AM	0:30	S	4.284	0.00	0.00	**0.00**	
	E	11:55 AM		E	4.284				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.00**

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Project Name :	Shriners Property			**Project Number:**	E24278.000
Test Location:	IB-3			**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'			**Tested By:**	ITK
Soil Description:	CLAY (CH)			**Tested on:**	9/19/2024
Perforated Casing Length (in):	12			**Boring Diameter (in):**	6
Casing Diameter (in):	2	**Base Plugged:**	Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	8:00 AM	0:30	S	3.543	0.00	0.00	**0.00**	Partly Cloudy, 80s
	E	8:30 AM		E	3.543				
2	S	8:30 AM	0:30	S	3.543	0.00	0.00	**0.00**	
	E	9:00 AM		E	3.543				
3	S	9:00 AM	0:30	S	3.543	0.00	0.00	**0.00**	
	E	9:30 AM		E	3.543				
4	S	9:30 AM	0:30	S	3.543	0.00	0.00	**0.00**	
	E	10:00 AM		E	3.543				
5	S	10:00 AM	0:30	S	3.543	0.00	0.00	**0.00**	
	E	10:30 AM		E	3.543				
6	S	10:30 AM	0:30	S	3.543	0.00	0.00	**0.00**	
	E	11:00 AM		E	3.543				
7	S	11:00 AM	0:30	S	3.543	0.00	0.00	**0.00**	
	E	11:30 AM		E	3.543				
8	S	11:30 AM	0:30	S	3.543	0.01	3.39	**0.03**	
	E	12:00 PM		E	3.553				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.01**

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Project Name :	Shriners Property			**Project Number:**	E24278.000
Test Location:	IB-4			**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'			**Tested By:**	ITK
Soil Description:	CLAY (CH)			**Tested on:**	9/19/2024
Perforated Casing Length (in):	12			**Boring Diameter (in):**	6
Casing Diameter (in):	2	**Base Plugged:**	Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	8:05 AM	0:30	S	1.964	0.08	27.14	**0.24**	Partly Cloudy, 80s
	E	8:35 AM		E	2.044				
2	S	8:35 AM	0:30	S	2.044	0.06	20.36	**0.18**	
	E	9:05 AM		E	2.104				
3	S	9:05 AM	0:30	S	2.104	0.07	23.75	**0.21**	
	E	9:35 AM		E	2.174				
4	S	9:35 AM	0:30	S	2.174	0.06	20.36	**0.18**	
	E	10:05 AM		E	2.234				
5	S	10:05 AM	0:30	S	2.234	0.06	20.36	**0.18**	
	E	10:35 AM		E	2.294				
6	S	10:35 AM	0:30	S	2.294	0.05	16.96	**0.15**	
	E	11:05 AM		E	2.344				
7	S	11:05 AM	0:30	S	2.344	0.06	20.36	**0.18**	
	E	11:35 AM		E	2.404				
8	S	11:35 AM	0:30	S	2.404	0.06	20.36	**0.18**	
	E	12:05 PM		E	2.464				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.17**

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Project Name :	Shriners Property			**Project Number:**	E24278.000
Test Location:	IB-5			**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'			**Tested By:**	ITK
Soil Description:	CLAY (CH)			**Tested on:**	9/19/2024
Perforated Casing Length (in):	12			**Boring Diameter (in):**	6
Casing Diameter (in):	2	**Base Plugged:**	Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	8:10 AM	0:30	S	1.202	0.00	0.00	**0.00**	Partly Cloudy, 80s
	E	8:40 AM		E	1.202				
2	S	8:40 AM	0:30	S	1.202	0.01	3.39	**0.03**	
	E	9:10 AM		E	1.212				
3	S	9:10 AM	0:30	S	1.212	0.00	0.00	**0.00**	
	E	9:40 AM		E	1.212				
4	S	9:40 AM	0:30	S	1.212	0.01	3.39	**0.03**	
	E	10:10 AM		E	1.222				
5	S	10:10 AM	0:30	S	1.222	0.01	3.39	**0.03**	
	E	10:40 AM		E	1.232				
6	S	10:40 AM	0:30	S	1.232	0.00	0.00	**0.00**	
	E	11:10 AM		E	1.232				
7	S	11:10 AM	0:30	S	1.232	0.01	3.39	**0.03**	
	E	11:40 AM		E	1.242				
8	S	11:40 AM	0:30	S	1.242	0.00	0.00	**0.00**	
	E	12:10 PM		E	1.242				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.01**

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Project Name :	Shriners Property	**Project Number:**	E24278.000
Test Location:	IB-6	**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'	**Tested By:**	ITK
Soil Description:	CLAY (CH)	**Tested on:**	9/19/2024
Perforated Casing Length (in):	12	**Boring Diameter (in):**	6
Casing Diameter (in):	2 **Base Plugged:** Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	8:15 AM	0:30	S	4.227	0.00	0.00	**0.00**	Partly Cloudy, 80s
	E	8:45 AM		E	4.227				
2	S	8:45 AM	0:30	S	4.227	0.00	0.00	**0.00**	
	E	9:15 AM		E	4.227				
3	S	9:15 AM	0:30	S	4.227	0.00	0.00	**0.00**	
	E	9:45 AM		E	4.227				
4	S	9:45 AM	0:30	S	4.227	0.00	0.00	**0.00**	
	E	10:15 AM		E	4.227				
5	S	10:15 AM	0:30	S	4.227	0.00	0.00	**0.00**	
	E	10:45 AM		E	4.227				
6	S	10:45 AM	0:30	S	4.227	0.01	3.39	**0.03**	
	E	11:15 AM		E	4.237				
7	S	11:15 AM	0:30	S	4.237	0.01	3.39	**0.03**	
	E	11:45 AM		E	4.247				
8	S	11:45 AM	0:30	S	4.247	0.00	0.00	**0.00**	
	E	12:15 PM		E	4.247				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.02**

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Project Name :	Shriners Property	**Project Number:**	E24278.000
Test Location:	IB-7	**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'	**Tested By:**	ITK
Soil Description:	CLAY (CH)	**Tested on:**	9/19/2024
Perforated Casing Length (in):	12	**Boring Diameter (in):**	6
Casing Diameter (in):	2 **Base Plugged:** Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	1:00 PM	0:30	S	1.170	0.05	16.96	**0.15**	Partly Cloudy, 80s
	E	1:30 PM		E	1.220				
2	S	1:30 PM	0:30	S	1.220	0.05	16.96	**0.15**	
	E	2:00 PM		E	1.270				
3	S	2:00 PM	0:30	S	1.270	0.05	16.96	**0.15**	
	E	2:30 PM		E	1.320				
4	S	2:30 PM	0:30	S	1.320	0.05	16.96	**0.15**	
	E	3:00 PM		E	1.370				
5	S	3:00 PM	0:30	S	1.370	0.06	20.36	**0.18**	
	E	3:30 PM		E	1.430				
6	S	3:30 PM	0:30	S	1.430	0.05	16.96	**0.15**	
	E	4:00 PM		E	1.480				
7	S	4:00 PM	0:30	S	1.480	0.05	16.96	**0.15**	
	E	4:30 PM		E	1.530				
8	S	4:30 PM	0:30	S	1.530	0.05	16.96	**0.15**	
	E	5:00 PM		E	1.580				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.15**

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Project Name :	Shriners Property			**Project Number:**	E24278.000
Test Location:	IB-8			**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'			**Tested By:**	ITK
Soil Description:	CLAY (CH)			**Tested on:**	9/19/2024
Perforated Casing Length (in):	12			**Boring Diameter (in):**	6
Casing Diameter (in):	2	**Base Plugged:**	Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	1:05 PM	0:30	S	2.450	0.01	3.39	**0.03**	Partly Cloudy, 80s
	E	1:35 PM		E	2.460				
2	S	1:35 PM	0:30	S	2.460	0.00	0.00	**0.00**	
	E	2:05 PM		E	2.460				
3	S	2:05 PM	0:30	S	2.460	0.00	0.00	**0.00**	
	E	2:35 PM		E	2.460				
4	S	2:35 PM	0:30	S	2.460	0.01	3.39	**0.03**	
	E	3:05 PM		E	2.470				
5	S	3:05 PM	0:30	S	2.470	0.00	0.00	**0.00**	
	E	3:35 PM		E	2.470				
6	S	3:35 PM	0:30	S	2.470	0.01	3.39	**0.03**	
	E	4:05 PM		E	2.480				
7	S	4:05 PM	0:30	S	2.480	0.00	0.00	**0.00**	
	E	4:35 PM		E	2.480				
8	S	4:35 PM	0:30	S	2.480	0.01	3.39	**0.03**	
	E	5:05 PM		E	2.490				

*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.02**

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Project Name :	Shriners Property	**Project Number:**	E24278.000
Test Location:	IB-9	**Date:**	9/19/2024
Infiltration Zone (ft):	9.5-10.5'	**Tested By:**	ITK
Soil Description:	CLAY (CH)	**Tested on:**	9/19/2024
Perforated Casing Length (in):	12	**Boring Diameter (in):**	6
Casing Diameter (in):	2 **Base Plugged:** Yes	**Test Surface Area (in^2):**	226.19

Trial No.	Time (hr:min)		Elapsed Time: Δ/total (min)	Water Drop During Interval (ft)			ΔV during interval (in^3)	Measured Percolation Rate (in/hr)*	Remarks: Weather Conditions, etc.
				Depth From Top of Grade		ΔH			
1	S	1:10 PM	0:30	S	1.093	0.00	0.00	**0.00**	Partly Cloudy, 80s
	E	1:40 PM		E	1.093				
2	S	1:40 PM	0:30	S	1.093	0.01	3.39	**0.03**	
	E	2:10 PM		E	1.103				
3	S	2:10 PM	0:30	S	1.103	0.01	3.39	**0.03**	
	E	2:40 PM		E	1.113				
4	S	2:40 PM	0:30	S	1.113	0.01	3.39	**0.03**	
	E	3:10 PM		E	1.123				
5	S	3:10 PM	0:30	S	1.123	0.01	3.39	**0.03**	
	E	3:40 PM		E	1.133				
6	S	3:40 PM	0:30	S	1.133	0.01	3.39	**0.03**	
	E	4:10 PM		E	1.143				
7	S	4:10 PM	0:30	S	1.143	0.01	3.39	**0.03**	
	E	4:40 PM		E	1.153				
8	S	4:40 PM	0:30	S	1.153	0.01	3.39	**0.03**	
	E	5:10 PM		E	1.163				

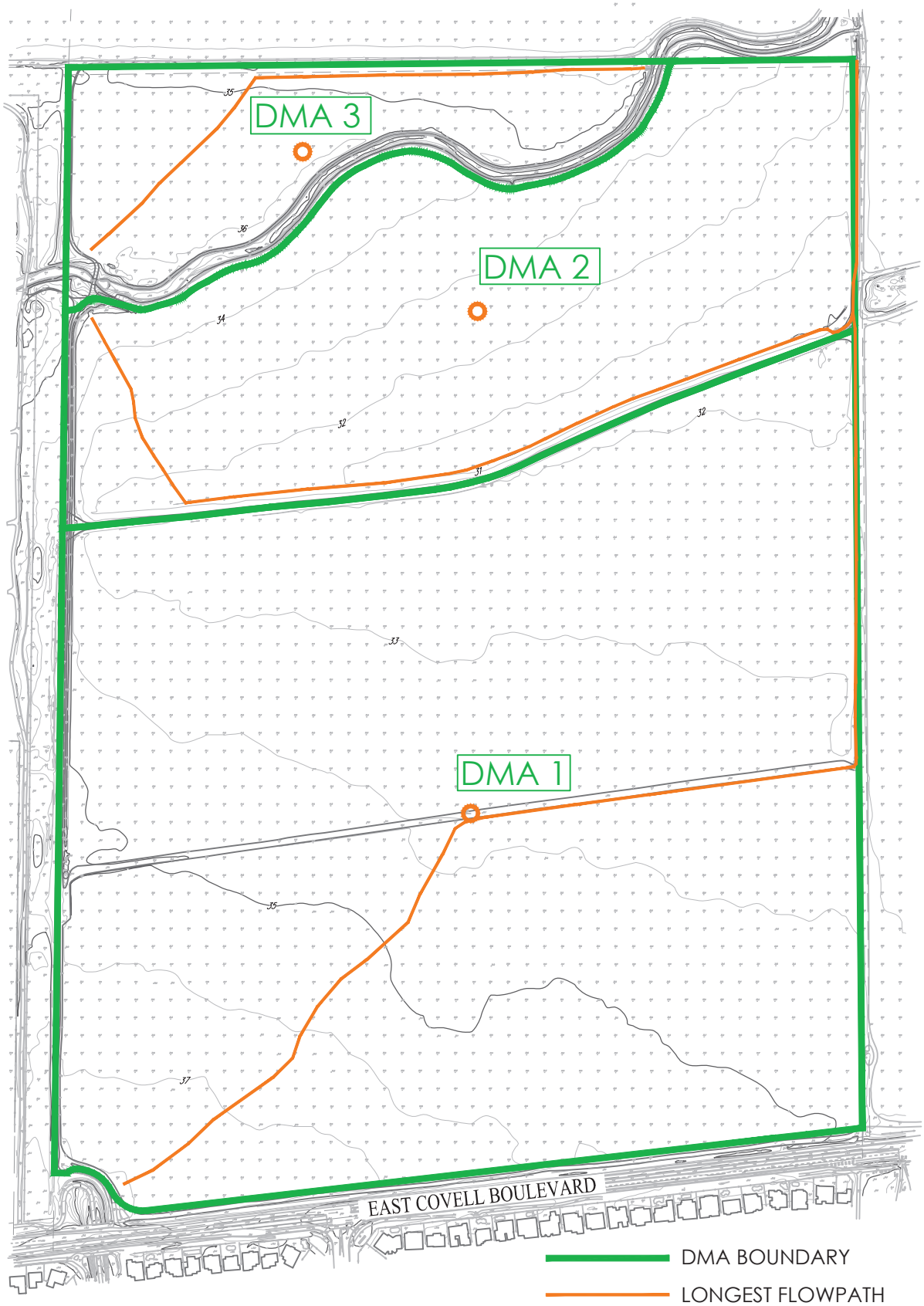
*** measured percolation rate = [ΔV/Test Surface Area]/Δtime**

Average Percolation Rate of Last 3 Intervals (in/hr):	**0.03**

DRAFT: FOR DISCUSSION PURPOSES ONLY

APPENDIX C

Pre-project Drainage Management Areas



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Appendix C. Pre-Project DMA Boundaries and Flow Paths, Willowgrove, City of Davis.

0' 250' 500' 1000'

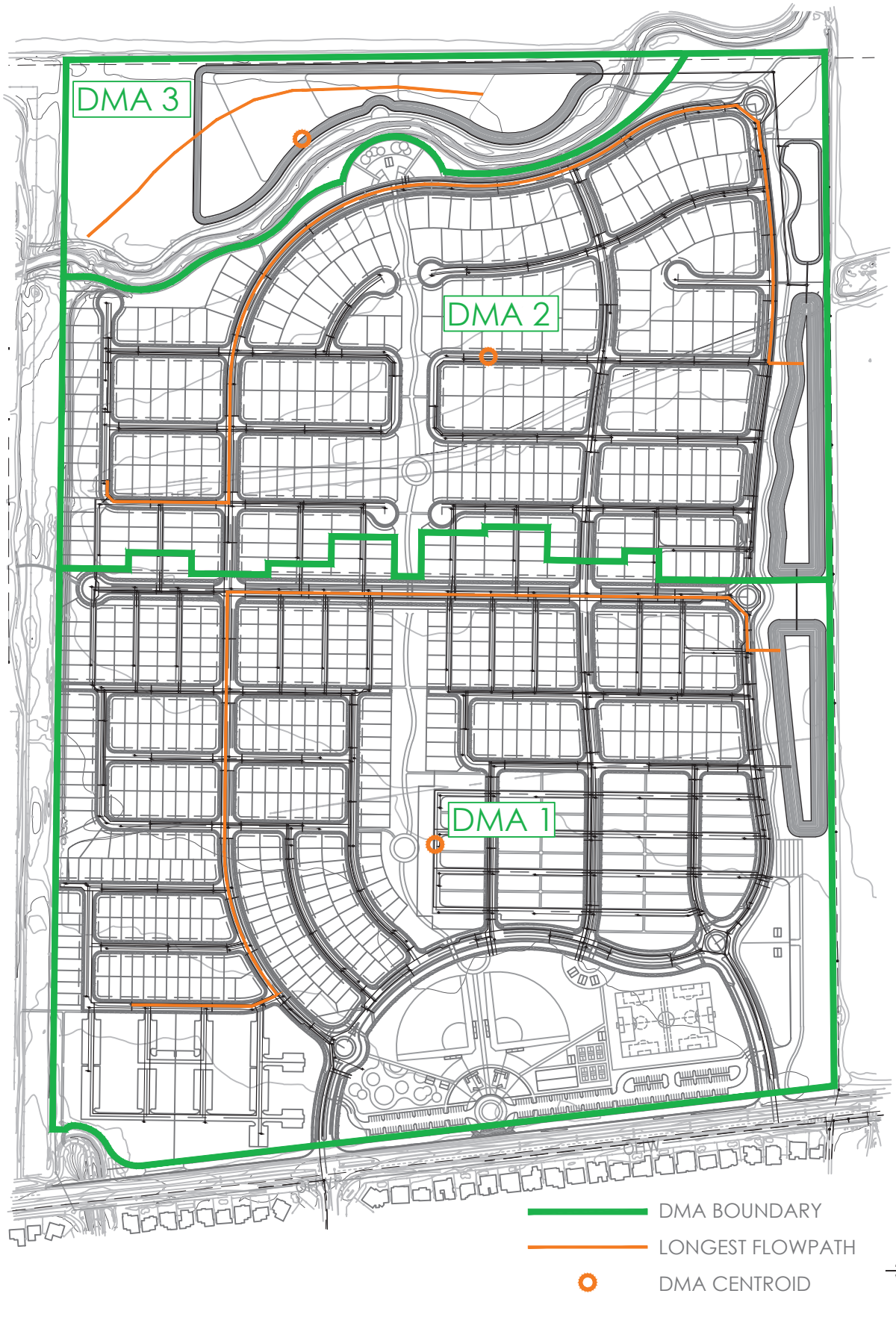
SCALE: 1" = 500'

Appendix C - Pre-project.dwg 6/6/2025 14:50

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APPENDIX D

Post-project Drainage Management Areas



Balance Hydrologics

Appendix D. Post-Project DMA Boundaries and Flow Paths, Willowgrove, City of Davis.

0' 250' 500' 1000'

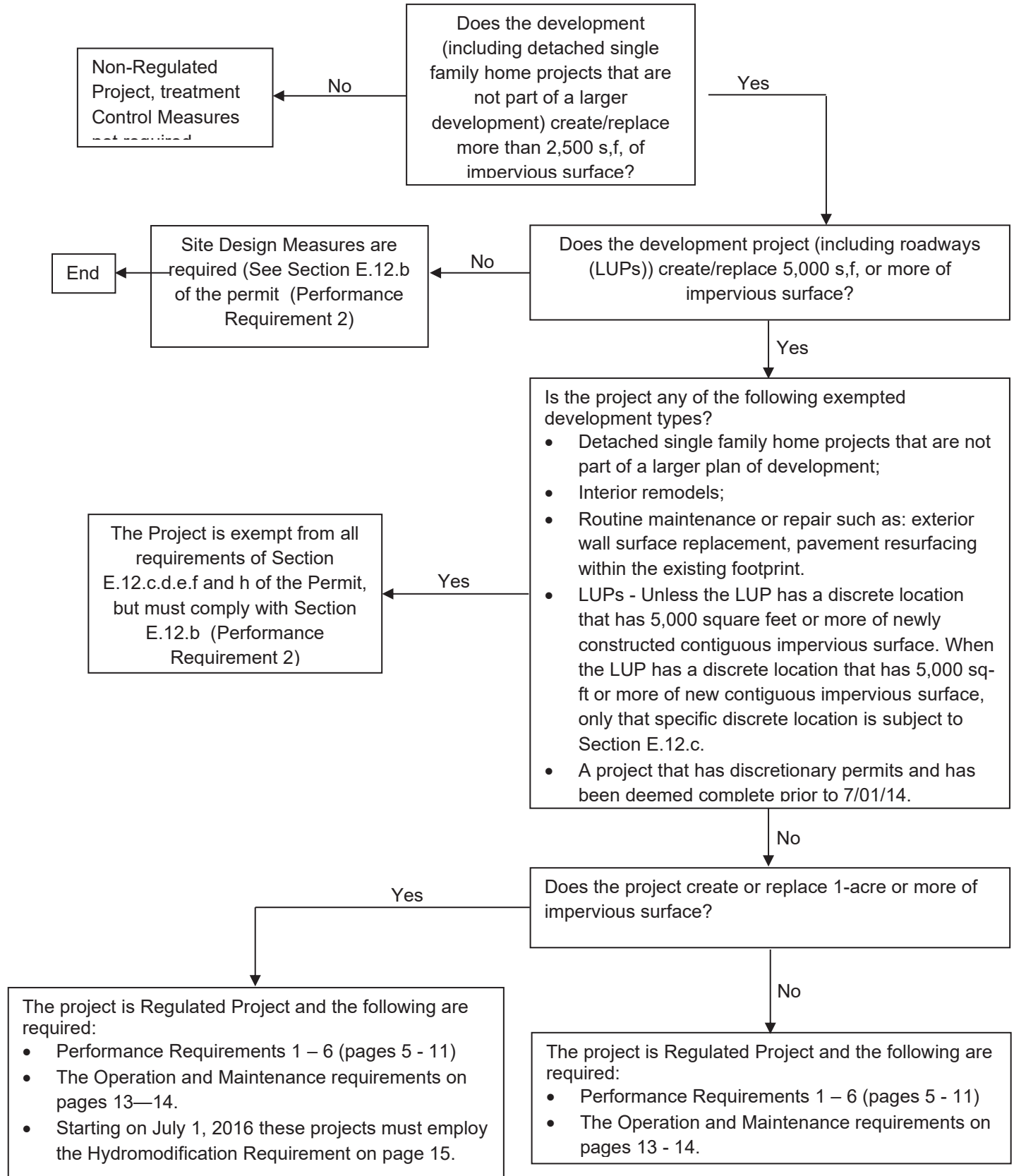
SCALE: 1" = 500'

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APPENDIX E

Performance Requirement Checklists

Section 1 Phase II Small MS4 SW General Permit Development Standards Flow Chart



Section 2 Site Design Measures

For projects that create or replace 2,500 but less than 5,000 s.f. of impervious surfaces.

For projects that create or replace 2,500 but less than 5,000 square feet of impervious surface, the Developer shall submit a stamped and signed Performance Requirement No.2 Certification by the Project Engineer prior to the issuance of a building permit. Performance Requirement No. 1 is optional for Developers more than 2,500 but less than 5,000 square feet of impervious surface. Developers may find it helpful to perform a Site Assessment Checklist below. See Section E.12.b Site Design Measures of the Permit in Appendix A.

(a) **Site Assessment**

At the earliest planning stages, all projects shall assess and evaluate how site conditions, such as soils, vegetation, and flow paths, will influence the placement of buildings and paved surfaces. The evaluation will be used to meet the goals of capturing and treating runoff and assuring these goals are incorporated into the project design. The Site Assessment Checklist below, may be helpful in achieving compliance with the Permit.

Performance Requirement No.1 - Site Assessment Checklist (Optional for Projects less than 5,000 sf of impervious surface)	
Project Name: Willowgrove	Date: May 2025
Project Address: East Covell Boulevard	
	Included
1. Site topography	Yes, part of grading concept
2. Hydrologic features including contiguous natural areas, wetlands, watercourses, seeps, or springs	Yes,Channel A with buffer
3. Depth to seasonal high groundwater	Yes, 40 feet below ground surface
4. Locations of groundwater wells used for drinking water	Not applicable
5. Depth to an impervious layer such as bedrock	Not applicable
6. Presence of unique geology (e.g., karst)	Not applicable
7. Geotechnical hazards	Not applicable
8. Documented soil and/or groundwater contamination	Not applicable
9. Soil types and hydrologic soil groups	Yes, on-site infiltration testing
10. Vegetative cover/trees	Yes, preservation and planting
11. Run-on characteristics (source and estimated runoff from offsite which discharges to the project area)	Not applicable
12. Existing drainage infrastructure for the site and nearby areas including the location of municipal storm drains	Agricultural only, will be replaced
13. Structures including retaining walls	Not applicable
14. Utilities	Yes
15. Easements	Yes
16. Covenants	Not applicable
17. Zoning/Land Use	Yes
18. Setbacks	Yes, ag buffer and Channel A
19. Open space requirements	Yes
20. Other pertinent overlay(s)	Not applicable

PERFORMANCE REQUIREMENT NO. 2 CERTIFICATION

Incorporate into the project at least one of the following design strategies and perform the runoff reduction calculation in #6.

PERFORMANCE REQUIREMENT NO. 2 - CERTIFICATION	
SITE DESIGN MEASURES	INCORPORATED
1. Limit disturbance of creeks and natural drainage features by providing setbacks or buffers from the vegetated area including trees, shrubs, and herbaceous vegetation, that exists or is established adjacent to a stream system or drainage feature.	Yes
2. Soil Quality Improvement and Maintenance - improvement and maintenance soil through soil amendments and creation of microbial community by minimizing compaction of highly permeable soils and using mulch for weed control.	Yes
3. Tree Planting and Preservation - plant and preserve healthy, established trees that include both evergreens and deciduous, as applicable. Limit clearing and grading of native vegetation at the site to the minimum area needed to build the project, allow access, and provide fire protection.	Yes
4. Concentrate improvements on the least sensitive areas of the site, while leaving the remaining land in a natural undisturbed state.	Yes
5. Minimize stormwater runoff by implementing one or more of the following design measures:	
a) Direct roof runoff into cisterns or rain barrels for reuse.	No
b) Direct roof runoff onto vegetated areas safely away from building foundations and footings.	Yes
c) Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas safely away from building foundations and footings.	Yes
d) Direct runoff from driveways and/or uncovered parking lots onto vegetated areas safely away from building foundations and footings.	Yes
e) Porous Pavement - pavement that allows runoff to pass through it, thereby reducing the runoff from a site and surrounding areas and filtering pollutants by constructing bike lanes, driveways, uncovered parking lots, sidewalks, walkways, and patios with permeable surfaces.	No
f) Green Roofs - a vegetative layer grown on a roof (rooftop garden).	No
g) Vegetated Swales - a vegetated, open-channel management practice designed specifically to treat and attenuate storm water runoff;	No
6. Developers shall quantify post construction runoff reduction using the State Water Board SMARTS Post-Construction Calculator, or equivalent resulting from implementation of site design measures. The SMARTS Post-Construction Calculator can be found at: Post-Construction Water Balance Calculator	Yes (Appendix F)

I,_____, acting as the Project Engineer for_____ project, located at_____, hereby state that the Site Design and Runoff Reductions design strategies initialed have been incorporated into the design of the project.

Signature_____ Date_____

Section 3 Standards for Regulated Projects

For projects that create or replace 5,000 s.f. or more, but less than 1-acre of impervious surface.

For projects that create or replace 5,000 or more square feet, but less than 1 acre of impervious surface (Regulated Project), to achieve compliance with the Permit, the Developer follow the steps outlined below including providing the performance Requirement.

Step – Description – Location in Document

1. Site Assessment (Performance Requirement No.1 in Section 2 – page 3)
2. Site Design Measures (Performance Requirement No. 2 in Section 2 - page 4),
3. Source Control (Performance Requirement No. 3, page 6),
4. Site Design Measures for Regulated Projects (Performance Requirement No. 4, page 7),
5. Baseline Hydromodification Management & Stormwater Treatment Design (Performance Requirement No. 5, page 8),
6. Drainage Management Areas (page 10)
7. Stormwater Control Plan Checklist (Performance Requirement No. 6, page 10)

All Regulated Projects shall implement low impact development (LID) standards designed to reduce runoff, treat storm water, and provide baseline hydromodification management to the extent feasible, to meet the Numeric Sizing Criteria for Storm Water Retention and Treatment under Section E.12.e(ii)(c) of the Permit. For related language from the Permit, see Section E.12.e. Low Impact Development (LID) Design Standards in Appendix B. All regulated projects shall be designed with the objective of achieving infiltration, evapotranspiration and/or harvesting/reuse of the 85th percentile 24 hour storm event.

The developer shall submit stamped and signed Performance Requirement Certifications No. 1, 2, 3, 4, and.5 by the Project Engineer prior to the issuance of a building permit. For further clarification on what constitutes a regulated project, see the Definition for Regulated Projects in Appendix A and Section E.12.c Regulated Projects of the Permit in Appendix B.

Step 3. Source Control Measures

All Regulated Projects with pollutant-generating activities and sources are required to implement standard permanent and/or operation source control measures consistent with recommendations from the CASQA Stormwater BMP Handbook for Development (See the referenced BMP Fact Sheets in Appendix C) and Redevelopment and Municipal BMP Handbook or equivalent for the following activities (See Section E.12.d Source Control Measures of the Permit in Appendix B):

PERFORMANCE REQUIREMENT NO. 3 - CERTIFICATION OF SOURCE CONTROL MEASURES			
	POLLUTANT SOURCE	CASQA BMP FACTSHEET NUMBER	BMP INCORPORATED
1.	(a) Accidental spills or leaks	SC-11**	Yes
2.	(b) Interior floor drains	SC-10**	Yes
3.	(c) Parking/storage areas and maintenance	SC-43**	Yes
4.	(d) Indoor and structural pest control	SC-10**	No
5.	(e) Landscape/outdoor pesticide use	SC-41**	Yes
6.	(f) Pools, spas, ponds, decorative fountains, and other water features	SC-72**	Yes
7.	(g) Restaurants, grocery stores, and other food service operations	SC-10 & SC-11**	n.a.
	(h) Refuse areas	SD-32*	Yes
	(i) Industrial processes	SC-10 & SC-11**	n.a.
	(j) Outdoor storage of equipment or materials	SD-34*	n.a.
	(k) Vehicle and equipment cleaning	SD-33*	n.a.
	(l) Vehicle and equipment repair and maintenance	SD-31*	n.a.
	(m) Fuel dispensing areas	SD-30*	n.a.
	(n) Loading docks	SD-31*	n.a.
	(o) Fire sprinkler test water	SC-10**	Yes
	(p) Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources	SC-10**	Yes
	(q) Unauthorized non-storm water discharges	SC-10**	Yes
	(r) Building and grounds maintenance	SC-41**	Yes

* Source CASQA Development and Redevelopment BMP Handbook

** Source: CASQA Municipal, and Industrial and Commercial BMP Handbooks.

I,_____ , acting as the Project Engineer for _____ project, located at , hereby state that LID Site Design Measures initialed have been incorporated into the design of the project.

Signature _____ Date _____

Step 4. Site Design Measures for Regulated Projects

All Regulated Projects must be designed to achieve infiltration, evapotranspiration and/or harvesting/reuse of the 85th percentile 24-hour storm runoff event (0.65 inches). Site design measures shall be used to reduce the amount of runoff, to the extent technically feasible, for which retention and runoff is required. Any remaining runoff from impervious DMAs may then be directed to one or more bioretention facilities as specified in Section E.12.e.(ii)(f)

PERFORMANCE REQUIREMENT NO. 4 - CERTIFICATION OF SITE DESIGN MEASURES to the 85th Percentile 24 Hour Storm Event (0.65 inches)		
	DESIGN MEASURE	INCORPORATED/OPTIMIZED
1.	Defining the development envelope, identifying the protected areas, and identifying areas that are most suitable for development and areas to be left undisturbed	Yes (Channel A and buffers)
2.	Concentrate development on portions of the site with less permeable soils and preserve areas that can promote infiltration.	Yes, though no high permeability area found
3.	Identifying conserved natural areas, including existing trees, other vegetation, and soils (shown on the plans)	Yes (Channel A)
4.	Limit the overall impervious footprint of the project with paving and roofs	Yes, greenbelt and buffers
5.	Set back development from creeks, wetlands, and riparian habitats	Yes (Channel A)
6.	Design conforms the site layout along natural landforms	Yes, grading follows topography
7.	Design avoids excessive grading and disturbance of vegetation and soils	To limited degree
8.	Replicate the site's natural drainage patterns.	Yes, drainage to east then north
9.	Detain and retain runoff throughout the site.	Yes, see site design measures

I,_____ , acting as the Project Engineer for _____ project, located at _____, hereby state that the Site Design Measures above have been incorporated into the design of the project to achieve infiltration, evapotranspiration and/or harvesting/reuse of the 85th percentile 24-hour storm runoff event.

Signature _____ Date _____

Step 5. Baseline Hydromodification Management & Stormwater Treatment Design

The Project Engineer shall certify the Project design optimizes the use of the following design measures. Initial each runoff retention measure that has been incorporated and optimized into the design or mark N/A if not applicable. See Appendix D for BMP Fact Sheets for various permanent treatment control measures. See Appendix E for rainfall charts for Sacramento. Assume 85th percentile one hour rain event for Davis is 0.1 inch/hour and the 85th percentile 24 hour rain event is 0.65. Assume annual 80th percentile rainfall for Davis is 19.1 inches.

PERFORMANCE REQUIREMENT NO. 5 CERTIFICATION		
	On-Site Water Quality Treatment Measures	INCORPORATED
1	Low Impact Development (LID) Treatment Systems designed to retain stormwater runoff generated by the 85th percentile 24-hour storm. Stormwater Control Measures Implement (circle all that apply, design documentation is required) • Harvesting and Use, • Infiltration, • Evapotranspiration	Yes
2	Biofiltration Treatment Systems – with the following design parameters: 1. Maximum surface loading rate appropriate to prevent erosion, scour and channeling within the biofiltration treatment system itself and equal to 5 inches per hour, based on the flow of runoff produced from a rain event equal to or at least: a) 0.2 inches per hour intensity; or b) Two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depth 2. Minimum surface reservoir volume equal to the biofiltration treatment system surface area times a depth of 6 inches 3. Minimum planting medium depth of 18 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used. A Regulated Project may utilize an alternative planting medium if it demonstrates its planting medium is equal to or more effective at attenuating pollutants than the specified planting medium mixture. 4. Proper plant selection 5. Subsurface drainage/storage (gravel) layer with an area equal to the biofiltration treatment system surface area and having a minimum depth of 12 inches 6. Underdrain with discharge elevation at top of gravel layer 7. No compaction of soils beneath the biofiltration facility (ripping/loosening of soils required if compacted) 8. No liners or other barriers interfering with infiltration, except for situations where lateral infiltration is not technically feasible	Yes

3	Non-Retention Based Treatment Systems – designed to meet at least one of the following hydraulic sizing criteria: a) Volume Hydraulic Design Basis – Treatment systems whose primary mode of action depends on volume capacity shall be designed to treat stormwater runoff equal to the volume of runoff generated by the 85th percentile 24-hour storm event, based on local rainfall data.	
	b) Flow Hydraulic Design Basis – Treatment systems whose primary mode of action depends on flow capacity shall be sized to treat: i. The flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or ii. The flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.	Yes

I,_____ , acting as the Project Engineer for _____ project, located at _____, hereby state that the On-Site Water Quality Treatment Measures initialed have been incorporated into the design of the project.

_____ _____

Signature Date

Step 5. Drainage Management Areas

The site shall be designed to provide for decentralized storm water management with discrete DMAs.

1. The developer shall provide a map of the entire project site showing the discrete DMAs and detailing the drainage for the rainfall event specified along with the other project development plans.
2. Drainage from each DMA shall be accounted for using the following measures:
   a) Undisturbed or areas planted with native vegetation that do not receive runoff from other areas are self-treating and no additional stormwater management is required.
   b) Runoff from impervious surfaces, generated by the rainfall events identified for Performance Requirement No. 5, may be directed to undisturbed or natural landscaped areas. Where the design demonstrates that this runoff will be infiltrated and will not produce runoff to the storm drain system, or a surface receiving waterbody, or create nuisance ponding, then no additional stormwater management is required for these impervious surfaces.

Step 6. STORM WATER CONTROL PLAN CHECKLIST

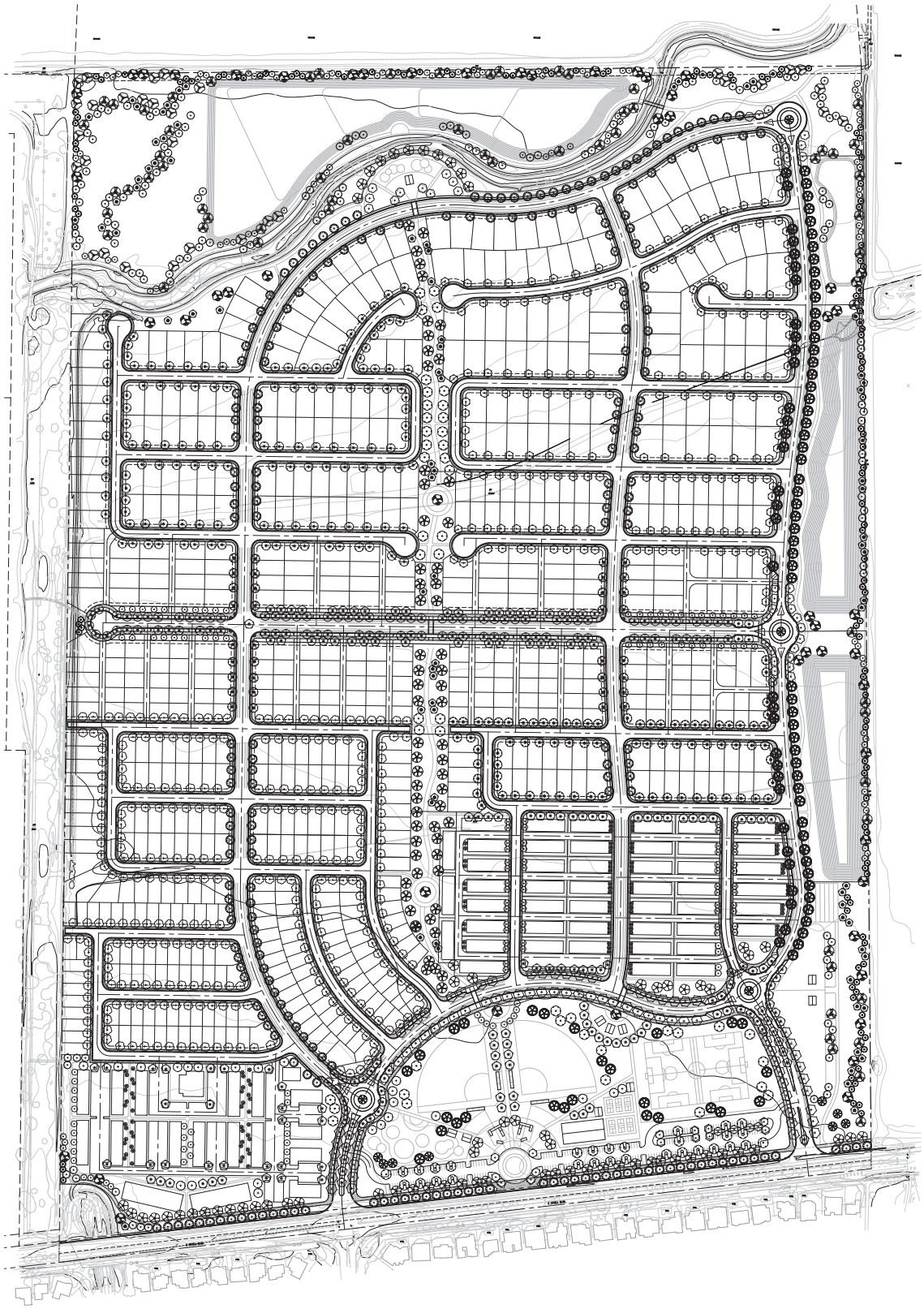
A Storm Water Control Plan is required. At a minimum, the Storm Water Control Plan shall include the following on the building plan submittal:

Storm Water Control Plan Check List - Performance Requirement No. 6	
	COMPLETED
1. Project Information	
a. Project name	Yes
b. Application number	TBD
c. Address and assessor's parcel number	Yes
d. Name of Applicant	Yes
e. Project Phase number (if project is being constructed in phases)	n.a.
f. Project Type (e.g., commercial, industrial, multi-unit residential, mixed-use, public), and description	Yes
2. Project Areas	
a. Total project site area	Yes
b. Total new impervious surface area	Yes
c. Total replaced impervious surface area	Yes
d. Total new pervious area	Yes
e. Calculation of Net Impervious Area	Yes
3. Site Assessment Summary PR 1.	Yes
4. Summary of Site Design PR 2	Yes
5. Summary of Source Control measures PR 3	Yes
7. Drainage Manage Area Map	Yes
8. Summary of Baseline Hydromodification Management & Stormwater Treatment Design PR 4,	Yes
9. LID Measures Used	
a. List all site design measure incorporated into the design of the project	Yes
b. Location and detail for all runoff reduction measures used	Pending
c. Location and detail for all post-construction structural water quality treatment measures	Yes

10. Calculations used to comply with the applicable on-site water quality treatment	Yes
11. Calculations used to comply with the applicable runoff retention requirements	Yes
12. Calculations used to comply with the applicable hydromodification management requirements for projects with 1 acre or more of new impervious surface	Yes
13. Documentation demonstrating infeasibility where Site Design and Runoff Reduction measures cannot retain required runoff volume	n.a.
14. Documentation demonstrating infeasibility where retention-based Stormwater Control Measures cannot retain and/or treat the required runoff volume	n.a.
15. Documentation demonstrating infeasibility where on-site compliance cannot be achieved	n.a.
16. Documentation certifying that the selection, sizing, and design of the on-site water quality treatment measures meet the E.12 requirements.	Yes
16. Water quality treatment calculations used to comply with E.12 requirement and any analysis to support infeasibility determination	Yes
17. Statement of Compliance: Statement that Water Quality Treatment Performance Requirement has been met on-site, or, if not achievable:	Yes
a. Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements.	
b. Statement of intent to comply with Water Quality Treatment Performance Requirement through Alternative Compliance	

APPENDIX F

Preliminary Landscape Plan



PLANT SCHEDULE

SYMBOL	BOTANICAL / COMMON NAME	SIZE	WATER USE	QTY
TREES				
	ACER PLATANOIDES 'DEBORAH' DEBORAH NORWAY MAPLE	15 GAL.	MODERATE	185
	ACER RUBRUM `OCTOBER GLORY` TM OCTOBER GLORY MAPLE	15 GAL.	MEDIUM	226
	ACER X FREEMANII 'JEFFERSRED' AUTUMN BLAZE® FREEMAN MAPLE	15 GAL.	MODERATE	77
	ARBUTUS X `MARINA` MARINA STRAWBERRY TREE MULTI-TRUNK	24" BOX	LOW	82
	CARPINUS BETULUS 'FASTIGIATA' UPRIGHT EUROPEAN HORNBEAM	15 GAL.	MODERATE	91
	FRAXINUS AMERICANA 'AUTUMN PURPLE' WHITE ASH	15 GAL.	MODERATE	323
	GEIJERA PARVIFLORA AUSTRALIAN WILLOW	24" BOX	MODERATE	125
	LIRIODENDRON TULIPIFERA TULIP POPLAR	15 GAL.	MODERATE	76
	MAGNOLIA GRANDIFLORA SOUTHERN MAGNOLIA	24" BOX	MODERATE	70
	MAGNOLIA GRANDIFLORA `LITTLE GEM` DWARF SOUTHERN MAGNOLIA	24" BOX	MEDIUM	123
	PINUS EDULIS PINYON PINE	15 GAL.	LOW	127
	PLATANUS X ACERIFOLIA LONDON PLANE TREE MULTI-TRUNK	15 GAL.	MODERATE	64
	QUERCUS COCCINEA SCARLET OAK	15 GAL.	MODERATE	64
	QUERCUS ILEX HOLLY OAK	24" BOX	LOW	113
	QUERCUS LOBATA VALLEY OAK	24" BOX	LOW	53
	QUERCUS PHELLOS WILLOW OAK	24" BOX	MODERATE	221
	QUERCUS SHUMARDII SHUMARD OAK	15 GAL.	MODERATE	115
	QUERCUS SUBER CORK OAK	24" BOX	LOW	23
	QUERCUS WISLIZENII INTERIOR LIVE OAK	24" BOX	LOW	31
	SALIX BABYLONICA WEEPING WILLOW	24" BOX	HIGH	12
	TILIA CORDATA `GREENSPIRE` GREENSPIRE LITTLELEAF LINDEN	15 GAL.	MEDIUM	183
	X CHITALPA TASHKENTENSIS 'PINK DAWN' PINK DAWN CHITALPA	15 GAL.	LOW	123

PRELIMINARY LANDSCAPE PLAN

WILLOWGROVE

CITY OF DAVIS YOLO COUNTY CALIFORNIA

DATE: APRIL 15, 2025

FUHRMAN LEAMY LAND GROUP
DESIGN - SERVICE - SOLUTIONS
3140 Professional Dr., Ste 115,Roseville, CA 95661 916.783.0263
www.fuhrmangroup.com

cbg CIVIL ENGINEERS ■ SURVEYORS ■ PLANNERS
SAN RAMON ■ (925) 866-0322
ROSEVILLE ■ (916) 788-4456
WWW.CBANDG.COM

0 120 240 360

JOB NO.: M086-010

SHEET NO. 1 OF 1 SHEETS

D:\FL LAND GROUP DROBOX\PROJECTS\CURRENT\M_086_0000_WILLOWGROVE_2 DD_3 LA\2000_DD\DTE.DWG

APPENDIX G

SMARTS Post-Construction Calculator Worksheets

Post-Construction Water Balance Calculator

User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.

(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below

(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.	***YOLO***
(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.	**DAVIS 2 WSW EXP FARM**

Project Information

Project Name:	***Willogrove, City of Davis***
Waste Discharge Identification (WDID):	***TBD***
Date:	***4/25/2025***
Sub Drainage Area Name (from map):	***DMA 1***

Runoff Calculations

(Step 2) Indicate the Soil Type (dropdown menu to right):	***Group D Soils***	**Very low infiltration. Clay loam, silty clay loam, sandy clay, silty clay, or clay. Infiltration rate 0 to 0.05 inch/hr when wet.**
(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):	***Cultivated Agricultural: minor crop residue cover***	
(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):	***A mix of lawn, grass, pasture and tress covering more than 75% of the open space***	

	Complete Either		
	Sq Ft	**Acres**	**Acres**
(Step 5) Total Project Site Area:		230.54	230.54
(Step 6) Sub-watershed Area:		123.03	123.03
Percent of total project :	53%		

Runoff Curve Numbers

Existing Runoff Curve Number	90.0
Proposed Development Runoff Curve Number	91.6

Design Storm

Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	0.65	in
The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	0.22	In
P used for calculations (in) (the greater of the above two criteria)	0.65	In
^Available at www.cabmphandbooks.com		

(Step 7) Sub-watershed Conditions	**Complete Either**		**Calculated Acres**
Sub-watershed Area (acres)	**Sq Ft**	**Acres**	123.03
Existing Rooftop Impervious Coverage		0	0.00
Existing Non-Rooftop Impervious Coverage		0	0.00
Proposed Rooftop Impervious Coverage		41.98	41.98
Proposed Non-Rooftop Impervious Coverage		39.85	39.85

Credits	**Acres**	**Square Feet**
Porous Pavement	0.00	0
Tree Planting	4.27	186,001
Downspout Disconnection	0.00	0
Impervious Area Disconnection	2.43	105,851
Green Roof	0.00	0
Stream Buffer	0.00	0
Vegetated Swales	0.00	0
Subtotal	6.70	291,852
Subtotal Runoff Volume Reduction Credit	4094 Cu. Ft.	

Pre-Project Runoff Volume (cu ft)	53,192	Cu.Ft.
Project-Related Runoff Volume Increase w/o credits (cu ft)	21,985	Cu.Ft.
Project-Related Volume Increase with Credits (cu ft)	0	Cu.Ft.

You have achieved your minimum requirements

(Step 9) Impervious Volume Reduction Credits	**Volume (cubic feet)**
Rain Barrels/Cisterns	0 Cu. Ft.
Soil Quality	62,517 Cu. Ft.
Subtotal Runoff Volume Reduction	62,517 Cu. Ft.
Total Runoff Volume Reduction Credit	66,611 Cu. Ft.

	A	B	C	D	E	F	G
1	**Tree Planting Credit Worksheet**						
2	Please fill out a tree canopy credit worksheet for each project sub-watershed.						
3							
4							
5	**Tree Canopy Credit Criteria**					Number of Trees Planted	Area Credit (acres)
6	Number of proposed evergreen trees to be planted (credit = number of trees x 0.005)*					370	1.85
7	Number of proposed deciduous trees to be planted (credit = number of trees x 0.0025)*					968	2.42
8						Square feet Under Canopy	
9	Square feet under an existing tree canopy, that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is LESS than 12 in diameter.					0	0.00
10	Square feet under an existing tree canopy that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is 12 in diameter or GREATER.					0	0.00
11	Please describe below how the project will ensure that these trees will be maintained.						
12							
13							Return to Calculator
14	* credit amount based on credits from Stormwater Quality Design Manual for the Sacramento and South Placer Regions						

	A	B	C	D	E	F	G	H
1	**Impervious Area Disconnection Credit Worksheet**							
2	Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.							
3								
4								
5	**Non-Rooftop Disconnection Credit Criteria**						Response	
6	Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?						◉ Yes ○ No	
7	Is the impervious area to any one discharge location less than 5,000 square feet?						◉ Yes ○ No	
8	The Stream Buffer credit **will not** be taken in this sub-watershed area?						◉ Yes ○ No	
9								
10	Percentage of existing 0 Acre(s) of non-rooftop surface area disconnected						0	
11	Percentage of the proposed 39.85 Acre(s) of non-rooftop surface area disconnected						6.1	%
12								
13							Return to Calculator	

	A	B	E	F	G
1					
2	Please fill out a soil quality worksheet for each project sub-watershed.				
6					Response
7					
8	Will the soils used for landscaping meet the ideal bulk densities listed in Table 1 below?[1]				◉ Yes ○ No
9	If you answered yes to the question above, and you know the area-weighted bulk density within the top 12 inches for soils used for landscaping (in g/cm^3)* , fill in the cell to the right and skip to cell G11. If not select from the drop-down menu in G10.				
10	If you answered yes to the question above, but you do not know the exact bulk density, which of the soil types in the drop down menu to the right best describes the top 12 inches for soils used for landscaping (in g/cm^3).				Silts, silt loams
11	What is the average depth of your landscaped soil media meeting the above criteria (inches)?				4.5
12	What is the total area of the landscaped areas meeting the above criteria (in acres)?				23.92
13					Return to Calculator
14	Table 1				
15	Sands, loamy sands	<1.6		**Credit (cu ft)**	**62517.312**
16	Sandy loams, loams	<1.4			
17	Sandy clay loams, loams, clay loams	<1.4			
18	Silts, silt loams	<1.3			
19	Silt loams, silty clay loams	<1.1			
20	Sandy clays, silty clays, some clay loams (35-45% clay)	<1.1			
21	Clays (>45% clay)	<1.1			
22	[1] USDA NRCS. "Soil Quality Urban Technical Note No.2-Urban Soil Compaction". March 2000.				
23	http://soils.usda.gov/sqi/management/files/sq_utn_2.pdf				
24					
25	* To determine how to calculate density see:				
26	http://www.globe.gov/tctg/bulkden.pdf?sectionID=94				

Post-Construction Water Balance Calculator

3		User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.			(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below		(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.			YOLO			
4							(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.			DAVIS 2 WSW EXP FARM			
5		***Project Information***					***Runoff Calculations***						
6		***Project Name:***	***Willogrove, City of Davis***				(Step 2) Indicate the Soil Type (dropdown menu to right):			***Group D Soils***	**Very low infiltration. Clay loam, silty clay loam, sandy clay, silty clay, or clay. Infiltration rate 0 to 0.05 inch/hr when wet.**		
7		***Waste Discharge Identification (WDID):***	***TBD***				(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):			***Cultivated Agricultural: minor crop residue cover***			
8		***Date:***	***4/25/2025***				(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):			***A mix of lawn, grass, pasture and tress covering more than 75% of the open space***			
9		***Sub Drainage Area Name (from map):***	***DMA 2***							**Complete Either**			
10		***Runoff Curve Numbers***								**Sq Ft**	**Acres**	**Acres**	
11		**Existing Runoff Curve Number**		**90.0**			*(Step 5) Total Project Site Area:*				**230.54**	**230.54**	
12		**Proposed Development Runoff Curve Number**		**90.3**			*(Step 6) Sub-watershed Area:*				**83.94**	**83.94**	
13		***Design Storm***					*Percent of total project :*			**36%**			
14		Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	**0.65**	**in**									
15		The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	**0.22**	**In**			*(Step 7) Sub-watershed Conditions*			**Complete Either**		**Calculated Acres**	
16		P used for calculations (in) (the greater of the above two criteria)	**0.65**	**In**			Sub-watershed Area (acres)			**Sq Ft**	**Acres**	**83.94**	
17		^Available at www.cabmphandbooks.com					Existing Rooftop Impervious Coverage				**0**	**0.00**	
18							Existing Non-Rooftop Impervious Coverage				**0**	**0.00**	
19							Proposed Rooftop Impervious Coverage				**26.30**	**26.30**	
20							Proposed Non-Rooftop Impervious Coverage				**23.59**	**23.59**	
21													
22							***Credits***			**Acres**		**Square Feet**	
23							Porous Pavement			**0.00**		**0**	
24							Tree Planting			**2.92**		**127,195**	
25		**Pre-Project Runoff Volume (cu ft)**	**36,292**	**Cu.Ft.**			Downspout Disconnection			**0.00**		**0**	
26		**Project-Related Runoff Volume Increase w/o credits (cu ft)**	**0**	**Cu.Ft.**			Impervious Area Disconnection			**1.67**		**72,745**	
27							Green Roof			**0.00**		**0**	
28							Stream Buffer			**0.00**		**0**	
29							Vegetated Swales			**0.00**		**0**	
30		**Project-Related Volume Increase with Credits (cu ft)**	**0**	**Cu.Ft.**			**Subtotal**			**4.59**		**199,940**	
31							**Subtotal Runoff Volume Reduction Credit**			**1984 Cu. Ft.**			
32													
33		You have achieved your minimum requirements					*(Step 9) Impervious Volume Reduction Credits*			**Volume (cubic feet)**			
34							Rain Barrels/Cisterns			**0 Cu. Ft.**			
35							Soil Quality			**29,429 Cu. Ft.**			
36							**Subtotal Runoff Volume Reduction**			**29,429 Cu. Ft.**			
37							**Total Runoff Volume Reduction Credit**			**31,413 Cu. Ft.**			
38													
39													

	A	B	C	D	E	F	G
1	**Tree Planting Credit Worksheet**						
2	Please fill out a tree canopy credit worksheet for each project sub-watershed.						
3							
4							
5	**Tree Canopy Credit Criteria**					Number of Trees Planted	Area Credit (acres)
6	Number of proposed evergreen trees to be planted (credit = number of trees x 0.005)*					253	1.27
7	Number of proposed deciduous trees to be planted (credit = number of trees x 0.0025)*					660	1.65
8						Square feet Under Canopy	
9	Square feet under an existing tree canopy, that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is LESS than 12 in diameter.					0	0.00
10	Square feet under an existing tree canopy that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is 12 in diameter or GREATER.					0	0.00
11	Please describe below how the project will ensure that these trees will be maintained.						
12							
13							Return to Calculator
14	* credit amount based on credits from Stormwater Quality Design Manual for the Sacramento and South Placer Regions						

	A	B	C	D	E	F	G	H
1	**Impervious Area Disconnection Credit Worksheet**							
2	Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.							
3								
4								
5	**Non-Rooftop Disconnection Credit Criteria**						Response	
6	Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?						◉ Yes ○ No	
7	Is the impervious area to any one discharge location less than 5,000 square feet?						◉ Yes ○ No	
8	The Stream Buffer credit **will not** be taken in this sub-watershed area?						◉ Yes ○ No	
9								
10	Percentage of existing 0 Acre(s) of non-rooftop surface area disconnected						0	
11	Percentage of the proposed 23.59 Acre(s) of non-rooftop surface area disconnected						7.1	%
12								
13							Return to Calculator	

	A	B	E	F	G
1					
2	Please fill out a soil quality worksheet for each project sub-watershed.				
6					Response
7					
8	Will the soils used for landscaping meet the ideal bulk densities listed in Table 1 below?[1]				◉ Yes ○ No
9	If you answered yes to the question above, and you know the area-weighted bulk density within the top 12 inches for soils used for landscaping (in g/cm^3)* , fill in the cell to the right and skip to cell G11. If not select from the drop-down menu in G10.				
10	If you answered yes to the question above, but you do not know the exact bulk density, which of the soil types in the drop down menu to the right best describes the top 12 inches for soils used for landscaping (in g/cm^3).				Silts, silt loams
11	What is the average depth of your landscaped soil media meeting the above criteria (inches)?				4.5
12	What is the total area of the landscaped areas meeting the above criteria (in acres)?				11.26
13					Return to Calculator
14	Table 1				
15	Sands, loamy sands	<1.6		**Credit (cu ft)**	**29429.136**
16	Sandy loams, loams	<1.4			
17	Sandy clay loams, loams, clay loams	<1.4			
18	Silts, silt loams	<1.3			
19	Silt loams, silty clay loams	<1.1			
20	Sandy clays, silty clays, some clay loams (35-45% clay)	<1.1			
21	Clays (>45% clay)	<1.1			
22	[1] USDA NRCS. "Soil Quality Urban Technical Note No.2-Urban Soil Compaction". March 2000.				
23	http://soils.usda.gov/sqi/management/files/sq_utn_2.pdf				
24					
25	* To determine how to calculate density see:				
26	http://www.globe.gov/tctg/bulkden.pdf?sectionID=94				

Post-Construction Water Balance Calculator

User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.		(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below		(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.	YOLO	
				(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.	DAVIS 2 WSW EXP FARM	

Project Information			Runoff Calculations		
Project Name:	Willogrove, City of Davis		(Step 2) Indicate the Soil Type (dropdown menu to right):	Group D Soils	Very low infiltration. Clay loam, silty clay loam, sandy clay, silty clay, or clay. Infiltration rate 0 to 0.05 inch/hr when wet.
Waste Discharge Identification (WDID):	TBD		(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):	Cultivated Agricultural: minor crop residue cover	
Date:	4/25/2025		(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):	A mix of lawn, grass, pasture and tress covering more than 75% of the open space	
Sub Drainage Area Name (from map):	DMA 3				

Runoff Curve Numbers				Complete Either Sq Ft	Complete Either Acres	Acres
Existing Runoff Curve Number	90.0		(Step 5) Total Project Site Area:		230.54	230.54
Proposed Development Runoff Curve Number	81.2		(Step 6) Sub-watershed Area:		23.57	23.57
			Percent of total project :		10%	

Design Storm			(Step 7) Sub-watershed Conditions	Complete Either Sq Ft	Complete Either Acres	Calculated Acres
Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	0.65	in				
The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	0.22	In	Sub-watershed Area (acres)			23.57
P used for calculations (in) (the greater of the above two criteria)	0.65	In	Existing Rooftop Impervious Coverage		0	0.00
^Available at www.cabmphandbooks.com			Existing Non-Rooftop Impervious Coverage		0	0.00
			Proposed Rooftop Impervious Coverage		0.00	0.00
			Proposed Non-Rooftop Impervious Coverage		2.78	2.78

			Credits	Acres	Square Feet
			Porous Pavement	0.00	0
			Tree Planting	0.82	35,719
Pre-Project Runoff Volume (cu ft)	10,191	Cu.Ft.	Downspout Disconnection	0.00	0
Project-Related Runoff Volume Increase w/o credits (cu ft)	0	Cu.Ft.	Impervious Area Disconnection	0.57	24,829
			Green Roof	0.00	0
			Stream Buffer	0.00	0
Project-Related Volume Increase with Credits (cu ft)	0	Cu.Ft.	Vegetated Swales	0.00	0
			Subtotal	1.39	60,548
			Subtotal Runoff Volume Reduction Credit	65 Cu. Ft.	

You have achieved your minimum requirements

(Step 9) Impervious Volume Reduction Credits	Volume (cubic feet)
Rain Barrels/Cisterns	0 Cu. Ft.
Soil Quality	0 Cu. Ft.
Subtotal Runoff Volume Reduction	0 Cu. Ft.
Total Runoff Volume Reduction Credit	65 Cu. Ft.

	A	B	C	D	E	F	G
1	**Tree Planting Credit Worksheet**						
2	Please fill out a tree canopy credit worksheet for each project sub-watershed.						
3							
4							
5	**Tree Canopy Credit Criteria**					Number of Trees Planted	Area Credit (acres)
6	Number of proposed evergreen trees to be planted (credit = number of trees x 0.005)*					71	0.36
7	Number of proposed deciduous trees to be planted (credit = number of trees x 0.0025)*					185	0.46
8						Square feet Under Canopy	
9	Square feet under an existing tree canopy, that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is LESS than 12 in diameter.					0	0.00
10	Square feet under an existing tree canopy that will remain on the property, with an average diameter at 4.5 ft above grade (i.e., diameter at breast height or DBH) is 12 in diameter or GREATER.					0	0.00
11	Please describe below how the project will ensure that these trees will be maintained.						
12							
13							Return to Calculator
14	* credit amount based on credits from Stormwater Quality Design Manual for the Sacramento and South Placer Regions						

	A	B	C	D	E	F	G	H
1	**Impervious Area Disconnection Credit Worksheet**							
2	Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.							
3								
4								
5	**Non-Rooftop Disconnection Credit Criteria**						Response	
6	Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?						◉ Yes ○ No	
7	Is the impervious area to any one discharge location less than 5,000 square feet?						◉ Yes ○ No	
8	The Stream Buffer credit **will not** be taken in this sub-watershed area?						◉ Yes ○ No	
9								
10	Percentage of existing 0 Acre(s) of non-rooftop surface area disconnected						0	
11	Percentage of the proposed 2.78 Acre(s) of non-rooftop surface area disconnected						20.5	%
12								
13							Return to Calculator	

	A	B	E	F	G
1					
2	Please fill out a soil quality worksheet for each project sub-watershed.				
6					Response
7					
8	Will the soils used for landscaping meet the ideal bulk densities listed in Table 1 below?[1]				◯ Yes ◉ No
9	If you answered yes to the question above, and you know the area-weighted bulk density within the top 12 inches for soils used for landscaping (in g/cm^3)* , fill in the cell to the right and skip to cell G11. If not select from the drop-down menu in G10.				
10	If you answered yes to the question above, but you do not know the exact bulk density, which of the soil types in the drop down menu to the right best describes the top 12 inches for soils used for landscaping (in g/cm^3).				Soil Type
11	What is the average depth of your landscaped soil media meeting the above criteria (inches)?				0
12	What is the total area of the landscaped areas meeting the above criteria (in acres)?				0
13					Return to Calculator
14	Table 1				
15	Sands, loamy sands	<1.6		**Credit (cu ft)**	
16	Sandy loams, loams	<1.4			
17	Sandy clay loams, loams, clay loams	<1.4			
18	Silts, silt loams	<1.3			
19	Silt loams, silty clay loams	<1.1			
20	Sandy clays, silty clays, some clay loams (35-45% clay)	<1.1			
21	Clays (>45% clay)	<1.1			
22	[1] USDA NRCS. "Soil Quality Urban Technical Note No.2-Urban Soil Compaction". March 2000.				
23	http://soils.usda.gov/sqi/management/files/sq_utn_2.pdf				
24					
25	* To determine how to calculate density see:				
26	http://www.globe.gov/tctg/bulkden.pdf?sectionID=94				