APPENDIX STORMMID

STORMWATER DESIGN REPORT MIDDLETOWN

SHERWOOD
DESIGN ENGINEERS

STORMWATER DESIGN REPORT

21000 SANTA CLARA AVE

MIDDLETON, CA
COUNTY OF LAKE

December 12, 2019

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OBJECTIVE

The objective of this report (The Report) is to provide an overview of the stormwater management design criteria as related to the 21000 Santa Clara housing project and tentative subdivision (The Project). This report includes analysis of the development types, approximate quantities of proposed impervious area, and other stormwater design considerations. In addition, this Report includes a description of the existing site conditions and addresses methodology for meeting post-construction mitigation requirements in compliance with cuttent State and Federal requirements.

PRIMARY DESIGN CRITERIA

As of the writing of this Report, Lake County has not published approved Phase II, Municipal Separate Storm Sewer System (MS4) permit guidelines and in practice defers to State requirements associated with the General Construction Permit for post-construction stormwater mitigation. In meetings with representation of the Lake County Public Works Department, this Project is designed to the requirements the Bay Area Stormwater Management Agencies Association (BASMAA) guidelines, which have been adopted in neighboring Marin, Sonoma, Napa, and Solano Counties and comply with State and Federal NPDES requirements. Therefore, the following report references the Bay Area Stormwater Management Association (BASMAA) guidelines.

The Project's Goals:

- Comply with regionally adopted Phase II MS4 guidelines (BASMAA), and
- Show all runoff from impervious areas as routed to an engineered Low Impact Development (LID) treatment facility.

EXISTING SITE CONDITIONS AND FEATURES

The Project is located on an undeveloped and relatively flat approximately 12.75 acre parcel that is majorily covered in grassland. It is located to the east of Highway 175 in central Middletown within South Lake County. The area is bounded on the western edge by a perennial stream named Dry Creek, on the northern edge by undeveloped land, and on the south and east by medium density residential development. Although the site is mainly flat, it generally drains to the west and into Dry Creek.
The Project is located adjacent to the Floodway and within the flood zone. Western portions of the Project site are in Floodzone AE and the remainder of the Project is within Floodzone AO. All building finished floor elevations have been coordinated with the floodzone administrator to be set sufficiently above the flood elevation. See **Figure 1** for the existing site limits.

SITE CONDITIONS AND PROPOSED TREATMENT

The Project is a residential development with a total of 49 residential parcels resulting in 28 duplex and 21 single family residential units and a community center, for a total of a 50 lot subdivision. This Project will be connected with a single access road to create a loop, connecting all of the residential parcels. There will also be a parking lot associated with the community center.

To provide treatment of the stormwater there will be a series of LID facilities thoughout the development. These will consist of small raingardens, located adjacent to each residential parcel, and a few treatment/detention basins (See Figure 1). The raingardens will serve to treat the roof and residential driveway areas, and will slow down the flows from these portions of the site, allowing for a longer travel times . These raingardens will overflow into a gutter along the roadway prior to discharging into two treatment and detention basins, one located in the center and the other at the west end of the development. (See **Figure 1)**

See **Table 1/below** for hardscape and softscape acreage breakdown.

Table 1 - 2-year 24-hr Storm

Zone	C*	Area (sqft)	Area (acre)	Intensity** (in/hr)	Flow (cfs)	Flow (gpm)	Volume (gal)
Hardscape	0.98	281,854	6.47	0.19	1.23	551.51	794,168
Landscape	0.4	171,533	3.94	0.19	0.31	137.00	197,273
-Raingarden		14,147	0.32				
-Stormwater Treatment Basin		14,552	0.33				
Total Area		453,387	10.41		**1.54**	**688.50**	**991,441**

*** Runoff Coefficient**

**** Intensity per NOAA Rainfall Table see Appendix A**

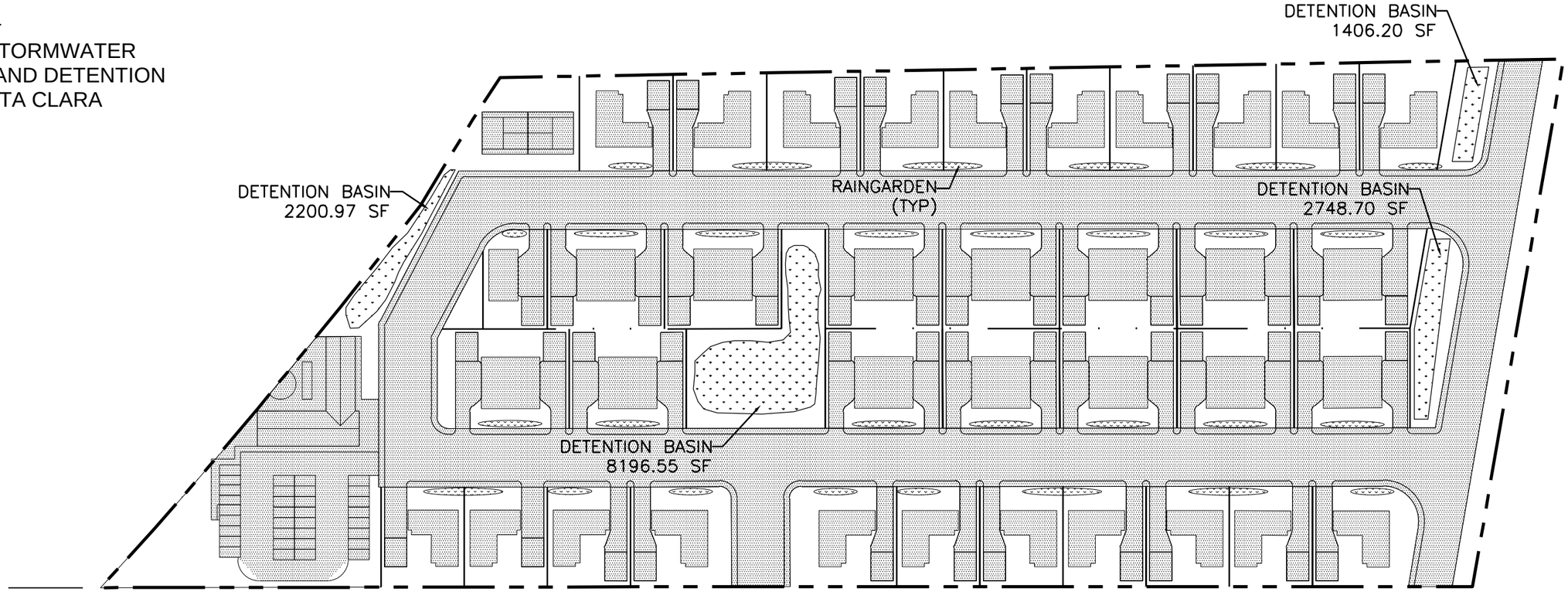
SUMMARY

The Project totals approximately 10.4 acres of which approximately 6.5 acres is impervious area within a 12.75 acre site. The site includes 0.33 acres of treatment and detention basins and 0.32 acres of raingardens. BASMAA requires the square footage treatment areas to total at least 4% of the new hardscape of within a site, which amounts to 0.26 acres of treatment for the Project. This treatment requirement is achieved through the treatment basins alone. To provide additional treatment, beyond the BASMAA requirements, raingardens will serve to collect and treat water from each of the residential parcels, including the roofs and portions of the driveways and hardscape, which account for approximately 3 acres of the total site hardscape. This combination of raingardens, treatment and detention facilities provides 2.5 times the required treatment area set by the regionally accepted BASMAA guidelines in compliance with Phase II MS4 permits.

FIGURE 1

FIGURE 1

PROPOSED STORMWATER
TREATMENT AND DETENTION
AT 21000 SANTA CLARA



Zone	C*	Area (sqft)	Area (acre)
Hardscape	0.98	281854.87	6.47
Landscape	0.4	171533.06	3.94
-Raingarden		14147.13	0.32
-Stormwater Treatment Basin		14552.42	0.33
Total Area		453387.93	10.41

*RUNOFF COEFFICIENT

LEGEND

LANDSCAPE

HARDSCAPE

RAINGARDEN

STORMWATER TREATMENT BASIN

APPROXIMATE BOUNDARY LINE

NORTH

0 50' 100' 200'

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PROPERTY OWNER:
SANTA CLARA INVESTMENTS

PRELIMINARY AREA TAKEOFF

SANTA CLARA SUBDIVISION
LAKE COUNTY, CALIFORNIA

December 12, 2019

APPENDIX A

PDF of NOAA Precipitation Frequency Data at 14000 Santa Clara Road:
P:\2018\18-016-06_Maha_Staff\03_Design\02_Exhibits\Hydrology Analysis\191211_Precipitation Frequency Data Server.pdf

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.96** (1.74-2.22)	**2.41** (2.14-2.75)	**3.01** (2.66-3.44)	**3.50** (3.07-4.03)	**4.16** (3.52-4.99)	**4.68** (3.85-5.74)	**5.21** (4.16-6.56)	**5.75** (4.46-7.48)	**6.48** (4.80-8.84)	**7.07** (5.03-10.0)
10-min	**1.40** (1.24-1.59)	**1.73** (1.54-1.97)	**2.16** (1.91-2.47)	**2.51** (2.20-2.89)	**2.99** (2.52-3.58)	**3.35** (2.77-4.12)	**3.73** (2.99-4.70)	**4.12** (3.20-5.36)	**4.65** (3.44-6.34)	**5.06** (3.61-7.18)
15-min	**1.13** (1.00-1.28)	**1.39** (1.24-1.58)	**1.74** (1.54-1.99)	**2.02** (1.78-2.33)	**2.41** (2.03-2.88)	**2.70** (2.23-3.32)	**3.01** (2.41-3.79)	**3.32** (2.58-4.32)	**3.75** (2.78-5.11)	**4.08** (2.91-5.79)
30-min	**0.808** (0.718-0.918)	**0.998** (0.886-1.14)	**1.25** (1.10-1.42)	**1.45** (1.27-1.67)	**1.73** (1.46-2.07)	**1.94** (1.60-2.38)	**2.15** (1.73-2.72)	**2.38** (1.85-3.10)	**2.69** (1.99-3.66)	**2.93** (2.08-4.15)
60-min	**0.572** (0.509-0.650)	**0.707** (0.628-0.805)	**0.884** (0.782-1.01)	**1.03** (0.900-1.18)	**1.22** (1.03-1.46)	**1.37** (1.13-1.68)	**1.53** (1.22-1.92)	**1.69** (1.31-2.19)	**1.90** (1.41-2.59)	**2.07** (1.48-2.94)
2-hr	**0.444** (0.394-0.504)	**0.548** (0.486-0.623)	**0.680** (0.602-0.776)	**0.785** (0.688-0.904)	**0.924** (0.780-1.11)	**1.03** (0.848-1.26)	**1.13** (0.908-1.43)	**1.24** (0.962-1.61)	**1.38** (1.02-1.88)	**1.49** (1.06-2.11)
3-hr	**0.384** (0.342-0.437)	**0.473** (0.420-0.538)	**0.584** (0.517-0.667)	**0.673** (0.590-0.775)	**0.789** (0.665-0.944)	**0.875** (0.721-1.07)	**0.960** (0.769-1.21)	**1.05** (0.811-1.36)	**1.16** (0.856-1.58)	**1.24** (0.883-1.76)
6-hr	**0.296** (0.263-0.336)	**0.364** (0.323-0.414)	**0.449** (0.398-0.513)	**0.516** (0.452-0.594)	**0.602** (0.508-0.720)	**0.664** (0.547-0.815)	**0.726** (0.581-0.915)	**0.786** (0.610-1.02)	**0.864** (0.639-1.18)	**0.921** (0.656-1.31)
12-hr	**0.213** (0.190-0.243)	**0.268** (0.237-0.304)	**0.334** (0.296-0.381)	**0.385** (0.338-0.444)	**0.451** (0.380-0.539)	**0.498** (0.410-0.610)	**0.543** (0.435-0.685)	**0.588** (0.456-0.765)	**0.644** (0.477-0.879)	**0.685** (0.488-0.972)
24-hr	**0.152** (0.136-0.172)	**0.194** (0.174-0.221)	**0.246** (0.221-0.281)	**0.286** (0.255-0.329)	**0.337** (0.292-0.397)	**0.374** (0.318-0.448)	**0.409** (0.341-0.500)	**0.443** (0.361-0.555)	**0.486** (0.383-0.631)	**0.518** (0.396-0.691)
2-day	**0.101** (0.090-0.114)	**0.129** (0.116-0.147)	**0.165** (0.148-0.188)	**0.193** (0.171-0.221)	**0.228** (0.197-0.269)	**0.254** (0.216-0.304)	**0.278** (0.232-0.341)	**0.303** (0.247-0.379)	**0.334** (0.263-0.433)	**0.357** (0.273-0.477)
3-day	**0.078** (0.070-0.089)	**0.100** (0.090-0.114)	**0.128** (0.115-0.146)	**0.150** (0.133-0.172)	**0.178** (0.154-0.210)	**0.199** (0.169-0.238)	**0.219** (0.182-0.267)	**0.238** (0.194-0.299)	**0.264** (0.208-0.342)	**0.283** (0.216-0.378)
4-day	**0.065** (0.059-0.074)	**0.084** (0.075-0.096)	**0.107** (0.096-0.122)	**0.126** (0.112-0.144)	**0.149** (0.129-0.176)	**0.167** (0.142-0.200)	**0.184** (0.153-0.225)	**0.200** (0.163-0.251)	**0.222** (0.175-0.288)	**0.238** (0.182-0.318)
7-day	**0.046** (0.041-0.052)	**0.059** (0.053-0.067)	**0.075** (0.067-0.086)	**0.088** (0.078-0.101)	**0.104** (0.090-0.123)	**0.117** (0.099-0.140)	**0.128** (0.107-0.157)	**0.140** (0.114-0.176)	**0.155** (0.122-0.201)	**0.167** (0.127-0.222)
10-day	**0.036** (0.033-0.041)	**0.047** (0.042-0.053)	**0.060** (0.053-0.068)	**0.070** (0.062-0.080)	**0.083** (0.071-0.097)	**0.092** (0.078-0.110)	**0.101** (0.084-0.124)	**0.110** (0.090-0.138)	**0.122** (0.096-0.158)	**0.130** (0.100-0.174)
20-day	**0.024** (0.022-0.027)	**0.031** (0.028-0.035)	**0.039** (0.035-0.045)	**0.046** (0.041-0.053)	**0.054** (0.047-0.064)	**0.060** (0.051-0.072)	**0.065** (0.055-0.080)	**0.071** (0.058-0.089)	**0.078** (0.061-0.101)	**0.083** (0.063-0.110)
30-day	**0.019** (0.017-0.022)	**0.025** (0.022-0.028)	**0.031** (0.028-0.036)	**0.036** (0.032-0.042)	**0.043** (0.037-0.050)	**0.047** (0.040-0.056)	**0.051** (0.043-0.063)	**0.055** (0.045-0.069)	**0.060** (0.047-0.078)	**0.064** (0.049-0.085)
45-day	**0.016** (0.014-0.018)	**0.020** (0.018-0.023)	**0.026** (0.023-0.029)	**0.029** (0.026-0.034)	**0.034** (0.030-0.040)	**0.038** (0.032-0.045)	**0.041** (0.034-0.050)	**0.044** (0.036-0.055)	**0.047** (0.037-0.061)	**0.050** (0.038-0.066)
60-day	**0.014** (0.013-0.016)	**0.018** (0.016-0.020)	**0.022** (0.020-0.025)	**0.026** (0.023-0.029)	**0.030** (0.026-0.035)	**0.032** (0.027-0.039)	**0.035** (0.029-0.043)	**0.037** (0.030-0.047)	**0.040** (0.031-0.052)	**0.042** (0.032-0.056)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates ▾ Submit