# PRELIMINARY
# DRAINAGE STUDY

## FOR

## Apollo Senior Care
## Escondido, CA 92027

**APN: 240-110-54, 55, 56**


**OWNER:**
Apollo Senior Care, LLC.
2661 Pummelo Ct.
Escondido, CA 92027
Tel: 760-855-8347

**ENGINEER:**
MASSON & ASSOCIATES, INC.
200 E. Washington Ave. Suite 200
Escondido, CA 92025
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BY:

_____
Robert D'Amaro, RCE# C081699



PN: 18195
Date: March 20, 2019
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Updated: September12, 2019

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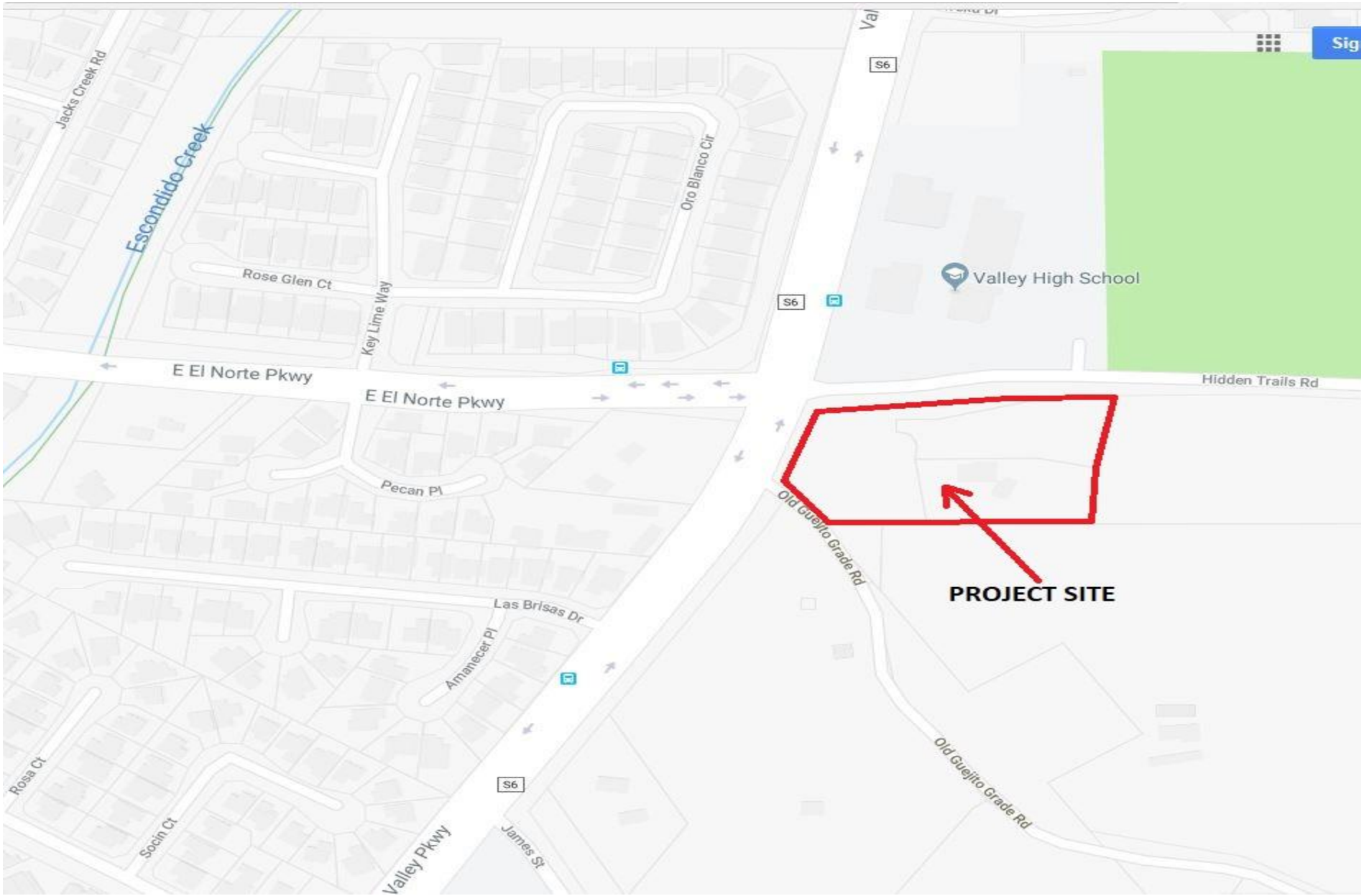
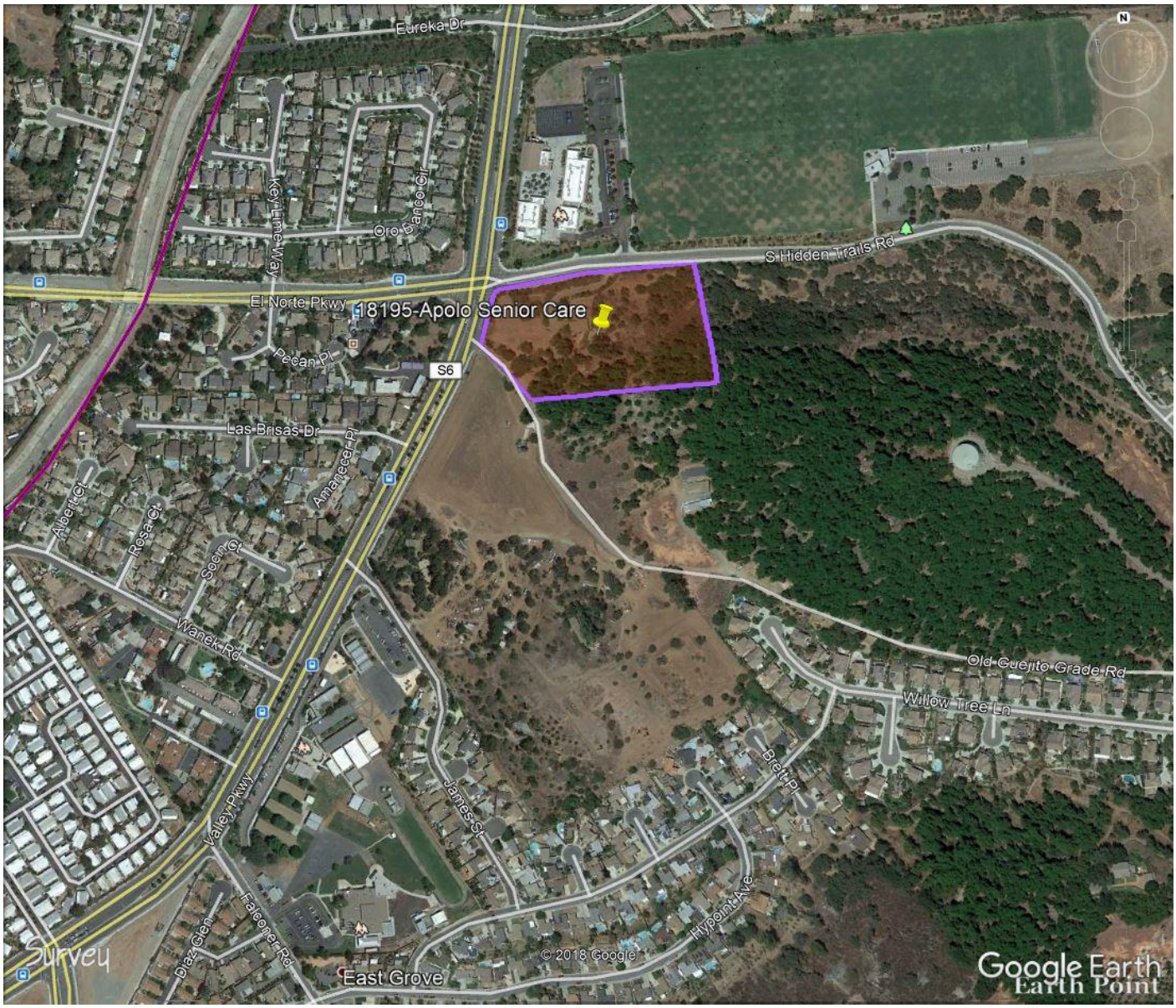
# VICINITY MAP
# Apollo Senior Care




*I:\18\18195\PROD\Reports\Hydrology\TM\18195 Hydrology TM.docx*

# CURRENT CONDITION



**METHODOLOGY:**

The method used herein to determine discharge quantities is the Rational Method as described in the City of Escondido Drainage Design Standards. A 100 year storm frequently was used due to the location of the site in a local valley and the potential for adverse effect on neighboring properties.

Per the City standards, the following parameters will be used:

| | |
|---|---|
| Intensity (I) = | 3.45 in/hr (Figure 1, 100-yr event) |
| Time of Concentration (Tc) = | 10 minutes minimum (Figure 2) |
| Runoff coefficients (C): | |
| Pre-Condition: | |
| Undeveloped Land = | 0.35 (Figure 1) |
| Residential = | 0.55 |
| Weighted C Coefficient = | 0.36 = [(0.20*0.55) + (3.06*0.35)]/3.26 (EX: Basin 1) |
| Post Condition: | |
| Undeveloped Land = | 0.35 |
| Multiple Units = | 0.7 |

One exception to the post condition C coefficients stated above is Post Basin 2 which combines landscape area and proposed street improvement. A weighted C coefficient of 0.52 was used in this case.

Pre and post development hydrology maps are located in the back of this report as Exhibit "A" and Exhibit "B" respectively. The included maps outline the sub-basins, flow paths and concentration points for runoff discharging from the site area. All applicable tables and charts referenced from the manual are included in Appendix "A" and Appendix "B".

**EXISTING CONDITION:**

The Project site is an existing single family house with approximately 3.3 acres located on South Hidden Tails Rd. and Valley Pkwy within the City of Escondido, California. The project site is located in Specific Plan Area #5 (SPA #5) zoning area. The existing drainage pattern sheet flows northerly into an existing storm drain system located on Hidden Trails Rd. and westerly into an existing storm drain system located on Old Guejito Grade Rd. with an average slope of 16%. The site will ultimately drain into Escondido Creek via an existing storm drain systems. Elevations range from a high point of approximately 820 feet to a low point of approximately 730 feet (above MSL). There are (3) drainage basins consisting of both on and offsite areas that sheet flow through the site from the southeast side of the site in northwesterly directions.

See Exhibit A and Appendix "A" for calculations.

According to the NRCS Websoil Survey, the site is situated in hydrologic soil groups C (±58%) and D (±42%).

**PROPOSED CONDITIONS:**

The proposed development project will consist of multi units senior care facility, driveway, parking lot, treatment basin and concrete channels.

The project will have 8 onsite drainage basins (see Exhibit B);

Basin-1 is an existing self-treating slope that drains into Hidden Trails Rd and Valley Pkwy and ultimately into existing storm drain systems located on Hidden Trails Rd and Valley Pkwy. It will also contain the proposed treatment basin, IMP #1.

Basin-2 includes a small manufactured slope and a portion of Old Guejito Grade Road which will be re-constructed to ultimate E. Valley Road widened conditions and treatment basin, IMP #3

Basin-3 is the proposed parking lot for the facility and will drain to the west into ribbon gutters which eventually drain into proposed treatment basin, IMP #1, through the public storm drain system, and then discharged into Escondido Creek.

Basin-4 will drain westerly via a proposed roof drain, curb gutter, into inlets located on the northwest corner of the parking lot prior to discharging into proposed treatment basin, IMP #1 and leaving that basin through a proposed public system then discharging into Escondido Creek.

Basin-5 is a natural self-treated area located on the east side of the site that sheet flows and is directed in a northerly direction to an existing storm drain system in Hidden Trails Rd.

Basin-6 is a natural self-treated area located on the east side of the site that sheet flows and is directed in a southwesterly direction to an existing storm drain system in Old Guejito Grade Road.

Basin-7 is an existing self-treating landscape slope that sheet flows onto Hidden Trails Rd and ultimately into an existing storm drain system. A portion of this area including treatment basin, IMP#1 are included here, which will drain all the treated runoff into an existing storm drain system located on the northeast corner of the site.

Basin-8 is a proposed driveway that sheet flows north into the proposed treatment basin, IMP #2 and into the public storm drain system, and then discharged into Escondido Creek.

There are three offsite basins (Offsite Basin-1, Offsite Basin-2, and Offsite Basin-3) located to the south and south east of the site.

Offsite Basin-1 sheet flows partially through onsite basin 6 then into a private by-pass drainage system and out letting into the public system, downstream of IMP #1 at the intersection of E. Valley Parkway and Hidden Trails Road.

Offsite Basin-2 sheet flows northerly partially through onsite basin 5, into a private by-pass system then into the public system, downstream of IMP #2 in Hidden Trails Road at the east side of the site.

Offsite Basin-3 sheet flows northwesterly to a private by-pass system then enters the public system downstream of IMP #3 on Old Guejito Grade Road.
See Appendix "B"

**CONCLUSIONS:**

A comparison of the on-site runoff from the existing condition to the proposed conditions shows an increase in runoff due to the proposed site design and revised C factor. The runoff from the proposed development has been minimized by the use of a combination water quality and hydromodification Best Management Practices (BMPs) bio-filtration basin (IMP #1) located along the west and northwest sides of the project site which consists of a bio-filtration basin and underground R-tanks. The calculations for the minimum volume needed to satisfy the hydromodification requirements are calculated using SDHM software and detailed in this project's SWQMP. The biofiltration basin on the north eastern side of the project (IMP #2) is a standard configuration basin without of R-Tanks. The bio-filtration basin located at the south west corner of the site (IMP #3) also is a standard configuration. All three basins satisfies all required area and volume quantities for hydromodification, water quality treatment and 100 year flood attenuation.

Details of each Sub-Basin are as follows:

In the Pre-Development Condition the basin that IMP #1 is located in has a 100-year flow of 4.1 cfs (See Appendix "A"). With the proposed development, onsite basins 1, 3, 4 and 6 flow into IMP #1 and combine with offsite basin 1 after IMP #1 creating with a 100-year flow of 7.2 cfs without any attenuation (See above). The flow is reduced to below Pre-Development through attenuation to 3.6 cfs (see Appendix "C").

For IMP #2 the Pre-Development 100-year flow is 2.7 cfs. With the proposed development onsite basin 8 and a portion of onsite basin 7 which includes the basin flowing into IMP #2, and when combined with flows from offsite basin 2 and post basin 5 the post un-attenuated Q is 2.9 cfs. The post attenuation flow is reduced to below Pre-Developed flow of 2.5cfs.

For IMP #3, the pre developed 100 year flow is 2.1 cfs. After development only Post Basin 2, which includes IMP #3, a portion of Old Guejito Grade Road and a small portion of the onsite manufactured slope along with the flow of Offsite Basin 3 has a post un-attenuated flow of into the public system also of 2.1 cfs. This indicated no attenuation is required however due to treatment requirements a basin is provided and the post Q into the public system is reduced to 1.9 cfs.
(see Appendix "B" and Exhibit "B").

## Drainage Basin Summary Table – Pre vs Post

| Basin | Area (Ac) Pre | Q100 (CFS) Pre | Area (Ac) Post | Q100 (CFS) Post |
|---|---|---|---|---|
| Onsite | N/A | N/A | 3.36 | 7.2 |
| Offsite | 7.2 | 8.9 | 3.64 | 5.0 |
| **Total** | N/A | **8.9** | 7.00 | **12.2** |

Onsite Difference Q (post) - Q (pre) = 12.2 - 8.9 = **3.3**

## Proposed Bio-Filtration Basin Attenuation Summary Table

| Basin | Q100-Pre CFS | Q100 – Post (W/O Attenuation) CFS | Q100 – Post (W/ Attenuation) CFS |
|---|---|---|---|
| IMP #1 | 4.1 | 7.2 | 3.6 |
| IMP #2 | 2.7 | 2.9 | 2.5 |
| IMP #3 | 2.1 | 2.1 | 1.9 |
| Total | **8.9** | **12.2** | **8.0** |

The total runoff has been increased by 3.3 cfs, which as mentioned above is reduced to below existing condition by the use of biofiltration basin to below the existing condition runoff. See attenuation calculations for reference.

# APPENDIX A
# PRE DEVELOPMENT CONDITIONS CALCULATIONS

**Summary Table**

| Existing Conditions Hydrology | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **BASIN ID** | **AREA** | **C** | **CA** | **Change in elevation** | **Longest Runoff length** | **Tc** | **I100** | **Q100** | **Cumulative Q100** |
| | (ac.) | | | ft | ft | ( min.) | (in/hr) | (cfs) | (cfs) |
| Basin-1 | 3.21 | 0.36 | 1.16 | 230 | 1026 | **10.0** | **3.45** | **4.1** | 4.1 |
| Basin-2 | 2.18 | 0.36 | 0.78 | 214 | 534 | **10.0** | **3.45** | **2.7** | 6.8 |
| Basin-3 | 1.59 | 0.36 | 0.57 | 160 | 661 | **10.0** | **3.45** | **2.1** | 8.9 |
| **Total** | **7.0** | | | | | | | **8.9** | |

Weighted C Coefficient = 0.36 [(0.20*0.55)+(3.06*0.35)]/3.26

# APPENDIX B
# POST DEVELOPMENT ATTENUATION CALCULATIONS

## Proposed Conditions Hydrology: Onsite + Offsite

| BASIN ID | AREA (ac.) | C | CA | Change in elevation ft | Longest Runoff length ft | $T_c$ ( min.) | $I_{100}$ (in/hr) | $Q_{100}$ (cfs) | Cumulative $Q_{100}$ (cfs) |
|---|---|---|---|---|---|---|---|---|---|
| Onsite Basin-1 | 0.31 | 0.35 | 0.11 | 23 | 194 | **10.0** | **3.45** | **0.4** | 0.4 |
| Onsite Basin-2 | 0.11 | 0.52 | 0.06 | 8 | 110 | **10.0** | **3.45** | **0.2** | 0.6 |
| Onsite Basin-3 | 0.82 | 0.70 | 0.57 | 8 | 270 | **10.0** | **3.45** | **2.3** | 2.9 |
| Onsite Basin-4 | 0.89 | 0.70 | 0.62 | 90 | 240 | **10.0** | **3.45** | **2.4** | 5.3 |
| Onsite Basin-5 | 0.74 | 0.35 | 0.26 | 84 | 280 | **10.0** | **3.45** | **1.0** | 6.3 |
| Onsite Basin-6 | 0.30 | 0.35 | 0.10 | 68 | 130 | **10.0** | **3.45** | **0.4** | 6.7 |
| Onsite Basin-7 | 0.17 | 0.35 | 0.06 | 18 | 220 | **10.0** | **3.45** | **0.2** | 6.9 |
| Onsite Basin-8 | 0.11 | 0.70 | 0.08 | 72 | 170 | **10.0** | **3.45** | **0.3** | 7.2 |

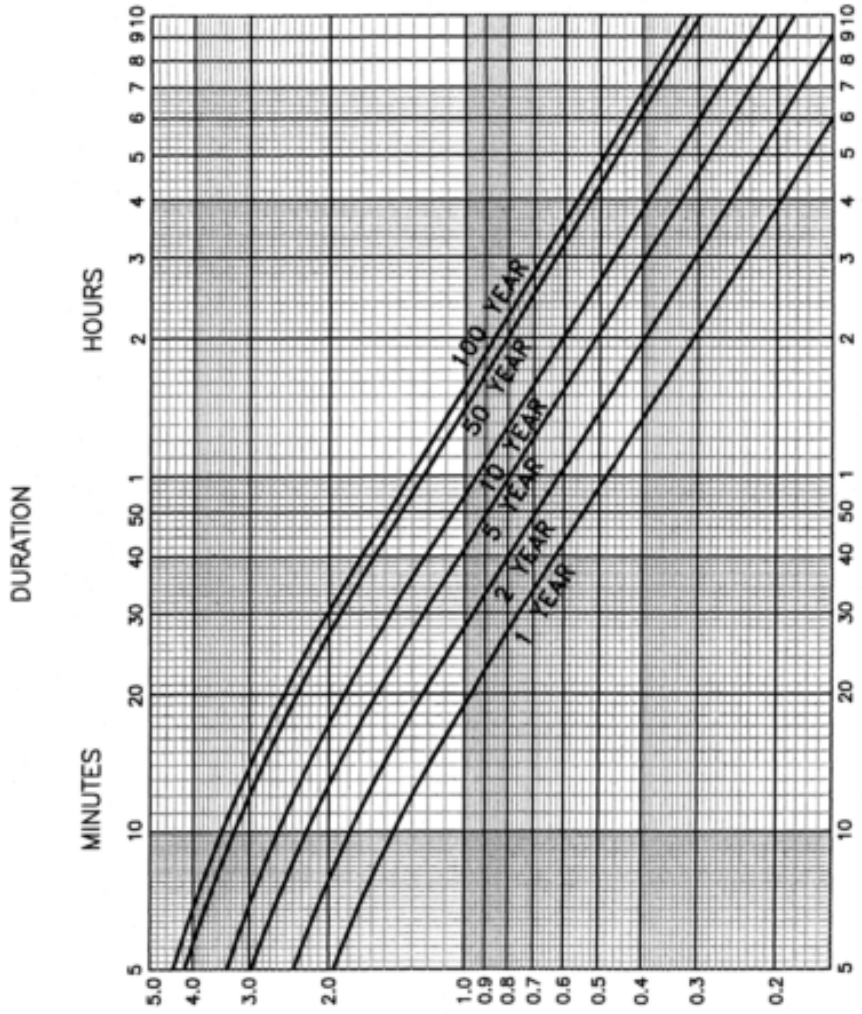
**Summary Table**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Offsite Basin-3 | 1.40 | 0.35 | 0.49 | 174 | 680 | **10.0** | **3.45** | **1.9** | 12.2 |
| **Total** | **7.0** | | | | | | | **12.2** | |

## Proposed Conditions Hydrology: Onsite + Offsite

| BASIN ID | AREA | C | CA | Change in elevation | Longest Runoff length | $T_c$ | $I_{100}$ | $Q_{100}$ | Cumulative $Q_{100}$ |
|---|---|---|---|---|---|---|---|---|---|
| | (ac.) | | | ft | ft | ( min.) | (in/hr) | (cfs) | (cfs) |
| Onsite Basin-1 | 0.31 | 0.35 | 0.11 | 23 | 194 | **10.0** | **3.45** | **0.4** | 0.4 |
| Onsite Basin-2 | 0.20 | 0.52 | 0.10 | 8 | 110 | **10.0** | **3.45** | **0.4** | 0.8 |
| Onsite Basin-3 | 0.80 | 0.70 | 0.56 | 8 | 270 | **10.0** | **3.45** | **2.3** | 3.1 |
| Onsite Basin-4 | 0.90 | 0.70 | 0.63 | 90 | 240 | **10.0** | **3.45** | **2.4** | 5.5 |
| Onsite Basin-5 | 0.70 | 0.35 | 0.25 | 84 | 280 | **10.0** | **3.45** | **1.0** | 6.5 |
| Onsite Basin-6 | 0.30 | 0.35 | 0.11 | 68 | 130 | **10.0** | **3.45** | **0.4** | 6.9 |
| Onsite Basin-7 | 0.20 | 0.35 | 0.07 | 18 | 220 | **10.0** | **3.45** | **0.2** | 7.1 |
| Onsite Basin-8 | 0.10 | 0.70 | 0.07 | 72 | 170 | **10.0** | **3.45** | **0.2** | 7.3 |
| Offsite Basin-1 | 1.20 | 0.35 | 0.42 | 145 | 480 | **10.0** | **3.45** | **1.7** | 9.0 |
| Offsite Basin-2 | 1.00 | 0.35 | 0.35 | 170 | 600 | **10.0** | **3.45** | **1.4** | 10.4 |
| Offsite Basin-3 | 1.40 | 0.35 | 0.49 | 174 | 680 | **10.0** | **3.45** | **1.9** | 12.3 |
| **Total** | **7.0** | | | | | | | **12.2** | |

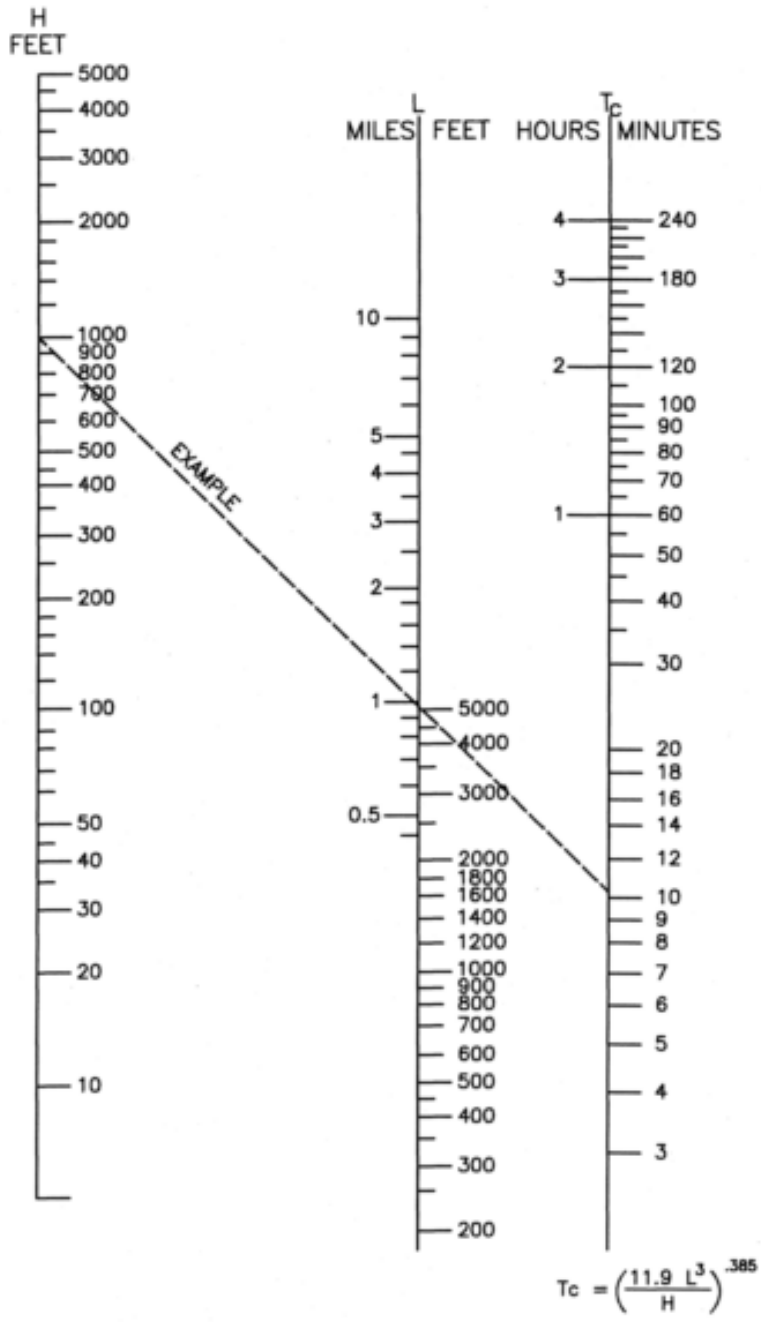
# APPENDIX C
# TABLES AND FIGURES FROM CITY OF ESCONDIDO DRAINAGE STANDARDS and SOILS DATA




## ESCONDIDO RUNOFF COEFFICIENTS

| | |
|---|---|
| PARKS, GOLF COURSES, CEMETERIES | 0.25 |
| UNDEVELOPED LAND, OPEN SPACE | 0.35 |
| RURAL – OVER 1/2 ACRE LOTS | 0.45 |
| SINGLE FAMILY | 0.55 |
| MOBILE HOME | 0.65 |
| MULTIPLE UNITS | 0.70 |
| COMMERCIAL | 0.85 |
| INDUSTRIAL | 0.95 |

| | | | |
|---|---|---|---|
| APPROVED: DATE: 5/8/09<br>DIRECTOR OF ENGINEERING SERVICES | | CITY OF ESCONDIDO<br>DEPARTMENT OF ENGINEERING SERVICES | SCALE:<br>NOT TO SCALE |
| REVISED | APPROVED | RUNNOFF INTENSITY DURATION CURVE | FIGURE NO.<br>1 |

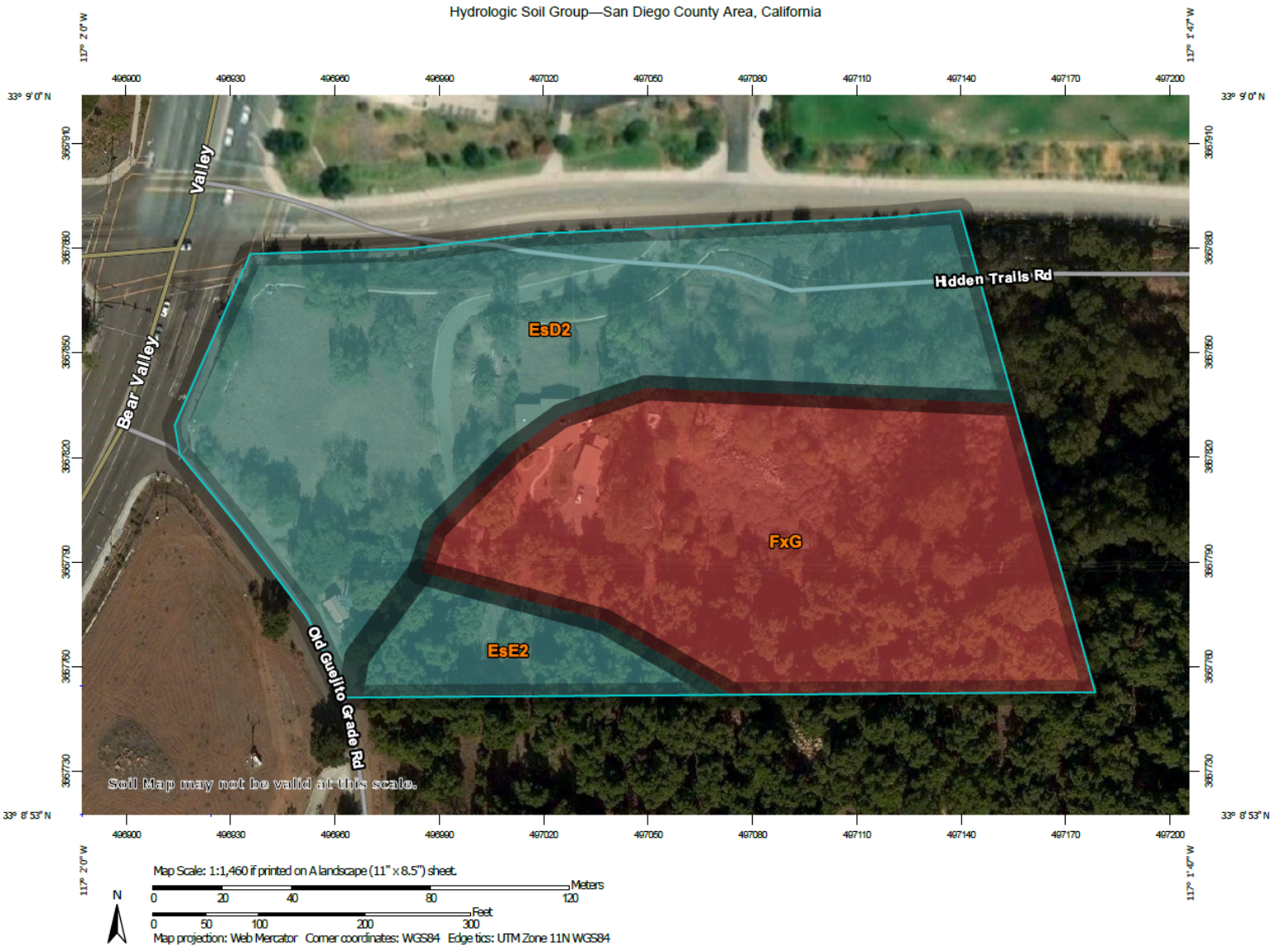



NOTE:

THIS CHART SHALL BE USED FOR ALL BASINS WITHIN THE CITY OF ESCONDIDO LESS 0.5 SQUARE MILE. THE MINIMUM Tc TO BE USED IS 10 MINUTES

Tc = TIME OF CONCENTRATION (HOURS)
L = LENGTH OF DRAINAGE COURSE (MILES)
H = DIFFERENCE IN ELEVATION FROM FURTHER MOST POINT OF DESIGN (FEET)

| APPROVED: DATE: 5/6/09<br>DIRECTOR OF ENGINEERING SERVICES | CITY OF ESCONDIDO<br>DEPARTMENT OF ENGINEERING SERVICES | SCALE:<br>NOT TO SCALE |
|---|---|---|
| REVISED / APPROVED | RUNOFF<br>TIME CHART | FIGURE NO.<br>2 |


Hydrologic Soil Group—San Diego County Area, California
117° 2'0" W
117° 1'47" W
33° 9'0" N
33° 8'53" N
406900
406930
406960
406990
407020
407050
407080
407110
407140
407170
407200
3667910
3667880
3667850
3667820
3667790
3667760
3667730
Valley
Bear Valley
Hdden Trails Rd
EsD2
FxG
EsE2
Old Guejito Grade Rd
Soil Map may not be valid at this scale.
Map Scale: 1:1,460 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
1/7/2019
Page 1 of 4

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Lines**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Points**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 13, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 3, 2010—Nov 22, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| EsD2 | Escondido very fine sandy loam, 9 to 15 percent slopes, eroded | C | 3.7 | 49.8% |
| EsE2 | Escondido very fine sandy loam, 15 to 30 percent slopes , eroded | C | 0.6 | 7.8% |
| FxG | Friant rocky fine sandy loam, 30 to 70 percent slopes | D | 3.2 | 42.4% |
| **Totals for Area of Interest** | | | **7.5** | **100.0%** |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

# EXHIBIT A

HIDDEN TRAILS RD

EXIST. STORM DRAIN

VALLEY PKWY

EXIST. BROW DITCH

258
0.00
1/2" CAP 4394

257
0.00
1/2" CAP 4394

EXIST. BROW DITCH

PRE-DEV. BASIN-2
A = 2.18 AC
Qp100 = 2.7 CFS

PROJECT BOUNDARY

117
728.5
2IN IP LS

EXIST. STORM DRAIN

PRE-DEV. BASIN-1
A = 3.21 AC
Qp100 = 4.1 CFS

121
759.72
.5REBARCAPLS4894

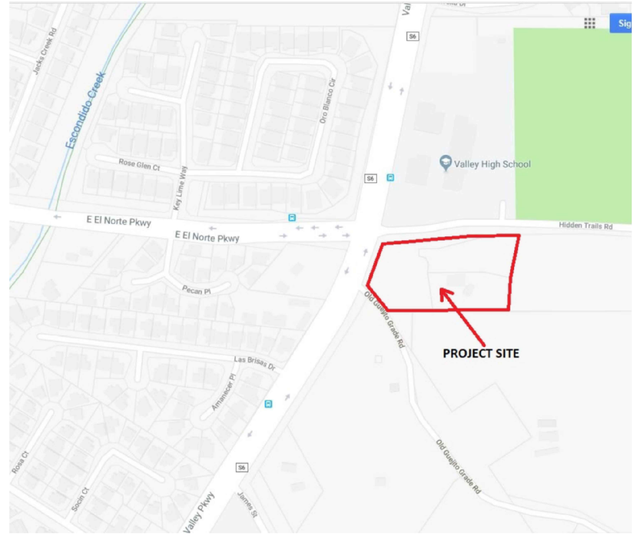
118
755.41
.75IN IP LS4760

OLD GUEJITO GRADE ROAD

PRE-DEV. BASIN-3
A = 1.59 AC
Qp100 = 2.1 CFS

## LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| PROJECT BOUNDRY | |
| BASIN BOUNDARY | |
| FLOW DIRECTION | |




N

40 20 0 40 80 120

SCALE IN FEET
GRAPHIC SCALE
1" = 40'

# EXHIBIT 'A'
# PRE DEVELOPMENT MAP FOR
# APOLLO SENIOR CARE
# CITY OF ESCONDIDO, CA


Planning ▲ Engineering ▲ Surveying
Solved.

200 E. Washington Ave., Suite 200
Escondido, CA 92025
O. 760.741.3570
F. 760.741.1786
www.masson-assoc.com



DATE: Sep 05, 2019-8:45am by: rdamaro FILE: I:\18\18195\PROD\Reports\Hydrology\Exhibits\18195-Pre Drainage Map.dwg

# EXHIBIT B

POC #1
PRE $Q_{100p}$ = 4.1 CFS
POST $Q_{100p}$ = 3.6 CFS

BASIN-1
A = 0.31 AC
$Q_{100p}$ = 0.4 CFS

POC #2
PRE $Q_{100p}$ = 2.7 CFS
POST $Q_{100p}$ = 2.5 CFS

BASIN-7
A= 0.17 AC
$Q_{100p}$ = 0.2 CFS

BASIN-8
A = 0.11 AC
$Q_{100p}$ = 0.3 CFS

BASIN-4
A = 0.89 AC
$Q_{100P}$ = 2.4 CFS

BASIN-5
A = 0.74 AC
$Q_{100p}$ = 1.0 CFS

POST OFFSITE
BASIN-2
A = 1.06 AC
$Q_{100p}$ = 1.4 CFS

POC #3
PRE $Q_{100p}$ = 2.1 CFS
POST $Q_{100p}$ = 1.9 CFS

BASIN-3
A = 0.82 AC
$Q_{100P}$ = 2.3 CFS

BASIN-6
A = 0.30 AC
$Q_{100p}$ = 0.4 CFS

BASIN-2
A = 0.11 AC
$Q_{100p}$ = 0.2 CFS

POST OFFSITE
BASIN-1
A = 1.18 AC
$Q_{100p}$ = 1.7 CFS

POST OFFSITE
BASIN-3
A = 1.40 AC
$Qp_{100p}$ = 1.9 CFS

737.00 BOTTOM BASIN No. 2
745TTOM AREA 218.0 S.F.

735.5 BOTTOM BASIN No. 1
BOTTOM AREA 1,879.0 S.F.

726.75 BOTTOM BASIN No. 3
BOTTOM AREA 1,510.0 S.F.

VALLEY PARKWAY

OHE

HV 5
A
931.71

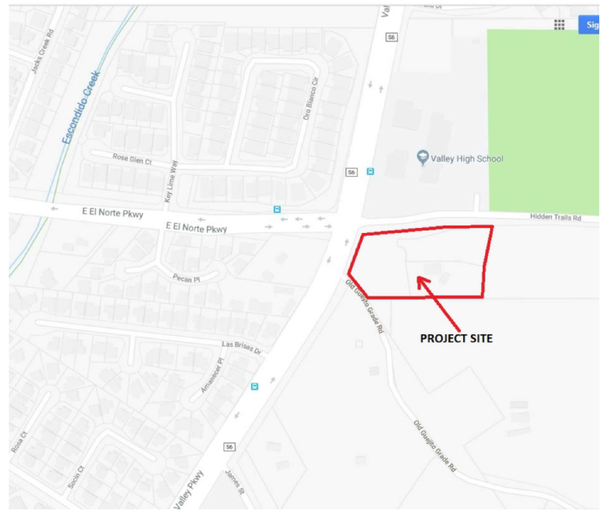
HV 4
A
895.98

N

40 20 0 40 80 120
SCALE IN FEET
GRAPHIC SCALE
1"=40'

## LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| PROJECT BOUNDARY | |
| BASIN BOUNDARY | |
| FLOW DIRECTION | |

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