
Drainage Study and Hydraulic Analysis For

**Hartmann Complex
19210 Hartmann Dr.,
Hidden Valley Lake, CA 95467**

APN: 119-0120-137

June 5, 2020



WARREN CONSULTING ENGINEERS, INC.
1117 WINDFIELD WAY, SUITE 110
EL DORADO HILLS, CA 95672

Table of Contents

| <u>Section</u> | <u>Page</u> |
|---|-------------|
| Cover | 1 |
| Table of Contents | 2 |
| Scope of Study | 3 |
| Existing Site Description | 3 |
| Location Map | 4 |
| Site Photos | 5 |
| Proposed Improvements | 4 |
| General Site Plan | 4 |
| Offsite Drainage Improvements | 5 |
| Drainage Easements or Permits Required | 5 |
| Drainage Facility Impacts to Habitats and Downstream Features | 5 |
| Site Grading | 5 |
| Storm Water Quality and Baseline Hydromodification | 5 |
| Runoff Calculation Methodology | 6 |
| Description of methods and criteria used | 6 |
| Peak Storm Water Runoff Rate and Volume | 6 |
| Hydraulic Analysis and Calculation | 6 |
| Overall Conclusions and Mitigation Measures | 6 |

| <u>Exhibit</u> | <u>Description</u> |
|----------------|---|
| Exhibit A | Pre-Development Shed Map, Exhibit A. |
| Exhibit B | Post-Development Shed Map, Exhibit B. |
| Exhibit C | Pre and Post Drainage Runoff Calculations |
| Exhibit D | Drainage System Flow Calculations |

Scope of Study

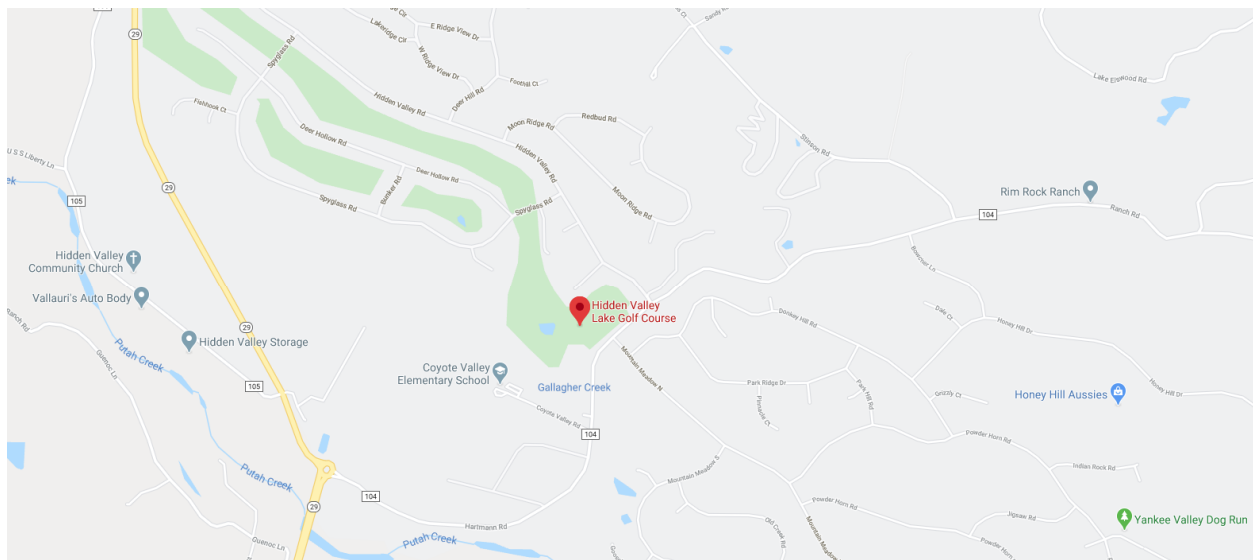
The purpose of this study is to give evidence through accepted calculation methods that the proposed development has been designed to accept and transmit the anticipated run-off based on the California State Phase II Small MS4 General Permit Requirements and Policies as well as Lake County Hydrology Design Standards

Existing Site Description

General Site Description

The existing project site is located on the Hidden Valley Lake Golf Course located at 19210 Hartmann Dr., Hidden Valley Lake. The project site is approximately 4.48 acres located on property with approximately 1.90 acres of impervious surface. This is a fully developed site with existing buildings, parking lots, and landscaping. The site has an unused/ineffective existing storm drain system which leaves the site's runoff to a swale that overland release into the creek located on the southwest edge of the property. The creek flows from the Northeast to the Southwest into a culvert that crosses under Hartmann Drive.

Location Map



Site Aerial



Proposed Improvements

Description of Improvements

The proposed project is the construction of an approximately 12,500 sqft building, an outdoor patio, drop off area, and parking lot. The proposed site will have a total of 2.91 acres of impervious surface out of the 4.48 acres project site and will have a storm drain system to transmit the storm water to it existing release point and will incorporate Bioretention. The proposed project's drainage system releases into the creek located on the southwest edge of the site at the same location of the existing site's swale releases.

General Site Plan

The project has been designed using traditional pipe and drain systems within the paved and landscaped areas which will collect runoff on-site and be piped to the County's storm drain system. Where able the site detaches paving to drain towards landscaping and Bioretention before being collected in the storm drainage system. A schematic of the drainage system can be seen in Exhibit B – Proposed Shed Map.

Offsite Drainage Improvements

None found necessary and none proposed with this development.

Drainage Easements or Permits Required

No Easement found necessary to be conveyed or granted and none existing to be utilized.

Drainage Facility Impacts to habitats and downstream features

Not expected or anticipated based on the proposed development and existing drainage features.

Site grading

The building and surrounding grading has been designed to generally slope away from the building in accordance with local and state codes. Drains and pipelines have been designed to convey typical runoff however, overland release points have been provided in the event drainage systems failure. The proposed structure is not at risk in the event all of the drainage systems fail, although proper maintenance of the proposed drainage systems should always be performed by the owner.

Storm Water Quality and Baseline Hydromodification

The California State Phase II Small MS4 General Permit requires treatment measures on regulated projects which are projects that create or replace more than 5,000 square feet of new impervious area per Section E.12. Projects that create or replace more than 1 acre (43,560 square feet) of new impervious area require hydromodification management measures. The proposed project creates or replaces approximately 2.91 acres of new impervious area.

The storm water treatment and the hydromodification management measures for the project will be Bioretention sized per Section E.12.ii.f, which is 4% of the tributary impervious created or replaced in the project. The project creates or replaces 126,958 square feet (2.91 acres) of impervious area and 4% of this area is 5,078 square feet. The Bioretention proposed for the project is approximately 5,318 square feet, which meets the sizing requirements.

Runoff Calculation Methodology

Description of methods and criteria used

To calculate to the peak storm water runoff of the site, Lake County Hydrology Design Standards were used. The design standards use the Time of Concentration and Rational Method to determine the runoff for the project shed. See Exhibit C for the Calculation of r both existing and proposed site plans.

Peak Storm Water Runoff Rate

The existing site's peak storm water runoff rate was found to be 3.12 cfs. The proposed site's peak storm water runoff rate was found to be 0.65 cfs, the reduction of the peak runoff comes from the increase in the time of concentration time gained from the 30 min it takes for the bioretention system to fill prior to releasing the runoff. See the attached calculations for both the existing and the proposed peak storm water runoff.

Hydraulic Analysis

Refer to the attached Exhibit D for the Drainage System Flow Calculations for the proposed storm drain system. The Calculations show the system is sized correctly. Exhibit D refers to Exhibit B to the shed areas used in the Drainage Runoff Calculations.

Overall Conclusions and Mitigation Measures

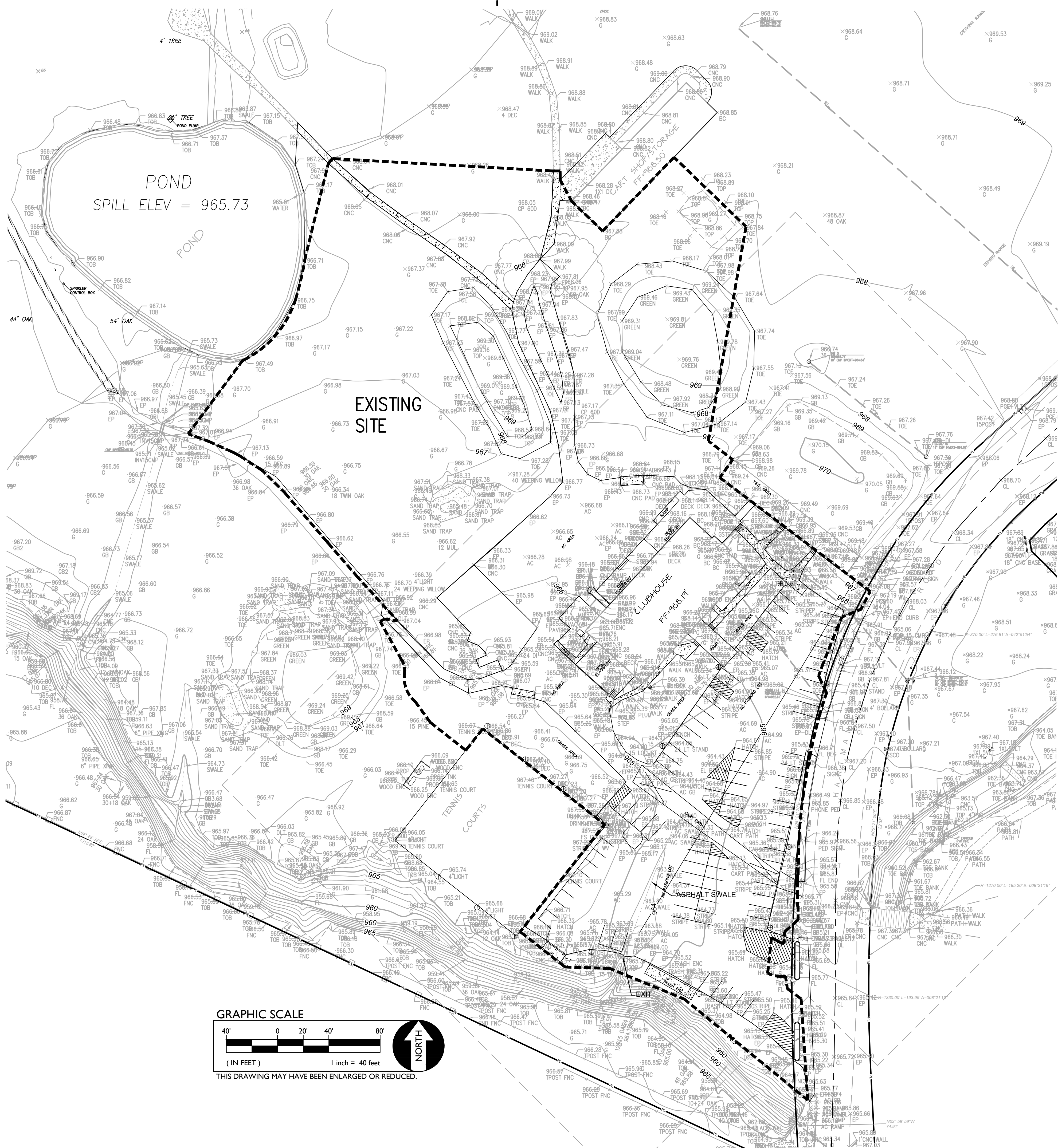
Proposed Drainage System design (Reference Exhibit B, C and D)

The project's mitigation measures for storm water quality and hydromodification are sized correctly to too meet the State requirements and the as shown by the calculations, the drainage system is adequately sized for the proposed site runoff.

WILLIAMS + PADDON ARCHITECTS - PLANNERS, INC. HEREBY EXPRESSLY RESERVES ITS COMMON LAW COPYRIGHT AND OTHER PROPERTY RIGHTS IN THESE PLANS. THESE PLANS AND DRAWINGS ARE NOT TO BE REPRODUCED, CHANGED OR COPIED IN ANY FORM OR MANNER WHATSOEVER WITHOUT FIRST OBTAINING THE EXPRESS WRITTEN PERMISSION OF WILLIAMS + PADDON / ARCHITECTS - PLANNERS, INC. NO PART OF THESE PLANS OR DRAWINGS ARE TO BE ASSIGNED TO ANY THIRD PARTY WITHOUT THE WRITTEN PERMISSION AND CONSENT.

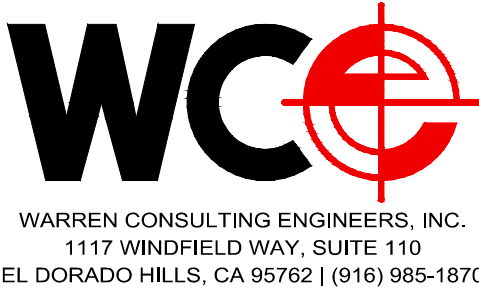
10/20/2014 5:00:17 PM C:\Users\jff\Desktop\HVL_EC.dwg

AD.5 CAL GREEN NOTES



TOTAL PROJECT SHED

TOTAL AREA = 194,996 SQFT = 4.48 ACRES
IMPERVIOUS AREA = 79,285 SQFT = 1.82 ACRES
PERVIOUS AREA = 115,711 SQFT = 2.66 ACRES



HARTMAN COMPLEX

HIDDEN VALLEY LAKE
ASSOCIATION

19210 HARTMANN DR.
HIDDEN VALLEY LAKE,
CA 95467

REVISIONS

DESIGN DEVELOPMENT

| | |
|----------------------------|----------------|
| JOB NO. | 131800.00 |
| DRAWN | W+P |
| DATE | 2.28.2020 |
| SCALE | As indicated |
| FILENAME | HVL_EC_CENTRAL |
| www.williamspluspaddon.com | |

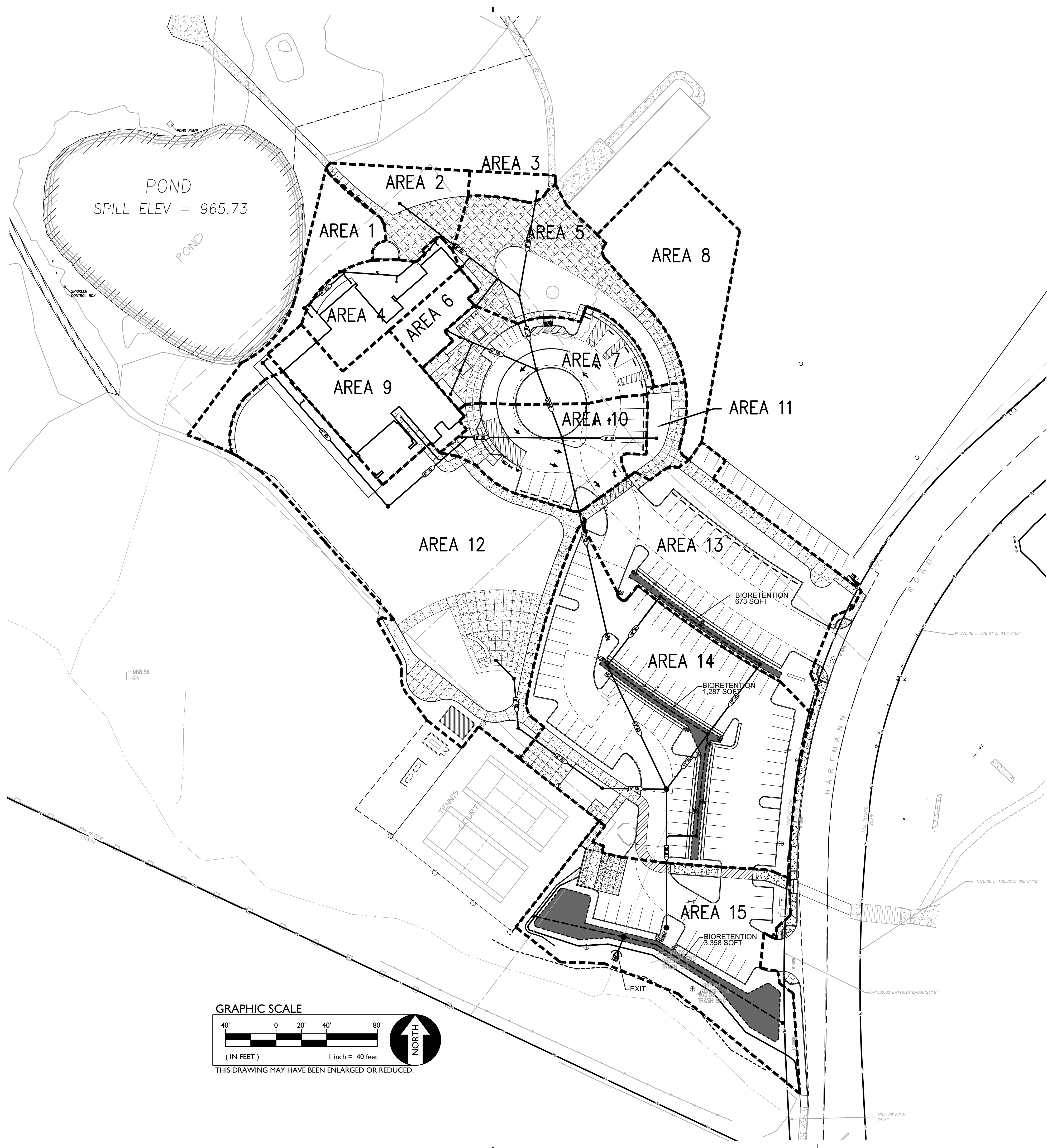
EXISTING SHED MAP

EX-A

WILLIAMS + PADDON ARCHITECTS - PLANNERS, INC. HEREBY EXPRESSLY RESERVES ITS COMMON LAW COPYRIGHT AND OTHER PROPERTY RIGHTS IN THESE PLANS. THESE PLANS AND DRAWINGS ARE NOT TO BE REPRODUCED, CHANGED OR COPIED IN ANY FORM OR MANNER WHATSOEVER WITHOUT FIRST OBTAINING THE EXPRESS WRITTEN PERMISSION OF WILLIAMS + PADDON / ARCHITECTS - PLANNERS, INC. FOR ANY USE, IN ANY MANNER, WITHOUT FIRST OBTAINING THE EXPRESS WRITTEN PERMISSION AND CONSENT.

10/27/2014 5:00:17 PM C:\Users\jld\Desktop\HVL_EC.dwg

AD-5 CAL GREEN NOTES



TOTAL PROJECT SHED

| | | |
|-----------------|-----------|-------------------|
| TOTAL AREA | = 194,996 | SQFT = 4.48 ACRES |
| IMPERVIOUS AREA | = 126,958 | SQFT = 2.91 ACRES |
| PERVIOUS AREA | = 68,038 | SQFT = 1.57 ACRES |

SHED AREAS

| | | |
|-----------------|---------|-------------------|
| SHED A1 | | |
| TOTAL AREA | = 6,049 | SQFT = 0.14 ACRES |
| IMPERVIOUS AREA | = 235 | SQFT = 0.01 ACRES |
| PERVIOUS AREA | = 5,814 | SQFT = 0.13 ACRES |

| | | |
|-----------------|---------|-------------------|
| SHED A2 | | |
| TOTAL AREA | = 5,398 | SQFT = 0.12 ACRES |
| IMPERVIOUS AREA | = 2,739 | SQFT = 0.06 ACRES |
| PERVIOUS AREA | = 2,659 | SQFT = 0.06 ACRES |

| | | |
|-----------------|---------|-------------------|
| SHED A3 | | |
| TOTAL AREA | = 1,294 | SQFT = 0.03 ACRES |
| IMPERVIOUS AREA | = 54 | SQFT = 0.00 ACRES |
| PERVIOUS AREA | = 1,244 | SQFT = 0.03 ACRES |

| | | |
|-----------------|---------|-------------------|
| SHED A4 | | |
| TOTAL AREA | = 6,083 | SQFT = 0.14 ACRES |
| IMPERVIOUS AREA | = 5,826 | SQFT = 0.13 ACRES |
| PERVIOUS AREA | = 257 | SQFT = 0.01 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A5 | | |
| TOTAL AREA | = 12,269 | SQFT = 0.28 ACRES |
| IMPERVIOUS AREA | = 8,079 | SQFT = 0.18 ACRES |
| PERVIOUS AREA | = 4,190 | SQFT = 0.10 ACRES |

| | | |
|-----------------|---------|-------------------|
| SHED A6 | | |
| TOTAL AREA | = 2,425 | SQFT = 0.05 ACRES |
| IMPERVIOUS AREA | = 2,425 | SQFT = 0.05 ACRES |
| PERVIOUS AREA | = 0 | SQFT = 0.00 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A7 | | |
| TOTAL AREA | = 10,725 | SQFT = 0.25 ACRES |
| IMPERVIOUS AREA | = 8,506 | SQFT = 0.20 ACRES |
| PERVIOUS AREA | = 2,219 | SQFT = 0.05 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A8 | | |
| TOTAL AREA | = 11,701 | SQFT = 0.27 ACRES |
| IMPERVIOUS AREA | = 0 | SQFT = 0.00 ACRES |
| PERVIOUS AREA | = 11,701 | SQFT = 0.27 ACRES |

| | | |
|-----------------|---------|-------------------|
| SHED A9 | | |
| TOTAL AREA | = 9,512 | SQFT = 0.22 ACRES |
| IMPERVIOUS AREA | = 9,512 | SQFT = 0.22 ACRES |
| PERVIOUS AREA | = 0 | SQFT = 0.00 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A10 | | |
| TOTAL AREA | = 10,030 | SQFT = 0.23 ACRES |
| IMPERVIOUS AREA | = 8,445 | SQFT = 0.19 ACRES |
| PERVIOUS AREA | = 1,585 | SQFT = 0.04 ACRES |

| | | |
|-----------------|---------|-------------------|
| SHED A11 | | |
| TOTAL AREA | = 2,314 | SQFT = 0.05 ACRES |
| IMPERVIOUS AREA | = 1,264 | SQFT = 0.03 ACRES |
| PERVIOUS AREA | = 1,053 | SQFT = 0.02 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A12 | | |
| TOTAL AREA | = 36,255 | SQFT = 0.83 ACRES |
| IMPERVIOUS AREA | = 26,064 | SQFT = 0.57 ACRES |
| PERVIOUS AREA | = 10,191 | SQFT = 0.26 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A13 | | |
| TOTAL AREA | = 21,325 | SQFT = 0.49 ACRES |
| IMPERVIOUS AREA | = 14,959 | SQFT = 0.34 ACRES |
| PERVIOUS AREA | = 6,366 | SQFT = 0.15 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A14 | | |
| TOTAL AREA | = 38,168 | SQFT = 0.87 ACRES |
| IMPERVIOUS AREA | = 29,744 | SQFT = 0.68 ACRES |
| PERVIOUS AREA | = 8,424 | SQFT = 0.19 ACRES |

| | | |
|-----------------|----------|-------------------|
| SHED A15 | | |
| TOTAL AREA | = 21,474 | SQFT = 0.49 ACRES |
| IMPERVIOUS AREA | = 9,106 | SQFT = 0.21 ACRES |
| PERVIOUS AREA | = 12,368 | SQFT = 0.28 ACRES |



HARTMAN COMPLEX

HIDDEN VALLEY LAKE ASSOCIATION

19210 HARTMANN DR.
HIDDEN VALLEY LAKE,
CA 95467

REVISIONS

DESIGN DEVELOPMENT

| | |
|----------------------------|----------------|
| JOB NO. | 131800.00 |
| DRAWN | W+P |
| DATE | 2.28.2020 |
| SCALE | As indicated |
| FILENAME | HVL_EC_CENTRAL |
| www.williamspluspaddon.com | |

PROPOSED SHED MAP

EX-B



Peak Storm Water Runoff Rate - Rational Method

| | |
|---------------|----------------------|
| Existing Site | |
| JOB NAME | HVL Hartmann Complex |
| FILE NAME | 20-020-DR1 |
| JOB # | 20-020 |
| USED BY | GV |
| DATE | May 13, 2020 |

Lake County - Hydrology Design

Peak Storm Water Runoff - Rational Formula

$$Q = CiAK$$

| | |
|----------------------|---------------------|
| Runoff Coefficient = | C = 0.53 |
| Rainfall Intensity = | i = 1.20 in/hr |
| Area = | A = 4.48 acres |
| "K" Factor = | K = 1.09 |
| Peak Runoff | Q = 3.12 cfs |

Runoff Coefficient

$$C = \left(\frac{A_p}{A_t} \right) (C_p) + \left(\frac{A_v}{A_t} \right) (C_v)$$

| | |
|-----------------------------|-----------------------------|
| Area - Paved = | A _p = 1.82 acres |
| Area - Total = | A _t = 4.48 acres |
| Area - Vegetated = | A _v = 2.66 acres |
| Coefficient - Paved = | C _p = 0.95 |
| Coefficient - Vegetated = | C _v = 0.25 |
| Runoff Coefficient = | C = 0.53 |

Time of Concentration and Rainfall Intensity

$$T_c = 10 + T_{of} + T_{ch}$$

| | | |
|----------------------|----------------------------|-------------------|
| Overland Flow Time = | T _{of} = 6.22 min | Based on Figure 2 |
| Channel Flow Time = | T _{ch} = 1.73 min | Based on Figure 2 |
| Time Concentration = | T _c = 18 min | |

| | | |
|------------------------------------|-----------------------|-------------------|
| Rainfall Intensity (10yr) = | i = 1.20 in/hr | Based on Figure 1 |
|------------------------------------|-----------------------|-------------------|

"K" factor Value

$$K = i_y / 35$$

| | | |
|---------------------------|------------------------------|-------------------|
| Year Rainfall Intensity = | i _y = 38.00 in/yr | Based on Figure 3 |
| "K" Factor = | K = 1.09 | |



Peak Storm Water Runoff Rate - Rational Method

| | |
|---------------|----------------------|
| Proposed Site | |
| JOB NAME | HVL Hartmann Complex |
| FILE NAME | 20-020-DR1 |
| JOB # | 20-020 |
| USED BY | GV |
| DATE | May 13, 2020 |

Lake County - Hydrology Design

Peak Storm Water Runoff - Rational Formula

$$Q = CiAK$$

| | |
|----------------------|----------------|
| Runoff Coefficient = | C = 0.65 |
| Rainfall Intensity = | i = 0.80 in/hr |
| Area = | A = 4.48 acres |
| "K" Factor = | K = 1.09 |
| Peak Runoff | Q = 2.52 cfs |

Runoff Coefficient

$$C = \left(\frac{A_p}{A_t} \right) (C_p) + \left(\frac{A_v}{A_t} \right) (C_v)$$

| | |
|---------------------------|-----------------------------|
| Area - Paved = | A _p = 2.54 acres |
| Area - Total = | A _t = 4.48 acres |
| Area - Vegetated = | A _v = 1.94 acres |
| Coefficient - Paved = | C _p = 0.95 |
| Coefficient - Vegetated = | C _v = 0.25 |
| Runoff Coefficient = | C = 0.65 cfs |

Time of Concentration and Rainfall Intensity

$$T_c = 10 + T_{of} + T_p + T_b$$

| | | |
|----------------------|----------------------------|---|
| Overland Flow Time = | T _{of} = 1.17 min | Based on Figure 2 |
| Pipe Flow Time = | T _p = 5.00 min | Based on Figure 2 |
| Basin fill time | T _b = 30.00 min | Bioretention fill time before releasing |
| Time Concentration = | T _c = 46 min | |

| | | |
|-----------------------------|----------------|-------------------|
| Rainfall Intensity (10yr) = | i = 0.80 in/hr | Based on Figure 1 |
|-----------------------------|----------------|-------------------|

"K" factor Value

$$K = i_y / 35$$

| | | |
|---------------------------|------------------------------|-------------------|
| Year Rainfall Intensity = | i _y = 38.00 in/yr | Based on Figure 3 |
| "K" Factor = | K = 1.09 | |



Drainage System Flow Calculations - By Rational Method

Exhibit C - Post Construction

| | |
|-----------|----------------------|
| JOB NAME | HVL Hartmann Complex |
| FILE NAME | 20-020 - DS1 |
| JOB # | 19-070 |
| USED BY | GV |
| DATE | May 15, 2020 |

| NODE | | INCR. | TOTAL | PIPE DATA (by Mannings Formulas) | | | | | | PIPE | PIPE | NODE RUNOFF (by Rational Method) | | | TOTAL PIPE | SYS. |
|-----------|---------|--------------|---------------|----------------------------------|-------|----------|----------|-----------|-------|------------|--------|----------------------------------|---------|------------------|------------------|---------------|
| Area FROM | Area TO | Area (A) ac. | Area (ΣA) ac. | Pipe Dia. in. | n | a sq.ft. | r sq.ft. | s ft./ft. | P ft. | V ft./sec. | Q cfs. | C | i in/hr | RUN-OFF (Q) cfs. | RUN-OFF (Q) cfs. | PASS ? yes/no |
| A4 | A2 | 0.140 | 0.140 | 6.00 | 0.015 | 0.196 | 0.125 | 0.005 | 1.571 | 1.751 | 0.34 | 0.92 | 1.20 | 0.15 | 0.155 | YES |
| A2 | A5 | 0.124 | 0.264 | 8.00 | 0.015 | 0.349 | 0.167 | 0.005 | 2.094 | 2.122 | 0.74 | 0.61 | 1.20 | 0.09 | 0.245 | YES |
| A3 | A5 | 0.030 | 0.030 | 8.00 | 0.015 | 0.349 | 0.167 | 0.005 | 2.094 | 2.122 | 0.74 | 0.92 | 1.20 | 0.03 | 0.033 | YES |
| A6 | A5 | 0.056 | 0.056 | 8.00 | 0.015 | 0.349 | 0.167 | 0.005 | 2.094 | 2.122 | 0.74 | 0.95 | 1.20 | 0.06 | 0.063 | YES |
| A5 | A7 | 0.282 | 0.631 | 8.00 | 0.015 | 0.349 | 0.167 | 0.005 | 2.094 | 2.122 | 0.74 | 0.71 | 1.20 | 0.24 | 0.582 | YES |
| A7 | A10 | 0.246 | 0.877 | 12.00 | 0.015 | 0.785 | 0.250 | 0.004 | 3.142 | 2.326 | 1.83 | 0.80 | 1.20 | 0.24 | 0.819 | YES |
| A9 | A10 | 0.218 | 0.218 | 8.00 | 0.015 | 0.349 | 0.167 | 0.005 | 2.094 | 2.122 | 0.74 | 0.95 | 1.20 | 0.25 | 0.249 | YES |
| A11 | A10 | 0.053 | 0.053 | 8.00 | 0.015 | 0.349 | 0.167 | 0.005 | 2.094 | 2.122 | 0.74 | 0.64 | 1.20 | 0.04 | 0.040 | YES |
| A10 | A14 | 0.230 | 1.379 | 12.00 | 0.015 | 0.785 | 0.250 | 0.004 | 3.142 | 2.326 | 1.83 | 0.84 | 1.20 | 0.23 | 1.340 | YES |
| A12 | A14 | 0.832 | 0.832 | 12.00 | 0.015 | 0.785 | 0.250 | 0.004 | 3.142 | 2.326 | 1.83 | 0.75 | 1.20 | 0.75 | 0.753 | YES |
| A13 | A14 | 0.490 | 0.490 | 12.00 | 0.015 | 0.785 | 0.250 | 0.004 | 3.142 | 2.326 | 1.83 | 0.74 | 1.20 | 0.43 | 0.435 | YES |
| A14 | A15 | 0.876 | 3.577 | 15.00 | 0.015 | 1.227 | 0.313 | 0.004 | 3.927 | 2.885 | 3.54 | 0.82 | 1.20 | 0.87 | 3.394 | YES |
| A15 | EXT | 0.493 | 4.070 | 15.00 | 0.015 | 1.227 | 0.313 | 0.005 | 3.927 | 3.226 | 3.96 | 0.54 | 1.20 | 0.32 | 3.716 | YES |