1st review

ALTITUDE
LAND CONSULTANTS INC
CIVIL | SURVEY | PLANNING | LANDSCAPE

REMOVED

~~ADDENDUM TO THE ADDENDED~~ DRAINAGE STUDY FOR

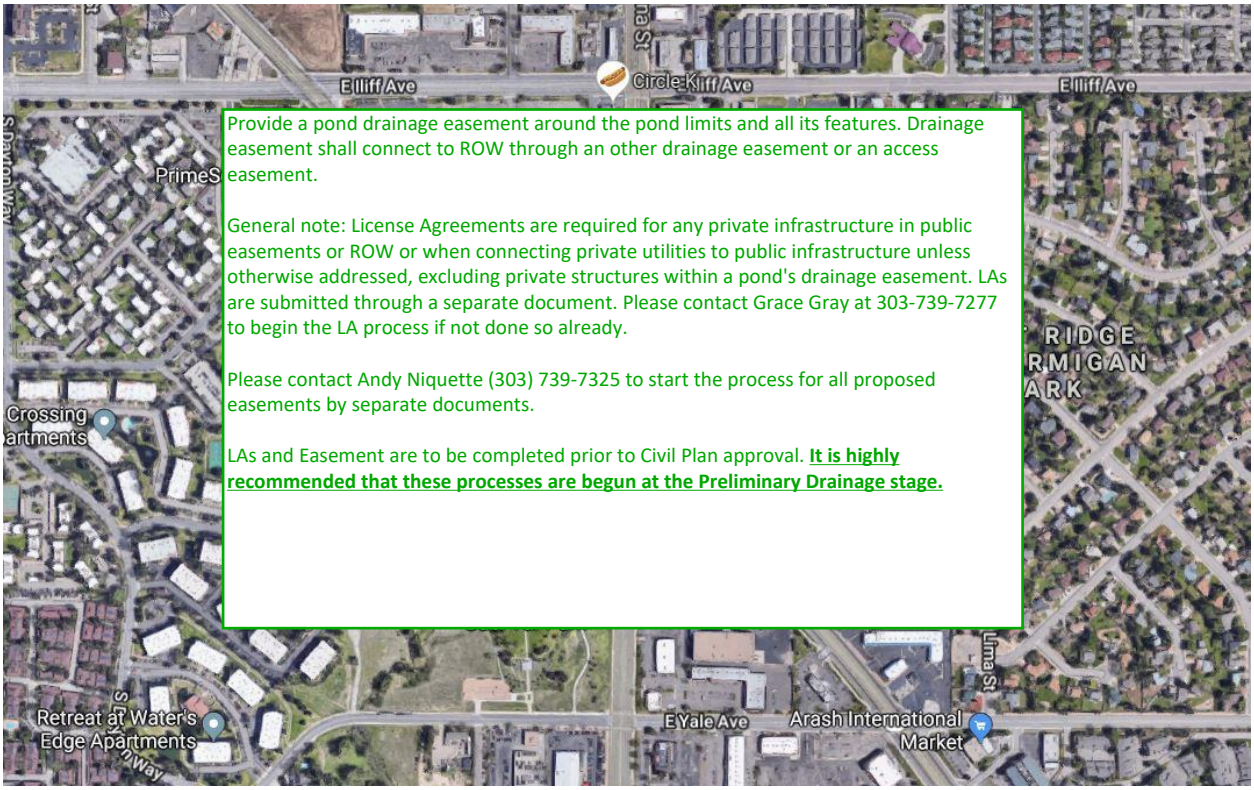
Filing 2 per plat (typ)
ADDRESSED

Advisory note:
This PDR approval required prior to Civil Plan approval
NOTED

Green comments provided by Public Works reviewer Jared Coleman - jcoleman@auroragov.org

WATERPARK SUBDIVISION FILING NO. 1
2430 S. Havana Street
City of Aurora, County of Arapahoe, Colorado

JOB NUMBER 18-224
Southeast 1/4 of Section 26, Township 04 South, Range 67 West of 6th P.M.,
City of Aurora, County of Arapahoe, State of Colorado



APPROVED FOR ONE YEAR FROM THIS DATE

_____

_____ _____
City Engineer **Date**

_____ _____
Water Department **Date**

PREPARED BY:
Salvatore C. Cambria, P.E.
Altitude Land Consultants, Inc.
3461 Ringsby Court – Suite. 125
Denver, CO 80216
720-594-9494

PREPARATION DATE:
June 24, 2020

TABLE OF CONTENTS

Informational note: Section / Chapter references marked as X.XX.X.XX.X refer to COA Roadway Design and Construction Specifications and Errata, most current edition. All other call outs should be called out directly: COA Storm Drain Design and Technical Criteria (SDDTC) and Urban Drainage and Flood Control District's Drainage Criteria Manual (UDFCD / USDCM). All comments are typical to all sheets/pages where applicable.

A comment response plan set with Engineer responses placed next to City responses on the PDF is highly encouraged to expedite reviews, but is optional. This can be submitted as misc. documents with a title of "Civil Plan/Review Response" for example. Without a comment response to reference, comments may be duplicated and treated as unresolved. This could hold up approvals.

Please also refer to returned "Checklist" in submittal portal for additional items looked for during reviews by Public Works. Please address unmarked or insufficient items as applicable.

STATEMENT PAGE

Engineer's Statement

The attached drainage plan was prepared under my direction and supervision and are correct to the best of my knowledge and belief. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Printed Name: Salvatore C. Cambria, P.E. Date: 06/24/2020

Seal:

A. INTRODUCTION

1.0 – Location

"Waterpark Subdivision Filing No. 1" is an existing office park and subdivision in the southwest quarter of Section 26, Township 4 South, Range 67 West of the Sixth Principal Meridian, Arapahoe County, Colorado. The subject site is located at 2430 South Havana Street and bounded by South Havana Street on the West, an existing private road on the East, and an existing private road to the North. See **Appendix A – Vicinity Map** for visual reference.

2.0 – Existing Development

The existing development is a restaurant/bar facility located on a 2.28-acre site with an existing detention pond located in the Southwesterly portion of the site. The detention pond has been designed per the "Addendum to Drainage Study for Waterpark Subdivision Filing No. 1". The detention pond has been designed to capture the subject site as well as the adjacent site to the east, a total of 7.25 acres of runoff. The bottom of pond currently sits at 5558.00', the top of pond is roughly 5562.00', and the invert of the outlet pipe currently sits at 5557.00'. Per the approved report, the pond was sized to detain 36,000 cu ft of volume although 35,000 was required based on their calculations.

3.0 – Proposed Development

The proposed additions to the existing development consist of an additional 3,915 square feet of impervious area. The existing detention pond was designed to capture all the runoff from the neighboring parking lot. However, the new design routes flows from the proposed additions to the existing detention pond. So, included in the proposed development will be the reshaping of the detention pond to capture all the runoff from the proposed development, and the runoff from the existing parking lot.

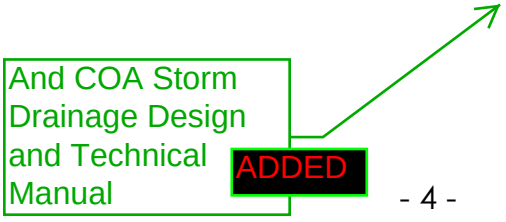
B. HISTORIC DRAINAGE

The historic drainage patterns will remain the same as delineated in the original "Final Drainage Study for Waterpark Subdivision Filing No. 1" which indicated that basins A1 and A2 consisted of 7.25 acres, flow into the detention pond.

C. DESIGN CRITERIA

1.0 – Reference

The Final Drainage Study for Waterpark Subdivision Filing No. 1(C4-2-451) and the Addendum to Drainage Study for Waterpark Subdivision Filing No. 1 (C4-2-451A) were referenced in the preparation of this drainage report. The Urban Storm Drainage Criteria Manual was also referenced in the preparation of this report.



See comment in attached table

2.0 – Methods

Using the same method as found in the referenced reports, a new composite runoff coefficient based upon the attached Table 3-1 of the revisions dated November 30, 1982 to the Urban Storm Drainage Criteria Manual was calculated for the proposed additions to the 2.28 acre. The 100-year storm was used as the major storm event to determine the ponds required volume. The detention pond release rate will remain the same as indicated in the "Final Drainage Study for Waterpark Subdivision Filing No. 1" as 8.8 cfs.

3.0 – Composite C Calculations

The original "Final Drainage Study for Waterpark Subdivision Filing No. 1" indicated that basins A1 and A2 consisted of 7.25 acres.

7.25 acres – 2.28 acres = 4.97 acres of existing commercial area.

Per the original study C = 0.8, $C_{100} = CC_f = 0.8 * 1.25 = 1.0$, $C_f = 1.25$ for the 100-year storm event.

COA nor USDCM utilizes this correction factor anymore, it is not needed. See other comments.

The breakup of the impervious area is as follows.

Total Building Coverage = 22,038 Sq. Ft.
Total Drive/Walk Coverage = 52,893 Sq. Ft.
Total Landscape Coverage = 28,168 Sq. Ft.

For the entire basin at 7.25 acres flowing to the detention pond, a composite runoff coefficient is calculation as follows.

$4.97 * 1.0 = 4.97$

$\frac{22{,}038}{43560} * 0.90 = 0.46$

$\frac{52{,}893}{43560} * 0.93 = 1.13$

$\frac{28{,}168}{43560} * 0.45 = 0.29$

$C_{100}A$ for Basins A1 + A2 = 6.85

ADDRESSED: DETENTION POND REDESIGNED TO ACCOMODATE 100-YEAR EVENT AND 1.2 TIMES WQCV USING COA AND USDCM.

An existing drainage map will need to be provided showing existing drainage conditions, basins, etc. utilizing current COA standards. A Composite C calculation using COA SDDTC Table 1, Intensities derived from SDDTC Eq 5.5 and USDCM Figure RA 1-6. A proposed map will will also need to be generated showing the proposed condition in comparison to existing. Tables with a breakdown of composite C calculations, Tc calculations, unrouted and routed flows will need to be provided in the preliminary drainage. Please see SDDTC Section 2.3 for preliminary drainage requirements

Per 3.61 detention will need to be reanalyzed for this development. Pond will need to have WQ/EURV included in redesign. The City requires that the WQCV includes an additional 20% volume to account for sedimentation. Ponds with tributary areas over 5 acres shall be designed to be Full Spectrum based on USDCM design criteria (SDDTC 3.70b). The 100yr shall be the larger of the USDCM derived volume or the COA V=KA method. The 100yr shall have 1.2WQCV or 0.5EURV volumes added to them in the case of less than or greater than 5 acre tributary, respectively.

The City has two freeboard criteria:
SDDTC 6.32 regards the 100yr+1.2WQCV (or 0.5EURV) WSEL to the crest of the emergency spillway
USDCM Chapter 12 Section 5.3 regards the emergency 100yr+1.2WQCV (or EURV) over the spillway to the top of the pond.

The pond release rate shall be based on the NRCS Hydrological Soil Group per SDDTC 6.33

Please reference all equations used in any calculation

4.0 – Detention Pond Calculations

Using a composite $C_{100}A$ of 6.85 and the Rainfall Intensity values from the "Addendum to Drainage Study for Waterpark Subdivision Filing No. 1" the pond is calculation using the mass diagram method as follows.

ADDRESSED: DETENTION POND REDESIGNED TO ACCOMODATE 100-YEAR EVENT AND 1.2 TIMES WQCV USING MHFD DETENTION BASIN STAGE STORAGE TABLE BUILDER AND DETENTION BASIN OUTLET DESIGN WORKBOOKS

Tc (Min)	Minute Secon					
5						19451
10						27189
15						31536
20						33417
25						35093
30						36193
35						37046
40						36913
45						37274
50						36894
55						36515
60	60	6.85	2.73	67322	31680	35642

The City only accepts the V=KA method per SDDTC 6.33 and MHFD's UD-Detention for design/sizing of ponds. Volume calculations must be made with the Prismoidal formula per SDDTC 6.33

The pond will need to be shown to still meet the City's current volume, drain time, and release rate criteria. The pond will also need to be designed for WQ/EURV as appropriate and become certified through the City's certification process. See SDDTC Chapter 6.

Right now it is unclear how the pond is outletting. C4-2-451 shows an overflow box but I was not able to locate detail for it. it is likely the pond wasn't designed for Water Quality. Water Quality will need to be provided for this project.

The Detention Volume Required is 37,274 Cu. Ft.

D. CONCLUSIONS

The "Addendum to Drainage Study for Waterpark Subdivision Filing No. 1" was prepared by Haynes and Associates dated 07-18-84. This study indicated that a detention volume of 35,000 Cu. Ft. was required to handle the developed flows from basins A1 & A2. ~~The release rate from the pond will remain the same at 8.8 cfs.~~

ADDRESSED: POND WILL RELEASE AT 90% OF EXISTING RELEASE CALCULATED TO BE 7.9CFS MAX

Based on the pro e has been increased to 37,274 Cu. Ft. In order to provide the additional 2,274 Cu. Ft., Altitude Land Consultants is proposing the pond to be regraded as shown on the grading plan. See **Appendix B – Grading Plan** for visual reference. The new bottom of pond will be 5557.00', the new top of pond will be 5563.00', providing a new detention pond volume of 37,815 Cu. Ft., see **Appendix C – Detention Calculations** for reference. The stormwater plan discussed above was designed in compliance with the City of Aurora standards. On-site flows will be adequately conveyed to the detention pond and the detention pond will now be able to handle the additional impervious areas.

E. REFERENCES

- Urban Drainage Flood Control District Criteria Manual

- Final Drainage Study for Waterpark Subdivision Filing No. 1(C4-2-451)

- Addendum to Drainage Study for Waterpark Subdivision Filing No. 1 (C4-2-451A)

Include COA SDDTC ADDED

F. APPENDICIES

A – Vicinity Map
B – Grading Plan
C –Detention Calculations

Please contact me directly with any questions or concerns at sal@altitudelandco.com or directly at 720.427.3017.

Thank you for your time,

Salvatore C. Cambria, P.E.
Vice President

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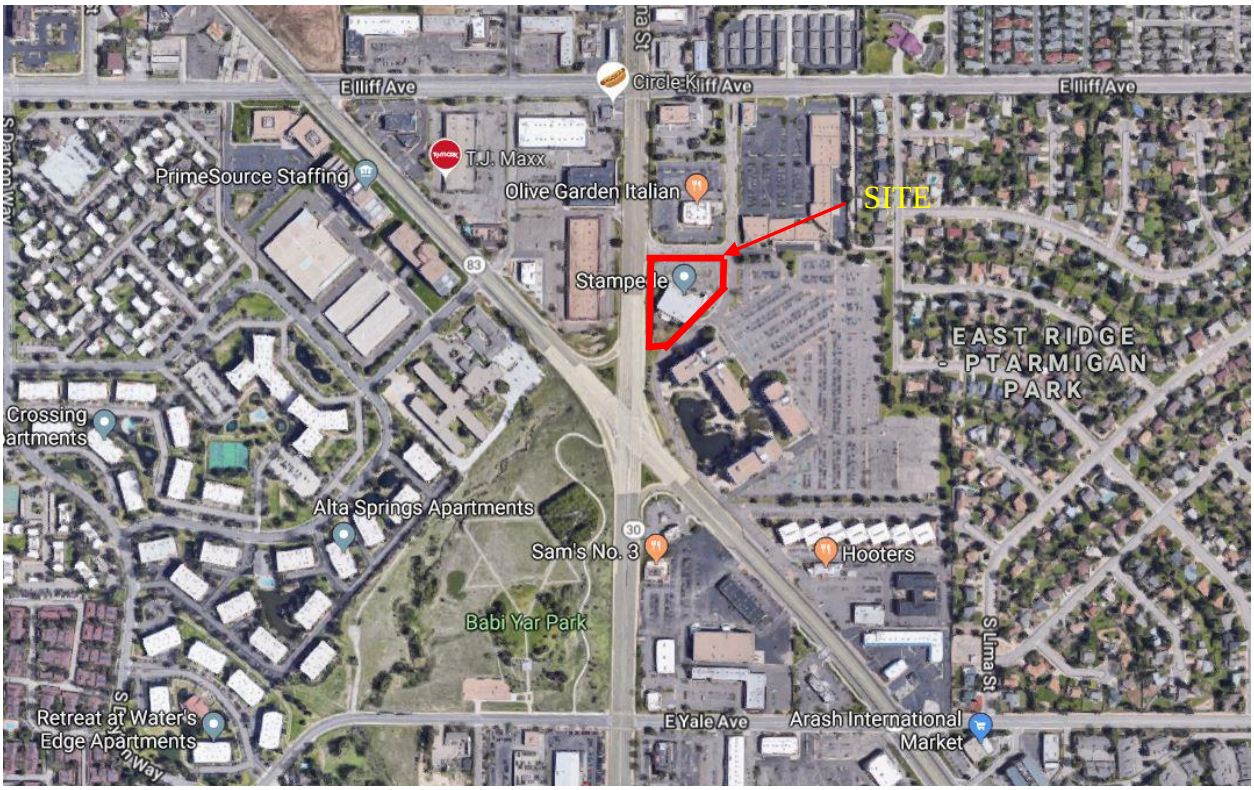
Denver, CO 80216
C: 720.427.3017
E: sal@altitudelandco.com

APPENDICIES

Appendix A

Vicinity Map



Also include:
NRCS Soil map with site delineated
FEMA FIRM with site delineated
Please make sure to rotate any sheet right side up.

ADDED

Appendix B

Drainage Plan

Please separate out this sheet from the report and submit separately from the report as its own individual sheet sized to 24x36 or 22x34

ADDRESSED: PRELIMINARY DRAINAGE PLAN SET CREATED SEPERATELY

Note for Civils:
And Inspection and Maintenance Plan will be required.

Preliminary Drainage Report

ADDRESSED

PARK SUBDIVISION FILING #1

LOCATED IN THE SOUTHEAST 1/4 OF SECTION 26, TOWNSHIP 04 SOUTH, RANGE 67 WEST OF THE 6TH P.M.
2430 SOUTH HAVANA STREET, CITY OF AURORA, COUNTY OF ARAPAHOE, STATE OF COLORADO.
~~MINOR SITE PLAN AMENDMENT~~

Show existing and proposed drainage basins in a map. Existing basins can be in the report on a sheet sized to 11x17. Proposed maps should be removed from the report and submitted as a separate document

ADDRESSED

DATE:
REVISIONS:
~~MINOR SITE PLAN AMENDMENT~~

Please refrain from using this space for internal and pre-approval revisions and submissions. This space should be reserved for revisions to approved plans.

Extend contours 50' beyond property and drainage basins or more to clearly show drainage patterns per 2.08.1.02 and SDDTC 2.22

ADDRESSED

ADDRESSED

Check page scale, measurements here taken at 20 scale

Per SDDTC 2.34 show drainage flow arrows around the site. General slope arrows are also needed on the plan and can be included with the flow arrows for convenience

Include a table in the drainage plan summarize basin, DPs, routed, and unrouted flows, percent impervious. C values and acreage of each basin should be displayed in basin drainage bubbles.

DRAINAGE PLAN WITH SUMMARY TABLE ADDED

Please add the following note to the cover sheet and all sheets showing a permanent Detention Pond per SDDTC 3.63: "The developer shall have a licensed Professional Engineer certify each stormwater detention pond and/or water quality BMP is built according to the approved plans and specifications and the required detention volume, including the WQCV when used, is met. The certification shall also [illegible]ent dimensions, elevations, required [illegible]lates for detention and WQCV and [illegible]t BMPs requirements are installed per the approved plans and specifications, and shall show the as-built design volumes (WQCV, 10- year, 100 year, EURV) and other pertinent dimensions, elevations and capacity requirements associated with the WQ BMP used. The certification shall be provided to the City of Aurora Engineering Control Section Principal Engineer. An approved pond certificate shall be required prior to the return of any Fiscal Security Deposit (as well as satisfying other conditions of the Stormwater permit) for sites that do not require a certificate of occupancy. Examples of these sites include but are not limited to: sites without vertical construction, oil and gas well pads, outdoor storage, and tow yards. An approved pond certificate shall be required prior to commencement of business operations. In no case shall a Certificate of Occupancy or Temporary Certificate of Occupancy be issued without an approved pond certificate."

ADDED TO COVER

Minimum 0.5% for concrete, 2% for other impervious, 5% for pervious for first 10 ft away from building per 2.08.1.06 and 2.08.1.06.2

ADDRESSED

Can curb be extended or some other way of conveyance be provided to direct flows to pond rather than releasing them at the foot of a staircase?

ADDRESSED

Add FFE

ADDRESSED

Ensure contours agree/tie in

ADDRESSED

Label material type of wall. Note that cast in place walls of any height will require structural calculation.

ADDRESSED

Label storm information
Label private

ADDRESSED

Per 2.11.1.09 and 2.03.5.07.1, please use COA complete benchmark description and ID found on Aurora Survey Control map page: https://auroraco.maps.arcgis.com/apps/webappviewer/index.html?id=72f79202572d45cbb2709c801b4a7ad0

ADDRESSED

REDESIGNED TO INCLUDE WQ

See notes in above pages. Appears this pond outlet will need to be redesigned to include WQ

Per SDDTC 2.34.G:
Show ponding limits, label 100yr+1.2WQCV (or 0.5EURV) WSEL
Show emergency weir location and overflow direction
Per SDDTC 6.39:
Show pond bottom slopes, 2% min
Show pond side slopes 4:1 max
Show access ramp to bottom of pond, top of outlet structure, emergency overflow weir. 10% max slope, 8 ft minimum width with 2ft recovery sections on either side.

Provide a drainage easement around the pond limits and all its features. Drainage easement shall connect to ROW through an other drainage easement or an access easement. This is required prior to Civil Plan approval.

FFEs need to be determined per SDDTC 2.34.B

ADDRESSED

Include the following notes:
"General Conformance note" per SDDTC 2.34.K
"Storm infrastructure is private and sized for the XXX yr storm unless otherwise noted.

ADDRESSED

"Preliminary Drainage Report

ADDRESSED

4.03 ft

9.23 ft

2430 SOUTH HAVANA ST.
ADDITION TO EXISTING STRUCTURE

PROPOSED MODIFICATIONS TO THE DETENTION POND
VOLUME : 37,815 CU. FT.
TOP OF POND: 5563.00
BOTTOM OF POND: 5557.00
RELEASE RATE: 8.8 CFS

GRADING PLAN NOTES:
1. BENCHMARK: TOP OF A FOUND 1.5" DIAMETER ALUMINUM CAP, NO. ILLEGIBLE, AT THE NORTHWEST PROPERTY CORNER, ELEVATION = 5571.02, NAVD 88 DATUM.
2. ALL FINISHED FLOOR ELEVATIONS HAVE BEEN ASSUMED.

FOUNDATION DETAIL

TOC
6" MIN
4" MIN
- MINIMUM 4" CLEARANCE FROM BOTTOM OF BUILDING FACE TO EXISTING GRADE AGAINST FOUNDATION
OR
- MINIMUM 6" CLEARANCE FROM TOP OF FOUNDATION TO EXISTING GRADE AGAINST FOUNDATION

ABBREVIATION LEGEND

FG: FINISHED GRADE
EG: EXISTING GRADE
FL: FLOW LINE
TC: TOP OF CURB
BC: BOTTOM OF CURB
BS: BOTTOM OF STEP
TS: TOP OF STEP
GB: GRADE BREAK
GS: GROUND SHOT
TW: TOP OF WALL
BW: BOTTOM OF WALL
DS: DOWNSPOUT
FFE: FINISHED FLOOR ELEVATION
HP: HIGH POINT

LEGEND:

PROPERTY LINE
ADJACENT PROPERTY LINE
LIMIT OF CONSTRUCTION
ADA ROUTE
PROPOSED CONCRETE
EXISTING CONCRETE
PROPOSED WOOD
PROPOSED WOOD
PROPOSED ASPHALT
5280' SPOT ELEVATION

ALL PLANAMETRIC LINEWORK THAT IS FADED BACK SHOWN HEREIN INDICATES AN EXISTING FEATURE (IMPROVEMENT, TOPOGRAPHY, UTILITY, ETC.). ALL PLANIMETRIC TEXT THAT IS FADED BACK AND ITALICIZED SHOWN HEREIN INDICATES A CALLOUT TO AN EXISTING FEATURE.

(IN FEET)
1 inch = 20 ft.

DRAWN BY: ACJ
CHECKED BY: SCC
DATE: 06-24-20
EG #
AD FILE:
R:

MINOR SITE PLAN AMENDMENT

Drainage PLAN

CD5.0

"Sheet 1"

Appendix C
Detention Calculation

Volume Calculations Average End Method

Top Area = 9,600 SF
Bottom Area = 3,007 SF

$$V = \frac{(Top\ Area + Bottom\ Area)}{2} * Height$$

$$V = \frac{(9{,}600 + 3{,}007)}{2} * (63.00 - 57.00)$$

$$V = 37{,}821\ Cu.Ft.$$

Utilize COA Eq. 6.3 and reference in calcs.

ADDRESSED

d) Pond volume shall be calculated using the prismoidal formula:

$$V = \frac{(A1 + A2 + \sqrt{A1xA2}\,)Depth}{3} \qquad (6.3)$$

FIGURE II

Utilize COA SDDTC Table 1
It has similar values as the one listed below and typically they are actually lower than what the provided table is showing. The exception being the lawn values for the smaller storms

ADDRESSED

TABLE 3-1 (42)

FF COEFFICIENTS FOR RATIONAL METHOD

SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	FREQUENCY 2	5	10	100
Business:					
Commercial Areas	95	.87	.88	.90	.93
Neighborhood Areas	65	.60	.65	.70	.80
Residential:					
Single-Family	40	.40	.45	50	70

RUNOFF COEFFICIENTS AND PERCENTS IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	FREQUENCY 2	5	10	100
Streets:					
Paved	100	.87	.88	.90	.93
Gravel	40	.15	.25	.35	.65
Concrete Drive and Walks	96	.87	.87	.88	.89
Roofs	90	.80	.85	.90	.90
Lawns, Sandy Soil (A and B Soils):	2				
2% Slope		.05	.06	.08	.10
2-7% Slope		.10	.11	.13	.15
>7% Slope		.15	.16	.18	.20
Lawns, Clay Soil (C and D Soils):	5				
2% Slope		.13	.14	.15	.17
2-7% Slope		.18	.19	.20	.22
>7% Slope		.25	.27	.30	.35

Streets:					
Paved	100	.87	.88	.90	.93
Gravel	7	.15	.25	.35	.65
Drive and Walks:	96	.85	.87	.90	.92
Roofs:	90	.80	.85	.90	.90
Lawns, Sandy Soil	0	.00	.05	.15	.45
Lawns, Clayey Soil	0	.05	.15	.25	.60

NOTE: These Rational Formula coefficients may not be valid for larger basins where the time-of-concentration exceeds 40 minutes.

Include highlights or other denotations showing which values were used for easier reference.