



AMERICAN CIVIL ENGINEERING CO.
207 N. MOSS ROAD, SUITE 211 · WINTER SPRINGS, FLORIDA 32708
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March 4, 2016

**CUBESMART
@ HANCOCK ROAD
LAKE COUNTY, FLORIDA**

STORMWATER MANAGEMENT REPORT

PREPARED FOR:

CLERMONT STORAGE CENTER, LLC
1041 CROWN PARK CR.
WINDER GARDEN, FL 34786

PREPARED BY:

AMERICAN CIVIL ENGINEERING COMPANY
207 N. MOSS ROAD, SUITE 211
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PRE VS POST ANALYSIS

PRE VS. POST ANALYSIS

<u>EVENT</u>	<u>Q(PRE)</u>	<u>Q(POST)</u>
25 YR/24 HR SCSIIMOD	10.61 CFS	10.15 CFS

$$\text{PRO-RATA SHARE} = (9.33 \text{ AC} / 9.99 \text{ AC}) \times 11.36 \text{ CFS} = 10.61 \text{ CFS}$$

DRAWDOWN TIME FOR WATER QUALITY VOLUME:
<72 HOURS

**PROJECT
NARRATIVE**

PROJECT NARRATIVE

PROJECT DESCRIPTION:

DEVELOP A 5.74 ACRE VACANT COMMERCIAL PARCEL LOCATED ON THE EAST SIDE OF HANCOCK ROAD APPROXIMATE ONE MILE SOUTH WEST COLONIAL DRIVE (SR 50) IN LAKE COUNTY, FLORIDA. THE DEVELOPMENT WILL CONSIST OF SUBDIVIDING THE PARCEL INTO THREE LOTS WITH OFFSITE DRY RETENTION AREAS THAT WILL BE RELOCATED WHEN THE FUTURE DEVELOPMENT TO THE EAST IS CONSTRUCTED. AND MASTER RETENTION SYSTEM. PHASE I WILL INCLUDE CONSTRUCTING THE LOT 1 IMPROVEMENTS AND EXTEND UTILITIES TO SERVE THE LOTS.

EXISTING CONDITIONS:

THE SITE DRAINS TO THE NORTH.

POSITIVE OUTFALL:

THE SITE RETENTION AREAS WILL OVERFLOW TO THE NORTH TO A LANDLOCKED BASIN.

METHODOLOGY:

THE SYSTEM WILL BE DESIGNED TO CONTAIN TWO DRY RETENTION AREAS AND ONE EXFILTRATION SYSTEM.

DRAWDOWN:

THE DRAWDOWN OF THE RETENTION SYSTEM WILL BE THROUGH NATURAL INFILTRATION.

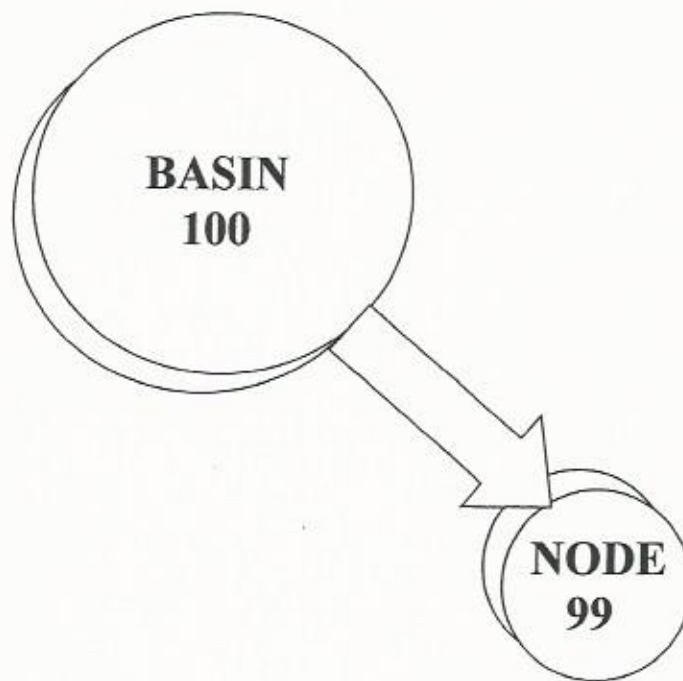
CONCLUSIONS:

THE RETENTION POND IS DESIGNED TO CONFORM TO THE LAKE COUNTY AND SJRWMD PERMIT REQUIREMENTS.

**PRE DEVELOPMENT
BASIN DATA**

PROJECT: CUBESMART @ HANCOCK ROAD
LAKE COUNTY, FLORIDA

PRE-DEVELOPED HYD. SCHEMATIC:



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PROJECT: CUBESMART @ HANCOCK ROAD
LAKE COUNTY, FLORIDA

PRE-DEVELOPED ANALYSIS:

HYDROGRAPH DATA:

BASIN NO. 100

TOTAL AREA (AC) ONSITE = 5.74 AC 9.99 ACRES
 OFFSITE = 4.25 AC

PERVIOUS AREA (AC) 9.99 ACRES

IMPERVIOUS AREA (AC) 0.00 ACRES

WATER SURFACE AREA (AC) 0.00 ACRE

SCS SOIL TYPE PASTURE-GOOD

PERVIOUS CN 39

IMPERVIOUS CN 98

WATER SURFACE CN 100

COMPOSITE CN 39

TIME OF CONCENTRATION: 31.8 MINUTES

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PROJECT: **CUBESMART @ HANCOCK ROAD**
LAKE COUNTY, FLORIDA

PRE-DEVELOPED TIME OF CONCENTRATION COMPUTATIONS:
BASED ON SOIL CONSERVATION SERVICE (SCS) TECHNICAL RELEASE 55 (TR-55)

BASIN NUMBER: **100**

1. **OVERLAND FLOW:** $T_1 = [0.007 (nL)^{0.8}] / (P)^{0.5}(s)^{0.4}$

n = MANNING'S ROUGHNESS **0.40**
L = FLOW LENGTH (ft) **300**
P = 4.75 INCHES
S = SLOPE OF HYD. GR. (ft/ft) **0.045**
T₁ = TRAVEL TIME (hr) **0.51 HOUR**

2. **CONCENTRATED FLOW:** $T_2 = L/V$

L = FLOW LENGTH (ft) **255**
V = VELOCITY BASED ON TR55 **4.6 FT/S**
T₂ = TRAVEL TIME (hr) **0.02 HOUR**

3. **PIPE FLOW:** $T_3 = L/V$

L = FLOW LENGTH (ft)
V = VEL. IN PIPE, ASSUME 4.0 ft/s
T₃ = TRAVEL TIME (hr) **0.0 HOUR**

4. **TOTAL TIME OF CONCENTRATION:**

$$T_c = T_1 + T_2 + T_3$$

$$T_c = 0.51 + 0.02 + 0.0 = \mathbf{0.53 \text{ HOUR}}$$

31.8 MIN.

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**PRE DEVELOPMENT
HYDROGRAPHS**

CUBESMART @ HANCOCK RD
PRE DEVELOPMENT

BASIN SUMMARY

Basin Name: 100
Group Name: BASE
Node Name: 99
Basin Type: Santa Barbara

Spec Time Inc (min): 5.00
Comp Time Inc (min): 5.00
Rainfall File: Sjrwnd96
Rainfall Amount (in): 11.500
Storm Duration (hrs): 96.00
Status: Onsite
Time of Conc (min): 31.20
Time Shift (hrs): 0.00
Area (ac): 9.990
Curve Number: 39.000
DCIA (%): 0.000

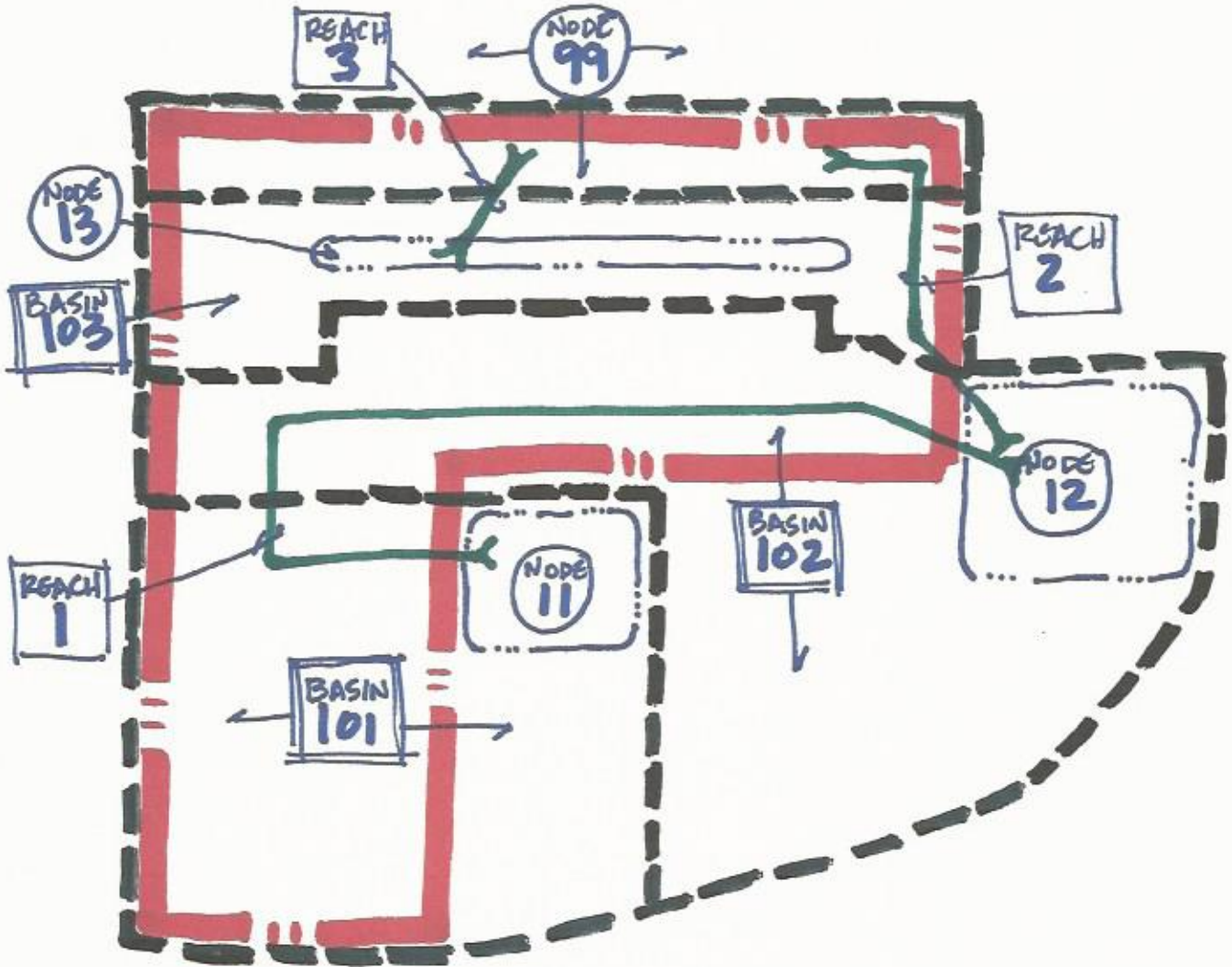
Time Max (hrs): 60.00
Flow Max (cfs): 11.359
Runoff Volume (in): 2.919
Runoff Volume (ft3): 105843.947

**POST DEVELOPMENT
BASIN DATA**

PROJECT: CUBESMART @ HANCOCK ROAD
LAKE COUNTY, FLORIDA

POST DEVELOPMENT ANALYSIS

POST-DEVELOPED HYD. SCHEMATIC:



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PROJECT: CUBESMART @ HANCOCK ROAD
 LAKE COUNTY, FLORIDA

POST-DEVELOPED ANALYSIS:

HYDROGRAPH DATA:

BASIN NO. **101**

TOTAL AREA (AC) ONSITE = 2.27 AC **3.79 ACRES**
 OFFSITE = 1.52 AC

PERVIOUS AREA (AC) **1.97 ACRES**

IMPERVIOUS AREA (AC) **1.82 ACRES**

WATER SURFACE AREA (AC) **0.00 ACRE**

SCS SOIL TYPE PASTURE-GOOD **HYD. GRP. A**

PERVIOUS CN **39**

IMPERVIOUS CN **98**

WATER SURFACE CN **100**

COMPOSITE CN $[(1.97)(39) + (1.82)(98)] / [3.79] =$ **67.3**

TIME OF CONCENTRATION: **15.0** MINUTES

PROJECT: CUBESMART @ HANCOCK ROAD
LAKE COUNTY, FLORIDA

POST-DEVELOPMENT ANALYSIS

SPECIFIC DESIGN CRITERIA:

DRY RETENTION AREA

FIRST 1.0" OF RUNOFF OR
1.25" X IMP. AREA + 0.5" (AREA)

WATER QUALITY VOLUME:

$$V_1 = (1.0'')(3.79 \text{ ACRE})/(12'' \text{ FT}) = \underline{\underline{0.316 \text{ AC-FT}}}$$

$$V_2 = \\ [(1.25'')(1.82 \text{ ACRE})+(0.50'')(3.79 \text{ ACRE})]/(12'') \\ = \underline{\underline{0.348 \text{ AC-FT}}}$$

REQUIRED WATER QUALITY VOLUME:

0.348 AC-FT

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PROJECT: CUBESMART @ HANCOCK ROAD
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POST-DEVELOPMENT ANALYSIS

STAGE/STORAGE DATA:

NODE 11

STAGE (ELEV)	AREA (ACRE)	AVE. AREA (ACRE)	DEPTH (FEET)	INCREM. VOLUME (AC-FT)	ACCUM. VOLUME (AC-FT)
172.00	0.040	-	-	-	-
173.00	0.064	0.052	1.00	0.052	0.052
174.00	0.096	0.080	1.00	0.080	0.132
175.00	0.132	0.114	1.00	0.114	0.246
176.00	0.171	0.152	1.00	0.152	0.398
177.00	0.233	0.202	1.00	0.202	0.600
178.00	0.322	0.278	1.00	0.278	0.877

$$\frac{(176.00 - X)}{(176.00 - 119.00)} = \frac{(0.330 - 0.348)}{(0.330 - 0.150)} \quad X = 119.60 \text{ (MIN)}$$

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POST-DEVELOPED ANALYSIS:

HYDROGRAPH DATA:

BASIN NO. 102

TOTAL AREA (AC)	ONSITE = 2.08 AC	<u>4.82 ACRES</u>
	OFFSITE = 2.72 AC	
PERVIOUS AREA (AC)		<u>2.67 ACRES</u>
IMPERVIOUS AREA (AC)		<u>2.15 ACRES</u>
WATER SURFACE AREA (AC)		<u>0.00 ACRE</u>

SCS SOIL TYPE	PASTURE-GOOD	<u>HYD. GRP. A</u>
PERVIOUS CN		<u>39</u>
IMPERVIOUS CN		<u>98</u>
WATER SURFACE CN		<u>100</u>
COMPOSITE CN	$[(2.67)(39) + (2.15)(98)] / [4.82] =$	<u>65.3</u>

TIME OF CONCENTRATION: 15.0 MINUTES

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POST-DEVELOPMENT ANALYSIS

SPECIFIC DESIGN CRITERIA:

DRY RETENTION AREA

FIRST 1.0" OF RUNOFF OR
1.25" X IMP. AREA + 0.5" (AREA)

WATER QUALITY VOLUME:

$$V_1 = (1.0'')(4.82 \text{ ACRE})/(12'' \text{ FT}) = \underline{\underline{0.402 \text{ AC-FT}}}$$

$$V_2 = \\ [(1.25'')(2.15 \text{ ACRE})+(0.50'')(4.82 \text{ ACRE})]/(12'') \\ = \underline{\underline{0.425 \text{ AC-FT}}}$$

REQUIRED WATER QUALITY VOLUME:

$$\underline{\underline{0.425 \text{ AC-FT}}}$$

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LAKE COUNTY, FLORIDA

POST-DEVELOPMENT ANALYSIS

STAGE/STORAGE DATA:

NODE 12

STAGE (ELEV)	AREA (ACRE)	AVE. AREA (ACRE)	DEPTH (FEET)	INCREM. VOLUME (AC-FT)	ACCUM. VOLUME (AC-FT)
168.00	0.156	-	-	-	-
169.00	0.189	0.173	1.00	0.173	0.173
170.00	0.225	0.207	1.00	0.207	0.380
171.00	0.263	0.244	1.00	0.244	0.624
172.00	0.305	0.284	1.00	0.284	0.908
173.00	0.396	0.351	1.00	0.351	1.258
174.00	0.556	0.476	1.00	0.476	1.734
175.00	2.850	1.703	1.00	1.703	3.437

$$\frac{(171.00 - X)}{(171.00 - 170.00)} = \frac{(0.624 - 0.425)}{(0.624 - 0.380)} \quad X = 170.20 \text{ (MIN)}$$

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PROJECT: CUBESMART @ HANCOCK ROAD
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POST-DEVELOPED ANALYSIS:

HYDROGRAPH DATA:

BASIN NO. 103

TOTAL AREA (AC)	<u>0.72 ACRES</u>
PERVIOUS AREA (AC)	<u>0.14 ACRES</u>
IMPERVIOUS AREA (AC)	<u>0.58 ACRES</u>
WATER SURFACE AREA (AC)	<u>0.00 ACRE</u>

SCS SOIL TYPE	PASTURE-GOOD	<u>HYD. GRP. A</u>
PERVIOUS CN		<u>39</u>
IMPERVIOUS CN		<u>98</u>
WATER SURFACE CN		<u>100</u>
COMPOSITE CN	$[(0.14)(39) + (0.58)(98)] / [0.72] =$	<u>86.5</u>

TIME OF CONCENTRATION: 10.0 MINUTES

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POST-DEVELOPMENT ANALYSIS

SPECIFIC DESIGN CRITERIA:

DRY RETENTION AREA

FIRST 1.0" OF RUNOFF OR
1.25" X IMP. AREA + 0.5" (AREA)

WATER QUALITY VOLUME:

$$V_1 = (1.0'')(0.72 \text{ ACRE})/(12'' \text{ FT}) = \underline{\underline{0.060 \text{ AC-FT}}}$$

$$V_2 = \\ [(1.25'')(0.58 \text{ ACRE})+(0.50'')(0.72 \text{ ACRE})]/(12'') \\ = \underline{\underline{0.090 \text{ AC-FT}}}$$

REQUIRED WATER QUALITY VOLUME:

0.090 AC-FT

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PROJECT: **CUBESMART @ HANCOCK ROAD**
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POST-DEVELOPMENT ANALYSIS

STAGE/STORAGE DATA:

NODE **13**

STAGE (ELEV)	AREA (ACRE)	AVE. AREA (ACRE)	DEPTH (FEET)	INCREM. VOLUME (AC-FT)	ACCUM. VOLUME (AC-FT)
155.85	0.060	-	-	-	-
156.85	0.060	0.060	1.00	0.060	0.060
157.85	0.060	0.060	1.00	0.060	0.120
158.85	0.060	0.060	1.00	0.060	0.180
159.85	0.060	0.060	1.00	0.060	0.240
160.85	0.060	0.060	1.00	0.060	0.300

$$\frac{(157.85 - X)}{(157.85 - 156.85)} = \frac{(0.120 - 0.090)}{(0.120 - 0.060)} \quad X = 157.35 \text{ (MIN)}$$

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CUBESMART @ HANCOCK ROAD
POST DEVELOPMENT

INPUT SUMMARY

Basins

Name: 101	Node: 11	Status: Onsite
Group: BASE	Type: Santa Barbara	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.500	Time of Conc(min): 15.00	
Area(ac): 3.790	Time Shift(hrs): 0.00	
Curve Number: 67.30	Time Increment(min): 5.00	
DCIA(%): 0.00	Max Allowable Q(cfs): 99999.000	

Name: 102	Node: 12	Status: Onsite
Group: BASE	Type: Santa Barbara	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.500	Time of Conc(min): 15.00	
Area(ac): 4.820	Time Shift(hrs): 0.00	
Curve Number: 65.30	Time Increment(min): 5.00	
DCIA(%): 0.00	Max Allowable Q(cfs): 999999.000	

Name: 103	Node: 13	Status: Onsite
Group: BASE	Type: Santa Barbara	
Rainfall File: Sjrwm96	Storm Duration(hrs): 96.00	
Rainfall Amount(in): 11.500	Time of Conc(min): 10.00	
Area(ac): 0.720	Time Shift(hrs): 0.00	
Curve Number: 86.50	Time Increment(min): 5.00	
DCIA(%): 0.00	Max Allowable Q(cfs): 999999.000	

Nodes

Name: 11	Base Flow(cfs): 0.000	Init Stage(ft): 172.000
Group: BASE		Warn Stage(ft): 178.000
Type: Stage/Area		

Stage(ft)	Area(ac)
172.000	0.0400
173.000	0.0640
174.000	0.0960

CUBESMART @ HANCOCK ROAD
POST DEVELOPMENT

INPUT SUMMARY

175.000	0.1320
176.000	0.1710
177.000	0.2330
178.000	0.3220

Name: 12	Base Flow(cfs): 0.000	Init Stage(ft): 168.000
Group: BASE		Warn Stage(ft): 175.000
Type: Stage/Area		

Stage (ft)	Area (ac)
168.000	0.1560
169.000	0.1890
170.000	0.2250
171.000	0.2630
172.000	0.3050
173.000	0.3960
174.000	0.5560
175.000	2.8500

Name: 13	Base Flow(cfs): 0.000	Init Stage(ft): 155.850
Group: BASE		Warn Stage(ft): 163.850
Type: Stage/Area		

Stage (ft)	Area (ac)
155.850	0.0600
156.850	0.0600
157.850	0.0600
158.850	0.0600
159.850	0.0600
160.850	0.0600
161.000	0.0010
163.850	0.0010

Name: 99	Base Flow(cfs): 0.000	Init Stage(ft): 154.930
Group: BASE		Warn Stage(ft): 157.000
Type: Time/Stage		

Time (hrs)	Stage (ft)
0.00	154.930
96.00	157.000

==== Weirs =====

CUBESMART @ HANCOCK ROAD
POST DEVELOPMENT

INPUT SUMMARY

Name: 1 From Node: 11
Group: BASE To Node: 12
Flow: Both Count: 1
Type: Vertical: Mavis Geometry: Rectangular

Span(in): 12.00
Rise(in): 24.00
Invert(ft): 176.000
Control Elevation(ft): 176.000

TABLE

Bottom Clip(in): 0.000
Top Clip(in): 0.000
Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600

Name: 2 From Node: 12
Group: BASE To Node: 99
Flow: Both Count: 1
Type: Vertical: Mavis Geometry: Rectangular

Span(in): 12.00
Rise(in): 24.00
Invert(ft): 172.000
Control Elevation(ft): 172.000

TABLE

Bottom Clip(in): 0.000
Top Clip(in): 0.000
Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600

Name: 3 From Node: 13
Group: BASE To Node: 99
Flow: Both Count: 1
Type: Vertical: Mavis Geometry: Rectangular

Span(in): 12.00
Rise(in): 42.00
Invert(ft): 159.850
Control Elevation(ft): 159.850

TABLE

Bottom Clip(in): 0.000
Top Clip(in): 0.000
Weir Discharge Coef: 3.200
Orifice Discharge Coef: 0.600

CUBESMART @ HANCOCK ROAD
POST DEVELOPMENT

INPUT SUMMARY

==== Hydrology Simulations =====

Name: POST 25 YR-96 H
Filename: C:\Program Files\Icpr3\examples\2015\15130\POST 25 YR-96 H.R32

Override Defaults: Yes
Storm Duration(hrs): 96.00
Rainfall File: Sjrwnd96
Rainfall Amount(in): 11.50

Time(hrs)	Print Inc(min)
96.000	5.00

==== Routing Simulations =====

Name: POST 25 YR-96 H Hydrology Sim: POST 25 YR-96 H
Filename: C:\Program Files\Icpr3\examples\2015\15130\POST 25 YR-96 H.I32

Execute: Yes Restart: No Patch: No
Alternative: No

Max Delta Z(ft): 1.00	Delta Z Factor: 0.00500
Time Step Optimizer: 10.000	
Start Time(hrs): 0.000	End Time(hrs): 96.00
Min Calc Time(sec): 0.5000	Max Calc Time(sec): 60.0000
Boundary Stages:	Boundary Flows:

Time(hrs)	Print Inc(min)
96.000	15.000

Group	Run
BASE	Yes

==== Boundary Conditions =====

**POST DEVELOPMENT
HYDROGRAPHS &
ROUTINGS**

CUBESMART @ HANCOCK ROAD
POST DEVELOPMENT

ROUTING SUMMARY

Name	Simulation	Max Stage ft	Warning Stage ft	Max Delta Stage ft	Max Surf Area ft2	Max Inflow cfs	Max Outflow cfs
11POST	25 YR-96 H	177.867	178.000	0.0050	13512	15.388	8.166
12POST	25 YR-96 H	174.033	175.000	0.0050	27496	24.742	9.242
13POST	25 YR-96 H	160.732	163.850	0.0050	2614	4.013	2.652
99POST	25 YR-96 H	157.000	157.000	0.0004	0	10.152	0.000

CUBESMART @ HANCOCK ROAD
POST DEVELOPMENT

BASIN SUMMARY

Basin Name: 101
Group Name: BASE
Node Name: 11
Basin Type: Santa Barbara

Spec Time Inc (min): 5.00
Comp Time Inc (min): 5.00
Rainfall File: Sjrwm96
Rainfall Amount (in): 11.500
Storm Duration (hrs): 96.00
Status: Onsite
Time of Conc (min): 15.00
Time Shift (hrs): 0.00
Area (ac): 3.790
Curve Number: 67.300
DCIA (%): 0.000

Time Max (hrs): 59.92
Flow Max (cfs): 15.389
Runoff Volume (in): 7.204
Runoff Volume (ft3): 99106.165

Basin Name: 102
Group Name: BASE
Node Name: 12
Basin Type: Santa Barbara

Spec Time Inc (min): 5.00
Comp Time Inc (min): 5.00
Rainfall File: Sjrwm96
Rainfall Amount (in): 11.500
Storm Duration (hrs): 96.00
Status: Onsite
Time of Conc (min): 15.00
Time Shift (hrs): 0.00
Area (ac): 4.820
Curve Number: 65.300
DCIA (%): 0.000

Time Max (hrs): 59.92
Flow Max (cfs): 18.900
Runoff Volume (in): 6.916
Runoff Volume (ft3): 121007.000

CUBESMART @ HANCOCK ROAD
POST DEVELOPMENT

BASIN SUMMARY

Basin Name: 103
Group Name: BASE
Node Name: 13
Basin Type: Santa Barbara

Spec Time Inc (min): 5.00
Comp Time Inc (min): 5.00
Rainfall File: Sjrwnd96
Rainfall Amount (in): 11.500
Storm Duration (hrs): 96.00
Status: Onsite
Time of Conc (min): 10.00
Time Shift (hrs): 0.00
Area (ac): 0.720
Curve Number: 86.500
DCIA (%): 0.000

Time Max (hrs): 59.92
Flow Max (cfs): 4.013
Runoff Volume (in): 9.818
Runoff Volume (ft3): 25660.920

DRAWDOWN ANALYSIS

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : CubeSmart @ Hancock - Node 11
MANUAL RUNOFF DATA USED
UNSATURATED ANALYSIS EXCLUDED

Pond Bottom Area	1,742.00 ft ²
Pond Volume between Bottom & DHWL	36,671.00 ft ³
Pond Length to Width Ratio (L/W)	2.00
Elevation of Effective Aquifer Base	165.50 ft
Elevation of Seasonal High Groundwater Table	168.50 ft
Elevation of Starting Water Level	172.00 ft
Elevation of Pond Bottom	172.00 ft
Is there overflow ?	Y
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.30
Unsaturated Vertical Hydraulic Conductivity	15.00 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	30.00 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.30
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00

Hydraulic Control Features:

Groundwater Control Features - Y/N

Distance to Edge of Pond

Elevation of Water Level

	Top	Bottom	Left	Right
N	N	N	N	N
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

Impervious Barrier - Y/N

Elevation of Barrier Bottom

	Top	Bottom	Left	Right
N	N	N	N	N
0.00	0.00	0.00	0.00	0.00

MODRET

TIME - RUNOFF INPUT DATA

PROJECT NAME: CUBESMART @ HANCOCK - NODE 11

STRESS PERIOD NUMBER	INCREMENT OF TIME (hrs)	VOLUME OF RUNOFF (ft ³)
Unsat	0.00	0.00
1	1.00	15,159.00
2	3.00	0.00
3	4.00	0.00
4	4.00	0.00
5	4.00	0.00
6	4.00	0.00
7	4.00	0.00
8	24.00	0.00
9	24.00	0.00
10	24.00	0.00
11	24.00	0.00
12	24.00	0.00
13	24.00	0.00
14	24.00	0.00
15	24.00	0.00
16	24.00	0.00
17	24.00	0.00

MODRET

ELEVATION VS OVERFLOW RELATIONSHIP

PROJECT NAME : CubeSmart @ Hancock - Node 11
Structure Type: BROAD CRESTED

Crest Elevation	176.00 ft
Crest Length	1.00 ft
Coefficient of Discharge	3.31
Weir Flow Exponent	1.50
Number of Contractions	1.00
Design High Water Level Elevation	177.87 ft

MODRET

SUMMARY OF RESULTS

PROJECT NAME : CubeSmart @ Hancock - Node 11

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft ³)
00.00 - 0.00	168.500	0.000 *		
			0.00000	
0.00	168.500	0.28810		
			0.27972	
1.00	174.265	0.27135		0.00
			0.24622	
4.00	173.840	0.21715		0.00
			0.17839	
8.00	173.428	0.15451		0.00
			0.13063	
12.00	173.127	0.11594		0.00
			0.10124	
16.00	172.894	0.09178		0.00
			0.08232	
20.00	172.704	0.07599		0.00
			0.06965	
24.00	172.544	0.06562		0.00
			0.04142	
46.78	172.000	0.03489		0.00
			0.02837	
72.00	171.578	0.02468		0.00
			0.02099	
96.00	171.288	0.01876		0.00
			0.01654	
120.00	171.060	0.01502		0.00
			0.01350	
144.00	170.873	0.01241		0.00
			0.01133	
168.00	170.716	0.01051		0.00

MODRET

SUMMARY OF RESULTS

PROJECT NAME : CubeSmart @ Hancock - Node 11

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft ³)
			0.00970	
192.00	170.582	0.00906		0.00
			0.00841	
216.00	170.466	0.00792		0.00
			0.00742	
240.00	170.363	0.00701		0.00
			0.00659	
264.00	170.272			0.00

Maximum Water Elevation: 174.265 feet @ 1.00 hours Recovery @ 46.778 hours
* Time increment when there is no runoff
Maximum Infiltration Rate: 3.869 ft/day

Analysis Date: 3/5/2016

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : CubeSmart @ Hancock - Node 12
MANUAL RUNOFF DATA USED
UNSATURATED ANALYSIS EXCLUDED

Pond Bottom Area	6,795.00 ft ²
Pond Volume between Bottom & DHWL	777,589.00 ft ³
Pond Length to Width Ratio (L/W)	2.00
Elevation of Effective Aquifer Base	163.00 ft
Elevation of Seasonal High Groundwater Table	166.00 ft
Elevation of Starting Water Level	168.00 ft
Elevation of Pond Bottom	168.00 ft
Is there overflow ?	Y
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.30
Unsaturated Vertical Hydraulic Conductivity	15.00 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	30.00 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.30
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00

Hydraulic Control Features:

Groundwater Control Features - Y/N

Distance to Edge of Pond
 Elevation of Water Level

	Top	Bottom	Left	Right
N	N	N	N	N
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

Impervious Barrier - Y/N

Elevation of Barrier Bottom

N	N	N	N
0.00	0.00	0.00	0.00

MODRET

TIME - RUNOFF INPUT DATA

PROJECT NAME: CUBESMART @ HANCOCK - NODE 12

STRESS PERIOD NUMBER	INCREMENT OF TIME (hrs)	VOLUME OF RUNOFF (ft ³)
Unsat	0.00	0.00
1	1.00	18,513.00
2	3.00	0.00
3	4.00	0.00
4	4.00	0.00
5	4.00	0.00
6	4.00	0.00
7	4.00	0.00
8	24.00	0.00
9	24.00	0.00
10	24.00	0.00
11	24.00	0.00
12	24.00	0.00
13	24.00	0.00
14	24.00	0.00
15	24.00	0.00
16	24.00	0.00
17	24.00	0.00

MODRET

ELEVATION VS OVERFLOW RELATIONSHIP

PROJECT NAME : CubeSmart @ Hancock - Node 12
Structure Type: BROAD CRESTED

Crest Elevation	172.00 ft
Crest Length	1.00 ft
Coefficient of Discharge	3.31
Weir Flow Exponent	1.50
Number of Contractions	1.00
Design High Water Level Elevation	174.03 ft

MODRET

SUMMARY OF RESULTS

PROJECT NAME : CubeSmart @ Hancock - Node 12

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft ³)
00.00 - 0.00	166.000	0.000 *		
			0.00000	
0.00	166.000	0.09816		
			0.09759	
1.00	168.141	0.09701		0.00
			0.09529	
4.00	168.133	0.09427		0.00
			0.09292	
8.00	168.122	0.09271		0.00
			0.09251	
12.00	168.112	0.09094		0.00
			0.08937	
16.00	168.102	0.09080		0.00
			0.09223	
20.00	168.092	0.09039		0.00
			0.08855	
24.00	168.082	0.08744		0.00
			0.08080	
48.00	168.028	0.07685		0.00
			0.07290	
61.68	168.000	0.06940		0.00
			0.06591	
96.00	167.935	0.06294		0.00
			0.05996	
120.00	167.895	0.05709		0.00
			0.05422	
144.00	167.858	0.05165		0.00
			0.04908	
168.00	167.825	0.04688		0.00

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : CubeSmart @ Hancock - Node 13
MANUAL RUNOFF DATA USED
UNSATURATED ANALYSIS EXCLUDED

Pond Bottom Area	2,614.00 ft ²
Pond Volume between Bottom & DHWL	12,754.00 ft ³
Pond Length to Width Ratio (L/W)	2.00
Elevation of Effective Aquifer Base	147.00 ft
Elevation of Seasonal High Groundwater Table	150.00 ft
Elevation of Starting Water Level	155.85 ft
Elevation of Pond Bottom	155.85 ft
Is there overflow ?	Y
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.30
Unsaturated Vertical Hydraulic Conductivity	15.00 ft/d
Factor of Safety	2.00
Saturated Horizontal Hydraulic Conductivity	30.00 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.30
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00

Hydraulic Control Features:

Groundwater Control Features - Y/N

	Top	Bottom	Left	Right
Distance to Edge of Pond	N	N	N	N
Elevation of Water Level	0.00	0.00	0.00	0.00

Impervious Barrier - Y/N

	Top	Bottom	Left	Right
Elevation of Barrier Bottom	N	N	N	N
	0.00	0.00	0.00	0.00

MODRET

TIME - RUNOFF INPUT DATA

PROJECT NAME: CUBESMART @ HANCOCK - NODE 13

STRESS PERIOD NUMBER	INCREMENT OF TIME (hrs)	VOLUME OF RUNOFF (ft ³)
Unsat	0.00	0.00
1	1.00	3,920.00
2	3.00	0.00
3	4.00	0.00
4	4.00	0.00
5	4.00	0.00
6	4.00	0.00
7	4.00	0.00
8	24.00	0.00
9	24.00	0.00
10	24.00	0.00
11	24.00	0.00
12	24.00	0.00
13	24.00	0.00
14	24.00	0.00
15	24.00	0.00
16	24.00	0.00
17	24.00	0.00

MODRET

ELEVATION VS OVERFLOW RELATIONSHIP

PROJECT NAME : CubeSmart @ Hancock - Node 13
Structure Type: BROAD CRESTED

Crest Elevation	159.85 ft
Crest Length	1.00 ft
Coefficient of Discharge	3.31
Weir Flow Exponent	1.50
Number of Contractions	1.00
Design High Water Level Elevation	160.73 ft

MODRET

SUMMARY OF RESULTS

PROJECT NAME : CubeSmart @ Hancock - Node 13

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft ³)
00.00 - 0.00	150.000	0.000 *		
			0.00000	
0.00	150.000	0.22687		
			0.22687	
1.00	157.037	0.22687		0.00
			0.22687	
4.00	156.100	0.19655		0.00
			0.15613	
5.16	155.850	0.11986		0.00
			0.08359	
12.00	154.779	0.07291		0.00
			0.06224	
16.00	154.436	0.05587		0.00
			0.04949	
20.00	154.164	0.04520		0.00
			0.04090	
24.00	153.938	0.03832		0.00
			0.02286	
48.00	153.183	0.01883		0.00
			0.01481	
72.00	152.693	0.01267		0.00
			0.01053	
96.00	152.345	0.00923		0.00
			0.00793	
120.00	152.083	0.00708		0.00
			0.00623	
144.00	151.877	0.00561		0.00
			0.00498	
168.00	151.712	0.00456		0.00

MODRET

SUMMARY OF RESULTS

PROJECT NAME : CubeSmart @ Hancock - Node 13

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft ³)
			0.00415	
192.00	151.575	0.00383		0.00
			0.00351	
216.00	151.459	0.00326		0.00
			0.00301	
240.00	151.360	0.00282		0.00
			0.00263	
264.00	151.273			0.00

Maximum Water Elevation: 157.037 feet @ 1.00 hours
Recovery @ 5.162 hours
* Time increment when there is no runoff
Maximum Infiltration Rate: 7.500 ft/day

NUTRIENT LOADING ANALYSIS

Cube Smart @ Hancock Road - Site-Specific Pre-/Post- Impaired Water Body Compensation Analysis

Existing Condition	Land Use	Soil Type	Total P Loading (kg/ac-yr)	Basin Acreage (acres)	Inflow Mass Loading (kg/yr)	Treatment System	Inches of Retention Over Basin Area (inches)	Pollutant Removal Efficiency (%)	Outflow Mass Loading (kg/yr)
Basin 1	PSTR	HSG A	0.026	X 9.99	= 0.26				0.26
Basin 2									
Basin 3									
Basin 4									
Basin 5									
Basin 6									
Basin 7									
Basin 8									
Basin 9									
Basin 10									

				<u>9.99</u>	<u>0.26</u>				<u>0.26</u>
Proposed Condition	Land Use	Soil Type	Total P Loading (kg/ac-yr)	Basin Acreage (acres)	Inflow Mass Loading (kg/yr)	Treatment System	Inches of Retention Over Basin Area (inches)	Pollutant Removal Efficiency (%)	Outflow Mass Loading (kg/yr)
Basin 1	HWY 75%	HSG A	1.053	X 5.74	= 6.04				
Basin 2	PSTR	HSG A	0.026	X 4.25	= 0.11	Dry Retention	3.25	97	0.17
Basin 3						Dry Retention	1.00	96	0.00
Basin 4									
Basin 5									
Basin 6									
Basin 7									
Basin 8									
Basin 9									
Basin 10									

9.99 6.15 0.17

