Willamette Engineering, Inc.
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PRELIMINARY STORM WATER REPORT PROPOSED QUAIL SPRING VILLAGE SUBDIVISION

LOCATED AT:

430 TURTLE BAY COURT
SALEM, OREGON 97306

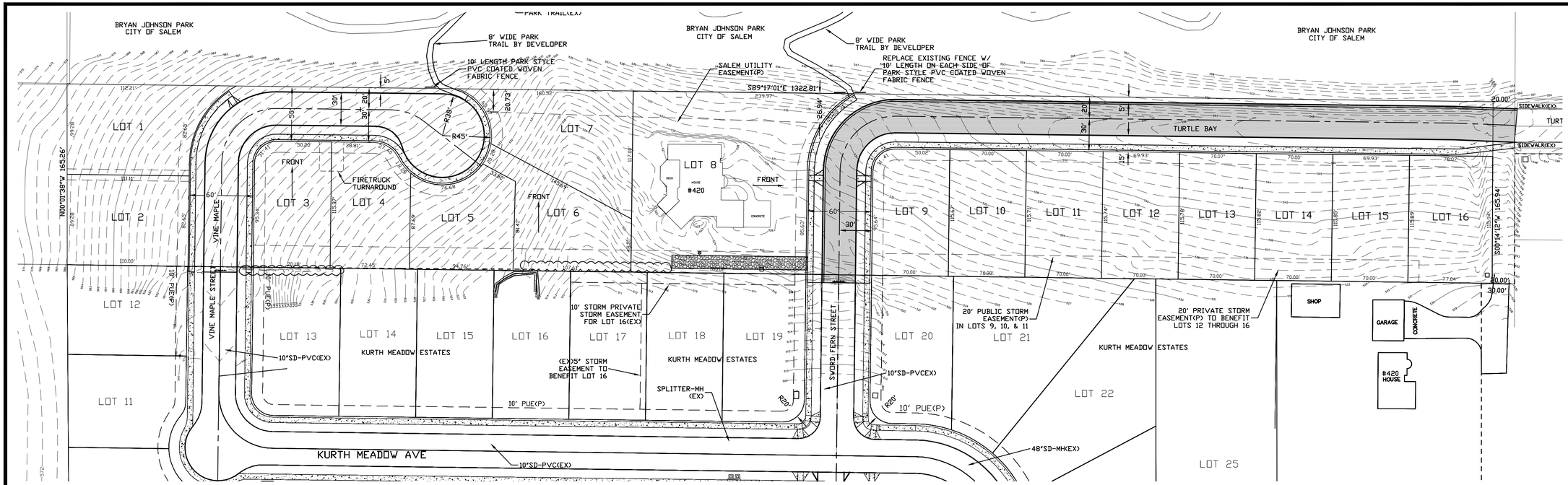
JOB NO. 2020-21
MARCH 11, 2021

PREPARED BY
GERALD P. HORNER, PE


REFERENCE ONLY
SPRING QUAIL VILLAGE
OFFSITE MAP
OFFSITE
TOTAL= 518170 SQ.FT.
148500
314440
450'
630'
525'
450'
360'
360'
645'
MOUNTAIN VISTA AV SE
MILDRED LN SE
LINN HAVEN DR SE
DUNBAR AV SE
SUMMERSIDE ST SE
MIRASOL AV SE
ROLLETTI DR SE
LONE OAK RD SE
PORT STEWART CT SE
CREEKSIDE DR SE
2168 CS-EARTH
2169 CS-EARTH
Legend
Historic Districts
Parcel
Manhole
UnitType
Cleanout
FC Cleanout
Manhole
FC Manhole
WQ Manhole
WQ Tree
WQ Vault
Wier
Main - Active
UnitType
Main
Perforated Pipe
Piped Creek
Piped Detention
UnitType
Ditch
Storage Basin
City Outline
UGB
Creek
N

150 75 0 150 300 450 600 Feet

1 inch = 150 feet



STORM WATER AREAS AND PRE-DEVELOPMENT TRAVEL TIME

SCALE: 1"=50'

SPRING QUAIL VILLAGE
PERVIOUS AND IMPERVIOUS AREAS

TOTAL SITE:	5.02 ACRES(218,881 SQUARE FEET)
EXISTING HOUSE AND APRONS:	4,700 SQUARE FEET
NEW STREETS:	27,750 SQUARE FEET
14 NEW HOUSES: 14 x 2,500 SQ. FEET	35,000 SQUARE FEET
14 NEW DRIVEWAYS: 14 x 30' x 25'	10,500 SQUARE FEET
14 NEW PATIOS: 14 x 20' x 20'	5,600 SQUARE FEET
SIDEWALKS	7,250 SQUARE FEET

TRAVEL TIME ON WEST SIDE

$\frac{564'-520'}{440'} = 10\%$

$T = \frac{0.93(300^{.6})(.30^{.6})}{(0.82^{.4})(0.10^{.3})} = 30$ MINUTES

I = 0.82" FOR 30 MINUTES

NORTH OFFSITE
PERVIOUS AND IMPERVIOUS AREAS

TOTAL SITE:	11.90 ACRES(518,170 SQUARE FEET)
EXISTING HOUSE AND APRONS: 261 SUMMERSIDE	3,500 SQUARE FEET
BRUSH AND GRASS:	514,670 SQUARE FEET

TRAVEL TIME ON NORTH OFFSITE

$\frac{596'-540'}{525'} = 10.7\%$

$T = \frac{0.93(300^{.6})(.30^{.6})}{(0.82^{.4})(0.107^{.3})} = 30$ MINUTES

I = 0.82" FOR 30 MINUTES

SPRING QUAIL VILLAGE
TREES

THERE ARE 21 EXISTING TREES TO BE SAVED AND AT LEAST TWO(2) TREES PLANTED PER LOT. THIS AMOUNTS TO A TOTAL POTENTIAL REDUCTION IN IMPERVIOUS AREA OF 1,610 SQUARE FEET OR 0.058 ACRES

14 LOTS – 14 x 2 x 20 SQUARE FEET = 560 SQUARE FEET.

21 TREES x 50 SQUARE FEET PER TREE = 1,050 SQUARE FEET

FOR APPLICATION

NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
13685
DIGITALLY SIGNED
OREGON
JULY 16, 1987
GERALD P. HORNER

EXPIRES: JUNE 30, 2021

REV.	DATE	BY	DESCRIPTION
0	03-10-21	GPH	ISSUED FOR SUBDIVISION APPLICATION

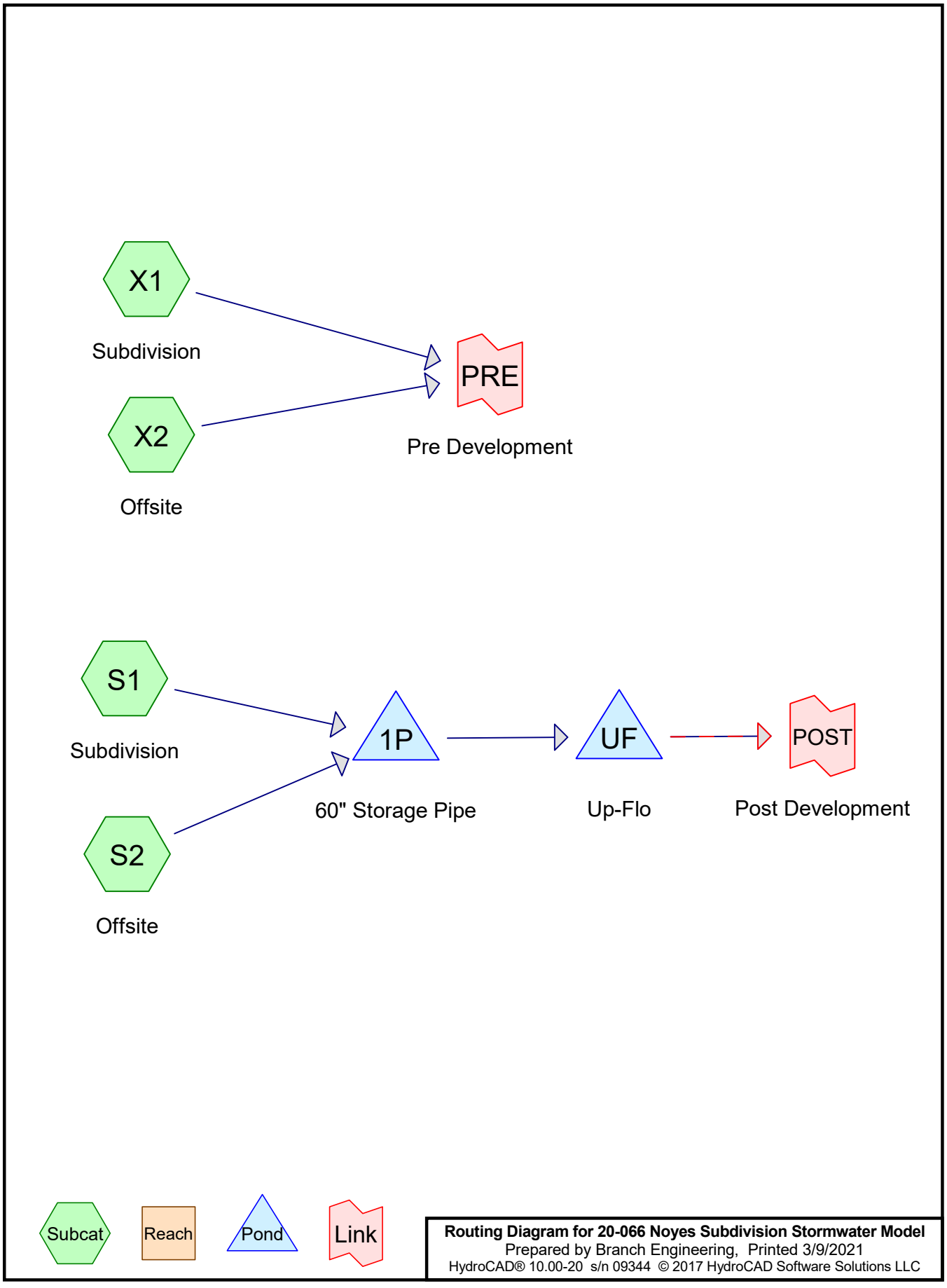
ENGINEER:
WILLAMETTE ENGINEERING INC.
P.O. BOX 9032
SALEM, OREGON 97305
PH: 503-304-0905
FAX: 503-304-9512

STORM WATER AREAS AND PRE-DEVELOPMENT TRAVEL TIME

SPRING QUAIL VILLAGE SUBDIVISION

430 TURTLE BAY CT SE
SALEM, OREGON 97306

DESIGNED BY:	GPH
DRAWN BY:	RW
DATE:	03-10-21
JOB NO.	2020-21
CLIENT NO.	
DRAWING NO.	C6
REV.	0



Routing Diagram for 20-066 Noyes Subdivision Stormwater Model
Prepared by Branch Engineering, Printed 3/9/2021

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,029,340	79	50-75% Grass cover, Fair, HSG C (S2, X2)
7,000	98	Existing House (S2, X2)
99,640	98	Impervious (S1)
116,731	74	Pervious (S1)
216,371	72	Woods/grass comb., Good, HSG C (X1)
1,469,082	**79**	**TOTAL AREA**

20-066 Noyes Subdivision Stormwater Model

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	513.50	513.00	50.0	0.0100	0.011	24.0	0.0	0.0
2	UF	512.50	512.10	20.0	0.0200	0.013	24.0	0.0	0.0
3	UF	512.50	512.00	20.0	0.0250	0.011	24.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Subdivision Runoff Area=216,371 sf 46.05% Impervious Runoff Depth=1.93"
Tc=10.0 min CN=74/98 Runoff=2.10 cfs 34,733 cf

Subcatchment S2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=1.35"
Tc=30.0 min CN=79/98 Runoff=2.31 cfs 58,196 cf

Subcatchment X1: Subdivision Runoff Area=216,371 sf 0.00% Impervious Runoff Depth=0.93"
Tc=30.0 min CN=72/0 Runoff=0.49 cfs 16,763 cf

Subcatchment X2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=1.35"
Tc=30.0 min CN=79/98 Runoff=2.31 cfs 58,196 cf

Pond 1P: 60" Storage Pipe Peak Elev=517.65' Storage=13,932 cf Inflow=4.38 cfs 92,929 cf
Outflow=2.76 cfs 90,026 cf

Pond UF: Up-Flo Peak Elev=514.02' Storage=169 cf Inflow=2.76 cfs 90,026 cf
Primary=2.48 cfs 65,896 cf Secondary=0.28 cfs 24,034 cf Outflow=2.76 cfs 89,930 cf

Link POST: Post Development Inflow=2.76 cfs 89,930 cf
Primary=2.76 cfs 89,930 cf

Link PRE: Pre Development Inflow=2.79 cfs 74,959 cf
Primary=2.79 cfs 74,959 cf

Total Runoff Area = 1,469,082 sf Runoff Volume = 167,887 cf Average Runoff Depth = 1.37"
92.74% Pervious = 1,362,442 sf 7.26% Impervious = 106,640 sf

Summary for Subcatchment S1: Subdivision

Runoff = 2.10 cfs @ 8.00 hrs, Volume= 34,733 cf, Depth= 1.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	99,640	98	Impervious
*	116,731	74	Pervious
	216,371	85	Weighted Average
	116,731	74	53.95% Pervious Area
	99,640	98	46.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Summary for Subcatchment S2: Offsite

Runoff = 2.31 cfs @ 8.08 hrs, Volume= 58,196 cf, Depth= 1.35"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 yr Rainfall=3.20"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X1: Subdivision

Runoff = 0.49 cfs @ 8.22 hrs, Volume= 16,763 cf, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 yr Rainfall=3.20"

Area (sf)	CN	Description
216,371	72	Woods/grass comb., Good, HSG C
216,371	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X2: Offsite

Runoff = 2.31 cfs @ 8.08 hrs, Volume= 58,196 cf, Depth= 1.35"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10 yr Rainfall=3.20"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Pond 1P: 60" Storage Pipe

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 1.52" for 10 yr event
Inflow = 4.38 cfs @ 8.00 hrs, Volume= 92,929 cf
Outflow = 2.76 cfs @ 8.75 hrs, Volume= 90,026 cf, Atten= 37%, Lag= 44.6 min
Primary = 2.76 cfs @ 8.75 hrs, Volume= 90,026 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 517.65' @ 8.75 hrs Surf.Area= 3,008 sf Storage= 13,932 cf

Plug-Flow detention time= 160.8 min calculated for 90,013 cf (97% of inflow)
Center-of-Mass det. time= 140.6 min (945.1 - 804.5)

Volume	Invert	Avail.Storage	Storage Description
#1	513.50'	15,708 cf	**60.0" Round Pipe Storage** x 4 L= 200.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	513.50'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 513.50' / 513.00' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	514.70'	**2.0" Horiz. Half 2-yr Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	516.20'	**9.0" Horiz. 10-yr Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	517.60'	**24.0" Vert. Overflow** C= 0.600

Primary OutFlow Max=2.76 cfs @ 8.75 hrs HW=517.65' TW=514.02' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.76 cfs of 26.84 cfs potential flow)
  ├**2=Half 2-yr Orifice** (Orifice Controls 0.18 cfs @ 8.27 fps)
  ├**3=10-yr Orifice** (Orifice Controls 2.56 cfs @ 5.79 fps)
  └**4=Overflow** (Orifice Controls 0.01 cfs @ 0.75 fps)

Summary for Pond UF: Up-Flo

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 1.47" for 10 yr event
Inflow = 2.76 cfs @ 8.75 hrs, Volume= 90,026 cf
Outflow = 2.76 cfs @ 8.75 hrs, Volume= 89,930 cf, Atten= 0%, Lag= 0.1 min
Primary = 2.48 cfs @ 8.75 hrs, Volume= 65,896 cf
Secondary = 0.28 cfs @ 7.70 hrs, Volume= 24,034 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 514.02' @ 8.75 hrs Surf.Area= 48 sf Storage= 169 cf

Plug-Flow detention time= 3.7 min calculated for 89,930 cf (100% of inflow)
Center-of-Mass det. time= 1.4 min (946.5 - 945.1)

Volume	Invert	Avail.Storage	Storage Description
#1	510.50'	240 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
510.50	48	0	0
513.50	48	144	144
515.50	48	96	240

Device	Routing	Invert	Outlet Devices
#1	Primary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.10' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	513.50'	**2.1' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Secondary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#4	Device 3	512.50'	**0.280 cfs WQ Filters** Phase-In= 0.01'

Primary OutFlow Max=2.48 cfs @ 8.75 hrs HW=514.02' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.48 cfs of 10.02 cfs potential flow)
  └**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.48 cfs @ 2.37 fps)

Secondary OutFlow Max=0.28 cfs @ 7.70 hrs HW=512.82' TW=0.00' (Dynamic Tailwater)
└**3=Culvert** (Passes 0.28 cfs of 0.62 cfs potential flow)
  └**4=WQ Filters** (Constant Controls 0.28 cfs)

Summary for Link POST: Post Development

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 1.47" for 10 yr event
Inflow = 2.76 cfs @ 8.75 hrs, Volume= 89,930 cf
Primary = 2.76 cfs @ 8.75 hrs, Volume= 89,930 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link PRE: Pre Development

Inflow Area = 734,541 sf, 0.48% Impervious, Inflow Depth = 1.22" for 10 yr event
Inflow = 2.79 cfs @ 8.10 hrs, Volume= 74,959 cf
Primary = 2.79 cfs @ 8.10 hrs, Volume= 74,959 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Subdivision Runoff Area=216,371 sf 46.05% Impervious Runoff Depth=2.94"
Tc=10.0 min CN=74/98 Runoff=3.29 cfs 53,018 cf

Subcatchment S2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=2.31"
Tc=30.0 min CN=79/98 Runoff=4.46 cfs 99,551 cf

Subcatchment X1: Subdivision Runoff Area=216,371 sf 0.00% Impervious Runoff Depth=1.75"
Tc=30.0 min CN=72/0 Runoff=1.20 cfs 31,497 cf

Subcatchment X2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=2.31"
Tc=30.0 min CN=79/98 Runoff=4.46 cfs 99,551 cf

Pond 1P: 60" Storage Pipe Peak Elev=518.46' Storage=15,692 cf Inflow=7.74 cfs 152,569 cf
Outflow=7.52 cfs 149,666 cf

Pond UF: Up-Flo Peak Elev=514.62' Storage=198 cf Inflow=7.52 cfs 149,666 cf
Primary=7.24 cfs 124,191 cf Secondary=0.28 cfs 25,379 cf Outflow=7.52 cfs 149,570 cf

Link POST: Post Development Inflow=7.52 cfs 149,570 cf
Primary=7.52 cfs 149,570 cf

Link PRE: Pre Development Inflow=5.66 cfs 131,048 cf
Primary=5.66 cfs 131,048 cf

Total Runoff Area = 1,469,082 sf Runoff Volume = 283,617 cf Average Runoff Depth = 2.32"
92.74% Pervious = 1,362,442 sf 7.26% Impervious = 106,640 sf

Summary for Subcatchment S1: Subdivision

Runoff = 3.29 cfs @ 8.00 hrs, Volume= 53,018 cf, Depth= 2.94"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr Rainfall=4.40"

	Area (sf)	CN	Description
*	99,640	98	Impervious
*	116,731	74	Pervious
	216,371	85	Weighted Average
	116,731	74	53.95% Pervious Area
	99,640	98	46.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Summary for Subcatchment S2: Offsite

Runoff = 4.46 cfs @ 8.03 hrs, Volume= 99,551 cf, Depth= 2.31"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr Rainfall=4.40"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X1: Subdivision

Runoff = 1.20 cfs @ 8.09 hrs, Volume= 31,497 cf, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr Rainfall=4.40"

Area (sf)	CN	Description
216,371	72	Woods/grass comb., Good, HSG C
216,371	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X2: Offsite

Runoff = 4.46 cfs @ 8.03 hrs, Volume= 99,551 cf, Depth= 2.31"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr Rainfall=4.40"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Pond 1P: 60" Storage Pipe

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 2.49" for 100 yr event
Inflow = 7.74 cfs @ 8.00 hrs, Volume= 152,569 cf
Outflow = 7.52 cfs @ 8.05 hrs, Volume= 149,666 cf, Atten= 3%, Lag= 2.8 min
Primary = 7.52 cfs @ 8.05 hrs, Volume= 149,666 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 518.46' @ 8.05 hrs Surf.Area= 677 sf Storage= 15,692 cf

Plug-Flow detention time= 112.1 min calculated for 149,645 cf (98% of inflow)
Center-of-Mass det. time= 99.4 min (883.0 - 783.6)

Volume	Invert	Avail.Storage	Storage Description
#1	513.50'	15,708 cf	**60.0" Round Pipe Storage** x 4 L= 200.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	513.50'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 513.50' / 513.00' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	514.70'	**2.0" Horiz. Half 2-yr Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	516.20'	**9.0" Horiz. 10-yr Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	517.60'	**24.0" Vert. Overflow** C= 0.600

Primary OutFlow Max=7.52 cfs @ 8.05 hrs HW=518.46' TW=514.62' (Dynamic Tailwater)
└─**1=Culvert** (Passes 7.52 cfs of 29.67 cfs potential flow)
  ├─**2=Half 2-yr Orifice** (Orifice Controls 0.20 cfs @ 9.34 fps)
  ├─**3=10-yr Orifice** (Orifice Controls 3.20 cfs @ 7.24 fps)
  └─**4=Overflow** (Orifice Controls 4.11 cfs @ 3.16 fps)

Summary for Pond UF: Up-Flo

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 2.45" for 100 yr event
Inflow = 7.52 cfs @ 8.05 hrs, Volume= 149,666 cf
Outflow = 7.52 cfs @ 8.05 hrs, Volume= 149,570 cf, Atten= 0%, Lag= 0.1 min
Primary = 7.24 cfs @ 8.05 hrs, Volume= 124,191 cf
Secondary = 0.28 cfs @ 6.60 hrs, Volume= 25,379 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 514.62' @ 8.05 hrs Surf.Area= 48 sf Storage= 198 cf

Plug-Flow detention time= 2.3 min calculated for 149,549 cf (100% of inflow)
Center-of-Mass det. time= 0.9 min (883.9 - 883.0)

Volume	Invert	Avail.Storage	Storage Description
#1	510.50'	240 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
510.50	48	0	0
513.50	48	144	144
515.50	48	96	240

Device	Routing	Invert	Outlet Devices
#1	Primary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.10' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	513.50'	**2.1' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Secondary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#4	Device 3	512.50'	**0.280 cfs WQ Filters** Phase-In= 0.01'

Primary OutFlow Max=7.23 cfs @ 8.05 hrs HW=514.62' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 7.23 cfs of 15.90 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 7.23 cfs @ 3.45 fps)

Secondary OutFlow Max=0.28 cfs @ 6.60 hrs HW=512.78' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.28 cfs of 0.49 cfs potential flow)
  └─**4=WQ Filters** (Constant Controls 0.28 cfs)

Summary for Link POST: Post Development

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 2.44" for 100 yr event
Inflow = 7.52 cfs @ 8.05 hrs, Volume= 149,570 cf
Primary = 7.52 cfs @ 8.05 hrs, Volume= 149,570 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link PRE: Pre Development

Inflow Area = 734,541 sf, 0.48% Impervious, Inflow Depth = 2.14" for 100 yr event
Inflow = 5.66 cfs @ 8.04 hrs, Volume= 131,048 cf
Primary = 5.66 cfs @ 8.04 hrs, Volume= 131,048 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Subdivision Runoff Area=216,371 sf 46.05% Impervious Runoff Depth=0.43"
Tc=10.0 min CN=74/98 Runoff=0.50 cfs 7,767 cf

Subcatchment S2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=0.11"
Tc=30.0 min CN=79/98 Runoff=0.09 cfs 4,553 cf

Subcatchment X1: Subdivision Runoff Area=216,371 sf 0.00% Impervious Runoff Depth=0.02"
Tc=30.0 min CN=72/0 Runoff=0.02 cfs 445 cf

Subcatchment X2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=0.11"
Tc=30.0 min CN=79/98 Runoff=0.09 cfs 4,553 cf

Pond 1P: 60" Storage Pipe Peak Elev=515.88' Storage=7,371 cf Inflow=0.51 cfs 12,319 cf
Outflow=0.11 cfs 9,417 cf

Pond UF: Up-Flo Peak Elev=512.63' Storage=102 cf Inflow=0.11 cfs 9,417 cf
Primary=0.00 cfs 0 cf Secondary=0.11 cfs 9,321 cf Outflow=0.11 cfs 9,321 cf

Link POST: Post Development Inflow=0.11 cfs 9,321 cf
Primary=0.11 cfs 9,321 cf

Link PRE: Pre Development Inflow=0.11 cfs 4,997 cf
Primary=0.11 cfs 4,997 cf

Total Runoff Area = 1,469,082 sf Runoff Volume = 17,317 cf Average Runoff Depth = 0.14"
92.74% Pervious = 1,362,442 sf 7.26% Impervious = 106,640 sf

Summary for Subcatchment S1: Subdivision

Runoff = 0.50 cfs @ 7.98 hrs, Volume= 7,767 cf, Depth= 0.43"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half-2 yr Rainfall=1.10"

	Area (sf)	CN	Description
*	99,640	98	Impervious
*	116,731	74	Pervious
	216,371	85	Weighted Average
	116,731	74	53.95% Pervious Area
	99,640	98	46.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Summary for Subcatchment S2: Offsite

Runoff = 0.09 cfs @ 18.85 hrs, Volume= 4,553 cf, Depth= 0.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half-2 yr Rainfall=1.10"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X1: Subdivision

Runoff = 0.02 cfs @ 23.01 hrs, Volume= 445 cf, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half-2 yr Rainfall=1.10"

Area (sf)	CN	Description
216,371	72	Woods/grass comb., Good, HSG C
216,371	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X2: Offsite

Runoff = 0.09 cfs @ 18.85 hrs, Volume= 4,553 cf, Depth= 0.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half-2 yr Rainfall=1.10"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Pond 1P: 60" Storage Pipe

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 0.20" for Half-2 yr event
Inflow = 0.51 cfs @ 7.98 hrs, Volume= 12,319 cf
Outflow = 0.11 cfs @ 24.06 hrs, Volume= 9,417 cf, Atten= 78%, Lag= 965.0 min
Primary = 0.11 cfs @ 24.06 hrs, Volume= 9,417 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 515.88' @ 24.06 hrs Surf.Area= 3,995 sf Storage= 7,371 cf

Plug-Flow detention time= 756.4 min calculated for 9,417 cf (76% of inflow)
Center-of-Mass det. time= 615.7 min (1,461.6 - 845.9)

Volume	Invert	Avail.Storage	Storage Description
#1	513.50'	15,708 cf	**60.0" Round Pipe Storage** x 4 L= 200.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	513.50'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 513.50' / 513.00' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	514.70'	**2.0" Horiz. Half 2-yr Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	516.20'	**9.0" Horiz. 10-yr Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	517.60'	**24.0" Vert. Overflow** C= 0.600

Primary OutFlow Max=0.11 cfs @ 24.06 hrs HW=515.88' TW=512.63' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.11 cfs of 17.76 cfs potential flow)
  ├─**2=Half 2-yr Orifice** (Orifice Controls 0.11 cfs @ 5.23 fps)
  ├─**3=10-yr Orifice** (Controls 0.00 cfs)
  └─**4=Overflow** (Controls 0.00 cfs)

Summary for Pond UF: Up-Flo

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth > 0.15" for Half-2 yr event
Inflow = 0.11 cfs @ 24.06 hrs, Volume= 9,417 cf
Outflow = 0.11 cfs @ 24.07 hrs, Volume= 9,321 cf, Atten= 0%, Lag= 0.5 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 0.11 cfs @ 24.07 hrs, Volume= 9,321 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 512.63' @ 24.07 hrs Surf.Area= 48 sf Storage= 102 cf

Plug-Flow detention time= 24.9 min calculated for 9,321 cf (99% of inflow)
Center-of-Mass det. time= 10.5 min (1,472.1 - 1,461.6)

Volume	Invert	Avail.Storage	Storage Description
#1	510.50'	240 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
510.50	48	0	0
513.50	48	144	144
515.50	48	96	240

Device	Routing	Invert	Outlet Devices
#1	Primary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.10' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	513.50'	**2.1' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Secondary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#4	Device 3	512.50'	**0.280 cfs WQ Filters** Phase-In= 0.01'

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=510.50' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.11 cfs @ 24.07 hrs HW=512.63' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Inlet Controls 0.11 cfs @ 1.25 fps)
  └─**4=WQ Filters** (Passes 0.11 cfs of 0.28 cfs potential flow)

Summary for Link POST: Post Development

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth > 0.15" for Half-2 yr event
Inflow = 0.11 cfs @ 24.07 hrs, Volume= 9,321 cf
Primary = 0.11 cfs @ 24.07 hrs, Volume= 9,321 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link PRE: Pre Development

Inflow Area = 734,541 sf, 0.48% Impervious, Inflow Depth = 0.08" for Half-2 yr event
Inflow = 0.11 cfs @ 19.84 hrs, Volume= 4,997 cf
Primary = 0.11 cfs @ 19.84 hrs, Volume= 4,997 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Subdivision Runoff Area=216,371 sf 46.05% Impervious Runoff Depth=0.59"
Tc=10.0 min CN=74/98 Runoff=0.65 cfs 10,714 cf

Subcatchment S2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=0.21"
Tc=30.0 min CN=79/98 Runoff=0.17 cfs 9,142 cf

Subcatchment X1: Subdivision Runoff Area=216,371 sf 0.00% Impervious Runoff Depth=0.08"
Tc=30.0 min CN=72/0 Runoff=0.04 cfs 1,456 cf

Subcatchment X2: Offsite Runoff Area=518,170 sf 0.68% Impervious Runoff Depth=0.21"
Tc=30.0 min CN=79/98 Runoff=0.17 cfs 9,142 cf

Pond 1P: 60" Storage Pipe Peak Elev=516.27' Storage=8,943 cf Inflow=0.69 cfs 19,856 cf
Outflow=0.28 cfs 16,953 cf

Pond UF: Up-Flo Peak Elev=512.96' Storage=118 cf Inflow=0.28 cfs 16,953 cf
Primary=0.00 cfs 0 cf Secondary=0.28 cfs 16,857 cf Outflow=0.28 cfs 16,857 cf

Link POST: Post Development Inflow=0.28 cfs 16,857 cf
Primary=0.28 cfs 16,857 cf

Link PRE: Pre Development Inflow=0.20 cfs 10,598 cf
Primary=0.20 cfs 10,598 cf

Total Runoff Area = 1,469,082 sf Runoff Volume = 30,453 cf Average Runoff Depth = 0.25"
92.74% Pervious = 1,362,442 sf 7.26% Impervious = 106,640 sf

Summary for Subcatchment S1: Subdivision

Runoff = 0.65 cfs @ 7.97 hrs, Volume= 10,714 cf, Depth= 0.59"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	99,640	98	Impervious
*	116,731	74	Pervious
	216,371	85	Weighted Average
	116,731	74	53.95% Pervious Area
	99,640	98	46.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Summary for Subcatchment S2: Offsite

Runoff = 0.17 cfs @ 17.04 hrs, Volume= 9,142 cf, Depth= 0.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X1: Subdivision

Runoff = 0.04 cfs @ 20.41 hrs, Volume= 1,456 cf, Depth= 0.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.38"

Area (sf)	CN	Description
216,371	72	Woods/grass comb., Good, HSG C
216,371	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Subcatchment X2: Offsite

Runoff = 0.17 cfs @ 17.04 hrs, Volume= 9,142 cf, Depth= 0.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
	514,670	79	50-75% Grass cover, Fair, HSG C
*	3,500	98	Existing House
	518,170	79	Weighted Average
	514,670	79	99.32% Pervious Area
	3,500	98	0.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Summary for Pond 1P: 60" Storage Pipe

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth = 0.32" for WQ event
Inflow = 0.69 cfs @ 8.00 hrs, Volume= 19,856 cf
Outflow = 0.28 cfs @ 17.06 hrs, Volume= 16,953 cf, Atten= 59%, Lag= 543.5 min
Primary = 0.28 cfs @ 17.06 hrs, Volume= 16,953 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 516.27' @ 17.06 hrs Surf.Area= 3,976 sf Storage= 8,943 cf

Plug-Flow detention time= 627.7 min calculated for 16,950 cf (85% of inflow)
Center-of-Mass det. time= 540.7 min (1,389.5 - 848.7)

Volume	Invert	Avail.Storage	Storage Description
#1	513.50'	15,708 cf	**60.0" Round Pipe Storage** x 4 L= 200.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	513.50'	**24.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 513.50' / 513.00' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	514.70'	**2.0" Horiz. Half 2-yr Orifice** C= 0.600 Limited to weir flow at low heads
#3	Device 1	516.20'	**9.0" Horiz. 10-yr Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	517.60'	**24.0" Vert. Overflow** C= 0.600

Primary OutFlow Max=0.28 cfs @ 17.06 hrs HW=516.27' TW=512.81' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.28 cfs of 20.14 cfs potential flow)
  ├─**2=Half 2-yr Orifice** (Orifice Controls 0.13 cfs @ 6.04 fps)
  ├─**3=10-yr Orifice** (Weir Controls 0.15 cfs @ 0.88 fps)
  └─**4=Overflow** (Controls 0.00 cfs)

Summary for Pond UF: Up-Flo

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth > 0.28" for WQ event
Inflow = 0.28 cfs @ 17.06 hrs, Volume= 16,953 cf
Outflow = 0.28 cfs @ 16.80 hrs, Volume= 16,857 cf, Atten= 1%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 0.28 cfs @ 16.80 hrs, Volume= 16,857 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 512.96' @ 18.06 hrs Surf.Area= 48 sf Storage= 118 cf

Plug-Flow detention time= 15.3 min calculated for 16,854 cf (99% of inflow)
Center-of-Mass det. time= 6.0 min (1,395.4 - 1,389.5)

Volume	Invert	Avail.Storage	Storage Description
#1	510.50'	240 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
510.50	48	0	0
513.50	48	144	144
515.50	48	96	240

Device	Routing	Invert	Outlet Devices
#1	Primary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.10' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	513.50'	**2.1' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Secondary	512.50'	**24.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 512.50' / 512.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#4	Device 3	512.50'	**0.280 cfs WQ Filters** Phase-In= 0.01'

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=510.50' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.28 cfs @ 16.80 hrs HW=512.75' TW=0.00' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.28 cfs of 0.39 cfs potential flow)
  └─**4=WQ Filters** (Constant Controls 0.28 cfs)

Summary for Link POST: Post Development

Inflow Area = 734,541 sf, 14.04% Impervious, Inflow Depth > 0.28" for WQ event
Inflow = 0.28 cfs @ 16.80 hrs, Volume= 16,857 cf
Primary = 0.28 cfs @ 16.80 hrs, Volume= 16,857 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link PRE: Pre Development

Inflow Area = 734,541 sf, 0.48% Impervious, Inflow Depth = 0.17" for WQ event
Inflow = 0.20 cfs @ 17.88 hrs, Volume= 10,598 cf
Primary = 0.20 cfs @ 17.88 hrs, Volume= 10,598 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs