			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
1	18.30	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	
2	18.30	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	
3	16.00	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6581.00

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
1	6579.00	6581.24	0.00	0.00	6581.00	6582.78	6581.53	2.02	6583.55
2	6581.24	6586.00	0.20	0.00	6582.98	6587.54	6586.97	1.34	6588.31
3	6587.71	6588.91	0.06	0.00	6588.85	6590.33	6590.77	0.89	6591.66

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

See CD comments also

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
1	22.76	3.00	4.00	5.50	0.00	0.00	0.00	6.52	4.34	1.51	10.18	Sewer Too Shallow
2	48.50	3.00	4.00	5.50	6.52	4.34	1.51	12.24	7.20	4.37	67.47	Sewer Too Shallow
3	38.26	2.50	4.00	4.92	9.32	5.45	3.20	6.78	4.18	1.93	37.61	Sewer Too Shallow

Total earth volume for sewer trenches = 115 cubic yards.

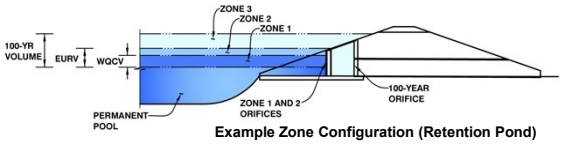
- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **Windermere Filing No. 1**

Basin ID: **North Pond**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.59	2.016	Orifice Plate
Zone 2 (EURV)	4.26	3.883	Orifice Plate
Zone 3 (100-year)	5.45	4.043	Weir&Pipe (Circular)
Total (all zones)		9.941	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	
Underdrain Orifice Diameter =		inches	

Calculated Parameters for Underdrain

Underdrain Orifice Area =		ft^2
Underdrain Orifice Centroid =		feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	
Depth at top of Zone using Orifice Plate =	4.26	ft (relative to basin bottom at Stage = 0 ft)	
Orifice Plate: Orifice Vertical Spacing =	17.00	inches	
Orifice Plate: Orifice Area per Row =	N/A	inches	

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.42	2.84					
Orifice Area (sq. inches)	11.00	11.00	11.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.30	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.75	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.75	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.30	N/A	feet
Overflow Weir Slope Length =	6.75	N/A	feet
Grate Open Area / 100-yr Orifice Area =	4.51	N/A	
Overflow Grate Open Area w/o Debris =	31.89	N/A	ft^2
Overflow Grate Open Area w/ Debris =	15.95	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	36.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	7.07	N/A	ft^2
Outlet Orifice Centroid =	1.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	70.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.92	feet
Stage at Top of Freeboard =	7.92	feet
Basin Area at Top of Freeboard =	5.10	acres
Basin Volume at Top of Freeboard =	21.63	acre-ft

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	2.016	5.899	4.497	6.048	7.280	9.553	11.773	14.673	24.739
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.497	6.048	7.280	9.553	11.773	14.673	24.739
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	1.5	2.2	19.7	39.5	65.5	155.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.15	0.30	0.49	1.17
Peak Inflow Q (cfs) =	N/A	N/A	49.7	67.5	81.3	119.9	153.1	194.1	328.3
Peak Outflow Q (cfs) =	1.0	1.8	1.6	1.8	7.1	24.1	40.8	66.0	142.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.2	3.3	1.2	1.0	1.0	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.7	1.2	2.0	2.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	66	59	68	71	69	67	65	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	71	63	73	76	76	75	74	71
Maximum Ponding Depth (ft) =	2.59	4.26	3.63	4.19	4.50	4.82	5.06	5.36	6.46
Area at Maximum Ponding Depth (acres) =	1.71	2.94	2.47	2.88	3.10	3.38	3.59	3.84	4.77
Maximum Volume Stored (acre-ft) =	2.027	5.908	4.179	5.675	6.602	7.673	8.510	9.625	14.322

See emails 3/2/22

LEGEND

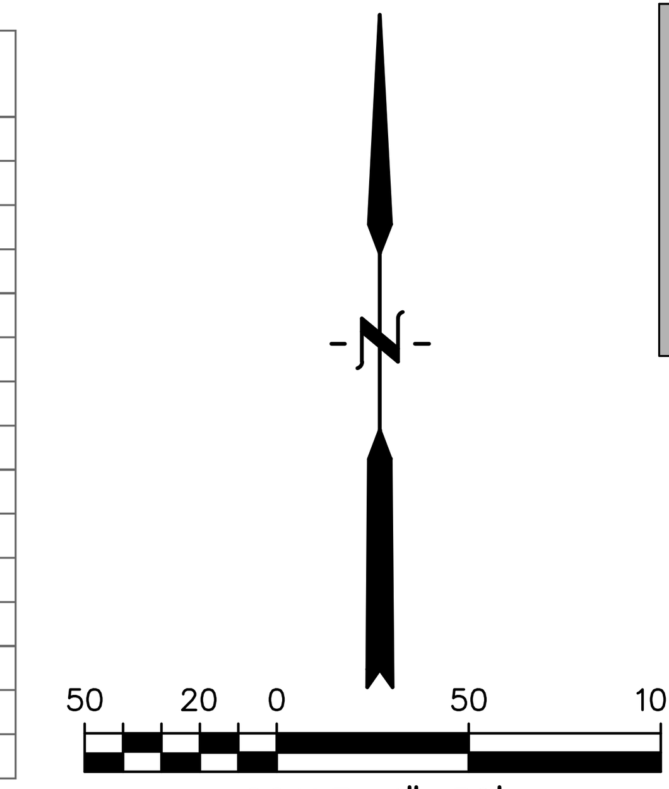
PROPOSED INTERMEDIATE CONTOUR	
PROPOSED INDEX CONTOUR	5750
EX. INTERMEDIATE CONTOUR	
EX. INDEX CONTOUR	5750
PROPOSED STORM SEWER	
PROPOSED INLET	
PROPOSED FLARED END SECTION	
PROPOSED SITE LIGHTING	
EX. MANHOLE	MH
EX. STORM SEWER	
BASIN BOUNDARY	
EXISTING FLOWPATH	
FLOW DIRECTION	
DESIGN POINT	1

BASIN: A1; AREA (ACRE): 2.32; Q5 (cfs): 3.8; Q100 (cfs): 8.7

DEVELOPED AREA DRAINING OFFSITE SEE SHEET DR4

DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
7	10.67	15.9	34.2
A	13.59	21.0	44.9
B	4.61	8.8	19.4
C	2.18	5.2	11.2
C1	20.38	29.5	63.5
D	1.01	1.7	3.8
D1	21.39	30.6	66.1
E	1.98	4.3	9.5
F	3.73	7.0	15.4
F1	27.10	38.2	82.8
G	1.56	3.0	6.6
H	2.96	6.1	13.4
H1	4.52	8.6	19.0
I	1.86	4.0	8.7
J	6.38	11.8	25.9
K	33.48	46.3	100.7
L	4.00	7.5	16.5
L1	37.48	51.4	111.8

DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
M	2.67	5.3	11.8
M1	40.15	54.8	119.4
24	83.54	90.7	229.0
N	133.15	145.4	357.5
North Pond Release		1.8	66.0
T	437.97	190.5	682.4
O	3.82	8.1	17.9
R	10.89	19.9	46.2
South Pond Release		0.2	9.2
4	2.73	4.9	10.7
S	16.57	10.0	33.7
19	1.61	5.1	9.8
J1	18.18	15.1	43.5
20	18.61	17.0	46.9
V	0.11	0.1	0.5



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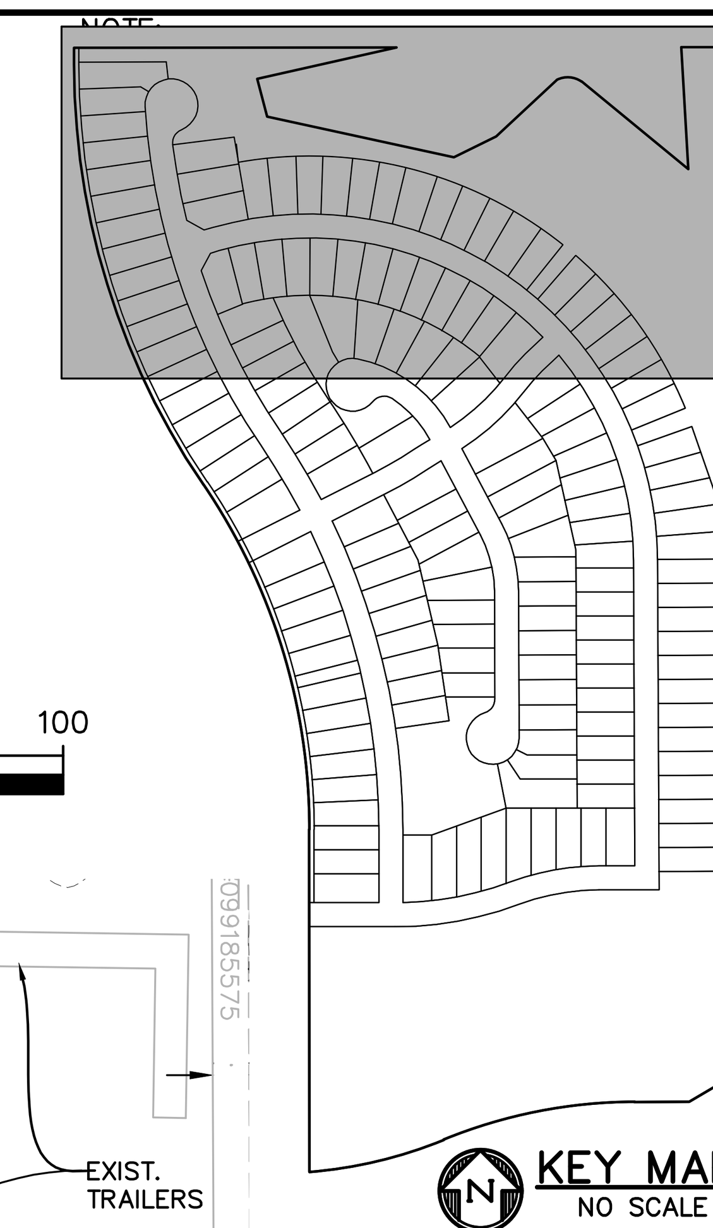

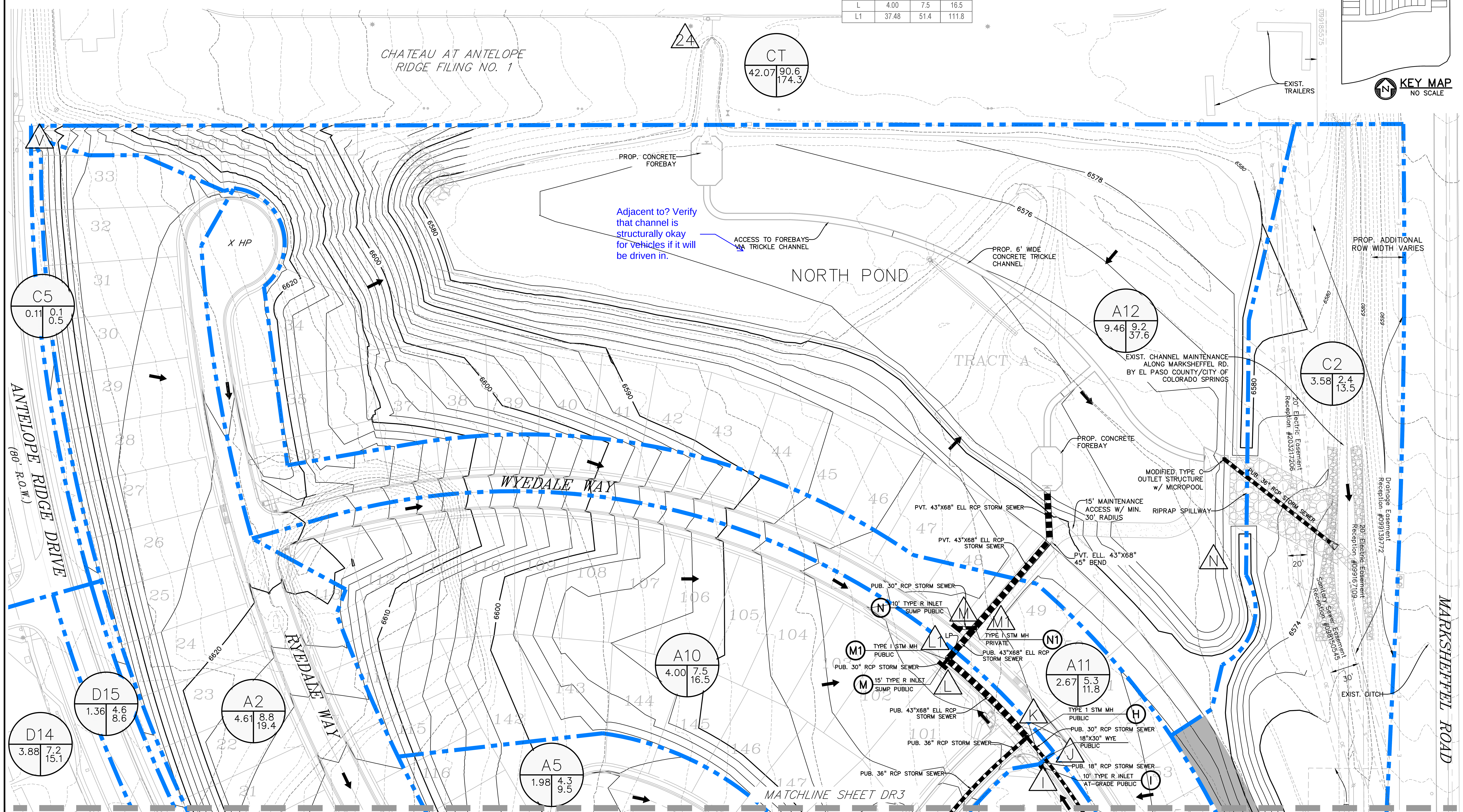

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DRAINAGE MAP FOR WINDERMERE FILING NO. 1
N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	7-9-21
RESUBMITTAL	1-5-22

DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1" = 50'
VERTICAL: N/A

PROPOSED DRAINAGE MAP

PROJECT NO. 21187-01CSCV
DRAWING NO.

DR2

SHEET: 2 OF 5