FINAL

Drainage Study and Stormwater Quality Plan

Mid Valley Apartments

Original Date: January 24, 2023
Updated: May 12, 2023
Final: December 15, 2023

Prepared by: Matthew Eggen, P.E.

NOTE

City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and the City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document

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CERTIFICATION

I hereby affirm that this Drainage Study and Stormwater Quality Plan for the Development Plan of the Mid Valley Apartments was prepared by me (or under my direct supervision) for the owners thereof and is, to the best of my knowledge, in accordance with the provisions of the City of Steamboat Springs Storm Drainage Criteria and approved variances. I understand that the City of Steamboat Springs does not and will not assume liability for drainage facilities designed by others.

NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

Matthew Eggen, P.E.
State of Colorado No. 50740

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INTRODUCTION AND LOCATION

The purpose of this drainage study and stormwater quality plan is to develop an analysis of stormwater runoff and drainage structures required for the Mid Valley Apartments, Lots 1a & 1b Mid Valley Housing. Included in this study are all the base data, methods, assumptions, and calculations for the stormwater management system for the development of the property.

The facts and opinions expressed in this report are based on Landmark Consultants, Inc.'s (Landmark's) understanding of the project and data gathered from:

- Site visit (summer 2022)
- Steamboat Springs GIS data
- NRCS soil maps
- FEMA FIRM Community Panel Numbers 08107-CO879-D (February 4, 2005)
- Detailed field survey by Landmark Consultants, Inc.
- Citywide Stormwater Master Plan, March 2013.
- References listed at the end of this report

The subject property located on Lot 1, Mid Valley Housing which is approximately 6.73 acres in size. It is in the Northeast ¼ of Section 28, Township 6 North, Range 84 West of the 6th Principal Meridian, City of Steamboat Springs, Routt County, Colorado. This project proposes four (4) multi-story, muti-family apartment style buildings with associated asphalt roadways, parking, pedestrian walkways, trails, and parks.

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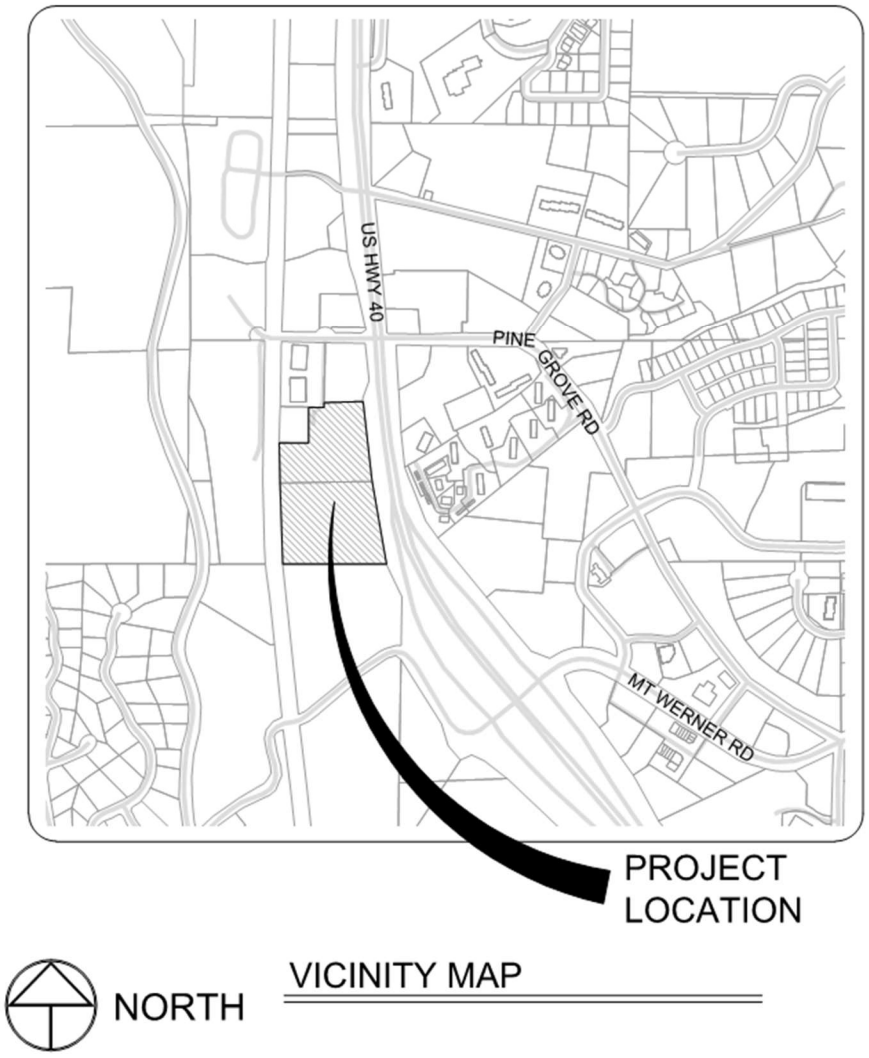

Figure 1- Vicinity Map

The existing site contains approximately 6.73 acres and generally lies between 6,740 feet and 6,770 feet of elevation on the NAVD88 datum. The site is bound by the existing Steamboat Crossings development to the north, Lincoln Avenue (US Highway 40) on the east, the City Core Trail on the south, and the Union Pacific Railroad on the west. The Yampa River is also located to the south and west of the property. The city limits for Steamboat Springs abuts the south property boundary.

DRAINAGE CRITERIA AND METHODOLOGY

Landmark prepared this report in accordance with *City of Steamboat Springs Engineering Standards, Section 5.0, Drainage Criteria* effective September 2007 and updated July 2019. The methods used by Landmark are described below and the actual calculations are presented in the Appendices. The scope of this report is limited to flow determinations related to the described hydrological storm event. This report does not attempt to model subsurface flows nor is it intended to be used in the design of structure features including foundation drains and roof drains.

Design Rainfall and Runoff Frequency

Landmark used the 1.25-year, 1 hour rainfall depth (8oth percentile storm) to design permanent stormwater treatment facilities using the TSS design standard, the 5-year, 24-hour storm to analyze the minor storm event and the 100-year, 24-hour storm for the major storm event per Section 5.5.3 from the Drainage Criteria and reference IDF Curve. Landmark used the Rational Method to determine peak runoff of small basins to design the on-site storm water runoff infrastructure associated with this project. The minimum time of concentration (t_c) used for this analysis is 5 minutes, based on the recommendations for urbanized watersheds found in Section 5.2.6.1 of the *Drainage Criteria*.

Storm Sewer Design

Storm sewers were designed and evaluated using Autodesk's Storm and Sanitary Sewer Analysis, which uses hydrodynamic routing. Storm sewers were sized to convey the minor storm event so that the HGL does not exceed the ground elevation however, the storm sewers convey the major storm event as well. In general, channels and roadside ditches are designed so that the Froude number during the major storm does not exceed 0.8.

Stormwater Quality

The project uses the Pollutant Removal (TSS) design standard to provide stormwater quality treatment in the form of a hydrodynamic separator. Treatment in series will also be provided by routing drainage into grass lined swales, lined with trees, prior to being collected and routed to the hydrodynamic separator.

EXISTING SITE CONDITIONS

The historic condition of the site is an undeveloped lot (6.73 acres) that is vacant and covered with native grasses and wetlands. In this report the term "historic condition" refers to the conditions of the site prior to any construction activity and may also be referred to as the "pre-development condition" or "existing condition".

Figure 2: Existing Conditions shows the features of the site prior to development.

Currently the site is vacant (except for a portion of asphalt roadway that extends in front of Lot 1, Mid Valley Business Center) and generally slopes to the south and receives runoff from two offsite basins located to the north of the site. Surface water from the north is mixed with surface water flows from

the northwestern part of the site and is routed into the existing storm sewer infrastructure via a system of culverts and a storm sewer system made up of 18" CMP and five (5) grated inlets. The existing storm sewer discharges to an isolated wetland pond located to the south of the existing daycare facility located on lot 1. The remainder of the surface water flows originating from within the site boundary drain as overland flow to the wetlands area at the south end of the site. From the wetlands, the runoff flows into a swale which runs south, discharging into the Yampa River at the Core Trail underpass at the railroad crossing. There are no existing drainage easements onsite.

At the south end of the project there is an existing 48" CMP that conveys water under US Hwy 40 and onto Lot 2. This culvert does not impact the proposed site design or proposed site drainage and therefore was not analyzed in this drainage report.

A review of the NRCS soil data for the area indicates the majority of the soils found on site are Toponas Loam with a NRCS hydrological soil group (HGS) of D. Soils with an HGS of D have a very slow infiltration rate when thoroughly wet and therefore have high runoff potential. Landmark used an HGS of D for the basis of the entire project evaluation.

FEMA FLOODPLAIN

Landmark reviewed FEMA FIRM Community Panel Numbers 08107- CO879-D (February 4, 2005) and determined that a portion of the property lies within a Zone AE (1-percent annual chance flood) and Zone X ((0.2% chance annual flood). The 100-year flood elevation at the site is 6755 feet on the NAVD88 datum.

Lidstone and Associates prepared a Conditional Letter of Map Revision (CLOMR) for the Steamboat Crossing Condominium project in 2006. This CLOMR was approved by FEMA on January 9, 2007.

PROPOSED SITE CONDITIONS

This project proposes the construction of four (4) multi-story buildings with a cumulative footprint of approximately 80,000 square feet. The development also includes new asphalt roadways, surface parking, sidewalk, soft surface trails, and landscaping associated the buildings. The proposed development is shown in Figure 3: Proposed Conditions.

The site has been divided into three subbasins, D1.a-D1.h, D2, & D3. Basins D1.a-D1.h comprises the majority of the site improvements and all runoff is collected in concrete valley pans, grass-lined swales, and storm sewer pipe and conveyed to the hydrodynamic separator which outfalls into Lot 2. Basin D2 comprises a 10-foot-wide concrete trail on the west side of the property and all of Lot 2. Runoff is conveyed via sheet flow and collected in existing ditches where it leaves the site to the southwest, where it is ultimately routed to the Yampa River. Basin D3 comprises the existing west side of US Hwy 40. Runoff is conveyed via sheet flow into an existing roadside ditch which is collected in storm sewer culverts under the existing Core Trail/US 40 sidewalk, where it outfalls into the Lot 2.

Table 1 summarizes and compares the hydrological characteristics of the developed site and the existing site:

Table 1: Basin Hydrology Summary														
Basin	Pre-Development							Post-Development						
	Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)	Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)
H1	12.10	15	0.24	0.54	19.31	5.62	27.88							
H2	1.61	66	0.49	0.65	11.96	2.10	6.07							
H3	0.98	57	0.45	0.63	11.78	1.16	3.55							
H4	2.67	13	0.23	0.54	11.35	1.63	8.44							
D1.a								0.72	85	0.68	0.79	5.66	1.82	4.62
D1.a-1								0.08	100	0.90	0.96	5.00	0.28	0.66
D1.b								0.73	68	0.51	0.67	5.66	1.82	4.62
D1.c								0.63	88	0.73	0.82	6.42	1.34	3.81
D1.d								1.01	73	0.57	0.70	5.00	1.78	4.35
D1.e								0.73	90	0.74	0.83	10.24	1.63	4.41
D1.f								0.74	76	0.59	0.71	5.96	2.01	4.88
D1.f-1								0.22	61	0.46	0.63	12.72	1.10	2.93
D1.g								0.77	87	0.70	0.80	9.48	1.62	4.05
D1.h								0.53	88	0.72	0.81	5.00	1.47	3.63
D2								5.80	9	0.21	0.53	12.56	3.04	16.94
D3								3.30	45	0.37	0.59	14.39	2.91	10.07

Design point DP1 quantifies combined flow of H2, H3, & D1.a-D1.h, which is the outfall of the proposed storm sewer system into Lot 2. Design point h1 quantifies the historic and developed site's combined flow where it leaves the site. Table 2 summarizes the design points.

Table 2: Design Point Hydrology Summary															
Design Point	Basins	Pre-Development							Post-Development						
		Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)	Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)
DP1	H2+H3+ (D1.a-D1.h)								8.46	75	0.59	0.71	17.75	10.22	27.19
h1		17.36	22	0.27	0.55	19.31	9.04	41.03	17.56	48	0.39	0.60	17.36	14.22	47.97

Detention

While the proposed flow is greater than the historic, no detention is proposed to mitigate the increase in runoff because the site is adjacent to the Yampa River.

Storm System

Storm sewer systems in general will be made up of ADS drain basins and corrugated HDPE pipe in sizes from 12" to 36".

STORMWATER QUALITY

Water quality in the Yampa River is degraded by the washing-off of accumulated deposits on the urban landscape of Steamboat Springs. Metals, salts, sand, gravel, trash, debris, and organics (including oil and gasoline) all accumulate on the streets and in parking lots of Steamboat Springs over the course of time. During a rainstorm event, these pollutants are washed into the Yampa River and its tributaries. Water quality problems caused by these pollutants include turbid water, nutrient enrichment, bacterial contamination, reduction in dissolved oxygen, and increased stress on aquatic life. The most prevalent pollutant in Steamboat Springs is sediment. BMP's included in this project are designed to minimize the amount of sediment leaving the site and entering the waterways.

Potential Pollutant Sources: The following are anticipated pollutant sources for this project:

1. Routine maintenance involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
2. On site waste management practices (waste piles, dumpsters, etc.)

BMP Selection:

From the Mile High Flood District's (MHFD) *Urban Storm Drainage Criteria Manual* (USDCM), Volume 3, BMP selection involves many factors such as physical site characteristics, treatment objectives, aesthetics, safety, maintenance requirements, and costs. As each site is unique, there is not a standard BMP that can be implemented for every application and therefore there may be multiple solutions including stand-alone BMPs or 'treatment trains' that combine multiple BMPs to achieve the water quality objectives.

A proprietary hydrodynamic separator was chosen, along with grass-lined swales and tree planting (a 'treatment train). The treatment facility is designed to treat the 80th percentile storm event using the manufacturers proprietary design software. The chosen treatment facility is a Stormceptor Hydrodynamic Separator, which has been tested and verified by NJCAT, Washington ECOLOGY and EN858 Class 2. The units do not require filters or confined space entry for maintenance.

Table 3 summarizes the design parameters for the TSS design standards:

Talbe 3: 80th Percentile Storm Event (For Water Quality Design Flow)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	$C_{1.25}$	Intensity $I_{1.25}$ (in/hr)	Flow $Q_{1.25}$ (cfs)
DP1	H2+H3+ (D1.a-D1.h)	8.46	17.75	0.53	0.95	4.25

When run through the manufacturer's design software, PCSWWM for Stormceptor, the above parameters resulted in a minimum facility size of the STC 2400. The design report for the STC 2400 is included in Appendix C.

The facility will treat 87% of the project site, or 5.87 acres of the 6.75 total disturbed acres. In addition, the facility will treat 2.57 acres of previously untreated development to the north of the project site that is to be captured in the proposed storm sewer system. The captured area for the project site includes all vehicular roadway and surface parking areas, all dumpster locations, and approximately 90% of snow

storage associated with the roadways and surface parking. The uncaptured area includes an area of landscaping between the building 4 parking lot and the existing railroad tracks, a 12-foot-wide concrete trail along US Hwy 40, a raised park/recreational area in Lot 2 and associated landscaping.

Site operation can significantly manage stormwater quality and care should be exercised to monitor and maintain the BMPs described. An Operation and Maintenance Plan is included in Appendix D (with final drainage study).

CONCLUSIONS

The proposed design of the development adequately conveys storm drainage in the area of study. While the proposed flow is greater than the historic, no detention is proposed to mitigate the increase in runoff because the site is adjacent to the Yampa River. Routine maintenance of the system should be performed so the system will operate adequately under subsequent storm events. The design is consistent with City of Steamboat Springs standards and includes provisions for stormwater quality.

LIMITATIONS

This study is intended to estimate and analyze peak stormwater runoff volumes generated by hydrologic events in order to evaluate existing drainage infrastructure and design new infrastructure needed to manage these flows. It does not account for groundwater, springs, or seeps and is not intended to be used for the evaluation or design of foundation drains or roof drains.

Basin delineations, areas, and soil characteristics are based on those described in the Report. Actual conditions may vary. Landmark's assumptions, recommendations and opinions are based on this information and the proposed site plan. If any of the data is found to be inaccurate or the proposed site plan is changed, Landmark should be contacted to review this report and make any necessary revisions.

The data, opinions, and recommendations of this report are applicable to the specific design elements and location that is the subject of this report. This report is not applicable to any other design elements or to any other locations. Any and subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendation without the prior written consent of Landmark Consultants, Inc.

Landmark Consultants, Inc. has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the contractor, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the Final Construction Drawings and Specifications.

The only warranty or guarantee made by Landmark Consultants, Inc. in connection with the services performed for this project is that such services are performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions, at the same time, and in the same or similar locality. No other warranty, expressed or implied, is made or intended by rendering such services or by furnishing written reports of the findings.

REFERENCES

1. Section 5.0 Drainage Criteria, City of Steamboat Springs Department of Public Works, July 2019.
2. Drainage Criteria Manual (Volumes 1 – 3), Mile High Flood District's (MHFD), 2019
3. Hydraulic Design of Energy Dissipators for Culverts and Channels (HEC 14), Federal Highway Administration, September 1983
4. Hydraulic Design of Highway Culverts (HDS-5), Federal Highway Administration, September 2001
5. Procedures for Determining Peak Flows in Colorado, Natural Resource Conservation Service, 1984
6. Urban Hydrology for Small Watersheds (TR-55), Natural Resource Conservation Service, June 1986
7. Citywide Stormwater Master Plan, City of Steamboat Springs, Colorado, SEH, March 2013.

APPENDIX A

HYDROLOGIC CALCULATIONS

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Matthew Eggen
12/15/2023

BASIN RUNOFF COEFFICIENT CALCULATIONS

Character of Surface	Percent Impervious
Asphalt Parking and Walkways	100%
Gravel	40%
Roof	90%
Lawns and Landscaping	2%
Hard Pack Gravel	80%
Residential Lots	85%

IDF	Soil Type
Steamboat Springs NOAA	D

Basin ID	Basin Area (sq.ft.)	Basin Area (acres)	Area of Asphalt Parking and Walkways (sq.ft.)	Area of Asphalt Parking and Walkways (acres)	Area of Gravel Surfaces (sq.ft)	Area of Gravel Surfaces (acres)	Area of Roof (sq.ft.)	Area of Roof (acres)	Area of Lawns and Landscaping (sq.ft.)	Area of Lawns and Landscaping (acres)	Percent Impervious	5-year Composite Runoff Coefficient	100-year Composite Runoff Coefficient
H1	527099	12.10	69,893	1.60	0	0.00	0	0.00	457206	10.50	15	0.24	0.54
H2	70076	1.61	32,394	0.74	0	0.00	14818	0.34	22864	0.52	66	0.49	0.65
H3	42783	0.98	24,170	0.55	0	0.00		0.00	18613	0.43	57	0.45	0.63
H4	116101	2.67	6,515	0.15	0	0.00	6776	0.16	102810	2.36	13	0.23	0.54
D1.a	31520	0.72	11,300	0.26	0	0.00	17106	0.39	3114	0.07	85	0.68	0.79
D1.a-1	3570	0.08	3,570	0.08	0	0.00		0.00		0.00	100	0.90	0.96
D1.b	31791	0.73	21,280	0.49	0	0.00	0	0.00	10511	0.24	68	0.51	0.67
D1.c	27525	0.63	8,861	0.20	0	0.00	17107	0.39	1557	0.04	88	0.73	0.82
D1.d	44012	1.01	23,149	0.53	0	0.00	9843	0.23	11020	0.25	73	0.57	0.70
D1.e	31670	0.73	16,662	0.38	0	0.00	13012	0.30	1996	0.05	90	0.74	0.83
D1.f	32447	0.74	16,641	0.38	0	0.00	8731	0.20	7075	0.16	76	0.59	0.71
D1.f-1	9645	0.22	5,789	0.13	0	0.00	0	0.00	3856	0.09	61	0.46	0.63
D1.g	33571	0.77	15,151	0.35	0	0.00	15534	0.36	2886	0.07	87	0.70	0.80
D1.h	23169	0.53	13,360	0.31	0	0.00	7718	0.18	2091	0.05	88	0.72	0.81
D2	252850	5.80	17,099	0.39	4350	0.10	0	0.00	231401	5.31	9	0.21	0.53
D3	143669	3.30	63,197	1.45	0	0.00	0	0.00	80472	1.85	45	0.37	0.59

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PROJECT: 2602-001 - Mid Valley Apartments
DESIGNER: Matthew Eggen
DATE: 12/15/2023
POND ID:

BASIN TIME OF CONCENTRATION CALCULATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}}$$ (Equation RO-3)

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, i From Figures 3.3.1-2 (Area II)

Velocity (Gutter Flow), V = 20·S$^{1/2}$

Velocity (Swale Flow), V = 15·S$^{1/2}$

Rational Equation: Q = CiA (Equation RO-1)

	Overland Flow 1				Conveyance		Swale Flow 1				Conveyance		Swale Flow 2				Time of Concentration		
Basin(s)	C_5*	Length, L (ft)	Slope, S (%)	T_i (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)	Comp. T_c (min)	$\frac{L}{180}+10$	Actual T_c (min)
H1	0.24	100	2.00	12.56	Grassed Waterway	15	1000	1.76	2.65	8.38	Heavy Meadow	2.5	575	0.66	1.62	47.19	68.12	19.31	19.31
H2	0.49	100	2.00	8.82	Grassed Waterway	15	400	2.00	2.83	3.14	Grassed Waterway	15			N/A	N/A	11.96	12.78	11.96
H3	0.45	100	0.54	14.75	Grassed Waterway	15	220	0.54	1.47	3.33	Grassed Waterway	15			N/A	N/A	18.07	11.78	11.78
H4	0.23	75	5.00	8.12	Grassed Waterway	15	410	2.00	2.83	3.22	Grassed Waterway	15			N/A	N/A	11.35	12.69	11.35
D1.a	0.21	25	6.20	4.44	Shallow Paved Swales	20	210	2.06	2.87	1.22	Grassed Waterway	15			N/A	N/A	5.66	11.31	5.66
D1.a-1	0.90	25	3.50	1.21	Shallow Paved Swales	20	110	1.10	2.10	0.87	Grassed Waterway	15			N/A	N/A	2.08	10.75	5.00
D1.b	0.51	35	5.17	3.70	Short Pasture and Lawns	7	90	1.96	2.80	1.53	Shallow Paved Swales	20	125	0.77	1.75	1.19	6.42	11.39	6.42
D1.c	0.73	45	3.20	3.10	Shallow Paved Swales	20	78	1.21	2.20	0.59	Shallow Paved Swales	20	92	1.30	2.28	0.67	4.36	11.19	5.00
D1.d	0.21	45	11.00	4.92	Short Pasture and Lawns	7	138	0.50	1.41	4.65	Shallow Paved Swales	20	57	0.50	1.41	0.67	10.24	11.33	10.24
D1.e	0.74	35	2.70	2.78	Shallow Paved Swales	20	71	0.90	1.90	0.62	Shallow Paved Swales	20	217	0.50	1.41	2.56	5.96	11.79	5.96
D1.f	0.59	100	2.20	7.26	Short Pasture and Lawns	7	80	0.70	1.67	2.28	Shallow Paved Swales	20	310	0.60	1.55	3.34	12.87	12.72	12.72
D1.f-1	0.46	100	2.20	8.98	Short Pasture and Lawns	7	80	0.70	1.67	2.28	Shallow Paved Swales	20			N/A	N/A	11.26	11.00	11.00
D1.g	0.74	100	1.00	6.60	Shallow Paved Swales	20	78	1.30	2.28	0.57	Shallow Paved Swales	20	240	0.75	1.73	2.31	9.48	12.32	9.48
D1.h	0.72	31	4.20	2.44	Shallow Paved Swales	20	31	1.00	2.00	0.26	Shallow Paved Swales	20	185	1.30	2.28	1.35	4.05	11.37	5.00
D2	0.21	100	4.60	9.84	Heavy Meadow	2.5	360	0.75	1.73	27.71	Grassed Waterway	15			N/A	N/A	37.56	12.56	12.56
D3	0.37	100	2.00	10.58	Grassed Waterway	15	690	1.60	2.53	6.06	Grassed Waterway	15			N/A	N/A	16.64	14.39	14.39

Note: C_5 for overland flow is C value for that segment of flow, not overall basin C_5

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DIRECT RUNOFF COMPUTATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}}$$ (Equation RO-3)

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, I from Equation 1 (Equation 1)

$$I = P_1 \times \frac{49.1}{(T_d + 7.84)^{0.919}}$$

Where:

I = rainfall intensity (inches per hour)
P_1 = 1-hour rainfall depth (inches)
T_d = storm duration (minutes)

Table 5.5.1.P1 and Intensity-Duration-Frequency Values

Return Period	P1	Rainfall Intensity for Storm Duration				
		5-min	10-min	15-min	30-min	60-min
1.25-year	0.38	1.79	1.33	1.06	0.66	0.39
2-year	0.55	2.58	1.90	1.52	0.95	0.56
5-year	0.82	3.84	2.84	2.26	1.42	0.83
10-year	1.04	4.89	3.61	2.88	1.81	1.06
25-year	1.34	6.30	4.66	3.71	2.33	1.36
50-year	1.57	7.38	5.46	4.35	2.73	1.60
100-year	1.79	8.42	6.22	4.96	3.12	1.82
500-year	2.31	10.86	8.03	6.40	4.02	2.35

Velocity (Gutter Flow), V = 20·$S^{½}$

Velocity (Swale Flow), V = 15·$S^{½}$

Rational Equation: Q = CiA (Equation RO-1)

Basin(s)	Area, A (acres)	T_c (min)	C_5	C_{100}	Intensity, I_5 (in/hr)	Intensity, I_{100} (in/hr)	Flow, Q_5 (cfs)	Q_5 per Acre (cfs/ac)	Flow, Q_{100} (cfs)	Q_{100} per Acre (cfs/ac)
H1	12.10	19.31	0.24	0.54	1.96	4.27	5.62	0.46	27.88	2.30
H2	1.61	11.96	0.49	0.65	2.65	5.78	2.10	1.31	6.07	3.77
H3	0.98	11.78	0.45	0.63	2.65	5.78	1.16	1.18	3.55	3.61
H4	2.67	11.35	0.23	0.54	2.71	5.92	1.63	0.61	8.44	3.17
D1.a	0.72	5.66	0.68	0.79	3.72	8.13	1.82	2.51	4.62	6.38
D1.a-1	0.08	5.00	0.90	0.96	3.86	8.42	0.28	3.47	0.66	8.08
D1.b	0.73	6.42	0.51	0.67	3.60	7.86	1.34	1.84	3.81	5.22
D1.c	0.63	5.00	0.73	0.82	3.86	8.42	1.78	2.81	4.35	6.89
D1.d	1.01	10.24	0.57	0.70	2.85	6.22	1.63	1.61	4.41	4.36
D1.e	0.73	5.96	0.74	0.83	3.72	8.13	2.01	2.77	4.88	6.71
D1.f	0.74	12.72	0.59	0.71	2.53	5.52	1.10	1.48	2.93	3.93
D1.f-1	0.22	11.00	0.46	0.63	2.71	5.92	0.28	1.26	0.83	3.74
D1.g	0.77	9.48	0.70	0.80	3.01	6.56	1.62	2.11	4.05	5.26
D1.h	0.53	5.00	0.72	0.81	3.86	8.42	1.47	2.76	3.63	6.82
D2	5.80	12.56	0.21	0.53	2.53	5.52	3.04	0.52	16.94	2.92
D3	3.30	14.39	0.37	0.59	2.37	5.17	2.91	0.88	10.07	3.05

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PROJECT: 2602-001 - Mid Valley Apartments
DESIGNER: Matthew Eggen
DATE: 12/15/2023
POND ID:

COMBINED RUNOFF COEFFICIENT CALCULATIONS

Character of Surface	Percent Impervious
Asphalt Parking and Walkways	100%
Gravel	40%
Roof	90%
Lawns and Landscaping	2%
Hard Pack Gravel	80%
Residential Lots	20%

Design Point	Combined Basin IDs	Basin Area (sq.ft.)	Basin Area (acres)	Area of Asphalt Parking and Walkways (sq.ft.)	Area of Asphalt Parking and Walkways (acres)	Area of Gravel Surfaces (sq.ft)	Area of Gravel Surfaces (acres)	Area of Roof (sq.ft.)	Area of Roof (acres)	Area of Lawns and Landscaping (sq.ft.)	Area of Lawns and Landscaping (acres)	Percent Impervious	5-year Composite Runoff Coefficient	100-year Composite Runoff Coefficient
DP1	H2+H3+ (D1.a-D1.h)	368564.00	8.46	182968.00	4.20	0.00	0.00	103869.00	2.38	81727.00	1.88	75	0.59	0.71
h1-H	H1+H2+H3+H4	756059.00	17.36	132972.00	3.05	0.00	0.00	21594.00	0.50	601493.00	13.81	22	0.27	0.55
h1-D	(D1.a-D1.h)+D2+ D3+H2+H3	765083.00	17.56	263264.00	6.04	4350.00	0.10	103869.00	2.38	393600.00	9.04	48	0.39	0.60

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DESIGNER: Matthew Eggen
DATE: 12/15/2023
POND ID:

COMBINED TIME OF CONCENTRATION COMPUTATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}}$$ (Equation RO-3)

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, i From Figures 3.3.1-2 (Area II)

Velocity (Gutter Flow), V = 20·$S^{½}$

Velocity (Swale Flow), V = 15·$S^{½}$

Rational Equation: Q = CiA (Equation RO-1)

		Overland Flow 1				land F	Conveyance		Swale Flow 1				Conveyance		Swale Flow 2				Time of Concentration		
Design Point	Basin(s)	C_5	Length, L (ft)	Slope, S (%)	T_i (min)	T_i (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)	Comp. T_c (min)	$\frac{L}{180}+10$	Actual T_c (min)
DP1	H2+H3+ (D1.a-D1.h)	0.59	100	2.00	7.49	N/A	Grassed Waterway	15	400	2.00	2.83	3.14	Shallow Paved Swales	20	895	0.60	1.55	9.63	20.27	17.75	17.75
h1-H	H1+H2+H3+H4	0.27	100	2.00	12.14	N/A	Grassed Waterway	15	1000	1.76	2.65	8.38	Heavy Meadow	2.5	575	0.66	1.62	47.19	67.70	19.31	19.31
h1-D	(D1.a-D1.h)+D2+ D3+H2+H3	0.39	100	2.00	10.40	N/A	Grassed Waterway	15	690	2.00	2.83	5.42	Heavy Meadow	2.5	535	0.55	1.48	48.09	63.92	17.36	17.36

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PROJECT: 2602-001 - Mid Valley Apartments
DESIGNER: Matthew Eggen
DATE: 12/15/2023
POND ID:

COMBINED DIRECT RUNOFF COMPUTATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}}$$

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, I from Equation 1

$$I = P_1 \times \frac{49.1}{(T_d + 7.84)^{0.919}}$$

Where:

I = rainfall intensity (inches per hour)
P_1 = 1-hour rainfall depth (inches)
T_d = storm duration (minutes)

Table 5.5.1.P1 and Intensity-Duration-Frequency Values

Return Period	P1	Rainfall Intensity for Storm Duration				
		5-min	10-min	15-min	30-min	60-min
1.25-year	0.38	1.79	1.33	1.06	0.66	0.39
2-year	0.55	2.58	1.90	1.52	0.95	0.56
5-year	0.82	3.84	2.84	2.26	1.42	0.83
10-year	1.04	4.89	3.61	2.88	1.81	1.06
25-year	1.34	6.30	4.66	3.71	2.33	1.36
50-year	1.57	7.38	5.46	4.35	2.73	1.60
100-year	1.79	8.42	6.22	4.96	3.12	1.82
500-year	2.31	10.86	8.03	6.40	4.02	2.35

Velocity (Gutter Flow), V = 20·$S^{½}$

Velocity (Swale Flow), V = 15·$S^{½}$

Rational Equation: Q = CiA (Equation RO-1)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	C_5	C_{100}	Intensity, I_5 (in/hr)	Intensity, I_{100} (in/hr)	Flow, Q_5 (cfs)	Q_5 per Acre (cfs/ac)	Flow, Q_{100} (cfs)	Q_{100} per Acre (cfs/ac)
DP1	H2+H3+ (D1.a-D1.h)	8.46	17.75	0.59	0.71	2.06	4.51	10.22	1.21	27.19	3.21
h1-H	H1+H2+H3+H4	17.36	19.31	0.27	0.55	1.96	4.27	9.04	0.52	41.03	2.36
h1-D	(D1.a-D1.h)+D2+ D3+H2+H3	17.56	17.36	0.39	0.60	2.10	4.59	14.22	0.81	47.97	2.73

80th Percentile Storm Event (For Water Quality Design Flow)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	$C_{1.25}$	Intensity $I_{1.25}$ (in/hr)	Flow $Q_{1.25}$ (cfs)
DP1	H2+H3+ (D1.a-D1.h)	8.46	17.75	0.52	0.95	4.17

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PROJECT: 2602-001 - Mid Valley Apartments
DESIGNER: Matthew Eggen
DATE: 12/15/2023
POND ID:

TABLES

Table 1: Basin Hydrology Summary

Basin	Pre-Development							Post-Development						
	Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)	Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)
H1	12.10	15	0.24	0.54	19.31	5.62	27.88							
H2	1.61	66	0.49	0.65	11.96	2.10	6.07							
H3	0.98	57	0.45	0.63	11.78	1.16	3.55							
H4	2.67	13	0.23	0.54	11.35	1.63	8.44							
D1.a								0.72	85	0.68	0.79	5.66	1.82	4.62
D1.a-1								0.08	100	0.90	0.96	5.00	0.28	0.66
D1.b								0.73	68	0.51	0.67	5.66	1.82	4.62
D1.c								0.63	88	0.73	0.82	6.42	1.34	3.81
D1.d								1.01	73	0.57	0.70	5.00	1.78	4.35
D1.e								0.73	90	0.74	0.83	10.24	1.63	4.41
D1.f								0.74	76	0.59	0.71	5.96	2.01	4.88
D1.f-1								0.22	61	0.46	0.63	12.72	1.10	2.93
D1.g								0.77	87	0.70	0.80	9.48	1.62	4.05
D1.h								0.53	88	0.72	0.81	5.00	1.47	3.63
D2								5.80	9	0.21	0.53	12.56	3.04	16.94
D3								3.30	45	0.37	0.59	14.39	2.91	10.07

Table 2: Design Point Hydrology Summary

Design Point	Basins	Pre-Development							Post-Development						
		Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)	Total Area (acres)	%Imp	C_5	C_{100}	T_c (min)	Q_5 (cfs)	Q_{100} (cfs)
DP1	H2+H3+ (D1.a-D1.h)								8.46	75	0.59	0.71	17.75	10.22	27.19
h1		17.36	22	0.27	0.55	19.31	9.04	41.03	17.56	48	0.39	0.60	17.36	14.22	47.97

Table 3: 80th Percentile Storm Event (For Water Quality Design Flow)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	$C_{1.25}$	Intensity $I_{1.25}$ (in/hr)	Flow $Q_{1.25}$ (cfs)
DP1	H2+H3+ (D1.a-D1.h)	8.46	17.75	0.53	0.95	4.25

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PROJECT:	2602-001
DESIGNER:	Matthew Eggen
DATE:	12/15/2023
POND ID:	

CRITICAL FLOW COMPUTATION

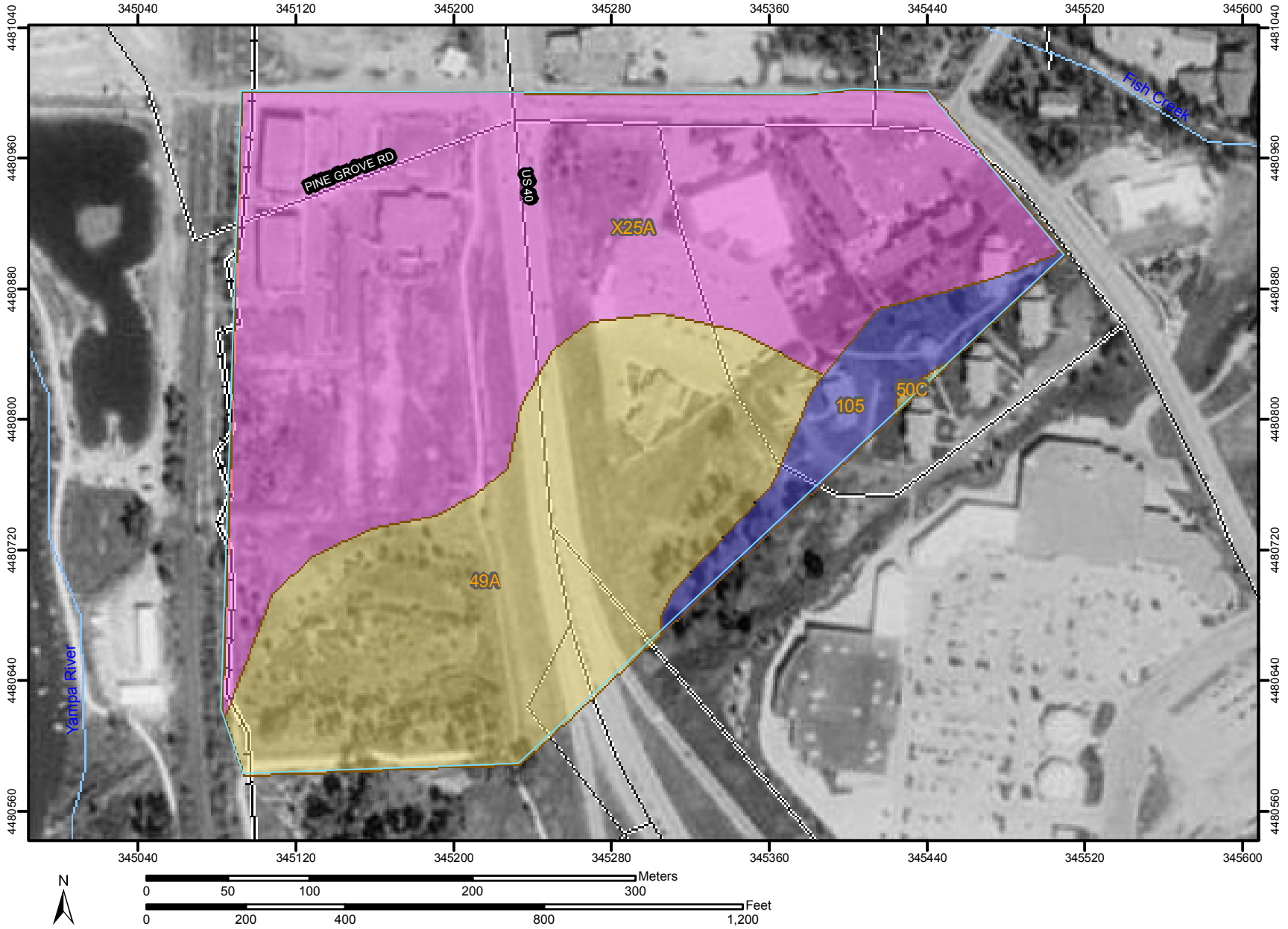
$$Fr = \frac{v}{\sqrt{gD_h}} \qquad (5.7.2)$$

Where:

Fr = Froude number (dimensionless)
v = velocity (ft/s)
g = gravitational acceleration (32.2 ft/s^2)
A = channel flow area (ft^2)
T = top width of flow area (ft)
D_h = hydraulic depth, D_h=A/T (ft)

	FR	V	G	a	t	Dh	DESIGN %	Check Dam Slope
D3	**0.65**	2.78	32.2	3.76	6.72	0.56	1.00%	NA
D1.f-1	**0.47**	1.23	32.2	0.71	3.36	0.21	0.70%	NA

Hydrologic Soil Group–Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
(Trailside Village)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Soil Ratings
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
Survey Area Data: Version 4, Sep 25, 2007

Date(s) aerial images were photographed: 1999

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Routt Area, Colorado, Parts of Rio Blanco and Routt Counties				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
49A	Menbar, gravelly substratum, 0 to 3 percent slopes	C	13.4	35.1%
50C	Lintim loam, 3 to 12 percent slopes	C	0.1	0.2%
105	Rabbitears very gravelly sandy loam, 30 to 50 percent slopes	B	2.3	6.2%
X25A	Toponas loam, 0 to 3 percent slopes	D	22.4	58.6%
Totals for Area of Interest (AOI)			38.1	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

1196-012

Federal Emergency Management Agency

Washington, D.C. 20472

January 09, 2007

THE HONORABLE PAULL HUGHES
CITY OF STEAMBOAT SPRINGS
P O BOX 775088
STEAMBOAT SPRINGS, CO 80477

CASE NO.: 06-08-B665C
COMMUNITY: CITY OF STEAMBOAT SPRINGS, ROUTT COUNTY, COLORADO
COMMUNITY NO.: 080159

DEAR MR. HUGHES:

This is in reference to a request that the Federal Emergency Management Agency (FEMA) determine if the property described in the enclosed document is located within an identified Special Flood Hazard Area, the area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood), on the effective National Flood Insurance Program (NFIP) map. Using the information submitted and the effective NFIP map, our determination is shown on the attached Conditional Letter of Map Revision based on Fill (CLOMR-F) Comment Document. This comment document provides additional information regarding the effective NFIP map, the legal description of the property and our comments regarding this proposed project.

Additional documents are enclosed which provide information regarding the subject property and CLOMR-Fs. Please see the List of Enclosures below to determine which documents are enclosed. Other attachments specific to this request may be included as referenced in the Determination/Comment document. If you have any questions about this letter or any of the enclosures, please contact the FEMA Map Assistance Center toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, 3601 Eisenhower Avenue, Suite 130, Alexandria, VA 22304-6439.

Sincerely,

William R Blanton Jr

William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

LIST OF ENCLOSURES:

CLOMR-F COMMENT DOCUMENT

cc: Mr. Ryan Spaustat

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION BASED ON FILL COMMENT DOCUMENT

COMMUNITY AND MAP PANEL INFORMATION		LEGAL PROPERTY DESCRIPTION
COMMUNITY	CITY OF STEAMBOAT SPRINGS, ROUTT COUNTY, COLORADO	A proposed portion of The Groves Subdivision, Routt County, Colorado The portion of property to be removed from the SFHA is more particularly described by the following metes and bounds: BEGINNING at the northeast corner of Lot 2, Mid-Valley Business Center Filing No. 2; thence S06°28'27"E, 203.34 feet; thence S06°49'10"E, 278.50 feet; thence S06°49'13"E, 31.64 feet; thence S09°57'19"E, 53.51
	COMMUNITY NO.: 080159	
AFFECTED MAP PANEL	NUMBER: 08107C0879D	
	DATE: 2/4/2005	
FLOODING SOURCE: YAMPA RIVER		APPROXIMATE LATITUDE & LONGITUDE OF PROPERTY: 40.463, -106.827 SOURCE OF LAT & LONG: PRECISION MAPPING STREETS 7.0 DATUM: NAD 83

COMMENT TABLE REGARDING THE PROPOSED PROPERTY (PLEASE NOTE THAT THIS IS NOT A FINAL DETERMINATION. A FINAL DETERMINATION WILL BE MADE UPON RECEIPT OF AS-BUILT INFORMATION REGARDING THIS PROPERTY.)

LOT	BLOCK/ SECTION	SUBDIVISION	STREET	OUTCOME WHAT WOULD BE REMOVED FROM THE SFHA	FLOOD ZONE	1% ANNUAL CHANCE FLOOD ELEVATION (NAVD 88)	LOWEST ADJACENT GRADE ELEVATION (NAVD 88)	LOWEST LOT ELEVATION (NAVD 88)
--	--	--	--	Portion of Property	X (shaded)	6755.0 feet	--	6755.3 feet

Special Flood Hazard Area (SFHA) - The SFHA is an area that would be inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood).

ADDITIONAL CONSIDERATIONS (Please refer to the appropriate section on Attachment 1 for the additional considerations listed below.)

LEGAL PROPERTY DESCRIPTION
PORTIONS REMAIN IN THE SFHA
CONDITIONAL LOMR-F DETERMINATION

This document provides the Federal Emergency Management Agency's comment regarding a request for a Conditional Letter of Map Revision based on Fill for the property described above. Using the information submitted and the effective National Flood Insurance Program (NFIP) map, we have determined that the proposed described portion(s) of the property(ies) would not be located in the SFHA, an area inundated by the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) if built as proposed. Our final determination will be made upon receipt of a copy of this document, as-built elevations, and a completed Community Acknowledgement form. Proper completion of this form certifies the subject property is reasonably safe from flooding in accordance with Part 65.5(a)(4) of our regulations. Further guidance on determining if the subject property is reasonably safe from flooding may be found in FEMA Technical Bulletin 10-01. A copy of this bulletin can be obtained by calling the FEMA Map Assistance Center toll free at (877) 336-2627 (877-FEMA MAP) or from our web site at http://www.fema.gov/mit/tb1001.pdf. This document is not a final determination; it only provides our comment on the proposed project in relation to the SFHA shown on the effective NFIP map.

This comment document is based on the flood data presently available. The enclosed documents provide additional information regarding this request. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, 3601 Eisenhower Avenue, Suite 130, Alexandria, VA 22304-6439.

William R Blanton Jr

William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

Federal Emergency Management Agency

Washington, D.C. 20472

CONDITIONAL LETTER OF MAP REVISION BASED ON FILL COMMENT DOCUMENT

ATTACHMENT 1 (ADDITIONAL CONSIDERATIONS)

LEGAL PROPERTY DESCRIPTION (CONTINUED)

feet; thence S80°02'41"W, 58.20 feet; thence N88°20'13"W, 141.78 feet; thence S68°34'41"W, 27.68 feet; thence N77°26'53"W, 25.60 feet; thence S45°07'47"W, 38.35 feet; thence S22°44'52"W, 42.25 feet; thence S44°19'00"W, 53.53 feet; thence S60°36'54"W, 6.74 feet; thence S76°54'49"W, 69.32 feet; thence S11°58'37"E, 10.49 feet; thence S33°01'23"W, 11.70 feet; thence S78°01'23"W, 11.70 feet; thence N61°05'54"W, 14.90 feet; thence S76°50'46"W, 72.48 feet; thence N39°54'11"W, 20.94 feet; thence N03°25'25"W, 38.54 feet; thence N01°37'43"E, 29.82 feet; thence N01°43'41"W, 156.95 feet; thence N01°43'41"W, 227.62 feet; thence S89°56'52"E, 139.58 feet; thence N01°26'58"W, 91.44 feet; thence N01°02'56"E, 123.75 feet; thence S88°55'28"E, 87.87 feet; thence N01°12'32"E, 40.00 feet; thence N88°28'22"E, 232.71 feet to the POINT OF BEGINNING

PORTIONS OF THE PROPERTY REMAIN IN THE SFHA (This Additional Consideration applies to the preceding 1 Property.)

Portions of this property, but not the subject of the Determination/Comment document, may remain in the Special Flood Hazard Area. Therefore, any future construction or substantial improvement on the property remains subject to Federal, State/Commonwealth, and local regulations for floodplain management.

CONDITIONAL LOMR-F DETERMINATION (This Additional Consideration applies to the preceding 1 Property.)

Comments regarding this conditional request are based on the flood data presently available. Our final determination will be made upon receipt of this Comment Document, certified as-built elevations and/or certified as-built survey. Since this request is for a Conditional Letter of Map Revision based on Fill, we will also require the applicable processing fee, and the "Community Acknowledgement" form. Please note that additional items may be required before a final as-built determination is issued.

This letter does not relieve Federal agencies of the need to comply with Executive Order 11988 on Floodplain Management in carrying out their responsibilities and providing Federally undertaken, financed, or assisted construction and improvements, or in their regulating or licensing activities.

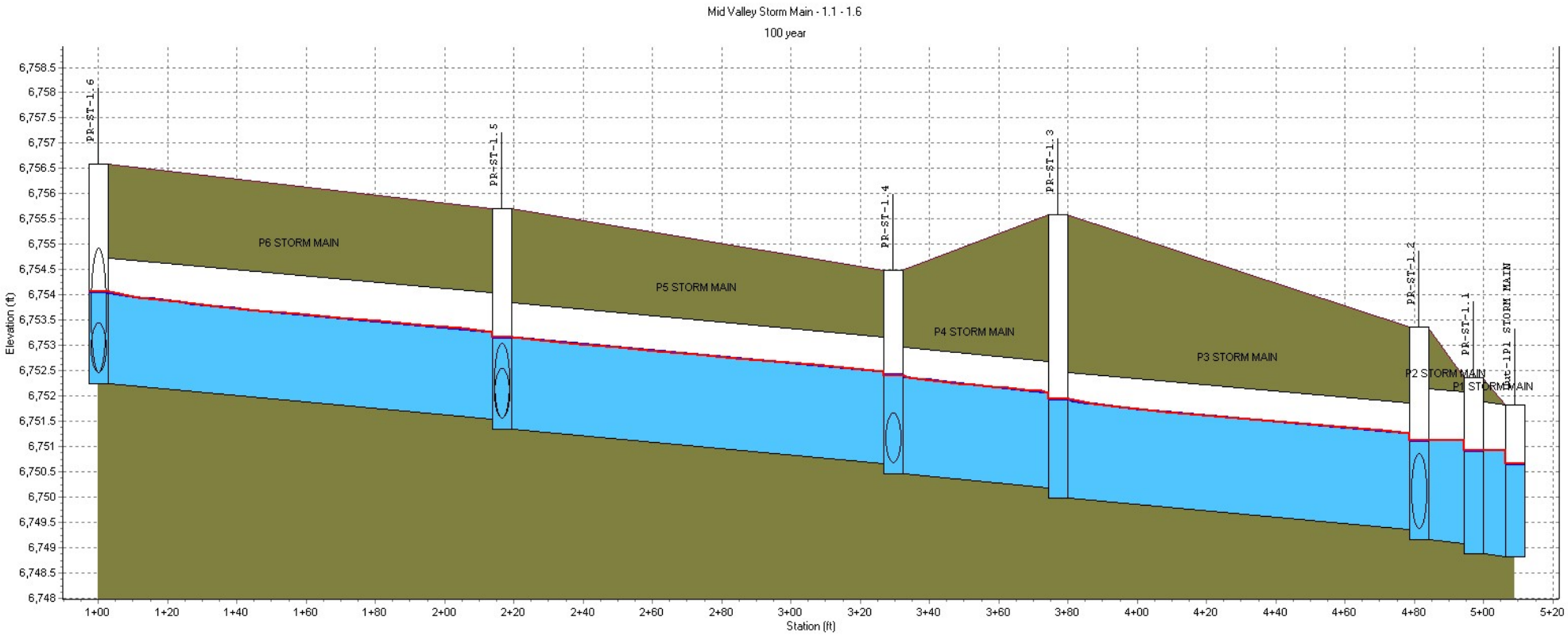
This attachment provides additional information regarding this request. If you have any questions about this attachment, please contact the FEMA Map Assistance Center toll free at (877) 336-2627 (877-FEMA MAP) or by letter addressed to the Federal Emergency Management Agency, 3601 Eisenhower Avenue, Suite 130, Alexandria, VA 22304-6439.

William R Blanton Jr

William R. Blanton Jr., CFM, Chief
Engineering Management Section
Mitigation Division

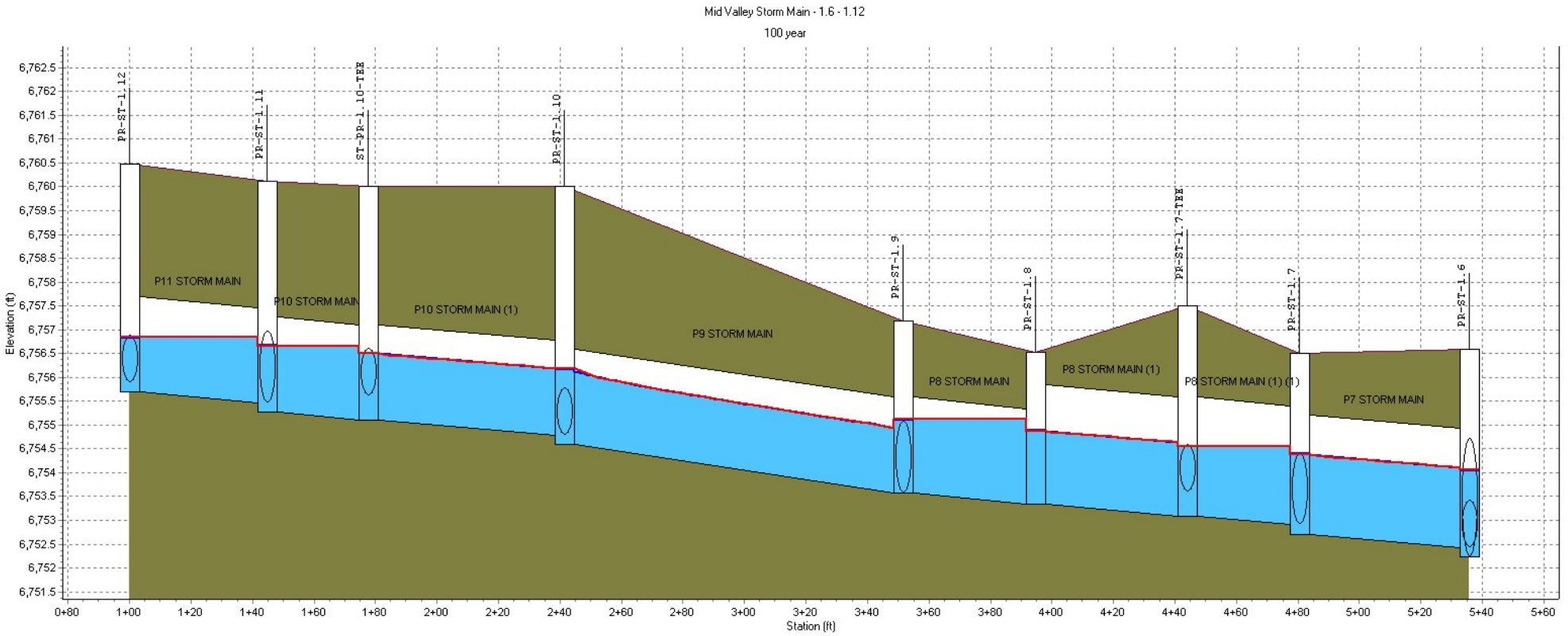
APPENDIX B

HYDRAULIC CALCULATIONS



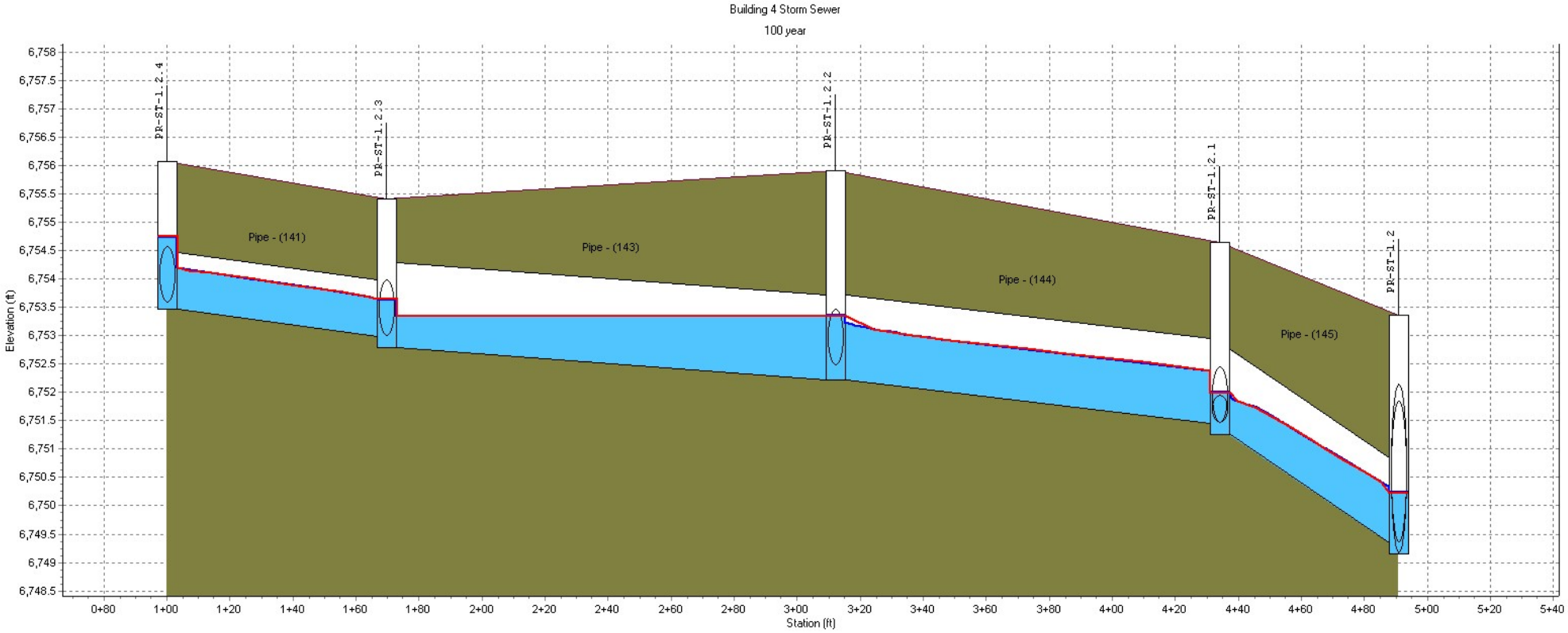
:	PR-ST-1.6	PR-ST-1.5	PR-ST-1.4	PR-ST-1.3	PR-ST-1.2	PR-ST-1.1	
Rim (ft):	6756.58	6755.70	6754.48	6755.58	6753.36	6752.36	
Invert (ft):	6752.23	6751.34	6750.46	6749.97	6749.15	6748.87	6748.81
Min Pipe Cover (ft):	1.65	1.67	1.33	2.91	1.21	0.29	
Max HGL (ft):	6754.11	6753.22	6752.45	6751.98	6751.17	6750.95	6750.69

:	P6 STORM MAIN	P5 STORM MAIN	P4 STORM MAIN	P3 STORM MAIN	P2 STORM MAIN	P1 STORM MAIN	
Length (ft):	116.36	113.04	47.73	104.05	15.84	11.99	
Dia (ft):	2.50	2.50	2.50	2.50	3.00	3.00	
Slope (ft/ft):	0.0059	0.0061	0.0060	0.0060	0.0050	0.0050	
Up Invert (ft):	6752.23	6751.34	6750.46	6749.97	6749.15	6748.87	
Dn Invert (ft):	6751.54	6750.66	6750.17	6749.35	6749.07	6748.81	
Max Q (cfs):	36.31	39.76	40.03	40.21	48.84	48.83	
Max Vel (ft/s):	10.36	10.65	10.56	10.52	10.48	10.48	
Max Depth (ft):	1.62	1.75	1.76	1.76	1.84	1.84	



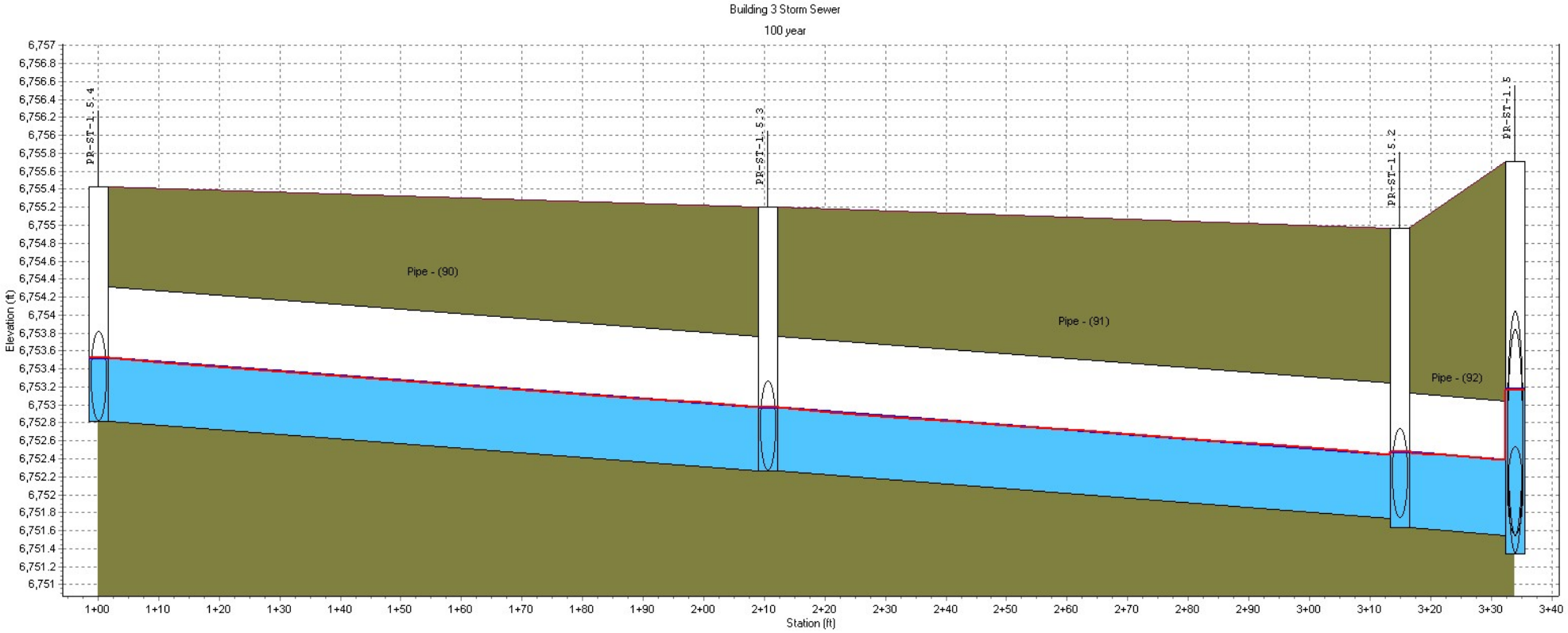
:	PR-ST-1.12	PR-ST-1.11	ST-PR-1.10-TEE	PR-ST-1.10	PR-ST-1.9	PR-ST-1.8	PR-ST-1.7-TEE	PR-ST-1.7	PR-ST-1.6
Rim (ft):	6760.47	6760.12	6760.00	6760.00	6757.19	6756.53	6757.50	6756.50	6756.58
Invert (ft):	6755.69	6755.27	6755.11	6754.59	6753.58	6753.34	6753.09	6752.71	6752.23
Min Pipe Cover (ft):	2.78	2.66	2.89	3.21	1.61	0.69	1.91	1.09	1.65
Max HGL (ft):	6756.85	6756.77	0.00	6756.25	6757.19	6755.01	0.00	6754.42	6754.11

:	P11 STORM MAIN	P10 STORM MAIN	P10 STORM MAIN (1)	P9 STORM MAIN	P8 STORM MAIN	P8 STORM MAIN (1)	P8 STORM MAIN (1) (1)	P7 STORM MAIN
Length (ft):	44.79	32.83	63.67	110.23	43.16	49.13	36.62	55.26
Dia (ft):	2.00	2.00	2.00	2.00	2.00	2.50	2.50	2.50
Slope (ft/ft):	0.0050	0.0050	0.0050	0.0091	0.0056	0.0050	0.0050	0.0050
Up Invert (ft):	6755.69	6755.27	6755.11	6754.59	6753.58	6753.34	6753.09	6752.71
Dn Invert (ft):	6755.47	6755.11	6754.79	6753.58	6753.34	6753.09	6752.91	6752.43
Max Q (cfs):	16.39	21.59	20.35	24.92	24.90	28.76	28.51	33.10
Max Vel (ft/s):	8.30	8.44	8.51	11.26	8.98	9.18	9.18	9.54
Max Depth (ft):	1.15	1.39	1.39	1.28	1.54	1.47	1.47	1.62



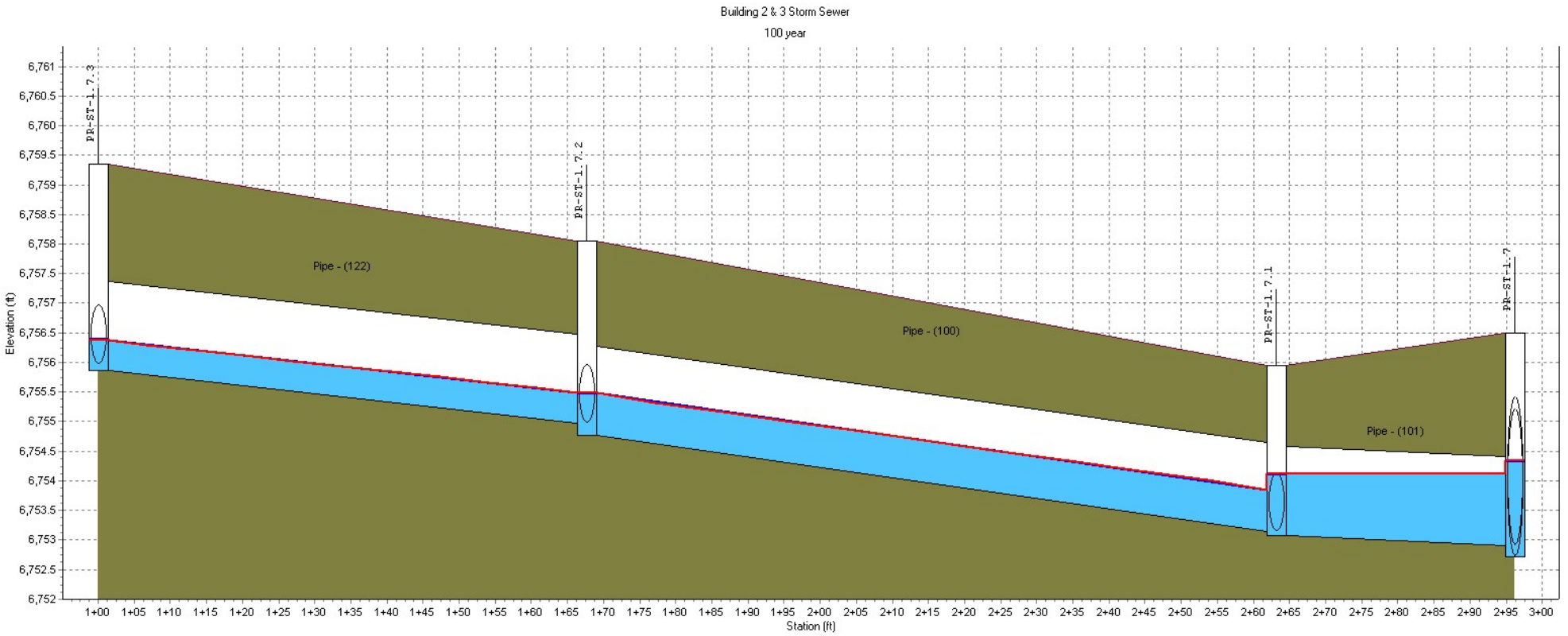
:	PR-ST-1.2.4	PR-ST-1.2.3	PR-ST-1.2.2	PR-ST-1.2.1	PR-ST-1.2
Rim (ft):	6756.06	6755.41	6755.91	6754.64	6753.36
Invert (ft):	6753.47	6752.79	6752.22	6751.26	6749.15
Min Pipe Cover (ft):	1.49	1.12	2.19	1.68	1.21
Max HGL (ft):	6754.79	6753.64	6753.35	6752.00	6750.24

:	Pipe - (141)	Pipe - (143)	Pipe - (144)	Pipe - (145)
Length (ft):	69.75	142.25	122.00	56.96
Dia (ft):	1.00	1.50	1.50	1.50
Slope (ft/ft):	0.0069	0.0040	0.0062	0.0335
Up Invert (ft):	6753.47	6752.79	6752.22	6751.26
Dn Invert (ft):	6752.99	6752.22	6751.46	6749.35
Max Q (cfs):	4.09	4.08	7.69	7.69
Max Vel (ft/s):	5.53	3.46	6.15	8.67
Max Depth (ft):	0.89	0.99	1.00	0.81



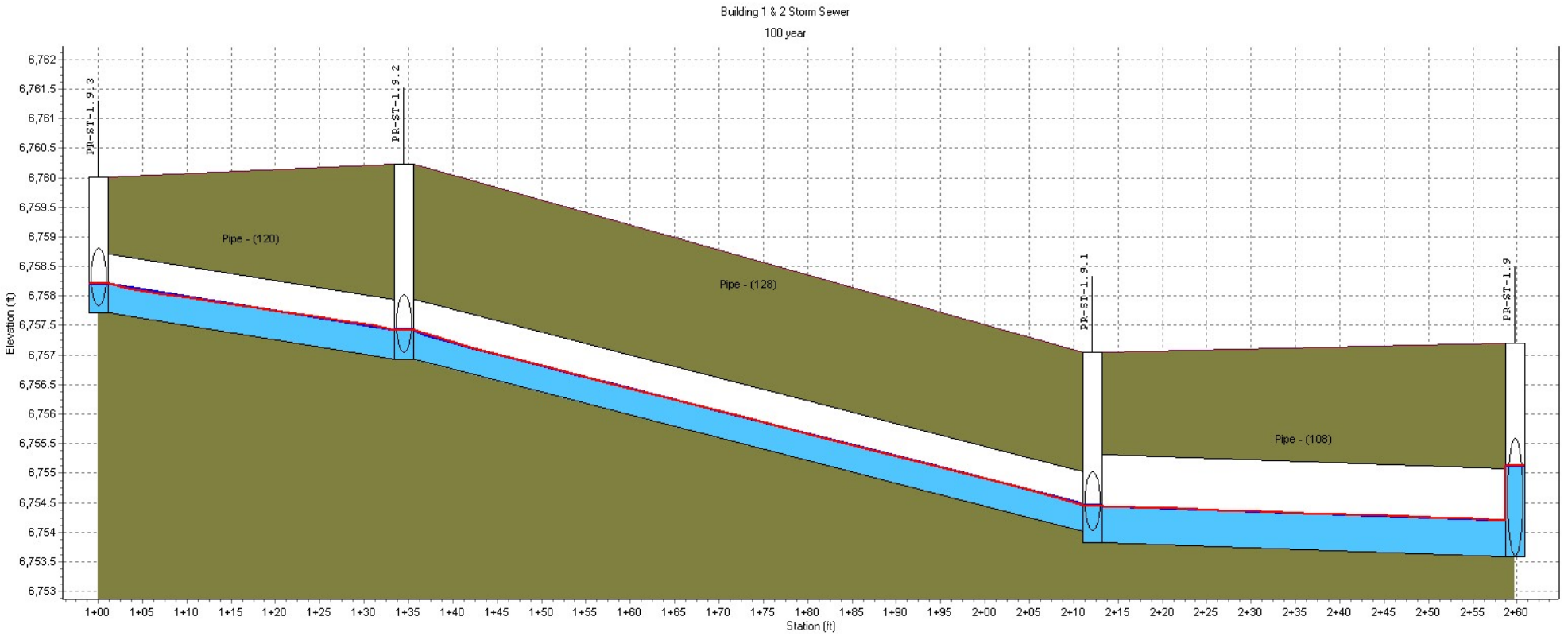
:	PR-ST-1.5.4	PR-ST-1.5.3	PR-ST-1.5.2	PR-ST-1.5
Rim (ft):	6755.42	6755.20	6754.96	6755.70
Invert (ft):	6752.81	6752.26	6751.64	6751.34
Min Pipe Cover (ft):	1.11	1.44	1.72	1.67
Max HGL (ft):	6753.52	6753.00	6752.53	6753.23

:	Pipe - (90)	Pipe - (91)	Pipe - (92)
Length (ft):	110.50	104.42	19.03
Dia (ft):	1.50	1.50	1.50
Slope (ft/ft):	0.0050	0.0050	0.0050
Up Invert (ft):	6752.81	6752.26	6751.64
Dn Invert (ft):	6752.26	6751.74	6751.54
Max Q (cfs):	5.23	5.34	5.26
Max Vel (ft/s):	6.19	6.29	4.82
Max Depth (ft):	0.71	0.71	0.84



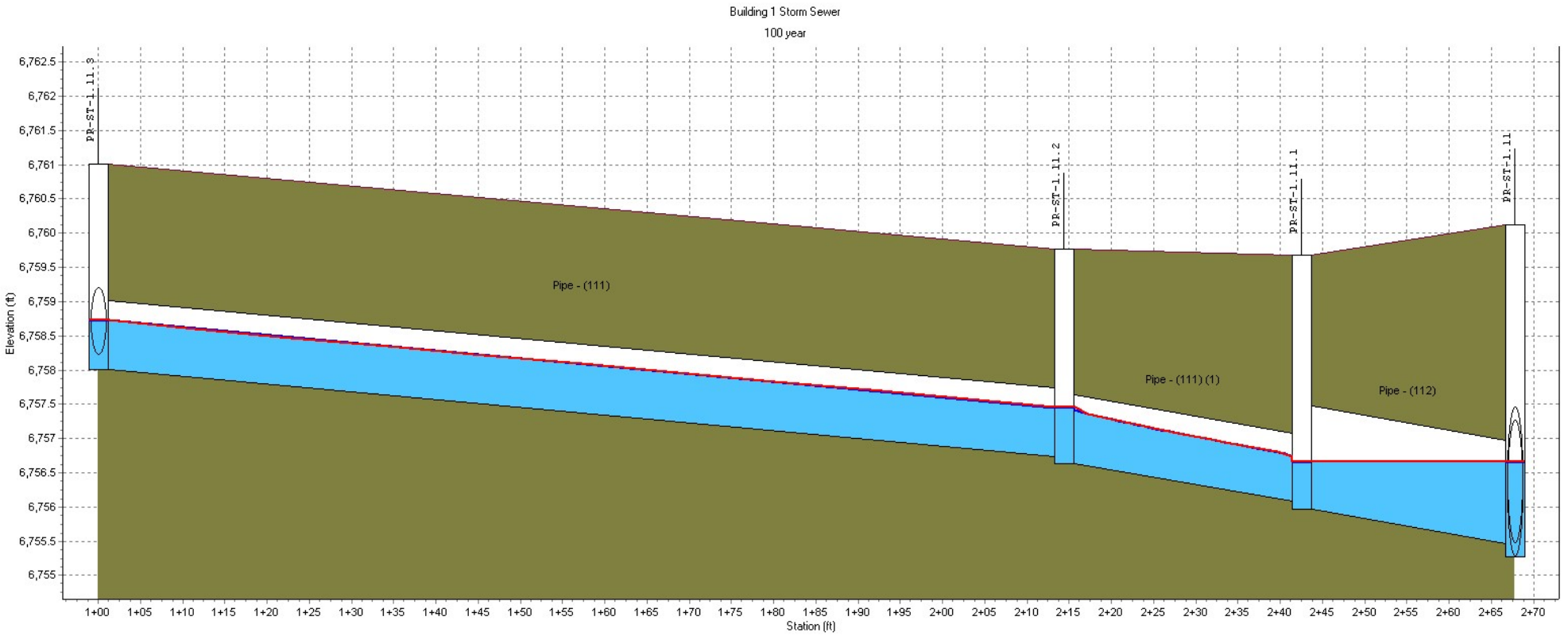
:	PR-ST-1.7.3	PR-ST-1.7.2	PR-ST-1.7.1	PR-ST-1.7
Rim (ft):	6759.35	6758.05	6755.95	6756.50
Invert (ft):	6755.87	6754.77	6753.07	6752.71
Min Pipe Cover (ft):	1.98	1.58	1.31	1.09
Max HGL (ft):	6756.38	6755.52	6754.20	6754.41

:	Pipe - (122)	Pipe - (100)	Pipe - (101)
Length (ft):	67.57	95.62	32.94
Dia (ft):	1.50	1.50	1.50
Slope (ft/ft):	0.0133	0.0171	0.0050
Up Invert (ft):	6755.87	6754.77	6753.07
Dn Invert (ft):	6754.97	6753.14	6752.91
Max Q (cfs):	5.02	9.79	9.22
Max Vel (ft/s):	8.97	11.34	6.97
Max Depth (ft):	0.51	0.70	1.03



:	PR-ST-1.9.3	PR-ST-1.9.2	PR-ST-1.9.1	PR-ST-1.9
Rim (ft):	6760.01	6760.23	6757.05	6757.19
Invert (ft):	6757.71	6756.93	6753.82	6753.58
Min Pipe Cover (ft):	1.20	2.20	1.73	1.61
Max HGL (ft):	6758.20	6757.45	6754.49	6757.19

:	Pipe - (120)	Pipe - (128)	Pipe - (108)
Length (ft):	34.48	77.60	47.59
Dia (ft):	1.00	1.00	1.50
Slope (ft/ft):	0.0225	0.0375	0.0050
Up Invert (ft):	6757.71	6756.93	6753.82
Dn Invert (ft):	6756.93	6754.02	6753.58
Max Q (cfs):	4.17	4.36	4.00
Max Vel (ft/s):	10.36	12.47	5.81
Max Depth (ft):	0.50	0.43	0.62



:	PR-ST-1.11.3	PR-ST-1.11.2	PR-ST-1.11.1	PR-ST-1.11
Rim (ft):	6761.00	6759.76	6759.67	6760.12
Invert (ft):	6758.01	6756.64	6755.97	6755.27
Min Pipe Cover (ft):	1.79	2.02	2.20	2.66
Max HGL (ft):	6758.73	6757.52	6756.69	6756.78

:	Pipe - (111)	Pipe - (111) (1)	Pipe - (112)
Length (ft):	114.37	28.12	25.24
Dia (ft):	1.00	1.00	1.50
Slope (ft/ft):	0.0111	0.0199	0.0198
Up Invert (ft):	6758.01	6756.64	6755.97
Dn Invert (ft):	6756.74	6756.08	6755.47
Max Q (cfs):	5.15	4.96	4.90
Max Vel (ft/s):	8.19	9.99	9.90
Max Depth (ft):	0.72	0.58	0.48

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Dec 12 2023

Basin D3 - US Hwy 40 / Core Trail Ditch

Triangular

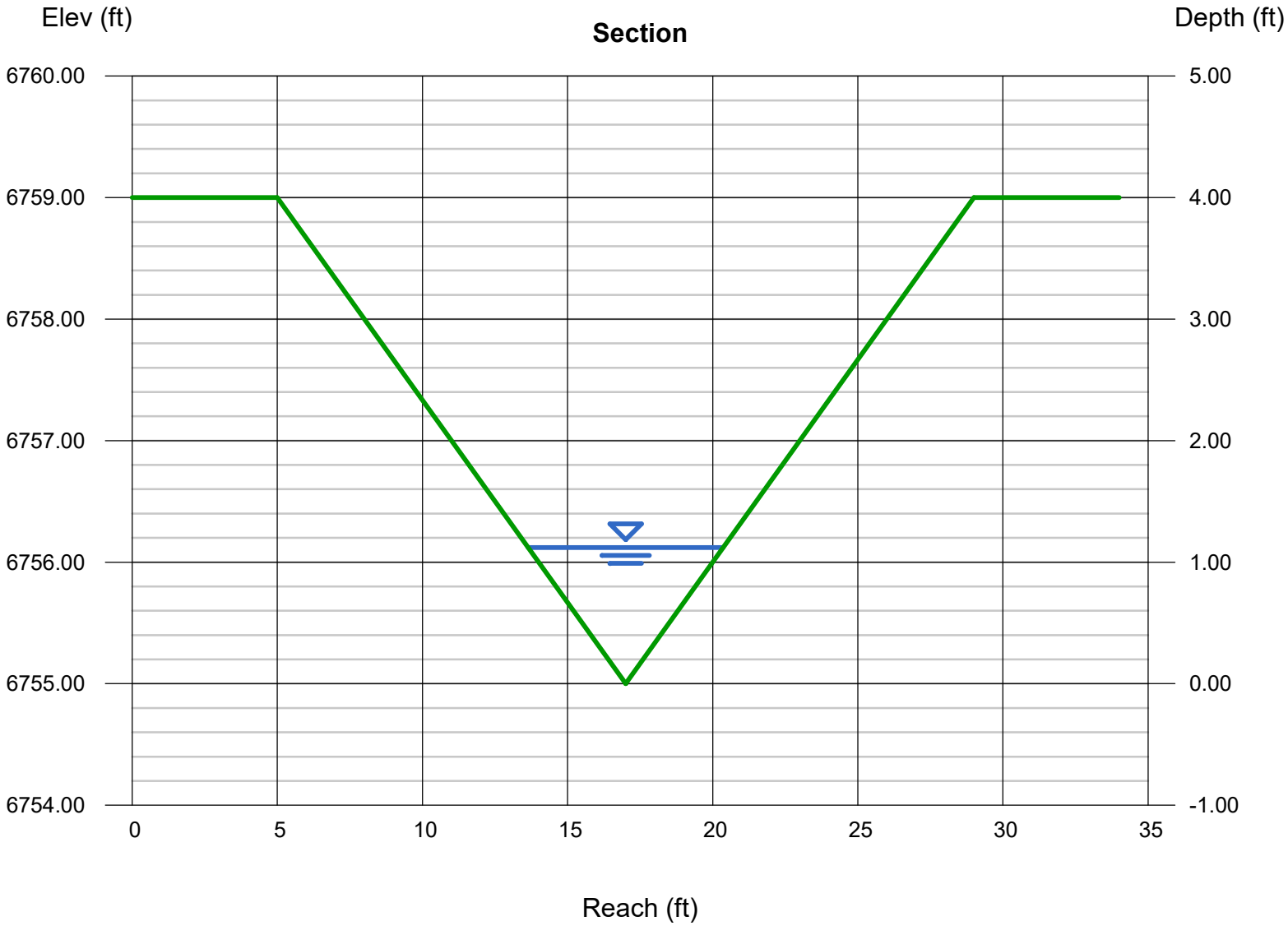
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 6755.00
Slope (%)	= 1.00
N-Value	= 0.035

Calculations

Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 1.12
Q (cfs)	= 10.48
Area (sqft)	= 3.76
Velocity (ft/s)	= 2.78
Wetted Perim (ft)	= 7.08
Crit Depth, Yc (ft)	= 0.95
Top Width (ft)	= 6.72
EGL (ft)	= 1.24



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Dec 12 2023

D1.f-1 - Grass Lined Swale

Triangular

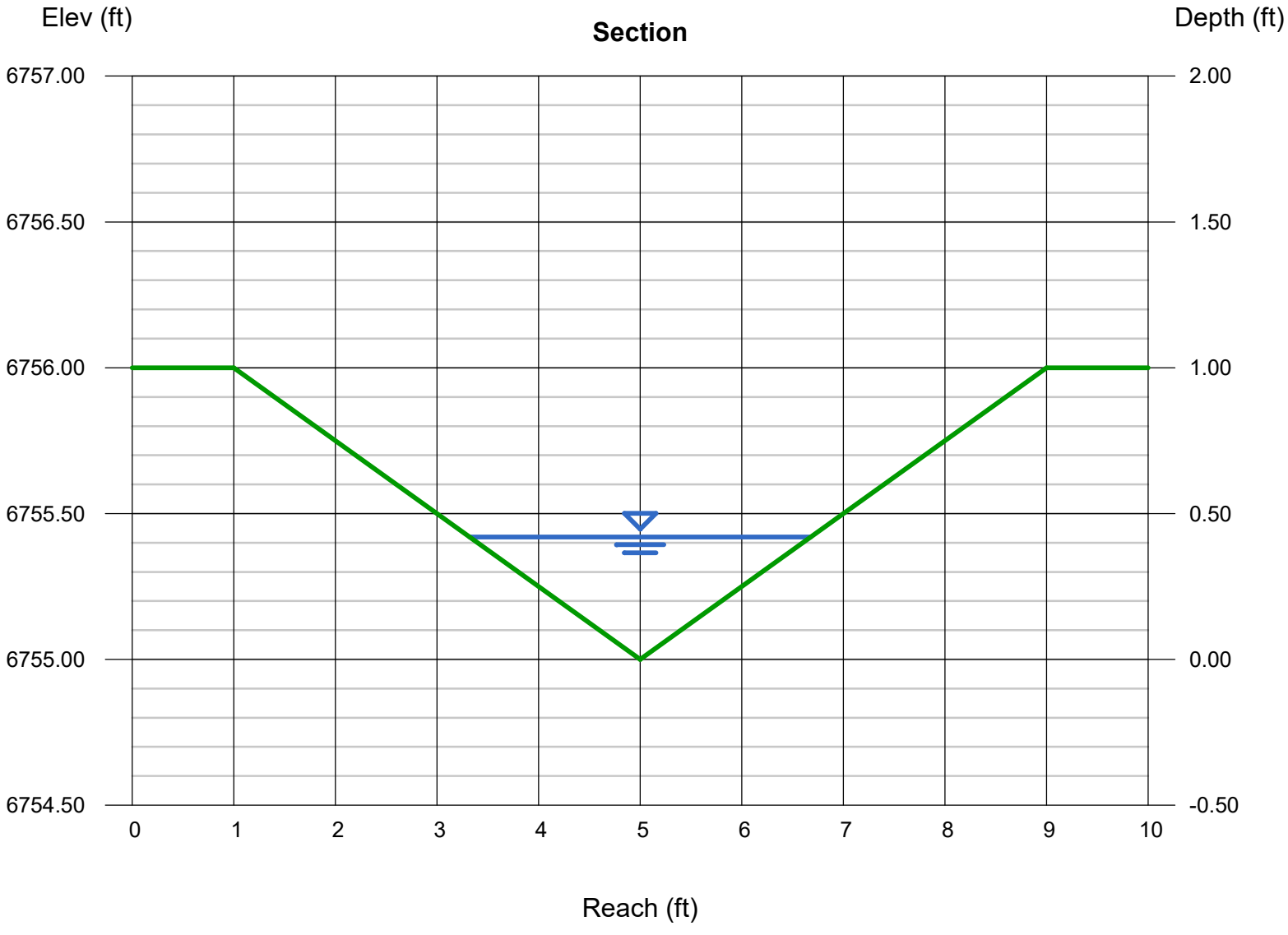
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 6755.00
Slope (%)	= 0.70
N-Value	= 0.035

Calculations

Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 0.42
Q (cfs)	= 0.867
Area (sqft)	= 0.71
Velocity (ft/s)	= 1.23
Wetted Perim (ft)	= 3.46
Crit Depth, Yc (ft)	= 0.32
Top Width (ft)	= 3.36
EGL (ft)	= 0.44



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Dec 12 2023

Core Trail Culvert

Invert Elev Dn (ft)	=	6752.69
Pipe Length (ft)	=	31.00
Slope (%)	=	3.29
Invert Elev Up (ft)	=	6753.71
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.009
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

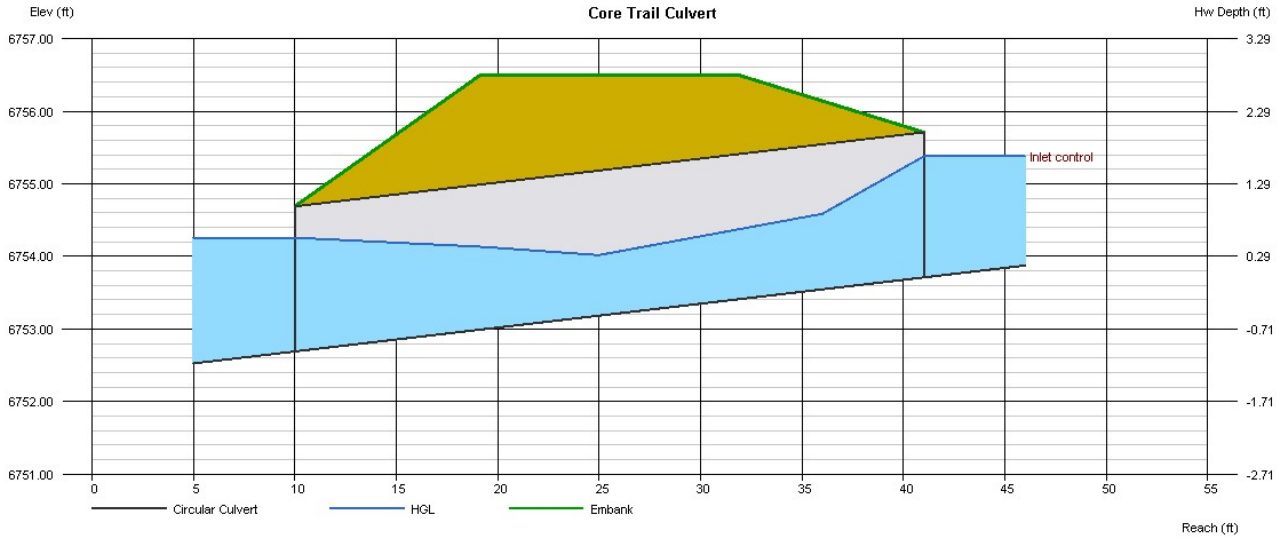
Top Elevation (ft)	=	6756.50
Top Width (ft)	=	12.70
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	10.07
Qmax (cfs)	=	10.07
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	10.07
Qpipe (cfs)	=	10.07
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.81
Veloc Up (ft/s)	=	5.47
HGL Dn (ft)	=	6754.26
HGL Up (ft)	=	6754.85
Hw Elev (ft)	=	6755.38
Hw/D (ft)	=	0.83
Flow Regime	=	Inlet Control



Culvert Report

Water Main Culvert

Invert Elev Dn (ft)	=	6754.13
Pipe Length (ft)	=	45.35
Slope (%)	=	0.51
Invert Elev Up (ft)	=	6754.36
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.009
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

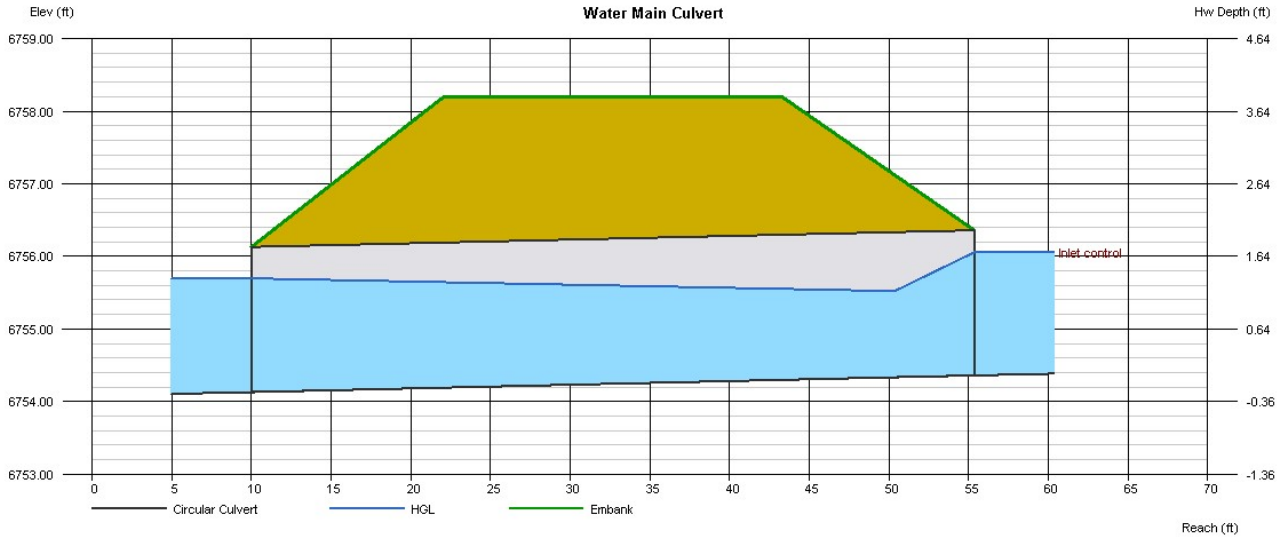
Top Elevation (ft)	=	6758.20
Top Width (ft)	=	21.20
Crest Width (ft)	=	31.30

Calculations

Qmin (cfs)	=	10.07
Qmax (cfs)	=	10.07
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	10.07
Qpipe (cfs)	=	10.07
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.81
Veloc Up (ft/s)	=	5.45
HGL Dn (ft)	=	6755.70
HGL Up (ft)	=	6755.50
Hw Elev (ft)	=	6756.06
Hw/D (ft)	=	0.85
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Dec 12 2023

Emergency Access Culvert

Invert Elev Dn (ft)	=	6759.97
Pipe Length (ft)	=	64.20
Slope (%)	=	1.74
Invert Elev Up (ft)	=	6761.09
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.009
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

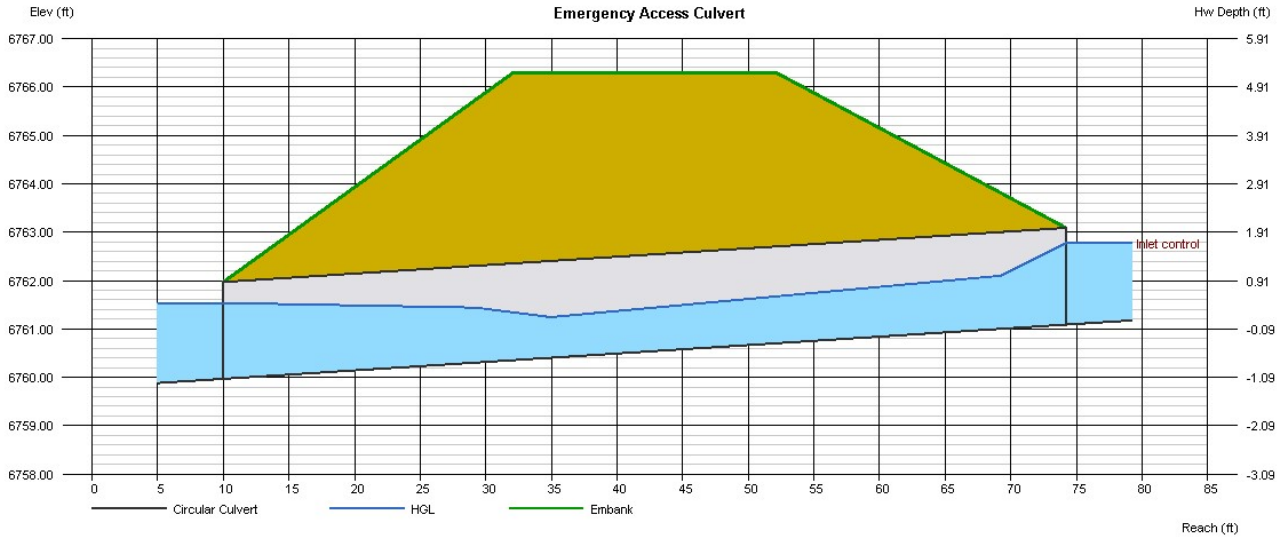
Top Elevation (ft)	=	6766.30
Top Width (ft)	=	20.00
Crest Width (ft)	=	47.00

Calculations

Qmin (cfs)	=	10.07
Qmax (cfs)	=	10.07
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

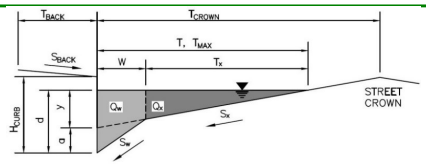
Qtotal (cfs)	=	10.07
Qpipe (cfs)	=	10.07
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.81
Veloc Up (ft/s)	=	5.47
HGL Dn (ft)	=	6761.54
HGL Up (ft)	=	6762.23
Hw Elev (ft)	=	6762.77
Hw/D (ft)	=	0.84
Flow Regime	=	Inlet Control



ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Mid Valley Apartments**
Inlet ID: **PR-ST-1.11.2**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.500	ft/ft
Warning 01 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.035	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	2.000	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	1.100	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	4.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

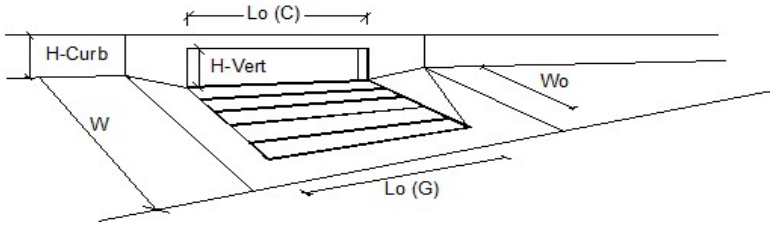
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**1.1**	**1.1**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Warning 01: Manning's n-value does not meet the USDCM recommended design range.

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Valley Grate		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	N/A	N/A	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.0**	**0.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.3**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**7**	**8**	**%**

APPENDIX C

WATER QUALITY CALCULATIONS

Detailed Stormceptor Sizing Report – Mid Valley Apartments

Project Information & Location			
Project Name	Mid Valley Apartments	**Project Number**	2602-001
City	Steamboat Springs	**State/ Province**	Colorado
Country	United States of America	**Date**	1/10/2023
Designer Information		**EOR Information (optional)**	
Name	Matthew Eggen	**Name**	
Company	Landmark Consultants, Inc.	**Company**	
Phone #	970-871-9494	**Phone #**	
Email	matte@landmark-co.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Mid Valley Apartments
Recommended Stormceptor Model	STC 2400
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	Fine Distribution
Rainfall Station	CRAIG

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	66
STC 900	75
STC 1200	75
STC 1800	76
STC 2400	80
STC 3600	81
STC 4800	85
STC 6000	85
STC 7200	87
STC 11000	90
STC 13000	91
STC 16000	92

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Colorado	**Total Number of Rainfall Events**	2705
Rainfall Station Name	CRAIG	**Total Rainfall (in)**	258.5
Station ID #	1928	**Average Annual Rainfall (in)**	8.9
Coordinates	40°32'0"N, 107°33'0"W	**Total Evaporation (in)**	51.2
Elevation (ft)	6280	**Total Infiltration (in)**	64.4
Years of Rainfall Data	29	**Total Rainfall that is Runoff (in)**	142.9

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (acres)	9.02
Imperviousness %	75.0

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	27.19
Water Quality Flow Rate (CFS)	4.46

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	6749.05
Stormceptor Outlet Invert Elev (ft)	6748.85
Stormceptor Rim Elev (ft)	6752.20
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	36
Pipe Material	HDPE - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Mid Valley Apartments

Site Details

Drainage Area

Total Area (acres)	9.02
Imperviousness %	75.0

Surface Characteristics

Width (ft)	1254.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

Buildup/Wash-off Parameters

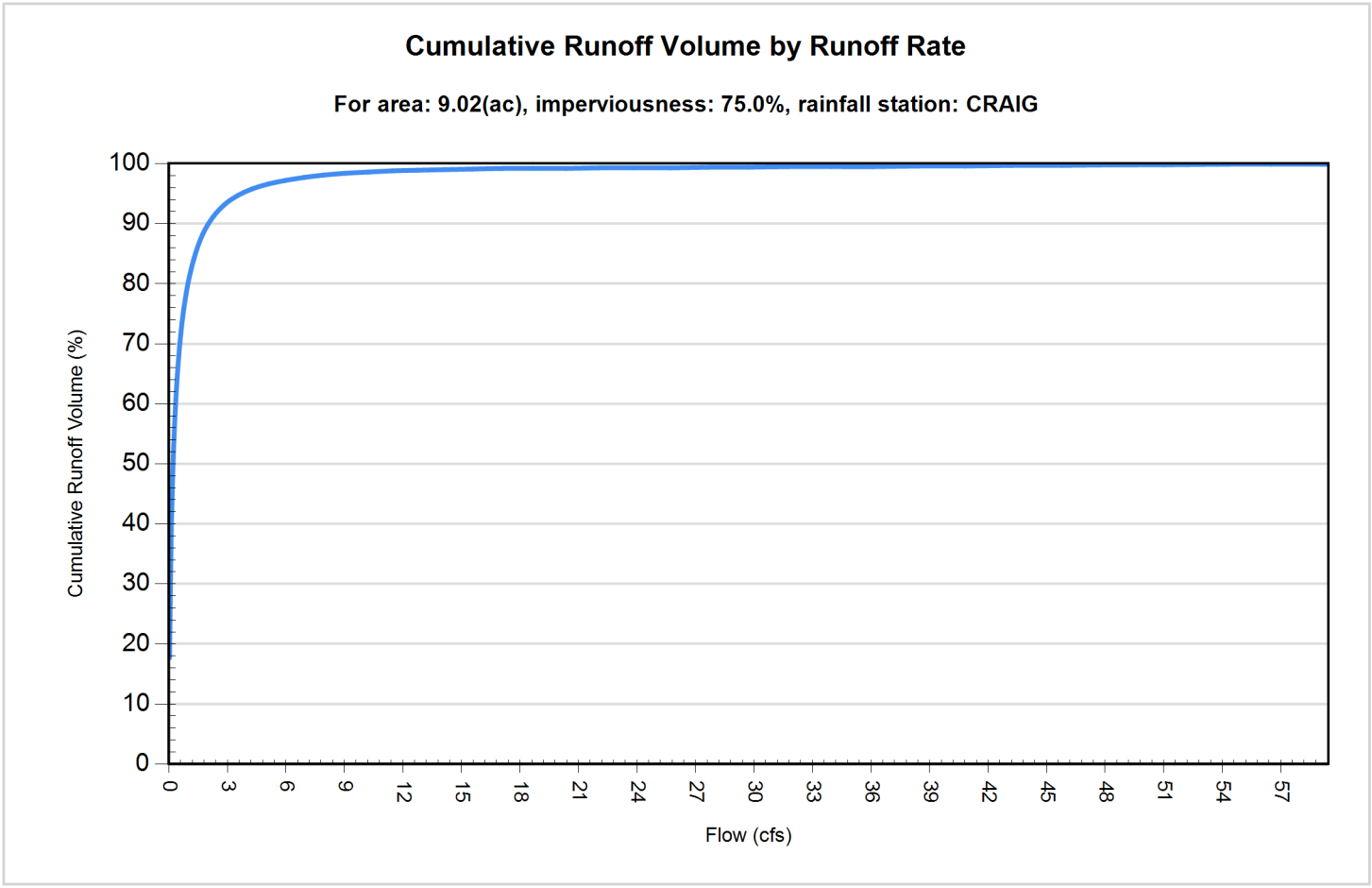
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

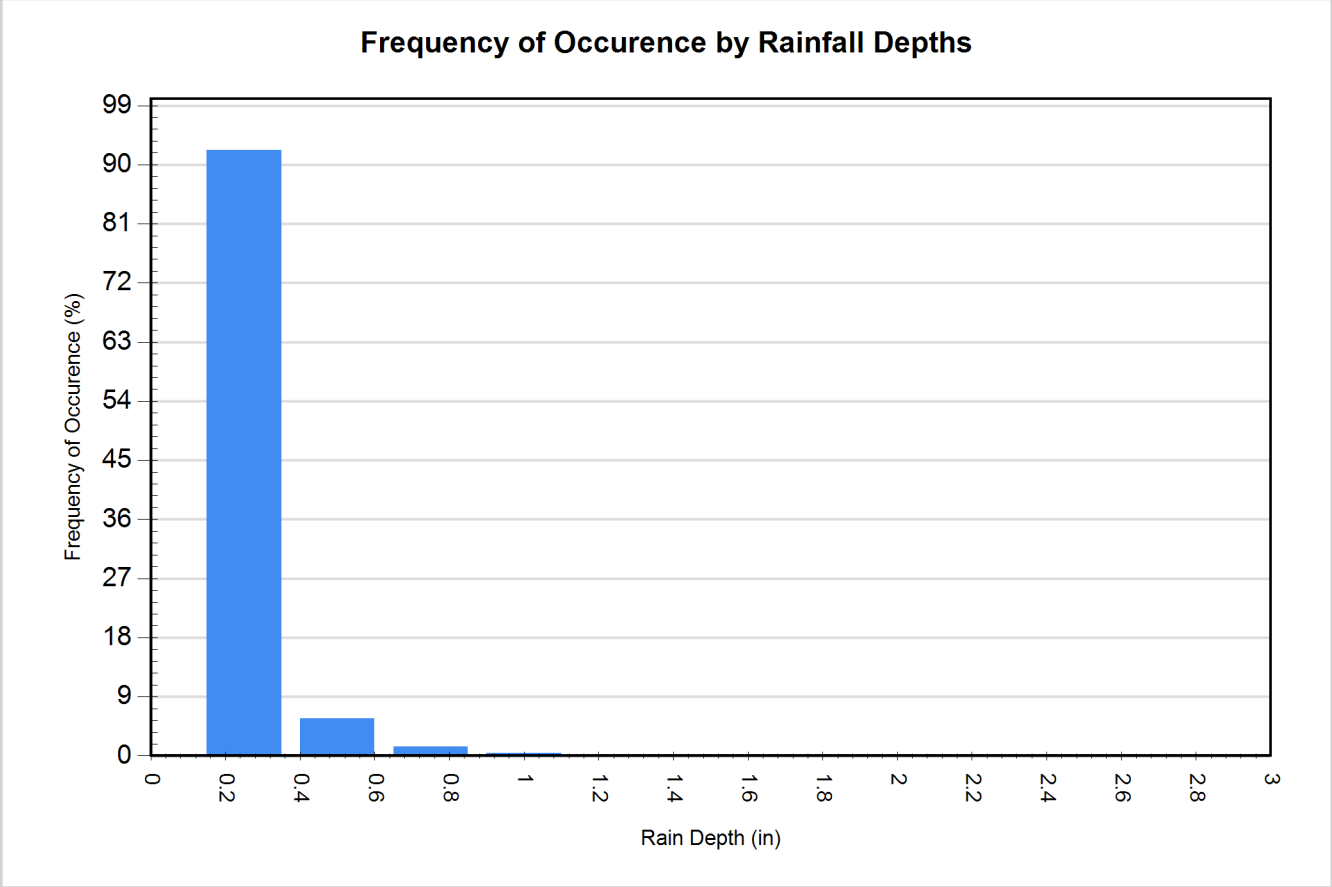
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	842711	3919633	17.7
0.141	1963712	2798549	41.2
0.318	2773365	1988887	58.2
0.565	3336098	1425867	70.1
0.883	3727087	1034899	78.3
1.271	4002034	759821	84.0
1.730	4198001	563885	88.2
2.260	4338090	423736	91.1
2.860	4438203	323627	93.2
3.531	4510326	251477	94.7
4.273	4562741	199067	95.8
5.085	4600820	160981	96.6
5.968	4630151	131650	97.2
6.922	4653522	108272	97.7
7.946	4671851	89941	98.1
9.041	4685954	75835	98.4
10.206	4697143	64645	98.6
11.442	4705236	56550	98.8
12.749	4710270	51517	98.9
14.126	4714093	47694	99.0
15.574	4718003	43785	99.1
17.092	4721636	40152	99.2
18.681	4724173	37614	99.2
20.341	4725956	35831	99.2
22.072	4727514	34274	99.3
23.873	4729135	32653	99.3
25.744	4730819	30968	99.3
27.687	4732567	29220	99.4
29.700	4734379	27409	99.4
31.783	4736254	25534	99.5
33.937	4738193	23595	99.5
36.162	4740198	21592	99.5
38.458	4742268	19527	99.6
40.824	4744397	17397	99.6
43.261	4746590	15204	99.7
45.768	4748851	12947	99.7
48.346	4751171	10627	99.8

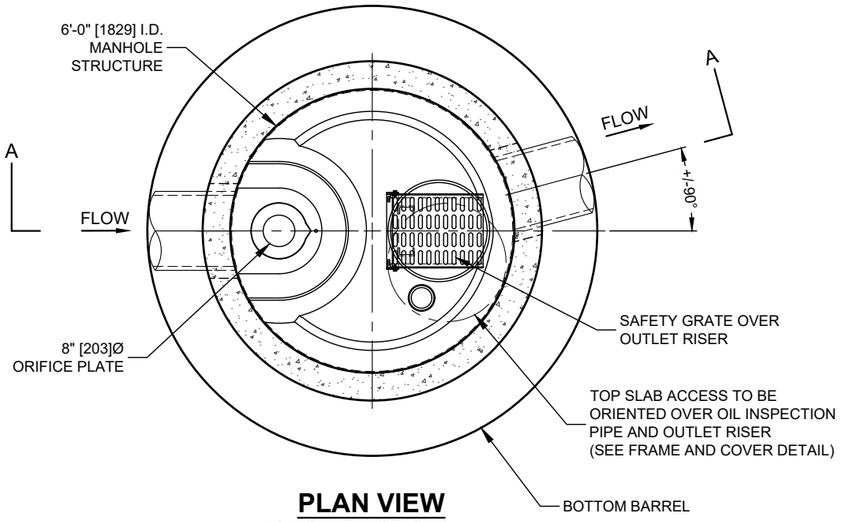
50.994	4753118	8682	99.8
53.714	4754750	7051	99.9
56.504	4756424	5377	99.9
59.364	4758142	3660	99.9



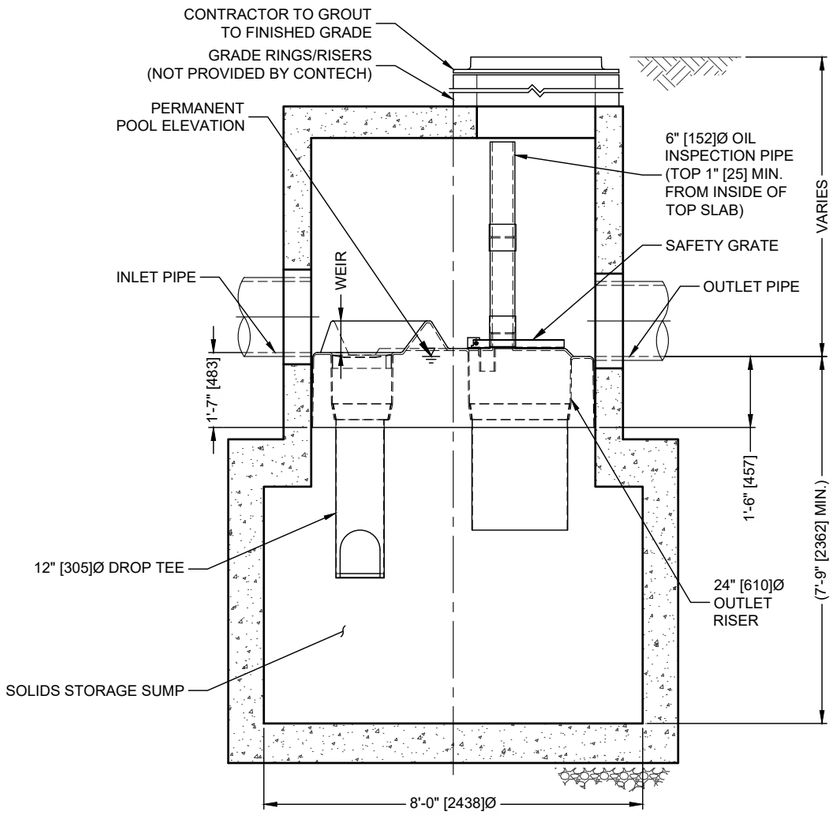
Rainfall Event Analysis				
Rainfall Depth (in)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (in)**	**Percentage of Annual Volume (%)**
0.25	2495	92.2	164	63.4
0.50	153	5.7	53	20.3
0.75	39	1.4	23	9.0
1.00	11	0.4	10	3.8
1.25	3	0.1	3	1.2
1.50	3	0.1	4	1.5
1.75	0	0.0	0	0.0
2.00	0	0.0	0	0.0
2.25	1	0.0	2	0.8
2.50	0	0.0	0	0.0
2.75	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX



PLAN VIEW
TOP SLAB NOT SHOWN



SECTION A-A

Stormceptor®
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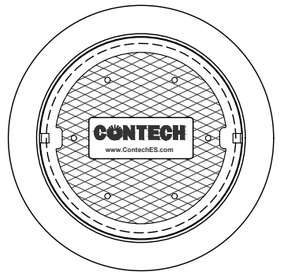
STORMCEPTOR DESIGN NOTES

THE STANDARD STC2400 CONFIGURATION IS SHOWN.



FRAME AND COVER
(MAY VARY)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. STORMCEPTOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STORMCEPTOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. STORMCEPTOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMCEPTOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

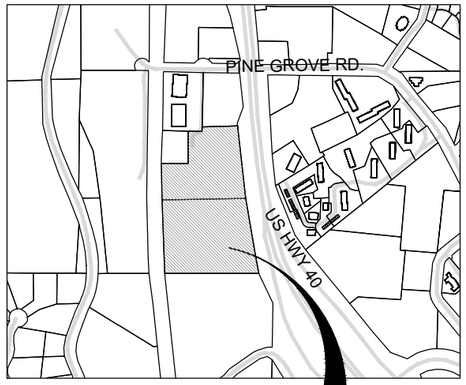
STC2400
STORMCEPTOR
STANDARD DETAIL

APPENDIX D

OWNERSHIP AND MAINTENANCE PLAN

MID VALLEY APARTMENTS
HYDRODYNAMIC SEPARATOR OWNERSHIP AND MAINTENANCE PLAN
CONSTRUCTED IN [MONTH, YEAR], MAINTENANCE TO BE PERFORMED BY EVERGREEN LOT 3

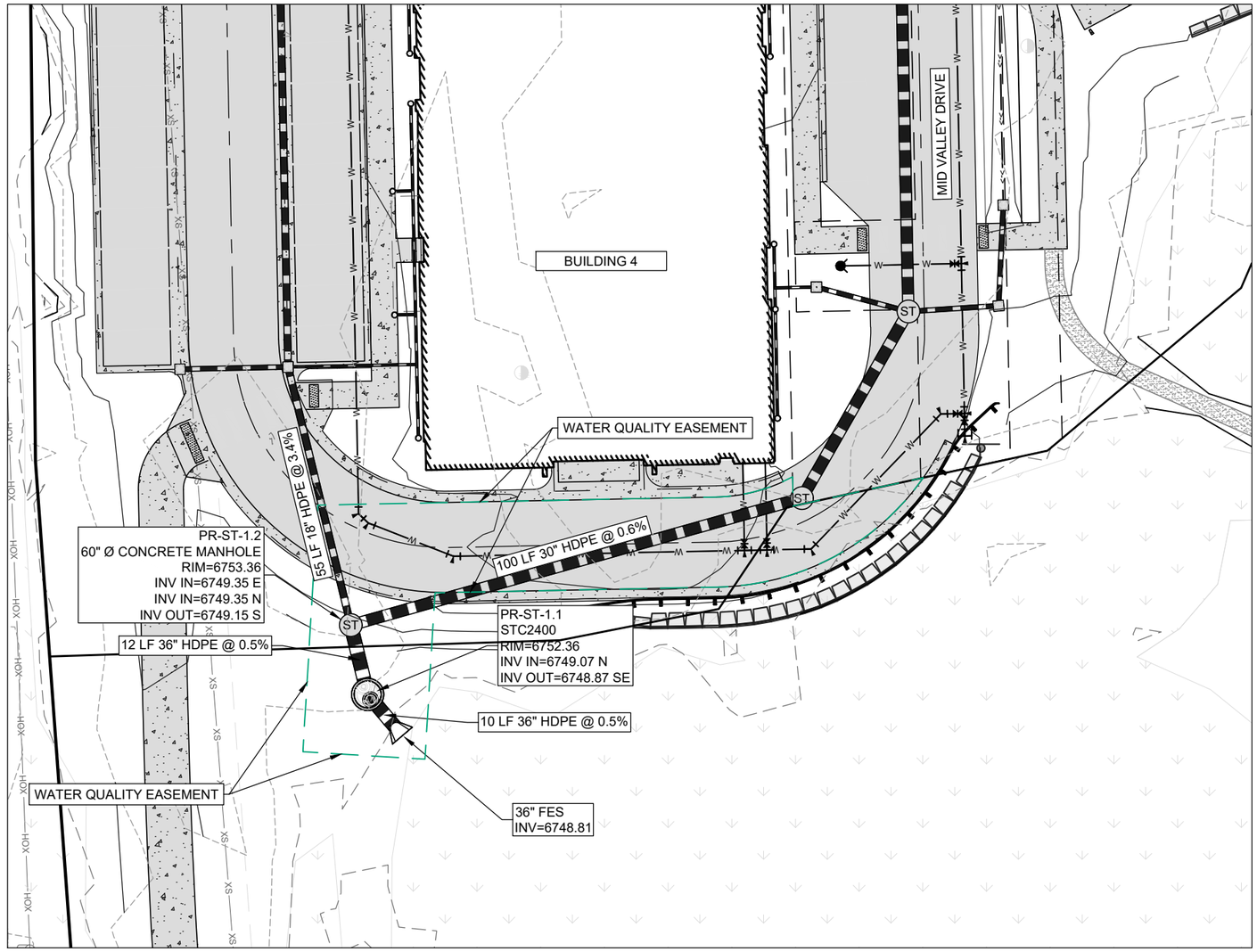
NORTH



LOCATION MAP
1" = 1000'

NOTES:

1. FOR ADDITIONAL DESIGN INFORMATION REFER TO THE CONSTRUCTION DRAWINGS FOR THIS PROJECT.
2. SEE DETAILED NOTES ON THE SECOND SHEET OF THIS PLAN FOR ALL MAINTENANCE REQUIREMENTS.



SITE PLAN
1" = 30'

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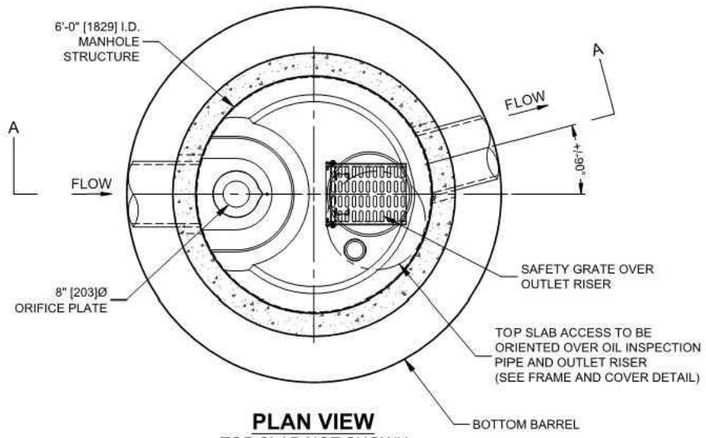
Steamboat Springs, Colorado 80477
(970) 871-9494 www.LANDMARK-CO.com
LANDMARK CONSULTANTS, INC.

Mid Valley Apartments
Hydrodynamic Separator
OWNERSHIP AND MAINTENENCE PLAN

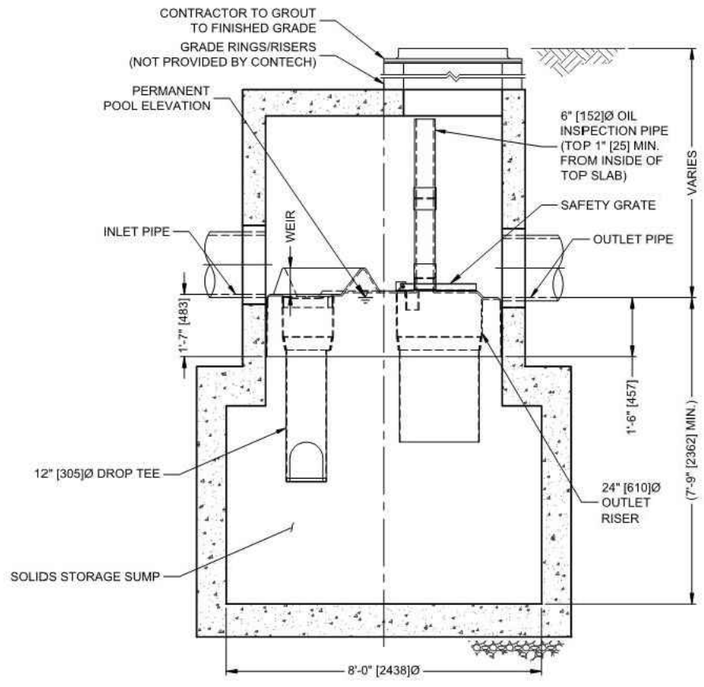
PROJECT:	2602-001
DATE:	12/15/23
DRAWN BY:	MCE
CHECKED BY:	LCI

SHEET 1 Of 3 Sheets

MID VALLEY APARTMENTS
HYDRODYNAMIC SEPARATOR OWNERSHIP AND MAINTENANCE PLAN
CONSTRUCTED IN [MONTH, YEAR], MAINTENANCE TO BE PERFORMED BY EVERGREEN LOT 3



PLAN VIEW
TOP SLAB NOT SHOWN



SECTION A-A

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FRAME AND COVER
(MAY VARY)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS			
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PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES / SPECIAL REQUIREMENTS:			

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LANDMARK CONSULTANTS, INC.

Mid Valley Apartments
Hydrodynamic Separator
OWNERSHIP AND MAINTENENCE PLAN

PROJECT: 2602-001
DATE: 12/15/23
DRAWN BY: MCE
CHECKED BY: LCI

MID VALLEY APARTMENTS
HYDRODYNAMIC SEPARATOR OWNERSHIP AND MAINTENANCE PLAN
CONSTRUCTED IN [MONTH, YEAR], MAINTENANCE TO BE PERFORMED BY EVERGREEN LOT 3

1. GENERAL PROJECT INFORMATION

A. ADDRESS: PIN 229600002 & 236204007
LEGAL DESCRIPTION: LOTS 1a, 1b AND 2, MID VALLEY HOUSING

B. RECEIVING WATER: YAMPA RIVER
PROPERTY OWNER: YAMPA VALLEY HOUSING AUTHORITY
CONTACT NAME: JASON PEASLEY
ADDRESS: 2100 ELK RIVER RD
STEAMBOAT SPRINGS, CO 80487
PHONE NUMBER: 970-870-0167

D. AGENCY RESPONSIBLE
FOR MAINTENANCE: YAMPA VALLEY HOUSING AUTHORITY
CONTACT NAME: JASON PEASLEY
ADDRESS: 2100 ELK RIVER RD
STEAMBOAT SPRINGS, CO 80487
PHONE NUMBER: 970-870-0167

E. DESIGN ENGINEER: LANDMARK CONSULTANTS, INC.
CONTACT NAME: MATTHEW EGGEN, P.E.
ADDRESS: 141 9TH STREET, STEAMBOAT SPRINGS, CO
PHONE NUMBER: 970-871-9494
EMAIL: matte@landmark-co.com
PE LICENCE NUMBER: 50740

2. GENERAL FACILITY DESCRIPTION

THIS FACILITY IS A HYDRODYNAMIC SEPARATOR THAT WILL PROVIDE WATER QUALITY TREATMENT FOR THE TARGET TSS REMOVAL OF 80%. THE FACILITY HAS BEEN ADOPTED AND APPROVED BY YAMPA VALLEY HOUSING AUTHORITY AS PART OF THE MID VALLEY APARTMENTS PROJECT. IT WILL RECEIVE RUNOFF FROM 8.46 ACRES AND WILL OCCUPY A PARCEL OF 0.08 ACRES THAT WILL BE USED TO PROVIDE TSS REMOVAL BASED WATER QUALITY TREATMENT, MAINTENANCE, & ACCESS OPERATIONAL ACTIVITIES.

3. INSPECTION & MAINTENANCE FREQUENCY & PROCEDURE

A. THE FOLLOWING ITEMS SHOULD BE INSPECTED:

TABLE 1: MAINTENANCE ACTIVITY/FREQUENCY	
ACTIVITY	REQUIRED FREQUENCY
INSPECTION OF OIL AND SEDIMENT LEVELS	TWICE ANNUALLY. ONE TIME TO OCCUR IN SPRING AFTER SNOWMELT FROM CONTRIBUTING BASIN IS COMPLETE.
CLEAN OUT STORMCEPTOR	ANNUAL SERVICE IS RECOMMENDED, HOWEVER THE FREQUENCY MAY NEED TO BE INCREASED OR DECREASED BASED ON CONDITIONS.*
HYDROCARBON SPILLS	IMMEDIATELY AFTER A SPILL OCCURS, BY A LICENSED LIQUID WASTE HAULER

* I.E. IF THE UNIT IS FILLING UP WITH SEDIMENT MORE QUICKLY THAN PROJECTED, MAINTENANCE MAY BE REQUIRED SEMI-ANNUALLY; CONVERSELY ONCE THE SITE HAS STABILIZED, MAINTENANCE MAY ONLY BE REQUIRED EVERY TWO OR THREE YEARS.

B. REVISIONS TO MAINTENANCE FREQUENCY:

C. TRAFFIC CONTROL: YES - UNIT IS ACCESSED OFF OF PRIVATE STREET

D. IT IS RECOMMENDED THAT CONFINED SPACE ENTRY PROTOCOLS BE FOLLOWED IF ENTRY TO THE UNIT IS REQUIRED. IN ADDITION, THE FIBERGLASS INSERT HAS THE HOLLOWING HEALTH AND SAFETY FEATURES:
D.A. DESIGNED TO WITHSTAND THE WEIGHT OF PERSONNEL
D.B. A SAFELY GRATE IS LOCATED OVER THE 24 INCH RISER PIPE OPENING

E. DEWATERING AND WATER CONTROL: NA

F. THE FOLLOWING PROCEDURES SHOULD BE TAKEN WHEN CLEANING THE STORMCEPTOR:
F.A. CHECK FOR OIL THROUGH THE OIL CLEANOUT PORT.
F.B. REMOVE ANY OIL SEPARATELY USING A SMALL PORTABLE PUMP.
F.C. DECANT THE WATER FROM THE UNIT TO THE SANITARY SEWER, IF PERMITTED BY THE CITY OF STEAMBOAT SPRINGS, OR INTO A SEPARATE CONTAINMENT TANK.
F.D. REMOVE THE SLUDGE FROM THE BOTTOM OF THE UNIT USING THE VACUUM TRUCK.
F.E. RE-FILL THE STORMCEPTOR WITH WATER.

G. VEGETATION MANAGEMENT
SEE SECTION 4 OF THE NOTES ON THIS SHEET.

H. WETLAND AREAS ARE ANTICIPATED.
SEE SECTION 8.0 OF THE NOTES ON THIS SHEET.

I. DESCRIBE ADDITIONAL REQUIRED MAINTENANCE PROCEDURES AND FREQUENCIES.-NA
SEE TABLE 1

J. MATERIALS TESTING OF SEDIMENT REMOVED FROM SITE IS NOT REQUIRED.

4. EQUIPMENT, STAFFING, AND VEGETATION MANAGEMENT

A. EQUIPMENT REQUIRED: VACUUM TRUCK.

B. STAFFING: DEPENDENT ON VACUUM SERVICE PROVIDER

C. SEED: NA

D. MOWING: NA.

WEEDS & UNDESIRABLE VEGETATION: NA.

5. SNOW AND ICE CONTROL

A. FACILITY IS NOT LOCATED WITHIN A SNOW STORAGE AREA AS DEFINED IN THE COMMUNITY DEVELOPMENT CODE.

6. RIGHT-OF-WAY, ADJACENT OWNERSHIP, & ACCESS

A. RIGHT-OF-WAY DESCRIPTION: N/A

B. ADJACENT OWNERSHIP: N/A

C. ACCESS INFORMATION AND DETAILS: THE FACILITY IS ACCESSED VIA THE MID VALLEY DRIVE PUBLIC ACCESS EASEMENT. A WATER QUALITY EASEMENT HAS BEEN PROVIDED FOR ACCESS AND MAINTENANCE NEEDS ACROSS LOT 1b ALONG THE SOUTH ENTRANCE TO BUILDING 4.

D. MAINTENANCE OPERATIONS WILL NOT IMPACT OR OBSTRUCT RIGHT-OF-WAY AND A RIGHT-OF-WAY PERMIT IS NOT REQUIRED.

7. HYDRAULIC DESIGN

Table 3: 80th Percentile Storm Event (For Water Quality Design Flow)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	$C_{1.25}$	Intensity $I_{1.25}$ (in/hr)	Flow $Q_{1.25}$ (cfs)
DP1	H2+H3+ (D1.a-D1.h)	8.46	17.75	0.53	0.95	4.25

8. SENSITIVE AREAS, WETLANDS, & PERMITS

THE SITE HAS KNOWN WETLANDS AND WORK WITHIN THE WATERS OF THE UNITED STATES ASSOCIATED WITH THE PROJECT ARE AUTHORIZED BY 2021 NWP 29 (ID SPK-2008-00570) AND IS VALID UNITL MARCH 14, 2026 (33 CFR 330.6). NO MAINTENANCE ACTIVITIES SHALL DISTURB OR IMPACT THE ADJACENT WETLANDS. NORTHERN AND EASTERN PORTIONS OF THE PROPERTY ARE WITHIN THE REGULATORY FLOODWAY AND SPECIAL FLOOD HAZARD AREAS (SFHA) ZONES AE (1-PERCENT ANNUAL CHANCE FLOOD) AND X (0.2% CHANCE ANNUAL FLOOD). NO DEVELOPMENT IS PROPOSED IN THE FLOODWAY.

9. MISCELLANEOUS INFORMATION

A. PROJECT SURVEY:
EXISTING CONDITIONS AND TOPOGRAPHIC INFORMATION PER CITY GIS DATA AND SUPPLEMENTED WITH LANDMARK CONSULTANTS, INC. ARCHIVED SURVEY FIELD DATA .
PROJECT BENCHMARK: NO. 5 REBAR W/ ALUMINUM CAP
NORTHING: 1414675.15
EASTING: 2630804.97
NAVD88 EL: 6761.12

COORDINATE SYSTEM: THE COORDINATE SYSTEM IS COLORADO COORDINATE SYSTEM, NORTH ZONE, NAD83 (2011), NAVD88, COMBINE SCALE FACTOR: (N)1415866.11(E)2636677.13, 1.000368966.

CIVIL ENGINEERS | SURVEYORS
141 9th Street ~ P.O. Box 774943
Steamboat Springs, Colorado 80477
(970) 871-9494 www.LANDMARK-CO.com
LANDMARK CONSULTANTS, INC.

Mid Valley Apartments
Hydrodynamic Separator
OWNERSHIP AND MAINTENENCE PLAN

PROJECT: 2602-001
DATE: 12/15/23
DRAWN BY: MCE
CHECKED BY: LCI

SHEET 3 Of 3 Sheets

APPENDIX E

CITY FORMS & CHECKLISTS

Standard Form No. 3 Final Drainage Study Checklist

Instructions:

1. The applicant shall identify with a "check mark" if information is provided with letter. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation.
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

__x__ A. Report typed and legible in 8½" x 11" format.
__x__ B. Report bound (comb, spiral, or staple – no notebook).
__x__ C. Drawings that are 8½ x 11 or 11 x 17 bound within report, larger drawings (up to 24 x 36) included in a pocket attached to the report. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Cover

_____ A. Report Type – Final Drainage Study.
__x__ B. Project Name, Subdivision, Original Date, Revision Date.
__x__ C. Preparer's name, firm, address, phone number.
__x__ D. "DRAFT" for 1st submittal and revisions; "FINAL" once approved.

III. Title Sheet

__x__ A. Table of Contents.
__x__ B. Certification, PE Stamp, signature, and date from licensed Colorado PE.
__x__ C. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and the City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

IV. Introduction

__x__ A. Description of site location, size in acres, existing and proposed land use, and any pertinent background info.
__x__ B. Reference planning application type and plan set date and preparer.
__x__ C. Identify drainage reports for adjacent development.

V. Drainage Criteria and Methodology Used

__x__ A. Identify design rainfall and storm frequency.
__x__ B. Identify the runoff calculation method used.
__x__ C. Identify culvert and storm sewer design methodology.
__na__ D. Identify detention discharge and storage methodology.
__x__ E. Discuss HEC-HMS methodologies and parameters, if HEC-HMS is used.

VI. Existing Conditions (Pre-Development/Historic)

x A. Indicate ground cover, imperviousness, topography, and size of site (acres).
x B. Describe existing stormwater system (sizes, materials, etc.).
x C. Describe other notable features (canals, major utilities, etc.).
x D. Note site outfall locations and ultimate outfall location (typically Yampa River).
x E. Note capacity of existing system and identify any constraints.
x F. Identify NRCS soil type.
x G. Discuss any existing easements.
x H. Identify the FEMA Map reviewed, if site is in floodplain/way, and zone designation.

VII. Proposed Conditions

x A. Indicate ground cover, imperviousness, topography, and disturbed area (acres).
x B. Describe proposed stormwater system (sizes, materials, etc.).
x C. Describe proposed outlets and indicate historic and proposed flow for each.
x D. Include calculations for all culverts, ditches, ponds, etc. in appendix.
x E. Include a summary table for the 5- and 100-year events showing historic flow and proposed flow for total site and each basin.
x F. Discuss proposed easements.
x G. Describe off-site flows to be passed thru site.
x H. Summarize any impacts to downstream properties or indicate none. Reference CLOMR/LOMR and impacts.

I. Detention Ponds.
NA 1. Indicate pond volume and area (size and depth) requirement.
NA 2. Indicate release rates.
NA 3. Discuss outfall design, location, and overflow location.
NA 4. Discuss maintenance requirements.

J. Curb and Gutter
x 1. Indicate gutter capacity.
x 2. Indicate curb capacity.
x 3. Indicate design velocity
x 4. Indicate design depth of flow in street.

K. Culverts
x 1. Indicate whether each culvert is under inlet or outlet control.
x 2. Show that headwater is less than the maximum allowable.
x 3. Indicate design velocity.
x 4. Indicate required and provided flow rates.
x 5. Discuss whether outlet protection is required and what will be used.

L. Inlets
x 1. Indicate inlet capacity.
x 2. Indicate the type of inlet(s) used.

M. Channels
x 1. Indicate design velocity (and type of dissipation if required).
x 2. Indicate required and provided flow capacity.
x 3. Show critical cross-section(s) including water surface.

N. Site Discharge
na 1. Discuss use and design of detention to ensure discharge is less than or equal to historic flow.
na 2. Provide documentation that downstream facilities are adequate and no adverse impacts to downstream property owners (i.e. no rise certification)

VIII. Post Construction Stormwater Management

__X__ A. Discuss in general terms which permanent BMP practices will be used to control pollutant and sediment discharge after construction is complete. Exhibit A, Storm Water Quality Plan shall be attached that will give details (see separate checklist)

IX. Conclusions

__X__ A. Provide general summary.
__X__ B. Note if site complies with criteria and any variances to criteria.
__X__ C. Indicate if peak proposed flow is less than, equal to, or greater than peak historic flow for each outfall, design point, and for the total site.
__X__ D. List proposed new stormwater system requirements.

X. References

__X__ A. Provide a reference list of all criteria, master plans, drainage reports and technical information used.

XI. Tables

__X__ A. Include a copy of all tables prepared for the study.

XII. Figures

__X__ A. Vicinity Map.
__X__ B. Site Plan (include the horizontal and vertical datum used and all benchmarks).
C. Existing conditions.
__X__ 1. Delineate existing basin boundaries.
__X__ 2. Delineate offsite basins impacting the site.
__X__ 3. Show existing and proposed topography at an interval of at least 2-ft.
__X__ 4. Show existing runoff flow arrows.
__X__ 5. Show existing stormwater features (structures, sizes, materials, etc.).
__X__ 6. Show floodplain limits and information.
__X__ 7. For each basin show bubble with basin number, acreage and % impervious.
__X__ 8. For each outlet show bubble with acreage and historic flow and proposed flow or provide information in summary table on figure.
D. Proposed Conditions
__X__ 1. Delineate proposed basin boundaries.
__X__ 2. Show proposed runoff flow arrows.
__X__ 3. Show existing and proposed topography at an interval of at least 2-ft.
__X__ 4. For each basin show bubble with basin number, acreage and percent impervious or provide a summary table or figure.
__X__ 5. For each outlet show bubble with acreage, historic flow, and proposed flow or provide a summary table or figure.
__X__ 6. Show floodplain limits and information.
__X__ 7. Show proposed building footprints and FFE for commercial and multi-family
__X__ 8. Show property lines and easements (existing and proposed).
__X__ 9. Label public and private facilities. A general note can be placed on the plans in lieu of labeling all facilities, if applicable.

XIII. Appendices

__x__ A. Runoff Calculations.
__x__ B. Culvert Calculations.
__na__ C. Pond Calculations.
__x__ D. Other Calculations.

Acknowledgements

Standard Form No. 3 was prepared by: __Matthew Eggen_____ 5/12/2023
Date

Include Attachment A – Scope Approval Form (see Standard Form No. 5)
Include Attachment B – Storm Water Quality Plan (see Standard Form No. 4)

PROJECT SHEET – BASE DESIGN STANDARDS (Site is not constrained)

Complete a Project Sheet for each project that includes Permanent Stormwater Treatment Facilities.

SITE INFORMATION

Project Name: Mid Valley Apartments	
Project Location: Lots 1 & 2, Mid Valley Housing	
Submitted Date: 12/15/2023	Submitted By: Landmark Consultants, Inc. Matthew Eggen, P.E.
Acreage Disturbed: 7.7	
Existing Impervious: 22%	New Net Impervious: 48%
Review Date:	Reviewed By:

Preparer	City	Requirements
✔		Design Details are included for all Treatment Facilities
✔		List or include a description of any source controls or other non-structural practices:

DESIGN STANDARDS

Multiple Design Standards may be used on a site, as necessary, to meet the requirements, but only one Design Standard may be used for each treatment facility's tributary area. Evaluation of suitability of permanent stormwater treatment facilities is based on meeting the specified Design Standard and ease of long-term maintenance. Facilities must be designed in accordance with the most current versions of the City's Engineering Standards and Volume 3 of the USDCM and meet the specific requirements for each Design Standard used.

1. Indicate below, which Design Standard(s) will be used for the project, and
2. Complete a separate, corresponding Design Standards checklist for each facility (e.g., WQCV)

Design Standard	*Quantity*	*Tributary Area*	*Location/Identifying information*
WQCV			
Pollutant Removal	4.25-cfs	8.46-acres	Stormceptor STC 2400, Identified by manhole in landscaping southeast of Mid Valley Drive terminus.
Runoff Reduction			

DESIGN CHECKLIST – Pollutant Removal (TSS) Standard

POLLUTANT REMOVAL STANDARD Criteria

Treatment facilities must be designed to provide treatment of the 80th percentile storm event. The treatment facilities shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS), at a minimum, to a median value of 30mg/L or less for 100% of the site. Substantiating data must meet criteria in Volume 3 of the USDCM and be included in the submittal. All runoff from the site shall be captured. Under certain conditions, up to 20% of the site may be excluded, not to exceed 1 acre. This may apply if it is not practicable to capture runoff from portions of the site t and it is not practicable to construct a separate treatment facility for those same portions of the site.

Complete checklist if using the Pollutant Removal Standard to meet Design Standard requirements.

Project Name: Mid Valley Apartments			
Preparer	**City**	**Requirements**	
✔		Facilities provide treatment of the 80th percentile storm event. The facilities treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30mg/L or less for 100% of the site.	
✔		Facility Type: Stormceptor STC 2400 Hydrodynamic Separator	Facility Location: Lot 1, Mid Valley Housing
✔		Storm event: 80th Percentile Storm	
✔		TSS mg/L reduction: 81%	
✔		% of site treated: 87%	
✔		See Drainage Report section: Stormwater Quality	

If less than 100% of the site is treated, complete the following:

Preparer	**City**	**Requirements**	
		% of site not treated by control measures (not to exceed 20% or 1 acre):	
✔		13% %	0.88-acres Size (acres)
✔		Provide explanation of why the excluded area is impractical to treat: The excluded areas are along the perimeter of the site or lower than the proposed hydrodynamic separator.	
✔		Provide explanation of why another facility is not practicable for the untreated area: The areas are too small and narrow and typically drain directly off site.	

December 19, 2022

Matthew Eggen
141 9TH ST
STEAMBOAT SPRINGS, CO 80487

RE: Approval Letter for Preconsultation - Drainage Scope Approval Form or Waiver Request for Mid Valley (PL20220631)

Dear Matthew Eggen,

The following are approved:

1. Drainage & Stormwater Treatment Scope Approval Form

If you have any questions or concerns please contact me at (970) 871-8271 or via email at esoltis@steamboatsprings.net.

Sincerely,

Emrick Soltis, P.E.
Community Development Engineer

December 8, 2022
City of Steamboat Springs Public Works Department
Attn: Emrick Soltis
PO Box 775088
Steamboat Springs, CO 80477

RE: Drainage and Stormwater Treatment Scope
Mid Valley – Lot 1, Mid Valley Housing

Dear Emrick:

I am writing this letter to discribe in detail my thoughts and justification for choosing the proposed permanent stormwater treatment for the Mid Valley Housing project.

Lot 1, Mid Valley Housing is a project of the the Yampa Valley Housing Authority and is propopsing 234 affordable housing units. Lot 1 generally slopes from north to south and outfalls onto Lot 2, which is zoned OR and mainly consists of jurisdictional wetlands. Lot 1 also receives runoff from approximately 2.5 acres of developed commercial property that is currently not treated. The proposed site layout, which includes wide concrete trails and parking lots around the perimeter of each building, is required to provide fire apparatus access to all points of the large buildings. Additionally, this project does not require detention as the drainage from Lot 2 outfalls directly into the Yampa River.

Ideally we would like to place a water quality pond in the middle of all the units. However, the grades simply don't work. Trying to flow drainage to the north (from the southern parking lots), into a pond with an under drain and back to the south into the wetlands is not feasible. Therefore we propose capturing at least 80% of our our site and 100% of the off site runon stormwater and routing it through a proprietary hydronymic separator (Stormceptor STC 900 or equal) prior to the outfall into the wetlands of Lot 2. To ensure additional treatment is provided, a large portion of the proposed parking lot and roadway surface drainage will be routed into grasslined swales*, lined with trees**, prior to being collected and routed to the hydrodynamic separator.

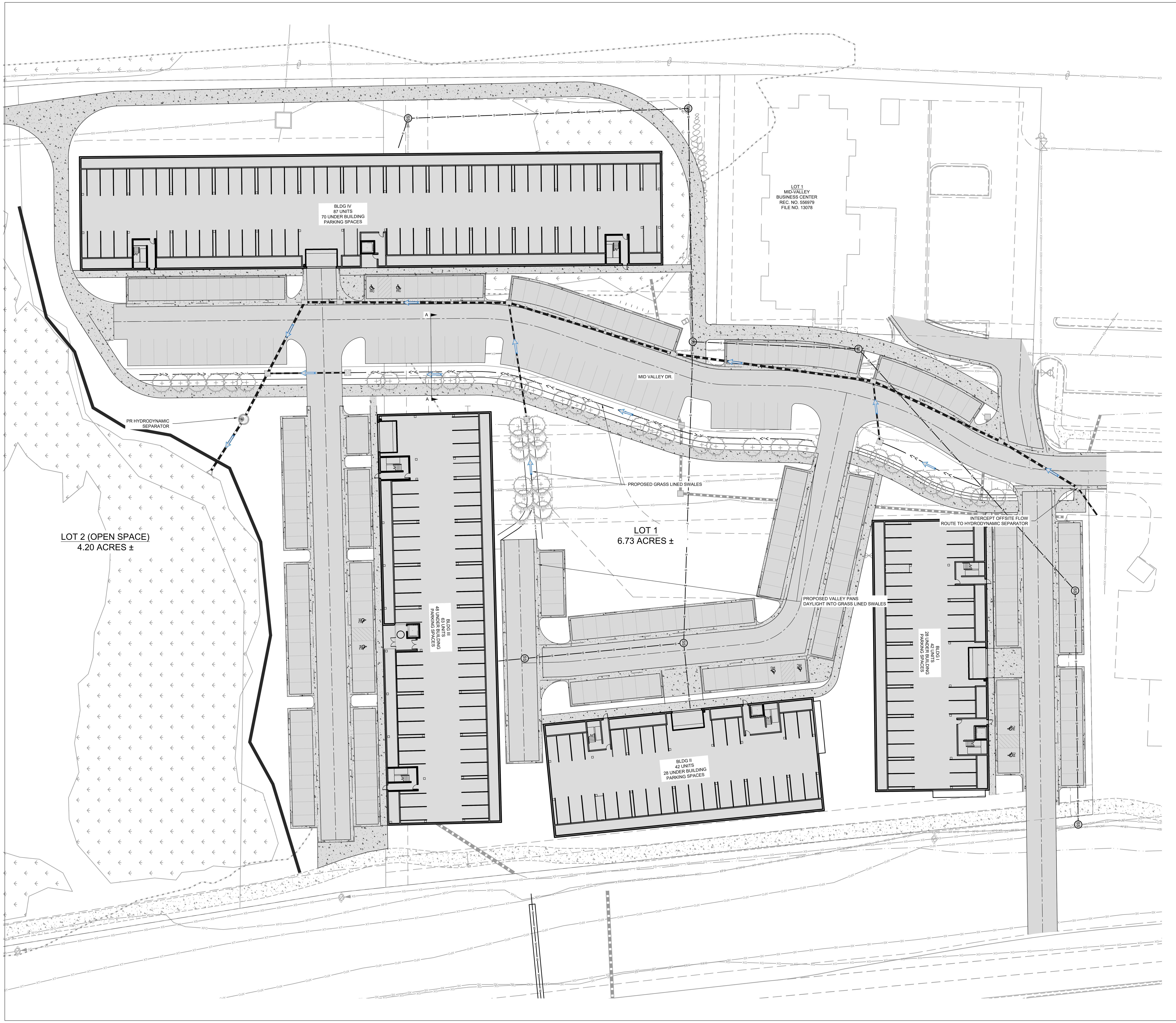
It is understood that proprietary structures for water quality treatment require more frequent maintenace. The maintenance requirements will be clearly stated in the O&M Plans that will be included in the Final Drainage Report.

Thank you in advance for your time and careful consideration of this application.

Sincerely,

Matthew Eggen, P.E.
Landmark Consultants, Inc.

* **Treatment in Series (Engineering Stanadards Chapter 5, pg 5.12-13,14):** *Treatment in Series is a very effective way to meet the pollutant removal standard and is encouraged.*
** **Engineering Standards Chapter 5, pg 5.12-3**: *Design engineers are also encouraged to be creative in their design approach to inlude green infrastructure, expecially trees. Trees have been shown to have a significant impact on runnoff reduction through interception of rainfall before it reaches the ground, evapotranspiration, and infiltration.*



NORTH

30 0 30 60 90 Feet

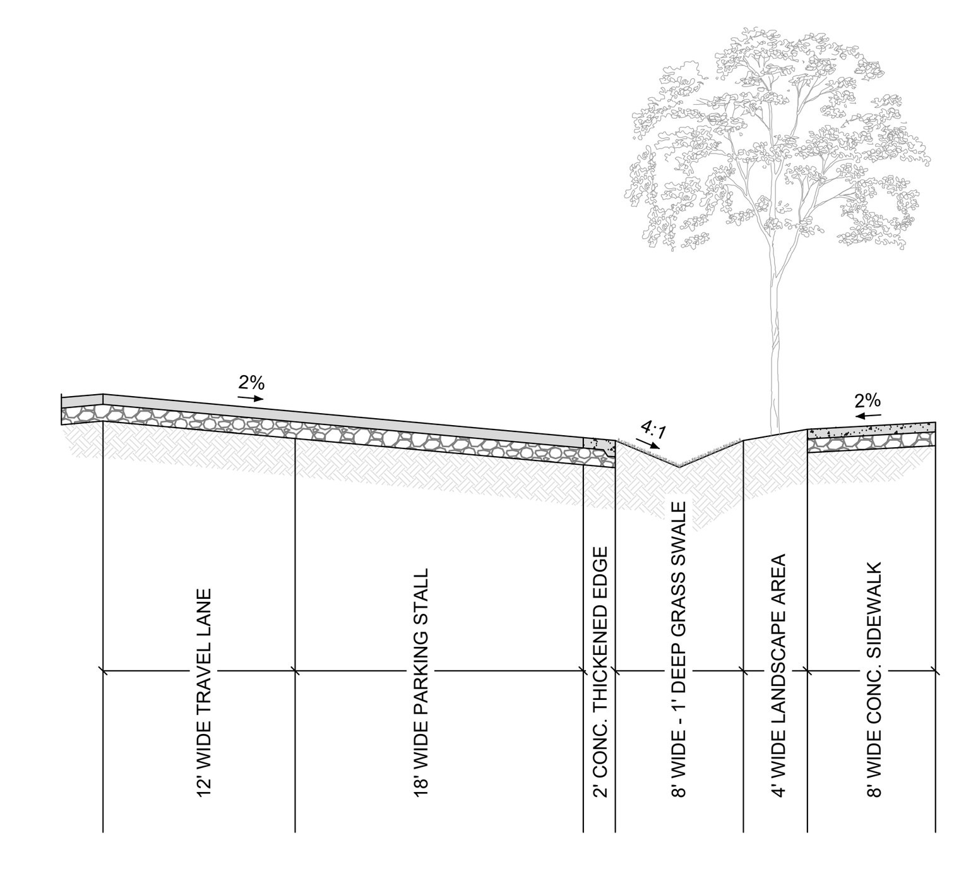
(IN FEET)
1 inch = 30 ft.

LEGEND:

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET (CURB & AREA)
- PROPOSED MAJOR CONTOUR (6805)
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR (6805)
- EXISTING MINOR CONTOUR
- PROPOSED SWALE
- PROPOSED CURB & GUTTER
- PROPERTY BOUNDARY
- PROPOSED LOT LINE
- EXISTING RIGHT OF WAY
- FLOOD HAZARD LIMITS
- PROPOSED SPOT ELEVATION (00.10)
- EXISTING SPOT ELEVATION (00.10 X)
- PROPOSED OVERLAND FLOW DIRECTION W/SLOPE (2.0%)
- PROPOSED CHANNELIZED FLOW DIRECTION W/ SLOPE (2.0%)
- EXISTING CHANNELIZED FLOW DIRECTION

NOTES:

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. ALL PROJECT DATA IS ON VERTICAL DATUM; NAVD 88. SEE NOTES SHEET FOR BENCHMARK REFERENCES.
3. ELEVATIONS FOR IMPROVEMENTS THAT ARE CONTROLLED BY ADJACENT EXISTING FACILITIES (SUCH AS PROPOSED GUTTERS ALONG EXISTING ASPHALT) MAY REQUIRE ADJUSTMENT BASED ON ACTUAL CONDITIONS. COORDINATE WITH ENGINEER TO ENSURE A CONSISTENT SECTION WITH SMOOTH TRANSITIONS WHERE NECESSARY.
4. SEE SOILS REPORT FOR PAVEMENT, SUBGRADE AND MATERIAL PREPARATION, DESIGN AND RECOMMENDATIONS.
5. ALL CURB SPOTS SHOWN ARE FLOWLINE ELEVATIONS, UNLESS NOTED OTHERWISE. ALL OTHER SPOTS ARE FINISHED GRADE ELEVATIONS.



CROSS SECTION A-A
NOT TO SCALE

CIVIL ENGINEERS | SURVEYORS
141 9th Street ~ P.O. Box 774943
Steamboat Springs, Colorado 80477
(970) 871-9494
www.LANDMARK-CO.com

LANDMARK CONSULTANTS, INC.

NO.	DATE:	BY:	DESCRIPTION:
			REVIEW SET NOT FOR CONSTRUCTION 12/8/2022

PROJECT: 2602-001
DATE: 12/8/2022
CONTACT: MCE
EMAIL: matte@landmark-co.com

MID VALLEY
SITE PLAN

SHEET
X.100
OF 1 SHEETS

Standard Form No. 5 Drainage and Stormwater Treatment Scope Approval Form

Prior to starting a development plan and before the first drainage submittal, a Drainage and Stormwater Treatment Scope Approval Form must be submitted for review and signed by the City Engineer. A signed form shall also be included in every drainage submittal as Attachment A. This Scope Approval Form is for City requirements only. Values may be approximate. The City encourages supporting calculations and figures to be attached.

Project Information	
Project name:	Mid Valley
Project location:	Lot 1, Mid Valley Housing
Developer name/contact info:	Yampa Valley Housing Authority jpeasley@yvha.org (970) 870-0167
Drainage engineer name/contact info:	Landmark Consultants, Inc. matte@landmark-co.com (970) 819-8893
Application Type:	Development Plan
Proposed Land Use:	Multifamily

Project Site Parameters	
Total parcel area (acres):	6.73
Disturbed area (acres):	6.73
Existing impervious area (acres, if applicable):	NA
Proposed new impervious area (acres):	4.3
Proposed total impervious area (acres):	4.3
Proposed number of project outfalls:	1
Number of additional parking spaces:	235
Description and site percentage of existing cover/land use(s):	6.4 acres - Open space, pervious area 0.3 acres - Paved areas
Description and site percentage of proposed cover/land use(s):	1.8 acres - roof area 2.5 acres - pavements 2.4 acres - open space, pervious areas
Expected maximum proposed conveyance gradient (%):	5%
Description of size (acres) and cover/land use(s) of offsite areas draining to the site	2.6 acres of heavy commercial area will drain onto the site and be captured into the projects system.

Type of Study Required:

☐ Drainage Letter
☒ Final Drainage Study
☐ Conceptual Drainage Study
☒ Stormwater Quality Plan

Hydrologic Evaluation:

☒ Rational Method ☐ CUHP/SWMM ☐ HEC-HMS ☐ Other_____

Project Drainage	
Number of subbasins to be evaluated:	3
Presence of pass through flow (circle):	(YES) NO
Description of proposed stormwater conveyance on site:	stormwater will generally be collected in concrete valley pans and grass lined swales where it will be conveyed into storm sewer pipe that will all be conveyed through a hydronymaic separator and onto Lot 2.
Project includes roadway conveyance as part of design evaluation (circle):	YES (NO)
Description of conveyance of site runoff downstream of site, identify any infrastructure noted in Stormwater Master Plan noted as lacking capacity for minor or major storm event:	Stormwater outfalls onto Lot 2 which consists mainly of wetlands. Lot 2 outfalls directly into the Yampa River via culverts and ditches. There are no infrastructure needs identified for this area in the Stormwater Master Plan.
Detention expected onsite (circle):	YES (NO)
Presence of Floodway or Floodplain on site (circle):	(YES) NO
Anticipated modification of Floodway or Floodplain proposed (circle):	(YES) NO
Describe culvert or storm sewer conveyance evaluative method:	Stormsewers are evaluated using Autodesks Storm and Sanitary Sewer Analysis, in either steady state or hydrodynamic routing

Permanent Stormwater Treatment Facility Design Standard (check all that apply with only one standard per tributary basin):

☐ WQCV Standard ☒ TSS Standard ☐ Infiltration Standard
☐ Constrained Redevelopment WQCV Standard
☐ Constrained Redevelopment TSS Standard
☐ Constrained Redevelopment Infiltration Standard
☐ Does not Require Permanent Stormwater Treatment (attach Exclusion Tracking Form)

Project Permanent Stormwater Treatment	
Justification of choice of proposed design standard, including how the site meets the constrained redevelopment standard, infiltration test results, etc.:	See attached letter
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	See attached letter
Proposed LID measures to reduce runoff volume:	Providing stormwater quality was a primary concern when considering drainage design
Will treatment evaluation include off-site, pass through flow (circle):	(YES) NO

Approvals

Matt Eggen, Landmark Consultants, Inc.	12/08/2022	(970)819-8893
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

Printed Name: City Engineer	Date

NORTH

60 0 60 120 180 Feet

(IN FEET)
1 inch = 60 ft.

LEGEND:

EXISTING STORM SEWER	
PROPOSED STORM SEWER	
PROPOSED STORM INLET (CURB & AREA)	
PROPOSED MAJOR CONTOUR	6805
PROPOSED MINOR CONTOUR	
EXISTING MAJOR CONTOUR	6805
EXISTING MINOR CONTOUR	
PROPOSED SWALE	
PROPOSED CURB & GUTTER	
PROPERTY BOUNDARY	
PROPOSED LOT LINE	
EXISTING RIGHT OF WAY	
FLOOD HAZARD LIMITS	
EXISTING BASIN	
PROPOSED BASIN	
PROPOSED SPOT ELEVATION	00.10
EXISTING SPOT ELEVATION	00.10 X
PROPOSED OVERLAND FLOW DIRECTION W/SLOPE	2.0%
PROPOSED CHANNELIZED FLOW DIRECTION W/ SLOPE	2.0%
EXISTING CHANNELIZED FLOW DIRECTION	

A1 X.XX XX%

BASIN ID

TOTAL AREA (ACRES)

PERCENT IMPERVIOUS

BASIN INFORMATION

h1

DESIGN POINT

NOTES:

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. ALL PROJECT DATA IS ON VERTICAL DATUM; NAVD 88. SEE NOTES SHEET FOR BENCHMARK REFERENCES.
3. ELEVATIONS FOR IMPROVEMENTS THAT ARE CONTROLLED BY ADJACENT EXISTING FACILITIES (SUCH AS PROPOSED GUTTERS ALONG EXISTING ASPHALT) MAY REQUIRE ADJUSTMENT BASED ON ACTUAL CONDITIONS. COORDINATE WITH ENGINEER TO ENSURE A CONSISTENT SECTION WITH SMOOTH TRANSITIONS WHERE NECESSARY.
4. SEE SOILS REPORT FOR PAVEMENT, SUBGRADE AND MATERIAL PREPARATION, DESIGN AND RECOMMENDATIONS.
5. ALL CURB SPOTS SHOWN ARE FLOWLINE ELEVATIONS, UNLESS NOTED OTHERWISE. ALL OTHER SPOTS ARE FINISHED GRADE ELEVATIONS.

TABLES

Table 1: Basin Hydrology Summary

Basin	Pre-Development Total Area (acres)	%Imp	C5	C100	Tc (min)	Q5 (cfs)	Q100 (cfs)	Post-Development Total Area (acres)	%Imp	C5	C100	Tc (min)	Q5 (cfs)	Q100 (cfs)
H1	12.10	15	0.24	0.54	19.31	5.62	27.88							
H2	1.61	66	0.49	0.65	11.96	2.10	6.07							
H3	0.98	57	0.45	0.63	11.78	1.16	3.55							
H4	2.67	13	0.23	0.54	11.35	1.63	8.44							
D1.a								0.72	85	0.68	0.79	5.66	1.82	4.62
D1.a-1								0.08	100	0.90	0.96	5.00	0.28	0.66
D1.b								0.73	68	0.51	0.67	5.66	1.82	4.62
D1.c								0.63	88	0.73	0.82	6.42	1.34	3.81
D1.d								1.01	73	0.57	0.70	5.00	1.78	4.35
D1.e								0.73	90	0.74	0.83	10.24	1.63	4.41
D1.f								0.74	76	0.59	0.71	5.96	2.01	4.88
D1.f-1								0.22	61	0.46	0.63	12.72	1.10	2.93
D1.g								0.77	87	0.70	0.80	9.48	1.62	4.05
D1.h								0.53	88	0.72	0.81	5.00	1.47	3.63
D2								5.80	9	0.21	0.53	12.56	3.04	16.94
D3								3.30	45	0.37	0.59	14.39	2.91	10.07

Table 2: Design Point Hydrology Summary

Design Point	Basins	Pre-Development Total Area (acres)	%Imp	C5	C100	Tc (min)	Q5 (cfs)	Q100 (cfs)	Post-Development Total Area (acres)	%Imp	C5	C100	Tc (min)	Q5 (cfs)	Q100 (cfs)
DP1	H2+H3+ (D1.a-D1.h)								8.46	75	0.59	0.71	17.75	10.22	27.19
h1		17.36	22	0.27	0.55	19.31	9.04	41.03	17.56	48	0.39	0.60	17.36	14.22	47.97

Table 3: 80th Percentile Storm Event (For Water Quality Design Flow)

Design Point	Basin(s)	Area, A (acres)	Tc (min)	C1.25	Intensity I1.25 (in/hr)	Flow Q1.25 (cfs)
DP1	H2+H3+ (D1.a-D1.h)	8.46	17.75	0.53	0.95	4.25

CALL UTILITY NOTIFICATION CENTER OF COLORADO

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Know what's below. Call before you dig.

CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

COLORADO LICENSED PROFESSIONAL ENGINEER
MATTHEW CARL EGGEN
50740
12/15/23

NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

LANDMARK CONSULTANTS, INC.
CIVIL ENGINEERS | SURVEYORS
141 9th Street ~ P.O. Box 774943, Steamboat Springs, CO 80477
(970) 871-9494 ~ www.LANDMARK-CO.com

NO.	DATE:	BY:	DESCRIPTION:

PROJECT: 2602-001
DATE: 12/19/2023
CONTACT: Matthew Eggen
EMAIL: matte@landmark-co.com

Mid Valley Apartments - Construction Drawings

Existing Drainage Plan

SHEET

FIG-2

NORTH

60 0 60 120 180 Feet

(IN FEET)
1 inch = 60 ft.

LEGEND:

EXISTING STORM SEWER
PROPOSED STORM SEWER
PROPOSED STORM INLET (CURB & AREA)
PROPOSED MAJOR CONTOUR — 6805
PROPOSED MINOR CONTOUR
EXISTING MAJOR CONTOUR — 6805
EXISTING MINOR CONTOUR
PROPOSED SWALE
PROPOSED CURB & GUTTER
PROPERTY BOUNDARY
PROPOSED LOT LINE
EXISTING RIGHT OF WAY
FLOOD HAZARD LIMITS
EXISTING BASIN
PROPOSED BASIN
PROPOSED SPOT ELEVATION — 00.10
EXISTING SPOT ELEVATION — 00.10 X
PROPOSED OVERLAND FLOW DIRECTION W/SLOPE — 2.0%
PROPOSED CHANNELIZED FLOW DIRECTION W/ SLOPE — 2.0%
EXISTING CHANNELIZED FLOW DIRECTION

A1 X.XXX XX
BASIN ID
TOTAL AREA (ACRES)
PERCENT IMPERVIOUS
BASIN INFORMATION

h1
DESIGN POINT

NOTES:

1. THE SIZE, TYPE AND LOCATION OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE WHEN SHOWN ON THESE DRAWINGS. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO VERIFY THE EXISTENCE OF ALL UNDERGROUND UTILITIES IN THE AREA OF THE WORK. BEFORE COMMENCING NEW CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES AND SHALL BE RESPONSIBLE FOR FOR ALL UNKNOWN UNDERGROUND UTILITIES.
2. ALL PROJECT DATA IS ON VERTICAL DATUM; NAVD 88. SEE NOTES SHEET FOR BENCHMARK REFERENCES.
3. ELEVATIONS FOR IMPROVEMENTS THAT ARE CONTROLLED BY ADJACENT EXISTING FACILITIES (SUCH AS PROPOSED GUTTERS ALONG EXISTING ASPHALT) MAY REQUIRE ADJUSTMENT BASED ON ACTUAL CONDITIONS. COORDINATE WITH ENGINEER TO ENSURE A CONSISTENT SECTION WITH SMOOTH TRANSITIONS WHERE NECESSARY.
4. SEE SOILS REPORT FOR PAVEMENT, SUBGRADE AND MATERIAL PREPARATION, DESIGN AND RECOMMENDATIONS.
5. ALL CURB SPOTS SHOWN ARE FLOWLINE ELEVATIONS, UNLESS NOTED OTHERWISE. ALL OTHER SPOTS ARE FINISHED GRADE ELEVATIONS.

TABLES

Table 1: Basin Hydrology Summary

Basin	Pre-Development Total Area (acres)	Pre %Imp	Pre C5	Pre C100	Pre Tc (min)	Pre Q5 (cfs)	Pre Q100 (cfs)	Post-Development Total Area (acres)	Post %Imp	Post C5	Post C100	Post Tc (min)	Post Q5 (cfs)	Post Q100 (cfs)
H1	12.10	15	0.24	0.54	19.31	5.62	27.88							
H2	1.61	66	0.49	0.65	11.96	2.10	6.07							
H3	0.98	57	0.45	0.63	11.78	1.16	3.55							
H4	2.67	13	0.23	0.54	11.35	1.63	8.44							
D1.a								0.72	85	0.68	0.79	5.66	1.82	4.62
D1.a-1								0.08	100	0.90	0.96	5.00	0.28	0.66
D1.b								0.73	68	0.51	0.67	5.66	1.82	4.62
D1.c								0.63	88	0.73	0.82	6.42	1.34	3.81
D1.d								1.01	73	0.57	0.70	5.00	1.78	4.35
D1.e								0.73	90	0.74	0.83	10.24	1.63	4.41
D1.f								0.74	76	0.59	0.71	5.96	2.01	4.88
D1.f-1								0.22	61	0.46	0.63	12.72	1.10	2.93
D1.g								0.77	87	0.70	0.80	9.48	1.62	4.05
D1.h								0.53	88	0.72	0.81	5.00	1.47	3.63
D2								5.80	9	0.21	0.53	12.56	3.04	16.94
D3								3.30	45	0.37	0.59	14.39	2.91	10.07

Table 2: Design Point Hydrology Summary

Design Point	Basins	Pre-Development Total Area (acres)	Pre %Imp	Pre C5	Pre C100	Pre Tc (min)	Pre Q5 (cfs)	Pre Q100 (cfs)	Post-Development Total Area (acres)	Post %Imp	Post C5	Post C100	Post Tc (min)	Post Q5 (cfs)	Post Q100 (cfs)
DP1	H2+H3+ (D1.a-D1.h)								8.46	75	0.59	0.71	17.75	10.22	27.19
h1		17.36	22	0.27	0.55	19.31	9.04	41.03	17.56	48	0.39	0.60	17.36	14.22	47.97

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Mid Valley Apartments - Construction Drawings

Proposed Site Level Drainage Plan

SHEET

FIG-3