This Drainage Letter and Stormwater Quality Plan was previously submitted and approved with PS51-0193 "Base Area Plaza Improvements". The proposed Plaza Building replaces previously approved impervious area and structures and does not materially alter how drainage and stormwater quality is addressed. No drainage or stormwater improvements are proposed as part of this project.

Drainage Letter and Stormwater Quality Plan

Gondola Plaza

Lot 1 Replat of Parcel D

Original Date: February 10, 2021

Prepared by: Deborah Spaustat, 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.

LANDMARK CONSULTANTS, INC.

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CERTIFICATION

I hereby affirm that this Drainage Letter and Stormwater Quality Plan for the Development Plan for the Gondola Plaza project 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.

4/07/2021

NOT VALID WITHOUT ORIGINAL SIGNATURE AND DATE

Deborah Spaustat, P.E.
State of Colorado No. 0041286

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INTRODUCTION AND LOCATION

The purpose of this report is to estimate peak stormwater runoff, evaluate existing infrastructure and design required infrastructure to manage the existing stormwater experienced onsite and the incremental stormwater generated by the proposed Gondola Plaza project (the Project). This report includes all the base data, methods, assumptions, and calculations used by Landmark Consultants, Inc. (Landmark) to design the stormwater management system for the project. It was prepared in conjunction with the Development Plan application submitted February 10, 2021.

The subject property, Lot 1 of Parcel D Replat, is 1.59-acres in total area and encompasses Gondola Square at the Steamboat Ski Resort. The main feature of the site is the existing Gondola Terminal building. The gondola terminal will be relocated offsite to Parcel D as part of the Steamboat Gondola Terminal Relocation project. The site is zoned Gondola-2 and is currently used for activities related to the Steamboat Resort. There is no proposed change in zoning or use.

This project proposes to replace the existing building with new building that will consist of a 24,000-sf lower level below the plaza and multiple small buildings at the plaza level totaling approximately 1,050-sf. An ice rink will be installed central to the plaza. Landscape planters will be installed throughout the plaza and the existing pavers will be replaced.

A related but separate project is being proposed on Gondola Square Condominiums property adjacent to Lot 1. The Goldwalk project proposes improvements to the pedestrian connectivity of the Base Area by installing an escalator, a new stairway and changing grades to eliminate other ramps and stairs. One hydrodynamic separator (WQU) will provide stormwater quality treatment to both the Gondola Plaza and Goldwalk projects. The WQU will be located in Lot 1 but can be installed in existing infrastructure independent of either project.

Landmark prepared this report in accordance with City of Steamboat Springs Drainage Criteria for the purpose of designing the storm water infrastructure required by the project at the time of this report. This report may not be used by other parties without the express written consent of Landmark

The facts and opinions expressed in this report are based on Landmark's understanding of the project and data gathered from:

- Site visits
- Steamboat Springs GIS data
- FEMA FIRM Map Number 08107C0883D and FIS Study
- LOMR 15-08-0994P
- NRCS soil maps
- Field survey by Landmark Consultants, Inc.
- Final Drainage Report for Steamboat Base Area Redevelopment by Drexel, Barrell & Co.
- Citywide Stormwater Masterplan by SEH
- References listed at the end of this report

The location of the project is shown on Figure 1: Vicinity Map.

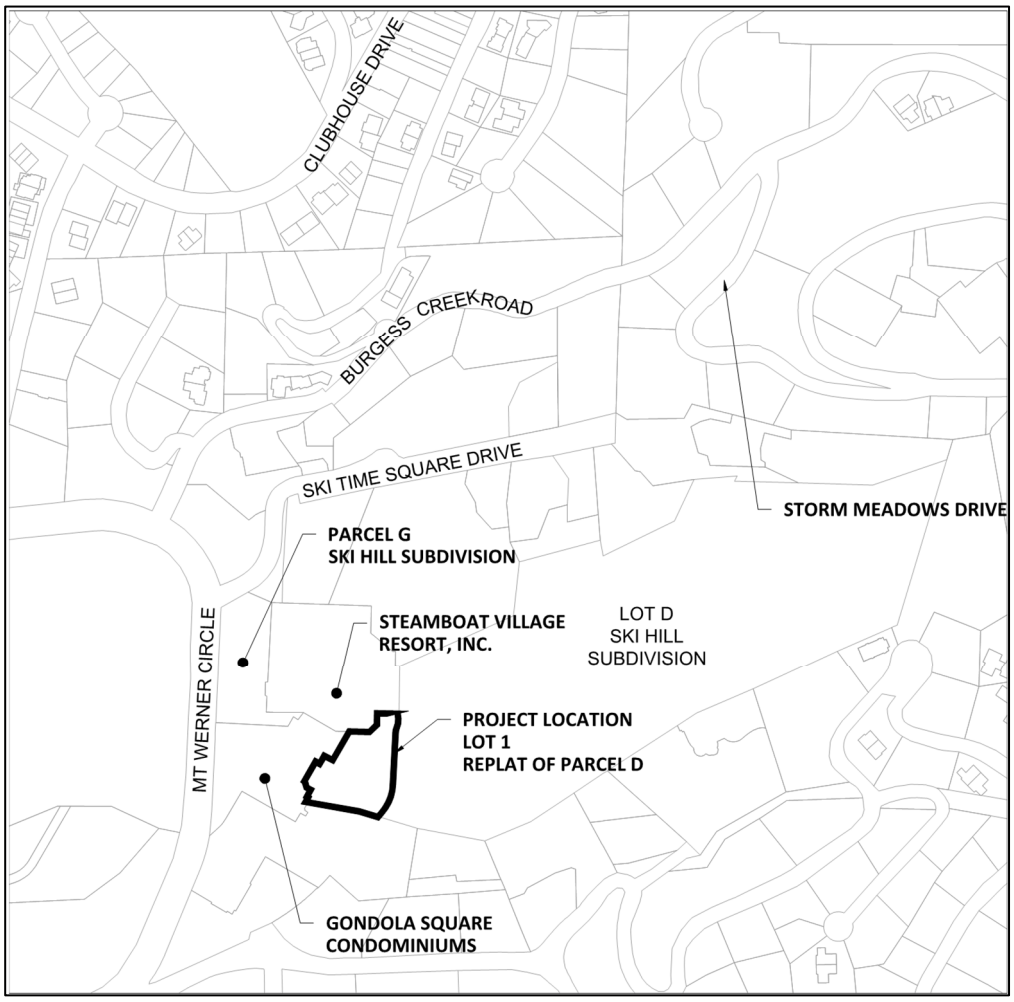


Figure 1- Vicinity Map

DRAINAGE CRITERIA AND METHODOLOGY

Landmark prepared this report in accordance with City of Steamboat Springs, Colorado Drainage Criteria, effective September 2007. 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 Rational Method to determine peak runoff of small basins to design the on-site storm water runoff infrastructure associated with this project. The 5-year, 24 hour storm was

used to analyze the minor storm event and the 100-year, 24 hour storm was used to analyze the major storm event. The 80th percentile storm was used to estimate the water quality volume for the sizing the hydrodynamic separator.

Storm Sewer Design

Autodesk Storm and Sanitary Sewer Analysis was used to design and analyze the proposed storm sewer systems. The storm sewers were designed so that the HGL of the minor storm does not exceed ground elevation.

Stormwater Quality

The project uses the TSS design standard to provide stormwater quality treatment in the form of a hydrodynamic separator. The TSS design standard is applicable to all sites. A proprietary structure was chosen after other options such as sand filters, bioretention ponds and grass buffers and swales were considered and rejected. These BMP's do not fit into the already developed site physically or aesthetically and would detract from the function of a public gathering place. There are currently no water quality treatment BMP's in the vicinity of this portion of the base area. The hydrodynamic separator will be located strategically to capture as much off-site flow as possible.

EXISTING SITE CONDITIONS

In this report the term "historic condition" refers to the conditions of the site at the time of this report and may also be referred to as "pre-development condition" or "existing condition". The site is 1.59-acres made up Routt loam soils with a hydrologic soil group of C. It is wholly developed and 100% impervious. The existing Gondola terminal building fills roughly half the lot with the remaining open plaza covered in brick pavers. Most of the site is at grades of 0%-2% although the east side of the property slopes down along the promenade to access the lower level of the existing building and the restrooms below the stage.

The runoff from the plaza is collected in valley pans and area drains that connect to an 8" and 12" HDPE storm system. Capacity analysis calculations indicate a limiting conveyance of 1.37-cfs in the 8" pipes and 2.92-cfs in the 12" pipe with additional capacity in downstream pipes. This system discharges to a 24" storm system that runs from north to south in the promenade largely located in Parcel D. As-built records indicate that there are no connections upstream EX STM MH 1-4, however it is possible that there are additional unknown sourced of runoff to this storm system. A capacity analysis shows a limiting flow of 25.86-cfs in pipe EX 01-4 with downstream pipes having additional capacity.

The storm and sanitary analysis profiles for EX STORM 1 and EX STORM 3 in appendix B show the capacities for the existing systems.

This storm sewer discharges to the 78" Burgess Creek Culvert, which outfalls to Burgess Creek and eventually the Yampa River. An abandoned 18" CMP remains buried in the plaza almost parallel to the 24" storm sewer. The 18" CMP connects to a still active 24" storm sewer that then joins with the other 24" storm sewer to the east.

Burgess Creek

While not located on the property, the 78" RCP that carries Burgess Creek from the north side of the base area to the southside during ski area operations is located directly east of the property on Parcel D. The daylighted Burges Creek is a man-made water feature that runs parallel to the

78" RCP and was designed for a maximum flow of approximately 5-cfs during the summer months. Flow in the daylighted Burgess Creek of more than 5-cfs is diverted into the 78" RCP by a sluice gate at the north end of the culvert. The daylighted creek returns to the 78" culvert south of the project site and then daylights to the natural Burgess Creek on One Steamboat Place property.

According to the Final Drainage Study for the Steamboat Base Area Redevelopment, the 78" RCP was sized to contain the 1% chance annual flood in Burgess Creek per the published flow in the Flood Insurance Study (FIS) for Routt County and Incorporated Areas, which is 399-cfs. The ultimate outfall for Burgess Creek is the Yampa River.

The Citywide Master Stormwater Plan identifies several areas downstream on Burgess Creek in need of maintenance or replacement. This project does not propose to increase peak flows in Burgess Creek and will not affect downstream properties.

The daylighted creek itself receives relatively little direct runoff.

Easements

The 78" RCP is located in a 40-ft. storm sewer easement. There are no drainage easements within the project property boundary. There are many other utility and access easements overlapping each other in the vicinity of the site. Only the storm sewer easements are shown on the drainage plans. See sheet C.003 Existing Conditions for locations of other easements. Figure 3: Existing Drainage Conditions shows the location of the project site features and drainage basins.

Drainage Basins

The site is broken into four drainage basins. Basins H1, H2 and H4 relate the Gondola Plaza project while basin H3 encompasses the Goldwalk project. Since the Goldwalk project will result in more runoff being diverted through Gondoloa Plaza the analysis for that project is included in this study.

Basin H1 represents all flow from the existing plaza and surrounding offsite areas that are collected in the valley pan storm sewer system. Basin H2 includes runoff from the building and lower-level outdoor area. Both basins discharge to the 24" storm sewer combining at Design Point 1 (DP1).

Basin H4 represents a small portion of upper-level deck that contributes runoff to an offsite basin in adjacent One Steamboat Place. Basin H3 includes the portion of Gondola Square Condominiums that is collected in a storm sewer that bisects the lot and continues into One Steamboat Place property. The Goldwalk project is partially located in this basin. DP2 represents the combined runoff from basins H3 and H4 to One Steamboat Place.

Table 1 summarizes the hydrologic characteristics of the existing basins:

Table 1: Summary of Basin Existing Conditions Hydrologic Characteristics

Basin	Total Area (acres)	%Imp	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
H1	1.13	100%	0.86	0.89	3.73	8.51
H2	0.80	100%	0.86	0.89	2.65	6.04
H3	0.93	100%	0.86	0.89	3.07	7.00
H4	0.07	100%	0.86	0.89	0.23	0.52

Table 2 summarizes the runoff to the design points:

Table 2: Summary of Design Point Existing Conditions Hydrologic Characteristics

Design Point	Total Area (acres)	%Imp	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
1	1.93	100%	0.86	0.89	6.38	14.55
2	1.00	100%	0.86	0.89	3.29	7.52

FEMA FLOODPLAIN

FEMA FIRM Number 08107C0883D dated February 4, 2005 and LOMR 15-08-0994P dated May 31, 2016, were reviewed and no portions of the property are within a Floodway or SFHA. The LOMR confirms that the SFHA Zone AE (1% chance annual flood) is confined to the 78" culvert. The flow in the manmade creek was calculated to reach a max depth of 0.70-ft during the 1% chance annual flood and remains a SFHA zone X.

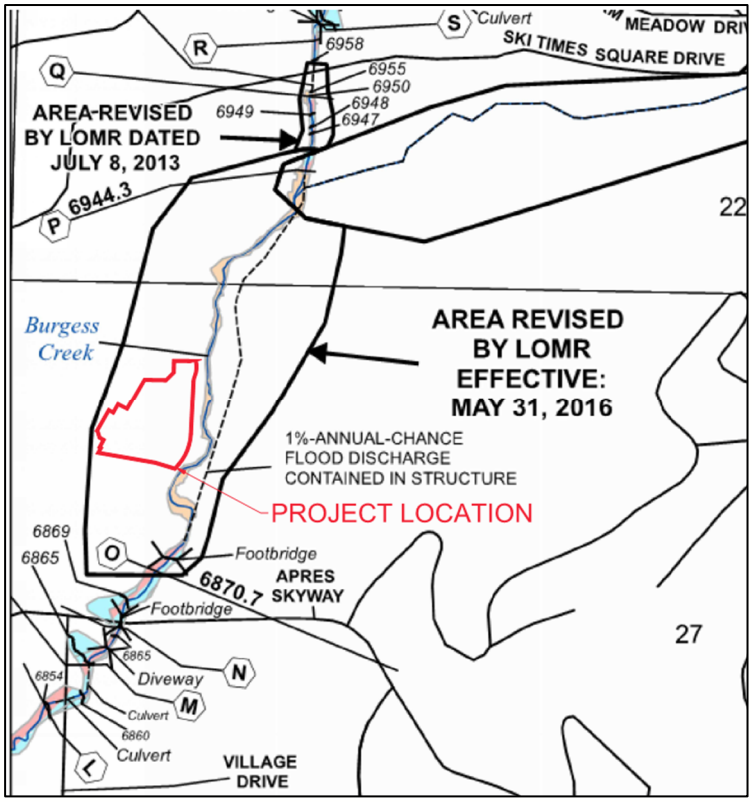


Figure 2- FEMA FIRM

PROPOSED SITE CONDITIONS

The project proposes to remove the existing building and replace it with a 24,000-sf "lower level" building. Several smaller buildings totaling 1,050-sf building will be built at the main plaza level (the second story of the building) and will contain food and beverage services as well as maintenance equipment. An ice rink will be installed central to the plaza as well as several landscape planters. The existing pavers will be replaced. The project proposes to disturb approximately 1.40-acres, leaving the deck at Torch and Timber as is.

The project will maintain the existing drainage pattern of the site and seeks to use the existing underground drainage infrastructure in place. Existing and new area drains at plaza level will collect runoff and direct it into the existing 8" and 12" storm system. Drains on top of the lower level will be routed through the building and connected to the ex 24" storm system to the east. Anticipated additional flow from the Goldwalk project has been included in proposed runoff calculations. The new storm systems will be a 12" HDPE and have the capacity for the minor storm event. The analysis of existing storm system in the plaza (EX STORM 03) shows a risk of flooding during the major storm event. The results indicate a maximum flooded time of 5-minutes during which water will pond around the area drains until additional capacity is available in the system.

Table 3 summarizes and compares the hydrological characteristics of the historical and developed basins:

Table 3: Comparison of Basin Hydrologic Characteristics

	Historical (H)						Developed (D)					
Basin	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**
1.1							0.18	100%	0.855	0.894	0.60	1.38
1.2							0.35	100%	0.855	0.894	1.14	2.61
1.3							0.21	100%	0.855	0.894	0.68	1.55
1.4							0.20	100%	0.855	0.894	0.66	1.51
1.5							0.12	100%	0.855	0.894	0.38	0.88
1.6							0.38	100%	0.855	0.894	1.27	2.89
1.7							0.28	100%	0.855	0.894	0.92	2.11
1	1.13	100%	0.86	0.89	3.73	8.51						
2	0.80	100%	0.86	0.89	2.65	6.04	0.48	100%	0.855	0.894	1.57	3.59
3	0.93	100%	0.86	0.89	3.07	7.00	0.67	100%	0.855	0.894	2.20	5.02
4	0.07	100%	0.86	0.89	0.23	0.52	0.07	100%	0.855	0.894	0.23	0.52

Table 4 compares the historical and developed runoff at the design points:

Table 4: Comparison of Design Point Hydrologic Characteristics

	Historical						Developed					
Design Point	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**
1	1.93	100%	0.86	0.89	6.38	14.55	2.20	100%	0.86	0.89	7.24	16.52
2	1.00	100%	0.86	0.89	3.29	7.52	5.00	100%	0.86	0.89	2.43	5.55

The combination of the two projects will increase the flow to ex 24" culvert at DP1 allowing more runoff to be treated for water quality. The flow at DP2 will decrease, however, since the flows from both design points combine in the 78" Burgess Creek Culvert there will be no net increase or decrease in runoff as a result these projects.

To account for each project separately, The Gondola Square Project will not cause an increase or decrease in runoff to either design point. The Goldwalk Project will increase the runoff to DP1 and decrease the runoff to DP2 because of changes in basin size. However, the net runoff to the 78" culvert will remain the same.

Runoff calculations are included in Appendix A. Calculations for storm system capacity are included in Appendix B. Water quality and detention calculations are included in Appendix C.

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 by the runoff 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. Ski Area operations vehicles
2. Landscaping maintenance
3. Snow removal and related transport of sand, dirt and oils;
4. Trash.

BMP Selection:

BMP selection involves many factors such as physical site characteristics, treatment objectives, aesthetics, safety, maintenance requirements, and costs. A proprietary hydrodynamic separator was chosen after other options such as sand filters, bioretention ponds and grass buffers and swales were considered and rejected. These BMP's do not fit into the already developed site physically or aesthetically and would detract from the function of a public gathering place. There are currently no water quality treatment BMP's in the vicinity of this portion of the base area.

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, Washinton ECOLOGY and EN858 Class 2. The units do not require filters or confined space entry for maintenance.

Table 5 summarizes the design parameters of for the TSS design standard:

Table 5: TSS Design Standard Parameters

Design Point	Basin(s)	Area, A (acres)	T_c (min)	$C_{1.25}$	Intensity $I_{1.25}$ (in/hr)	Flow $Q_{1.25}$ (cfs)	Max Flow Q_{100} (cfs)
d1	D1	2.19	5.00	0.86	0.79	1.48	16.46

When run through the manufacturer's design software, PCSWWM for Stormceptor, the above parameters resulted in a minimum facility size of the STC 900. To account for uncertainties regarding unknown connections to the existing 24" storm sewer, and to provide additional capacity for potential future connections, the project proposes to install the next size up, the STC 1200. This model is capable of treating up 2.4-acres with 100% imperviousness and a water quality design flow of 1.6-cfs. Design reports for both the STC 900 and the STC 1200 are included in Appendix C.

The facility will treat 95% of the project site. The remaining 5% of the site currently drains to the adjacent property. It is impractical to change the grades in this area and still maintain a cohesive connection to the adjoining property.

A draft Operation and Maintenance Plan is provided in the appendices of this report. A final O&M Plan will be provided with CD's.

TEMPORARY EROSION AND SEDIMENT CONTROL

The primary source of storm water contaminants in the City of Steamboat Springs are suspended sediments and are most susceptible during construction activities. Temporary erosion and sediment control during construction is the responsibility of the permit holder (including NPDES permitting). Appropriate best management practices (BMP's) for construction activities are detailed in Erosion and Sediment Control During Construction by Routt County, Colorado. It is the responsibility of the permit holder to identify and properly handle all materials that are potential pollution sources prior to mobilization. The following are some common examples of potential pollution sources:

- Stockpiling of materials that can be transported to receiving waterways
- Uncovered trash bins
- Exposed and stored soils, management of contaminated soils
- Off-site tracking of soils and sediment
- Loading and unloading operations
- Outdoor storage of building materials, chemicals, fertilizers, etc.
- Vehicle and equipment maintenance and fueling
- Significant dust or particulate generating processes
- Routine maintenance activities involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
- On-site waste disposal practices (waste piles, dumpsters, etc.)
- Concrete truck/equipment washing.
- Non-industrial waste sources that may be significant, such as worker trash and portable toilets.

It is not possible to identify all materials that will be used or stored on the construction site. It is the sole responsibility of the permit holder to identify and properly handle all materials that are potential pollutant sources prior to mobilization.

Some temporary BMP's include, but are not limited to, straw bales, silt fences, ditch checks, berms, slope drains, seeding and mulching, pipes, and sediment basins. In order to prevent mud from being transported into public right of ways, vehicle tracking pads and wheel wash areas should be utilized. Temporary BMP's should be coordinated with the site's permanent erosion control measures to assure continuous and economical erosion control. Because different BMP's are required at different stages of construction, the site should be periodically reviewed by the permit holder to verify the proper BMP's are in place.

Temporary BMP's should be inspected at a minimum once every two weeks, after each significant storm event, and at 24 hour intervals during extended storm events. Repairs or reconstruction of temporary BMP's shall occur within two working days in order to ensure continued performance.

It is the responsibility of the Construction Site Operator to conduct bi-weekly inspections, maintain BMP's, and keep records of site conditions and inspections.

Areas used for material storage which are exposed to precipitation, disturbed areas, the construction site perimeter, and all applicable/installed erosion and sediment control measures shall be inspected for evidence of, or the potential for, pollutants entering the drainage system.

Preventative maintenance of all temporary BMP's shall be provided in order to ensure continued performance. Maintenance activities and actions shall be noted and recorded during inspections. All temporary erosion control measures must be kept in place and maintained until the site has been sufficiently stabilized in accordance with permit requirements.

It is recommended that a Stormwater Management Plan (SWMP) be completed prior to commencement of any land disturbing activities. Additionally, all pertinent local, state, and federal permits should be obtained prior to construction.

CONCLUSIONS

The improvements proposed for the Gondola Plaza project replacing the existing building with a below ground building and smaller plaza level buildings, installing an ice rink, replacing all the hardscape and installing landscaping. The existing drainage infrastructure will largely be left in place and additional drain inlets will be installed as necessary. The inlets on top of the building in the plaza will be routed down through the building and out to the existing storm sewer. The project will not result in an increase in imperviousness as it is already at 100%. No increase in runoff is anticipated and no detention is proposed.

A hydrodynamic separator will be installed inline on the existing 24" storm sewer to provide water quality treatment for this project as well as the adjacent proposed project, The Goldwalk. The treatment facility can be installed in existing infrastructure independent of either project.

The design contained herein complies with the criteria set forth in the City's Drainage Design Manual. The storm sewer system and hydrodynamic separator will require routine maintenance to maintain proper function.

LIMITATIONS

This study is intended to estimate and analyze peak stormwater runoff volumes generated by hydrologic events 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 the best available information listed in the INTRODUCTION AND LOCATION section of 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 100-year event is defined as the rainfall, runoff, or flooding event which has a probability of 1-percent of occurring in any given year based on available data. The 100-year event could occur in successive years or even multiple times in a single year. Events greater than the 100-year event or lesser events combined with malfunctioning drainage works can occur on rare occasion and may cause flooding damage.

The data, opinions, and recommendations of this report are applicable to the specific design elements and location that is the subject of this report. The 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.

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.

REFERENCES

1. Section 5.0 Drainage Criteria, City of Steamboat Springs Department of Public Works, September 2007.

2. Drainage Criteria Manual (Volumes 1 – 3), Urban Drainage and Flood Control District, June 2001

3. Hydraulic Design of Highway Culverts (HDS-5), Federal Highway Administration, September 2001

4. Procedures for Determining Peak Flows in Colorado, Natural Resource Conservation Service, 1984

5. Urban Hydrology for Small Watersheds (TR-55), Natural Resource Conservation Service, June 1986

6. Final Drainage Report for Steamboat Base Area Redevelopment, Drexel, Barrell & Co., December 1, 2006.

7. Citywide Stormwater Master Plan for the City of Steamboat Spring, Colorado, SEH, March 2013.

APPENDIX A

HYDROLOGIC CALCULATIONS

IDF Table for Steamboat Springs, CO

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

Based on 1-hour rainfall depths from NOAA Atlas 14 for Steamboat Springs (station ID-05-7936) and the equation:

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

Where:

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

Table 6-3. Recommended percentage imperviousness values

Land Use or Surface Characteristics	Percentage Imperviousness (%)
Business:	
Downtown Areas	95
Suburban Areas	75
Residential lots (lot area only)**:**	
Single-family	
2.5 acres or larger	12
0.75 – 2.5 acres	20
0.25 – 0.75 acres	30
0.25 acres or less	45
Apartments	75
Industrial:	
Light areas	80
Heavy areas	90
Parks, cemeteries	10
Playgrounds	25
Schools	55
Railroad yard areas	50
Undeveloped Areas:	
Historic flow analysis	2
Greenbelts, agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

Table 6-5. Runoff coefficients, *c*

Total or Effective % Impervious	NRCS Hydrologic Soil Group A						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.01	0.01	0.01	0.04	0.13	0.27
5%	0.02	0.02	0.02	0.03	0.07	0.15	0.29
10%	0.04	0.05	0.05	0.07	0.11	0.19	0.32
15%	0.07	0.08	0.08	0.1	0.15	0.23	0.35
20%	0.1	0.11	0.12	0.14	0.2	0.27	0.38
25%	0.14	0.15	0.16	0.19	0.24	0.3	0.42
30%	0.18	0.19	0.2	0.23	0.28	0.34	0.45
35%	0.21	0.23	0.24	0.27	0.32	0.38	0.48
40%	0.25	0.27	0.28	0.32	0.37	0.42	0.51
45%	0.3	0.31	0.33	0.36	0.41	0.46	0.54
50%	0.34	0.36	0.37	0.41	0.45	0.5	0.58
55%	0.39	0.4	0.42	0.45	0.49	0.54	0.61
60%	0.43	0.45	0.47	0.5	0.54	0.58	0.64
65%	0.48	0.5	0.51	0.54	0.58	0.62	0.67
70%	0.53	0.55	0.56	0.59	0.62	0.65	0.71
75%	0.58	0.6	0.61	0.64	0.66	0.69	0.74
80%	0.63	0.65	0.66	0.69	0.71	0.73	0.77
85%	0.68	0.7	0.71	0.74	0.75	0.77	0.8
90%	0.73	0.75	0.77	0.79	0.79	0.81	0.84
95%	0.79	0.81	0.82	0.83	0.84	0.85	0.87
100%	0.84	0.86	0.87	0.88	0.88	0.89	0.9
Total or Effective % Impervious	**NRCS Hydrologic Soil Group B**						
	2-Year	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**	**500-Year**
2%	0.01	0.01	0.07	0.26	0.34	0.44	0.54
5%	0.03	0.03	0.1	0.28	0.36	0.45	0.55
10%	0.06	0.07	0.14	0.31	0.38	0.47	0.57
15%	0.09	0.11	0.18	0.34	0.41	0.5	0.59
20%	0.13	0.15	0.22	0.38	0.44	0.52	0.61
25%	0.17	0.19	0.26	0.41	0.47	0.54	0.63
30%	0.2	0.23	0.3	0.44	0.49	0.57	0.65
35%	0.24	0.27	0.34	0.47	0.52	0.59	0.66
40%	0.29	0.32	0.38	0.5	0.55	0.61	0.68
45%	0.33	0.36	0.42	0.53	0.58	0.64	0.7
50%	0.37	0.4	0.46	0.56	0.61	0.66	0.72
55%	0.42	0.45	0.5	0.6	0.63	0.68	0.74
60%	0.46	0.49	0.54	0.63	0.66	0.71	0.76
65%	0.5	0.54	0.58	0.66	0.69	0.73	0.77
70%	0.55	0.58	0.62	0.69	0.72	0.75	0.79
75%	0.6	0.63	0.66	0.72	0.75	0.78	0.81
80%	0.64	0.67	0.7	0.75	0.77	0.8	0.83
85%	0.69	0.72	0.74	0.78	0.8	0.82	0.85
90%	0.74	0.76	0.78	0.81	0.83	0.84	0.87
95%	0.79	0.81	0.82	0.85	0.86	0.87	0.88
100%	0.84	0.86	0.86	0.88	0.89	0.89	0.9

Table 6-5. Runoff coefficients, *c* (continued)

Total or Effective % Impervious	NRCS Hydrologic Soil Group C						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
2%	0.01	0.05	0.15	0.33	0.40	0.49	0.59
5%	0.03	0.08	0.17	0.35	0.42	0.5	0.6
10%	0.06	0.12	0.21	0.37	0.44	0.52	0.62
15%	0.1	0.16	0.24	0.4	0.47	0.55	0.64
20%	0.14	0.2	0.28	0.43	0.49	0.57	0.65
25%	0.18	0.24	0.32	0.46	0.52	0.59	0.67
30%	0.22	0.28	0.35	0.49	0.54	0.61	0.68
35%	0.26	0.32	0.39	0.51	0.57	0.63	0.7
40%	0.3	0.36	0.43	0.54	0.59	0.65	0.71
45%	0.34	0.4	0.46	0.57	0.62	0.67	0.73
50%	0.38	0.44	0.5	0.6	0.64	0.69	0.75
55%	0.43	0.48	0.54	0.63	0.66	0.71	0.76
60%	0.47	0.52	0.57	0.65	0.69	0.73	0.78
65%	0.51	0.56	0.61	0.68	0.71	0.75	0.79
70%	0.56	0.61	0.65	0.71	0.74	0.77	0.81
75%	0.6	0.65	0.68	0.74	0.76	0.79	0.82
80%	0.65	0.69	0.72	0.77	0.79	0.81	0.84
85%	0.7	0.73	0.76	0.79	0.81	0.83	0.86
90%	0.74	0.77	0.79	0.82	0.84	0.85	0.87
95%	0.79	0.81	0.83	0.85	0.86	0.87	0.89
100%	0.83	0.85	0.87	0.88	0.89	0.89	0.9

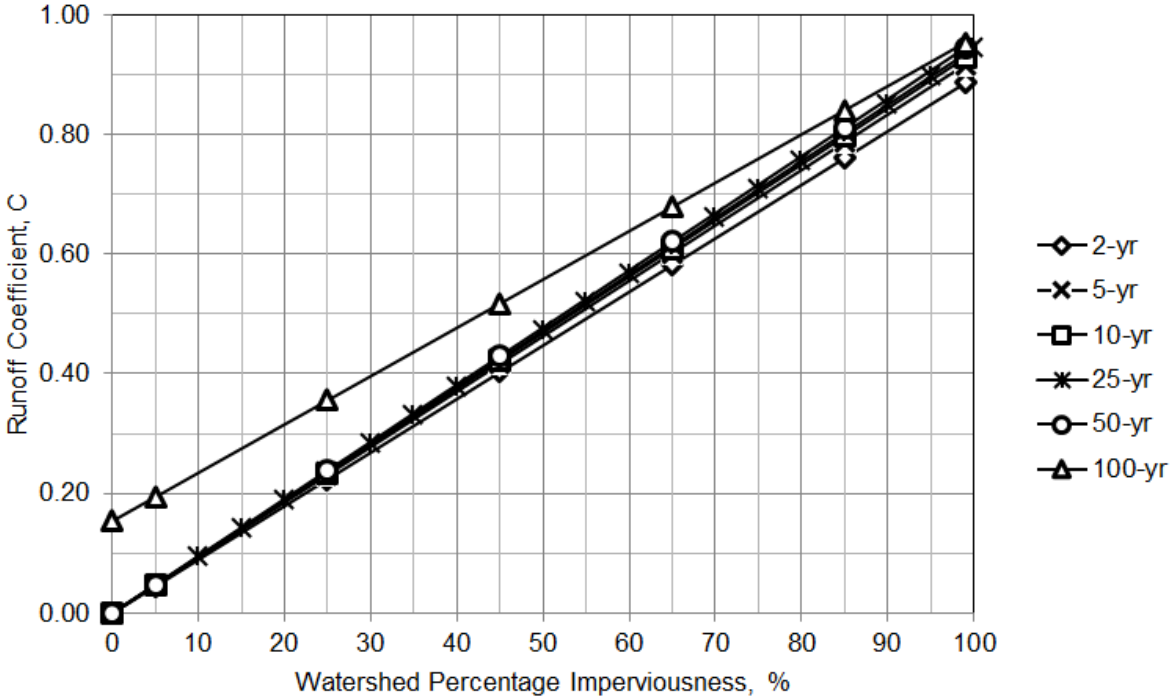


Figure 6-1. Runoff coefficient vs. watershed imperviousness NRCS HSG A

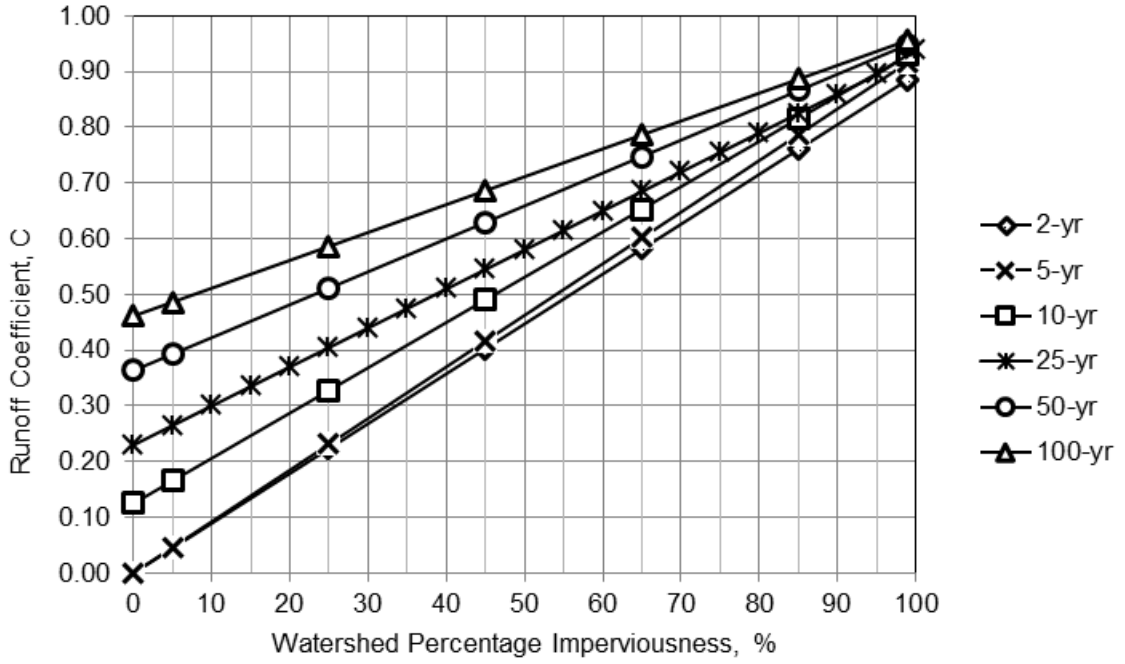


Figure 6-2. Runoff coefficient vs. watershed imperviousness NRCS HSG B

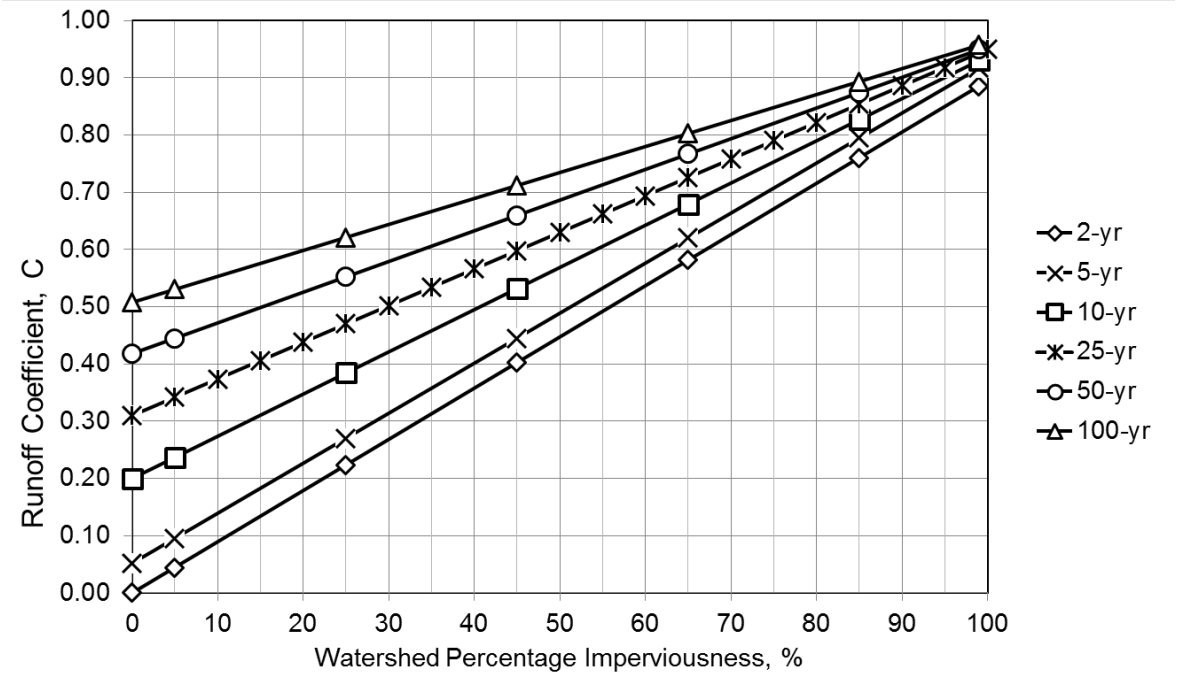
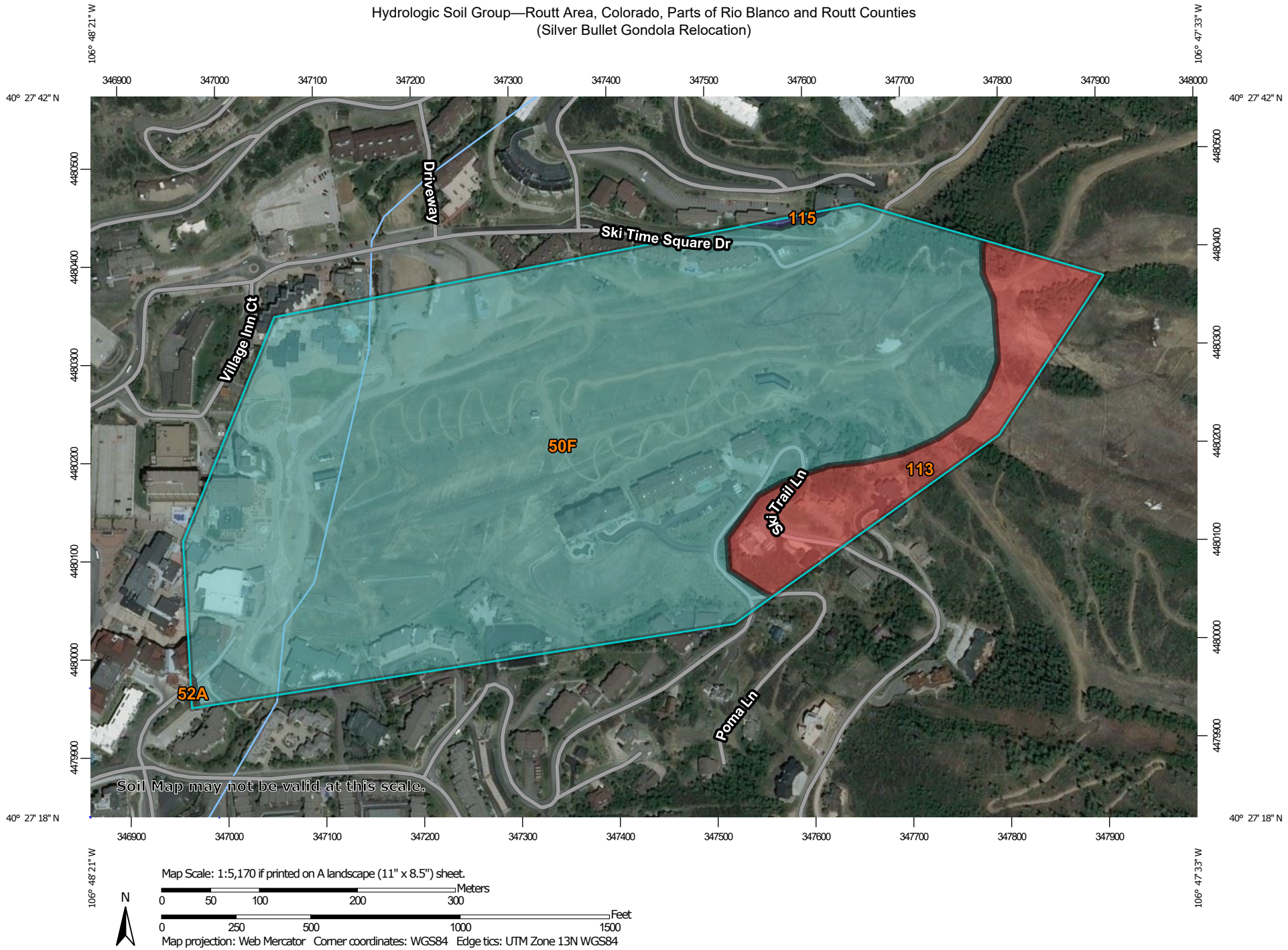


Figure 6-3. Runoff coefficient vs. watershed imperviousness NRCS HSG C and D

Hydrologic Soil Group—Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
(Silver Bullet Gondola Relocation)



Map Scale: 1:5,170 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
50F	Routt loam, 25 to 65 percent slopes, very stony	C	68.2	89.8%
52A	Slocum loam, 0 to 3 percent slopes	C/D	0.0	0.0%
113	Bucklon, very stony-Skyway complex, 30 to 75 percent slopes	D	7.6	10.0%
115	Gateview cobbly loam, 30 to 75 percent slopes, very bouldery	B	0.1	0.1%
Totals for Area of Interest			**76.0**	**100.0%**

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PROJECT	Gondola Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021
LOCATION	Steamboat Springs, CO

COMPOSITE 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: Steamboat Springs NOAA

Soil Type: C

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	49273.23	1.13	49273.23	1.13	0.00	0.00		0.00		0.00	100%	0.855	0.894
H2	34981.84	0.80	34981.84	0.80	0.00	0.00		0.00		0.00	100%	0.855	0.894
H3	40502.99	0.93	40502.99	0.93	0.00	0.00		0.00		0.00	100%	0.855	0.894
H4	3033.13	0.07	3033.13	0.07	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1.1	7980.96	0.18	7980.96	0.18	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1.2	15116.35	0.35	15116.35	0.35	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1.3	8992.43	0.21	8992.43	0.21	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1.4	8767.76	0.20	8767.76	0.20	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1.5	5078.84	0.12	5078.84	0.12	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1.6	16714.79	0.38	16714.79	0.38	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1.7	12199.29	0.28	12199.29	0.28	0.00	0.00		0.00		0.00	100%	0.855	0.894
D2	20423.64	0.47	20423.64	0.47	0.00	0.00		0.00		0.00	100%	0.855	0.894
D3	29077.63	0.67	29077.63	0.67	0.00	0.00		0.00		0.00	100%	0.855	0.894
D4	3036.25	0.07	3036.25	0.07	0.00	0.00		0.00		0.00	100%	0.855	0.894

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PROJECT	Gondola Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

DIRECT RUNOFF COMPUTATIONS

Overland Flow, Time of Concentration:

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

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, I from Fig. RA-2 (Equation

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	1.13	5.00	0.86	0.89	3.86	8.42	3.73	3.30	8.51	7.52
H2	0.80	5.00	0.86	0.89	3.86	8.42	2.65	3.30	6.04	7.52
H3	0.93	5.00	0.86	0.89	3.86	8.42	3.07	3.30	7.00	7.52
H4	0.07	5.00	0.86	0.89	3.86	8.42	0.23	3.30	0.52	7.52
D1.1	0.18	5.00	0.86	0.89	3.86	8.42	0.60	3.30	1.38	7.52
D1.2	0.35	5.00	0.86	0.89	3.86	8.42	1.14	3.30	2.61	7.52
D1.3	0.21	5.00	0.86	0.89	3.86	8.42	0.68	3.30	1.55	7.52
D1.4	0.20	5.00	0.86	0.89	3.86	8.42	0.66	3.30	1.51	7.52
D1.5	0.12	5.00	0.86	0.89	3.86	8.42	0.38	3.30	0.88	7.52
D1.6	0.38	5.00	0.86	0.89	3.86	8.42	1.27	3.30	2.89	7.52
D1.7	0.28	5.00	0.86	0.89	3.86	8.42	0.92	3.30	2.11	7.52
D2	0.47	5.00	0.86	0.89	3.86	8.42	1.55	3.30	3.53	7.52
D3	0.67	5.00	0.86	0.89	3.86	8.42	2.20	3.30	5.02	7.52
D4	0.07	5.00	0.86	0.89	3.86	8.42	0.23	3.30	0.52	7.52

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PROJECT	Gondola Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

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
h1	H1+H2	84255.07	1.93	84255.07	1.93	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89
h2	H3+H4	43536.12	1.00	43536.12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89
d1	1.1+D1.2+D1.3+D1.4+D1.5+D1.6+D1.7+D	95274.06	2.19	95274.06	2.19	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89
d2	D3+D4	32113.88	0.74	32113.88	0.74	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89

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PROJECT	Gondola Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

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 Fig. RA-2

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

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

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

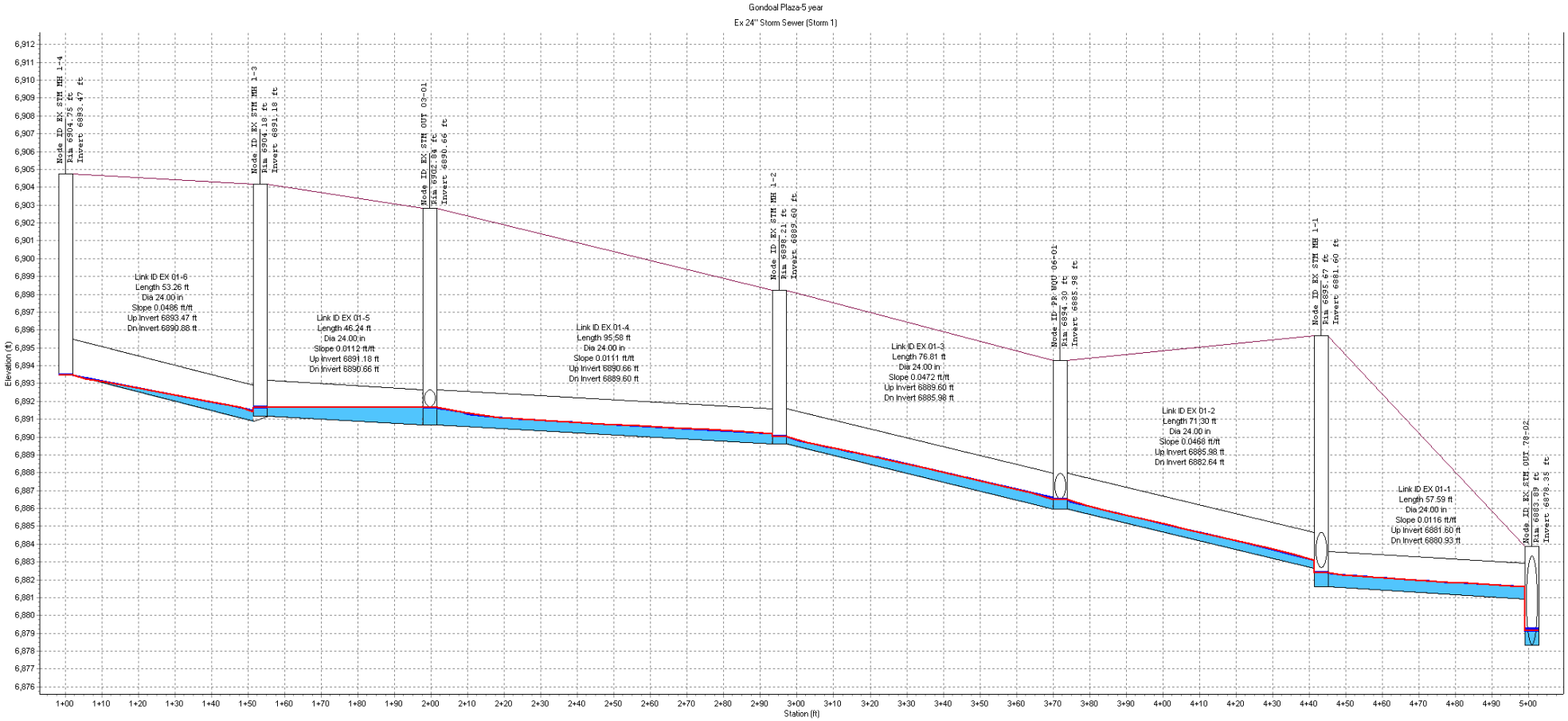
Design Point	Basin(s)	Area, A (acres)	T_c (min)	C_5	C_{100}	Intensity I_5 (in/hr)	Intensity I_{100} (in/hr)	Flow Q_5 (cfs)	Q_5 per Acre (cfs/ac)	Flow Q_{100} (cfs)	Q_{100} per Acre (cfs/ac)
h1	H1+H2	1.93	5.00	0.86	0.89	3.86	8.42	6.38	3.30	14.55	7.52
h2	H3+H4	1.00	5.00	0.86	0.89	3.86	8.42	3.29	3.30	7.52	7.52
d1	D1.1+D1.2+D1.3+D1.4+D1.5+D1.6+D1.7+D2	2.19	5.00	0.86	0.89	3.86	8.42	7.21	3.30	16.46	7.52
d2	D3+D4	0.74	5.00	0.86	0.89	3.86	8.42	2.43	3.30	5.55	7.52

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)
d1	D1.1+D1.2+D1.3+D1.4+D1.5+D1.6+D1.7+D2	2.19	5.00	0.86	0.79	1.48

APPENDIX B

HYDRAULIC CALCULATIONS

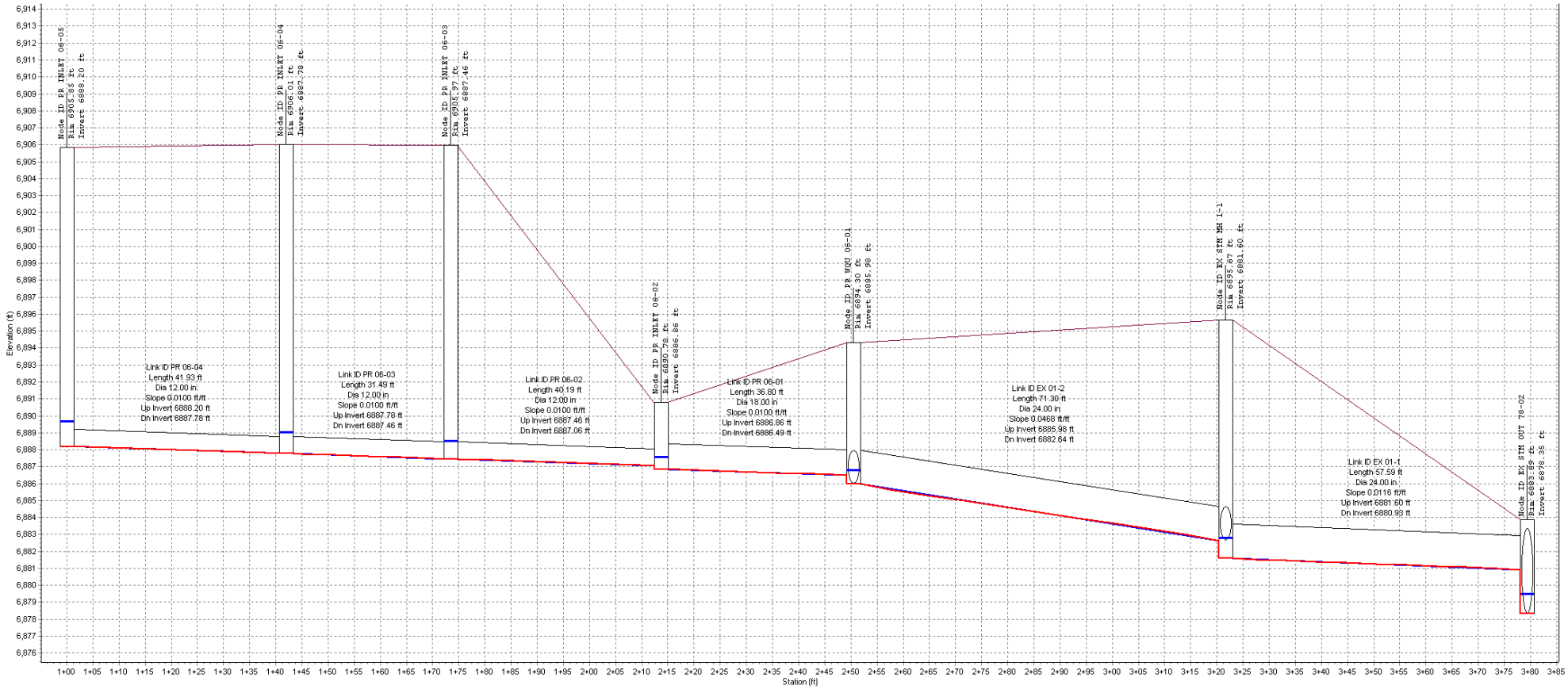


Node ID:		EX STM MH 1-3	EX STM OUT 03-01	EX STM MH 1-2	PR WQU 06-01	EX STM MH 1-1	
Rim (ft):	6904.75	6904.18	6902.84	6898.21	6894.30	6895.67	6883.89
Invert (ft):	6893.47	6891.18	6890.66	6889.60	6885.98	6881.60	6878.35
Min Pipe Cover (ft):	9.28	11.00	10.18	6.61	6.31	11.03	0.54
Max HGL (ft):	6893.47	6891.69	6891.65	6890.05	6886.52	6882.41	6879.25

Link ID:	EX 01-6	EX 01-5	EX 01-4	EX 01-3	EX 01-2	EX 01-1	
Length (ft):	53.26	46.24	95.58	76.81	71.30	57.59	
Dia (in):	24.00	24.00	24.00	24.00	24.00	24.00	
Slope (ft/ft):	0.0486	0.0112	0.0111	0.0472	0.0468	0.0116	
Up Invert (ft):	6893.47	6891.18	6890.66	6889.60	6885.98	6881.60	
Dn Invert (ft):	6890.88	6890.66	6889.60	6885.98	6882.64	6880.93	
Max Q (cfs):	0.00	0.96	4.97	4.92	6.16	6.15	
Max Vel (ft/s):	0.00	2.60	5.12	8.23	10.05	5.91	
Max Depth (ft):	0.25	0.75	0.72	0.49	0.50	0.73	

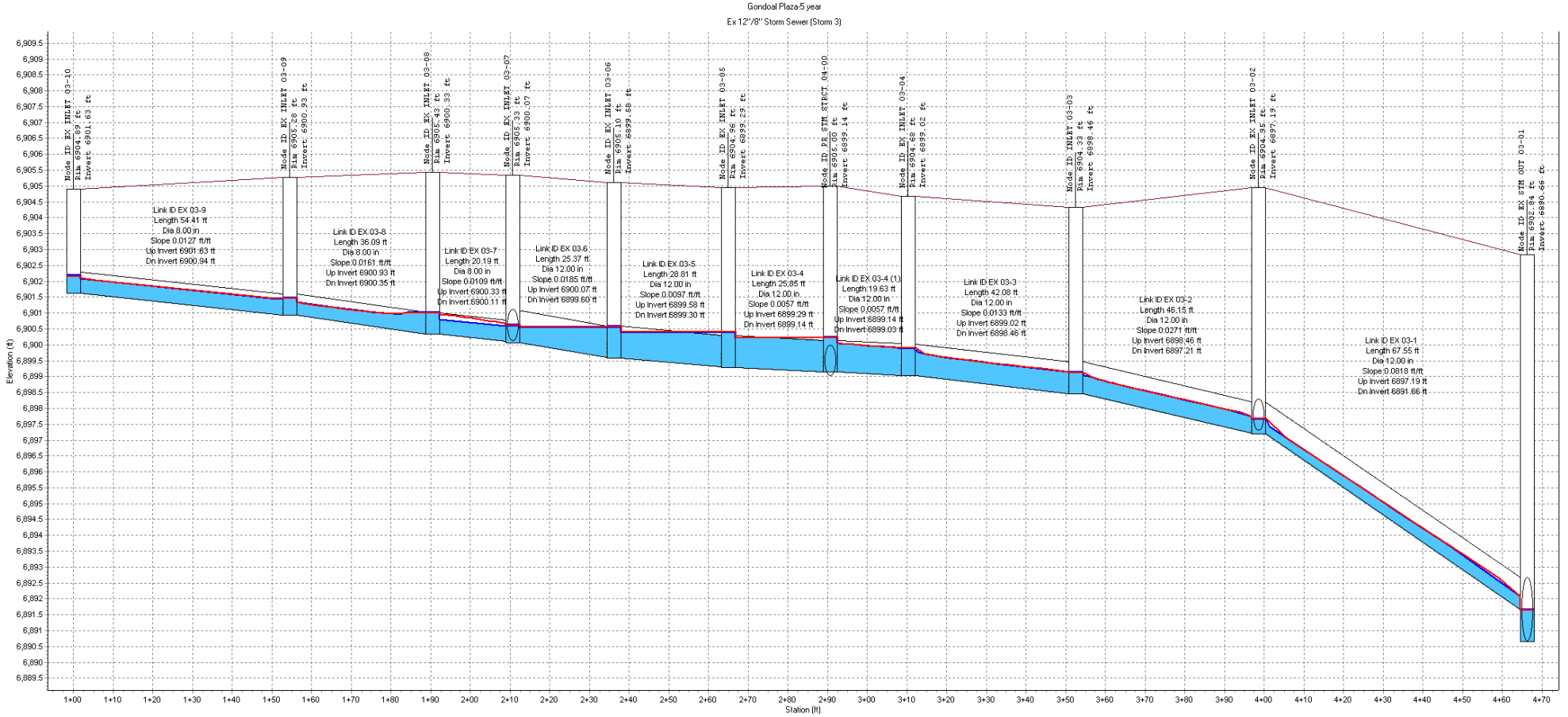
Gondoal Plaza-100 year

EX STORM 01



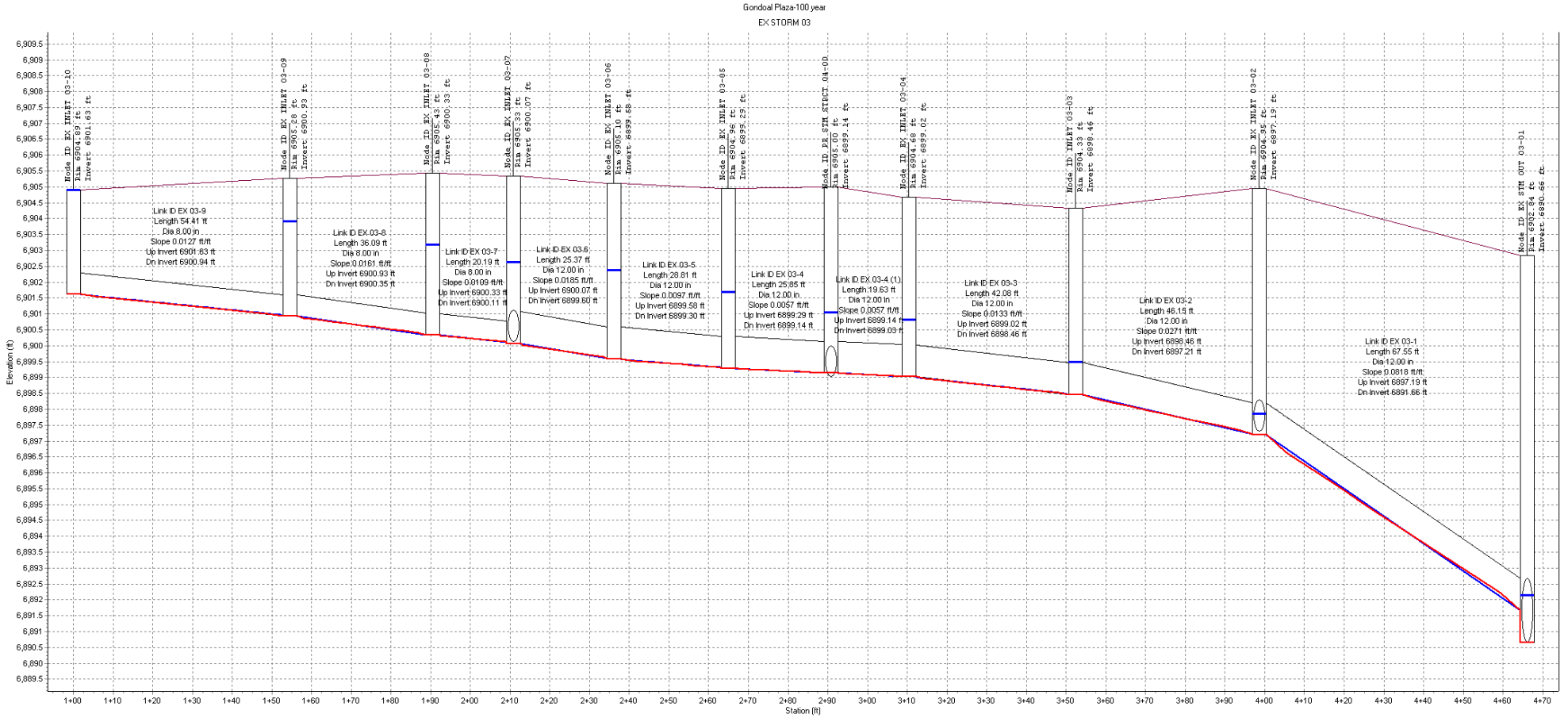
Node ID:		PR INLET 06-04	PR INLET 06-03	PR INLET 06-02	PR WQU 06-01	EX STM MH 1-1	
Rim (ft):	6905.85	6906.01	6905.97	6890.78	6894.30	6895.67	6883.89
Invert (ft):	6888.20	6887.78	6887.46	6886.86	6885.98	6881.60	6878.35
Min Pipe Cover (ft):	16.65	17.23	17.51	2.42	6.31	11.03	0.54
Max HGL (ft):	6889.67	6889.01	6888.50	6887.56	6886.76	6882.79	6879.48

Link ID:	PR 06-04	PR 06-03	PR 06-02	PR 06-01	EX 01-2	EX 01-1
Length (ft):	41.93	31.49	40.19	36.80	71.30	57.59
Dia (in):	12.00	12.00	12.00	18.00	24.00	24.00
Slope (ft/ft):	0.0100	0.0100	0.0100	0.0100	0.0468	0.0116
Up Invert (ft):	6888.20	6887.78	6887.46	6886.86	6885.98	6881.60
Dn Invert (ft):	6887.78	6887.46	6887.06	6886.49	6882.64	6880.93
Max Q (cfs):	3.52	3.52	3.36	3.35	11.29	11.30
Max Vel (ft/s):	4.48	4.50	4.75	4.79	11.45	6.75
Max Depth (ft):	1.00	1.00	0.86	0.63	0.70	1.05



Node ID:		EX INLET 03-09	EX INLET 03-08	EX INLET 03-07	EX INLET 03-06	EX INLET 03-05	PR STM STRCT 04-00	EX INLET 03-04	INLET 03-03	EX INLET 03-02	
Rim (ft):	6904.89	6905.28	6905.43	6905.33	6905.10	6904.96	6905.00	6904.68	6904.33	6904.95	6902.84
Invert (ft):	6901.63	6900.93	6900.33	6900.07	6899.58	6899.29	6899.14	6899.02	6898.46	6897.19	6890.66
Min Pipe Cover (ft):	2.60	3.67	4.41	4.22	4.50	4.66	4.86	4.65	4.87	6.66	10.18
Max HGL (ft):	6902.19	6901.47	6901.01	6900.62	6900.57	6900.40	6900.23	6899.89	6899.13	6897.67	6891.65

Link ID:	EX 03-9	EX 03-8	EX 03-7	EX 03-6	EX 03-5	EX 03-4	EX 03-4 (1)	EX 03-3	EX 03-2	EX 03-1	
Length (ft):	54.41	36.09	20.19	25.37	28.81	25.85	19.63	42.08	46.15	67.55	
Dia (in):	8.00	8.00	8.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	
Slope (ft/ft):	0.0127	0.0161	0.0109	0.0185	0.0097	0.0057	0.0057	0.0133	0.0271	0.0818	
Up Invert (ft):	6901.63	6900.93	6900.33	6900.07	6899.58	6899.29	6899.14	6899.02	6898.46	6897.19	
Dn Invert (ft):	6900.94	6900.35	6900.11	6899.60	6899.30	6899.14	6899.03	6898.46	6897.21	6891.66	
Max Q (cfs):	1.23	1.21	1.18	1.47	1.98	1.98	2.54	3.49	3.49	4.04	
Max Vel (ft/s):	4.03	3.78	3.70	3.04	2.86	2.52	3.34	5.38	7.10	11.74	
Max Depth (ft):	0.54	0.59	0.59	0.76	1.00	1.00	0.93	0.77	0.60	0.45	

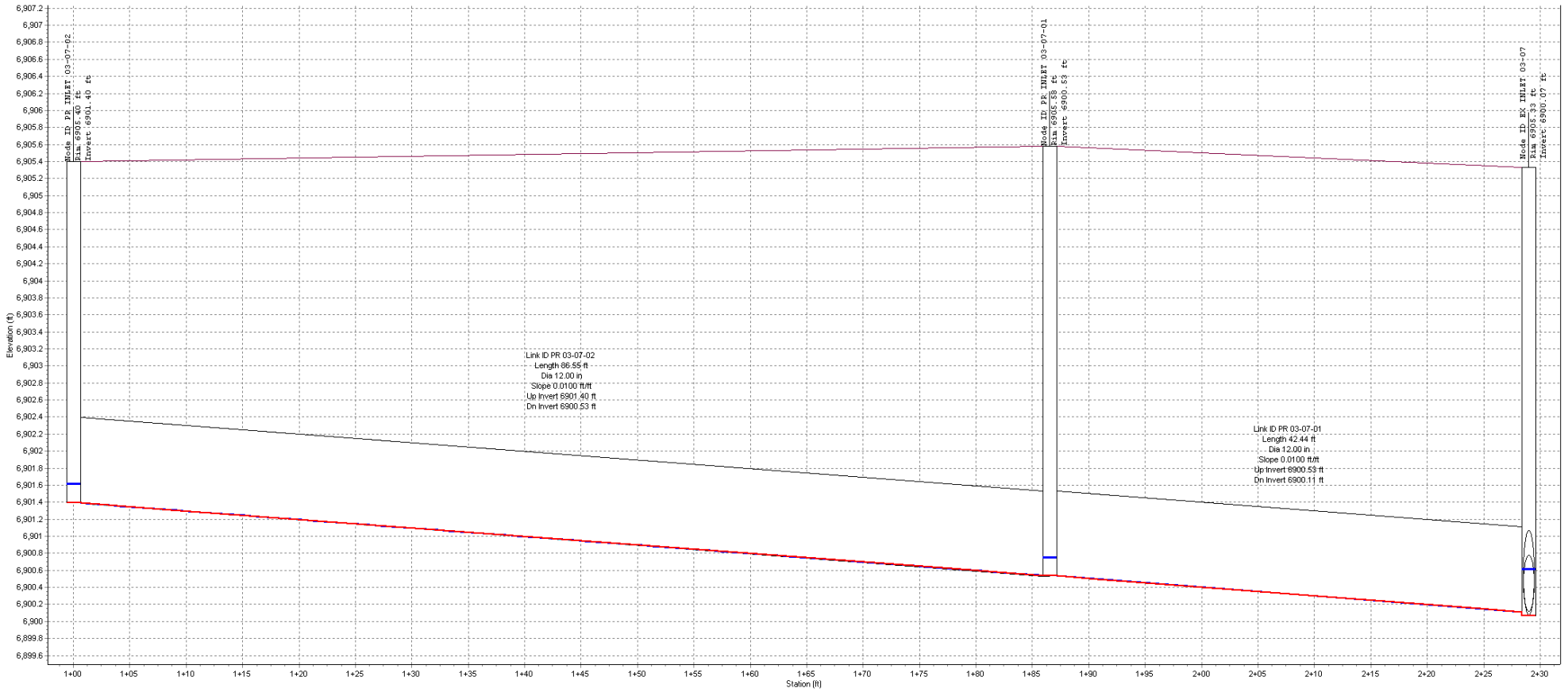


Node ID:		EX INLET 03-09	EX INLET 03-08	EX INLET 03-07	EX INLET 03-06	EX INLET 03-05	PR STM STRCT 04-00	EX INLET 03-04	INLET 03-03	EX INLET 03-02	
Rim (ft):	6904.89	6905.28	6905.43	6905.33	6905.10	6904.96	6905.00	6904.68	6904.33	6904.95	6902.84
Invert (ft):	6901.63	6900.93	6900.33	6900.07	6899.58	6899.29	6899.14	6899.02	6898.46	6897.19	6890.66
Min Pipe Cover (ft):	2.60	3.67	4.41	4.22	4.50	4.66	4.86	4.65	4.87	6.66	10.18
Max HGL (ft):	6904.89	6904.26	6903.78	6903.23	6902.79	6901.94	6901.26	6900.92	6899.47	6897.85	6892.14

Link ID:	EX 03-9	EX 03-8	EX 03-7	EX 03-6	EX 03-5	EX 03-4	EX 03-4 (1)	EX 03-3	EX 03-2	EX 03-1
Length (ft):	54.41	36.09	20.19	25.37	28.81	25.85	19.63	42.08	46.15	67.55
Dia (in):	8.00	8.00	8.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Slope (ft/ft):	0.0127	0.0161	0.0109	0.0185	0.0097	0.0057	0.0057	0.0133	0.0271	0.0818
Up Invert (ft):	6901.63	6900.93	6900.33	6900.07	6899.58	6899.29	6899.14	6899.02	6898.46	6897.19
Dn Invert (ft):	6900.94	6900.35	6900.11	6899.60	6899.30	6899.14	6899.03	6898.46	6897.21	6891.66
Max Q (cfs):	1.92	1.91	1.91	2.42	3.90	3.91	3.42	5.13	5.02	6.29
Max Vel (ft/s):	5.49	5.48	5.48	3.08	4.97	4.97	4.36	6.57	7.41	12.77
Max Depth (ft):	0.67	0.67	0.67	1.00	1.00	1.00	1.00	1.00	0.83	0.60

Gondoal Plaza-5 year

PR STORM 03-07

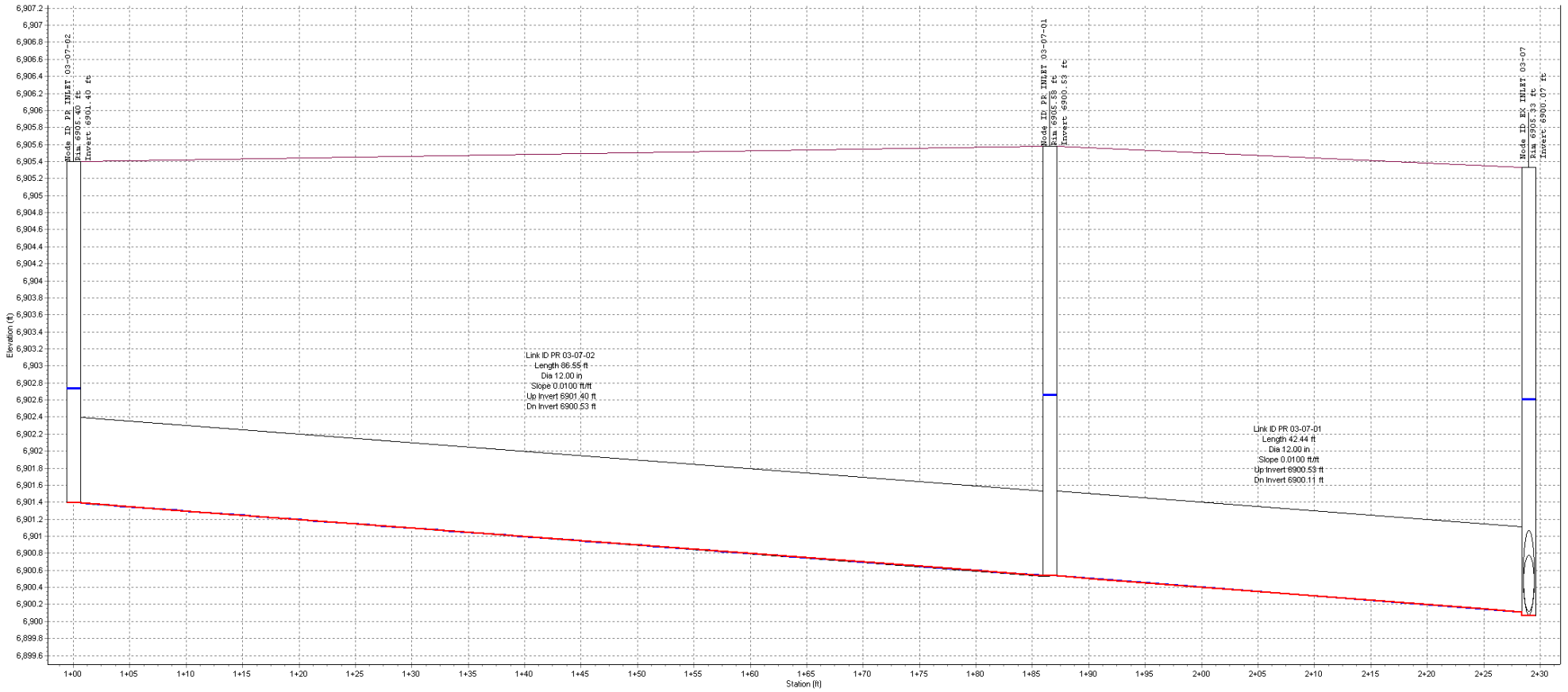


Node ID:		PR INLET 03-07-01	EX INLET 03-07
Rim (ft):	6905.40	6905.58	6905.33
Invert (ft):	6901.40	6900.53	6900.07
Min Pipe Cover (ft):	3.01	4.04	4.22
Max HGL (ft):	6901.62	6900.75	6900.62

Link ID:	PR 03-07-02	PR 03-07-01
Length (ft):	86.55	42.44
Dia (in):	12.00	12.00
Slope (ft/ft):	0.0100	0.0100
Up Invert (ft):	6901.40	6900.53
Dn Invert (ft):	6900.53	6900.11
Max Q (cfs):	0.39	0.38
Max Vel (ft/s):	3.08	1.77
Max Depth (ft):	0.22	0.36

Gondoal Plaza-100 year

PR STORM 03-07



Node ID:		PR INLET 03-07-01	EX INLET 03-07
Rim (ft):	6905.40	6905.58	6905.33
Invert (ft):	6901.40	6900.53	6900.07
Min Pipe Cover (ft):	3.01	4.04	4.22
Max HGL (ft):	6904.01	6904.89	6903.23

Link ID:	PR 03-07-02	PR 03-07-01	
Length (ft):	86.55	42.44	
Dia (in):	12.00	12.00	
Slope (ft/ft):	0.0100	0.0100	
Up Invert (ft):	6901.40	6900.53	
Dn Invert (ft):	6900.53	6900.11	
Max Q (cfs):	0.91	1.16	
Max Vel (ft/s):	3.38	1.87	
Max Depth (ft):	1.00	1.00	

Gondoal Plaza-5 year

PR STORM 04

Node ID:		PR INLET 04-01	
Rim (ft):	6928.08	6900.94	6905.00
Invert (ft):	6907.88	6899.23	6899.14
Min Pipe Cover (ft):	19.20	0.71	4.86
Max HGL (ft):	6908.04	6900.25	6900.23

Link ID:	PR 04-02	PR 04-01
Length (ft):	86.54	23.03
Dia (in):	12.00	12.00
Slope (ft/ft):	0.1000	0.0100
Up Invert (ft):	6907.88	6899.23
Dn Invert (ft):	6899.23	6899.00
Max Q (cfs):	0.69	0.58
Max Vel (ft/s):	5.24	1.50
Max Depth (ft):	0.58	1.00

Gondoal Plaza-100 year

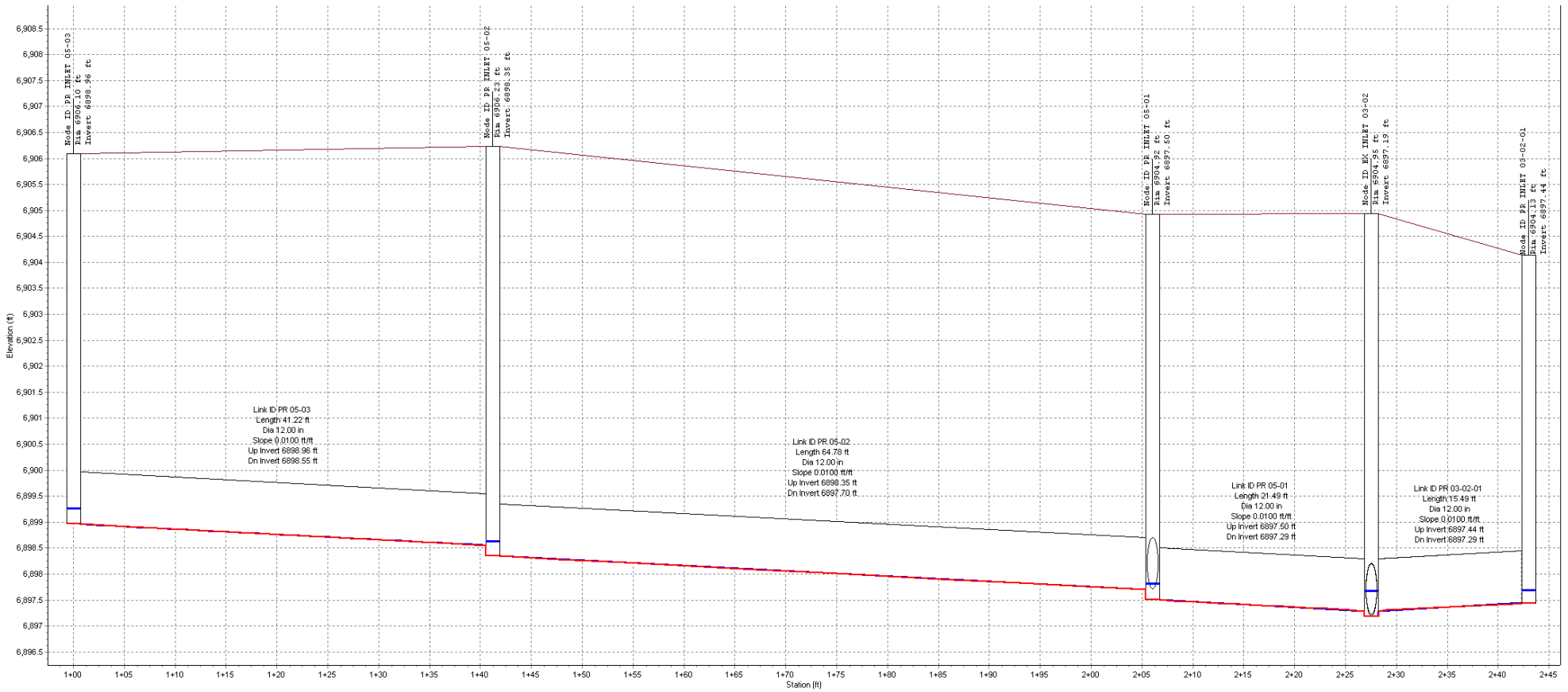
PR STORM 04

Node ID:		PR INLET 04-01	
Rim (ft):	6928.08	6900.94	6905.00
Invert (ft):	6907.88	6899.23	6899.14
Min Pipe Cover (ft):	19.20	0.71	4.86
Max HGL (ft):	6908.13	6900.94	6901.26

Link ID:	PR 04-02	PR 04-01
Length (ft):	86.54	23.03
Dia (in):	12.00	12.00
Slope (ft/ft):	0.1000	0.0100
Up Invert (ft):	6907.88	6899.23
Dn Invert (ft):	6899.23	6899.00
Max Q (cfs):	1.56	1.43
Max Vel (ft/s):	6.22	1.82
Max Depth (ft):	0.62	1.00

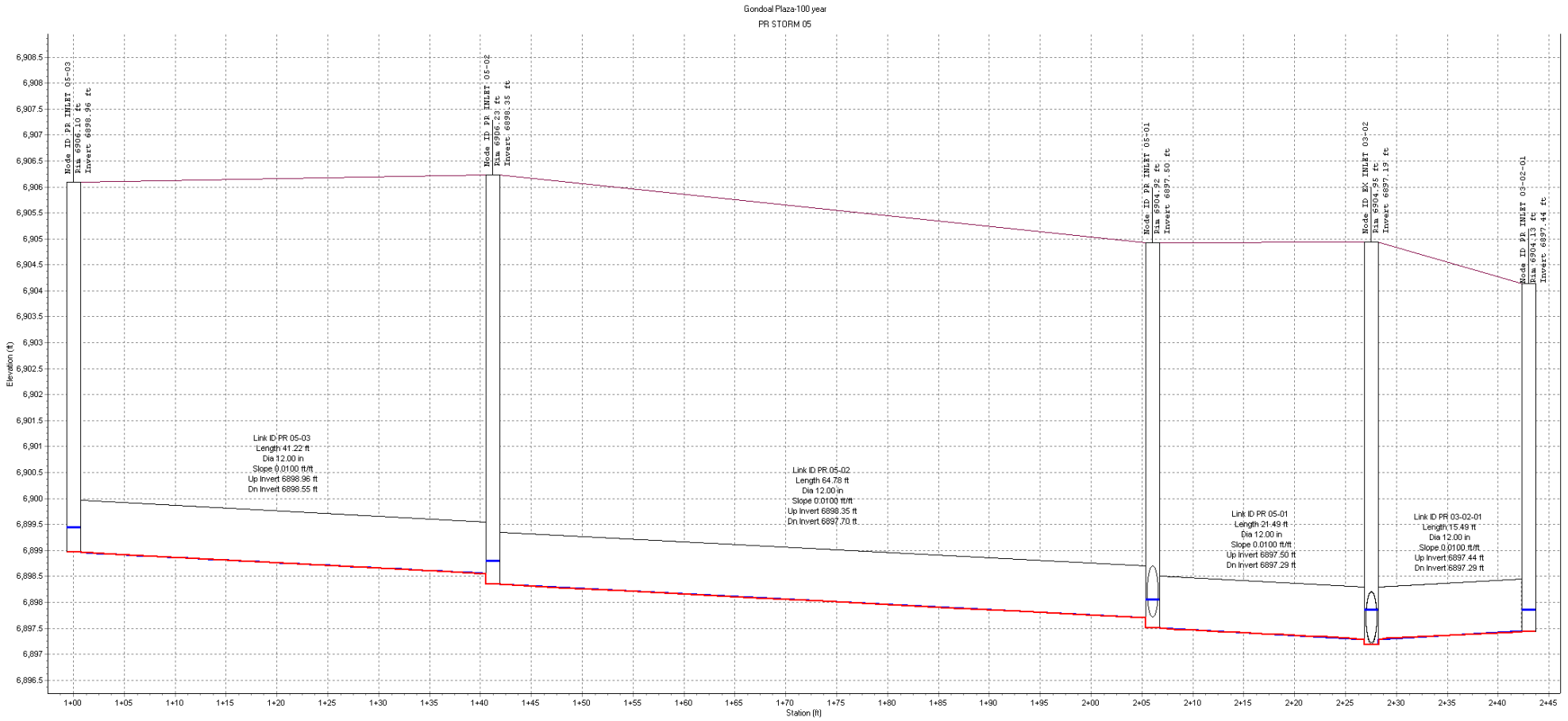
Gondoal Plaza-5 year

PR STORM 05



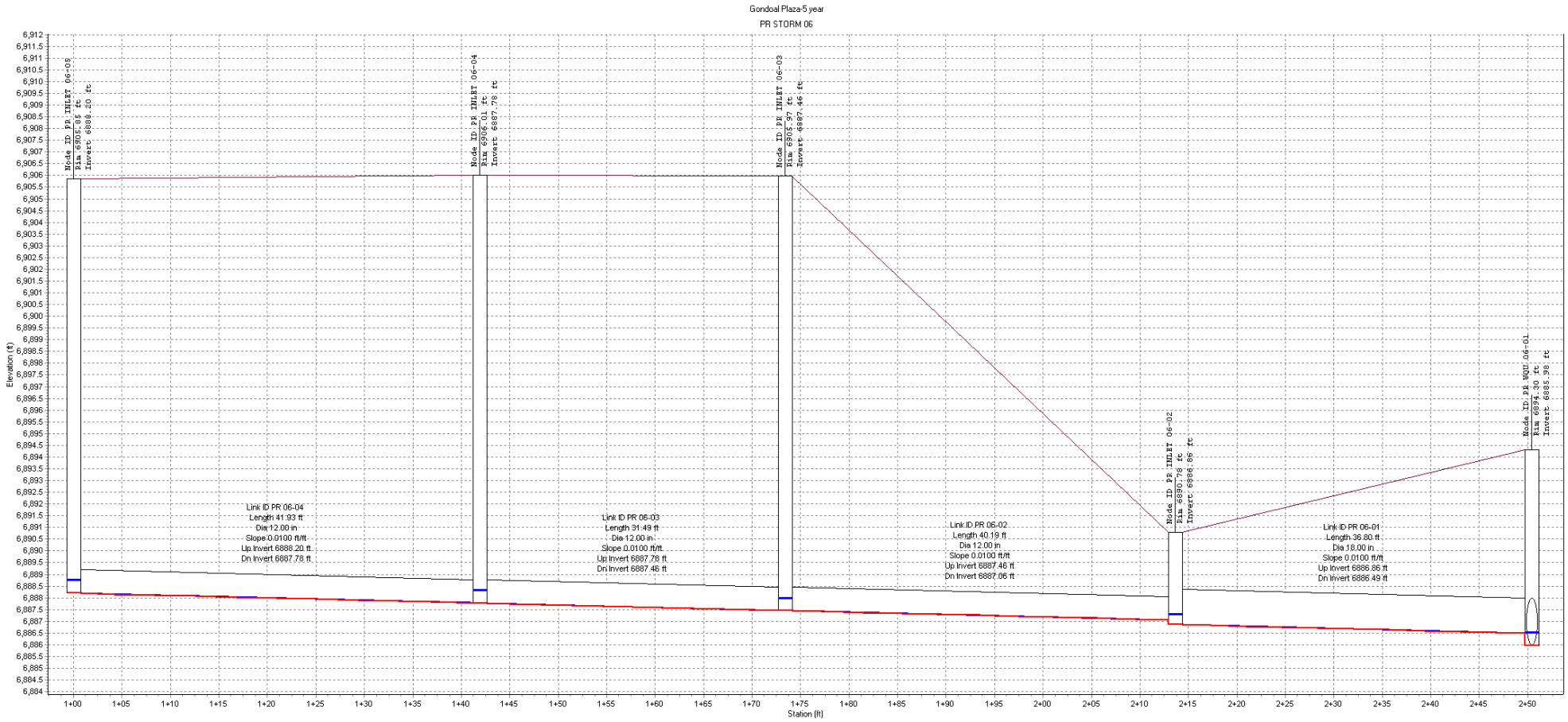
Node ID:		PR INLET 05-02		PR INLET 05-01		EX INLET 03-02	
Rim (ft):	6906.10	6906.23		6904.92		6904.95	6904.13
Invert (ft):	6898.96	6898.35		6897.50		6897.19	6897.44
Min Pipe Cover (ft):	6.14	6.68		6.22		6.66	5.69
Max HGL (ft):	6899.26	6898.63		6897.82		6897.67	6897.68

Link ID:	PR 05-03	PR 05-02	PR 05-01	PR 03-02-01	
Length (ft):	41.22	64.78	21.49	15.49	
Dia (in):	12.00	12.00	12.00	12.00	
Slope (ft/ft):	0.0100	0.0100	0.0100	0.0100	
Up Invert (ft):	6898.96	6898.35	6897.50	6897.44	
Dn Invert (ft):	6898.55	6897.70	6897.29	6897.29	
Max Q (cfs):	0.58	0.57	0.57	0.05	
Max Vel (ft/s):	3.27	3.34	2.63	0.56	
Max Depth (ft):	0.28	0.27	0.35	0.31	



Node ID:		PR INLET 05-02		PR INLET 05-01		EX INLET 03-02	
Rim (ft):	6906.10	6906.23		6904.92		6904.95	6904.13
Invert (ft):	6898.96	6898.35		6897.50		6897.19	6897.44
Min Pipe Cover (ft):	6.14	6.68		6.22		6.66	5.69
Max HGL (ft):	6899.44	6898.80		6898.05		6897.85	6897.85

Link ID:	PR 05-03	PR 05-02	PR 05-01	PR 03-02-01	
Length (ft):	41.22	64.78	21.49	15.49	
Dia (in):	12.00	12.00	12.00	12.00	
Slope (ft/ft):	0.0100	0.0100	0.0100	0.0100	
Up Invert (ft):	6898.96	6898.35	6897.50	6897.44	
Dn Invert (ft):	6898.55	6897.70	6897.29	6897.29	
Max Q (cfs):	1.33	1.31	1.30	0.11	
Max Vel (ft/s):	4.00	4.10	2.94	0.78	
Max Depth (ft):	0.44	0.43	0.55	0.48	

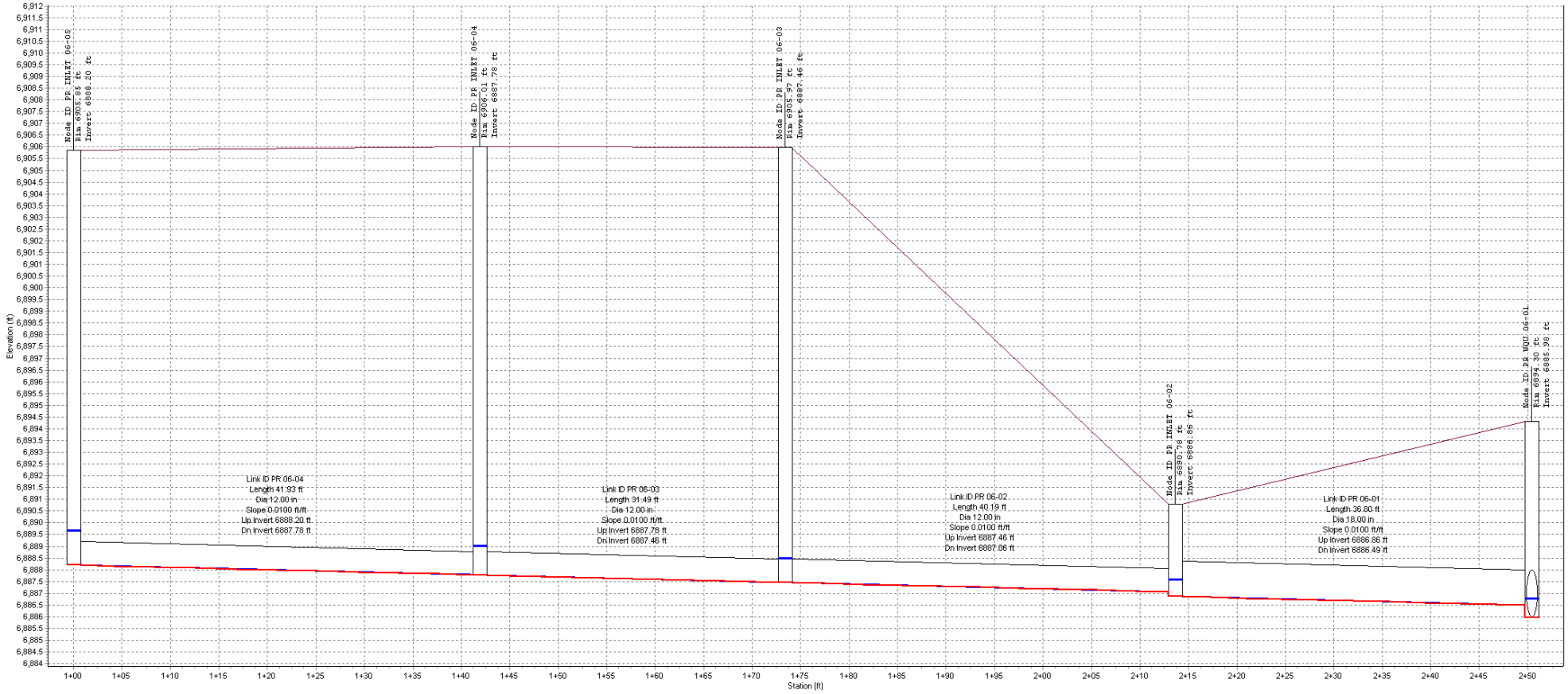


Node ID:		PR INLET 06-04	PR INLET 06-03	PR INLET 06-02	PR WQU 06-01
Rim (ft):	6905.85	6906.01	6905.97	6890.78	6894.30
Invert (ft):	6888.20	6887.78	6887.46	6886.86	6885.98
Min Pipe Cover (ft):	16.65	17.23	17.51	2.42	6.31
Max HGL (ft):	6888.73	6888.32	6887.98	6887.29	6886.52

Link ID:	PR 06-04	PR 06-03	PR 06-02	PR 06-01
Length (ft):	41.93	31.49	40.19	36.80
Dia (in):	12.00	12.00	12.00	18.00
Slope (ft/ft):	0.0100	0.0100	0.0100	0.0100
Up Invert (ft):	6888.20	6887.78	6887.46	6886.86
Dn Invert (ft):	6887.78	6887.46	6887.06	6886.49
Max Q (cfs):	1.54	1.52	1.50	1.50
Max Vel (ft/s):	3.57	3.61	4.10	3.96
Max Depth (ft):	0.54	0.53	0.47	0.40

Gondoal Plaza-100 year

PR STORM 06



Node ID:		PR INLET 06-04	PR INLET 06-03	PR INLET 06-02	PR WQU 06-01
Rim (ft):	6905.85	6906.01	6905.97	6890.78	6894.30
Invert (ft):	6888.20	6887.78	6887.46	6886.86	6885.98
Min Pipe Cover (ft):	16.65	17.23	17.51	2.42	6.31
Max HGL (ft):	6889.67	6889.01	6888.50	6887.56	6886.76

Link ID:	PR 06-04	PR 06-03	PR 06-02	PR 06-01
Length (ft):	41.93	31.49	40.19	36.80
Dia (in):	12.00	12.00	12.00	18.00
Slope (ft/ft):	0.0100	0.0100	0.0100	0.0100
Up Invert (ft):	6888.20	6887.78	6887.46	6886.86
Dn Invert (ft):	6887.78	6887.46	6887.06	6886.49
Max Q (cfs):	3.52	3.52	3.36	3.35
Max Vel (ft/s):	4.48	4.50	4.75	4.79
Max Depth (ft):	1.00	1.00	0.86	0.63

APPENDIX C

WATER QUALITY CALCULATIONS

LANDMARK CONSULTANTS, INC.

CIVIL ENGINEERS | SURVEYORS

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

PROJECT	Gondola Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

TSS DESIGN STANDARD CALCS

80th Percentile Storm Event (Calculated Project Values)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	$C_{1.25}$	Intensity $I_{1.25}$ (in/hr)	Flow $Q_{1.25}$ (cfs)	Max Flow Q_{100} (cfs)
d1	D1	2.19	5.00	0.86	0.79	1.48	16.46

80th Percentile Storm Event (Max for STC 1200)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	$C_{1.25}$	Intensity $I_{1.25}$ (in/hr)	Flow $Q_{1.25}$ (cfs)	Max Flow Q_{100} (cfs)
d1	D1	2.40	5.00	0.86	0.79	1.62	18.06

% of Site Treated

Total Site (acres)	Total Treated (acres)	% Treated (acres)
1.59	1.52	96%

Detailed Stormceptor Sizing Report – Gondola Plaza

Project Information & Location			
Project Name	Gondola Plaza	**Project Number**	2550-001
City	Steamboat Springs	**State/ Province**	Colorado
Country	United States of America	**Date**	1/26/2021
Designer Information		**EOR Information (optional)**	
Name	Deborah Spaustat	**Name**	
Company	Landmark Consultants, Inc	**Company**	
Phone #	970-871-9494	**Phone #**	
Email	debs@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	Gondola Plaza
Recommended Stormceptor Model	STC 900
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	Fine Distribution
Rainfall Station	DURANGO

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	72
STC 900	80
STC 1200	80
STC 1800	81
STC 2400	85
STC 3600	86
STC 4800	89
STC 6000	89
STC 7200	91
STC 11000	93
STC 13000	94
STC 16000	95

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**	2272
Rainfall Station Name	DURANGO	**Total Rainfall (in)**	365.0
Station ID #	2432	**Average Annual Rainfall (in)**	11.1
Coordinates	37°17'0"N, 107°53'0"W	**Total Evaporation (in)**	62.8
Elevation (ft)	6600	**Total Infiltration (in)**	0.0
Years of Rainfall Data	33	**Total Rainfall that is Runoff (in)**	302.2

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)	2.20
Imperviousness %	100.0

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	16.52
Water Quality Flow Rate (CFS)	1.48

Project Paramters

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

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

Design Details	
Stormceptor Inlet Invert Elev (ft)	6886.49
Stormceptor Outlet Invert Elev (ft)	6885.98
Stormceptor Rim Elev (ft)	6894.30
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	24
Pipe Material	HDPE - plastic
Multiple Inlets (Y/N)	Yes
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	Gondola Plaza

Site Details

Drainage Area

Total Area (acres)	2.20
Imperviousness %	100.0

Surface Characteristics

Width (ft)	619.00
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	

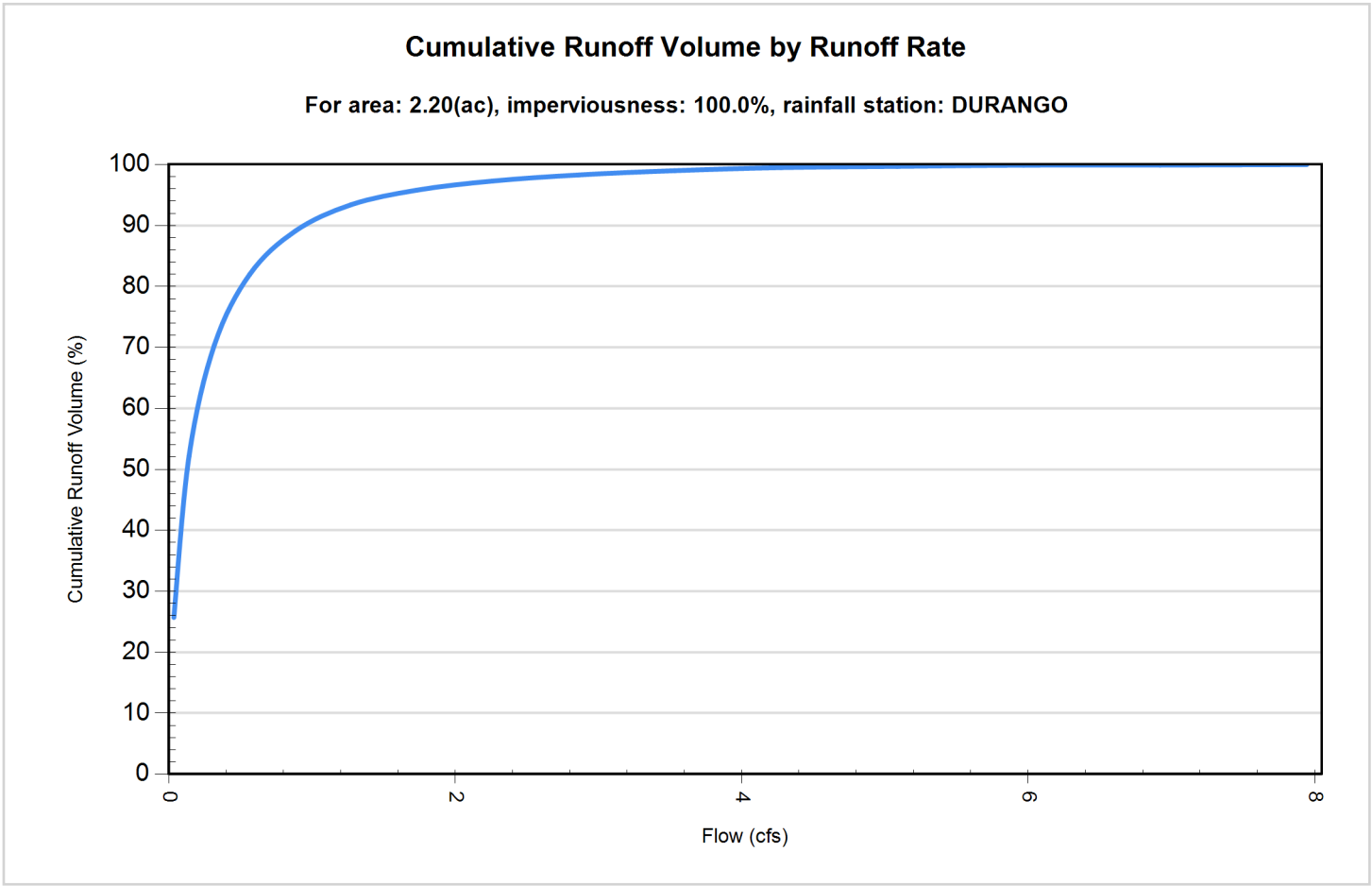
Buildup/Wash-off Parameters

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

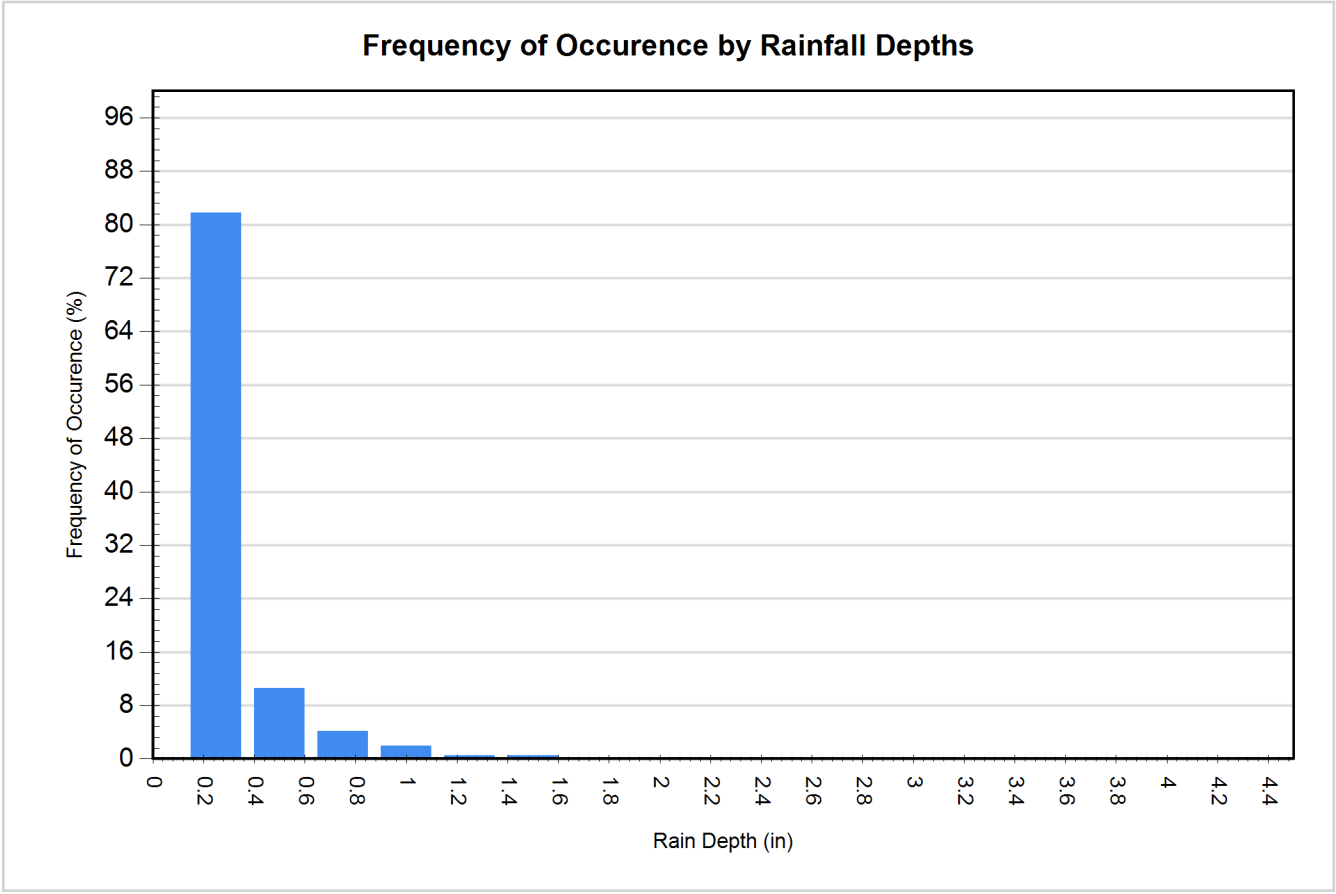
TSS Availability Parameters

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

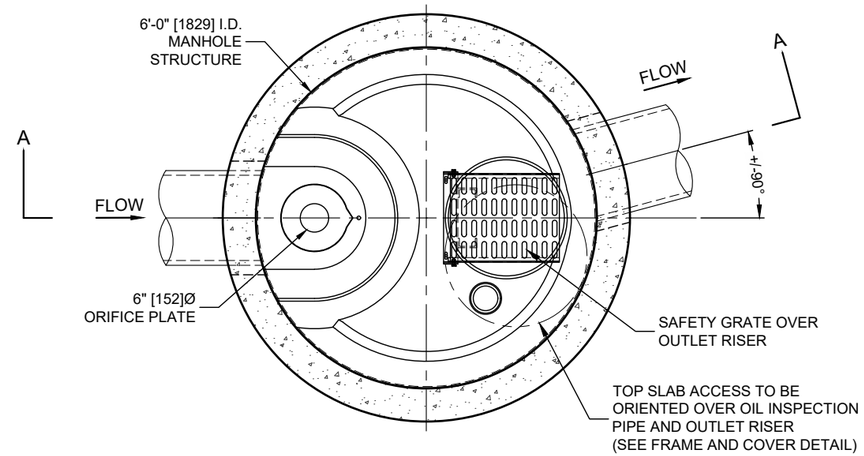
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	635877	1837449	25.7
0.141	1291811	1181509	52.2
0.318	1741377	731867	70.4
0.565	2028126	445095	82.0
0.883	2203709	269502	89.1
1.271	2309361	163844	93.4
1.730	2369160	104042	95.8
2.260	2405697	67505	97.3
2.860	2431064	42136	98.3
3.531	2448245	24956	99.0
4.273	2459720	13484	99.5
5.085	2466385	6818	99.7
5.968	2469629	3573	99.9
6.922	2471461	1742	99.9
7.946	2472463	740	100.0



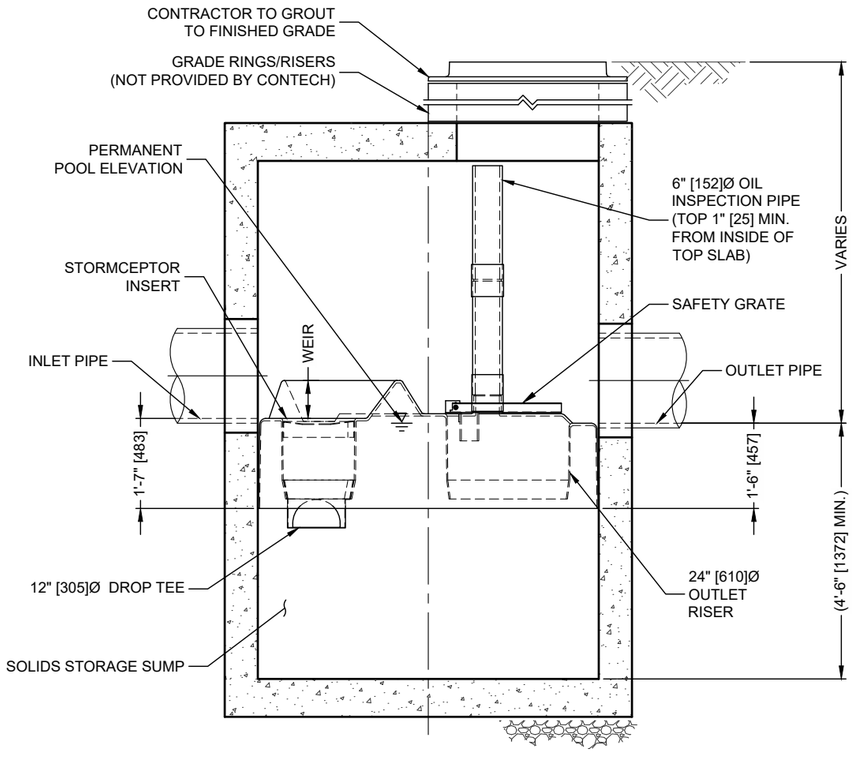
Rainfall Event Analysis				
Rainfall Depth (in)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (in)**	**Percentage of Annual Volume (%)**
0.25	1859	81.8	138	37.8
0.50	241	10.6	86	23.5
0.75	96	4.2	57	15.7
1.00	46	2.0	39	10.7
1.25	11	0.5	13	3.5
1.50	12	0.5	16	4.5
1.75	4	0.2	6	1.7
2.00	0	0.0	0	0.0
2.25	1	0.0	2	0.6
2.50	0	0.0	0	0.0
2.75	0	0.0	0	0.0
3.00	0	0.0	0	0.0
3.25	0	0.0	0	0.0
3.50	0	0.0	0	0.0
3.75	2	0.1	7	2.0
4.00	0	0.0	0	0.0
4.25	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

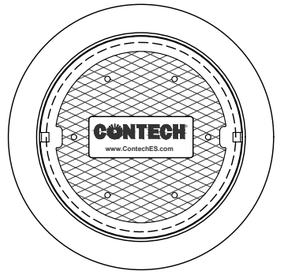


SECTION A-A

Stormceptor®
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

STORMCEPTOR DESIGN NOTES

THE STANDARD STC900 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.
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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
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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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STC900
STORMCEPTOR
STANDARD DETAIL

Detailed Stormceptor Sizing Report – Basin D1

Project Information & Location			
Project Name	Gondola Plaza -Test	**Project Number**	2550-001
City	Steamboat Springs	**State/ Province**	Colorado
Country	United States of America	**Date**	2/5/2021
Designer Information		**EOR Information (optional)**	
Name	Deborah Spaustat	**Name**	
Company	Landmark Consultants, Inc	**Company**	
Phone #	970-871-9494	**Phone #**	
Email	debs@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	Basin D1
Recommended Stormceptor Model	STC 1200
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	Fine Distribution
Rainfall Station	DURANGO

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	71
STC 900	79
STC 1200	80
STC 1800	80
STC 2400	84
STC 3600	85
STC 4800	88
STC 6000	88
STC 7200	90
STC 11000	93
STC 13000	93
STC 16000	95

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**	2272
Rainfall Station Name	DURANGO	**Total Rainfall (in)**	365.0
Station ID #	2432	**Average Annual Rainfall (in)**	11.1
Coordinates	37°17'0"N, 107°53'0"W	**Total Evaporation (in)**	62.9
Elevation (ft)	6600	**Total Infiltration (in)**	0.0
Years of Rainfall Data	33	**Total Rainfall that is Runoff (in)**	302.1

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)	2.4
Imperviousness %	100.0

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	18.06
Water Quality Flow Rate (CFS)	1.62

Max parameters for STC 1200

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

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

Design Details	
Stormceptor Inlet Invert Elev (ft)	6886.49
Stormceptor Outlet Invert Elev (ft)	6885.98
Stormceptor Rim Elev (ft)	6894.30
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	25
Pipe Material	HDPE - plastic
Multiple Inlets (Y/N)	Yes
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	Basin D1

Site Details

Drainage Area

Total Area (acres)	2.4
Imperviousness %	100.0

Surface Characteristics

Width (ft)	647.00
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	

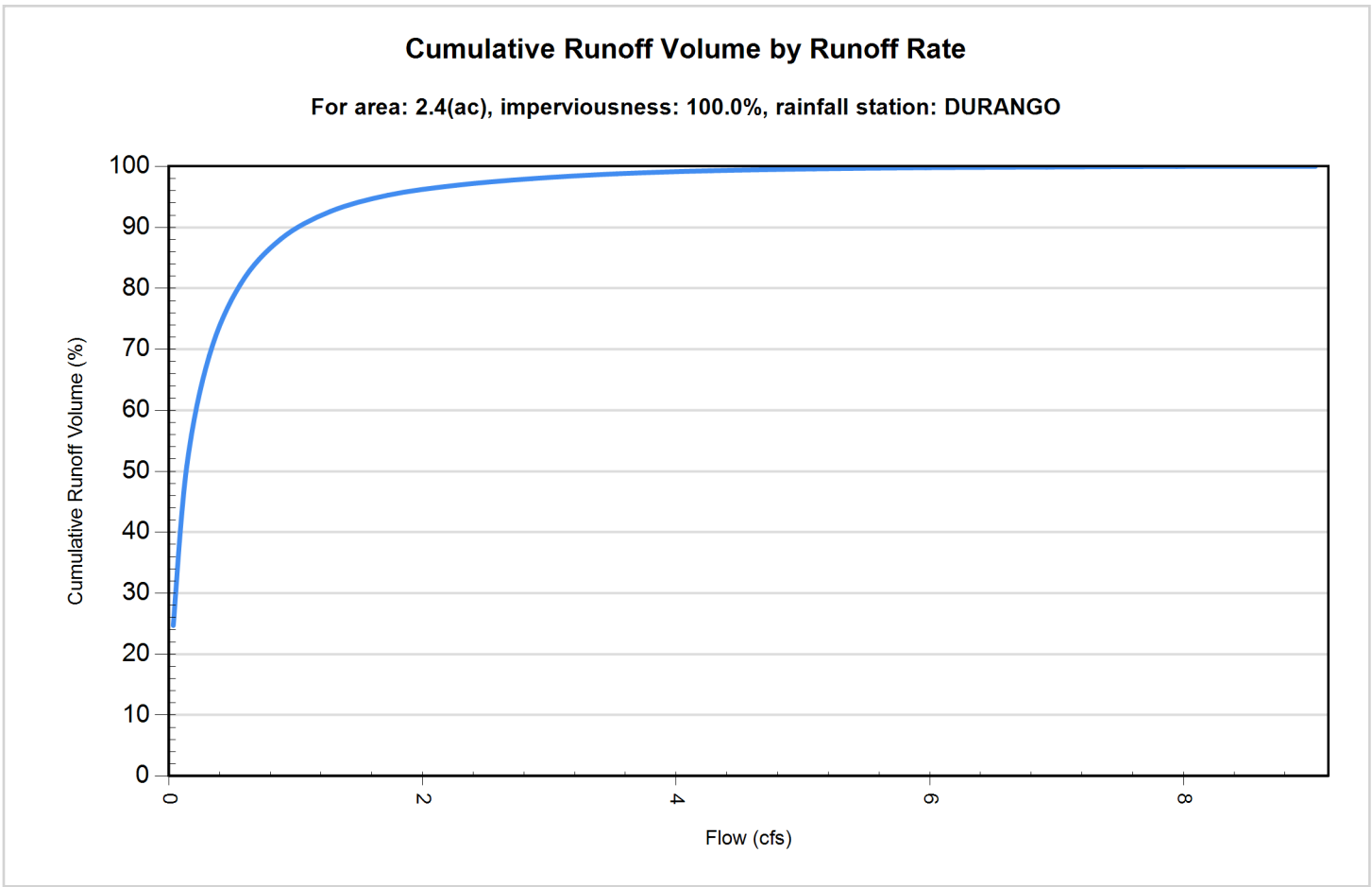
Buildup/Wash-off Parameters

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

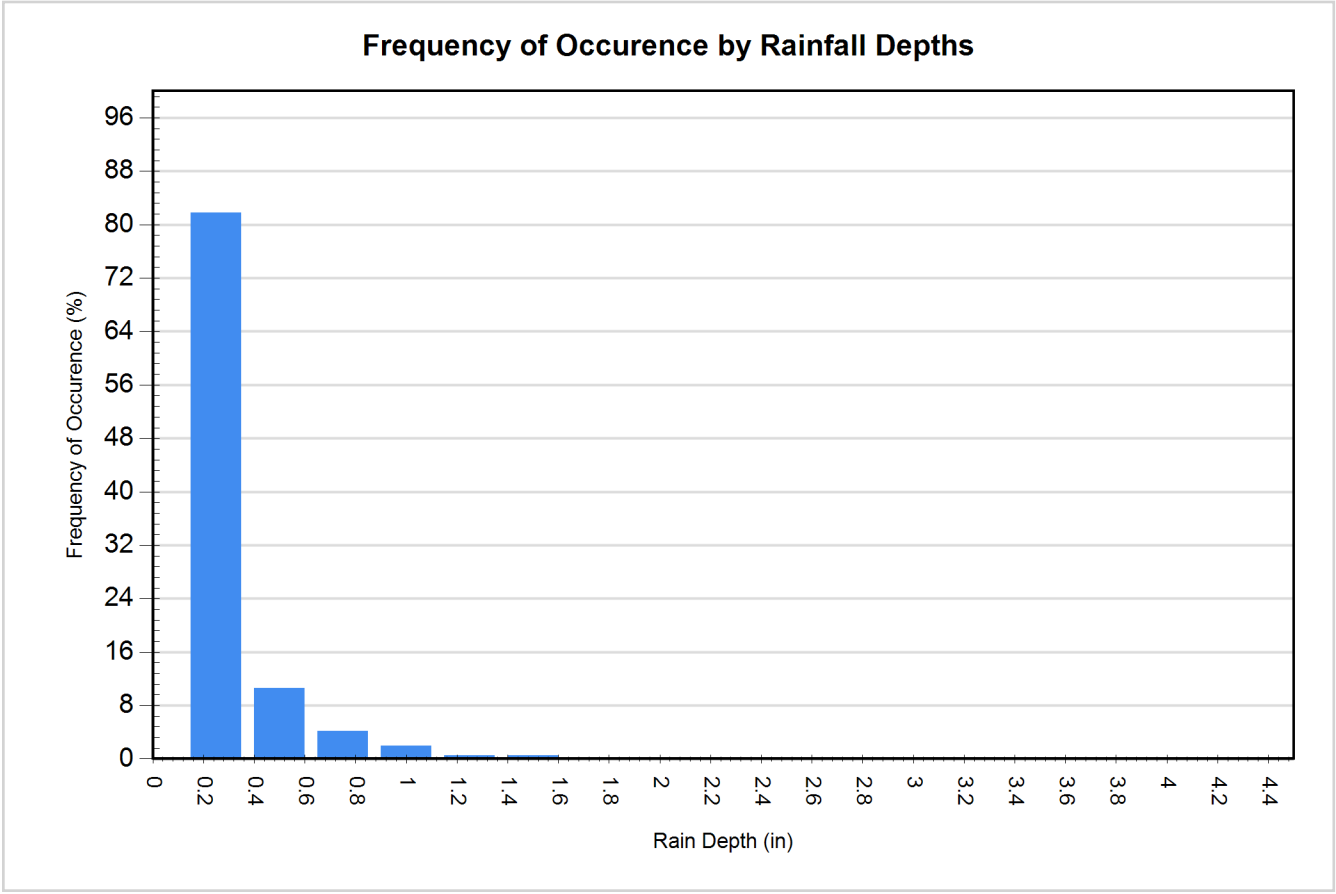
TSS Availability Parameters

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

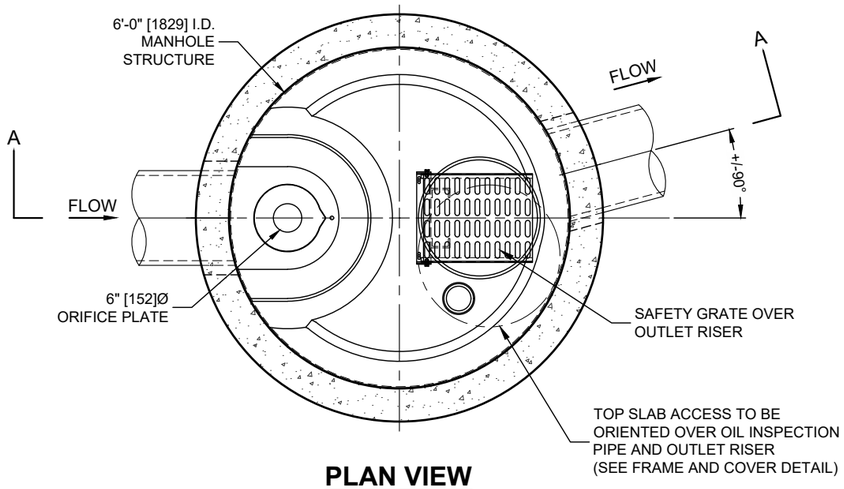
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	665409	2029502	24.7
0.141	1367932	1326942	50.8
0.318	1858007	836857	68.9
0.565	2174952	519910	80.7
0.883	2373762	321104	88.1
1.271	2495731	199136	92.6
1.730	2567108	127773	95.3
2.260	2610942	83939	96.9
2.860	2639999	54886	98.0
3.531	2661362	33525	98.8
4.273	2675117	19772	99.3
5.085	2684508	10381	99.6
5.968	2689471	5419	99.8
6.922	2691935	2954	99.9
7.946	2693579	1310	100.0
9.041	2694310	579	100.0



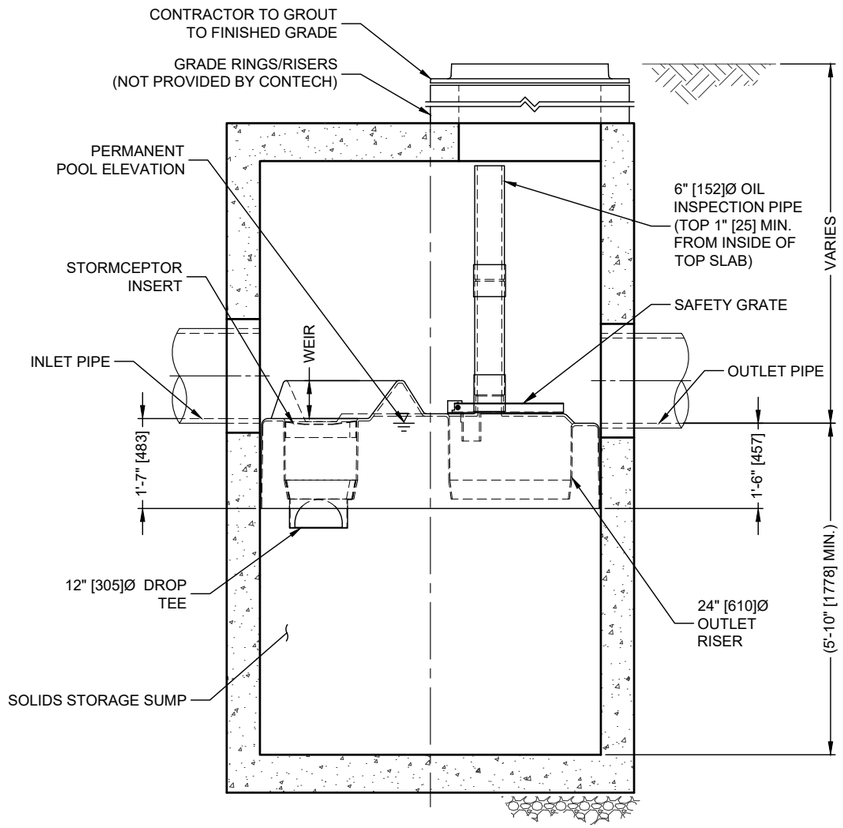
Rainfall Event Analysis				
Rainfall Depth (in)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (in)**	**Percentage of Annual Volume (%)**
0.25	1859	81.8	138	37.8
0.50	241	10.6	86	23.5
0.75	96	4.2	57	15.7
1.00	46	2.0	39	10.7
1.25	11	0.5	13	3.5
1.50	12	0.5	16	4.5
1.75	4	0.2	6	1.7
2.00	0	0.0	0	0.0
2.25	1	0.0	2	0.6
2.50	0	0.0	0	0.0
2.75	0	0.0	0	0.0
3.00	0	0.0	0	0.0
3.25	0	0.0	0	0.0
3.50	0	0.0	0	0.0
3.75	2	0.1	7	2.0
4.00	0	0.0	0	0.0
4.25	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

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STORMCEPTOR DESIGN NOTES

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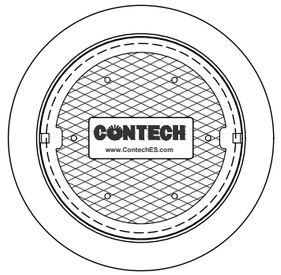

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PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

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800-338-1122 513-645-7000 513-645-7993 FAX

STC1200
STORMCEPTOR
STANDARD DETAIL

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APPENDIX D

BMP MAINTENANCE PLAN

APPENDIX E

CITY CHECKLISTS

STANDARD FORM NO. 1 DRAINAGE LETTER 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

✓ A. Typed and legible in 8½ x 11" format.
✓ B. Drawings that are 8½" x 11" or 11 x 17 bound within letter, larger drawings (up to 24 x 36) included in a pocket attached to the letter. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Title Page

✓ A. Type of Letter.
✓ B. Project Name, Subdivision, Original Date, Revision Date.
✓ C. Preparer's name, firm, address, and phone number.
✓ D. Certifications, PE stamp, signature and date from licensed Colorado PE (for FINAL letter).
✓ E. "DRAFT" for 1st Submittal and revisions; "FINAL" once approved.
✓ F. 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.

III. Introduction

✓ A. Description of site location, size in acres, existing and proposed land use, and any pertinent background info.
✓ B. Identify drainage reports for adjacent development.

IV. Drainage Criteria and Methodology Used

✓ A. Identify design rainfall and storm frequency.
✓ B. Identify runoff calculation method used.

V. Existing Conditions (Pre-Development/Historic)

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

VI. Proposed Conditions

- ✓ A. Indicate ground cover, imperviousness, topography, and disturbed area (acres).
- ✓ B. Describe proposed stormwater system (sizes, materials, etc.).
- ✓ C. Describe proposed outlets and indicate historic and proposed flow for each.
- ✓ D. Include calculations for all pipes, inlets, culverts, ditches, ponds, etc. in appendix.
- ✓ E. Include a summary table for the 5- and 100-year events showing historic flow and proposed flow for total site and each basin.
- ✓ F. Include a summary of proposed water quality measures to be constructed.

VII. Conclusions

- ✓ A. Provide general summary.
- ✓ B. Note if site does or does not comply with criteria and any variances to criteria.
- ✓ 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.
- ✓ D. Indicate proposed stormwater quality system.

VIII. References

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

IX. Figures

- ✓ A. Vicinity Map.
- ✓ B. Site Plan (include the horizontal and vertical datum used and all benchmarks).
- C. Existing conditions.
  - ✓ 1. Delineate existing basin boundaries.
  - ✓ 2. Show existing runoff flow arrows.
  - ✓ 3. Show existing topography.
  - ✓ 4. Show existing stormwater features (structures, sizes, materials, etc.).
  - ✓ 5. Show floodplain limits and information.
  - ✓ 6. For each basin, show bubble with basin number, acreage and percent impervious or provide information in summary table or figure.
  - ✓ 7. For each outlet show bubble with acreage and historic flow and proposed flow or provide information in summary table on figure.
- D. Proposed Conditions
  - ✓ 1. Delineate proposed basin boundaries.
  - ✓ 2. Show proposed runoff flow arrows.
  - ✓ 3. Show existing and proposed topography at an interval of at least 5-ft.
  - ✓ 4. For each basin show bubble with basin number, acreage and percent impervious or provide a summary table or figure.
  - ✓ 5. For each outlet show bubble with acreage, historic flow, and proposed flow or provide a summary table or figure.
  - ✓ 6. Show floodplain limits and information.
  - ✓ 7. Show proposed stormwater system (components, sizes, materials, & slopes).
  - ✓ 8. Show property lines and easements.
  - ✓ 9. Show any new easements required.

X. Appendices

- ✓ A. Runoff Calculations
- ✓ B. Culvert Calculations
- NA C. Pond Calculations.
- ✓ D. Other Calculations

Acknowledgements:

Standard Form No. 1 was prepared by: _____ 2/7/2021
Date

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

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:	Gondola Plaza
Project location:	Lot 1 ,Replat of Parcel D, Steamboat Springs, CO
Developer name/contact info:	Jon Gambrill, Gensler, 1225 17th Street, Denver, CO 80202 jon_gambrill@gensler.com, 303-595-8585
Drainage engineer name/contact info:	Deborah Spaustat, PE, Landmark Consultants, Inc. 970-871-9494, debs@landmark-co.com
Application Type:	Development Plan
Proposed Land Use:	Resort Commercial

Project Site Parameters	
Total parcel area (acres):	1.59-acres
Disturbed area (acres):	1.39-acres
Existing impervious area (acres, if applicable):	100% (1.59-acres)
Proposed new impervious area (acres):	0
Proposed total impervious area (acres):	100% (1.59-acres)
Proposed number of project outfalls:	1
Number of additional parking spaces:	NA
Description and site percentage of existing cover/land use(s):	Site is currently 100% developed and completely covered with the ex gondola building and pavers.
Description and site percentage of proposed cover/land use(s):	Proposed site will remove the ex building and install an ice rink, a food and beverage building with a lower level and landscaping
Expected maximum proposed conveyance gradient (%):	5%
Description of size (acres) and cover/land use(s) of offsite areas draining to the site	Approximately 0.6-acres of off site runoff flows from the Sheraton, Gondola Condominiums and One Steamboat Place to Lot D. These areas are 100% impervious. The Stormceptor unit is designed to treat runoff from the adjacent proposed Goldwalk project.

Type of Study Required:

- [x] Drainage Letter
- [ ] Final Drainage Study
- [ ] Conceptual Drainage Study
- [x] Stormwater Quality Plan

Hydrologic Evaluation:

- [x] Rational Method
- [ ] CUHP/SWMM
- [ ] HEC-HMS
- [ ] Other_____

Project Drainage	
Number of subbasins to be evaluated:	Four
Presence of pass through flow (circle)	(YES) NO
Description of proposed stormwater conveyance on site:	Sheet flow to area drains. Stormsystem to hydrodynamic separator. Outfall is the Burgess Creek Culvert.
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:	The Burgess Creek Culvert discharges to Burgess Creek and ultimately the Yampa River. The Stormwater Master Plan notes several areas on Burgess Creek lacking capacity. This Project does not propose to increase the flow from the property for either design storm.
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
- [x] 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.	The TSS design standard is applicable to all sites. A proprietary structure was chosen after other options such as sand filters, bioretention ponds and grass buffers and swales were considered and rejected. These BMP's do not fit into the already developed site physically or aesthetically and would detract from the function of a public gathering place.*
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	The unit will be a Stormceptor STC 900 or equal. It will be installed in-line on the existing 24" storm system, which is the receiving system for the site. The Stormceptor will provide water quality for the adjacent Goldwalk Project in the Gondola Square Condominiums. It may be installed independent of either project with the existing infrastructure
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

1/29/2021	970-871-9494
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

Emrick Soltis

Digitally signed by Emrick Soltis
DN: C=US, E=esoltis@steamboatsprings.net, O=City of Steamboat Springs, OU=PW - Engineering Div., CN=Emrick Soltis
Date: 2021.02.04 10:59:26-07'00'

Printed Name: City Engineer	Date

*Justification Cont'd: There are currently no water quality treatment BMP's in the vicinity of this portion of the base area. The Stormceptor will be located strategically to capture as much off-site flow as possible.

LANDMARK CONSULTANTS, INC.

CIVIL ENGINEERS | SURVEYORS

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

PROJECT	Slopeside Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021
LOCATION	Steamboat Springs, CO

COMPOSITE 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: Steamboat Springs NOAA

Soil Type: C

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	49273.23	1.13	49273.23	1.13	0.00	0.00		0.00		0.00	100%	0.855	0.894
H2	34981.84	0.80	34981.84	0.80	0.00	0.00		0.00		0.00	100%	0.855	0.894
H3	40502.99	0.93	40502.99	0.93	0.00	0.00		0.00		0.00	100%	0.855	0.894
H4	3033.13	0.07	3033.13	0.07	0.00	0.00		0.00		0.00	100%	0.855	0.894
D1	96824.60	2.22	96824.60	2.22	0.00	0.00		0.00		0.00	100%	0.855	0.894
D3	30925.62	0.71	30925.62	0.71	0.00	0.00		0.00		0.00	100%	0.855	0.894
HTOT	127791.19	2.93		0.00	0.00	0.00		0.00		0.00	0%	0.035	0.484
DTOT	127750.22	2.93		0.00									

Property	Basin Area (sq.ft.)	Basin Area (acres)	Disturbed Area (sq.ft.)	Disturbed Area (acres)
Lot 1	69373.88	1.59	60811.67	1.40
Gondola Square Condominiums	108241.22	2.48	13391	0.31
Lot G Ski Hill Subdivision		1.6	400.36	0.01
Steamboat Resort Village, LLC		3.87	604.41	0.01

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141 9th Street ~ P.O. Box 774943
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(970) 871-9494
www.LANDMARK-CO.com

PROJECT	Slopeside Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

DIRECT RUNOFF COMPUTATIONS

Overland Flow, Time of Concentration:

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

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, I from Fig. RA-2 (Equation

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	1.13	5.00	0.86	0.89	3.86	8.42	3.73	3.30	8.51	7.52
H2	0.80	5.00	0.86	0.89	3.86	8.42	2.65	3.30	6.04	7.52
H3	0.93	5.00	0.86	0.89	3.86	8.42	3.07	3.30	7.00	7.52
H4	0.07	5.00	0.86	0.89	3.86	8.42	0.23	3.30	0.52	7.52
D1	2.22	5.00	0.86	0.89	3.86	8.42	7.33	3.30	16.73	7.52
D3	0.71	5.00	0.86	0.89	3.86	8.42	2.34	3.30	5.34	7.52

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PROJECT	Slopeside Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

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
h1	H1+H2	84255.07	1.93	84255.07	1.93	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89
h2	H3+H4	43536.12	1.00	43536.12	1.00	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89
d1	D1	96824.60	2.22	96824.60	2.22	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89
d2	D3	30925.62	0.71	30925.62	0.71	0.00	0.00	0.00	0.00	0.00	0.00	100%	0.86	0.89

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PROJECT	Slopeside Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

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 Fig. RA-2

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

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

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)
h1	H1+H2	1.93	5.00	0.86	0.89	3.86	8.42	6.38	3.30	14.55	7.52
h2	H3+H4	1.00	5.00	0.86	0.89	3.86	8.42	3.29	3.30	7.52	7.52
d1	D1	2.22	5.00	0.86	0.89	3.86	8.42	7.33	3.30	16.73	7.52
d2	D3	0.71	5.00	0.86	0.89	3.86	8.42	2.34	3.30	5.34	7.52

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)
d1	D1	2.22	5.00	0.86	0.79	1.50

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PROJECT	Slopeside Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

Hydrology Summary for Slopeside Plaza and Goldwalk

Historical

Basin	Total Area (acres)	%Imp	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
H1	1.13	100%	0.86	0.89	2.15	8.51
H2	0.80	100%	0.86	0.89	2.15	6.04
H3	0.93	100%	0.86	0.89	2.15	7.00
H4	0.07	100%	0.86	0.89	2.15	0.52
D1	2.22	100%	0.86	0.89	2.15	16.73
D3	0.71	100%	0.86	0.89	2.15	5.34

Design Point Summary for Slopeside Plaza and Goldwalk

	Historical						Developed					
Design Point	Total Area (acres)	%Imp	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	Total Area (acres)	%Imp	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
1	1.93	100%	0.86	0.89	6.38	14.55	2.22	100%	0.86	0.89	7.33	16.73
2	1.00	100%	0.86	0.89	3.29	7.52	5.00	100%	0.86	0.89	2.34	5.34
Combined					9.67	22.08					9.67	22.07

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)
d1	D1	2.22	5.00	0.86	0.79	1.50

Brief Stormceptor Sizing Report - Gondola Plaza

Project Information & Location			
Project Name	Gondola Plaza	**Project Number**	2550-001
City	Steamboat Springs	**State/ Province**	Colorado
Country	United States of America	**Date**	1/26/2021
Designer Information		**EOR Information (optional)**	
Name	Deborah Spaustat	**Name**	
Company	Landmark Consultants, Inc	**Company**	
Phone #	970-871-9494	**Phone #**	
Email	debs@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	Gondola Plaza
Target TSS Removal (%)	80
TSS Removal (%) Provided	80
Recommended Stormceptor Model	STC 900

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	72
STC 900	80
STC 1200	80
STC 1800	81
STC 2400	85
STC 3600	85
STC 4800	89
STC 6000	89
STC 7200	91
STC 11000	93
STC 13000	94
STC 16000	95

Sizing Details

Drainage Area

Total Area (acres)	2.22
Imperviousness %	100.0

Rainfall

Station Name	DURANGO
State/Province	Colorado
Station ID #	2432
Years of Records	33
Latitude	37°17'0"N
Longitude	107°53'0"W

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	15.35
Water Quality Flow Rate (CFS)	1.50

Up Stream Storage

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

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

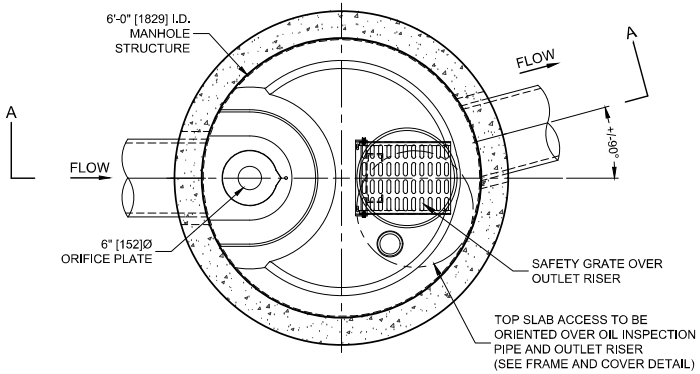
Fine Distribution

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

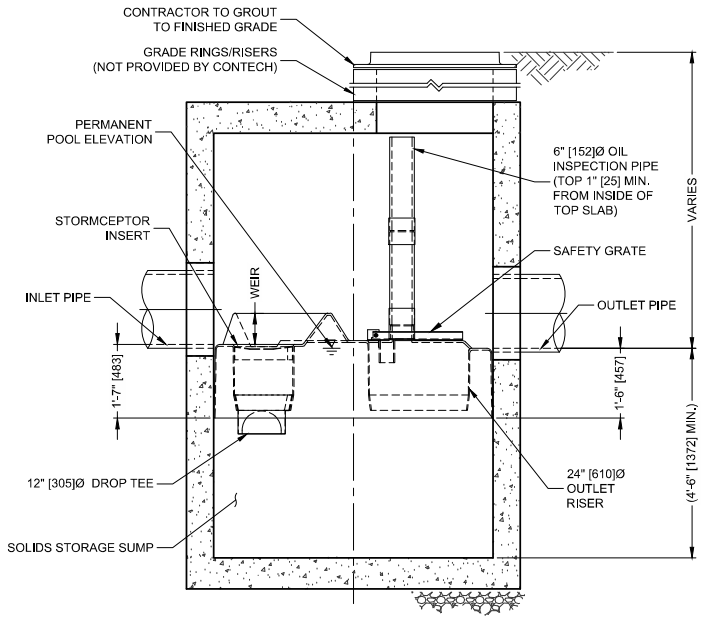
Notes

- 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.

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



PLAN VIEW
TOP SLAB NOT SHOWN

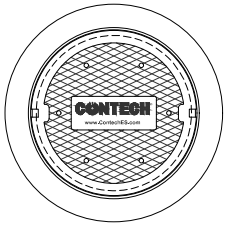


SECTION A-A

Stormceptor®
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

STORMCEPTOR DESIGN NOTES

THE STANDARD STC900 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			

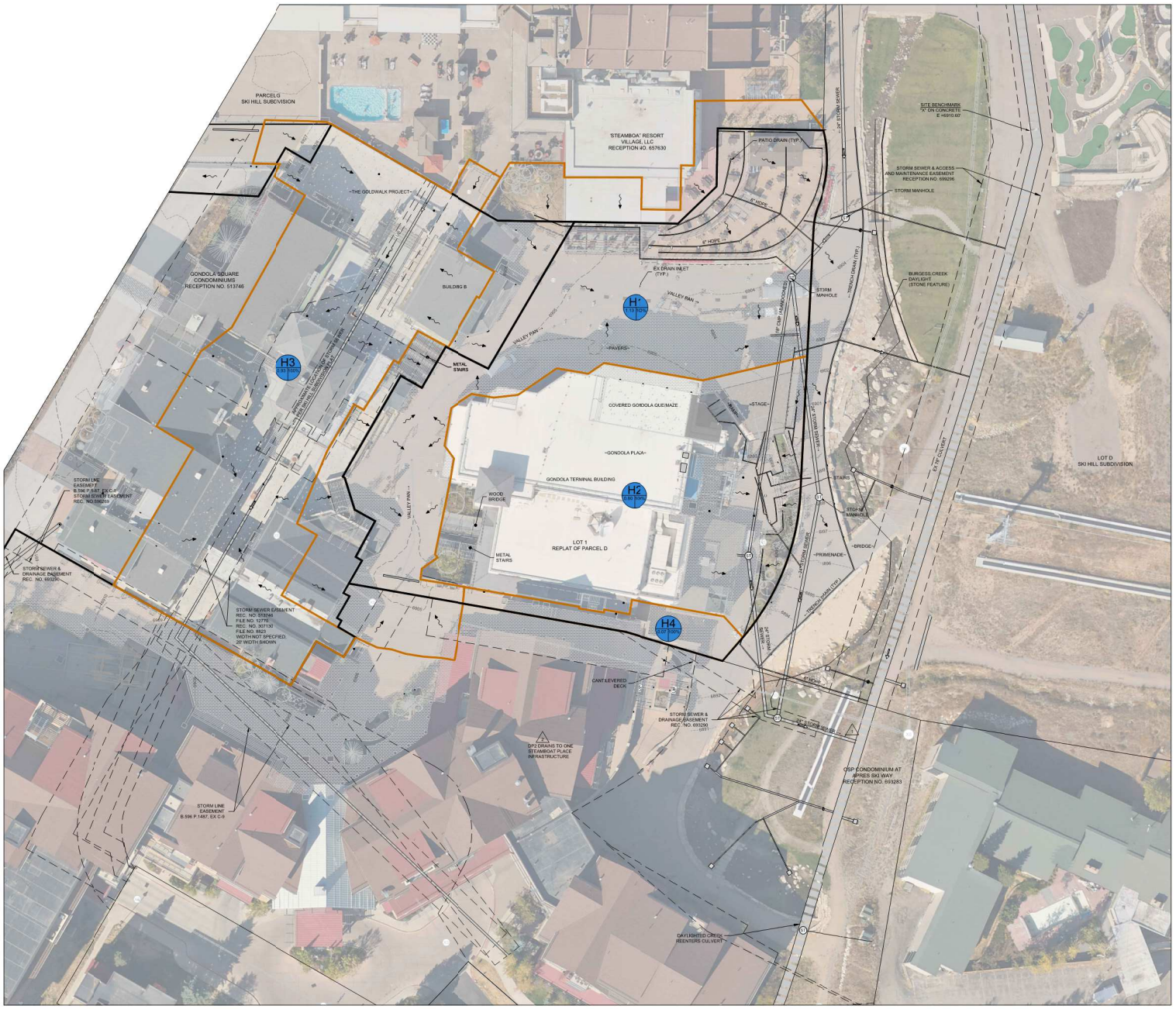
NOTES / SPECIAL REQUIREMENTS:

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.

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

STC900
STORMCEPTOR
STANDARD DETAIL



NORTH

SCALE 0 SCALE SCALE SCALE Feet

(IN FEET)
1 inch = SCALE ft.

LEGEND:

- PROPERTY BOUNDARY
- EXISTING EASEMENT
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET (CURB & AREA)
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING DRAINAGE BASIN
- PROPOSED DRAINAGE BASIN
- DRAINAGE BASIN CALLOUT (BASIN ID, SIZE (ACRES), IMPERV. (%))
- DESIGN POINT
- OVERLAND FLOW DIRECTION
- 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 UNBERGROUND 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.

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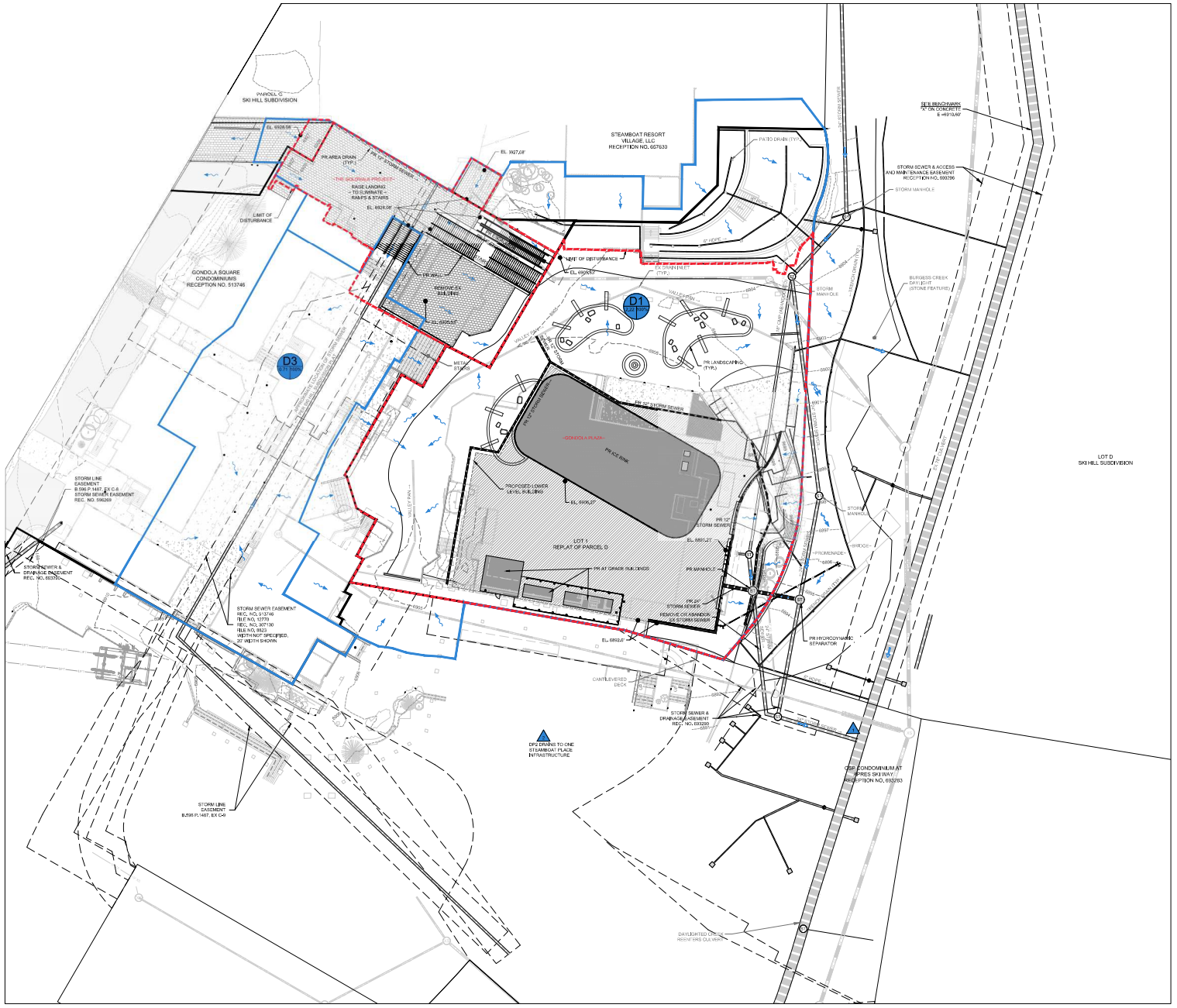
NO.	DATE:	BY:	DESCRIPTION:
			REVIEW SET NOT FOR CONSTRUCTION XX/XX/XX

PROJECT: 2050-001
DATE: 10/7/2021
CONTACT: DCS
EMAIL: dcs@landmark-co.com

Gondola Plaza
Scope Analysis
Existing Conditions

SHEET
1
OF 1 SHEETS



NORTH

SCALE 0 SCALE SCALE SCALEFeet

(IN FEET)
1 inch = SCALE ft.

LEGEND:

- PROPERTY BOUNDARY
- EXISTING EASEMENT
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET (CURB & AREA)
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- APPROX LIMITS OF DISTURBANCE
- EXISTING DRAINAGE BASIN
- PROPOSED DRAINAGE BASIN
- DRAINAGE BASIN CALLOUT (BASIN ID, SIZE (ACRES), IMPERV. (%))
- DESIGN POINT
- OVERLAND FLOW DIRECTION
- 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.
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(970) 879-2461
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LANDMARK CONSULTANTS, INC.

NO.	DATE:	BY:	DESCRIPTION:
			REVIEW SET NOT FOR CONSTRUCTION XX/XX/XX

PROJECT: 2004-001
DATE: 1/27/2021
CONTACT: DCS
EMAIL: dan@landmark-co.com

Gondola Plaza
Scope Analysis
Proposed Improvements

SHEET
1
OF 1 SHEETS

Standard Form No. 4 Stormwater Quality Plan Checklist

This list is not an exhaustive list of every possible item that may be required or requested in a Stormwater Quality Plan but provides a general guideline for preparation of the Stormwater Quality Plan.

Instructions:

1. The applicant shall identify with a "check mark" if information is provided within the Stormwater Quality Plan. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation. If information is included with the associated drainage letter or study, indicated with a "D."
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

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

II. Cover

- ✓ A. Report Type – Stormwater Quality Plan.
- ✓ B. Project Name, Subdivision or Development, Original Date, Revision Date.
- ✓ C. Preparer's name, firm, address, and phone number.
- ✓ D. "DRAFT" for 1st submittal and revisions; "FINAL" once approved.

III. Title Sheet

- ✓ A. Table of Contents.
- ✓ B. Certification, PE Stamp, signature and date from licensed Colorado PE (for Final).
- ✓ C. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and 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 and Background

- ✓ A. Description of site location, study limits, size in acres, existing and proposed land use, soil data, permeability of the site, drainage patterns, and any pertinent background info.
- ✓ B. State purpose and goal of Stormwater Quality Plan and report along with any special requirements of the desired outcome.
- ✓ C. List any project stakeholders and/or requestors.
- ✓ D. Describe the background of the flooding source and any previous studies.

V. Design Criteria and Methodology Used

- ✓ A. Identify design rainfall and storm frequency used to design permanent stormwater treatment facilities.
- ✓ B Identify the runoff calculation method used to design permanent stormwater treatment facilities.
- ✓ C. Identify the standard the design will meet and the means and methodologies by which it will use to meet the standard.
- ✓ D. Provide all details supporting the use of the selected design standard.

VI. Proposed Conditions

- ✓ A. Identify total site area, total site imperviousness, area to be treated, and impervious area to be treated. Include justification for treating less than the total site area.
- ✓ B. Describe potential site contaminant sources including sediment.
- ✓ C. Identify source and quantity of on-site and off-site stormwater flows that need to be managed and how they will be managed.
- ✓ D. For each permanent treatment facility, identify the design standard, MDCIA level (if applicable), area treated (& percentage of total), imperviousness of area treated, C values of area treated, soil types, and all pertinent data for design.
- NA E. Volume based facilities: Provide total storage pond volume, WQCV, drain time, release rate, sediment storage, outlet & overflow structures, area and depth of pond, micropool, forebays, etc. (include all calculations in the appendix).
- ✓ F. Flow based facilities: Provide design flow rate and all treatment calculations and how flows larger than the water quality design flow rate will be handled. If proprietary facilities are proposed, provide the justification and sizing requirements from manufacturer.
- NA G. If stormwater detention is provided, discuss how water quality is provided within the detention facility. No underground detention is allowed.

VII. Operation and Maintenance Plan Requirements

NOTE: DRAFT O&M PLAN INCLUDED. FINAL O&M PLAN WILL BE SUBMITTED WITH CD'S

See template O&M plan and guidance document.

- SEE NOTE A. Describe general project information, facility description, ROW and access information, vegetation management, hydraulic design parameters, environmental permitting, snow and ice control, and additional pertinent information in the notes.
- SEE NOTE B. Indicate, describe, and detail the permanent stormwater treatment facilities.
- SEE NOTE C Include section details where necessary of the permanent treatment facilities.
- SEE NOTE D. Provide an inspection and maintenance schedule and procedure of permanent treatment facilities and who is responsible for them.
- SEE NOTE E. Identify design specifications for construction.

Acknowledgements

Standard Form No. 4 prepared by: _____ 2/05/2021

Date

Include appropriate Project Sheet(s) and Design Checklist(s) (See Section 5.12)
Include this form as part of the Stormwater Quality Plan.

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:	Gondola Plaza		
Project Location:	Lot 1 Replat of Parcel D, Steamboat Springs, CO		
Submitted Date:	2/10/2021	Submitted By:	Landmark Consultants, Inc. Deborah Spaustat, P.E.
Acreage Disturbed:	1.4-acres		
Existing Impervious:	100%	New Net Impervious:	100%
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: The Ice Rink will not be treated with chemicals.

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	1.48-cfs	2.19-acres	Stormceptor STC 1200, Identified by manhole in promenade in Parcel D Ski Hill Subdivision
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: Gondola Plaza			
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 1200 Hydrodynamic Separator	Facility Location: Parcel D Ski Hill Subdivision
✓		Storm event: 80th Percentile Storm	
✓		TSS mg/L reduction: 80%	
✓		% of site treated: 95%	
✓		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):	
✓		5% %	0.07-acres Size (acres)
✓		Provide explanation of why the excluded area is impractical to treat: The excluded area is in a location that drains currently drains off-site to the storm sewer in the adjacent property. It is impractical to change the grades in this area and still maintain a cohesive connection to the adjoining property.	
✓		Provide explanation of why another facility is not practicable for the untreated area: The area is too small to warrant its own facility	

TABLES

LANDMARK CONSULTANTS, INC.

CIVIL ENGINEERS | SURVEYORS

141 9th Street ~ P.O. Box 774943
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PROJECT	Gondola Plaza and Goldwalk
DESIGNER	D. Spaustat
DATE	1/27/2021

Hydrology Summary for Gondola Plaza and Goldwalk

	Historical (H)						Developed (D)					
Basin	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**
1.1							0.18	100%	0.855	0.894	0.60	1.38
1.2							0.35	100%	0.855	0.894	1.14	2.61
1.3							0.21	100%	0.855	0.894	0.68	1.55
1.4							0.20	100%	0.855	0.894	0.66	1.51
1.5							0.12	100%	0.855	0.894	0.38	0.88
1.6							0.38	100%	0.855	0.894	1.27	2.89
1.7							0.28	100%	0.855	0.894	0.92	2.11
1	1.13	100%	0.86	0.89	3.73	8.51						
2	0.80	100%	0.86	0.89	2.65	6.04	0.47	100%	0.855	0.894	1.55	3.53
3	0.93	100%	0.86	0.89	3.07	7.00	0.67	100%	0.855	0.894	2.20	5.02
4	0.07	100%	0.86	0.89	0.23	0.52	0.07	100%	0.855	0.894	0.23	0.52

Design Point Summary for Gondola Plaza and Goldwalk

	Historical						Developed					
Design Point	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**	**Total Area (acres)**	**%Imp**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**
1	1.93	100%	0.86	0.89	6.38	14.55	2.19	100%	0.86	0.89	7.21	16.46
2	1.00	100%	0.86	0.89	3.29	7.52	0.74	100%	0.86	0.89	2.43	5.55

80th Percentile Storm Event (Calculated Project Values)

Design Point	**Basin(s)**	**Area, A (acres)**	**T_c (min)**	**$C_{1.25}$**	**Intensity $I_{1.25}$ (in/hr)**	**Flow $Q_{1.25}$ (cfs)**	**Max Flow Q_{100}** (cfs)
d1	D1	2.19	5.00	0.86	0.79	1.48	16.46

80th Percentile Storm Event (Max for STC 1200)

Design Point	**Basin(s)**	**Area, A (acres)**	**T_c (min)**	**$C_{1.25}$**	**Intensity $I_{1.25}$ (in/hr)**	**Flow $Q_{1.25}$ (cfs)**	**Max Flow Q_{100}** (cfs)
d1	D1	2.40	5.00	0.86	0.79	1.62	18.06

% of Site Treated

Total Site (acres)	**Total Treated (acres)**	**% Treated (acres)**
1.59	1.52	96%

LEGEND:

- PROPERTY BOUNDARY
- EXISTING EASEMENT
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET (CURB & AREA)
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING DRAINAGE BASIN
- PROPOSED DRAINAGE BASIN
- DRAINAGE BASIN CALLOUT (BASIN ID, SIZE (ACRES), IMPERV. (%))
- DESIGN POINT
- OVERLAND FLOW DIRECTION
- 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.

Hydrology Summary for Gondola Plaza and Goldwalk

	Historical (H)						Developed (D)					
Basin	Total Area (acres)	%Imp	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	Total Area (acres)	%Imp	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
1.1							0.18	100%	0.855	0.894	0.60	1.38
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1.6							0.38	100%	0.855	0.894	1.27	2.89
1.7							0.28	100%	0.855	0.894	0.92	2.11
1	1.13	100%	0.86	0.89	3.73	8.51						
2	0.80	100%	0.86	0.89	2.65	6.04	0.48	100%	0.855	0.894	1.57	3.59
3	0.93	100%	0.86	0.89	3.07	7.00	0.67	100%	0.855	0.894	2.20	5.02
4	0.07	100%	0.86	0.89	0.23	0.52	0.07	100%	0.855	0.894	0.23	0.52

Design Point Summary for Gondola Plaza and Goldwalk

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1	1.93	100%	0.86	0.89	6.38	14.55	2.20	100%	0.86	0.89	7.24	16.52
2	1.00	100%	0.86	0.89	3.29	7.52	5.00	100%	0.86	0.89	2.43	5.55

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NO. | DATE: | BY: | DESCRIPTION:

REVIEW SET
NOT FOR CONSTRUCTION
XX/XX/XX

PROJECT: 2050-001
DATE: 1/27/2021
CONTACT: DCS
EMAIL: debs@landmark-co.com

Gondola Plaza
Figure 3:
Existing Drainage Plan

SHEET
1
OF 1 SHEETS

LEGEND:

- PROPERTY BOUNDARY
- EXISTING EASEMENT
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET (CURB & AREA)
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- APPROX LIMITS OF DISTURBANCE
- EXISTING DRAINAGE BASIN
- PROPOSED DRAINAGE BASIN
- DRAINAGE BASIN CALLOUT (BASIN ID – H1; SIZE (ACRES) – 1.13; IMPERV. (%) – 100%)
- DESIGN POINT
- OVERLAND FLOW DIRECTION
- EXISTING CHANNELIZED FLOW DIRECTION

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Gondola Plaza
Figure 4: Proposed Drainage Plan

SHEET 1
OF 1 SHEETS