DRAINAGE LETTER REPORT
for
WINDERMERE FILING NO. 2

Colorado Springs, CO

March 2024

Prepared for:

Colo Windermere #2, LLC
4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918
Contact: James Todd Stephens

Prepared by:

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TABLE OF CONTENTS

APPENDICES

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for

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Colorado Springs, Colorado

1.0 CERTIFICATION STATEMENTS

ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports, and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omission on my part in preparing this report.

_____

Tim D. McConnell, P.E. Date
Colorado P.E. License No. 33797
For and on Behalf of Drexel, Barrell & Co.

DEVELOPER'S STATEMENT

I, the developer have read and will comply with all the requirements specified in this drainage report and plan.

Business Name: Colo Windermere #2, LLC

By: _____

James Todd Stephens Date
Title: Owner
Address: 4164 Austin Bluffs Parkway, #361
Colorado Springs, CO 80918

EL PASO COUNTY

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and the Engineering Criteria Manual, as amended.

_____

County Engineer/ECM Administrator Date

CONDITIONS

DRAINAGE LETTER REPORT
for
WINDERMERE FILING NO. 2
Colorado Springs, Colorado

2.0 PURPOSE

This report is prepared by Drexel, Barrel & Co in support of the Windermere Filing No. 2 subdivision. The purpose of this report is to identify onsite and offsite drainage patterns, storm sewer, inlet locations, and areas tributary to the site, and to safely route developed storm water runoff to adequate outfall facilities.

3.0 GENERAL SITE DESCRIPTION

Location

The site is located at the northwest corner of N. Carefree Cir. and Marksheffel Rd. - the E 1/2 of Section 29, Township 13 S, Range 65 W of the 6th P.M., El Paso County, Colorado.

The site is bound on the west by Antelope Ridge Dr., on the north by the Windermere Filing No. 1 subdivision (Pronghorn Meadows Circle), on the east by Marksheffel Rd., and on the south by N. Carefree Cir.

Site Conditions

The site is approximately 9.26 acres in size and is proposed as a multi-family home subdivision. The proposed site development includes approximately 200 multi-family units. The site has recently been overlot graded, seeded and mulched as part of the Windermere Filing No. 1 development to the north. The site is located within the Sand Creek Drainage Basin. Historically, this site drains to the southeast towards the intersection of N. Carefree Circle and Marksheffel Road.

This site was studied as part of the approved Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1, by Classic Consulting (October 2014) and the more recently approved Final Drainage Report for Windermere Filing No. 1, by Drexel, Barrell & Co. (April 2022).

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is underlain by Truckton sandy loam, a type 'A' hydrologic soil. See appendix for map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the

majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel #08041C0543 G (December 7, 2018) the project site is within a designated Zone X area described as "area of minimal hazard". A firmette map is included in the appendix.

4.0 HISTORIC HYDROLOGY

It appears that excerpt was not provided in the appendix.

Refer to an excerpt in the appendix for historic condition drainage map.

Existing Design Point 6 (DP-6-EX) covers runoff from DP-4-EX, Basin EX-R, and Basin EX-A.

- Design Point DP-4-EX consists of runoff from off-site Basin D-16, that discharges onto the Windermere property in the southwest corner and travels via roadside ditch towards DP-6-EX with runoff rates of Q_5=4.9 cfs and Q_{100}=10.7 cfs.
- EX-R is 0.53 acres of existing Marksheffel Road and roadside ditch that drains to the existing grated area drain at DP-6. (Q_5=2.4 cfs and Q_{100}=4.4 cfs)
- Basin EX-A is 13.20 acres of Windermere property with historic runoff of Q_5=14.5 cfs and Q_{100}=34.2 cfs.

Runoff rates of Q_5=18.5 cfs and Q_{100}=41.8 cfs reach the existing area drain at DP-6-EX in the historic condition. As discussed in the Classic Consulting report referenced above, the existing 24" storm sewer that exits this area drain appears to have been undersized, as the capacity of the existing 24" RCP pipe at 0.5% grade is only 17.2 cfs.

Existing Design Point 19 (DP-19-EX) consists of runoff from off-site basin NC-2 (Q_5=6.5 cfs and Q_{100}=11.8 cfs). An existing 15' Type R at-grade curb inlet just west of the intersection of N. Carefree Circle and Marksheffel Road intercepts a portion of this runoff (Q_5=4.8 cfs and Q_{100}=8.1 cfs) and discharges to the east via public 18" RCP storm sewer. Bypass flows continue to the east towards DP-20-EX.

Existing Design Point 20 (DP-20-EX) consists of basin runoff from basin NC-1, flowby from the at-grade inlet at DP-19-EX and pipe flow from DP-6-EX. An existing 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-6-EX and DP-19-EX inlet capture. Total historic runoff at this location is Q_5=24.5 cfs and Q_{100}=52.6 cfs. This runoff is captured in its entirety and continues within the existing Marksheffel Road storm system to the south.

5.0 EXISTING HYDROLOGY

As described above, the Windermere Filing No. 2 site was overlot graded as part of the Windermere Filing No. 1 development. A full-spectrum detention facility was designed as part of the Filing No.1 Final Drainage Report, and in order to minimize future grading within the detention facility area, the volume was based on assumed final build-out

watershed imperviousness of 68%. Comparison between the original design and this proposed condition is further described below.

6.0 PROPOSED HYDROLOGY & HYDRAULIC SUMMARY

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals. Mile High Flood District design software (MHFD-Detention v.4.03) and Flowmaster were used to identify pond and storm system sizing, and inlet capacity charts from the current drainage criteria manual used for inlet sizing (see appendix for calculations). See below for a summary runoff table and description of each design point.

Rational Method Runoff Summary

BASIN	AREA (AC)	Q5 (cfs)	Q100 (cfs)
A1	2.90	7.3	15.3
A2	3.29	6.4	13.4
B1	3.33	7.2	16.0
B2	0.49	1.0	2.3
B4	0.16	0.4	0.8
P1	1.00	0.5	2.7
D16	2.73	4.9	10.7
A3	1.61	1.4	6.1
NC2	1.61	6.3	12.1
EXR	0.53	2.4	4.4
C3	0.63	0.5	2.5
Pond Release	0.00	0.3	10.6
NC1	0.43	1.9	3.4

The basins and design points described below are based on a preliminary concept site design. Grading and subsequent areas tributary to the detention facility are subject to change and any areas not tributary to the detention facility will be assessed for water quality treatment in adherence to County drainage criteria at the final drainage report stage.

Design Point 1 represents the flows generated by basin A1 (Q_5=7.3 cfs and Q_{100}=15.3 cfs). These flows are captured by a proposed public 10' Type R sump inlet located at the low point of the proposed roadway.

Design Point 2 represents the surface flows generated by basin A2 (Q_5=6.4 cfs and Q_{100}=13.4 cfs), and the piped flows from DP1. The surface flows will be captured in their entirety by a proposed 10' Type R sump inlet located at the low point in the proposed roadway. These flows then combine with the piped flows from DP1, for a total flow of Q_5=12.1 cfs and Q_{100}=25.4 cfs, that will be discharged to the north via public 24" RCP

storm sewer.

Design Point 3 covers flow from offsite basins B1 and B2, combined with onsite DP2. Flows of Q_5=18.2 cfs and Q_{100}=38.8 cfs travel via the existing private 24" RCP storm sewer to the east and discharge into the north end of the detention facility.

Design Point 4 represents all flows reaching the existing detention facility (Basins B4, P1 and DP3) for a total flow of Q_5= 18.4cfs and Q_{100}=41.1cfs. The existing detention facility and modifications for this developed condition are described further below,

Design Point 5 is identical to DP-4-EX in the historic condition, and represents flows (Q_5= 4.9cfs and Q_{100}=10.7cfs) from offsite basin D16 discharges on to the Windermere property. In the developed condition, it is proposed that the roadside ditch be continued to capture flows that are not able to be captured by the detention facility due to grading restraints. This swale would allow flows to continue to the east to be captured by the existing Type D area inlet at the intersection of N. Carefree Cir. and Marksheffel Road. As the grading for the site is refined, the area tributary to the detention facility will be maximized to the extent possible given the site grading constraints.

Design Point 19 is equivalent to DP-19-EX, and consists of runoff from off-site basin NC-2 and basin A3, for a total flow of Q_5= 6.3cfs and Q_{100}=12.1cfs) An existing 15' Type R at-grade curb inlet just west of the intersection of N. Carefree Circle and Marksheffel Road intercepts a portion of this runoff (Q_5=4.8 cfs and Q_{100}=8.1 cfs) and discharges to the east via public 18" RCP storm sewer.

Design Point S is located at the same existing area inlet as DP-6-EX. In the developed condition flows reaching this point, from basins EXR, A3 and C3, Design Point 5 and the pond release rate equate to Q_5= 8.3 cfs and Q_{100}=31.5 cfs. Far less than the *Q_5=18.5 cfs and Q_{100}=41.8 cfs in* the historic condition. As identified in the historic analysis of this design point, the existing 24" storm sewer exiting the area inlet is currently undersized. In this developed condition, the reduction in flows will allow for this existing pipe to function within capacity.

Design Point J1 is located at the existing manhole on the north side of N. Carefree Circle and represents the combining of flows from DP-19 and DP-S. Flows of Q_5= 12.9 cfs and Q_{100}=40.3 cfs continue to the south via 30" RCP towards DP-20.

Design Point 20 (equivalent to DP-EX-20) as in the existing condition consists of surface runoff from basin NC-1, flowby from the at-grade inlet at DP-19 and pipe flow from DP-J1. An existing 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-J1 and DP-19 existing at-grade inlet capture. Total developed runoff at this location is Q_5=14.3 cfs and Q_{100}=42.7 cfs, significantly less that the historic Q_5=24.5 cfs and Q_{100}=52.6 cfs. This runoff continues within the existing Marksheffel Road storm system to the south.

7.0 EXISTING DETENTION/WATER QUALITY FACILITY

As part of the overlot design for Windermere Filing No. 1, the detention pond located in the southeast corner of the property was designed as a full-spectrum detention facility to capture flows from the Windermere Filing No. 2 basins.

In order to minimize future grading within the detention facility area, the volume was based on an assumed final build-out watershed imperviousness of 68.0%, which considered Windermere Filing No. 2 (Windermere Filing No. 1 – Tract B) as potentially higher density than single-family residential. As part of the Windermere Filing 1 overlot grading, the pond was excavated to full volume and the outlet structure and associated piping installed. An interim orifice plate (assuming full developed condition within the street right-of-way, but no further development) was installed to allow for appropriate WQCV drain time. The orifice plate will need to be switched out to allow for discharge of the developed flows, and the restrictor plate raised to 7.80" above the invert of the 18" outfall pipe. No other portion of the detention facility will need to be modified.

Based on the analysis in this report, the developed condition encompasses a total of 12.79 acres that is tributary to this existing facility, with a composite imperviousness of 54.9% for the final fully developed condition. Required volumes are listed below.

		Required Volume		
	Imperviousness	**WQCV**	**EURV**	**100-YR**
FINAL	54.9%	0.24	0.83	1.29

The actual pond volume at the proposed spillway stage is 1.15 acre-feet. A concrete forebay with an energy dissipater has been installed where the flows enter the pond. The volume of the forebay was designed for 3% of the WQCV volume for the pond, as is still within that limit for this final design condition. The flows exit the forebay through a notch, discharging into the concrete trickle channel at the bottom of the pond. The trickle channel conveys the flows to the micropool. The outlet structure then releases the flows at a reduced flow rate with the use of a plate with orifice holes, into a proposed 18" pipe with restrictor plate, discharging into an existing storm inlet at the corner of N. Carefree Circle and Marksheffel Rd, after which the flows continue to the south via the existing storm sewer system.

In accordance with El Paso County criteria, the modified Type C outlet structure with a permanent micropool will release the WQCV over a 40-hour period. Switching out of the orifice plate will ensure that the WQCV release rate remains within criteria for the final developed condition. The outlet structure will remain in place for the final condition and will result in release rates of Q_5=0.3 cfs and Q_{100}=10.6 cfs. For comparison, the existing basin EX-A released flow rates of Q_5=11.3 cfs and Q_{100}=28.2 cfs.

A 27-ft wide riprap emergency spillway is located on the south side of the pond. In the event that water overtops the spillway, flow will discharge into existing area inlet at the intersection of N. Carefree Cir and Marksheffel Rd, where it is then picked up by the existing storm system.

All detention facility calculations, including excerpts for forebay volumes, micropool surface areas, outlet structures, discharge pipes and spillway design are provided in the appendix.

The pond has a 15' wide maintenance access that provides access to the pond bottom, forebay and outlet structure per ECM 3.3.3.K. A private maintenance agreement and O&M manual has been established for this pond as required by the County.

8.0 FOUR-STEP PROCESS

This project conforms to the City of Colorado Springs/El Paso County Four Step Process. The process focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

1. ***Employ Runoff Reduction Practices:*** Proposed impervious areas on this site (roofs, asphalt/sidewalk) will sheet flow across landscaped ground as much as possible to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets and storm sewer system. This will minimize directly connected impervious areas within the project site.

2. ***Implement BMP's that provide a Water Quality Capture Volume with slow release:*** Runoff from this project will be treated through capture and slow release of the WQCV in apermanent Extended Detention Basin designed per current City of El Paso County drainage criteria.

3. ***Stabilize Drainage Ways:*** Flows from the detention facility are released directly into the existing storm sewer system and no stabilization will be necessary.

4. ***Implement Site Specific and Other Source Control BMP's:*** The site is proposed as a residential development, and as such standard household source control will be utilized in order to minimize potential pollutants entering the storm system. Example source control measures consist of: garages for storage of household chemicals, trash receptacles for individual households and in common areas for pet waste. The need for Industrial and Commercial BMP's was considered, however per ECM I.7.2.A the need for industrial and commercial BMPs are not applicable for this project.

9.0 GEOTECHNICAL HAZARDS

In accordance with geotechnical recommendations, the project design is intended to direct runoff away from structures, and into the receiving storm sewer system and water quality/detention basins. This will be accomplished by a variety of means, i.e. curb and gutter and storm sewer. Per "Soils and Geology Study, Windermere Subdivision" by RMG, October 26, 2020 (Revised January 18, 2021), and updated with an addendum for Tract B (March 30, 2022)

10.0 FACILITY MAINTENANCE

Ownership and maintenance of all public facilities, generally located within the public

right-of-way will be by El Paso County. Ownership and maintenance of all tracts and private facilities will be by the Sands Metropolitan District #4.

11.0 CONSTRUCTION COST ESTIMATE

Construction cost estimate will be provided with the Final Drainage Report.

12.0 DRAINAGE/BRIDGE FEES

Tract B was considered as an open space tract for the drainage fee calculation for Windermere Filing No. 1. Development of this tract will require payment of drainage and bridge fees associated with the proposed impervious acreage. This will be determined with the Final Drainage Report for this development as site imperviousness is confirmed.

13.0 CONCLUSIONS

The Windermere Filing No. 2 project has been designed in accordance with El Paso County criteria. The detention facility has been designed to limit the release of storm runoff to historic conditions. This development will not negatively impact or increase flows in the downstream facilities.

14.0 REFERENCES

The sources of information used in the development of this study are listed below:

1. City of Colorado Springs "Drainage Criteria Manual", 2016.

2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised October 2019.

3. Soil Survey for Colorado Springs and El Paso County, Colorado, U.S. Department of Agriculture, Soil Conservation Service, June 1980.

4. "Flood Insurance Studies for Colorado Springs and El Paso County, Colorado", prepared by the Federal Emergency Management Agency (FEMA), 2018.

5. "Soils and Geology Study, Windermere Subdivision", prepared by RMG, October 26, 2020, Revised January 18, 2021.

6. "Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1," prepared by Classic Consulting Engineers & Surveyors, October 2014.

7. "Final Drainage Report Marksheffel Road from Constitution Ave. to Dublin Rd.," by CH2M Hill, dated May 2008 and Marksheffel Road Construction Drawings by Wilson & Company.

8. "Final Drainage Report for Windermere Filing No. 1" prepared by Drexel, Barrell & Co., March 8, 2022.

Please include all hydrology, hydraulic, pond calculations. This drainage report cannot be fully reviewed without calculations and map. Additional comments may be added once calculations and map are provided.

APPENDIX

Please include all maps: soil map, FEMA map, vicinity map, drainage maps.