Drainage Report
Presented at
Planning & Zoning
Commission

March 23, 2023

AMENDED
OVERALL DRAINAGE REPORT

FOR

Ziegler–Corbett

Prepared by:
Highland Development Services
6355 Fairgrounds Ave, Suite 100
Windsor, Colorado 80550
Phone: 970.674.7550

Prepared for:
Landmark Real Estate Holdings, LLC
6341 Fairgrounds Ave, Suite 100
Windsor, Colorado 80550
Office: 970.460.0567

November 11, 2022

Job Number 21-1044-00

HIGHLAND
DEVELOPMENT SERVICES

November 11, 2022

Mr. Wes Lamarque
Fort Collins Utilities
700 Wood Street
Fort Collins, CO 80522

RE: Amended Overall Drainage Report - Ziegler-Corbett

Dear Wes,

We are pleased to submit for your review, the Overall Drainage Report for the Ziegler – Corbett Overall Development Plan. This report is amended to include the Young Property (described herein as *Parcel 3*) and describes the general drainage design intent to be implemented with future development and in accordance with the criteria in the City of Fort Collins Storm Drainage Manual.

I appreciate your time and consideration in reviewing this submittal. Please call if you have any questions.

Sincerely,
Highland Development Services

Jason T. Claeys, P.E., LEED AP

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ENGINEER'S CERTIFICATION BLOCK

I hereby certify that this Overall Drainage Report for Ziegler-Corbett was prepared by me (or under my direct supervision) for the owners thereof and meets or exceeds the criteria of the City of Fort Collins Stormwater Design Standards.

_____

Jason T. Claeys, PE
Registered Professional Engineer
State of Colorado No. 42122

GENERAL DESCRIPTION AND LOCATION

SITE DESCRIPTION AND LOCATION

The Ziegler-Corbett property is located in the Southeast Quarter of Section32, Township 7 North, Range 68 West of the Sixth Principal Meridian, City of Fort Collins, County of Larimer, State of Colorado. More specifically, the Ziegler-Corbett property is located north of the Front Range Village commercial area, east of the Affinity residences, south of the English Ranch residential subdivision, and west of Ziegler Road.

The project site is approximately 32.78 acres currently and is undeveloped agricultural and rural residential land, with one residence and multiple outbuildings. The site appears to be mostly vegetated with grass harvested for livestock feed. The site generally slopes from the west to the east at about 0.7% slope.

The intent of the Amended Overall Development Plan (ODP) is to update the existing ODP with the anticipated uses and the inclusion of *Parcel 3*. No improvements are being constructed with the ODP, but rather establishing future expectations for development. The property is anticipated to be a high-density multi-use development, mainly multi-family residential with retail space and supporting amenities.

The Ziegler-Corbett property is located within the City's Fox Meadows Drainage Basin. In addition to the City of Fort Collins Stormwater Design Standards, drainage requirements are also described in both the "Front Range Village Final Drainage and Erosion Control Study," prepared by Stantec Consulting Inc., dated February 2007, and the "Final Drainage Report for Affinity Fort Collins", prepared by JR Engineering, LLC, dated March 2, 2016.

No City or FEMA floodplains/floodways are located within the Ziegler-Corbett property.

STORM DRAINAGE CRITERIA

This Overall Drainage Report was prepared to establish future design expectations that meet or exceed the City of Fort Collins storm water criteria. The City of Fort Collin's Storm Drainage Design Criteria and amendments to the Urban Drainage Flood Control District's (UDFCD) Drainage Criteria Manual (USDCM) Volumes 1, 2 and 3 were referenced as guidelines for this design.

EXISTING CONDITIONS

The Ziegler – Corbett property overall is a part of a drainage basin that is situated north of Harmony Road, and west of Ziegler Road, which runoff is conveyed east under Ziegler Road into the existing drainage channel on the HP Harmony Campus property. It has been determined in the *Front Range Village Final Drainage Report* that this area is allowed to contribute 76.7 cfs to the HP Campus drainage channel during 100-year event peak discharge. More specific to this site, 20.1 cfs release rate was allocated to the Ziegler-Corbett & the Affinity Fort Collins properties. Per *The Final Drainage Report for Affinity Fort Collins*, the Affinity site has a 100-yr peak release rate of 2.1 cfs, allowing a 100-yr peak discharge of 18.0 cfs from the Ziegler – Corbet property.

The Harmony Village Manufactured Home Community does not provide adequate detention facilities and during a 100-yr storm event, a portion of the site that flows to the east into both the Front Range Village development as well as the Affinity Fort Collins site. This runoff was evaluated in the *Front Range Village Final Drainage Report* and was determined to be 116 cfs peak runoff during the 100-yr event. This runoff is to be collected in the Front Range Village Detention Pond D, which is intended to collect, but not detain this flow. During the 100-year event, this peak flow of 116 cfs will flow over the weir on the north side of Detention Pond D and will be conveyed via the private drive aisles to a level spreading weir on the northeast side of the Affinity Fort Collins site, where it is discharged into the Ziegler-Corbett property. This flow is then assumed to sheet flow east to be inadvertently detained on the east side of the Ziegler-Corbett property along Ziegler Road.

In reference to the *Front Range Village Final Drainage Report*, a future detention pond is planned to be incorporated into the Ziegler-Corbett site, Detention Pond 298. The volume of Detention Pond 298 will be determined by the lesser of the two following scenarios:

1. Standard detention volume required for the site, detaining the 100-yr peak developed runoff to the 2-yr historic runoff rate, plus the existing inadvertent detention volume,

the detention volume currently provided onsite due to existing constraints such as grade features and outlet restrictions, or

2. The volume required to detain the combination of 100-yr peak runoff rates from the developed onsite and existing offsite flows to the allocated release rate of 20.1 cfs.

For the purposes of this report, it is assumed that scenario 1 is the lesser of the two. Future detention volume calculations should confirm this assumption.

Based on the topographic survey of the existing conditions, the inadvertent detention volume is constrained for this site by the spill location along the north property line, at an approximate elevation of 4928.0 ft. The inadvertent detention volume is estimated to be 7.5± acre-ft. The estimated volume did not account for the 2 existing culverts along the west side of Ziegler Road that currently provide ponding relief for the Ziegler-Corbet site.

The FAA Method was utilized to estimate the required detention for the developed conditions in accordance with the City of Fort Collins requirements (the 100-year developed peak runoff detained to the 2-year historical peak runoff) to be 8.8± acre-ft. Combining the inadvertent detention and the required detention volume, a total of 16.3± acre-ft is required to accommodate the developed site, as well as account for the displacement of the historical inadvertent detention.

All supporting preliminary calculations are located in the Appendix.

DRAINAGE BASINS

The Ziegler-Corbett property conceptual developed drainage basins, percent impervious, and flow paths are to be determined with future applications. For the purposes of this study, it is assumed the site is approximately 90% impervious for high-density mixed-use sites and the corresponding runoff coefficient. Historical drainage analysis was completed for the Ziegler-Corbett property to determine the allowed 2-yr historic runoff rate.

DRAINAGE FACILITY DESIGN

DRAINAGE CONVEYANCE DESIGN

Storm infrastructure to convey runoff will potentially include overland grass-lined swales, concrete trickle pans, inlets, storm sewer and culverts. Stormwater detention and water quality enhancement will be achieved through the use of a series of extended detention basins and low impact development techniques. Storm inlets, storm sewers and the roadway culverts will be appropriately sized with the final drainage design

DETENTION/WATER QUALITY POND DESIGN

Multiple extended detention basins (EDB) with a dry bottom will be utilized as the detention and water quality facility for the Ziegler-Corbett property. The EDBs will combine to provide an estimated detention volume of 16.3± acre-ft, accounting for the existing inadvertent detention on the site, as well as the additional detention required to accommodate the site in its developed condition. Detention volume calculations are to be confirmed with future applications. For the overall drainage study, the FAA method was used to estimate the detention volume needed. EPA SWWM or the Rational Method may be utilized for the final drainage design, as determined by the City. UDFCD is referenced for the water quality capture volume (WQCV) with a 40-yr drain time. Due to the limited grades on the site, multiple ponds are proposed throughout the site with the main detention pond being located in the northwest corner of the site. The ultimate outfall will be the existing HP Harmony Campus storm channel system, which ultimately flows into the Cache La Poudre River.

Reference the appendix for estimated calculations and the drainage plan.

LOW IMPACT DEVELOPMENT

The City of Fort Collins updated the Low Impact Development ordinance in 2016 (Ordinance No. 007, 2016) to require:

- Treat at least 75% of any newly developed or redeveloped impervious area using one or a combination of LID techniques, or
- Treat at least 50% of any newly developed or redeveloped impervious area using one or a combination of LID techniques when 25% of private drivable surfaces are permeable.

To satisfy the required implementation of Low Impact Development (LID) techniques, the Ziegler-Corbett property could utilize below grade infiltration galleries (such as ADS StormTech chamber system), bioretention ponds/rain gardens, and/or permeable pavers. Other LID techniques will be explored, but due to the limited grade available and the amount of detention volume required, shallow infiltration galleries may assist in maintaining storm drain grades and detention volumes. Infiltration galleries, rain gardens, and permeable pavers can promote infiltration while capturing fine sediment that drains off the impervious areas. Isolator rows can be implemented at the headworks to the infiltration galleries to allow larger sediment particles to settle prior to entering the infiltration gallery. The isolator rows will be accessible to remove sediments. Standard water quality is also provided, as needed, within the detention ponds in addition to these LID infiltration galleries. A Standard Operations Procedure will be provided at final design to assist in ensuring that these BMPs will adequately perform over time.

Below is a description of the 4-step process for selecting structural BMPs:

Urban Drainage and Flood Control District (UDFCD) recommends a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways and implementing long-term source controls. The Four Step Process applies to the management of smaller, frequently occurring events.

Step 1: Employ Runoff Reduction Practices

To reduce runoff peaks, volumes, and pollutant loads from urbanizing areas, implement Low Impact Development (LID) strategies, including Minimizing Directly Connected Impervious Areas (MDCIA).

Captured runoff from strategic areas are routed through below grade infiltration galleries, bioretention pond/rain gardens, and/or permeable pavers. Infiltration galleries, rain gardens,

and permeable pavers will slow runoff, promote infiltration, and filter runoff prior to being released into the adjacent storm drain system.

Step 2: Implement BMPs that Provide a Water Quality Capture Volume with Slow Release

The infiltration galleries, rain gardens, and permeable pavers are designed to provide water quality capture volume per Urban Drainage's recommendations and calculations. The captured runoff is design for a 12-hr drain time.

Step 3: Stabilize Drainageways

Natural Drainageways are subject to bed and bank erosion due to increases in frequency, duration, rate, and volume of runoff during and following development. Because the site will drain to an existing storm system, bank stabilization is unnecessary with this project.

Step 4: Implement Site Specific and Other Source Control BMPs

Proactively controlling pollutants at their source by preventing pollution rather than removing contaminants once they have entered the stormwater system or receiving waters is important when protecting storm systems and receiving waters. This can be accomplished through site specific needs such as construction site runoff control, post-construction runoff control and pollution prevention / good housekeeping. It will be the responsibility of the contractor to develop a procedural best management practice for the site.

STORMWATER POLLUTION PREVENTION

Erosion and sedimentation can be controlled on-site by use of sediment control logs, inlet protection, a gravel construction entrance, seeding, mulch, and turf. The measures are designed to limit the overall sediment yield increase due to construction as required by the City of Fort Collins. During overlot and final grading the soil will be roughened and furrowed perpendicular to the prevailing winds.

During the performance of the work required by these specifications or any operations appurtenant thereto, whether on right-of-way provided by the City or elsewhere, the contractor shall furnish all labor, equipment, materials, and means required. The Contractor shall conduct proper efficient measures wherever and as necessary to reduce dust nuisance, and to prevent dust nuisance that has originated from his operations from damaging crops, orchards, cultivated fields, and dwellings, or causing naissance to persons. The Contractor will be held liable for any damage resulting from dust originating from his operations under these specifications on right-of-way or elsewhere.

It is unlawful to track or cause to be tracked mud or other debris onto city streets or rights-of-way. Wherever construction vehicles access routes or intersect paved public roads, previsions must be made to minimize the transport of sediment by runoff or vehicles tracking onto the paved surface. Stabilized construction entrances are required with base material consisting of 6” coarse aggregate. The contractor will be responsible for clearing mud tracked onto city streets on a daily basis.

All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure continued performance of their intended function. Silt fence and sediment control logs will require periodic replacement. Maintenance is the responsibility of the contractor.

All disturbed areas must be seeded and mulched within 30 days of project start. Vegetation shall not be considered established until a ground cover is achieved which is demonstrated to be mature enough to control soil erosion to the satisfaction of the City Inspector and to survive severe weather conditions.

CONCLUSIONS

This Overall Drainage Report for the Ziegler-Corbett property has been prepared to comply with the stormwater criteria set by the City of Fort Collins. The proposed development's drainage system will be designed to convey the developed peak storm water runoff through the site to the existing storm drain system and to the development's detention, water quality, and LID facilities. Storm drains will be sized to provide the required roadway relief in both the 2-yr and 100-yr storm events, and to adequately convey the released runoff from the detention ponds disbursed throughout the site. Overland relief will be provided at all sump locations. The calculated 100-yr peak flows released from the Ziegler-Corbett property will adhere to the allowed rates as established in the *Front Range Village* & *Affinity Fort Collins* drainage studies. This overall drainage report anticipates the implementation of best management practices for erosion control, temporary and permanent, and on-site construction facilities that will be further designed and details in future Preliminary and Final Drainage Reports.

It can therefore be concluded that future development of the Ziegler-Corbett property will comply with the storm water jurisdictional criteria and will not adversely affect the adjacent properties, streets, storm drain system and/or detention/water quality facilities. Controlling the developed runoff from these improvements will improve the current situations currently existing on the site. Therefore, this preliminary report satisfies the burden of proof needed to proceed to a future Preliminary & Final Drainage Reports.

REFERENCES

1. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3), Urban Drainage and Flood Control District, Revised August 2018.

2. Fort Collins Stormwater Criteria Manual, Fort Collins Utilities, City of Fort Collins, Colorado, Dated November 2018

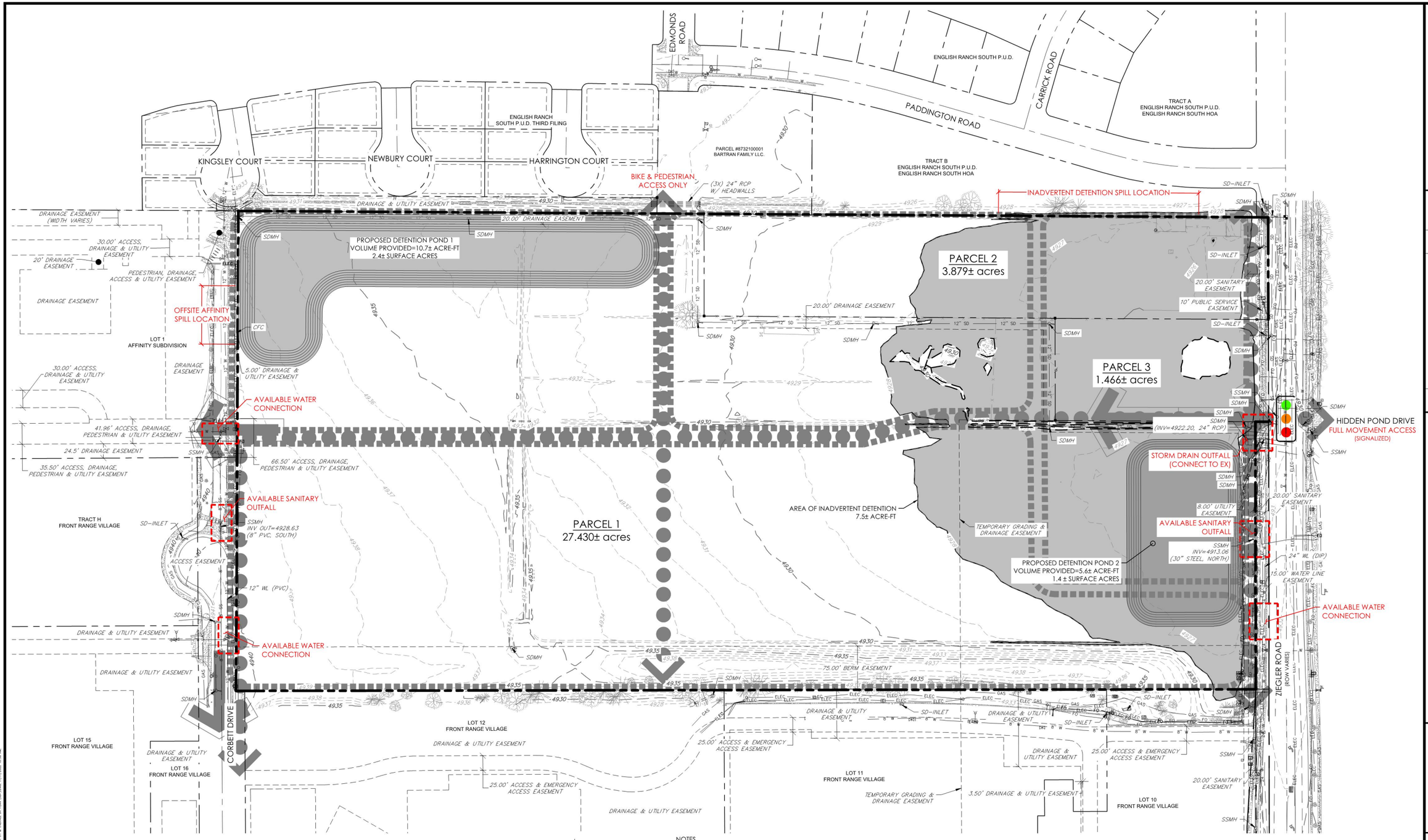
3. "Final Drainage Report for Affinity Fort Collins," prepared by JR Engineering, LLC, Dated March 2, 2016.

4. "Final Drainage and Erosion Control Study for Front Range Village, Fort Collins, Colorado," Prepared by Stantec Consulting, Inc., dated February 2007.

APPENDIX

Appendix A – References

APPENDIX A – REFERENCES



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W E
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80 40 0 80 160

SCALE: 1" = 80'

NOTES

1. TOTAL SITE AREA IS 32.78± ACRES.
2. BOUNDARY, UTILITY AND TOPOGRAPHICAL INFORMATION PROVIDED BY ALTA LAND TITLE SURVEY PREPARED BY MAJESTIC SURVEYING, DATED 9-24-21.
3. PROJECT VERTICAL DATUM IS ON NAVD88.
4. WATER SERVICE TO BE PROVIDED BY THE CITY OF FORT COLLINS UTILIZING MAIN WITHIN CORBETT DRIVE AND ZIEGLER ROAD.
5. SEWER SERVICE TO BE PROVIDED BY THE CITY OF FORT COLLINS UTILIZING 30" MAIN ALONG THE WEST SIDE OF ZIEGLER ROAD AND/OR THE 8" MAIN ALONG EAST SIDE OF CORBETT DRIVE.
6. STORMWATER OUTFALL PROVIDED BY THE EXISTING 24" STORM DRAIN STUB, IN COMBINATION WITH ADEQUATELY SIZED SPILLWAYS.
7. ALL POINTS OF ACCESS, POINTS OF UTILITY CONNECTIONS, AND STORMWATER DETENTION LOCATIONS ARE CONCEPTUAL AND ARE SUBJECT TO CHANGE WITH SUBSEQUENT PROJECT DEVELOPMENT APPLICATIONS.

HIGHLAND
DEVELOPMENT SERVICES
6355 FAIRGROUNDS AVENUE, SUITE 100 | WINDSOR, CO 80550
PHONE: 970.674.4500 | EMAIL: info@highlandsdc.com | www.highlandsdc.com

NO.	REVISION	BY	DATE

ZIEGLER-CORBETT

AMENDED OVERALL DEVELOPMENT PLAN
MASTER UTILITY & OVERALL DRAINAGE PLAN

PREPARED BY OR UNDER THE DIRECT SUPERVISION OF:

FOR AND ON BEHALF OF HIGHLAND DEVELOPMENT SERVICES

DATE	11/11/22
SCALE (H)	1" = 80'
SCALE (V)	N/A
DRAWN BY	JTC
CHECKED BY	JTC
HDS PROJECT #	21-1044-00

ODP

SHEET 1 OF 1

Ziegler-Corbett

Inadvertent Detention Volume

Design Engineer:	J.Claeys
Design Firm:	Highland Development
Project Number:	21-1044-00
Date:	November 9, 2022

DESIGN CRITERIA

Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, Revised August 2018

Stage Storage

Volume (pond volume calculated using the prismoidal formula):

$$V = \frac{\left(A_1 + A_2 + \sqrt{A_1 A_2}\right) Depth}{3}$$

CONTOUR (FT)	AREA (FT^2)	AREA (ACRE)	VOLUME (ACRE-FT)	DEPTH (FT)	CUMULATIVE VOLUME (ACRE-FT)
4925.00	0	0.00	0.00	0.00	0.00
4926.00	3144	0.07	0.02	1.00	0.02
4927.00	164156	3.77	1.45	2.00	1.48
4928.00	377427	8.66	6.05	3.00	**7.53**

*Inadvertant spill elevation = 4928.00 ft

Ziegler-Corbett

EXISTING IMPERVIOUS AREA CALCULATION

Design Engineer: J.Claeys
Design Firm: Highland Development Services
Project Number: 21-1044-00
Date: November 11, 2022

DESIGN CRITERIA:

Fort Collins Stormwater Criteria Manual, December 2018

BASINS:

% Impervious values from Table RO-11 in the Fort Collins Amendments to the Urban Drainage and Flood Control District Criteria Manual
Runoff Coefficients and Frequency Adjustment Factors for City of Fort Collins - Storm Water Criteria Manual

Land Use	% Impervious	Runoff Coefficient C
Paved	100%	0.95
Roof	90%	0.95
Walks/RAP	90%	0.95
Gravel/Pavers	40%	0.50
Lawns (Clayey Soil)	2%	0.20

Return Period	Frequency Adjustment Factor (C_f)
2-year to 10-year	1.00
100-year	1.25

Sub-basin Designation	A_{total} (sq feet)	A_{total} (acres)	A_{paved} (sq feet)	A_{roof} (sq feet)	$A_{walk/RAP}$ (sq feet)	$A_{gravel/pavers}$ (sq feet)	A_{lawn} (sq feet)	Weighted % Impervious	COMPOSITE	
									C_2 to C_{10}	C_{100}
H1	1,427,720	32.78	3,427	9,737	6,176	39,454	1,368,926	**4.3%**	**0.22**	**0.27**

Ziegler-Corbett

HISTORIC TIME OF CONCENTRATION

Design Engineer: J.Claeys
Design Firm: Highland Development
Project Number: 21-1044-00
Date: November 11, 2022

DESIGN CRITERIA:

Fort Collins Stormwater Criteria Manual, December 2018

EQUATIONS:

$$t_c = t_i + t_t$$ -Equation 6-2

$$V = C_v S_w^{0.5}$$ -Equation 6-4

$$t_c = (18 - 15i) + \frac{L}{60(24i + 12)\sqrt{S}}$$ -Urbanized Check Equation 6-5

$$t_i = \frac{1.87(1.1 - C_x C_f)\sqrt{L}}{\sqrt[3]{S}}$$ - CoFC Overland Flow

$$t_t = \frac{L}{60V}$$

CONSTRAINTS:

300 ft - Overland flow shall not exceed for developed condition
500 ft - Overland flow shall not exceed for undeveloped condition

Final t_c = minimum of $t_i + t_t$ and urbanized basin check
recommended minimum t_c = 5 min for urbanized basins

Time of Concentration (2-yr to 10-yr)

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)						$t_c=t_i+t_t$ (min)	Urban Check		Final t_c (min)
DESIGN POINT	Sub-basin	% Impervious	C_{2-10}	AREA (acres)	LENGTH (ft)	SLOPE (ft/ft)	t_i (min)	LENGTH (ft)	SLOPE (ft/ft)	Table RO-2 Type of Travel Surface	Table RO-2 C_v	VELOCITY (ft/s)	t_t (min)		OVERALL SLOPE (ft/ft)	t_c (min)	
H1	H1	4.3%	0.22	32.78	500	0.0074	40.75	1453	0.0074	Tilage/Field	5	0.43	56.30	97.06	0.0074	46.41	**46.41**

Ziegler-Corbett

HISTORIC TIME OF CONCENTRATION

Design Engineer: J.Claeys
Design Firm: Highland Development
Project Number: 21-1044-00
Date: November 11, 2022

DESIGN CRITERIA:

Fort Collins Stormwater Criteria Manual, December 2018

EQUATIONS:

$t_c = t_i + t_t$ -Equation 6-2

$V = C_v S_w^{0.5}$ -Equation 6-4

$t_c = (18 - 15i) + \frac{L}{60(24i + 12)\sqrt{S}}$ -Urbanized Check Equation 6-5

$t_i = \frac{1.87(1.1 - C_x C_f)\sqrt{L}}{\sqrt[3]{S}}$ - CoFC Overland Flow

$t_t = \frac{L}{60V}$

CONSTRAINTS:

300 ft - Overland flow shall not exceed for developed condition
500 ft - Overland flow shall not exceed for undeveloped condition

Final t_c = minimum of $t_i + t_t$ and urbanized basin check
recommended minimum t_c = 5 min for urbanized basins

Time of Concentration (100-yr)

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)						$t_c=t_i+t_t$ (min)	Urban Check		Final t_c (min)
DESIGN POINT	Sub-basin	% Impervious	C_{100}	AREA (acres)	LENGTH (ft)	SLOPE (ft/ft)	t_i (min)	LENGTH (ft)	SLOPE (ft/ft)	Table RO-2 Type of Travel Surface	Table RO-2 C_v	VELOCITY (ft/s)	t_t (min)		OVERALL SLOPE (ft/ft)	t_c (min)	
H1	H1	4.3%	0.27	32.776	500	0.0074	38.23	1453	0.0074	Tilage/Field	5	0.43	56.30	94.53	0.0074	46.41	**46.41**

Ziegler-Corbett

HISTORIC PEAK RUNOFF

Design Engineer: J.Claeys
Design Firm: Highland Development Services
Project Number: 21-1044-00
Date: November 11, 2022

DESIGN CRITERIA:

Fort Collins Stormwater Criteria Manual, December 2018

EQUATIONS:

$$Q_n = C_n I_n A_n$$

Q_n = n-yr peak discharge (cfs)
C_n = n-yr runoff coefficient
I_n = n-yr rainfall intensity (in/hr)
A_n = Basin drainage area (ac)

$$I = \frac{28.5 P_1}{(10 + t_c)^{(0.786651)}}$$

I = rainfall intensity (in/hr)
P_1 = one-hour point rainfall depth (in)
t_c = time of concentration (min)
$P_{1\text{-}2yr}$ = **0.82** in
$P_{1\text{-}100yr}$ = **2.86** in

BASIN SUMMARY:

Design Point	Sub-basin	Area (acres)	2-yr Peak Runoff					100-yr Peak Runoff				
			t_c (min)	Runoff Coeff (C_5)	C(A) (acres)	Intensity (in/hr)	Q (ft^3/s)	t_c (min)	Runoff Coeff. (C_{100})	C(A) (acres)	Intensity (in/hr)	Q (ft^3/s)
H1	H1	32.78	46.41	0.22	7.16	0.98	**7.01**	46.41	0.27	8.95	3.42	**30.57**

Ziegler-Corbett
100-yr Detention Volume - FAA Method

Design Engineer: J.Claeys
Design Firm: Highland Development Services
Project Number: 21-1044-00
Date: November 11, 2022

DESIGN CRITERIA

Fort Collins Stormwater Criteria Manual, December 2018

Developed Detention Volume Calculation

Runoff Coefficient (C)	0.85	
Frequency Factor (C_f)	1.25	
Adjusted Runoff Coefficient (CC_f)	1.00	
Area (A)	32.78	acres
Allowed Release Rate	7.01	cfs

Required Detention	
ft^3	acre-ft
383,731	**8.81**

Time (min)	100-yr Intensity (I, in/hr)	Q_{100} (cfs)	Accumulative Runoff Volume (ft^3)	Release Volume (ft^3)	Detained Volume (ft^3)	Detained Volume (acre-ft)
0	0.00	0.00	0	0	0	0.00
5	9.95	326.11	97,833	2,103	95,730	2.20
10	7.72	253.02	151,814	4,206	147,608	3.39
15	6.52	213.69	192,324	6,309	186,015	4.27
20	5.60	183.54	220,248	8,412	211,836	4.86
25	4.98	163.22	244,829	10,515	234,314	5.38
30	4.52	148.14	266,657	12,618	254,039	5.83
35	4.08	133.72	280,816	14,721	266,095	6.11
40	3.74	122.58	294,188	16,824	277,364	6.37
45	3.46	113.40	306,184	18,927	287,257	6.59
50	3.23	105.86	317,590	21,030	296,560	6.81
55	3.03	99.31	327,717	23,133	304,584	6.99
60	2.86	93.74	337,451	25,236	312,215	7.17
65	2.72	89.15	347,677	27,339	320,338	7.35
70	2.59	84.89	356,526	29,442	327,084	7.51
75	2.48	81.28	365,769	31,545	334,224	7.67
80	2.38	78.00	374,422	33,648	340,774	7.82
85	2.29	75.05	382,779	35,751	347,028	7.97
90	2.21	72.43	391,137	37,854	353,283	8.11
95	2.13	69.81	397,921	39,957	357,964	8.22
100	2.06	67.52	405,099	42,060	363,039	8.33
105	2.00	65.55	412,965	44,163	368,802	8.47
110	1.94	63.58	419,651	46,266	373,385	8.57
115	1.89	61.94	427,419	48,369	379,050	8.70
120	1.84	60.31	434,203	50,472	**383,731**	**8.81**