HENDERSON CREEK MAJOR DRAINAGEWAY PLAN

BASELINE HYDROLOGY REPORT

June 2020

Project Sponsors:

Prepared by:

RESPEC

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July 22, 2020

Mr. David Skuodas
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Subject: Henderson Creek
Major Drainageway Plan
UDFCD Agreement No. 19-10.31

Dear Mr. Skuodas:

RESPEC Consulting & Services is pleased to submit this report entitled *Henderson Creek Major Drainageway Plan –Baseline Hydrology*, dated July 22, 2020. We would like to acknowledge the help and support in the preparation of this report that was furnished by Unincorporated Adams County and the City of Commerce City.

This hydrologic study lays out the foundation and design flows for the Henderson Creek Major Drainageway Plan. Peak flows are presented for Henderson Creek and its tributaries for the 2-, 5-, 10-, 25-, 50-, 100-year, and 500-year return periods for existing, future, and natural land use conditions. This study also provides a preliminary review of the proposed Reunion Village 9 and Turnberry South detention provided in the reports entitled, *Preliminary Drainage Report for Reunion Village 9,* prepared by JR Engineering, LLC, dated April 10, 2020, and the report entitled *Turnberry South Final Drainage Study,* prepared by CVL Consultants, dated November 2018.

Thank you for the opportunity to complete this phase of the project.

Best Regards,
RESPEC Consulting & Services

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Section to be completed in future submittals of the report.

LIST OF ABBREVIATIONS

CDOT	Colorado Department of Transportation
CFS	Cubic Feet per Second
CUHP	Colorado Urban Hydrograph Procedure
DEM	Digital Elevation Model
DFA	Direct Flow Area
DP	Design Point
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHAD	Flood Hazard Area Delineation
GIS	Geographic Information System
MDP	Major Drainageway Plan
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
OSP	Outfall Systems Plan
RMNA	Rocky Mountain National Arsenal
SWMM	Stormwater Management Model
USDA	United States Department of Agriculture
USDCM	Urban Storm Drainage Criteria Manual
USGS	United States Geological Survey
WSS	Web Soil Survey

1 INTRODUCTION

1.1 AUTHORIZATION

On November 11, 2019, the Mile High Flood District (MHFD) contracted with RESPEC Consulting & Services (RESPEC) to provide engineering services for a Major Drainageway Planning (MDP) Study for the Henderson Creek watershed (Agreement No. 19-10.31). The study is co-sponsored by MHFD, the City of Commerce City (Commerce City), and Unincorporated Adams County (Adams County) (Project Sponsors).

1.2 PURPOSE AND SCOPE

Several drainageway studies have been completed for varying portions of the Henderson Creek watershed. Located in between the larger, more thoroughly studied First and Second Creeks, Henderson Creek has not previously been studied independently of its adjacent watersheds. Peak flows established for areas throughout the watershed are outdated as the result of recent development. The objective of this study is to supply an up-to-date and complete major drainageway plan for the entire Henderson Creek watershed that considers the recent and upcoming future development. This study will serve as a planning document for the Project Sponsors as the watershed is further developed.

The MDP includes three phases: baseline hydrology, alternatives development, and conceptual design. The baseline hydrology was developed to combine multiple previous studies into one cohesive model and determine the peak flows for the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year return periods for the entire watershed. The baseline hydrology phase was completed in May 2020. The peak discharges were used to determine existing deficiencies within the watershed and then develop alternative solutions to those deficiencies. The final alternatives evaluation was completed in XXXX 2020. After alternatives were developed, a final alternative was selected, and a conceptual design was prepared for the final alternative. The final conceptual design was completed in XXXX 2020.

1.3 PLANNING PROCESS

The Project Sponsors reviewed the draft baseline hydrology and returned comments on June 12, 2020. A public meeting was held to discuss proposed alternatives on XXXX 2020. The Project Sponsors reviewed the draft conceptual design and returned comments on XXXX 2020. Project Sponsor representatives involved with this study are listed in Section 1.6 – Acknowledgments. Meeting minutes including sign-in sheets, and review comments and responses are included in Appendix A – Project Correspondence.

1.4 MAPPING AND SURVEYS

Color aerial photography provided by MHFD provides background/base mapping for the study maps. The photography was generated as part of the Denver Region Aerial Photography Project (DRAPP) by the Denver Region Council of Governments (DRCOG). Photographs are from spring 2016, meet 1" = 200' horizontal mapping standards, and have a resolution of 1 foot. The topography for the watershed was developed from the post-2013 flood digital elevation model (DEM) created by the Federal Emergency Management Agency (FEMA) October 16, 2013. All mapping is on the Colorado State Plane North Zone projection, horizontal North American Datum of 1983 (NAD83) and North American Vertical Datum of 1988 (NAVD88). See Section 8 – References for a complete list of digital data obtained for this study.

1.5 DATA COLLECTION

Previous studies for Henderson Creek have included the watershed as part of Direct Flow Area (DFA) 0053 located between the First Creek and Second Creek watersheds. Below is a list of former studies that have included the Henderson Creek watershed:

- *Second Creek, Third Creek, DFA 0053 & Barr Lake Drainage Basin Planning,* prepared by Kiowa Engineering Corporation, dated January 1989.
- *Second Creek (Downstream of DIA) and Direction Flow Area (DFA) 0053 Watersheds Outfall Systems Planning Study Update*, prepared by Kiowa Engineering Corporation, dated August 2004.

In addition to the above MDP studies, the following reports were also consulted when preparing this study:

- *Preliminary Drainage Report for Reunion Village 9,* prepared by JR Engineering, LLC, dated April 10, 2020.
- *Phase 1 Final Drainage Report for Reunion Village 9,* prepared by JR Engineering, LLC, dated April 10, 2020.
- *Turnberry South Final Drainage Study,* prepared by CVL Consultants, dated November 2018.

Data from several other sources was utilized during this study. Below is an abbreviated list of the types of information collected. A complete list of references is provided in Section 8 – References.

- Digital mapping files
- Digital geographic information systems (GIS) and computer-aided design (CAD) files that include storm sewer, drainageways, streets, zoning, and land use
- Effective Flood Insurance Rate Map (FIRM) and FIS data from FEMA
- Planning study PDF files from the Project Sponsors
- Various maps provided by Project Sponsors

1.6 ACKNOWLEDGEMENTS

RESPEC wishes to acknowledge the valuable contributions made by the following individuals in conducting this study:

Dave Skuodas	Mile High Flood District
Russell Nelson	Adams County
Brent Soderlin	Commerce City
Brad Piede	Denver Water
Jim Jannicke	CVL
James Hayes	Oakwood Land Co.
Joe Des Jardin	Proterra Properties
Andrea Vaughan	Jacobs
Aaron Clutter	JR Engineering

The following individuals from RESPEC contributed to this study:

Alan Leak	Principal
Jennifer Winters	Project Manager
Rachel Grafman	Project Engineer
William Lynn	Project Engineer
Andy Cross	Staff Engineer

Refer to Appendix A – Project Correspondence for more detailed information on meetings, attendance, and comment letters.

2 STUDY AREA

2.1 PROJECT AREA

The Henderson Creek watershed is a tributary area to the South Platte River with a total drainage area of 4.6 square miles located within Adams County, Colorado. Henderson Creek passes through Commerce City and Unincorporated Adams County. Ragweed Drain is the major tributary to Henderson Creek and passes through the northern border of the Rocky Mountain National Arsenal (RMNA), Commerce City, and unincorporated Adams County. Figure 2-1 – Project Area Map illustrates the Henderson Creek watershed, which roughly begins at the intersection of 96th Avenue and Chambers Road and ends at the confluence with the South Platte River at Henderson Road.

Henderson Creek watershed has a width that ranges from 1.5 miles at its widest point to approximately 0.25 mile at the thinnest point. The watershed generally drains to the northwest with the lowest and highest watershed elevations of 4,977 feet and 5,258 feet, respectively. The average slope of the main channel is approximately 0.01 feet/foot**.** The watershed's primary tributary is Ragweed Drain.

Henderson Creek, from its terminus at the South Platte River and moving upstream, crosses Brighton Road in Adams County between Henderson Road and East 120th Avenue. East of Brighton Road it passes through East 120th Avenue and under East 120th Parkway into cultivated farmland before crossing the Fulton Ditch and reaching US 85 and Havana Street. Upstream of US-85 Henderson Creek flows through Commerce City and heads southwest parallel to Havana Street in a roadside swale until crossing East 112th Avenue. Between East 112th Avenue and I-76 Henderson Creek flows south through cultivated farmland and crosses East 108th Avenue. After crossing I-76, Henderson Creek crosses under East 104th Avenue and the O'Brian canal then crosses Highway 2. East of Highway 2 Henderson Creek crosses Peoria and Potomac Streets before reaching the upstream study limit at East 96th Avenue.

Beginning at the confluence with Henderson Creek at Havana Street and moving upstream, Ragweed Drain passes through the River Run housing development and crosses East 112th Avenue, heading into the River Oaks housing development before crossing I-76. Upstream of I-76, Ragweed Drain crosses cultivated farmland before reaching the O'Brian canal and Highway 2. Between Highway 2 and East 104th Avenue it passes through the Turnberry housing development and a non-regional small detention pond. Upstream of East 104th Avenue, Ragweed Drain continues southeast towards Peoria and Potomac Streets across cultivated farmland before reaching the upstream study limit at East 96th Avenue and Chambers Street.

2.2 LAND USE

Existing land use in Henderson Creek varies across the watershed. From Chambers Street to Peoria Street, land is currently undeveloped grasslands. Undeveloped grasslands continue to be the most common land use between Peoria Street and I-76, with some commercial land use. Downstream of I-76, industrial and utility land use is present southwest of the intersection of Havana Street and E 108th Ave, but the area is predominantly agricultural farmland. At East 112th Avenue the land use transitions to single family homes before Henderson Creek and Ragweed Drain converge east of Havana Street and Highway 85. Downstream of Highway 85, the 160-acre Dunes Reservoir is the largest land use in the area leading up to East 120th Parkway, where single family homes and agricultural land are present. Between East 120th Parkway and Brighton Road, mixed land use including commercial land such as the Henderson post office, a high density residential manufactured housing community and some agricultural land can be found. Downstream of Brighton Road Henderson Creek passes through a small pond before discharging into the South Platte River.

Existing land use in the upper extents of the Ragweed Drain includes about 65 acres of the RMNA and 17 acres of the Fronterra Village development beginning at 96th Avenue and Chambers. To the northwest, the proposed Reunion 9 housing development will convert a majority of the open land between the Arsenal and 104th Avenue. Between 104th Avenue and Highway 2 the Turnberry development is comprised of a mix of commercial and residential use. Downstream of Highway 2 to I-76, the watershed is not currently developed, but the Aberdeen Crossing project will introduce housing in this area in the future. From I-76 to the confluence with the rest of Henderson Creek, Ragweed Drain passes through residential developments.

Plans for future land development within the Ragweed Drain are concentrated at the upstream portion of the basin. Major plans include the Reunion Village 9 and Aberdeen Crossing housing developments. Figure B-1 – Interactive Hydrology Map in Appendix B – Hydrologic Analysis illustrates both existing and future land uses throughout the watershed.

2.3 REACH DESCRIPTIONS

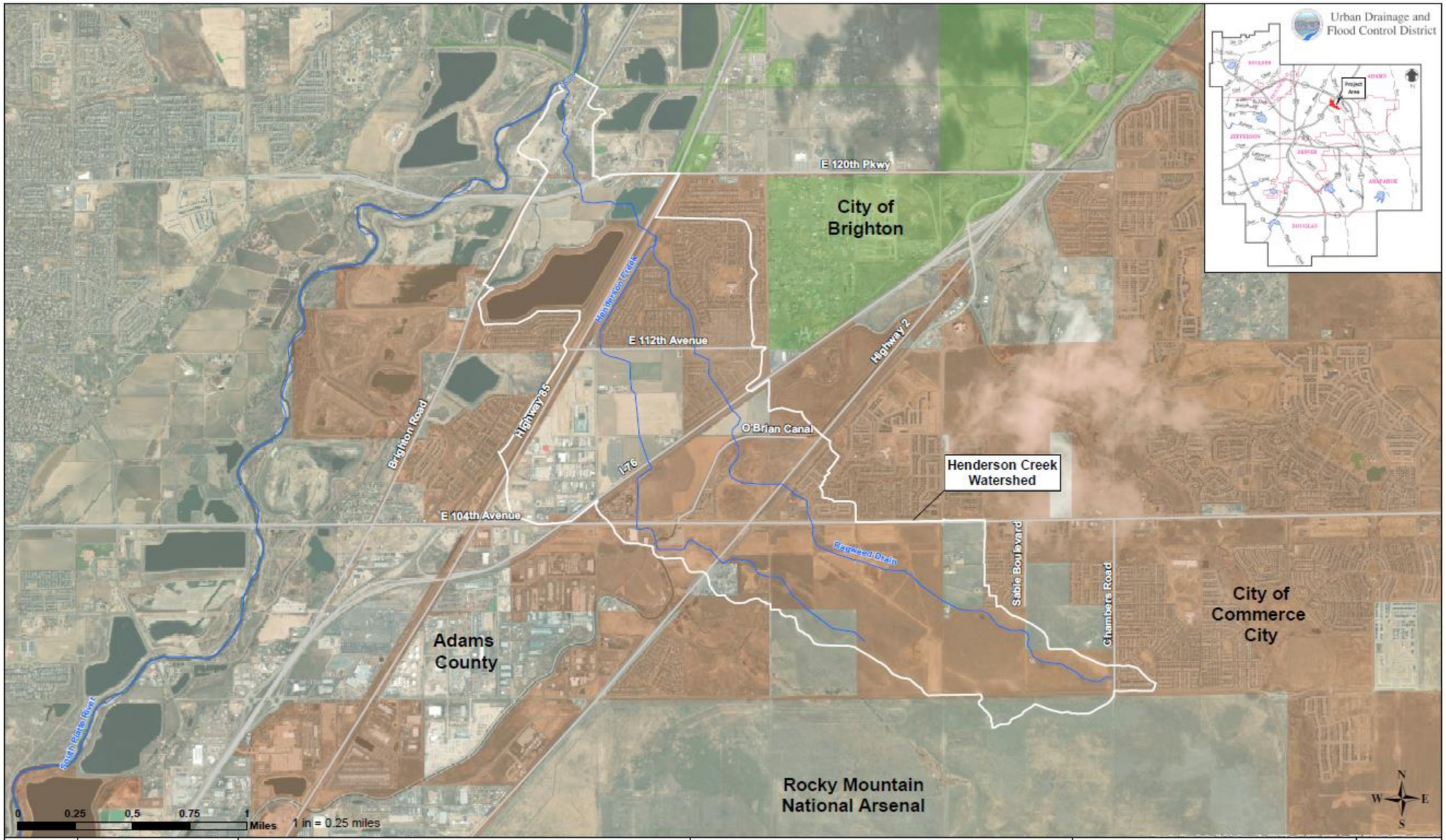
To be completed in future submittals of the report.

2.4 FLOOD HISTORY

To be completed in future submittals of the report.

2.5 ENVIRONMENTAL ASSESSMENT

To be completed in future submittals of the report.



RESPEC	720 S. Colorado Blvd. Suite 410 S Denver, CO 80246 (303) 757-3655 www.respec.com	Mile High Flood District, City of Commerce City and Adams County	Henderson Creek Major Drainageway Plan	Project Area Map July 2020	Figure 2-1

3 HYDROLOGIC ANALYSIS

3.1 OVERVIEW

The previous hydrologic models for Henderson Creek are outdated and were included as part of the larger Second Creek studies. Also, since the previous study, portions of the watershed have been developed with the remainder planned for development in the near future. Therefore, the intent of this study is to update the baseline hydrology for Henderson Creek and to create a stand-alone model and study.

The storm runoff hydrographs and routing for Henderson Creek were generated using the Colorado Urban Hydrograph Procedure (CUHP) 2005 (version 2.0.1, Release 10/31/2019) and the Environmental Protection Agency Stormwater Management Model (EPA SWMM) (version 5.1, Release 5.1.013). Peak discharges for the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year return periods were analyzed for the watershed. Three models were run for each return period: existing conditions, future conditions, and planned conditions. Descriptions of each scenario are as follows:

- **Natural Conditions:** Represents the peak flows within the watershed prior to development for the purposes of guiding proposed detention and other master planning efforts. The model was developed by assuming no existing detention within the watershed and an overall basin imperviousness of 2%.
- **Existing Conditions:** Represents the existing peak flows within the watershed.
- **Future Conditions:** Represents the future peak flows given the level of anticipated development that will occur within the watershed.

Detailed hydrologic input and output are described in the following sections. See Table B-2 in Appendix B – Hydrologic Analysis for the CUHP subcatchment characteristics used in this study.

3.2 DESIGN RAINFALL

The 1-hour rainfall depth for the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year return periods were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 8 – Midwestern States, Point Precipitation-Frequency Estimates for the centroid of the project area. The rainfall depths were input into CUHP to model the design storms. The point rainfall depths are shown in Table 3-1 and the CUHP storm hyetographs are available in Table B-6 in Appendix B – Hydrologic Analysis.

Table 3-1. Point Rainfall Depth (inches)

Return Period	1-hour
2-year	0.841
5-year	1.12
10-year	1.38
25-year	1.79
50-year	2.14
100-year	2.52
500-year	3.53

3.3 SUBCATCHMENT CHARACTERISTICS

3.3.1 Subcatchment Delineation

Subcatchment boundaries for Henderson Creek were delineated using one-foot contours developed from the 2016 Denver Regional Council of Governments (DRCOG) Denver Regional Aerial Photography Project (DRAPP). Preliminary boundary delineation was performed in ArcMap using the 2004 OSP subcatchments as a basis. Subcatchments were refined using existing land uses and updated topographic information. The overall watershed boundary was compared to the neighboring First Creek, Second Creek, and DFA 0053 watersheds prior to finalization to ensure contiguous boundaries.

A total of 49 subcatchments were delineated for the existing and future conditions found in Henderson Creek. The subcatchments range in size from 16.26 to 129.7 acres with a median drainage area size of 35 acres in Ragweed Drain and 9.19 to 163.7 acres with a median drainage area size of 51 acres in the remaining Henderson Creek watershed.

Four of the 2004 subcatchments (10, 18, 40, and 49) were updated in this study to incorporate drainage area that was once tributary to DFA 0053 that now flows to Henderson Creek as a result of development or updated contours. 2004 subcatchments 83 and 86 were removed from the Henderson Creek and subcatchments 74 and 85 were decreased in size compared to 2004 subcatchments after review of the 2016 DRAPP contours.

The subcatchment identification, area, and locations are displayed on Figure B-1 – Interactive Hydrology Map in Appendix B – Hydrologic Analysis.

3.3.2 Watershed Imperviousness

Current land use and zoning data was collected from Adams County and Commerce City and confirmed by reviewing aerial photography. Due to the extensive plans for future development in the upper watershed, land use and corresponding imperviousness values were created for both existing conditions and future conditions. The following is a list of land use sources:

- 2018 Second Creek MDP
- United States Geological Survey (USGS) National Land Cover Database (NLCD) Impervious Surface (30 meter, 2011)
- GIS and PDF municipal land use and zoning plans (See Figure B-2 in Appendix B – Future Land Use Maps)
    - Adams County *Future Land Use Map* (November 2012)
    - Commerce City *Future Land Use Plan* (September 2010)
- Proposed land development master plans and drainage reports
- Discussions with the Project Sponsors

The above sources were utilized to develop the existing and future land use maps. The foundation of the existing land use is the USGS NLCD Imperviousness (2016), which was tested by visual inspection using aerial imagery. The NLCD was updated to reflect a minimum imperviousness of 2%. This data was used in creating an area weighted average to determine the existing percent impervious in each subcatchment. A portion of the Turnberry housing development was not yet constructed and was not included in the 2016 NLCD data; therefore, the NLCD data was adjusted to reflect existing imperviousness values for the impacted subcatchments.

Future land use for the Henderson Creek watershed was calculated using future land use data provided by Commerce City and Adams County. To the extent possible, future impervious values were matched to those used in the Second Creek MDP to maintain consistency between the studies. RMNA as well as developed areas between East 104th Avenue and Highway 2, I-76 and Havana Street in Ragweed Drain and the industrial area southwest of the intersection of Havana Street and East 108th Avenue in Henderson Creek are completely built-out; therefore, existing and future land use in these areas were assumed to be identical. See Table B-2 in Appendix B – Hydrologic Analysis for the imperviousness values assigned to land use data collected from municipal plans. Polygons provided by Commerce City and Adams County provided the foundation of the calculations for future imperviousness values, but they contained voids for roadways. To create an area weighted average under future conditions, these polygons were combined with NLCD data that reflected the imperviousness of Highway 85, I-76, and other roads throughout Ragweed Drain and Henderson Creek. Impervious values for the upstream portion of Henderson Creek, near the proposed Turnberry South development, were determined by utilizing the *Turnberry South Final Drainage Study,* prepared by CVL Consultants, dated November 2018. To adjust for the difference in subcatchment sizes, weighted impervious averages were determined by area. See Table B-2 in Appendix B – Hydrologic Analysis for the future imperviousness values assigned to each subcatchment.

3.3.3 Soils Information

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) classifies soils into four hydrologic groups: A, B, C, and D. Type A soils have a low runoff potential, Type B soils have a moderate runoff potential, Type C soils have a moderately high runoff potential, and Type D soils have a high runoff potential.

Soil information was collected from the USDA NRCS Web Soil Survey (WSS), dated March 16, 2020.

The watershed shows some trends in the hydrologic soils group. Type A soils are primarily found downstream of Highway 2. Type B soils are predominately found upstream of Highway 2. Type C soils are dispersed in small areas throughout the watershed, with the largest concentration in the undeveloped land between Potomac Street and East 104th Avenue. Type D soils are only found in the lower portion of the Henderson Creek watershed.

Horton infiltration properties for the different hydrologic soil types are listed in Table 3-2. These values are in accordance with MHFD criteria, as referenced in the Runoff Chapter of the Urban Storm Drainage Criteria Manual (USDCM). The distribution of the soil types is shown on Figure B-1 – Interactive Hydrology Map in Appendix B – Hydrologic Analysis.

Table 3-2. Horton Infiltration Properties

NRCS Hydrologic Soil Group	Infiltration (inches per hour)		Decay Coefficient
	Initial	Final	
A	5.0	1.0	0.0007
B	4.5	0.6	0.0018
C	3.0	0.5	0.0018
D	3.0	0.5	0.0018

3.4 DETENTION

There is no regional detention currently within the Henderson Creek baseline hydrology model. There is an existing online pond located just upstream of Highway 2 along Ragweed Drain. However, the pond (known as “Pond B”) was not included in this study for two reasons: (1.) it was never intended to be a regional detention pond and (2.) it does not provide a significant reduction in peak flows for larger storm events.

3.5 HYDROGRAPH ROUTING

Subcatchment centroids, flow paths and length weighted slopes were calculated in ArcGIS using a Python script. These values were input into CUHP along with imperviousness and Horton's infiltration rates to create individual hydrographs for each subcatchment. The hydrographs were routed through the watershed using the EPA SWMM model.

The drainage network in this watershed is generally comprised of subcatchments with open channels. The EPA SWMM Schematic is included on Figure B-1 – Interactive Hydrology Map in Appendix B – Hydrologic Analysis. It illustrates where the subcatchments connect into the drainage system elements and how they are routed through the system.

The primary routing element within this model is open channel flow. Within EPA SWMM, the routing was defined according to channel shape, maximum depth, length, and roughness as estimated by contours, aerial photography and previous studies. Dummy links were used to model the connect the subcatchment hydrographs input from CUHP into the SWMM model.

A summarized input file and example output files from the EPA SWMM model are included in Table B-3 in Appendix B – Hydrologic Analysis, which includes the physical attributes assigned to each conveyance element used in the EPA SWMM model.

3.6 REVISIONS TO PREVIOUS STUDIES

The revisions to previous studies are as follows:

- The existing land use imperviousness was updated to account for development that has occurred within the watershed since the 2004 Second Creek/DFA 0053 MDP study was completed. All revisions resulted in an increase in existing imperviousness. See Table B-2 in Appendix B – Hydrologic Analysis for a list of the modified subcatchment values.
- All future land use imperviousness values were replaced to account for the most current proposed development within the watershed. See Section 3.3.2 – Watershed Imperviousness for further details.
- Subcatchment parameters were modeled through the latest release of CUHP 2005 (version 2.0.1).
- Subcatchment boundaries were updated based on updated topographic information and existing land uses.
- Rainfall data was updated to current NOAA 1-hour rainfall depths

3.7 PREVIOUS STUDIES

As noted in Section 1.5 – Data Collection, Henderson Creek was most recently studied in the report entitled *Second Creek (Downstream of DIA) and Direction Flow Area (DFA) 0053 Watersheds Outfall Systems Planning Study Update*, prepared by Kiowa Engineering Corporation, dated August 2004. Table 3-3 compares this study's 100-year natural, existing, and future peak flows (RESPEC 2020) to flows from 2004.

The existing and future peak flows determined in this study are overall higher when compared to the 2004 study. This can be attributed to three major reasons:

1.) Portions of the watershed have been developed since the 2004 study thereby increasing the current imperviousness (Existing Conditions).
2.) The density of development is higher than what was planned in the 2004 study; therefore, the imperviousness is higher than previously planned (Existing and Future Conditions).
3.) The 2004 SWMM modeled used a unique routing method that utilized two flow paths for each routing element. The routing consisted of one large overland flow path and one small channelized path that were connected at each junction using an overflow divider. The reasoning behind this routing is unknown; but regardless resulted in a greater attenuation of the hydrograph than the routing utilized in this study (Existing and Future Conditions).

3.8 RESULTS OF ANALYSIS

The 2-, 5-, 10-, 25-, 50- and 100-year peak flows and volumes are presented in Tables B-4 and B-5 in Appendix B – Hydrologic Analysis for the existing, future, and natural conditions. Natural, existing, and future conditions peak flow profiles are plotted in Figures B-3, B-4, and B-5. Hydrographs for the 100-year existing and future conditions are shown in Figures B-6, B-7, and B-8 for several points of interest along Henderson Creek.

The upper portion of the watershed is largely undeveloped; therefore, the natural conditions peak flows are similar to the existing conditions in these areas. The middle and lower portions of the watershed have been moderately developed which results in higher existing conditions peak flows as compared to the natural conditions. As previously discussed, the upper watershed is planned to be developed in the near future and will result in increased peak flows and volumes for the Henderson Creek and Ragweed Drain channels. On average, the natural conditions peak flows are 17% less than existing conditions peak flows and 55% less than future conditions peak flows.

The Henderson Creek watershed is narrow in the upper headwaters, increases in width in the middle section of the watershed near the confluence of Ragweed Drain with Henderson Creek, and narrows again in the lower watershed

near the confluence with the South Platte River. Going downstream from the headwaters, the resulting peak flows increase slowly until approximately East 104th Avenue, then increase at a faster rate until approximately East 120th Avenue, and then are relatively flat until the confluence with the South Platte River (as shown in Figures B-3, B-4, and B-5 in Appendix B – Hydrologic Analysis).

Several floodplain obstructions restrict flow in the along both the Henderson Creek and Ragweed Drain channels. Specifically, crossings at... [*To be completed in future versions of the report*.]

Table 3-3. Comparison of 100-year Peak Flows to Previous Studies

Design Point	Location	Jurisdiction	Subwatershed	Henderson Creek MDP RESPEC 2020			Second Creek OSP Kiowa 2004	
				Existing	Future	Natural	Existing	Future
OF2	Outfall at South Platte River	Adams County	Henderson	2308.33	3761.19	1588.59	1361	2586
J176	Brighton Rd	Adams County	Henderson	2266.87	3719.31	1559.21	1176	2255
J177	E 120th Ave	Adams County	Henderson	2245.08	3689.4	1546.9	1169	2193
J179	E 120th Pkwy	Adams County	Henderson	2224.92	3664.14	1534.61	1178	2264
J150	US 85	Commerce City	Henderson	1804.73	3113.49	1292.38	1086	2152
J138	E 112th Avenue	Adams County	Henderson	1204.71	2231.84	984.92	339	1354
J134	I-76/Highway 6	Adams County	Henderson	550.37	1066.22	498.16	207	537
J130	E 104th Avenue	Commerce City	Henderson	336.9	628.7	310.12	-	-
J122	O'Brian Canal	Commerce City	Henderson	305.05	583.25	281.75	195	396
J120	Highway 2	Commerce City	Henderson	226.9	434.88	216.5	143	280
J118	Peoria St	Commerce City	Henderson	139.75	292.01	139.67	-	-
J113	Tucson St	Commerce City	Henderson	65.63	143.74	65.59	-	-
J107	Potomac St	Commerce City	Henderson	11.97	27.34	11.93	81	171
J139	E 112th Avenue	Adams County	Ragweed	557.26	1143.04	511.14	532	886
J133	I-76/Highway 6	Adams County	Ragweed	540.87	1099.88	499.17	533	885
J124	O'Brian Canal	Commerce City	Ragweed	511.04	1020.47	471.71	511	802
J117	Highway 2	Commerce City	Ragweed	503.77	1004.22	466.51	511	829
J112	E 104th Ave	Commerce City	Ragweed	462.87	916.51	423.39	480	751
J108	Vaughn Way	Commerce City	Ragweed	338.5	592.07	297.48	-	-
J106	Potomac St	Commerce City	Ragweed	238.69	428.26	199	349	497
J104	Sable Blvd	Commerce City	Ragweed	127.77	210.39	92.73	211	286
J101	Chambers Rd	Commerce City	Ragweed	51.88	51.88	12.36	44	112

4 HYDRAULIC ANALYSIS

To be completed in future submittals of the report.

5 PRELIMINARY ALTERNATIVE REVIEW

To be completed in future submittals of the report.

6 RECOMMENDED PLAN

To be completed in future submittals of the report.

7 CONCEPTUAL DESIGN OF SELECTED PLAN

To be completed in future submittals of the report.

8 REFERENCES

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Appendix A – Project Correspondence

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Appendix B – Hydrologic Analysis

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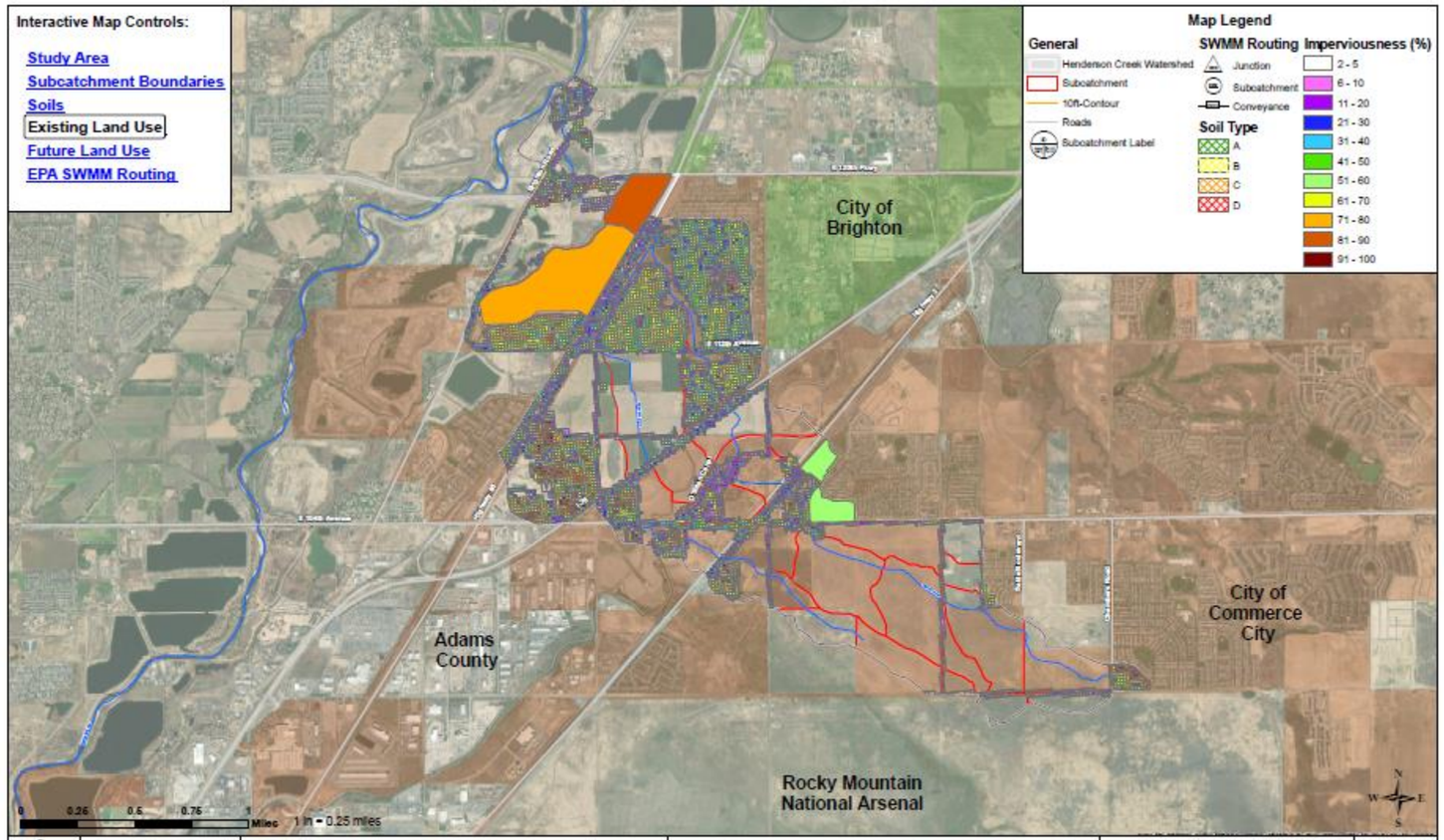
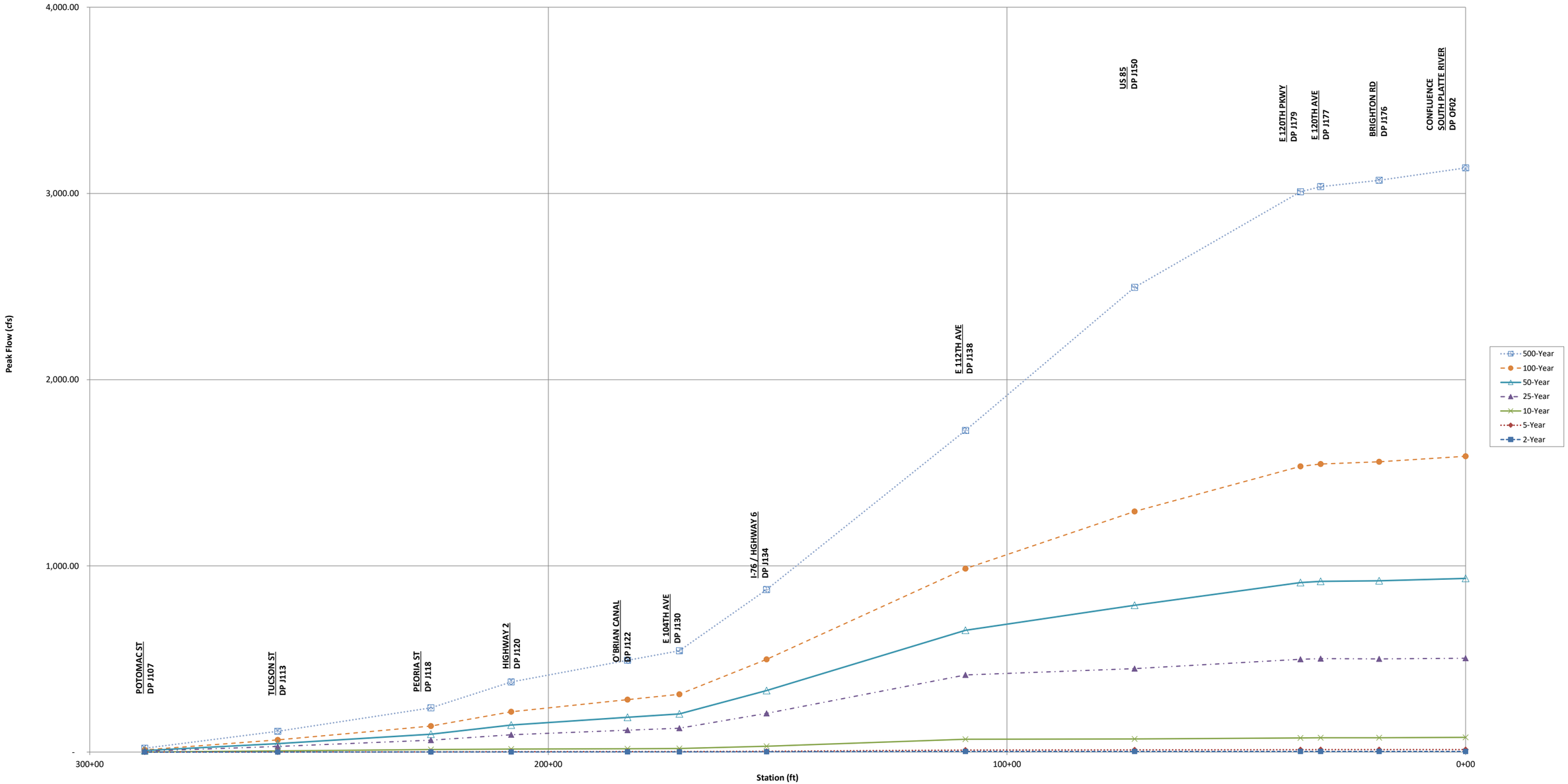
Figure B-1 Interactive Hydrology Map



RESPEC	720 S. Colorado Blvd. Suite 410 S Denver, CO 80246 (303) 757-3655 www.respec.com	Mile High Flood District, City of Commerce City and Adams County	Henderson Creek Major Drainageway Plan and Flood Hazard Area Delineation	Interactive Hydrology Map May 2020	Figure B-1

Click here to open the Interactive Hydrology Map

Figure B-5
Natural Land Use Peak Flow Profile
Henderson Creek



Appendix C – Hydraulic Analysis

{to be completed in future versions of report}

Appendix D – Legal Opinion

{to be completed in future versions of report}

Appendix E – Wetland and Riparian Inventory

{to be completed in future versions of report}

Appendix F – Alternatives Analysis

{to be completed in future versions of report}