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City of Littleton
City Council
2255 W. Berry Avenue
Fort Collins, CO 80524

RE: June 20, 2021 City Council ("**Council**") Public Hearing, City of Littleton (the "**City**") – Application for Sixth Amendment to Area K of the Southbridge Planned Development Plan (the "**Application**")

Dear Members of City Council:

We represent McDonald Automotive Group ("**McDonald**"), the contract purchaser of the property located at 1151 W. Mineral Avenue, east of South Windemere Street at the northwest corner of the W. Mineral Avenue cul-de-sac (the "**Property**"), with respect to the Application. The purpose of this letter is to summarize how the Application meets the criteria for approval of an amendment to a Planned Development ("**PD**") plan under the Littleton City Code (the "**Code**") in order to assist the Council in its review of the Application.

I. **BACKGROUND AND HISTORY**

McDonald has been an active member of the business community of the City since 1965 and is known for owning and operating high-quality automobile dealerships and service facilities. For more than 55 years, McDonald has contributed to the economic well-being of the City and has demonstrated a commitment to giving back to the community. For example, over the last 18 years, the McDonald organization and family have contributed \$10.2 million to local organizations and charities. Since 2019, McDonald–Audi Denver has been a proud sponsor of the Littleton Twilight Criterium and Bike Fest. Today, McDonald is one of the top 10 largest employers in the City.

Now McDonald is proposing to develop the Property as a high-quality reconditioning facility with associated office uses (the "**Reconditioning Facility**") that McDonald hopes will continue its strong relationship with the City and contribute to the growth of the local business community. The Reconditioning Facility is proposed to be two stories (30 feet) in height, with 37,822 square feet in gross area. The Application proposes a maximum building height on the Property of 45 feet (with a maximum of 30 feet within 150 feet of any residential uses) and a maximum building gross area of 42,200 square feet. The Application also requires 25% unobstructed open space. The Reconditioning Facility is designed to be a good neighbor to the surrounding uses because, unlike more intensive types of car service facilities such as body shops, it will limit its activities to the reconditioning and preparation of vehicles for sale. Such activities will be performed indoors where they will not generate noise or odor, and will include mask/tint installation, paintless dent repair, glass crack repair, minor tune-ups, detailing, and a photo booth in support of internet sales. Unlike a dealership, the Reconditioning Facility will not feature a retail component and will not even be open to the public, which limits traffic generation to and from the Facility.

The Property on which this Reconditioning Facility is proposed consists of approximately 6.64 acres and is located within Area K of the Southbridge PD Plan. The Southbridge Tentative PD Plan, a precursor to the Southbridge PD Plan, was adopted in 1979 and designated the use of the Property as Office Park. Pursuant

to the current Southbridge PD Plan, the Property is currently zoned Planned Development – Commercial (“**PD-C**”), and the current use is still designated as Office Park. However, for more than 40 years since the Property initially was designated for the Office Park use, the Property has remained undeveloped and vacant.

The area to the north of the Property is zoned Planned Development – Residential according to the Southbridge PD Plan and contains single family residential uses. To the west are office uses, to the south are office and retail uses, and to the east is the Encompass Health hospital.

Now, McDonald seeks approval of the Application to permit a change in use that would allow the reconditioning use. Specifically, McDonald is requesting these changes to the Southbridge PD Plan:

- Permit automotive service (not to include auto-body repair, vehicle painting, wrecking yard or demolition operations, or industrial assembly, and not open to the general public);
- Permit vehicle storage;
- Impose restrictions on the number of vehicle haulers on site per day, designated routes, loading areas and requirements, fencing types, security lighting levels, and general architectural standards for review of the site development plan;
- Impose zoning standards for unobstructed open space, setbacks, building height, and gross floor area; and
- Limit non-emergency access to the site to business hours only.

On August 6, 2020, a pre-application meeting for the Application between McDonald and City Staff was held. At the request of McDonald, the Application was reviewed according to the Preliminary Project Plan Process (the “**P4 Process**”), which provided McDonald the opportunity to receive and incorporate feedback from Planning Commission in a study session held November 23, 2020, and from Council in a study session held December 8, 2020. On January 11, 2021, after making changes to the Application to incorporate and address feedback from the Planning Commission, Council, and neighbors, McDonald submitted the complete Application that is presently before you.

City Staff recommended approval of the Application to Planning Commission. On June 14, 2020, Planning Commission held a public hearing and voted against a recommendation of approval by a vote of 4-3. While discussing the Application, the Commissioners cited concerns about the compatibility of the Application with surrounding development and with the guidance in the Envision Littleton Comprehensive Plan (the “**Comprehensive Plan**”), which designates the Property as Suburban Commercial. Specifically, the Planning Commission expressed concern with what it interpreted to be an “auto-oriented use.”

However, for reasons that will be explained in more detail below, the Planning Commission did not properly apply the criteria in the Code or the guidance of the Comprehensive Plan. As this Letter will demonstrate, the Application meets all of the criteria in the Code for approval of an amendment to a PD plan and is consistent with the Comprehensive Plan. McDonald has revised the Application several times in a variety of ways in response to neighborhood comments to ensure compatibility with the neighborhood, as will be described in detail in this letter. Although the Comprehensive Plan does provide the City with the discretion to limit auto-oriented uses in this area, the Application nonetheless merits approval because (1) the Reconditioning Facility is not the type of auto-oriented use that the Comprehensive Plan seeks to limit, and (2) even if the Reconditioning Facility were such a type of auto-oriented use, the Application incorporates and requires the high-quality landscaping and site design that the Comprehensive Plan states will move the development into the Suburban Commercial context. The Application applies creative design principles to mitigate impacts on neighboring properties and proposes a compatible use that allows the Property, which has been vacant for 40 years, to contribute to the economy of the City in a way that is consistent with the existing character of the community. Therefore, McDonald respectfully requests approval of the Application.

II. **NEIGHBORHOOD OUTREACH**

As an existing proud institution of the City, McDonald has remained committed to meaningful dialogue with the community and has demonstrated its commitment through significant neighborhood outreach and by continuously refining and improving the Application to address community feedback.

Because COVID-19 prevented McDonald from holding an in-person neighborhood meeting in May 2020, McDonald developed a website describing the proposed Reconditioning Facility in detail at <http://sites.google.com/view/1151wmineralave> and sent out a mailer to surrounding residents soliciting feedback through that website. The comment form on the website was made live May 11, 2020, and was open for a little more than a month and a half. During that time, there were 56 independent views of the video and more than 112 views of the website, and a total of 17 comments were collected through the website. In late June 2020, McDonald sent responses to those questions to commenters via direct email and uploaded responses to the website. A copy of the responses uploaded to the website, as updated, is attached hereto as **Exhibit A**.

Subsequently, McDonald held two neighborhood meetings via Zoom, one on September 21, 2020 and one on March 31, 2021. At these meetings, McDonald solicited information about what types of landscaping neighbors wanted to see and responded to community concerns. As a result of the cumulative outreach and to address the concerns of the neighboring residents, McDonald made the following changes to the Application:

- Reduced parking spaces by about 30% from 694 stalls to 483 stalls;
- Increased the percentage of landscaping from 20% to 25%;
- Provided enhanced landscaping and landscaped berms in the 50-foot buffer at the north of the Property between the Reconditioning Facility and residences to the north, as well as seating options and a crushed granite walking path for use by the neighborhood residents;
- Limited public access to the 50-foot landscaped buffer based on neighbors' security concerns;
- Added living screen walls on northern internal parking islands to further buffer views of parked vehicles;
- Added permeable paving as an innovative feature to further improve water quality and soften the amount of pavement;
- Relocated the trash enclosure farther away from residences by locating it in the south east corner near the entrance to the site;
- Limited vehicle hauler trips to one per day and an average of five per week;
- Committed to require in the Site Development Plan that all vehicle trips shall be only on Mineral Avenue and Broadway, and shall not cut through nearby neighborhoods;
- Configured the site to require vehicle haulers that enter the site to pull in, make deliveries, and exit on the south side of the site to reduce noise;
- Reduced lighting levels for security lighting to eliminate light trespass and glare onto neighboring properties;
- Allowed the neighbors to select the trees to be included in the 50-foot buffer at the north of the site, provided that such trees are permitted by the City;
- Limited non-emergency access to the site to business hours only, including access by vehicle transporters, delivery vehicles, and waste haulers.

McDonald has made every effort to keep the neighborhood abreast of updates to the Application and to respond to community concerns throughout the Application process.

III. **ANALYSIS**

The Code requires that Council base its decision with respect to the Application on the conformance of the Application with the intent of and operating standards for the PD-C district. Code, § 10-2-23. Additionally, when making a decision on the Application, Council must determine if the Application meets the provisions of the declaration of public policy set forth in Section 10-12-1 of the Code. Code, § 10-12-4(B)(3)(e). As described in detail below, the Application conforms to all relevant requirements in the Code.

A. **Criteria for Major Amendments to PDs**

The Code requires that the Application must meet the criteria for major amendments to PDs in Section 10-2-23(B) of the Code. An analysis follows of how the Application complies with all of these requirements.

1. *Encourage more creative and effective use of land and public or private services, and to accommodate changes in land development technology so that the resulting economies benefit the community.*

Since the time that the Southbridge Tentative PD Plan designated the Property as Office Park in 1979, the Property has remained undeveloped and vacant. In the intervening 40 years, Area K of the Southbridge PD Plan has been amended multiple times to allow flexibility in uses such that non-Office Park uses including an assisted living and memory care facility could be constructed. Considering that the very purpose of the PD districts is to permit flexibility and creativity in development, it is appropriate that a PD plan be amended when it results in vacant land that remains undeveloped for decades. By proposing a specific narrow automotive use that carves out the auto-oriented uses that could be considered noxious to the surrounding community, the Application proposes a creative and effective development that will finally permit the Property to increase property taxes and provide employment opportunities. Therefore, the Application meets this criterion for approval.

2. *Encourage innovation and efficiency in residential development to meet the growing demands for housing of all types and designs for persons of any social or economic status.*

As the Application does not propose or involve residential development, this criterion does not apply.

3. *Encourage innovative development or redevelopment of all land uses to meet the contemporary needs of the community by providing for a greater variety and mix of uses including those which may coexist on the same parcel or within the same building as shown on an approved general PD plan.*

Although in 1979 the Southbridge Tentative PD Plan envisioned that an Office Park use would fulfill the needs of the nearby community, the intervening 40 years have demonstrated that such use is not economically feasible, particularly at the ratios of buildings to open space to paving envisioned by the Comprehensive Plan for the Suburban Commercial area in which the Property is located. Since 1979, the Southbridge PD Plan has been amended to include residential family units, a church, incidental accommodation of visiting missionary sleeping rooms, and an assisting living and memory care facility. For this Property, an automotive use with an office component has proven to be in demand, as demonstrated by the Application. Unlike a facility serving the general public would be less compatible with the surrounding uses and would generate noise and traffic that could be bothersome to the nearby neighborhood, the Reconditioning Facility is an innovative and creative proposal that allows an in-demand use while enhancing compatibility with surrounding development compared to the already-allowed Office Park use.

For example, the Application meets community needs by creatively proposing a use that will generate far less traffic than an Office Park use. Under the current Southbridge PD Plan, a four-story office building with a 500-stall parking lot generating *2,000 daily trips* would have been permissible by right. By contrast, the Traffic Letter attached hereto as **Exhibit B** shows that the Reconditioning Facility will generate *up to 144 trips per day*, with up to 37 trips in the peak hours. Moreover, traffic to the site will be disbursed throughout the day, whereas traffic to an Office Park could be expected to be heaviest during peak hours. While employees of an Office Park may have chosen any route they like to get to the office, McDonald will provide a route plan as part of its Site Development Plan setting forth the procedures and paths for all vehicle movement to the site by staff so as not to direct traffic through or disturb the neighborhood.

The amount of parking the Reconditioning Facility will require will also meet community needs because it can be expected to be the same as what an Office Park would require, especially considering that an office building could have built to a much higher height than the Reconditioning Facility. As noted above, under the current Southbridge PD Plan, a four-story office building with a 500-stall parking lot would have been permissible by right.

The Reconditioning Facility also meets the community's needs by generating little to no noise or smell because all of the reconditioning activities will take place within the facility. Trash trucks will only pick up trash during business hours. The number of vehicle haulers that visit the site will be limited to only one per day and an average of five per week, and those vehicle haulers will conduct all of their activities on the south half of the site, as far as possible from the residential uses to the north. To locate vehicles on the site, McDonald will utilize computer-based vehicle tracking that will eliminate the need for using vehicle remotes or alarms.

The lighting on the site will meet community needs because it is designed to be minimum low-level security lighting, which is defined as no more than one foot-candle on average or an 80% reduction in light level. All non-essential lighting must be turned off after the close of business or 10:00 p.m., whichever is more restrictive. A photometric analysis was performed, attached hereto as **Exhibit C**, and the light levels at all property lines were determined to be 0.0 foot candles. The maximum light level at any point on the site will be less than 5.0 foot candles, which equates to the lighting level at a shopping center when it is closed.

The Application also incorporates numerous innovative design elements, including the living screen walls to screen the building and parking lot from neighbors to the north, as well as innovative storm drainage features including a bio-retention rain garden and permeable pavers. The load on public utilities and services such as water, sewer, and electrical is also lower than what a typical four-story office building would require. For example, a four-story office building could require up to 249 plumbing fixture units, but the Reconditioning Facility will only require about 62.5 plumbing fixture units.

To further ensure that the visual impact to the neighbors to the north is minimized, the Application also provides a 50-foot buffer between the development and the neighbors to the north, which buffer will feature enhanced landscaping. As noted previously, McDonald has worked with the neighbors to choose which trees will be located in the buffer. Not only will the buffer screen the development from the Property and absorb any vestiges of light trespass, but a granite walkway path with seating areas for the use of the residents to the north of the Property will be provided.

Ultimately, McDonald is proposing an innovative use incorporating creative design principles that respond to and will meet community needs. The Reconditioning Facility will generate jobs and property tax revenues in a way that is compatible with the nearby community and the existing community character. Therefore, the Application meets this criterion for approval.

4. *Provide a process which relates the design and development of a site to the particular characteristics of the site.*

As noted above, the Application has been designed with sensitivity to the surrounding uses and the location of the Property. It incorporates elements such as an enhanced landscape buffer, a lower intensity of use than is allowed by the current Southbridge PD Plan, and high quality building materials. The building massing also steps back in order to better address residential scale.

As described in more detail above, McDonald has also taken many steps within the proposed PD plan to adapt to the characteristics of the site. The current Southbridge PD Plan does not require a buffer between on-site development and the residences to the north, as permitted by Section 10-2-23(D)(2)(a) of the Code, because the Property and the residences are part of the same PD plan. However, the Application exceeds Code requirements by requiring a 50-foot buffer with enhanced landscaping at the north of the site, and incorporating within that buffer a gravel walking path and seating areas for residents north of the Property to enjoy. The Application also proposes living screen walls along the proposed building and on northern parking islands to buffer the views of the site. The current Southbridge PD Plan imposes no height limit on any portion of a structure that is farther than 150 feet from the residential uses, but the Application imposes a height limit of 45 feet to maintain compatibility with the single-family residential development north of the site. The Application further restricts height to only 30 feet within 150 feet of residential uses. Additionally, the Southbridge PD Plan requires only 20% landscaping, but the Application increases the required landscaping to 25%. The Application also configures the site to ensure that the trash enclosure and all vehicle hauler activity is at the south of the site, as far as possible from the residential uses, thus minimizing activity in proximity to the existing neighborhood. McDonald has implemented these features to ensure that McDonald meets all of the community's needs and is the best neighbor possible.

Therefore, the Application meets this criterion for approval.

5. *Require that the nature and intensity of development be supported by adequate utilities, transportation network, drainage systems and open space to serve the development, and to minimize impacts on adjacent existing and future development.*

As demonstrated by the Traffic Letter attached as **Exhibit B** and as discussed in more detail above, the proposed development will have minimal impact on the transportation network. To minimize impact on adjacent development, the Application limits vehicle haulers to one per day and an average of five per week. The Application also sets forth travel routes for vehicle haulers and individual vehicles to avoid incursion into the neighborhoods and requires that vehicle delivery and pick-up occur only on private property. The Site Development Plan will also include a requirement that all vehicle hauler activities will occur on the southern portion of the Property, which is at least 225 feet from the nearby residences.

Additionally, a drainage study was conducted in connection with the Application, attached hereto as **Exhibit D**, demonstrating that the drainage improvements proposed for the Reconditioning Facility meet the criteria set forth by the City Storm Drainage and Technical Criteria Manual and Urban Drainage and Flood Control District Storm Drainage Criteria Manual. The Application also proposes creative storm water quality treatments for the development including a bio-retention pond, permeable paving, and landscaping.

With respect to open space, the Application provides 25% open space when only 20% open space is required under the original Southbridge PD Plan. The development also includes enhanced landscape areas in greater quantity and quality than is required by the Code. With input from direct adjacent neighbors, the Application has included a walking path with sitting areas and has selected a variety of trees and shrubs for the 50-foot buffer based on adjacent property owner input. Living screen walls have been included at the northern end of the parking runs to further minimize visibility of parked vehicles. As noted above, the impacts

of the development are anticipated to be much less than that of a four-story office building that would be permitted by right in the current Southbridge PD Plan.

As described in detail above, the Application further minimizes impacts on adjacent existing and future development by limiting site access to business hours, setting restrictions on lighting levels, and mitigating noise and smell by performing reconditioning activities within the facility and conducting noise-generating activities such as truck hauling and waste hauling as far as possible from the residences to the north.

Throughout the Site Development Plan process, McDonald will continue to cooperate with the City to determine that the site is supported by adequate infrastructure and that all impacts, including infrastructure-related impacts, will be minimized on adjacent development. Therefore, the Application satisfies this criterion.

6. *Encourage development that is consistent with the policies and guidelines established in the adopted Comprehensive Plan for the area and for the City.*

McDonald has prepared and City Staff has commented upon a checklist of Comprehensive Plan policies and guidelines attached hereto as **Exhibit E** (the "**Comp Plan Checklist**"). For the reasons set forth in the checklist and analyzed further in Section III.C below, the Application is consistent with the policies and guidelines established in the Comprehensive Plan.

B. Conditions and Performance Standards

The Application must meet the conditions and performance standards for the PD-C district in Section 10-2-23(D)(2) of the Code. As described in what follows, the Application meets or exceeds all of these conditions and performance standards.

1. *At least twenty percent (20%) of the site area designated for PD-C shall be maintained in unobstructed open space. In addition, there shall be a fifty foot (50') wide area of unobstructed open space provided along any boundary of a PD-C which abuts any residential property not approved on the same general PD plan, or any subsequent amendment thereto.*

The Application exceeds all of these Code standards with respect to open space. Instead of 20% open space, the Application provides 25% open space. Because the residential property to the north of the Property is approved on the same Southbridge PD Plan as the Property, the 50-foot buffer between development on the Property and the residences to the north is not required. Nonetheless, the Application provides for a 50-foot buffer to the north with enhanced landscaping, a granite walkway, and seating areas for the residents to use. The Application also provides enhanced perimeter landscaping. Therefore, the Application exceeds these standards.

2. *The maximum height of structures in PD-C areas located within one hundred fifty feet (150') of any residential property boundary shall not exceed thirty feet (30'), except for PD-C areas located adjacent to residential uses which have been approved on the same general PD plan, or any subsequent amendment thereto.*

The Application exceeds these Code standards with respect to maximum height of structures. Because the residential property to the north of the Property is approved on the same Southbridge PD Plan as the property, the maximum 30-foot height within 150 feet of residential uses is not required by the Code. Nonetheless, not only does the Application provide for a maximum 30-foot height within 150 feet of any residential development, it sets a maximum height of 45 feet on the Property as a whole. Therefore, the Application exceeds these standards.

3. *Minimum off street parking and loading shall be provided in conformance with section 10-4-9 of this title. Joint or multiple use of parking spaces provided for commercial uses may be permitted, provided a schedule of operation, including the proposed method of regulation, is defined on the final PD plan approved by the director of community development. In the event that the uses sharing parking spaces are proposed to change, the new uses shall be reviewed by the director of community development to ensure that the original schedule of operation and method of regulating remain valid. If not, additional parking spaces shall be provided.*

The Application meets the Code standards with respect to parking. As noted above, the number of space provided on the Property (483) is consistent with the number of parking spaces that could be provided as of right for a four-story office building, which is a use by right under the current Southbridge PD Plan. Therefore, the Application satisfies all of the Code standards with respect to the PD-C district.

C. Consistency with the Policies and Guidelines in the Comprehensive Plan

The relevant goals and policies in the Comprehensive Plan are divided into the following categories: Land Use and Community Character, Housing and Neighborhoods, Transportation, Economy and Tax Base, Environment, and Special Areas and Design, each of which is analyzed below. The Application is consistent with each of the relevant policies and guidelines in these categories, as described in more detail in the Comp Plan Checklist.

1. Land Use and Community Character

The Application is compatible with the land use and character goals and policies of the Comprehensive Plan, as detailed further in the Comp Plan Checklist, in part because, as City Staff notes, the Property could be developed in the same layout with an office use, the proposed development will support the fiscal needs of the City by providing jobs and increased property taxes, the Reconditioning Facility will incorporate high-quality design, and the Property will maintain the established character of the neighborhood.

The Comprehensive Plan designates the Property as within the Suburban Commercial area. The primary land use types envisioned for this area include commercial retail and service uses, office, and planned development to accommodate custom site designs or mixing of uses in a suburban character setting. As a combination of an office use and a reconditioning center, the Reconditioning Facility is compatible with these land uses.

The Suburban Commercial area is defined by the several characteristics set forth in the Comprehensive Plan. The Application is compatible with each of these characteristics as follows:

a. *Suburban character primarily from reduced site coverage relative to most auto-oriented commercial development.*

The Application provides an amount of open space that exceeds the requirements for open space within the PD-C district. While the PD-C district requires 20% open space, the Application provides 25% open space and provides enhanced landscaping to enhance the community character and the suburban feel. The 50-foot buffer, which incorporates a granite walkway and multiple seating areas, is designed to reduce the site coverage and to provide a suburban walkway that improves the pedestrian experience for nearby residents.

Additionally, the Application does not allow a use that is similar to “most auto-oriented commercial development.” To understand why this is true, it is important to understand the nature and purpose of “auto-oriented uses.” Neither the Comprehensive Plan nor the Code defines “auto-oriented uses.” However, in

Ordinance No. 04, Series 2020, an ordinance in which the City enacted a temporary moratorium on new auto-oriented business development, attached hereto as **Exhibit F**, the City set forth the following definition of “auto-oriented uses”: “those types of commercial uses that require an automobile and tend to increase traffic and reduce walkability.” The ordinance also identifies a list of uses that qualify as auto-oriented uses. The Reconditioning Facility also does not appear on this list. While some uses on that list appear similar, such as “Automotive services, not including junk or wrecking yard operations” and “Services related to the installation of accessories including car stereos, window tinting, etc., and not including services related to mechanical, electrical or body repair,” a critical distinction between those uses and the Reconditioning Facility is that the Reconditioning Facility is not open to the public and is not intended to serve customers.

It is clear that the reason the City seeks to limit “auto-oriented uses” is not because the City wants to restrict the ability of businesses and car owners to service or store their cars. It is because the City wants to reduce certain undesirable side effects of businesses that rely on automobiles: namely, increased traffic and a community character defined by a “sea of cars.” The Reconditioning Facility does work with automobiles, but it does not have these undesirable side effects. First, the Traffic Letter demonstrates that the Reconditioning Facility will have little to no impact on traffic. Second, the Reconditioning Facility is not open to public, which is extremely significant because it means that no public parking is required and that the parking lot is only the size that would be permitted as of right on this Property for a four-story office building. Also, it means that, unlike a dealership or other type of commercial retail or service use, the Reconditioning Facility gains no benefit from the visibility of its operations or the cars in its lot and accordingly has provided enhanced perimeter landscaping that will screen the parking lot from its neighbors. The Reconditioning Facility is therefore designed to “stand apart from most auto-oriented contemporary development,” as the Comprehensive Plan envisions for the Suburban Commercial area.

Finally, the Reconditioning Facility is consistent with the current character of existing development. Of the eight existing sites in Area K of the current Southbridge PD Plan, five sites feature more paving than landscaping without changing the suburban character of the area. The Reconditioning Facility is therefore compatible with surrounding development and fits with the existing suburban character.

Therefore, the Application is compatible with this characteristic.

b. *Encouraged at key community entries and along high-profile roadway corridors, may also involve other criteria to yield less intensive and more attractive development outcomes relative to auto-oriented areas, including higher standards for landscaping (along street frontages and within parking areas), signs, and building design.*

The Application is not located along a community entry and is not fronting a high-profile roadway corridor. Nonetheless, the Reconditioning Facility is a less intensive development than the Office Park use permitted as of right, for the reasons described above, including minimal impact on traffic and a lower demand on public infrastructure. The Application also incorporates enhanced landscape areas that exceed what is required in both quantity as well as quality. Because the site is not a retail site, it does not require typical building signage or other means of attracting customers. Rather, the site incorporates enhanced building design and high quality materials that cause the building to blend seamlessly and harmoniously into its surroundings. Features that particularly enhance the attractiveness of the site include the living screen walls to screen the parking lot from the view of the neighboring residents to the north and the 50-foot landscaped buffer at the north of the site. As noted previously, in response to neighborhood feedback, the Application increases the required landscaping from 20% to 25% and reduces parking spaces by about 30%, decreasing the intensity of the use. The building design also addresses the adjacent residential scale by stepping the second story back farther than required by the Code. Within 150 feet of the residential property lines, the proposed Reconditioning Facility is only a single story (24 feet in height) and outside of that 150-foot range has a maximum height of 30 feet. The total height of any development on the Property is limited by the Application

to 45 feet, whereas the current Southbridge PD Plan does not limit height farther than 150 feet from a residential property line. Therefore, the Application is compatible with this characteristic.

c. *May exclude some auto-oriented uses that cannot achieve a Suburban character (e.g., car washes).*

As noted above, the Application calls for a use that can and has achieved a suburban character through increased open space and enhanced landscaping. Even if the Reconditioning Facility were considered to be an auto-oriented use, it has fulfilled the vision of the Comprehensive Plan, which states that “preservation of trees or other natural site features, along with generous landscaping, can also move a site into the Suburban range of the community character spectrum relative to sites where ‘gray’ spaces predominate over ‘green’ and open spaces.” Here, the increase in required landscaping in the Application from 20% to 25%, including the provision of the 50-foot buffer to the north of the site that is not required by the Code, the internal landscaping, and the enhanced landscaped perimeter, constitute exactly the type of generous landscaping that moves the Reconditioning Facility into the suburban range. Additionally, the landscaping in the 50-foot buffer exceeds the requirements for quality and quantity of trees and shrubs, which were selected with input from neighboring residents.

Also, as described above, the Application also meets the suburban character of the Suburban Commercial area in many other ways besides landscaping, including its lower intensity than the intensity of a four-story office building that would be allowed as of right, enhanced building design that addresses the residential scale with maximum heights and an upper story setback as well as quality building materials, and innovative storm-water drainage design with bio-retention rain gardens and permeable paving.

Additionally, the “may” in this characteristic is permissive. The Application merits approval because it provides the landscaping that makes it compatible with the Suburban Commercial area, but additionally Council is empowered to exercise discretion in cases such as these where an auto-oriented use is quiet, well-screened, and well-buffered, and has little to no impact on traffic. The Application has taken extensive measures to limit any adverse conditions that could be associated with an automotive facility. The Application limits the automotive uses that may be performed by the site, restricts non-emergency access to the site to business hours, limits security lighting levels, and limits noise by placing any noise-producing activities such as vehicle hauling and trash removal to the corner of the Property farthest away from the nearby residential uses. Therefore, the Application is compatible with this characteristic.

d. *Near residential properties and areas, the permitted scale and intensity of nonresidential uses should be limited to ensure compatibility (including adequate buffering/screening, criteria for placement and orientation of buildings and parking areas, height limits, and residential-in-appearance architectural standards).*

As noted previously, the Application has imposed several limits on the development of the Reconditioning Facility to ensure that it is compatible with nearby residential uses. A 50-foot buffer to the north with enhanced landscaping both buffers and screens the development from the neighbors to the north. The living screen walls also screen the building and parking lot from the neighbors to the north. Other features of the development that minimize impact on neighboring properties including the orientation of the Reconditioning Facility such that all openings face away from adjacent residential neighbors, the placement of the building central to the site to screen the vehicle hauler activities and trash services from the neighboring residents, the height of the building that is limited to 30 feet within 150 feet of the residential properties and to 45 feet in all other areas, and the stepback of the second story away from the residences. Parking on site has been reduced by 30% in response to community concerns. Therefore, the Application is compatible with this characteristic.

e. *More opportunity for natural and/or swale drainage (and storm water retention/absorption) versus concentrated storm water conveyance in auto-oriented areas.*

In contrast to existing sites in this area that use traditional storm conveyances by sheet flowing to storm drains with limited water quality improvements, the Application proposes such storm water and drainage techniques as a bio-retention pond, permeable paving, and landscaping, which provide more green space and also infiltrate and improve storm water management within the parking areas. The bulk of the storm water drainage will be captured by the proposed bio-retention rain gardens to improve the water quality and regulate the release to match historical rates. Therefore, the Application is compatible with this characteristic.

2. Housing and Neighborhoods

As the Comp Plan Checklist highlights, an important component of the City's livability is the availability of suitable and economical options for housing. While the Application does not propose residential uses, and Area K of the Southbridge PD Plan was never intended to include residential uses, the Application never fulfills the relevant policies and guidelines with respect to residential neighborhoods.

For example, the Application ensures that neighborhoods are safe and comfortable for all residents in many ways. The Reconditioning Facility will generate little to no traffic, as demonstrated by the Traffic Letter; the proposed PD plan will limit vehicle hauler visits to the site to one per day and an average of five per week; and McDonald will implement policies to ensure there is no traffic "cutting through" the neighborhoods. The Application also provides significant buffering along the northern edge of the Property as well as enhanced perimeter landscaping, and the Reconditioning Facility will generate little to no noise. According to the photometric study, there will also be no light trespass to the nearby residential community. For these reasons, and the reasons detailed in the Comp Plan Checklist, the Application is compatible with the goals of the Comprehensive Plan related to housing and neighborhoods.

3. Transportation

The Comprehensive Plan sets forth various goals related to transportation, including "connect people conveniently to the community, resources and opportunities," and "contribute to our economic prosperity while maintaining and enhancing our community's character." The Application is compatible with the goals and policies related to transportation for various reasons. As set forth in the Traffic Letter, the Reconditioning Facility will result in little to no traffic. Vehicle haulers are limited to one per day and an average of five times per week. McDonald will also implement policies to ensure that truck and vehicle traffic are on designated routes and will not "cut through" neighborhoods. For these reasons and other reasons detailed in the Comp Plan Checklist, the Application is compatible with the transportation-related policies and goals in the Comprehensive Plan.

4. Economy and Tax Base

The Comprehensive Plan sets forth goals and policies related to the City's economy and tax base, and the Application is compatible with all such goals and policies, as set forth in more detail in the Comp Plan Checklist. Most significantly, the Application proposes to develop a long-vacant piece of property and thereby contribute increased property taxes and employment opportunities to the community. The Application does so in a way that is compatible with the character of the area and the City and in a way that can be accommodated with adequate public infrastructure and services.

5. Environment

In keeping with the City's commitment to responsible stewardship of the land, water, and air resources, the Comprehensive Plan sets forth goals and policies related to the environment. The Application is compatible with these goals and policies because it proposes an efficient drip irrigation system that was deemed acceptable by City Staff, high efficiency LED lighting, and "green" building elements such as the living screen walls. The Application will also mitigate noise by performing reconditioning activities within the facility and will mitigate light by providing low level lighting that will result in light levels of 0.0 foot candles at all property lines. For these reasons and others as set forth in the Comp Plan Checklist, the Application meets all relevant goals and policies relevant to the environment.

6. Special Areas and Design

The Application is compatible with the goal in the Comprehensive Plan relevant to special areas and design: "Roadway corridors that fulfill their primary transportation functions for drivers, pedestrians, cyclists, and public transit while advancing the community's economic development, housing, and aesthetic interests." As noted above and in the Traffic Letter, the Application will result in little to no increased traffic, and such traffic is expected to be much less than what would be generated by the Office Park use proposed by the current Southgate PD Plan. Because the Reconditioning Facility will not be open to the public, and vehicle truck trips are limited by the Application, the Application is compatible with this goal.

Therefore, the Application is compatible with all the relevant goals and policies of the Comprehensive Plan.

IV. **CONCLUSION**

On behalf of the Applicant, we sincerely appreciate your thoughtful consideration of the Application and the materials submitted in connection therewith, including this letter. We respectfully request that you approve the Application.

Sincerely,

A handwritten signature in black ink, appearing to read 'Carolynne C. White', written in a cursive style.

Carolynne C. White

Exhibit A
Exhibit B
Exhibit C
Exhibit D
Exhibit E
Exhibit F

Exhibit A

Responses to Neighborhood Comment

Copied from project website at:

<https://sites.google.com/view/1151wmineralave/project-description>

Site address

The address is 1151 Mineral Avenue

Type of work in reconditioning facility

This is not a body shop, the functions within the building are reconditioning/preparing vehicles for sale to include mask/tint installation, paintless dent repair, glass crack repair, oil/filter changes, detailing and photo booth in support of internet sales for McDonald's dealerships. The schedule for construction is set at approximately 7 months.

Noise levels

This is not a body shop, the functions within the building are reconditioning/preparing vehicles for sale. All work is done inside of the building and the design of the building orients access doors away, and screened from the residential area to the north. No exterior intercom system will be allowed and techs will utilize a computer based system to identify vehicle locations on site via a parking stall matrix.

Light levels

All fixtures are downcast with shielding at the property edges. We have performed a photometric analysis and the light levels at all property lines will be 0.0 foot candles. The maximum light level at any point in the site is less than 5.0 foot candles which equates to the light level at a shopping center when it is closed.

Smells - paint

There will not be a paint booth included within this facility.

Parking amount - Heat island

The project meets the 20% open space requirement and exceeds the interior landscape located in the parking areas.

Buffer to residential area

The landscape buffer is 50'-0" from the fence line to the parking lot curb. The rendering is based on the current site plan layout.

Traffic

The site will be used for inventory storage and reconditioning activities. Vehicle traffic will be disbursed throughout the work day and not impact the morning or evening rush hours. On average, there will be 1 vehicle transport delivery per day (1 trip into site and 1 trip out of site). The vehicle transporter will only travel

along the southern portion of the site with unloading on south side of the building, shielded from residential view. Trash pickup will be during normal business hours and bins located closest to the main street entrance, furthest away from residential properties.

Staff driving route

McDonald Automotive will provide a route plan as part of the SDP submittal detailing the procedure and path for all vehicle movement to and from the site by staff.

Storm water runoff

Storm water will be managed in compliance with all city and state requirements. Storm water will be collected on site, run through on site water quality features and then released to the storm water system.

McDonald's commitment to the community

The McDonald's have been an integral part of the Littleton community for three generations totaling 50+ years. They are one of the Top 10 largest employers in Littleton and have paid property taxes and sales tax supporting the City's budget for those same 50+ years. As a company, the McDonald's are involved in several charitable organizations leading a foundation that has raised \$5,000,000 for the Juvenile Diabetes Research Foundation along with support for local high schools.

Compatibility with Comprehensive Plan

The Site Plan Submittal includes a checklist reviewed by city staff for compliance with the Comprehensive Plan. Link [HERE](#)

The Comprehensive Plan states it may exclude some auto-oriented uses that cannot achieve a Suburban character. However, we have taken many steps to align our design with the suburban character.

- *Our site coverage exceeds the PUD 20% requirement (23.5% landscaping). This is on par with the majority of existing office sites in Southbridge Area K. Using GIS data, the open space in this area ranges from 16% - 50%. Furthermore, only 2 of the 9 sites could satisfy the open space character's pie chart (approx. 40% based illustration). Those two locations include a development area drainage basin on one, and the other purchased a second parcel of land that has yet to be developed. On average this area K has approx. 50% paving, 35% open space, and 15% building. Our proposed development has approx. 60% paving, 30% open space, and 10% building.*
- *Our development is less intensive than traditional office building development as it relates to traffic patterns & public utility demand (water, sewer, and electrical).*
 - *Our daily trips generated are a fraction of what a typical office building would generate. Per Institute of Transportation Engineers Trip Generation Manual, our site would generate average of 144 daily trips (30 employees, 1 delivery truck, 30 vehicle shuttling) where a typical 2-story office building of similar footprint would generate 2,227 daily trips, and require similar parking stalls.*
 - *Our facility would require half as much demand on water and sewer compared to an equivalent sized 2-story office building (approximately 62.5 plumbing fixture units vs 130 plumbing fixture units).*
- *Our building design is scale appropriate to adjacent residential with only a single story height within 150' of property line and 30' max at the second story. This is also lower intensity than allowed by zoning code.*

- Our site design includes enhanced 50' landscape buffer (width and quality) and living wall green screens along adjacent residential properties. This exceeds the zoning requirement in dimension, area, and quality.
- Our project also included innovative and natural storm water drainage techniques including bio-retention rain gardens and permeable paving.

Compatibility Adjacent Residential Zoning

The current PUD allowed uses includes "Office Park." This is not a standard zoning found in the current Littleton zoning code. Our proposed rezoning is to include "Automotive Reconditioning" and "Office". This aligns with the City of Littleton's B-1/B-2 zone district. Additionally, since this PUD included the residential use on same general PD plan, there is no required open space landscape buffer required, nor any height limit on the structure. However, we are providing a 50'-0" open space landscape buffer along the adjacent residential properties. Our design also reduces the overall height to less than 30'-0", and keeping single story structure with in 150' of residential property .

Intensity of Use

A use by right office build out has a FAR (floor area ration) of 2:1 allowing up to 580,706 sf and 4 stories. Based on required setbacks and landscape requirements a 4 story 52'-0" high office building could fit on this site with up to 500 parking stalls, over 2,000 daily trips generated, and up to 259 plumbing fixture units.

Our proposed development is lower overall intensity compared with an allowable office build out. This project has a FAR of 0.13:1 (37,822 sf) with a 2-story 30'-0" high building. Our height setback, and building scale are more sensitive to the adjacent neighbors compared to what is allowed by the zoning code. This design includes an enhanced landscape buffer both in dimensional width and quality compared to what is required by the zoning code. The traffic patterns for this development are much lower than an office development and occur during non-peak times. Lastly, the load on public utilities/services (water, sewer, electrical) is lower than typical allowed office build out with approximately 62.5 plumbing fixture units.

Exhibit B

Traffic Letter

[*see attached*]

MEMORANDUM

To: Steve More, Commercial Building Services

From: Cassie Slade, PE, PTOE

Date: November 30, 2020

Project: McDonald Automotive Group Administration and Reconditioning Facility – Littleton, Colorado

Subject: Traffic Letter

Pursuant to your request, the Fox Tuttle Transportation Group, LLC has completed a traffic letter for a proposed McDonald Automotive Group Administration and Reconditioning Facility. The new facility in Littleton, Colorado will provide space for auto repairs and auto storage for McDonald dealership vehicles. The project proposes to construct a new two-story auto repair building with approximately 733 parking spaces. The vacant property is located at 1151 W. Mineral Avenue and is adjacent to existing office buildings on all sides except the north side which includes existing single-family homes. A traffic letter was requested by the City of Littleton to understand the trip generation of the proposed project. This memorandum summarizes the methodology and findings.

Project Description

The proposed auto reconditioning center will be within a new 37,822 square foot building with 31,985 square feet on the first floor and 5,837 square feet on the second floor. Approximately 28,000 square feet will be designated for the auto reconditioning and repair center with the rest of the building used for administrative office space. The site plan proposes to include approximately 733 parking spaces to store vehicles that will be delivered to this site and then transported to dealerships. There is existing access to the site via a roadway spur from Mineral Place which leads to Mineral Avenue. Near the property, Mineral Avenue is a four-lane east-west arterial with approximately 24,500 vehicles per day (Year 2018, CDOT TDMS).

Trip Generation

The Institute of Transportation Engineers (ITE) *Trip Generation Manual*¹ does not provide trip generation rates for auto dealership reconditioning and storage centers; therefore, the operational data provided by the McDonald Automotive Group was utilized to estimate peak hour and daily trips.

It is anticipated that the auto reconditioning staff trips will occur during peak periods, but the auto storage trips will occur outside of the peak period conditions. It is understood that there will be up to 30 employees on-site each day working Monday through Friday from 7:30am to 4:30pm and on Saturdays from 9:00am to 5:00pm. It was estimated that there will be up to 10 auto delivery trucks per week and up to 30 trips by staff to shuttle vehicles between the site and dealerships.

For conservative purposes, it was assumed all employees arrive in the AM peak hour and leave in the PM peak hour and a non-auto reduction was not applied even though the site is near facilities for walking, biking, and transit. It was assumed a small portion of employees will make a trip during the day for lunch or errands. For conservative purposes, it was assumed there would be one truck delivery in each peak and the shuttling of vehicles was averaged per hours of operation. **Table 1** summarizes the trip generation calculations.

Table 1 – Trip Generation Estimates

Trip Purpose	Quantity	Weekday Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Employees	30 / day	80	30	0	30	0	30	30
Delivery Trucks	10 / week	4	1	0	1	0	1	1
Vehicle Shuttling	30 / day	60	3	3	6	3	3	6
Total		144	34	3	37	3	34	37

As shown on **Table 1**, **the proposed auto reconditioning and storage center is estimated to generate up to 144 trips per day and up to 37 trips in the peak hours.** The trips associated with the auto reconditioning center are anticipated to have little to no impact on the operations of the intersection of Mineral Avenue at Mineral Place and the existing roadway network can accommodate the trips.

¹ *Trip Generation 10th Edition*, Institute of Transportation Engineers, 2017.

Auto Trip Reductions

The property is located in a well-established part of Littleton and employees may take advantage of nearby pedestrian, bicycle, and transit facilities. On Mineral Avenue at Mineral Place, there is one bus stop per direction for Route 401 that provides access to the Littleton/Mineral Light Rail Station and access to Broadway and Highlands Ranch Town Center.

Mineral Avenue has designated on-street bike lanes and detached sidewalks. These walking and biking facilities lead to local trails (Lee Gulch), regional trails (Highline Canal), and the Littleton/Mineral Light Rail Station. Although it is likely that some of the employees will use non-auto modes of transportation to get to and from the project site, a non-auto reduction was not applied for a conservative trip estimate.

Proposed Access

The property plans to utilize the existing access road that leads to Mineral Place and then to Mineral Avenue. The intersection of Mineral Avenue at Mineral Place provides full-movement and has side-street stop-control. There are left-turn and right-turn lanes on Mineral Avenue to facilitate vehicles turning onto Mineral Place to the project site.

Conclusion

Based on a review of the site plan and estimated trip generation, **little to no traffic impacts are anticipated with the proposed auto reconditioning and storage project and the existing roadway network can support the trips.** Hopefully the contents of this traffic letter are helpful. If you have any questions, please give me a call.

Cassie Slade, PE, PTOE
Senior Transportation Engineer



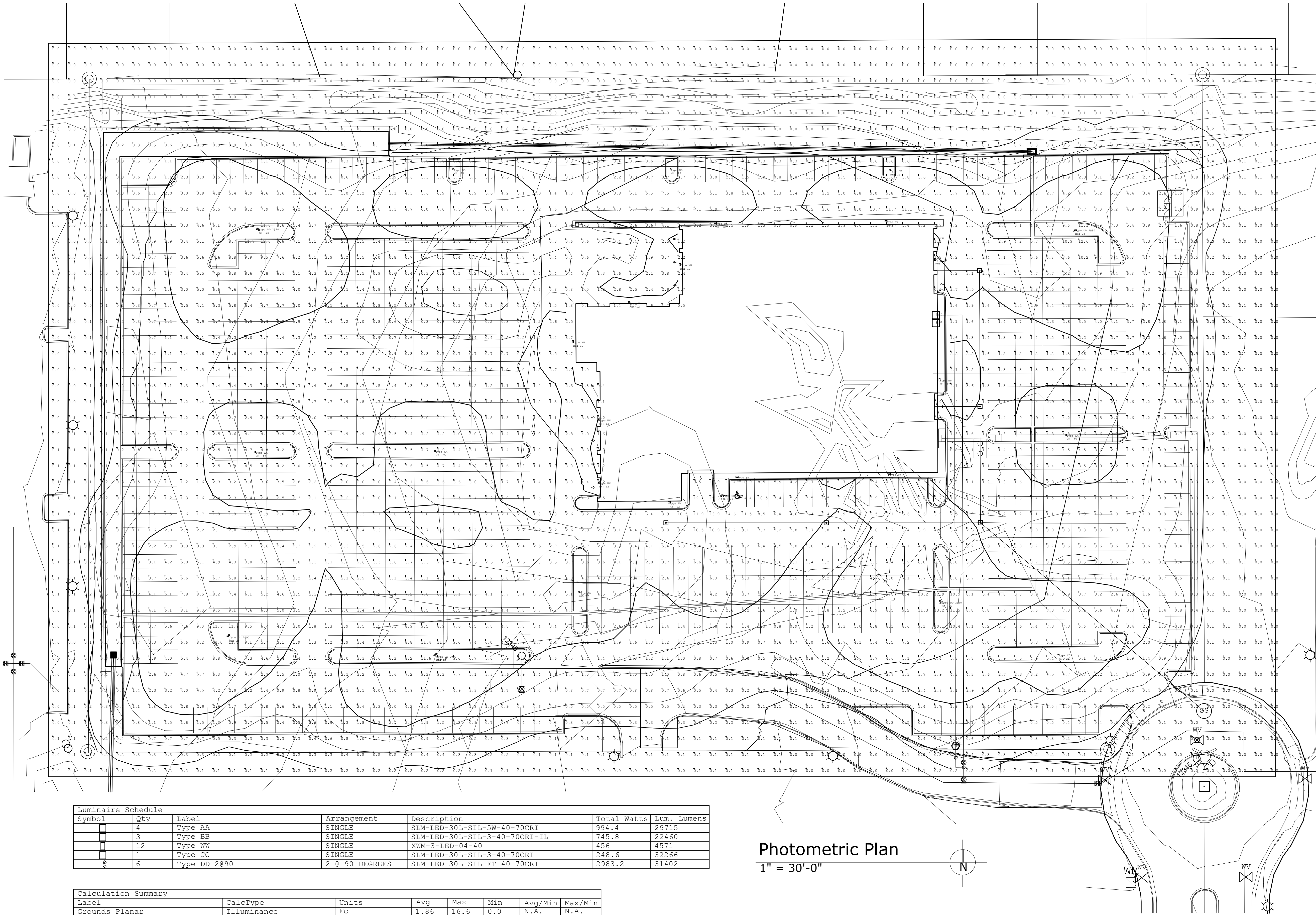
Exhibit C

Photometric Analysis

[*see attached*]

MCDONALD RECONDITIONING CENTER DEVELOPMENT PLAN

CASE NUMBER: SDP21-0001



Luminaire Schedule						
Symbol	Qty	Label	Arrangement	Description	Total Watts	Lum. Lumens
□	4	Type AA	SINGLE	SLM-LED-30L-SIL-5W-40-70CRI	994.4	29715
□	3	Type BB	SINGLE	SLM-LED-30L-SIL-3-40-70CRI-IL	745.8	22460
□	12	Type WW	SINGLE	XWM-3-LED-04-40	456	4571
□	1	Type CC	SINGLE	SLM-LED-30L-SIL-3-40-70CRI	248.6	32266
□	6	Type DD 2890	2 @ 90 DEGREES	SLM-LED-30L-SIL-FT-40-70CRI	2983.2	31402

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
Grounds Planar	Illuminance	Fc	1.86	16.6	0.0	N.A.	N.A.

Photometric Plan

1" = 30'-0"

REVISION DESCRIPTION
SUBMITTED TO LITTLETON
SUBMITTED TO LITTLETON

DATE
10/02/20
4/09/21

1
2

DRN

CHK

DSG

MCDONALD RECONDITIONING CENTER
SITE DEVELOPMENT PLAN
1151 WEST MINERAL AVE., LITTLETON, COLORADO

PHOTOMETRIC PLAN

COMMERCIAL
BUILDING
SERVICES
INC.

7561 S. GRANT ST. A-4
LITTLETON, CO 80122 303.730.3001
www.cbsconstruction.com

JOB NO.

SCALE
1" = 30'-0"

PLOT DATE
9-30-20

SHEET
7

Exhibit D

Drainage Study

[*see attached*]



Action Civil Engineering
Engineering.Planning.Surveying

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ENGLEWOOD, CO 80112
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FINAL DRAINAGE REPORT

McDonald Reconditioning Center

Littleton, Colorado

January 8, 2021
Revised: April 7, 2021

PREPARED FOR:
Commercial Building Services
7561 S. Grant Street, Suite A-4
Littleton, CO 80122
Contact: Steve More
(303) 730-3001

PREPARED BY:
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Project No. 2013

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Appendix B	Hydrologic Calculations
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Appendix E	Drainage Maps
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GENERAL LOCATION AND DESCRIPTION

Location

The site is located at 1151 West Mineral Avenue, Littleton, Colorado 80120.

The property legal description is a tract of land situated on Lot 1, Southbridge Filing No. 3, located in the NE ¼ of Section 33 Township 5S, R68W of the 6th Principle Meridian, City of Littleton, County of Arapahoe, State of Colorado. The property is bounded by office buildings to the west, east, and south and residential development to the north.

A site map is included in Appendix A.

Description of Property

The site is approximately 6.7 acres (291,852 square-feet). The existing site is undeveloped and consists of native grasses and vegetation. There are no existing drainage or irrigation facilities onsite.

According to the NRCS Soil Survey the site consists of Type C soils described by the soil survey as 86 percent "Fondis silt loam, 1 to 3 percent slopes" and 14 percent "Weld silt loam, 0 to 3 percent slopes" (Web Soil Survey, 8/14/2020)."

According to the FEMA Firmette, panel 08005C0434K effective 12/17/2010, the site is in an area of minimal flood hazard and it is not located within the 100-year flood plain.

Description of Proposed Development

The proposed development consists of a one-story building with a footprint of 31,331 square-feet that will provide vehicle rehabilitation services. Approximately 238,709 square-feet of the site will serve as inventory storage. Access to the site will be from West Mineral Ave and South Mineral Place. Proposed site infrastructure includes parking, sanitary sewer, water, storm sewer, sidewalks, landscaping, and a bioretention pond.

Previous Studies

1. "Littleton Rehabilitation Hospital Healthsouth" revised April 18, 2012 performed by Martin/Martin, Inc.
2. "Southbridge I and II Office Buildings Drainage Study" dated revised April 21, 1981 performed by KKBNA

Existing Drainage Conditions

According to Figure 202 of LSDDTC (Appendix D) the site is located within the Lee Gulch Major Drainageway. No regional drainage facilities exist onsite or nearby. The site is located south of Lee Gulch and east of the Highline Canal. The site lies outside the 100-year floodplain as shown on the FEMA Firmette (Appendix A). There are no existing irrigation facilities onsite that will be affected by the proposed development.

The existing site generally slopes from east to west at a grade of approximately 2 to 4 percent. Along the northern boundary of the site the existing ground slopes away from the existing residential development at a grade of approximately 14 to 30 percent. There is an existing low point located at the southwest corner of the site. A portion of the existing site to the east (Basin OS1) drains northwest onto the site. A portion of the existing site to the east (Basin OS2) drains west onto the site. A portion of the existing site to the south (Basin OS3) drains north onto the site. Existing storm sewer to the south of the site collects runoff and conveys it west. There is an existing detention pond to the east of the property which will not be impacted by the proposed development.

Master Drainage Plan

A master drainage plan is not available for the site at this time. Development of the site will not impact offsite areas.

DRAINAGE DESIGN CRITERIA

Drainage improvements have been designed in accordance with the City of Littleton Storm Drainage Design and Technical Criteria (LSDDTC) and Urban Drainage and Flood Control District (UDFCD) Urban Storm Drainage Criteria Manual.

The Rational Method was used for all runoff calculations for the 5-year and 100-year frequency events. The 5-year and 100-year storm events were used to size the proposed bioretention pond and the outlet pipe from the pond.

1-hour point rainfall values were obtained from Table 5-a of the LSDDTC. The following 1-hour point rainfall values were used:

5-year: 1.08 inches (Minor Storm)

100-year: 2.24 inches (Major Storm)

Hydrologic and hydraulic criteria were followed without variance. No additional variances are being requested for the site at the time that this report was prepared.

DRAINAGE BASINS

Proposed Basins

The site within the property boundary was divided into seven basins: A1, A2, A3, and A4. Three offsite basins were also identified: OS1, OS2, and OS3.

Sub-Basin A1 is 0.28 acres and is located along the western boundary of the site and consists entirely of landscaped area. The basin drains to the west and runs offsite through landscaped area undetained. The 5-year and 100-year runoff coefficients are based on a composite imperviousness of 2% resulting in runoff coefficients of 0.05 and 0.49

for the 5 and 100-year return events, respectively. The total runoff generated within Sub-Basin A for the 5 and 100-year events is 0.03 cfs and 1.04 cfs, respectively.

Sub-basin A2 is 4.58 acres and consists primarily of a portion of the proposed building, pavement, and landscaped area. The basin drains from east to west and west to east where it is collected by the proposed detention pond. Drainage from Basin A2 consists of sheet flow and two concrete pans which direct runoff to the pond. The 5-year and 100-year runoff coefficients are based on a composite imperviousness of 76% resulting in runoff coefficients of 0.66 and 0.79 for the 5 and 100-year return events, respectively. The total runoff generated within Sub-Basin A2 for the 5 and 100-year events is 7.38 cfs and 21.91 cfs, respectively.

Sub-basin A3 is 1.76 acres consists primarily of a portion of the, pavement, and a landscaped area. Runoff generated within Sub-Basin A3 will sheet flow from the north to the proposed gutter which will collect the runoff and convey it to a 5-foot Type R inlet designed in a sump. The inlet collects and conveys runoff to an 18-inch RCP, which conveys runoff to the proposed bioretention pond. Runoff from the west will sheet flow east and runoff from the east will sheet flow west to a proposed concrete pan which will convey runoff to the proposed 5-foot Type R inlet. The 5-year and 100-year runoff coefficients are based on a composite imperviousness of 75% resulting in runoff coefficients of 0.65 and 0.79 for the 5 and 100-year return events, respectively. The total runoff generated within Sub-Basin A3 for the 5 and 100-year events is 2.75 cfs and 8.77 cfs, respectively.

Sub-Basin A4 is .06 acres and consists entirely of landscape area. It is located at the northeastern corner of the property. Runoff generated within Sub-Basin A4 will be collected by a Type C inlet and conveyed to the proposed pond. The 5-year and 100-year runoff coefficients are based on a composite imperviousness of 2% resulting in runoff coefficients of 0.05 and 0.49 for the 5 and 100-year return events, respectively. The total runoff generated within Sub-Basin A4 for the 5 and 100-year events is 0.01 cfs and .18 cfs, respectively.

The total composite site imperviousness, for Basins A1-A4 is 52 percent and the 5 and 100-year runoff coefficients are 0.62 and 0.78, respectively. Summarized in Table 1 are the runoff coefficients and flow rates for the 5 and 100-year events for each sub-basin.

Existing Basins

Sub-basin OS1 is 2.57 acres and is located entirely offsite to the east of the property. It consists entirely of landscape area. Runoff generated within Sub-basin OS1 flows northwest where it enters the property at Sub-basin A2 and is captured by a Type C inlet which ultimately conveys runoff to the bioretention pond by way of an 18-inch RCP (Pipe Segment N1). Capacity calculations for the 18-inch RCP are provided in Appendix C. The 5-year and 100-year runoff coefficients are based on a composite imperviousness of 2% resulting in runoff coefficients of 0.05 and 0.49 for the 5 and 100-year return events, respectively. The total runoff generated within Sub-Basin OS1 for the 5 and 100-year events is 0.25 cfs and 5.11 cfs, respectively.

Sub-basin OS2 is 0.44 acres and is located entirely offsite to the east of the property. It consists entirely of landscape area. Runoff generated within Sub-basin OS2 flows west where it enters the property at Sub-basin A2, then sheet flows to the proposed drainage pan which captures the runoff and conveys it north to the proposed Type R inlet. Runoff captured by the Type R inlet is conveyed to the 24-inch RCP (Pipe Segment N2 and Pipe Segment N3) which conveys it to the bioretention pond. Capacity calculations for the two segments of 24-inch RCP are provided in Appendix C. The 5-year and 100-year runoff coefficients are based on a composite imperviousness of 2% resulting in runoff coefficients of 0.05 and 0.49 for the 5 and 100-year return events, respectively. The total runoff generated within Sub-Basin OS2 for the 5 and 100-year events is 0.06 cfs and 1.29 cfs, respectively.

Sub-basin OS3 is 0.73 acres and is located entirely offsite to the south of the property. It consists primarily of landscape area with a small portion of hardscape contributed by the existing drive that runs along the south boundary of the site. Runoff generated within Sub-basin OS3 flows northwest to an existing low-lying area. Runoff from Sub-basin OS3 will not enter the site. The Existing drainage patterns and existing imperviousness of Sub-basin OS3 are not being altered. The 5-year and 100-year runoff coefficients are based on a composite imperviousness of 2% resulting in runoff coefficients of 0.05 and 0.49 for the 5 and 100-year return events, respectively. The total runoff generated within Sub-Basin OS3 for the 5 and 100-year events is 0.08 cfs and 1.59 cfs, respectively.

The total composite site imperviousness, for Basins A1-A4 as well as OS1 and OS2 is 47 percent. The total site imperviousness for all basins within the study area is 50.5 percent. The distinction is made between the two because the proposed bioretention pond does not capture runoff from OS3, which means calculations to size the pond did not include that basin.

Summarized in Table 1 are the runoff coefficients and flow rates for the 5 and 100-year events for each sub-basin.

Table 1 – Runoff Analysis Data Table

Runoff Analysis Data Table					
Basin ID	Design Point	C₅	C₁₀₀	Q₅ (cfs)	Q₁₀₀ (cfs)
A1	1	0.05	0.49	0.03	1.04
A2	2	0.66	0.79	7.38	21.91
A3	3	0.65	0.79	2.75	8.77
A4	4	0.05	0.49	0.01	0.18
OS-1	8	0.05	0.49	0.25	5.11
OS-2	9	0.05	0.49	0.06	1.29
OS-3	10	0.05	0.49	0.08	1.59

Storm Water Quality and Erosion Control Standards

Storm water quality has been provided in accordance with the City of Littleton Storm Drainage and Technical Criteria Manual, dated July 2019. The LSDDTC states that all new developments with total site imperviousness exceeding 70 percent is required to provide permanent storm water quality control measures. The proposed bioretention pond was designed in accordance with the Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3. The bioretention pond was designed with adequate capacity to store the EURV. Runoff greater than the EURV and up to the 100-year storm will be stored in the parking lot per LSDDTC requirements. An emergency spillway was designed for any runoff greater than the 100-year storm.

Erosion control measures shall be implemented prior to the commencement of any earthwork or demolition activities onsite. Erosion control measures shall be properly installed, inspected, and maintained throughout the course of construction. Erosion control measures will include silt fence and construction fence around the entire

site, vehicle tracking control, concrete washout, inlet protection, a sedimentation basin, erosion control blanket, and seeding and mulching.

Stabilized Staging Area

The SSA is for storing construction materials, equipment, and vehicles. Drip pans, cardboard, plywood, or other absorbent materials must be placed beneath parked vehicles to control the release of hazardous materials from the SSA. Hazardous materials include but are not limited to gasoline, motor oil, hydraulic oil, and anti-freeze.

Silt Fence

Silt fence is a sediment-trapping device installed prior to beginning earthwork activities. Silt fences will be installed inside the property boundary and at sensitive locations. The silt fence along the property boundaries will remain in place until permanent vegetation has been established. Details for installing silt fences and other BMPs are included on the Erosion Control Detail Sheet.

Vehicle Tracking Control

The access road with an entrance onto a paved road will be graveled for a minimum distance of 50 linear feet to retain mud and other potential pollutants on-site. An approximate thickness of 12 inches of 3 – 6-inch rock is recommended, but this design will be subject to revision based on site conditions to achieve the desired result. If mud or soils are tracked onto the paved public roads, the roads will be cleaned as soon as possible by a street cleaner. No construction debris or soil deposits will be allowed to impede the smooth flow of traffic on public roads.

Concrete Washout Area

A portable concrete washout consists of a shallow container that is designed to capture wastewater and waste products resulting from the cleaning of concrete and masonry equipment. They are used to contain concrete and liquids from chutes of concrete mixers and hoppers that are rinsed out after delivery. The washout consolidates solids and allows for evaporation of liquids for easier disposal and to prevent runoff into storm sewers or waters on the site. The washout area will be located near the SSA to control tracking of mud.

Inlet Protection

All storm sewer inlets made operable during construction will have sediment-entrapment facilities installed to prevent sediment-laden runoff from entering the inlet. Contractor will install the most effective method of inlet protection for the site conditions.

Vegetation – Seeding and Mulch

Graded areas will be vegetated or paved within 14 days following completion of grading. Stockpiled soils that remain undisturbed for 30 or more days will be temporarily vegetated with a non-irrigated native grass seed mix and mulched. Soil roughening in large, sloping areas is preferable to smooth grading for preventing sediment from being eroded and carried off-site by wind or water erosion. The finished turf areas will be seeded with a native grass mix.

Sedimentation Basin

A temporary sedimentation basin will be provided for sediment collection during the course of construction. The temporary sediment basin will be located in the same location as the permanent bioretention pond.

PROPOSED DRAINAGE FACILITY DESIGN

General Concept

The site within the property boundary was divided into four basins: A1, A2, A3, and A4. Three offsite basins were also identified: OS1, OS2, and OS3. Runoff from the site, excluding Sub-Basins A1 and OS3, is captured and conveyed to the proposed detention pond. Runoff from Sub-Basins A1 and OS3 are captured by the proposed inlet with beehive grate just south of Sub-basin A1.

The bioretention pond will discharge runoff offsite by way of a 24-inch RCP to an existing 42-inch RCP that runs parallel to W. Mineral Ave to the south. The bioretention pond was designed with adequate capacity to store the EURV. For storm events greater than the EURV runoff will be stored in the parking lot pursuant to Section 14.5 of the LSDDTC.

Bioretention Pond

The proposed bioretention pond was designed in accordance with the specifications set forth in the UDFCD manual. Those specifications can be found in their entirety in Appendix D, herein. The proposed bioretention pond was designed using the UDFCD "Detention Basin Design Workbook" Version 4, December 2019.

The bioretention pond was designed with adequate capacity to store the EURV and will be equipped with an outlet structure, underdrain system, and 24-inch RCP outlet, which will convey stormwater to the existing line to the south. Runoff greater than the EURV will be stored in the parking lot per LSDDTC requirements.

The depth of the water quality capture volume (WQCV) was determined to be 0.56 feet for an effective site imperviousness of 50.5 percent and a 12-hour drain time. The WQCV WSE is 5567.16 feet. The proposed bioretention pond will have vertical walls of 8-inch-thick concrete. The bioretention media layer will be a minimum of 18-inches thick and will conform to Table B-1, Chapter 4, Volume 3 the UDFCD manual. No amendments to the bioretention media are planned.

The depth of the EURV, inclusive of the WQCV, was determined to be 1.91 feet, resulting in a water surface elevation of 5568.51 feet. The EURV is released over 27 hours through an orifice plate designed with 3 orifices having an area of 3 square inches spaced 5.6 inches apart.

The depth of the 100-year storm, inclusive of the WQCV and EURV, was determined to be 3.24 feet, resulting in a 100-year WSE of 5569.84 feet. The 100-year runoff volume is entirely contained within the pond whose top of wall elevation is 5569.92 feet (minimum).

The pond ties-in directly to the parking lot with a minimum top of wall elevation of 5569.92 feet. The pond outlet is designed with an orifice and restrictor plate, which discharges runoff greater than the EURV and up to the 100-year storm to the 24-inch RCP outlet pipe. An emergency spillway was designed for any runoff greater than the 100-year storm. The spillway is located at the southwest corner of the site adjacent to the south edge of the pond. The spillway is a 5-foot wide and 0.5-foot-deep curb cut which discharged to the undeveloped area to the south of the site. The maximum ponding depth in the parking lot for the 500-year storm is 0.92 feet. The WSE of the spillway is 5570.84 feet and the depth of water over the spillway is 0.14 feet. Hydraulic analysis was performed on the spillway to determine the type of lining necessary to prevent erosion of the spillway. Results of the analysis are included in Appendix C.

The WQCV was designed to drain within 12 hours. The EURV was designed to drain within 27 hours (pursuant to Section 15.4.4 of the LSDDTC).

Design information for the proposed bioretention pond is summarized in Table 2 below.

Table 2 – Bioretention Pond Summary Table

Effective Imperviousness of Tributary Area, Ia (Excluding A1 & OS3)	50.5%
Contributing Watershed Area (Excluding A1 & OS3)	9.41 acres
WQCV	0.130 acre-feet
Volume Required (to store EURV)	0.450 acre-feet
Total Pond Depth (including grow media and filtration media)	5.32 ft
Depth of Bioretention Grow Media	1.5 feet
Depth of Filtration Media	0.5 ft
WQCV Stage	0.56 ft
WQCV WSE	5567.16 ft
WQCV Drain Time	12 hours
EURV Stage	1.91 ft
EURV WSE	5568.51 ft
EURV Drain Time	27 hours
100 Year Stage	3.22 ft
100 Year WSE	5569.84 ft
Side Slopes	0 ft/ft
Depth Over Emergency Spillway	.14 ft
WSE Over Emergency Spillway	5570.84 ft

Permeable Pavers

Approximately 10,464 square-feet of permeable pavement is being proposed throughout the site. The purpose of the proposed permeable pavement system is to reduce the overall imperviousness of the site. The permeable pavement system will not act as water quality treatment and it will not provide stormwater storage; therefore, there will be no underdrain system required. All stormwater storage and treatment required for the site is provided by the proposed bioretention pond.

Drainage Facility Maintenance

The project owner, McDonald Real Estate Mineral, LLC shall be responsible for maintenance of all onsite drainage features.

SUMMARY

The drainage improvements proposed for McDonald Mazda Reconditioning Center meet the criteria set forth by the City of Littleton Storm Drainage and Technical Criteria Manual and Urban Drainage and Flood Control District Storm Drainage Criteria Manual.

Developed runoff from Sub-basins A1 through A4 as well as undeveloped runoff from sub-basins OS1 and OS2 drains to the proposed bioretention pond. Existing drainage patterns for OS3 are not being altered.

The existing drainage patterns of Basins OS1 through OS3 are maintained. The proposed bioretention pond will capture, treat, and release the WQCV over 12-hours. The proposed bioretention pond was designed with adequate capacity to store the EURV which is discharged through an orifice plate. Runoff exceeding the EURV and less than or equal to the 100-year storm will be stored in the parking lot in accordance with Section 14.5 of LSDDTC. A spillway was designed to capture runoff greater than the 100-year storm and convey it to a 24-inch RCP. The maximum ponding depth in the parking lot is 0.954 feet for the 500-year storm.

The bioretention pond complies with State Statutes C.R.S 37-92-602 (8).

The site is not within the 100-year floodplain.

No variances are being requested for the proposed site.

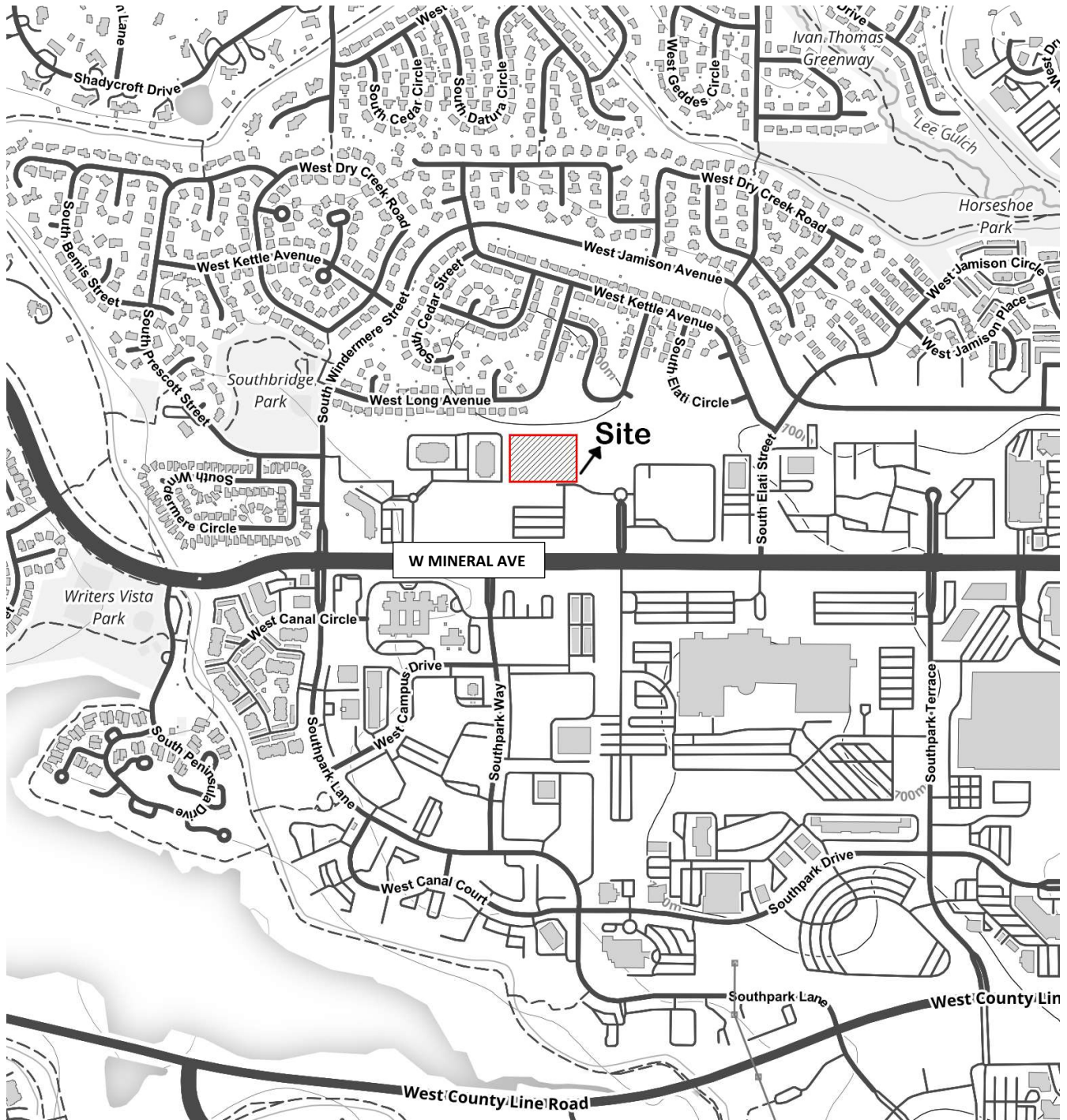
REFERENCES

1. City of Littleton Storm Drainage and Technical Criteria Manual. July 1, 2019.
2. Urban Drainage and Flood Control District (UDFCD). 2017. *Drainage Criteria Manual, Volumes 1, 2, & 3, Urban Drainage and Flood Control District.*
3. "Littleton Rehabilitation Hospital Healthsouth" revised April 18, 2012 performed by Martin/Martin, Inc.
4. "Southbridge I and II Office Buildings Drainage Study" dated revised April 21, 1981 performed by KKBNA

APPENDIX A

LOCATION, SOILS, FIRM

LOCATION MAP



National Flood Hazard Layer FIRMette



105°0'26"W 39°34'45"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/11/2020 at 4:01 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

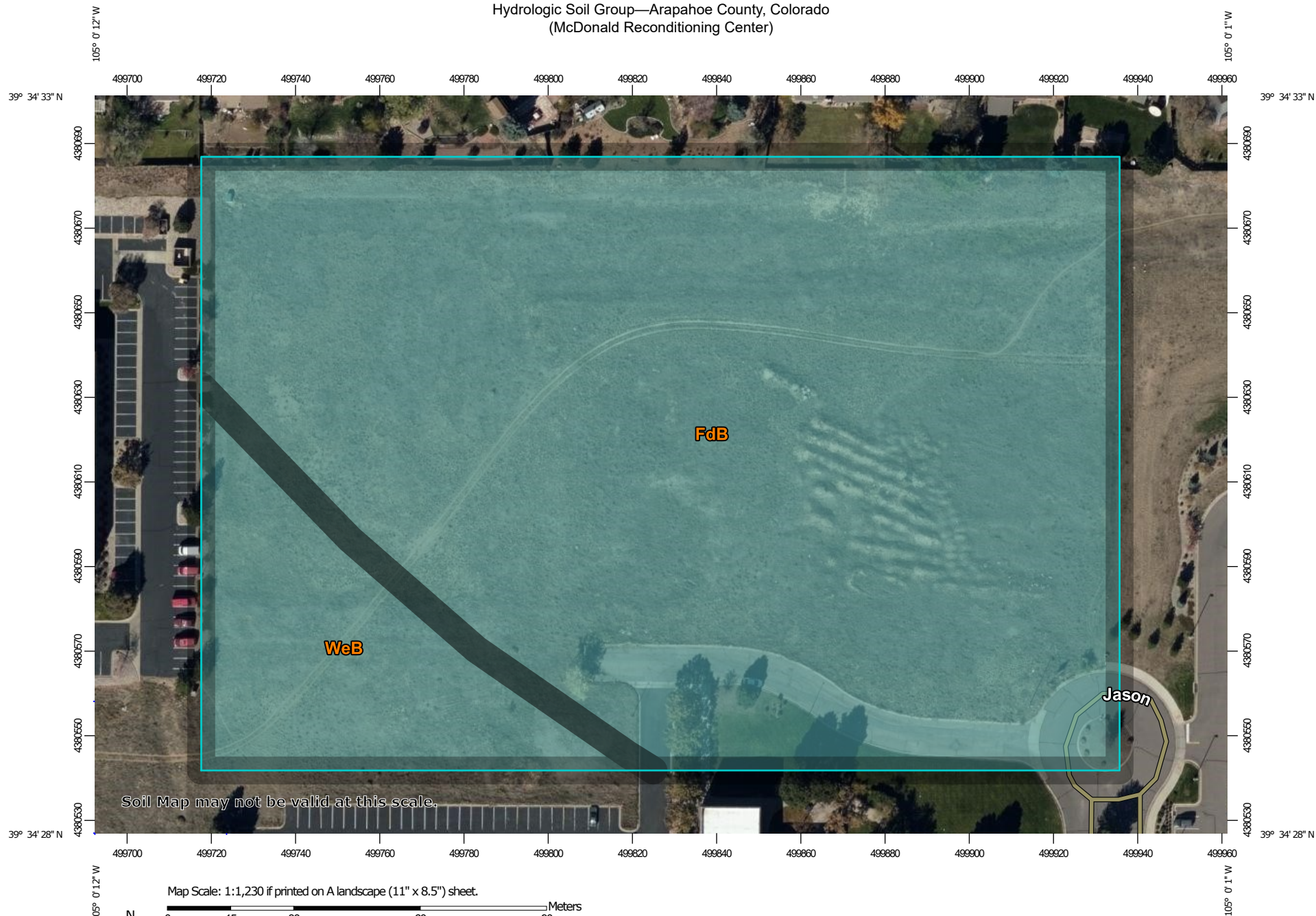
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

USGS The National Map: Orthoimagery. Data refreshed April 2020

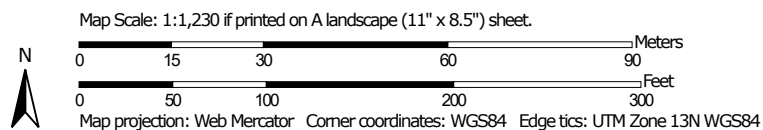
104°59'49"W 39°34'17"N

0 250 500 1,000 1,500 2,000 Feet 1:6,000

Hydrologic Soil Group—Arapahoe County, Colorado (McDonald Reconditioning Center)



Soil Map may not be valid at this scale.



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

8/14/2020
Page 1 of 4

Hydrologic Soil Group—Arapahoe County, Colorado
(McDonald Reconditioning Center)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Arapahoe County, Colorado
 Survey Area Data: Version 16, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 20, 2018—Oct 26, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FdB	Fondis silt loam, 1 to 3 percent slopes	C	6.8	86.0%
WeB	Weld silt loam, 0 to 3 percent slopes	C	1.1	14.0%
Totals for Area of Interest			7.9	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

HYDROLOGIC CALCULATIONS

RUNOFF COEFFICIENTS - DEVELOPED

PROJECT NAME: MCDONALD RECONDITIONING CENTER
 PROJECT NUMBER: 2013
 CALCULATED BY: EKC
 CHECKED BY: TWD

DATE: January 8, 2021

Land Use	Type C Soils			
	Paved	Roofs	Drives/Walks	Yard/Landscape
2-Yr Coeff.	0.83	0.74	0.74	0.01
5-YEAR Coeff.	0.85	0.77	0.77	0.05
100-YEAR Coeff.	0.89	0.85	0.85	0.49
Impervious	100%	90%	90%	2%

Note: Runoff coefficients shown were obtained from UDFCD Table 6-3 and 6-5

Design Basin	Design Point	Paved Area (AC)	Roofs Area (AC)	Drives/Walks Area (AC)	Yard/Landscape Area (AC)	Area (AC)	CC ₂	CC ₅	CC ₁₀₀	% Imp.
A1	1				0.28	0.28	0.01	0.05	0.49	2%
A2	2	3.13	0.39		1.06	4.58	0.63	0.66	0.79	76%
A3	3	1.01	0.33		0.41	1.76	0.62	0.65	0.79	75%
A4	4				0.06	0.06	0.01	0.05	0.49	2%
SUBTOTAL FOR BASIN A		4.15	0.72	0.00	1.81	6.68	0.60	0.62	0.78	72%
		62.1%	10.8%	0.0%	27.1%	100%				
OS-1	5				2.57	2.57	0.01	0.05	0.49	2%
OS-2	6				0.44	0.44	0.01	0.05	0.49	2%
OS-3	7				0.73	0.73	0.01	0.05	0.49	2%
SUBTOTAL FOR BASIN OS		0.00	0.00	0.00	3.74	3.74	0.01	0.05	0.49	2%
		0.0%	0.0%	0.0%	100.0%	100%				
TOTAL STUDY AREA (Excluding OS3 for Bioretention Pond Calculations)		4.15	0.72	0.00	4.82	9.69	0.42	0.45	0.69	50.5%
		42.8%	7.4%	0.0%	49.8%					
TOTAL STUDY AREA (Including OS3)		4.15	0.72	0.00	5.55	10.42	0.64	0.40	0.41	47%
		39.8%	6.9%	0.0%	53.3%					

STANDARD FORM SF-2 - DEVELOPED **Time of Concentration**

PROJECT NAME: MCDONALD RECONDITIONING CENTER
 PROJECT NUMBER: 2013.0
 CALCULATED BY: EKC
 CHECKED BY: TWD

DATE: January 8, 2021

SUB-BASIN DATA			INITIAL TIME (T _i)			TRAVEL TIME (T _t)						t _c CHECK (URBANIZED BASINS)				FINAL t _c
DESIGN BASIN (1)	AREA Ac (2)	C _s (3)	LENGTH Ft (4)	SLOPE % (5)	T _i Min. (6)	LENGTH Ft. (7)	SLOPE % (8)	C _v (9)	Land Surface (10)	VEL fps (11)	T _t Min. (12)	COMP. t _c (13)	Channel Flow (Lt) (14)	Imperv. i (15)	t _c vs. Eq. 6-5 Min. (16)	Min.
A1	0.28	0.05	15	12.5%	3.2	0	0.0%	15.0	Grassed Waterway	0.2	0.0	3.2	0	0.0	25.7	5.0
A2	4.58	0.66	160	2.0%	8.1	342	2.0%	20.0	Paved Areas	2.8	2.0	10.2	342	0.8	15.0	10.2
A3	1.76	0.65	105	2.0%	6.8	265	1.0%	20.0	Paved Areas	2.0	2.2	9.0	265	0.8	15.5	9.0
A4	0.06	0.05	66	6.0%	8.6	0	0.0%	20.0	Paved Areas	0.2	0.0	8.6	0	0.0	25.7	8.6
OS-1	2.57	0.05	435	6.0%	22.1	160	2.0%	15.0	Grassed Waterway	2.1	1.3	23.4	160	0.0	27.7	23.4
OS-2	0.44	0.05	95	6.0%	10.3	0	1.0%	15.0	Grassed Waterway	1.5	0.0	10.3	0	0.0	25.7	10.3
OS-3	0.73	0.05	165	2.0%	19.6	0	1.0%	15.0	Grassed Waterway	1.5	0.0	19.6	0	0.0	25.7	19.6

$$T_i = \frac{0.395(1.1 - C)L^{1/2}}{S^{1/3}}$$

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

STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 5-YEAR EVENT

PROJECT NAME: MCDONALD RECONDITIONING CENTER
PROJECT NUMBER: 2013
CALCULATED BY: EKC
CHECKED BY: TWD

P₁ (1-Hour Rainfall) = 1.08

DATE: January 8, 2021

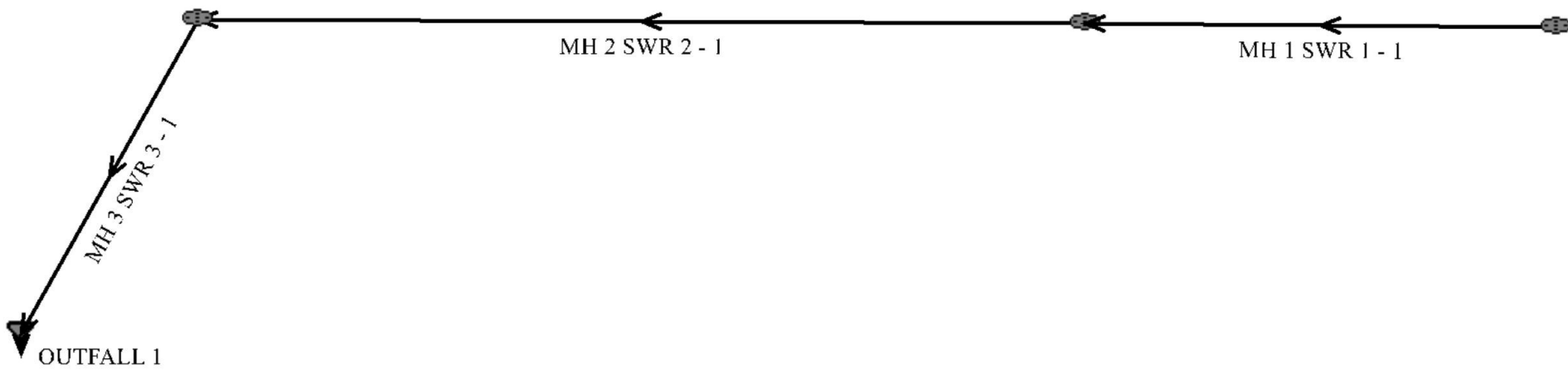
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STANDARD FORM SF-3 - DEVELOPED		
STORM DRAINAGE DESIGN - RATIONAL METHOD 100-YEAR EVENT		
PROJECT NAME: MCDONALD RECONDITIONING CENTER		DATE: January 8, 2021
PROJECT NUMBER: 2013	P₁ (1-Hour Rainfall) =	2.24
CALCULATED BY: EKC		
CHECKED BY: TWD		

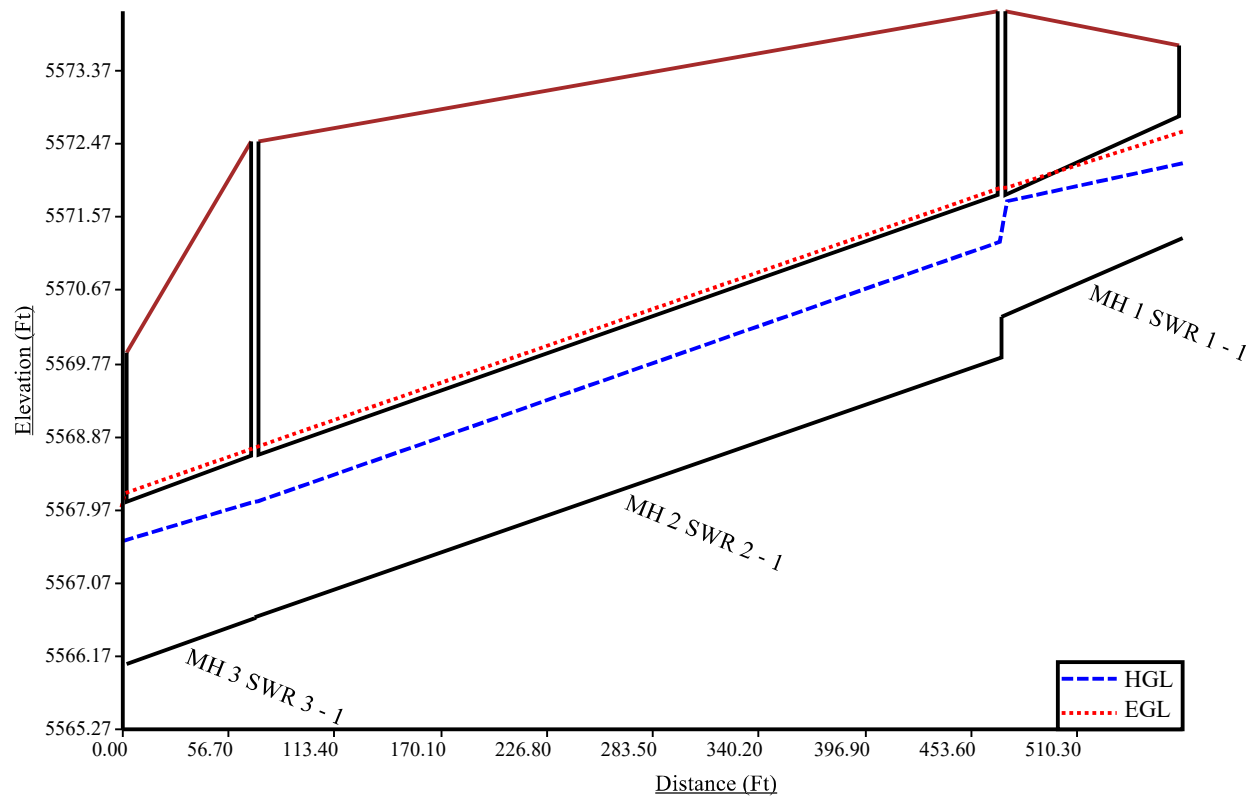
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APPENDIX C

HYDRAULIC CALCULATIONS



Profile



Program:
UDSEWER Math
Model Interface
2.1.1.4
Run Date:
4/8/2021 11:09:50
AM

UDSewer Results Summary

Project Title: New UDSEWER System Module
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 2.24
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 5567.60

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
OUTFALL 1	5569.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH 3	5572.51	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SWR 3 - 1										
MH 2 SWR 2 - 1	5574.11	15.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MH 1 SWR 1 - 1	5573.69	5.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
OUTFALL 1	0.00	0.00	0.00	0.00	0.00	1.52	10.26	0.24	15.60	
MH 3 SWR 3 - 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.60	
MH 2 SWR 2 - 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.60	
MH 1 SWR 1 - 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.70	

Sewer Input Summary:

	Elevation				Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
MH 3 SWR 3 - 1	70.47	5566.08	0.8	5566.64	0.013	0.63	0.00	CIRCULAR	24.00 in	24.00 in
MH 2 SWR 2 - 1	399.41	5566.65	0.8	5569.85	0.013	0.05	0.00	CIRCULAR	24.00 in	24.00 in
MH 1 SWR 1 - 1	96.92	5570.35	1.0	5571.32	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
MH 3 SWR 3 - 1	20.29	6.46	17.09	6.52	15.78	7.12	1.17	Supercritical	15.60	0.00	
MH 2 SWR 2 - 1	20.29	6.46	17.09	6.52	15.78	7.12	1.17	Supercritical	15.60	0.00	
MH 1 SWR 1 - 1	10.53	5.96	11.05	5.01	9.43	6.08	1.35	Supercritical	5.70	0.00	

- A Froude number of 0 indicates that pressurized flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
MH 3 SWR 3 - 1	15.60	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	
MH 2 SWR 2 - 1	15.60	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	
MH 1 SWR 1 - 1	5.70	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics were calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 5567.60

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
MH 3 SWR 3 - 1	5566.08	5566.64	0.00	0.00	5567.60	5568.06	5568.18	0.55	5568.72
MH 2 SWR 2 - 1	5566.65	5569.85	0.02	0.00	5568.08	5571.27	5568.76	3.18	5571.93
MH 1 SWR 1 - 1	5570.35	5571.32	0.01	0.00	5571.77	5572.24	5571.94	0.69	5572.63

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = $Bend\ K * V_{fi}^2 / (2 * g)$
- Lateral loss = $V_{fo}^2 / (2 * g) - Junction\ Loss\ K * V_{fi}^2 / (2 * g)$.
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft

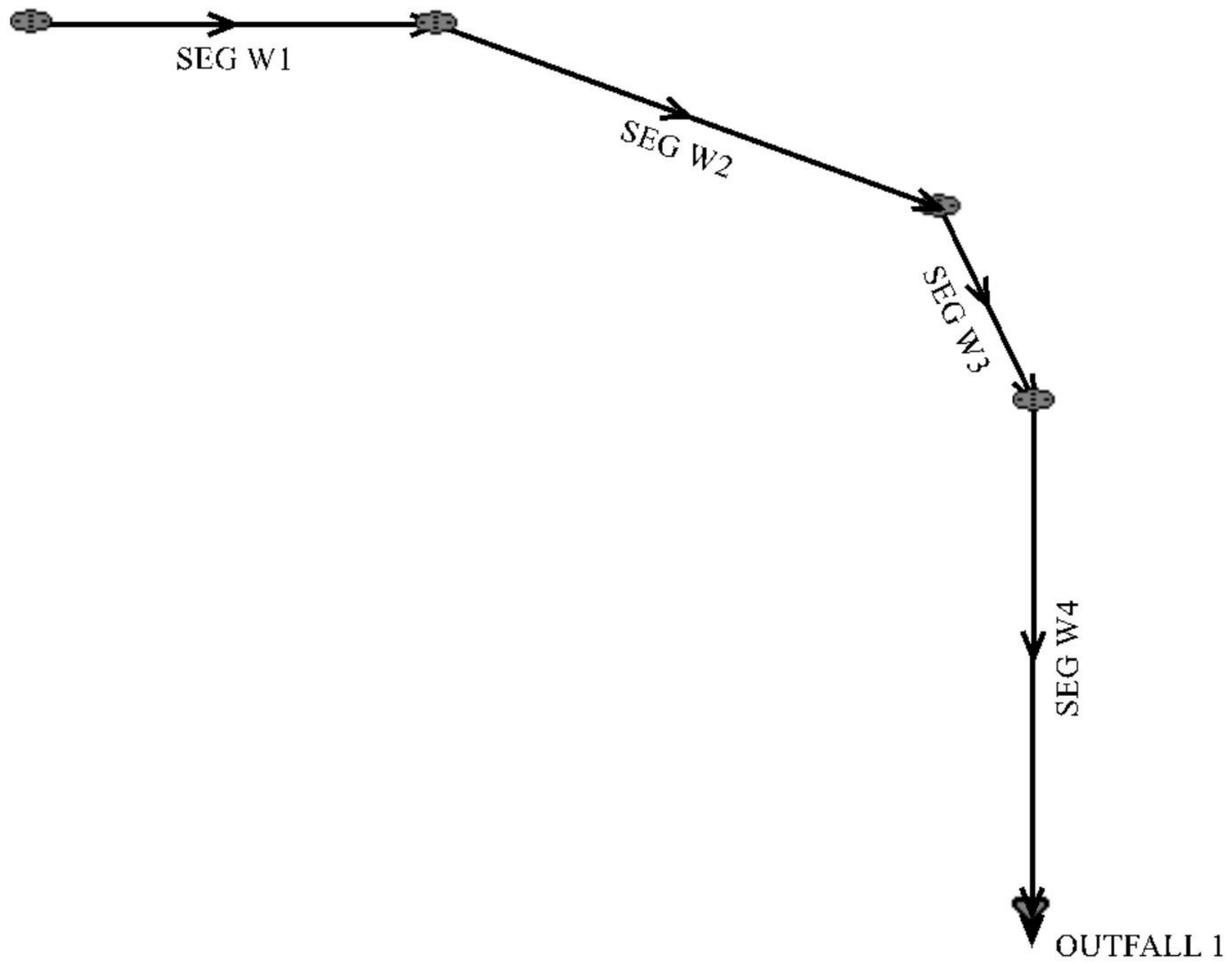
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
MH 3 SWR 3 - 1	70.47	3.00	4.00	5.50	6.67	4.42	1.58	10.74	6.45	3.62	87.43	Sewer Too Shallow
MH 2 SWR 2 - 1	399.41	3.00	4.00	5.50	10.71	6.44	3.61	7.52	4.84	2.01	516.71	
MH 1 SWR 1 - 1	96.92	2.50	4.00	4.92	7.02	4.30	2.05	4.92	2.91	0.66	59.79	Sewer Too

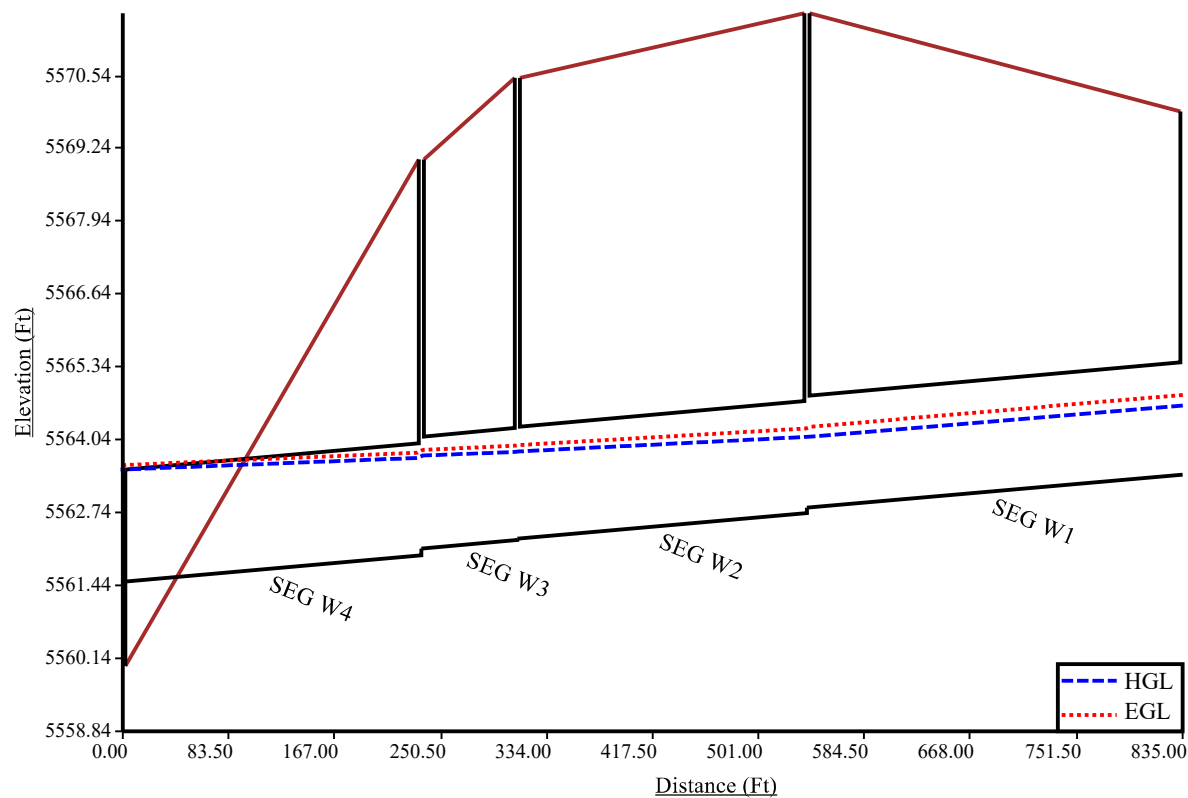
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Total earth volume for sewer trenches = 664 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
 - Four inches for pipes less than 33 inches.
 - Six inches for pipes less than 60 inches.
 - Eight inches for all larger sizes.



Bioretention Pond Outfall Pipe Profile



Program:
UDSEWER Math
Model Interface
2.1.1.4
Run Date:
4/8/2021 11:02:32
AM

UDSewer Results Summary

Project Title: New UDSEWER System Module
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 2.24
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 5563.51

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
OUTFALL 1	5560.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEG W4	5569.04	7.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SEG W3	5570.50	7.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEG W2	5571.65	7.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEG W1	5569.90	7.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

Element Name	Local Contribution					Total Design Flow				Comment
	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	
OUTFALL 1	0.00	0.00	0.00	0.00	0.00	0.77	9.21	1.73	7.10	Surface Water Present (Upstream)
SEG W4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.10	Surface Water Present (Downstream)
SEG W3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.10	
SEG W2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.10	
SEG W1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.10	

Sewer Input Summary:

Element Name	Sewer Length (ft)	Elevation			Loss Coefficients			Given Dimensions		
		Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
SEG W4	235.25	5561.51	0.2	5561.98	0.013	0.08	0.00	CIRCULAR	24.00 in	24.00 in
SEG W3	75.55	5562.10	0.2	5562.25	0.013	0.52	0.00	CIRCULAR	24.00 in	24.00 in
SEG W2	228.36	5562.27	0.2	5562.73	0.013	0.12	0.00	CIRCULAR	24.00 in	24.00 in
SEG W1	296.19	5562.83	0.2	5563.42	0.013	0.05	0.00	CIRCULAR	24.00 in	24.00 in

Sewer Flow Summary:

Element Name	Full Flow Capacity		Critical Flow		Normal Flow						
	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
SEG W4	10.14	3.23	11.35	4.86	14.79	3.49	0.60	Subcritical Surcharged	7.10	0.49	
SEG W3	10.14	3.23	11.35	4.86	14.79	3.49	0.60	Subcritical	7.10	0.00	
SEG W2	10.14	3.23	11.35	4.86	14.79	3.49	0.60	Subcritical	7.10	0.00	
SEG W1	10.14	3.23	11.35	4.86	14.79	3.49	0.60	Subcritical	7.10	0.00	

- A Froude number of 0 indicates that pressurized flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft ²)	Comment
SEG W4	7.10	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	
SEG W3	7.10	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	
SEG W2	7.10	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	
SEG W1	7.10	CIRCULAR	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	24.00 in	3.14	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics were calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 5563.51

Invert Elev.		Downstream Manhole Losses		HGL		EGL			
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
SEG W4	5561.51	5561.98	0.00	0.00	5563.51	5563.72	5563.59	0.22	5563.81
SEG W3	5562.10	5562.25	0.04	0.00	5563.76	5563.82	5563.86	0.08	5563.94
SEG W2	5562.27	5562.73	0.01	0.00	5563.83	5564.09	5563.95	0.30	5564.24
SEG W1	5562.83	5563.42	0.00	0.00	5564.09	5564.65	5564.27	0.57	5564.84

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = $Bend\ K * V_{fi}^2 / (2 * g)$
- Lateral loss = $V_{fo}^2 / (2 * g)$ - Junction Loss $K * V_{fi}^2 / (2 * g)$.
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft

The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
SEG W4	235.25	3.00	4.00	5.50	0.00	0.00	0.00	13.12	7.64	4.81	246.38	Sewer Too Shallow
SEG W3	75.55	3.00	4.00	5.50	12.88	7.52	4.69	15.50	8.83	6.00	179.91	
SEG W2	228.36	3.00	4.00	5.50	15.45	8.81	5.98	16.84	9.50	6.67	666.64	

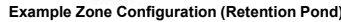
SEG W1	296.19	3.00	4.00	5.50	16.64	9.41	6.57	11.96	7.06	4.23	724.37	
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Total earth volume for sewer trenches = 1817 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
 - Four inches for pipes less than 33 inches.
 - Six inches for pipes less than 60 inches.
 - Eight inches for all larger sizes.

MHFD-Detention, Version 4.03 (May 2020)

Basin ID: Bioretention Pond



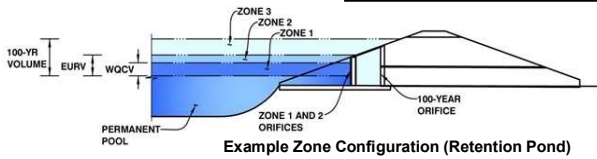
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: 2013 McDonald Reconditioning Center

Basin ID: Bioretention Pond



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.56	0.130	Filtration Media
Zone 2 (EURV)	1.91	0.320	Orifice Plate
Zone 3 (100-year)	3.22	0.312	Weir&Pipe (Restrict)
Total (all zones)		0.762	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	2.00	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	1.85	inches

Calculated Parameters for Underdrain		
Underdrain Orifice Area =	0.0	ft ²
Underdrain Orifice Centroid =	0.08	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.60	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.00	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	5.70	inches
Orifice Plate: Orifice Area per Row =	3.00	sq. inches (diameter = 1-15/16 inches)

on BMP)		Calculated Parameters for Plate
WQ Orifice Area per Row =	2.083E-02	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.60	1.07	1.53					
Orifice Area (sq. inches)	3.00	3.00	3.00					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice		
	Not Selected	Not Selected
Vertical Orifice Area =	N/A	N/A
Vertical Orifice Centroid =	N/A	N/A

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	2.20	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	% , grate open area/total area
Debris Clogging % =	50%	N/A	%

	Zone 3 Weir	Not Selected	
= 0 ft) Height of Grate Upper Edge, H _u =	3.20	N/A	feet
Overflow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	15.15	N/A	
Overflow Grate Open Area w/o Debris =	11.54	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.77	N/A	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.90	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	7.00		inches

<u>Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate</u>				
		Zone 3 Restrictor	Not Selected	
om at Stage = 0 ft)	Outlet Orifice Area =	0.76	N/A	ft ²
	Outlet Orifice Centroid =	0.34	N/A	feet
	Half-Central Angle of Restrictor Plate on Pipe =	1.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	4.10	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	5.00	feet
Spillway End Slopes =	0.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway		
Spillway Design Flow Depth=	1.14	feet
Stage at Top of Freeboard =	6.24	feet
Basin Area at Top of Freeboard =	0.99	acres
Basin Volume at Top of Freeboard =	1.72	acre-ft

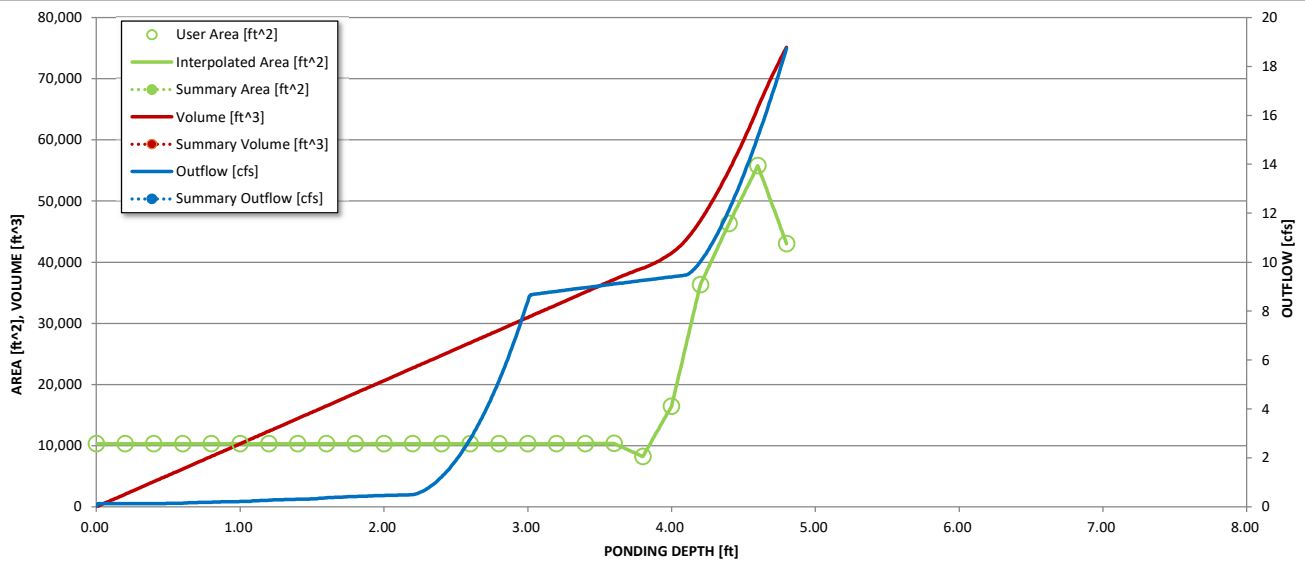
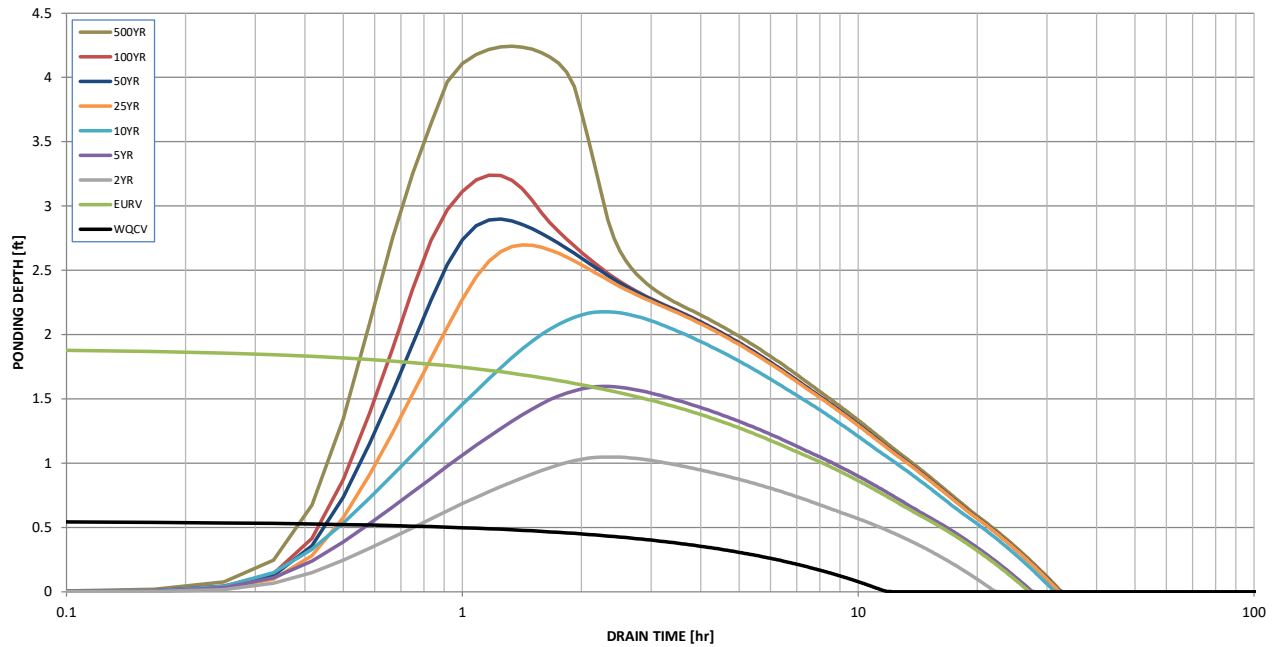
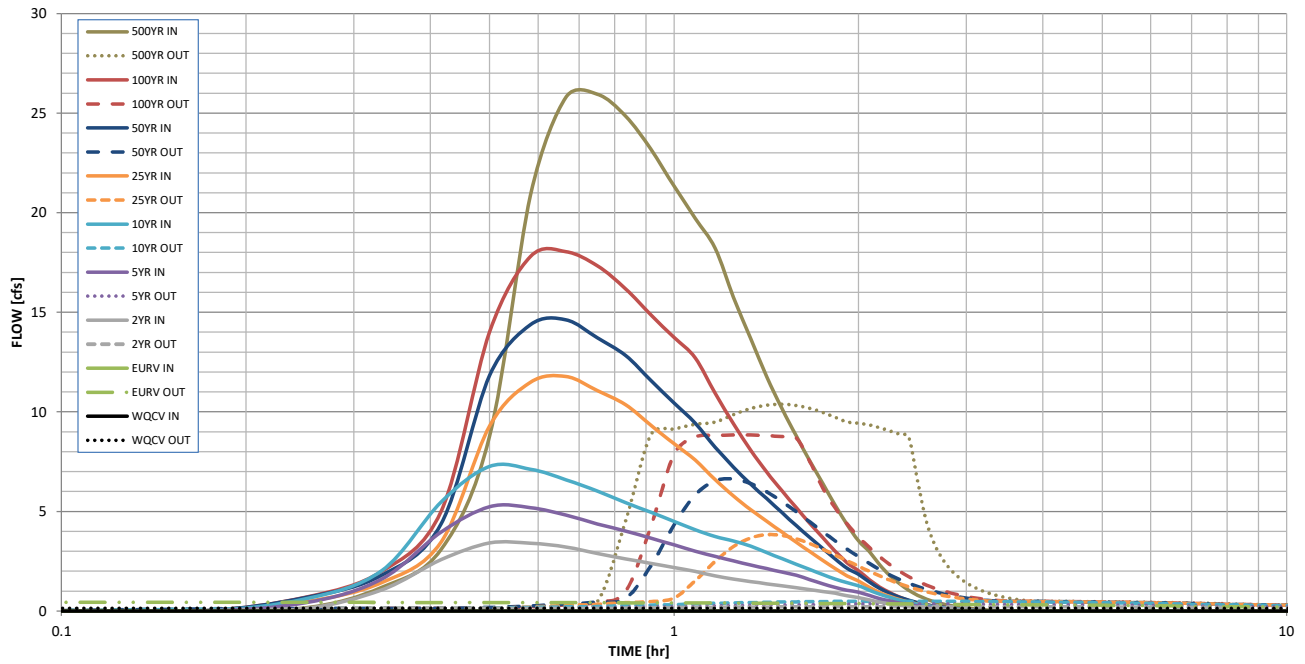
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.81	1.08	1.31	1.66	1.94	2.24	3.01
One-Hour Rainfall Depth (in) =	0.130	0.450	0.286	0.433	0.590	0.897	1.117	1.385	2.018
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.286	0.433	0.590	0.897	1.117	1.385	2.018
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	0.6	1.7	4.7	6.4	8.7	13.7
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.06	0.18	0.50	0.68	0.93	1.45
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	3.4	5.2	7.3	11.8	14.6	18.0	26.0
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.2	0.4	0.5	3.8	6.6	8.8	10.4
Peak Inflow Q (cfs) =	N/A	N/A	0.6	0.3	0.8	1.0	1.0	1.0	0.8
Peak Outflow Q (cfs) =	N/A	N/A	0.6	0.3	0.8	1.0	1.0	1.0	0.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	0.6	0.3	0.8	1.0	1.0	1.0	0.8
Structure Controlling Flow =	Filtration Media	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.5	0.7	0.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	11	26	21	26	30	30	29	28	27
Time to Drain 99% of Inflow Volume (hours) =	12	27	22	27	31	31	31	31	31
Maximum Ponding Depth (ft) =	0.55	1.91	1.05	1.60	2.18	2.70	2.90	3.24	4.24
Area at Maximum Ponding Depth (acres) =	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.88
Maximum Volume Stored (acre-ft) =	0.130	0.452	0.246	0.376	0.514	0.637	0.685	0.768	1.108

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



APPENDIX D

REFERENCE MATERIAL

Description

A BMP that utilizes bioretention is an engineered, depressed landscape area designed to capture and filter or infiltrate the water quality capture volume (WQCV). BMPs that utilize bioretention are frequently referred to as rain gardens or porous landscape detention areas (PLDs). The term PLD is common in the UDFCD region as this manual first published the BMP by this name in 1999. In an effort to be consistent with terms most prevalent in the stormwater industry, this document generally refers to the treatment process as *bioretention* and to the BMP as a *rain garden*.



Photograph B-1. This recently constructed rain garden provides bioretention of pollutants, as well as an attractive amenity for a residential building. Treatment should improve as vegetation matures.

The design of a rain garden may provide detention for events exceeding that of the WQCV. There are generally two ways to achieve this. The design can provide the flood control volume above the WQCV or the design can provide and slowly release the flood control volume in an area downstream of one or more rain gardens. See the *Storage* chapter in Volume 2 of the USDCM for more information.

This infiltrating BMP requires consultation with a geotechnical engineer when proposed adjacent to a structure. A geotechnical engineer can assist with evaluating the suitability of soils, identifying potential impacts, and establishing minimum distances between the BMP and structures.

Terminology

The term *bioretention* refers to the treatment process although it is also frequently used to describe a BMP that provides biological uptake and retention of the pollutants found in stormwater runoff. This BMP is sometimes referred to as a *porous landscape detention (PLD) area* or *rain garden*.

Bioretention (Rain Garden)	
Functions	
LID/Volume Red.	Yes
WQCV Capture	Yes
WQCV+Flood Control	Yes
Fact Sheet Includes EURV Guidance	No
Typical Effectiveness for Targeted Pollutants ³	
Sediment/Solids	Very Good ¹
Nutrients	Moderate
Total Metals	Good
Bacteria	Moderate
Other Considerations	
Life-cycle Costs ⁴	Moderate
¹ Not recommended for watersheds with high sediment yields (unless pretreatment is provided). ³ Based primarily on data from the International Stormwater BMP Database (www.bmpdatabase.org). ⁴ Based primarily on BMP-REALCOST available at www.udfcd.org . Analysis based on a single installation (not based on the maximum recommended watershed tributary to each BMP).	

Site Selection

This BMP allows WQCV treatment within one or more areas designated for landscape (see design step 7 for suggested vegetation). In this way, it is an excellent alternative to extended detention basins for small sites. A typical rain garden serves a tributary area of one impervious acre or less, although they can be designed for larger tributary areas. Multiple installations can be used within larger sites. Rain gardens should not be used when a baseflow is anticipated. They are typically small and installed in locations such as:

- Parking lot islands
- Street medians
- Landscape areas between the road and a detached walk
- Planter boxes that collect roof drains

Bioretention requires a stable watershed. Retrofit applications are typically successful for this reason. When the watershed includes phased construction, sparsely vegetated areas, or steep slopes in sandy soils, consider another BMP or provide pretreatment before runoff from these areas reaches the rain garden.

The surface of the rain garden should be flat. For this reason, rain gardens can be more difficult to incorporate into steeply sloping terrain; however, terraced applications of these facilities have been successful in other parts of the country.

When bioretention (and other BMPs used for infiltration) are located adjacent to buildings or pavement areas, protective measures should be implemented to avoid adverse impacts to these structures. Oversaturated subgrade soil underlying a structure can cause the structure to settle or result in moisture-related problems. Wetting of expansive soils or bedrock can cause swelling, resulting in structural movements. A geotechnical engineer should evaluate the potential impact of the BMP on adjacent structures based on an evaluation of the subgrade soil, groundwater, and bedrock conditions at the site. Additional minimum requirements include:

- In locations where subgrade soils do not allow infiltration and/or where infiltration could adversely impact adjacent structures, include a drainage layer (with underdrain) under the growing medium.
- In locations where potentially expansive soils or bedrock exist, placement of a rain garden adjacent to structures and pavement should only be considered if the BMP includes a drainage layer (with underdrain) and an impermeable geomembrane liner designed to restrict seepage.

Benefits

- Bioretention uses multiple treatment processes to remove pollutants, including sedimentation, filtering, adsorption, evapotranspiration, and biological uptake of constituents.
- Stormwater treatment occurs within attractive landscaped areas.
- There is a potential reduction of irrigation requirements by taking advantage of site runoff.

Limitations

- Additional design and construction steps are required for placement of any ponding or infiltration area near or upgradient from a building foundation and/or when expansive (low to high swell) soils exist. This is discussed in the design procedure section.
- In developing or otherwise erosive watersheds, high sediment loads can clog the facility.

Designing for Maintenance

Recommended maintenance practices for all BMPs are in Chapter 6 of this manual. During design, consider the following to ensure ease of maintenance over the long-term:

- Do not put a filter sock on the underdrain. This is not necessary and can cause the underdrain to clog.
- The best surface cover for a rain garden is full vegetation. Use rock mulch sparingly within the rain garden because rock mulch limits infiltration and is more difficult to maintain. Wood mulch handles sediment build-up better than rock mulch; however, wood mulch floats and may clog the overflow depending on the configuration of the outlet or settle unevenly. Some municipalities may not allow wood mulch for this reason.
- Consider all potential maintenance requirements such as mowing (if applicable) and replacement of the growing medium. Consider the method and equipment for each task required. For example, in a large rain garden where the use of hand tools is not feasible, does the shape and configuration of the rain garden allow for removal of the growing medium using a backhoe?
- Provide pre-treatment when it will reduce the extent and frequency of maintenance necessary to maintain function over the life of the BMP. For example, if the tributary is larger than one acre, prone to debris or the use of sand for ice control, consider a small forebay.
- Make the rain garden as shallow as possible. Increasing the depth unnecessarily can create erosive side slopes and complicate maintenance. Shallow rain gardens are also more attractive.
- Design and adjust the irrigation system (temporary or permanent) to provide appropriate water for the establishment and maintenance of selected vegetation.

Is Pretreatment Needed?

Designing the inflow gutter to the rain garden at a minimal slope of 0.5% can facilitate sediment and debris deposition prior to flows entering the BMP. Be aware, this will reduce maintenance of the BMP, but may require more frequent sweeping of the gutter to ensure that the sediment does not impede flow into the rain garden.

Design Procedure and Criteria

1. **Subsurface Exploration and Determination of a No-Infiltration, Partial Infiltration, or Full Infiltration Section:** Infiltration BMPs can have three basic types of sections. The appropriate section will depend on land use and activities, proximity to adjacent structures and soil characteristics. Sections of each installation type are shown in Figure B-1.
 - **No-Infiltration Section:** This section includes an underdrain and an impermeable liner that prevents infiltration of stormwater into the subgrade soils. Consider using this section when any of the following conditions exist:
 - The site is a stormwater hotspot and infiltration could result in contamination of groundwater.
 - The site is located over contaminated soils and infiltration could mobilize these contaminants.
 - The facility is located over potentially expansive soils or bedrock that could swell due to infiltration and potentially damage adjacent structures (e.g., building foundation or pavement).
 - **Partial Infiltration Section:** This section does not include an impermeable liner, and allows some infiltration. Stormwater that does not infiltrate is collected and removed by an underdrain

system.

- **Full Infiltration Section:** This section is designed to infiltrate the water stored in the basin into the subgrade below. UDFCD recommends a minimum infiltration rate of 2 times the rate needed to drain the WQCV over 12 hours. A conservative design could utilize the partial infiltration section with the addition of a valve at the underdrain outlet. In the event that infiltration does not remain adequate following construction, the valve could be opened and allow this section to operate as a partial infiltration section.

A geotechnical engineer should scope and perform a subsurface study. Typical geotechnical investigation needed to select and design the section includes:

- Prior to exploration review geologic and geotechnical information to assess near-surface soil, bedrock and groundwater conditions that may be encountered and anticipated ranges of infiltration rate for those materials. For example, if the facility is located adjacent to a structure and the site is located in a general area of known shallow, potentially expansive bedrock, a no-infiltration section will likely be required. It is also possible that this BMP may be infeasible, even with a liner, if there is a significant potential for damage to the adjacent structures (e.g., areas of dipping bedrock).
- Drill exploratory borings or exploratory pits to characterize subsurface conditions beneath the subgrade and develop requirements for subgrade preparation. Drill at least one boring or pit for every 40,000 ft², and at least two borings or pits for sites between 10,000 ft² and 40,000 ft². The boring or pit should extend at least 5 feet below the bottom of the base, and at least 20 feet in areas where there is a potential of encountering potentially expansive soils or bedrock. More borings or pits at various depths may be required by the geotechnical engineer in areas where soil types may change, in low-lying areas where subsurface drainage may collect, or where the water table is likely within 8 feet below the planned bottom of the base or top of subgrade. Installation of temporary monitoring wells in selected borings or pits for monitoring groundwater levels over time should be considered where shallow groundwater is encountered.
- Perform laboratory tests on samples obtained from the borings or pits to initially characterize the subgrade, evaluate the possible section type, and to assess subgrade conditions for supporting traffic loads. Consider the following tests: moisture content (ASTM D 2216); dry density (ASTM D 2936); Atterberg limits (ASTM D 4318); gradation (ASTM D 6913); swell-consolidation (ASTM D 4546); subgrade support testing (R-value, CBR or unconfined compressive strength); and hydraulic conductivity. A geotechnical engineer should determine the appropriate test method based on the soil type.
- For sites where a full infiltration section may be feasible, perform on-site infiltration tests using a double-ring infiltrometer (ASTM D 3385). Perform at least one test for every 160,000 ft² and at least two tests for sites between 40,000 ft² and 160,000 ft². The tests should be located near completed borings or pits so the test results and subsurface conditions encountered in the borings can be compared, and at least one test should be located near the boring or pit showing the most unfavorable infiltration condition. The test should be performed at the planned top of subgrade underlying the growing media.
- Be aware that actual infiltration rates are highly variable dependent on soil type, density and moisture content and degree of compaction as well as other environmental and construction influences. Actual rates can differ an order of magnitude or more from those indicated by infiltration or permeability testing. Select the type of section based on careful assessment of the subsurface exploration and testing data.

The following steps outline the design procedure and criteria, with Figure B-1 providing a corresponding cross-section.

2. **Basin Storage Volume:** Provide a storage volume based on a 12-hour drain time.

Find the required WQCV (watershed inches of runoff). Using the imperviousness of the tributary area (or effective imperviousness where LID elements are used upstream), use Figure 3-2 located in Chapter 3 of this manual to determine the WQCV based on a 12-hour drain time.

Calculate the design volume as follows:

$$V = \left[\frac{\text{WQCV}}{12} \right] A \quad \text{Equation B-1}$$

Where:

V = design volume (ft³)

A = area of watershed tributary to the rain garden (ft²)

3. **Basin Geometry:** UDFCD recommends a maximum WQCV ponding depth of 12 inches to maintain vegetation properly. Provide an inlet or other means of overflow at this elevation. Depending on the type of vegetation planted, a greater depth may be utilized to detain larger (more infrequent) events. The bottom surface of the rain garden, also referred to here as the filter area, should be flat. Sediment will reside on the filter area of the rain garden; therefore, if the filter area is too small, it may clog prematurely. If the filter area is not flat, the lowest area of the filter is more likely to clog as it will have a higher sediment loading. Increasing the filter area will reduce clogging and decrease the frequency of maintenance. Equation B-2 provides a minimum filter area allowing for some of the volume to be stored beyond the area of the filter (i.e., above the sideslopes of the rain garden).

Note that the total surcharge volume provided by the design must also equal or exceed the design volume. Where needed to meet the the required volume, also consider the porosity of the media at 14 percent. Use vertical walls or slope the sides of the basin to achieve the required volume. Sideslopes should be no steeper than 4:1 (horizontal:vertical).

$$A_F = 0.02AI \quad \text{Equation B-2}$$

Where:

A_F = minimum (flat) filter area (ft²)

A = area tributary to the rain garden (ft²)

I = imperviousness of area tributary to the rain garden (percent expressed as a decimal)

4. **Growing Medium:** Provide a minimum of 18 inches of growing medium to enable establishment of the roots of the vegetation (see Figure B-1). A previous version of this manual specified a mixture consisting of 85% coarse sand and a 15% compost/shredded paper mixture (by volume). Based on field monitoring of this medium, compost was removed to reduce export of nutrients and fines and silts were added to both benefit the vegetation and increase capture of metals in stormwater.

Table B-1 specifies the growing media as well as other materials discussed in this Fact Sheet. Growing media is engineered media that requires a high level of quality control and must almost always be imported. Obtaining a particle size distribution and nutrient analysis is the only way to ensure that the media is acceptable. UDFCD has identified placement of media not meeting the specification as the most frequent cause of failure. Sample the media after delivery and prior to placement or obtain a sample from the supplier in advance of delivery and placement and have this analyzed prior to delivery.

Other Rain Garden Growing Medium Amendments

The specified growing medium was designed for filtration ability, clogging characteristics, and vegetative health. It is important to preserve the function provided by the rain garden growing medium when considering additional materials for incorporation into the growing medium or into the standard section shown in Figure B-1. When desired, amendments may be included to improve water quality or to benefit vegetative health as long as they do not add nutrients, pollutants, or modify the infiltration rate. For example, a number of products, including steel wool, capture and retain dissolved phosphorus (Erickson 2009). When phosphorus is a target pollutant, proprietary materials with similar characteristics may be considered. Do not include amendments such as top soil, sandy loam, and compost.

Table B-1. Material specification for bioretention/rain garden facilities

Material	Specification	Submittals	Testing	Notes
Bioretention Growing Media (soil + organics)	Bioretention soil	Particle size distribution and nutrient analysis required.		Percentages are in weight.
	Particle size distribution: 80-90% sand (0.05 - 2.0 mm diameter) 3-17% silt (0.002-0.5 mm diameter) 3-17% clay (<0.002 diameter) Chemical attribute and nutrient analysis: pH 6.8 - 7.5 organic matter < 15% nitrogen < 15 ppm phosphorus < 15 ppm salinity < 6 mmhos/cm			
Bioretention organics	3 to 5% shredded mulch (by weight of growing media)			bioretention soil required. Aged 6 months (minimum). Aged 6 months (minimum). No weed fabric allowed.
Landscape mulch	Shredded hardwood			
Underdrain aggregate	COOT filter material (Class B or C as specified)	Mass Percent Passing Square Mesh Sieve		
		Sieve Size	Class B	Class C
		37.5 mm (1.5")	100	100
		19.0 mm (0.75")		100
		4.75 mm (No. 4)	20-60	60-100
		1.18 mm (No. 16)	10-30	
		300 um (No. 50)	0-10	10-30
		150 um (No. 100)		0-10
		75 um (No. 200)	0-3	0-3
Underdrain Pipe	Pipe diameter and type	Maximum slot width (inches)	Minimum open area (per foot)	
		0.032	1.90 in. ²	
	4-inch slotted PVC	0.032	1.98 in. ²	Pipe must conform to requirements of ASTM designation F949. There shall be no evidence of splitting, cracking, or breaking when the pipe is tested per ASTM test method D2412 in accordance with F949 section 7.5 and ASTM F794 section 8.5.
Impermeable liner		Thickness 0.76 mm (30 mil)	Test method	
		+/-5	ASTM D 1593	
	Thickness, % Tolerance	12.25 (70)	ASTM D8 82, method B	
	Tensile strength, kN/m (lbf/in)	5.25 (30)	ASTM D8 82, method B	
	Modulus at 100% elongation, kN/m	350	ASTM D8 82, method A	
	Ultimate elongation, %	38 (8.5)	ASTM D 1004	
	Tear resistance, N/lbs	-29 (-20)	ASTM D 1790	
	Low temperature impact, °C (°F)	0.7	ASTM D8 82, method A	
	Volatiles loss, % maximum	1 (max)	N/A	
	Pinholes, no. per 8 m ² (no. per 10 yd. ²)	80	N/A	
	Bonded seam strength, % of tensile			
				Thermal welding required for fully lined facilities (not a curtain). Leak testing in the field required.

5. **Underdrain System:** When using an underdrain system, provide a control orifice sized to drain the design volume in 12 hours or more (see Equation B-3). Use a minimum orifice size of 3/8 inch to avoid clogging. This will provide detention and slow release of the WQCV, providing water quality benefits and reducing impacts to downstream channels. Space underdrain pipes a maximum of 20 feet on center. Provide cleanouts to enable maintenance of the underdrain. Cleanouts can also be used to conduct an inspection (by camera) of the underdrain system to ensure that the pipe was not crushed or disconnected during construction.

Calculate the diameter of the orifice for a 12-hour drain time using Equation B-3 (Use a minimum orifice size of 3/8 inch to avoid clogging.):

$$D_{12 \text{ hour drain time}} = \sqrt{\frac{V}{1414 y^{0.41}}} \quad \text{Equation B-3}$$

Where:

- D = orifice diameter (in)
- y = distance from the lowest elevation of the storage volume (i.e., surface of the filter) to the center of the orifice (ft)
- V = volume (WQCV or the portion of the WQCV in the rain garden) to drain in 12 hours (ft³)

In previous versions of this manual, UDFCD recommended that the underdrain be placed in an aggregate layer and that a geotextile (separator fabric) be placed between this aggregate and the growing medium. This version of the manual replaces that section with materials that, when used together, eliminate the need for a separator fabric.

The underdrain system should be placed within an 6-inch-thick section of CDOT Class B or Class C filter material meeting the gradation in Table B-1. Use slotted pipe that meets the slot dimensions provided in Table B-3.

6. Impermeable Geomembrane Liner and Geotextile Separator Fabric:

For no-infiltration sections, install a 30 mil (minimum) PVC geomembrane liner, per Table B-1, on the bottom and sides of the basin, extending up at least to the top of the underdrain layer. Provide at least 9 inches (12 inches if possible) of cover over the membrane where it is attached to the wall to protect the membrane from UV deterioration. The geomembrane should be field-seamed using a dual track welder, which allows for non-destructive testing of almost all field seams. A small amount of single track is allowed in limited areas to seam around pipe perforations, to patch seams removed for destructive seam testing, and for limited repairs. The liner should be installed with slack to prevent tearing due to backfill, compaction, and settling. Place CDOT Class B geotextile separator fabric above the geomembrane to protect it from being punctured during the placement of the filter material above the liner. If the subgrade contains angular rocks or other material that could puncture the geomembrane, smooth-roll the surface to create a suitable surface. If smooth-rolling the surface does not provide a suitable surface, also place the separator fabric between the geomembrane and the underlying subgrade. This should only be done when necessary because fabric placed under the geomembrane can increase seepage losses through pinholes or other geomembrane defects. Connect the geomembrane to perimeter concrete walls around the basin perimeter, creating a watertight seal between the geomembrane and the walls using a continuous batten bar and anchor connection (see Figure B-3). Where the need for the impermeable membrane is not as critical, the membrane can be attached with a nitrile-based vinyl adhesive. Use watertight PVC boots for underdrain pipe penetrations through the liner (see Figure B-2) or the technique shown in photo B-3.



Photograph B-2. The impermeable membrane in this photo has ripped from the bolts due to placement of the media without enough slack in the membrane.



Photograph B-3. Ensure a water-tight connection where the underdrain penetrated the liner. The heat-welded “boot” shown here is an alternative to the clamped detail shown in Figure B-2.

Table B-2. Physical requirements for separator fabric¹

Property	Class B		Test Method
	Elongation < 50% ²	Elongation > 50% ²	
Grab Strength, N (lbs.)	800 (180)	510 (115)	ASTM D 4632
Puncture Resistance, N (lbs.)	310 (70)	180 (40)	ASTM D 4833
Trapezoidal Tear Strength, N (lbs.)	310 (70)	180 (40)	ASTM D 4533
Apparent Opening Size, mm (US Sieve Size)	AOS < 0.3mm (US Sieve Size No. 50)		ASTM D 4751
Permittivity, sec ⁻¹	0.02 default value, must also be greater than that of soil		ASTM D 4491
Permeability, cm/sec	k fabric > k soil for all classes		ASTM D 4491
Ultraviolet Degradation at 500 hours	50% strength retained for all classes		ASTM D 4355

¹ Strength values are in the weaker principle direction

² As measured in accordance with ASTM D 4632

7. **Inlet and Outlet Control:** In order to provide the proper drain time, the bioretention area can be restricted at the underdrain outlet with an orifice plate or can be designed without an underdrain (provided the subgrade meets the requirements above). Equation B-3 is a simplified equation for sizing an orifice plate for a 12-hour drain time. UD-BMP or UD-Detention, available at www.udfcd.org, also perform this calculation.

How flow enters and exits the BMP is a function of the overall drainage concept for the site. Curb cuts can be designed to both allow stormwater into the rain garden as well as to provide release of stormwater in excess of the WQCV. Roadside rain gardens located on a steep site might pool and overflow into downstream cells with a single curb cut, level spreader, or outlet structure located at the most downstream cell. When selecting the



Photograph B-4. The curb cut shown allows flows to enter this rain garden while excess flows bypass the facility.

type and location of the outlet structure, ensure runoff will not short-circuit the rain garden. This is a frequent problem when using a curb inlet located outside the rain garden for overflow.

For rain gardens with concentrated points of inflow, provide a forebay and energy dissipation. A depressed concrete slab works best for a forebay. It helps maintain a vertical drop at the inlet and allows for easily removal of sediment using a square shovel. Where rock is used for energy dissipation, provide separator fabric between the rock and growing medium to minimize subsidence.

8. **Vegetation:** UDFCD recommends that the filter area be vegetated with drought tolerant species that thrive in sandy soils. Table B-3 provides a suggested seed mix for sites that will not need to be irrigated after the grass has been established.

Mix seed well and broadcast, followed by hand raking to cover seed and then mulched. Hydromulching can be effective for large areas. Do not place seed when standing water or snow is present or if the ground is frozen. Weed control is critical in the first two to three years, especially when starting with seed.

When using sod, specify sand-grown sod. Do not use conventional sod. Conventional sod is grown in clay soil that will seal the filter area, greatly reducing overall function of the BMP.

When using an impermeable liner, select plants with diffuse (or fibrous) root systems, not taproots. Taproots can damage the liner and/or underdrain pipe. Avoid trees and large shrubs that may interfere with restorative maintenance. Plant these outside of the area of growing medium. Use a cutoff wall to ensure that roots do not grow into the underdrain or place trees and shrubs a conservative distance from the underdrain.

9. **Irrigation:** Provide spray irrigation at or above the WQCV elevation or place temporary irrigation on top of the rain garden surface. Do not place sprinkler heads on the flat surface. Remove temporary irrigation when vegetation is established. If left in place this will become buried over time and will be damaged during maintenance operations.

Adjust irrigation schedules during the growing season to provide the minimum water necessary to maintain plant health and to maintain the available pore space for infiltration.

Designing for Flood Protection

Provide the WQCV in rain gardens that direct excess flow into to a landscaped basin designed for flood control or design a single basin to provide water quality and flood control. See the *Storage* chapter in Volume 2 of the USDCM for more information. UD-Detention, available at www.udfcd.org, will facilitate design either alternative.

Table B-3. Native seed mix for rain gardens

Common Name	Scientific Name	Variety	PLS ² lbs per Acre	Ounces per Acre
Sand bluestem	Andropogon hallii	Garden	3.5	
Sideoats grama	Bouteloua curtipendula	Butte	3	
Prairie sandreed	Calamovilfa longifolia	Goshen	3	
Indian ricegrass	Oryzopsis hymenoides	Paloma	3	
Switchgrass	Panicum virgatum	Blackwell	4	
Western wheatgrass	Pascopyrum smithii	Ariba	3	
Little bluestem	Schizachyrium scoparium	Patura	3	
Alkali sacaton	Sporobolus airoides		3	
Sand dropseed	Sporobolus cryptandrus		3	
Pasture sage ¹	Artemisia frigida			2
Blue aster ¹	Aster laevis			4
Blanket flower ¹	Gaillardia aristata			8
Prairie coneflower ¹	Ratibida columnifera			4
Purple prairieclover ¹	Dalea (Petalostemum) purpurea			4
Sub-Totals:			27.5	22
Total lbs per acre:			28.9	

¹ Wildflower seed (optional) for a more diverse and natural look.² PLS = Pure Live Seed.

Aesthetic Design

In addition to effective stormwater quality treatment, rain gardens can be attractively incorporated into a site within one or several landscape areas. Aesthetically designed rain gardens will typically either reflect the character of their surroundings or become distinct features within their surroundings. Guidelines for each approach are provided below.

Reflecting the Surrounding

- Determine design characteristics of the surrounding. This becomes the context for the drainage improvement. Use these characteristics in the structure.
- Create a shape or shapes that "fix" the forms surrounding the improvement. Make the improvement part of the existing surrounding.
- The use of material is essential in making any new improvement an integral part of the whole. Select materials that are as similar as possible to the surrounding architectural/engineering materials. Select materials from the same source if possible. Apply materials in the same quantity, manner, and method as original material.
- Size is an important feature in seamlessly blending the addition into its context. If possible, the overall size of the improvement should look very similar to the overall sizes of other similar objects in the improvement area.
- The use of the word texture in terms of the structure applies predominantly to the selection of plant material. The materials used should as closely as possible, blend with the size and texture of other plant material used in the surrounding. The plants may or may not be the same, but should create a similar feel, either individually or as a mass.

Reflective Design

A reflective design borrows the characteristics, shapes, colors, materials, sizes and textures of the built surroundings. The result is a design that fits seamlessly and unobtrusively in its environment.

Creating a Distinct Feature

Designing the rain garden as a distinct feature is limited only by budget, functionality, and client preference. There is far more latitude in designing a rain garden that serves as a distinct feature. If this is the intent, the main consideration beyond functionality is that the improvement create an attractive addition to its surroundings. The use of form, materials, color, and so forth focuses on the improvement itself and does not necessarily reflect the surroundings, depending on the choice of the client or designer.

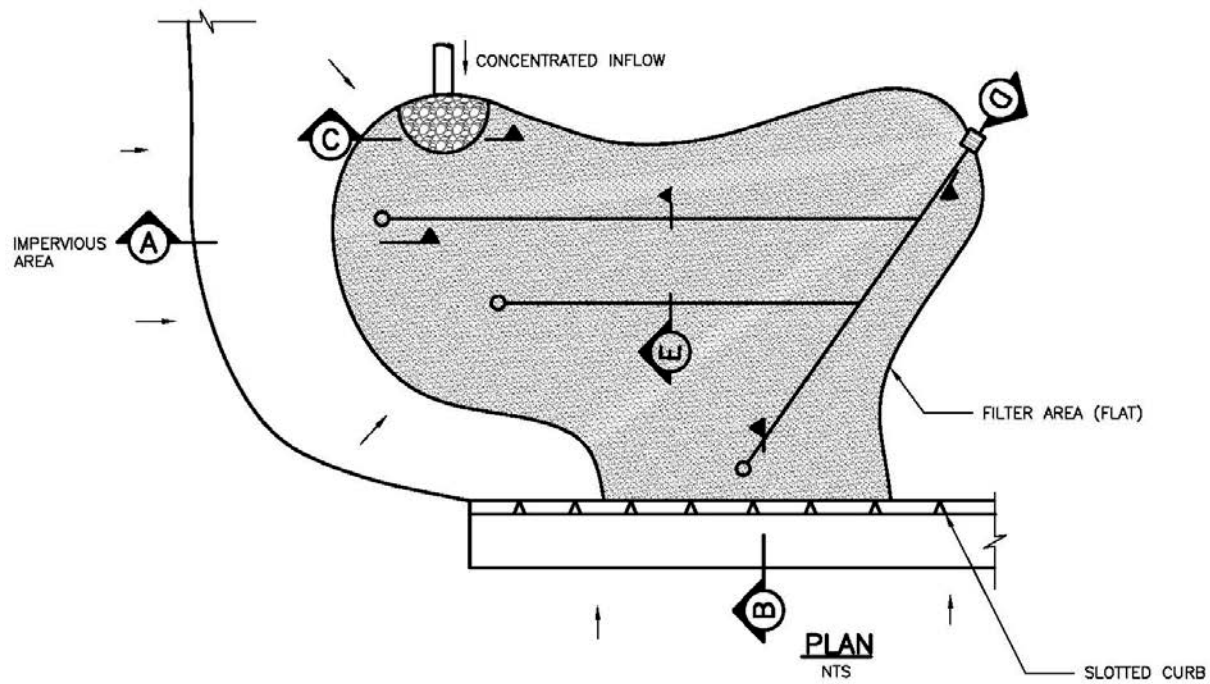
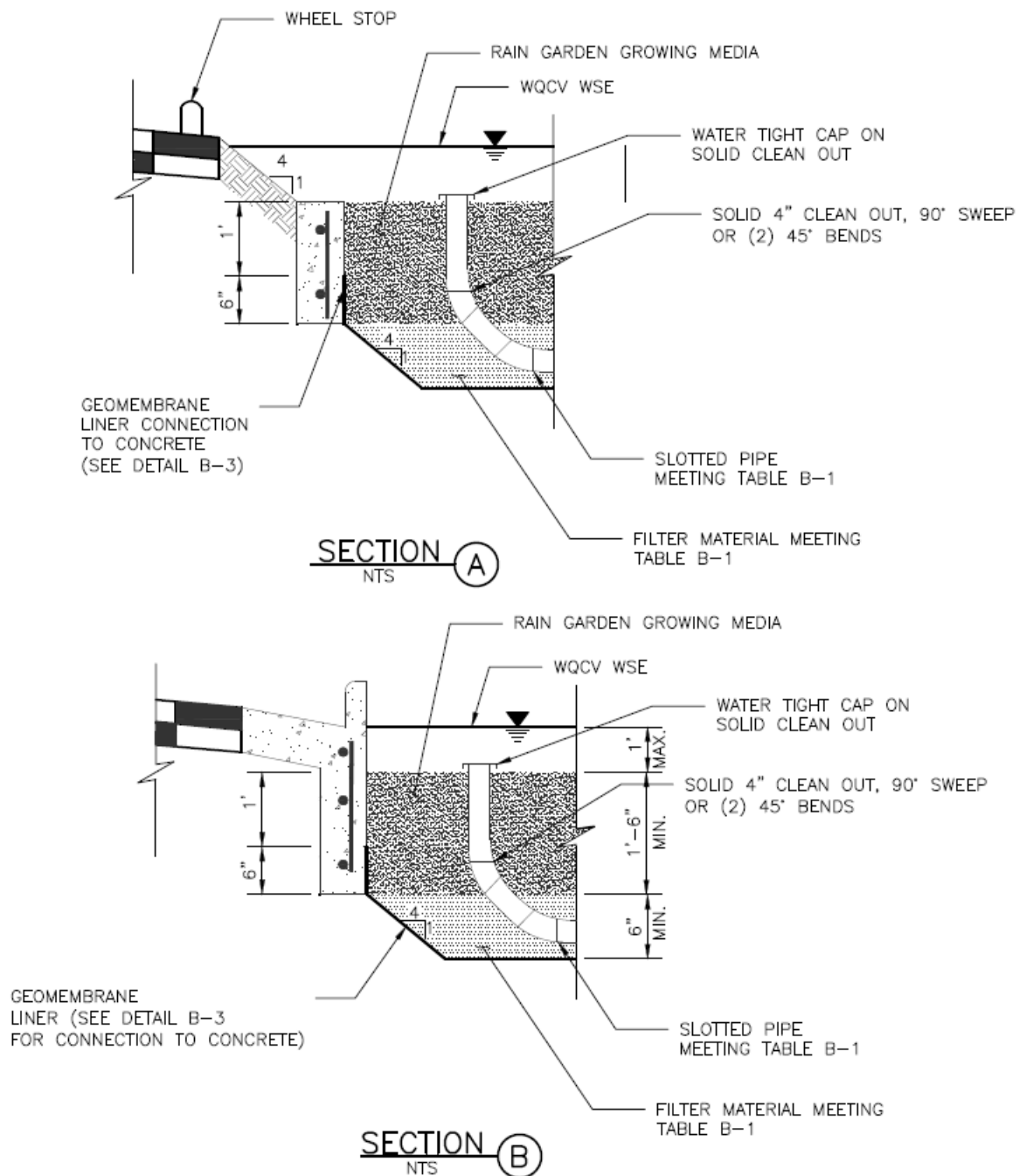
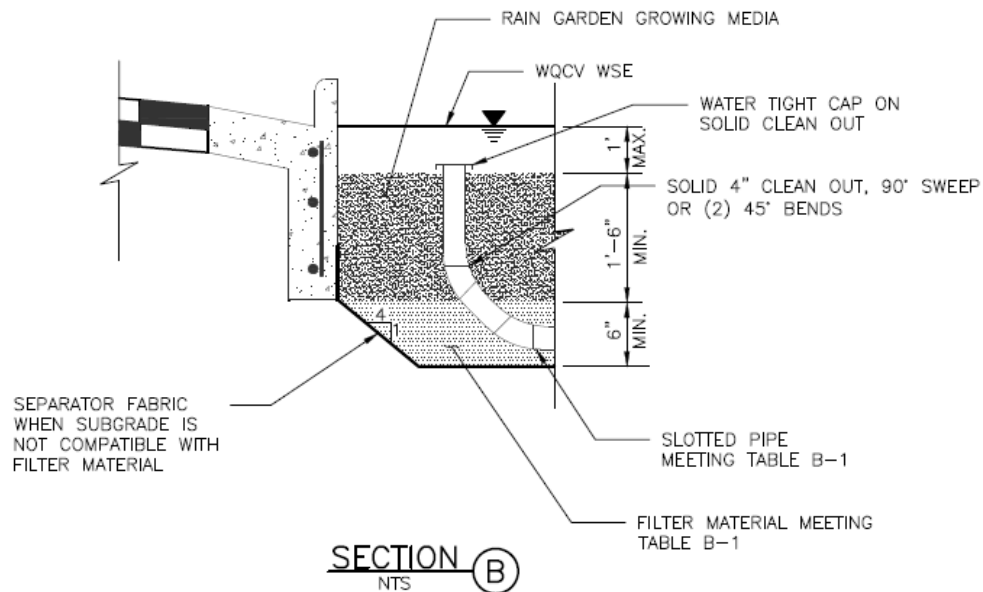
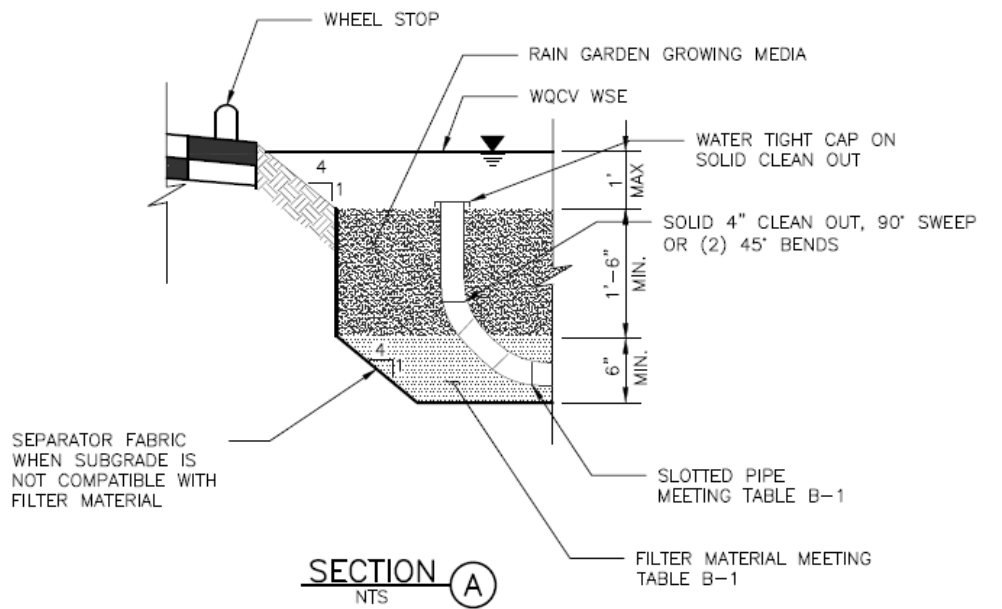


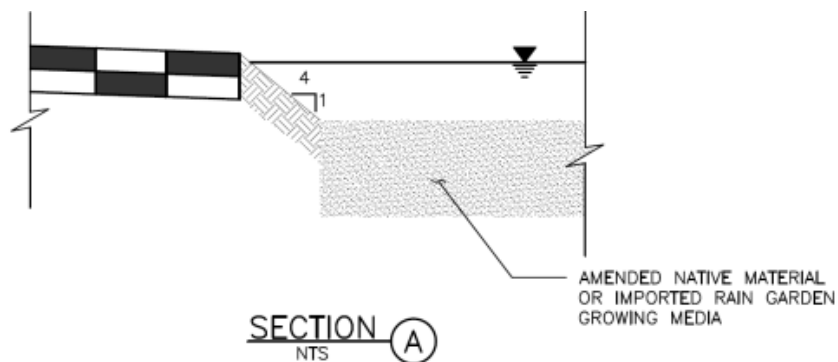
Figure B-1 – Typical rain garden plan and sections



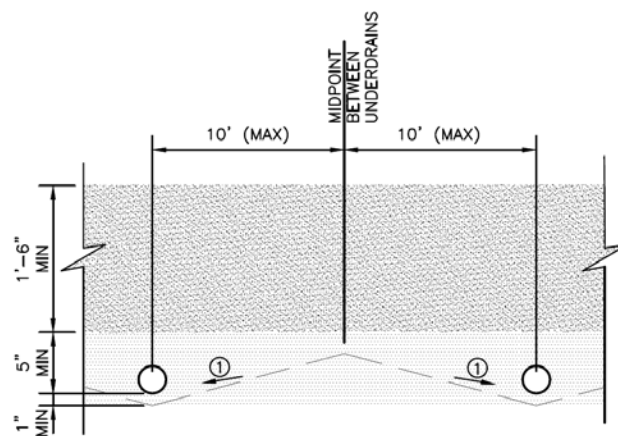
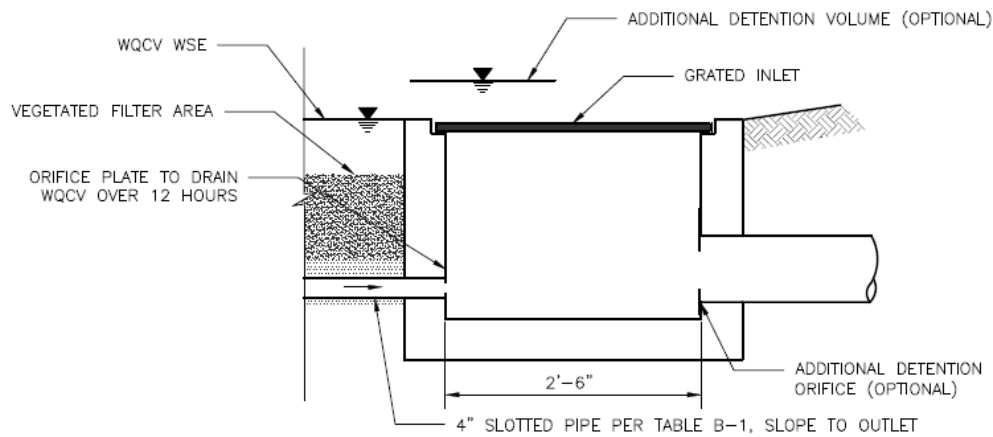
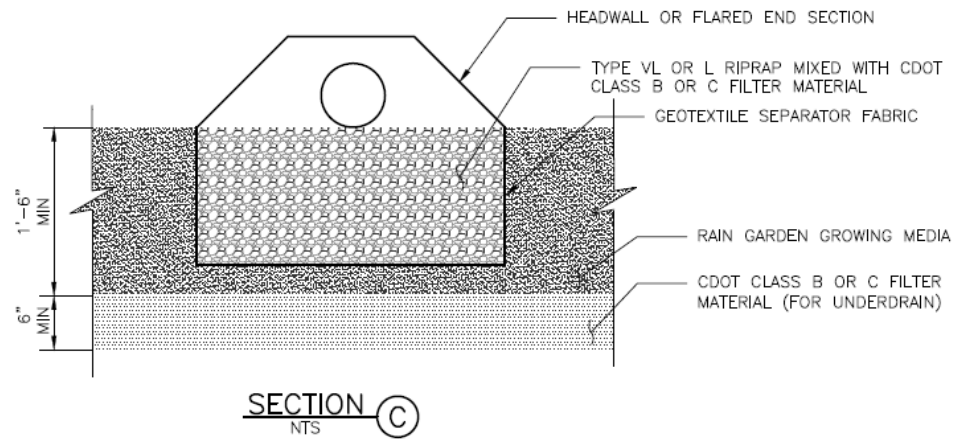
NO-INFILTRATION SECTIONS



PARTIAL INFILTRATION SECTIONS



FULL INFILTRATION SECTION



① SLOPE (STRAIGHT GRADE) SUBGRADE (2-10%) TO UNDERDRAIN TO REDUCE SATURATED SOIL CONDITIONS BETWEEN STORM EVENTS (OPTIONAL)

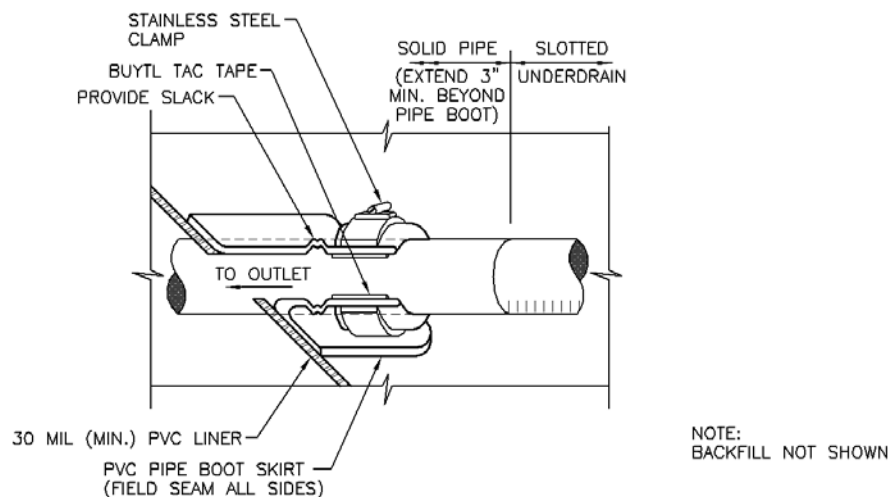


Figure B-2. Geomembrane Liner/Underdrain Penetration Detail

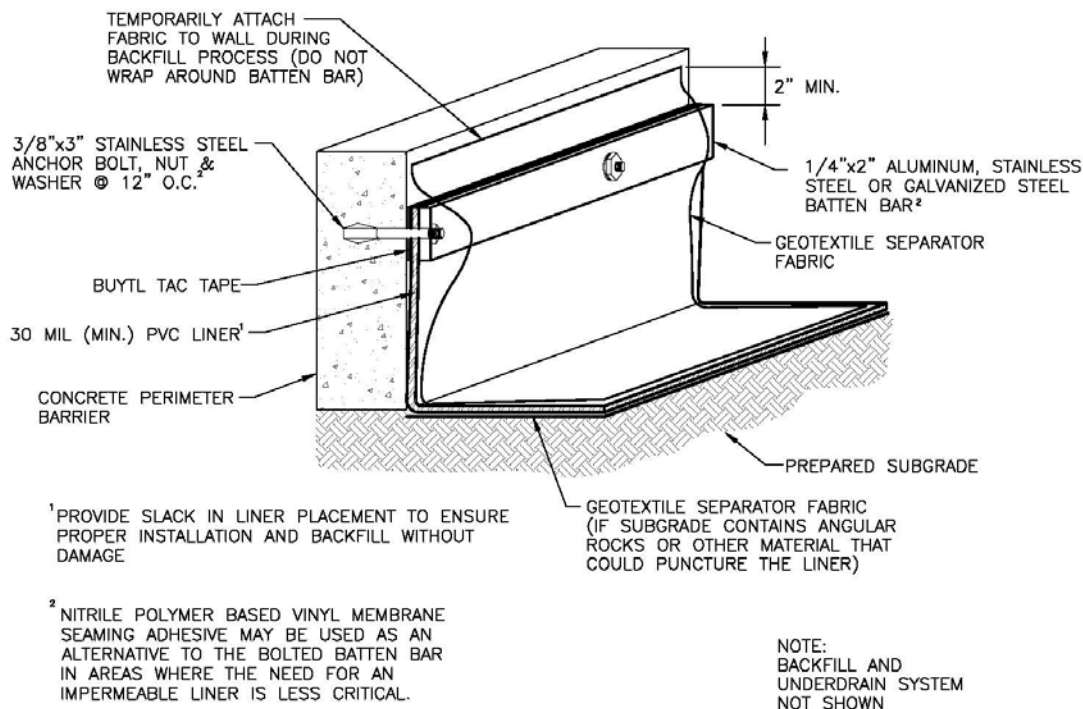


Figure B-3. Geomembrane Liner/Concrete Connection Detail

Construction Considerations

Proper construction of rain gardens involves careful attention to material specifications, final grades, and construction details. For a successful project, implement the following practices:

- Protect area from excessive sediment loading during construction. This is the most common cause of clogging of rain gardens. The portion of the site draining to the rain garden must be stabilized before allowing flow into the rain garden. This includes completion of paving operations.
- Avoid over compaction of the area to preserve infiltration rates (for partial and full infiltration sections).
- Provide construction observation to ensure compliance with design specifications. Improper installation, particularly related to facility dimensions and elevations and underdrain elevations, is a common problem with rain gardens.
- When using an impermeable liner, ensure enough slack in the liner to allow for backfill, compaction, and settling without tearing the liner.
- Provide necessary quality assurance and quality control (QA/QC) when constructing an impermeable geomembrane liner system, including but not limited to fabrication testing, destructive and non-destructive testing of field seams, observation of geomembrane material for tears or other defects, and air lace testing for leaks in all field seams and penetrations. QA/QC should be overseen by a professional engineer. Consider requiring field reports or other documentation from the engineer.
- Provide adequate construction staking to ensure that the site properly drains into the facility, particularly with respect to surface drainage away from adjacent buildings. Photo B-3 and Photo B-4 illustrate a construction error for an otherwise correctly designed series of rain gardens.



Photograph B-3. Inadequate construction staking may have contributed to flows bypassing this rain garden.

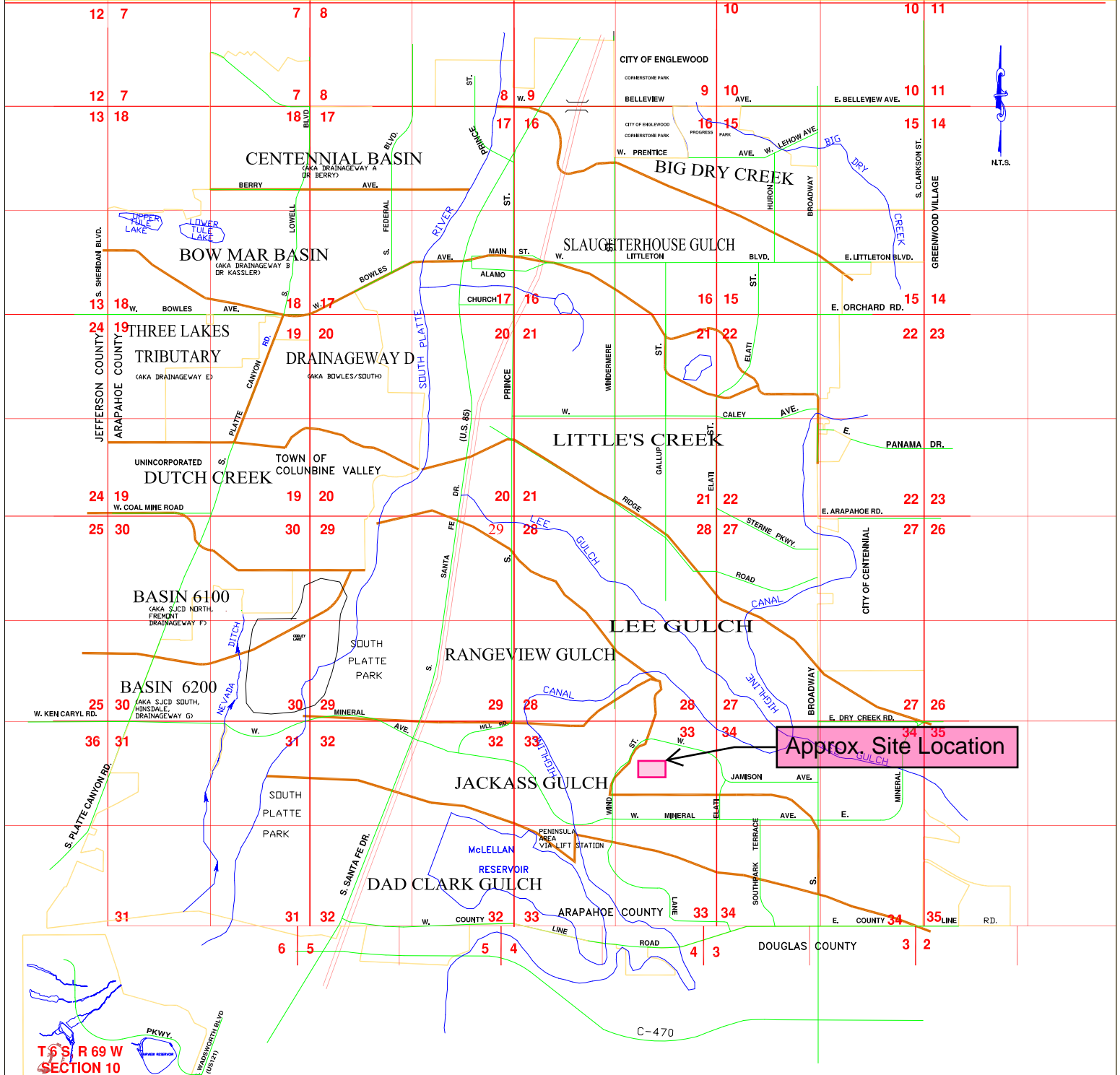


Photograph B-4. Runoff passed the upgradient rain garden, shown in Photo B-3, and flooded this downstream rain garden.

References

- Erickson, Andy. 2009. Field Applications of Enhanced Sand Filtration. University of Minnesota *Stormwater Management Practice Assessment Project Update*. <http://wrc.umn.edu>.
- Hunt, William F., Davis, Allen P., Traver, Robert. G. 2012. "Meeting Hydrologic and Water Quality Goals through Targeted Bioretention Design" *Journal of Environmental Engineering*. (2012) 138:698-707. Print.

CITY OF LITTLETON MAJOR DRAINAGEWAYS T 5 S , R 68 W



DATE: JULY 2019
REV:

STORM DRAINAGE DESIGN AND TECHNICAL CRITERIA

FIGURE 202

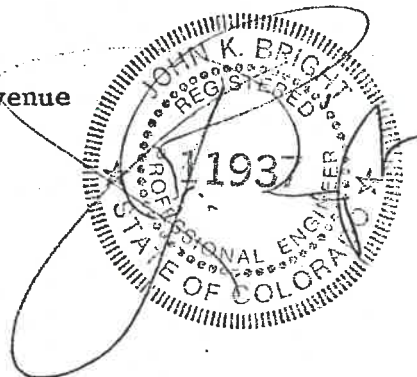
SOUTHBRIDGE I AND II
OFFICE BUILDINGS

DRAINAGE STUDY
APRIL 3, 1981

REVISED APRIL 21, 1981

Prepared by: KKBNA
7456 West Fifth Avenue
Denver, CO 80226
Phone: 232-6050

For: Jay Roulrier Interests
5970 South Syracuse
Englewood, CO 80111



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LITTLETON, COLORADO

#256

***LITTLETON REHABILITATION HOSPITAL
HEALTHSOUTH***

City of Littleton

FINAL DRAINAGE REPORT

PROJECT NO. 23330.C.01

December 14, 2011

REV. February 28, 2012

REV. April 18, 2012


PREPARED BY:
MARTIN/MARTIN, INC.
12499 WEST COLFAX AVENUE
LAKEWOOD, COLORADO 80215
(303) 431-6100

PREPARED FOR:
HEALTHSOUTH
3660 GRANDVIEW PARKWAY, SUITE 200
BIRMINGHAM, AL 35243
CONTACT: JOHN TSCHUDIN

PRINCIPAL-IN-CHARGE: DUANE A. JANSEN, P.E.
PROJECT ENGINEER: PHILLIP M. KRIEBLE, P.E.
ENGINEER: MELYSSA C. LORENGER, P.E.

"I hereby certify that this *Final Drainage Report* and Plan for the design of Littleton Rehabilitation Hospital HealthSouth was prepared by me (or under my direct supervision) in accordance with the provisions of *City of Littleton Storm Drainage Design and Technical Criteria* for the owners thereof. I understand that the City of Littleton does not and will not assume liability for drainage facilities designed by others."




Registered Professional Engineer
State of Colorado No. 18892
(Affix Seal)

HealthSouth Corporation hereby certifies that the drainage facilities for Littleton Rehabilitation Hospital HealthSouth shall be constructed according to the design presented in this report. I understand that the City of Littleton does not and will not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that the City of Littleton reviews drainage plans but cannot, on behalf of Littleton Rehabilitation Hospital HealthSouth, guarantee that final drainage design review will absolve HealthSouth and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Final Plat and/or Final Development Plan does not imply approval of my engineer's drainage design.

HEALTHSOUTH CORPORATION

Name of Developer

 4/12/12

Authorized Signature

Date

Table 2D
City of Littleton Storm Drainage Design and Technical Criteria
Drainage Report Checklist

- Instructions:**
1. Applicant to identify with a "*check-mark*" if information is provided with report. If applicant believes information is not required, indicate with "*n/a*" and attach separate sheet with explanation.
 2. City will determine if information labeled "*n/a*" is required and whether information must be submitted.
 3. Those items noted with an "*asterisk*" are not required for a conceptual report.
 4. Submit three (3) copies of report and include copy of check list bound with report.

TITLE PAGE

- A Type of report (Conceptual, Final, Flood Hazard)
- B Project name
- C Preparer name, firm, address, number, and date.
- D. Professional Engineers seal of preparer

I INTRODUCTION

- A. Background
 - 1 Identify report preparer and purpose
 - 2 Identify date of letter with previous City comments.
- B. Project Location
 - 1 Identify Township, Range, and Section
 - 2 Identify adjacent street and subdivision names
 - 3 Reference to General Location Map
- C. Property Description
 - 1 Identify area in acres of entire contiguous ownership.
 - 2 Describe existing ground cover, vegetation, soils, topography and slopes.
 - 3 Describe existing drainage facilities, such as channels, detention areas, or structures.
 - 4 Describe existing irrigation facilities, such as ditches, head-gates, or diversions.
 - 5 Identify proposed types of land use and encumbrances.
- D. Previous Investigations
 - 1 Identify Major Drainageway Planning Study, Outfall System Planning Study, Flood Hazard Area Delineation Study, Flood Hazard Zones, and flood insurance rate maps.
 - 2 Identify other master drainage plan for the area.

II DRAINAGE SYSTEM DESCRIPTION

- A. Existing Drainage Conditions
 - 1 Describe existing topography and provide map with contours extending a minimum of 100-feet beyond property limits
 - 2 Identify major drainageway or outfall drainageway and describe map showing location of proposed development within the drainageways.
 - 3 Identify pre-developed drainage patterns and describe map showing pre-developed sub-basins and concentrated discharge locations. Provide calculations of pre-developed peak flows entering and leaving the site.
- B. Master Drainage Plan

Describe location of the project relative to a previously prepared master drainage plan, including drainage plans prepared for adjacent development.
- C. Offsite Tributary Area
 - 1 Identify all offsite drainage basins that are tributary to the project.
 - 2 Identify assumptions regarding existing and future land use and effects of offsite detention on peak flows.
- D. Proposed Drainage System Description
 - 1 Identify how offsite storm water is collected and conveyed through the site.
 - 2 Identify sub-basins and describe, in general terms, how onsite storm water is collected and conveyed through the site for each location where storm water is discharged from the site.
 - 3 Describe detention volumes, release rates and pool elevations.
 - 4 Identify the difference in elevation between pond invert and the groundwater table.
 - 5 Describe how stormwater is discharged from the site, including both concentrated and dispersed discharges.
 - 6 Describe storm water quality facilities.
 - 7 Describe maintenance access aspects of design
 - 8 Describe easements and tracts for drainage purposes, including limitations on use.
- E Drainage Facility Maintenance
 - 1 Identify responsible parties for maintenance of each drainage and water quality facility.
 - 2 Identify general maintenance activities and schedules.

Drainage Report Checklist

III DRAINAGE ANALYSIS AND DESIGN CRITERIA

A. Regulations

- 1 Identify that analysis and design was prepared in accordance with the provisions of the City's CRITERIA.
- 2 Identify other City regulations or criteria which have been used to prepare analysis and design.

B. Development Criteria

- 1 Identify drainage constraints placed on the project by a Major Drainageway Planning Study, an Outfall Systems Study, a master drainage plan, or other area wide development plan.
- 2 Identify drainage constraints placed on the project from major street alignments, utilities, rapid transit, existing structures, and other developments.

C. Hydrologic Criteria

(If CRITERIA was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information.)

- 1 Identify how storm runoff peak flows and volumes were determined, including rainfall intensity or incremental amounts.
- 2 Identify which storm events were used for minor and major flood analysis and design.
- 3 Identify how and why any other deviations from the CRITERIA occurred.

D. Hydraulic Criteria

(If CRITERIA was followed without deviation, then a statement to that effect is all that is required. Otherwise provide the following information)

- 1 Identify type(s) of streets within and adjacent to development and source for allowable street capacity.
- 2 Identify which type(s) of storm inlets were analyzed or designed and source for allowable capacity.
- 3 Identify which type of storm sewers which were analyzed or designed and Manning's n-values used.
- 4 Identify which method was used to determine detention volume requirements and how allowable release rates were determined.
- 5 Identify how the capacity of open channels and culverts were determined.
- 6 Identify any special analysis or design requirements not contained within the CRITERIA.
- 7 Identify how and why any other deviations from the CRITERIA occurred.

E. Variance from Criteria

- 1 Identify which provisions of the CRITERIA a variance is requested.
- 2 Identify pre-existing conditions which cause the variance request.

IV GRADING & EROSION & SEDIMENT CONTROL PLAN (ESCP) See CRITERIA, Chapter 13 for requirements.

A. Additional Site Information

- 1 Describe soils, including hydrologic group, mapping units, erodibility, permeability, depth, texture and structure.
- 2 Provide estimate of fill and excavation quantities and surface area of disturbance.

B. Erosion Control Measures

Describe methods used to control erosion and sediment discharges from the site during and after construction.

C. Schedule

Identify anticipated start and completion times for site grading construction sequence, BMP installation and removal, stockpiles, exposure time for each area prior to completion of temporary measures.

D. Maintenance

Provide schedule of regular inspections and repair activities, including removal of sediment.

E. Cost Estimate

Provide an estimate of installation and maintenance costs for erosion and sediment control measures for the purpose of determining amount of surety or bonding requirements.

F. Calculations

Provide calculations performed for design of erosion and sediment control facilities.

G. Owner's Certification

A signature page shall be provided for the owner/developer acknowledging the review and acceptance of the responsibility for the plan. The certification shall be worded as provided in Section 2.3.

H. Spill Prevention, Containment and Clean-up

Describe spill prevention, containment and cleanup procedures to be used during construction phase.

I. Standard Drainage and Erosion Control Notes

Include standard drainage and erosion control notes (see Chapter 17)

Drainage Report Checklist

* V STORMWATER MANAGEMENT PLAN (SWMP). See CRITERIA, Chapter 15 for requirements.

* A. Storm Water Quality Control Measures

* Describe BMPs to control discharge of pollutants from the project site.

* B. Calculations

Provide methods and calculations for WQCV, sediment storage, and water quality outlet structure.

VI CONCLUSIONS

A. Compliance with Criteria

Compliance with CRITERIA, major drainageway and outfall systems planning studies.

B. Design Effectiveness

Effectiveness of drainage design to control impacts of storm runoff.

C. Areas in Flood Hazard Zone

Meet requirements of Floodplain Regulations (Title 10-Chapter 66-Article 5) of the City of Littleton, otherwise, Special Use Permit required.

D. Variances from Criteria

Applicant shall identify any requested variances and provide basis for approving variance. If no variances are requested, applicant shall state that none are requested.

VII REFERENCES

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

TABLES

Include copy of all tables prepared for report.

FIGURES

A. General Location Map (see Section 2.4.2(A))

B. Flood Plain Information (see Section 2.4.2(B))

C. Drainage Plan (see Section 2.4.2 (C))

D. Other pertinent figures.

APPENDICES

A. DESIGN CHARTS

Provide copy of all design charts (i.e.: tables, figures, charts from other criteria) used for the report.

B. HYDROLOGIC CALCULATIONS (see CRITERIA, Chapters 5 and 6)

1 Land use assumptions for off-site runoff calculations

2 Time of concentration and runoff coefficients for pre-existing and post developed conditions

3 Pre-developed hydrologic computations

4 Developed conditions hydrologic computations.

C. HYDRAULIC CALCULATIONS

1 Capacity of existing channels, streets, storm sewers, inlets, culverts and other facilities.

2 Calculations for existing storm sewer and open channel.

3 Irrigation ditch flows and ditch system capacity

4 Detention pond design (see CRITERIA, Chapter 14 for requirements):

a. Storage volume, release rates, and pool elevations for 10-year and 100-year storm

b. Outlet structure dimensions, orifice diameter, weir lengths, pipe headwater and other data.

c. Outlet velocity and energy dissipation requirements.

d. Routing of outlet flows and emergency spillway flows.

5 Street capacity calculations, if data in CRITERIA not used (see Chapter 10).

6 Storm inlet capacity calculations, if data in CRITERIA not used (see Chapter 9).

7 Storm sewer capacity calculations, if data in CRITERIA not used (see Chapter 8).

8 Channel capacity calculations, if data in CRITERIA not used (see Chapter 7).

9 Culvert capacity calculations. (see CRITERIA, Chapter 11).

10 Other hydraulic structure calculations (see CRITERIA, Chapter 12)

D. STORMWATER QUALITY CALCULATIONS

1 Water Quality Capture Volume (WQCV)

2 Storage volume for sediment volume and pool elevations for WQCV.

3 Outlet calculations for required area per row, diameter of individual holes, number of holes per row, and number or holes per column.

ACKNOWLEDGMENTS

Drainage Report checklist was prepared by

EKC

Table 2E
City of Littleton Storm Drainage Design and Criteria
Drainage Construction Plan Checklist

Instructions:

1. Applicant to identify with a "check-mark " if information is provided. If applicant believes information is not required, indicate with "n/a".
2. City will determine if information labeled "n/a" is required and whether information must be submitted.

I EXISTING FACILITIES

- A. Contours at two foot intervals, based on USGS datum. Contours to extend at least 50 feet past property line
- B. Location and elevation of USGS benchmarks or benchmarks referenced to USGS.
- C. Property lines
- D. Drainage easements
- E. Street names
- F. Major and minor channels and floodplains.

II PROPOSED FACILITIES

- A. Contours at two foot intervals, based on USGS datum.
- B. Property lines
- C. Drainage easements
- D. Street names and grades
- E. Right of way and easement
- F. Finished floor elevations for protection from major storm run-off.
- G. Detention pond information:
 - 1. Location of each detention pond with site plan at 1" = 50' scale or larger with 2-foot contour intervals.
 - 2. Inlet and outlet structure, and trickle channel design details.
 - 3. Details of emergency spillway and channel.
 - 4. Landscape information, including side slopes, vegetation and planting requirements.
 - 5. Details of water quality outlet structure.
- H. Channel information:
 - 1. Profiles with existing and proposed grades.
 - 2. Cross sections on 100-foot stations showing existing and proposed topography and required rights of way.
 - 3. Locations and size of all existing and proposed structures.
 - 4. Locations and profiles of adjacent utilities.
 - 5. Typical channel section and lining details.
- I. Storm sewer information:
 - 1. Alignment and location of manholes, inlets, and outlet structures.
 - 2. Profile of invert and pipe crown.
 - 3. Invert elevations at manholes and inlets.
 - 4. Lengths and grades between manholes and inlets.
 - 5. Locations and elevations of utilities adjacent to and crossing storm sewer.
 - 6. Easement and other O&M access geometry.
 - 7. Outlet details, such as end sections, headwall and wingwalls, erosion control, and vegetation.
- J. Street cross section with desing 100-year flood depth.
- K. Other drainage related structures and facilities, including under drains and sump pump discharge lines.

III HYDRAULIC AND HYDROLOGIC INFORMATION

- A. Routing and accumulative runoff peaks at upstream and downstream ends of the site and at various critical points onsite for initial and major storms. Inflow and outflow from each subbasin shall be shown for both initial and major storms.
- B. Street cross sections showing 100-year flood levels.
- C. Major and minor channels and floodplains.
- D. Detention pond data:
 - 1. Release rates for 10- and 100-year storm events.
 - 2. Required and provided volumes for 10- and 100-year storm events.
 - 3. Design depths for 10- and 100-year storm events.
 - 4. Water quality capture volume and pool elevation.
- E. Channel data:
 - 1. Water surface profiles.
 - 2. Representative 100-year flow velocity and Froude number
- F. Storm sewer data:
 - 1. Profile of water surface for design flow rate.
 - 2. Peak flows for design flow, 5-year and 100-year storm events.

IV STANDARD NOTES

- A. No building, structure, or fill will be placed in the detention areas and no changes or alternations affecting the hydraulic characteristics of the detention areas will be made without the approval of the City Engineer.
- B. Maintenance and operation of the detention and water quality areas is the responsibility of property owner. If owner fails in this responsibility, the City has the right to enter the property, maintain the detention areas, and be reimbursed for costs incurred.
- C. Detention pond volumes, all drainage appurtenances, and basin boundaries shall be verified. As-built drawings shall be prepared by a registered professional engineer prior to issuance of certificate of occupancy for any structure within the development.
- D. Permission to reproduce these plans is hereby given to the City of Littleton for City purposes associated with plan review, approval, permitting, inspection and construction of the work

V. PROFESSIONAL ENGINEERS SEAL AND SIGNATURE

VI. OTHER

- A. Horizontal and vertical control information and ties to existing and proposed features.

ACKNOWLEDGMENTS

Drainage Construction Plan checklist was prepared by

EKC

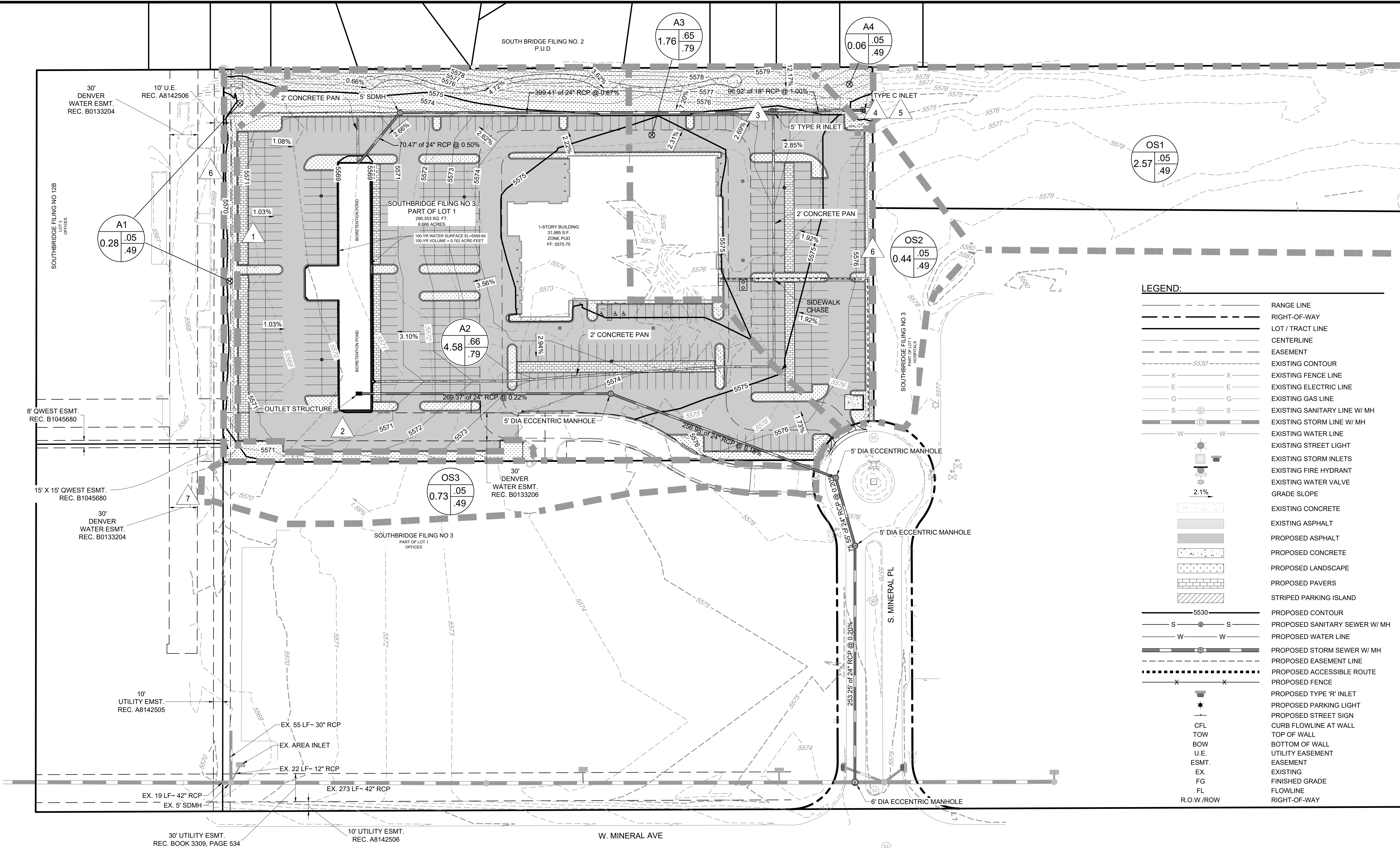
Table 2F
City of Littleton Storm Drainage and Technical Criteria
Grading and Erosion and Sediment Control Plan Checklist

Instructions: 1. Applicant to identify with a "check-mark " if information is provided.
If applicant believes information is not required, indicate with "n/a".
2. City will determine if information labeled "n/a" is required and whether information must be submitted.

✓	I. PLAN SHEET FORMAT	A. Scale: 1" = 50' or larger
✓		B. North arrow
✓		C. Title Block
✓		D. Vicinity Map, 1" = 500'
✓		E. Contour lines at 2' maximum intervals.
✓		F. 24" x 36" drawing size.
✓		G. Original and revision dates.
✓		H. Dated, checked, sealed and signed by a P.E.
✓		I. Legend
✓		J. Street names, dimensions and grades.
✓		K. Match lines and sheet numbers.
✓		L. Approval block
✓		M. Standard Notes (see Chapter 17)
✓		O. Baseline or control line.
✓	II. PRE-EXISTING SITE CONDITIONS	
✓		A. Site topography extending 50-feet minimum past property line.
✓		B. Easements and ROWs
✓		C. Utilities
✓		D. Drainageways with designated floodplains and floodways
✓		E. Irrigation facilities.
✓		F. Buildings, fences, retaining walls, trees and other physical features.
✓	III. PROPOSED SITE CONDITIONS	
✓		A. Site contours with connection to existing contours
✓		B. Drainage direction arrows
✓		C. Grade breaks and slopes 3:1 or greater
✓		D. Cut and fill areas with quantities, if separate grading permit requested.
✓		E. Sidewalks, bikepaths and other public improvements.
✓		F. Driveway dimensions and grades.
✓		G. Storm drainage structures.
✓		H. Fences, retaining walls and other physical site improvements.
✓		I. Cross sections, if necessary to detail features.
✓		J. Finished floor elevations for all buildings
✓		K. Erosion protection
✓	IV. STANDARD DETAILS	
✓		A. City or CDOT standard detail reference
✓		B. Other appropriate details.

APPENDIX E

DRAINAGE MAPS



LEGEND:

- RANGE LINE
- RIGHT-OF-WAY
- LOT / TRACT LINE
- CENTERLINE
- EASEMENT
- EXISTING CONTOUR
- EXISTING FENCE LINE
- EXISTING ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING SANITARY LINE W/ MH
- EXISTING STORM LINE W/ MH
- EXISTING WATER LINE
- EXISTING STREET LIGHT
- EXISTING STORM INLETS
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- GRADE SLOPE
- EXISTING CONCRETE
- EXISTING ASPHALT
- PROPOSED ASPHALT
- PROPOSED CONCRETE
- PROPOSED LANDSCAPE
- PROPOSED PAVERS
- STRIPED PARKING ISLAND
- PROPOSED CONTOUR
- PROPOSED SANITARY SEWER W/ MH
- PROPOSED WATER LINE
- PROPOSED STORM SEWER W/ MH
- PROPOSED EASEMENT LINE
- PROPOSED ACCESSIBLE ROUTE
- PROPOSED FENCE
- PROPOSED TYPE 'R' INLET
- PROPOSED PARKING LIGHT
- PROPOSED STREET SIGN
- CURB FLOWLINE AT WALL
- TOP OF WALL
- BOTTOM OF WALL
- UTILITY EASEMENT
- EASEMENT
- EXISTING
- FINISHED GRADE
- FLOWLINE
- RIGHT-OF-WAY

BASIS OF BEARINGS:

BASIS OF BEARING FOR THIS SURVEY IS THE LINE CREATED BY A FOUND 1.5"ALUM.CAP ON #5 REBAR AT THE NORTHWEST CORNER OF SAID LOT 1. AND A FOUND #6 REBAR WITH YELLOW PLASTIC CAP LS 25965 AT THE NORTHEAST CORNER OF SAID LOT 1. BEARING NORTH 89°49'10" EAST A DISTANCE OF 694.07 FEET.

SITE BENCHMARK:

ELEVATIONS ARE NAVD88. DERIVED BY GPS BETWEEN TWO NGS BENCHMARKS, BENCHMARK BAUR LOCATED ON S.UNIVERSITY BLVD. NAVD 88 5510.35. AND NGS BENCHMARK Q23 LOCATED ON CANAM HWY. NAVD 88 5395.24.

NOTES:

- A. NO BUILDING, STRUCTURE, OR FILL WILL BE PLACED IN THE DETENTION AREAS AND NO CHANGES OR ALTERNATIONS AFFECTING THE HYDRAULIC CHARACTERISTICS OF THE DETENTION AREAS WILL BE MADE WITHOUT THE APPROVAL OF THE CITY ENGINEER.
- B. MAINTENANCE AND OPERATION OF THE DETENTION AND WATER QUALITY AREAS IS THE RESPONSIBILITY OF PROPERTY OWNER. IF OWNER FAILS IN THIS RESPONSIBILITY, THE CITY HAS THE RIGHT TO ENTER THE PROPERTY, MAINTAIN THE DETENTION AREAS, AND BE REIMBURSED FOR COSTS INCURRED.
- C. DETENTION POND VOLUMES, ALL DRAINAGE APPURTENANCES, AND BASIN BOUNDARIES SHALL BE VERIFIED. AS-BUILT DRAWINGS SHALL BE PREPARED BY A REGISTERED PROFESSIONAL ENGINEER PRIOR TO ISSUANCE OF CERTIFICATE OF OCCUPANCY FOR ANY STRUCTURE WITHIN THE DEVELOPMENT.
- D. PERMISSION TO REPRODUCE THESE PLANS IS HEREBY GIVEN TO THE CITY OF LITTLETON FOR CITY PURPOSES ASSOCIATED WITH PLAN REVIEW, APPROVAL, PERMITTING, INSPECTION AND CONSTRUCTION OF THE WORK

Bioretention Pond Summary Table	
Effective Imperviousness of Tributary Area, Ia (Excluding A1 & OS3)	50.50%
Contributing Watershed Area (Excluding A1 & OS3)	9.41 acres
WQCV	0.130 acre-feet
Volume Required (to store EURV)	0.450 acre-feet
Total Pond Depth (including grow media and filtration media)	5.32 ft
Depth of Bioretention Grow Media	1.5 feet
Depth of Filtration Media	0.5 ft
WQCV Stage	0.56 ft
WQCV WSE	5567.16 ft
WQCV Drain Time	12 hours
EURV Stage	1.91 ft
EURV WSE	5568.51 ft
EURV Drain Time	27 hours
100 Year Stage	3.22 ft
100 Year WSE	5569.84 ft
Side Slopes	0 ft/ft
Depth Over Emergency Spillway	.14 ft
WSE Over Emergency Spillway	5570.84 ft

Runoff Analysis Data Table					
Basin ID	Design Point	C _s	C ₁₀₀	Q _s (cfs)	Q ₁₀₀ (cfs)
A1	1	0.05	0.49	0.03	1.04
A2	2	0.66	0.79	7.38	21.91
A3	3	0.65	0.79	2.75	8.77
A4	4	0.05	0.49	0.01	0.18
OS-1	5	0.05	0.49	0.25	5.11
OS-2	6	0.05	0.49	0.06	1.29
OS-3	7	0.05	0.49	0.08	1.59

DRAINAGE LEGEND

BASIN

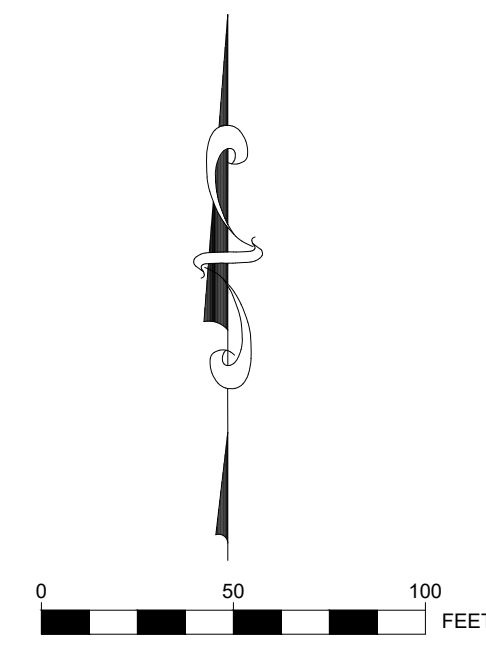
- BASIN NAME
- AREA
- 5 yr C VALUE
- 100 yr C VALUE
- BASIN ACREAGE

DESIGN POINT

- DESIGN POINT

BASIN BOUNDARY LINE

- EX. MAJOR CONTOUR
- EX. MINOR CONTOUR
- PR. MAJOR CONTOUR
- PR. MINOR CONTOUR
- SURFACE FLOW DIRECTION



REVISION DESCRIPTION	
DATE	SUBMITTED TO LITTLETON
1/8/21	SUBMITTED TO LITTLETON
4/9/21	
#	
2	
DRN	TWD
CHK	
DSG	TWD
MC DONALD RECONDITIONING CENTER	
1151 WEST MINERAL AVE., LITTLETON, COLORADO	
PROPOSED DRAINAGE PLAN	
ACTION CIVIL ENGINEERING	
9777 PYRAMID CT, SUITE 225	
ENGLEWOOD, CO 80112 720.826.3965	
tdenning@actioncivileng.com	
JOB NO.	1802
SCALE	---
PLOT DATE	4/9/2021
SHEET	1 OF 1

APPENDIX F

SITE PHOTOS

McDonald Reconditioning Center

Aerial View

Legend

- 1151 W Mineral Ave
- W Mineral Ave &



Google Earth

©2010 Google

McDonald Reconditioning Center

West end of Existing Driveway Tie-In to Site

Legend

- 1151 W Mineral Ave
- W Mineral Ave &



Google Earth

© 2020 Google

McDonald Reconditioning Center

Intersection of W Mineral Ave & S Mineral Pl

Legend

- 1151 W Mineral Ave
- W Mineral Ave &



Google Earth

© 2020 Google


3.46 ft



Exhibit E

Comp Plan Checklist

[*see attached*]

	Envision Littleton Comprehensive Plan Analysis Checklist Limited SDP Checklist
Applicant Name: McDonald Automotive Group	Case No. APD21-0001
Address 1151 W. Mineral Ave.	Date 10-7-20

The following table is to be completed through the review of land development applications for compliance with the Envision Littleton Comprehensive Plan.
Staff response is in **blue** for criterion met and **red** for not met. Please provide your response in **black** below staff review to maintain the comment record.

Standard	Applicant Response	Met	Not Met	N/A
Land Use And Community Character The following descriptions indicate the anticipated principal uses in each category, plus the intended character of the areas in which the land uses occur, abut, or mix. Public and institutional uses commonly occur in all of these areas and should match the character. Specific standards for land development based on these designations are articulated through the City's implementing regulations (zoning and subdivision) as they currently exist and may be further amended over time based on this planning guidance.				
<p>Suburban commercial This designation involves commercial developments, whether at a neighborhood-focused or larger scale, that stand apart from most auto-oriented contemporary development. The Suburban character is achieved through lesser coverage of the site with buildings and especially paved areas. Preservation of trees or other natural site features, along with generous landscaping, can also move a site into the Suburban range of the community character spectrum relative to sites where "gray" spaces predominate over "green" and open spaces.</p> <p>1. Suburban character primarily from reduced site coverage relative to most auto-oriented commercial development.</p> <p>2. Encouraged at key community entries and along high-profile roadway corridors, may also involve other criteria to yield less intensive and more attractive development</p>	<p>1. Suburban character: vehicle parking is a key element of this facility and the design utilizes landscaping buffers and interior landscaping to screen areas for vehicle storage. The design of the building replicates elements of a contemporary office building.</p> <p>The development exceeds the minimum unobstructed open-space. The facility not being open to the public further reduces the impact on traffic like other auto-oriented designs.</p> <p>2. Entry point to site via access drive and cul-de-sac from W. Mineral Avenue. Enhanced perimeter</p>	<p>X</p> <p>X</p>		

<p>outcomes relative to auto-oriented areas, including higher standards for landscaping (along street frontages and within parking areas), signs, and building design.</p> <p>3. May exclude some auto-oriented uses that cannot achieve a Suburban character (e.g., car washes).</p> <p>4. Near residential properties and areas, the permitted scale and intensity of nonresidential uses should be limited to ensure compatibility (including adequate buffering/screening, criteria for placement and orientation of buildings and parking areas, height limits, and residential-in-appearance architectural standards).</p> <p>5. More opportunity for natural and/or swale drainage (and storm water retention/absorption) versus concentrated storm water conveyance in auto-oriented areas.</p>		<p>landscaping including a 50'-0" wide landscape buffer between the site and the residential properties to the north. This site is not a retail site and will not require typical building signage.</p> <p>3. Not applicable</p> <p>Automotive services are contained inside the building and not open to the public to maintain the suburban character.</p> <p>4. This project includes a 50'-0" buffer with enhanced landscaping between the site and the residential area. The current sub zone is for office park and our building placement and design reflect a contemporary office facility placed 92'-6" from the north property edge.</p> <p>The buffer meets the minimum code requirement and has been enhanced with amenities like a walking path and benches. It appears this criterion is met.</p> <p>5. The design for storm water drainage will incorporate a water quality detention pond. The soils will not allow for a retention/absorption approach.</p> <p>The site uses more natural storm water and drainage techniques than traditional water conveyance (grey infrastructure) approaches.</p>	X		
Land Use & Character Goals and Policies					
GOAL L&C 1:	A land use allocation and pattern that supports and promotes Littleton's pride in, and reputation for, quality neighborhoods and an abundance of parks and preserved open space.	<p>Our buffer design provides access to the enhanced landscape area for the adjacent neighbors. The area will have a walking path, seating areas and multi-layered landscaping with berms.</p> <p>The proposed lot could be developed in the same layout exemplified in the site development plan SDP21-0001 with an office use. The site plan meets the minimum requirements in the code.</p>	X		
GOAL L&C 2:	A sustained focus on the long-term fiscal sustainability of Littleton City government while recognizing the direct connection to the	This development will generate increased property tax revenue for the city.	X		

	community's land use mix, especially for sales tax revenue needs.	The subject property is undeveloped and vacant. The proposed development would support the fiscal needs of the city.			
GOAL L&C 4:	A more attractive community, based on quality design and character of both private development and the public realm.	The proposed building design incorporates materials utilized in professional office buildings to include architectural canopies, glazing systems and living walls to soften the exterior façade facing residential areas. The landscaping, buffers, and building appear to be quality design.	X		
Policy L&C 1:	Emphasize compatible intensities and character when evaluating applications involving more intensive and/or nonresidential development near homes and neighborhoods.	The proposed building is setback 92.5' from the north property line adjacent to the residential area with a 50' landscaped buffer. The building design is compatible with other office buildings within this PD zone. The building design and limited automotive services are intended to ensure a compatible intensity given the site's proximity to residential homes. The site could develop as an office building with the same parking area and would have a greater impact on traffic.	X		
Policy L&C 2:	Plan for and take actions to maintain the established character of its residential neighborhoods.	The enhanced landscaped buffer will provide neighbors with a natural transition between their back yards and the working area of this development. The proposed development meets the requirements established under the code in which it applied.	X		
Housing And Neighborhoods Housing needs, gaps, and challenges in Littleton are central to this Plan. A key component of a city's livability is whether its residents can find suitable and economical housing options at all stages of life to remain in the community they love. Littleton also must offer quality and sustainable neighborhoods, the elements of which – safe streets, great schools, nearby shopping, and parks and trails, among others – cut across all parts of this Plan. While the development of new residences and the rehabilitation of older housing occurs primarily through the private sector, municipal government and other public and non-profit partners have essential roles to play. The City and other partners protect residential investments over time, and strong neighborhoods support the local economy and tax base. Having a diverse stock of housing – new and old, big and small, ownership and rental – is crucial for offering choice and providing for the individual needs of all households, regardless of economic conditions.					
Goal H&N 3:	Neighborhoods that are safe and comfortable for all residents.	The enhanced buffer will significantly soften the transition between the residential and commercial uses. All traffic from this site will be via Mineral Ave. and will not impact the residential areas. The subject property is zoned for office commercial uses. The PD also has provisions to ensure truck and vehicle traffic is only on designated routes and not through the neighborhoods.	X		

Goal H&N 4:	Neighborhoods that maintain their character or are carefully managed when headed toward transition.	Not applicable N/A			X
Transportation Envision Littleton involved concurrent preparation of a new Comprehensive Plan and the City's first-ever Transportation Master Plan (TMP). The two plans were synchronized through joint community and leadership engagement processes involving City Council, Planning Commission, other City boards/commissions, a Project Management Team with City staff and consultant representatives for both plans, and extensive interaction with residents and other stakeholders across the city. During each Envision Littleton phase, inputs to the Comprehensive Plan and the Transportation Master Plan were coordinated to ensure an integrated set of policies and priorities, along with ongoing discussion of the Future Land Use and Character map. The Framework for Action presented below is intended as the outline for the TMP and should be revisited upon each update of the TMP to ensure consistency. In addition to goals, the TMP process resulted in a transportation Mission, as well as policies, which are summarized herein.					
Goal TMP 1:	Connect people conveniently to the community, resources, and opportunities.	This facility is not planned to be open to the public N/A			X
Goal TMP 4:	Contribute to our economic prosperity while maintaining and enhancing our community's character.	Development of this facility will produce increased property taxes for the city and will improve the efficiency of the McDonald dealerships it supports further enhancing sales tax revenues. The subject property is undeveloped and vacant. The proposed development would support the fiscal needs of the city. The landscaping, buffers, and building appear to be quality design.	X		
Policy TMP 5:	Enhance the safety of vulnerable user groups on streets and trails.	This facility will alleviate vehicle load on the other McDonald properties located within the City of Littleton. The PD has provisions to ensure truck and vehicle traffic is only on designated routes and not through the neighborhoods	X		
Policy TMP 6:	Support connections to employment, retail, and entertainment/recreation land uses given the opportunity.	This new facility will provide employment opportunities in Littleton. The subject property is undeveloped and vacant. The proposed development would support the fiscal needs of the city.	X		
Policy TMP 19:	In development proposals, limit curb cuts along proposed planned bicycle and pedestrian routes.	Access to this site will be via an established street off of Mineral Avenue. The location of the site is on a cul-de-sac. Curb cuts will not disrupt bicycle and pedestrian routes.	X		
Economy and Tax Base Continued economic opportunity and prosperity in Littleton will bolster the community's tax base to support quality public services and amenities. The City's development strategies and implementation tools must be nimble and flexible enough to respond to a dynamic economic climate at the local, regional, and national levels. Successful economic development also requires a focus on quality of place, capitalizing on Littleton's special character and unique identity to attract and retain businesses and draw visitors seeking shopping, services, entertainment, recreation, arts and culture, and heritage tourism.					

Goal E&T: 3	Revitalized commercial centers and areas that alleviate obsolete conditions and vacant sites and that meet the contemporary shopping and service needs of Littleton residents and visitors.	<p>Development of this site will activate a parcel of land in Littleton that has been vacant and on the market for several decades. This facility will make the McDonald Automotive Group more efficient and provide the opportunity to better meet the service needs of the community.</p> <p>The subject property has remained vacant and undeveloped for its current zoned use as office park. The proposed development will meet service needs while taking steps to remain in-line with the office park character.</p>	X		
Policy E&T: 2	Seek opportunities to enhance the City's tax base and diversify revenue sources in ways that are compatible and consistent with Littleton's unique character (e.g., extensive Suburban residential character, rich architectural heritage, South Platte River and abundant green space, etc.) while also providing relief from the tax burden residents bear.	<p>Development of this facility will produce increased property taxes for the city and will improve the efficiency of the McDonald dealerships it supports further enhancing sales tax revenues. The incorporation of higher end materials and design features show the McDonald's commitment to constructing a facility compatible and consistent with the architecture of Littleton.</p> <p>The subject property is undeveloped and vacant. The proposed development would support the fiscal needs of the city. The landscaping, buffers, and building appear to be quality design.</p>	X		
Policy E&T: 9	Determine whether development proposals are consistent with adopted City policies and regulations and can be accommodated with adequate public infrastructure and services.	<p>We believe the proposed project is consistent with the adopted City policies and regulations and the available public infrastructure has been deemed adequate to support the planned operations.</p> <p>The proposed development is consistent with the minimum requirements established by the code it was applied under. There appear to be adequate public infrastructure and services to accommodate the development.</p>	X		

Environment

The quality of land, water, and air resources is essential to the character and livability of a community, especially within a highly populated, and relatively intensively developed, metropolitan area. Individuals, groups, and governments have a responsibility to appreciate and assess their respective contributions, both positive and negative, to a shared natural environment. To be responsible stewards they must determine how best to integrate such considerations into their planning and decision-making processes.

All the other Plan elements tie to the environment including topics such as: land management through municipal planning and development regulation; design of housing and neighborhoods; availability of travel options; provision of water, sanitary sewer, waste disposal, storm drainage, and other public services; and planning for recreation and

enjoyment of the outdoors. Consideration of prudent resource conservation practices requires a holistic view of the community and how it interacts with, benefits from, and manages the integrity of its natural “infrastructure.”					
Goal ENV: 3	Efficient use and conservation of water resources.	The landscape irrigation will be predominantly drip irrigation, providing an efficient system supporting the landscape elements. The landscape requirements have been reviewed by city staff and are deemed acceptable to meet this criterion.	X		
Goal ENV: 4	Reduced energy consumption and solid waste generation by residents, businesses, and the City.	All light fixtures will be high efficiency LED and all HVAC equipment will have energy efficient ratings. Recycling practices will be in place for appropriate waste streams. The site plan has been reviewed by city staff and are deemed acceptable to meet this criterion.	X		
Policy ENV: 6	Reduce excessive noise and outdoor lighting levels.	All service functions will be performed within the facility and access doors are oriented away and/or screened from view of the adjacent neighborhood reducing noise concerns. All site lighting will be fully shielded and light levels will be maintained at a low level security foot candle The landscape requirements have been reviewed by city staff and are deemed acceptable to meet this criterion. The PD further clarifies operations, number of vehicle truck trips,	X		
Policy ENV: 8	Encourage energy efficiency and other “green” building practices, including adaptive reuse whenever possible.	The facility will be designed to meet the requirements of the 2012 IECC and we will be utilizing living walls as screening elements on site. The site plan has been reviewed by city staff and are deemed acceptable to meet this criterion.	X		
Special Areas and Design					
Goal S&D: 4	Roadway corridors that fulfill their primary transportation functions for drivers, pedestrians, cyclists, and public transit while advancing the community’s economic development, housing, and aesthetic interests.	Access to this site will be via an established street off of Mineral Avenue. The subject property is currently zoned to allow an office building and office use. An office use would likely generate more vehicle trips at peak hours and lunch hours and would have a more significant impact on the traffic on Mineral. The proposed use is not open to the public and the vehicle truck trips are limited to two per day. It appears the proposed development meets this criterion.	X		

Exhibit F

Temporary Moratorium

[*see attached*]



Legal Notice

Date: 02/06/2020

Subject: An ordinance of the City of Littleton, Colorado, enacting a temporary moratorium on any new auto oriented business development within the area as set forth in the Downtown Littleton Design Standards, and upon the submission, acceptance, processing, or approval of any site development plans, demolition permit, applications or plan approvals, or other types of approval by the City of Littleton related to such activities

Passed/Failed: Passed on second reading and public hearing

CITY OF LITTLETON, COLORADO

ORDINANCE NO. 04
Series, 2020

CITY OF LITTLETON, COLORADO

ORDINANCE NO. 04

Series, 2020

AN ORDINANCE OF THE CITY OF LITTLETON, COLORADO, ENACTING A TEMPORARY MORATORIUM ON ANY NEW AUTO-ORIENTED BUSINESS DEVELOPMENT WITHIN THE AREA AS SET FORTH IN THE DOWNTOWN LITTLETON DESIGN STANDARDS, AND UPON THE SUBMISSION, ACCEPTANCE, PROCESSING, OR APPROVAL OF ANY SITE DEVELOPMENT PLANS, DEMOLITION PERMITS, APPLICATIONS OR PLAN APPROVALS, OR OTHER TYPES OF APPROVAL BY THE CITY OF LITTLETON RELATED TO SUCH ACTIVITIES

WHEREAS, the City of Littleton (“City”) is a Colorado home-rule municipality with all the powers and authority vested under Colorado law; and

WHEREAS, on July 9, 2018 the Planning Commission of the City of Littleton adopted the Downtown Littleton Design Standards (“Design Standards”) which were subsequently ratified by City Council on August 7, 2018; and

WHEREAS, the Design Standards delineates the subareas that comprise Downtown Littleton; and

WHEREAS, on October 15, 2019; City Council adopted the Envision Littleton Comprehensive Plan (“Comprehensive Plan”); and

WHEREAS, currently the City’s zoning allows for several different types of auto-oriented uses which may not be consistent with the goals and policies as set forth in the Comprehensive Plan; and

WHEREAS, auto-oriented uses may not meet certain goals and policies such as encouraging a more walkable community, pedestrian-focused, vibrant retail and mixed-use; and

WHEREAS, in order to ensure consistency with the newly adopted Comprehensive Plan, changes need to be made to the City’s Code; and

WHEREAS, the City has retained Kendig Keast Collaborative to begin a complete rewrite of the City’s Zoning Regulations which is anticipated to take an extended period of time; and

WHEREAS, in the interim, City Staff has been exploring near-term changes to address certain inconsistencies between the Comprehensive Plan and City Code; and

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49 **WHEREAS**, the imposition of a temporary moratorium of 90 days on any new
50 auto-oriented development within the Downtown Littleton area as set forth in the Design
51 Standards including the submission, acceptance, processing, or approval of any site development
52 plans, demolition permit, applications or plan approvals or other types of approval by the City
53 related to such activities is reasonable in time, scope, and location and will allow the City the
54 time needed to enact appropriate regulations for the protection of the public health, safety, and
55 welfare as it relates to the Downtown Littleton Area.

56
57 **NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF**
58 **THE CITY OF LITTLETON, COLORADO, THAT:**

59
60 **Section 1:** The foregoing recitals are hereby adopted by the City Council as
61 findings in support of the adoption of this Ordinance.

62
63 **Section 2:** The City Council further finds and declares that:

64
65 a. The City's current laws, ordinances, rules and regulations may not
66 adequately address the issues and challenges associated with protecting the character of
67 the Downtown Littleton area as it relates to new commercial development involving auto-
68 oriented uses; and

69
70 b. Auto-oriented uses shall have the meaning as those types of commercial
71 uses that require an automobile and tend to increase traffic and reduce walkability as such
72 are identified and set forth in Exhibit A.

73
74 c. The City may suffer irreparable harm if a short, temporary moratorium, as
75 herein described, is not imposed to prevent land-use activities detrimental to the character
76 of the Downtown Littleton area being pursued prior to the implementation of permanent
77 regulations; and

78
79 d. This ordinance is necessary and proper to provide for the safety, preserve
80 the health, promote the prosperity, and welfare of the City of Littleton and the inhabitants
81 thereof; and

82
83 e. The duration of the moratorium imposed by this Ordinance is reasonable in
84 length and is no longer than is required for the City to properly investigate, develop, and,
85 if appropriate, adopt and implement any regulations deemed necessary with respect to the
86 subject matter addressed herein; and

87
88 f. Property owners within the area subject to this Ordinance, and desiring to
89 engage in land-use activities prohibited herein, will not be unfairly prejudiced by the
90 imposition of the short, temporary moratorium imposed by this Ordinance.

91
92 **Section 3:** Upon the effective date of this Ordinance, a moratorium is imposed on
93 any new auto-oriented business development as identified in Exhibit A within the

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Downtown Littleton area as set forth in the Design Standards as more specifically delineated in Exhibit B, attached hereto and incorporated herein, including the submission, acceptance, processing, or approval of any site development plans, demolition permit, applications or plan approvals or other types of approval by the City related to such activities, excepting building permits related to already approved site development plans. The City staff and all applicable commissions, boards, departments, divisions, and representatives are directed to refuse to accept for filing, and not to process or review, any such new applications during the moratorium period.

Section 4: The moratorium imposed by this Ordinance shall commence as of the effective date of this Ordinance, and shall expire in 90 days, unless extended or sooner repealed.

Section 5: Before the expiration of the moratorium imposed by this Ordinance, City staff shall continue to investigate the matters addressed herein and all reasonable options including but not limited to: amending zoning regulations; amending or modifying existing Design Standards; amending Operational Standards; or taking such other steps as deemed appropriate or as may be further directed by City Council and the City Manager.

Section 6: The City Council hereby finds, determines and declares that it has the power to adopt this Ordinance pursuant to: (i) the Local Government Land Use Control Enabling Act, Article 20 of title 29, C.R.S.; (ii) Part 3 of Article 23 of title 31, C.R.S. (concerning municipal zoning powers); (iii) Section 31-15-103, C.R.S. (concerning municipal police powers); (iv) Section 31-15-40, C.R.S.(concerning municipal police powers); (v) the authority granted to home rule municipalities by Article XX of the Colorado Constitution; (vi) Colorado case law; and (vii) the powers contained in the Littleton Charter and the Littleton City Code.

Section 7: Severability. If any part, section, subsection, sentence, clause or phrase of this ordinance is for any reason held to be invalid, such invalidity shall not affect the validity of the remaining sections of this ordinance. The City Council hereby declares that it would have passed this ordinance, including each part, section, subsection, sentence, clause or phrase hereof, irrespective of the fact that one or more parts, sections, subsections, sentences, clauses or phrases may be declared invalid.

Section 8: This ordinance shall become effective 7 days after passage and shall expire ninety (90) days thereafter, unless sooner or repealed or extended by a duly adopted ordinance of the city council.

Section 9: Repealer. All ordinances or resolutions, or parts thereof, in conflict with this ordinance are hereby repealed, provided that this repealer shall not repeal the repealer clauses of such ordinance nor revive any ordinance thereby.

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139
140 INTRODUCED AS A BILL at a regularly scheduled meeting of the City Council
141 of the City of Littleton on the 21st day of January, 2020, passed on first reading by a vote of 7
142 FOR and 0 AGAINST; and ordered published by posting at Littleton Center, Bemis Library, the
143 Municipal Courthouse and on the City of Littleton Website.

144 PUBLIC HEARING on the Ordinance to take place on the 4th day of February,
145 2020, in the Council Chamber, Littleton Center, 2255 West Berry Avenue, Littleton, Colorado,
146 at the hour of 6:30 p.m., or as soon thereafter as it may be heard.

147
148 PASSED on second and final reading, following public hearing, by a vote of 7 FOR and
149 0 AGAINST on the 4th day of February, 2020 and ordered published by posting at Littleton
150 Center, Bemis Library, the Municipal Courthouse and on the City of Littleton Website.

151 ATTEST:

DocuSigned by:

Colleen Norton

Colleen E. Norton

DEPUTY CITY CLERK

DocuSigned by:

Jerry Valdes

Jerry Valdes

MAYOR

156 APPROVED AS TO FORM:

DocuSigned by:

Reid Betzing

Reid Betzing

CITY ATTORNEY



Exhibit A: Auto-Oriented Uses
Ordinance 04-2020 – Moratorium on Auto-Oriented Uses

Auto-oriented uses shall have the meaning as those types of commercial uses that require an automobile and tend to increase traffic and reduce walkability as such are identified and set forth below:

- Financial services, such as banks, savings and loans and brokerages that feature drive up or drive through services
- Ambulance facilities
- Service within enclosed area under roof with drive-through facility
- Primary takeout and delivery
- Automotive curbside service
- Wholesale sales and distribution to retailers/businesses
- Sales of automobiles by licensed dealers
- Sales of new automobiles
- Sales, leasing, rental or pawning of used motor vehicles
- Sales of gasoline
- Sales of automotive parts, not including wrecking yard operations
- Automotive services, not including junk or wrecking yard operations
- Services related to the installation of accessories including car stereos, window tinting, etc., and not including services related to mechanical, electrical or body repair
- Services related to cleaning (e.g., car washes), mechanical (e.g., engine, steering, drive train, tires, brakes) and body repair
- Commercial cleaning/laundry operations

Exhibit B: Downtown as defined in the Downtown Littleton Design Standards
Ordinance 04-2020 – Moratorium on Auto-Oriented Uses

