Comprehensive Stormwater Pollution Prevention Plan (C-SWPPP) For Construction Activities:

Project/Site Name:

Caliber Collision – Lee's Summit, MO

Project Address/Location:
710 SE Blue Parkway
Lee's Summit, MO 64063
Cass County

Primary Permittee:

Cross Development CC Lee's Summit, LLC.

Permittee/Owner Contact:
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Day-to-Day Operator:

TBD

C-SWPPP Preparation Date:

12 / 16 / 2021

Modification Dates:
Modification I: __ __ / __ __ / __ __ __ __
Modification II: __ __ / __ __ / __ __ __ __

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C-SWPPP is acronym for Comprehensive Storm Water Pollution Prevention Plan
****OS-SWPPP is acronym for On-Site Storm Water Pollution Prevention Plan***

Section 1 PROJECT OVERVIEW

1.1 Narrative (CGP Section 3.2.1)

Construction Activities and BMP Summary

This report details the storm water management system for Caliber Collision located at 710 SE Blue Parkway, Lee's Summit, Missouri in Jackson County.

The subject property is currently undeveloped and is approximately 1.38 acres in size. It is bordered by SE 7th Terrace to the north, Calvert's Express Auto Service & Tire to the east, SE Blue Parkway to the south, and a vacant (undeveloped) property to the immediate west. West of the small vacant property is Lawn and Leasure of Lee's Summit, Inc. The property to be developed is owned now/formerly by Thomas Anthony Kraft Trust and is zoned CP-2, Planned Community Commercial. Note that the entities listed above owned or occupied the surrounding properties per the Jackson County GIS at the time this report was drafted.

Development will consist of the construction of an approximately 11,600 square foot Caliber Collision automotive collision repair facility, all associated utilities, vehicle storage area, parking areas, grading, landscaping, and stormwater management facilities. A StormTech Underground Detention System is proposed for the developed site's stormwater runoff requirements. This underground detention system consists of 45" high MC-3500 Chambers with 9" of stone below and 12 "of stone above it with total storage height of 66" from elev. 2008.5 to elev. 2014.0. The outfall of the underground detention system is to exit the site via a storm sewer to an existing catch basin storm structure located within the existing drainage easement at the northeast of the site in Lot 3 Chapman Plaza II. All of the runoff from the developed site (approximately 1.1 acres in total) is captured by/treated by the underground detention system. A storm sewer is provided along the north of site to by-pass the runoff from future development at west of the site. The construction activities for the Caliber Collision discussed above will disturb approximately 1.30 acres.

This site is located within the Missouri River Watershed Drainage Basin. The Caliber Collision site discharges to the SE 7th Terrace right-of-way, which drains to the East Fork Little Blue River, a tributary of the Blue River.

Perimeter Control BMP's will be installed prior to the initiation of the mass clearing/grubbing and grading of the site. Rows of silt fence, a stabilized construction entrance, and inlet protection measures will be the primary sediment control measures used during the lifespan of all construction activities, until final stabilization is reached.

Construction activities for this project will be implemented in two distinct phases. Once all permits are received and the City of Lee's Summit is notified, all meetings will be held and only then after are construction activities allowed to commence. The first activity will be to install the erosion control measures. This includes installation of all perimeter controls, the construction entrance, the temporary truck wash area, and the inlet

protection measures at the existing inlets. The remaining construction control items such as the SWPPP sign, the temporary soil stockpile area and designated construction equipment parking area can also be installed at this time. After these are installed, removal of the gravel drives on site may be removed and general "clearing and grubbing" of the site's surface may be begin. Temporary seeding and mulch stabilization shall be added to all areas where work will be ceased for a period of more than 14 days. Also, once the area to be utilized as the temporary stockpile area is confirmed, it shall also be stabilized with temporary seeding.

The second phase of construction shall include construction of the site's proposed elements, general grading and earthwork activities, utility installations, landscaping, and all components detailed in this project's Site Development Plans. Before grading is to commence, it is the responsibility of the contractor to inspect and maintain all BMP's, replacing/repairing them as necessary. Once inspected, the site's grading can begin. Permanent seeding shall be applied to all areas as soon as they are complete. Although not proposed for this development, Erosion Control Blankets are to be installed on all intermediate slopes that exceed 3:1. The building pad area is also to be graded at this time so that building construction can commence. Next, all utilities, the underground detention system, storm sewers, and storm drain structures are to be installed. Inlet protection measures shall be installed at each catch basin as they are constructed. The contractor is also responsible for installing a concrete washout prior to all concrete installation; after installation, the proposed curb and gutter, sidewalk and all other concrete areas can be constructed. Paving is to occur at this time as well. Stone base shall be installed in all paved areas as soon as practicable. The construction exist shall be removed only once the building pad, parking lot, and driveway have been stabilized with stone base. The building construction should be completed, along with all the sidewalks, plantings, etc. As construction nears completion, the temporary BMP's can be removed as soon as their contributing drainage areas have been stabilized. Seed and mulch shall be used to stabilize any disturbed areas during the removal of the temporary BMP's. Lastly, the Missouri Department of Environmental Quality shall be contacted for final inspection and the owner shall be contacted for coordination on filing the Notice of Termination (NOT).

Pre-Development Conditions

The proposed development is situated on an approximately 1.38-acre tract of land located at 710 SE 7th Terrace, Lee's Summit, MO in Jackson County. As discussed above, the property is currently owned by Thomas Anthony Kraft Trust and is surrounded by the properties described above. The site generally slopes from the southwest corner of the property to the northeast corner of the property. Grades drop approximately 6.5 feet over the site in this slope. The site is undeveloped and consists of a combination of grass and gravel. These gravel areas on the site appear to be used for drive aisles and parking areas previously. The site is located in FEMA Zone X, "Area of Minimal Flood Hazard" per FEMA Map 29095C0438G, effective 01/20/2017. The existing site has Hydrologic Soil group "C" soil.

There are no wetlands (jurisdictional or isolated) within the development area. Reference Appendix A for a soils map showing the various hydrological soil classifications of the soils on site.

Post-Development Conditions

The area analyzed in the Post-Development condition comprises of 1.1 acres of developed site from total of 1.38 acres. Visual representations of these areas and their layout configuration have been provided in Appendix A of this report and is titled the "Post Development Map". This area contains the majority of the proposed Caliber Collision development including the building all the paved parking and curbed areas. Utilizing proposed curb and gutters, roof leaders, inlets, vegetated swales and the proposed storm sewer system by Caliber Collision, Post-Development Area will be routed to the proposed underground detention system.

A hydraulic study was performed that shows the proposed site will be developed to meet all City of Lee's Summit Stormwater Management requirements. The on-site storm system has been designed to meet the requirements in Section 5608.4.C1 Comprehensive Control as outlined in APWA Section 5600 "Storm Drainage Systems & Facilities", which requires the design to "limit the two-year rate less than or equal to 0.5 cfs per site acre, ten-year rate less than or equal to 2.0 cfs per site acre, 100-yr rate less than or equal to 3.0 cfs per site acre and 40-hour extended detention of 1.37"/24 hour rainfall. As previously mentioned, various site constraints prevent a traditional stormwater pond design. The provided system's designs primary method of attenuating the requirements will be via underground storage.

Below is a Flow Rate Summary Table that compares the allowed and actual discharges.

Flow Rate Summary Table

Developed Site Area Acre	Storm Event (24-hour duration)	Allowable Development Peak Flow Rate (cfs)	Post-Development Peak Flow Rates (cfs)
1.1	2-year	0.55	0.31
1.1	10-year	2.2	0.53
1.1	100-year	3.3	2.4

Flooding Issues

The site is located in FEMA Zone X, "Area of Minimal Flood Hazard" per FEMA Map 29095C0438G, effective 01/20/2017. The existing site has Hydrologic Soil group "C" soil.

Residential Subdivision Information

Not Applicable

1.2 Stormwater Management and Sediment Control (CGP Section 3.2.2)

Industrial Stormwater Discharges

There are no stormwater discharges associated with industrial activity anticipated as part of this project.

Erosion Prevention BMPs

As the existing site is cleared and graded to the proposed contours shown on the Construction Site Plans, erosion prevention BMPs shall be placed throughout the construction site to aid in the prevention of sediment-laden stormwater runoff. These BMPs shall be focused at the discharge area for the site. These BMPs shall be focused in areas with high potential of erosion and shall be applied to all steep slopes equal to or greater than 3H:1V.

Each erosion prevention measure shall be selected on a site-specific basis and details have been provided on the Construction Site Plans. The Plans identify all proposed Erosion Prevention BMPs, and include recommended installation, maintenance, and inspection procedures.

Examples of Erosion Prevention BMPs are, but are not limited to, surface roughening, temporary seeding, erosion control blankets, riprap, outlet protection, dust control, and polyacrylamide (PAM). Information on the design and proper use of Erosion Prevention BMPs can be located in Chapter 4 of the Missouri DN WPCP.

Sediment Control BMPs

Sediment Control BMPs are designed to remove some of the sediment accumulated within stormwater runoff, to the best extent practicable. These BMPs help prevent sediment impacts to adjacent properties and water bodies from stormwater discharges originating from construction sites.

Typically, these BMPs are placed near each of the site's outfalls and are installed prior to clearing and grubbing of the site (before large areas of soil are exposed). However, some Sediment Control BMPs are either located interior to the construction site or must be

phased along with construction activities. In these circumstances, the Sediment Control BMPs are installed during and after mass grading activities. Placement, sizing and modifications of Sediment Control BMPs should be left to the SWPPP preparer and/or the Site Engineer. **Contractors must consult the SWPPP Preparer as listed at the front of this SWPPP before making any significant changes to these BMPs**.

Each sediment control BMP shall be selected on a site-specific basis. Examples of Sediment Control BMPs are, but are not limited to sediment traps, sediment basins, silt fence, rock check dams, rock sediment dikes, diversion dikes, sediment tubes, and inlet protection. Please consult Chapter 4 of the Missouri DN WPCP for more information on Sediment Control BMPs.

Structural Control BMPs and Floodplain Placement

This site-specific SWPPP utilizes the following structural control BMPs: **an existing detention pond, permanent vegetated swales and storm sewer systems.** These practices have been designed to either divert flows from exposed soils, to retain/detain flows, and to otherwise limit the runoff rate and the discharge of pollutants from disturbed areas of the construction site.

For areas where existing buildings and/or pavements are removed, these areas shall be brought to final grade as soon as possible, and permanent stabilization shall be installed immediately upon achieving final grade, either in the form of permanent seed/groundcover or stone base for pavements and building slabs.

Throughout the lifespan of the construction project this BMP will be installed and maintained, as required by the SWPPP and the Construction Site Plans, until final stabilization has been achieved for the areas draining to each BMP. Upon final stabilization, the structural control BMP must be removed as the conditions show within the approved Construction Site Plans.

This project does not involve placement of any Structural Control BMPs within the 100-year floodplain. If any Structural Control BMPs were being proposed within the 100-yr floodplain, approval would be required from the local regulating agency, since MO DNR does not have the authority to regulate within the associated flood plains. Approvals from the local agency will be located in **Appendix C, Additional Approvals/Certifications** of this SWPPP. If the required approval is not located in this SWPPP, please contact the Primary Permittee listed on the title sheet of this SWPPP before performing work within the floodplain.

Construction Entrances and Dust Control

All access areas into and out of the limits of disturbance, as shown on the Construction Site Plans, are required to be equipped with a construction entrance. The use of this BMP will limit the amount of sediment being transported by construction vehicles onto existing roadways or other impervious areas. Any tracked sediment, along with any attached pollutants, deposited on impervious areas could be washed downstream during the next

rain event. Each construction entrance must be installed as shown in the details section of the Construction Site Plans.

If a new entrance or exit is required, that is not shown on the Plans, install the construction entrance as noted by the construction entrance detail, mark the location on the Plans and make a record of this minor modification in the SWPPP's modification log, which is located within one of the appendices of the On-site SWPPP.

Each stabilized construction entrance should be used in conjunction with street sweeping measures if it becomes apparent that sediment is still being tracked onto adjacent impervious areas, even with the use of the construction entrance. Additionally, wheel washing may be required for all vehicles which exit the construction site either full-time or on an intermittent basis.

During extremely dry conditions, drought, and/or excessive winds, the construction site should be treated for dust control to prevent the suspension of fine sediment particles into the air, being carried offsite, and deposited on adjacent properties or surface waters. This practice may not be directly called out on the Construction Site Plans. A water tanker used to spray the soil down should be an effective way to prevent excessive dust at a construction site. Any other dust control practices should be discussed with the SWPPP preparer prior to implementation.

Water Quality BMPs during Construction

Site-specific water quality BMPs (e.g., sediment basins, sediment traps, rock check dams, and rock sediment dikes) must be installed prior to the mass clearing, grubbing and grading of the site, and must be kept in functioning order throughout the lifespan of all construction activities. Each of these BMPs must be maintained and inspected until all areas draining to these BMPs have reached final stabilization, approved by the construction site inspector or the SWPPP Preparer, and recorded within the stabilization log, located as an appendix of the On-site SWPPP.

The location, installation procedures, and maintenance procedures for each water quality BMP can be found within the approved Construction Site Plans.

Post-Construction Water Quality

All construction sites disturbing 5 acres or more, including construction activities associated with Larger Common Plans disturbing 5 acres or more (for sites located within an MS4 this may be 1 acre or more), must be designed to treat water quality post-construction. These water quality controls must be installed and stabilized prior to terminating coverage under the CGP. These controls will require routine maintenance to remain functional; this is to be conducted by the Primary Permittee or the entity that accepts responsibility for these structures once construction has been completed. Additional information, including permanent maintenance and inspection procedures, can be found in **Appendix C** of the OS-SWPPP or within the construction site plans.

Upon final stabilization, each construction site will have to make the transition from temporary BMPs to permanent BMPs. This transition may include the conversion of a

sediment basin to a detention basin, a sediment trap to a bioretention area, or diversion swales to permanently vegetated swales. All post-construction (permanent) water quality and water quantity BMPs are identified in the final phase of the Erosion and Sediment Control located within the construction site plans.

Other Stormwater Management Procedures

Based on the nature, conditions, and/or procedures associated with this construction site, the following items must be followed and adopted by all those conducting land disturbing activities at this site:

- All construction debris must be stockpiled in designated areas, which have been provided with the proper BMPs to prevent the discharge of pollutants through stormwater runoff from building or other similar materials off-site or into surface waters.
- Any additional waste material or stockpile material (i.e., soil and mulch) must also be stored in the designated areas as shown on the Construction Site Plans or as the contractor, responsible for day-day activities at this site, deems appropriate. Silt fence or an approved equal shall surround all stockpiled materials.
- All parties conducting work at this construction site must be informed of and make note of pollutant sources, both industrial and construction, at this site, and be informed of all controls and measures the will be implemented to prevent the discharge of these pollutants in stormwater runoff.
- Any additional non-stormwater discharges, as referenced in the CGP, should be eliminated or reduced to the maximum extent feasible. All unpreventable non-stormwater discharges shall be treated through the approved stormwater management system before release off-site. Following is a list of allowable non-stormwater discharges:

    - Fire hydrant flushing
    - Wash water without detergents
    - Water used for dust control
    - Potable water
    - Building wash down water without detergents
    - Uncontaminated pavement wash water
    - Uncontaminated condensation from mechanical equipment
    - Uncontaminated ground or spring water
    - Water from foundation of footing drains
    - Uncontaminated excavation dewatering
    - Landscape irrigation.

1.3 Sequence of Construction

The construction sequence for this project is shown below, but can also be seen on **Sheets 4 and 5** of the construction site plans. Each item/step of that construction sequence has been listed is the sequence that they should be implemented.

For additional information or questions on the sequencing please contact the SWPPP Preparer or the Permittee referenced on the cover of this SWPPP.

PHASE I

1. SUBMIT PLANS FOR REVIEW
2. OBTAIN GRADING PERMIT (MAY INCLUDE PRE-CONSTRUCTION CONFERENCE). CONTRACTOR SHALL OBTAIN ALL APPROPRIATE PERMITS REQUIRED FOR DEMOLITION AND LAND DISTURBANCE ACTIVITIES.
3. CONTRACTOR SHALL CONTACT CITY OF LEE'S SUMMIT DEVELOPMENT SERVICES TO SCHEDULE A PRECONSTRUCTION MEETING AT (816) 969-1200.
4. REMOVE THE MINIMAL AMOUNT OF PERIMETER SITE FEATURES IN ORDER TO INSTALL STABILIZED CONSTRUCTION EXIT AND SILT FENCE. ENSURE DRAINAGE IS DIRECTED TOWARDS SILT FENCE.
5. INSTALL INLET PROTECTION AT THE EXISTING STORM STRUCTURE OFF THE NORTHEAST CORNER OF THE PROPERTY ON THE ADJACENT PROPERTY.
6. INSTALL SWPPP SIGN, TEMPORARY STOCKPILE AREA, AND DESIGNATE AN AREA FOR THE PARKING OF CONSTRUCTION VEHICLES.
6. BEGIN DEMOLITION OF THE SITE FEATURES PER THE DEMOLITION PLAN. DO NOT BEGIN DEMOLITION OF THE PAVEMENT AND CONCRETE CURB ALONG SE 7TH TERRACE UNTIL READY TO BEGIN WATER MAIN INSTALLATION/ CONNECTION.
7. INSTALL CONCRETE WASHOUT AT SITE ENTRANCE/ EXIT
8. INSTALL TEMPORARY SEEDING AND MULCH STABILIZATION TO ALL AREAS WHERE WORK WILL BE CEASED FOR A PERIOD OF MORE THAN 7 DAYS.

PHASE II

9. CONTINUALLY INSPECT AND MAINTAIN ALL BMP'S. REPAIR AND REPLACE ANY BMP'S AS NEEDED.
10. BEGIN GENERAL GRADING OF SITE. APPLY PERMANENT SEEDING TO ALL AREAS AS SOON AS THEY ARE COMPLETE. DO NOT WAIT UNTIL JOB COMPLETION TO PERMANENTLY SEED DISTURBED AREAS. ADD EROSION CONTROL BLANKETS AS NEEDED FOR ALL AREAS WITH SLOPES THAT EXCEED 3:1.
11. INSTALL UNDERGROUND DETENTION SYSTEM PER CONTECH'S SPECIFICATIONS AND THE GRADING PLAN. INSTALL STORM SEWERS AND STRUCTURES. INLET PROTECTION SHALL BE ADDED AT EACH STRUCTURE IMMEDIATELY AFTER THEY HAVE BEEN

CONSTRUCTED. CONNECT TO EXISTING STORM STRUCTURE AS SHOWN, REPAIRING/REPLACING ANY APPURTENANCES AS NEEDED.

12. INSTALL UNDERGROUND UTILITIES AND COORDINATE WITH EACH UTILITY PROVIDER. BRING ALL BUILDING'S UTILITIES TO THE PROPOSED PAD LOCATION AND CAP FOR FUTURE CONNECTION.
13. INSTALL WATER LINE EXTENSION TO EXISTING MAIN NORTH OF SE 7TH TERRACE. IMMEDIATELY RE-PAVE ASPHALT AND INSTALL CURB & GUTTER PER CITY OF LEE'S SUMMIT STANDARDS AND SPECS.
14. COMMENCE GRADING OF BUILDING PAD AND AREAS AROUND BUILDING PAD.
15. INSTALL CURB AND GUTTER AND FINE GRADE PARKING AREAS. STONE BASE SHALL BE INSTALLED IN ALL PAVED AREAS AS SOON AS PRACTICABLE. CONSTRUCTION EXIT SHALL BE REMOVED ONLY ONCE THE BUILDING PAD, PARKING LOT, AND DRIVEWAY HAVE BEEN STABILIZED WITH STONE BASE.
16. PAVE SITE AND INSTALL APPROPRIATE INLET PROTECTION DEVICES FOR PAVED AREAS AS WORK PROGRESSES.
17. COMPLETE BUILDING CONSTRUCTION, SIDEWALKS, PLANTINGS, ETC.
18. REMOVE TEMPORARY BMP'S AS SOON AS THEIR CONTRIBUTING DRAINAGE AREAS HAVE BEEN STABILIZED. SEED AND MULCH ANY DISTURBANCE FROM REMOVAL OF TEMPORARY BMP'S.
19. INSPECT/ CLEAN/ FLUSH UNDERGROUND DETENTION SYSTEM. CONTRACTOR SHALL CONTACT MANUFACTURER FOR FINAL INSPECTION AND CERTIFICATION.
20. CONTACT MODNR FOR FINAL INSPECTION AND OWNER FOR COORDINATION OF FILING THE NOTICE OF TERMINATION (NOT).

1.4 Non-Numeric Effluent Limits

Stormwater Volume and Velocity Control

During the implementation of construction activities, all parties performing work at this construction site whose work may affect the implementation of the SWPPP must be informed of and directed on how to comply with this Non-Numeric Effluent Limit, which requires the management of stormwater runoff within the construction site and at each outfall. The purpose of this requirement is to control the stormwater volume and velocity at these locations to minimize erosion.

Specifically, each responsible party should be made aware of the practices that have been or should be implemented at the construction site to accomplish these particular stormwater management practices. Below is a list of practices that may be utilized within the disturbed area and at each outfall at construction sites to control stormwater volume and velocity:

Volume Control

- Limiting the amount of disturbed area and exposed soils
- Staging and/or Phasing of the Construction Sequence;
- Sediment Basins and Sediment Traps
- Diverting off-site flow around the construction site;
- Controlling the Drainage Patterns within the Construction Site;
- Temporary Stabilization of Disturbed Areas.

Velocity Control

- Surface Roughening and/or other Slope Stabilization Practices;
- Level Spreaders, Riprap Plunge Pools and/or other Velocity Dissipation BMPS located at the Construction Site's and Sediment Basin Outfalls.
- Use of Rock Checks, Sediment Tubes, Etc. in Temporary Diversions Swales and Ditches.
- Use of Erosion Control Blankets, Turf Reinforcement Mats, and other Non-Vegetative BMPs that can be used to Quickly Stabilize Disturbed Areas.

The SWPPP Preparer/Engineer should approve any modifications (Additional BMPs or Changes to Existing BMPs) to address the management of stormwater volume and velocity prior to implementation. All approved SWPPPs that were issued coverage under the CGP should include ample BMPs and other control measures to address this specific Non-Numeric Effluent Limit.

Soil Exposure, Compaction and Preservation

Throughout construction activities, the amount of soil exposed during construction should be kept to a minimum. This may be accomplished by minimizing the amount the disturbed area within the permitted Limits of Disturbance (shown on the approved construction site plans) to only that which is necessary to complete the proposed work. For areas that have already been disturbed and where construction activities will not begin for a period of 14 days or more, temporary stabilization techniques must be implemented.

Prior to implementation of any major grading activities, topsoil is to be preserved by placing it in areas designated for stockpiling until final grades are reached. Each stockpile must be equipped with proper sediment and erosion controls to preserve the topsoil and protect adjacent areas from impacts. Once final grades have been reached, the preserved topsoil should be utilized to apply to areas identified for stabilization. Topsoil contains nutrients and organisms that aid in the growth of vegetation.

The Compaction of Soil should also be minimized to the degree practicable during grading activities. This is especially important during the replacement of topsoil to aid in a quick establishment of vegetative cover. Compaction of soil may also reduce rainfall's ability to infiltrate into the soil, increasing the amount of stormwater runoff.

Soil Stabilization

Throughout construction activities, soil stabilization techniques are to be initiated as soon as practicable whenever any clearing, grading, excavating, or other land-disturbing

activities have permanently or temporarily ceased on any portion of the construction site and will not resume for a period exceeding 14 calendar days. For areas where initiating stabilization measures is infeasible, (e.g., where snow cover, frozen ground, or drought conditions preclude stabilization), initiate vegetative or non-vegetative stabilization measures as soon as practicable.

Steep Slopes (Slopes of 30% grade or greater)

All disturbed steep slopes (30% grade, ~3H:1V, or greater), and steep slopes to be created through grading activities must be managed in a fashion that limits the potential of erosion along the slopes. All parties whose work is/was responsible for the creation/disturbance of steep slopes must comply with the following items:

- Minimize the Disturbance of all steep slopes, when possible.
- Divert Concentrated or Channelized Flows of stormwater away from and around steep slope disturbances.
- Use Specialized BMP Controls including temporary and permanent seeding with soil binders, erosion control blankets, surface roughening, reducing continuous slope length with terracing or diversions, gradient terraces, interceptor dikes and swales, grass-lined channels, pipe slope drains, subsurface drains, level spreaders, check dams, seep berms, and triangular silt dikes to minimize erosion.
- Initiate Stabilization Measures as soon as practicable on any disturbed steep slope areas where construction activities have permanently or temporarily ceased, and will not resume for a period exceeding 7 calendar days.
- A Vegetative and/or Non-Vegetative Cover must be established within 3 working days from the time that stabilization measures were initiated.

Stabilization of steep slopes should be a priority for those performing work at the construction site. At the very least, runoff control BMPs should be implemented to transport stormwater runoff from the top of the slope to the toe of the slope. An example of this is to install diversion swales along the top of slope and direct the runoff towards pipe slopes drains to transports the runoff to the toe of the slope. All pipe slope drain outlets are to be equipped proper outlet protection.

Sediment Discharge Minimization

Permittees, Contractors, and all other parties responsible for conducting land-disturbing activities are required to install and maintain all erosion and sediment BMPs that are identified on the approved construction site plans. These BMPs have been designed and approved to address such factors as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soils particle sizes expected to be present on the construction site. Proper installation, inspection, and maintenance will allow these BMPs to operate at maximum efficiencies in order to minimize sediment discharges to the maximum extent practical.

Pollutant Discharge Minimization

Permittees, Contractors, and all other parties responsible for conducting land-disturbing activities are required to install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, the following items must be implemented:

- Minimize the discharge of pollutants from dewatering trenches and excavations by managing runoff with the appropriate controls. Otherwise these discharges are prohibited;
- Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
- Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater; and
- Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

Prohibited Discharges

Permittees, Contractors, and all other responsible parties for conducting land-disturbing activities are prohibited to discharges, from the construction site, the following items:

- Wastewater from washout of concrete, unless managed by an appropriate control;
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
- Soaps or solvents used in vehicle and equipment washing.

1.5 Buffer Zone Management

All construction sites that contain or are adjacent to surface waters must provide a vegetated buffer of at least 50 linear feet or per the City of Belton's Code of Ordinances. This requirement is only applicable during construction. Work may be conducted within the buffer area once all disturbed areas discharging towards the buffer zone have had final stabilization measures implemented. This work must have been included within the SWPPP at the time of coverage approval.

Buffer Zones Requirements should be explained in detail during the Pre-Construction Conference. These details should include the outlining of the exact location of where the buffer starts and ends, the sediment and erosion controls precluding the buffer and all other general information pertinent to maintaining the buffer zone area during construction.

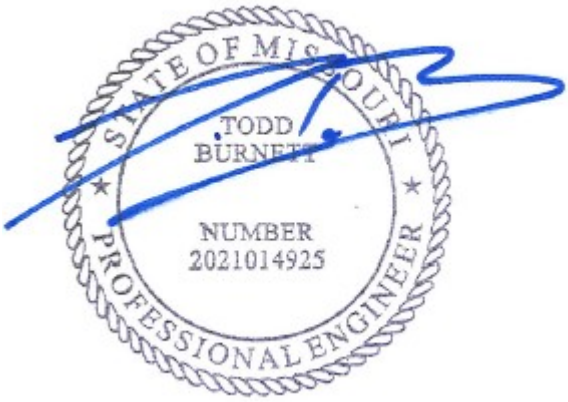
All contractors and sub-contractors shall be made aware of the buffer zones and establish a work procedure that preserves and protects these areas. The buffer zones should be flagged prior to any perimeter control placement and, most importantly,

before mass clearing and grubbing. These areas must also be inspected during construction for areas of excessive sediment impacts, which may need to be removed if sediment impacts are evident within the buffer zone.

In the event that a portion of a buffer is accidentally disturbed, the contractor shall temporarily stabilize the area as soon as possible and consult with the construction site's inspector, permittee, and/or engineer on the installation of any additional sediment control or erosion prevention measure to protect the portion of the buffer still undisturbed.

1.6 Certification Statement

"I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. This Storm Water Pollution Prevention Plan has been reviewed and found to be in accordance with good engineering practice and the Missouri General Operation Permit



Name: **Todd Burnett**

Title: **Engineer of Record**

Date: **December 16, 2021**

Section 2

SITE FEATURES AND SENSITIVE AREAS

2.1 Sources of Pollution

Throughout construction activities, each permittee, contractor, and person responsible for conducting work will need to ensure that sources of pollution are managed to prevent their discharge from the construction site. Expected pollution sources during construction have been identified in **Table 2.1-A**, but due to the nature of construction activities, it is often tough to predict all pollution sources that may appear throughout the life of a construction project. For that reason, the following table has also been provided to help all those performing work at this construction site identify possible sources of pollution Stormwater runoff subjected to the identified pollution sources must be treated by the appropriate BMPs as directed by this SWPPP. In the event that any additional sources of pollution are identified during construction, the person(s) with day-to-day operational control at the site is to add the new source(s) to **Table 2.1-A** and consult with the SWPPP Preparer to properly address this source and to prevent the discharge of its pollutant through stormwater runoff.

Table 2.1-A: Potential Sources of Pollution

Source	Material or Chemical	Location*	Appropriate Control Measures
Loose soil exposed/disturbed during clearing, grubbing and grading activities	Sediment	All areas within the Limits of Disturbance	As directed by the construction Plans. This includes Silt Fence, sediment tubes, sediment basins, and sediment traps.
Areas where construction equipment are cleaned, a.k.a. concrete washout	Heavy Metals & pH	Located adjacent to each construction entrance	Concrete Washout Basin as shown on sheet 3 &4 of the plans.
Water encountered during trenching	Nutrients & Sediment	In and around any trenching activities.	Direct water into impoundments such as basins or traps to allow for the sedimentation of the listed pollutants.
Paving Operations	Sediment & Trash	All areas to be paved.	Inlet protection.
Material Delivery and Storage Areas	Nutrients, pH, Sediment, Heavy Metals, oils & grease	All areas used as storage areas	Silt fence and/or sediment dikes
Equipment fueling and maintenance areas	Metals, hydrocarbons, oils and greases	Areas surrounding fuel tanks	Provide secondary containments, locate in upland areas. Repair leaking and broken hoses.
Paints	Metal oxides, stoddard solvent, talc, calcium-carbonate,	Throughout site, primarily in areas of building construction	Washwater should be contained and is prohibited from being discharged

	arsenic		

***Area where material/chemical is used on site.**

2.2 Surface Waters

This site is located within the Missouri River Watershed Drainage Basin. The Caliber Collision site discharges to the SE 7th Terrace right-of-way, which drains to the East Fork Little Blue River, a tributary of the Blue River.

2.3 Impairments and TMDLs

As stated above, the Project drains to the East Fork Little Blue River (Waterbody ID: 0428.00, a tributary of the Blue River. (HUC 8: 10300101).

East Fork Little Blue River waterbody is not entirely impaired, however there are traces of oxygen, dissolved (W) from an unknown source per the 2020 EPA Approved Section 303d Listed Waters

https://dnr.mo.gov/document/2020-epa-approved-section-303d-listed-waters

After a pre-determined period of time, DNR is obliged to develop a Total Maximum Daily Load (TMDL) for the pollutant of concern for each impaired station listed on the 303(d) List. A TMDL is the amount of a single pollutant (such as bacteria, nutrients, metals) that can enter a waterbody on daily basis and that waterbody still meet water quality standards. "TMDL" refers to both a calculation of a pollutant entering a waterbody as well as the document containing this calculation along with source assessments, watershed and land use information, reductions and allocations information, implementation and other relevant information, maps, figures, and pictures.

Once a TMDL has been developed and approved by the EPA, the impaired WoS is removed from the 303(d) list. A separate list is maintained for WoS with approved TMDLs.

Any construction site whose discharges are released into a WoS listed on the 303(d) List or for which an EPA-approved TMDL has been developed must address the specific

pollutant set forth in the TMDL and/or potential pollutants for the impairment. The SWPPP must include a description of BMPs to address these pollutants.

The primary permittee and/or contractor must ensure that the construction site discharges remain in compliance with the State's water quality standards. To do so, these parties will have to ensure the function of all approved BMPs to handle the specific pollutant.

Construction Stormwater Discharges are expected to contain pollutants that contribute and/or can cause the following impairments to receiving water bodies: BIO (Macroinvertebrate Community), Turbidity, TP (Total Phosphorus), TN (Total Nitrogen), CHLA (Chlorophyll-a), and Fecal Coliform in waters classified for Shellfish Harvesting in the coastal zone. The presence of any of these impairments in receiving waters will require approval control of the site's construction stormwater discharges. Information on each of these impairments and how to treat stormwater runoff for these impairments has been provided below.

Impairment Sources and Prevention

Construction sites can contribute to these impairments directly through the release of excess soil and/or nutrients within stormwater runoff. For this reason, proper sediment and erosion control BMPs should be implemented and the design of the stormwater management systems, during both construction and post-construction, should address the control of stormwater runoff. A reduction in the volume released or the rate at which this volume is released can significantly improve the quality of stormwater runoff and limit the amount of the pollutants that contribute to the above listed impairments.

As an example, sediment basins and/or traps should be used during construction to allow for sedimentation of soils/nutrients, and to control the release of stormwater into the impaired water body. Vegetated Detention and Infiltration structures should be implemented as post-construction BMPs to control stormwater volumes. Caution is advised when using fertilizers to reach Final Stabilization; excess fertilizer can contribute to each of the above listed impairments.

Site-Specific Requirements

This construction site's discharges drain into WoS that is listed on the State's 303(d) list for impaired waterbodies but does not have an established TMDL.

Section 3

Compliance Requirements

3.1 SWPPP Availability

A copy of the On-Site SWPPP (OS-SWPPP) must be maintained on-site at all times throughout construction, until the Notice of Termination has been submitted. The on-site location of the OS-SWPPP (e.g. construction trailer) must be clearly indicated on the

SWPPP entrance sign. A copy of the OS-SWPPP must be made available to regulatory authorities, including the Cass County, MoDNR and EPA, at the time of inspection.

If a location within the construction site is unavailable to store the OS-SWPPP when no personnel are present, notice of the plan's location, along with any updated contact information, must be posed near the main entrance of the construction site.

Contractors who have day-to-day operational control over OS-SWPPP implementation must have a copy of this SWPPP available at a central location within the construction site for the use by all those identified as having responsibilities under the OS-SWPPP.

3.2 SWPPP Modifications

The SWPPP must be modified if during inspections it is determined that it is ineffective in either eliminating or minimizing pollutant discharge in accordance with the CGP. Additional or modified BMPs which are designed to correct problems identified during site inspections must be completed within 7 calendar days following the inspection.

Major modifications to the SWPPP, which generally include changes to sediment basins or traps, changes in grading or drainage patterns which affect flow to BMPs, amending the construction sequence, addition of disturbed area, etc., must be submitted to the regulatory authority for approval prior to implementation.

Minor modifications to the SWPPP, which may include addition of BMPs such as silt fence, inlet protections, relocation of the construction entrance, etc., must be noted on the SWPPP modification log and updated on the office copy of the Construction Site Plans.

Contact the SWPPP Preparer for clarification regarding Major and Minor SWPPP modifications, and for assistance with the regulatory approval process if needed.

3.3 Pre-Construction Conferences

A pre-construction conference must be held for this project. **Each contractor, subcontractor, blanket utility provider, etc., who will work at this site and whose work involves land-disturbing activities and/or implementation of the OS-SWPPP must attend this conference in person.**

The primary purpose of this conference is for the SWPPP-preparer, or someone with a registration equivalent to the SWPPP-preparer, to review and explain the OS-SWPPP so that all parties are aware of its requirements before performing construction-related (land disturbing) activities that may affect the implementation of the approved OS-SWPPP. This conference may be held simultaneously with all contractors and builders present, or may be conducted separately with one or more contractors, subcontractors, etc. present.

It is the General Contractor's responsibility to ensure that all sub-contractors have attended an appropriate Pre-Construction Conference prior to being allowed to work on the site.

The pre-construction conference for this project must be held on-site.

Each pre-construction conference must also specifically address Section 3.1.7, Modifications, detailing how each type of modification, Major and Minor, will be addressed and processed at the construction site to maintain compliance with this permit. Persons conducting this conference must document each contractor, sub-contractor, blanket utility, etc., attending the conference. This documentation must be maintained with the On-Site SWPPP (OS-SWPPP), and include dates, locations, times, as well as, identification of those in attendance. A Pre-Construction Conference Attendance Log is included in Appendix G.

3.4 Inspection Requirements

Construction Site Inspections are to be conducted on a routine basis, as outlined in Section 4.2.B of the CGP, and must include all areas disturbed by construction activity, including perimeter BMPs and areas used for storage of materials that are exposed to precipitation. Each Inspection must look for the evidence of, or the potential for, inefficiencies within the implemented OS-SWPPP, including whether the inefficiencies are a direct result of improper design, installation or maintenance, by inspecting, at a minimum, the following:

1. All areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation;
2. All stormwater conveyance systems for any evidence of, or the potential for, pollutants entering these systems;
3. All BMPs identified in the OS-SWPPP;
4. All discharge locations to ascertain whether the implemented BMPs are effective in preventing the discharge of sediment from the site. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable; and
5. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking.

After construction activities begin until a Notice of Termination is submitted, inspections must be conducted, at a minimum, as follows:

- At least once every calendar week.
- Within 24 hours of the end of a storm event of 0.5 inches or greater (over a 24-hour period).

The Contractor shall maintain a rain gauge on the construction site at all times throughout construction. All rainfall amounts shall be recorded in Rain Log, a copy of which is included in Appendix F, and retained in the OS-SWPPP. **Rainfall records for the day**

of an inspection, and any significant rainfall events since the last inspection, must be reported on each weekly inspection report.

Inspections must be conducted by qualified personnel. "Qualified personnel" means a person knowledgeable in the principles and practice of erosion and sediment controls, who possesses the skills to assess conditions at the construction site that could impact stormwater quality and to assess the effectiveness of any BMPs selected to control the quality of stormwater discharges from the construction site. This person must be either the preparer of the C-SWPPP, or an individual who is under the direct supervision of the preparer of the approved C-SWPPP and who meets the requirements in this paragraph, or an individual who has been certified through a Construction Site Inspector Certification Course that has been approved by DNR. Inspections may also be conducted by a person with a registration equivalent to the registration of the preparer of the C-SWPPP and who meets the qualifications of this paragraph, or an individual who is under the direct supervision of the person with an equivalent registration and who meets the requirements in this paragraph.

It is the Contractor's responsibility to clearly identify the individual who will be performing the required SWPPP inspections for this project at the Pre-Construction Conference, and to ensure that SWPPP inspections commence at the start of construction activities.

An inspection report must be generated for every required SWPPP inspection. At a minimum, the inspection report must include:

1. The inspection date;
2. Names, titles, and, if not previously given in an inspection report, the qualifications of personnel making the inspection, unless those qualifications change;
3. Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether you know if any discharges occurred. At the very least, the total rainfall (in inches) since the time of the last inspection must be recorded;
4. Weather information and a description of any discharges occurring at the time of the inspection;
5. Location(s) of discharges of sediment or other pollutants from the Site;
6. Location(s) of BMPs that need maintenance;
7. Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
8. Location(s) where additional BMPs are needed that did not exist at the time of inspection;
9. Corrective action required including any changes to the OS-SWPPP necessary and implementation dates;
10. Site Name, Operator Name and permit number; and
11. Verification that all BMPs and stormwater controls identified in the OS-SWPPP have been installed and are operating as designed.

A record of each inspection and of any actions taken in accordance with this Section must be retained as part of the OS-SWPPP for at least three years from the date that permit coverage expires or is terminated. A sample Inspection Form is included in Appendix E, along with a log which can be used to track when inspections are made. The qualified inspector, as discussed herein, must sign the inspection report.

3.5 Maintenance Requirements

All BMP's and other protective measures identified in the SWPPP must be maintained in effective operating condition. If site inspections required the MOR100 and MORA identify BMPs that are not operating effectively, maintenance must be performed within seven (7) calendar days, before the next inspection, or as reasonably possible, and before the next storm event whenever practicable to maintain the continued effectiveness of Stormwater controls.

If periodic inspection or other information indicates that a BMP has been used inappropriately, or incorrectly, the Permittee must address the necessary replacement or modification required to correct the BMP within a time frame of 48 hours of identification.

If existing BMPs need to be modified or if additional BMPs are necessary to comply with the requirements of this permit and/or Missouri's Water Quality Standards, implementation must be completed before the next storm event whenever practicable. If implementation before the next storm event is impracticable, the situation must be documented in the SWPPP and alternative BMPs must be implemented as soon as reasonably possible.

Specific maintenance procedures for each BMP's are provided below:

1. Minimize Disturbed Area, Protect Natural Features, and Soil:

Disturbance will be minimized to include only areas necessary for grading and construction of the improvements and erosion control measures as indicated on the construction plans.

Topsoil stripped from the immediate construction area will be stockpiled as identified on the plans. The stockpiles will be in areas that will not interfere with construction phases and at least 15 feet away from areas of concentrated flows or pavement. The slopes of the stockpile will be seeded and/or stabilized and will not exceed 3:1 to minimize erosion. A silt fence will be installed around the perimeter of each stockpile, in accordance with the silt fence design specifications

2. Phased Construction Activity

See the sections above for detailed information on how the construction activity is to be phased.

The current construction schedule, construction activity and control installation logs are retained in Appendix E.

3. Control Storm Water Flowing Onto and Through the Project:

   - BMP Description: Temporary diversion ditches to the proposed rock sediment dike and sediment basin as part of the initial construction. The diversions will be constructed of compacted soil and have a depth of 1.5 feet and 2:1 side slopes. The diversions will be stabilized to prevent erosion and damage immediately after construction.
   - Installation Schedule: The diversions will be installed before infrastructure construction begins at the site.
   - Inspection and Maintenance: The diversions will be inspected weekly and after storm events for erosion damage and structural failures. If seeding and mulching fails or is washed away, areas will be reseeded and re-mulched. Any erosion damage or structural failures will be repaired immediately. Accumulated sediments will be removed from the channel when one-third of the height of the channel is reached. Removed sediments will be mixed with on-site fill material.
   - Responsible Party: Permittee

4. Stabilize Soils:

   - BMP Description: Temporary vegetative cover will be established using hydroseeding for exposed soil (including stockpiles) where construction has ceased for more than 14 days. Hydroseeding will consist of wood fibers, seed, fertilizer, and stabilized emulsion and applied at a rate of 8 pounds per acre. Seeding will be conducted during periods of the year when vegetation is more likely to be established.

     0 Permanent 1 Temporary
   - Installation Schedule: Temporary stabilization measures will be applied to portions of the site where construction activities will temporarily cease for more than 14 days.
   - Inspection and Maintenance: Stabilized areas will be inspected weekly and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area will be reseeded, fertilized and mulched immediately.
   - Responsible Party: Permittee

5. Protect Slopes:

- BMP Description: All slopes greater than 3:1 and less than 4:1 and/or 8 feet vertical are to receive an erosion control blanket in accordance with the specifications upon completion of grading of slopes. The contractor shall immediately install topsoil, blanket and permanent seeding. The contractor shall install topsoil, mat and permanent seeding. All 3:1 slopes are to be sodded in according to the specifications immediately upon completion of grading of the slope. The selection of erosion control blankets and TRM's shall be in accordance with MoDNR Stormwater Management BMP Handbook 2005.
- Installation: Grade and compact areas to be protected with TRMs as indicated on the plans. Remove large rocks, soil clods, vegetation, and other sharp objects that could keep the TRM from intimate contact with subgrade. Prepare seedbed by loosening 2 to 3 inches of soil above final grade. The proper installation of TRMs is different for each product, therefore the recommended installation procedure from the specific manufacturer should be followed. When requested, a Manufacturer's Representative may be required to be on-site to oversee and approve the initial installation of the TRM. When requested, a letter from the Manufacturer approving the contractor installation may be required.
- Inspection and Maintenance:
    - Check areas protected by TRMs for dislocation or failure every 7 calendar days and within 24-hours after each storm that produces ½-inch or more of rain.
    - Conduct regular inspections until grasses are firmly established.
    - Adhere to the pinning or stapling pattern as shown on the Manufacturer's installation sheet. If there is evidence that the TRM is not securely fastened to the soil, install extra pins or staples to inhibit the TRM from becoming dislodged.
    - If washout or breakage occurs, repair all damaged areas immediately by restoring the soil on slopes or channels to its finished grade, re-apply fertilizer and seed, and replacing the appropriate TRM material as needed.
- Responsible Party: Permittee

6. Protect Storm Drain Inlets:

- BMP Description: Storm drain inlet protection is achieved by placing a temporary filtering device around any inlet to trap sediment. This mechanism prevents sediment from entering inlet structures. Additionally, it serves to prevent the silting-in of inlets, storm drainage systems, or receiving channels. There are several storm drain inlet protection details shown on the plan. The contractor shall select appropriate measure as guided in Mo DNR Stormwater Management BMP Handbook.
- Installation Schedule: Once the storm drain inlets have been installed on-site, selected BMP will be immediately placed around the inlets.

- Inspection and Maintenance:
    - Inspect every 7 calendar days and within 24-hours after each storm that produces ½-inches or more of rain. Handle any damage or needed repairs immediately.
    - Inspect after installation for gaps that may permit sediment to enter the storm drainage system.
    - Remove accumulated sediment and debris from the surface and vicinity of Inlet Filters after each rain event or as directed by the Engineer, Inspector or Manufacturer's Representative.
    - Remove sediment when it reaches approximately 1/3 the height of the Inlet Filter. If a sump is used, remove sediment when it fills approximately 1/3 the depth of the hole. Maintain the pool area, always providing adequate sediment storage volume for the next storm event.
    - Remove, move, and/or replace as required to adapt to changing construction site conditions.
    - Remove Inlet Filters from the site when the functional longevity is exceeded as determined by the Engineer, Inspector or Manufacturer's Representative.
    - Dispose of Inlet Filters no longer in use at an appropriate recycling or solid waste facility.
    - Prior to final stabilization, backfill and repair all trenches, depressions, and other ground disturbances caused by the removal of Inlet Filters.
    - Remove all construction material and sediment and dispose of them properly. Grade the disturbed areas to the elevation of the inlet structure crest. Stabilize all bare areas immediately.
- Responsible Party: Permittee

7. Establish perimeter controls and sediment barriers:
    - BMP Description: Silt fences will be installed around the entire perimeter of the site. A silt fence will also be installed around the topsoil stockpile. Silt fences will be installed by excavating a 12-inch-deep trench along the line of proposed installation. Steel posts supporting the silt fence will be spaced 4 to 6 feet apart and driven securely into the ground; a minimum of 18 to 20 inches deep. The silt fence will be fastened securely to the steel posts with wire ties spaced every 24 inches at the top, mid section, and bottom of the steel post. The bottom edge of the silt fence will extend across the bottom of the trench and the trench will be backfilled and compacted to prevent stormwater and sediment from discharging underneath the silt fence.
    - Installation Schedule: The silt fences will be installed before construction begins at the site and around topsoil stockpiles once they have been established.

- Inspection and Maintenance: Silt fences will be inspected weekly and immediately after storm events to ensure it is intact and that there are no gaps where the fence meets the ground or tears along the length of the fence. If gaps or tears are found during the inspection, the fabric will be repaired or replaced immediately. Accumulated sediment will be removed from the fence base if it reaches one-third the height of the silt fence and hauled off-site for disposal at nearby landfill. If accumulated sediment is creating noticeable strain on the fabric and the fence might fail from a sudden storm event, the sediment will be removed more frequently. Before the fence is removed from the project area, the sediment will be removed. The anticipated life span of the silt fence is 12 months and will likely need to be replaced after this period.
- Responsible Party: Permittee

8. Retain Sediment On-Site and Control Dewatering Practices:

- BMP Description: Temporary rock sediment dikes will be installed at the outfalls from the project to treat sediment laden run-off from the construction before releasing it from the site. The sediment dikes will be constructed per the dimensions and details specified on the plans. It will be formed by excavating a pond or by placing an earthen embankment across a low area or drainage swale. An outlet or spillway will be constructed using stones or aggregate to slow the release of runoff. The dike retains the runoff long enough to allow most of the silt to settle out.
- Installation Schedule: Install a non-woven geotextile filter fabric before installing the stone for the outlet structure. Allow stone to extend downstream past the toe of the embankment. Mark the sediment cleanout level of the trap with a stake in the field. Seed and mulch all disturbed area.
- Inspection and Maintenance: The sediment dikes will be inspected weekly and within 24-hr of a rainfall event that produces ½" or more of precipitation for erosion damage and structural failures. Any erosion damage or structural failures will be repaired immediately. Accumulated sediments will be removed from the trap when the sediment reaches 50 percent of the storage volume or top of the cleanout stake. Removed sediments will be mixed with on-site fill material.
- Responsible Party: Permittee

9. Establish Stabilized Construction Exits:

- BMP Description: Stone anti-tracking pads will be installed at the exit, as identified on the site map, to prevent the off-site transport of sediment by construction vehicles. The stabilized exit will be a least 100 feet long, a minimum of 24 feet wide, flared at the end closest to the paved road, and will consist of a 6–inch-thick layer of crushed stone (3 to 5 inches in diameter). The crushed stone will be placed over a layer of geotextile filter fabric to reduce the mitigation of sediment from the underlying soil.

- Installation Schedule: The stabilized exit will be installed before construction begins on the site. The stone anti-tracking pads will remain in place until the subgrade of pavement is installed at the site.
- Inspection and Maintenance: The stabilized exit will be inspected weekly and after storm events or heavy use. The exit to the construction site will be maintained in a condition that will prevent sediment tracking offsite. This could require adding additional crushed stone to the exit. All sediment tracked, spilled, dropped, or washed onto the road will be swept up immediately and hauled off-site for disposal. Once sediment clogs the voids in the crushed stone and the effectiveness of the anti-tracking pad is no longer keeping sediment on the site, the pad will be topdressed with new crushed stone. Replacement of the entire pad might be necessary when the pad becomes completely filled with sediment. The pad will be reshaped as needed for drainage and runoff control. Broken road pavement as a result of construction activities on roadways immediately adjacent to the project site will be repaired immediately. The stone anti-tracking pad will be removed before the subgrade of pavement is applied to the Rutherford Road entrance. The removed stone and sediment from the pad will be hauled off-site and disposed of properly.

A. **Permanent Maintenance**

Permanent Stormwater management structures must be routinely maintained to operate per design. The Department requires inclusion of a Permanent Stormwater Management Maintenance Agreement and a Maintenance Plan to ensure proper operation. No permanent stormwater management devices are proposed for this site.

- Responsible Party: Permittee

3.6 Record Keeping

The maintenance log and records are retained in Appendices section of this SWPPP. These records shall be kept up to date and maintained as part of the SWPPP.

3.7 Final Stabilization

Permanent seeding will be applied immediately after the final design grades are achieved on portions of the site but no later than 14 days after construction activities have permanently ceased. After the entire site is stabilized, any sediment that has accumulated will be removed and hauled off-site for disposal. Construction debris, trash and temporary BMPs (including silt fences, material storage areas, sanitary toilets, and inlet protection) will also be removed and any areas disturbed during removal will be seeded immediately.

Seedbed Preparation:

1. In areas where disturbance results in subsoil being the final grade surface, topsoil will be spread over the finished area at minimum depth of 2 to 6 inches.
2. The seedbed will be free of large clods, rocks, woody debris and other objectionable materials.
3. Fertilizer and lime will be applied to the seedbed according to the manufacturer's recommendations or soil tests (soil tests are omitted from this example SWPPP).
4. The top layer of soil will be loosened to a depth of 3–5 inches by raking, tilling, disking or other suitable means.

Grass Selection/Application: Lawns will be stabilized with a mixture seed mixture as indicated on the construction drawings.

Appendix A

Site Maps

To develop a site-specific SWPPP for a construction map, an assortment of site maps must be used in addition to an on-site assessment to develop an effective stormwater sediment and erosion control plan. The maps located in this appendix have been obtained from various sources, or have been developed by the SWPPP Preparer. Listed below is standard information on a few of the type of maps that may be found within this Appendix.

Locations Maps

A general location map is helpful to identify nearby water bodies in proximity to other properties, and can be a useful tool used to locate the site when on the road. This map should include the outlined project locations, labeled roadways, a North arrow and a scale. SWPPP Preparers may opt to locate this map on the first sheet of the construction site plans in lieu of including it in this appendix.

Site Maps

Site maps tend to go a step beyond a typically location map by adding zooming in on the limits of disturbance and identifying a number of features at the construction site related to land-disturbing activities and stormwater management practices. Each site map should include the following: Stormwater flow directions and discharge locations, Areas and features to be protected, Outline of disturbed areas, Locations of all major BMPs, Areas to remain stabilized, and Adjacent features (e.g., road and water bodies).

Topographic Maps

Topographic Maps can be very useful when determining the existing contours at a construction site, not to mention the existing drainage patterns. These maps must include the project boundary outline, route of runoff from site to nearest waterbody shown, and adjacent road names. These maps are readily available on the Internet (e.g., www.terraserver.com) or by contacting the US Geological Survey Store (http://store.usgs.gov).

Soils Maps

Soils Maps are helpful tools used to determine the soil types and other soil characteristics that are located at a construction site. Each soils map must contain the project boundary outline and the predominate soil types found at the site. Soils Maps can be readily obtain online from the NRCS (http://soils.usda.gov).

Floodway Maps

Floodway Maps are used to determine the location of the 100-yr Flood Plain and other related flooding issues at or adjacent to the construction site. Each Floodway Map must contain the project boundary outline and a legend. These maps can be readily obtain online from FEMA (www.fema.gov).

July 20, 2021

Tax Parcels

Selected Parcel

Green: Band_2

Addresses

Nearmap

Blue: Band_3

Addresses

Red: Band_1

1:2,257

0 0.01 0.03 0.06 mi

0 0.02 0.04 0.09 km

City of Lees Summit, Jackson County, MO, Missouri Dept. of Conservation,

FREELAND and KAUFFMAN, INC.

*Engineers * Landscape Architects*
209 West Stone Avenue
Greenville, South Carolina 29609
864-233-5497
fax 864-233-8915

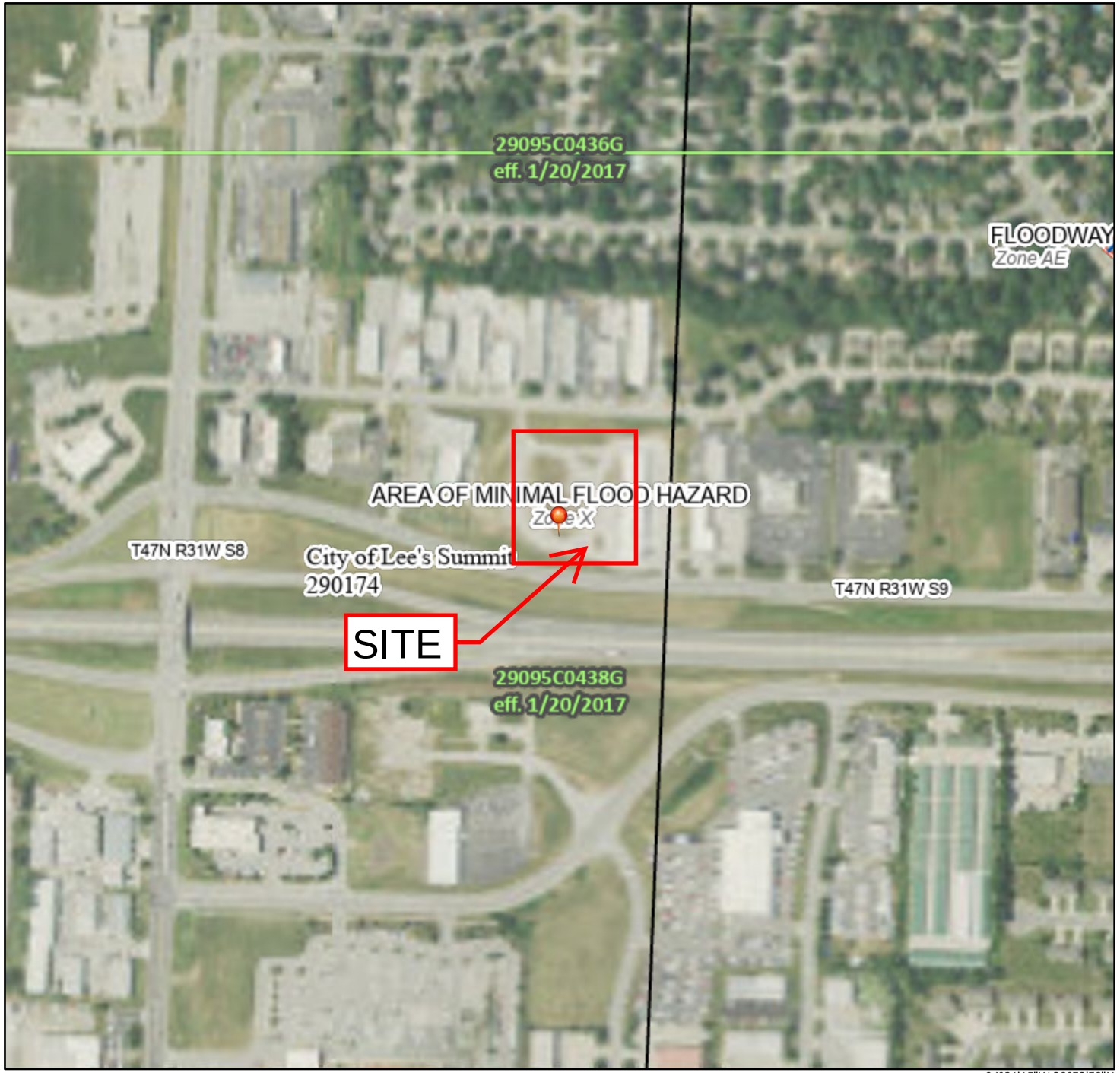
CALIBER COLLISION
710 SE 7TH TERRACE
LEE'S SUMMIT, MO 64063

USGS QUAD MAP

National Flood Hazard Layer FIRMette

FEMA

94°21'53"W 38°54'26"N



94°21'15"W 38°53'58"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

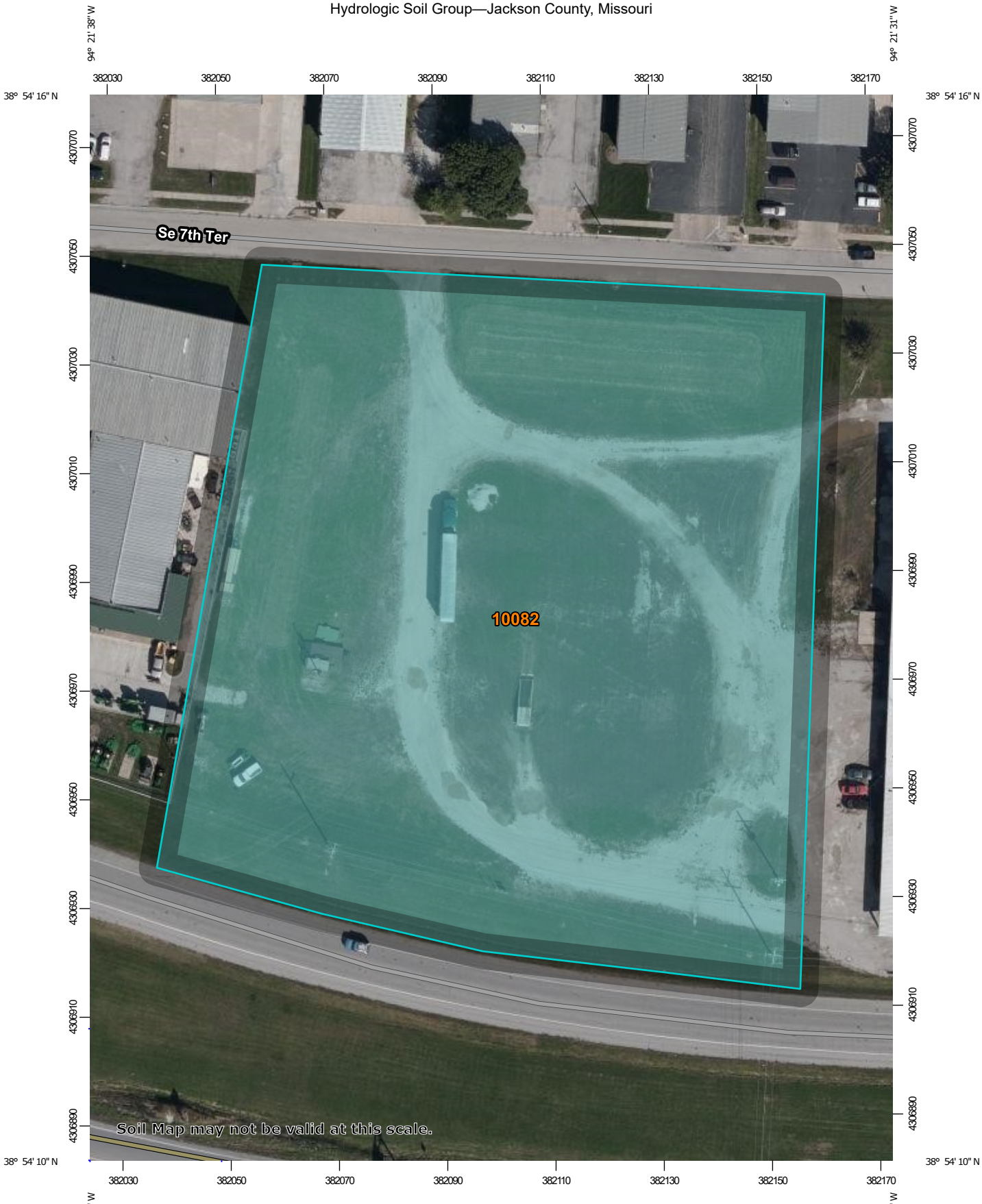
N

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 7/1/2021 at 11:23 AM 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.



Map Scale: 1:956 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

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 1:24,000.

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: Jackson County, Missouri
Survey Area Data: Version 22, May 29, 2020

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	3.4	100.0%
Totals for Area of Interest			**3.4**	**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

NOAA Atlas 14, Volume 8, Version 2
Location name: Lees Summit, Missouri, USA*
Latitude: 38.9038°, Longitude: -94.3595°
Elevation: 1016.38 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.97** (3.92-6.28)	**5.81** (4.57-7.33)	**7.19** (5.65-9.10)	**8.35** (6.53-10.6)	**9.98** (7.57-13.1)	**11.3** (8.36-14.9)	**12.6** (9.05-17.0)	**13.9** (9.64-19.3)	**15.7** (10.5-22.3)	**17.1** (11.2-24.6)
10-min	**3.64** (2.87-4.60)	**4.25** (3.35-5.37)	**5.26** (4.13-6.66)	**6.11** (4.78-7.77)	**7.31** (5.54-9.56)	**8.25** (6.13-10.9)	**9.20** (6.62-12.4)	**10.2** (7.05-14.1)	**11.5** (7.69-16.3)	**12.5** (8.17-18.0)
15-min	**2.96** (2.34-3.74)	**3.46** (2.72-4.36)	**4.28** (3.36-5.42)	**4.97** (3.89-6.32)	**5.94** (4.51-7.78)	**6.71** (4.98-8.88)	**7.48** (5.38-10.1)	**8.28** (5.73-11.5)	**9.36** (6.25-13.3)	**10.2** (6.64-14.6)
30-min	**2.05** (1.62-2.59)	**2.41** (1.90-3.04)	**2.99** (2.35-3.79)	**3.49** (2.73-4.43)	**4.18** (3.17-5.46)	**4.72** (3.50-6.24)	**5.26** (3.78-7.11)	**5.82** (4.03-8.06)	**6.57** (4.39-9.32)	**7.15** (4.66-10.3)
60-min	**1.34** (1.06-1.69)	**1.57** (1.24-1.99)	**1.96** (1.54-2.49)	**2.29** (1.79-2.92)	**2.76** (2.10-3.62)	**3.13** (2.33-4.15)	**3.51** (2.53-4.75)	**3.90** (2.70-5.41)	**4.43** (2.96-6.29)	**4.84** (3.16-6.96)
2-hr	**0.827** (0.657-1.04)	**0.972** (0.771-1.22)	**1.21** (0.960-1.53)	**1.42** (1.12-1.79)	**1.72** (1.31-2.24)	**1.95** (1.46-2.57)	**2.19** (1.59-2.95)	**2.44** (1.71-3.37)	**2.79** (1.88-3.94)	**3.06** (2.01-4.36)
3-hr	**0.623** (0.497-0.777)	**0.731** (0.583-0.913)	**0.916** (0.728-1.15)	**1.08** (0.850-1.35)	**1.31** (1.00-1.70)	**1.49** (1.12-1.96)	**1.68** (1.23-2.26)	**1.88** (1.32-2.59)	**2.16** (1.46-3.04)	**2.38** (1.57-3.39)
6-hr	**0.376** (0.302-0.466)	**0.444** (0.356-0.550)	**0.561** (0.449-0.697)	**0.664** (0.528-0.827)	**0.813** (0.631-1.05)	**0.934** (0.708-1.22)	**1.06** (0.780-1.42)	**1.20** (0.846-1.63)	**1.38** (0.944-1.94)	**1.53** (1.02-2.16)
12-hr	**0.220** (0.178-0.270)	**0.262** (0.212-0.323)	**0.335** (0.270-0.413)	**0.400** (0.320-0.494)	**0.493** (0.386-0.634)	**0.570** (0.435-0.740)	**0.650** (0.481-0.862)	**0.735** (0.524-0.998)	**0.853** (0.587-1.19)	**0.947** (0.635-1.33)
24-hr	**0.129** (0.105-0.158)	**0.154** (0.126-0.188)	**0.198** (0.160-0.242)	**0.236** (0.190-0.290)	**0.292** (0.230-0.372)	**0.337** (0.260-0.435)	**0.385** (0.287-0.507)	**0.436** (0.313-0.588)	**0.507** (0.352-0.701)	**0.563** (0.380-0.786)
2-day	**0.076** (0.062-0.092)	**0.090** (0.073-0.108)	**0.113** (0.092-0.137)	**0.134** (0.109-0.163)	**0.164** (0.130-0.208)	**0.189** (0.147-0.242)	**0.215** (0.162-0.282)	**0.243** (0.176-0.326)	**0.282** (0.197-0.388)	**0.313** (0.213-0.434)
3-day	**0.056** (0.046-0.068)	**0.065** (0.054-0.079)	**0.081** (0.066-0.098)	**0.095** (0.077-0.115)	**0.115** (0.092-0.145)	**0.132** (0.103-0.168)	**0.150** (0.113-0.195)	**0.169** (0.123-0.225)	**0.195** (0.137-0.267)	**0.217** (0.148-0.299)
4-day	**0.046** (0.038-0.055)	**0.052** (0.043-0.063)	**0.064** (0.053-0.077)	**0.075** (0.061-0.090)	**0.090** (0.072-0.113)	**0.102** (0.080-0.130)	**0.116** (0.088-0.150)	**0.130** (0.095-0.173)	**0.150** (0.105-0.204)	**0.165** (0.113-0.228)
7-day	**0.031** (0.026-0.037)	**0.035** (0.029-0.042)	**0.042** (0.035-0.050)	**0.048** (0.039-0.058)	**0.057** (0.045-0.070)	**0.064** (0.050-0.080)	**0.071** (0.054-0.091)	**0.079** (0.058-0.104)	**0.089** (0.063-0.121)	**0.098** (0.068-0.134)
10-day	**0.025** (0.020-0.029)	**0.028** (0.023-0.033)	**0.033** (0.027-0.039)	**0.037** (0.031-0.045)	**0.044** (0.035-0.054)	**0.049** (0.038-0.061)	**0.054** (0.041-0.069)	**0.059** (0.043-0.077)	**0.066** (0.047-0.089)	**0.072** (0.050-0.098)
20-day	**0.016** (0.014-0.019)	**0.018** (0.016-0.022)	**0.022** (0.018-0.026)	**0.025** (0.021-0.029)	**0.028** (0.023-0.035)	**0.031** (0.025-0.039)	**0.034** (0.026-0.043)	**0.037** (0.027-0.048)	**0.040** (0.029-0.054)	**0.043** (0.030-0.058)
30-day	**0.013** (0.011-0.015)	**0.015** (0.013-0.017)	**0.018** (0.015-0.021)	**0.020** (0.017-0.023)	**0.023** (0.018-0.027)	**0.025** (0.020-0.030)	**0.027** (0.021-0.034)	**0.029** (0.021-0.037)	**0.031** (0.022-0.041)	**0.033** (0.023-0.044)
45-day	**0.011** (0.009-0.013)	**0.012** (0.010-0.014)	**0.014** (0.012-0.017)	**0.016** (0.013-0.019)	**0.018** (0.015-0.022)	**0.020** (0.016-0.024)	**0.021** (0.016-0.026)	**0.023** (0.017-0.029)	**0.024** (0.017-0.032)	**0.025** (0.018-0.034)
60-day	**0.009** (0.008-0.011)	**0.010** (0.009-0.012)	**0.012** (0.010-0.014)	**0.014** (0.012-0.016)	**0.016** (0.013-0.019)	**0.017** (0.013-0.020)	**0.018** (0.014-0.022)	**0.019** (0.014-0.024)	**0.020** (0.015-0.027)	**0.021** (0.015-0.028)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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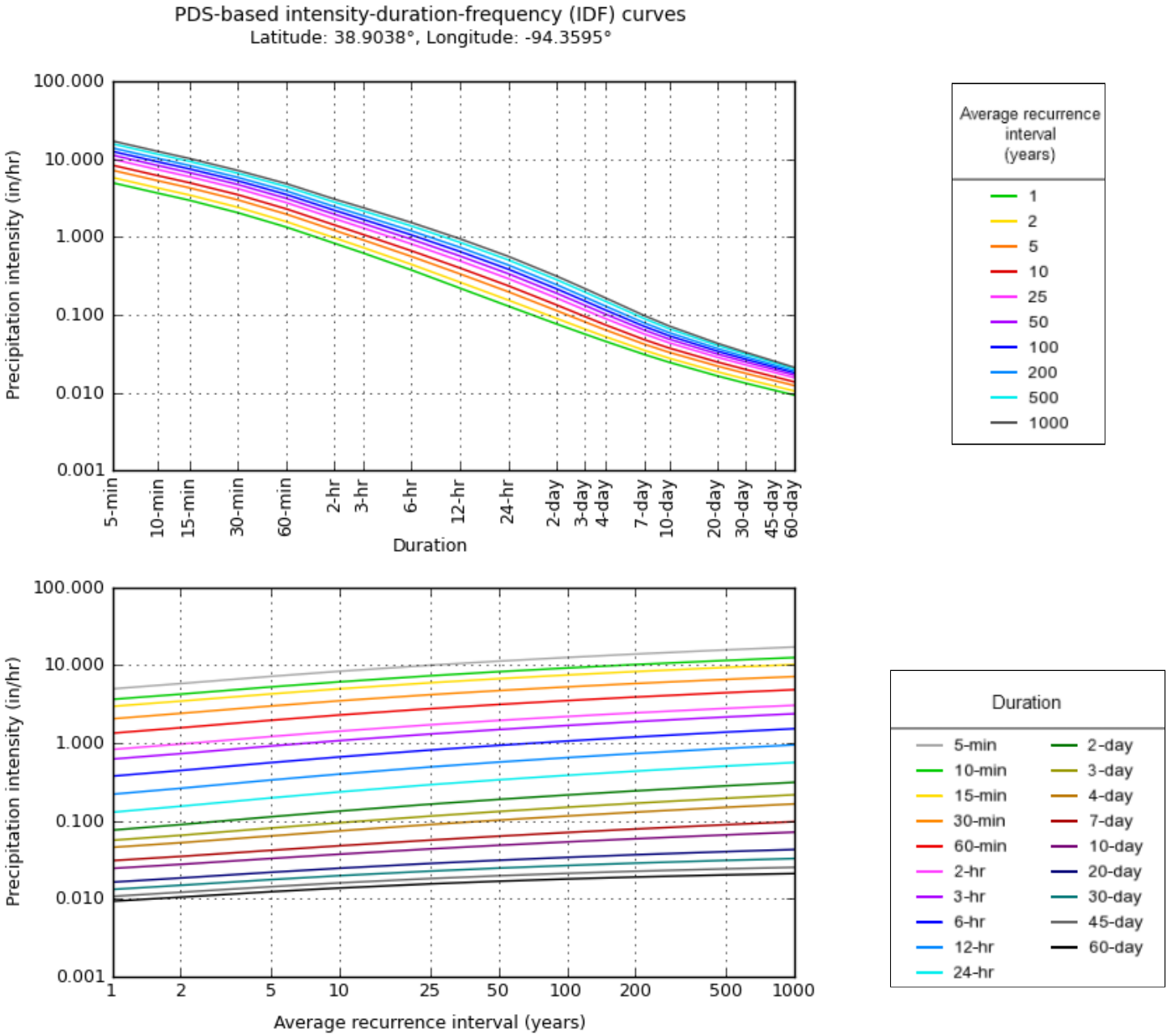
PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Thu Jul 15 13:49:29 2021

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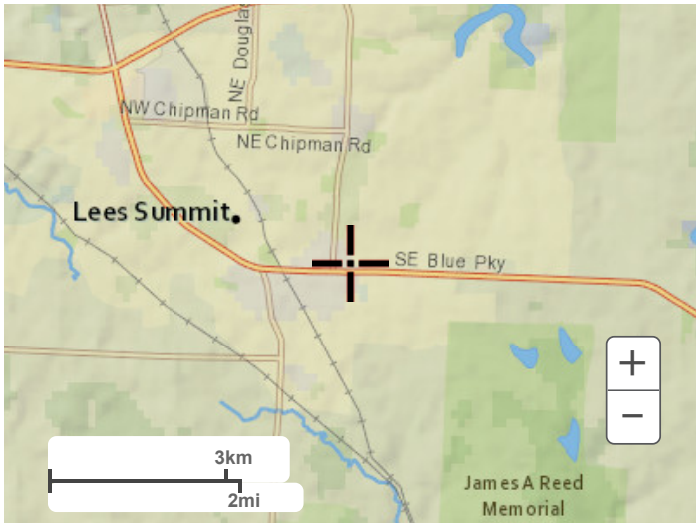
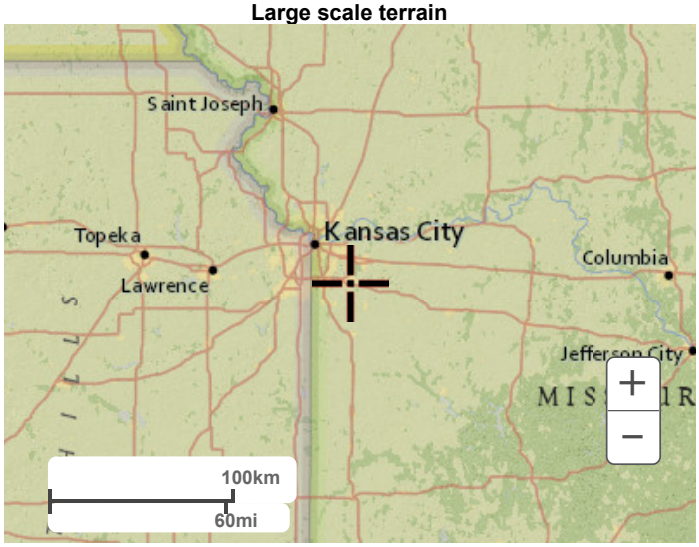
Maps & aerials

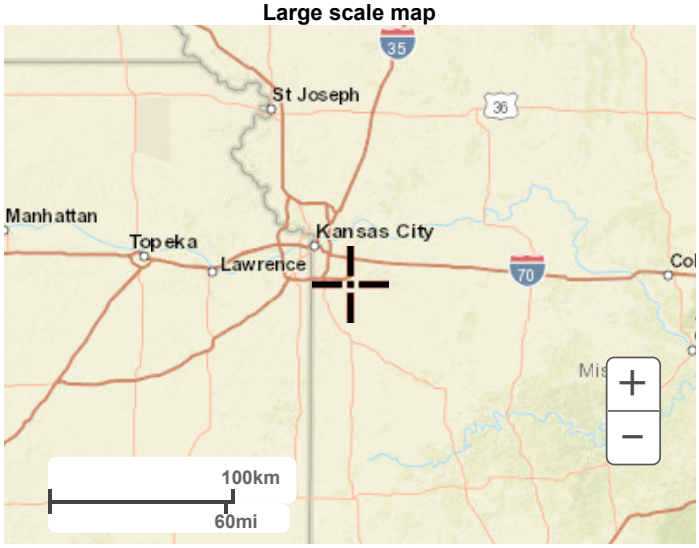
Small scale terrain



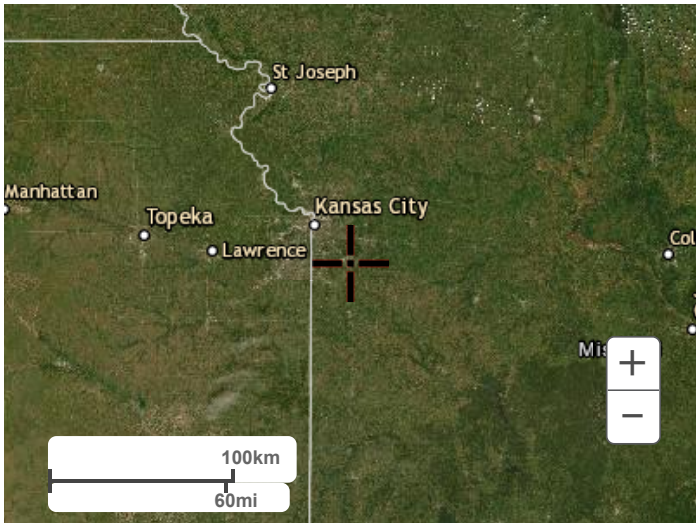
Large scale terrain



Large scale map



Large scale aerial



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National Weather Service
National Water Center
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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 8, Version 2
Location name: Lees Summit, Missouri, USA*
Latitude: 38.9038°, Longitude: -94.3595°
Elevation: 1016.38 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.414** (0.327-0.523)	**0.484** (0.381-0.611)	**0.599** (0.471-0.758)	**0.696** (0.544-0.885)	**0.832** (0.631-1.09)	**0.939** (0.697-1.24)	**1.05** (0.754-1.42)	**1.16** (0.803-1.61)	**1.31** (0.875-1.86)	**1.43** (0.930-2.05)
10-min	**0.607** (0.479-0.766)	**0.708** (0.558-0.895)	**0.877** (0.689-1.11)	**1.02** (0.797-1.30)	**1.22** (0.924-1.59)	**1.38** (1.02-1.82)	**1.53** (1.10-2.07)	**1.70** (1.18-2.35)	**1.92** (1.28-2.72)	**2.09** (1.36-3.00)
15-min	**0.740** (0.584-0.934)	**0.864** (0.681-1.09)	**1.07** (0.840-1.35)	**1.24** (0.972-1.58)	**1.49** (1.13-1.94)	**1.68** (1.25-2.22)	**1.87** (1.35-2.53)	**2.07** (1.43-2.87)	**2.34** (1.56-3.32)	**2.55** (1.66-3.66)
30-min	**1.02** (0.808-1.29)	**1.20** (0.948-1.52)	**1.50** (1.18-1.90)	**1.75** (1.36-2.22)	**2.09** (1.58-2.73)	**2.36** (1.75-3.12)	**2.63** (1.89-3.56)	**2.91** (2.02-4.03)	**3.29** (2.19-4.66)	**3.57** (2.33-5.14)
60-min	**1.34** (1.06-1.69)	**1.57** (1.24-1.99)	**1.96** (1.54-2.49)	**2.29** (1.79-2.92)	**2.76** (2.10-3.62)	**3.13** (2.33-4.15)	**3.51** (2.53-4.75)	**3.90** (2.70-5.41)	**4.43** (2.96-6.29)	**4.84** (3.16-6.96)
2-hr	**1.65** (1.31-2.07)	**1.94** (1.54-2.44)	**2.43** (1.92-3.05)	**2.84** (2.24-3.59)	**3.43** (2.63-4.47)	**3.90** (2.92-5.14)	**4.39** (3.18-5.90)	**4.89** (3.41-6.74)	**5.58** (3.76-7.87)	**6.11** (4.01-8.73)
3-hr	**1.87** (1.49-2.33)	**2.20** (1.75-2.74)	**2.75** (2.19-3.44)	**3.23** (2.55-4.06)	**3.92** (3.02-5.10)	**4.48** (3.37-5.88)	**5.05** (3.68-6.78)	**5.66** (3.97-7.77)	**6.49** (4.39-9.14)	**7.14** (4.71-10.2)
6-hr	**2.25** (1.81-2.79)	**2.66** (2.13-3.30)	**3.36** (2.69-4.17)	**3.98** (3.16-4.95)	**4.87** (3.78-6.30)	**5.60** (4.24-7.31)	**6.36** (4.67-8.48)	**7.16** (5.07-9.79)	**8.28** (5.65-11.6)	**9.16** (6.09-12.9)
12-hr	**2.65** (2.14-3.26)	**3.16** (2.55-3.89)	**4.04** (3.26-4.98)	**4.82** (3.86-5.96)	**5.94** (4.65-7.64)	**6.87** (5.24-8.91)	**7.83** (5.80-10.4)	**8.86** (6.32-12.0)	**10.3** (7.08-14.3)	**11.4** (7.65-16.0)
24-hr	**3.10** (2.53-3.78)	**3.71** (3.01-4.52)	**4.75** (3.85-5.80)	**5.66** (4.57-6.95)	**7.00** (5.51-8.93)	**8.10** (6.23-10.4)	**9.24** (6.90-12.2)	**10.5** (7.52-14.1)	**12.2** (8.44-16.8)	**13.5** (9.13-18.9)
2-day	**3.66** (3.00-4.42)	**4.30** (3.53-5.21)	**5.43** (4.43-6.58)	**6.42** (5.22-7.82)	**7.88** (6.25-9.98)	**9.07** (7.04-11.6)	**10.3** (7.77-13.5)	**11.7** (8.46-15.6)	**13.5** (9.47-18.6)	**15.0** (10.2-20.8)
3-day	**4.06** (3.34-4.89)	**4.71** (3.87-5.67)	**5.83** (4.78-7.04)	**6.83** (5.57-8.28)	**8.30** (6.62-10.5)	**9.51** (7.41-12.1)	**10.8** (8.15-14.1)	**12.2** (8.85-16.2)	**14.1** (9.89-19.2)	**15.6** (10.7-21.5)
4-day	**4.39** (3.63-5.27)	**5.04** (4.16-6.05)	**6.16** (5.07-7.41)	**7.16** (5.85-8.65)	**8.62** (6.89-10.8)	**9.83** (7.68-12.5)	**11.1** (8.41-14.4)	**12.5** (9.10-16.6)	**14.4** (10.1-19.6)	**15.9** (10.9-21.9)
7-day	**5.20** (4.32-6.20)	**5.88** (4.88-7.02)	**7.05** (5.83-8.43)	**8.06** (6.63-9.68)	**9.52** (7.64-11.8)	**10.7** (8.40-13.5)	**11.9** (9.09-15.4)	**13.2** (9.71-17.5)	**15.0** (10.6-20.3)	**16.4** (11.3-22.5)
10-day	**5.89** (4.91-7.00)	**6.65** (5.53-7.90)	**7.90** (6.56-9.41)	**8.97** (7.41-10.7)	**10.5** (8.43-12.9)	**11.7** (9.19-14.6)	**12.9** (9.85-16.5)	**14.2** (10.4-18.6)	**15.9** (11.3-21.4)	**17.2** (11.9-23.5)
20-day	**7.86** (6.60-9.25)	**8.88** (7.45-10.5)	**10.5** (8.80-12.4)	**11.9** (9.86-14.1)	**13.7** (11.0-16.6)	**15.0** (11.9-18.5)	**16.3** (12.5-20.6)	**17.7** (13.1-22.9)	**19.4** (13.8-25.8)	**20.6** (14.4-28.0)
30-day	**9.50** (8.01-11.1)	**10.7** (9.05-12.6)	**12.7** (10.7-14.9)	**14.3** (11.9-16.9)	**16.3** (13.2-19.7)	**17.9** (14.1-21.9)	**19.3** (14.8-24.2)	**20.7** (15.4-26.6)	**22.4** (16.1-29.7)	**23.7** (16.6-32.0)
45-day	**11.6** (9.82-13.5)	**13.1** (11.1-15.3)	**15.5** (13.0-18.1)	**17.3** (14.5-20.3)	**19.7** (15.9-23.5)	**21.3** (17.0-26.0)	**22.9** (17.7-28.5)	**24.4** (18.2-31.2)	**26.2** (18.8-34.4)	**27.4** (19.3-36.8)
60-day	**13.4** (11.4-15.6)	**15.1** (12.8-17.6)	**17.8** (15.0-20.7)	**19.8** (16.7-23.2)	**22.4** (18.2-26.7)	**24.2** (19.3-29.3)	**25.9** (20.0-32.1)	**27.4** (20.5-34.9)	**29.2** (21.1-38.2)	**30.4** (21.5-40.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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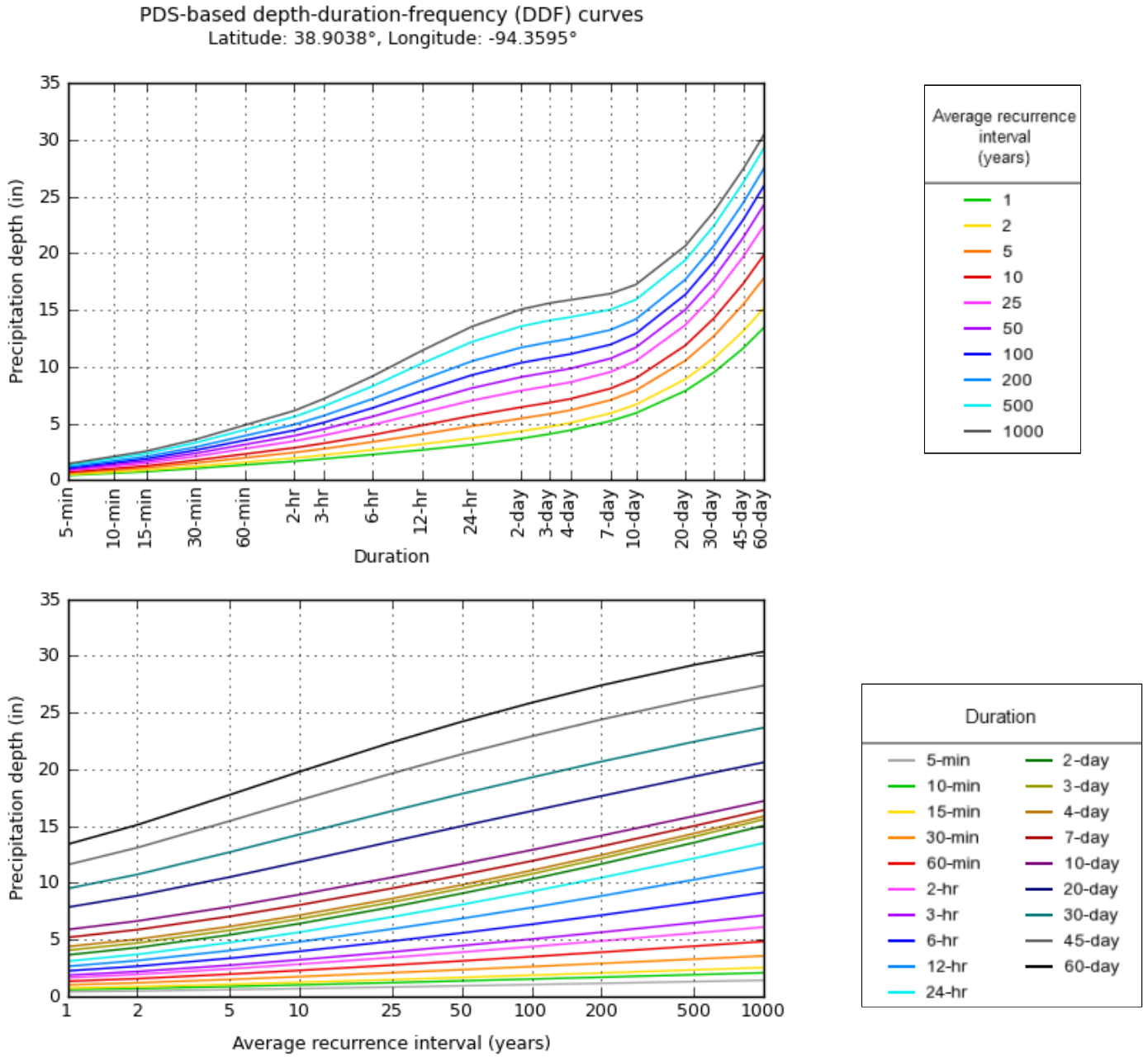
PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Thu Jul 15 13:48:55 2021

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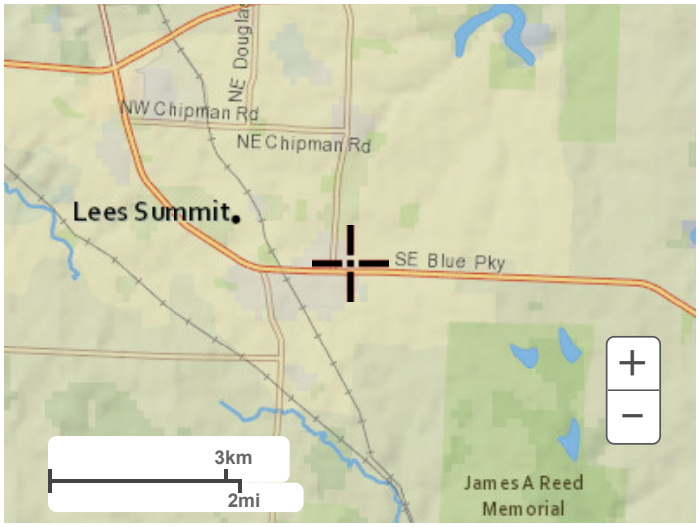
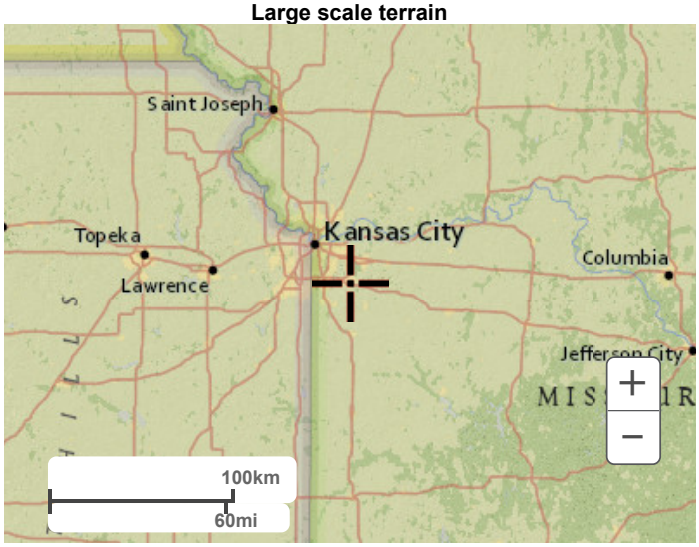
Maps & aerials

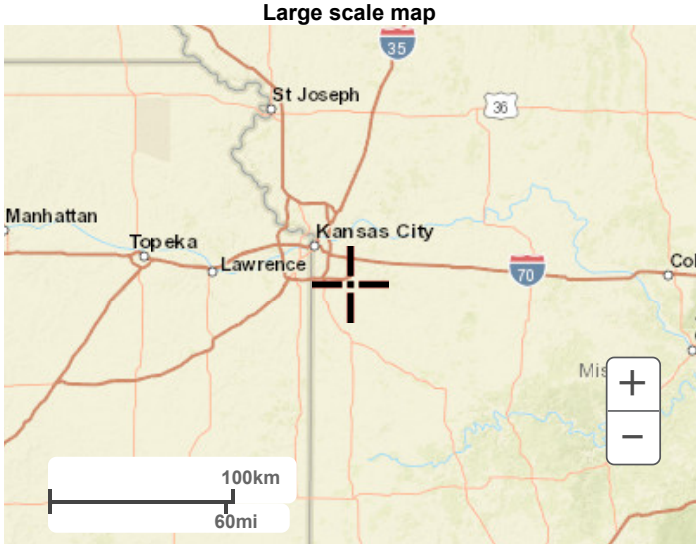
Small scale terrain



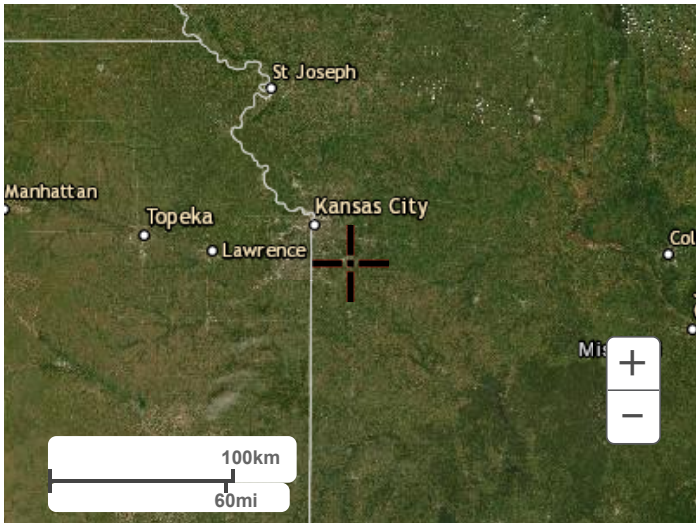
Large scale terrain



Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Appendix B

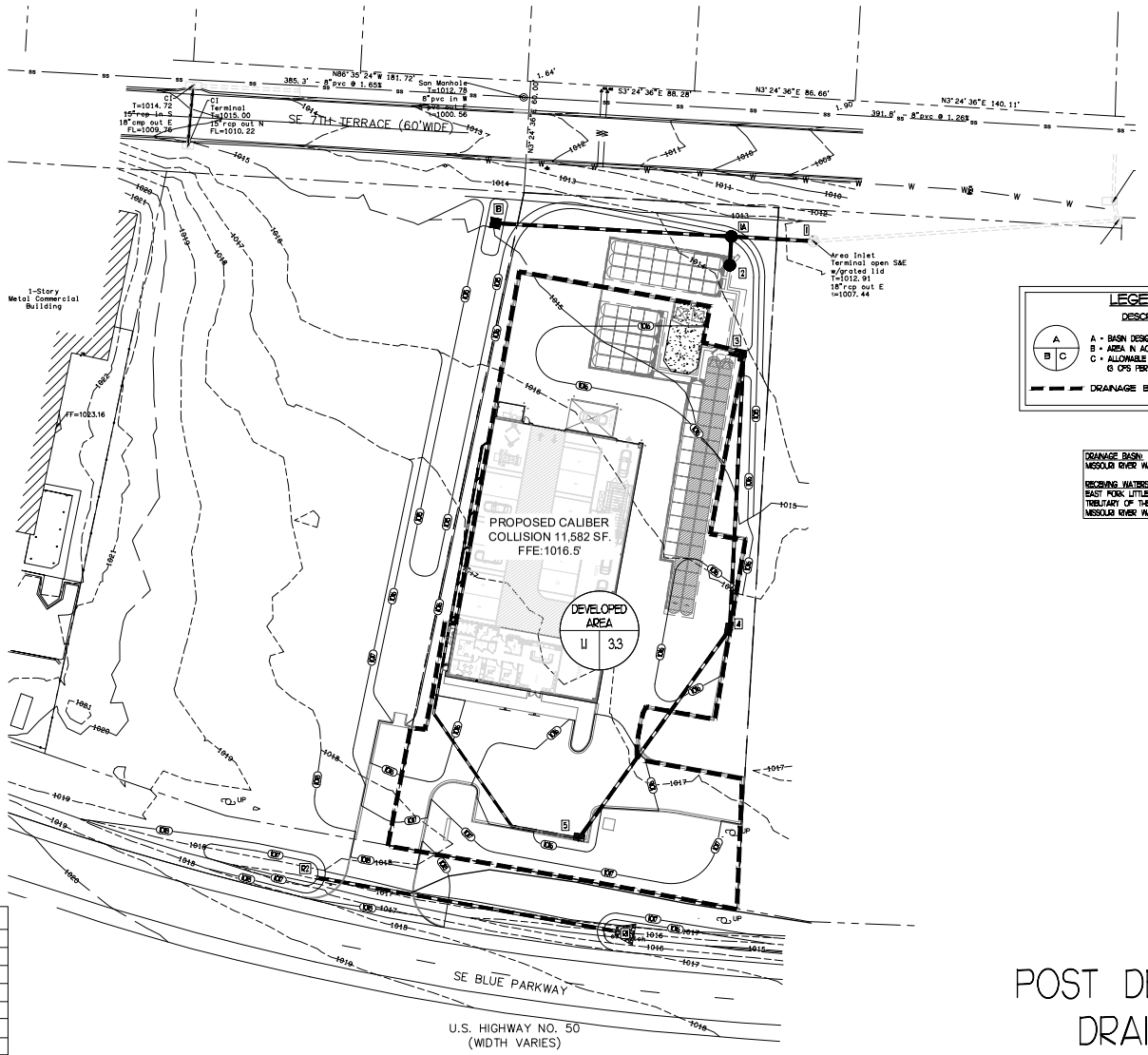
Drainage Maps

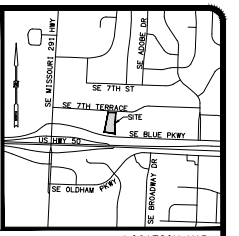
Drainage maps become an essential tool when both developing and reviewing hydrology models of a construction site during the various phases of developing such a site (i.e. pre-development conditions, construction conditions, and post-development conditions). Typically these maps are enhanced site maps that add the features of drainage basins outlines and their respective outfall markers. Each SWPPP must contain, at a minimum, a pre-development and a post-development drainage map for the entire on-site area and adjacent off-site areas that contribute runoff to any of the marked outfall locations.

Additional drainage maps should also be included for any sediment control BMP in which sediment trapping efficiency calculations are required to be submitted. A drainage map for "During Construction" conditions should also be included if the basin and subbasin drainage patterns differ from both the pre-development and post-development patterns.

All provided drainage maps must clearly correspond to any calculations submitted for review, the outfall locations chosen for comparing runoff rates and the total drainage area analyzed (from pre- to post-development conditions) may not change. However, the immediate drainage areas contributing to each outfall location may shift.

Each Drainage Map should be provide on an 11x17 sheet and must show the contours for the specific stage of construction each map represents.





LOCATION MAP
NOT TO SCALE

LEGEND

DESCRIPTION

A - BASIN DESIGNATION
B - AREA IN ACRES
C - ALLOWABLE DISCHARG IN CFS
(5 CFS PER 1 ACRE FOR 100 YEAR)

DRAINAGE BASIN BOUNDARY

DRAINAGE BASIN:
MISSOURI RIVER WATERSHED

RECEIVING WATERS:
EAST FORK LITTLE BLUE RIVER, TRIBUTARY OF THE BLUE RIVER - MISSOURI RIVER WATERSHED

ACREAGE SUMMARY (IN ACRES)	
TOTAL PARCEL AREA	1.35
ON-SITE DISTURBED AREA	1.35
OFF-SITE DISTURBED AREA	0.58
TOTAL DISTURBED AREA	1.93
IMPERVIOUS AREA PRE-CONSTRUCTION (CONCRETE ONLY)	0.46
PERVIOUS AREA PRE-CONSTRUCTION (CONCRETE ONLY)	0.00
IMPERVIOUS AREA POST-CONSTRUCTION (CONCRETE ONLY)	0.00
PERVIOUS AREA POST-CONSTRUCTION (CONCRETE ONLY)	0.46
IMPERVIOUS AREA INCREASE (PRE VS POST) (CONCRETE ONLY)	0.42
IMPERVIOUS PERCENTAGE (AT POST-CONSTRUCTION STATE)	65.2%

EVERY DIGGING JOB REQUIRES A CALL – EVEN SMALL PROJECTS LIKE PLANTING TREES OR SHRUBS. IF YOU HIT AN UNDERGROUND UTILITY LINE WHILE DIGGING, YOU COULD BE RESPONSIBLE FOR THE COST OF REPAIRS. YOU COULD ALSO CAUSE AN ENTIRE NEIGHBORHOOD AND POTENTIALLY BE RESPONSIBLE FOR FINES AND REPAIR COSTS.

SMART DIGGING MEANS CALLING 811 BEFORE EACH JOB, WHETHER YOU ARE A HOMEOWNER OR A PROFESSIONAL EXCAVATOR. ONE CALL TO 811 GETS YOUR UNDERGROUND UTILITY LINES MARKED FOR FREE.

POST DEVELOPMENT DRAINAGE AREA

SCALE 1" = 30'

REVISIONS	BY

FREELAND and KAUFFMAN, INC.
Engineers + Landscape Architects
209 West Stone Avenue
Greenville, South Carolina 29609
864-233-5497
fax 864-233-8915

7/23/2021

CALIBER COLLISION
710 SE 7TH TERRACE
LEE'S SUMMIT, MO 64063

CROSS DEVELOPMENT, CC LEE'S SUMMIT, LLC
4336 MARSH RIDGE ROAD
CARROLLTON, TX 75010
TEL: (214) 914-8282

DRAWN	BAC
CHECKED	TMB
DATE	7/23/2021
SCALE	
DRAWING	14

STORM DRAIN NOTES

1. ALL HYDRAULIC DATA FOR THE STORM DRAINAGE PIPES ARE BASED ON THE 100-YEAR DESIGN STORM.
2. ALL MANHOLE DIAMETERS AND ALL INLET DIMENSIONS SHALL HAVE A MINIMUM INSIDE DIMENSION OF 4' DIAMETER (CIRCULAR) OR 4'x4' (SQUARE). STRUCTURES SHALL BE UPSIZED AS NEEDED TO ACCOMMODATE THE CONNECTING PIPE SIZES/ ANGLES.
3. STORM DRAIN PIPE SHALL BE CLASS III, WALL 'B' RCP IN ACCORDANCE WITH ASTM C-76, UNLESS NOTED OTHERWISE.
4. HIGH DENSITY POLYETHYLENE PIPE (HDPE) MAY BE USED AS AN ALTERNATE. ALL HDPE PIPE, JOINTS, AND FITTINGS SHALL MEET THE REQUIREMENTS OF AASHTO DESIGNATIONS M252 AND M294 TYPE S.
5. PIPE LENGTHS ARE BASED ON HORIZONTAL DISTANCE FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE AND USED FOR DESIGN ONLY. CONTRACTOR TO FIELD VERIFY ACTUAL PIPE LENGTHS NEEDED FOR CONSTRUCTION.
6. CONTRACTOR IS RESPONSIBLE FOR COMPARING THE STORM DRAIN WITH THE PROFILES FOR THE STORM DRAIN LINES AND INFORMING THE ENGINEER OF ANY CONFLICTS OR DISCREPANCIES PRIOR TO COMMENCEMENT OF CONSTRUCTION.
7. STORM DRAIN PIPE SHALL HAVE WATER TIGHT JOINTS IN ACCORDANCE WITH ASTM C 361, C443, AND D3212.

INLET DRAINAGE AREAS

TYPE	INLET	AREA (AC.)	TC (MIN.)	IMPERVIOUS COVERAGE (ACRE)	IMPERVIOUS RUNOFF COEFFICIENT	PERVIOUS COVERAGE (ACRE)	PERVIOUS RUNOFF COEFFICIENT	WEIGHTED RUNOFF COEFFICIENT	"I" 50	"I" 100	Q50 (CFS)	Q100 (CFS)	PONDING DEPTH @ INLET PER 100-YR STORM (FT)
PROPOSED	1B *	1.70	5	0.04	0.90	1.66	0.35	0.36	11.30	12.60	6.97	7.77	0.3000
	3	0.26	5	0.26	0.90	0.00	0.35	0.90	11.30	12.60	2.64	2.95	0.2600
	4	0.15	5	0.15	0.90	0.00	0.35	0.90	11.30	12.60	1.53	1.70	0.2000
	5	0.62	5	0.47	0.90	0.15	0.35	0.77	11.30	12.60	5.37	5.99	0.3900
	R–2	0.94	5	0.29	0.90	0.65	0.35	0.52	11.30	12.60	5.52	6.16	** NOT CALCULATED
EXISTING	EX–1	0.08	5	0.02	0.90	0.06	0.35	0.49	11.30	12.60	0.44	0.49	** NOT CALCUALTED
	EX–2	0.47	5	0.08	0.90	0.39	0.35	0.44	11.30	12.60	2.36	2.63	** NOT CALCULATED

RUNOFF COEFFICIENTS USED TO CALCULATE THE WEIGHTED RUNOFF COEFFICIENT ARE LISTED BELOW
- LAWNS/GRASS: 0.35
- ROOFS/PAVEMENT: 0.90

RAINFALL DATA FROM NOAA ATLAS 14, VOLUME 8, VERSION 2, LEE'S SUMMIT, MISSOURI

* THE AREA SHOWN FOR INLET 1B ASSUMES THAT THE ADJACENT PROPERTY WILL BE DEVELOPED AND CONNECT IT'S STORM SEWER SYSTEM TO STRUCTURE 1B. PER THE CITY OF LEE'S SUMMIT CODE, THE MAXIMUM ALLOWED DISCHARGE FROM THE DEVELOPED SITE IS 3 CFS PER DEVELOPED ACRE. ASSUMING 1.70 ACRES OF DEVELOPED AREA, THE MAXIMUM DISCHARGE ALLOWED FROM THE ADJACENT SITE WOULD BE 5.1 CFS WHICH IS LESS THAN THE EXISTING SITE'S UNDEVELOPED CONDITION (WHICH RESULTS IN THE VALUE(S) SHOWN IN THE TABLE ABOVE). TO BE CONSERVATIVE, THE RELEASES FOR INLET 1B ABOVE ARE USED TO ADEQUATELY SIZE THE STORM SEWER PIPES PROPOSED BY THE CALIBER COLLISION DEVELOPMENT.

** THE PONDING DEPTHS FOR THESE INLETS WERE NOT CALCULATED AS THEY ARE A RESULT OF THE EXISTING CONDITIONS OF THE SURROUNDING PROPERTIES AND ADDITIONAL SURVEY INFORMATION WILL BE REQUIRED TO ACCURATELY CALCULATE. ADDITIONALLY, THESE "INLETS" ARE OPEN-ENDED PIPES AND NOT "STORM STRUCTURES". THEIR PONDING DEPTHS ARE NEGLECTED AS THEY CONTAIN CONDITIONS WHERE PONDING IS NOT AN ISSUE (I.E. CONTAINED WITHIN DITCHES)

RAINFALL DISTRIBUTION FOR LEE'S SUMMIT, MISSOURI

STORM EVENT	2-YR	10-YR	25-YR	50-YR	100-YR
RAINFALL (INCHES/HR)	5.81	8.35	9.98	11.30	12.60

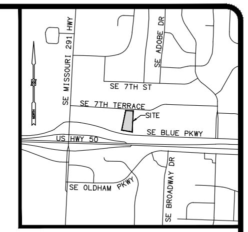
- THE RAINFALL FOR RAINFALL DISTRIBUTION DATA TAKEN FROM NOAA ATLAS 14, VOLUME 8, VERSION 2 FOR LEE'S SUMMIT, MISSOURI
- STORM DISTRIBUTION TYPE II
- 24-HOUR STORM DISTRIBUTION

LEGEND

DESCRIPTION

A : BASIN DESIGNATION
B : AREA IN ACRES
C : RUNOFF COEFFICIENT

DRAINAGE BASIN BOUNDARY



LOCATION MAP
NOT TO SCALE

FREELAND and KAUFFMAN, INC.
Engineers • Landscape Architects
209 West Stone Avenue
Greenville, South Carolina 29609
864-233-5497
fax 864-233-8915

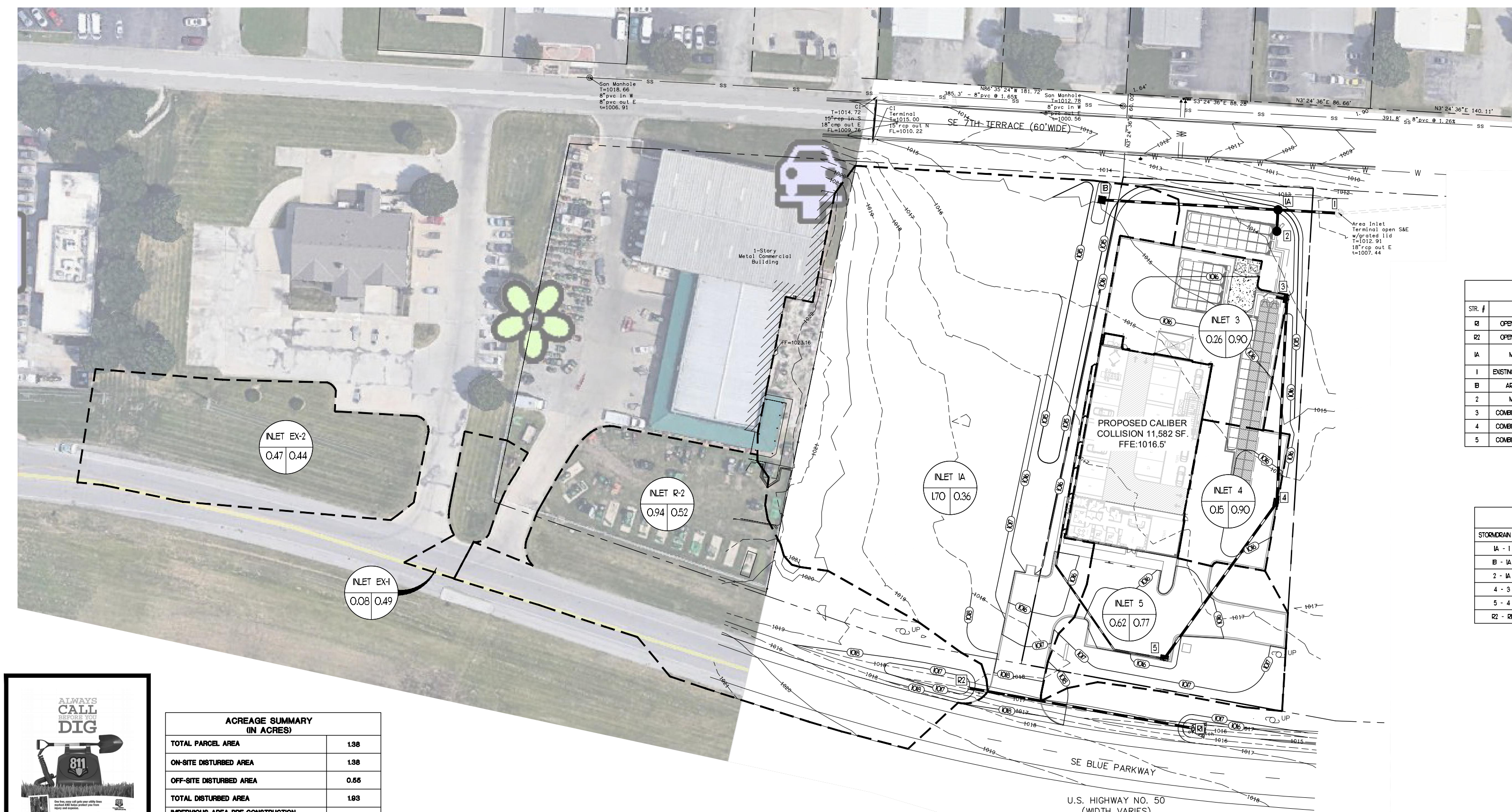
7/23/2021

WATER TIGHT STORM PIPES:
CONTRACTOR TO ENSURE THAT ALL STORM PIPES ARE WATER TIGHT AND TESTED PER ASTM C902-02

CONTRACTOR TO ENSURE ALL STORM DRAIN PIPE SHALL HAVE WATER TIGHT JOINTS IN ACCORDANCE WITH ASTM C 361, C443, AND D3212.

DRAINAGE BASIN:
MISSOURI RIVER WATERSHED

RECEIVING WATERS:
EAST FORK, LITTLE BLUE RIVER, TRIBUTARY OF THE BLUE RIVER - MISSOURI RIVER WATERSHED



STORM DRAIN STRUCTURE TABLE

STR. #	TYPE	RIM/THROAT	INV. IN	INV. OUT
R1	OPEN END PIPE	1017.36	1015.15 (R2)	
R2	OPEN END PIPE	1018.21		1016.00 (R1)
1A	MANHOLE	1016.00	1008.30 (1B) 1008.30 (2)	1008.10 (1)
1	EXISTING AREA INLET	1012.91	1007.60 (1A)	
1B	AREA INLET	1014.00		1009.60 (1A)
2	MANHOLE	1016.20		1008.50 (1A)
3	COMBINATION INLET	1015.50	1008.10 (4)	1007.90 (UGD)
4	COMBINATION INLET	1015.60	1009.70 (5)	1009.50 (3)
5	COMBINATION INLET	1015.00		1011.00 (4)

STORM PIPE TABLE

STORMDRAIN PIPE	SIZE	LENGTH	SLOPE	INV. IN	INV. OUT
1A - 1	18"	44'	1.13%	1008.10'	1007.60'
1B - 1A	18"	127'	1.02%	1009.60'	1008.30'
2 - 1A	18"	16'	1.29%	1008.50'	1008.30'
4 - 3	18"	147'	0.95%	1009.50'	1008.10'
5 - 4	18"	139'	0.94%	1011.00'	1009.70'
R2 - R1	18"	164'	0.52%	1016.00'	1015.15'

ACREAGE SUMMARY (IN ACRES)

TOTAL PARCEL AREA	1.38
ON-SITE DISTURBED AREA	1.38
OFF-SITE DISTURBED AREA	0.55
TOTAL DISTURBED AREA	1.93
IMPERVIOUS AREA PRE-CONSTRUCTION (ON-SITE ONLY & INCLUDES GRAVEL)	0.48
PERVIOUS AREA PRE-CONSTRUCTION (ON-SITE ONLY)	0.90
IMPERVIOUS AREA POST-CONSTRUCTION (ON-SITE ONLY)	0.90
PERVIOUS AREA POST-CONSTRUCTION (ON-SITE ONLY)	0.48
IMPERVIOUS AREA INCREASE (PRE VS POST) (ON-SITE ONLY)	0.42
IMPERVIOUS PERCENTAGE (AT POST-CONSTRUCTION STATE)	65.2%

INLET AREA MAP

SCALE 1" = 30'
0' 30' 60'

REVISIONS	BY

CALIBER COLLISION
710 SE 7TH TERRACE
LEE'S SUMMIT, MO 64063

CROSS DEVELOPMENT, CC LEE'S SUMMIT, LLC
4336 MARSH RIDGE ROAD
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TEL: (214) 614-8252

DRAWN	BAC
CHECKED	TMB
DATE	7/23/2021
SCALE	
DRAWING	14

Appendix C

Additional Approvals/Certifications

This Appendix of the Storm Water Pollution Prevention Plan Report has been removed for this project. No additional approvals or certifications will be required.

Appendix D

Engineering Reports

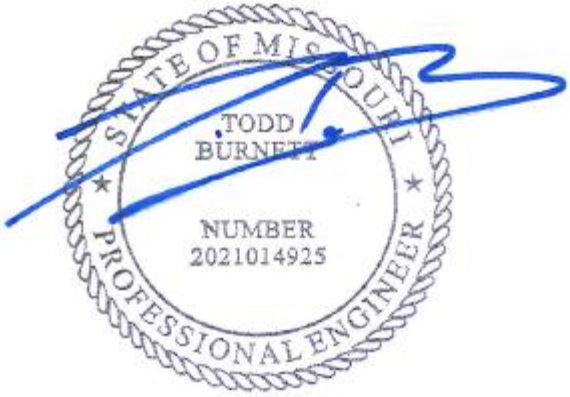
Hydrologic Analysis

Each hydrologic analysis was performed in a manner consistent with Missouri Department of Natural Resources and the SC DHEC Stormwater Management BMP requirements. Each analysis, at a minimum, meets the following requirements or guidelines:

- Analysis Points (Outfalls) for comparing runoff rates and the total drainage area analyzed do not change from pre- to post-development conditions (although the immediate drainage areas contributing to each analysis point my shift);
- Post-development and Construction runoff peak discharges for the 2-yr and 10-yr storm events are less then Pre-Development peak discharges to the existing pond.
- Each analysis was performed using NOAA Atlas 14, Volume 8, Version 2

STORMWATER MANAGEMENT REPORT

Caliber Collision
710 SE 7th Terrace
Lee's Summit, Missouri 64063



Original Submittal: 07/23/2021

Prepared by
Freeland and Kauffman, Inc.
Engineers – Landscape Architects
209 West Stone Avenue
Greenville, SC 29609
864-233-5497

INDEX

I. PROJECT DESCRIPTION

The following is the stormwater management report for the proposed Caliber Collision at 710 SE 7th Terrace in Lee's Summit, Missouri This site is approximately 1.38 acres . Development will consist of the construction of a 11,500 square foot Caliber Collision automotive collision repair facility, all associated utilities, vehicle storage area, parking areas, grading, landscaping, and stormwater management facilities. As there is not enough surface area available due to site restraints and landscape requirements, a StormTech Underground Detention System is proposed for the developed site's stormwater runoff requirements. This underground detention system consists of 45" high MC-3500 Chambers with 9" of stone below and 12 "of stone above it with total storage height of 66" from elev. 2008.5 to elev. 2014.0. The outfall of the underground detention system is to exit the site via a storm sewer to an existing catch basin storm structure located within the existing drainage easement at the northeast of the site in Lot 3 Chapman Plaza II. All of the runoff from the developed site (approximately 1.1 acres in total) is captured by/treated by the underground detention system. A storm sewer is provided along the north of site to by-pass the runoff from future development at west of the site. The construction activities for the Caliber Collision discussed above will disturb approximately 1.30 acres.

The property is bordered by SE 7th Terrace to the north, SE Blue Parkway to the south, Calvert's Express Auto Service & Tire to the east, and Classic paint & Collision, Inc. to the west.

As previously stated, *all* discharge from the site is ultimately routed to an offsite storm structure located in Lot 3, Chapman Plaza II which will be connected to storm system at SE 7th Terrace and ultimately directed to a tributary of the E. Fork Little Blue River.

Executive Summary

This hydraulic study will show the proposed site will be developed to meet all City of Lee's Summit Stormwater Management requirements. The on-site storm system has been designed to meet the requirements in Section 5608.4.C1 Comprehensive Control as outlined in APWA Section 5600 "Storm Drainage Systems & Facilities", which requires the design to "limit the two-year rate less than or equal to 0.5 cfs per site acre, ten-year rate less than or equal to 2.0 cfs per site acre, 100-yr rate less than or equal to 3.0 cfs per site acre and 40-hour extended detention of 1.37"/24 hour rainfall. The existing site has Hydrologic Soil group "C" soil. As previously mentioned, various site constraints prevent a traditional stormwater pond design. The provided system's designs primary method of attenuating the requirements will be via underground storage.

Flow Rate Summary Table

Developed Site Area Acre	Storm Event (24-hour duration)	Allowable Development Peak Flow Rate (cfs)	Post-Development Peak Flow Rates (cfs)
1.1	2-year	0.55	0.31
1.1	10-year	2.2	0.53
1.1	100-year	3.3	2.4

II. PRE-DEVELOPMENT CONDITIONS:

The proposed development is situated on an approximately 1.38-acre tract of land located at 710 SE 7th Terrace. The site is legally described as Lot 2, Chapman Plaza II.
Per topographic survey by Heideman Associates Inc. dated 05-04-21, the property was covered with gravel and grass and elevations varied from 2014 t0 2018. The site generally slopes downward in direction from south side of the site to north side. The runoff from the site is collected and conveyed by the existing storm drain system at SE 7th Terrace. As the required stormwater Management does not take account of the existing condition, this report has not analyzed the existing hydrology parameters.
:

III. POST-DEVELOPMENT CONDITIONS:

An underground chamber detention system is proposed to be located at the north and east of the site within the open space and parking lot. The proposed underground detention system is a MC-3500 StormTech Chamber System, an open bottomed chamber. Reference the Site Development Plans for Caliber Collision for additional information of the underground detention system. Outflow from the detention system will be routed through an outlet riser structure and conveyed through a proposed storm pipe system to an existing catch basin storm structure located within the existing drainage easement at the northeast of the site in Lot 3 Chapman Plaza II. The outflow from detention system will be connected to the by-pass line from Lot 1 before connecting it to the existing catch basin structure. This piped system drains eventually to the tributary of E. Fork Little Blue River through the storm drain system at SE 7th Terrace.

The detention system is designed to store and release the majority of runoff generated by the proposed development.

The area analyzed in the Post-Development condition comprises of 1.1 acres of developed site from total of 1.38 acres. Visual representations of these areas and their layout configuration have been provided in Appendix A of this report and is titled the “Post Development Map”. This area contains the majority of the proposed Caliber Collision

development including the building all the paved parking and curbed areas. Utilizing proposed curb and gutters, roof leaders, inlets, vegetated swales and the proposed storm sewer system by Caliber Collision, Post-Development Area will be routed to the proposed underground detention system.

Runoff Calculations:

Runoff calculations are performed for Post-Development drainage area as per SCS unit Hydrograph method using Hydraflow and TR-55.

A. Runoff Curve Number:

Land use curve number is used based upon Section 5602.3, Table 5602-3 APWA "Storm Drainage Systems & Facilities ".

Post-Development Area

Business: Neighborhood Areas Hydrologic Soil Group C
CN = 94

Total Land Area = 1.1 Acres
Weighted Runoff Curve Number = 94

B. Time of Concentration:
Shortest time of concentration of 0.10 hour is assumed.

C. Rainfall:

The 24-hour precipitation amounts for the site as provided by SCS Tr-55 for Jackson County are as follows:

2-year storm event:	3.8 inches
10-year storm event:	5.5 inches
100-year storm event:	8.3 inches

D. Rate of Runoff:

Above curve numbers and times of concentration were used to determine rate of runoff using the SCS hydrograph method. A hydrograph for the post-development conditions of the site under study can be generated showing rate of flow versus time. These hydrographs are included in Appendix B. Following are the computed peak rates of runoff for the drainage basins:

Post-Development Area (to Underground Detention System)

Storm Event (24-hour duration)	Peak Flow Rate, Q (cfs)
2-year	5.3
10-year	8.0
100-year	12.3

Post-Development Area (Out of the Underground Detention System)

Storm Event (24-hour duration)	Peak Flow Rate, Q (cfs)	WS elev (Top of Storage el. 2014.0)
2-year	0.31	1010.4
10-year	0.53	1011.3
100-year	2.4	1013.0

Developed Site Area Acre	Storm Event (24-hour duration)	Allowable Development Peak Flow Rate (cfs)	Post-Development Peak Flow Rates (cfs)
1.1	2-year	0.55	0.31
1.1	10-year	2.2	0.53
1.1	100-year	3.3	2.4

As can be seen in the table above, the underground detention system acts to reduce the developed peak discharges from the 2-year, 10-year, and 100-year, 24-hour storm events. This is aided by the by the open bottomed design of the MC-3500 StormTech Chamber System proposed for this development.

IV. WATER QUALITY DESIGN AND CALCULATIONS:

Water Quality for the project was designed per the City of Lee's Summit's ordinances which requires the 40-hour extended detention of 1.37"/24 hour rainfall.

The Water Quality Volume (WQ_V) that is to be detained for 40 hour is calculated as per APWA/MARC-BMP Manual, 6.2:

- WQ_V = P x Rv x (43560/12) where:
  - P = Rainfall event in inches = 1.37"
  - Rv = Volumetric runoff coefficient = 0.05 +0.009 (I)
  - I = Percent Site Impervious
    I = 85%
    Rv = .05 +.009 x 85 = 0.815

- WQ_V = (1.37) x (0.815) x (43560/12)
  = 4053 Cu. Ft
  Use storage at elev. 1009.83, Storage available = 4199 Cu. Ft
  Release it in 40 hours

- Release rate :4199 cu ft x (1/40x 3600 sec) = 0.029 cf/sec
- Using a 1.0" Orifice
- $Q_{Release} = C_d A_o (SQRT(2*G*H)$
  =0.6*0.055*SQRT(2*32.2*1.33/2)
  =0.022 cf/sec < 0.029 cf/sec, therefore orifice meets 40 hour minimum

Water Quality Storage is provided from elev. 1008.5 to elev. 1009.83 and is released by 1" orifice at elev. 1008.5.
Next opening is 4" orifice at 1009.83

V. PIPE SIZING CALCULATIONS:

Included in this report in Appendix C are the pipe sizing calculations for the on-site pipes and catch basins. These are generated by the rational method, and are based on the 100-year intensity for all storm drain structures flowing to the detention system. These calculations show the total flow for each pipe section, velocity, hydraulic grade elevations, and spreads at each inlet. Reference the Inlet Area Map in Appendix A for clarification of the drainage areas discharging to each inlet and pipe.

Drainage areas for each structure were delineated (see Inlet Area Map in Appendix A) and flow to each catch basin was determined. The drainage to each structure was determined using the Rational Method form of storm analysis where weighted Runoff Coefficients were determined based on each area's coverage. In addition to each structure's added

stormwater from their respective drainage area, the discharge from the underground detention system was added to the pipe's directly "downstream" of the underground detention system.

An analysis of the proposed storm system along SE Blue Parkway was performed to ensure the discharge to the proposed pipe under the proposed driveway is adequately sized when combined with the discharge from the upstream pipes. Also, a storm sewer stub is proposed from the adjacent property to the west of the Caliber Collision property. Inlet "1B" in the plans is proposed to provide connection to an existing storm structure for the adjacent site should it be developed in the future. Per the City of Lee's Summit Code, the maximum allowed discharge form a developed site is 3 cfs per developed acre. Assuming the 1.70 acres delineated in the Inlet Area Map (in Appendix A) is developed, the maximum discharge allowed from the adjacent site would be approximately 5.1 cfs. This runoff value is less than the existing conditions site runoff calculated the Rational Method. Reference should once again be made to the Inlet Area Map provided in Appendix A for calculations and delineations of the drainage areas. To be conservative in the design, the runoff values generated from the existing conditions (the higher value) are used for adequately sizing the storm sewer pipe for the adjacent property's connection to Inlet 1B, and ultimately to the existing storm structure connection point.

Storm profiles of the storm sewer pipe network were created and the Hydraulic Grade Lines resulting from the 100-year, 24-hour storm event discharge was mapped to each pipe. Having each pipe's HGL remain within the pipe proves that each storm pipe is sufficiently sized to accommodate the storm runoff from each structure and development. In the analysis performed for this project, each pipe's 100-year storm event HGL remained within their respective pipes. Reference the Storm Profiles Sheets within the Site Development Plans prepared by Freeland and Kauffman, Inc.

Appendix A

July 20, 2021

Tax Parcels

Selected Parcel

Green: Band_2

Addresses

Nearmap

Blue: Band_3

Addresses

Red: Band_1

1:2,257

0 0.01 0.03 0.06 mi

0 0.02 0.04 0.09 km

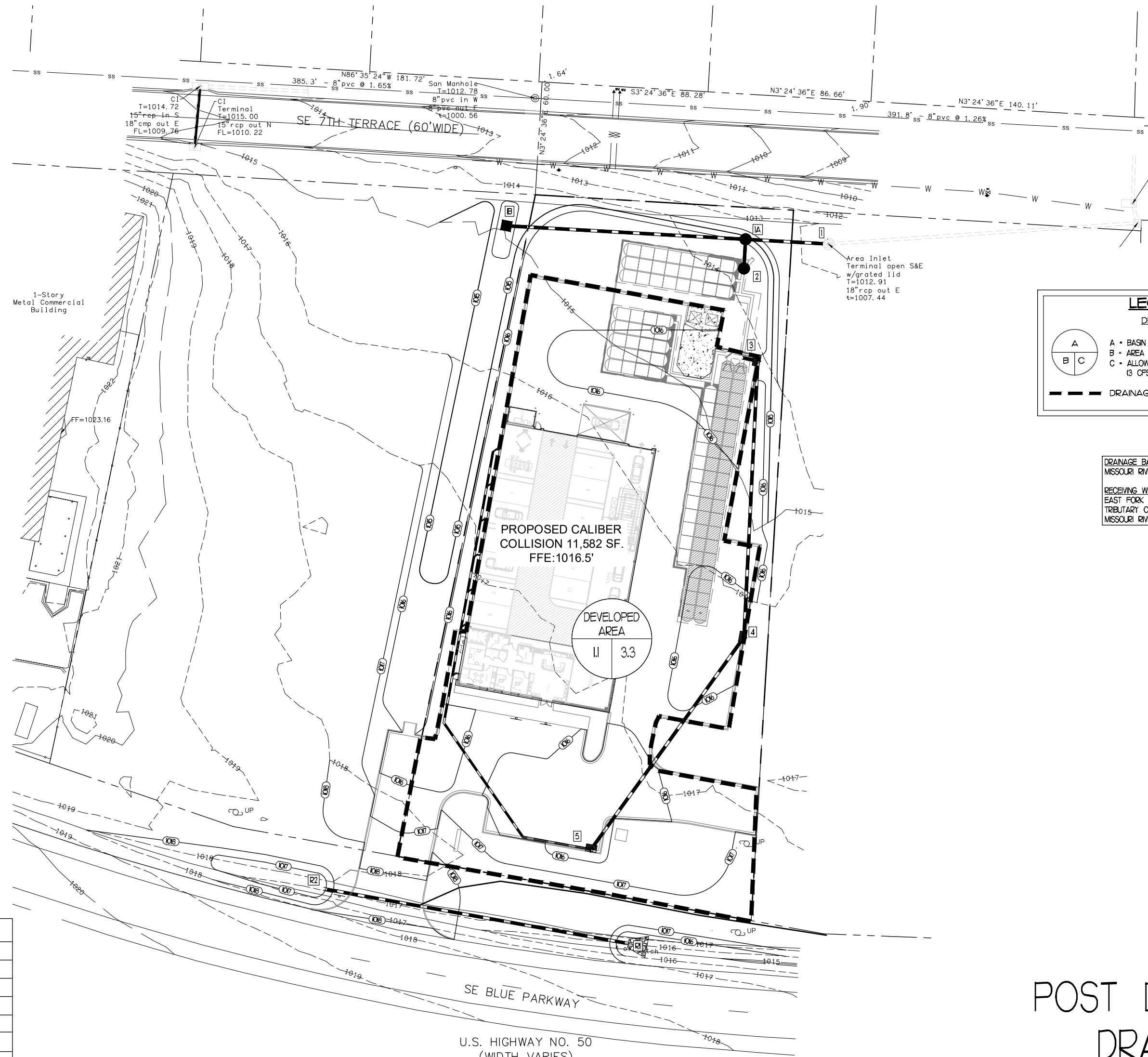
City of Lees Summit, Jackson County, MO, Missouri Dept. of Conservation,

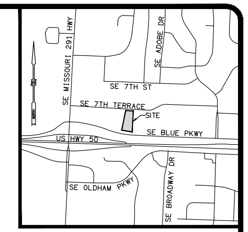
FREELAND and KAUFFMAN, INC.

*Engineers * Landscape Architects*
209 West Stone Avenue
Greenville, South Carolina 29609
864-233-5497
fax 864-233-8915

CALIBER COLLISION
710 SE 7TH TERRACE
LEE'S SUMMIT, MO 64063

USGS QUAD MAP





LOCATION MAP
NOT TO SCALE

LEGEND

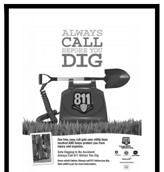
DESCRIPTION

A = BASIN DESIGNATION
B = AREA IN ACRES
C = ALLOWABLE DISCHARG IN CFS (3 CFS PER 1 ACRE FOR 100 YEAR)
DRAINAGE BASIN BOUNDARY

DRAINAGE BASIN:
MISSOURI RIVER WATERSHED

RECEIVING WATERS:
EAST FORK LITTLE BLUE RIVER, TRIBUTARY OF THE BLUE RIVER - MISSOURI RIVER WATERSHED

ACREAGE SUMMARY (IN ACRES)	
TOTAL PARCEL AREA	1.38
ON-SITE DISTURBED AREA	1.38
OFF-SITE DISTURBED AREA	0.55
TOTAL DISTURBED AREA	1.93
IMPERVIOUS AREA PRE-CONSTRUCTION (ON-SITE ONLY & INCLUDES GRAVEL)	0.48
PERVIOUS AREA PRE-CONSTRUCTION (ON-SITE ONLY)	0.90
IMPERVIOUS AREA POST-CONSTRUCTION (ON-SITE ONLY)	0.90
PERVIOUS AREA POST-CONSTRUCTION (ON-SITE ONLY)	0.48
IMPERVIOUS AREA INCREASE (PRE VS POST) (ON-SITE ONLY)	0.42
IMPERVIOUS PERCENTAGE (AT POST-CONSTRUCTION STATE)	65.2%



EVERY DIGGING JOB REQUIRES A CALL – EVEN SMALL PROJECTS LIKE PLANTING TREES OR SHRUBS. IF YOU HIT AN UNDERGROUND UTILITY LINE WHILE DIGGING, YOU CAN HARM YOURSELF OR THOSE AROUND YOU, DISRUPT SERVICE TO AN ENTIRE NEIGHBORHOOD AND POTENTIALLY BE RESPONSIBLE FOR FINES AND REPAIR COSTS.

SMART DIGGING MEANS CALLING 811 BEFORE EACH JOB. WHETHER YOU ARE A HOMEOWNER OR A PROFESSIONAL EXCAVATOR, ONE CALL TO 811 GETS YOUR UNDERGROUND UTILITY LINES MARKED FOR FREE.

POST DEVELOPMENT DRAINAGE AREA

SCALE 1" = 30'

REVISIONS	BY

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864-233-5497
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TODD BURNS NUMBER 2021014925 PROFESSIONAL ENGINEER
7/23/2021

CALIBER COLLISION
710 SE 7TH TERRACE
LEE'S SUMMIT, MO 64063

CROSS DEVELOPMENT, CC LEE'S SUMMIT, LLC
4336 MARSH RIDGE ROAD
CARROLLTON, TX 75010
TEL: (214) 614-8252

DRAWN BAC
CHECKED TMB
DATE 7/23/2021
SCALE

DRAWING
14

STORM DRAIN NOTES

1. ALL HYDRAULIC DATA FOR THE STORM DRAINAGE PIPES ARE BASED ON THE 100-YEAR DESIGN STORM.
2. ALL MANHOLE DIAMETERS AND ALL INLET DIMENSIONS SHALL HAVE A MINIMUM INSIDE DIMENSION OF 4' DIAMETER (CIRCULAR) OR 4'x4' (SQUARE). STRUCTURES SHALL BE UPSIZED AS NEEDED TO ACCOMMODATE THE CONNECTING PIPE SIZES/ ANGLES.
3. STORM DRAIN PIPE SHALL BE CLASS III, WALL "B" RCP IN ACCORDANCE WITH ASTM C-76, UNLESS NOTED OTHERWISE.
4. HIGH DENSITY POLYETHYLENE PIPE (HDPE) MAY BE USED AS AN ALTERNATE. ALL HDPE PIPE, JOINTS, AND FITTINGS SHALL MEET THE REQUIREMENTS OF AASHTO DESIGNATIONS M252 AND M294 TYPE S.
5. PIPE LENGTHS ARE BASED ON HORIZONTAL DISTANCE FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE AND USED FOR DESIGN ONLY. CONTRACTOR TO FIELD VERIFY ACTUAL PIPE LENGTHS NEEDED FOR CONSTRUCTION.
6. CONTRACTOR IS RESPONSIBLE FOR COMPARING THE STORM DRAIN WITH THE PROFILES FOR THE STORM DRAIN LINES AND INFORMING THE ENGINEER OF ANY CONFLICTS OR DISCREPANCIES PRIOR TO COMMENCEMENT OF CONSTRUCTION.
7. STORM DRAIN PIPE SHALL HAVE WATER TIGHT JOINTS IN ACCORDANCE WITH ASTM C 361, C443, AND D3212.

INLET DRAINAGE AREAS

TYPE	INLET	AREA (AC.)	TC (MIN.)	IMPERVIOUS COVERAGE (ACRE)	IMPERVIOUS RUNOFF COEFFICENT	PERVIOUS COVERAGE (ACRE)	PERVIOUS RUNOFF COEFFICENT	WEIGHTED RUNOFF COEFFICIENT	"i" 50	"i" 100	Q50 (CFS)	Q100 (CFS)	PONDING DEPTH @ INLET PER 100-YR STORM (FT)
PROPOSED	1B *	1.70	5	0.04	0.90	1.66	0.35	0.36	11.30	12.60	6.97	7.77	0.3000
	3	0.26	5	0.26	0.90	0.00	0.35	0.90	11.30	12.60	2.64	2.95	0.2600
	4	0.15	5	0.15	0.90	0.00	0.35	0.90	11.30	12.60	1.53	1.70	0.2000
	5	0.62	5	0.47	0.90	0.15	0.35	0.77	11.30	12.60	5.37	5.99	0.3900
	R-2	0.94	5	0.29	0.90	0.65	0.35	0.52	11.30	12.60	5.52	6.16	** NOT CALCULATED
EXISTING	EX-1	0.08	5	0.02	0.90	0.06	0.35	0.49	11.30	12.60	0.44	0.49	** NOT CALCUALTED
	EX-2	0.47	5	0.08	0.90	0.39	0.35	0.44	11.30	12.60	2.36	2.63	** NOT CALUCLATED

RUNOFF COEFFICIENTS USED TO CALCULATE THE WEIGHTED RUNOFF COEFFICIENT ARE LISTED BELOW
- LAWNS/GRASS: 0.35
- ROOFS/PAVEMENT: 0.90

RAINFALL DATA FROM NOAA ATLAS 14, VOLUME 8, VERSION 2, LEE'S SUMMIT, MISSOURI

* THE AREA SHOWN FOR INLET 1B ASSUMES THAT THE ADJACENT PROPERTY WILL BE DEVELOPED AND CONNECT IT'S STORM SEWER SYSTEM TO STRUCTURE 1B. PER THE CITY OF LEE'S SUMMIT CODE, THE MAXIMUM ALLOWED DISCHARGE FROM THE DEVELOPED SITE IS 3 CFS PER DEVELOPED ACRE. ASSUMING 1.70 ACRES OF DEVELOPED AREA, THE MAXIMUM DISCHARGE ALLOWED FROM THE ADJACENT SITE WOULD BE 5.1 CFS WHICH IS LESS THAN THE EXISTING SITE'S UNDEVELOPED CONDITION (WHICH RESULTS IN THE VALUE(S) SHOWN IN THE TABLE ABOVE). TO BE CONSERVATIVE, THE RELEASES FOR INLET 1B ABOVE ARE USED TO ADEQUATELY SIZE THE STORM SEWER PIPES PROPOSED BY THE CALIBER COLLISION DEVELOPMENT.

** THE PONDING DEPTHS FOR THESE INLETS WERE NOT CALCULATED AS THEY ARE A RESULT OF THE EXISTING CONDITIONS OF THE SURROUNDING PROPERTIES AND ADDITIONAL SURVEY INFORMATION WILL BE REQUIRED TO ACCURATELY CALCULATE. ADDITIONALLY, THESE "INLETS" ARE OPEN-ENDED PIPES AND NOT "STORM STRUCTURES". THEIR PONDING DEPTHS ARE NEGLECTED AS THEY CONTAIN CONDITIONS WHERE PONDING IS NOT AN ISSUE (I.E. CONTAINED WITHIN DITCHES)

RAINFALL DISTRIBUTION FOR LEE'S SUMMIT, MISSOURI

STORM EVENT	2-YR	10-YR	25-YR	50-YR	100-YR
RAINFALL (INCHES/HR)	5.81	8.35	9.98	11.30	12.60

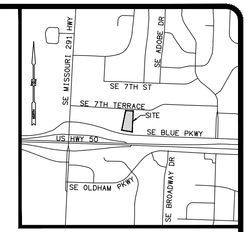
- THE RAINFALL FOR RAINFALL DISTRIBUTION DATA TAKEN FROM NOAA ATLAS 14, VOLUME 8, VERSION 2 FOR LEE'S SUMMIT, MISSOURI
- STORM DISTRIBUTION TYPE II
- 24-HOUR STORM DISTRIBUTION

LEGEND

DESCRIPTION

A - BASIN DESIGNATION
B - AREA IN ACRES
C - RUNOFF COEFFICIENT

DRAINAGE BASIN BOUNDARY



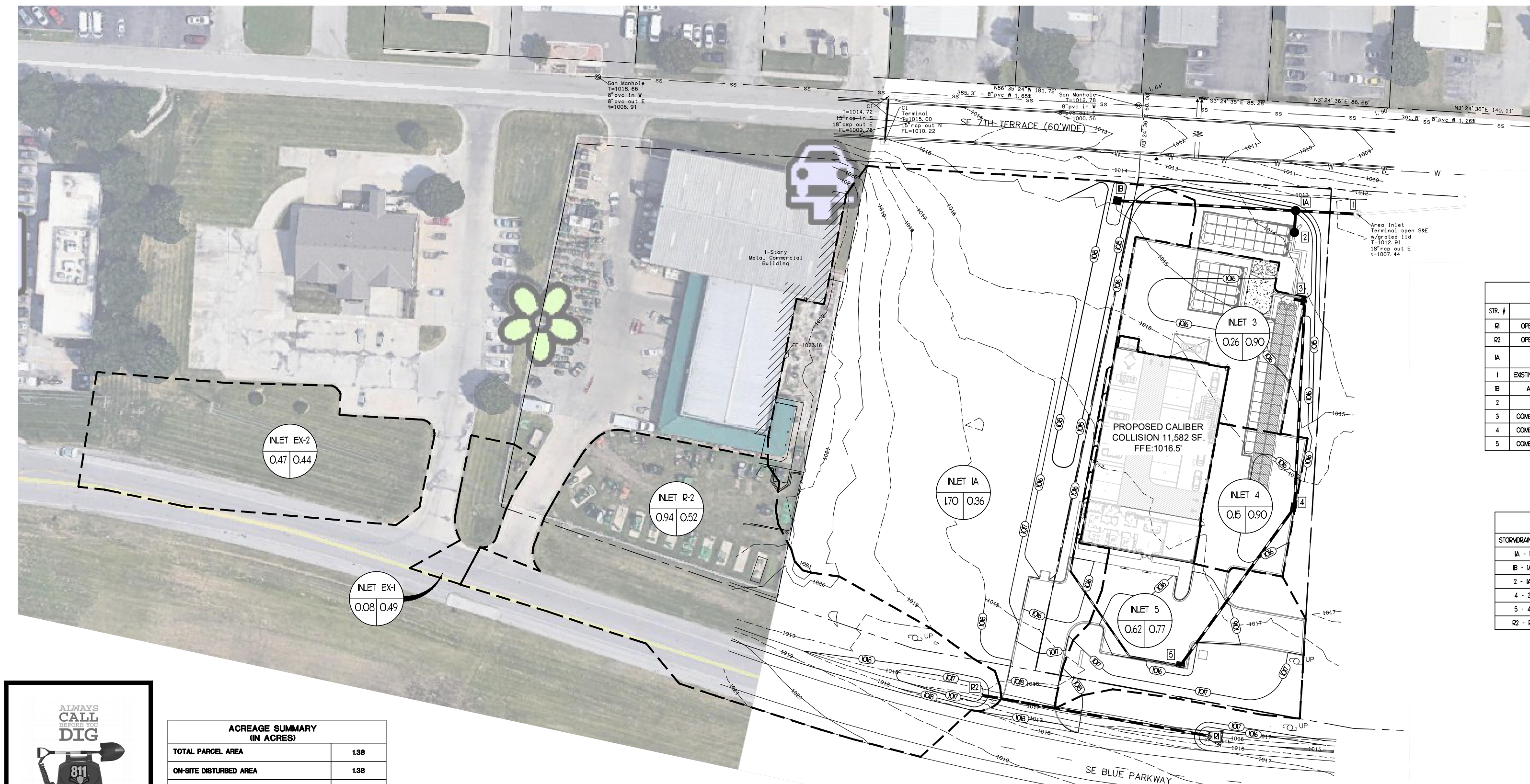
LOCATION MAP
NOT TO SCALE

WATER TIGHT STORM PIPES:
CONTRACTOR TO ENSURE THAT ALL STORM PIPES ARE WATER TIGHT AND TESTED PER ASTM C902-02

CONTRACTOR TO ENSURE ALL STORM DRAIN PIPE SHALL HAVE WATER TIGHT JOINTS IN ACCORDANCE WITH ASTM C 361, C443, AND D3212.

DRAINAGE BASIN:
MISSOURI RIVER WATERSHED

RECEIVING WATERS:
EAST FORK, LITTLE BLUE RIVER, TRIBUTARY OF THE BLUE RIVER - MISSOURI RIVER WATERSHED



STORM DRAIN STRUCTURE TABLE				
STR. #	TYPE	RIM/THROAT	INV. IN	INV. OUT
R1	OPEN END PIPE	1017.36	1015.15 (R2)	
R2	OPEN END PIPE	1018.21		1016.00 (R1)
1A	MANHOLE	1016.00	1008.30 (1B) 1008.30 (2)	1008.10 (1)
1	EXISTING AREA INLET	1012.91	1007.60 (1A)	
1B	AREA INLET	1014.00		1009.60 (1A)
2	MANHOLE	1016.20		1008.50 (1A)
3	COMBINATION INLET	1015.50	1008.10 (4)	1007.90 (UGD)
4	COMBINATION INLET	1015.60	1009.70 (5)	1009.50 (3)
5	COMBINATION INLET	1015.00		1011.00 (4)

STORM PIPE TABLE					
STORMDRAIN PIPE	SIZE	LENGTH	SLOPE	INV. IN	INV. OUT
1A - 1	18"	44'	1.13%	1008.10'	1007.60'
1B - 1A	18"	127'	1.02%	1009.60'	1008.30'
2 - 1A	18"	16'	1.29%	1008.50'	1008.30'
4 - 3	18"	147'	0.95%	1009.50'	1008.10'
5 - 4	18"	139'	0.94%	1011.00'	1009.70'
R2 - R1	18"	164'	0.52%	1016.00'	1015.15'

ACREAGE SUMMARY (IN ACRES)	
TOTAL PARCEL AREA	1.38
ON-SITE DISTURBED AREA	1.38
OFF-SITE DISTURBED AREA	0.55
TOTAL DISTURBED AREA	1.93
IMPERVIOUS AREA PRE-CONSTRUCTION (ON-SITE ONLY & INCLUDES GRAVEL)	0.48
PERVIOUS AREA PRE-CONSTRUCTION (ON-SITE ONLY)	0.90
IMPERVIOUS AREA POST-CONSTRUCTION (ON-SITE ONLY)	0.90
PERVIOUS AREA POST-CONSTRUCTION (ON-SITE ONLY)	0.48
IMPERVIOUS AREA INCREASE (PRE VS POST) (ON-SITE ONLY)	0.42
IMPERVIOUS PERCENTAGE (AT POST-CONSTRUCTION STATE)	65.2%

INLET AREA MAP

SCALE 1" = 30'

REVISIONS	BY

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TEL: (214) 614-8252

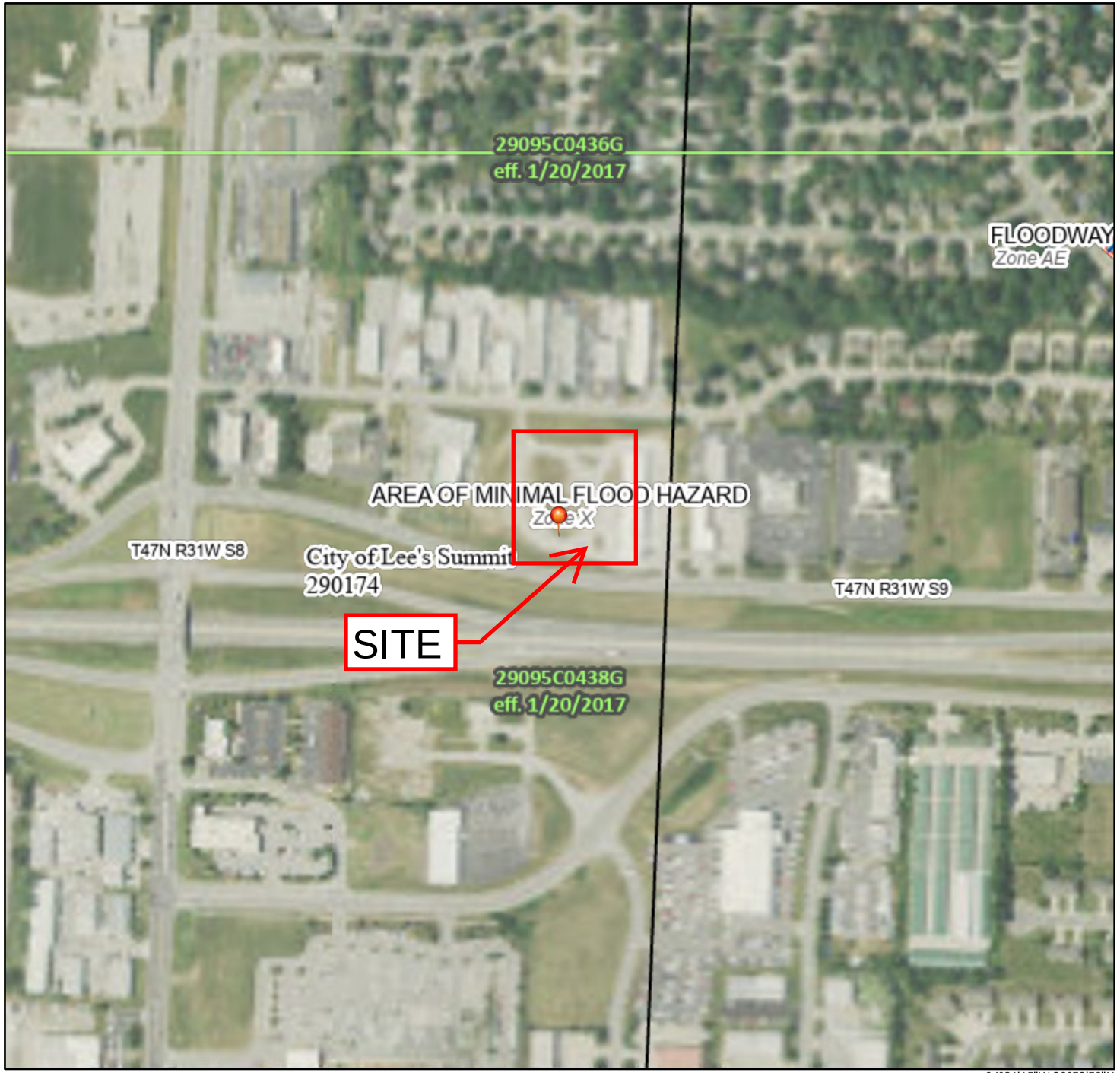
DRAWN: BAC
CHECKED: TMB
DATE: 7/23/2021
SCALE

DRAWING
14

National Flood Hazard Layer FIRMette

FEMA

94°21'53"W 38°54'26"N



94°21'15"W 38°53'58"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

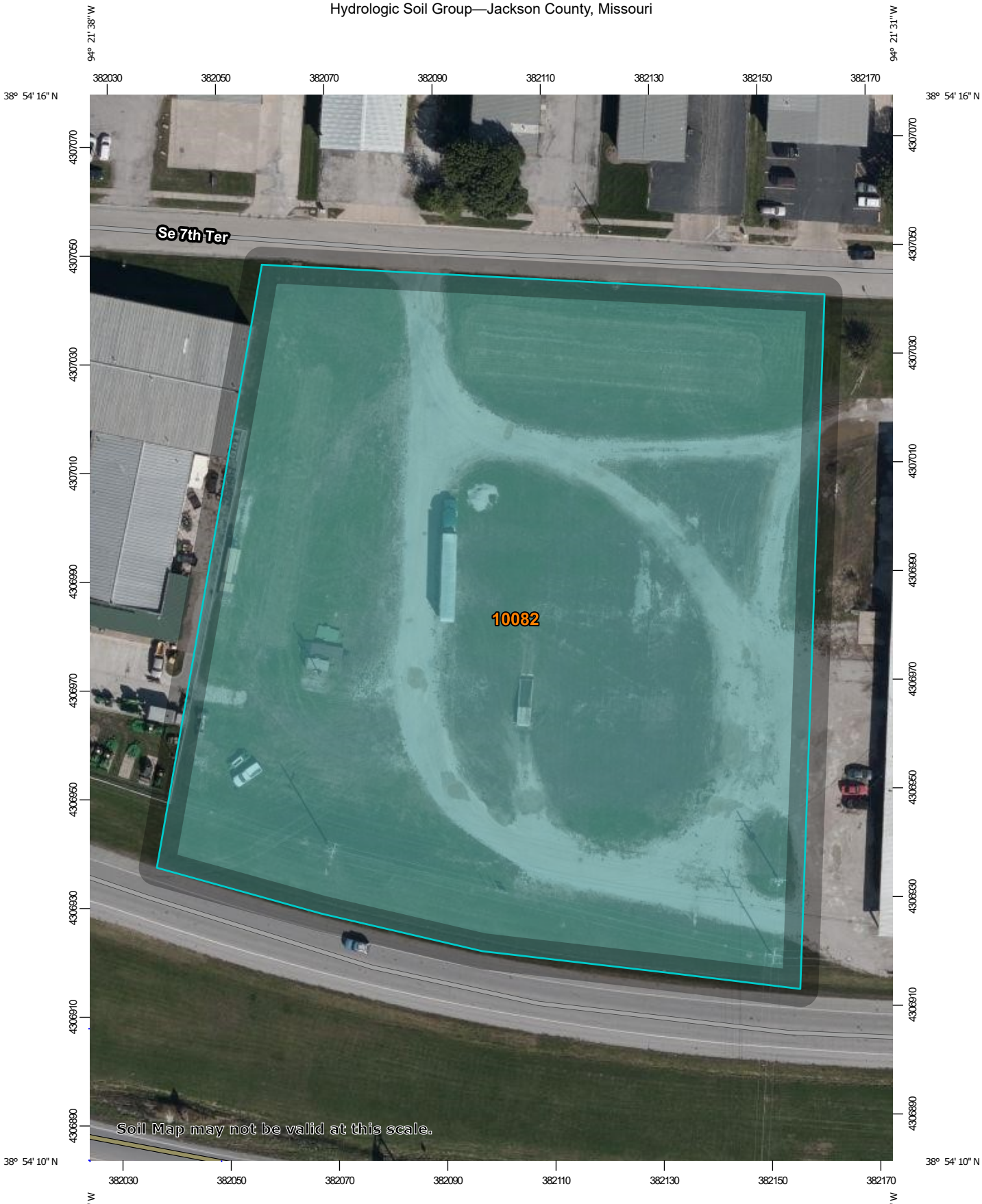
N

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 7/1/2021 at 11:23 AM 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.



Map Scale: 1:956 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

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 1:24,000.

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: Jackson County, Missouri
Survey Area Data: Version 22, May 29, 2020

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	3.4	100.0%
Totals for Area of Interest			**3.4**	**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

NOAA Atlas 14, Volume 8, Version 2
Location name: Lees Summit, Missouri, USA*
Latitude: 38.9038°, Longitude: -94.3595°
Elevation: 1016.38 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.97** (3.92-6.28)	**5.81** (4.57-7.33)	**7.19** (5.65-9.10)	**8.35** (6.53-10.6)	**9.98** (7.57-13.1)	**11.3** (8.36-14.9)	**12.6** (9.05-17.0)	**13.9** (9.64-19.3)	**15.7** (10.5-22.3)	**17.1** (11.2-24.6)
10-min	**3.64** (2.87-4.60)	**4.25** (3.35-5.37)	**5.26** (4.13-6.66)	**6.11** (4.78-7.77)	**7.31** (5.54-9.56)	**8.25** (6.13-10.9)	**9.20** (6.62-12.4)	**10.2** (7.05-14.1)	**11.5** (7.69-16.3)	**12.5** (8.17-18.0)
15-min	**2.96** (2.34-3.74)	**3.46** (2.72-4.36)	**4.28** (3.36-5.42)	**4.97** (3.89-6.32)	**5.94** (4.51-7.78)	**6.71** (4.98-8.88)	**7.48** (5.38-10.1)	**8.28** (5.73-11.5)	**9.36** (6.25-13.3)	**10.2** (6.64-14.6)
30-min	**2.05** (1.62-2.59)	**2.41** (1.90-3.04)	**2.99** (2.35-3.79)	**3.49** (2.73-4.43)	**4.18** (3.17-5.46)	**4.72** (3.50-6.24)	**5.26** (3.78-7.11)	**5.82** (4.03-8.06)	**6.57** (4.39-9.32)	**7.15** (4.66-10.3)
60-min	**1.34** (1.06-1.69)	**1.57** (1.24-1.99)	**1.96** (1.54-2.49)	**2.29** (1.79-2.92)	**2.76** (2.10-3.62)	**3.13** (2.33-4.15)	**3.51** (2.53-4.75)	**3.90** (2.70-5.41)	**4.43** (2.96-6.29)	**4.84** (3.16-6.96)
2-hr	**0.827** (0.657-1.04)	**0.972** (0.771-1.22)	**1.21** (0.960-1.53)	**1.42** (1.12-1.79)	**1.72** (1.31-2.24)	**1.95** (1.46-2.57)	**2.19** (1.59-2.95)	**2.44** (1.71-3.37)	**2.79** (1.88-3.94)	**3.06** (2.01-4.36)
3-hr	**0.623** (0.497-0.777)	**0.731** (0.583-0.913)	**0.916** (0.728-1.15)	**1.08** (0.850-1.35)	**1.31** (1.00-1.70)	**1.49** (1.12-1.96)	**1.68** (1.23-2.26)	**1.88** (1.32-2.59)	**2.16** (1.46-3.04)	**2.38** (1.57-3.39)
6-hr	**0.376** (0.302-0.466)	**0.444** (0.356-0.550)	**0.561** (0.449-0.697)	**0.664** (0.528-0.827)	**0.813** (0.631-1.05)	**0.934** (0.708-1.22)	**1.06** (0.780-1.42)	**1.20** (0.846-1.63)	**1.38** (0.944-1.94)	**1.53** (1.02-2.16)
12-hr	**0.220** (0.178-0.270)	**0.262** (0.212-0.323)	**0.335** (0.270-0.413)	**0.400** (0.320-0.494)	**0.493** (0.386-0.634)	**0.570** (0.435-0.740)	**0.650** (0.481-0.862)	**0.735** (0.524-0.998)	**0.853** (0.587-1.19)	**0.947** (0.635-1.33)
24-hr	**0.129** (0.105-0.158)	**0.154** (0.126-0.188)	**0.198** (0.160-0.242)	**0.236** (0.190-0.290)	**0.292** (0.230-0.372)	**0.337** (0.260-0.435)	**0.385** (0.287-0.507)	**0.436** (0.313-0.588)	**0.507** (0.352-0.701)	**0.563** (0.380-0.786)
2-day	**0.076** (0.062-0.092)	**0.090** (0.073-0.108)	**0.113** (0.092-0.137)	**0.134** (0.109-0.163)	**0.164** (0.130-0.208)	**0.189** (0.147-0.242)	**0.215** (0.162-0.282)	**0.243** (0.176-0.326)	**0.282** (0.197-0.388)	**0.313** (0.213-0.434)
3-day	**0.056** (0.046-0.068)	**0.065** (0.054-0.079)	**0.081** (0.066-0.098)	**0.095** (0.077-0.115)	**0.115** (0.092-0.145)	**0.132** (0.103-0.168)	**0.150** (0.113-0.195)	**0.169** (0.123-0.225)	**0.195** (0.137-0.267)	**0.217** (0.148-0.299)
4-day	**0.046** (0.038-0.055)	**0.052** (0.043-0.063)	**0.064** (0.053-0.077)	**0.075** (0.061-0.090)	**0.090** (0.072-0.113)	**0.102** (0.080-0.130)	**0.116** (0.088-0.150)	**0.130** (0.095-0.173)	**0.150** (0.105-0.204)	**0.165** (0.113-0.228)
7-day	**0.031** (0.026-0.037)	**0.035** (0.029-0.042)	**0.042** (0.035-0.050)	**0.048** (0.039-0.058)	**0.057** (0.045-0.070)	**0.064** (0.050-0.080)	**0.071** (0.054-0.091)	**0.079** (0.058-0.104)	**0.089** (0.063-0.121)	**0.098** (0.068-0.134)
10-day	**0.025** (0.020-0.029)	**0.028** (0.023-0.033)	**0.033** (0.027-0.039)	**0.037** (0.031-0.045)	**0.044** (0.035-0.054)	**0.049** (0.038-0.061)	**0.054** (0.041-0.069)	**0.059** (0.043-0.077)	**0.066** (0.047-0.089)	**0.072** (0.050-0.098)
20-day	**0.016** (0.014-0.019)	**0.018** (0.016-0.022)	**0.022** (0.018-0.026)	**0.025** (0.021-0.029)	**0.028** (0.023-0.035)	**0.031** (0.025-0.039)	**0.034** (0.026-0.043)	**0.037** (0.027-0.048)	**0.040** (0.029-0.054)	**0.043** (0.030-0.058)
30-day	**0.013** (0.011-0.015)	**0.015** (0.013-0.017)	**0.018** (0.015-0.021)	**0.020** (0.017-0.023)	**0.023** (0.018-0.027)	**0.025** (0.020-0.030)	**0.027** (0.021-0.034)	**0.029** (0.021-0.037)	**0.031** (0.022-0.041)	**0.033** (0.023-0.044)
45-day	**0.011** (0.009-0.013)	**0.012** (0.010-0.014)	**0.014** (0.012-0.017)	**0.016** (0.013-0.019)	**0.018** (0.015-0.022)	**0.020** (0.016-0.024)	**0.021** (0.016-0.026)	**0.023** (0.017-0.029)	**0.024** (0.017-0.032)	**0.025** (0.018-0.034)
60-day	**0.009** (0.008-0.011)	**0.010** (0.009-0.012)	**0.012** (0.010-0.014)	**0.014** (0.012-0.016)	**0.016** (0.013-0.019)	**0.017** (0.013-0.020)	**0.018** (0.014-0.022)	**0.019** (0.014-0.024)	**0.020** (0.015-0.027)	**0.021** (0.015-0.028)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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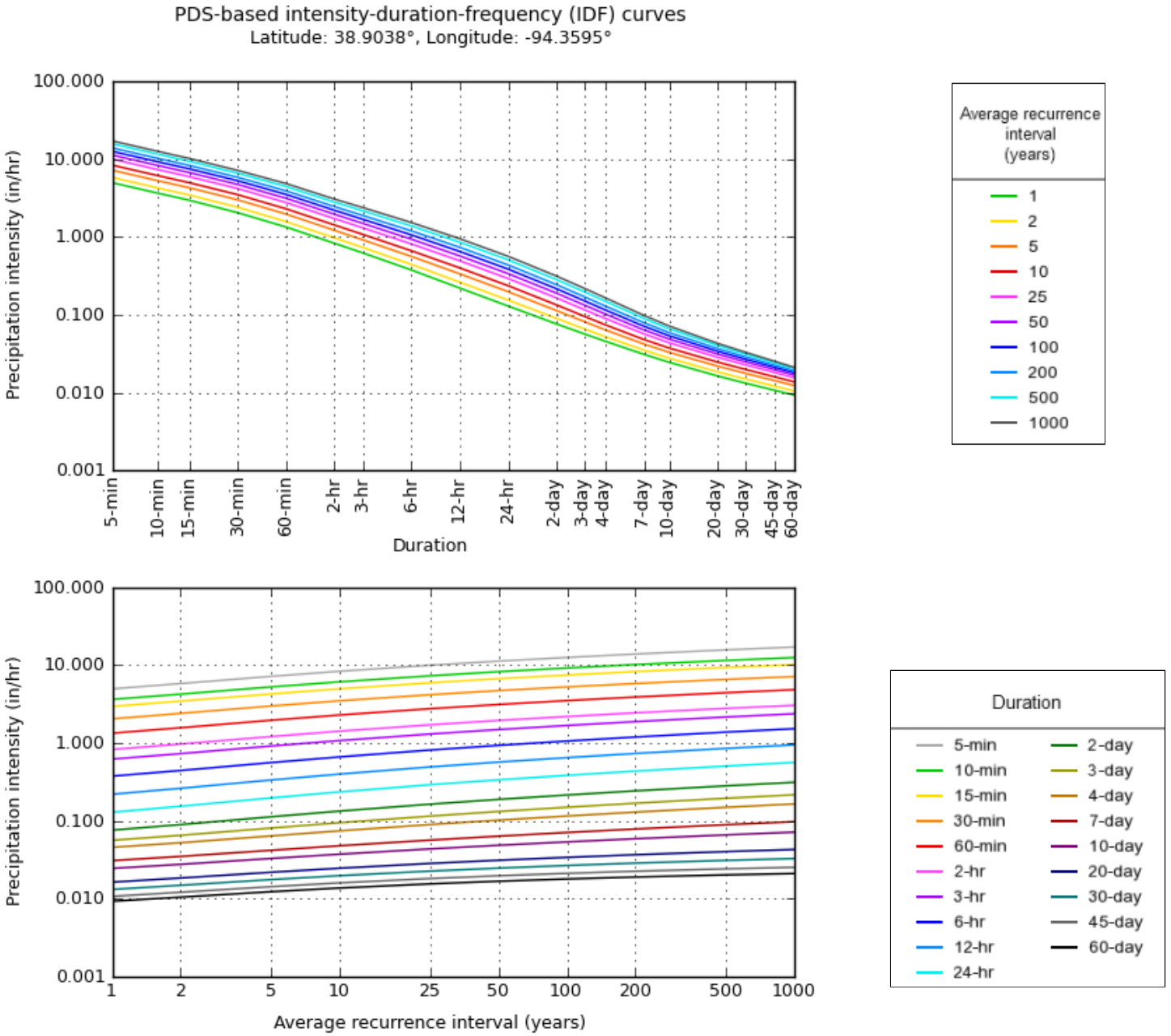
PF graphical



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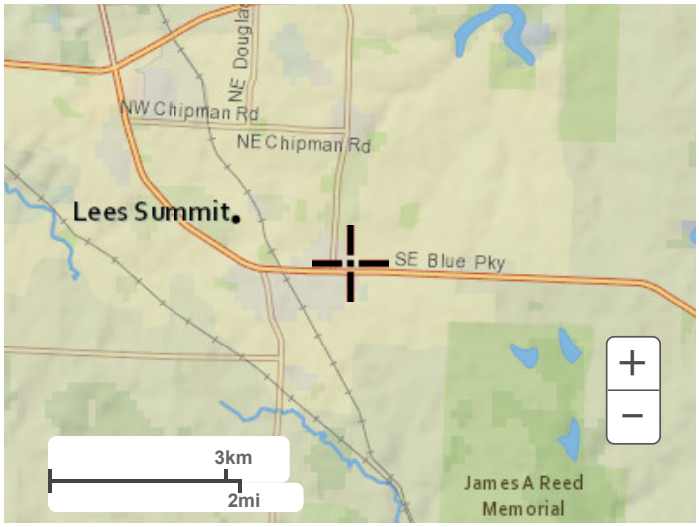
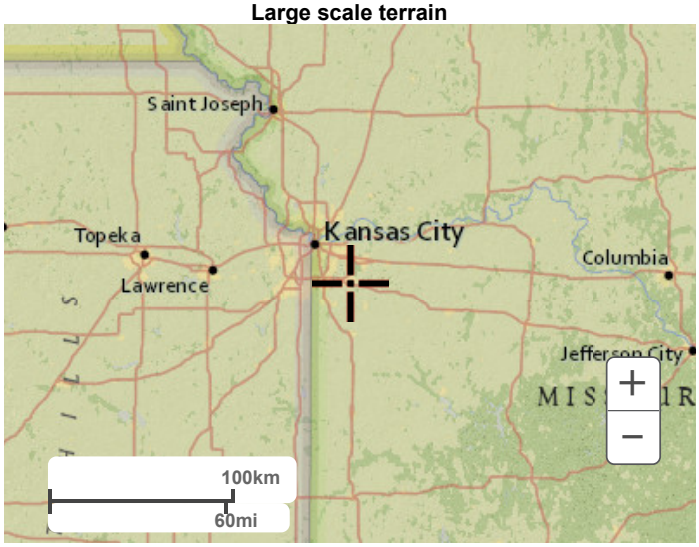
Maps & aerials

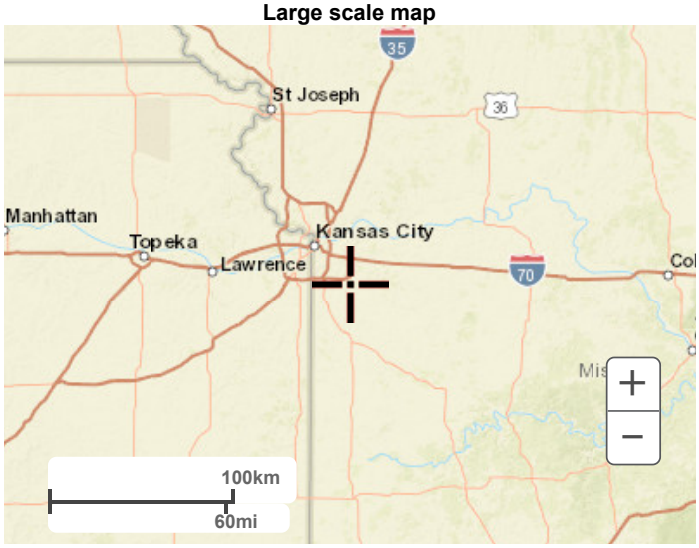
Small scale terrain



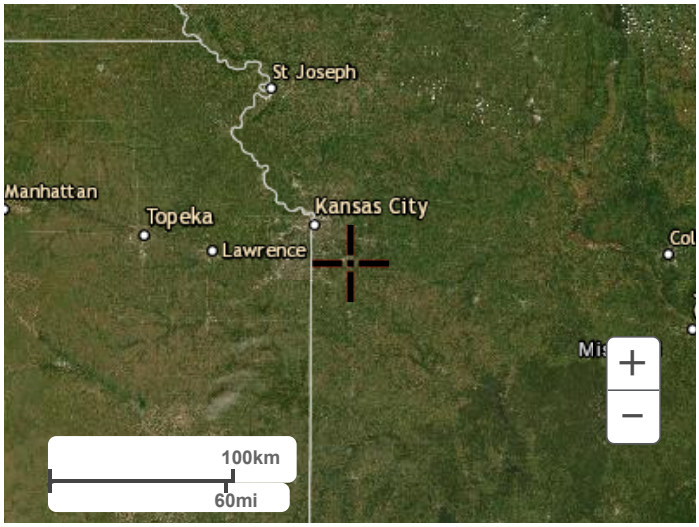
Large scale terrain



Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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NOAA Atlas 14, Volume 8, Version 2
Location name: Lees Summit, Missouri, USA*
Latitude: 38.9038°, Longitude: -94.3595°
Elevation: 1016.38 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.414** (0.327-0.523)	**0.484** (0.381-0.611)	**0.599** (0.471-0.758)	**0.696** (0.544-0.885)	**0.832** (0.631-1.09)	**0.939** (0.697-1.24)	**1.05** (0.754-1.42)	**1.16** (0.803-1.61)	**1.31** (0.875-1.86)	**1.43** (0.930-2.05)
10-min	**0.607** (0.479-0.766)	**0.708** (0.558-0.895)	**0.877** (0.689-1.11)	**1.02** (0.797-1.30)	**1.22** (0.924-1.59)	**1.38** (1.02-1.82)	**1.53** (1.10-2.07)	**1.70** (1.18-2.35)	**1.92** (1.28-2.72)	**2.09** (1.36-3.00)
15-min	**0.740** (0.584-0.934)	**0.864** (0.681-1.09)	**1.07** (0.840-1.35)	**1.24** (0.972-1.58)	**1.49** (1.13-1.94)	**1.68** (1.25-2.22)	**1.87** (1.35-2.53)	**2.07** (1.43-2.87)	**2.34** (1.56-3.32)	**2.55** (1.66-3.66)
30-min	**1.02** (0.808-1.29)	**1.20** (0.948-1.52)	**1.50** (1.18-1.90)	**1.75** (1.36-2.22)	**2.09** (1.58-2.73)	**2.36** (1.75-3.12)	**2.63** (1.89-3.56)	**2.91** (2.02-4.03)	**3.29** (2.19-4.66)	**3.57** (2.33-5.14)
60-min	**1.34** (1.06-1.69)	**1.57** (1.24-1.99)	**1.96** (1.54-2.49)	**2.29** (1.79-2.92)	**2.76** (2.10-3.62)	**3.13** (2.33-4.15)	**3.51** (2.53-4.75)	**3.90** (2.70-5.41)	**4.43** (2.96-6.29)	**4.84** (3.16-6.96)
2-hr	**1.65** (1.31-2.07)	**1.94** (1.54-2.44)	**2.43** (1.92-3.05)	**2.84** (2.24-3.59)	**3.43** (2.63-4.47)	**3.90** (2.92-5.14)	**4.39** (3.18-5.90)	**4.89** (3.41-6.74)	**5.58** (3.76-7.87)	**6.11** (4.01-8.73)
3-hr	**1.87** (1.49-2.33)	**2.20** (1.75-2.74)	**2.75** (2.19-3.44)	**3.23** (2.55-4.06)	**3.92** (3.02-5.10)	**4.48** (3.37-5.88)	**5.05** (3.68-6.78)	**5.66** (3.97-7.77)	**6.49** (4.39-9.14)	**7.14** (4.71-10.2)
6-hr	**2.25** (1.81-2.79)	**2.66** (2.13-3.30)	**3.36** (2.69-4.17)	**3.98** (3.16-4.95)	**4.87** (3.78-6.30)	**5.60** (4.24-7.31)	**6.36** (4.67-8.48)	**7.16** (5.07-9.79)	**8.28** (5.65-11.6)	**9.16** (6.09-12.9)
12-hr	**2.65** (2.14-3.26)	**3.16** (2.55-3.89)	**4.04** (3.26-4.98)	**4.82** (3.86-5.96)	**5.94** (4.65-7.64)	**6.87** (5.24-8.91)	**7.83** (5.80-10.4)	**8.86** (6.32-12.0)	**10.3** (7.08-14.3)	**11.4** (7.65-16.0)
24-hr	**3.10** (2.53-3.78)	**3.71** (3.01-4.52)	**4.75** (3.85-5.80)	**5.66** (4.57-6.95)	**7.00** (5.51-8.93)	**8.10** (6.23-10.4)	**9.24** (6.90-12.2)	**10.5** (7.52-14.1)	**12.2** (8.44-16.8)	**13.5** (9.13-18.9)
2-day	**3.66** (3.00-4.42)	**4.30** (3.53-5.21)	**5.43** (4.43-6.58)	**6.42** (5.22-7.82)	**7.88** (6.25-9.98)	**9.07** (7.04-11.6)	**10.3** (7.77-13.5)	**11.7** (8.46-15.6)	**13.5** (9.47-18.6)	**15.0** (10.2-20.8)
3-day	**4.06** (3.34-4.89)	**4.71** (3.87-5.67)	**5.83** (4.78-7.04)	**6.83** (5.57-8.28)	**8.30** (6.62-10.5)	**9.51** (7.41-12.1)	**10.8** (8.15-14.1)	**12.2** (8.85-16.2)	**14.1** (9.89-19.2)	**15.6** (10.7-21.5)
4-day	**4.39** (3.63-5.27)	**5.04** (4.16-6.05)	**6.16** (5.07-7.41)	**7.16** (5.85-8.65)	**8.62** (6.89-10.8)	**9.83** (7.68-12.5)	**11.1** (8.41-14.4)	**12.5** (9.10-16.6)	**14.4** (10.1-19.6)	**15.9** (10.9-21.9)
7-day	**5.20** (4.32-6.20)	**5.88** (4.88-7.02)	**7.05** (5.83-8.43)	**8.06** (6.63-9.68)	**9.52** (7.64-11.8)	**10.7** (8.40-13.5)	**11.9** (9.09-15.4)	**13.2** (9.71-17.5)	**15.0** (10.6-20.3)	**16.4** (11.3-22.5)
10-day	**5.89** (4.91-7.00)	**6.65** (5.53-7.90)	**7.90** (6.56-9.41)	**8.97** (7.41-10.7)	**10.5** (8.43-12.9)	**11.7** (9.19-14.6)	**12.9** (9.85-16.5)	**14.2** (10.4-18.6)	**15.9** (11.3-21.4)	**17.2** (11.9-23.5)
20-day	**7.86** (6.60-9.25)	**8.88** (7.45-10.5)	**10.5** (8.80-12.4)	**11.9** (9.86-14.1)	**13.7** (11.0-16.6)	**15.0** (11.9-18.5)	**16.3** (12.5-20.6)	**17.7** (13.1-22.9)	**19.4** (13.8-25.8)	**20.6** (14.4-28.0)
30-day	**9.50** (8.01-11.1)	**10.7** (9.05-12.6)	**12.7** (10.7-14.9)	**14.3** (11.9-16.9)	**16.3** (13.2-19.7)	**17.9** (14.1-21.9)	**19.3** (14.8-24.2)	**20.7** (15.4-26.6)	**22.4** (16.1-29.7)	**23.7** (16.6-32.0)
45-day	**11.6** (9.82-13.5)	**13.1** (11.1-15.3)	**15.5** (13.0-18.1)	**17.3** (14.5-20.3)	**19.7** (15.9-23.5)	**21.3** (17.0-26.0)	**22.9** (17.7-28.5)	**24.4** (18.2-31.2)	**26.2** (18.8-34.4)	**27.4** (19.3-36.8)
60-day	**13.4** (11.4-15.6)	**15.1** (12.8-17.6)	**17.8** (15.0-20.7)	**19.8** (16.7-23.2)	**22.4** (18.2-26.7)	**24.2** (19.3-29.3)	**25.9** (20.0-32.1)	**27.4** (20.5-34.9)	**29.2** (21.1-38.2)	**30.4** (21.5-40.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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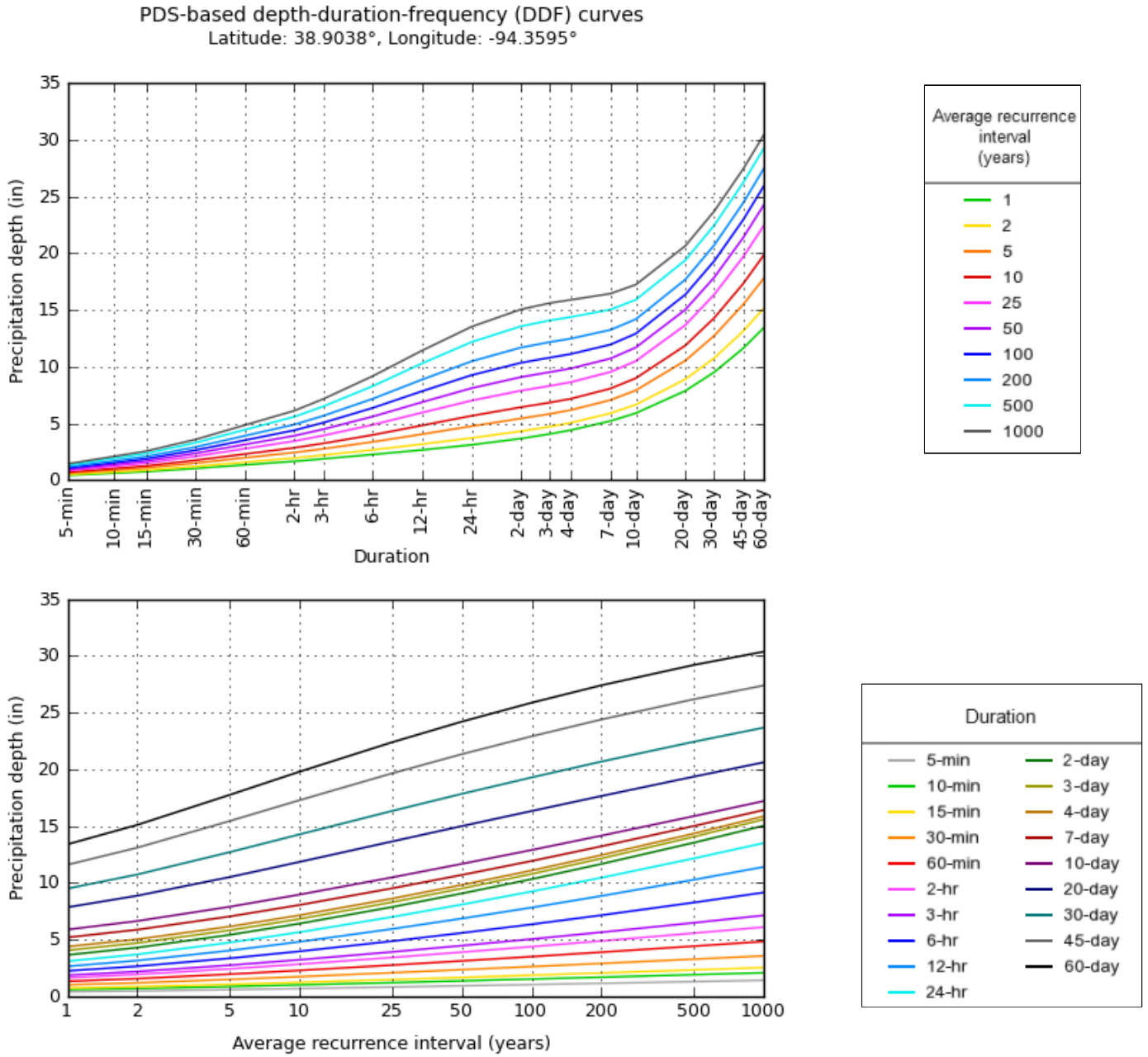
PF graphical



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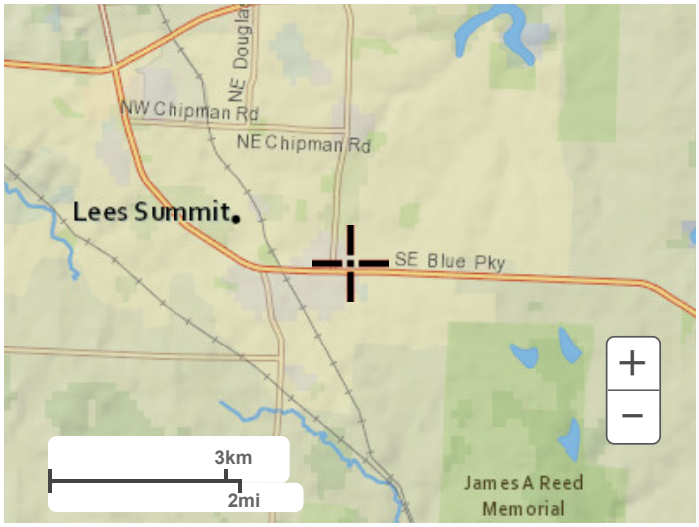
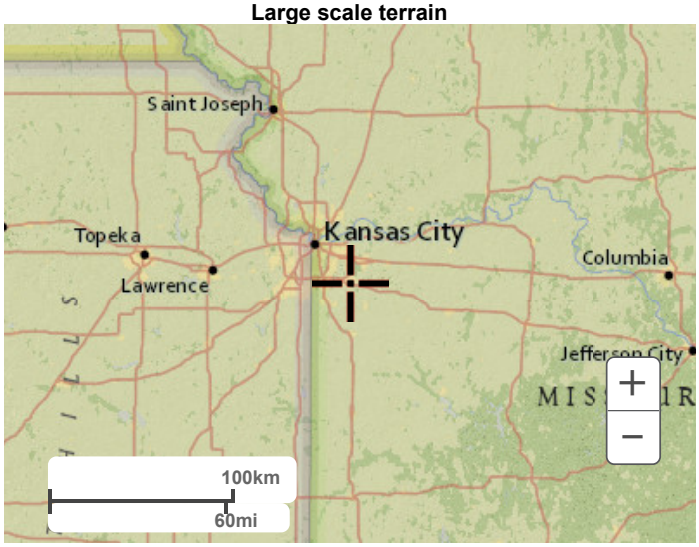
Maps & aerials

Small scale terrain



Large scale terrain



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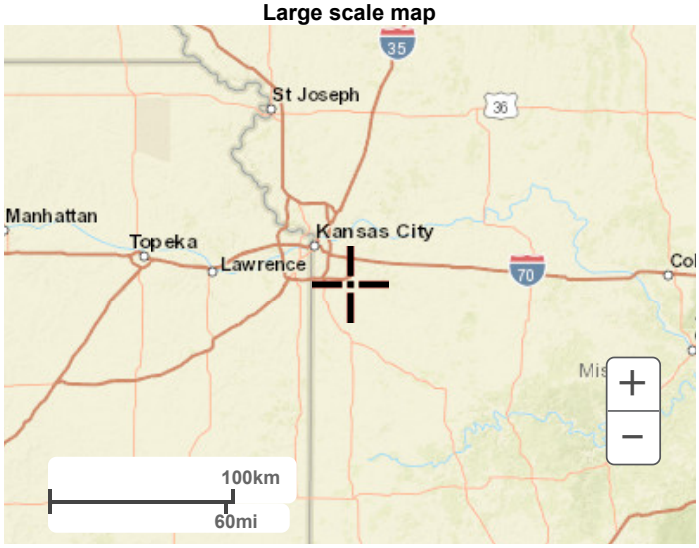
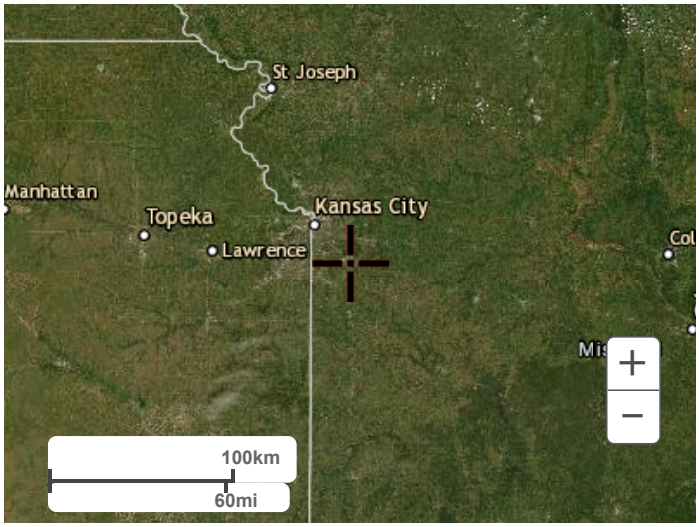


Large scale aerial



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Silver Spring, MD 20910
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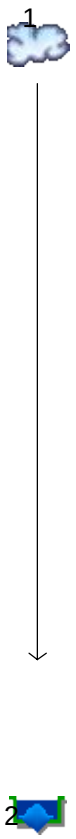
Appendix B

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Developed Area
2	Reservoir	<no description>

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	5.340	-------	-------	7.974	9.970	11.65	12.26	Developed Area
2	Reservoir	1	-------	0.312	-------	-------	0.525	0.660	1.405	2.384	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

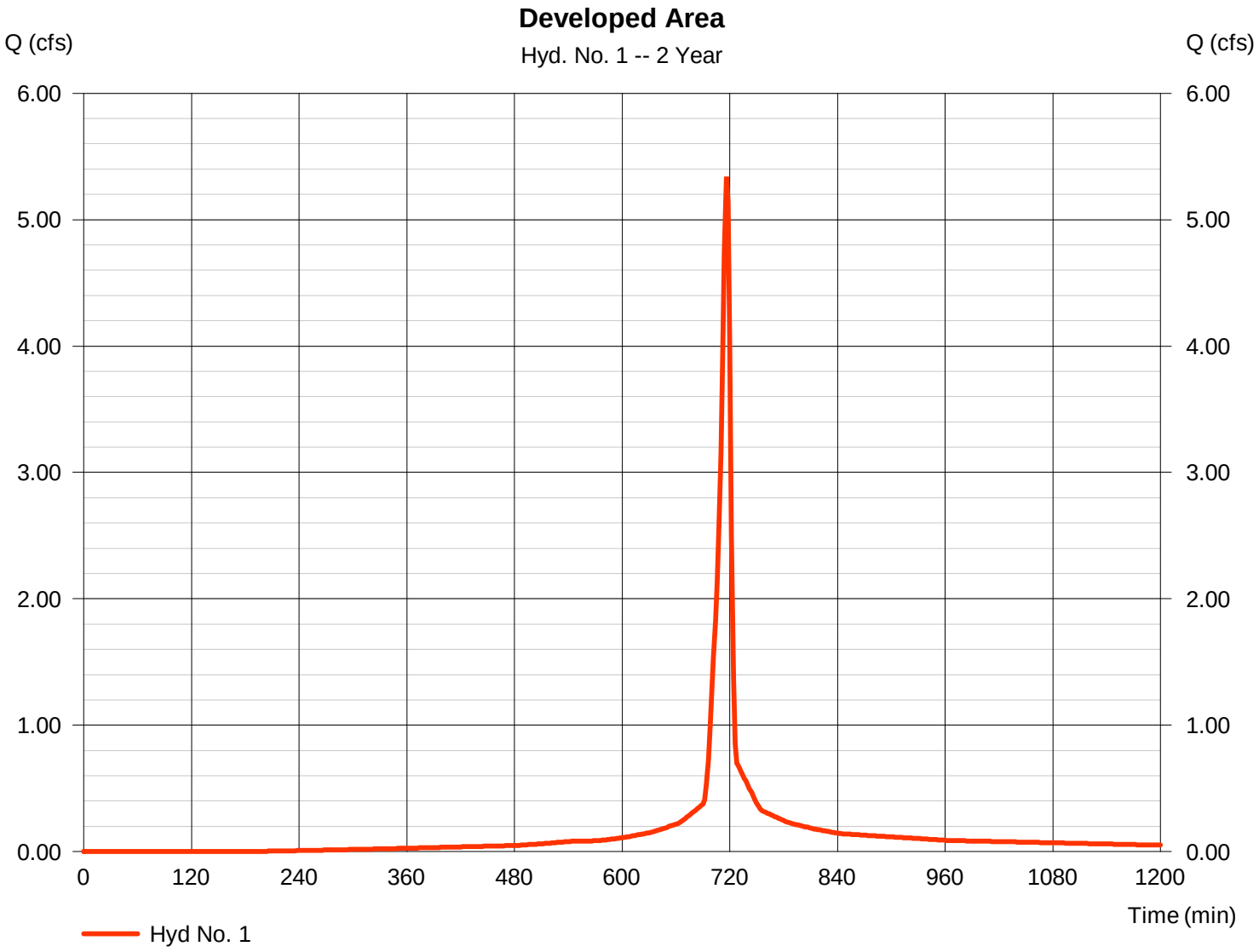
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	5.340	2	716	11,712	------	------	------	Developed Area
2	Reservoir	0.312	2	760	11,706	1	1010.43	6,950	<no description>

Hydrograph Report

Hyd. No. 1

Developed Area

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.340 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	11,712 cuft
Drainage area	=	1.100 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Report

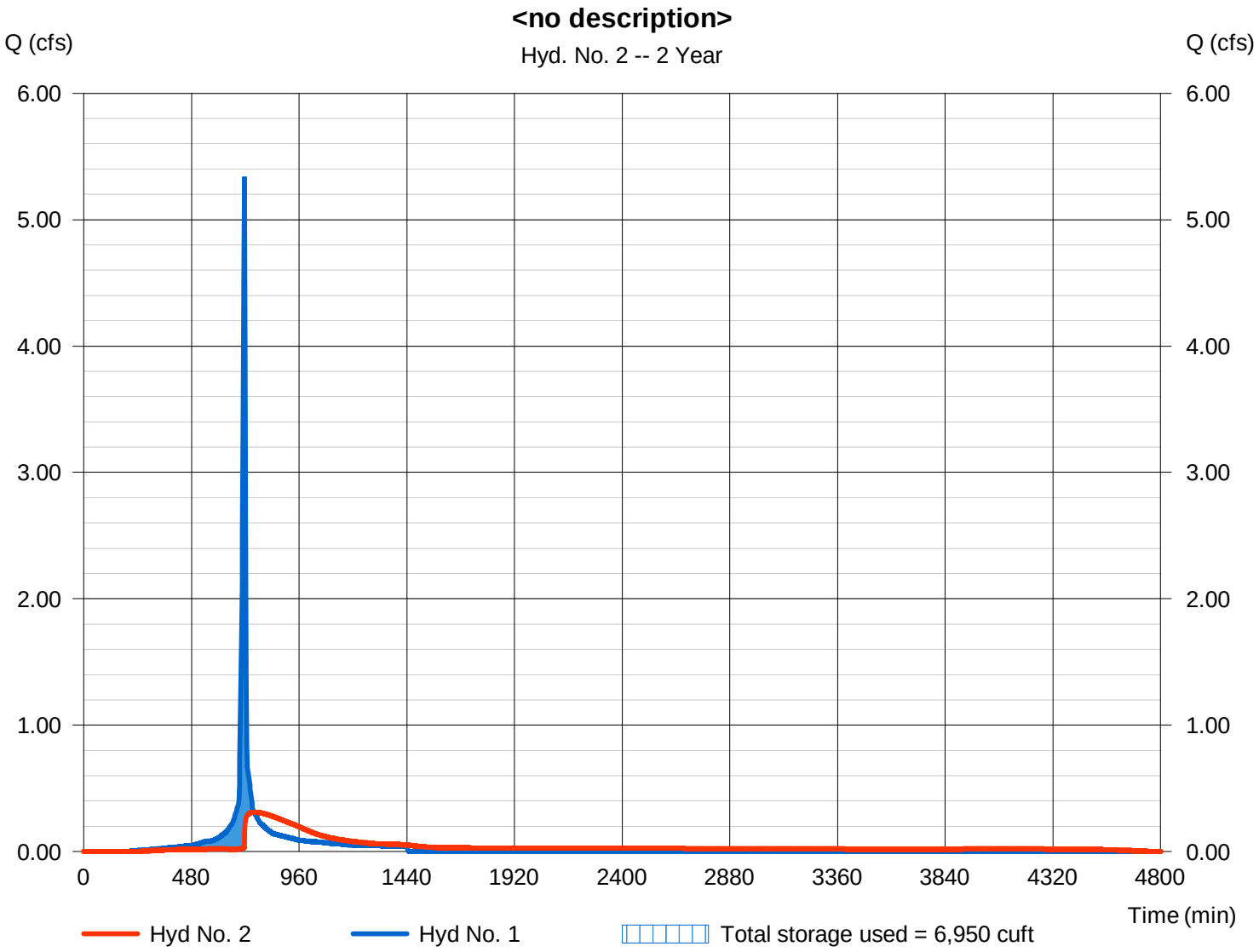
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Tuesday, 07 / 20 / 2021

Hyd. No. 2

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 0.312 cfs
Storm frequency	= 2 yrs	Time to peak	= 760 min
Time interval	= 2 min	Hyd. volume	= 11,706 cuft
Inflow hyd. No.	= 1 - Developed Area	Max. Elevation	= 1010.43 ft
Reservoir name	= Pond	Max. Storage	= 6,950 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1008.50	n/a	0	0
0.50	1009.00	n/a	155	155
1.00	1009.00	n/a	798	953
1.50	1009.50	n/a	1,673	2,626
2.00	1010.00	n/a	2,349	4,975
2.50	1010.50	n/a	2,279	7,254
3.00	1011.00	n/a	2,183	9,437
3.50	1011.50	n/a	2,054	11,491
4.00	1012.00	n/a	1,878	13,369
4.50	1012.50	n/a	1,613	14,982
5.00	1013.00	n/a	1,134	16,116
5.50	1013.50	n/a	953	17,068
6.00	1014.00	n/a	953	18,021

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	1.00	4.00	0.00
Span (in)	= 18.00	1.00	4.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1008.50	1008.50	1009.83	8.00
Length (ft)	= 20.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

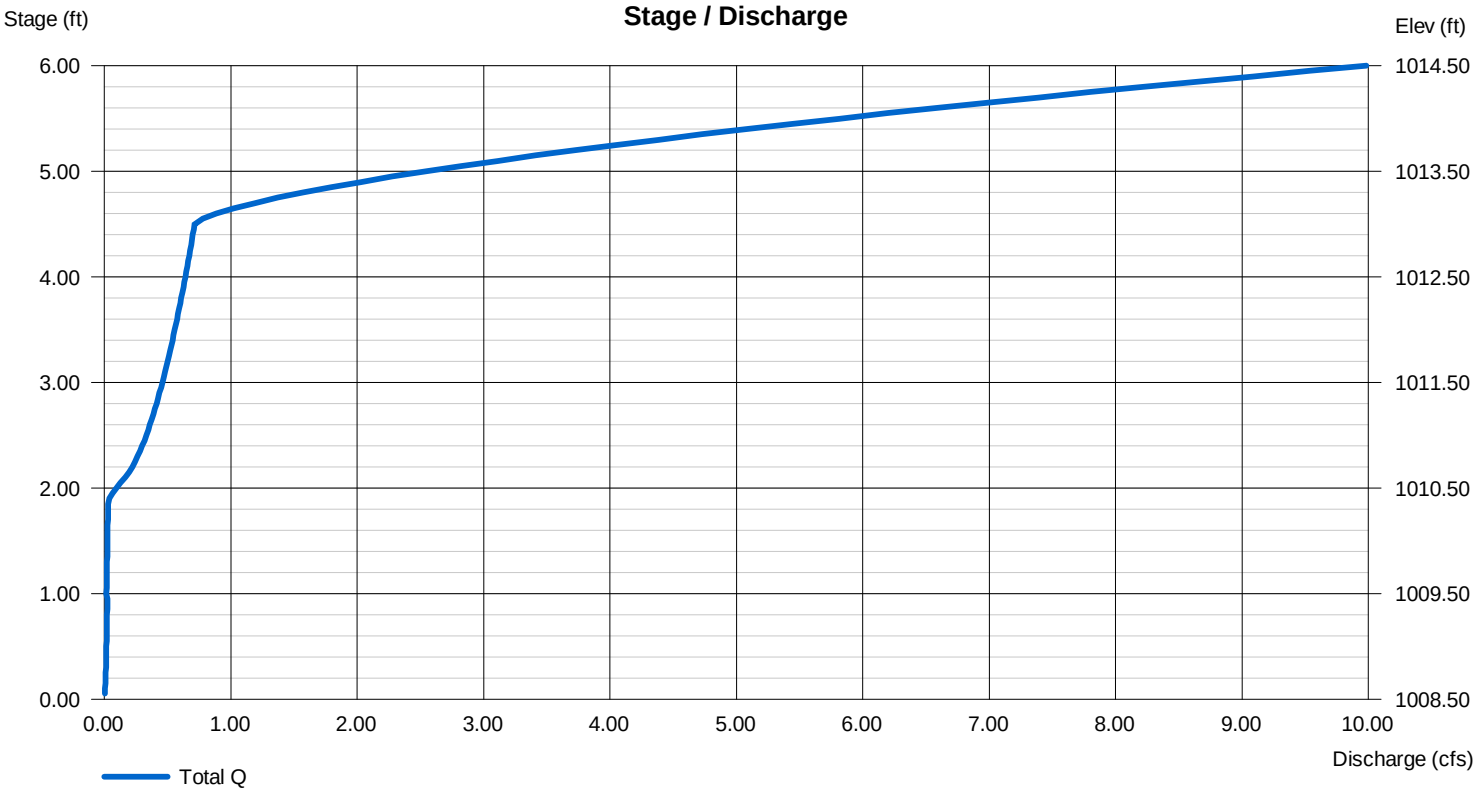
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	1.50	0.00	0.00
Crest El. (ft)	= 0.00	1012.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

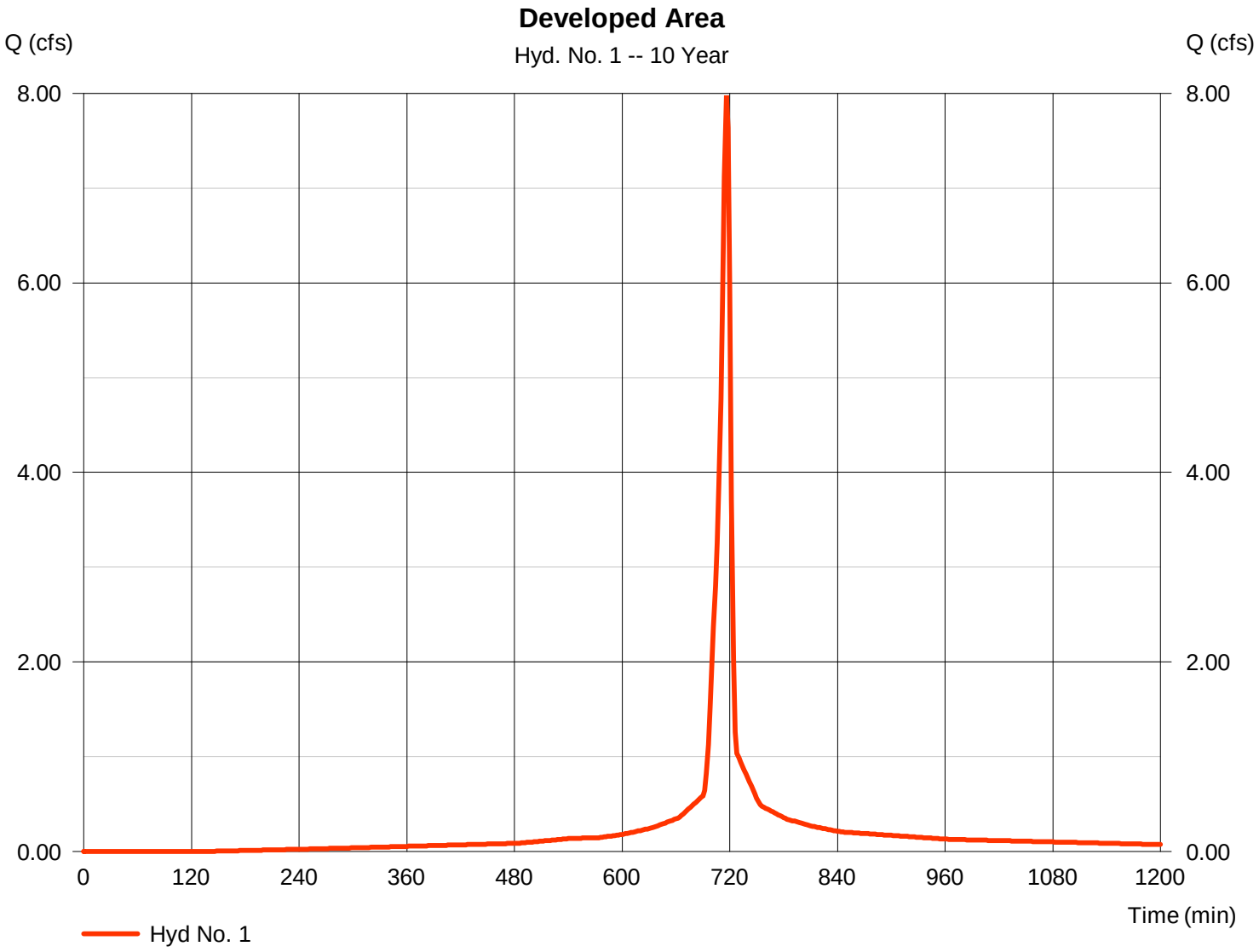
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.974	2	716	17,975	------	------	------	Developed Area
2	Reservoir	0.525	2	752	17,969	1	1011.32	10,758	<no description>

Hydrograph Report

Hyd. No. 1

Developed Area

Hydrograph type	= SCS Runoff	Peak discharge	= 7.974 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 17,975 cuft
Drainage area	= 1.100 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



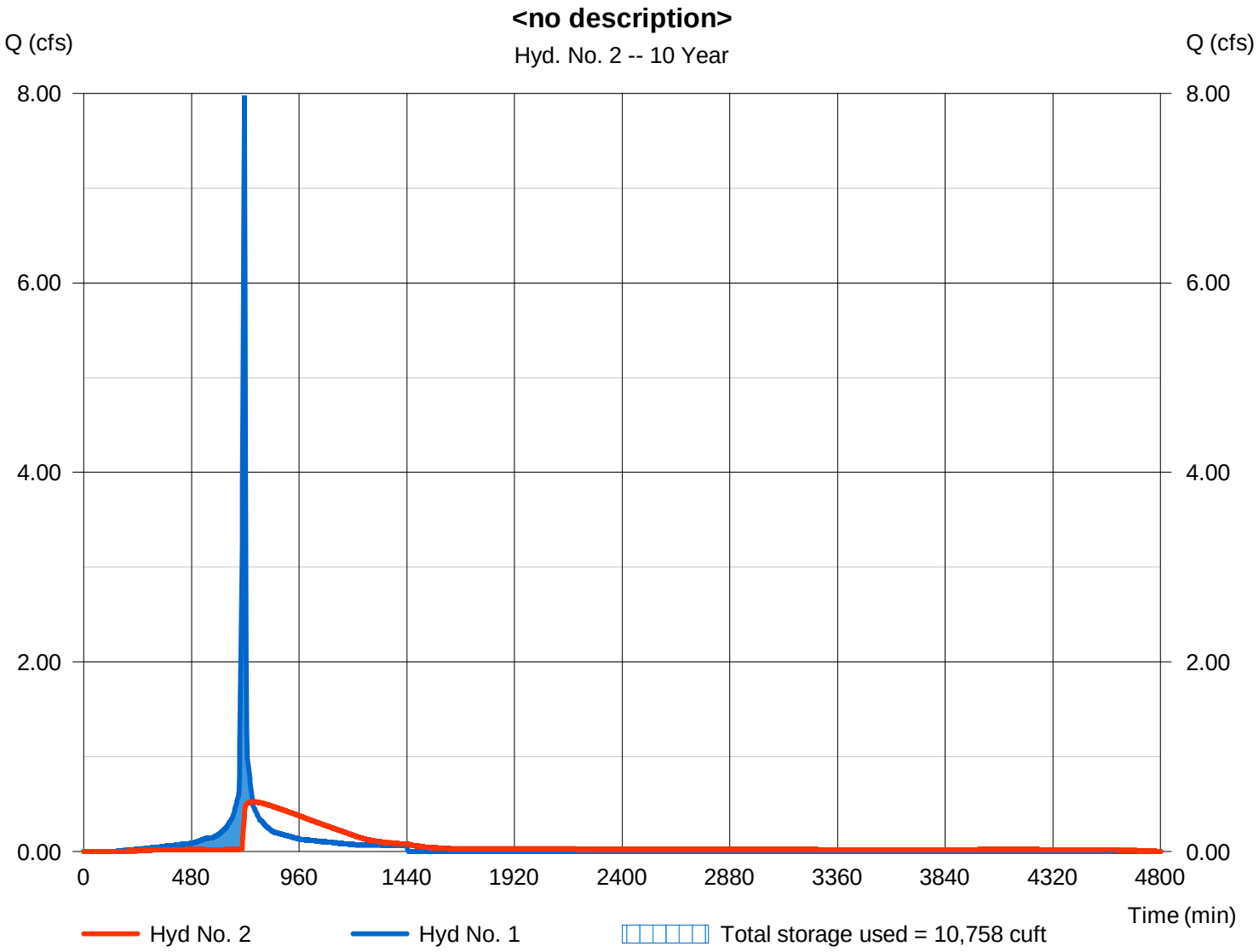
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	0.525 cfs
Storm frequency	=	10 yrs	Time to peak	=	752 min
Time interval	=	2 min	Hyd. volume	=	17,969 cuft
Inflow hyd. No.	=	1 - Developed Area	Max. Elevation	=	1011.32 ft
Reservoir name	=	Pond	Max. Storage	=	10,758 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

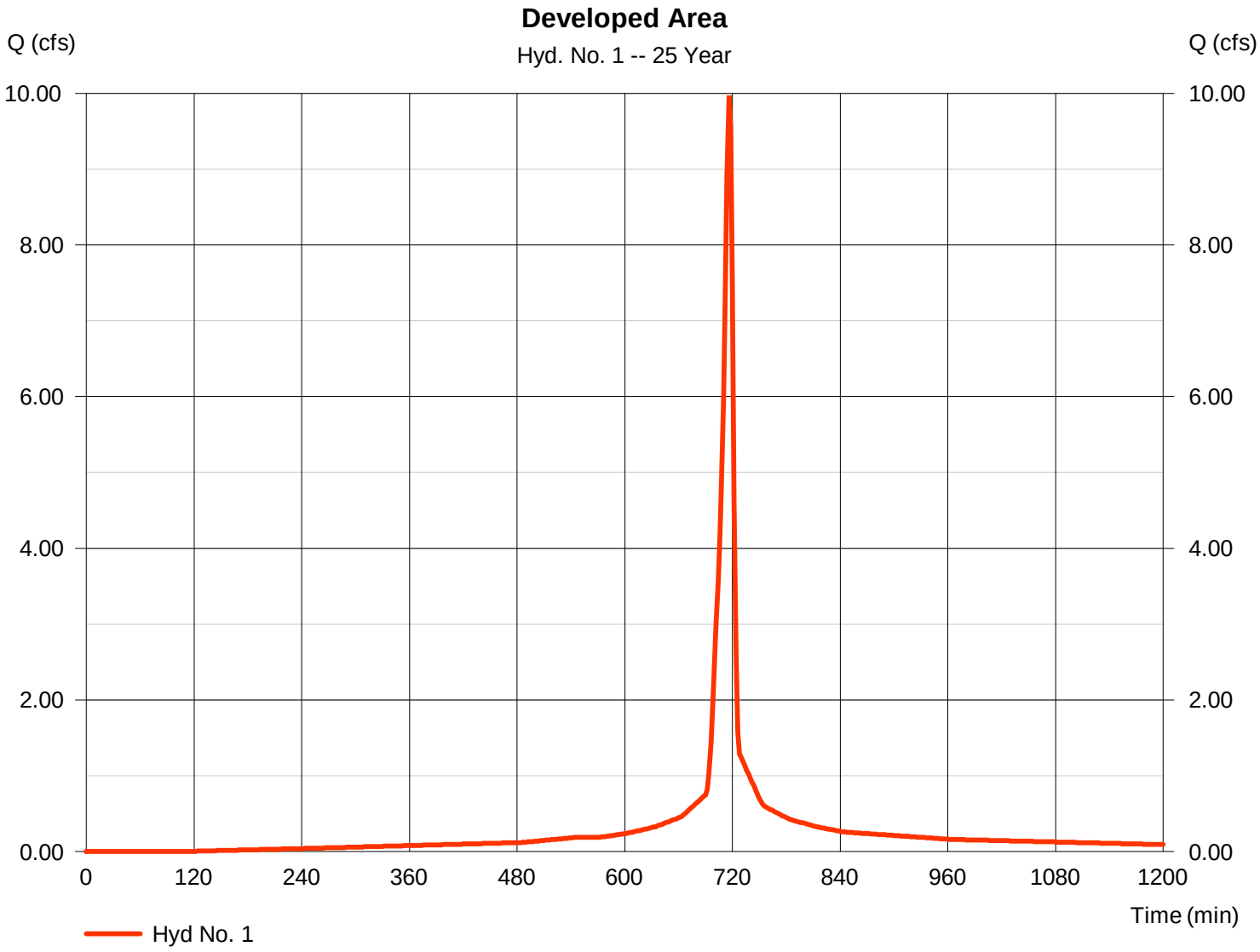
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	9.970	2	716	22,797	------	------	------	Developed Area
2	Reservoir	0.660	2	752	22,791	1	1012.12	13,754	<no description>

Hydrograph Report

Hyd. No. 1

Developed Area

Hydrograph type	= SCS Runoff	Peak discharge	= 9.970 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 22,797 cuft
Drainage area	= 1.100 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 6.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



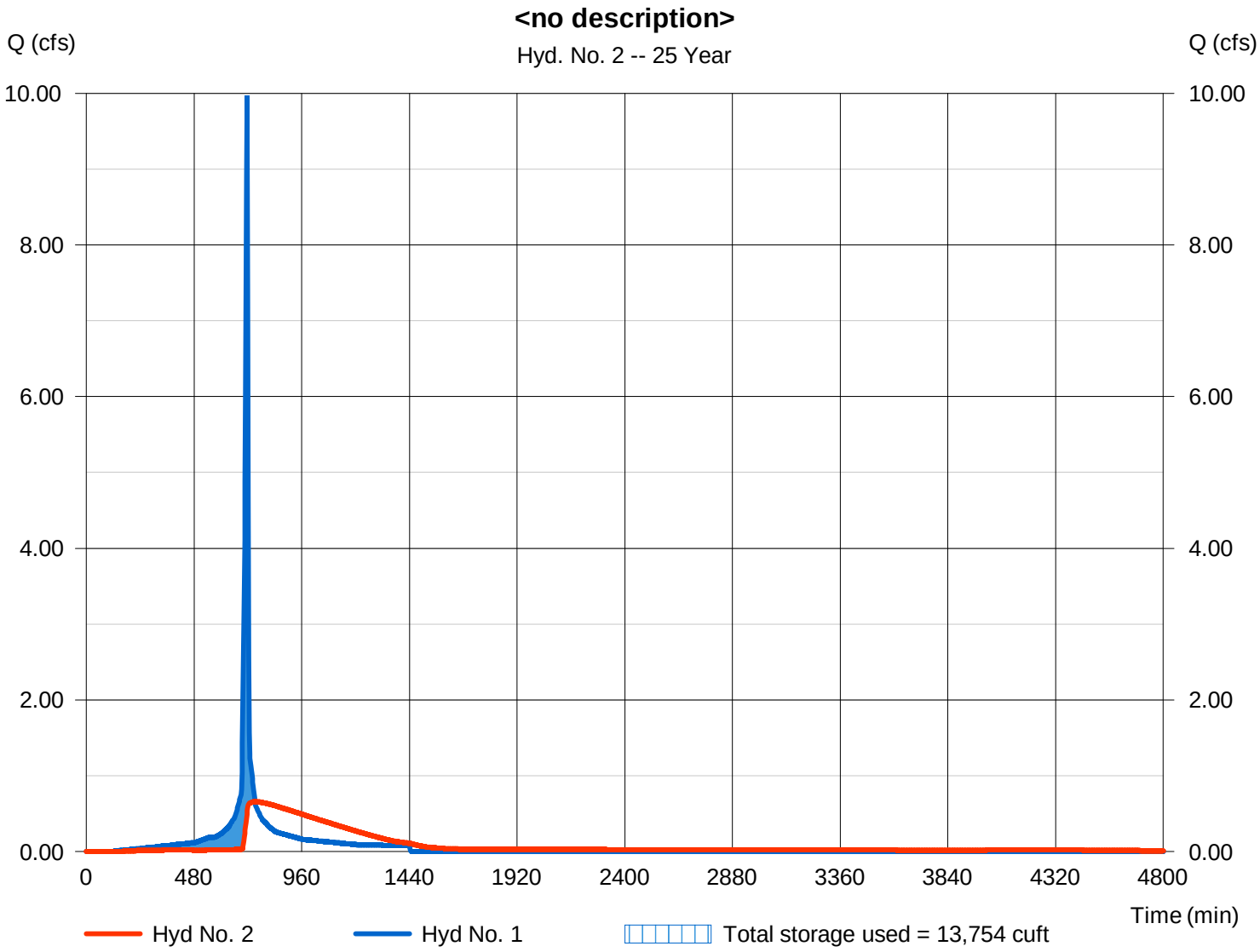
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	0.660 cfs
Storm frequency	=	25 yrs	Time to peak	=	752 min
Time interval	=	2 min	Hyd. volume	=	22,791 cuft
Inflow hyd. No.	=	1 - Developed Area	Max. Elevation	=	1012.12 ft
Reservoir name	=	Pond	Max. Storage	=	13,754 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

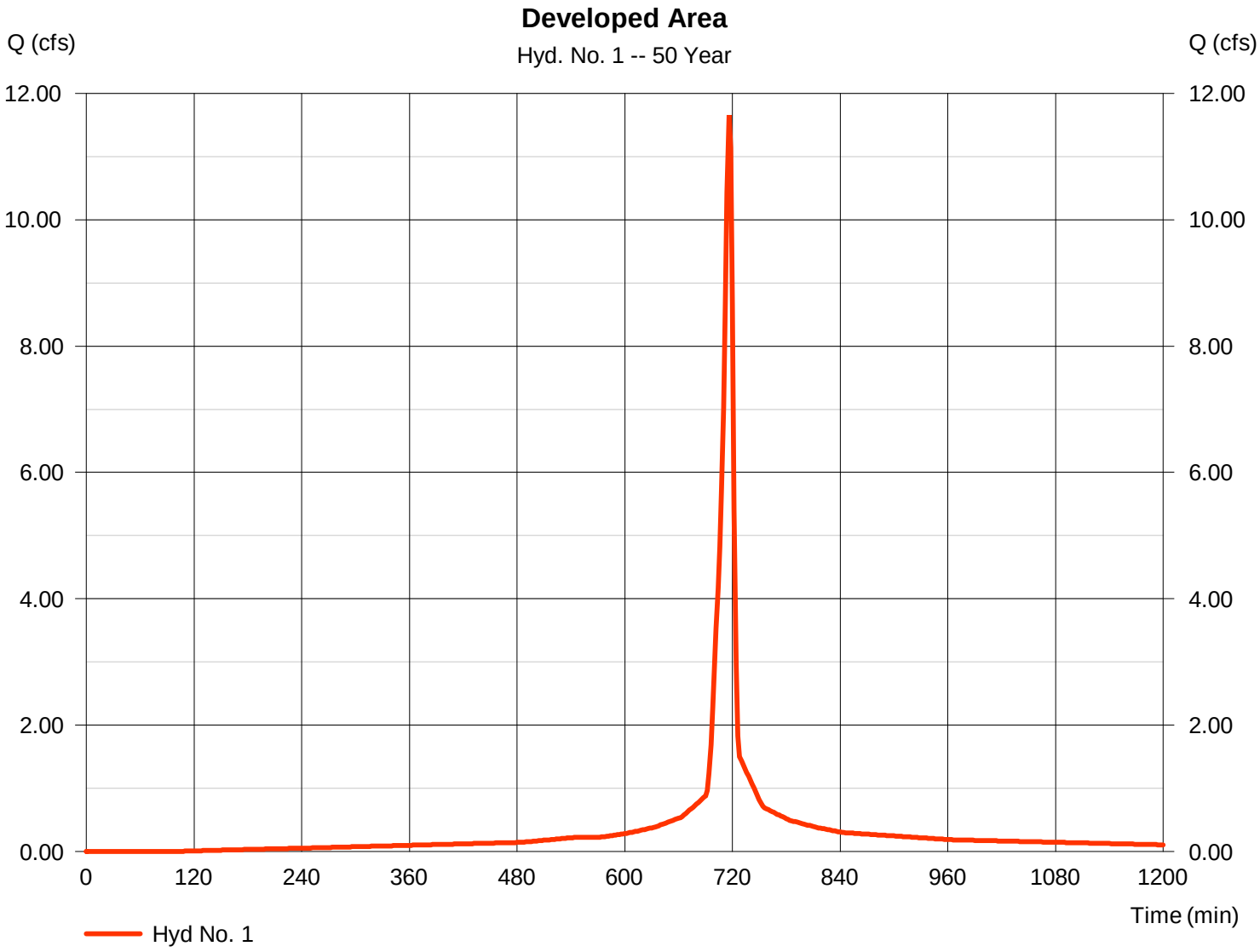
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	11.65	2	716	26,887	------	------	------	Developed Area
2	Reservoir	1.405	2	732	26,881	1	1012.76	15,567	<no description>

Hydrograph Report

Hyd. No. 1

Developed Area

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.65 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	26,887 cuft
Drainage area	=	1.100 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



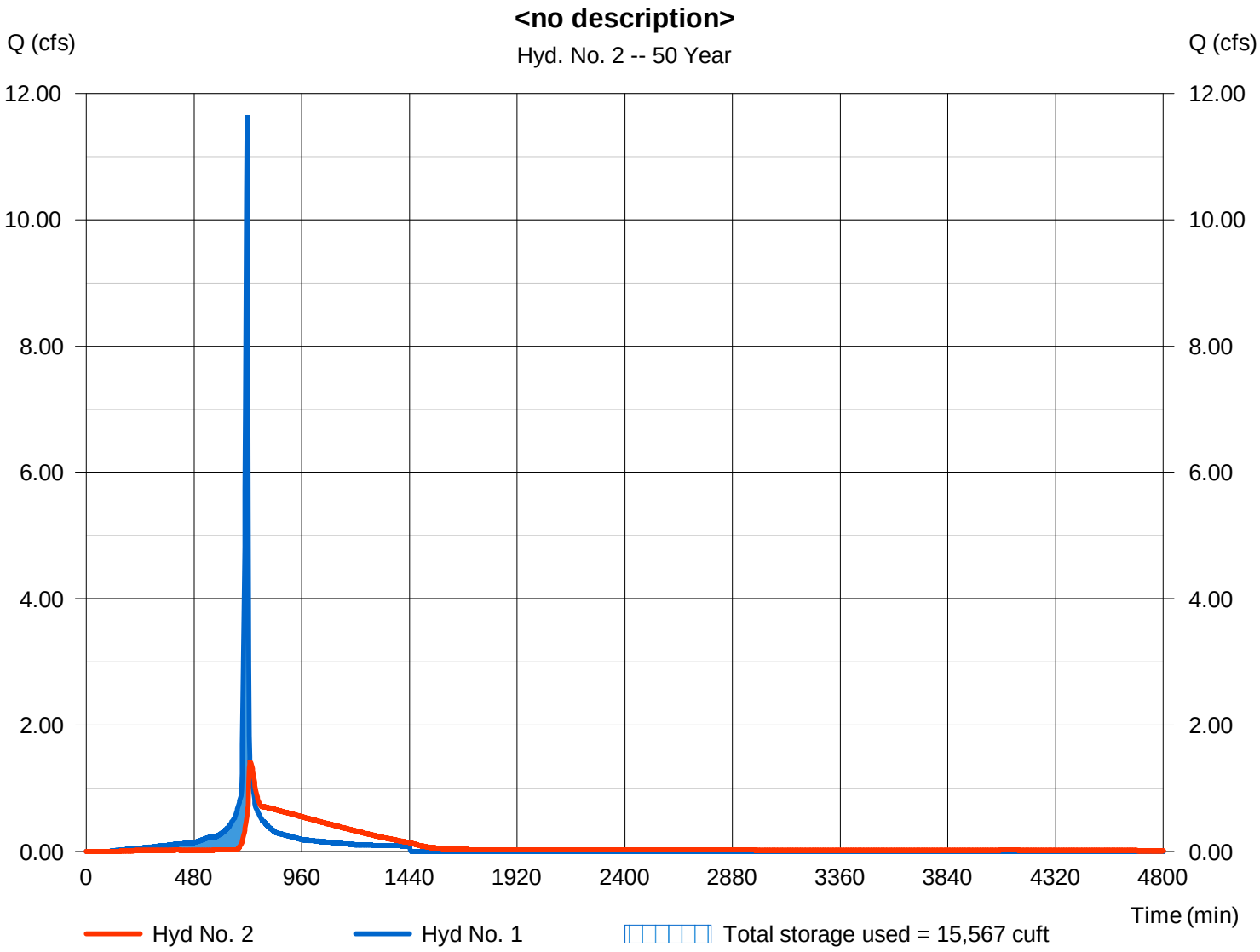
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	1.405 cfs
Storm frequency	=	50 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	26,881 cuft
Inflow hyd. No.	=	1 - Developed Area	Max. Elevation	=	1012.76 ft
Reservoir name	=	Pond	Max. Storage	=	15,567 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

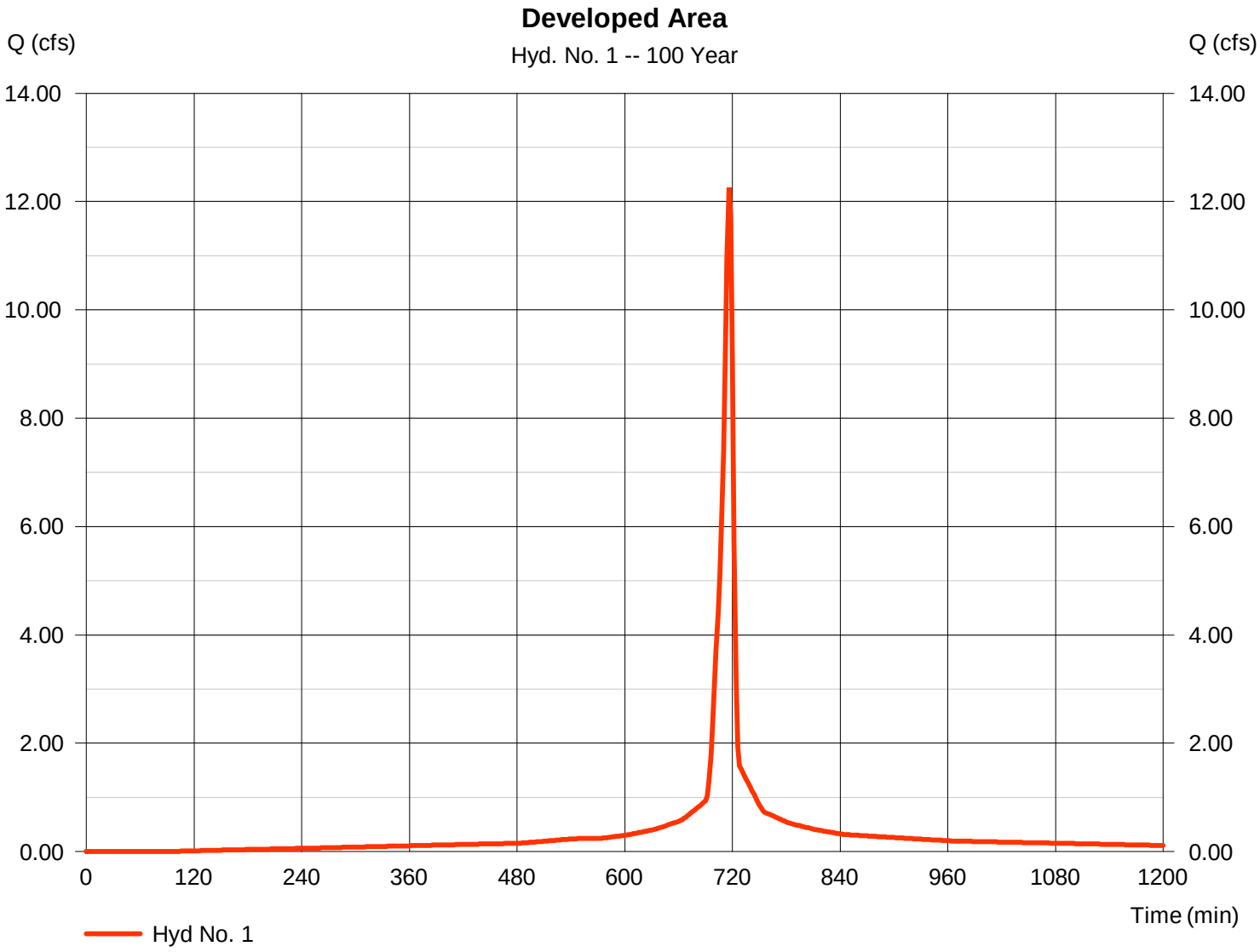
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	12.26	2	716	28,376	------	------	------	Developed Area
2	Reservoir	2.384	2	726	28,370	1	1012.97	16,047	<no description>

Hydrograph Report

Hyd. No. 1

Developed Area

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.26 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	28,376 cuft
Drainage area	=	1.100 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



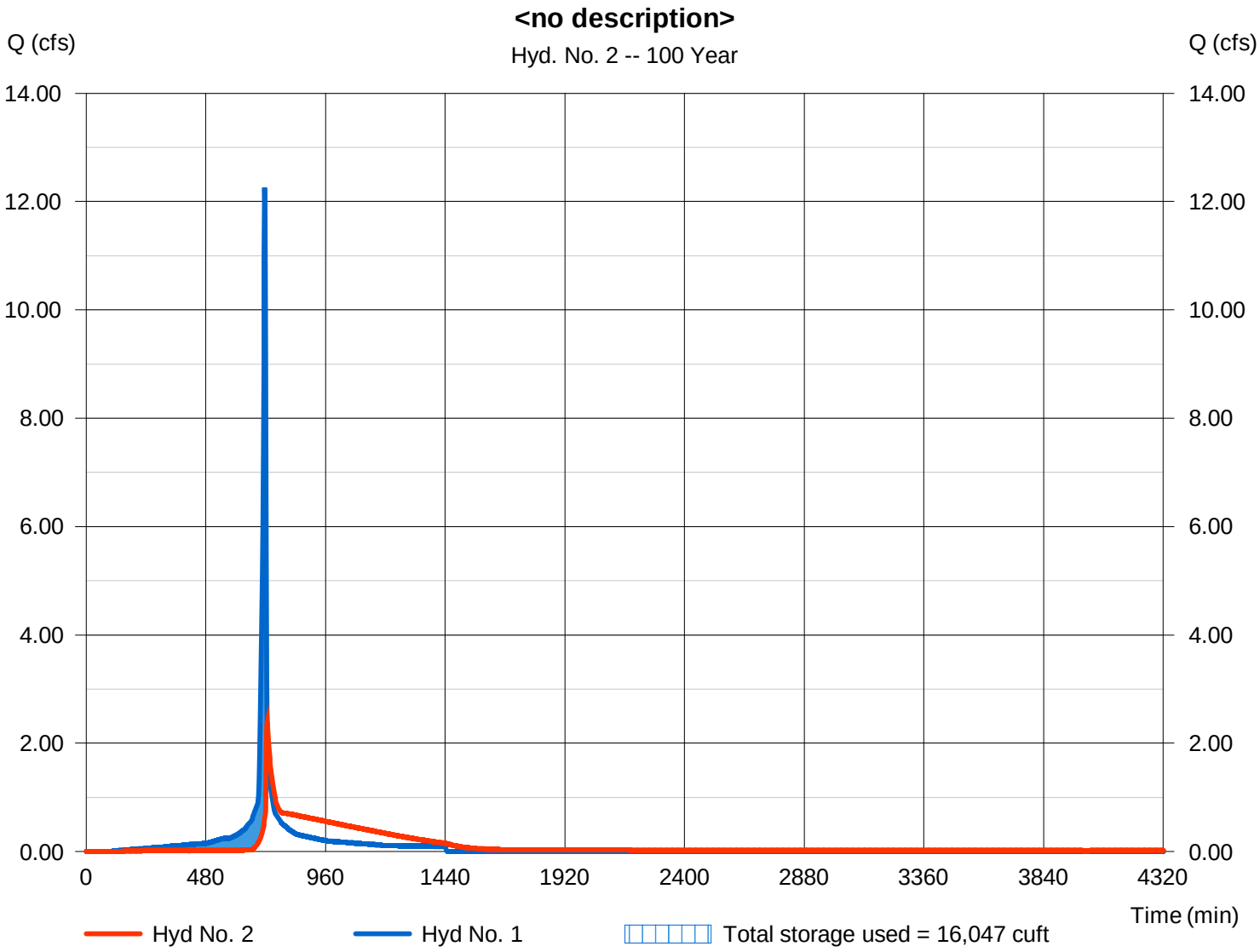
Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	=	Reservoir	Peak discharge	=	2.384 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	28,370 cuft
Inflow hyd. No.	=	1 - Developed Area	Max. Elevation	=	1012.97 ft
Reservoir name	=	Pond	Max. Storage	=	16,047 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	0.0000	0.0000	0.0000	--------
3	0.0000	0.0000	0.0000	--------
5	0.0000	0.0000	0.0000	--------
10	0.0000	0.0000	0.0000	--------
25	0.0000	0.0000	0.0000	--------
50	45.9758	3.8000	0.6466	--------
100	48.1629	3.4000	0.6312	--------

File name: Lee's Summit IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	11.27	8.42	6.90	5.92	5.23	4.72	4.32	3.99	3.72	3.49	3.30	3.13
100	12.57	9.36	7.66	6.58	5.83	5.26	4.82	4.46	4.16	3.91	3.70	3.51

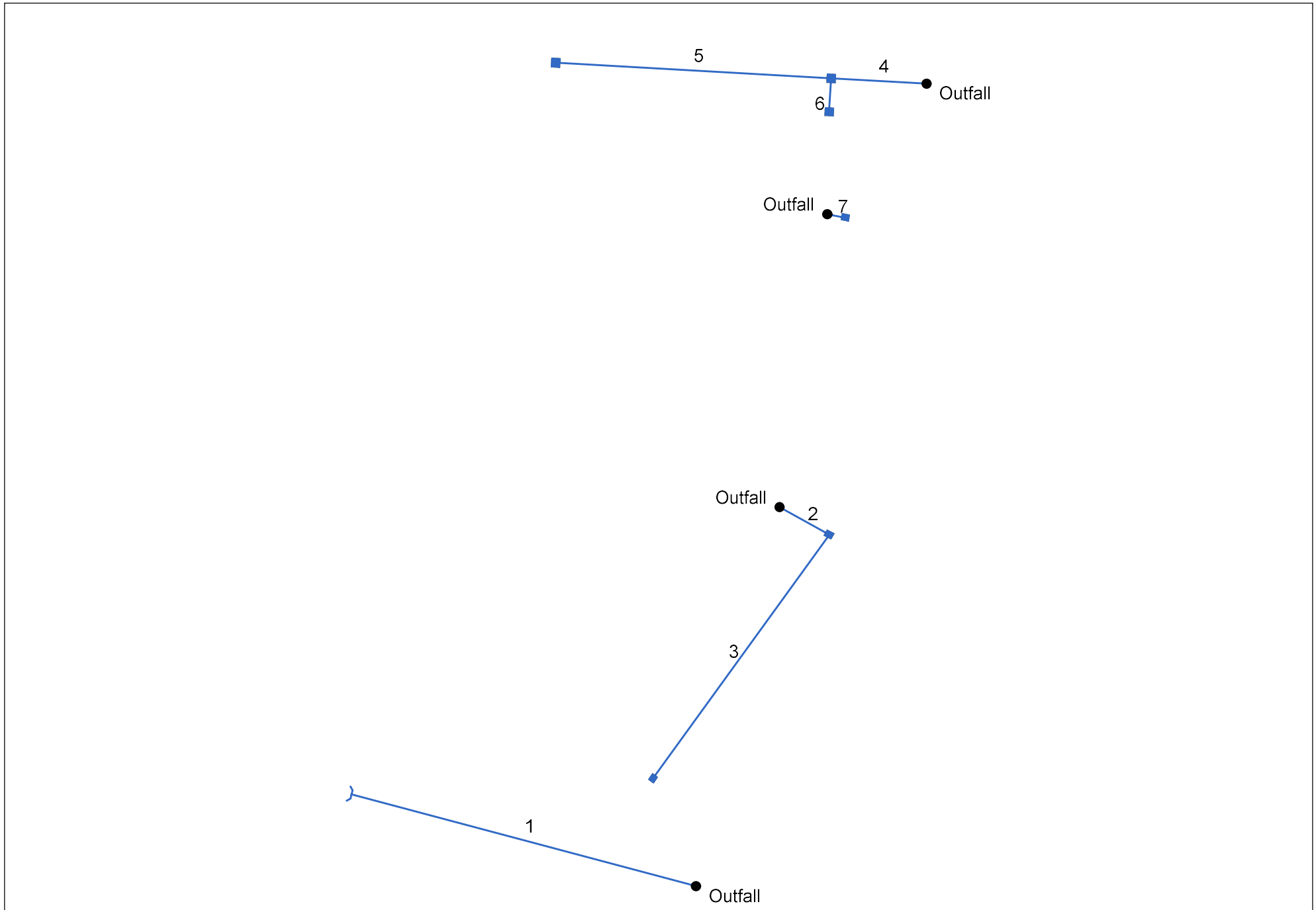
Tc = time in minutes. Values may exceed 60.

Precip. file name: G:\Projects\Cross Development\Lee's Summit, MO\Documents\SWM Design\Calculations\rainfall.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.80	0.00	0.00	5.50	6.80	7.90	8.30
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix C

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: CC Lees Summit MO Storm Sewers (2021 - 0722).stm	Number of lines: 7	Date: 7/22/2021

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	R1-R2	9.26	18	Cir	164.400	1015.15	1016.00	0.517	1016.33*	1017.64*	0.43	1018.07	End	OpenHeadwall
2	UGD-4	7.33	18	Cir	26.209	1009.20	1009.50	1.145	1010.25	1010.55	n/a	1010.55 j	End	Combination
3	4-5	6.00	18	Cir	138.832	1009.70	1011.00	0.936	1010.55	1011.95	n/a	1011.95	2	Combination
4	1-1A	9.72	18	Cir	44.108	1007.60	1008.10	1.134	1008.80	1009.30	n/a	1009.30	End	Manhole
5	1A-1B	7.69	18	Cir	127.189	1008.30	1009.60	1.022	1009.30	1010.67	n/a	1010.67	4	DropCurb
6	1A-2	2.30	18	Cir	15.501	1008.30	1008.50	1.290	1009.30	1009.07	n/a	1009.07	4	Manhole
7	UGD-3	2.94	18	Cir	8.339	1007.80	1007.90	1.200	1008.45	1008.55	n/a	1008.55	End	Combination

Project File: CC Lees Summit MO Storm Sewers (2021 - 0722).stm | Number of lines: 7 | Run Date: 7/22/2021

NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	164.400	0.94	0.94	0.52	0.49	0.49	5.0	5.0	12.6	9.26	8.18	5.73	18	0.52	1015.15	1016.00	1016.33	1017.64	1017.36	1018.21	R1-R2
2	End	26.209	0.15	0.77	0.90	0.14	0.61	5.0	5.7	12.0	7.33	12.17	5.55	18	1.14	1009.20	1009.50	1010.25	1010.55	1016.04	1015.60	UGD-4
3	2	138.832	0.62	0.62	0.77	0.48	0.48	5.0	5.0	12.6	6.00	11.01	5.47	18	0.94	1009.70	1011.00	1010.55	1011.95	1015.60	1015.00	4-5
4	End	44.108	0.00	1.70	0.90	0.00	0.61	5.0	5.5	12.1	9.72	12.11	6.41	18	1.13	1007.60	1008.10	1008.80	1009.30	1012.91	1016.00	1-1A
5	4	127.189	1.70	1.70	0.36	0.61	0.61	5.0	5.0	12.6	7.69	11.50	5.91	18	1.02	1008.30	1009.60	1009.30	1010.67	1016.00	1013.50	1A-1B
6	4	15.501	0.00	0.00	0.90	0.00	0.00	5.0	5.0	0.0	2.30	12.92	2.77	18	1.29	1008.30	1008.50	1009.30	1009.07	1016.00	1016.20	1A-2
7	End	8.339	0.26	0.26	0.90	0.23	0.23	5.0	5.0	12.6	2.94	12.46	4.00	18	1.20	1007.80	1007.90	1008.45	1008.55	1015.60	1015.40	UGD-3

Project File: CC Lees Summit MO Storm Sewers (2021 - 0722).stm

Number of lines: 7

Run Date: 7/22/2021

NOTES:Intensity = 48.16 / (Inlet time + 3.40) ^ 0.63; Return period =Yrs. 100 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	R2	9.26*	0.00	9.26	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	4	1.70	0.00	1.70	0.00	Comb	6.0	3.58	3.09	2.98	1.98	Sag	2.00	0.050	0.020	0.000	0.20	6.95	0.20	6.95	0.0	Off
3	5	6.00	0.00	6.00	0.00	Comb	6.0	3.58	3.09	2.98	1.98	Sag	2.00	0.050	0.020	0.000	0.39	16.58	0.39	16.58	0.0	Off
4	1A	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
5	1B	7.69	0.00	7.69	0.00	DrCrb	6.0	15.35	0.00	0.00	0.00	Sag	0.00	0.020	0.020	0.000	0.30	15.16	0.30	15.16	0.0	Off
6	2	2.30*	0.00	0.00	2.30	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
7	3	2.94	0.00	2.94	0.00	Comb	6.0	3.58	3.09	2.98	1.98	Sag	2.00	0.050	0.020	0.000	0.26	10.18	0.26	10.18	0.0	Off

This 2.30 cfs of discharge added to the system is the discharge of the 100-year, 24-hour storm event from the underground detention system. This value was calculated utilizing HydroCAD and these calculation can be found in Appendix B of this report.

This 9.26 cfs of discharge added to the system is the sum of the runoff directed to inlet "R-2", the runoff directed to inlet "EX-1", and the runoff directed to inlet "EX-2". Reference the Inlet Area Map included in Appendix A of the report for clarification. This combined discharge represents the approximate total runoff discharged to inlet R-2 via the ditch on the north margin of the right-of-way of SE Blue Parkway.

Project File: CC Lees Summit MO Storm Sewers (2021 - 0722).stm | Number of lines: 7 | Run Date: 7/22/2021

NOTES: Inlet N-Values = 0.016; Intensity = 48.16 / (Inlet time + 3.40) ^ 0.63; Return period = 100 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Appendix D

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER:	DIRK HUDSON 816-602-4201 DIRK.HUDSON@ADS-PIPE.COM
ADS SALES REP:	DUSTIN KETCHUM 316-201-7032 DUSTIN.KETCHUM@ADS-PIPE.COM
PROJECT NO:	S248764

Advanced Drainage Systems, Inc.

SiteASSIST™
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

CALIBER COLLISION

LEE'S SUMMIT, MO

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 450 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT

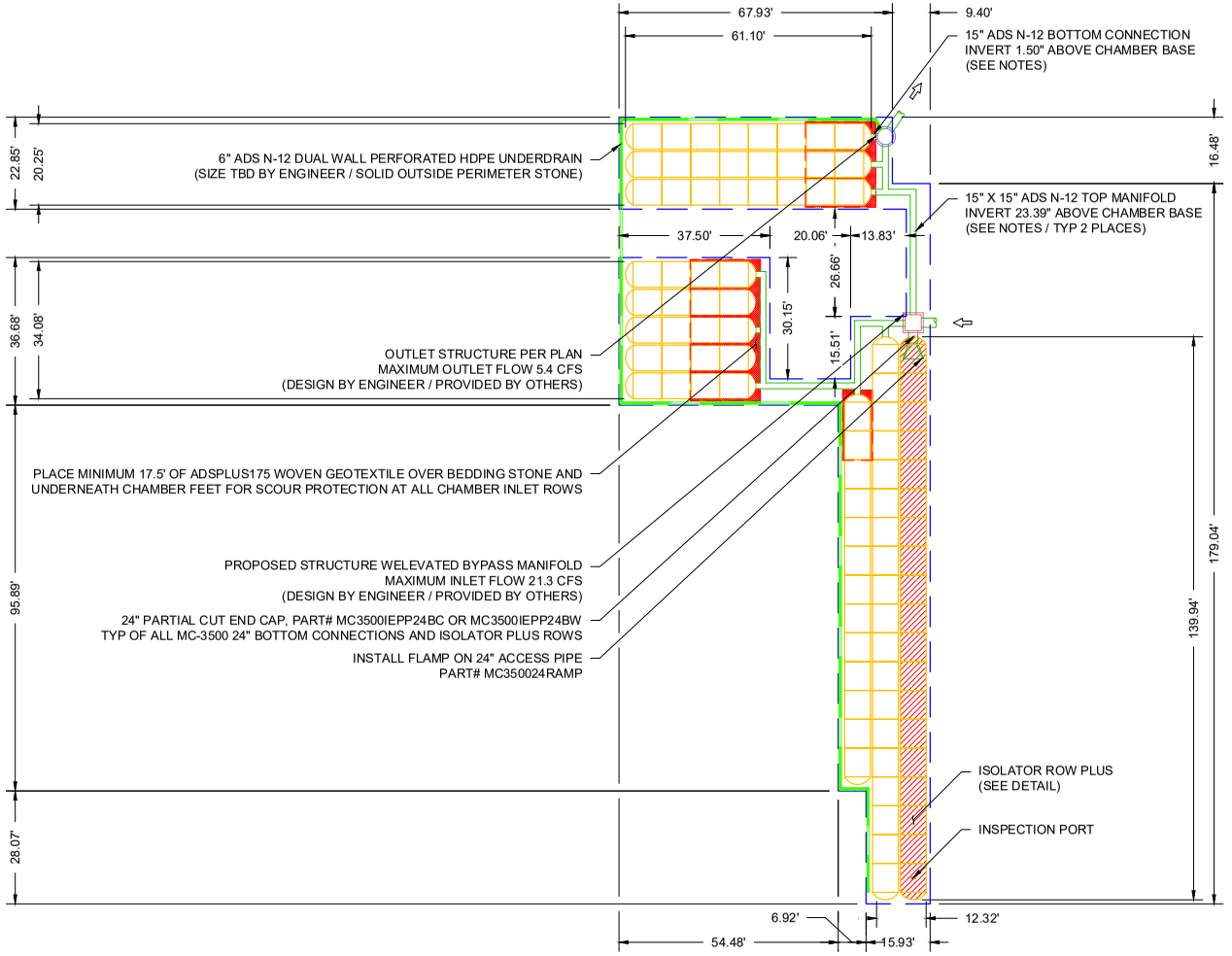
95	STORMTECH MC-3500 CHAMBERS
22	STORMTECH MC-3500 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
30	% STONE VOID
18,021	**INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED)**
6351	SYSTEM AREA (ft²)
749	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS

1021.00	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED)
1015.00	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC)
1014.50	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC)
1014.50	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)
1014.50	MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)
1014.00	TOP OF STONE
1013.00	TOP OF MC-3500 CHAMBER
1011.37	15" TOP MANIFOLD INVERT
1009.42	24" ISOLATOR ROW PLUS CONNECTION INVERT
1009.38	15" BOTTOM CONNECTION INVERT
1009.25	BOTTOM OF MC-3500 CHAMBER
1008.50	UNDERDRAIN INVERT
1008.50	BOTTOM OF STONE

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECHNICAL NOTE 6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.



CALIBER COLLISION
LEE'S SUMMIT, MO

DATE: 07-16-21 | DRAWN: RSG | CHECKED: AGC
PROJECT #: S248764

DATE	DRWN	CHKD	DESCRIPTION
07-21-21	RSG	AGC	REMOVED SECOND WQ STRUCTURE

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

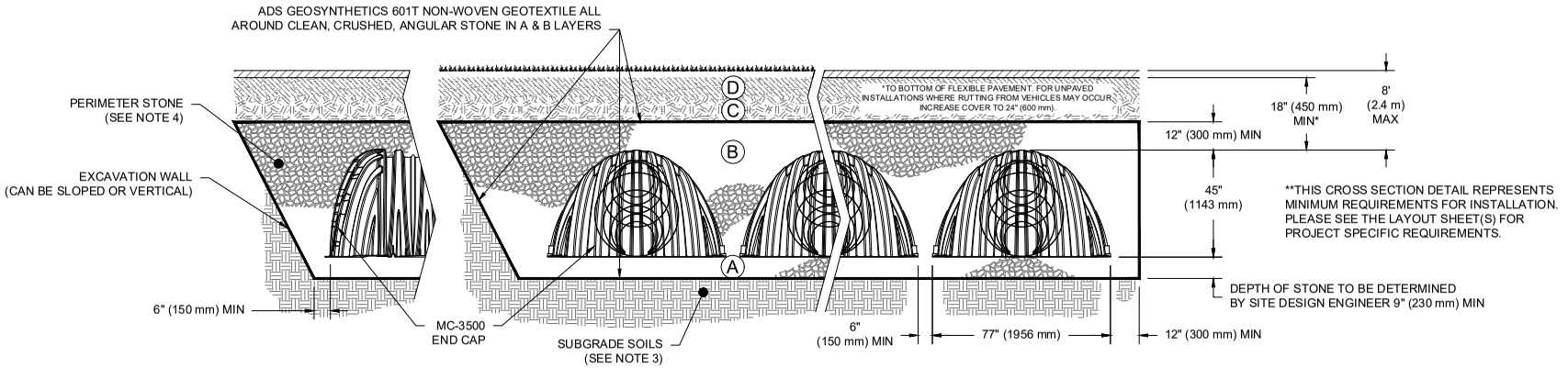
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026

0 30' 60'

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

CALIBER COLLISION
LEE'S SUMMIT, MO
DATE: 07-16-21 | DRAWN: RSG | PROJECT #: S248764 | CHECKED: AGC

DATE	DRWN	CHKD	DESCRIPTION
07-21-21	RSG	AGC	REMOVED SECOND WQ STRUCTURE

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ADS
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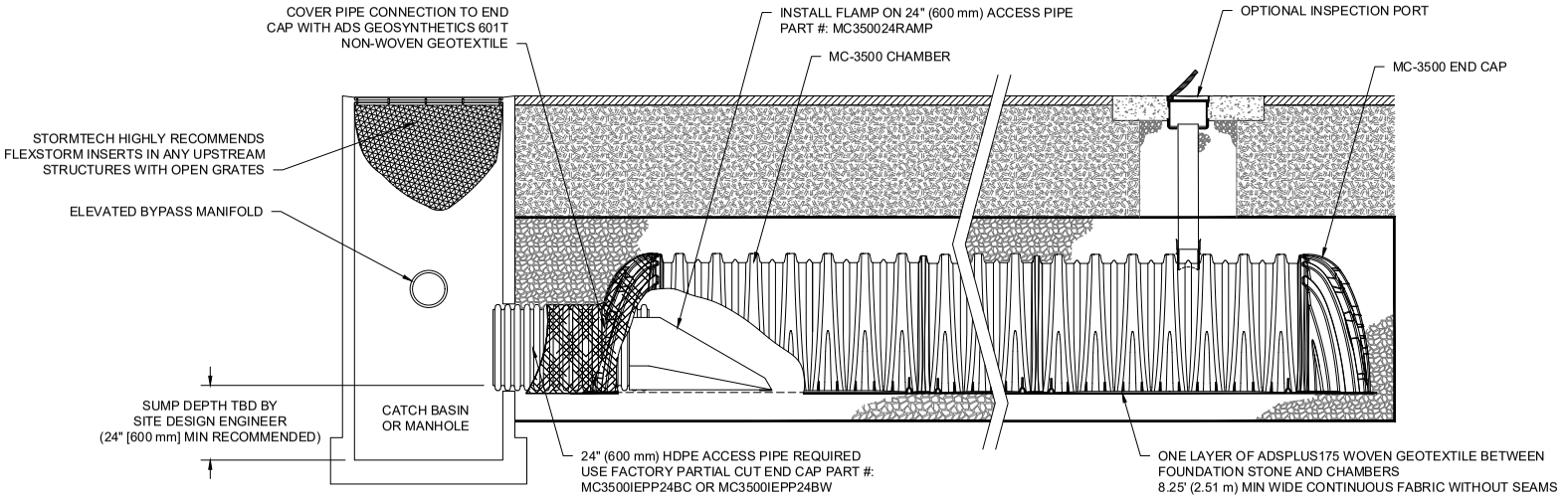


MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

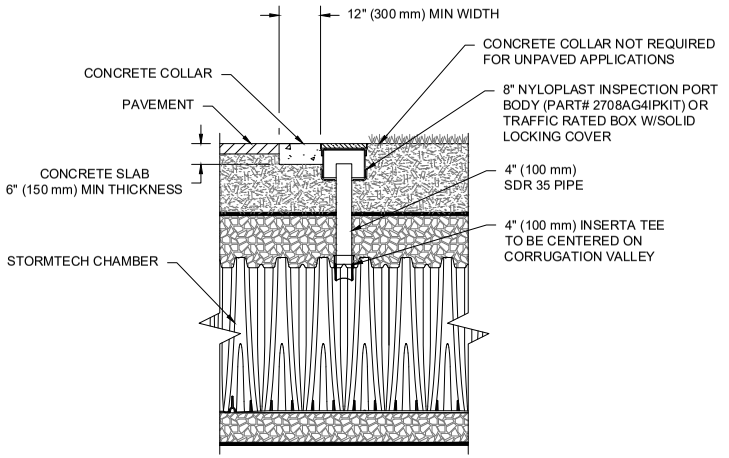
STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)
NTS

CALIBER COLLISION
LEE'S SUMMIT, MO
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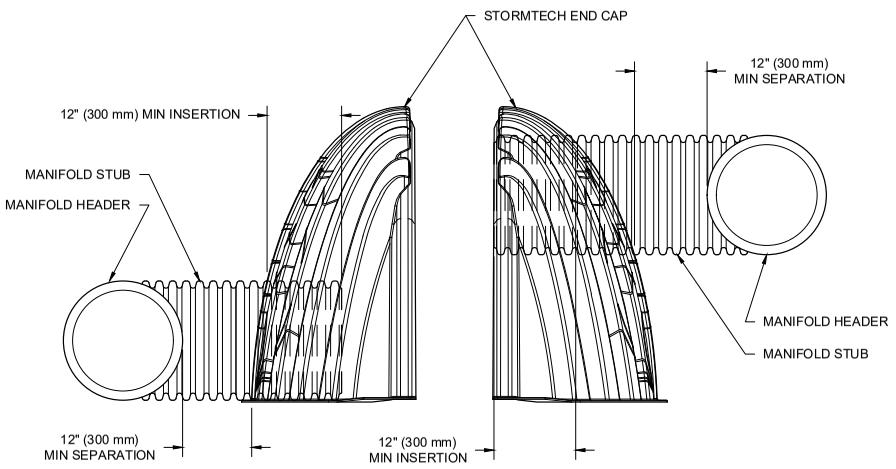
MC-SERIES END CAP INSERTION DETAIL

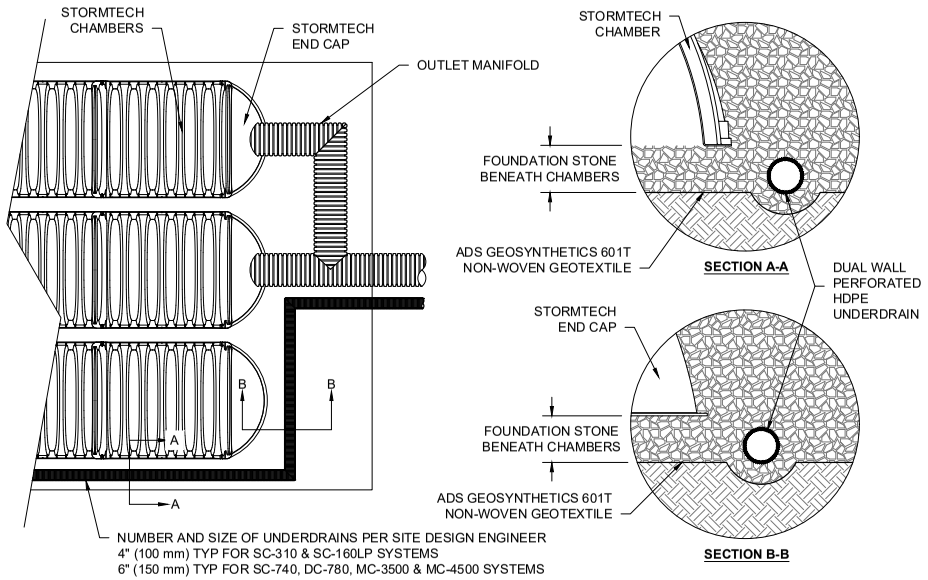
NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

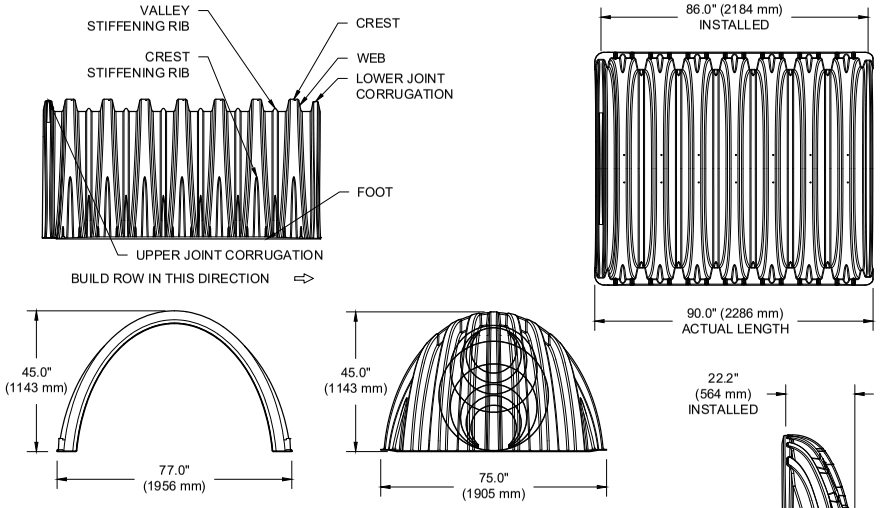
UNDERDRAIN DETAIL

NTS



MC-3500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

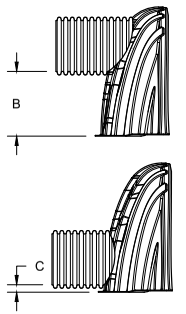
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" (152 mm) STONE BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PARTIAL CUT INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

CALIBER COLLISION
LEE'S SUMMIT, MO
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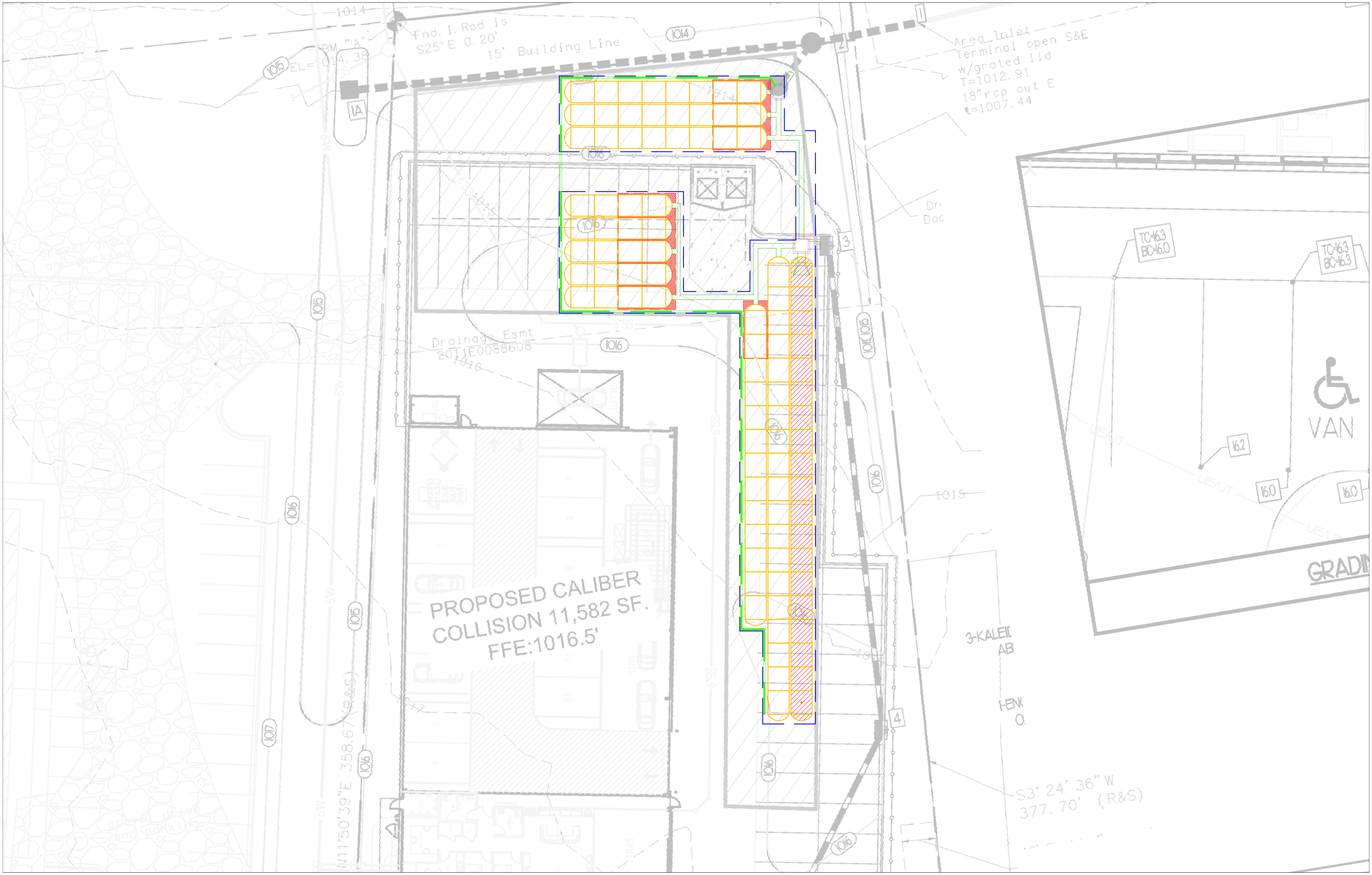

Fnd. I. Rod is
S25°E 0.20'
15' Building Line
Area Inlet
Terminal open S&E
w/grated lid
T=1012.91
18"rcp out E
Drainage Esmt
2011E0088608
PROPOSED CALIBER
COLLISION 11,582 SF.
FFE:1016.5'
S3°24'36"W
377.70' (R&S)
N11°50'39"E 358.67' (R&S)
VAN
GRADI

Project: **Caliber Collision**

Chamber Model -	MC-3500	
Units -	**Imperial**	Click Here for Metric
Number of Chambers -	95	
Number of End Caps -	22	
Voids in the stone (porosity) -	30	%
Base of Stone Elevation -	1008.50	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	9	in
Amount of Stone Between Chambers -	6	in
Area of system -	6351	sf Min. Area - 5067 sf min. area

☑ Include Perimeter Stone in Calculations

StormTech MC-3500 Cumulative Storage Volumes

Height of System (inches)	Incremental Single Chamber (cubic feet)	Incremental Single End Cap (cubic feet)	Incremental Chambers (cubic feet)	Incremental End Cap (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch, EC and Stone (cubic feet)	Cumulative System (cubic feet)	Elevation (feet)
66	0.00	0.00	0.00	0.00	158.78	158.78	18020.96	1014.00
65	0.00	0.00	0.00	0.00	158.78	158.78	17862.19	1013.92
64	0.00	0.00	0.00	0.00	158.78	158.78	17703.41	1013.83
63	0.00	0.00	0.00	0.00	158.78	158.78	17544.64	1013.75
62	0.00	0.00	0.00	0.00	158.78	158.78	17385.86	1013.67
61	0.00	0.00	0.00	0.00	158.78	158.78	17227.09	1013.58
60	0.00	0.00	0.00	0.00	158.78	158.78	17068.31	1013.50
59	0.00	0.00	0.00	0.00	158.78	158.78	16909.54	1013.42
58	0.00	0.00	0.00	0.00	158.78	158.78	16750.76	1013.33
57	0.00	0.00	0.00	0.00	158.78	158.78	16591.99	1013.25
56	0.00	0.00	0.00	0.00	158.78	158.78	16433.21	1013.17
55	0.00	0.00	0.00	0.00	158.78	158.78	16274.44	1013.08
54	0.06	0.00	5.52	0.00	157.12	162.64	16115.66	1013.00
53	0.19	0.02	18.44	0.53	153.09	172.05	15953.02	1012.92
52	0.29	0.04	27.93	0.83	150.15	178.90	15780.97	1012.83
51	0.40	0.05	38.35	1.13	146.93	186.41	15602.07	1012.75
50	0.69	0.07	65.28	1.49	138.74	205.51	15415.66	1012.67
49	1.03	0.09	97.69	1.94	128.89	228.52	15210.15	1012.58
48	1.25	0.11	118.71	2.36	122.46	243.52	14981.63	1012.50
47	1.42	0.13	135.11	2.78	117.41	255.30	14738.11	1012.42
46	1.57	0.14	149.45	3.18	112.99	265.61	14482.81	1012.33
45	1.71	0.16	162.18	3.58	109.05	274.81	14217.20	1012.25
44	1.83	0.18	173.71	4.00	105.46	283.17	13942.39	1012.17
43	1.94	0.20	184.09	4.41	102.23	290.72	13659.22	1012.08
42	2.04	0.22	193.88	4.80	99.17	297.85	13368.50	1012.00
41	2.13	0.23	202.80	5.17	96.39	304.35	13070.65	1011.92
40	2.22	0.25	211.30	5.51	93.73	310.54	12766.30	1011.83
39	2.31	0.27	219.15	5.84	91.28	316.27	12455.75	1011.75
38	2.38	0.28	226.55	6.16	88.96	321.67	12139.49	1011.67
37	2.46	0.29	233.61	6.47	86.75	326.83	11817.81	1011.58
36	2.53	0.31	240.18	6.77	84.69	331.64	11490.98	1011.50
35	2.59	0.32	246.41	7.07	82.73	336.21	11159.34	1011.42
34	2.66	0.33	252.33	7.36	80.87	340.55	10823.14	1011.33
33	2.72	0.35	257.93	7.63	79.10	344.67	10482.58	1011.25
32	2.77	0.36	263.27	7.92	77.42	348.61	10137.91	1011.17
31	2.82	0.37	268.34	8.19	75.82	352.35	9789.30	1011.08
30	2.88	0.38	273.17	8.45	74.29	355.91	9436.95	1011.00
29	2.92	0.40	277.79	8.71	72.82	359.33	9081.04	1010.92
28	2.97	0.41	282.14	8.97	71.44	362.55	8721.71	1010.83
27	3.01	0.42	286.18	9.21	70.16	365.55	8359.16	1010.75
26	3.05	0.43	290.06	9.45	68.92	368.43	7993.61	1010.67
25	3.09	0.44	293.96	9.69	67.68	371.33	7625.18	1010.58
24	3.13	0.45	297.40	9.92	66.58	373.90	7253.85	1010.50
23	3.17	0.46	300.74	10.14	65.51	376.39	6879.95	1010.42
22	3.20	0.47	303.95	10.35	64.48	378.79	6503.56	1010.33
21	3.23	0.48	306.96	10.56	63.52	381.04	6124.78	1010.25
20	3.26	0.49	309.83	10.76	62.60	383.19	5743.74	1010.17
19	3.29	0.50	312.57	10.96	61.72	385.25	5360.55	1010.08
18	3.32	0.51	315.21	11.14	60.87	387.22	4975.30	1010.00
17	3.34	0.51	317.69	11.32	60.07	389.08	4588.08	1009.92
16	3.37	0.52	320.02	11.49	59.32	390.83	4199.00	1009.83
15	3.39	0.53	322.29	11.65	58.59	392.53	3808.17	1009.75
14	3.41	0.54	324.38	11.80	57.92	394.10	3415.64	1009.67
13	3.44	0.54	326.52	11.95	57.24	395.70	3021.53	1009.58
12	3.46	0.55	328.48	12.09	56.60	397.17	2625.83	1009.50
11	3.48	0.56	330.48	12.21	55.97	398.66	2228.66	1009.42
10	3.51	0.59	332.98	13.09	54.95	401.03	1830.00	1009.33
9	0.00	0.00	0.00	0.00	158.78	158.78	1428.98	1009.25
8	0.00	0.00	0.00	0.00	158.78	158.78	1270.20	1009.17
7	0.00	0.00	0.00	0.00	158.78	158.78	1111.43	1009.08
6	0.00	0.00	0.00	0.00	158.78	158.78	952.65	1009.00
5	0.00	0.00	0.00	0.00	158.78	158.78	793.88	1008.92
4	0.00	0.00	0.00	0.00	158.78	158.78	635.10	1008.83
3	0.00	0.00	0.00	0.00	158.78	158.78	476.33	1008.75
2	0.00	0.00	0.00	0.00	158.78	158.78	317.55	1008.67
1	0.00	0.00	0.00	0.00	158.78	158.78	158.78	1008.58

Appendix E

Inspection Log and Reports

SWPPP Inspection Log

Name of Construction Site	Location of Construction Site

Date of Inspection	Inspector Name	Does Inspection Report require maintenance of installed BMPs?	
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No
		☐ Yes	☐ No

SWPPP Inspection Log (Continued)			
Date of Inspection	**Inspector Name**	**Does Inspection Report require maintenance of installed BMPs?**	
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**
		☐ **Yes**	☐ **No**

Appendix F

Rainfall Log and Reports

SWPPP Rainfall Records (January - June)										Year:	
January	Rainfall	February	Rainfall	March	Rainfall	April	Rainfall	May	Rainfall	June	Rainfall
1		1		1		1		1		1	
2		2		2		2		2		2	
3		3		3		3		3		3	
4		4		4		4		4		4	
5		5		5		5		5		5	
6		6		6		6		6		6	
7		7		7		7		7		7	
8		8		8		8		8		8	
9		9		9		9		9		9	
10		10		10		10		10		10	
11		11		11		11		11		11	
12		12		12		12		12		12	
13		13		13		13		13		13	
14		14		14		14		14		14	
15		15		15		15		15		15	
16		16		16		16		16		16	
17		17		17		17		17		17	
18		18		18		18		18		18	
19		19		19		19		19		19	
20		20		20		20		20		20	
21		21		21		21		21		21	
22		22		22		22		22		22	
23		23		23		23		23		23	
24		24		24		24		24		24	
25		25		25		25		25		25	
26		26		26		26		26		26	
27		27		27		27		27		27	
28		28		28		28		28		28	
29		29		29		29		29		29	
30				30		30		30		30	
31				31				31			

SWPPP Rainfall Records (July - December)										Year:	
July	Rainfall	August	Rainfall	September	Rainfall	October	Rainfall	November	Rainfall	December	Rainfall
1		1		1		1		1		1	
2		2		2		2		2		2	
3		3		3		3		3		3	
4		4		4		4		4		4	
5		5		5		5		5		5	
6		6		6		6		6		6	
7		7		7		7		7		7	
8		8		8		8		8		8	
9		9		9		9		9		9	
10		10		10		10		10		10	
11		11		11		11		11		11	
12		12		12		12		12		12	
13		13		13		13		13		13	
14		14		14		14		14		14	
15		15		15		15		15		15	
16		16		16		16		16		16	
17		17		17		17		17		17	
18		18		18		18		18		18	
19		19		19		19		19		19	
20		20		20		20		20		20	
21		21		21		21		21		21	
22		22		22		22		22		22	
23		23		23		23		23		23	
24		24		24		24		24		24	
25		25		25		25		25		25	
26		26		26		26		26		26	
27		27		27		27		27		27	
28		28		28		28		28		28	
29		29		29		29		29		29	
30		30		30		30		30		30	
31		31				31				31	

Appendix G

Additional Site Logs and Records

SWPPP Pre-Construction Conference Attendance Log

Date & Time	Description/Outline and Name of the Presenter of SWPPP and Site Requirements

Name	Company	Signature

SWPPP Pre-Construction Conference Attendance Log (Continued)

Name	Company	Signature

SWPPP Contractor & Sub-Contractor Log

Name of Construction Site	Location of Construction Site

Company/Individual Name		Work Responsibilities
1.)		
Start Date:		
Completion Date:		
2.)		
Start Date:		
Completion Date:		
3.)		
Start Date:		
Completion Date:		
4.)		
Start Date:		
Completion Date:		
5.)		
Start Date:		
Completion Date:		
6.)		
Start Date:		
Completion Date:		
7.)		
Start Date:		
Completion Date:		
8.)		
Start Date:		
Completion Date:		
9.)		
Start Date:		
Completion Date:		
10.)		
Start Date:		
Completion Date:		

SWPPP Contractor & Sub-Contractor Log (Continued)

11.)		
Start Date:		
Completion Date:		
12.)		
Start Date:		
Completion Date:		
13.)		
Start Date:		
Completion Date:		
14.)		
Start Date:		
Completion Date:		
15.)		
Start Date:		
Completion Date:		
16.)		
Start Date:		
Completion Date:		
17.)		
Start Date:		
Completion Date:		
18.)		
Start Date:		
Completion Date:		
19.)		
Start Date:		
Completion Date:		
20.)		
Start Date:		
Completion Date:		
21.)		
Start Date:		
Completion Date:		

SWPPP Modification Log

Name of Construction Site	Location of Construction Site

Type of Modification		Description of Modification		Location of Modification
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	

SWPPP Modification Log (Continued)

Name of Construction Site	Location of Construction Site

Type of Modification		Description of Modification		Location of Modification
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	
Type of Modification		**Description of Modification**		**Location of Modification**
☐ Major ☐ Minor				
Start Date:				
Completion Date:				
Reason for Modifications:			Approved/Implemented By:	

SWPPP Soil Stabilization Log

Name of Construction Site	Location of Construction Site

Type of Stabilization		Description of Stabilization		Location of Stabilization
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	

SWPPP Modification Log (Continued)

Name of Construction Site	Location of Construction Site

Type of Stabilization		Description of Stabilization		Location of Stabilization
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	
Type of Stabilization		**Description of Stabilization**		**Location of Stabilization**
☐ Final ☐ Temporary				
Initiate Date:				
Completion Date:				
Additional work proposed for this area:			Inspection Frequency for Stabilized Area:	