



City of Arvada

City Council Agenda

FEBRUARY 12, 2024
CITY COUNCIL CHAMBERS
Regular Business

Councilmembers:

Lauren Simpson, Mayor
Randy Moorman, Mayor Pro-Tem
Shawna Ambrose, District 2
Sharon Davis, At large
Lisa Feret, At large
Bob Fifer, District 4
John Marriott, District 3

Staff Members Usually Present:

Lorie Gillis, City Manager
Linda Haley, Deputy City Manager
Don Wick, Deputy City Manager
Rachel Morris, City Attorney
Jacqueline Rhoades, Director of Public Works
Sharon Israel, Director of Utilities
Jessica Garner, Director of Community & Econ. Dev.
Bryan Archer, Director of Finance
Gabiella Bommer, Director of Human Resources
Rachael Kuroiwa, Director of Communications & Engagement
Kristen Rush, City Clerk

Info: 720-898-7550

STUDY SESSION - TRAFFIC - THIRD FLOOR CONFERENCE ROOM
(The study session can only be watched via Zoom: tinyurl.com/arvadastudy)
4:00 P.M.

CITY COUNCIL MEETING – CITY COUNCIL CHAMBERS

6:00 PM

1. Call to Order - 6:00 PM
2. Moment of Reflection and Pledge of Allegiance - Councilmember Ambrose
3. Roll Call of Councilmembers
4. Approval of Minutes - None
5. Recognitions and Communications
 - A. Presentation of APWA Award for the Lake Arbor Restoration Project - Presented by Mayor Pro Tem Moorman
 - B. Recognition of the Infrastructure Work System for APWA Re-Accreditation - Presented by Councilmember Marriott
6. Presentations - None
7. Public Comment on Issues not Scheduled on Agenda - Three Minute Limit
8. New Business
 - A. Consent Agenda
 1. R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00

2. R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to Accommodate an Accessible Pedestrian Ramp for the Tenant Space at 7357 Grandview Avenue, Unit A, within Public Right of Way
3. R24-020, A Resolution Authorizing Change Order No. 5 to An Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for Construction of 18-ST-40 Ralston Road - Yukon Street to Garrison Street in an Amount not to Exceed \$17,724,045.35

B. Resolutions

1. R24-021, A Resolution Authorizing a Second Amendment to the Master Intergovernmental Agreement By and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex (Presenter: Enessa Janes, Director of Vibrant Community and Neighborhoods)
2. R24-022, A Resolution Authorizing an Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line (Presented by Sharon Israel, Director of Utilities)

C. Ordinances (First Reading)

1. CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code (Public Hearing to be set for March 4, 2024 at 6:15 p.m.) (Presenter: Sharon Israel, Director of Utilities)

9. Other

- A. Motion to cancel March 11, 2024, City Council Meeting

10. Public Hearings - 6:15 PM

- A. CB24-001, An Ordinance Amending Various Provisions of Arvada's Land Development Code Pertaining to Floodplain Regulation (Ordinance No. 4867) (Presenter: Melanie Walter, Floodplain Administrator)

11. Public Comment - Five Minute Limit

12. Reports from City Council

- A. Council Committee Reports

13. Reports from City Manager

- A. Review of Future Workshops and Presentations

14. Reports from City Attorney

15. Adjournment



REPORT TO CITY COUNCIL

AGENDA ITEM
5.A.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: Presentation of APWA Award for the Lake Arbor Restoration Project - Presented by Mayor Pro Tem Moorman

Report in Brief

The Colorado Chapter of the American Public Works Association (APWA) has awarded Lake Arbor restoration as project of the year in the environment category for a large community. This award is in recognition of extraordinary municipal projects in the state of Colorado.

Pete Adler, APWA Colorado Chapter Delegate, will present the award for the Lake Arbor Restoration project that was completed in the summer of 2023.

Prepared by:
Melanie Walter, Engineering Manager

Reviewed by:

Approved by:

Jenny Wolfschlag, City Engineer	12/18/2023
Jacqueline Rhoades, Public Works Director	1/24/2024
Bryan Archer, Director of Finance	1/25/2024
Tammy Hedlund, Legal Specialist	1/25/2024
Erika Pierce, Litigation Paralegal	1/25/2024
Kelsy Sargent, Assistant City Attorney	1/26/2024
Jessica Morales, Assistant City Attorney	1/29/2024
Don Wick, Deputy City Manager	1/29/2024
Rachel Morris, City Attorney	1/31/2024
Linda Haley, Deputy City Manager	1/31/2024
Lorie Gillis, City Manager	1/31/2024

Enclosure, exhibits & attachments required to support the report



REPORT TO CITY COUNCIL

AGENDA ITEM
5.B.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: Recognition of the Infrastructure Work System for APWA Re-Accreditation - Presented by Councilmember Marriott

Report in Brief

The City of Arvada Public Works and Utilities Departments, which make up the Infrastructure Work System, were recently reaccredited with the American Public Works Association (APWA). The accreditation formally recognizes the City for being in full compliance with the recommended management practices in APWA's Public Works Management Practices Manual.

The purpose of accreditation is to promote excellence in the operation and management of a public works agency, its programs, and its employees. Accreditation is designed to assist in the continuous improvement of operations and management, and in providing a valid and objective evaluation of agency programs as a service to the public and the profession.

The City was first accredited in 2016 with re-accreditations in 2020 and 2023. The City is proud of the many hard working, dedicated team members who help to ensure the highest standards of excellence in maintaining this accreditation. Congratulations to the Infrastructure Work System for their achievement!

Prepared by:
Chris Koch, CCO Admin

Reviewed by:
Toni Riebschlager, Law Office Administrator 1/25/2024
Laura Hemler, Assistant City Attorney 1/25/2024

Approved by:

Jacqueline Rhoades, Public Works Director 1/24/2024
Rachel Morris, City Attorney 1/31/2024
Linda Haley, Deputy City Manager 1/31/2024
Lorie Gillis, City Manager 1/31/2024

Enclosure, exhibits & attachments required to support the report

presented to

***CITY OF ARVADA'S
INFRASTRUCTURE WORK
SYSTEM***

In recognition of their APWA Re-Accreditation

Presented this 12th day of February 2024

Lauren Simpson, Mayor

Randy Moorman, Mayor Pro Tem

Shawna Ambrose, Councilmember

Sharon Davis, Councilmember

Lisa Feret, Councilmember

Bob Fifer, Councilmember

John Marriott, Councilmember



REPORT TO CITY COUNCIL

AGENDA ITEM
8.A.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: Consent Agenda

Report in Brief

1.R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designsapes, Inc for Construction of the Standley Lake Library Trailhead (CSB23-VCN-119) in an Amount Not to Exceed \$742,000.00

2. R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to Accommodate an Accessible Pedestrian Ramp for the Tenant Space at 7357 Grandview Avenue, Unit A, within Public Right of Way

3.R24-020, A Resolution Authorizing Change Order No. 5 to An Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for Construction of 18-ST-40 Ralston Road - Yukon Street to Garrison Street in an Amount not to Exceed \$17,724,045.35

Suggested Motion: Moved by: _____ I move that the Consent Item(s),
Number(s)_____

be
(Removed from the Consent Agenda and Heard Upon Item _____) (Referred to a Workshop) (Postponed
Indefinitely).

YES _____ NO _____ ABSENT _____

That All/Remaining Consent Items be (Approved) (Rejected).

YES _____ NO _____ ABSENT _____

Prepared by:
Chris Koch, CCO Admin

Reviewed by:

Approved by:

Enclosure, exhibits & attachments required to support the report



REPORT TO CITY COUNCIL RESOLUTION

AGENDA ITEM
8.A.1.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00

Report in Brief

The City team received construction bids through the Competitive Sealed Bid (CSB) solicitation process for the construction of the Standley Lake Library Trailhead, a new trailhead located adjacent to the Standley Lake Library at 8485 Kipling Street, Arvada, CO 80005. Colorado Designscares has been selected for the trailhead construction project. The City is financing the construction of the Standley Lake Library Trailhead for a contract amount of \$742,000.00.

The Arvada team recommends that the City Council approve R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00.

Financial Impact

In 2021, through the Jefferson County Trails Partnership Program, the City was awarded funding for nearly half of the estimated cost of the trailhead construction: \$304,739.78. The City of Arvada is matching the remainder of the project cost, which is available in the CIP accounts 94590 and 91567.

As per the terms of the 2021 IGA with JCPL, the City of Arvada will be responsible for cleaning, repair and replacement of site features including the trails, furnishings, and signs. Upkeep of these site features will be financed using capital improvement funding at an estimated annual cost of \$5,000.

Background

In 2021, the City of Arvada applied for and was granted funding from the Jefferson County Partnership Program to build a trailhead at the Standley Lake Library. Arvada partnered closely with Jefferson County Public Library (JCPL) to conduct community outreach and planning around the design of the trailhead. The new trailhead will connect JCPL patrons to Jefferson County's outdoor systems and give them the opportunity to observe nature and resource conservation. Additionally, the trailhead will connect Arvada residents and visitors to the Rocky Mountain Greenway, Little Dry Creek, and Heritage Canal Trails.

The new Standley Lake Library Trailhead is within 1 mile of 4,063 households and is accessible by walking or biking from existing sidewalks along Kipling Street. The nearest trailhead serving RMG is 2.65 miles away in Westminster. The new trailhead includes a number of amenities such as a shelter and kiosk, seating, bicycle parking and repair station, interpretive and wayfinding signage, and ADA ramps.

In 2021, in order to clarify each organization's maintenance duties and ensure an organized partnership on trailhead programming and parking, Arvada and JCPL entered an intergovernmental agreement that delegates maintenance and other responsibilities. The intergovernmental agreement outlines maintenance and replacement responsibility and shared use of the facility, the existing 159-vehicle parking lot, and associated grounds.

Discussion

The 25-plus mile Rocky Mountain Greenway (RMG) is a system of uninterrupted multimodal trails linking three urban National Wildlife Refuges and many other locally-held parks, open spaces, and greenbelts throughout the Denver Metro area. Stretching across 4 miles in the City of Arvada alone, the RMG was completed and dedicated on June 4, 2016. No facilities currently exist to provide access points to the RMG from Standley Lake Public Library or the parking area.

The new trailhead is located on the west side of Standley Lake Library's parking lot and east of the RMG Trail, on library-owned land. The new trailhead will provide safe ADA access to Arvada trails, which doesn't currently exist in this location.

The RMG is a collaborative project endeavor with Federal, State, Local and Non-governmental agency partners working side by side to complete an ambitious vision. The trailhead will serve as a wayside accessory and education center supporting the RMG vision of conservation advocacy, reconnecting residents with the outdoors, and providing service expansion at this already-important community hub.

The trailhead at Standley Lake Library is necessary in order to resolve site condition obstacles and achieve accessibility. This project will enhance trail user experience by providing a place to park and meet friends for a hike, by providing wayfinding information, and highlighting nearby destinations and travel distances. The project supports not only RMG users, but users of Arvada's broader park and open space network, including Standley Lake Regional Park, Two Ponds National Wildlife Refuge, Arvada Volunteer Firefighters Park, Lakecrest Park, Michael Northey Park, Sierra West Lake Park, and Wood Run Park.

Public Contact

Posting of the City Council agenda.

Commission Recommendation

N/A

Strategic Alignment

The City's 2016 Parks, Trails and Open Space Master Plan identified this location as a park improvement priority area. Construction of the Standley Lake Library Trailhead achieves the goals of activating parks, trails and open spaces; providing new parks and improvements to existing parks; and encouraging access to healthy living for all.

Alternative Courses of Action

Alternative No. 1: Approve R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00.

Alternative No. 2: Do not approve R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00.

Recommendation for Action

The Arvada team recommends that the City Council approve Alternative No. 1.

Approve R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00.

Suggested Motion:

SUBJECT: R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00

PAGE: 3
ITEM: 8.A.1.

I move that R24-018, A Resolution Authorizing An Agreement Between the City of Arvada and Colorado Designscares, Inc for Construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) in an Amount Not to Exceed \$742,000.00, be (approved) (rejected).

Prepared by:

Enessa Janes, Director of Vibrant Community and Neighborhoods

Reviewed by:

Approved by:

Enessa Janes, Director of Vibrant Community and Neighborhoods	1/17/2024
Bryan Archer, Director of Finance	1/17/2024
Gail Walker, Legal Specialist-Contracts	1/24/2024
Kylie Justus, Assistant City Attorney	1/24/2024
Don Wick, Deputy City Manager	1/24/2024
Laura Hemler, Assistant City Attorney	1/29/2024
Rachel Morris, City Attorney	1/31/2024
Lorie Gillis, City Manager	1/31/2024

Enclosure, exhibits & attachments required to support the report

RESOLUTION NO. R24-018

A RESOLUTION AUTHORIZING AN AGREEMENT BETWEEN THE CITY
OF ARVADA AND COLORADO DESIGNSCAPES, INC FOR
CONSTRUCTION OF THE STANDLEY LAKE LIBRARY TRAILHEAD (CSB
23-VCN-119) IN AN AMOUNT NOT TO EXCEED \$742,000.00

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ARVADA, COLORADO:

Section 1. The Mayor or Mayor Pro Tem is authorized to sign and the City Clerk to attest, in a form approved by the City Attorney, an agreement, which is in substantially the same form as attached between the City of Arvada and Colorado Designscares, Inc. for construction of the Standley Lake Library Trailhead in an amount not to exceed \$742,000.00.

Section 2. This resolution shall be effective upon its approval by the City Council.

APPROVED AND ADOPTED this 12th day of February, 2024

Lauren Simpson, Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:
Rachel A. Morris, City Attorney

By: _____

**AN AGREEMENT BY AND BETWEEN THE CITY OF ARVADA AND
COLORADO DESIGNSCAPES, INC
FOR CONSTRUCTION OF THE STANDLEY LAKE LIBRARY TRAILHEAD
(CSB 23-VCN-119) IN AN AMOUNT NOT TO EXCEED \$742,000.00**

This Agreement made this _____ day of _____, 2024, by and between the City of Arvada, a home rule municipal corporation (“Arvada” and/or “City”) and Colorado Designscares, Inc, a Colorado corporation with a principal address of 15440 E. Fremont Dr., Centennial, CO 80112 (“Contractor”).

WITNESSETH: That for and in consideration of the covenants, promises, and payments hereinafter mentioned:

WITNESSETH:

WHEREAS, Arvada solicited proposals from interested construction professionals for the provision of construction services related to construction of the Standley Lake Library Trailhead (CSB 23-VCN-119) as described in the Contract Documents (the “Project” or the “Work”); and

WHEREAS, based on Contractor’s submissions, Arvada has selected Contractor for the Project; and

WHEREAS, Arvada and Contractor desire to enter into this Agreement regarding the construction of the Project.

NOW, THEREFORE, for and in consideration of the covenants, promises, and payments hereinafter mentioned, the parties agree as follows:

ARTICLE 1. GENERAL DESCRIPTION OF SERVICES

- 1.1. **The Services.** Contractor agrees to furnish or arrange for the construction services set forth in the Contract Documents and required for the completion of the Project within the timeframe provided in the Contract Documents. Contractor represents that it is thoroughly familiar with, and understands, the requirements of the Project’s scope and is experienced in the construction of projects of the type and scope contemplated by the Contract Documents. Contractor represents to Arvada that Contractor has all necessary education, skill, knowledge, expertise and experience required for construction of the Project, and will maintain, at all times during the term of this Agreement, such personnel on its staff to provide the services contemplated hereby within the time periods required hereby. In addition, Contractor represents that it or Arvada-approved subcontractors or subconsultants performing services under this Agreement have all applicable licenses required by the State of Colorado to perform such services and all required insurance coverage as required by this Agreement and by law.
- 1.2. **Cooperation.** The Contractor shall endeavor to develop, implement and maintain, a spirit of cooperation, collegiality, and open communication with Arvada, Arvada’s Consultants,

and Arvada's residents so that the goals and objectives of each are clearly understood, potential problems are resolved promptly, and upon completion, the Project is deemed a success by all interested parties.

- 1.3. **Preparation/Sufficiency of Site.** Before commencing the Project, the Contractor shall (i) visit and thoroughly inspect the Project Site and any structure(s) or other man-made features to be modified and become familiar with local conditions under which the Project will be constructed and operated; (ii) familiarize itself with the survey, including the location of all existing buildings, utilities, conditions, streets, equipment, components and other attributes having or likely to have an impact on the Project; (iii) familiarize itself with Arvada's engineering and design requirements, design objectives, and budget for the Project; (iv) familiarize itself with pertinent Project dates and programming needs, including the Project schedule; (v) review and analyze all Project geotechnical, environmental, and construction materials tests, investigations and recommendations, (vi) review all specifications; and (vii) gather any other information necessary for a thorough understanding of the Project. Claims by Contractor resulting from Contractor's failure to familiarize itself with the Site or pertinent documents shall be deemed waived.
- 1.4. **Contract Documents.** The Contract Documents are incorporated herein by reference. The term "Contract Documents" means and includes the following:
 - A. Arvada's solicitation entitled CSB 23-VCN-119 Standley Lake Library Trailhead ("CSB"), including all special provisions, exhibits and/or addenda;
 - B. Contractor's Response to CSB 23-VCN-119, Advertisement for Bid, Bid Proposal, Bid Schedule, Bid Bond ("Contractor's Response");
 - C. Notice of Award;
 - D. Performance and Payment Bond;
 - E. Notice(s) to Proceed;
 - F. Change Orders (if any);
 - G. City of Arvada Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements;
 - H. Requests for Information and Responses (if any);
 - I. Detail drawings and Bid Documents, including specification illustrations and attachments, prepared or issued by the City of Arvada (or its consultant, as applicable); and
 - I. All supplementary requirements regarding wage rates, E.E.O., affirmative action and all other Federal-State requirements as outlined in the specifications (if applicable).
- 1.5. **Interpretation of Contract Documents.** In the event of conflicts or discrepancies among the Contract Documents, the documents shall govern in the following order: (1) the Agreement; (2) Arvada's solicitation CSB 23-VCN-119; (3) Detail drawings and Bid Documents, including specification illustrations and attachments, prepared by the City of Arvada (or its consultant); (4) City of Arvada Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements; (5) Contractor's Response; (6) Change Orders; (7) Requests for Information and Response.

ARTICLE 2. ARVADA'S DUTIES, OBLIGATIONS AND RESPONSIBILITIES

- 2.1. **Project Information.** Contractor acknowledges that Arvada has provided Contractor with information regarding Arvada's requirements for the Project as set forth in the Contract Documents, including Project Specifications.
- 2.2. **Arvada's Budget.** Arvada has established, and will update, an overall budget for the Project, including amounts allocated for construction, Arvada's other costs, and reasonable contingencies related to these costs as appropriate.
- 2.3. **Arvada's Representative.** Arvada designates Chad Hollingsworth, chollingsworth@arvada.org as Arvada's representative, authorized to act on Arvada's behalf with respect to the Project. In the event Arvada changes its representative, Arvada will notify Contractor of the new contact information,
- 2.4. **Purpose of Arvada's Review.** Arvada's review, inspection, or approval of any work, Testing Documents, Applications for Payment, or other submittals shall be solely for the purpose of determining whether the same are generally consistent with Arvada's standards, policies and requirements. No review, inspection, or approval by Arvada of such work or documents shall relieve Contractor of its responsibility for the performance of its obligations under the Agreement or the accuracy, adequacy, fitness, suitability, or coordination of its construction services. Approval by any governmental or other regulatory agency or other governing body of any work, Testing Document, or the Construction Documents shall not relieve Contractor of responsibility for the performance of its obligations under this Agreement. Payment by Arvada pursuant to the Agreement shall not constitute waiver of any of Arvada's rights under the Agreement or at law, and Contractor expressly accepts the risk that defects in its performance, if any, may not be discovered until after payment, including final payment, is made by Arvada. Notwithstanding the foregoing, reasonable notice shall be given by Arvada to the Contractor if Arvada becomes aware of any fault or defect in the Project or non-conformance with the Contract Documents.

ARTICLE 3. CONSTRUCTION SERVICES REQUIREMENTS AND STANDARDS

- 3.1. **Quality of Construction Services.** Contractor shall be responsible for the quality, completeness, accuracy, and coordination of the Work. Contractor shall provide construction services that meet all industry standards, including all environmental and regulatory requirements. Arvada will provide and be responsible for all material testing and all other testing if needed.
- 3.2. **Arvada's Right to Carry Out the Work.** If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven calendar day period after written notice from Arvada to commence and continue correction of such default or neglect with diligence and promptness, Arvada may after such seven-day period, without prejudice to other remedies Arvada may have, correct such deficiencies. In such a case, an appropriate Change Order shall be issued deducting from payments then or

thereafter due the Contractor the cost of correcting such deficiencies, including compensation for any consultant's additional services and expenses made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to Arvada within ten days of receipt of an invoice for such amounts from Arvada.

- 3.3. **Legal Standard.** Contractor shall furnish construction services in accordance with industry standards currently practiced by construction professionals on projects similar in size, complexity and cost to the Project.
- 3.4. **Construction Standards.** Contractor shall perform all services in accordance with requirements of governmental agencies having jurisdiction over the Project, the City of Arvada Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements, and the requirements set forth in the Contract Documents. In addition, Contractor's work shall comply with all applicable building codes, accessibility laws and regulations, environmental regulations, and other applicable legal requirements in effect at the time of the work. To the extent Arvada's standards exceed applicable legal requirements, such standards shall be met unless Contractor obtains a variance from Arvada in writing.
- 3.5. **Permits.** Contractor shall be responsible for obtaining all necessary permits and other governmental approvals necessary for the development of the Project and shall obtain the same at the times necessary to meet the Project schedule. Contractor's responsibility includes providing environmental services and permitting coordination as further described in the Contract Documents.
- 3.6. **Notice of Non-Compliance.** Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by Arvada, and shall at once report to Arvada any errors, inconsistencies or omissions discovered as well as any foreseeable constructability issues arising from the project specifications and/or site conditions. If the Contractor performs any construction activity knowing or should have known it involves an error, inconsistent, omission or constructability issue in the Contract Documents without such notice to Arvada, the Contractor shall assume full responsibility for such performance and shall bear the full costs for correction, including reimbursement for any delay caused to the Project.

ARTICLE 4. CHANGES TO THE WORK

- 4.1. **Minor Contract Revisions.** Miscellaneous modifications in the Work, ordered by Arvada in the form of a Field Order, will be considered a Minor Contract Revision. Payment for accepted work performed under this pay item "Minor Contract Revision" will be made in accordance with SC-22 of Exhibit A and any applicable provisions of the Arvada Engineering Code of Standards and Specifications.
- 4.2. **Field Orders.** An authorized representative of the Contractor shall acknowledge receipt of Field Orders by promptly signing all written field orders delivered to the job site. Verbal

field orders given by Arvada will be recorded in writing in the municipal inspector's daily report that is to be signed by the Contractor's authorized representative.

- 4.3. **Field Engineered Changes.** Arvada may modify the construction plans including changing the slope and alignment of flow lines and appurtenances or modifying other improvements as necessary to accommodate construction around existing utilities or other field conditions. No additional compensation shall be made for minor costs and inconveniences incurred while performing field engineering changes as directed by Arvada or its consultant. No additional compensation shall be made for any down time encountered while Arvada determines what field engineered changes would be appropriate to accommodate construction around existing utilities or other field conditions. Reasonable time must be allowed for Arvada or its consultant to design field engineered changes. Any additional costs for performing field engineered construction changes to accommodate existing utilities or other field conditions and for also allowing Arvada reasonable time to design field engineered changes as necessary to complete the work shall be considered a subsidiary obligation of the contract.
- 4.4. **Pre-Construction Meetings.** Contractor agrees to assist in the preparation for and to participate in any pre-construction meetings with Arvada.
- 4.5. **Arvada Change Orders.** Arvada may, by written order signed by Arvada, at any time, and without notice to any surety, and subject to all appropriate adjustments, make changes within the general scope of this Contract in any one or more of the following: (a) changes in scope of services; (b) completion date; (c) contract amount; (d) any applicable material modifications; and, (e) any other matters that the parties deem necessary.
- 4.6. **Contractor Requested Change Orders.** The Contractor may request a Change in the Work ("Requested Change Order"), including one or more of the following: (a) changes in scope of services; (b) completion date; (c) contract amount; (d) any applicable material modifications; and, (e) any other matters that the parties deem necessary.
- 4.7. **Change Order Contents.** Any requested Change Order shall include (a) a detailed description of the requested change to the original contract; (b) itemized documentation of any subcontractor costs; (c) the total costs associated with the proposed change; (d) the impact on the project completion date, if any, associated with the proposed change; and (e) a statement of the contractual basis for the requested change.
- 4.8. **Basis for Change Order Requests.** The following may be considered a valid basis for requesting a Change Order: (a) Contract Document error or omission; (b) Arvada induced enhancement; (c) unforeseeable constructability issue; or (d) unforeseeable geotechnical issue. The following will not be considered a valid basis for requesting a Change Order absent extraordinary circumstances: (a) utility relocation; (b) utility conflicts; (c) foreseeable geotechnical issue; (d) foreseeable constructability issue; or (e) defective construction.

- 4.9. **Written Authorization Required.** The Contractor shall not proceed with any change in the Work without the appropriate written authorization.

ARTICLE 5. SUPERVISION AND CONSTRUCTION PROCEDURES

- 5.1. **Supervision.** The Contractor shall supervise and direct the Work using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under this Contract, unless Contract Documents give other specific instructions concerning these matters.
- 5.2. **Acts and Omissions of Subcontractors and Agents.** The Contractor shall be responsible to Arvada for acts and omission of the Contractor's employees, subcontractors, and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.
- 5.3. **Inspection and Subsequent Work.** The Contractor shall be responsible for inspection or portions of Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

ARTICLE 6. COMPENSATION.

- 6.1. **Completion of Services.** Contractor will furnish all material, supplies, tools, equipment, labor, and other services necessary for the completion of the Work within Arvada's timeframe and monetary limitations set forth below:
- 6.1.1. Contractor shall commence the Work required by the Contract Documents within seven calendar days after the date of the Notice to Proceed unless otherwise mutually agreed-upon by the Parties in writing;
- 6.1.2. Contractor shall complete the Work required by the Contract Documents within 240 working days after the date of the Notice to Proceed unless the period for completion is extended otherwise by the Contract Documents; and
- 6.1.3. Compensation Amount. Contractor agrees to perform the Work for an amount not to exceed **\$742,000.00**.
- 6.2. **Term.** The term of the Agreement shall be from the Parties' execution of this Agreement until October 31, 2026. This term includes the time for Contractor to complete the Work as described in Sec. 6.1.2, and a two-year warranty period as described below. Contractor shall not be released from its obligations under this Agreement unless and until all Work complies with Arvada's standards as described in the Engineering Specifications. The term of this Agreement may be amended by mutual written agreement of the Parties and is subject to availability of funds and is subject to Arvada's termination for convenience under the Contract Documents. There is no automatic renewal following the natural expiration of this Agreement.

- 6.3. **Additional Services.** While Arvada has listed its major requirements for its solicitation in the Contract Documents, Arvada may, during the term of this Agreement, wish to purchase other related services identified and offered by Contractor, based upon the Bid Schedule amounts contained in Contract Documents. Arvada reserves the right to award these ancillary items to Contractor. This option, if exercised, in no way obligates Arvada to pursue additional services with Contractor.
- 6.4. **Payment for Services.** At least twenty (20) calendar days before the date established for each monthly progress payment, the Contractor shall submit to Arvada an itemized Application for Payment for construction completed in accordance with the Bid Schedule. Such application shall be supported by such data substantiating the Contractor's right to payment as Arvada may require, such as copies of invoices or requisitions from subcontractors and material suppliers and reflecting retainage. Arvada shall pay NET 30 for services performed in accordance with the Bid Schedule and with this Agreement, but in no event shall the total Contract Amount exceed \$742,000.00 absent a properly executed Change Order. Measurement of the work performed and monthly payment shall be made in accordance with requirements of the Measurement and Payment Section in the Contract Documents unless otherwise specifically provided herein.
- 6.5. **Non-Conforming Materials or Construction.** Where materials installed or the finished product fails to meet minimum requirements of the Contract Documents, the basis of determining final payment to the Contractor shall be determined in accordance with the Contract Documents.
- 6.6. **Retainage Requirements.** Contractor agrees to submit monthly invoices together with any retainage requirements as prescribed by Colorado state statutes (*see e.g.*, C.R.S. § 24-91-101 *et seq*). Payment from Arvada will be paid NET 30 days. Invoices will accurately reflect actual work completed by Contractor and its subconsultants or subcontractors.

ARTICLE 7. MISCELLANEOUS.

- 7.1. **Waiver.** No provision of this Agreement may be waived except by written agreement of the parties. A waiver of any provision on one occasion shall not be deemed a waiver of that provision on any subsequent occasion, unless specifically stated in writing. A waiver of any provision shall not affect or alter the remaining provisions of this Agreement.
- 7.2. **Strict Compliance.** No failure of Arvada to insist upon strict compliance by the Contractor with any provision of the Contract Documents shall operate to release, discharge, modify, change or affect any of the Contractor's obligations.
- 7.3. **Successors and Assigns.** Arvada and Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement and to the partners, successors and assigns of such other parties with respect to all covenants of this Agreement. Contractor shall not assign (whether partially or wholly) this Agreement whether by operation of law or otherwise, without the written consent of

Arvada. If Contractor makes an assignment in accordance with this provision, Contractor shall nevertheless remain legally responsible for all obligations arising under the Agreement, unless otherwise agreed in writing by Arvada.

- 7.4. **Additional Documents.** The parties agree to execute any additional documents and to take any additional action that is necessary to carry out this Agreement.
- 7.5. **Binding Effect.** This Agreement shall inure to the benefit of, and be binding upon, the parties, their respective legal representatives, successors, heirs, and assigns; provided, however, that nothing in this paragraph shall be construed to permit the assignment of this Agreement except as otherwise expressly authorized herein. All provisions of this Agreement which contain continuing obligations shall survive its expiration or termination.
- 7.6. **Paragraph Captions.** The paragraph captions in this Agreement are set forth only for the convenience and reference of the parties and are not intended in any way to define, limit, or describe the scope or intent of this Agreement.
- 7.7. **Integration, Amendment, and Severability.** This Agreement represents the entire agreement between the parties, and there are no oral or collateral agreements or understandings. This Agreement may be amended only by an instrument in writing signed by the parties. If any other provision of this Agreement is held invalid or unenforceable, no other provision shall be affected by such holding, and all of the remaining provisions of this Agreement shall continue in full force and effect if the essential terms and conditions of this Agreement for both parties remain valid, legal, and enforceable.
- 7.8. **Notices.** Any notice or notification required or permitted by the Agreement shall be in writing and shall be deemed to have been sufficiently given for all purposes if sent electronically, or by certified mail or registered mail, postage and fees prepaid, addressed to the party to whom such notice is to be given at the address set forth on the signature page below, or at such other address as has been previously furnished in writing, to the other party or parties. Such notice or notification shall be deemed to have been given when electronically sent or when deposited in the United States mail.
- 7.9. **Binding Authority.** Contractor represents and affirms that the signature page hereof accurately states the full legal name of Contractor (whether as a corporation, partnership, limited liability company, sole proprietorship, or other), contains all requisite signature(s) on behalf of Contractor, and in all other respects is effective to bind Contractor, in accordance with all applicable statutes, regulations, resolutions, rules, bylaws, agreements, or similar sources of authority or limitation. This Agreement may be executed in counterpart(s), each of which shall be deemed to be an original, and all of which, taken together, shall constitute one instrument.
- 7.10. **Preferences in Employment of Colorado Labor.** To the extent that obligations and responsibilities may be established by C.R.S. § 8-17-101 *et seq.*, as amended, with respect to certain public entities and those contracting therewith as to the procurement of services:

7.10.1. Colorado labor shall be employed to perform eighty percent (80%) of the work.

7.10.2. Any waiver of this requirement must comply with C.R.S. § 8-17-101 *et seq.*, as amended.

7.11 **Performance Measures.** The Performance Measures for this Contract shall be those outlined by Contractor in Exhibit B.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement which shall be deemed an original on the date first above written.

[signatures on next page]

DATED this _____ day of _____, 2024.

CITY OF ARVADA, a Colorado home
rule municipal corporation

Lauren Simpson, Mayor
8101 Ralston Road
Arvada, CO 80002

ATTEST:

City Clerk

APPROVED AS TO FORM:
Rachel A. Morris, City Attorney

By: _____

COLORADO DESIGNSCAPES, INC.

Phil Steinhaur, President
1544 E. Fremont Dr.
Centennial, CO 80112
psteinhauer@designscapes.org

Exhibit A

CBS



EXHIBIT

A

COMPETITIVE SEALED BID

BID #: 23-VCN-119

Title: Standley Lake Library Trailhead

CSB Issued: 12/8/2023

Pre-bid Meeting: 12/15/2023 – 9:00 am MT
On-Site Location: 8485 Kipling Street, Arvada, CO 80005

Questions Deadline: 12/22/2023 - 2:00 pm MT
Submit questions on BidnetDirect.com. Responses will be posted via addendum.

Bids Due By: 1/10/2024 - 2:00 pm MT

Virtual Opening: **Join Zoom Meeting:**
<https://us06web.zoom.us/j/87845013057?pwd=aBYF7TBmodesVYAqQCWn9JEAfPIXWr.1>
Meeting ID: 878 4501 3057
Passcode: 450745

Bid Delivery address: Electronic Submissions must be submitted online at BidNetDirect.com by the above date and time.
Late responses will not be considered for award.

Submit bid as one (1) PDF file. Company name must start the file name.
Late responses will not be considered for award.

For additional administrative information NOT related to the project, contact: Cheryl Dye at cdye@arvada.org

Documents included in this BID:

Cover Page	page 1
Advertisement for Bidders	page 2
General Terms and Conditions	page 3
Special Terms and Conditions for Bidders	page 6
Insurance Requirements	page 9
Project Special Provisions	page 10
Submittal Forms to be completed and returned	
• Bid Bond	page 19
• Bid Proposal	page 20
• Bid Schedule	page 21
• Required Contractor Submittal Form	page 22
• Performance Measures Form	page 23
Preview of Documents if Awarded	page 24

ARVADA'S VISION MISSION AND VALUES

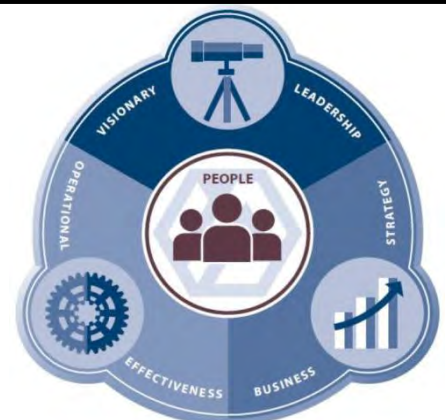
VISION: We dream big and deliver.

MISSION: We are dedicated to delivering superior services to enhance the lives of everyone in our community.

VALUES:

Innovation – We excel in creativity, flexibility and the use of best practices while valuing diverse backgrounds, ideas and perspectives. **Passion** – We are a high performing, inclusive team inspiring each other to pursue excellence.

Opportunity – We value our diversity, embrace possibilities, face challenges, persevere and take action to deliver quality results.



ADVERTISEMENT FOR BIDS

Submit bids electronically on Bidnetdirect.com for the construction of City of Arvada, Bid No: 23-VCN-119
Project Title: Standley Lake Library Trailhead

The BID DOCUMENTS, consisting of Advertisement for Bids, General Terms and Conditions, Special Terms and Conditions, Insurance Requirements, Project Special Provisions, Addendum when issued, Bid Bond, Bid Proposal, Bid Schedule, Performance and Payment Bond, Submittal Checklist and References, Sample documents, and the Project Drawings may be examined at the following location: www.bidnetdirect.com

No cost- bid documents may be obtained at www.bidnetdirect.com on or after 12/8/2023.

ESTIMATED APPROXIMATE QUANTITIES OF SOME MAJOR ITEMS OF WORKARE:

Mobilization & General Conditions	1	LS
Erosion Control & Stormwater Management	1	LS
Construction Surveying and Staking	1	LS
Site Demolition	1	LS
Clearing and Grubbing	1	LS
Tree Protection	480	LF
Site Grading & Earthwork	1	LS
Strip, Stockpile, & Place Topsoil	1	LS
Modify Outlet Structure	1	LS
Electrical Service & Lighting System	1	LS
Concrete Paving (Standard Grey)	15,825	SF
Concrete Paving (Colored)	230	SF
Asphalt Paving	430	SF
Curb Ramp	3	EA
Sidewalk Chase	2	EA
Concrete Edger	541	LF
Curb & Gutter	62	LF
Curb Cuts	18	LF
Parking Lot Striping & Signage	1	LS
Sandblasted Images & Lithichrome Paint	1	LS
Shelter	1	LS
Trash Receptacle	6	EA
Picnic Table	2	EA
Seating Table	4	EA
Bike Rack	5	EA
Metal Bench	4	EA
Interpretive Signage	3	EA
Landscape Boulder	27	EA
Bluegrass Sod	6,810	SF
Native Seed	64,170	SF
Shrub Bed Prep. & Wood Mulch	1,490	SF
Shrub Bed Prep. & Cobblestone Mulch	7,715	SF
Trees	48	EA
Shrubs	170	EA
Ornamental Grasses	155	EA
Complete Irrigation System	1	LS

Bidders, subcontractors and suppliers must be familiar with the current City of Arvada Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements, which will be combined with the Bid Documents to form the Contract Documents for the Project. A copy of the current Standards may be obtained from the office of the City Engineer upon a non-refundable payment of \$50.00. Holders will be notified when supplemental revisions and additions are available as they are adopted. The current Standards are also available at no cost on the City's web site at <https://www.arvadaco.gov/167/Engineering-Code>. Holders are responsible for keeping current their City of Arvada Engineering Code of Standards and Specifications.

Date: 12/7/2023

CITY OF ARVADA



Enessa Janes
Director
Department of Vibrant Community and
Neighborhoods
8101 Ralston Road, Arvada, Colorado 80002

GENERAL TERMS AND CONDITIONS

1. PAYMENTS TO CONSTITUTE CURRENT EXPENDITURES. Financial obligations of the City of Arvada, if any, after the current fiscal year are contingent on funds for that purpose being appropriated, budgeted and otherwise made available by the City Council for the City of Arvada. The City of Arvada's obligations under the Agreement shall be from year to year only and shall not constitute a multiple-fiscal year direct or indirect debt or other financial obligation of the City of Arvada within the meaning of Article X, Section 20 of the Colorado Constitution.

2. TAXES. The City of Arvada is not subject to taxation. Contractor shall not invoice Arvada for any state, federal or local taxes whatsoever. Upon written notification by the City of Arvada, Contractor shall reimburse the City of Arvada in a timely manner for any taxes erroneously paid by the City of Arvada. The Colorado Department of Revenue, Certification of Exemption for Colorado State Sales/Use Tax account number for the City of Arvada is 98-01789-0000. An exemption certificate will be provided, where applicable, upon request.

3. NO INDEMNIFICATION BY ARVADA. The City of Arvada is prohibited by Article XI, Section 1, Colorado Constitution, from indemnifying anyone. Therefore, notwithstanding any provision in the response to solicitation or proposed contract, lease, escrow agreement or any other type of agreement to the contrary, the City of Arvada does not indemnify Contractor or anyone else under this Agreement.

4. INDEMNIFICATION OF CITY.

A. Contractor: Notwithstanding any provision in the response to solicitation or proposed contract, lease, escrow agreement or any other type of agreement to the contrary, Contractor agrees to investigate, defend, indemnify and hold harmless Arvada, its elected officials, officers, employees, agents, insurers, and representatives from and against any claims, costs, losses, expenses, demands, actions, or causes of action, including reasonable attorney fees and other costs and expenses of litigation, which may be asserted against or incurred by Arvada or for which Arvada may be liable, arising from the negligence, willful misconduct, or other fault of Contractor or its employees, agents, or subcontractors in performance of the Agreement. Nothing herein is intended to constitute a covenant, promise, or agreement to indemnify and hold harmless Arvada from any liability or damages directly caused by or attributable to Arvada's own negligence. Nothing herein intended to be nor may be construed as a waiver of the immunities, protections, or limitations on damages provided to Arvada by the Colorado Governmental Immunity Act, C.R.S. §§ 24-10-101 *et seq.*, as it may from time to time be amended.

(or)

B. Architect, Engineer, Surveyor Services for Public Works Construction: Contractor agrees to hold harmless and indemnify Arvada, its officers and employees, from and against any liability or any claims, suits, or actions arising out of, made, or asserted for any damage to persons or property resulting from errors, omissions or fault of Contractor in connection with the performance by Contractor of obligations under this solicitation and any subsequent Agreement with Arvada. Nothing herein is intended to constitute a covenant, promise, or agreement to indemnify and hold harmless Arvada from any liability or damages directly caused by or attributable to Arvada's own negligence. Nothing herein is intended to be nor construed as a waiver of the immunities, protections, or limitations on damages provided to Arvada by the Colorado Governmental Immunity Act, C.R.S. §§ 24-10-101 *et seq.*, as it may from time to time be amended.

5. NO OPINION OF COUNSEL LETTERS. Pursuant to Section 8.1 of the Arvada City Charter, the City Attorney provides advice to the City Council and City Officials in matters relating to their official powers and duties, and will perform such other duties as City Council may prescribe by ordinance or resolution. The City Attorney will not issue opinion of counsel letters, memoranda or statements to third parties, including, but not limited to that any contract or lease is binding on the public entity, enforceable, etc.

6. CONFIDENTIAL DOCUMENTS. Contractors may designate specific pages or sections within their submission as trade secret or confidential commercial information or as otherwise protected by law ("Confidential Information"). Documents and data that are considered Confidential Information shall be clearly marked as such and separated from the rest of the solicitation submission documents. Comingling is not acceptable. The City does not favor blanket assertions of Confidential Information. Please note that blanket assertions that merely classify and/or broadly claim information is confidential are insufficient as a matter of law. *See, International Brotherhood of Electrical Workers Local 68 v. Denver Metropolitan Major League Baseball Stadium District*, 880 P.2d 160 (Colo. App. 1994). Any information that will be included in any resulting contract cannot be considered Confidential. Under no circumstances may submission pricing information be considered Confidential. In the event a formal contract is entered into with the City and a portion of the Proposal/Response carries a designation indicating the Contractor believes it is Confidential Information, then the City agrees that it will use its best efforts to forward any request for the disclosure of the Confidential Information to the Contractor. By its submission of the Proposal/Response, Contractor agrees to promptly respond to the request for disclosure with any objections and reasons therefor in accordance with the Colorado Open Records Act C.R.S. §§ 24-72-101 *et seq.* and any other applicable law. Further, Contractor agrees to assume the obligation to defend, hold harmless, and indemnify the City in any legal proceeding that arises from non-disclosure of documents or data pursuant to the Contractor's objection.

7. OWNERSHIP OF WORK PRODUCT. The originals of all plans, reports, studies, data, or other materials or information relating to the Work that are produced by Contractor shall be delivered to and become the property of Arvada. Contractor may retain copies of any originals; however, no plans, reports, studies, data, or other materials or information relating to the Work shall be released to any person or entity without the prior written consent of Arvada. Nothing in this clause is intended to affect Contractor's right to use generic know-how learned in the course of providing services under the Agreement for the future benefit of the City of Arvada or others.

8. ASSIGNMENT. Contractor shall not assign the Agreement without the prior written consent of the City of Arvada, which will

not be unreasonably withheld, conditioned, or delayed. Contractor may assign the Agreement to any successor to the business of the party by merger, consolidation, or sale of assets. No assignment shall be permitted that enlarges any duty, responsibility or obligation of the City of Arvada, or that limits, curtails, or diminishes any right or privilege of the City of Arvada without the City of Arvada's express written consent.

9. NO THIRD PARTY BENEFICIARIES. It is expressly understood and agreed that enforcement of the terms and conditions of the Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to Arvada and Contractor and nothing contained in the Agreement shall give or allow any such claim or right of action to any other third party on the Agreement. It is the express intention of Arvada and Contractor that any person other than Arvada or Contractor receiving services or benefits under the Agreement shall be deemed to be an incidental beneficiary only.

10. INDEPENDENT CONTRACTOR. Contractor and Arvada hereby represent that Contractor is an independent contractor for all purposes hereunder. As such, Contractor is not covered by any worker's compensation insurance or any other insurance maintained by Arvada except as would apply to members of the general public. Contractor shall not create any indebtedness on behalf of Arvada.

11. SUBCONTRACTING. Contractor shall not award work to subcontractor(s) in excess of fifty percent of the total contract price without Arvada's prior written approval. Contractor shall be responsible for any failure by any subcontractor or subcontractor personnel to perform in accordance with the Agreement or to comply with any duties or obligations imposed on Contractor under the Agreement to the same extent as if such failure to perform or comply was committed by Contractor or Contractor's personnel. Contractor shall be Arvada's sole point of contact regarding the services, including with respect to payment.

12. NO WAIVER OF GOVERNMENTAL IMMUNITY. Nothing contained in this or any of the exhibits attached thereto shall be construed as a waiver of any of the immunities, limitations, privileges, rights, procedures, or requirements contained in the Colorado Governmental Immunity Act, C.R.S. §§24-10-101 *et seq.*

13. RIGHT TO TERMINATE. The City of Arvada shall have the right to terminate, without cause, the Agreement. Any such termination shall not be considered a breach of the Agreement or any extension thereof. In the event of termination by the City of Arvada for convenience, Contractor will be paid for requested work performed up until the time of termination by the City of Arvada, not to exceed the total amount of the contract price agreed upon by the parties.

14. COMPLIANCE WITH ALL LAWS. All of the services performed under this Agreement by Contractor shall comply with all applicable laws, rules, regulations and codes of the United States and State of Colorado, and with the charter, ordinances, rules and regulations of the City of Arvada.

15. WAIVER OF BREACH. A waiver by any party to the Agreement or the breach of any term or provision of the Agreement shall not operate or be construed as a waiver of any subsequent breach by either party.

16. GOVERNING LAW AND VENUE. Notwithstanding any provision in the response to solicitation or proposed contract, lease, escrow agreement or any other type of agreement to the contrary, the Agreement shall be governed by the laws of the State of Colorado. Venue for any action arising under the Agreement or for the enforcement of the Agreement shall be in the appropriate court for Jefferson County, Colorado.

17. FORCE MAJEURE. Any delays in or failure of performance by any party of its obligations under the Agreement shall be excused if such delays or failure are a result of acts of God, fires, floods, strikes, labor disputes, accidents, regulations or orders of civil or military authorities, shortages of labor or materials, or other causes, similar or dissimilar, which are beyond the control of such party.

18. BINDING ARBITRATION PROHIBITED. The City of Arvada does not agree to binding arbitration by any extra-judicial body or person. Any provision to the contrary in response to the solicitation, or incorporated by reference, shall be null and void.

19. EQUAL EMPLOYMENT OPPORTUNITY. Contractor shall not refuse to hire, discharge, promote or demote, or discriminate in matters of compensation against any person otherwise qualified solely because of race, creed, sex, color, national origin or ancestry, religion, disability, age, sexual orientation, gender identity, veteran status, or any other basis prohibited by federal, state, or local law.

20. BINDING AUTHORITY. Contractor represents and affirms that the signature page hereof accurately states the full legal name of Contractor (whether as a corporation, partnership, limited liability company, sole proprietorship, or other), contains all requisite signature(s) on behalf of Contractor, has been properly acknowledged by attestation, notary acknowledgment, or both, and in all other respects is effective to bind Contractor, in accordance with all applicable statutes, regulations, resolutions, rules, bylaws, agreements, or similar sources of authority or limitation.

21. PREFERENCES IN EMPLOYMENT OF COLORADO LABOR. To the extent that obligations and responsibilities may be established by C.R.S. § 8-17-101 *et seq.*, as amended, with respect to certain public entities and those contracting therewith as to the procurement of services:

- a. Colorado labor shall be employed to perform eighty percent (80%) of the work.
- b. Any waiver of this requirement must comply with C.R.S. § 8-17-101 *et seq.*, as amended.

22. RETAINAGE REQUIREMENTS. Contractor agrees to submit monthly invoices together with any retainage requirements as prescribed by Colorado state statutes (see e.g., C.R.S. §§24-91-101 *et seq.*). Payment from Arvada will traditionally be paid NET (15) days but no later than NET thirty (30) days. Invoices will accurately reflect actual work completed by Contractor.

23. ACCESSIBILITY COMPLIANCE.

- 23.1 Arvada is obligated to comply with the Colorado Anti-Discrimination Act (C.R.S. §§24-34-300 *et seq.*)("CADA"), which requires all digital and online platform and content providers to comply with the minimum *Accessibility Standards for Individuals with a Disability*, adopted by the Colorado Office of Information Technology ("OIT") under C.R.S §24-85-103(2.5). Contractor has been advised to familiarize itself with CADA.
- 23.2 To the extent the Work or any of Contractor's services provided under the Agreement involves digital, technological components, including but not limited to software, websites, applications, digital documents (the "Material"), all Material shall comply with the OIT's currently adopted minimum *Accessibility Standards for Individuals with a Disability* at all times.
- 23.3 Contractor shall indemnify, save, and hold harmless Arvada, its employees, agents and assignees (the "Indemnified Parties") against any and all costs, expenses, claims, damages, liabilities, court awards and other amounts (including attorneys' fees and related costs) incurred by any of the Indemnified Parties in relationship to Contractor's failure to comply with Section (23.2) above.
- 23.4 Upon Arvada's request, Contractor shall certify to Arvada that its service(s) and digital documents are compliant with Section (23.2) above. Arvada may require Contractor's compliance to the OIT's currently adopted minimum standards of accessibility to be determined by a third party selected by Arvada to attest to Contractor's compliance.

SPECIAL TERMS AND CONDITIONS FOR BIDDERS

1. RECEIPT AND OPENING OF BIDS. Bids submitted electronically on the BidnetDirect.com web site only become available to the City of Arvada after the bid closes.

Bidder shall assume full responsibility for timely upload of bid to the BidnetDirect web site. The City reserves the right, where its best interest will be served, to accept or reject any conditional or qualified bid.

2. QUANTITY AND NATURE OF THE WORK. Bidders must satisfy themselves of the accuracy of the estimated quantities in the Bid Schedule by examination of the site and a review of the drawings and specifications including Addendum. After Bids have been submitted the Bidder shall not assert that there was a misunderstanding concerning the quantities of work or of the nature of the work to be done.

3. CONTENTS OF BID. Contractors are required to submit Bids with the following conditions:

- 1) Contractors shall make all investigations necessary to inform themselves of the sites affected and the work required by the Solicitation.
- 2) Any official interpretation of the Solicitation may only be issued by an authorized agent of the City. The City shall not be responsible for other interpretations offered by employees not authorized.
- 3) The City shall issue Addenda if substantial changes are required which may impact the content and submission of Bids. A copy of such addenda will be publicly posted with the original CSB posting.
- 4) The apparent silence or omissions within this Solicitation regarding a detailed description of the materials or services shall be interpreted to mean that only the best commercial practices are to prevail and that only materials and workmanship of first quality are to be provided.

4. BID SECURITY. Each Bid must be accompanied by a PHOTO of the Bid Bond, on the form attached to these contract documents, payable to the City for five (5) percent of the total amount of the Bid. As soon as the bid Prices have been compared, the City will issue intent to award on the Bidnetdirect.com web site. The vendor who is named as the intent to award Contractor must submit the physical Bid Bond within 10 days or the intent to award may be revoked. The Bid Bond of the successful Bidder will be retained until the Payment and Performance Bond has been executed and approved after which it will be returned. A certified check may be used in lieu of a Bid Bond.

5. POWER OF ATTORNEY. Attorneys-in-fact who sign Bid Bonds or Payment and Performance Bonds must file with each bond a certified and effective dated copy of their power of attorney.

6. QUALIFICATION OF BIDDER. The City may make such investigation as it deems necessary to determine the ability of the Bidder to perform the work. The City reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the City that such Bidder is properly qualified to carry out the obligation of the Contract Agreement and to complete the work contemplated therein. The City reserves the right, before awarding the contract, to require a Contractor to submit evidence of its qualifications including, but not limited to, financial, technical and other qualifications, as well as past performance with the City, for consideration in making the award in the best interest of the City.

7. AWARD OF CONTRACT. Bids shall be awarded to the lowest-priced responsible and most responsive bidder whose bid meets the requirements and criteria set forth in the CSB within the limits of funds available and that best serves the City's interest. The City, within seven (7) calendar days of receipt of acceptable Contract Security and triplicate copies of the Contract Agreement, signed by the Bidder to whom the Contract was awarded, shall sign the Contract Agreement and return to the Bidder an executed copy of the Contract Agreement. Should the City not execute the Contract Agreement within such period, the Bidder may, by written notice, withdraw their signed Contract Agreement. Such notice of withdrawal shall be effective upon receipt of the written notice by the City.

8. NOTICE OF AWARD AND FAILURE TO ENTER INTO CONTRACT. The party to whom the Contract is to be awarded will be required to execute the Contract Agreement in triplicate, obtain Certificates of Insurance and a Performance and Payment Bond, as Contract security, within five (5) calendar days from the date the Notice of Award is delivered to the Bidder. The Notice of Award shall be accompanied by the Contract Agreement and the necessary Performance and Payment Bond forms. In case of failure of the bidder to execute the Contract Agreement and provide satisfactory Insurance and Contract Security, the City may at its option, consider the Bidder in default, in which case the Bid Bond accompanying the Proposal shall become the property of the City.

9. CONTRACT DOCUMENTS. The Contract Documents consisting of the Bid Documents, which include the Advertisement for Bids, Information for Bidders, General Terms and Conditions, Special Terms and Conditions, Insurance Requirements, Project Special Provisions, Addendum, Bid Bond, Bid Proposal, Bid Schedule, Vendor Submittal Form, Construction Drawings, Supplemental Specifications and the City of Arvada "Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements", which include the Measurement and Payment specifications, and the attached Notice of Award form, Contract Agreement form, Performance and Payment Bond form, Notice to Proceed form, and Change Order form, when combined, contain the provisions required for the construction of the Project. Information obtained from an agent or employee of the City or any other person shall not affect the risks or obligations assumed by the Contractor or relieve him from fulfilling any of the conditions of the contract.

10. TERM OF CONTRACT. This contract shall commence on the date of the purchase order or contract execution and shall remain in effect until such time as the commodities, equipment and/or services acquired in conjunction with this Bid have been

accepted by the City's authorized representative. Any required warranty period which exceeds this term shall remain in full force for the duration of the warranty period.

11. PRICING SHALL BE FIXED AND FIRM. The prices offered by the Contractor shall remain fixed and firm for at least 90 ninety days. No changes in the Bid shall be allowed after the date and time of the Bid deadline due to error by the Contractor.

12. CONTRACT SECURITY. A Performance and Payment Bond, on the form attached to these contract documents, in the amount of 100% of the Contract price, with a corporate surety approved by the City, will be required for the faithful performance of the Contract.

13. NOTICE TO PROCEED. The Notice to Proceed shall be issued within seven (7) calendar days of the execution of the Contract Agreement by the City. Should there be reason why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement between the City and the Contractor. In the event the Notice to Proceed has not been issued within the seven day period or within the period mutually agreed upon the Contractor may terminate the Contract Agreement without further liability on the part of either party.

14. MODIFICATION OR WITHDRAWAL OF BIDS BY CONTRACTOR.

Modifications to Bids- Changes to the Bid after the submission deadline shall be allowed only when the Contractor can show convincing evidence that an unintentional factual mistake was made. Modification requests must be made in writing. Any modification submitted to the City must have the Contractor's name, address, Solicitation Number and title included.

Withdrawal of Bids- If a Bid is withdrawn by Contractor after the Bid Opening, the City may, at its option, suspend the Contractor for a six (6) month period following the withdrawal. Withdrawal of the Bid after the Bid Opening will result in the Contractor forfeiting the provided Bid Bond.

15. REJECTION OF OFFERS BY CITY.

- A. The City may reject a Bid, in whole or in part, for reasons including, but not be limited to:
 - 1) The Contractor misstates or conceals any material fact in its Bid;
 - 2) The Contractor's Bid does not strictly conform to the law or requirements of the Solicitation;
 - 3) The Bid expressly requires or implies a conditional award that conflicts with the method of award stipulated in the Special Conditions;
 - 4) The Bid does not include documents which are required for submission with the Bid; or
 - 5) The Bid has not been executed by the Contractor through an authorized signature.
- B. The City may, at its sole and absolute discretion:
 - 1) Reject all or parts of Bids submitted by prospective Contractors;
 - 2) Re-advertise this Solicitation;
 - 3) Postpone or cancel the Solicitation;
 - 4) A Bid may not be accepted from, nor any contract be awarded to, any person or firm which
 - a) is in arrears to the City for any debt or Contract, or is a defaulter as surety for any obligation to the City.
 - b) has failed to perform faithfully any previous contract with the City, State or Federal government for a minimum period of one (1) year after this previous Contract was terminated for cause.
 - c) has pending litigation against the City on the date and time that the Solicitation is due.

16. CLARIFICATION AND MODIFICATIONS. The contract resulting from this solicitation will be subject to the Solicitation materials, City Ordinance, State and Federal Statutes. When conflicts occur, the highest authority shall prevail. Contractors are required to indicate any variances to the terms, conditions, requirements and specifications of this Solicitation; no matter how slight. If variations are not stated in the Contractor's Bid, it shall be agreed that the Contractor's Bid fully complies with all conditions identified in this Solicitation.

17. ELIGIBILITY OF CONTRACTORS: MUST BE ENGAGED IN SUPPLYING PRODUCTS OR SERVICES RENDERED. Bids will only be considered from firms which have been engaged in the business of manufacturing or distributing the goods and/or performing services described in this Solicitation. Contractors must be able to produce evidence that they have an established satisfactory record of performance for at least two (2) years and have sufficient finances and structure to ensure that they can satisfactorily execute the Contract requirements, as determined by authorities of the City. The City reserves the right, before awarding the contract, to require a Contractor to submit evidence of its qualifications including, but not limited to, financial, technical and other qualifications, as well as past performance with the City, for consideration in making the award in the best interest of the City.

18. ELECTRONIC PAYMENT METHODS - CITY OF ARVADA SINGLE USE ACCOUNT.

Contractors are encouraged to consider the following method of payment.

Single Use Account: The City incorporates the use of Single User Accounts as an option to seamlessly process payment of larger dollar purchase orders and contracts to vendors/contractors/providers. A secure, one-time payment transaction account processes to pay invoices via the Contractor's merchant bank. Invoice payments have an enhanced speed-of-pay cycle that can significantly benefit cash flow.

19. CONDITIONS OF WORK AND OBLIGATION OF BIDDER. Each Bidder is responsible for independently inspecting the site and for reading and being thoroughly familiar with the Contract Documents and for providing the names of major suppliers and sub-contractors in the space provided on the Bid Proposal form. The failure or omission of any Bidder to do any of the foregoing shall in no way relieve the Bidder from any obligation in respect to their Bid Proposal.

20. CONTRACTOR LICENSE. The Contractor to whom the contract is awarded and any subcontractors employed by the Contractor must have or acquire the appropriate Contractor's license issued by the City of Arvada Engineering Division, including submittal of license bond, necessary insurance certificate, and license fee before initiating any work. The Contractor and any subcontractors will also be required to obtain a no charge Public Improvements Permit from the City of Arvada Engineering Division prior to initiating any and all work on this project.

21. PERFORMANCE MEASUREMENTS FOR SERVICES MORE THAN \$15,000.

The City has incorporated Performance Management into its organizational culture. The City will monitor and report on the following performance measures. These measures will determine, in part, renewals and eligibility for future awards. Measures include: (a) safety as defined by observation and OSHA reportable injuries, (b) quality of contracted work, (c) work completed within required schedule, (d) administration and coordination of estimates, RFIs, ASIs, change orders, pay requests and close out documents, (e) fair and justifiable change orders, (f) responsiveness and follow through on requests.

SERVICES means: the furnishing of labor, time, effort, maintenance, etc., by a vendor/contractor/consultant, with an initial contract amount of more than \$15,000.

22. PREPARATION AND SUBMISSION.

Bids will be prepared as follow:

- 1) A blank shall be construed as "No Bid/not offered". Where there is a discrepancy between the unit price and the extension of prices, the unit price shall prevail.
- 2) Contractors will not knowingly participate in solicitations where there exists a conflict of interest with their firm and a member of City staff or their immediate family.
- 3) The only authorized version of this Bid is posted on WWW.BIDNETDIRECT.COM. Registration is available to receive email notification of new solicitations, addenda, and communications.

INSURANCE REQUIREMENTS

The following listed insurance requirements shall be carried by the selected Contractor for the entirety of the contract. Applicable requirements for this solicitation are identified by completed check boxes.

1. ☒ **Commercial General Liability**, written on an occurrence form, for limits not less than \$1,000,000 for bodily injury and property damage for each occurrence and not less than \$2,000,000 aggregate. Coverage shall include premises and operations liability, blanket contractual, broad form property damage, products and completed operations and personal injury endorsements.
2. ☒ **Workers' Compensation and Employers Liability** as required by statute. Employers Liability coverage is to be carried for a minimum limit of \$1,000,000 each accident/disease and \$2,000,000 aggregate.
3. ☒ **Automobile Liability** for limits not less than \$1,000,000 combined single limit for bodily injury and property damage for each occurrence. Coverage shall include owned, non-owned and hired automobiles.
4. ☒ **Umbrella Liability** of \$5,000,000.00 following form to the Commercial General Liability.
5. ☐ **Builders Risk or Course of Construction** Purchased by contractor to cover physical damage to property in construction or rehab. Contractors will ensure that City and subcontractors will be covered as additional insureds, excluding their own machinery, tools and equipment.
6. ☐ **Professional Liability** Professional Liability insurance in an amount of not less than \$1,000,000 per occurrence, covering the professional work contemplated under this proposal. The coverage shall have an extended reporting period of three (3) years following the date of substantial completion of the work for reporting of claims.
7. ☐ **Pollution Legal Liability Insurance** for limits not less than \$1,000,000 per occurrence (or claims made) and not less than \$1,000,000 aggregate for bodily Injury, personal Injury and property Damage.
8. ☐ **Privacy/Network/Cyber Liability Insurance** for limits not less than \$1,000,000 for any firm providing product or services associated with IT, software, communication, or network.

Additional Insurance Requirements:

- Contractor will be required to, at its own expense, keep in full force and effect during the term of the Agreement, and during the term of any extension or amendment of the Agreement, insurance reasonably sufficient to insure against the liability assumed by Contractor pursuant to the provisions of the solicitation sent by the City of Arvada or as determined by the City of Arvada Risk Manager.
- All coverage must be written with carriers holding a minimum A.M. Best rating of A-:VII, and authorized to do business in Colorado. Coverage shall be primary, and any insurance held by the City of Arvada is excess and non-contributory.
- Issuance of a Purchase Order/Contract is contingent upon the receipt of the insurance documents. Work shall not commence before this requirement is met. If the Contractor fails to submit the required insurance documents within 15 calendar days after notice to submit such policies is given to the Contractor by a City representative, the Contractor may be in default of the Award.
- Except for Workers Compensation, Employer's Liability insurance, Automobile Liability and Professional Liability insurance, the City of Arvada must be endorsed as an additional insured on a Certificate of Insurance.
- The City, through its Risk Manager, reserves the right to require additional insurance coverage and other requirements.

SPECIAL PROVISIONS

City of Arvada, Bid No: 23-VCN-119, Project Title: Standley Lake Library Trailhead

Conditions peculiar, but essential, to the successful performance and acceptance of the work on this project are itemized below. As such, they shall take precedence over the City of Arvada Engineering Code of Standards and Specifications.

SC-1 MEASUREMENT AND PAYMENT:

Measurement of the Work performed and Payment, at the unit or lump sum price quoted in the Bid Schedule, shall be made in accordance with requirements of the Measurement and Payment Section of the Contract Documents or as hereinafter stated in the Special Conditions.

SC-2 SERVICE INTERRUPTION:

The Contractor shall notify all parties that will be affected, two hours prior to the time he will disconnect or interrupt known sewer or water service or immediately upon the interruption of a service not shown on the plans. All service so interrupted or damaged shall be immediately repaired and service restored. No service shall be left inoperative overnight.

SC-3 NON-CONFORMITY OF MATERIAL OR FINISHED PRODUCT:

Where materials installed or the finished product fails to meet the minimum requirements of these Contract Documents, the basis of determining final payment to the Contractor shall be determined in accordance with the current revised Section 105.03 of the Colorado Department of Highways Standard Specifications.

SC-4 PRE-BID CONFERENCE:

A Pre-Bid Conference will be held at **8485 Kipling Street, Arvada, CO 80005** on **December 15, 2023 at 9:00 am (MT)** for the purpose of disseminating additional information and clarifying existing information about the project.

SC-5 PRE-CONSTRUCTION MEETING:

Within two weeks following the date of the Notice of Award, a Pre-Construction Conference will be held per the Project Manager's instructions, to review the Contractor's Construction Schedule. The Contractor and all available subcontractors will attend.

SC-6 PROJECT MANAGER/OWNER'S REPRESENTATIVE:

The Project Manager or Owner's Representative is the authorized representative of the Owner assigned to the project site or any part thereof. Project Manager will be interchanged for Project Engineer in the City Standard Specifications.

SC-7 PROTECTION:

Water Protection: Contractor shall, at all times, protect excavation, trenches, and structures from damage from rain water, spring water, ground water, backing up of drains and sewers, and all other water. He/she shall provide all pumps and equipment to provide this protection.

Temporary Drainage: Contractor shall construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations free of water. Water may be drained to adjacent properties only upon approval from the Owner.

SWMP: Contractor to follow all requirements set out in the storm water management plan and as agreed to when obtaining permit with no exceptions unless approved by Owner.

SC-8 LOSSES FROM NATURAL CAUSES:

All loss and damage arising out of the nature of the work to be done, or from the action of the elements or from floods or overflows, or from ground water or from unusual obstruction or difficulties, which may be encountered in the prosecution of the said work, shall be sustained and borne by the Contractor at his own expense.

SC-9 ESTIMATED QUANTITIES:

The Contractor agrees that the quantities of work as stated in his/her proposal and bid, or indicated on the plans, are only approximate, and that during the progress of the work the Owner may find it advisable and shall have the right to omit portions of the work and to increase or decrease the quantities; and the Owner reserves the right to add to or subtract from any items as may be deemed necessary or desirable. Under no circumstances or conditions will the Contractor be paid anything on account of anticipated profits upon the work or any portion thereof covered by this contract, which is not actually performed, and which has not actually entered into the construction of said improvement.

SC-10 TAXES:

The Contractor will pay all applicable sales, use and other similar taxes required by the laws of the State of Colorado. Notwithstanding the above, the Contractor shall obtain from the Department of Revenue a Certificate of Exemption indicating, where applicable, that the Contractor's purchase of construction or building materials is for use in the building erection, alteration or repair of public works owned and used by the City of Arvada, in its governmental capacity. Where a transaction is exempt from such tax, the amount of such tax shall not be included in any bid proposal.

Where taxes are required 30 days or more before the date set forth for final payment, the Contractor shall furnish the Project Manager, in triplicate, and on City of Arvada Engineering Department Form ED-A-76 and ED-5-76, certified receipts of sales, use and other similar taxes, required by law, paid on all materials and equipment incorporated in or used in the performance of the work.

SC-11 STORAGE:

A storage trailer and/or construction staging area will be allowed on the site. This facility will only be allowed during the period of active construction by the General Contractor and his/her subcontractors. The location of the trailers and/or construction yards must be approved by the Project Manager prior to the contractor moving onto the site.

SC-12 SUPERVISION & EXPEDITING:

Unless noted otherwise, all Contractors shall place orders for materials and equipment immediately upon receipt of contracts, and follow-up vigorously to insure adequate and timely supply to the work and shall perform all tracing and expediting operations. The General Contractor shall arrange to have all subcontractors on the job at the proper times to avoid delays and they shall attend any scheduled job meetings.

SC-13 SIGNS:

The General Contractor shall maintain the premises free from advertising and see that no signs are erected except those mandated by Federal or State agencies. The Owner reserves the right to put up such signs or notices as deemed proper.

SC-14 FINAL CLEANING:

The Contractor shall remove all marks, stains, fingerprints, and other soil or dirt from all painted, decorated, and stained work. Contractor shall remove all temporary protections and shall clean and polish all resilient surfaces at completion. All concrete surfaces are to be left clean and free of any tire marks or rubbings. All site furniture, playground equipment, site structures, and site signage shall be cleaned and free of any marks, stains, graffiti, scuffing, and blemishes.

SC-15 ROUGH GRADING:

The following requirements are to be considered as supplementary to City of Arvada Standard Specifications: Excavation and Grading.

General Site Grading: All designated areas are to be graded to true and even surfaces, to uniform slopes between grade elevations given. No excess material will exist from excavations and grading.

Compaction: Soil under all concrete pavements is to be compacted to 95% Standard Proctor Density unless noted otherwise and in open park areas to 85% Standard Proctor Density with 2% of optimum moisture content.

The Contractor will mow and remove the top 8" of existing grasses from the site. Any remaining grasses may be buried in approved non-structural fill section, minimum 12" cover. Stockpile topsoil on the project site in area approved by Owner. After all structural elements (e.g. walls, paving, edging, etc.) have been installed, the first priority for this soil will be the planting beds. The Contractor will be required to remove any debris encountered interfering with construction, if encountered. All excess dirt removed during construction will be disposed of at the contractors' expense on-site and included in the Rough Grading bid item.

The Contractor shall place stockpiled topsoil back over the site upon grading of subgrade to approximate grades and after installation of structural elements. Topsoil shall be spread evenly and uniformly to final rough grade. If excess topsoil remains, it will be spread evenly throughout the grass areas.

All areas are to be raked by hand or mechanical means after soil improvement, to smooth and uniform conditions, free from bumps, rocks and clods over 2" in diameter. Puddling or negative drainage occurring up to one year after the date of acceptance must be promptly adjusted by Contractor, at no additional cost. Final rough grade will be within 1/10th of a foot of proposed contours as shown on plans. Grades under proposed hard surfaces will be $\pm .05$ of a foot. Surfaces shall be left smooth, clean and even, graded to drain and to fit into any undisturbed surrounding terrain. All trash and debris shall be removed from site by the Contractor at the Contractor's expense. Earth that has been rendered unfit to receive planting due to concrete, water, mortar, limewater, or other deleterious substances dumped on it, shall be removed and replaced with clean topsoil at the Contractor's expense.

SC-16 FINE GRADING:

The following requirements are to be considered as supplementary to City of Arvada Standard Specifications: Excavation and Grading.

General Site Grading: All designated areas are to be graded to true and even surfaces, to uniform slopes between grade elevations given. No excess material will exist from excavations and grading.

Any areas upon completion of grading that contain weeds or undesired grasses will be tilled to eliminate all vegetation prior to fine grading and seeding.

Fine grading is considered to be preparation for installation of seed or shrub planting in beds after the rough grading and soil preparation is completed. The Contractor will complete the topsoil installation, spread the topsoil (rough grading), install the irrigation system, install soil amendments and till (see soil amendment and bed preparation). The Contractor will then rake to grade and remove rocks over 1" in diameter from the soil mix.

All areas are to be raked by hand or mechanical means after trenching and soil improvement, to smooth and uniform conditions, free from bumps, rocks and clods over 1" in diameter. Puddling or negative drainage occurring up to one year after the date of acceptance must be promptly adjusted by Contractor, at no additional cost. Finish grade will conform to the proposed contours and elevations as shown on plans. Surfaces will be left smooth, clean and even, graded to drain and to fit into any undisturbed surrounding terrain. All trash and debris shall be removed daily from all work areas within the right-of-way by Contractor at his/her own expense. All irregularities in the ground surface shall be removed. Sticks, stones, debris and other similar material more than 1" in diameter shall be removed. Any objectionable depressions or other variances from a smooth grade shall be corrected.

Earth that has been rendered unfit to receive planting due to concrete, water, mortar, limewater, or other deleterious substances dumped on it, shall be removed and replaced with clean topsoil at the Contractor's expense.

SC-17 SOIL PREPARATION:

Separate areas are identified on the plans for specific soil amendment treatments and fine grading procedures. These procedures and materials area as follows:

MATERIALS:

Soil Amendments:

Submit laboratory affirmation on any soil amendments specified.

Compost:

A-1 Organics Compost, BIO Comp-Class 1, available from A-1 Compost, Eaton, Colorado, (303) 454-2213. Submit analysis for approval prior to delivery.

Gravel Backfill:

Clean washed 1" – 1½" crushed rock backfill.

Preparation of Shrub Bed Areas:

1. All bed areas will be over-excavated and will receive a minimum of 6" of on-site topsoil mixed with the specified soil amendments as specified. (Refer to landscape plan.)
2. Loosen subgrade of lawn areas to a minimum, depth of 6" by rototilling. Remove stones over 1" in any dimension, sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted immediately.
3. For planting areas, apply "Roundup" or equal short-term herbicide to inhibit unwanted plant growth prior to topsoil distribution. Apply in accordance with manufacturer's recommendations for this purpose and sufficiently in advance of planting to avoid damage to new lawns.
4. Spread compost at a rate of 5 CY per 1000 SF in turf and shrub beds and 3 CY per 1000 SF in native areas (per code 1022.01) after topsoil is spread, till in thoroughly to a depth of 6", and bring to minimum depth required to meet lines, grades and elevations shown after natural settlement.
5. Where topsoil is required, add soil amendments and place approximately one-half of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder.

SC-18 CONTROL WIRE / EXTRA WIRE:

The Contractor will furnish and install a #14 copper UF red common control wire to each automatic control valve location on the drawings, a #12 UF white control wire continuous from the controller to each automatic valve location. The Contractor to furnish four (4) black #14 Copper UF spare control wires and two (2) Yellow #12 Copper UF spare common wires (Total of 6 spares) from the controller to the end of each capped main. (See irrigation specifications for further detail.) Master valve wires shall be run sub grade, in continuous PVC schedule 40, 1.25 inch conduit, from irrigation controller pad to backflow/master valve assembly pad.

SC-19 IRRIGATION CONTROLLERS, FLOW SENSORS, R.P.B.P.:

An electric irrigation controller (or "clock") will be supplied, installed and operated by the Contractor during construction and until any contract-related turf/landscape is established and approved by the city. Upon completion and city acceptance of the project, the Contractor will remove the installed electric controller and install the city's Motorola controller(s), unless otherwise specified. The Motorola irrigation controller(s) will be purchased by the City out of the project budget and supplied to the contractor to install at project completion.

The Contractor will provide all materials and labor including, but not limited to, install of city-furnished controller, all electrical connections, foundation pads, conduit and necessary installation (and materials) wiring connections, etc. to provide a fully operational irrigation controller. The Contractor will install the city-provided Hydrometer/Master Valve with (2) Blue #14 UF, (2) Green #14 UF, and (2) Orange #14 UF control wires. Contractor will also install four (4) black #14 Copper UF spare control wires and two (2) Yellow #12 Copper UF spare common wires (Total of 6 spares) throughout the system for future additions. The Contractor is responsible for all winterization and spring start-up procedures, if applicable. (Refer to the drawings and specifications for further detail.)

SC-20 NEW SLEEVE CONSTRUCTION:

The Contractor will furnish and install new sleeving where shown on the drawings. The sleeves will be installed to the pipe diameter and depth shown on the drawings and specifications prior to installation of new flatwork. Each new sleeve will extend eighteen inches past each edge of the new surface. Each sleeve location will be marked by a one-inch deep, two-inch long notch in the concrete (Consult irrigation section for additional detail.) The Contractor is responsible for locating all utilities.

SC-21 SHELTER:

Supplier to provide preliminary design drawings for approval by Landscape Architect and/or owner's representative prior to submitting final stamped engineering drawings. Submittal to include final configuration, equipment, and color selection:

SYSTEM DESCRIPTION

- A. Column to footing connection to be in compliance with OSHA Steel Erection Standard CFR 1926.750 Part R, which requires a minimum of four (4) anchor bolts per column. No single anchor bolt column base connection allowed.
- B. Design Method shall be per applicable The City of Arvada Engineering Code of Standards and Specifications for the design and construction of public improvements. Manufacturer's design shall utilize a three-dimensional structural analysis to determine all member loads and forces. Design and detailing shall be in compliance with AISC 341, Part I or III.
- C. Field labor shall be only for the assembly of the pre-fabricated parts. No onsite welding shall be required or permitted. Tube frame connection bolts and fasteners shall be concealed, within the tubing or hidden. All rafter tails shall be factory welded into place as well as all compression ring/tube covers. On multi-tiered buildings the rafter risers shall be welded to the lower rafters for ease of installation. No openings near the base of the column with screwed on cover plates. No through bolting shall be allowed for any connections due to the possibility of the deformation of the tube steel parts.

SUBMITTALS

- A. Submit a minimum of 2 sets of shop drawings and 2 sets of structural calculations signed and sealed by a Professional Engineer in the state of Colorado.
- B. Manufacturer shall provide site specific foundation design signed and sealed by a Professional Engineer in the state of Colorado. Generic or "typical" foundation details and design shall not be acceptable.
- C. Structural calculations shall show the conformance to the International Building Code (IBC latest Edition).

DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery requirements with Owner and other installers. Contractor is responsible for protection of site amenities, including Trolley and pavement and rails, pre-existing the delivery of structure.
- B. Store products in manner to prevent damage prior to installation. Where products need to be stored outdoors, store off the ground and place so that water will drain.
- C. Inspect parts within 48 hours of delivery, compare with manufacturer's bill of materials and report any missing or non-conforming parts to the manufacturer within this time frame.

SC-22 MINOR CONTRACT REVISIONS:

Miscellaneous modifications in the work, ordered by the Project Manager in the form of a field order, will be considered a minor contract revision. Payment for accepted work performed under this item will be made in accordance with General Condition 2.16 and 2.17 of the City of Arvada Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements.

SC-23 COMPLETION OF SERVICES:

The date of beginning and the time for completion of the work on City projects are essential conditions of the contract documents and the work embraced shall be commenced on the date specified in the Notice to Proceed.

The Contractor will proceed with the work at such rate of progress to ensure full completion within the contract time. It is expressly understood and agreed, by and between the Contractor and the Owner, that the contract time for the completion of the work described in the contract documents is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

A daily charge will be made against the Contractor for each calendar day, including free time that any work remains uncompleted after the expiration of contract time. This daily charge, determined by the original contract amount for the project from the table herein below, will be deducted from any money due the Contractor. This deduction will be considered liquidated damages, not a penalty.

The general schedule of liquidated damages set forth below is an amount, agreed to by the Contractor and the Owner, as reasonably representing additional construction engineering costs incurred by the Owner if the Contractor fails to complete performance within the contract time on City or Arvada projects. Final determination of Liquidated Damages shall be determined by the Owner's Project Manager and will reside within the executed contract documents.

Liquidated Damages Schedule

Original Contract Amount		Daily Charge
From More Than	To and Including	
\$0	\$150,000	\$500
150,001	250,000	600
250,001	500,000	800
500,001	1,000,000	1,400
1,000,001	2,000,000	2,000
2,000,001	4,000,000	3,300
4,000,001	10,000,000	3,900

Over \$10,000,000 - daily charge will increase by \$300 increments for each \$1,000,000 over \$10,000,000.

Permitting the Contractor to continue and finish the work or any part thereof after elapse of contract time will not operate as a waiver on the part of the Owner of any of its rights under the contract.

Any deduction assessed as liquidated damages under this section shall not relieve the Contractor from liability for any damages or costs resulting from delays to other Contractors on the project or other projects caused by a failure of the assessed Contractor to complete the work according to contract times.

The Contractor shall not be charged with liquidated damages or any excess cost when a change in contract time is approved as outlined in Section 1121.07 - Time for Completion and Liquidated Damages, of the Engineering Code of Standards and Specifications, dated July 26, 2022.

The Owner shall have the right to deduct the amount of liquidated damages from any monies due or to become due to the Contractor, or to sue for and recover compensation for damages for non-performance of the work, from the Contractor and his surety, as stipulated in the contract documents.

SC-24 SUPPLEMENTARY MEASUREMENT AND PAYMENT:

BASE BID:

.01 – Mobilization and General Conditions

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment shall be on a percentage of total job completion basis including compensation for all mobilization activities. (See standard City specifications for further detail)

Work: The work of this bid item includes, but is not limited to: all general conditions, mobilization costs, staging area, restoration of disturbed areas due to staging and general construction activities, protective construction fencing, temporary facilities, testing, potholing, vehicle tracking, dust control, permits, taxes, and fees.

.02 – Erosion Control & Stormwater Management

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price.

Work: The work of this bid item includes but is not limited to: application for and obtaining a CDPS Construction Activity Permit from the Colorado Department of Health and Environment (CDPHE), implementation of the Stormwater Management Plan (SWMP) in accordance with the Contract Drawings and Specifications and the CDPHE regulations. Also included in the work is installation, maintenance and removal of temporary BMPs for erosion and sediment control and the services of a qualified Erosion Control Supervisor with duties as described in the SWMP Drawings. Excluded from this item is Seeding.

.03 – Construction Surveying and Staking

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price.

Work: The work of this bid item includes but is not limited to: all construction surveying required to complete project.

.04 – Site Demolition

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price.

Work: The work in this bid item includes, but is not limited to: removal of existing curb and gutter, concrete paving, pedestrian ramps, asphalt pavement, saw-cutting, any items found on site that may interfere with placement of all proposed improvements, disposal of waste materials, incidental work, and all additional materials, labor and equipment necessary to complete the work.

.05 – Clearing and Grubbing

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price.

Work: The work of this bid item includes, but is not limited to: all clearing and grubbing of surface vegetation, shrubbery, removal of trees, disposal of waste materials, incidental work, and all additional materials, labor and equipment necessary to complete the work.

.06 – Tree Protection

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work of this bid item includes, but is not limited to: establish tree protection, remove the tree protection at the end of the project. The unit price should also include the maintenance of the tree protection throughout the duration of the project, incidental work, and all additional materials, labor and equipment necessary to complete the work.

.07 – Site Grading & Earthwork

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price.

Work: The work of this section includes, but is not limited to: general excavation, general embankment, importing material, exporting material, backfill materials, compaction, finish grading, protection and replacement of USGS benchmarks, incidental work, and all materials and labor necessary to complete the work.

.08 – Strip, Stockpile, and Place Topsoil

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price.

Work: The work of this section includes, but is not limited to: topsoil stripping, topsoil stockpiling, placing topsoil, incidental work, and all materials and labor necessary to complete the work.

.09 – Modify Outlet Structure

Measurement: No unit measurement will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price.

Work: The work in this bid item includes, but is not limited to: existing inlet structure modifications, orifice plate, restrictor plate, gaskets, screens, hardware, fabrication, incidental work, and all additional materials, labor and equipment necessary to complete the work.

.10 – Electrical Service & Lighting System

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price.

Work: The work in this bid item includes, but is not limited to: light fixtures, GFCI outlets, conduit, wiring, connections to existing system, electrical panel modifications, incidental work, and all additional materials, labor and equipment necessary to complete installation and fully operational lighting system.

.11 – Concrete Paving (Standard Grey)

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: 6-inch depth concrete, sub-grade preparation, base course material, formwork, fibermesh reinforcement, finishing, saw cutting or hand-tooling (per plans), dowels, joint material, backfill along paving, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.12 – Concrete Paving (Colored)

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: 6-inch depth colored concrete, sub-grade preparation, base course material, formwork, fibermesh reinforcement, finishing, saw cutting or hand-tooling (per plans), dowels, joint material, backfill along paving, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.13 – Asphalt Paving

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: asphalt paving, sub grade preparation, saw cutting, finishing, backfill along edges, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.14 – Curb Ramps

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: concrete ramps, sub grade preparation, fibermesh reinforcement, formwork, dowels, truncated domes, finishing, backfill along edges, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.15 – Sidewalk Chase

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: concrete sidewalk chases, sub grade preparation, formwork, steel reinforcement, metal plate, finishing, backfill along edges, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.16 – Concrete Edger

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: concrete edge, steel reinforcement, PVC weep holes (where necessary), sub grade preparation, formwork, fibermesh reinforcement, finishing, backfill along edges, gravel sumps, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.17 – Curb & Gutter

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: concrete curb and gutters, sub grade preparation, formwork, fibermesh reinforcement, finishing, backfill along edges, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.18 – Curb Cuts

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: concrete curb cuts, sub grade preparation, formwork, fibermesh reinforcement, finishing, backfill along edges, disposal of excess excavated material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.19 – Parking Lot Striping & Signage

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price.

Work: The work in this bid item includes, but is not limited to: all asphalt striping, A.D.A. symbols, A.D.A. signage, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.20 – Sandblasted Images & Lithichrome Paint

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price.

Work: The work in this bid item includes, but is not limited to: sandblasting images, Lithichrome paint, prep work, clean-up work, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.21 – Shelter

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract lump sum price.

Work: The work in this bid item includes, but is not limited to: a prefabricated shade shelter (per plan), custom stone veneer post bases, permitting, foundation, excavation, subgrade preparation, painting, hardware, Colorado engineered and stamped fabrication shop drawings, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.22 – Trash Receptacle

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: trash receptacles, mounting hardware, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.23 – Picnic Table

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: picnic tables, mounting hardware, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.24 – Seating Table

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: seating tables, mounting hardware, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.25 – Bike Rack

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: bike racks, mounting hardware, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.26 – Metal Bench

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: benches, mounting hardware, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.27 – Interpretive Signage

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: signage, sample proofs, frames, mounting hardware, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.28 – Landscape Boulders

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: all boulders, excavation, subgrade preparation, placement, washing, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.29 – Bluegrass Sod

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: soil preparation, amendments, fine grading, sod, rolling, fertilizing, weeding, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.30 – Native Seed

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: soil preparation, amendments, fine grading, seed mix, hydro-mulch, fertilizing, broadcasting, weeding, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.31 – Shrub Bed Prep. & Wood Mulch

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: soil preparation, mycorrhiza inoculants, specified wood mulch, amendments, fertilizers, fine grading, weeding, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.32 – Shrub Bed Prep. & Cobblestone Mulch

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: soil preparation, mycorrhiza inoculants, specified cobblestone rock mulch, amendments, fertilizers, fine grading, weeding, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.33 – Deciduous Shade Tree

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: excavation, mycorrhiza inoculants, wire, straps, PVC pipe, plant material, fertilizers, tree stakes, wood mulch, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.34 – Evergreen Tree

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: excavation, mycorrhiza inoculants, wire, straps, PVC pipe, plant material, fertilizers, tree stakes, wood mulch, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.35 – Ornamental Tree

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: excavation, mycorrhiza inoculants, wire, straps, PVC pipe, plant material, fertilizers, tree stakes, wood mulch, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.36 – Deciduous Shrub

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: excavation, plant material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.37 – Evergreen Shrub

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: excavation, plant material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.38 – Ornamental Grass

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work completed will be made at the contract unit price.

Work: The work in this bid item includes, but is not limited to: excavation, plant material, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

.39 – Complete Irrigation System (Excluding Tap & Meter Pit)

Measurement: No unit measurement for payment will be made for this work.

Payment: Payment for all work included will be at the contract lump sum price.

Work: The work in this bid item includes, but is not limited to: excavation, patching, controller, backflow preventer, laterals, mainline, valve boxes, wiring, spray heads, rotors, dripline, connections, trenching, incidental work, and all additional materials, labor and equipment necessary for a complete installation.

BID BOND

We, the undersigned _____ as
Principal, and _____ as Surety, are hereby held and firmly bound unto the City of
Arvada, Colorado, in the penal sum of _____
for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and
assigns.

THE CONDITION of this obligation is such that whereas the Principal has submitted to the City of Arvada, Colorado
the accompanying Bid Proposal, and hereby made a part hereof to enter into a Contract Agreement for the
construction of City of Arvada Project No. _____.

WHEREAS, the City, as a condition for receiving said Bid Proposal, requires the Principal to deposit with the City
a Bid Proposal Guaranty, equivalent to not less than 5 Percent of the amount of said Bid Proposal.

NOW THEREFORE,

- (A) If said Bid Proposal shall be rejected; or in the alternate,
- (B) If said Bid Proposal shall be accepted and the Principal shall execute and deliver a Contract Agreement (properly completed in accordance with said Bid Proposal) and shall furnish a Performance and Payment Bond upon the forms prescribed by the City for the faithful performance of said Contract; and for the payment of all persons performing labor or furnishing materials in connection therewith; and shall in all other respects perform the agreement created by the acceptance of said Bid Proposal;

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the City may accept such Bid and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, this _____ day of _____, 2023, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

PRINCIPAL

SURETY

Name: _____

Address: _____

By: _____

By: _____

Title: _____

Title: _____

Attorney-in-Fact:

(SEAL)

NOTE: Surety Companies executing bonds must be authorized to transact business in the State of Colorado and be acceptable to the City.

BID PROPOSAL

TO: City of Arvada, Colorado (hereinafter called "CITY").

FROM: _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____ doing business as (a corporation), (a partnership), (an individual).

The Bidder, in compliance with your Advertisement for Bids, hereby proposes to perform all Work in strict accordance with the Contract Documents, for the construction of City of Arvada Project No. _____ entitled _____ within the time set forth therein, and at the prices stated on the included Bid Schedule as totaled herein.

By submission of this Bid Proposal, each Bidder certifies, and in the case of a joint venture each party thereto certifies as to his/her own organization, that this Bid Proposal has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid Proposal with any other Bidder or with any competitor.

Bidder acknowledges receipt of **Addendum Nos.** Initials: _____

Bidder states that their:

Major Material Suppliers are:

Material They Will Supply

Major Subcontractors are:

Work They Will Perform

CONTRACT TIME AND LIQUIDATED DAMAGES: All work shall be completed, including clean-up, within **240** working days after the date to be specified in the Notice to Proceed. A Notice to Proceed is anticipated to be issued on or about **January 23, 2024**. The bidder shall agree to pay the owner the sum as identified in Section 1121.07 on the Engineering Code of Standards & Specifications or each calendar day that the work exceeds the executed contract time. Contract time may be adjusted by Change Order as approved by the Project Manager.

Total from included Bid Schedule:

TOTAL BID \$ _____

SUBMITTED BY:

Company Name: _____

Contact Names: _____

Address: _____

Phone: (_____) _____ Email(s): _____

The undersigned hereby affirms that:

- He/she is a duly authorized agent of the Contractor;
- He/she has read all Terms and Conditions and technical specifications made available in conjunction with this solicitation and fully accept and acknowledge this bid is consistent with the specifications and terms and conditions.
- The bid is in all respects fair, without outside collusion or otherwise illegal action.

By: _____
Signature of Authorized Agent Date FEIN

Typed/Printed Name of Agent Title of Agent Agent email

PAYMENT TERMS: The City standard is net thirty (30) days but every effort is made to meet net fifteen (15) days after the approved partial payment date when the contractor is satisfactorily performing the contract. The final 5% of total payment will be paid once the contract is completed satisfactorily, advertisement for final settlement is complete, and the project is accepted by the City. Payment is the date of the check mailing or date of the credit card transaction.

City of Arvada CSB # 23-VCN 119
Standley Lake Library Trailhead Project



**Use provided attached Excel spreadsheet
for bid Submittal**

BID SCHEDULE

Contractor Name: _____

Bid Prepared By: _____

1. Contractor to submit bids for all items, failure to do so will render bid non-responsive. On lump sum items, provide total price on item; on unit price bid items, provide the unit price and the extended amount of the bid.
2. If no bid item existing for a portion of the work, include the costs in a related bid item. Contractor to provide a bid for a fully completed project.

BASE BID ITEMS

Item No.	M&P No.	Description	Est. Qty.	Unit	Unit Price	Total Cost
1	SC-24.01	Mobilization/General Conditions	1	LS	\$	-
2	SC-24.02	Erosion Control & Stormwater Management	1	LS	\$	-
3	SC-24.03	Construction Surveying & Staking	1	LS	\$	-
4	SC-24.04	Site Demolition	1	LS	\$	-
5	SC-24.05	Clearing and Grubbing	1	LS	\$	-
6	SC-24.06	Tree Protection	480	LF	\$	-
7	SC-24.07	Site Grading & Earthwork	1	LS	\$	-
8	SC-24.08	Strip, Stockpile, & Place Topsoil	1	LS	\$	-
9	SC-24.09	Modify Outlet Structure	1	LS	\$	-
10	SC-24.10	Electrical Service & Lighting System	1	LS	\$	-
11	SC-24.11	6" Concrete Paving (Standard Grey)	15,825	SF	\$	-
12	SC-24.12	6" Concrete Paving (Colored)	230	SF	\$	-
13	SC-24.13	Asphalt Paving	430	SF	\$	-
14	SC-24.14	Curb Ramp	3	EA	\$	-
15	SC-24.15	Sidewalk Chase	2	EA	\$	-
16	SC-24.16	Concrete Edger	541	LF	\$	-
17	SC-24.17	Curb & Gutter	62	LF	\$	-
18	SC-24.18	Curb Cuts	18	LF	\$	-
19	SC-24.19	Parking Lot Striping & Signage	1	LS	\$	-
20	SC-24.20	Sandblasted Images & Lithichrome Paint	1	LS	\$	-
21	SC-24.21	Shelter	1	LS	\$	-
22	SC-24.22	Trash Receptacle	6	EA	\$	-
23	SC-24.23	Picnic Table	2	EA	\$	-
24	SC-24.24	Seating Table	4	EA	\$	-
25	SC-24.25	Bike Rack	5	EA	\$	-
26	SC-24.26	Metal Bench	4	EA	\$	-
27	SC-24.27	Interpretive Signage	3	EA	\$	-
28	SC-24.28	Landscape Boulder	27	EA	\$	-
29	SC-24.29	Bluegrass Sod	6,810	SF	\$	-
30	SC-24.30	Native Seed	64,170	SF	\$	-
31	SC-24.31	Shrub Bed Prep. & Wood Mulch	1,490	SF	\$	-
32	SC-24.32	Shrub Bed Prep. & Cobblestone Mulch	7,715	SF	\$	-
33	SC-24.33	Deciduous Shade Tree	17	EA	\$	-
34	SC-24.34	Evergreen Tree	15	EA	\$	-
35	SC-24.35	Ornamental Tree	16	EA	\$	-
36	SC-24.36	Deciduous Shrub	118	EA	\$	-
37	SC-24.37	Evergreen Shrub	52	EA	\$	-
38	SC-24.38	Ornamental Grass	155	EA	\$	-
39	SC-24.39	Complete Irrigation System	1	LS	\$	-
TOTAL BASE BID					\$	-

SUPPLEMENTAL BID SCHEDULE - UNIT PRICES

Item	Unit	Unit Price
1 Earthwork - Import of Soil	CY	
2 Earthwork - Export of Soil	CY	
3 Earthwork - Cut/ Fill and Compact On-Site Soil	CY	
4 Topsoil Stripping, Stockpiling, and Replacement	CY	
5 Hydro-mulching	SF	

REQUIRED CONTRACTOR SUBMITTAL FORM

SUBMITTAL CHECKLIST:

Proposals shall be submitted in the order listed below with each section clearly identified. **Missing information or required documents may result in submission being deemed non-responsive.**

- ☐ Submit completed City Submittal Forms including this sheet, Bid Bond, Bid Proposal, Bid Schedule, Performance Measures Form, and any other attachments requested.
- ☐ Submit implementation timeline and warranties, if applicable.
- ☐ Attach Contractor's Licensing, if applicable.
- ☐ Insurance – Checking this box accepts that the insurance requirements listed by the City are acceptable.
- ☐ Please initial to acknowledge Addenda, if any, have been considered in your proposal:

#1 _____ #2 _____ #3 _____

REFERENCES:

- ☐ Check here if Contractor's standard reference sheet is attached, otherwise, use the space below.

Name: _____ Contact Person: _____

Address: _____

Telephone No: _____ Email: _____

Describe type of work/service performed or items supplied: _____

Name: _____ Contact Person: _____

Address: _____

Telephone No: _____ Email: _____

Describe type of work/service performed or items supplied: _____

Name: _____ Contact Person: _____

Address: _____

Telephone No: _____ Email: _____

Describe type of work/service performed or items supplied: _____

PERFORMANCE MEASURES FORM INSTRUCTIONS:

The City has incorporated Performance Management into its organizational culture. When vendors submit offers to the City in response to solicitations for **Services** (not associated with the primary purchase of goods, supplies, or software), they shall identify the methods and goals by which they will monitor and report their performance providing those services to the City. Vendor's performance shall be documented as to (a) Price/Cost, (b) Punctuality/Responsiveness (c) Quality/Reliability, and (d) Sustainability/or Innovation.

1. Vendor will define 1-2 measures for (a) Price/Cost, (b) Punctuality/Responsiveness (c) Quality/Reliability, and (d) Sustainability/or Innovation, that follow S.M.A.R.T goals: Specific, Measurable, Achievable, Relevant, and Timely, per category.
2. The awarded vendor will self-score their defined metrics within a score card emailed from purchasing 2 months prior to contract renewal. The department will review the vendor's self-scored measures.

SERVICES means: the furnishing of labor, time, effort, maintenance, etc., by a vendor/contractor/consultant, with an initial contract amount of more than \$15,000.

(a) Price/Cost

Example Measure: Consultant will submit detailed invoices substantiating amounts requested.

1. _____
2. _____

(b) Punctuality/Responsiveness

Example Measure: Reporting of project status will occur monthly with the City and consultant's Project Manager.

1. _____
2. _____

(c) Quality/Reliability

Example Measure: Revisions are drafted within two weeks, and no more than 3 revisions prior to final draft.

1. _____
2. _____

(d) Sustainability and/or Innovation

Example Measure: Digital reports delivered to the City 95% of the time will to reduce the use of paper.

1. _____
2. _____

Performance measures will be queried for every year of the contract. Performance measures reporting will partially inform re-contracting with or renewing a contract with a vendor.

PERFORMANCE AND PAYMENT BOND

Bond No. _____

(Firm) _____

(Address) _____
(an Individual), (a Partnership), (a Corporation), hereinafter called Principal; and

(Firm) _____

(Address) _____
hereinafter called Surety, are held and firmly bound unto the City of Arvada, a Colorado municipal corporation, 8101 Ralston Road, Arvada, Colorado 80002, hereinafter called the City, in the penal sum of _____, Dollars, _____, in lawful money of the United States, for the payment of such sum will and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION are such that the Principal entered into a certain Contract with the City, dated the _____ day of _____, 2023, a copy of which is hereto attached and made a part hereof, for the performance of City of Arvada Project No.'s _____.

NOW THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the City, with or without Notice to the surety and during the life of the guaranty period, and if he shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save harmless the City from all cost and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the City all outlay and expense which the City may incur in making good any default, and if he shall promptly make payment to all persons, firms, subcontractors and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such Contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, repairs on machinery, equipment and tools, consumed, rented or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in anyway affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between City and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in three counterparts, each one of which shall be deemed an original, this the ____ day of _____, 2023.

IN PRESENCE OF:

PRINCIPAL _____

By _____

Address _____

(Corporate Seal)

OTHER PARTNERS

(Surety Seal)

SURETY _____

Attorney _____ in _____ Fact _____

Address _____

Note: If Contractor is Partnership, all partners should execute Bond.

Important: Surety Company must be authorized to transact business in the State of Colorado and be acceptable to the City.

NOTICE OF AWARD

Date _____

Company Address
City, State Zip _____

RE: Project Bid No. _____, _____

Dear Representative of _____:

The City of Arvada, Colorado (hereinafter called "City") has considered the Bid Proposals submitted for referenced work in response to its Advertisement for Bids dated _____ and Information for Bidders.

You are hereby notified that your Bid Proposal has been accepted, for items and prices stated in the Bid Schedule, in the amount of \$ _____.

You are required to execute the Contract, the Insurance Certificates and a Performance and Payment Bond within seven (7) days from the date of this Notice to you.

The Performance and Payment Bond needs to be filled out, returned (one original must be returned to the City), and accompanied by the Power of Attorney from your surety company. Also, please make sure that the insurance certificate is in the minimum amounts set forth in the Contract Documents and the City of Arvada is named as an additional insured for the specific Project Number and Title. An Additional Insured endorsement certificate should also be attached.

If you fail to execute said Contract and furnish the necessary Insurance Certificates and Bond within the time allotted from this date, the City will be entitled to consider all your rights arising out of the City's acceptance of your Bid Proposal as abandoned and as a forfeiture of your Bid Bond. The City will be entitled to such other rights as may be granted bylaw.

You are required to return an acknowledged copy of this Notice of Award and enclosures to the Parks & Urban Design Manager.

CITY OF ARVADA, COLORADO

Parks & Urban Design Manager

BIDDER

Company _____

Receipt of above Notice of Award accompanied with a Performance and Payment Bond form and a copy of the Contract is hereby acknowledged.

This _____ day of _____, 20____.

By: _____

Name: _____

Title: _____

NOTICE TO PROCEED

Date

Company
Address
City, State Zip

RE: Project No. _____, _____

Dear Representative of _____:

You are hereby notified to commence work on referenced Project, in accordance with the Contract dated _____
on or before _____, and you are to complete the Work, including cleanup within _____ calendar days thereafter.

The date of completion of all Work is therefore _____.

CITY OF ARVADA, COLORADO

Parks & Urban Design Manager

BIDDER

Receipt of this Notice to Proceed is hereby acknowledged this _____ day of _____, 20____.

Company

By: _____

Title: _____

AN AGREEMENT BY AND BETWEEN THE CITY OF ARVADA AND
FOR _____
IN AN AMOUNT NOT TO EXCEED \$ _____ .00

This Agreement made this _____ day of _____, 20____ by and between the City of Arvada, a home rule municipal corporation (“Arvada” and/or “City”) and _____, a _____ (“Contractor”).

WITNESSETH: That for and in consideration of the covenants, promises, and payments hereinafter mentioned:

1. Contractor will commence and complete the _____ described in the Contract Documents relating to CSB- _____, issued _____, 20 , (“the Work”).
2. Contractor will furnish all material, supplies, tools, equipment, labor, and other services necessary for the completion of the Work.
3. Contractor will commence the work required by the Contract Documents within ten (10) calendar days after the date of Notice to Proceed.
4. Contractor will complete the work required by the Contract Documents by _____ after the date of the Notice to Proceed unless the period for completion is extended otherwise by the Contract Documents.
5. Contractor agrees to perform all of the work described in the Contract Documents for an amount not to exceed \$ _____ .00 for the Work.
6. The term “Contract Documents” means and includes the following:
 - A. Arvada’s Request for [Project Title], CSB- _____ (“CSB”);
 - B. CSB Exhibits (if any);
 - C. CSB Addenda (if any);
 - D. Contractor’s Response to CSB- _____, Advertisement for Bid, Bid Proposal, Bid Schedule, Bid Bond, Certificate of Insurance;
 - E. Notice of Award;
 - F. Performance and Payment Bond;
 - G. Notice to Proceed;
 - H. Change Orders (if any);
 - I. City of Arvada Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements;
 - J. Project special provisions prepared or issued by City of Arvada (or its Consultant if applicable);
 - K. Detail drawings and Bid Documents prepared or issued by City of Arvada (or its Consultant if applicable);
 - L. Specification Illustrations and attachments; and
 - M. All supplementary requirements regarding wage rates, E.E.O., affirmative action and all other Federal-State requirements as outlined in the specifications.
7. INVOICES AND COMPENSATION. Contractor will follow Bid schedule and partial payments will be made accordingly NET 15 but no later than NET 30.

8. GENERAL TERMS AND CONDITIONS, SPECIAL TERMS AND CONDITIONS, INSURANCE REQUIREMENTS, PROJECT SPECIAL PROVISIONS, AND OTHER CSB REQUIREMENTS. Contractor affirms that it has read and is familiar with the Contract Documents, including but not limited to the General Terms and Conditions, Special Terms and Conditions, Insurance Requirements, Project Special Provisions, and other CSB requirements, and agrees to be bound by those terms and conditions.

9. CHANGE ORDERS. Contractor shall perform the Work as described in the Contract Documents or as amended by the mutual consent of the parties in writing. Should the parties agree in writing to a change in the scope of services, then the parties will timely execute any applicable Change Order, which will address changes in scope of services, completion date, contract amount, any applicable material modifications, and any other matters that the parties deem necessary.

10. PREFERENCES IN EMPLOYMENT OF COLORADO LABOR. To the extent that obligations and responsibilities may be established by C.R.S. § 8-17-101 *et seq.*, as amended, with respect to certain public entities and those contracting therewith as to the procurement of services:

- a. Colorado labor shall be employed to perform eighty percent (80%) of the work.
- b. Any waiver of this requirement must comply with C.R.S. § 8-17-101 *et seq.*, as amended.

11. PERFORMANCE MEASURES. The Performance Measures for this Agreement shall be those outlined by Arvada in Section 22 of Special Terms and Conditions for Bidders in the CSB, which are included in the Contract Documents that are exhibits to this agreement.

12. ADDITIONAL DOCUMENTS OR ACTION. The parties agree to execute any additional documents and to take any additional action that is necessary to carry out this Agreement.

13. BINDING EFFECT. This Agreement shall inure to the benefit of, and be binding upon, the parties, their respective legal representatives, successors, heirs, and assigns; provided, however, that nothing in this paragraph shall be construed to permit the assignment of this Agreement except as otherwise expressly authorized herein.

14. PARAGRAPH CAPTIONS. The paragraph captions in this Agreement are set forth only for the convenience and reference of the parties and are not intended in any way to define, limit, or describe the scope or intent of this Agreement.

15. INTEGRATION, AMENDMENT, AND SEVERABILITY. This Agreement represents the entire agreement between the parties, and there are no oral or collateral agreements or understandings. This Agreement may be amended only by an instrument in writing signed by the parties. If any other provision of this Agreement is held invalid or unenforceable, no other provision shall be affected by such holding, and all of the remaining provisions of this Agreement shall continue in full force and effect if the essential terms and conditions of this Agreement for both parties remain valid, legal, and enforceable.

16. NOTICES. Any notice or notification required or permitted by the Agreement shall be in writing and shall be deemed to have been sufficiently given for all purposes if sent by certified mail or registered mail, postage and fees prepaid, addressed to the party to whom such notice is to be given at the address set forth on the signature page below, or at such other address as has been previously

furnished in writing, to the other party or parties. Such notice or notification shall be deemed to have been given when deposited in the United States mail.

17. **BINDING AUTHORITY.** Contractor represents and affirms that the signature page hereof accurately states the full legal name of Contractor (whether as a corporation, partnership, limited liability company, sole proprietorship, or other), contains all requisite signature(s) on behalf of Contractor, has been properly acknowledged by attestation, notary acknowledgment, or both, and in all other respects is effective to bind Contractor, in accordance with all applicable statutes, regulations, resolutions, rules, bylaws, agreements, or similar sources of authority or limitation. This Agreement may be executed in counterpart(s), each of which shall be deemed to be an original, and all of which, taken together, shall constitute one instrument.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement which shall be deemed an original on the date first above written.

CITY OF ARVADA, COLORADO

8101 Ralston Road
Arvada, CO 80002

ATTEST/WITNESS:

City Clerk

APPROVED AS TO FORM:

For Rachael Morris, City Attorney

By: _____

CONTRACTOR

Name:

Title:

CHANGE ORDER

No. ____

TO:

Upon Contractor acceptance and City approval, the work and Contract Documents for City of Arvada, Project No._____, entitled _____ will be adjusted to include the following:

<u>Item</u>	<u>Description</u>	<u>Qty.</u>	<u>Unit</u>	<u>Unit Cost</u>	<u>Add/Delete</u>
--------------------	---------------------------	--------------------	--------------------	-------------------------	--------------------------

1.
2.
3.
4.

TOTAL ADD

\$

Adjustments to Contract Price & Time

**Contract
Dollars**

**Calendar
Days**

Contract Totals through and including

\$

Previous Change Orders

Adjustments this Change Order

\$

(Increase)

Contract Totals to Date – Including

Change Order No. _

\$

Contract Time Expires on:

APPROVED FOR CITY

ATTEST:

8101 Ralston Road
Arvada, CO 80002

City Clerk

ACCEPTED FOR CONTRACTOR

APPROVED AS TO FORM:

For Rachael Morris, City Attorney

By: _____

Title: _____

Date: _____

By: _____

Exhibit A-1

Addendum No. one to the CSB



CITY OF ARVADA

PURCHASING DIVISION
FACSIMILE: 720-898-7098 ▲ TDD: 720-898-7869
PHONE: 720-898-7099

**EXHIBIT
A-1**

CSB- ADDENDUM No. One

Proposal #: 23-VCN-119
Title: Standley Lake Library Trailhead Project
Addendum #: One (1)
Today's Date: 12/27/2023
Proposals Due By: 01/10/2024 - **2:00 PM** MDT (NO CHANGE)
Questions Deadline: 12/22/2023 - **2:00 PM** MDT (NO CHANGE)

Solicitation and all related addenda and communications are available at WWW.BIDNETDIRECT.COM

The following Addendum includes the Mandatory Pre-Bid Attendance Sheet, Pre-Bid Agenda, Pre-Bid Additional notes, and Q & A to be incorporated into the CSB 23-VCN-119.
All other information shall remain unchanged.

Additional notes/comments that were discussed:

- The library is open 7 days a week with many events and the parking lot is often busy. The contractor will need to maintain clear and consistent communication with the library staff throughout the construction period. Construction staging and storage will need to be coordinated with library staff.
- The irrigation controller is located within the library mechanical room. The library will be responsible for maintenance of the irrigation after project completion.

ATTENDANCE SHEET

Bid # 23-VCN-119 CSB Standley Lake Library Trailhead

Meeting Date/Time: 12/15/23 - 9:00 am

Facilitator: C. Holingsworth, PM

Place: 8485 Kipling St, Arvada, CO 80005

COMPANY NAME	Representative Name	Phone	E-Mail	Signature
Triple M Construction	Mabel Moreno	720-331-6342	Triplemconstruction@aol.com	Mabel Moreno
AJI	Gary Olson	3/289-4388	golson@arrowj.com	Gary Olson
Goodland Const.	Ryan Neenan	3/278-8100	Ryan@GoodlandConstruction.com	Ryan Neenan
Elite Industries	Chris Klausner	720-339-5772	chris@eliteindustriesinc.com	Chris Klausner
TCC Corp	Raechele Powell	970-631-4614	Rpowell@tcccorp.net	Raechele Powell
Jags Enterprises	Robert Beas	970-339-9971	Jags7@Jagstent.com	Robert Beas
DHM Design	Kyle Davis	303-212-5746	kdavis@dhmdesign.com	Kyle Davis
James Coleman				
JL Melton	James Coleman	907-360-7698	james@jlmelton.com	James Coleman
Jeffco Library	Charles Carvelari			
Jeffco LIBRARY	Terri Gardner			
Hall-Irwin Corp.	Rob Laidig	970-342-6795	rlaidig@hall-irwin.com	Rob Laidig
SCC LLC	Terri Lee	3-901-5111	territ@scclcontractor.com	Terri Lee

COM

ATTENDANCE SHEET

Bid # 23-VCN-119 CSB Standley Lake Library Trailhead

Meeting Date/Time: 12/15/23 – 9:00 am

Facilitator: C. Holingsworth, PM

Place: 8485 Kipling St, Arvada, CO 80005

COMPANY NAME	Representative Name	Phone	E-Mail	Signature
Front Range Excavating	Phil Wallace	3-940-3299	phil@frontrangeexcavating.com	Phil Wallace
Greatland Concrete	John Rodriguez	720-984-1497	greatland16@gmail.com	J.R.
CHAD Holingsworth	COA - pm			
CHEVIE DYE,	COA - Sr. PROCUREMENT Sp.			



Pre-Bid Meeting Agenda

PROJECT NAME: 23-VCN-119 CSB – Standley Lake Library Trailhead

MEETING DATE/TIME: Date: December 15, 2023
Time: 9:00 – 10:00 am
Meeting Location: Project Site - 8485 Kipling Street, Arvada, CO 80005

1. Sign-in list for Pre-Bid attendee's
 - a. This meeting is not mandatory
2. Introductions
 - a. Chad Hollingsworth – City of Arvada
 - b. Darin DeLay – City of Arvada
 - c. Cheryl Dye – City of Arvada
 - d. Kyle Davis – DHM Design
 - e. Perri Gardner – Jefferson County Public Library
3. Project Overview
 - a. Area and limits of construction
 - b. Project scope - Items include, but not limited to:
 1. Mobilization & General Conditions
 2. Erosion Control & Stormwater Management
 3. Construction Surveying and Staking
 4. Site Demolition
 5. Clearing and Grubbing
 6. Tree Protection
 7. Site Grading & Earthwork:

Earthwork quantities shown on the Erosion Control plans are approximate and the contractor is responsible for all earthwork to achieve the design.
 8. Strip, Stockpile, & Place Topsoil
 9. Modify Outlet Structure
 10. Electrical Service & Lighting System
 11. Concrete Paving (Standard Grey and Colored)
 12. Asphalt Paving
 13. Curb Ramp
 14. Sidewalk Chase
 15. Concrete Edger
 16. Curb & Gutter
 17. Curb Cuts
 18. Parking Lot Striping & Signage
 19. Sandblasted Images & Lithichrome Paint
 20. Shelter
 21. Trash Receptacle
 22. Picnic Table
 23. Seating Table
 24. Bike Rack
 25. Metal Bench
 26. Interpretive Signage



- 27. Landscape Boulder
- 28. Bluegrass Sod
- 29. Native Seed
- 30. Shrub Bed Prep. & Wood Mulch
- 31. Shrub Bed Prep. & Cobblestone Mulch
- 32. Trees
- 33. Shrubs
- 34. Ornamental Grasses
- 35. Complete Irrigation System

4. Coordination Items:

- a. **Contractor to bid plans "As-is"**. No pre-approved substitutes prior to bidding.
 - 1. If no bid item exists for a portion of work, include the costs in a related bid item.
- b. Bidders, sub-contractors and suppliers must be familiar with the current City of Arvada Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements, dated July 26, 2022
- c. Bidding Dates:
 - 1. Question deadline: 12/22/2023 – 2:00 pm MT
 - 2. Bid due: 1/10/2024 – 2:00 pm MT
- d. Bid Delivery Address: Electronic submissions must be submitted online at BidNetDirect.com by the above date and time. Late responses will not be considered for award. Submit bid as one (1) PDF file. Company name must start the file name. Late responses will not be considered for award.
- e. Bid Security:
 - 1. Each Bid must be accompanied by a PHOTO of the Bid Bond, on the form attached to these contract documents, payable to the City for five (5) percent of the total amount of the Bid. As soon as the bid Prices have been compared, the City will issue intent to award on the Bidnetdirect.com web site. The vendor who is named as the intent to award Contractor must submit the physical Bid Bond within 10 days or the intent to award may be revoked. The Bid Bond of the successful Bidder will be retained until the Payment and Performance Bond has been executed and approved after which it will be returned. A certified check may be used in lieu of a Bid Bond.
- f. Contract Security:
 - 1. A Performance and Payment Bond, on the form attached to the contract documents, in the amount of 100% of the Contract price, with a corporate surety approved by the City, will be required for the faithful performance of the Contract.
- g. Contract Time: 240 calendar days after the Notice to Proceed
- h. Liquidated Damages: Refer to the Schedule in Section SC-23 of CSB
- i. Materials Testing: Provided and paid for by Contractor
- j. Construction Surveying: Provided and paid for by Contractor
- k. Contractor is responsible for providing all as-built drawings at the end of the project.

5. Contractor questions

Questions & Answers - 1

Project

23-VCN-119 - Standley Lake Library Trailhead Project

Buying Organization

City of Arvada

No	Question/Answer	Question Date
Q1	Question: tax exempt cert is the project exempt? please advise. Answer: The City of Arvada is Tax Exempt. The City will work with the awarded Contractor regarding any supplies needing purchased with Exemption status.	12/15/2023
Q2	Question: Pre-Bid Q: - Permits What Permits will be required by the contractor? Answer: The City of Arvada will require the Site Disturbance (Greater than 1 Acre) Permit, DEV (Development) Permit, Building Permit (Shade Structure), Electrical (Lighting) Permit, and a General Municipal Contractor License. With the DEV permit, the City will need a site compaction testing report, concrete (compressive strength) testing report, and pond certification letter with drain time spreadsheet, but those are handled under the DEV permit and do not require a separate permit for each. The City will be waiving our permit fees since it is a city project. The Colorado Department of Public Health and Environment will require the Construction Stormwater Permit and SWMP Permit through the CEOS public portal.	12/27/2023
Q3	Question: Pre-Bid Q: Plans Approval Has the City approved the plans? Answer: The City of Arvada's Engineering, Planning, Stormwater, and Parks Departments have reviewed and approved the construction plans as part of the Development Application (DA) submittal process. Farmers Reservoir and Irrigation Company (FRICO) has also reviewed and approved the plans. The licensed contractor will need to submit the plans for the shade structure and lighting to the Building Department for their review before the corresponding permits are issued.	12/27/2023
Q4	Question: Pre-Bid Q: - Start Date When is the anticipated start date? Answer: After the bidding process is complete, an intent to award will be sent to the recommended contractor. The recommended contract will be presented to City Council on 02/05/2024 for approval. It is anticipated that the Notice-To-Proceed will be issued immediately following Council's approval on or about 02/06/2024. The contractor that is awarded the project will have 240 working days to complete the construction.	12/27/2023
Q5	Question: Pre-Bid Q: De-watering Should de-watering be included in the Bid? Answer: De-watering is not anticipated to be an issue with construction. However, the contractor is responsible for determining if de-watering will be necessary based on the provided geotechnical report.	12/27/2023

No	Question/Answer	Question Date
Q6	Question: Pre-Bid Q: Construction Standard What construction standards is the contractor required to follow? Answer: The contractor is responsible for following the most current version of the City of Arvada Engineering Code of Standards and Specifications.	12/27/2023
Q7	Question: Pre-Bid Q: Plant Maintenance How long is the contractor responsible for the maintenance of the plant material? Answer: Per Section 1044.00 of the City of Arvada's Engineering Code of Standards and Specifications, the contractor will be responsible for all maintenance until the project receives the Initial Warranty Acceptance Letter at Final Completion. The maintenance includes hand-watering, weeding, spraying, cultivating, trimming, mulching, tree-wrapping, tightening, and repairing guy wires, removal and replacement of all dead materials, and resetting plants to proper grade and an upright position as required. In other words, the contractor is responsible for taking care of all the site improvements including plant material until the construction is complete and the warranty begins. The two (2) year warranty period shall begin on the date of issue of the Memorandum of Construction Acceptance. The Performance and Payment Bond shall remain in full force and effect through the two (2) year guarantee and warranty period on City projects. During the warranty period, the Jefferson County Public Library will be responsible for mowing, watering, trash removal, and snow plowing of sidewalks and structures.	12/27/2023
Q8	Question: Pre-Bid Q: Ditch Flows What are the ditch flows and when will they ramp up? Answer: Ditch flow information can be requested from the Farmers Reservoir and Irrigation Company. Note that minimal work on top of the ditch embankment is anticipated and use of heavy equipment on top of the ditch embankment should be minimized. All earthwork for the trail connections to the existing greenway trail is a "fill" condition, with no "cut" along the ditch embankment.	12/27/2023
Q9	Question: Engineer's Cost Estimate Is there an Engineer's Cost Estimate available to be shared? Answer: There is an Engineer's Cost Estimate, but it will not be shared to ensure competitive bidding.	12/27/2023

Exhibit A-2

Addendum No. two to the CSB



CITY OF ARVADA

PURCHASING DIVISION
FACSIMILE: 720-898-7098 ▲ TDD: 720-898-7869
PHONE: 720-898-7099

**EXHIBIT
A-2**

CSB- ADDENDUM No. Two

Proposal #: 23-VCN-119
Title: Standley Lake Library Trailhead Project
Addendum #: Two (2)
Today's Date: 01/08/2024
Proposals Due By: 01/10/2024 - **2:00 PM** MDT (NO CHANGE)

Solicitation and all related addenda and communications are available at WWW.BIDNETDIRECT.COM

The following information includes Clarification only.
All other information shall remain unchanged.

1. The Pre-Bid Agenda Item 4 – Coordination items letter g. is incorrect.
Contract time is 240 working days. It is NOT calendar days.
The bid proposal form on page 20 of the CSB is correct.

Exhibit B

Contractor's Response

REQUIRED CONTRACTOR SUBMITTAL FORM**SUBMITTAL CHECKLIST:**

Proposals shall be submitted in the order listed below with each section clearly identified. **Missing information or required documents may result in submission being deemed non-responsive.**

- ☒ Submit completed City Submittal Forms including this sheet, Bid Bond, Bid Proposal, Bid Schedule, Performance Measures Form, and any other attachments requested.
- ☒ Submit implementation timeline and warranties, if applicable.
- ☒ START 2/2024 COMPLETION OCTOBER 3, 2024. WARRANTY IS PER SPEC 2 YEARS.
Attach Contractor's Licensing, if applicable.
- ☒ SEE ATTACHED
Insurance – Checking this box accepts that the insurance requirements listed by the City are acceptable.
- ☒ Please initial to acknowledge Addenda, if any, have been considered in your proposal:

#1 PS #2 PS #3 _____

REFERENCES:

- ☐ Check here if Contractor's standard reference sheet is attached, otherwise, use the space below.

Name: BIBLE PARK Contact Person: KRISTIN BEARD

Address: 6802 E YALE AVE, DENVER, CO 80224

Telephone No: 720-913-0614 Email: _____

Describe type of work/service performed or items supplied: LANDSCAPE & IRRIGATION
CONCRETE, PLAYGROUND

Name: DELONG PARK Contact Person: STACY TURNER

Address: GOLDEN, CO 80401

Telephone No: 303-384-8191 Email: _____

Describe type of work/service performed or items supplied: LANDSCAPE & IRRIGATION

Name: QUAIL STREET PARK Contact Person: NESTOR FEDAK

Address: 1960 QUAIL STREET, LAKEWOOD, CO 80215

Telephone No: _____ Email: _____

Describe type of work/service performed or items supplied: LANDSCAPE & IRRIGATION
SITE FURNISHINGS, PLAYGROUND

BID BOND

We, the undersigned Colorado Designscares, Inc. as
Principal, and Westfield Insurance Company as Surety, are hereby held and firmly bound unto the City of
Arvada, Colorado, in the penal sum of -Five Percent of Amount Bid- (-5%-)
for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and
assigns.

THE CONDITION of this obligation is such that whereas the Principal has submitted to the City of Arvada, Colorado
the accompanying Bid Proposal, and hereby made a part hereof to enter into a Contract Agreement for the
construction of City of Arvada Project No. 23-VCN-119, Standley Lake Library Trailhead

WHEREAS, the City, as a condition for receiving said Bid Proposal, requires the Principal to deposit with the City
a Bid Proposal Guaranty, equivalent to not less than 5 Percent of the amount of said Bid Proposal.

NOW THEREFORE,

- (A) If said Bid Proposal shall be rejected; or in the alternate,
- (B) If said Bid Proposal shall be accepted and the Principal shall execute and deliver a Contract Agreement (properly completed in accordance with said Bid Proposal) and shall furnish a Performance and Payment Bond upon the forms prescribed by the City for the faithful performance of said Contract; and for the payment of all persons performing labor or furnishing materials in connection therewith; and shall in all other respects perform the agreement created by the acceptance of said Bid Proposal;

Then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the City may accept such Bid and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, this 10th day of January, 2024, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

PRINCIPAL

Name: Colorado Designscares, Inc.

Address: 15440 E. Fremont Drive

Centennial, CO 80112

By: Philip E. Steinhauer

Title: President



SURETY

Westfield Insurance Company

P.O. Box 5001, Westfield Center, OH 44251-5001

By: Elizabeth Ostblom

Title: Attorney-in-Fact

Attorney-in-Fact:

Elizabeth Ostblom

(SEAL)

NOTE: Surety Companies executing bonds must be authorized to transact business in the State of Colorado and be acceptable to the City.

General
Power
of Attorney

Westfield Insurance Co.
Westfield National Insurance Co.
Ohio Farmers Insurance Co.
Westfield Center, Ohio

CERTIFIED COPY

Know All Men by These Presents, That WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY, corporations, hereinafter referred to individually as a "Company" and collectively as "Companies," duly organized and existing under the laws of the State of Ohio, and having its principal office in Westfield Center, Medina County, Ohio, do by these presents make, constitute and appoint
EVAN E. MOODY, KAREN A. FEGGESTAD, BRADLEY J. MOODY, JODY L. ANDERSON, ELIZABETH OSTBLOM, ANDREW J. WATERBURY, JOINTLY OR SEVERALLY

of DENVER and State of CO its true and lawful Attorney(s)-in-Fact, with full power and authority hereby conferred in its name, place and stead, to execute, acknowledge and deliver any and all bonds, recognizances, undertakings, or other instruments or contracts of suretyship.

LIMITATION: THIS POWER OF ATTORNEY CANNOT BE USED TO EXECUTE NOTE GUARANTEE, MORTGAGE DEFICIENCY, MORTGAGE GUARANTEE, OR BANK DEPOSITORY BONDS.

and to bind any of the Companies thereby as fully and to the same extent as if such bonds were signed by the President, sealed with the corporate seal of the applicable Company and duly attested by its Secretary, hereby ratifying and confirming all that the said Attorney(s)-in-Fact may do in the premises. Said appointment is made under and by authority of the following resolution adopted by the Board of Directors of each of the WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY:

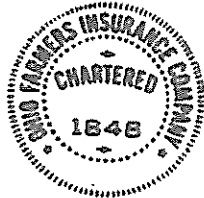
"Be It Resolved, that the President, any Senior Executive, any Secretary or any Fidelity & Surety Operations Executive or other Executive shall be and is hereby vested with full power and authority to appoint any one or more suitable persons as Attorney(s)-in-Fact to represent and act for and on behalf of the Company subject to the following provisions:

The Attorney-in-Fact, may be given full power and authority for and in the name of and on behalf of the Company, to execute, acknowledge and deliver, any and all bonds, recognizances, contracts, agreements of indemnity and other conditional or obligatory undertakings and any and all notices and documents canceling or terminating the Company's liability thereunder, and any such instruments so executed by any such Attorney-in-Fact shall be as binding upon the Company as if signed by the President and sealed and attested by the Corporate Secretary."

"Be It Further Resolved, that the signature of any such designated person and the seal of the Company heretofore or hereafter affixed to any power of attorney or any certificate relating thereto by facsimile, and any power of attorney or certificate bearing facsimile signatures or facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is attached" (Each adopted at a meeting held on February 8, 2000).

In Witness Whereof, WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY have caused these presents to be signed by their National Surety Leader and Senior Executive and their corporate seals to be hereto affixed this 01st day of MARCH A.D., 2022.

Corporate
Seals
Affixed



WESTFIELD INSURANCE COMPANY
WESTFIELD NATIONAL INSURANCE COMPANY
OHIO FARMERS INSURANCE COMPANY

By: Gary W. Stumper, National Surety Leader and Senior Executive

State of Ohio
County of Medina ss:

On this 01st day of MARCH A.D., 2022, before me personally came Gary W. Stumper to me known, who, being by me duly sworn, did depose and say, that he resides in Hartford, CT; that he is National Surety Leader and Senior Executive of WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY, the companies described in and which executed the above instrument, that he knows the seals of said Companies, that the seals affixed to said instrument are such corporate seals; that they were so affixed by order of the Boards of Directors of said Companies, and that he signed his name thereto by like order.

Notarial
Seal
Affixed



State of Ohio
County of Medina ss:

David A. Kotnik, Attorney at Law, Notary Public
My Commission Does Not Expire (Sec. 147.03 Ohio Revised Code)

I, Frank A. Carrino, Secretary of WESTFIELD INSURANCE COMPANY, WESTFIELD NATIONAL INSURANCE COMPANY and OHIO FARMERS INSURANCE COMPANY, do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney, executed by said Companies, which is still in full force and effect, and furthermore, the resolutions of the Boards of Directors, set out in the Power of Attorney are in full force and effect.

In Witness Whereof, I have hereunto set my hand and affixed the seals of said Companies at Westfield Center, Ohio, this 10th day of January A.D., 2024.



Frank A. Carrino, Secretary

BID PROPOSAL

TO: City of Arvada, Colorado (hereinafter called "CITY").

FROM: COLORADO DESIGNSCAPES INC. (hereinafter called "BIDDER"), organized and existing under the laws of the State of COLORADO doing business as (a corporation), (a partnership), (an individual).

The Bidder, in compliance with your Advertisement for Bids, hereby proposes to perform all Work in strict accordance with the Contract Documents, for the construction of City of Arvada Project No. 23-VCH-119 entitled STANDLEY LAKE LIBRARY TRAILHEAD within the time set forth therein, and at the prices stated on the included Bid Schedule as totaled herein.

By submission of this Bid Proposal, each Bidder certifies, and in the case of a joint venture each party thereto certifies as to his/her own organization, that this Bid Proposal has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid Proposal with any other Bidder or with any competitor.

Bidder acknowledges receipt of Addendum Nos. Initials: #1 P #2 P

Bidder states that their:

Major Material Suppliers are:

CPS
GREEN SPOT

Material They Will Supply

IRRIGATION
PLANTS

Major Subcontractors are:

JIF

Work They Will Perform

CONCRETE

CONTRACT TIME AND LIQUIDATED DAMAGES: All work shall be completed, including clean-up, within **240** working days after the date to be specified in the Notice to Proceed. A Notice to Proceed is anticipated to be issued on or about **January 23, 2024**. The bidder shall agree to pay the owner the sum as identified in Section 1121.07 on the Engineering Code of Standards & Specifications or each calendar day that the work exceeds the executed contract time. Contract time may be adjusted by Change Order as approved by the Project Manager.

Total from included Bid Schedule:

TOTAL BID \$ 742,000⁰⁰

SUBMITTED BY:

Company Name: COLORADO DESIGNSCAPES INC.

Contact Names: JEFF THOMPSON

Address: 1544 E. FREMONT DR. CENTENNIAL, CO 80112

Phone: (303) 912-7253 Email(s): JTHOMPSON@DESIGNSCAPES.ORG

The undersigned hereby affirms that:

- He/she is a duly authorized agent of the Contractor;
- He/she has read all Terms and Conditions and technical specifications made available in conjunction with this solicitation and fully accept and acknowledge this bid is consistent with the specifications and terms and conditions.
- The bid is in all respects fair, without outside collusion or otherwise illegal action.

By: Phil E. Steinhauser 1/10/2024 84-1197138
Signature of Authorized Agent Date FEIN

Phil Steinhauser President JThompson@Designscapes.org
Typed/Printed Name of Agent Title of Agent Agent email

PAYMENT TERMS: The City standard is net thirty (30) days but every effort is made to meet net fifteen (15) days after the approved partial payment date when the contractor is satisfactorily performing the contract. The final 5% of total payment will be paid once the contract is completed satisfactorily, advertisement for final settlement is complete, and the project is accepted by the City. Payment is the date of the check mailing or date of the credit card transaction.

**BID SCHEDULE**

Contractor Name: Colorado Designscares Inc.

Bid Prepared By: Jeff Thompson

1. Contractor to submit bids for all items, failure to do so will render bid non-responsive. On lump sum items, provide total price on item; on unit price bid items, provide the unit price and the extended amount of the bid.
2. If no bid item existing for a portion of the work, include the costs in a related bid item. Contractor to provide a bid for a fully completed project.

BASE BID ITEMS

Item No.	M&P No.	Description	Est. Qty.	Unit	Unit Price	Total Cost
1	SC-24.01	Mobilization/General Conditions	1	LS	\$ 55,880.75	\$ 55,880.75
2	SC-24.02	Erosion Control & Stormwater Management	1	LS	\$ 14,500.00	\$ 14,500.00
3	SC-24.03	Construction Surveying & Staking	1	LS	\$ 15,500.00	\$ 15,500.00
4	SC-24.04	Site Demolition	1	LS	\$ 2,300.00	\$ 2,300.00
5	SC-24.05	Clearing and Grubbing	1	LS	\$ 34,000.00	\$ 34,000.00
6	SC-24.06	Tree Protection	480	LF	\$ 4.00	\$ 1,920.00
7	SC-24.07	Site Grading & Earthwork	1	LS	\$ 28,000.00	\$ 28,000.00
8	SC-24.08	Strip, Stockpile, & Place Topsoil	1	LS	\$ 12,500.00	\$ 12,500.00
9	SC-24.09	Modify Outlet Structure	1	LS	\$ 9,400.00	\$ 9,400.00
10	SC-24.10	Electrical Service & Lighting System	1	LS	\$ 17,000.00	\$ 17,000.00
11	SC-24.11	6" Concrete Paving (Standard Grey)	15,825	SF	\$ 8.65	\$ 136,886.25
12	SC-24.12	6" Concrete Paving (Colored)	230	SF	\$ 10.25	\$ 2,357.50
13	SC-24.13	Asphalt Paving	430	SF	\$ 29.00	\$ 12,470.00
14	SC-24.14	Curb Ramp	3	EA	\$ 1,350.00	\$ 4,050.00
15	SC-24.15	Sidewalk Chase	2	EA	\$ 5,100.00	\$ 10,200.00
16	SC-24.16	Concrete Edger	541	LF	\$ 39.00	\$ 21,099.00
17	SC-24.17	Curb & Gutter	62	LF	\$ 44.00	\$ 2,728.00
18	SC-24.18	Curb Cuts	18	LF	\$ 25.00	\$ 450.00
19	SC-24.19	Parking Lot Striping & Signage	1	LS	\$ 1,900.00	\$ 1,900.00
20	SC-24.20	Sandblasted Images & Lithichrome Paint	1	LS	\$ 4,800.00	\$ 4,800.00
21	SC-24.21	Shelter	1	LS	\$ 45,000.00	\$ 45,000.00
22	SC-24.22	Trash Receptacle	6	EA	\$ 2,900.00	\$ 17,400.00
23	SC-24.23	Picnic Table	2	EA	\$ 2,700.00	\$ 5,400.00
24	SC-24.24	Seating Table	4	EA	\$ 5,700.00	\$ 22,800.00
25	SC-24.25	Bike Rack	5	EA	\$ 1,500.00	\$ 7,500.00
26	SC-24.26	Metal Bench	4	EA	\$ 3,300.00	\$ 13,200.00
27	SC-24.27	Interpretive Signage	3	EA	\$ 1,950.00	\$ 5,850.00
28	SC-24.28	Landscape Boulder	27	EA	\$ 1,000.00	\$ 27,000.00
29	SC-24.29	Bluegrass Sod	6,810	SF	\$ 1.10	\$ 7,491.00
30	SC-24.30	Native Seed	64,170	SF	\$ 0.50	\$ 32,085.00
31	SC-24.31	Shrub Bed Prep. & Wood Mulch	1,490	SF	\$ 3.00	\$ 4,470.00
32	SC-24.32	Shrub Bed Prep. & Cobblestone Mulch	7,715	SF	\$ 2.50	\$ 19,287.50
33	SC-24.33	Deciduous Shade Tree	17	EA	\$ 540.00	\$ 9,180.00
34	SC-24.34	Evergreen Tree	15	EA	\$ 800.00	\$ 12,000.00
35	SC-24.35	Ornamental Tree	16	EA	\$ 565.00	\$ 9,040.00
36	SC-24.36	Deciduous Shrub	118	EA	\$ 46.00	\$ 5,428.00
37	SC-24.37	Evergreen Shrub	52	EA	\$ 61.00	\$ 3,172.00
38	SC-24.38	Ornamental Grass	155	EA	\$ 21.00	\$ 3,255.00
39	SC-24.39	Complete Irrigation System	1	LS	\$104,500.00	\$ 104,500.00

TOTAL BASE BID**\$ 742,000.00****SUPPLEMENTAL BID SCHEDULE - UNIT PRICES**

Item	Unit	Unit Price
1 Earthwork - Import of Soil	CY	\$45.00
2 Earthwork - Export of Soil	CY	\$80.00
3 Earthwork - Cut/ Fill and Compact On-Site Soil	CY	\$35.00
4 Topsoil Stripping, Stockpiling, and Replacement	CY	\$28.00
5 Hydro-mulching	SF	\$0.10

PERFORMANCE MEASURES FORM INSTRUCTIONS:

The City has incorporated Performance Management into its organizational culture. When vendors submit offers to the City in response to solicitations for **Services** (not associated with the primary purchase of goods, supplies, or software), they shall identify the methods and goals by which they will monitor and report their performance providing those services to the City. Vendor's performance shall be documented as to (a) Price/Cost, (b) Punctuality/Responsiveness (c) Quality/Reliability, and (d) Sustainability/or Innovation.

1. Vendor will define 1-2 measures for (a) Price/Cost, (b) Punctuality/Responsiveness (c) Quality/Reliability, and (d) Sustainability/or Innovation, that follow S.M.A.R.T goals: Specific, Measurable, Achievable, Relevant, and Timely, per category.
2. The awarded vendor will self-score their defined metrics within a score card emailed from purchasing 2 months prior to contract renewal. The department will review the vendor's self-scored measures.

SERVICES means: the furnishing of labor, time, effort, maintenance, etc., by a vendor/contractor/consultant, with an initial contract amount of more than \$15,000.

(a) Price/Cost

Example Measure: Consultant will submit detailed invoices substantiating amounts requested.

1. Contractor will submit backup subcontractor invoices paid applications to ensure fair costs to the city.
2. Contractor will provide 3 subcontractor / vendor quotes for any scope change proposals.

(b) Punctuality/Responsiveness

Example Measure: Reporting of project status will occur monthly with the City and consultant's Project Manager.

1. Contractor will respond with pricing within 5 business days for any and all pricing requests.
2. Contractor will provide contact information for 24 hour Emergency project contact.

(c) Quality/Reliability

Example Measure: Revisions are drafted within two weeks, and no more than 3 revisions prior to final draft.

1. Contractor has performed successfully 3+ other park projects for the City and is aware of the contracting requirements.
2. Contractor intends to furnish all required contracting documents including bonds, insurance, signatures within 10 days of notice of award.

(d) Sustainability and/or Innovation

Example Measure: Digital reports delivered to the City 95% of the time will to reduce the use of paper.

1. Contractor will look for ways to reduce impacts to the environment by utilizing recycled materials if possible. Ex. Using recycled concrete as road base where applicable.
2. Contractor trains employees about not idling equipment or vehicles when not in use on job sites.

Performance measures will be queried for every year of the contract. Performance measures reporting will partially inform re-contracting with or renewing a contract with a vendor.

AEC1774

CONTRACTOR'S LICENSE

CONTRACTOR - BID/ENG

Contractor Information:

COLORADO DESIGNSCAPES INC
15440 E FREMONT DR
CENTENNIAL CO 80112

License Information:

Expiration: 4/12/2024

Authorized Signer's: TOM BROWNFIELD CHRIS STONE MARK DEMROVSKY MATT FLANAGAN

License Grades: MUNICIPAL GENERAL CONTRACTOR
UNLIMITED



Justin Clark
Chief Building Official

Contractor's Responsibilities:

Arvada City Code Sec. 18-72. Responsibilities. All licensees shall be responsible for any work requiring a permit under the provisions of this chapter, without limitation to the items as herein listed to:

- (a) Provide generally recognized safety measures and equipment to protect laborers and the public in general;
- (b) Present the required city license card when required by the building official or the building official's authorized representative;
- (c) Inform the building inspection division promptly of any change in licensee's address or telephone number;
- (d) Obtain a permit when the same is required;
- (e) Provide correct and honest factual information on all applications for permits;
- (f) Pay all fees assessed under authority of this chapter and other city regulations and to accurately inform the customer of the exact permit fee and other costs associated with obtaining a permit;
- (g) Construct without substantial departure from or disregard of drawings and specifications when such drawings and specifications have been filed and approved by the building inspection division and permit issued for same unless changes are approved by the building inspection division;
- (h) Perform the activity authorized by a permit in a proficient, workmanlike manner consistent with acceptable building practices;
- (i) Complete all work authorized by the permit issued under the authority of this chapter unless good cause is proved;
- (j) Notify the building official when work is ready for inspection, and provide access to and means for the inspection, or if access to the work has been denied by the property owner, to comply with the requirements of section 18-33(c);
- (k) Obtain all required inspections and special inspections when the same are required by this chapter;
- (l) Take all reasonable actions to assist the building inspection division in ensuring that all inspections, including a final inspection, are completed before the expiration of the building permit. This includes, but is not limited to, ensuring that work subject to inspection is not concealed by subsequent work, assisting in making timely arrangements for inspections so that approvals may be completed before a permit expires, and engaging in timely and continuing communications with the division concerning the inspection process until a final inspection is completed and the permit is closed;
- (m) Obtain a final inspection and approval, a certificate of completion, a temporary certificate of occupancy, or a certificate of occupancy, when required, upon completion of the work authorized by the licensee's permit;
- (n) Keep streets and sidewalks that are adjacent to construction sites and open to the public traffic free of obstructions, construction materials, equipment, debris, mud, dirt or any other material that may be a hindrance or hazard to vehicular or pedestrian traffic;
- (o) Observe and conform to all of the rules and regulations governing construction and land use in the city; and
- (p) Comply with all orders, conditions, and restrictions issued by written order of the building official or the Board.

Exhibit I

Drainage Report, Plans, and SWMP and Geotech Report

City of Arvada Standley Lake Library Trailhead Drainage Report

Prepared for:
City of Arvada
Arvada, CO

October 2023

KLJ Project #2204-00356



KLJ Engineering
400 Inverness Parkway
Ste #150
Englewood, CO 80012

This Drainage Report for the design of the Standley Lake Library Trailhead project was prepared by me or under my direct supervision in accordance with the City of Arvada Engineering Code of Standards and Specifications and acceptable professional practices of the industry. I acknowledge that the City of Arvada's review of this Drainage Report is only for general conformance with submittal requirements, current design criteria and standard engineering principles and practices and that the design and concept remains the responsibility of the professional engineer whose stamp and signature appear hereon.



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FIGURE 1 PROJECT VICINITY MAP	1
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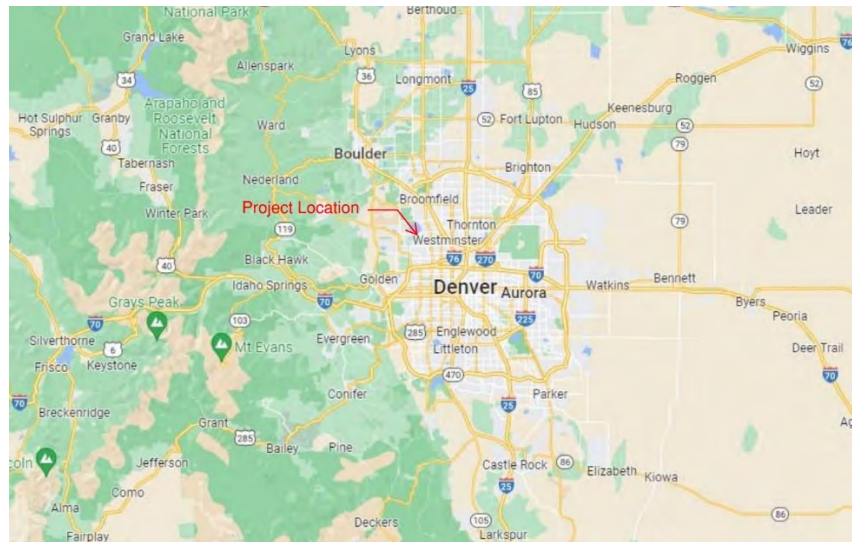
APPENDIX A WORKSHEETS	
APPENDIX B DRAINAGE OVERVIEW MAPS	
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APPENDIX D DRAINAGE REPORT CHECKLIST	
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1 INTRODUCTION

1.1 Summary

The City of Arvada is working in collaboration with Jefferson County Public Library (JCPL) on a project to build a trailhead serving the Rocky Mountain Greenway (RMG) on JCPL property. The trailhead will provide access from Standley Lake Library, existing parking area, and Kipling Street to a central public trailhead. This report will seek to provide information concerning the grading and drainage changes that will be made to the JCPL property to accommodate the trailhead. A general layout of the project has been included in Appendix B. The project site is not in a flood plain; see the FIRM panel in the SWMP. Per the geotechnical report, the existing soils are NRCS soil group C. The site drains to City storm sewer. A vicinity map is provided in Figure 1.

FIGURE 1 PROJECT VICINITY MAP



2 DRAINAGE BASINS

2.1 Major & Minor

As stated in the most recent available drainage study, dated May 2, 1990, and found in Appendix E, by DSW, water drains from the west and northwest corners of the property to the southeast where it is captured by inlets in the parking lot and routed to an existing detention pond. The water from roof drains and the north of the property drains into a detention area north of the library entrance which connects to the pond. The pond outlets west under Kipling Street to the City storm sewer system.

The site currently consists of JCPL with a parking lot directly south of the building. The proposed project will add a concrete trail to the surrounding vegetated area from the entrance area, south around the parking lot, and connecting to the RMG on the west side of the property. The additional impervious area requires expansion of the existing pond to accommodate the additional runoff. This expansion will not impact existing infrastructure. The drainage patterns will largely remain the same, as seen in the drainage overview maps in Appendix B. A description of each minor drainage area is included in the drainage overview maps. A1 has the only increase in rates, with the water directed into swales developed in A7 to achieve longer time of concentration and meet runoff rate goals.

3 DRAINAGE DESIGN CRITERIA

3.1 Mile High Flood District

Mile High Flood District's rules and standards can be found in their Urban Storm Drainage Criteria Manual.

3.2 City of Arvada

The City of Arvada Land Development Code outlines the regulations for development within the City. The City follows MS4 guidelines.

3.3 Methods

The existing and proposed conditions for the site were analyzed using HydroCAD software and Atlas-14 rainfall data obtained from the NOAA website. A survey of the project site was completed to provide accurate infrastructure and topographic information.

4 STORMWATER MANAGEMENT FACILITY DESIGN

4.1 Peak Runoff Rate

The intent of the project is to continue existing drainage patterns as much as practical. According to regulations, the post-development runoff rates shall not exceed the existing rates for the 2-, 10-, and 100-year storm events. This has been achieved with swales and the expansion of the existing stormwater pond. The swales will extend the time of concentration for runoff from the site prior to outletting into existing curb and gutter and storm inlets in the parking lot. Swales require minimal maintenance such as inspections and removing any buildup of debris or sediment. The existing storm inlets and pond outlet control structure will remain. The outlet control structure uses a weir to maintain the release rate of water from the pond to the storm sewer. The analysis results for existing and proposed conditions may be viewed in Appendix C. Outflow stated is the amount of water entering the City of Arvada storm sewer system.

	2 Year	5 Year	10 Year	100 Year
Existing Outflow (cfs)	6.30	6.63	6.98	56.72
Proposed Outflow (cfs)	4.61	6.56	6.93	36.06

4.2 Runoff Volume

Regulations state that 1" of runoff generated from new impervious surface must be retained onsite. Due to poor soil conditions, infiltration is not possible. A copy of the geotechnical report can be found in the SWMP. Expansion of the existing pond was used to achieve volume control. There is no new maintenance associated with the expanded pond, and there is no impact on existing City infrastructure. The table below summarizes the required and achieved volumes.

Added Impervious (acres)	0.54
Pond Expansion (acre-ft)	0.23

4.3 Water Quality

MS4 Regulations require that stormwater runoff be treated prior to discharge from the site. Water quality goals are being achieved through the use of swales and the stormwater pond. Both vegetated and rock swales are proposed to capture sediment from the water. Expansion of the stormwater pond will continue to allow sediment to settle before discharging to the storm sewer. The existing outlet structure does not provide any WQCV, so this will be modified.

The existing structure has a 6.5" tall x 11" wide opening for drainage to discharge through. This will require the existing structure to be modified, with 3x orifices installed all having a diameter of 1-1/16". These orifices need to be set at 0" height, 11.3" height, and 22.3" height from the pond bottom/valley pan flowline.

An additional orifice shall be constructed by stopping the orifice plate at a height of 2.50'. Above this, there will be a vertical orifice opening approximately 12" wide x 18" tall, allowing water to drain out of the pond prior to the overflow weir/safety grate outfall.

4.4 Floodplain

As discussed in the SWMP, the project site is not in a floodplain.

5 CONCLUSIONS AND RECOMMENDATIONS

The analysis of existing and proposed conditions for Standley Lake Library Trailhead account for the existing drainage, reviewing the existing conditions as modeled in 1990 and modeled using current rainfall data. The proposed conditions reduce the 100-yr pond discharge by increasing the temporary storage volume, due to the pond having a fixed discharge rate. The data is shown in Appendix C.

To comply with rate and volume regulations mandated by the various agencies with jurisdiction over this project, swales are proposed to be constructed, increasing the time of concentration before stormwater reaches the pond, and the existing pond will be expanded to meet the demands of increased impervious. The proposed stormwater conveyance infrastructure and treatment BMPs have been designed in accordance with applicable regulations.

The proposed swales are not able to be properly modeled for water quality in the MHFD detention spreadsheets which are required to show the WQCV. Due to this, the outlet structure will receive a minor modification to verify the entire Standley Lake Library site meets or exceeds current stormwater quality requirements.

APPENDIX A WORKSHEETS

Post-Construction Stormwater Management Design Standards

Developer must complete and submit this form for each water quality control measure on projects that disturb more than 1 acre. Attach completed form(s) to Drainage Report.

PROJECT AND SITE INFORMATION

Project / Site Name:	Standley Lake Trail	Project Location:	Arvada, CO
DA Case / Project No.		Total Site Acreage:	8.11
Owner Name:	Jefferson County Lib.	Existing Impervious Area (Ac):	2.05
Date Submitted:	4/26/2023	Proposed Impervious Area (Ac):	2.59
Est. Project Completion Date:	2023	Does this project overlap multiple MS4 jurisdictions?	☐ YES ☒ NO

4-STEP PROCESS FOR STORMWATER QUALITY MANAGEMENT (ANALYSIS REQUIRED)

STEP	YES/NO	DESCRIPTION OF PRACTICE
STEP 1: Does the project employ runoff reduction practices by implementing low impact development (LID) strategies such as minimizing directly connected impervious area, implementing swales, rain gardens or permeable pavements?	Yes	swales
STEP 2: Does the project implement Best Management Practices (BMPs) that provide a Water Quality Capture Volume (WQCV) with slow release such as detention and retention ponds, sand filters, or permeable pavers with subsurface storage?	Yes	pond
STEP 3: Does the project stabilize drainage ways to maintain natural functions such as stream bank stabilization or drop structures?	Yes	erosion control
STEP 4: Does the project implement site specific or other source control (both structural and procedural) such as covering storage areas or removing pollutants?	Yes	erosion control

This Post-Construction Stormwater Management Design Standards form is to be completed to address water quality requirements only. Flood control may also be required and should be included in project proposals.

Select only ONE base or ONE constrained redevelopment sites design standard below for each proposed Control Measure (CM).

If multiple CMs are used on a single site, a separate form must be completed for each CM detailing the base design standard and portion of the project being addressed.

Are multiple CMs being implemented?	☐ YES ☒ NO	If yes, how many CMs are being implemented?	
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BASE DESIGN STANDARDS			
BASE DESIGN STANDARD		DESIGN DETAILS	RESPONSE
☐	A) WQCV Standard <i>The control measure(s) is designed to provide treatment and/or infiltration of the WQCV and:</i> 1) 100% of the applicable development site is captured, except the permittee may exclude up to 20%, not to exceed 1 acre, of the applicable development site area when the permittee has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the permittee must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to the street). 2) Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented. Consideration of the drain time shall include maintaining vegetation necessary for operation of the control measure (e.g., wetland vegetation).	Percentage of site (disturbance) the control measure provides treatment/infiltration of WQCV?	%
		CM Type:	
		% of site not treated:	%
		Acreage of site not treated:	
		Why is the excluded area impractical to treat?	
		Why is another CM not practicable for the untreated area?	
☐	B) Pollutant Removal Standard <i>The control measure(s) is designed to treat at a minimum the 80th percentile storm event. The control measure(s) shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less.</i> 1) 100% of the applicable site is captured, except the permittee may exclude up to 20% not to exceed 1 acre of the applicable development site area when the permittee has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the permittee must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to the street).	Meets design standards and requirements?	☐ Yes ☐ No
		Percentage of storm event designed to treat:	%
		Median TSS mg/L. expected in effluent:	
		Documentation for basis of expected TSS result:	
		Percentage of site (disturbance) the control measure provides treatment/infiltration of WQCV?	%
		% of site not treated:	%
		Acreage of site not treated:	
		Why is the excluded area impractical to treat?	
		Why is another CM not practicable for the untreated area?	

BASE DESIGN STANDARD (continued)		DESIGN DETAILS	RESPONSE
☐	C) Runoff Reduction Standard <i>The control measure(s) is design to infiltrate into the ground where site geology permits, evaporate, or evapotranspire a quantity of water equal to 60% of what the calculated WQCV would be if all impervious area for the applicable development site discharged without infiltration. This base design standard can be met through practices such as green infrastructure. "Green infrastructure" generally refers to control measures that use vegetation, soils, and natural processes or mimic natural processes to manage stormwater. Green infrastructure can be used in place of or in addition to low impact development principles.</i> Refer to Mile High Flood District UD BMP Workbook for calculations.	Meets design standards and requirements?	☐ Yes ☐ No
		CM type:	
		Percentage of site (disturbance) that the WQCV is infiltrated, evaporated or evapotranspired:	%
		Percentage of WQCV reduction:	%
☒	D) Applicable Development Site Draining to a Regional WQCV Control Measure <i>The regional WQCV control measure must be designed to accept the drainage from the applicable development site. Stormwater from the site must not discharge to a water of the state before being discharged to the regional WQCV control measure. The regional WQCV control measure must meet the requirements of the WQCV in part I.E.4.a.iv(A) (see below):</i> <u>Part I.E.4.a.iv(A)</u> 1) 100% of the applicable development site is captured, except the permittee may exclude up to 20%, not to exceed 1 acre, of the applicable development site area when the permittee has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the permittee must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to the street). 2) Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented. Consideration of the drain time shall include maintaining vegetation necessary for operation of the control measure (e.g., wetland vegetation).	Is Regional Control Measure designed to accept drainage from site?	☒ Yes ☐ No
		Does stormwater discharge to Waters of the State before being discharged to Regional WQCV Control Measure?	☐ Yes ☒ No *If Yes, Go to the next standard (E)
		Percentage of site (disturbance) the control measure provides treatment/infiltration of WQCV?	100 %
		% of site not treated:	0 %
		Acreage of site not treated:	0.0
		Why is the excluded area impractical to treat?	N/A
		Why is another CM not practicable for the untreated area?	N/A

BASE DESIGN STANDARD (continued)		DESIGN DETAILS	RESPONSE
☐	E) Applicable Development Site Draining to a Regional WQCV Facility <i>The regional WQCV facility is designed to accept drainage from the applicable development site. Stormwater from the site may discharge to a water of the state before being discharged to the regional WQCV facility. Before discharging to a water of the state, at least 20% of the upstream imperviousness of the applicable development site must be disconnected from the storm drainage system and drain through a receiving pervious area control measure comprising a footprint of at least 10% of the upstream disconnected impervious area of the applicable development site. The control measure must be designed in accordance with a design manual identified by the permittee (USDCM Vol 3 Preferred). In addition, the stream channel between the discharge point of the applicable development site and the regional WQCV facility must be stabilized.</i> <i>The regional WQCV facility must meet the following requirements:</i> 1) <i>The regional WQCV facility must be implemented, functional, and maintained following good engineering, hydrologic and pollution control practices.</i> 2) <i>The regional WQCV facility must be designed and maintained for 100% WQCV for its entire drainage area.</i> 3) <i>The regional WQCV facility must have capacity to accommodate the drainage from the applicable development site.</i> 4) <i>The regional WQCV facility be designed and built to comply with all assumptions for the development activities planned by the permittee within its drainage area, including the imperviousness of its drainage area and the applicable development site.</i> 5) <i>Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the facility. Consideration of drain time shall include maintaining vegetation necessary for operation of the facility (e.g., wetland vegetation).</i> 6) <i>The permittee shall meet the requirements in Parts I.E.4.a.v. and vii. and Part I.E.4.b. for the regional WQCV facility consistent with requirements and actions for control measures.</i> 7) <i>The regional WQCV facility must be subject to the permittee's authority consistent with requirements and actions for a Control Measure in accordance with Part I.E.4.a.iv.</i> 8) <i>Regional Facilities must be designed and implemented with flood control or water quality as the primary use. Recreational ponds and reservoirs may not be considered Regional Facilities. Water bodies listed by name in surface water quality classifications and standards regulations (5 CCR 1002-32 through 5 CCR 1002-38) may not be considered regional facilities.</i>	Is the Regional WQCV facility implemented, functional, and maintained following good engineering, hydrologic and pollution control practices (Part I.E.4.a.iv.E.1)?	☐ Yes ☐ No
	Percentage of site (disturbance) that the WQCV is treated:	% *Must be 100%	
	Does the Regional WQCV facility have capacity to accommodate the drainage from the applicable development site?	☐ Yes ☐ No	
	Is the Regional WQCV facility designed and built to comply with all assumptions for the development activities planned by the permittee within its drainage area, including the imperviousness of its drainage area and the applicable development site?	☐ Yes ☐ No	
	Is the evaluation of the minimum drain time based on the pollutant removal mechanism and functionality of the facility? Consideration of drain time shall include maintaining vegetation necessary for operation of the facility (e.g., wetland vegetation).	☐ Yes ☐ No	
	Is the Regional WQCV facility designed, constructed, and implemented with flood control and water quality as the primary use?	☐ Yes ☐ No	
	Was the stream channel stabilized? (include documentation)	☐ Yes ☐ No	
	Method of stabilization:		
	Name of stream reach stabilized:		
	Area of unconnected impervious area (UIA) going to receiving pervious area (RPA): (RPA ≥10% UIA)	Square Feet	
	Area of RPA:	Square Feet	
	RPA BMP type:		
	Name and location of Regional WQCV Facility:		
Regional WQCV Facility type:			

CONSTRAINED REDEVELOPMENT SITES DESIGN STANDARDS

"Redevelopment" means a site that is already substantially developed with 35% or more of existing imperviousness; with the creation or addition of impervious area (including removal and/or replacement), to include the expansion of a building footprint or addition or replacement of a structure; structural development including construction, replacement of impervious area that is not part of a routine maintenance activity; and land disturbing activities.

CONSTRAINED REDEVELOPMENT SITES DESIGN STANDARD	DESIGN DETAILS	RESPONSE
REQUIRED	F.1) Constrained Redevelopment Site Standards a) The applicable redevelopment site is for a site that has greater than 75% impervious area, and b) The permittee has determined that it is not practicable to meet any of the base design standards. The permittee's determination shall include an evaluation of the applicable redevelopment sites ability to install a control measure without reducing surface area covered with the structures.	The applicable redevelopment site has greater than 75% impervious area? ☐ Yes ☐ No
	Provide an explanation of the infeasibility of Base Design Standards and justification for use of Constrained Site Standard.	
☐	F.2.a) Constrained WQCV Standard The control measure(s) is designed to provide treatment of the WQCV for the area captured. The captured area shall be 50% or more of the impervious area of the applicable redevelopment site. Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented.	Provides treatment of WQCV? ☐ Yes ☐ No
	CM type:	
	% of site treated:	
☐	F.2.b) Constrained Pollutant Removal Standard The control measure is designed to provide treatment for the 80th percentile storm event. The control measure(s) shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less.	Meets Design Standards and Requirements for TSS removal? ☐ Yes ☐ No
	CM type:	
	% of site treated:	%
	Median TSS mg/L expected in effluent:	mg/L
	Documentation for basis of expected TSS result:	
☐	F.2.c) Constrained Runoff Reduction Standard The control measure(s) is designed to infiltrate, evaporate, or evapotranspire, through practices such as green infrastructure, a quantity of water equal to 30% of what the calculated WQCV would be if all impervious area for the applicable redevelopment site area be directed to a control measure(s) as long as the overall removal goal is met or exceeded.	Meets design standards and requirements for infiltration, evaporation and transpiration? ☐ Yes ☐ No
	CM type:	
	% of WQCV infiltrated, evaporated or evapotranspired:	

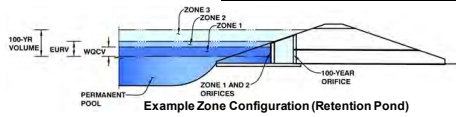
DATE	REVISION
9/20/2018	City of Arvada
10/2/2018	City of Arvada
10/12/2018	City of Arvada
11/7/2018	City of Arvada
9/20/2021	City of Arvada

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Standley Lake Library Trailhead

Basin ID: Expanded Existing



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	8.12 acres
Watershed Length =	1,036 ft
Watershed Length to Centroid =	650 ft
Watershed Slope =	0.015 ft/ft
Watershed Imperviousness =	70.00% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	Westminster - City Hall

After providing required inputs above including 1-hour rainfall depths, click "Run CUHP" to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.186 acre-feet
Excess Urban Runoff Volume (EURV) =	0.552 acre-feet
2-yr Runoff Volume (P1 = 0.82 in.) =	0.357 acre-feet
5-yr Runoff Volume (P1 = 1.1 in.) =	0.521 acre-feet
10-yr Runoff Volume (P1 = 1.36 in.) =	0.691 acre-feet
25-yr Runoff Volume (P1 = 1.75 in.) =	0.978 acre-feet
50-yr Runoff Volume (P1 = 2.08 in.) =	1.210 acre-feet
100-yr Runoff Volume (P1 = 2.43 in.) =	1.472 acre-feet
500-yr Runoff Volume (P1 = 3.37 in.) =	2.145 acre-feet
Approximate 2-yr Detention Volume =	0.340 acre-feet
Approximate 5-yr Detention Volume =	0.508 acre-feet
Approximate 10-yr Detention Volume =	0.617 acre-feet
Approximate 25-yr Detention Volume =	0.739 acre-feet
Approximate 50-yr Detention Volume =	0.802 acre-feet
Approximate 100-yr Detention Volume =	0.903 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
	inches
	inches
	inches
	inches
	inches
	inches

Define Zones and Basin Geometry

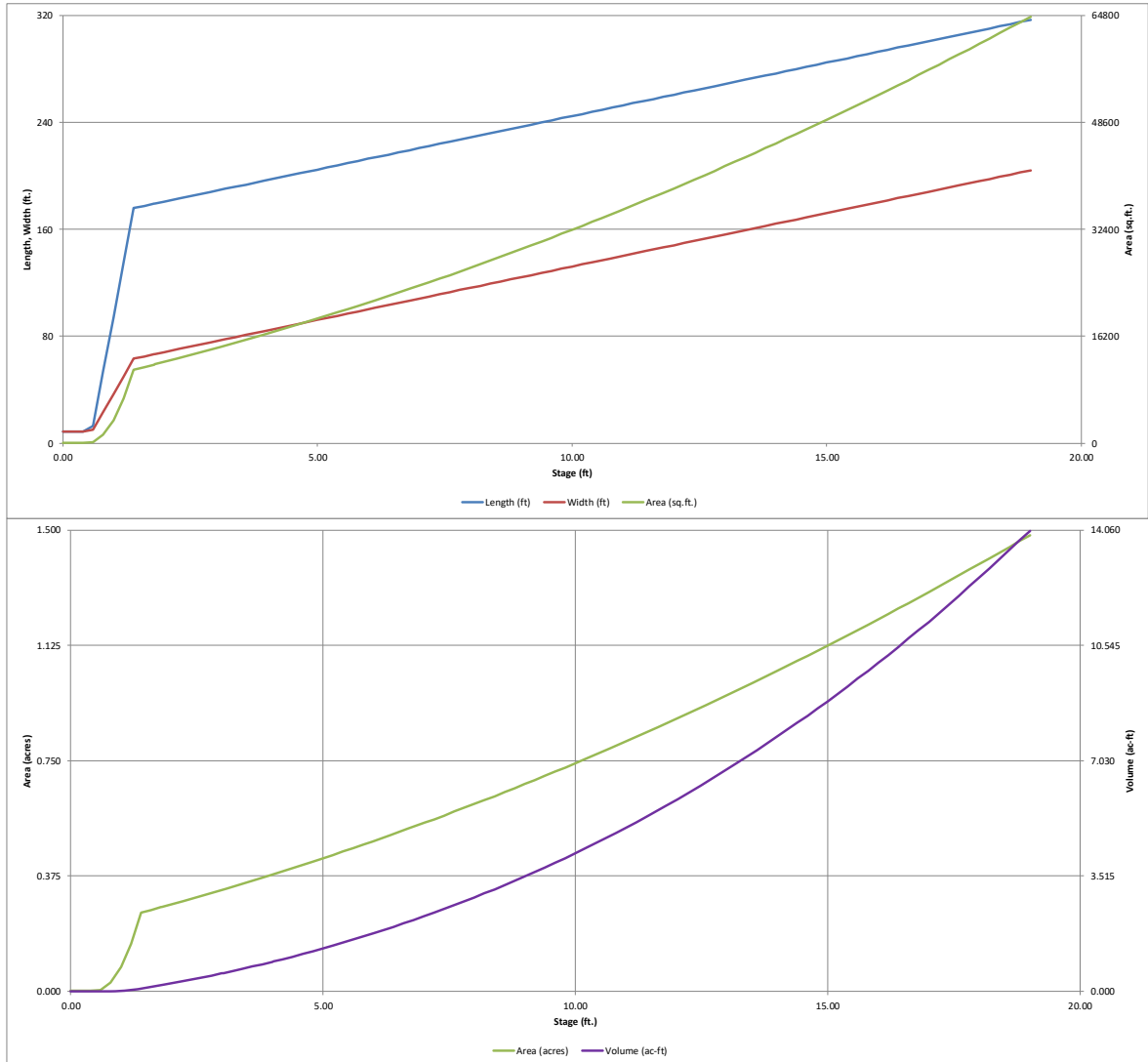
Zone 1 Volume (WQCV) =	0.186 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.366 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.351 acre-feet
Total Detention Basin Volume =	0.903 acre-feet
Initial Surge Volume (ISV) =	24 ft ³
Initial Surge Depth (ISD) =	0.33 ft
Total Available Detention Depth (H _{total}) =	4.00 ft
Depth of Trickle Channel (H _{tc}) =	0.25 ft
Slope of Trickle Channel (S _{tc}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 H:V
Basin Length-to-Width Ratio (R _{LW}) =	3

Initial Surge Area (A _{ISV}) =	74 ft ²
Surcharge Volume Length (L _{ISV}) =	8.6 ft
Surcharge Volume Width (W _{ISV}) =	8.6 ft
Depth of Basin Floor (H _{FLOOR}) =	0.82 ft
Length of Basin Floor (L _{FLOOR}) =	175.9 ft
Width of Basin Floor (W _{FLOOR}) =	63.3 ft
Area of Basin Floor (A _{FLOOR}) =	11,124 ft ²
Volume of Basin Floor (V _{FLOOR}) =	3,308 ft ³
Depth of Main Basin (H _{MAIN}) =	2.60 ft
Length of Main Basin (L _{MAIN}) =	196.7 ft
Width of Main Basin (W _{MAIN}) =	84.1 ft
Area of Main Basin (A _{MAIN}) =	16,530 ft ²
Volume of Main Basin (V _{MAIN}) =	35,718 ft ³
Calculated Total Basin Volume (V _{total}) =	0.897 acre-feet

Depth Increment =	0.20	ft							
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		8.6	8.6	74		0.002		
ISV	0.33		8.6	8.6	74		0.002	24	0.001
	0.40		8.6	8.6	74		0.002	29	0.001
	0.60		12.7	9.9	126		0.003	45	0.001
	0.80		53.5	23.3	1,243		0.029	163	0.004
	1.00		94.3	36.6	3,449		0.079	614	0.014
	1.20		135.1	49.9	6,742		0.155	1,615	0.037
Floor	1.40		175.9	63.3	11,124		0.255	3,384	0.078
	1.60		177.5	64.9	11,509		0.264	5,647	0.130
	1.80		179.1	66.5	11,899		0.273	7,988	0.183
Zone 1 (WQCV)	1.81		179.1	66.5	11,919		0.274	8,107	0.186
	2.00		180.7	68.1	12,294		0.282	10,407	0.239
	2.20		182.3	69.7	12,695		0.291	12,906	0.296
	2.40		183.9	71.3	13,101		0.301	15,485	0.355
	2.60		185.5	72.9	13,511		0.310	18,146	0.417
	2.80		187.1	74.5	13,927		0.320	20,890	0.480
	3.00		188.7	76.1	14,348		0.329	23,718	0.544
Zone 2 (EURV)	3.03		188.9	76.3	14,412		0.331	24,149	0.554
	3.20		190.3	77.7	14,774		0.339	26,630	0.611
	3.40		191.9	79.3	15,206		0.349	29,628	0.680
	3.60		193.5	80.9	15,642		0.359	32,712	0.751
	3.80		195.1	82.5	16,083		0.369	35,885	0.824
	4.00		196.7	84.1	16,530		0.379	39,146	0.899
Zone 3 (100-year)	4.02		196.8	84.2	16,575		0.381	39,477	0.906
	4.20		198.3	85.7	16,982		0.390	42,497	0.976
	4.40		199.9	87.3	17,438		0.400	45,939	1.055
	4.60		201.5	88.9	17,900		0.411	49,473	1.136
	4.80		203.1	90.5	18,367		0.422	53,100	1.219
	5.00		204.7	92.1	18,840		0.432	56,820	1.304
	5.20		206.3	93.7	19,317		0.443	60,636	1.392
	5.40		207.9	95.3	19,799		0.455	64,547	1.482
	5.60		209.5	96.9	20,287		0.466	68,556	1.574
	5.80		211.1	98.5	20,780		0.477	72,663	1.668
	6.00		212.7	100.1	21,277		0.488	76,868	1.765
	6.20		214.3	101.7	21,780		0.500	81,174	1.863
	6.40		215.9	103.3	22,288		0.512	85,581	1.965
	6.60		217.5	104.9	22,801		0.523	90,089	2.068
	6.80		219.1	106.5	23,320		0.535	94,702	2.174
	7.00		220.7	108.1	23,843		0.547	99,418	2.282
	7.20		222.3	109.7	24,372		0.559	104,239	2.393
	7.40		223.9	111.3	24,905		0.572	109,167	2.506
	7.60		225.5	112.9	25,444		0.584	114,202	2.622
	7.80		227.1	114.5	25,988		0.597	119,345	2.740
	8.00		228.7	116.1	26,537		0.609	124,597	2.860
	8.20		230.3	117.7	27,091		0.622	129,960	2.983
	8.40		231.9	119.3	27,650		0.635	135,434	3.109
	8.60		233.5	120.9	28,215		0.648	141,020	3.237
	8.80		235.1	122.5	28,784		0.661	146,720	3.368
	9.00		236.7	124.1	29,359		0.674	152,534	3.502
	9.20		238.3	125.7	29,938		0.687	158,464	3.638
	9.40		239.9	127.3	30,523		0.701	164,510	3.777
	9.60		241.5	128.9	31,113		0.714	170,673	3.918
	9.80		243.1	130.5	31,708		0.728	176,955	4.062
	10.00		244.7	132.1	32,308		0.742	183,357	4.209
	10.20		246.3	133.7	32,914		0.756	189,879	4.359
	10.40		247.9	135.3	33,524		0.770	196,523	4.512
	10.60		249.5	136.9	34,140		0.784	203,289	4.667
	10.80		251.1	138.5	34,760		0.798	210,179	4.825
	11.00		252.7	140.1	35,386		0.812	217,193	4.986
	11.20		254.3	141.7	36,017		0.827	224,334	5.150
	11.40		255.9	143.3	36,653		0.841	231,600	5.317
	11.60		257.5	144.9	37,294		0.856	239,095	5.487
	11.80		259.1	146.5	37,940		0.871	246,818	5.659
12.00		260.7	148.1	38,592		0.886	254,772	5.835	
12.20		262.3	149.7	39,248		0.901	262,956	6.014	
12.40		263.9	151.3	39,910		0.916	269,871	6.195	
12.60		265.5	152.9	40,577		0.932	277,920	6.380	
12.80		267.1	154.5	41,249		0.947	286,102	6.568	
13.00		268.7	156.1	41,925		0.962	294,420	6.759	
13.20		270.3	157.7	42,608		0.978	302,873	6.953	
13.40		271.9	159.3	43,295		0.994	311,463	7.150	
13.60		273.5	160.9	43,987		1.010	320,191	7.351	
13.80		275.1	162.5	44,685		1.026	329,058	7.554	
14.00		276.7	164.1	45,387		1.042	338,065	7.761	
14.20		278.3	165.7	46,095		1.058	347,213	7.971	
14.40		279.9	167.3	46,808		1.075	356,504	8.184	
14.60		281.5	168.9	47,526		1.091	365,937	8.401	
14.80		283.1	170.5	48,249		1.108	375,514	8.621	
15.00		284.7	172.1	48,977		1.124	385,237	8.844	
15.20		286.3	173.7	49,710		1.141	395,105	9.070	
15.40		287.9	175.3	50,449		1.158	405,121	9.300	
15.60		289.5	176.9	51,192		1.175	415,285	9.534	
15.80		291.1	178.5	51,941		1.192	425,598	9.770	
16.00		292.7	180.1	52,695		1.210	436,062	10.011	
16.20		294.3	181.7	53,454		1.227	446,677	10.254	
16.40		295.9	183.3	54,218		1.245	457,444	10.501	
16.60		297.5	184.9	54,987		1.262	468,364	10.752	
16.80		299.1	186.5	55,761		1.280	479,439	11.006	
17.00		300.7	188.1	56,540		1.298	490,669	11.264	
17.20		302.3	189.7	57,325		1.316	502,055	11.526	
17.40		303.9	191.3	58,115		1.334	513,599	11.791	
17.60		305.5	192.9	58,909		1.352	525,301	12.059	
17.80		307.1	194.5	59,709		1.371	537,163	12.332	
18.00		308.7	196.1	60,514		1.389	549,185	12.608	
18.20		310.3	197.7	61,324		1.408	561,369	12.887	
18.40		311.9	199.3	62,139		1.427	573,715	13.171	
18.60		313.5	200.9	62,960		1.445	586,225	13.458	
18.80		315.1	202.5	63,785		1.464	598,900	13.749	
19.00		316.7	204.1	64,616		1.483	611,740	14.044	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

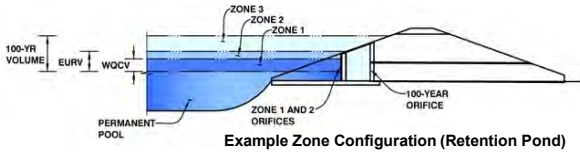


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Standley Lake Library Trailhead

Basin ID: Expanded Existing



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.81	0.186	Orifice Plate
Zone 2 (EURV)	3.03	0.366	Rectangular Orifice
Zone 3 (100-year)	4.02	0.351	Weir&Pipe (Restrict)
Total (all zones)		0.903	

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

Underdrain Orifice Invert Depth = N/A ft (distance below the filtration media surface)
Underdrain Orifice Diameter = N/A inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = N/A ft²
Underdrain Orifice Centroid = N/A feet

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

Calculated Parameters for Plate

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 2.50 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = N/A inches
Orifice Plate: Orifice Area per Row = 0.89 sq. inches (diameter = 1-1/16 inches)

WQ Orifice Area per Row = 6.181E-03 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.93	1.86					
Orifice Area (sq. inches)	0.89	0.89	0.89					

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

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.50	N/A	ft (relative to basin bottom at Stage = 0 ft)		0.58	N/A	ft ²
Depth at top of Zone using Vertical Orifice =	3.03	N/A	ft (relative to basin bottom at Stage = 0 ft)		0.29	N/A	feet
Vertical Orifice Height =	7.00	N/A	inches				
Vertical Orifice Width =	12.00		inches				

Vertical Orifice Area =
Vertical Orifice Centroid =

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	3.08	N/A	ft (relative to basin bottom at Stage = 0 ft)		3.08	N/A	feet
Overflow Weir Front Edge Length =	3.25	N/A	feet		3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V				
Horiz. Length of Weir Sides =	3.00	N/A	feet		12.20	N/A	
Overflow Grate Type =	Type C Grate	N/A			6.79	N/A	ft ²
Debris Clogging % =	0%	N/A	%		6.79	N/A	ft ²

Height of Grate Upper Edge, H_u =
Overflow Weir Slope Length =
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris =
Overflow Grate Open Area w/ Debris =

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)		0.56	N/A	ft ²
Outlet Pipe Diameter =	12.00	N/A	inches		0.37	N/A	feet
Restrictor Plate Height Above Pipe Invert =	8.00		inches		1.91	N/A	radians

Outlet Orifice Area =
Outlet Orifice Centroid =
Half-Central Angle of Restrictor Plate on Pipe =

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	5.70	ft (relative to basin bottom at Stage = 0 ft)		Spillway Design Flow Depth =	0.09	feet	
Spillway Crest Length =	250.00	feet		Stage at Top of Freeboard =	6.79	feet	
Spillway End Slopes =	10.00	H:V		Basin Area at Top of Freeboard =	0.53	acres	
Freeboard above Max Water Surface =	1.00	feet		Basin Volume at Top of Freeboard =	2.17	acre-ft	

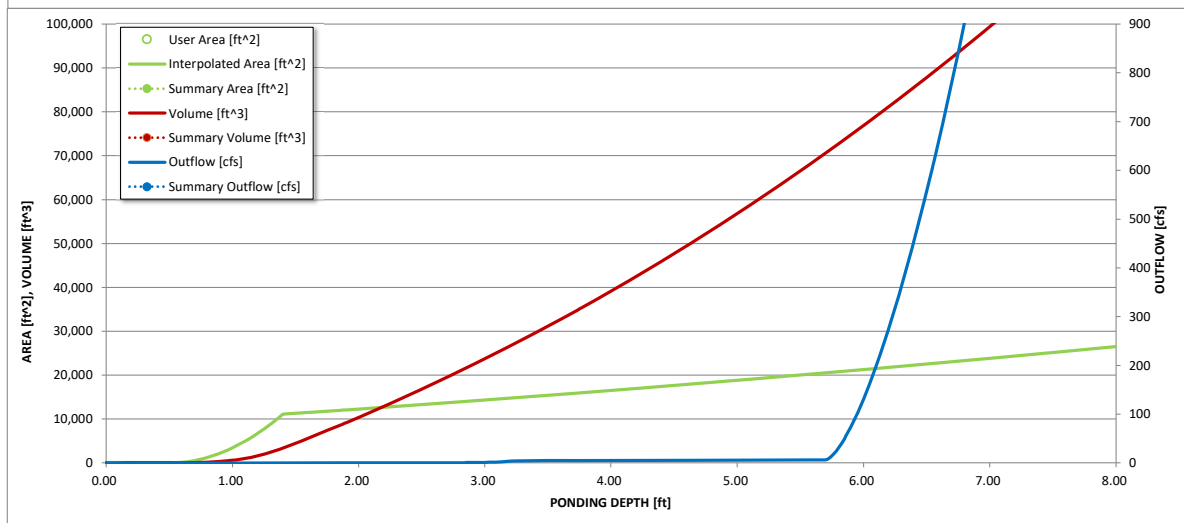
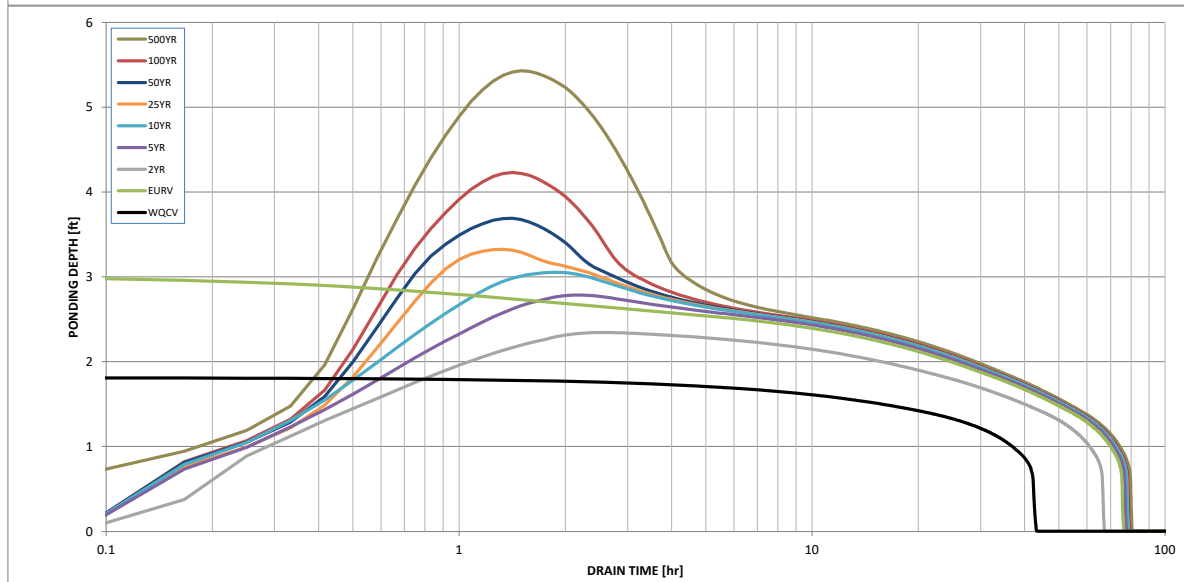
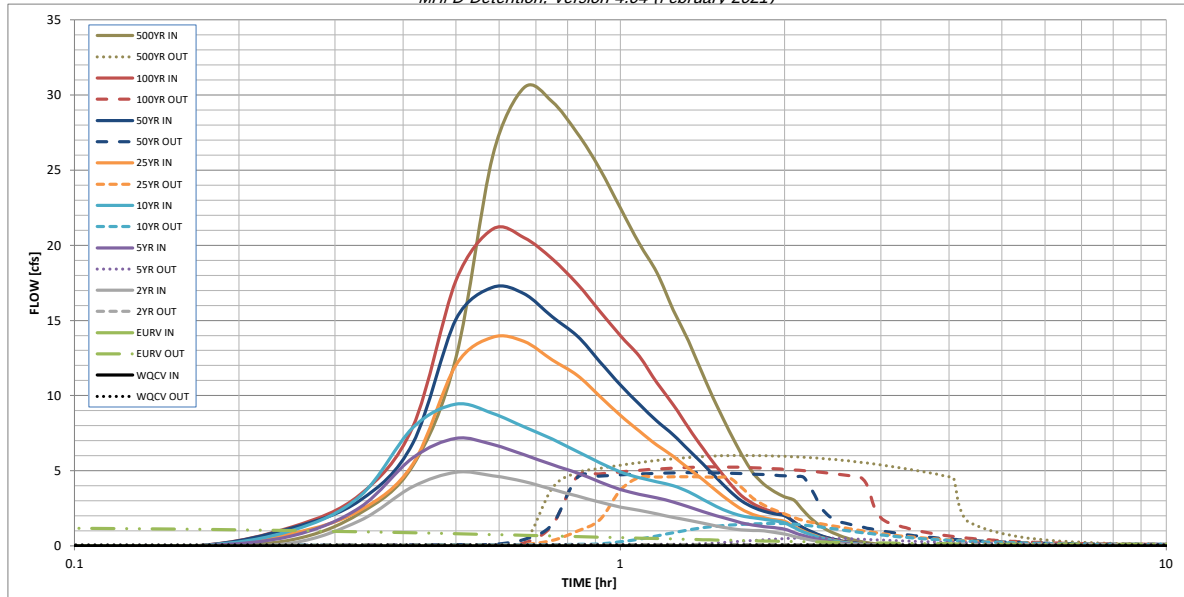
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	0.82	1.10	1.36	1.75	2.08	2.43	3.37
One-Hour Rainfall Depth (in) =	0.186	0.552	0.357	0.521	0.691	0.978	1.210	1.472	2.145
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.357	0.521	0.691	0.978	1.210	1.472	2.145
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	0.6	1.7	4.4	6.2	8.3	13.4
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.07	0.21	0.54	0.76	1.03	1.65
Peak Inflow Q (cfs) =	N/A	N/A	4.9	7.2	9.4	13.9	17.2	21.1	30.5
Peak Outflow Q (cfs) =	0.1	1.3	0.1	0.5	1.5	4.6	4.9	5.3	6.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.9	1.0	0.8	0.6	0.4
Structure Controlling Flow =	Plate	Vertical Orifice 1	Plate	Vertical Orifice 1	Vertical Orifice 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	0.3	0.3	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	69	62	71	71	68	67	65	62
Time to Drain 99% of Inflow Volume (hours) =	42	74	65	75	75	74	74	73	72
Maximum Ponding Depth (ft) =	1.81	3.03	2.34	2.79	3.05	3.32	3.69	4.23	5.43
Area at Maximum Ponding Depth (acres) =	0.27	0.33	0.30	0.32	0.33	0.35	0.36	0.39	0.46
Maximum Volume Stored (acre-ft) =	0.186	0.554	0.338	0.473	0.561	0.652	0.780	0.983	1.491

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41
	0:15:00	0.00	0.00	0.20	0.68	1.03	0.83	1.21	1.27	2.18
	0:20:00	0.00	0.00	1.69	2.56	3.30	2.38	3.03	3.41	5.33
	0:25:00	0.00	0.00	3.94	5.85	7.86	5.42	6.81	7.91	12.51
	0:30:00	0.00	0.00	4.91	7.15	9.43	12.04	15.08	17.64	25.93
	0:35:00	0.00	0.00	4.68	6.75	8.81	13.88	17.20	21.07	30.49
	0:40:00	0.00	0.00	4.28	6.07	7.92	13.60	16.77	20.50	29.55
	0:45:00	0.00	0.00	3.76	5.41	7.11	12.37	15.24	19.09	27.47
	0:50:00	0.00	0.00	3.32	4.85	6.29	11.35	13.97	17.44	25.09
	0:55:00	0.00	0.00	2.92	4.26	5.54	9.96	12.27	15.62	22.47
	1:00:00	0.00	0.00	2.59	3.76	4.92	8.69	10.72	13.99	20.12
	1:05:00	0.00	0.00	2.37	3.44	4.54	7.65	9.43	12.62	18.18
	1:10:00	0.00	0.00	2.13	3.21	4.27	6.72	8.31	10.86	15.70
	1:15:00	0.00	0.00	1.91	2.92	4.01	5.96	7.39	9.39	13.63
	1:20:00	0.00	0.00	1.71	2.60	3.61	5.16	6.39	7.86	11.39
	1:25:00	0.00	0.00	1.52	2.29	3.10	4.42	5.46	6.49	9.40
	1:30:00	0.00	0.00	1.33	2.01	2.63	3.67	4.53	5.29	7.65
	1:35:00	0.00	0.00	1.17	1.78	2.25	3.00	3.69	4.23	6.11
	1:40:00	0.00	0.00	1.08	1.55	2.01	2.44	3.00	3.35	4.87
	1:45:00	0.00	0.00	1.03	1.39	1.87	2.10	2.58	2.81	4.10
	1:50:00	0.00	0.00	1.01	1.29	1.77	1.88	2.31	2.47	3.61
	1:55:00	0.00	0.00	0.90	1.21	1.68	1.74	2.13	2.23	3.27
	2:00:00	0.00	0.00	0.80	1.12	1.54	1.64	2.01	2.06	3.02
	2:05:00	0.00	0.00	0.63	0.89	1.21	1.29	1.58	1.59	2.33
	2:10:00	0.00	0.00	0.49	0.68	0.93	0.98	1.20	1.19	1.74
	2:15:00	0.00	0.00	0.38	0.52	0.71	0.75	0.91	0.89	1.30
	2:20:00	0.00	0.00	0.29	0.40	0.54	0.57	0.69	0.67	0.99
	2:25:00	0.00	0.00	0.22	0.30	0.40	0.43	0.52	0.51	0.74
	2:30:00	0.00	0.00	0.17	0.22	0.30	0.32	0.38	0.38	0.56
	2:35:00	0.00	0.00	0.12	0.16	0.22	0.23	0.28	0.28	0.41
	2:40:00	0.00	0.00	0.09	0.12	0.17	0.18	0.21	0.21	0.31
	2:45:00	0.00	0.00	0.06	0.08	0.12	0.13	0.15	0.15	0.22
	2:50:00	0.00	0.00	0.04	0.06	0.08	0.09	0.10	0.10	0.15
	2:55:00	0.00	0.00	0.02	0.03	0.05	0.05	0.06	0.06	0.09
	3:00:00	0.00	0.00	0.01	0.02	0.02	0.03	0.03	0.03	0.05
	3:05:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

[illegible]

Calculation of Peak Runoff using Rational Method	
--	--

Version 2.00 released May 2017

$$t_1 = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_i^{0.22}}$$
$$t_{\text{minimum}} = 5 \text{ (urban)}$$
$$t_{\text{minimum}} = 10 \text{ (non-urban)}$$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website ([click this link](#))

Cells of this color are for optional override values.

Cells of this color are for calculated results based on overrides

$$t_1 = \frac{L_c}{60K/\sqrt{C}} = \frac{L_c}{60V_1}$$
$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9) \cdot \sqrt{S}}$$
$$\text{Selected } t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

1-hour rainfall depth, P1 (in) =	0.83	1.09	1.33	1.69	1.99	2.31	3.14
----------------------------------	------	------	------	------	------	------	------

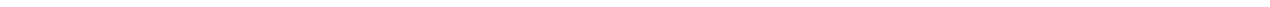
Intensity Equation Coefficients =

a	b	c
28.50	10.00	0.786

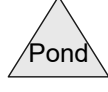
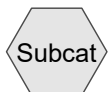
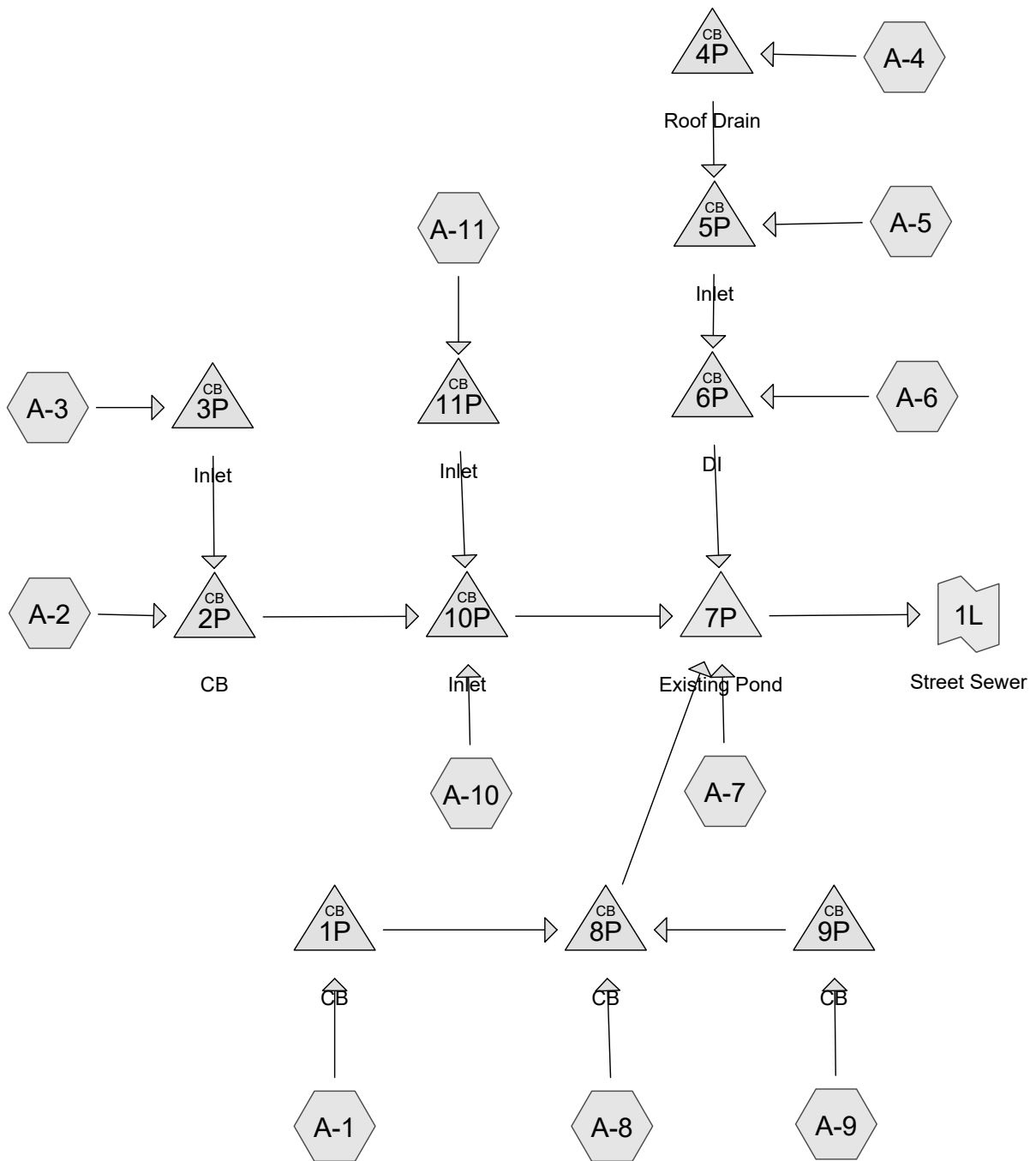
 $I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$
$$Q(cfs) = CIA$$
[illegible]

APPENDIX B DRAINAGE OVERVIEW MAPS



APPENDIX C HYDROCAD RESULTS



Routing Diagram for StandleyLake_Existing
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StandleyLake_Existing

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr Storm	MSE 24-hr	3	Default	24.00	1	1.82	2
2	5-yr Storm	MSE 24-hr	3	Default	24.00	1	2.35	2
3	10-yr Storm	MSE 24-hr	3	Default	24.00	1	2.82	2
4	50-yr Storm	MSE 24-hr	3	Default	24.00	1	4.07	2
5	100-yr Storm	MSE 24-hr	3	Default	24.00	1	4.66	2

StandleyLake_Existing

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.022	86	<50% Grass cover, Poor, HSG C (A-10)
5.339	74	>75% Grass cover, Good, HSG C (A-1, A-11, A-2, A-3, A-5, A-6, A-7, A-8, A-9)
2.047	98	Paved parking, HSG C (A-1, A-10, A-11, A-2, A-5, A-6, A-8, A-9)
0.697	98	Roofs, HSG C (A-4)

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Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	5,525.59	5,524.54	190.0	0.0055	0.015	0.0	18.0	0.0
2	2P	5,525.60	5,524.37	181.0	0.0068	0.015	0.0	18.0	0.0
3	3P	5,526.71	5,525.60	163.0	0.0068	0.015	0.0	18.0	0.0
4	4P	5,523.90	5,523.30	118.0	0.0051	0.015	0.0	18.0	0.0
5	5P	5,522.94	5,522.61	108.0	0.0031	0.015	0.0	18.0	0.0
6	6P	5,522.61	5,522.48	42.0	0.0031	0.015	0.0	18.0	0.0
7	7P	5,521.40	5,521.00	65.0	0.0062	0.015	0.0	18.0	0.0
8	8P	5,524.48	5,522.69	240.0	0.0075	0.015	0.0	18.0	0.0
9	9P	5,526.43	5,524.57	79.0	0.0235	0.015	0.0	18.0	0.0
10	10P	5,524.37	5,522.67	254.0	0.0067	0.015	0.0	18.0	0.0
11	11P	5,524.66	5,524.37	44.0	0.0066	0.015	0.0	18.0	0.0

StandleyLake_Existing

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Time span=2.00-24.00 hrs, dt=0.01 hrs, 2201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A-1: Runoff Area=2.173 ac 26.78% Impervious Runoff Depth>0.46"
Flow Length=415' Tc=7.0 min CN=80 Runoff=1.67 cfs 0.083 af

Subcatchment A-10: Runoff Area=0.232 ac 90.52% Impervious Runoff Depth>1.49"
Flow Length=131' Tc=7.0 min CN=97 Runoff=0.57 cfs 0.029 af

Subcatchment A-11: Runoff Area=0.145 ac 28.28% Impervious Runoff Depth>0.49"
Flow Length=74' Slope=0.0300 '/' Tc=8.7 min CN=81 Runoff=0.11 cfs 0.006 af

Subcatchment A-2: Runoff Area=0.762 ac 35.04% Impervious Runoff Depth>0.53"
Flow Length=234' Tc=7.0 min CN=82 Runoff=0.70 cfs 0.034 af

Subcatchment A-3: Runoff Area=0.832 ac 0.00% Impervious Runoff Depth>0.27"
Flow Length=229' Slope=0.0524 '/' Tc=10.1 min CN=74 Runoff=0.26 cfs 0.019 af

Subcatchment A-4: Runoff Area=0.697 ac 100.00% Impervious Runoff Depth>1.60"
Flow Length=150' Tc=7.0 min CN=98 Runoff=1.77 cfs 0.093 af

Subcatchment A-5: Runoff Area=1.236 ac 7.12% Impervious Runoff Depth>0.32"
Flow Length=312' Slope=0.0545 '/' Tc=10.9 min CN=76 Runoff=0.49 cfs 0.033 af

Subcatchment A-6: Runoff Area=0.603 ac 55.89% Impervious Runoff Depth>0.77"
Flow Length=294' Tc=11.7 min CN=87 Runoff=0.67 cfs 0.039 af

Subcatchment A-7: Runoff Area=0.674 ac 0.00% Impervious Runoff Depth>0.27"
Flow Length=326' Tc=11.6 min CN=74 Runoff=0.20 cfs 0.015 af

Subcatchment A-8: Runoff Area=0.539 ac 63.27% Impervious Runoff Depth>0.88"
Flow Length=145' Tc=7.0 min CN=89 Runoff=0.85 cfs 0.040 af

Subcatchment A-9: Runoff Area=0.212 ac 85.38% Impervious Runoff Depth>1.23"
Flow Length=112' Tc=7.0 min CN=94 Runoff=0.45 cfs 0.022 af

Pond 1P: CB Peak Elev=5,526.37' Inflow=1.67 cfs 0.083 af
18.0" Round Culvert n=0.015 L=190.0' S=0.0055 '/' Outflow=1.67 cfs 0.083 af

Pond 2P: CB Peak Elev=5,526.14' Inflow=0.91 cfs 0.053 af
18.0" Round Culvert n=0.015 L=181.0' S=0.0068 '/' Outflow=0.91 cfs 0.053 af

Pond 3P: Inlet Peak Elev=5,526.98' Inflow=0.26 cfs 0.019 af
18.0" Round Culvert n=0.015 L=163.0' S=0.0068 '/' Outflow=0.26 cfs 0.019 af

Pond 4P: Roof Drain Peak Elev=5,525.08' Inflow=1.77 cfs 0.093 af
18.0" Round Culvert n=0.015 L=118.0' S=0.0051 '/' Outflow=1.77 cfs 0.093 af

Pond 5P: Inlet Peak Elev=5,524.93' Inflow=2.13 cfs 0.126 af
18.0" Round Culvert n=0.015 L=108.0' S=0.0031 '/' Outflow=2.13 cfs 0.126 af

StandleyLake_Existing*MSE 24-hr 3 2-yr Storm Rainfall=1.82"*

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Pond 6P: DI

Peak Elev=5,524.86' Inflow=2.72 cfs 0.165 af
18.0" Round Culvert n=0.015 L=42.0' S=0.0031 '/' Outflow=2.72 cfs 0.165 af

Pond 7P: Existing Pond

Peak Elev=5,524.77' Storage=0.096 af Inflow=7.38 cfs 0.411 af
Outflow=6.30 cfs 0.345 af

Pond 8P: CB

Peak Elev=5,525.61' Inflow=2.96 cfs 0.144 af
18.0" Round Culvert n=0.015 L=240.0' S=0.0075 '/' Outflow=2.96 cfs 0.144 af

Pond 9P: CB

Peak Elev=5,526.72' Inflow=0.45 cfs 0.022 af
18.0" Round Culvert n=0.015 L=79.0' S=0.0235 '/' Outflow=0.45 cfs 0.022 af

Pond 10P: Inlet

Peak Elev=5,525.27' Inflow=1.58 cfs 0.087 af
18.0" Round Culvert n=0.015 L=254.0' S=0.0067 '/' Outflow=1.58 cfs 0.087 af

Pond 11P: Inlet

Peak Elev=5,525.27' Inflow=0.11 cfs 0.006 af
18.0" Round Culvert n=0.015 L=44.0' S=0.0066 '/' Outflow=0.11 cfs 0.006 af

Link 1L: Street Sewer

Inflow=6.30 cfs 0.345 af
Primary=6.30 cfs 0.345 af

StandleyLake_Existing

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-1:

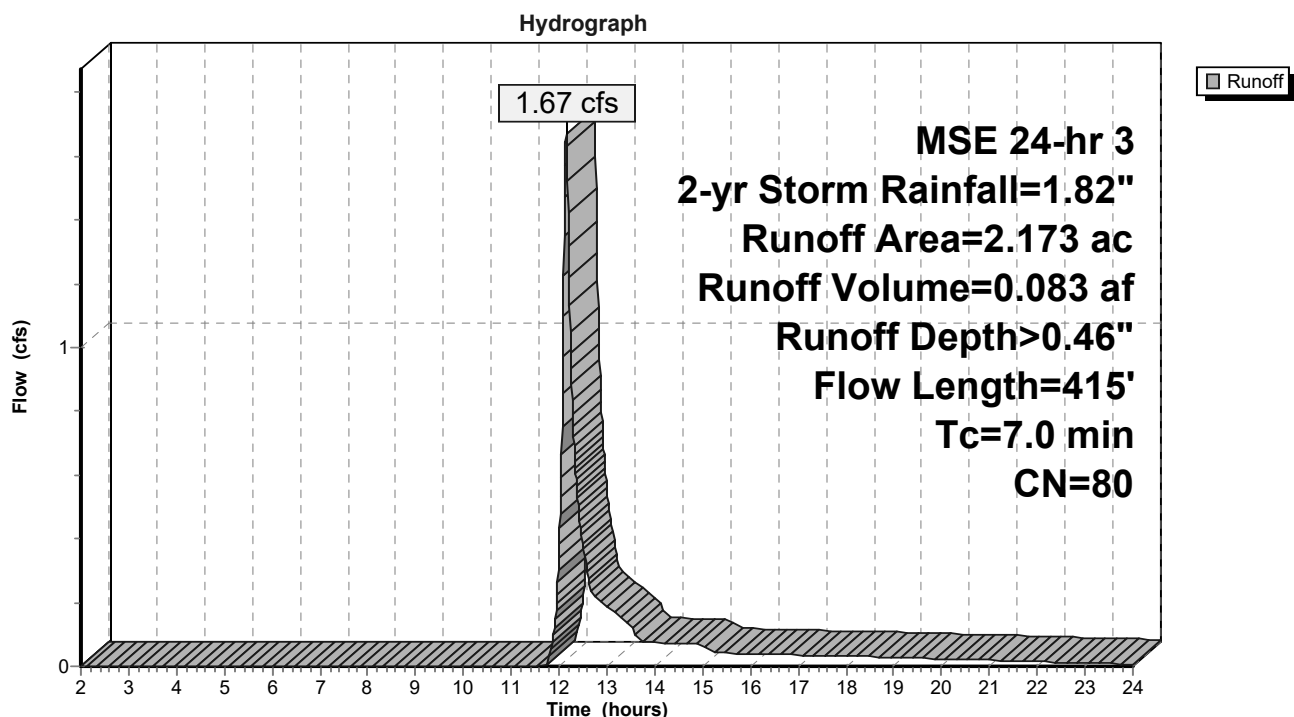
Runoff = 1.67 cfs @ 12.15 hrs, Volume= 0.083 af, Depth> 0.46"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.582	98	Paved parking, HSG C
1.591	74	>75% Grass cover, Good, HSG C
2.173	80	Weighted Average
1.591		73.22% Pervious Area
0.582		26.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	65	0.1540	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.2	111	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	239	0.0126	2.28		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.0	415	Total			

Subcatchment A-1:



StandleyLake_Existing

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Summary for Subcatchment A-10:

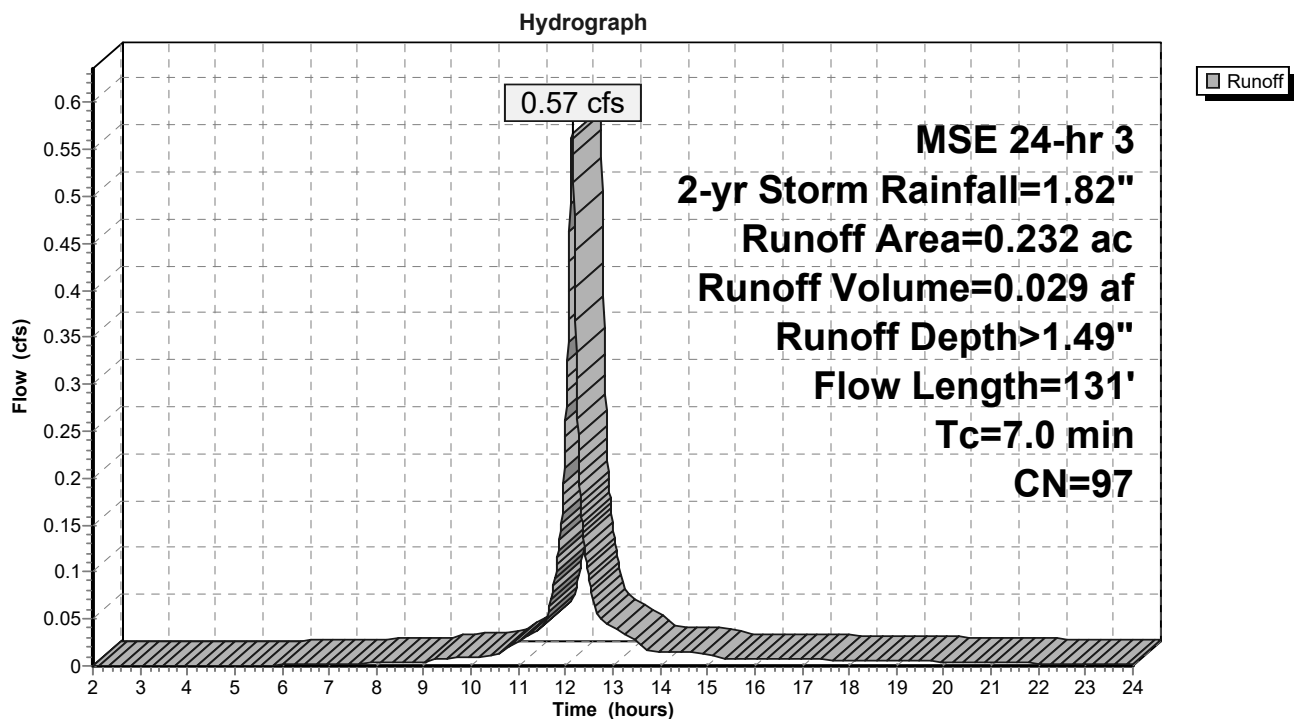
Runoff = 0.57 cfs @ 12.14 hrs, Volume= 0.029 af, Depth> 1.49"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-11:

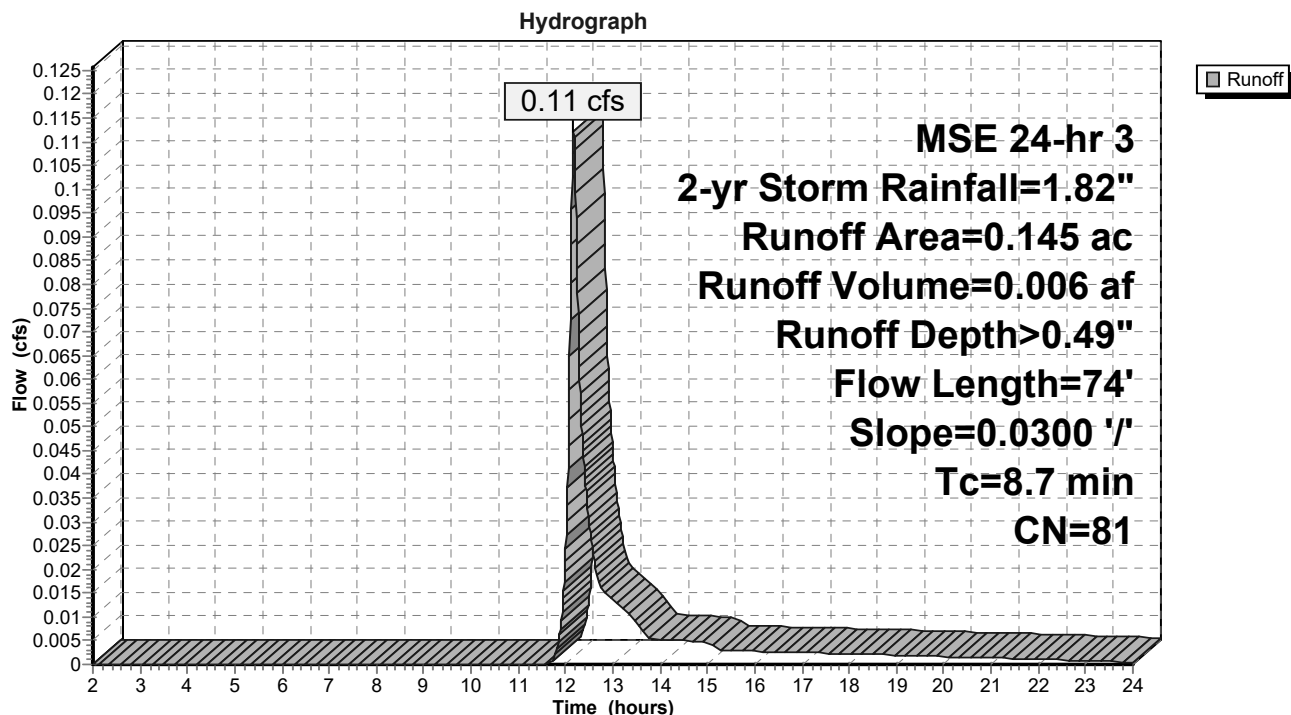
Runoff = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af, Depth> 0.49"
Routed to Pond 11P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-2:

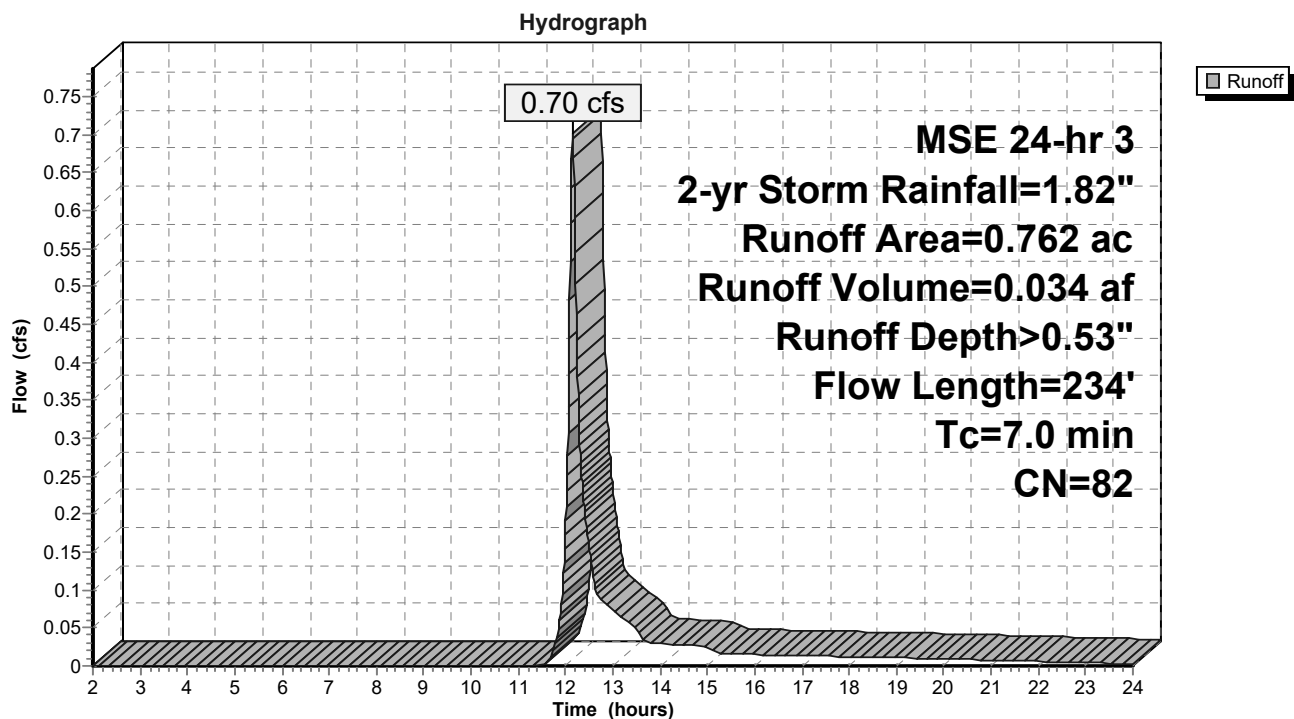
Runoff = 0.70 cfs @ 12.15 hrs, Volume= 0.034 af, Depth> 0.53"
Routed to Pond 2P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.267	98	Paved parking, HSG C
0.495	74	>75% Grass cover, Good, HSG C
0.762	82	Weighted Average
0.495		64.96% Pervious Area
0.267		35.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	234		0.56		Direct Entry, Minimum

Subcatchment A-2:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-3:

Runoff = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af, Depth> 0.27"
Routed to Pond 3P : Inlet

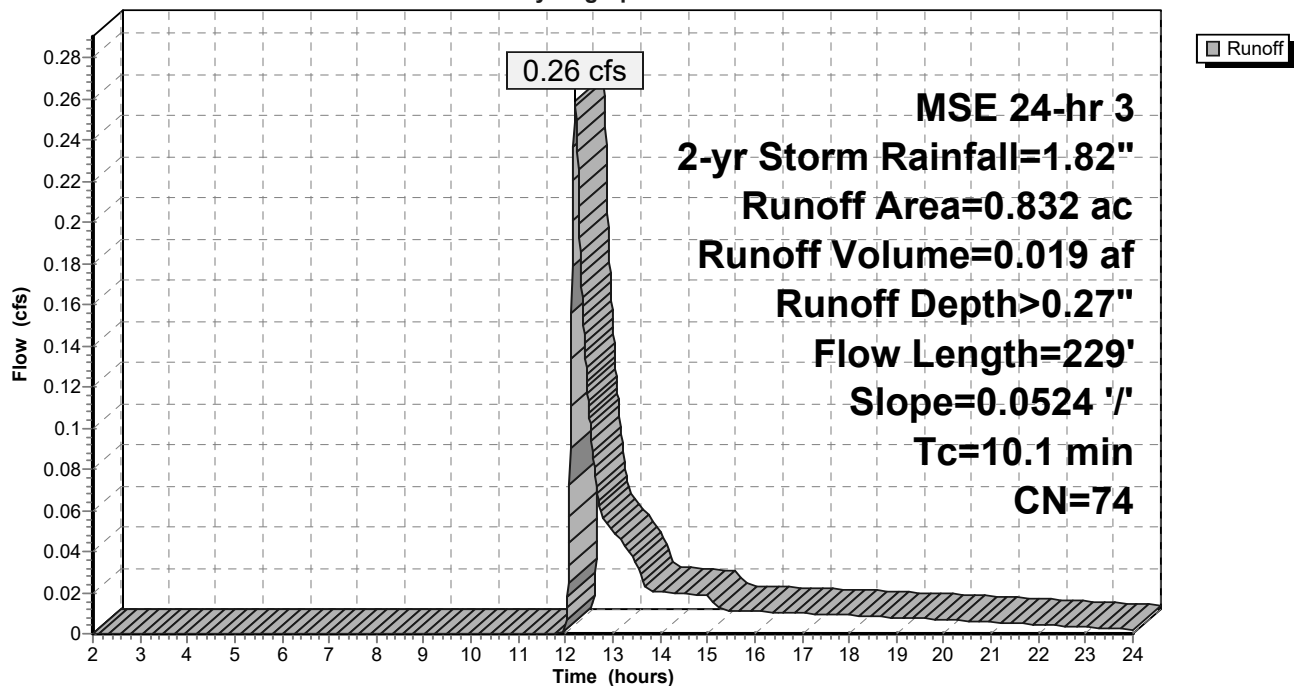
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



StandleyLake_Existing

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-4:

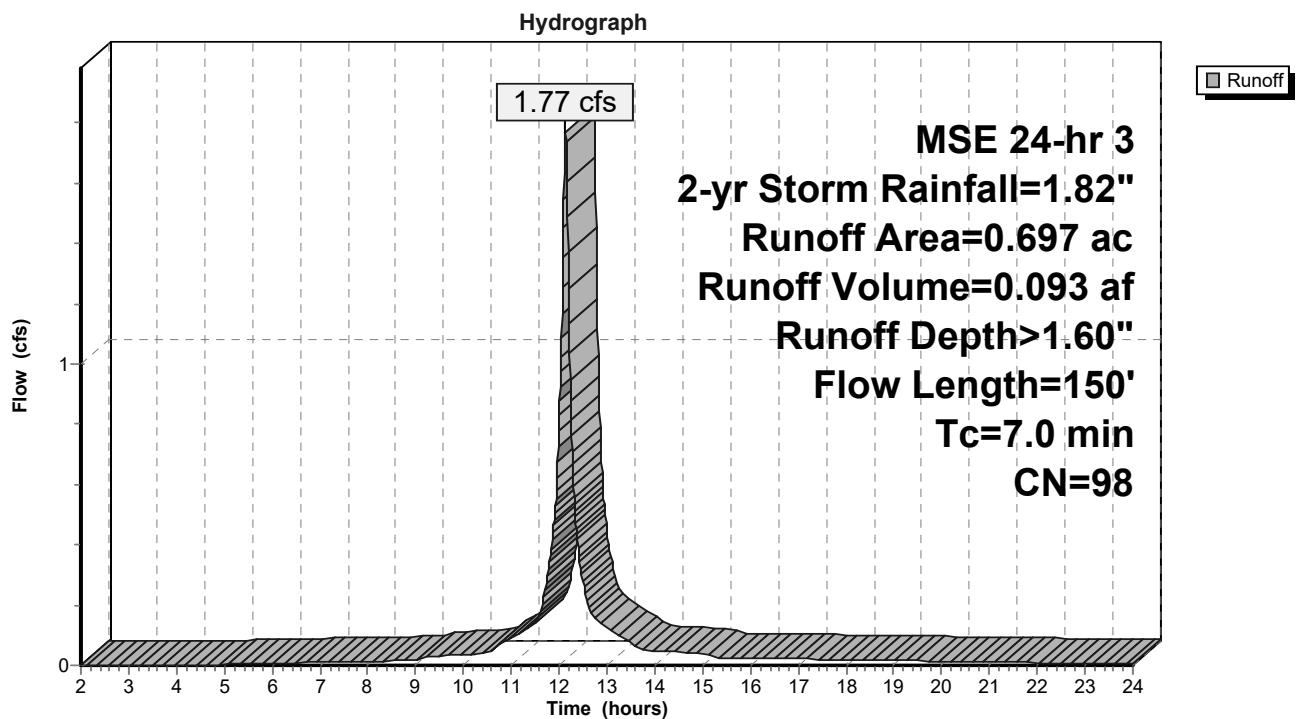
Runoff = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af, Depth> 1.60"
Routed to Pond 4P : Roof Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-5:

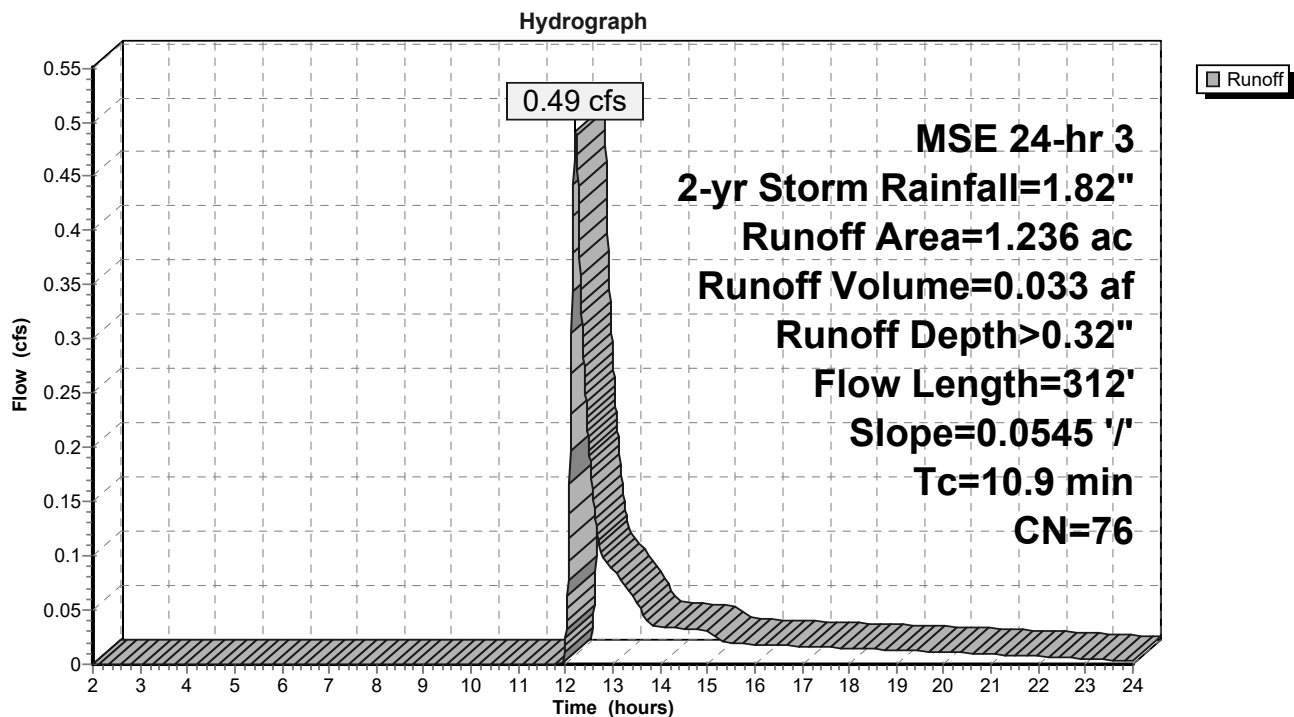
Runoff = 0.49 cfs @ 12.21 hrs, Volume= 0.033 af, Depth> 0.32"
Routed to Pond 5P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-6:

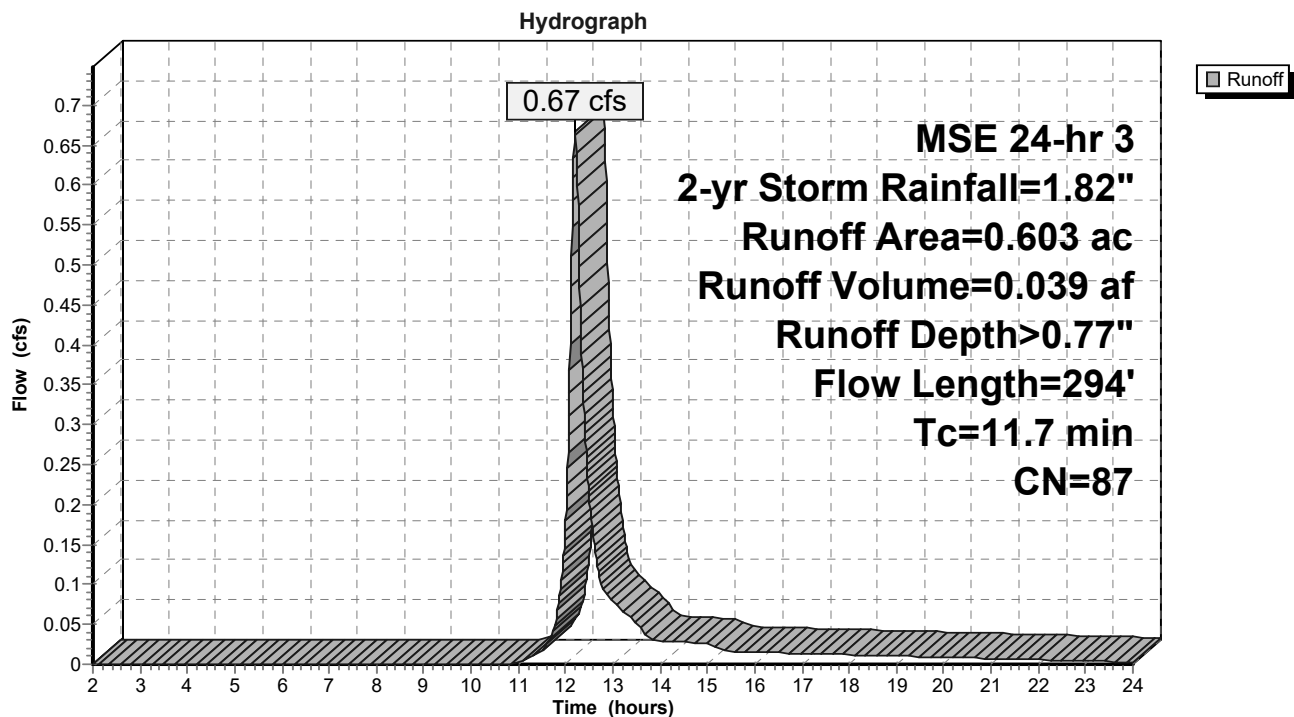
Runoff = 0.67 cfs @ 12.20 hrs, Volume= 0.039 af, Depth> 0.77"
Routed to Pond 6P : DI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-7:

Runoff = 0.20 cfs @ 12.23 hrs, Volume= 0.015 af, Depth> 0.27"
Routed to Pond 7P : Existing Pond

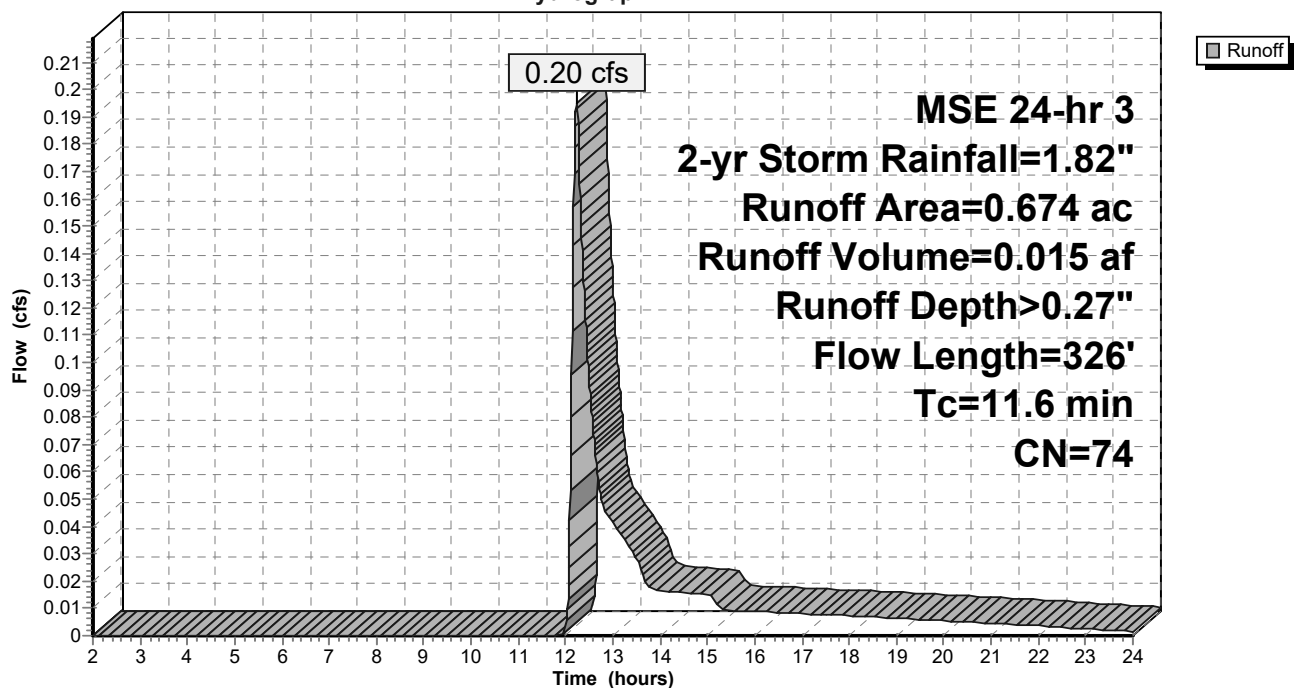
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.674	74	>75% Grass cover, Good, HSG C
0.674		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-8:

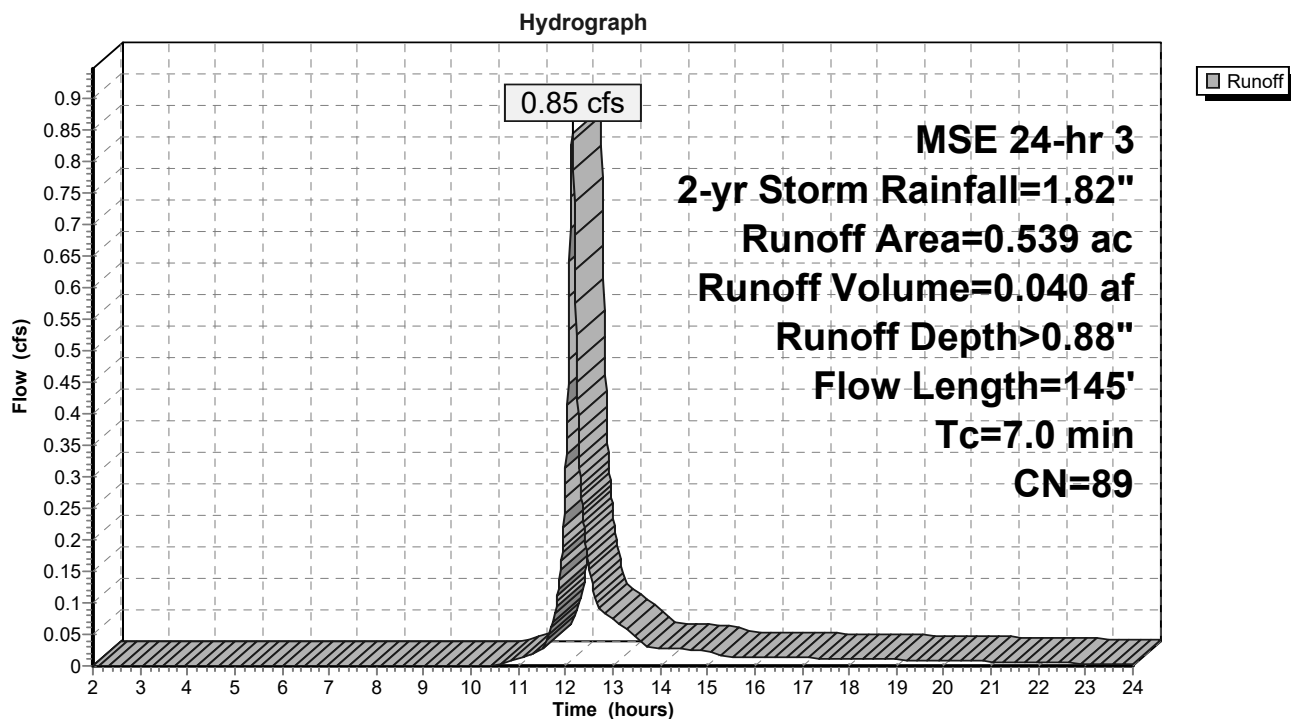
Runoff = 0.85 cfs @ 12.15 hrs, Volume= 0.040 af, Depth> 0.88"
Routed to Pond 8P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-9:

Runoff = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af, Depth> 1.23"
Routed to Pond 9P : CB

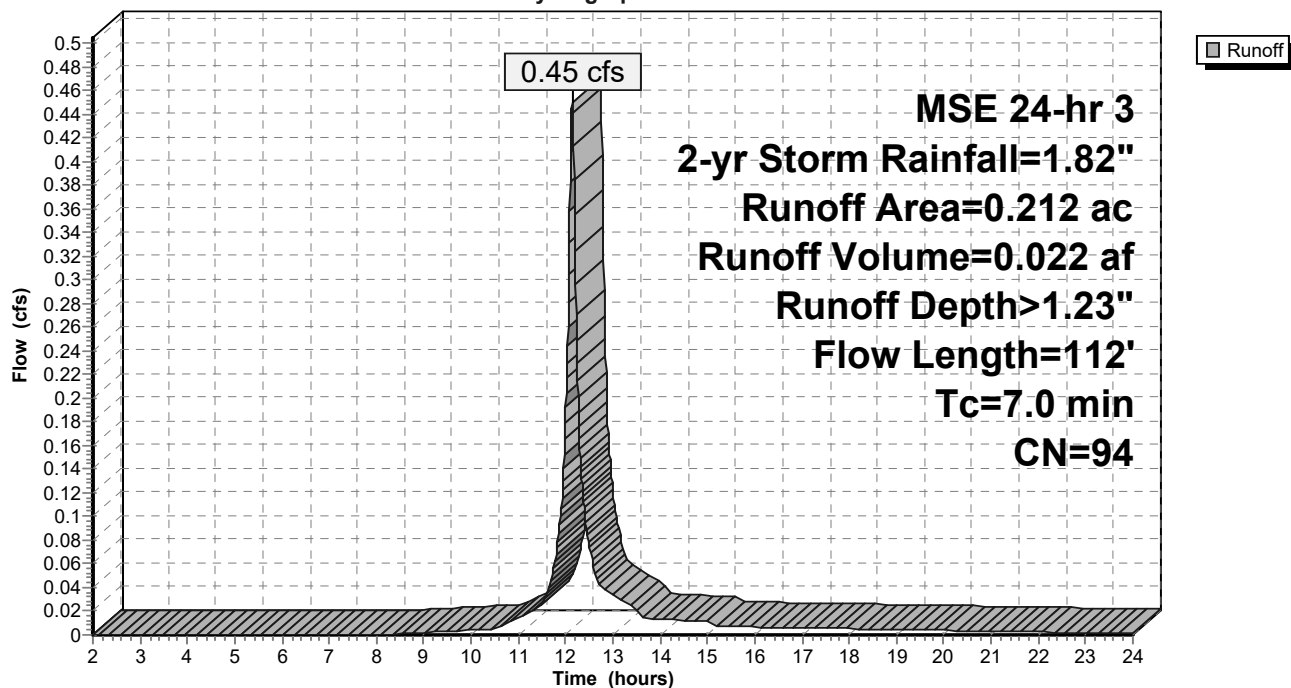
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 1P: CB

Inflow Area = 2.173 ac, 26.78% Impervious, Inflow Depth > 0.46" for 2-yr Storm event
Inflow = 1.67 cfs @ 12.15 hrs, Volume= 0.083 af
Outflow = 1.67 cfs @ 12.15 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min
Primary = 1.67 cfs @ 12.15 hrs, Volume= 0.083 af
Routed to Pond 8P : CB

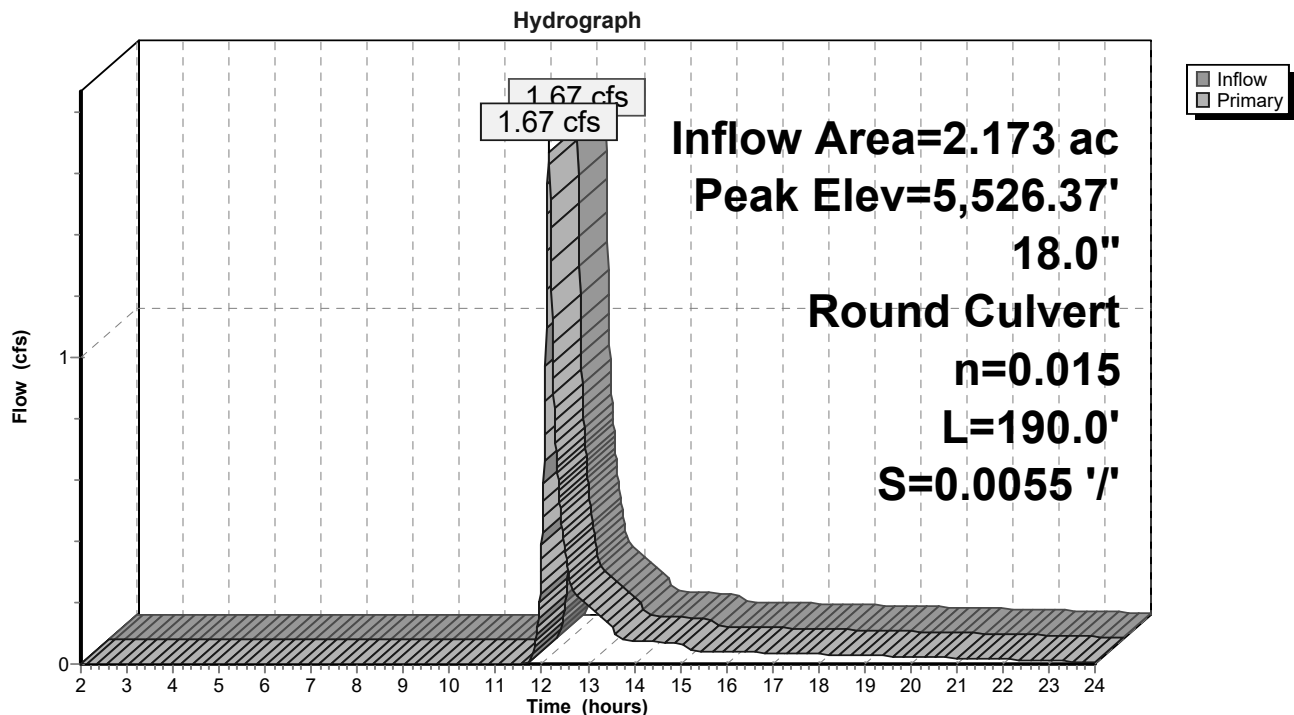
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.37' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.66 cfs @ 12.15 hrs HW=5,526.37' TW=5,525.61' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.66 cfs @ 2.59 fps)

Pond 1P: CB



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 2P: CB

Inflow Area = 1.594 ac, 16.75% Impervious, Inflow Depth > 0.40" for 2-yr Storm event
Inflow = 0.91 cfs @ 12.16 hrs, Volume= 0.053 af
Outflow = 0.91 cfs @ 12.16 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Primary = 0.91 cfs @ 12.16 hrs, Volume= 0.053 af
Routed to Pond 10P : Inlet

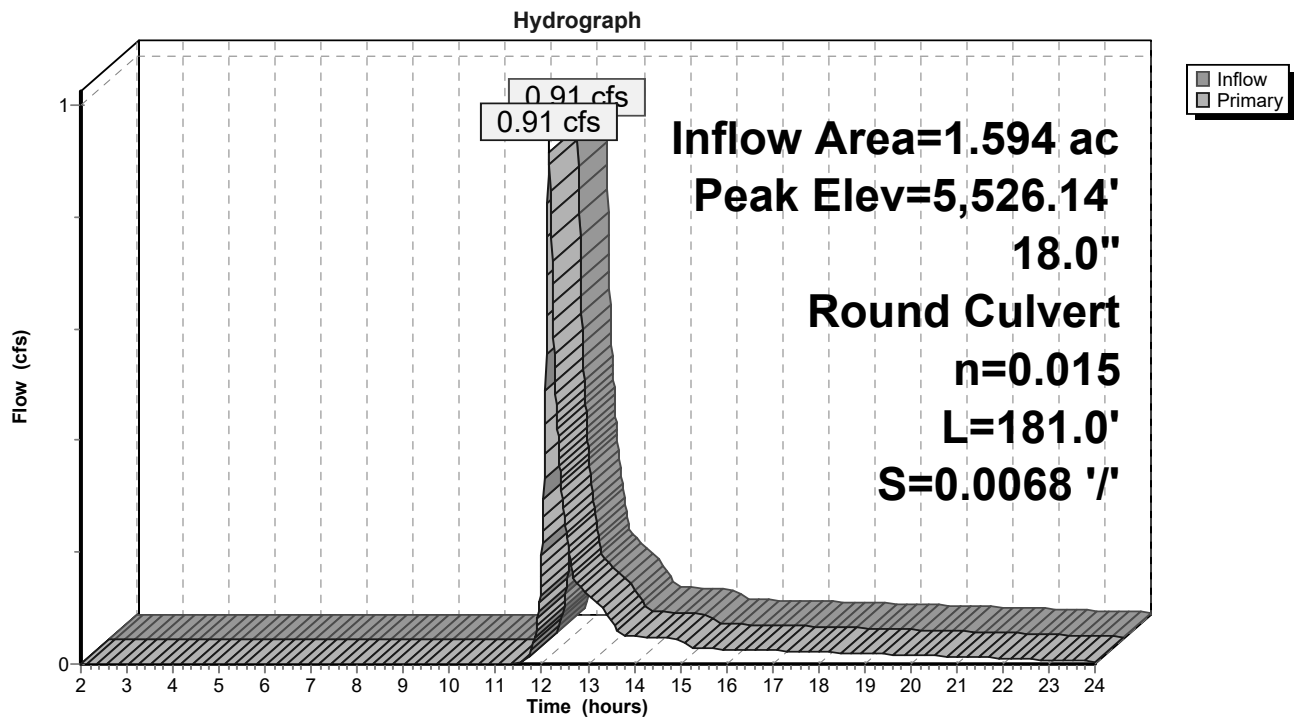
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.14' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.91 cfs @ 12.16 hrs HW=5,526.14' TW=5,525.27' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.91 cfs @ 2.39 fps)

Pond 2P: CB



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 0.27" for 2-yr Storm event
Inflow = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af
Outflow = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af
Routed to Pond 2P : CB

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

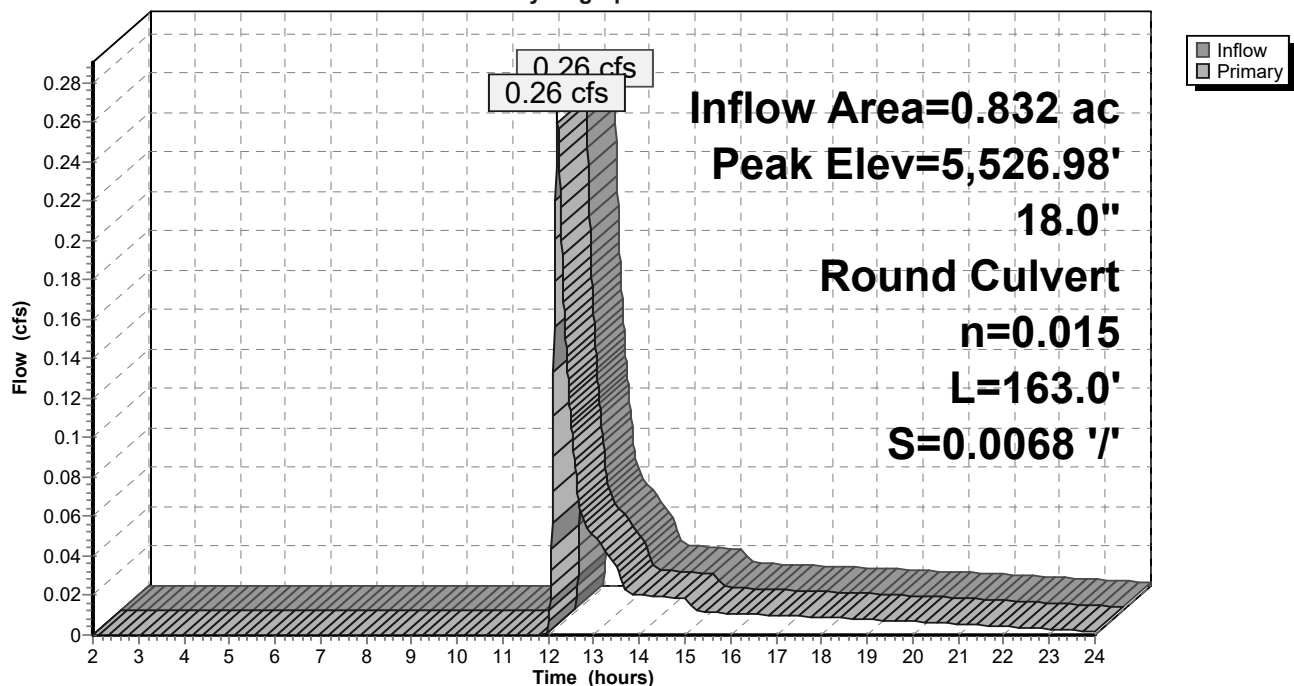
Peak Elev= 5,526.98' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.26 cfs @ 12.20 hrs HW=5,526.98' TW=5,526.10' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.26 cfs @ 1.78 fps)

Pond 3P: Inlet

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 1.60" for 2-yr Storm event
Inflow = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af
Outflow = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af
Routed to Pond 5P : Inlet

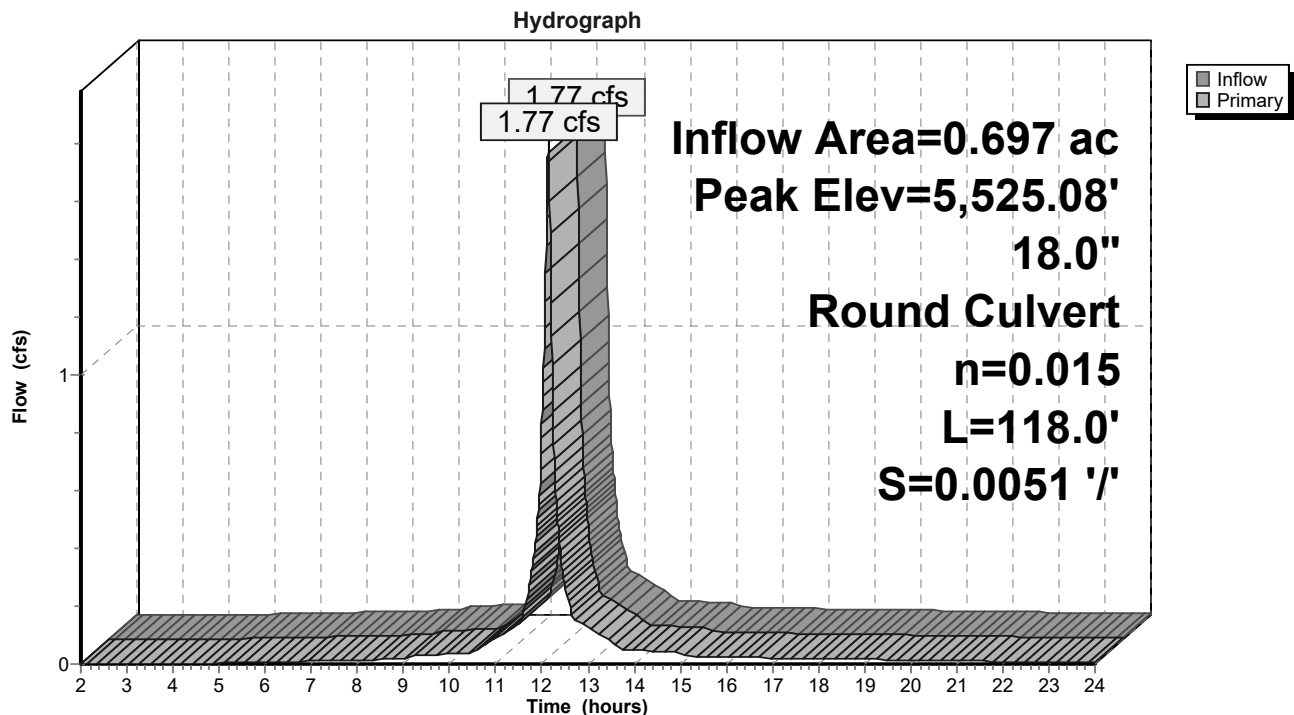
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.08' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.73 cfs @ 12.14 hrs HW=5,525.05' TW=5,524.89' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.73 cfs @ 1.64 fps)

Pond 4P: Roof Drain



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 0.78" for 2-yr Storm event
Inflow = 2.13 cfs @ 12.15 hrs, Volume= 0.126 af
Outflow = 2.13 cfs @ 12.15 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min
Primary = 2.13 cfs @ 12.15 hrs, Volume= 0.126 af
Routed to Pond 6P : DI

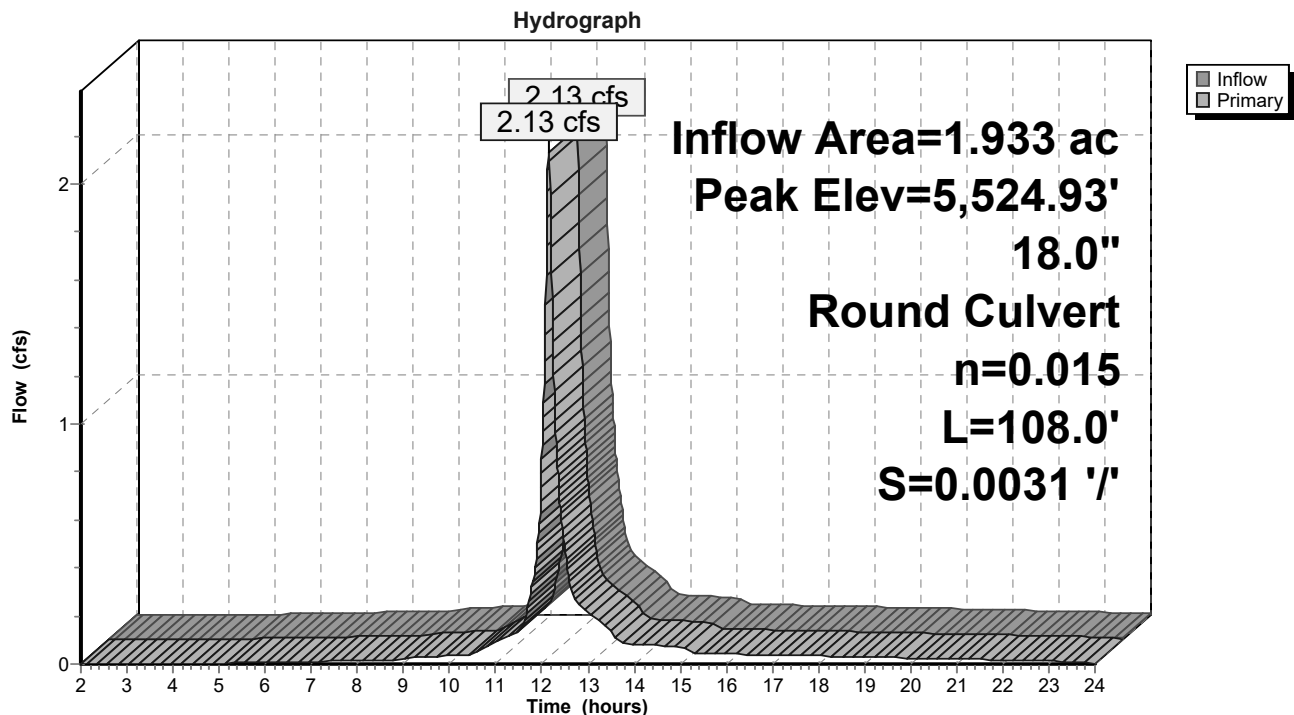
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,524.93' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 ' / Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.93 cfs @ 12.15 hrs HW=5,524.91' TW=5,524.84' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.93 cfs @ 1.10 fps)

Pond 5P: Inlet



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 0.78" for 2-yr Storm event
Inflow = 2.72 cfs @ 12.16 hrs, Volume= 0.165 af
Outflow = 2.72 cfs @ 12.16 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min
Primary = 2.72 cfs @ 12.16 hrs, Volume= 0.165 af
Routed to Pond 7P : Existing Pond

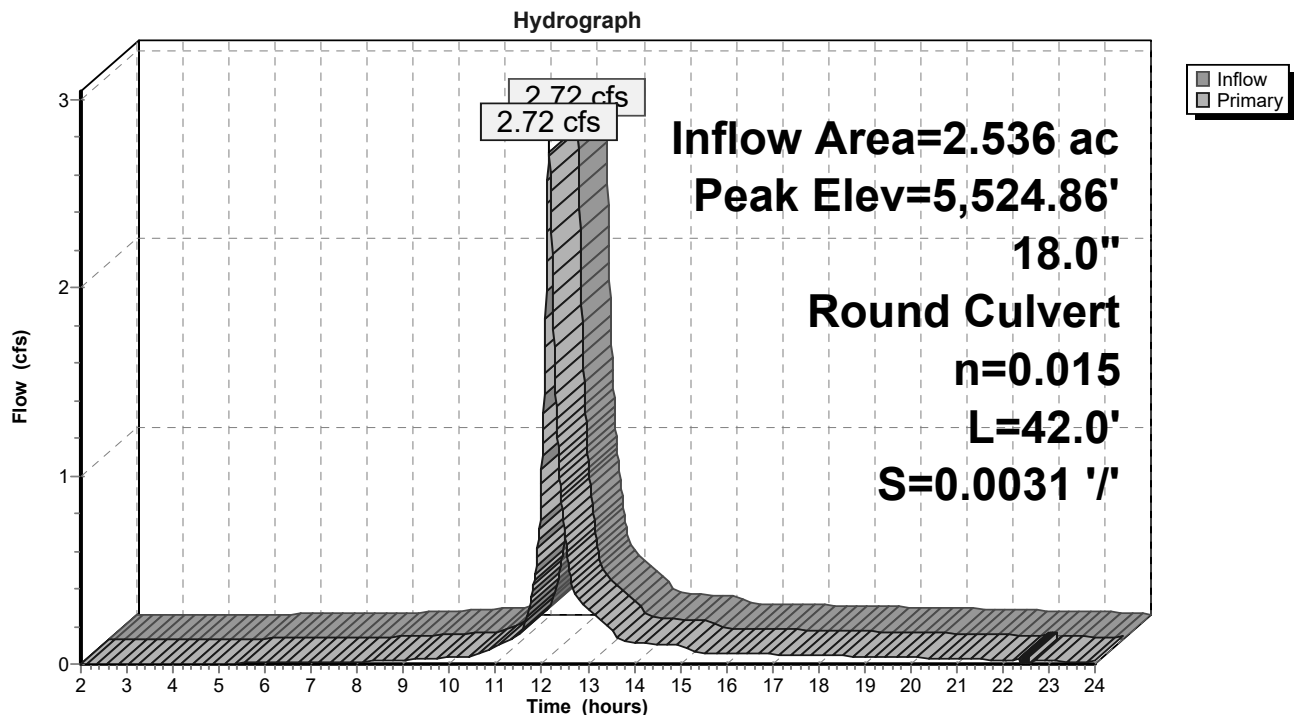
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,524.86' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.71 cfs @ 12.16 hrs HW=5,524.85' TW=5,524.74' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 2.71 cfs @ 1.53 fps)

Pond 6P: DI



StandleyLake_Existing

MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 7P: Existing Pond

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 0.61" for 2-yr Storm event
 Inflow = 7.38 cfs @ 12.15 hrs, Volume= 0.411 af
 Outflow = 6.30 cfs @ 12.20 hrs, Volume= 0.345 af, Atten= 15%, Lag= 2.5 min
 Primary = 6.30 cfs @ 12.20 hrs, Volume= 0.345 af
 Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 5,524.77' @ 12.20 hrs Surf.Area= 0.130 ac Storage= 0.096 af

Plug-Flow detention time= 92.4 min calculated for 0.345 af (84% of inflow)
 Center-of-Mass det. time= 31.1 min (845.2 - 814.1)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.347 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.007	0.004	0.004
5,524.00	0.043	0.025	0.029
5,525.00	0.157	0.100	0.129
5,526.00	0.279	0.218	0.347

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

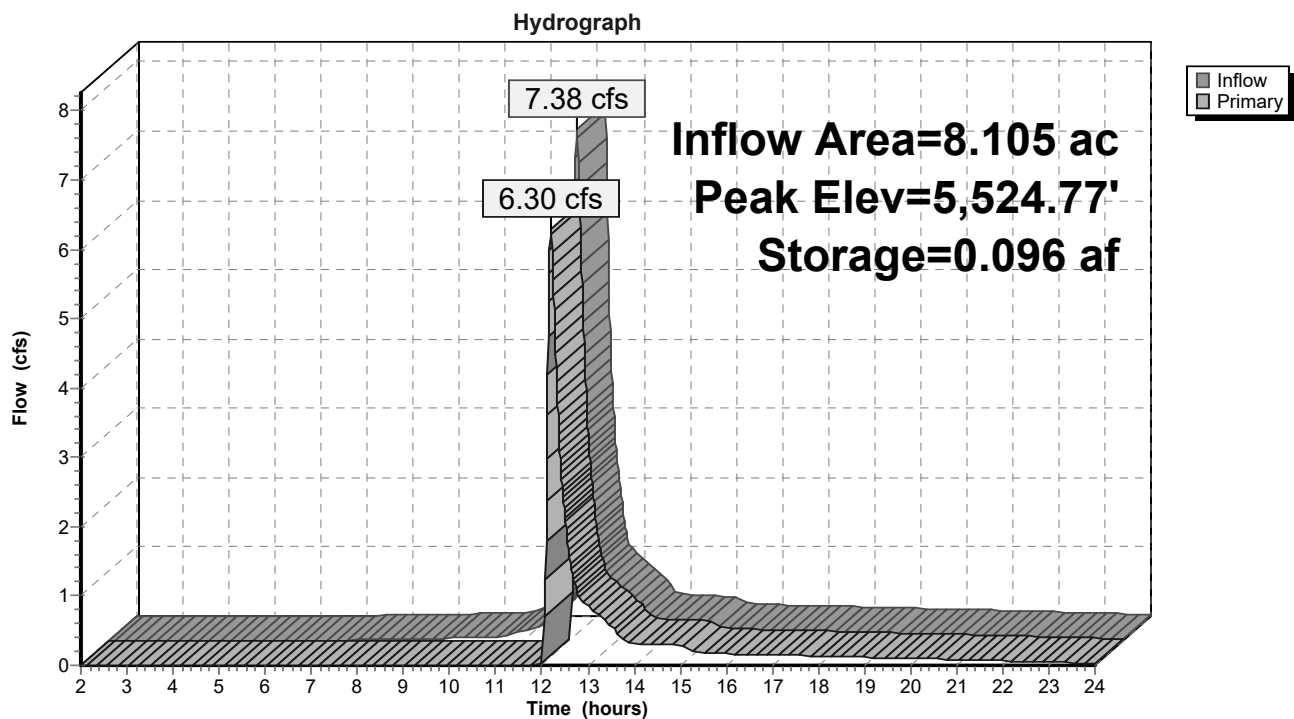
Primary OutFlow Max=6.29 cfs @ 12.20 hrs HW=5,524.77' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 6.29 cfs of 12.16 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 6.29 cfs @ 8.39 fps)

↑ **1=Orifice/Grate** (Passes 6.29 cfs of 6.31 cfs potential flow)

Pond 7P: Existing Pond



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 8P: CB

Inflow Area = 2.924 ac, 37.76% Impervious, Inflow Depth > 0.59" for 2-yr Storm event
Inflow = 2.96 cfs @ 12.15 hrs, Volume= 0.144 af
Outflow = 2.96 cfs @ 12.15 hrs, Volume= 0.144 af, Atten= 0%, Lag= 0.0 min
Primary = 2.96 cfs @ 12.15 hrs, Volume= 0.144 af
Routed to Pond 7P : Existing Pond

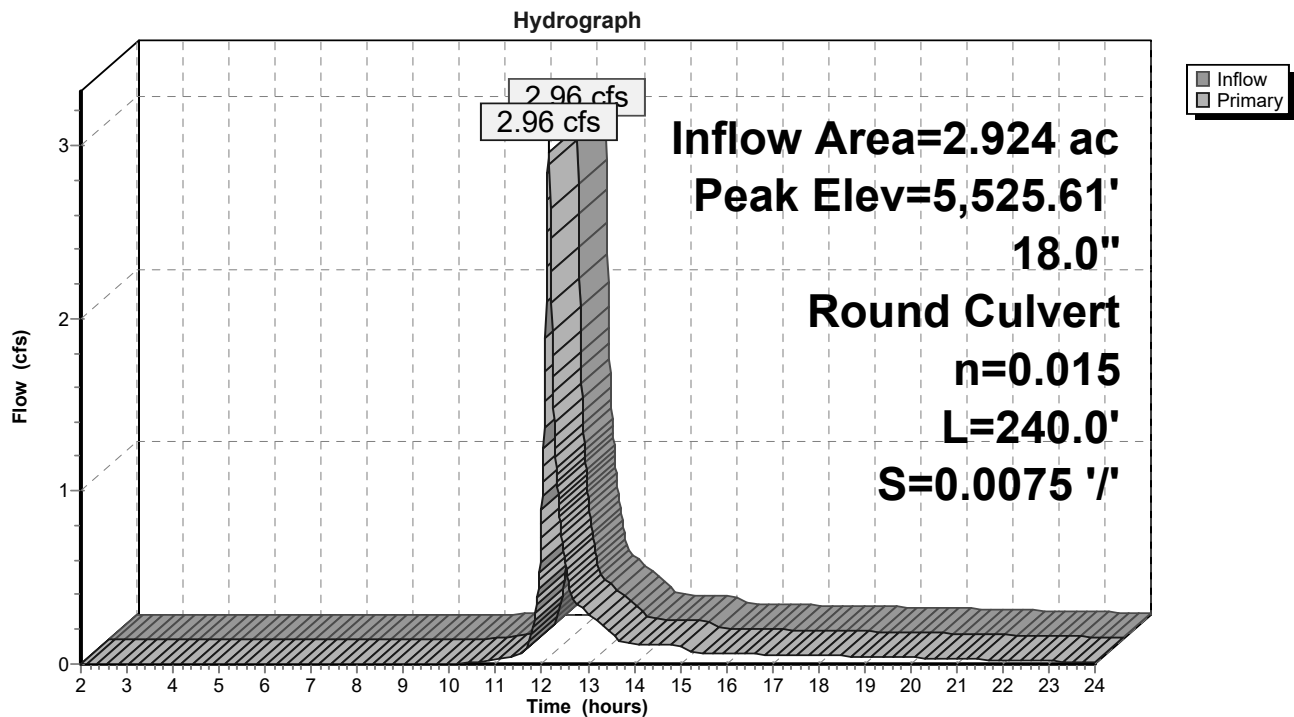
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.61' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.96 cfs @ 12.15 hrs HW=5,525.61' TW=5,524.73' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.96 cfs @ 2.88 fps)

Pond 8P: CB



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 1.23" for 2-yr Storm event
Inflow = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af
Outflow = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min
Primary = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af
Routed to Pond 8P : CB

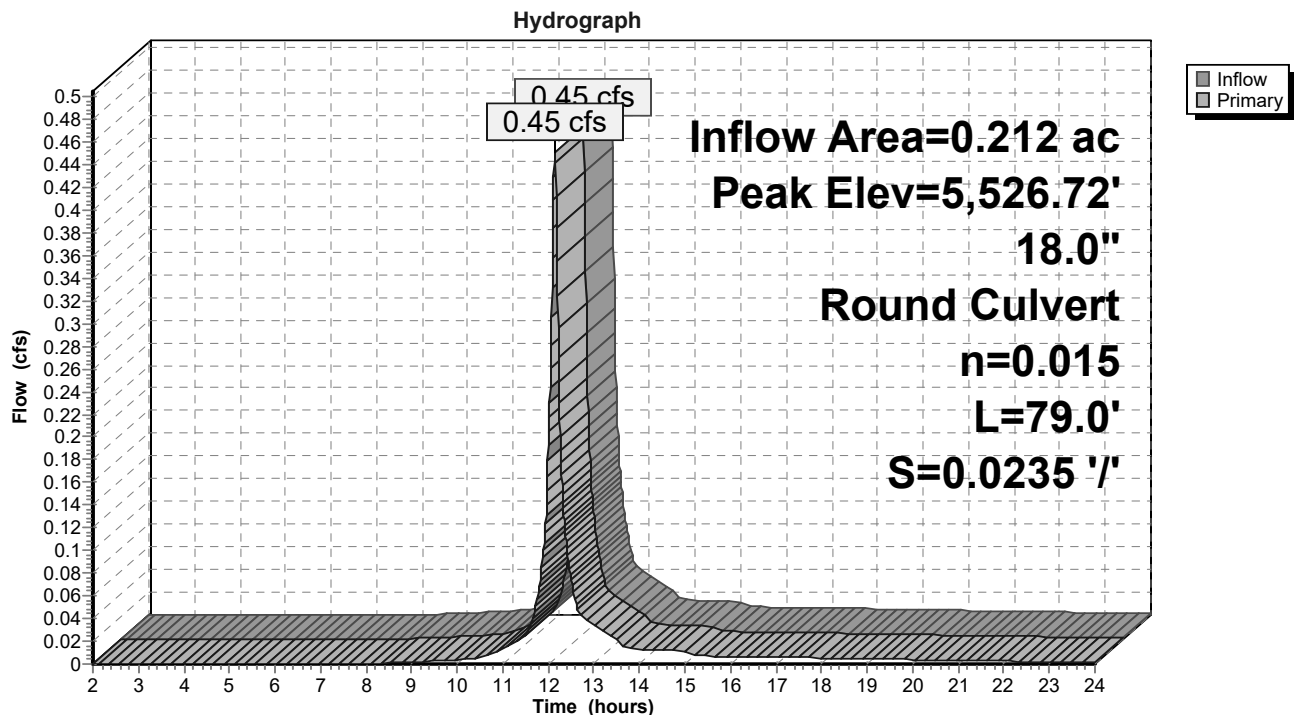
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.72' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.45 cfs @ 12.14 hrs HW=5,526.72' TW=5,525.60' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 0.45 cfs @ 1.84 fps)

Pond 9P: CB



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Summary for Pond 10P: Inlet

Inflow Area = 1.971 ac, 26.28% Impervious, Inflow Depth > 0.53" for 2-yr Storm event
Inflow = 1.58 cfs @ 12.15 hrs, Volume= 0.087 af
Outflow = 1.58 cfs @ 12.15 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min
Primary = 1.58 cfs @ 12.15 hrs, Volume= 0.087 af
Routed to Pond 7P : Existing Pond

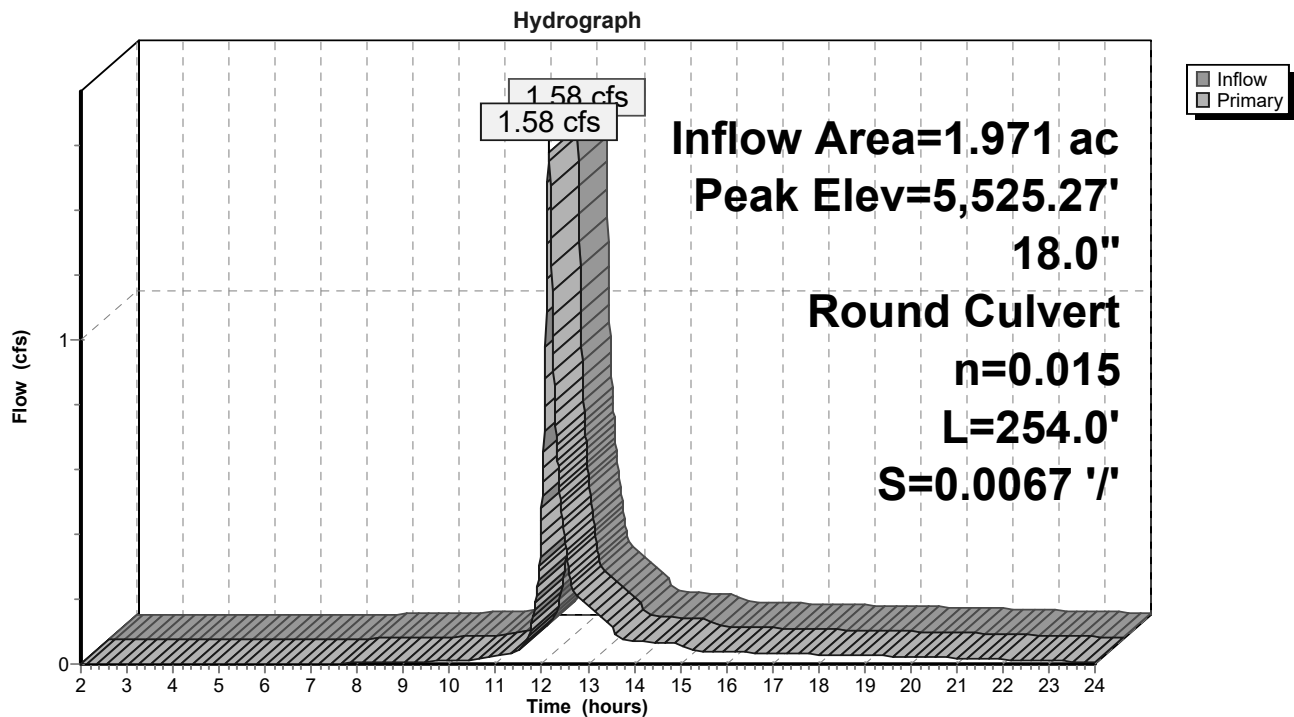
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.27' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.57 cfs @ 12.15 hrs HW=5,525.27' TW=5,524.74' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.57 cfs @ 2.03 fps)

Pond 10P: Inlet



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Summary for Pond 11P: Inlet

Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 0.49" for 2-yr Storm event
Inflow = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af
Outflow = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

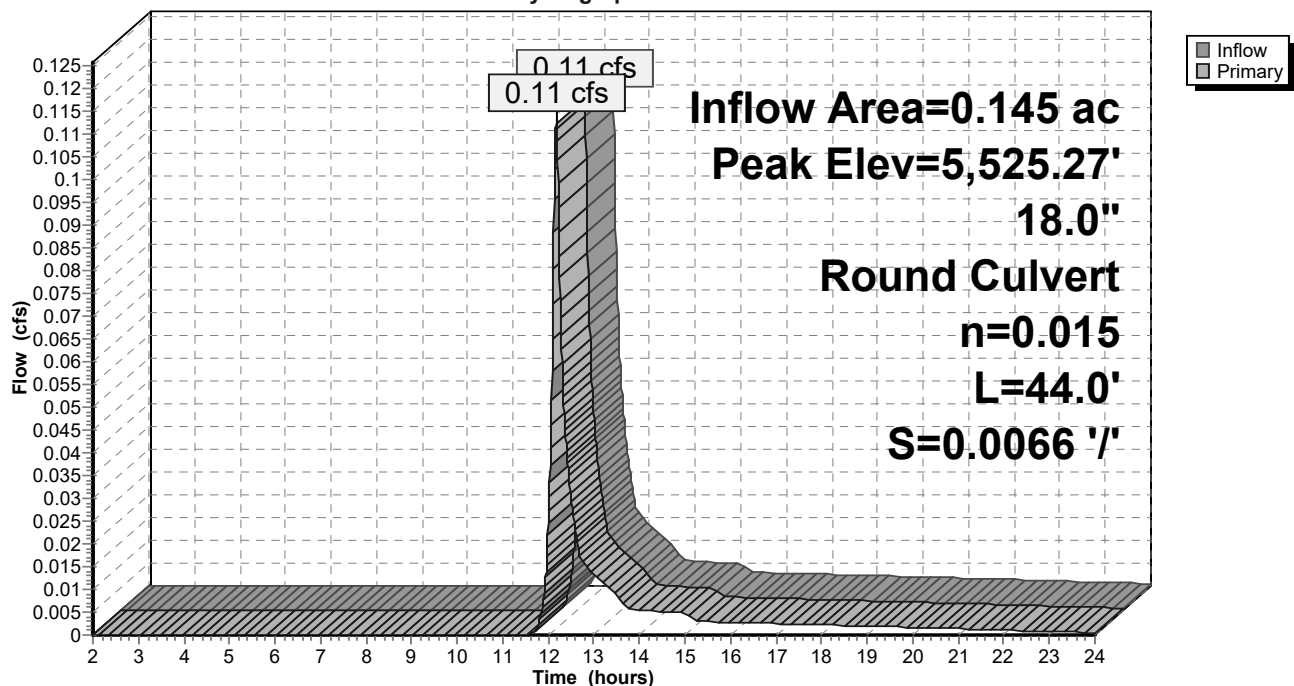
Peak Elev= 5,525.27' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=5,525.27' TW=5,525.27' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 11P: Inlet

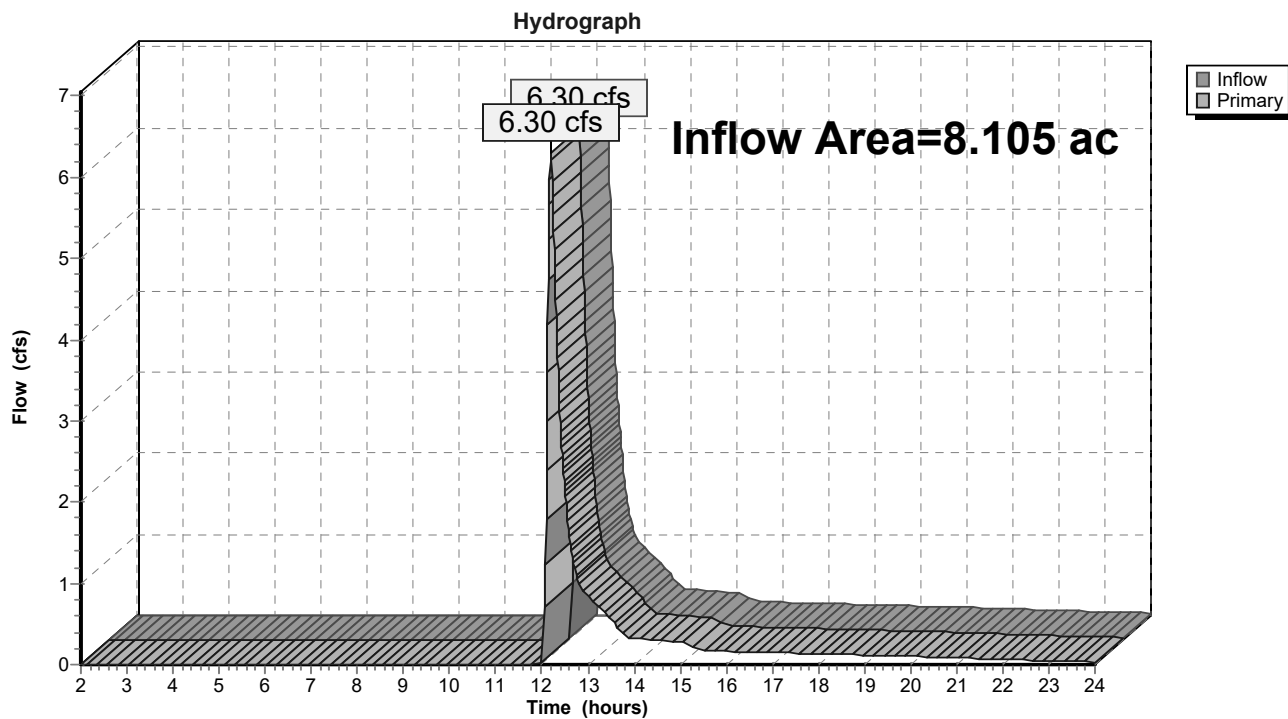
Hydrograph



Summary for Link 1L: Street Sewer

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 0.51" for 2-yr Storm event
Inflow = 6.30 cfs @ 12.20 hrs, Volume= 0.345 af
Primary = 6.30 cfs @ 12.20 hrs, Volume= 0.345 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer

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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Time span=2.00-24.00 hrs, dt=0.01 hrs, 2201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A-1:	Runoff Area=2.173 ac 26.78% Impervious Runoff Depth>0.79" Flow Length=415' Tc=7.0 min CN=80 Runoff=3.01 cfs 0.142 af
Subcatchment A-10:	Runoff Area=0.232 ac 90.52% Impervious Runoff Depth>2.02" Flow Length=131' Tc=7.0 min CN=97 Runoff=0.75 cfs 0.039 af
Subcatchment A-11:	Runoff Area=0.145 ac 28.28% Impervious Runoff Depth>0.84" Flow Length=74' Slope=0.0300 '/ Tc=8.7 min CN=81 Runoff=0.20 cfs 0.010 af
Subcatchment A-2:	Runoff Area=0.762 ac 35.04% Impervious Runoff Depth>0.89" Flow Length=234' Tc=7.0 min CN=82 Runoff=1.20 cfs 0.056 af
Subcatchment A-3:	Runoff Area=0.832 ac 0.00% Impervious Runoff Depth>0.53" Flow Length=229' Slope=0.0524 '/ Tc=10.1 min CN=74 Runoff=0.61 cfs 0.036 af
Subcatchment A-4:	Runoff Area=0.697 ac 100.00% Impervious Runoff Depth>2.12" Flow Length=150' Tc=7.0 min CN=98 Runoff=2.31 cfs 0.123 af
Subcatchment A-5:	Runoff Area=1.236 ac 7.12% Impervious Runoff Depth>0.60" Flow Length=312' Slope=0.0545 '/ Tc=10.9 min CN=76 Runoff=1.04 cfs 0.062 af
Subcatchment A-6:	Runoff Area=0.603 ac 55.89% Impervious Runoff Depth>1.19" Flow Length=294' Tc=11.7 min CN=87 Runoff=1.04 cfs 0.060 af
Subcatchment A-7:	Runoff Area=0.674 ac 0.00% Impervious Runoff Depth>0.53" Flow Length=326' Tc=11.6 min CN=74 Runoff=0.46 cfs 0.029 af
Subcatchment A-8:	Runoff Area=0.539 ac 63.27% Impervious Runoff Depth>1.32" Flow Length=145' Tc=7.0 min CN=89 Runoff=1.26 cfs 0.059 af
Subcatchment A-9:	Runoff Area=0.212 ac 85.38% Impervious Runoff Depth>1.73" Flow Length=112' Tc=7.0 min CN=94 Runoff=0.62 cfs 0.030 af
Pond 1P: CB	Peak Elev=5,526.73' Inflow=3.01 cfs 0.142 af 18.0" Round Culvert n=0.015 L=190.0' S=0.0055 '/ Outflow=3.01 cfs 0.142 af
Pond 2P: CB	Peak Elev=5,526.38' Inflow=1.74 cfs 0.093 af 18.0" Round Culvert n=0.015 L=181.0' S=0.0068 '/ Outflow=1.74 cfs 0.093 af
Pond 3P: Inlet	Peak Elev=5,527.14' Inflow=0.61 cfs 0.036 af 18.0" Round Culvert n=0.015 L=163.0' S=0.0068 '/ Outflow=0.61 cfs 0.036 af
Pond 4P: Roof Drain	Peak Elev=5,525.49' Inflow=2.31 cfs 0.123 af 18.0" Round Culvert n=0.015 L=118.0' S=0.0051 '/ Outflow=2.31 cfs 0.123 af
Pond 5P: Inlet	Peak Elev=5,525.37' Inflow=3.17 cfs 0.186 af 18.0" Round Culvert n=0.015 L=108.0' S=0.0031 '/ Outflow=3.17 cfs 0.185 af

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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Pond 6P: DI

Peak Elev=5,525.23' Inflow=4.11 cfs 0.245 af
18.0" Round Culvert n=0.015 L=42.0' S=0.0031 '/' Outflow=4.11 cfs 0.245 af

Pond 7P: Existing Pond

Peak Elev=5,525.10' Storage=0.145 af Inflow=12.00 cfs 0.649 af
Outflow=6.63 cfs 0.583 af

Pond 8P: CB

Peak Elev=5,526.00' Inflow=4.89 cfs 0.232 af
18.0" Round Culvert n=0.015 L=240.0' S=0.0075 '/' Outflow=4.89 cfs 0.232 af

Pond 9P: CB

Peak Elev=5,526.80' Inflow=0.62 cfs 0.030 af
18.0" Round Culvert n=0.015 L=79.0' S=0.0235 '/' Outflow=0.62 cfs 0.030 af

Pond 10P: Inlet

Peak Elev=5,525.57' Inflow=2.67 cfs 0.142 af
18.0" Round Culvert n=0.015 L=254.0' S=0.0067 '/' Outflow=2.67 cfs 0.142 af

Pond 11P: Inlet

Peak Elev=5,525.56' Inflow=0.20 cfs 0.010 af
18.0" Round Culvert n=0.015 L=44.0' S=0.0066 '/' Outflow=0.20 cfs 0.010 af

Link 1L: Street Sewer

Inflow=6.63 cfs 0.583 af
Primary=6.63 cfs 0.583 af

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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-1:

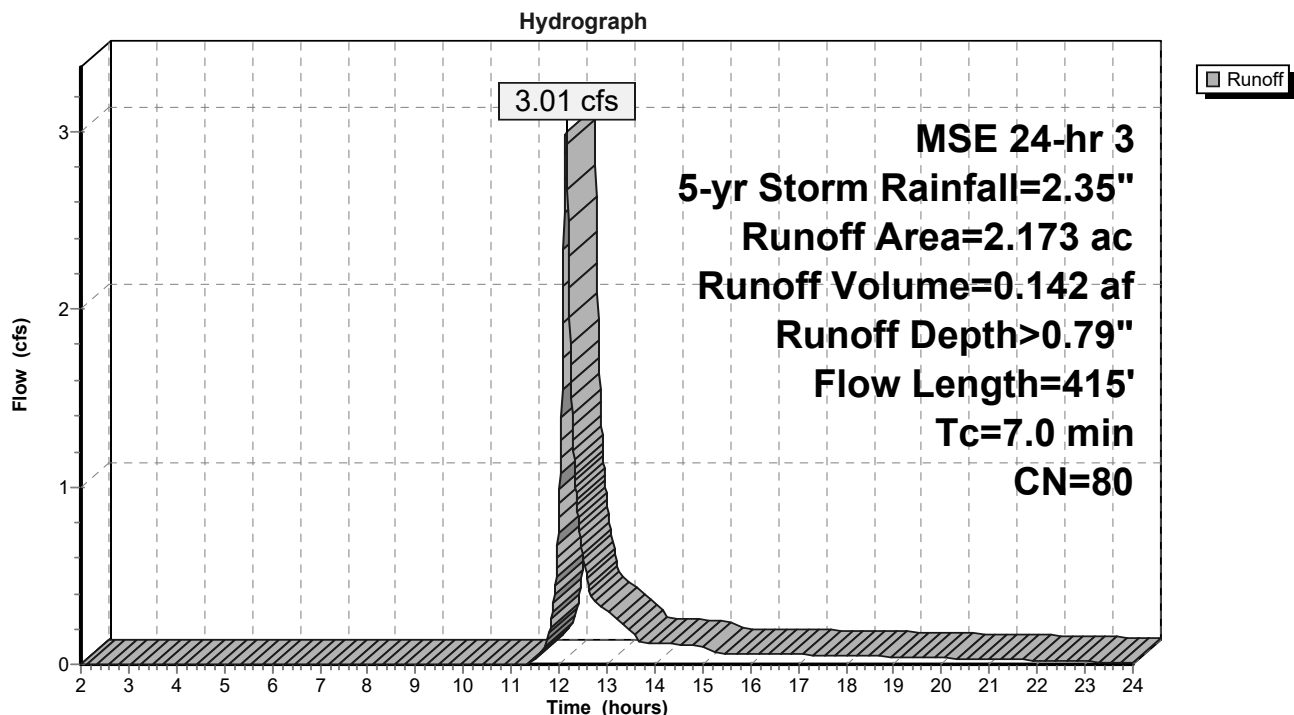
Runoff = 3.01 cfs @ 12.15 hrs, Volume= 0.142 af, Depth> 0.79"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.582	98	Paved parking, HSG C
1.591	74	>75% Grass cover, Good, HSG C
2.173	80	Weighted Average
1.591		73.22% Pervious Area
0.582		26.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	65	0.1540	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.2	111	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	239	0.0126	2.28		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.0	415	Total			

Subcatchment A-1:



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Summary for Subcatchment A-10:

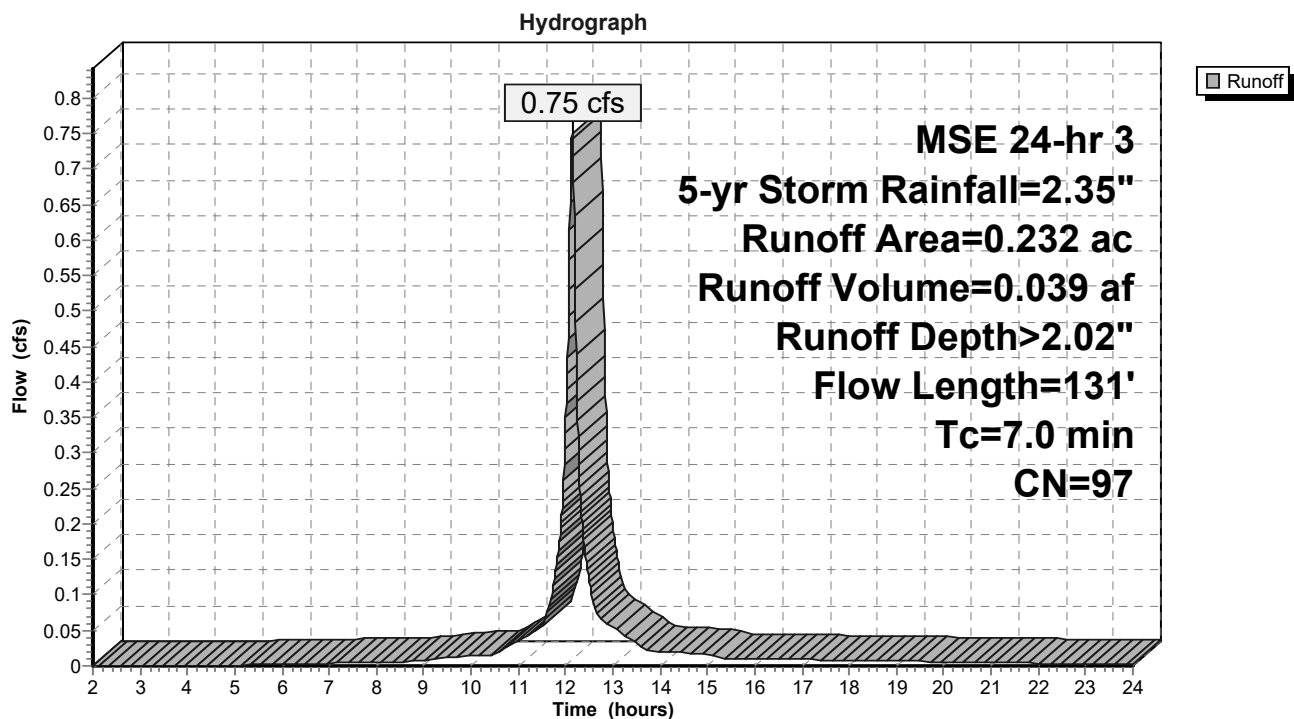
Runoff = 0.75 cfs @ 12.14 hrs, Volume= 0.039 af, Depth> 2.02"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



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Summary for Subcatchment A-11:

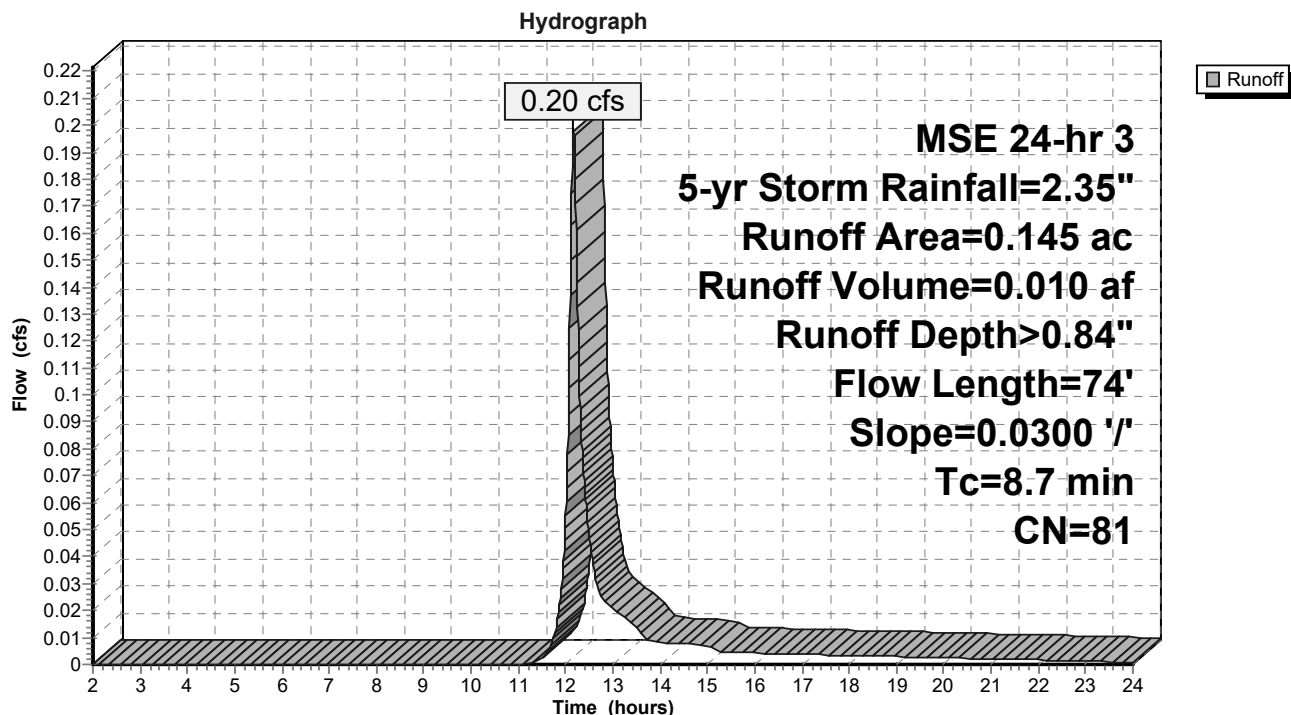
Runoff = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af, Depth> 0.84"
Routed to Pond 11P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-2:

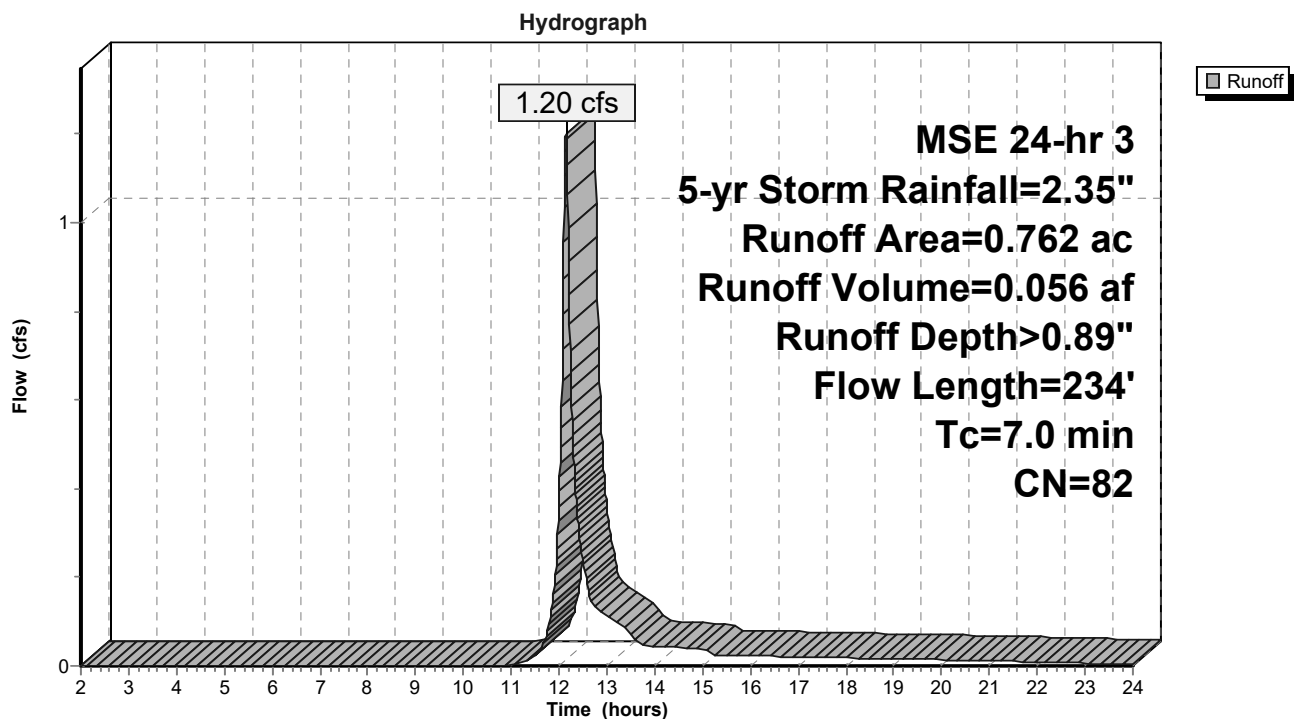
Runoff = 1.20 cfs @ 12.15 hrs, Volume= 0.056 af, Depth> 0.89"
Routed to Pond 2P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.267	98	Paved parking, HSG C
0.495	74	>75% Grass cover, Good, HSG C
0.762	82	Weighted Average
0.495		64.96% Pervious Area
0.267		35.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	234		0.56		Direct Entry, Minimum

Subcatchment A-2:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-3:

Runoff = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af, Depth> 0.53"
Routed to Pond 3P : Inlet

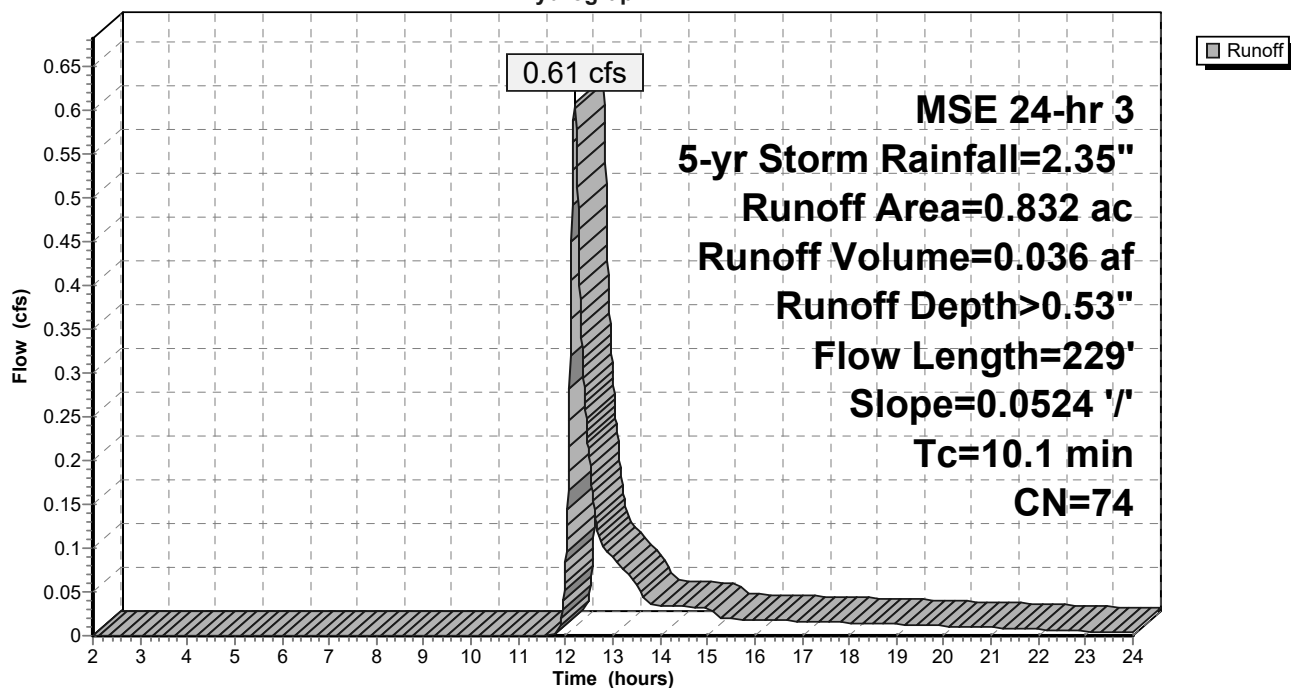
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-4:

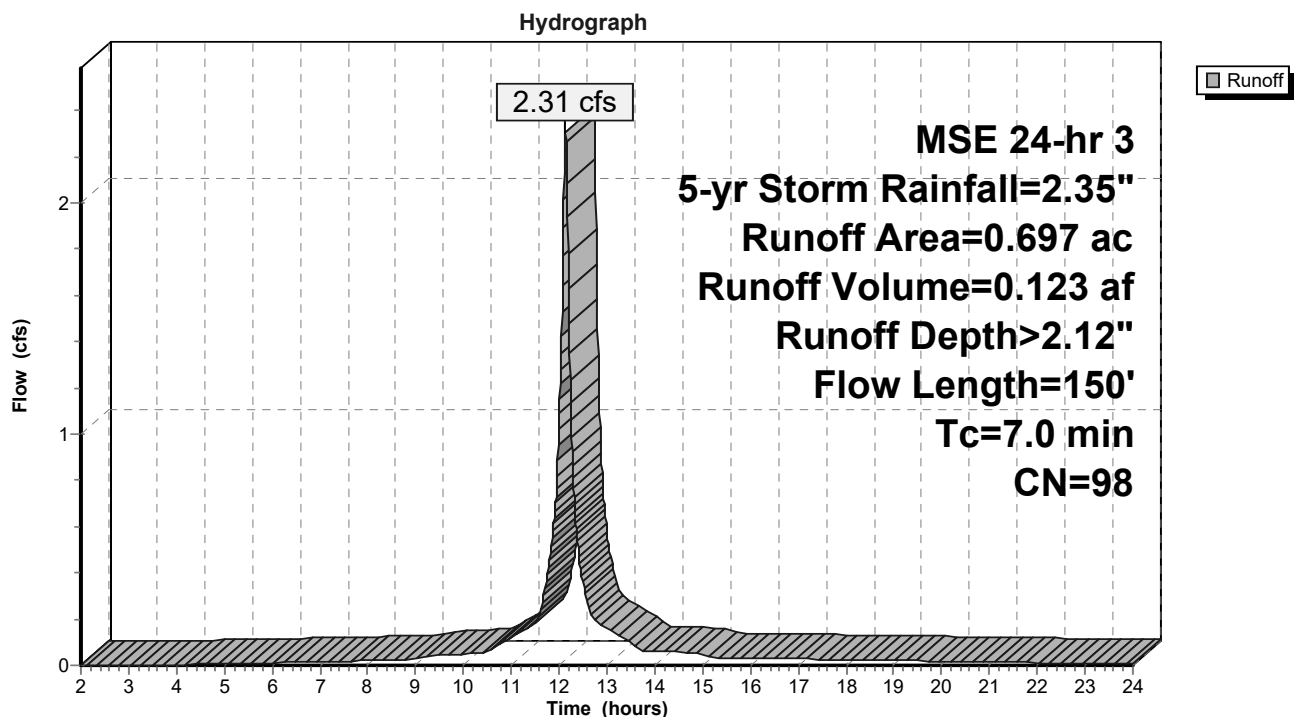
Runoff = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af, Depth> 2.12"
Routed to Pond 4P : Roof Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-5:

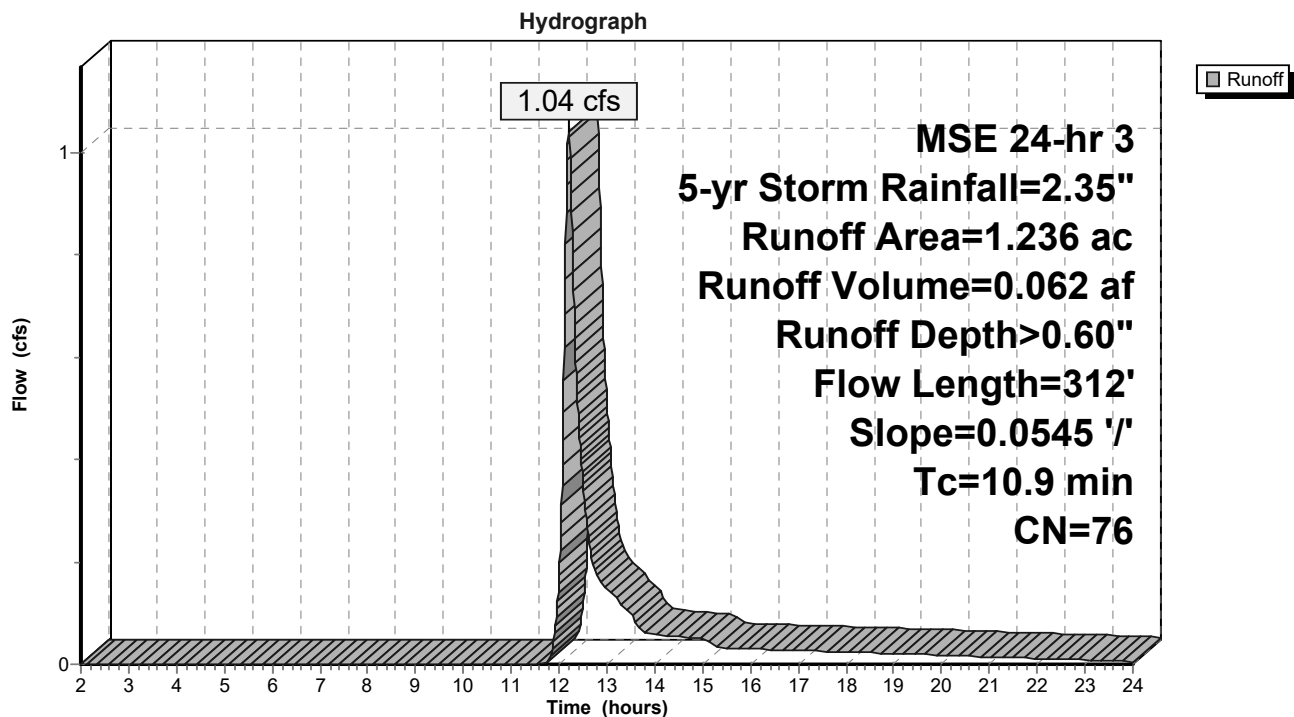
Runoff = 1.04 cfs @ 12.20 hrs, Volume= 0.062 af, Depth> 0.60"
Routed to Pond 5P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-6:

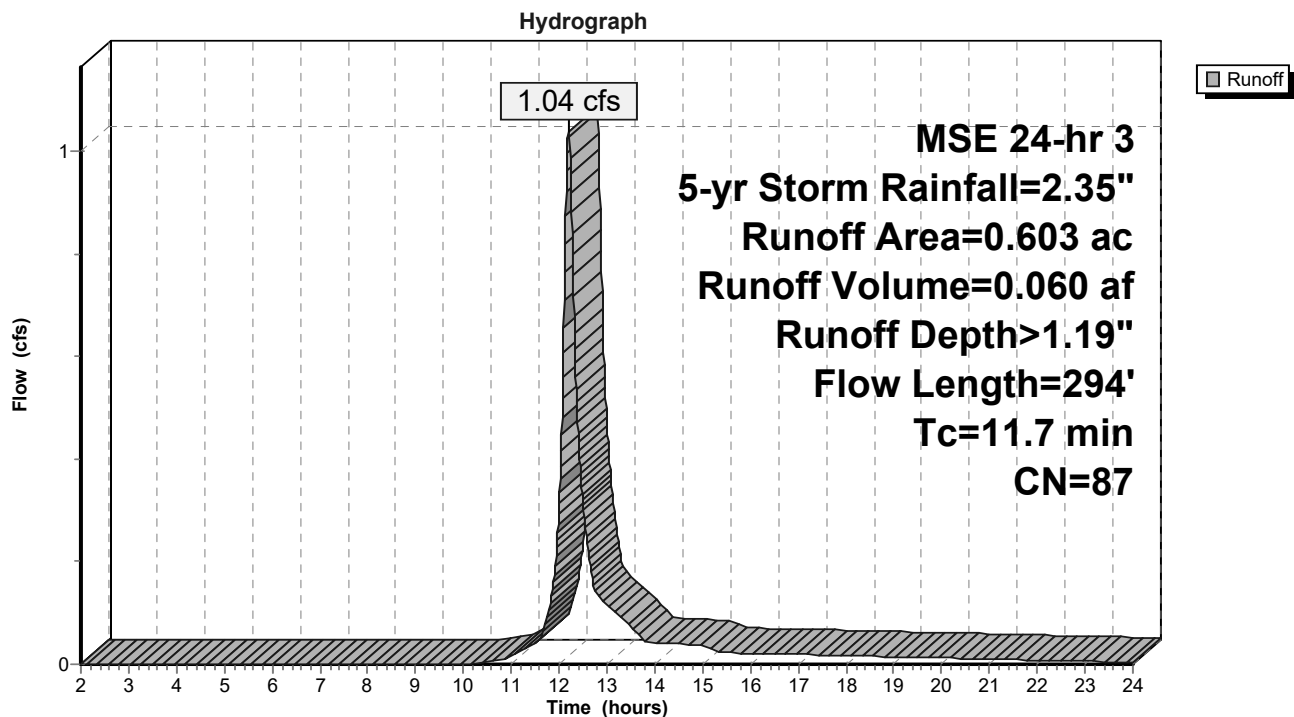
Runoff = 1.04 cfs @ 12.20 hrs, Volume= 0.060 af, Depth> 1.19"
Routed to Pond 6P : DI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-7:

Runoff = 0.46 cfs @ 12.21 hrs, Volume= 0.029 af, Depth> 0.53"
Routed to Pond 7P : Existing Pond

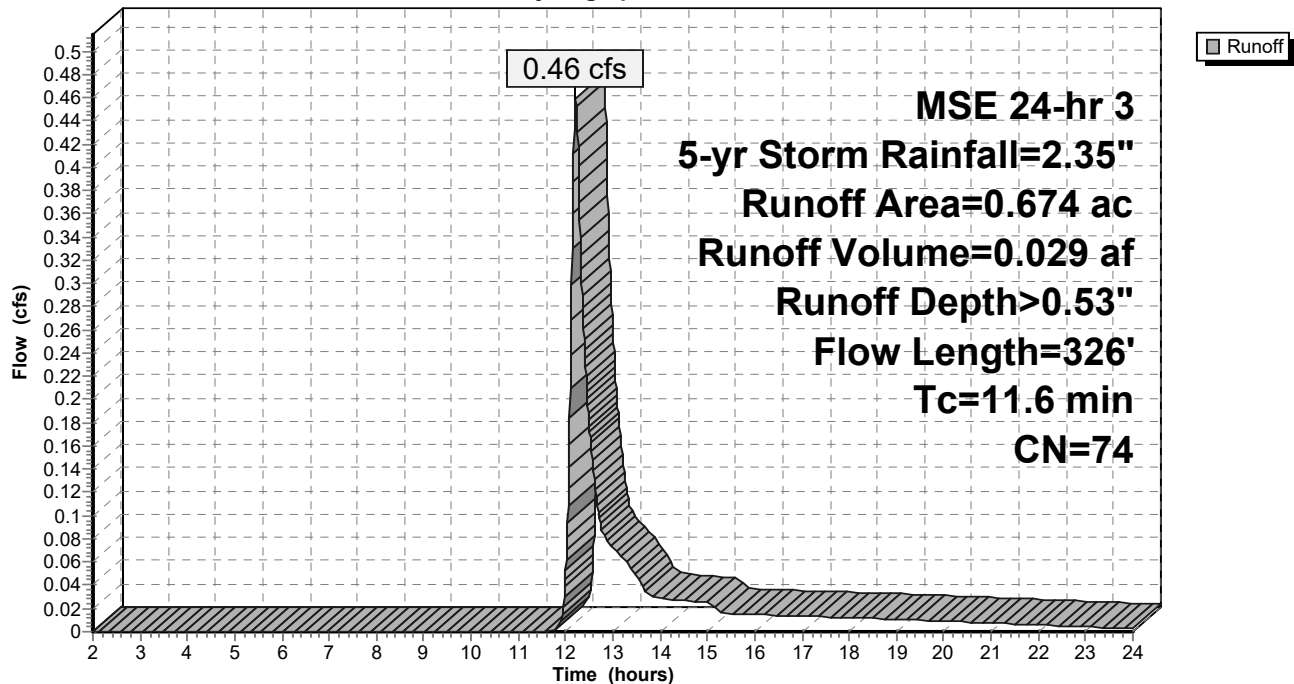
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.674	74	>75% Grass cover, Good, HSG C
0.674		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-8:

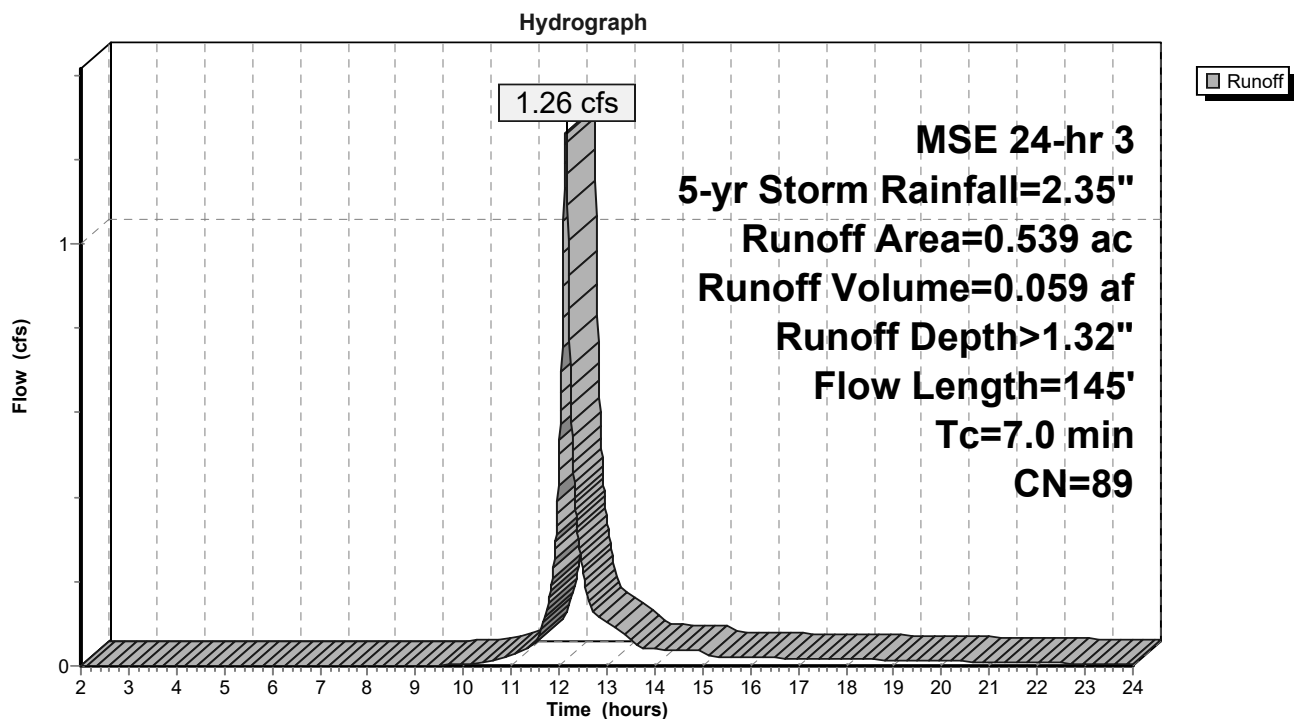
Runoff = 1.26 cfs @ 12.14 hrs, Volume= 0.059 af, Depth> 1.32"
Routed to Pond 8P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-9:

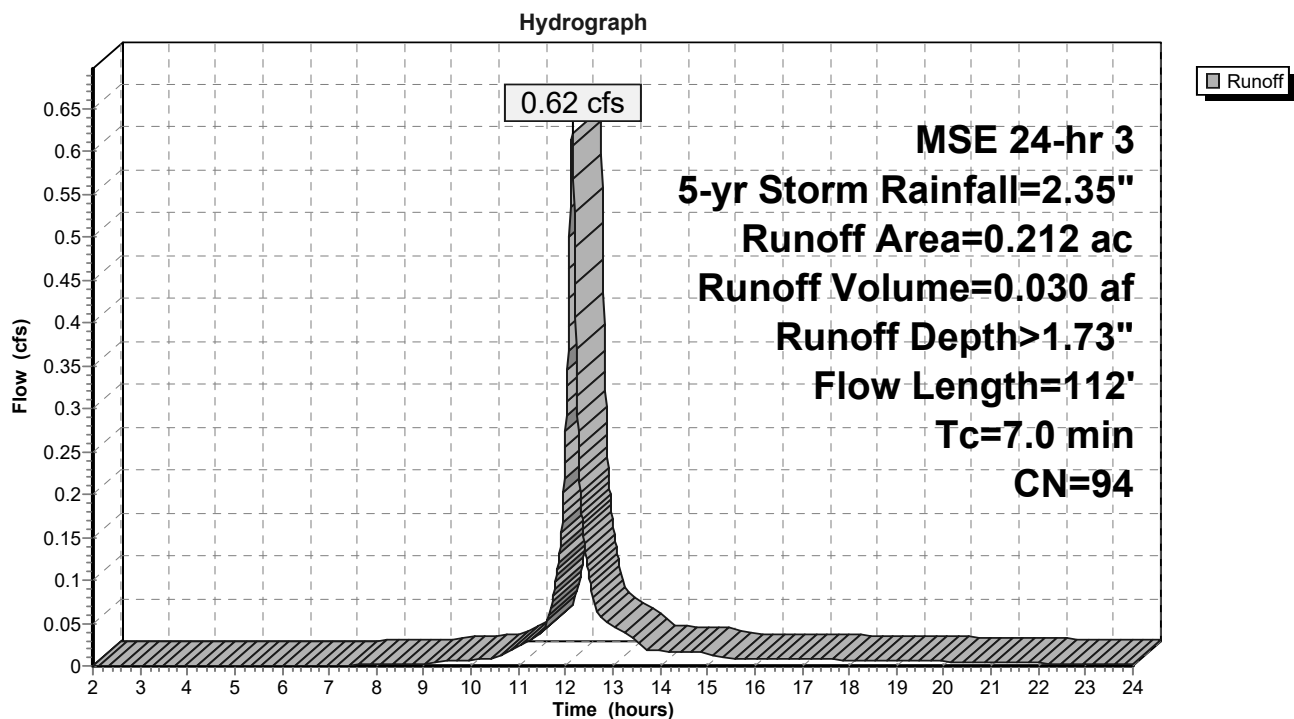
Runoff = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af, Depth> 1.73"
Routed to Pond 9P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 1P: CB

Inflow Area = 2.173 ac, 26.78% Impervious, Inflow Depth > 0.79" for 5-yr Storm event
Inflow = 3.01 cfs @ 12.15 hrs, Volume= 0.142 af
Outflow = 3.01 cfs @ 12.15 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min
Primary = 3.01 cfs @ 12.15 hrs, Volume= 0.142 af
Routed to Pond 8P : CB

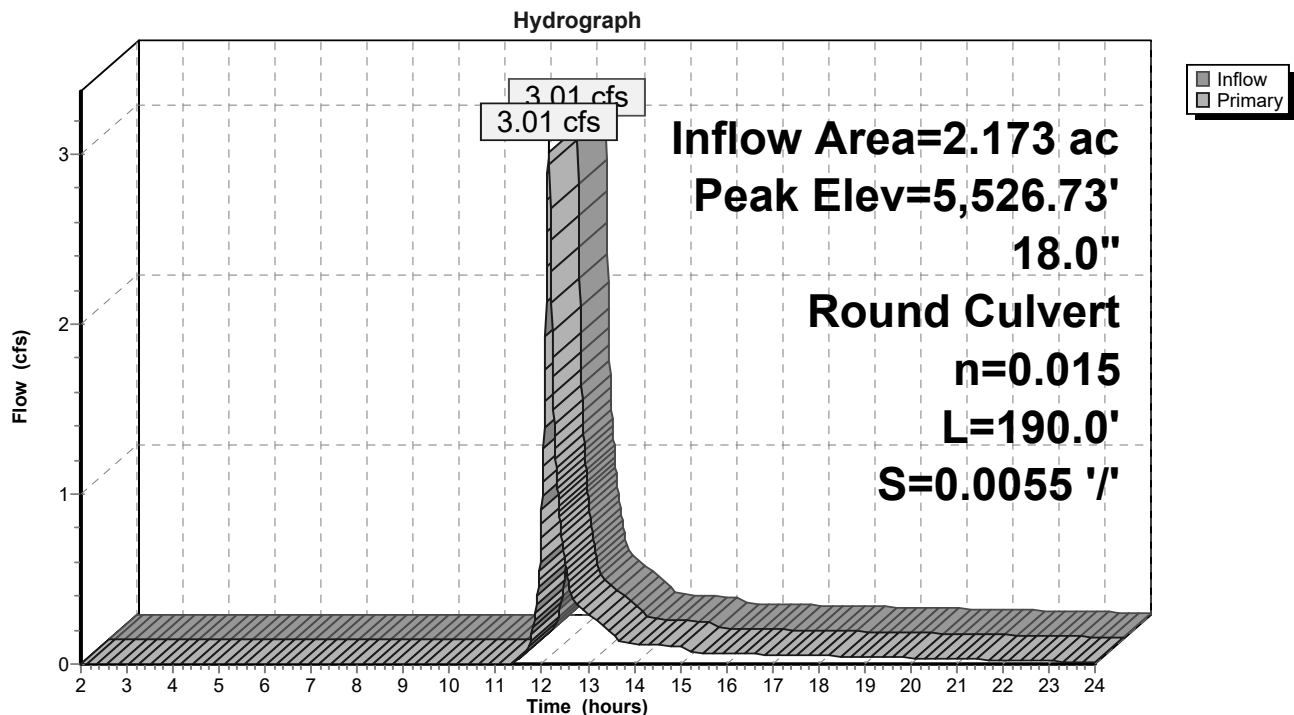
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.73' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.98 cfs @ 12.15 hrs HW=5,526.72' TW=5,525.99' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.98 cfs @ 2.88 fps)

Pond 1P: CB



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 2P: CB

Inflow Area = 1.594 ac, 16.75% Impervious, Inflow Depth > 0.70" for 5-yr Storm event
Inflow = 1.74 cfs @ 12.16 hrs, Volume= 0.093 af
Outflow = 1.74 cfs @ 12.16 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.74 cfs @ 12.16 hrs, Volume= 0.093 af
Routed to Pond 10P : Inlet

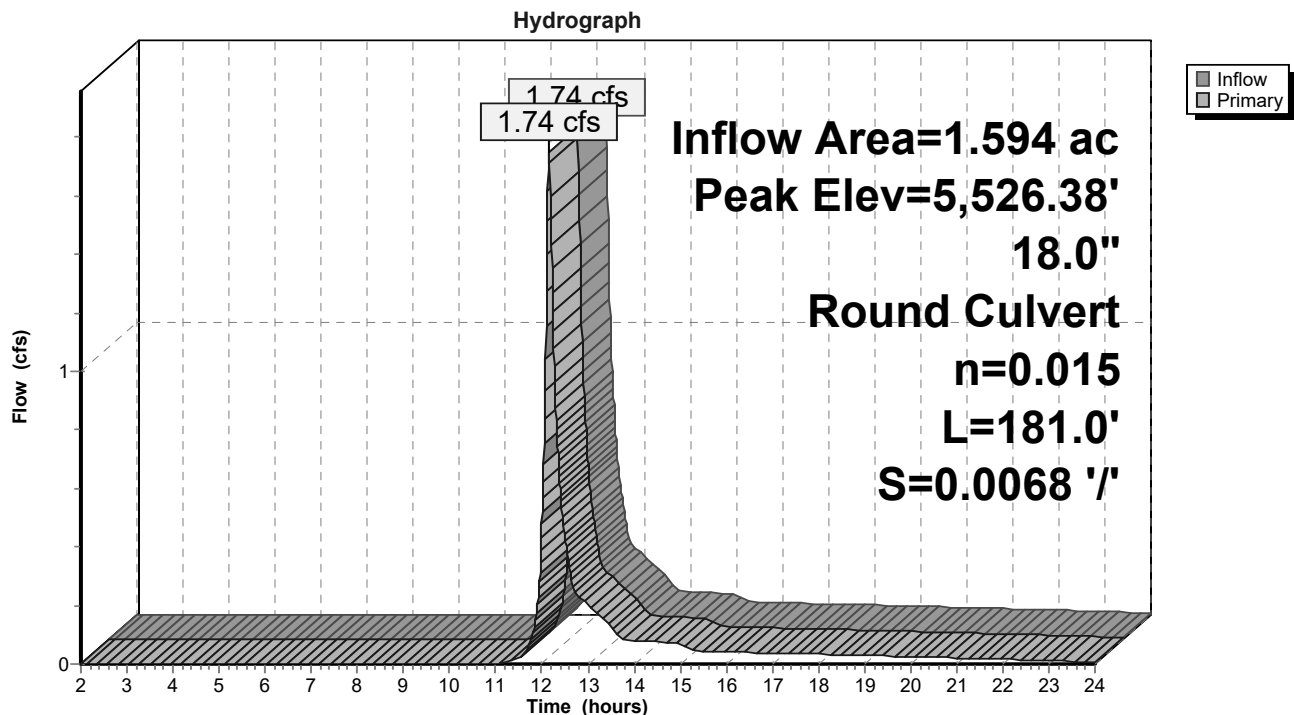
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.38' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.73 cfs @ 12.16 hrs HW=5,526.38' TW=5,525.57' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.73 cfs @ 2.72 fps)

Pond 2P: CB



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 0.53" for 5-yr Storm event
Inflow = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af
Outflow = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af
Routed to Pond 2P : CB

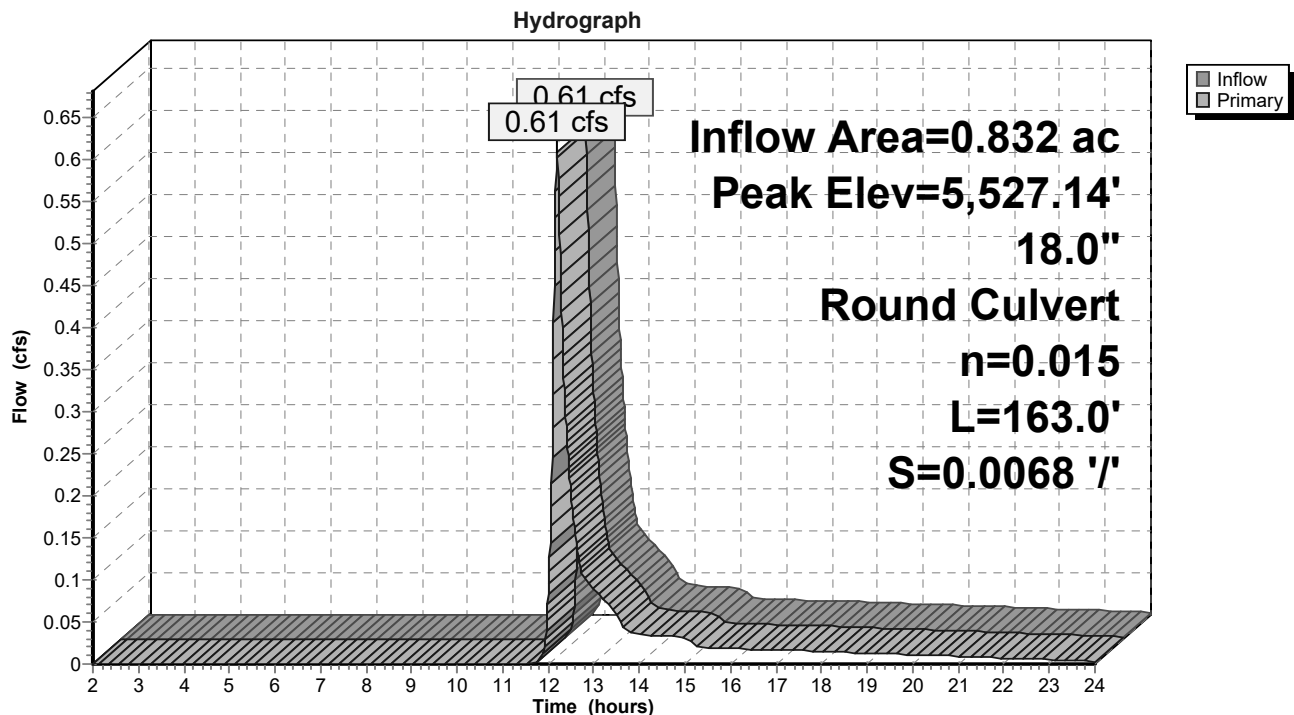
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,527.14' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.61 cfs @ 12.19 hrs HW=5,527.14' TW=5,526.34' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.61 cfs @ 2.16 fps)

Pond 3P: Inlet



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 2.12" for 5-yr Storm event
Inflow = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af
Outflow = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min
Primary = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af
Routed to Pond 5P : Inlet

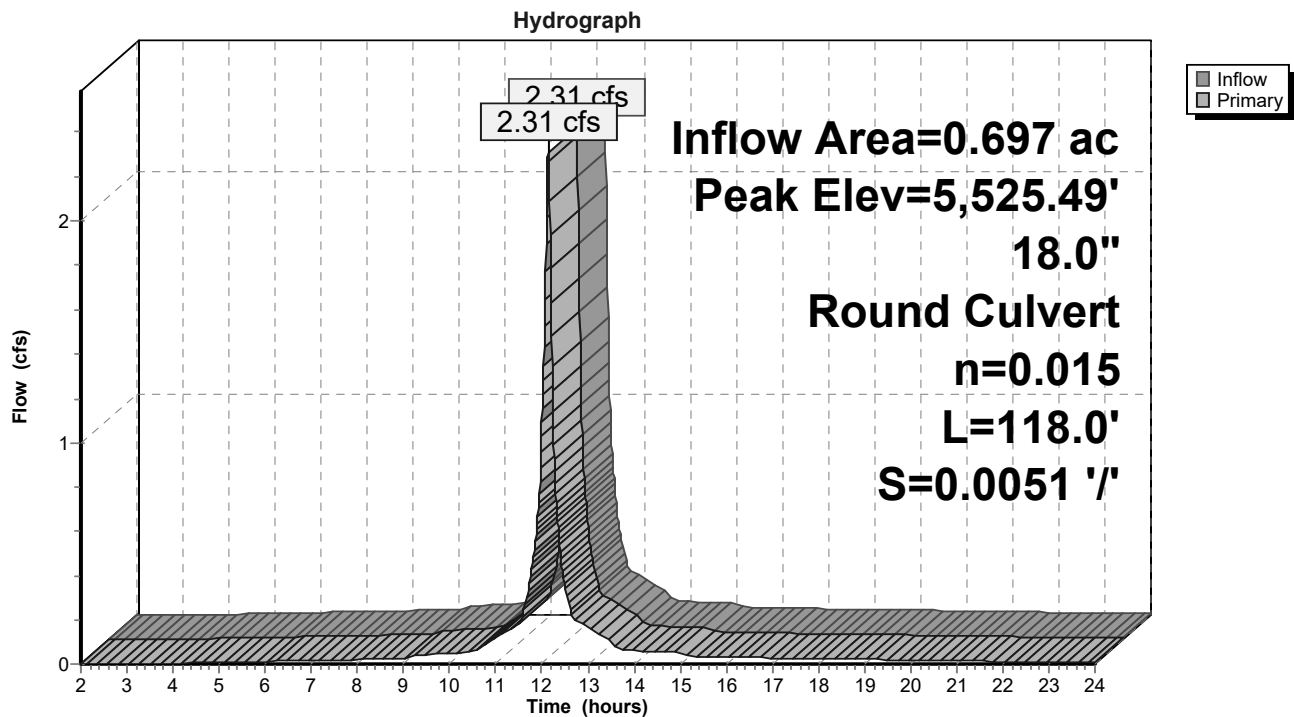
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.49' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 ' /' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.19 cfs @ 12.14 hrs HW=5,525.41' TW=5,525.27' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.19 cfs @ 1.53 fps)

Pond 4P: Roof Drain



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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 1.15" for 5-yr Storm event
Inflow = 3.17 cfs @ 12.15 hrs, Volume= 0.186 af
Outflow = 3.17 cfs @ 12.15 hrs, Volume= 0.185 af, Atten= 0%, Lag= 0.0 min
Primary = 3.17 cfs @ 12.15 hrs, Volume= 0.185 af
Routed to Pond 6P : DI

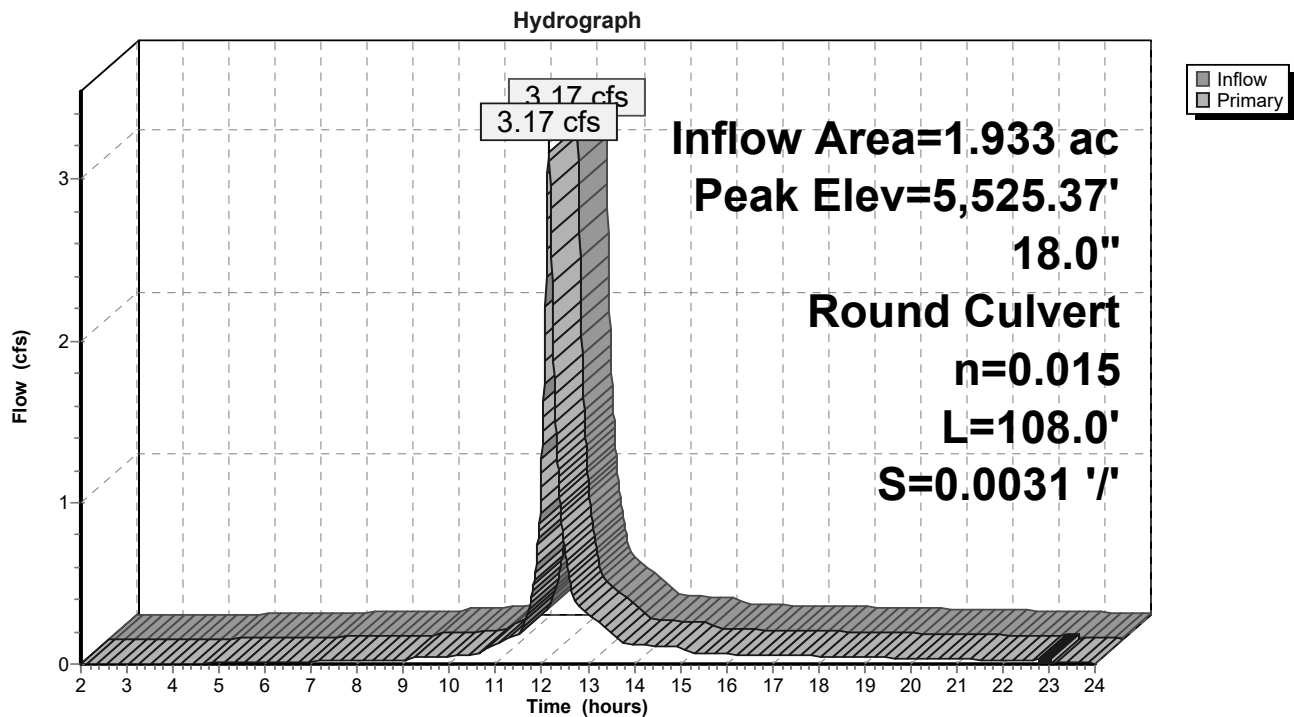
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.37' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.92 cfs @ 12.15 hrs HW=5,525.33' TW=5,525.15' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.92 cfs @ 1.65 fps)

Pond 5P: Inlet



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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 1.16" for 5-yr Storm event
Inflow = 4.11 cfs @ 12.16 hrs, Volume= 0.245 af
Outflow = 4.11 cfs @ 12.16 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.0 min
Primary = 4.11 cfs @ 12.16 hrs, Volume= 0.245 af
Routed to Pond 7P : Existing Pond

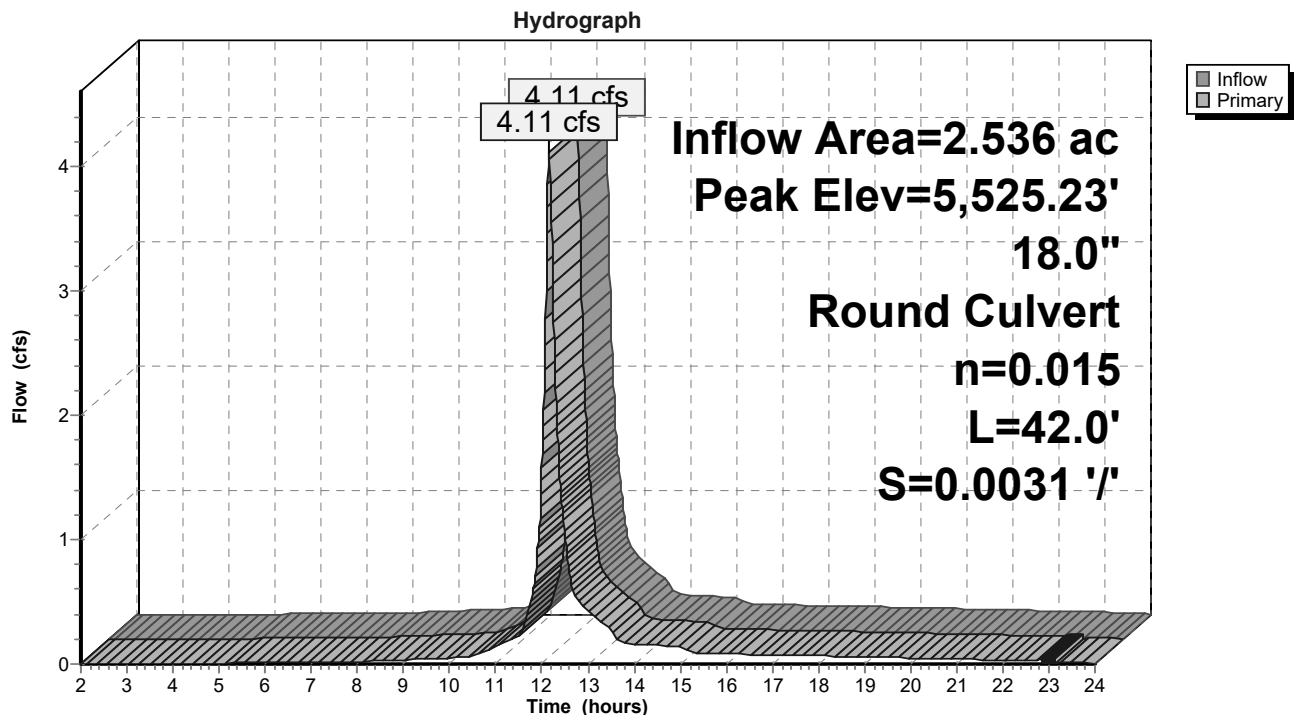
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.23' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=4.11 cfs @ 12.16 hrs HW=5,525.18' TW=5,524.94' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 4.11 cfs @ 2.32 fps)

Pond 6P: DI



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Summary for Pond 7P: Existing Pond

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 0.96" for 5-yr Storm event
 Inflow = 12.00 cfs @ 12.15 hrs, Volume= 0.649 af
 Outflow = 6.63 cfs @ 12.27 hrs, Volume= 0.583 af, Atten= 45%, Lag= 7.1 min
 Primary = 6.63 cfs @ 12.27 hrs, Volume= 0.583 af
 Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 5,525.10' @ 12.27 hrs Surf.Area= 0.169 ac Storage= 0.145 af

Plug-Flow detention time= 68.0 min calculated for 0.583 af (90% of inflow)
 Center-of-Mass det. time= 23.7 min (831.5 - 807.9)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.347 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.007	0.004	0.004
5,524.00	0.043	0.025	0.029
5,525.00	0.157	0.100	0.129
5,526.00	0.279	0.218	0.347

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

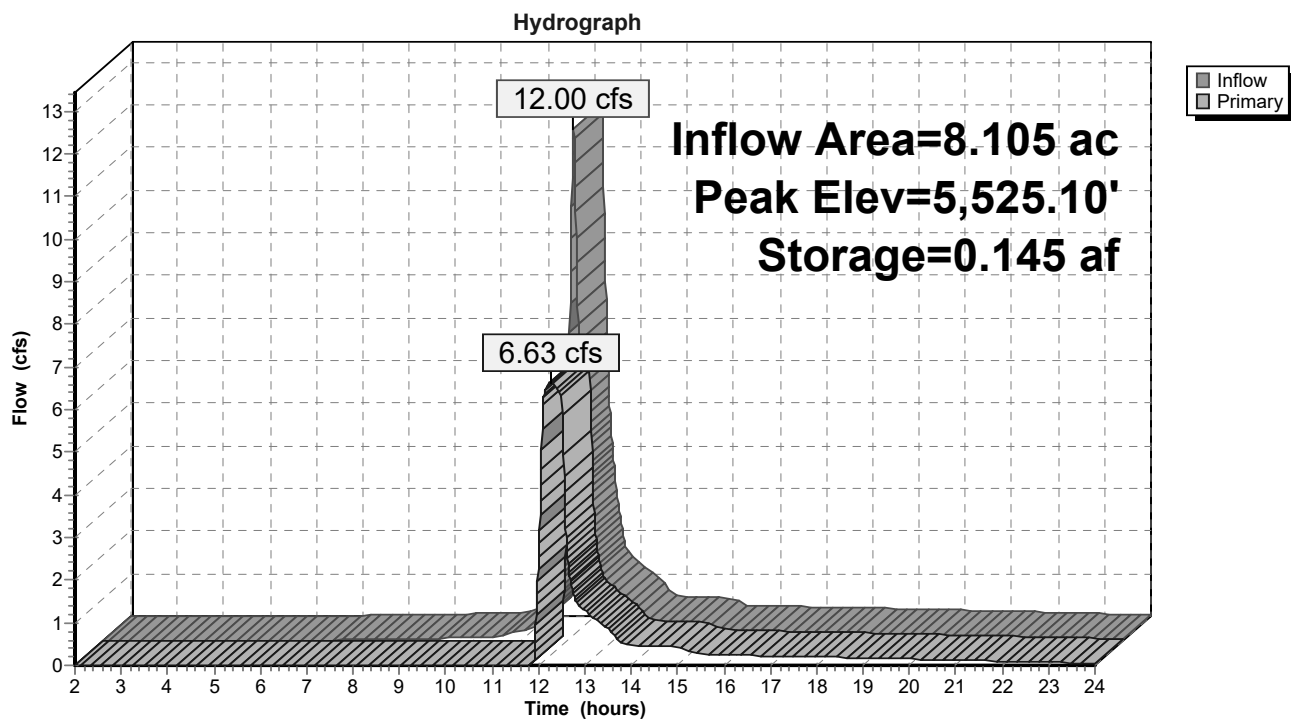
Primary OutFlow Max=6.63 cfs @ 12.27 hrs HW=5,525.10' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 6.63 cfs of 13.02 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 6.63 cfs @ 8.84 fps)

↑ **1=Orifice/Grate** (Passes 6.63 cfs of 21.24 cfs potential flow)

Pond 7P: Existing Pond



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Summary for Pond 8P: CB

Inflow Area = 2.924 ac, 37.76% Impervious, Inflow Depth > 0.95" for 5-yr Storm event
Inflow = 4.89 cfs @ 12.15 hrs, Volume= 0.232 af
Outflow = 4.89 cfs @ 12.15 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min
Primary = 4.89 cfs @ 12.15 hrs, Volume= 0.232 af
Routed to Pond 7P : Existing Pond

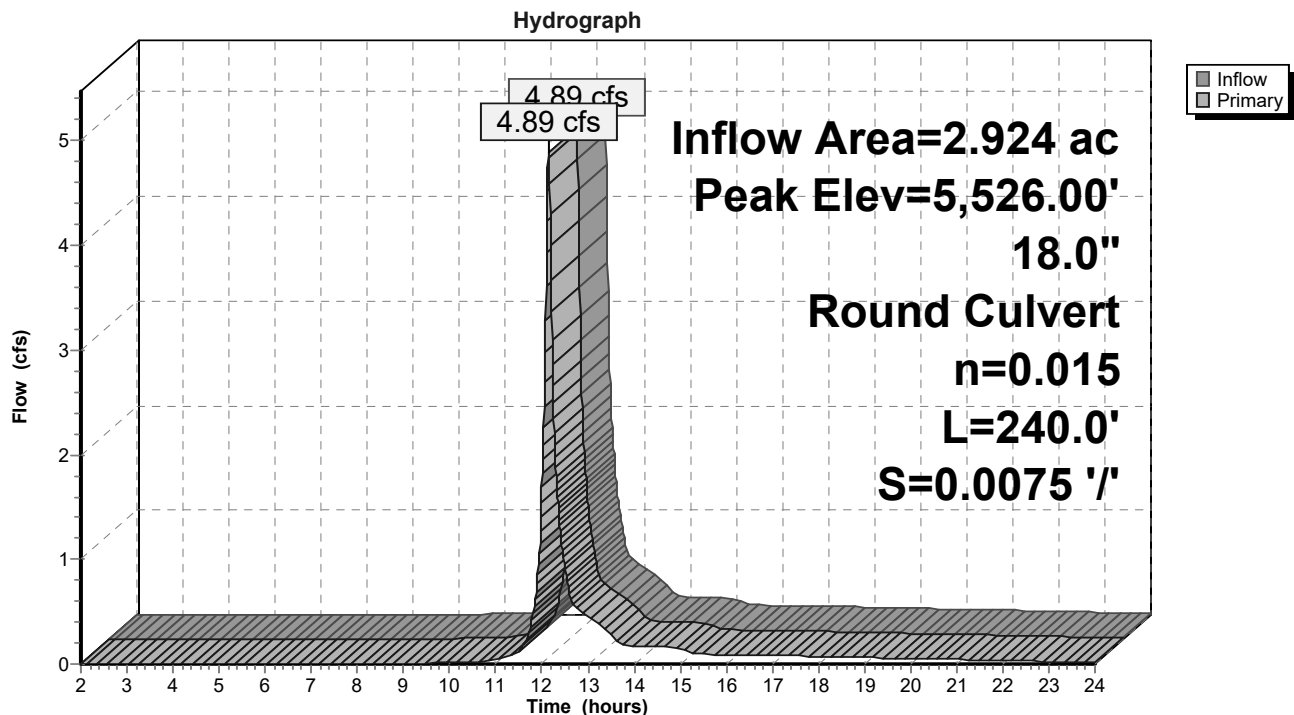
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.00' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=4.87 cfs @ 12.15 hrs HW=5,525.99' TW=5,524.91' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 4.87 cfs @ 3.40 fps)

Pond 8P: CB



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 1.73" for 5-yr Storm event
Inflow = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af
Outflow = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min
Primary = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af
Routed to Pond 8P : CB

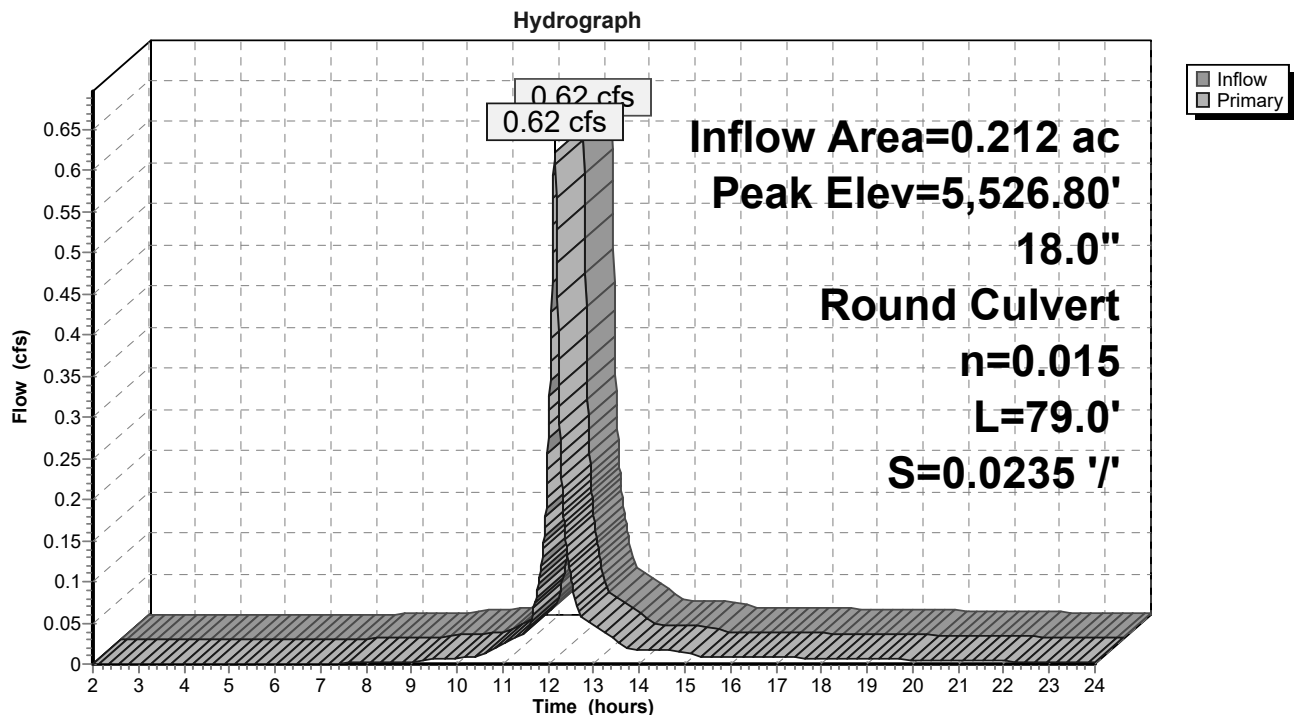
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.80' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.62 cfs @ 12.14 hrs HW=5,526.80' TW=5,525.98' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.62 cfs @ 2.73 fps)

Pond 9P: CB



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 10P: Inlet

Inflow Area = 1.971 ac, 26.28% Impervious, Inflow Depth > 0.86" for 5-yr Storm event
Inflow = 2.67 cfs @ 12.15 hrs, Volume= 0.142 af
Outflow = 2.67 cfs @ 12.15 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min
Primary = 2.67 cfs @ 12.15 hrs, Volume= 0.142 af
Routed to Pond 7P : Existing Pond

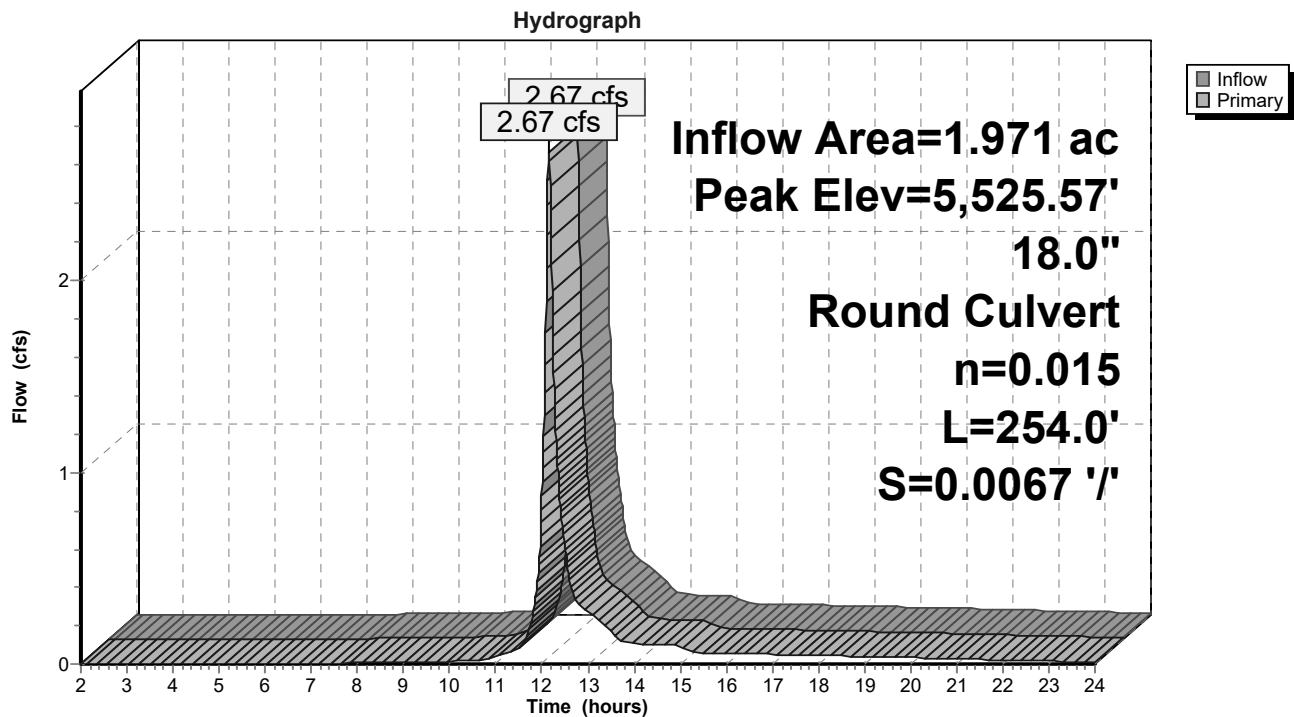
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.57' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 ' /' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.67 cfs @ 12.15 hrs HW=5,525.56' TW=5,524.93' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.67 cfs @ 2.43 fps)

Pond 10P: Inlet



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Summary for Pond 11P: Inlet

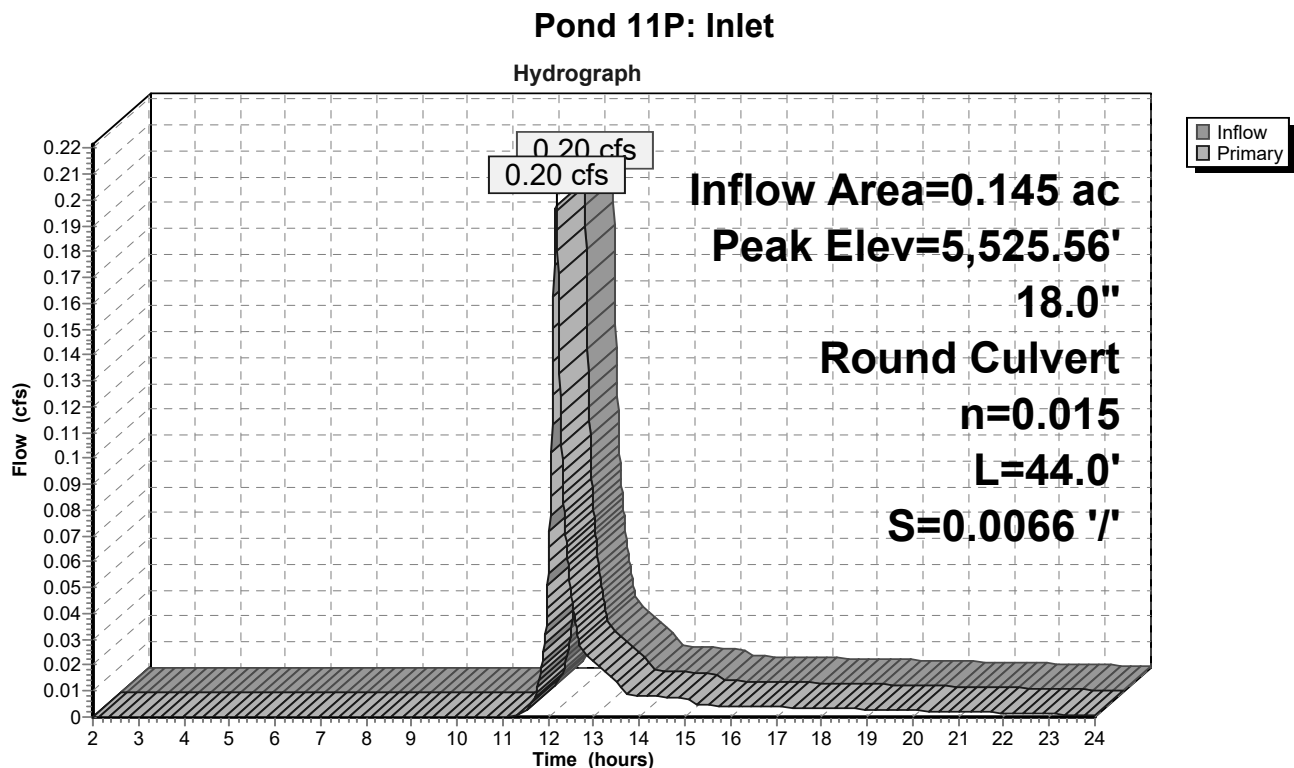
Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 0.84" for 5-yr Storm event
Inflow = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af
Outflow = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.56' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

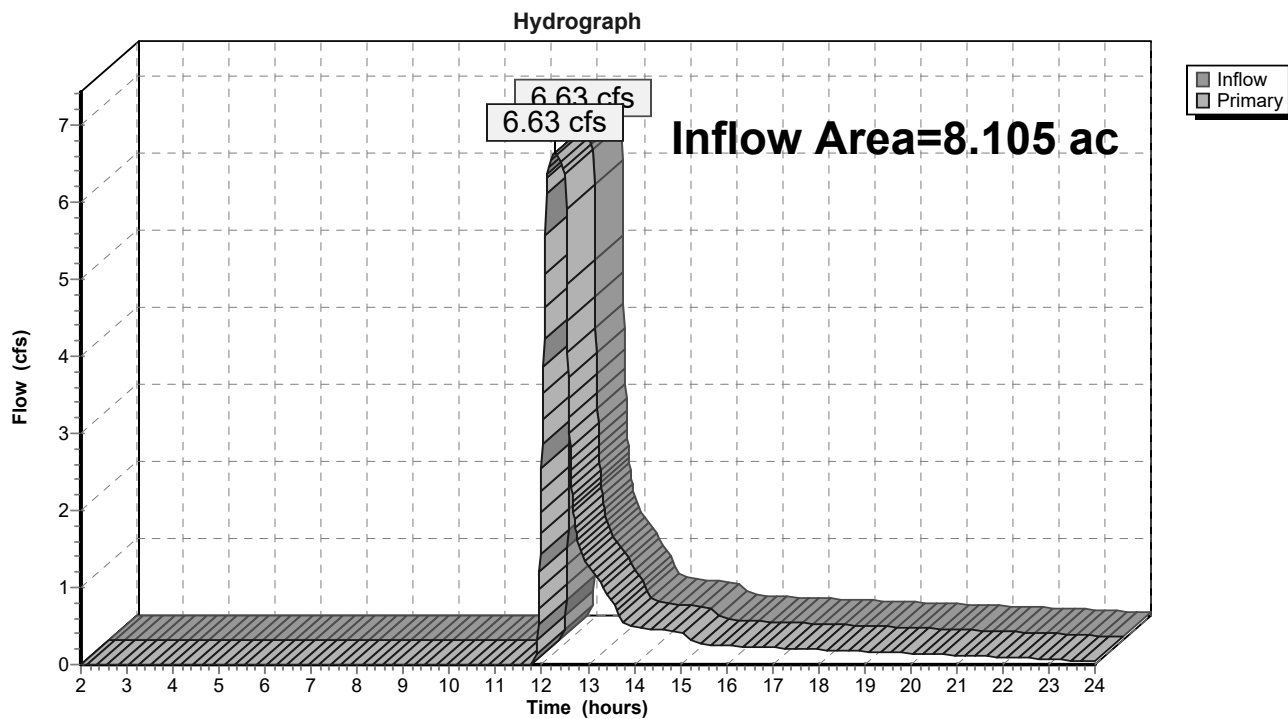
Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=5,525.56' TW=5,525.57' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)



Summary for Link 1L: Street Sewer

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 0.86" for 5-yr Storm event
Inflow = 6.63 cfs @ 12.27 hrs, Volume= 0.583 af
Primary = 6.63 cfs @ 12.27 hrs, Volume= 0.583 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer

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Time span=2.00-24.00 hrs, dt=0.01 hrs, 2201 points x 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A-1:	Runoff Area=2.173 ac 26.78% Impervious Runoff Depth>1.12" Flow Length=415' Tc=7.0 min CN=80 Runoff=4.32 cfs 0.202 af
Subcatchment A-10:	Runoff Area=0.232 ac 90.52% Impervious Runoff Depth>2.48" Flow Length=131' Tc=7.0 min CN=97 Runoff=0.91 cfs 0.048 af
Subcatchment A-11:	Runoff Area=0.145 ac 28.28% Impervious Runoff Depth>1.18" Flow Length=74' Slope=0.0300 '/ Tc=8.7 min CN=81 Runoff=0.28 cfs 0.014 af
Subcatchment A-2:	Runoff Area=0.762 ac 35.04% Impervious Runoff Depth>1.24" Flow Length=234' Tc=7.0 min CN=82 Runoff=1.68 cfs 0.079 af
Subcatchment A-3:	Runoff Area=0.832 ac 0.00% Impervious Runoff Depth>0.80" Flow Length=229' Slope=0.0524 '/ Tc=10.1 min CN=74 Runoff=0.98 cfs 0.055 af
Subcatchment A-4:	Runoff Area=0.697 ac 100.00% Impervious Runoff Depth>2.59" Flow Length=150' Tc=7.0 min CN=98 Runoff=2.79 cfs 0.150 af
Subcatchment A-5:	Runoff Area=1.236 ac 7.12% Impervious Runoff Depth>0.89" Flow Length=312' Slope=0.0545 '/ Tc=10.9 min CN=76 Runoff=1.60 cfs 0.092 af
Subcatchment A-6:	Runoff Area=0.603 ac 55.89% Impervious Runoff Depth>1.58" Flow Length=294' Tc=11.7 min CN=87 Runoff=1.38 cfs 0.079 af
Subcatchment A-7:	Runoff Area=0.674 ac 0.00% Impervious Runoff Depth>0.80" Flow Length=326' Tc=11.6 min CN=74 Runoff=0.74 cfs 0.045 af
Subcatchment A-8:	Runoff Area=0.539 ac 63.27% Impervious Runoff Depth>1.74" Flow Length=145' Tc=7.0 min CN=89 Runoff=1.64 cfs 0.078 af
Subcatchment A-9:	Runoff Area=0.212 ac 85.38% Impervious Runoff Depth>2.18" Flow Length=112' Tc=7.0 min CN=94 Runoff=0.77 cfs 0.038 af
Pond 1P: CB	Peak Elev=5,527.29' Inflow=4.32 cfs 0.202 af 18.0" Round Culvert n=0.015 L=190.0' S=0.0055 '/ Outflow=4.32 cfs 0.202 af
Pond 2P: CB	Peak Elev=5,526.60' Inflow=2.57 cfs 0.134 af 18.0" Round Culvert n=0.015 L=181.0' S=0.0068 '/ Outflow=2.57 cfs 0.134 af
Pond 3P: Inlet	Peak Elev=5,527.29' Inflow=0.98 cfs 0.055 af 18.0" Round Culvert n=0.015 L=163.0' S=0.0068 '/ Outflow=0.98 cfs 0.055 af
Pond 4P: Roof Drain	Peak Elev=5,526.06' Inflow=2.79 cfs 0.150 af 18.0" Round Culvert n=0.015 L=118.0' S=0.0051 '/ Outflow=2.79 cfs 0.150 af
Pond 5P: Inlet	Peak Elev=5,525.92' Inflow=4.16 cfs 0.243 af 18.0" Round Culvert n=0.015 L=108.0' S=0.0031 '/ Outflow=4.16 cfs 0.243 af

StandleyLake_Existing*MSE 24-hr 3 10-yr Storm Rainfall=2.82"*

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Pond 6P: DI

Peak Elev=5,525.66' Inflow=5.44 cfs 0.322 af
18.0" Round Culvert n=0.015 L=42.0' S=0.0031 '/' Outflow=5.44 cfs 0.322 af

Pond 7P: Existing Pond

Peak Elev=5,525.46' Storage=0.215 af Inflow=16.47 cfs 0.881 af
Outflow=6.98 cfs 0.815 af

Pond 8P: CB

Peak Elev=5,526.77' Inflow=6.73 cfs 0.319 af
18.0" Round Culvert n=0.015 L=240.0' S=0.0075 '/' Outflow=6.73 cfs 0.319 af

Pond 9P: CB

Peak Elev=5,526.99' Inflow=0.77 cfs 0.038 af
18.0" Round Culvert n=0.015 L=79.0' S=0.0235 '/' Outflow=0.77 cfs 0.038 af

Pond 10P: Inlet

Peak Elev=5,525.86' Inflow=3.74 cfs 0.196 af
18.0" Round Culvert n=0.015 L=254.0' S=0.0067 '/' Outflow=3.74 cfs 0.196 af

Pond 11P: Inlet

Peak Elev=5,525.84' Inflow=0.28 cfs 0.014 af
18.0" Round Culvert n=0.015 L=44.0' S=0.0066 '/' Outflow=0.28 cfs 0.014 af

Link 1L: Street Sewer

Inflow=6.98 cfs 0.815 af
Primary=6.98 cfs 0.815 af

StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-1:

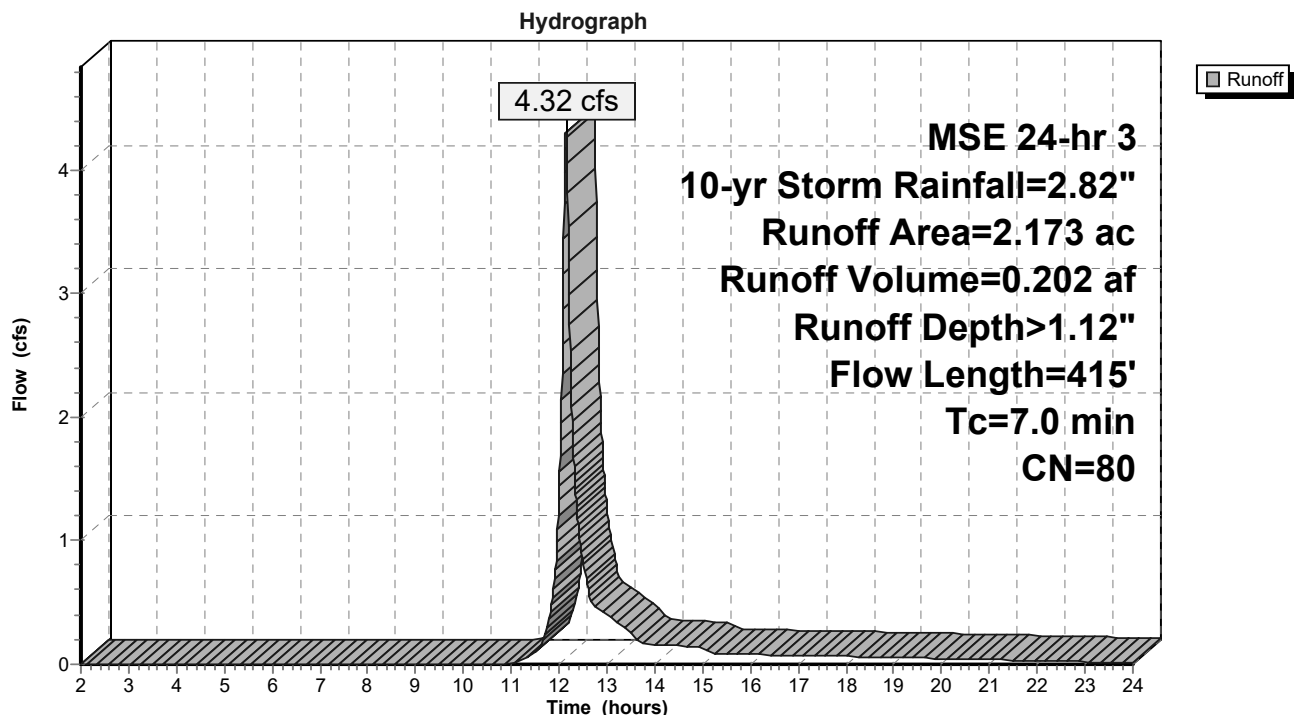
Runoff = 4.32 cfs @ 12.15 hrs, Volume= 0.202 af, Depth> 1.12"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.582	98	Paved parking, HSG C
1.591	74	>75% Grass cover, Good, HSG C
2.173	80	Weighted Average
1.591		73.22% Pervious Area
0.582		26.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	65	0.1540	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.2	111	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	239	0.0126	2.28		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.0	415	Total			

Subcatchment A-1:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-10:

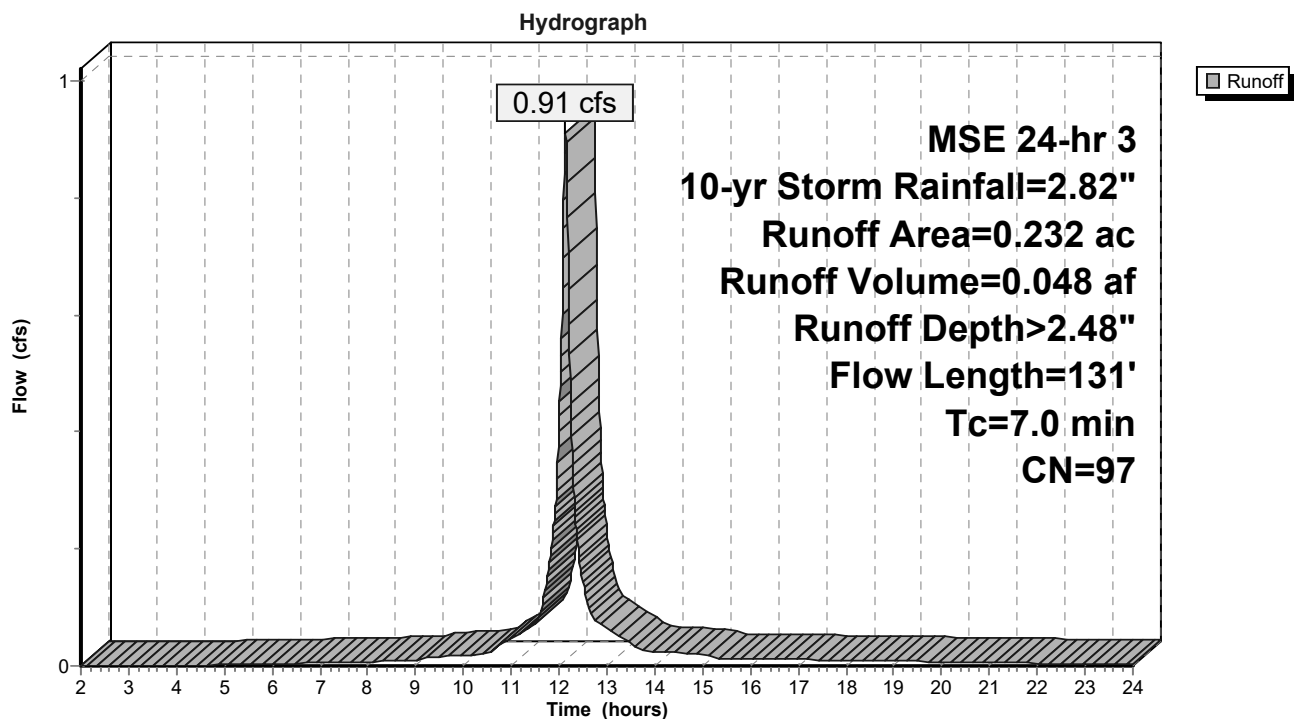
Runoff = 0.91 cfs @ 12.14 hrs, Volume= 0.048 af, Depth> 2.48"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-11:

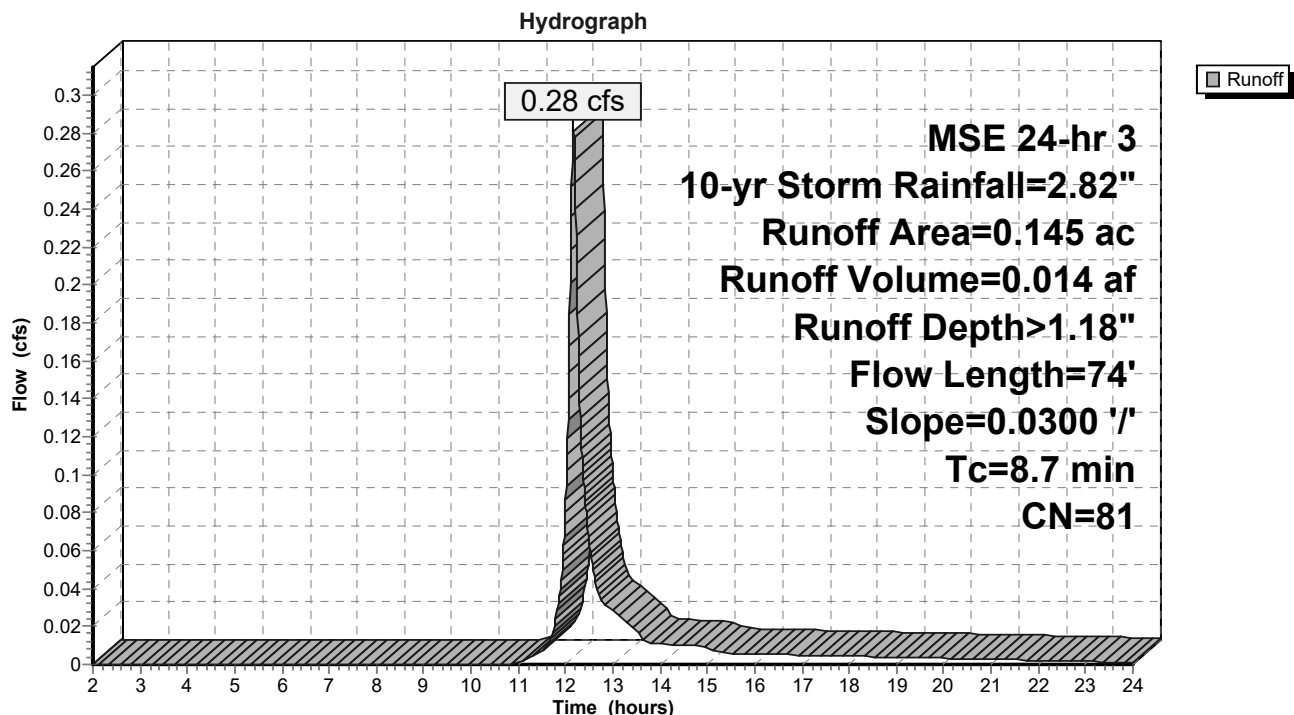
Runoff = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af, Depth> 1.18"
Routed to Pond 11P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-2:

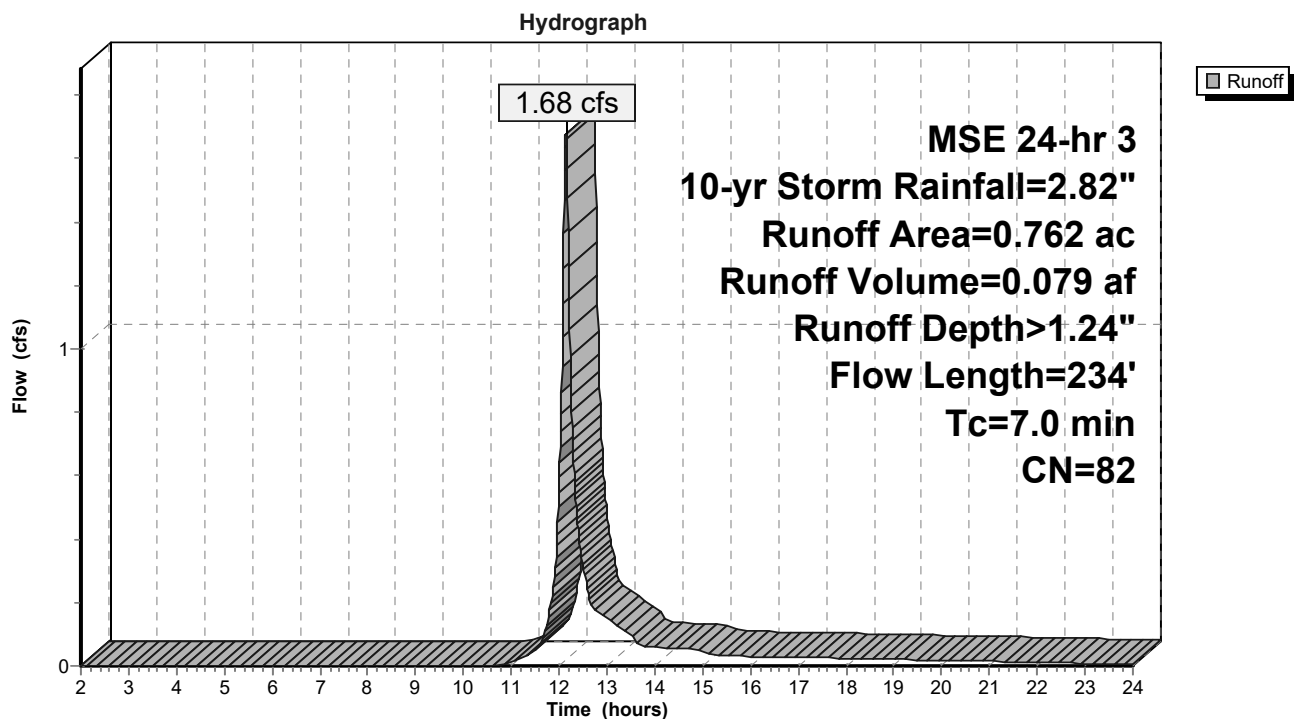
Runoff = 1.68 cfs @ 12.15 hrs, Volume= 0.079 af, Depth> 1.24"
Routed to Pond 2P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.267	98	Paved parking, HSG C
0.495	74	>75% Grass cover, Good, HSG C
0.762	82	Weighted Average
0.495		64.96% Pervious Area
0.267		35.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	234		0.56		Direct Entry, Minimum

Subcatchment A-2:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-3:

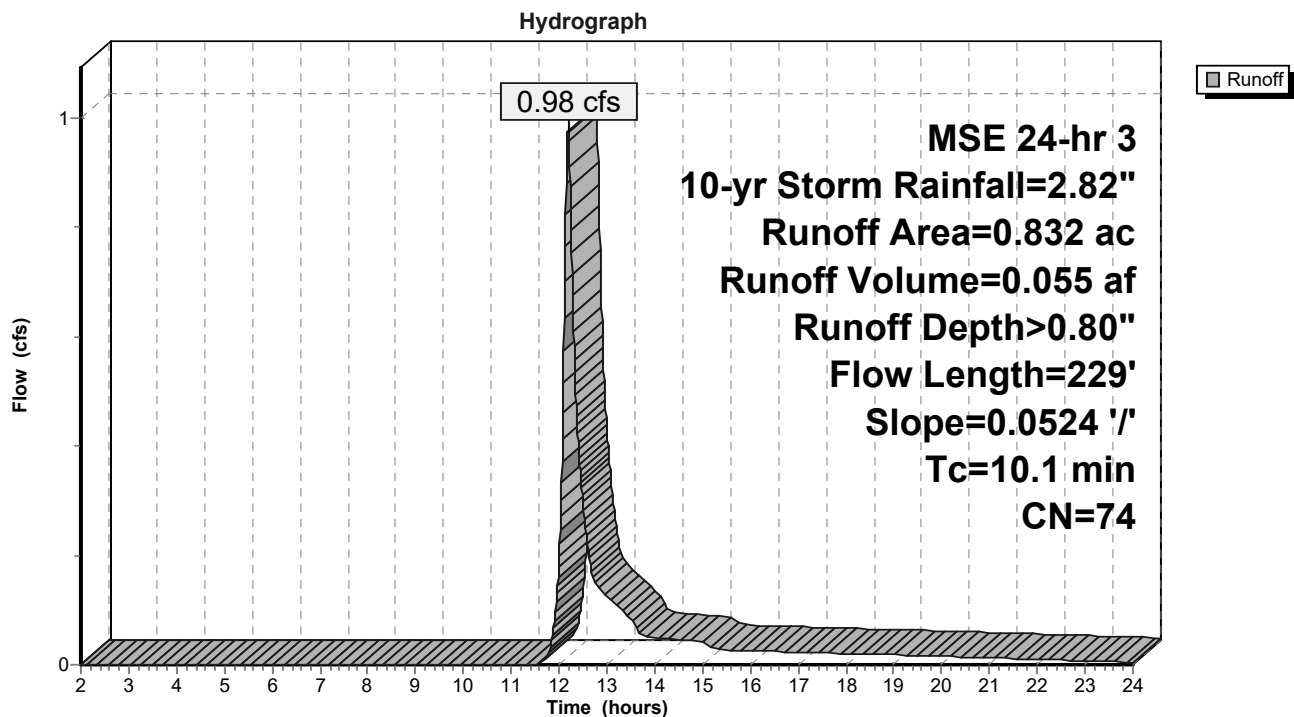
Runoff = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af, Depth> 0.80"
Routed to Pond 3P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-4:

Runoff = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af, Depth> 2.59"
Routed to Pond 4P : Roof Drain

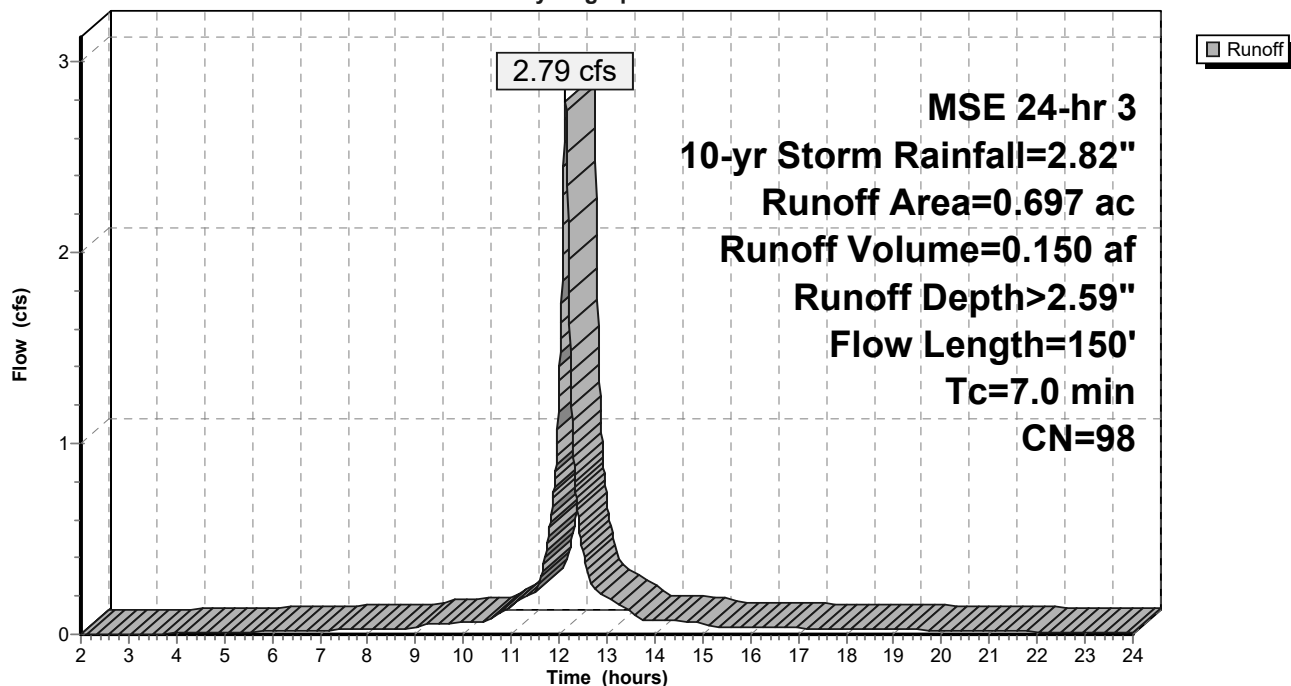
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:

Hydrograph



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-5:

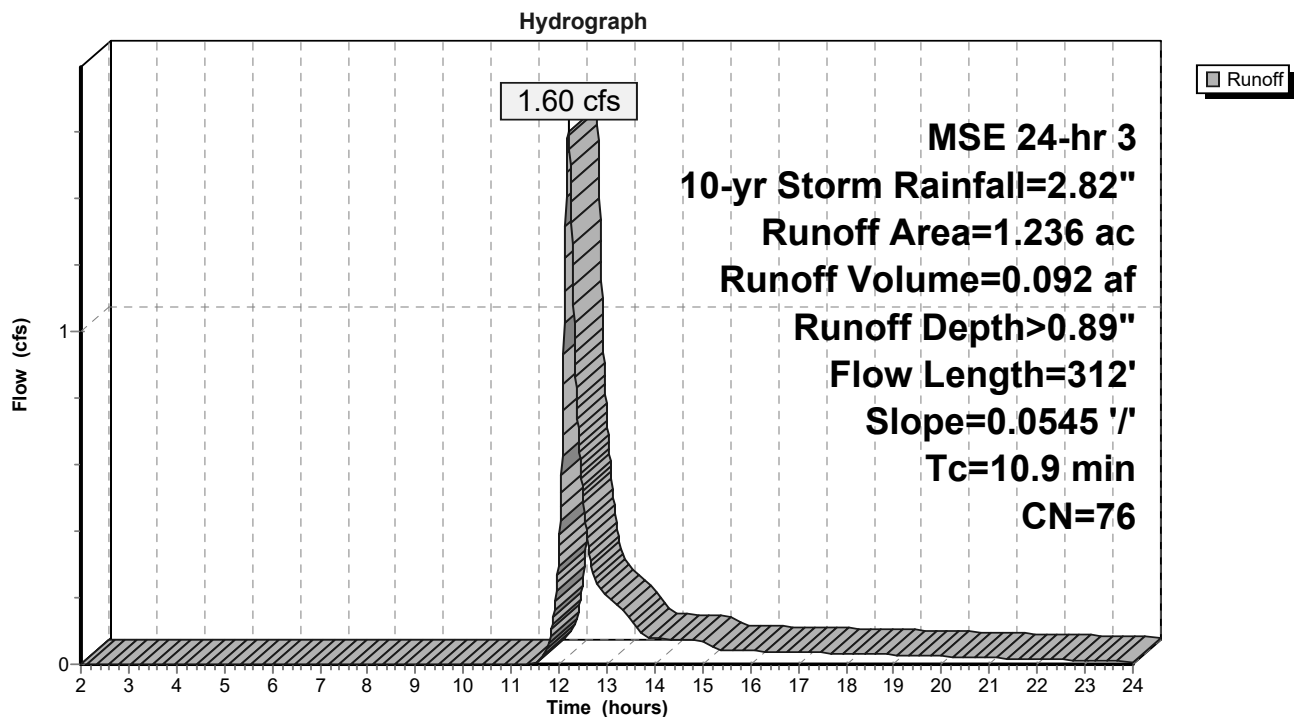
Runoff = 1.60 cfs @ 12.20 hrs, Volume= 0.092 af, Depth> 0.89"
Routed to Pond 5P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-6:

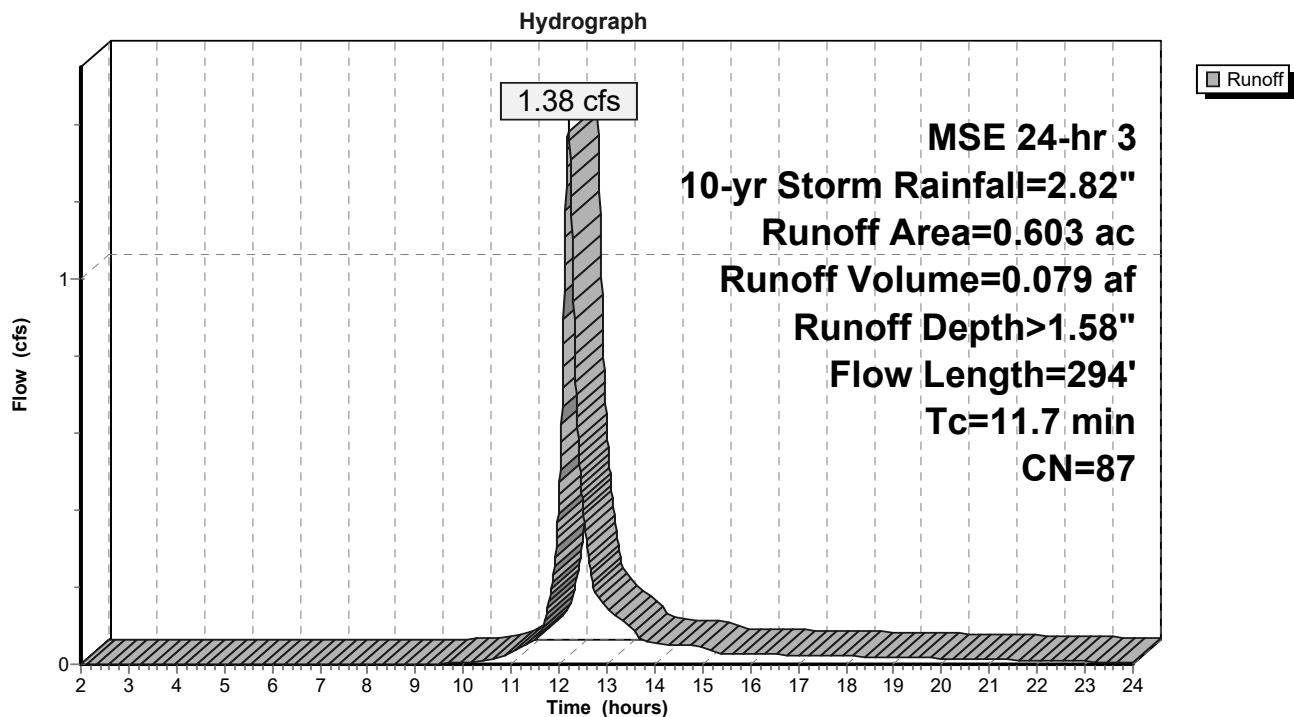
Runoff = 1.38 cfs @ 12.20 hrs, Volume= 0.079 af, Depth> 1.58"
Routed to Pond 6P : DI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-7:

Runoff = 0.74 cfs @ 12.21 hrs, Volume= 0.045 af, Depth> 0.80"
Routed to Pond 7P : Existing Pond

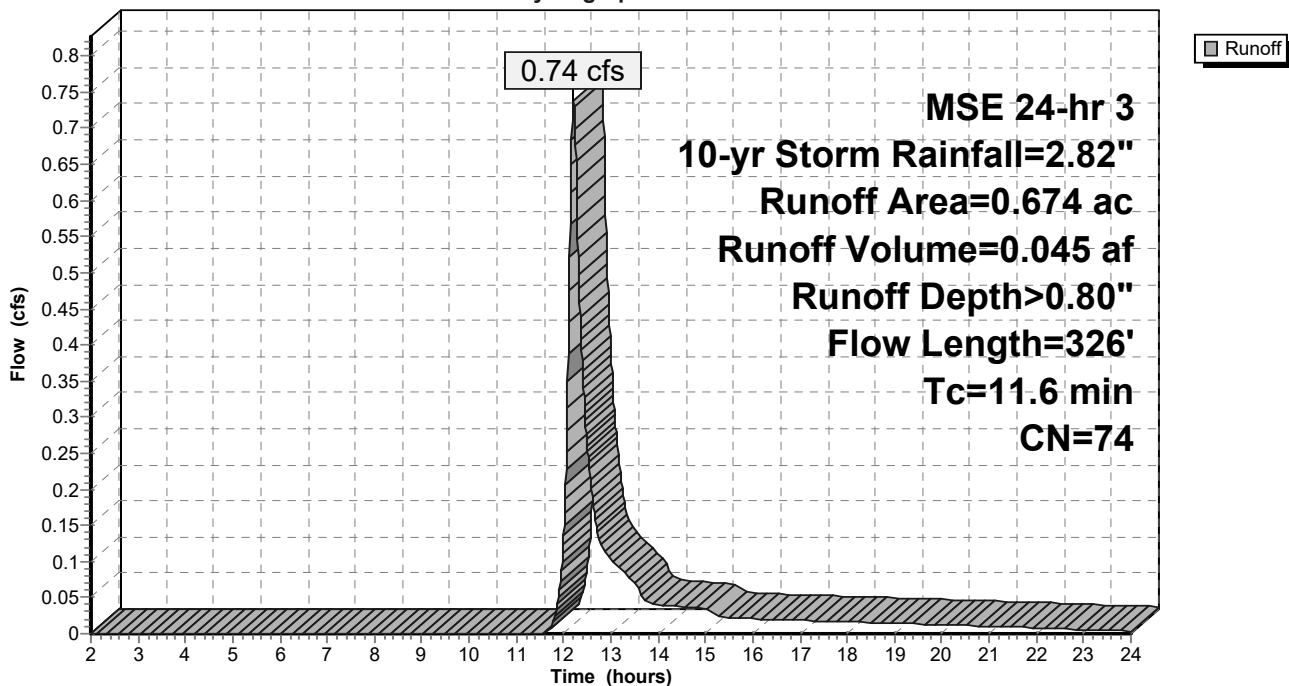
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.674	74	>75% Grass cover, Good, HSG C
0.674		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-8:

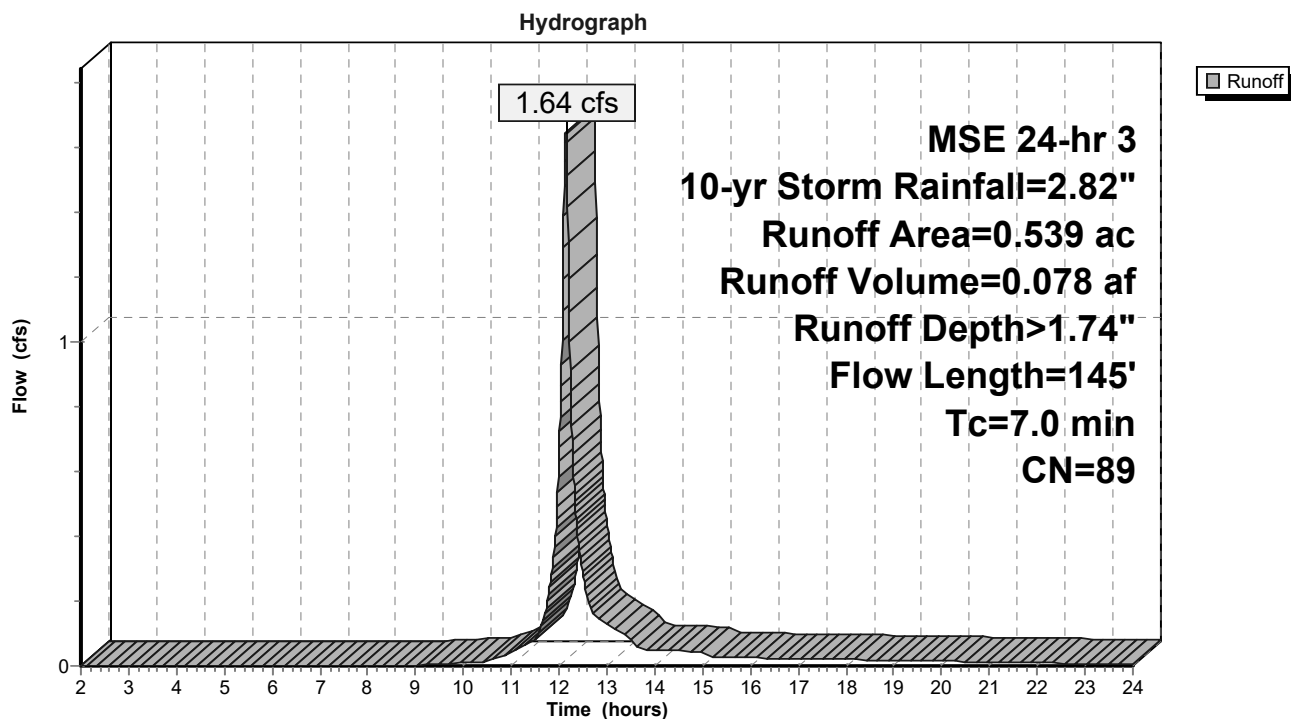
Runoff = 1.64 cfs @ 12.14 hrs, Volume= 0.078 af, Depth> 1.74"
Routed to Pond 8P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:



StandleyLake_Existing

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-9:

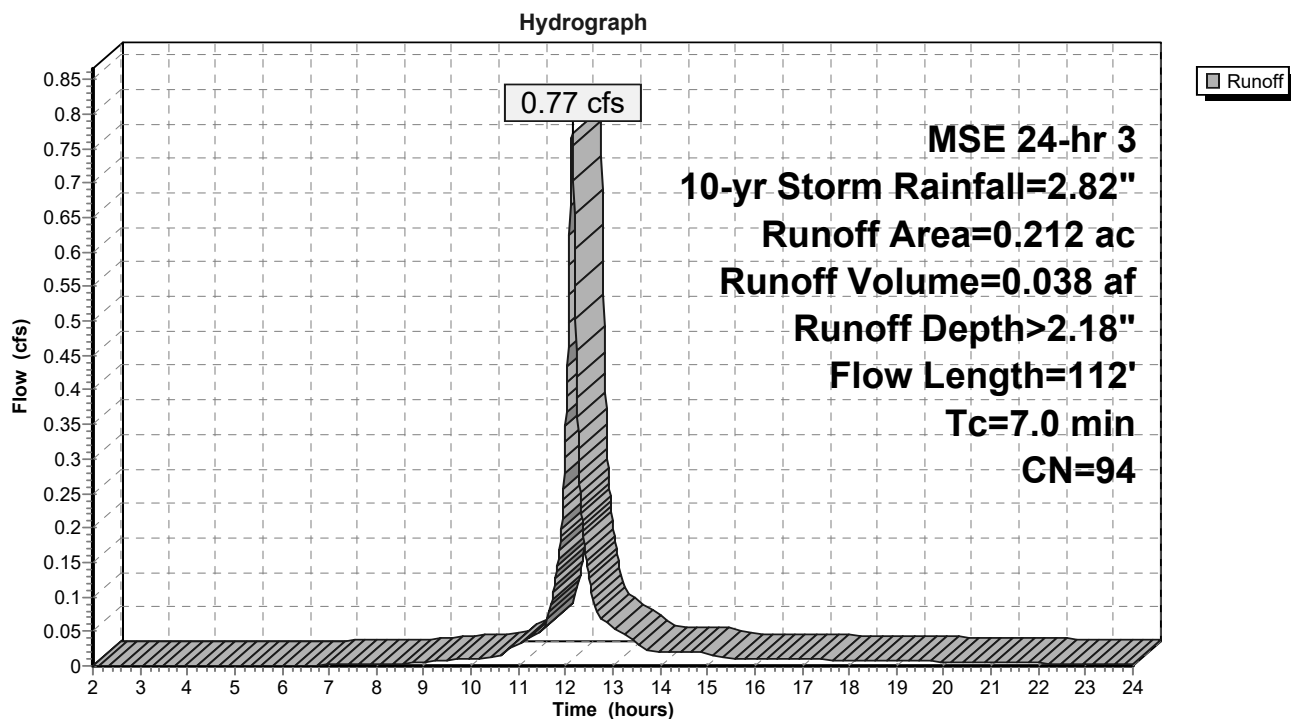
Runoff = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af, Depth> 2.18"
Routed to Pond 9P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 1P: CB

Inflow Area = 2.173 ac, 26.78% Impervious, Inflow Depth > 1.12" for 10-yr Storm event
Inflow = 4.32 cfs @ 12.15 hrs, Volume= 0.202 af
Outflow = 4.32 cfs @ 12.15 hrs, Volume= 0.202 af, Atten= 0%, Lag= 0.0 min
Primary = 4.32 cfs @ 12.15 hrs, Volume= 0.202 af
Routed to Pond 8P : CB

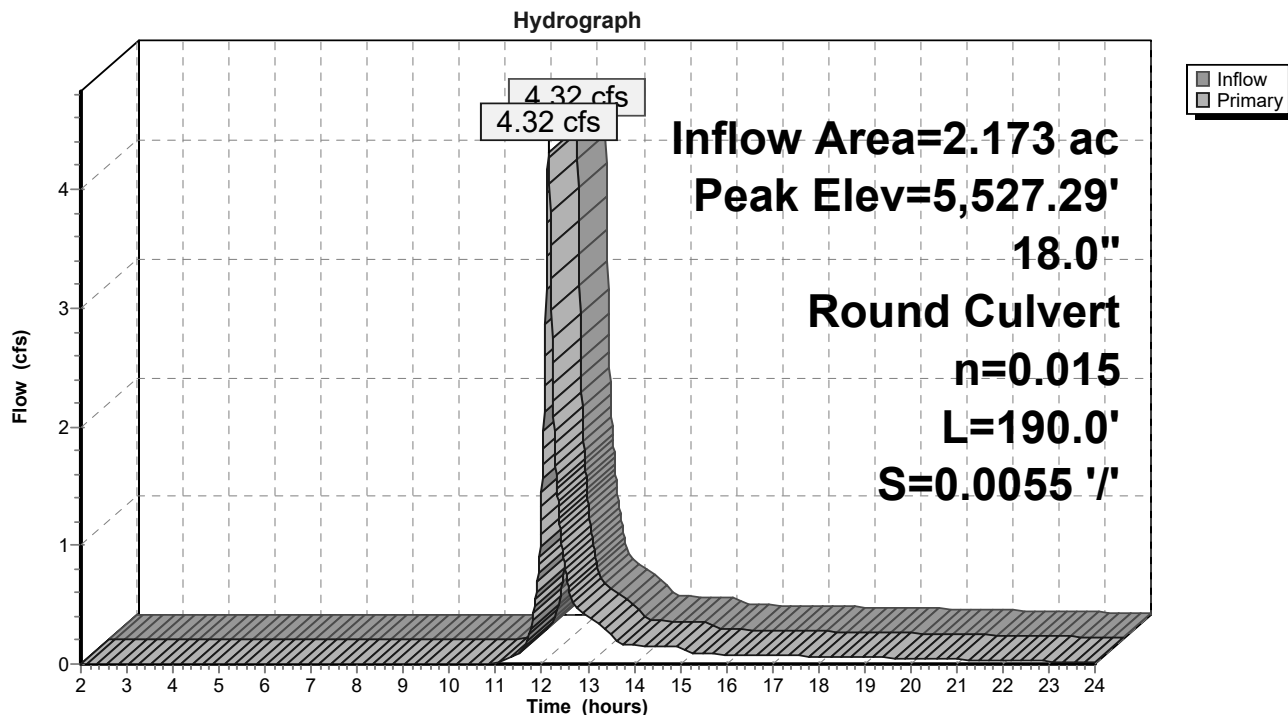
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,527.29' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=4.13 cfs @ 12.15 hrs HW=5,527.28' TW=5,526.76' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 4.13 cfs @ 2.59 fps)

Pond 1P: CB



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 2P: CB

Inflow Area = 1.594 ac, 16.75% Impervious, Inflow Depth > 1.01" for 10-yr Storm event
Inflow = 2.57 cfs @ 12.16 hrs, Volume= 0.134 af
Outflow = 2.57 cfs @ 12.16 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min
Primary = 2.57 cfs @ 12.16 hrs, Volume= 0.134 af
Routed to Pond 10P : Inlet

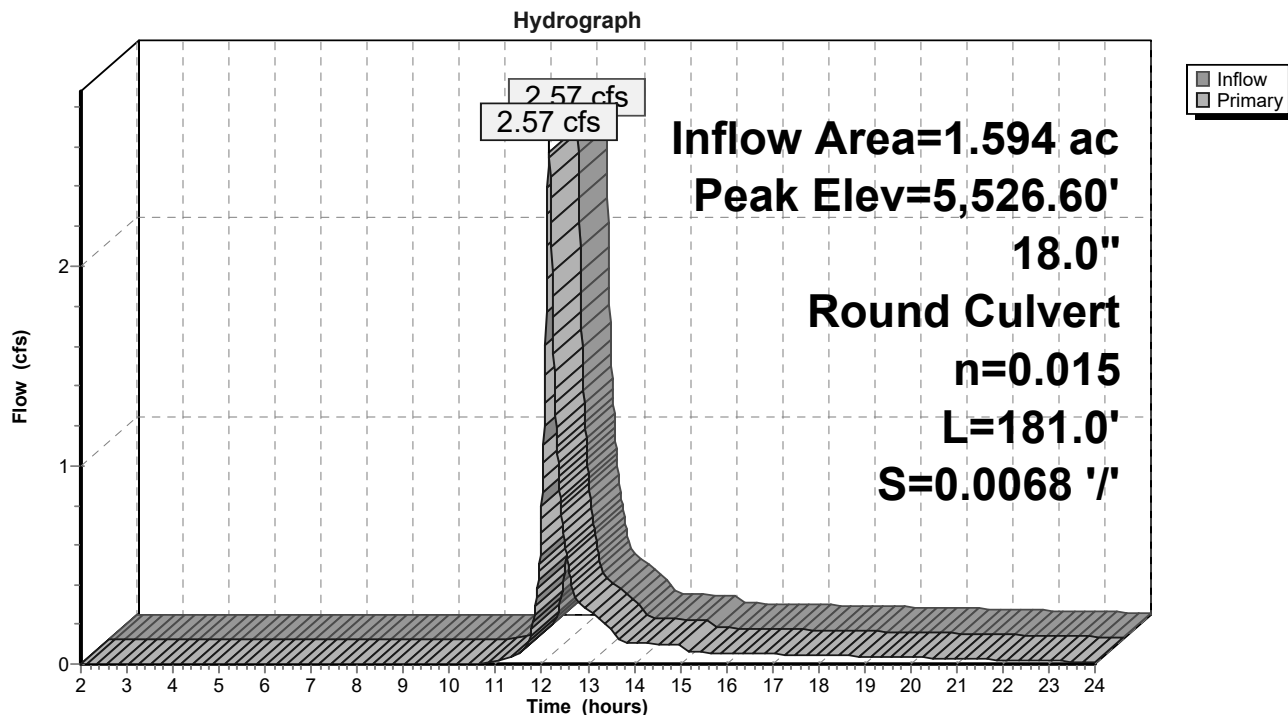
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.60' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.53 cfs @ 12.16 hrs HW=5,526.60' TW=5,525.85' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.53 cfs @ 2.86 fps)

Pond 2P: CB



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 0.80" for 10-yr Storm event
Inflow = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af
Outflow = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min
Primary = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af
Routed to Pond 2P : CB

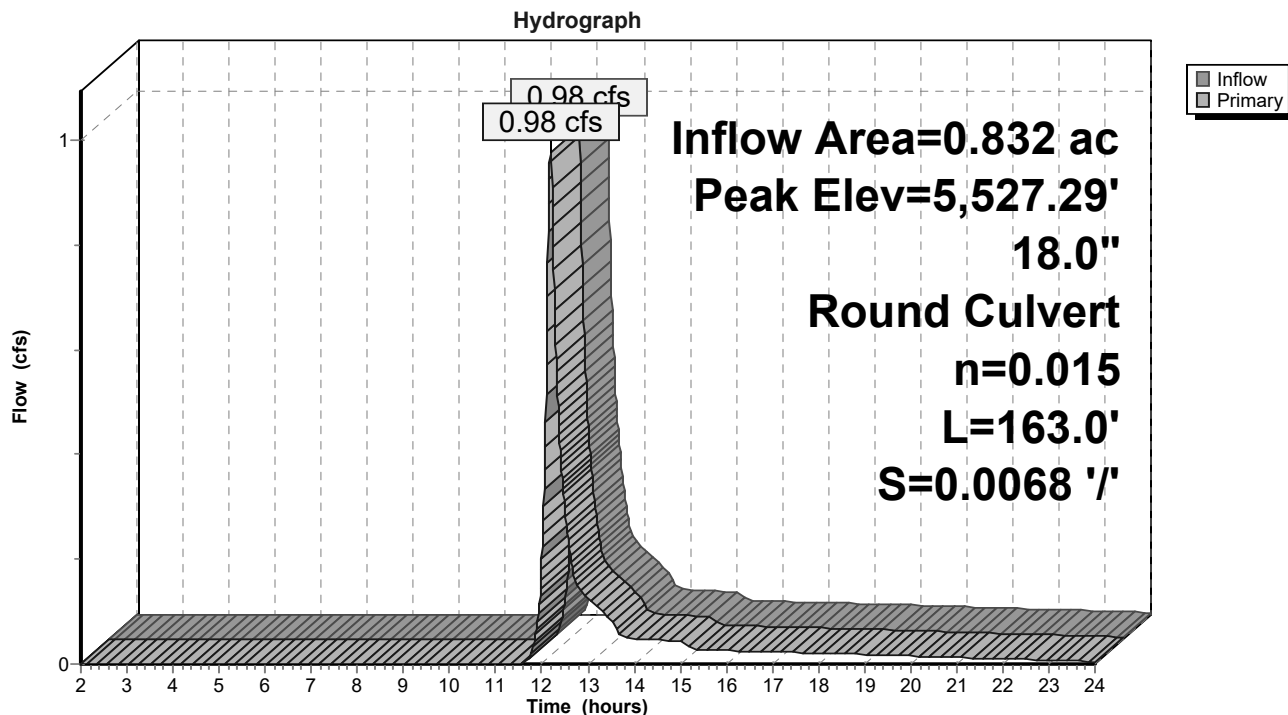
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,527.29' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.98 cfs @ 12.19 hrs HW=5,527.28' TW=5,526.57' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.98 cfs @ 2.34 fps)

Pond 3P: Inlet



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 2.59" for 10-yr Storm event
Inflow = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af
Outflow = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min
Primary = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af
Routed to Pond 5P : Inlet

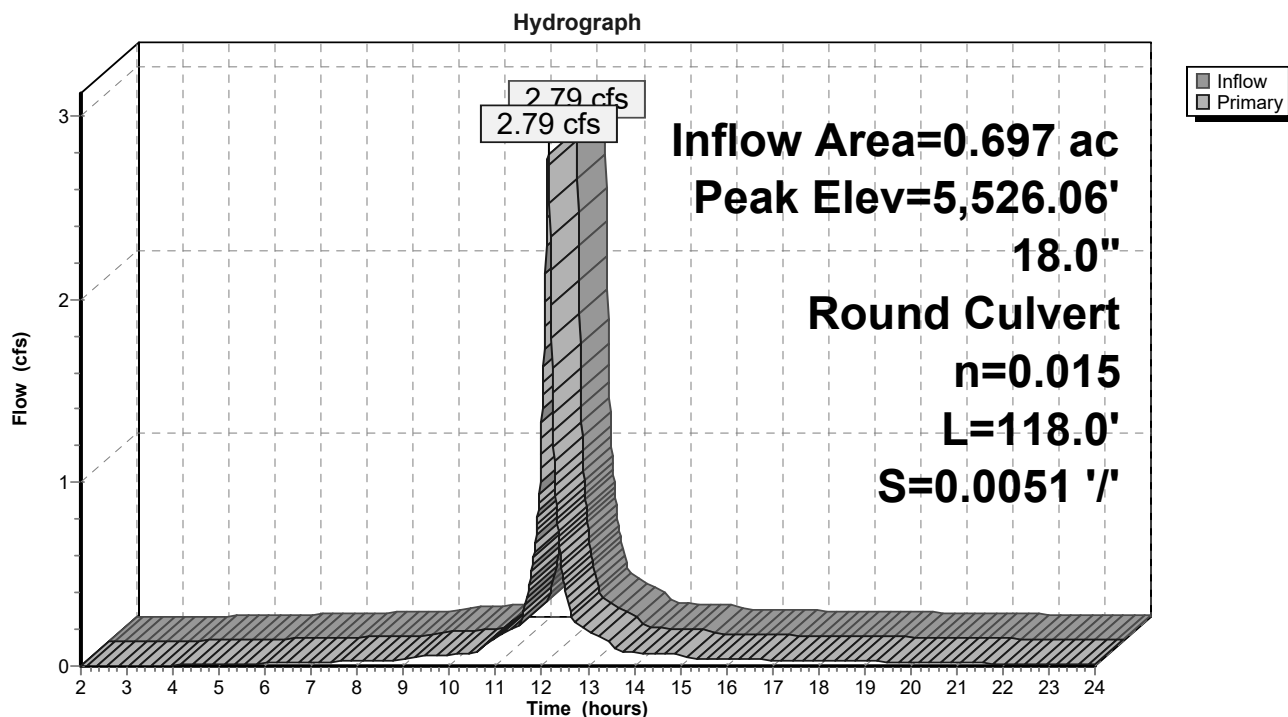
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.06' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.57 cfs @ 12.14 hrs HW=5,525.90' TW=5,525.76' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.57 cfs @ 1.46 fps)

Pond 4P: Roof Drain



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 1.51" for 10-yr Storm event
Inflow = 4.16 cfs @ 12.15 hrs, Volume= 0.243 af
Outflow = 4.16 cfs @ 12.15 hrs, Volume= 0.243 af, Atten= 0%, Lag= 0.0 min
Primary = 4.16 cfs @ 12.15 hrs, Volume= 0.243 af
Routed to Pond 6P : DI

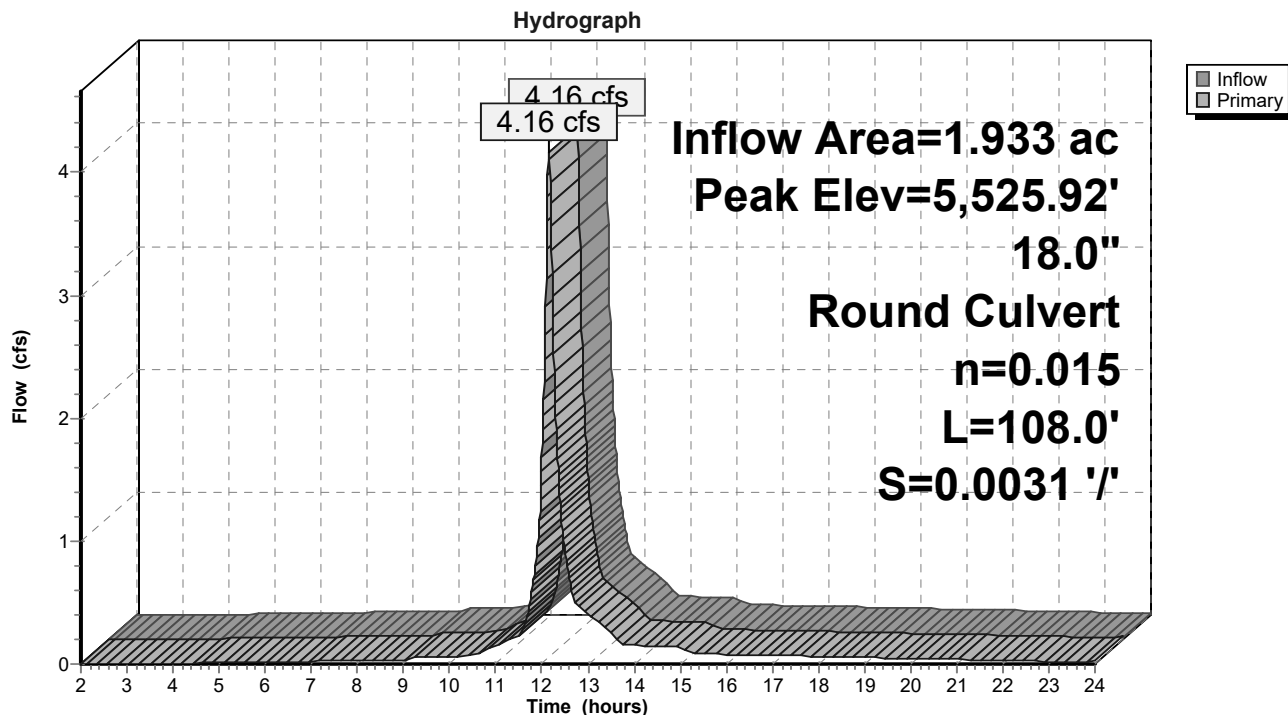
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.92' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.87 cfs @ 12.15 hrs HW=5,525.85' TW=5,525.54' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.87 cfs @ 2.19 fps)

Pond 5P: Inlet



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 1.52" for 10-yr Storm event
Inflow = 5.44 cfs @ 12.16 hrs, Volume= 0.322 af
Outflow = 5.44 cfs @ 12.16 hrs, Volume= 0.322 af, Atten= 0%, Lag= 0.0 min
Primary = 5.44 cfs @ 12.16 hrs, Volume= 0.322 af
Routed to Pond 7P : Existing Pond

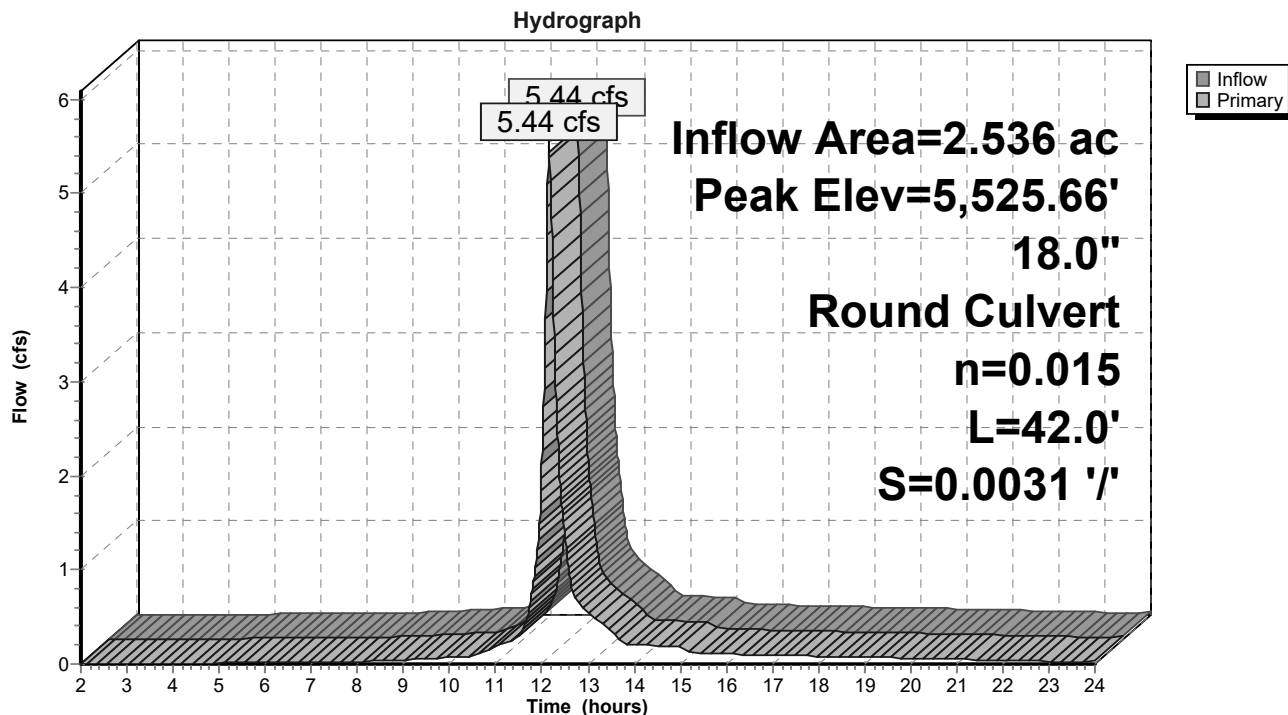
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.66' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=5.43 cfs @ 12.16 hrs HW=5,525.58' TW=5,525.17' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 5.43 cfs @ 3.08 fps)

Pond 6P: DI



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Summary for Pond 7P: Existing Pond

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 1.30" for 10-yr Storm event
 Inflow = 16.47 cfs @ 12.15 hrs, Volume= 0.881 af
 Outflow = 6.98 cfs @ 12.32 hrs, Volume= 0.815 af, Atten= 58%, Lag= 10.1 min
 Primary = 6.98 cfs @ 12.32 hrs, Volume= 0.815 af
 Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 5,525.46' @ 12.32 hrs Surf.Area= 0.214 ac Storage= 0.215 af

Plug-Flow detention time= 57.3 min calculated for 0.815 af (92% of inflow)
 Center-of-Mass det. time= 22.4 min (825.9 - 803.5)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.347 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.007	0.004	0.004
5,524.00	0.043	0.025	0.029
5,525.00	0.157	0.100	0.129
5,526.00	0.279	0.218	0.347

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

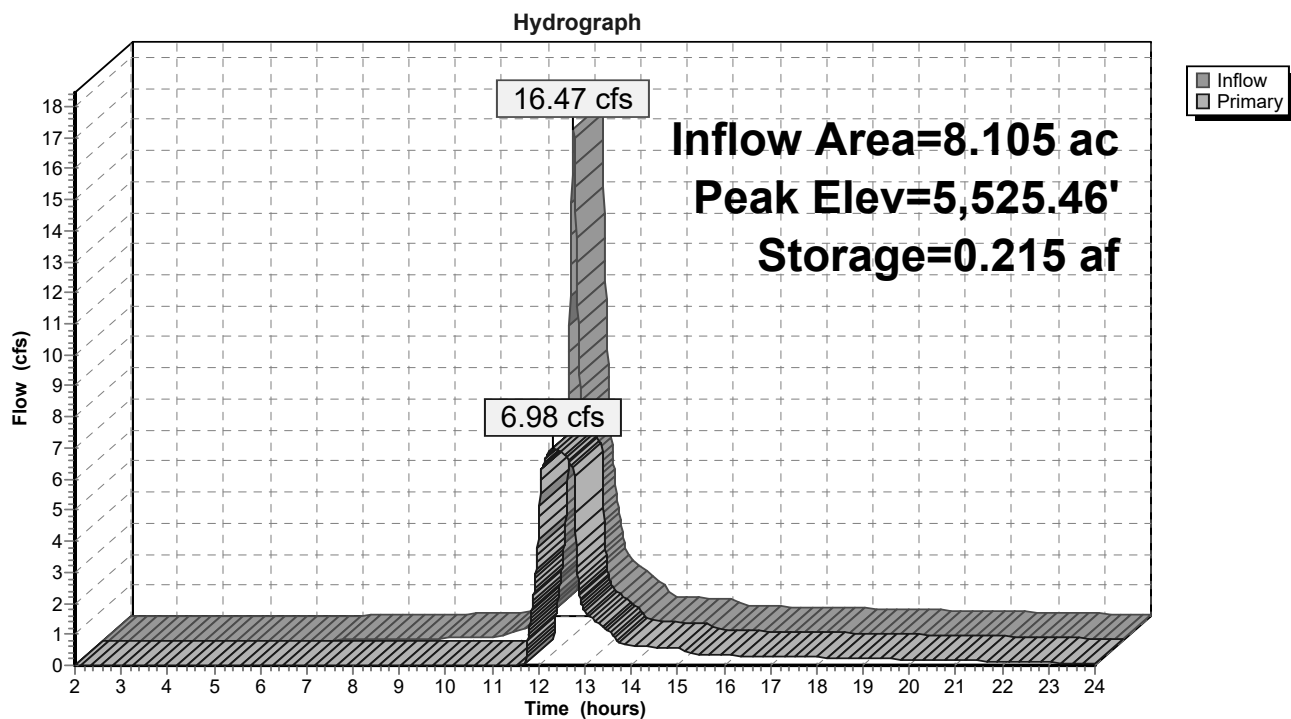
Primary OutFlow Max=6.98 cfs @ 12.32 hrs HW=5,525.46' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 6.98 cfs of 13.90 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 6.98 cfs @ 9.30 fps)

↑ **1=Orifice/Grate** (Passes 6.98 cfs of 43.28 cfs potential flow)

Pond 7P: Existing Pond



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Summary for Pond 8P: CB

Inflow Area = 2.924 ac, 37.76% Impervious, Inflow Depth > 1.31" for 10-yr Storm event
Inflow = 6.73 cfs @ 12.15 hrs, Volume= 0.319 af
Outflow = 6.73 cfs @ 12.15 hrs, Volume= 0.319 af, Atten= 0%, Lag= 0.0 min
Primary = 6.73 cfs @ 12.15 hrs, Volume= 0.319 af
Routed to Pond 7P : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

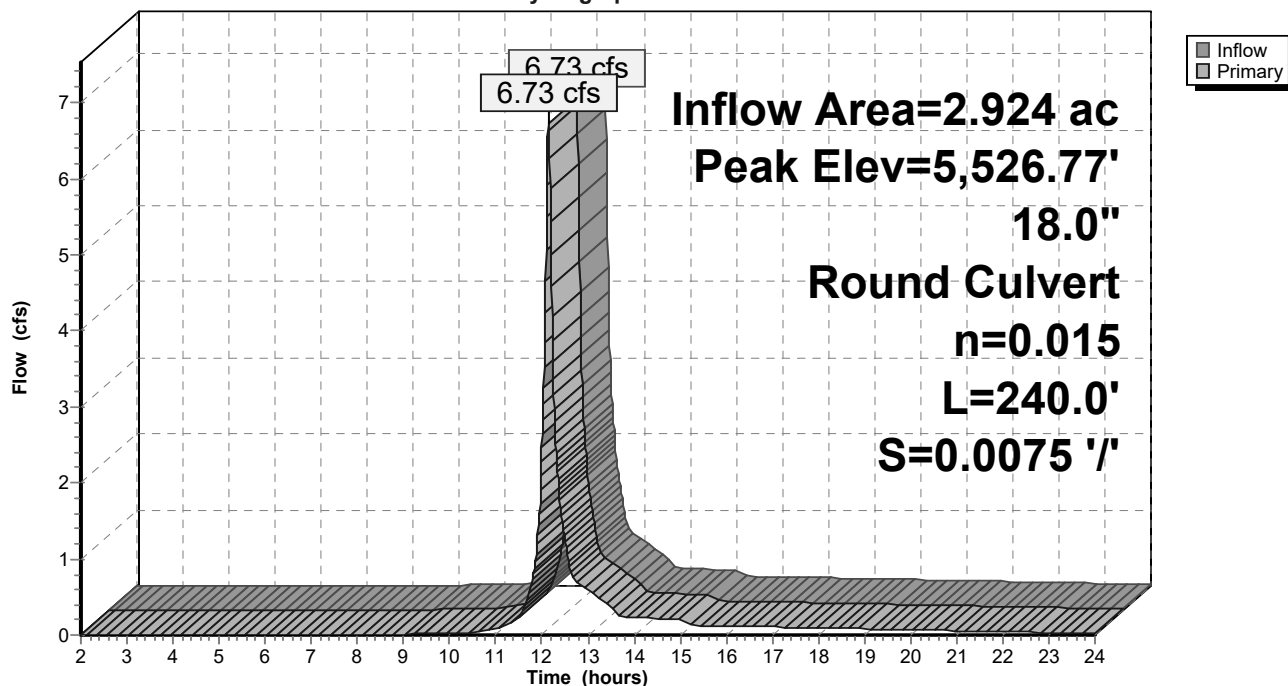
Peak Elev= 5,526.77' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=6.71 cfs @ 12.15 hrs HW=5,526.75' TW=5,525.10' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 6.71 cfs @ 3.80 fps)

Pond 8P: CB

Hydrograph



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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 2.18" for 10-yr Storm event
Inflow = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af
Outflow = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af
Routed to Pond 8P : CB

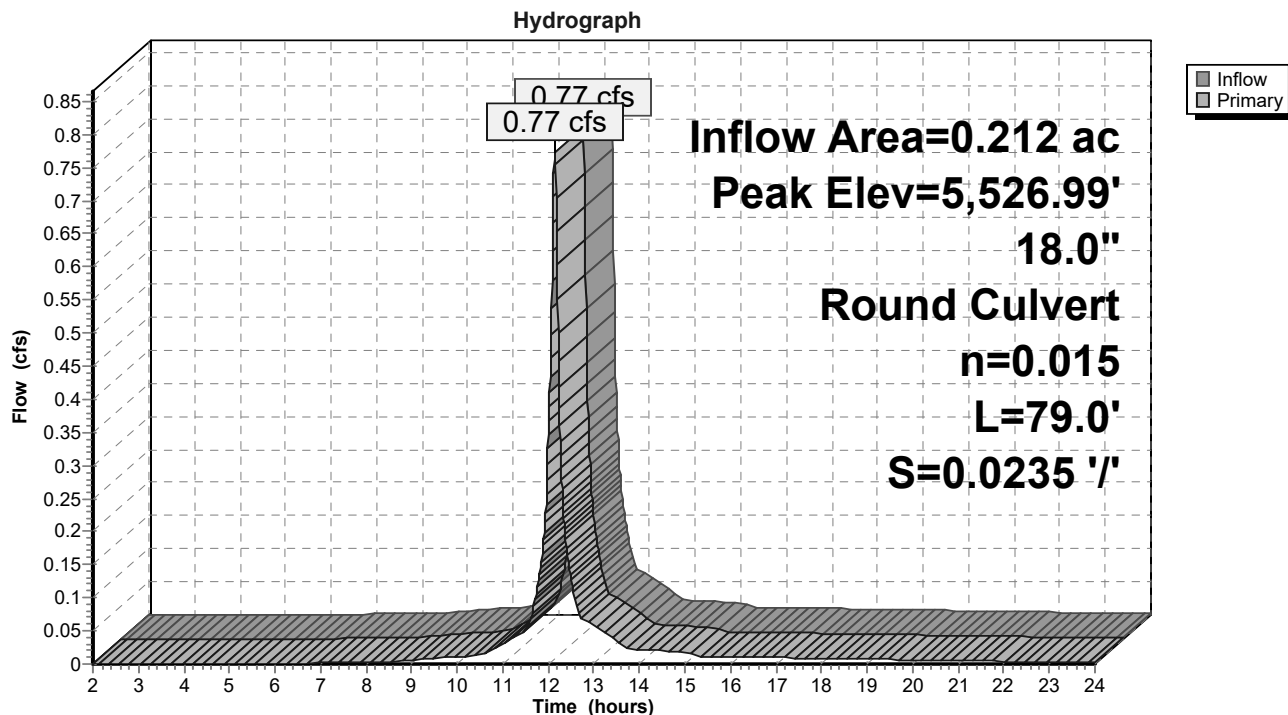
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,526.99' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.71 cfs @ 12.14 hrs HW=5,526.98' TW=5,526.72' (Dynamic Tailwater)
1=RCP_Round 18" (Outlet Controls 0.71 cfs @ 1.80 fps)

Pond 9P: CB



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Summary for Pond 10P: Inlet

Inflow Area = 1.971 ac, 26.28% Impervious, Inflow Depth > 1.19" for 10-yr Storm event
Inflow = 3.74 cfs @ 12.15 hrs, Volume= 0.196 af
Outflow = 3.74 cfs @ 12.15 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.0 min
Primary = 3.74 cfs @ 12.15 hrs, Volume= 0.196 af
Routed to Pond 7P : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

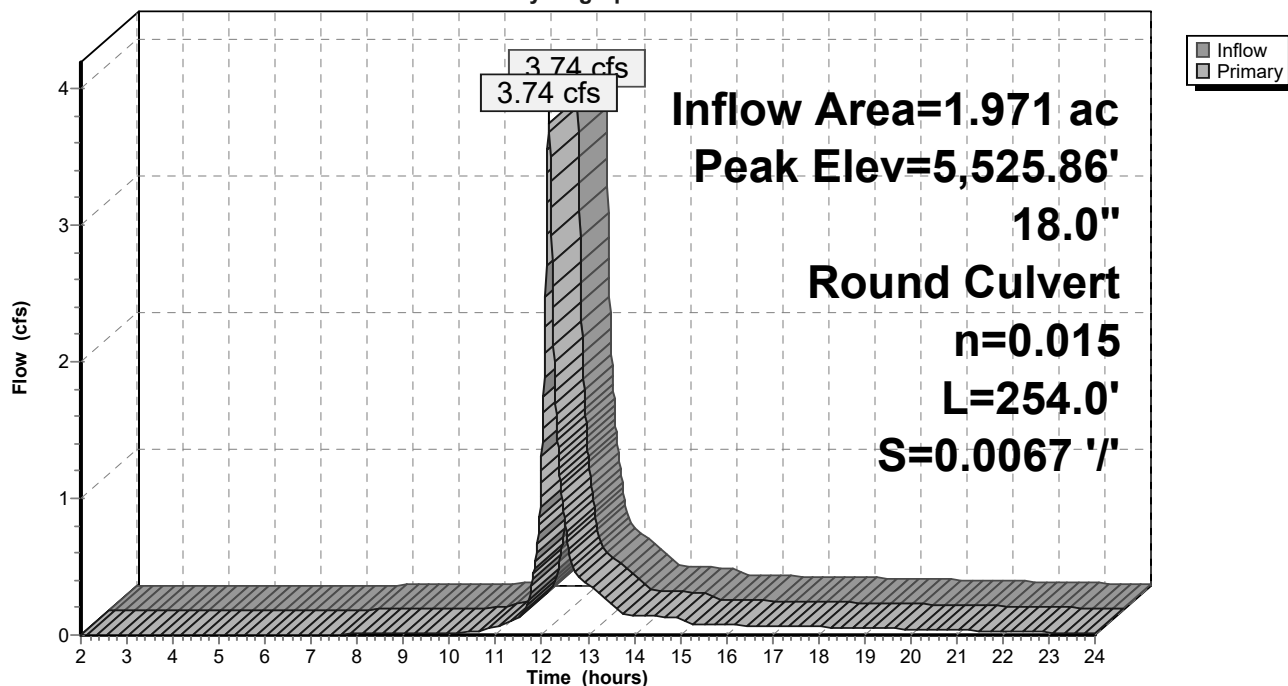
Peak Elev= 5,525.86' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 ' / ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.74 cfs @ 12.15 hrs HW=5,525.84' TW=5,525.14' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.74 cfs @ 2.68 fps)

Pond 10P: Inlet

Hydrograph



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Summary for Pond 11P: Inlet

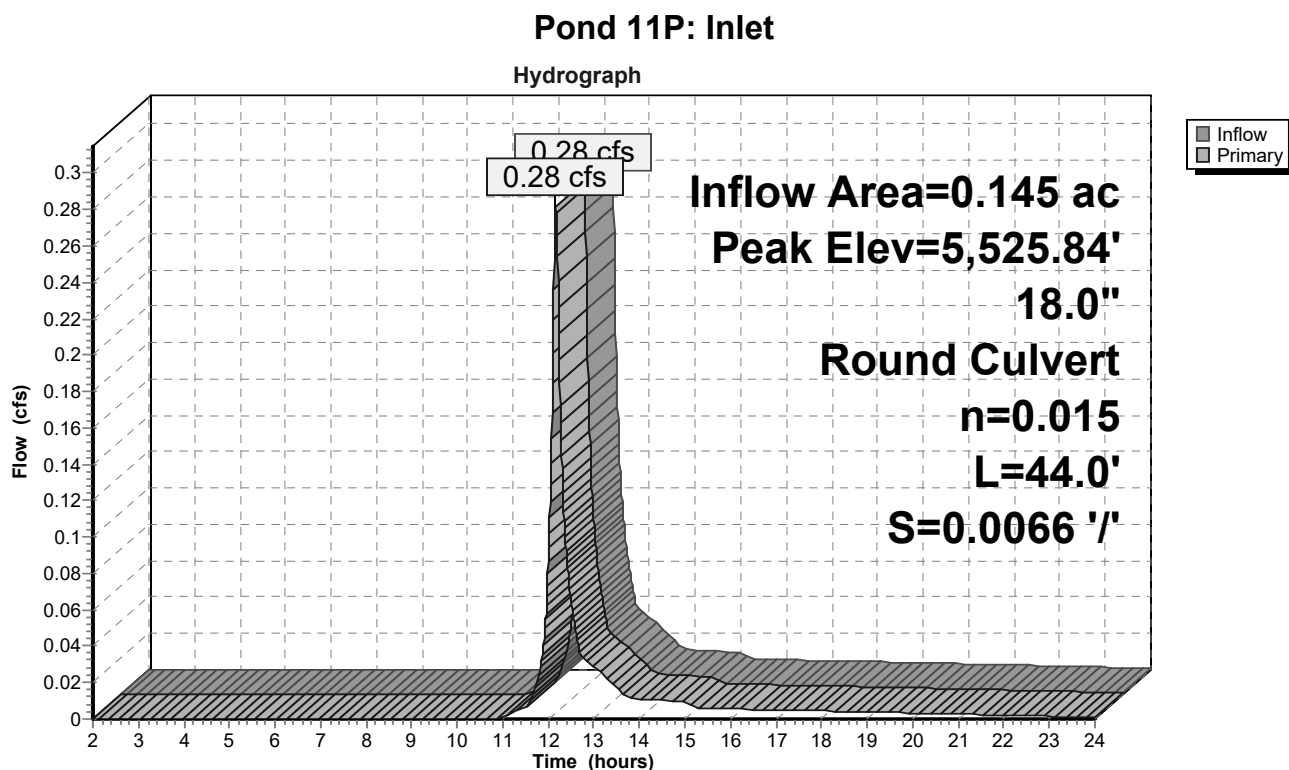
Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 1.18" for 10-yr Storm event
Inflow = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af
Outflow = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,525.84' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

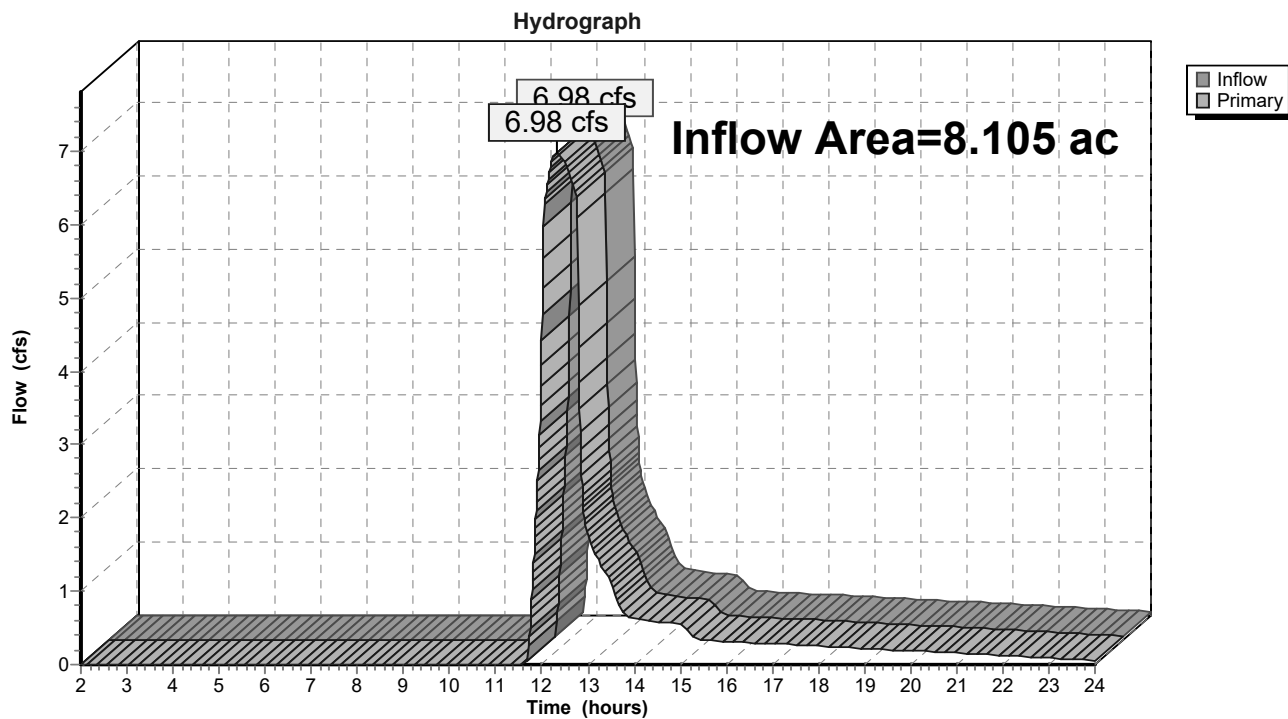
Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=5,525.84' TW=5,525.86' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)



Summary for Link 1L: Street Sewer

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 1.21" for 10-yr Storm event
Inflow = 6.98 cfs @ 12.32 hrs, Volume= 0.815 af
Primary = 6.98 cfs @ 12.32 hrs, Volume= 0.815 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Time span=2.00-24.00 hrs, dt=0.01 hrs, 2201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A-1:	Runoff Area=2.173 ac 26.78% Impervious Runoff Depth>2.10" Flow Length=415' Tc=7.0 min CN=80 Runoff=8.12 cfs 0.380 af
Subcatchment A-10:	Runoff Area=0.232 ac 90.52% Impervious Runoff Depth>3.72" Flow Length=131' Tc=7.0 min CN=97 Runoff=1.34 cfs 0.072 af
Subcatchment A-11:	Runoff Area=0.145 ac 28.28% Impervious Runoff Depth>2.18" Flow Length=74' Slope=0.0300 '/ Tc=8.7 min CN=81 Runoff=0.52 cfs 0.026 af
Subcatchment A-2:	Runoff Area=0.762 ac 35.04% Impervious Runoff Depth>2.26" Flow Length=234' Tc=7.0 min CN=82 Runoff=3.06 cfs 0.144 af
Subcatchment A-3:	Runoff Area=0.832 ac 0.00% Impervious Runoff Depth>1.65" Flow Length=229' Slope=0.0524 '/ Tc=10.1 min CN=74 Runoff=2.12 cfs 0.114 af
Subcatchment A-4:	Runoff Area=0.697 ac 100.00% Impervious Runoff Depth>3.83" Flow Length=150' Tc=7.0 min CN=98 Runoff=4.06 cfs 0.223 af
Subcatchment A-5:	Runoff Area=1.236 ac 7.12% Impervious Runoff Depth>1.79" Flow Length=312' Slope=0.0545 '/ Tc=10.9 min CN=76 Runoff=3.31 cfs 0.184 af
Subcatchment A-6:	Runoff Area=0.603 ac 55.89% Impervious Runoff Depth>2.70" Flow Length=294' Tc=11.7 min CN=87 Runoff=2.33 cfs 0.136 af
Subcatchment A-7:	Runoff Area=0.674 ac 0.00% Impervious Runoff Depth>1.65" Flow Length=326' Tc=11.6 min CN=74 Runoff=1.61 cfs 0.092 af
Subcatchment A-8:	Runoff Area=0.539 ac 63.27% Impervious Runoff Depth>2.89" Flow Length=145' Tc=7.0 min CN=89 Runoff=2.67 cfs 0.130 af
Subcatchment A-9:	Runoff Area=0.212 ac 85.38% Impervious Runoff Depth>3.39" Flow Length=112' Tc=7.0 min CN=94 Runoff=1.17 cfs 0.060 af
Pond 1P: CB	Peak Elev=5,628.56' Inflow=8.12 cfs 0.380 af 18.0" Round Culvert n=0.015 L=190.0' S=0.0055 '/ Outflow=8.12 cfs 0.380 af
Pond 2P: CB	Peak Elev=5,626.90' Inflow=5.03 cfs 0.258 af 18.0" Round Culvert n=0.015 L=181.0' S=0.0068 '/ Outflow=5.03 cfs 0.258 af
Pond 3P: Inlet	Peak Elev=5,627.16' Inflow=2.12 cfs 0.114 af 18.0" Round Culvert n=0.015 L=163.0' S=0.0068 '/ Outflow=2.12 cfs 0.114 af
Pond 4P: Roof Drain	Peak Elev=5,627.16' Inflow=4.06 cfs 0.223 af 18.0" Round Culvert n=0.015 L=118.0' S=0.0051 '/ Outflow=4.06 cfs 0.223 af
Pond 5P: Inlet	Peak Elev=5,626.93' Inflow=7.02 cfs 0.407 af 18.0" Round Culvert n=0.015 L=108.0' S=0.0031 '/ Outflow=7.02 cfs 0.407 af

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Pond 6P: DI

Peak Elev=5,626.32' Inflow=9.20 cfs 0.543 af
18.0" Round Culvert n=0.015 L=42.0' S=0.0031 '/' Outflow=9.20 cfs 0.543 af

Pond 7P: Existing Pond

Peak Elev=5,625.33' Storage=0.347 af Inflow=29.27 cfs 1.561 af
Outflow=36.78 cfs 1.495 af

Pond 8P: CB

Peak Elev=5,628.11' Inflow=11.96 cfs 0.570 af
18.0" Round Culvert n=0.015 L=240.0' S=0.0075 '/' Outflow=11.96 cfs 0.570 af

Pond 9P: CB

Peak Elev=5,627.66' Inflow=1.17 cfs 0.060 af
18.0" Round Culvert n=0.015 L=79.0' S=0.0235 '/' Outflow=1.17 cfs 0.060 af

Pond 10P: Inlet

Peak Elev=5,626.57' Inflow=6.85 cfs 0.356 af
18.0" Round Culvert n=0.015 L=254.0' S=0.0067 '/' Outflow=6.85 cfs 0.356 af

Pond 11P: Inlet

Peak Elev=5,626.42' Inflow=0.52 cfs 0.026 af
18.0" Round Culvert n=0.015 L=44.0' S=0.0066 '/' Outflow=0.52 cfs 0.026 af

Link 1L: Street Sewer

Inflow=36.78 cfs 1.495 af
Primary=36.78 cfs 1.495 af

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-1:

Runoff = 8.12 cfs @ 12.14 hrs, Volume= 0.380 af, Depth> 2.10"
Routed to Pond 1P : CB

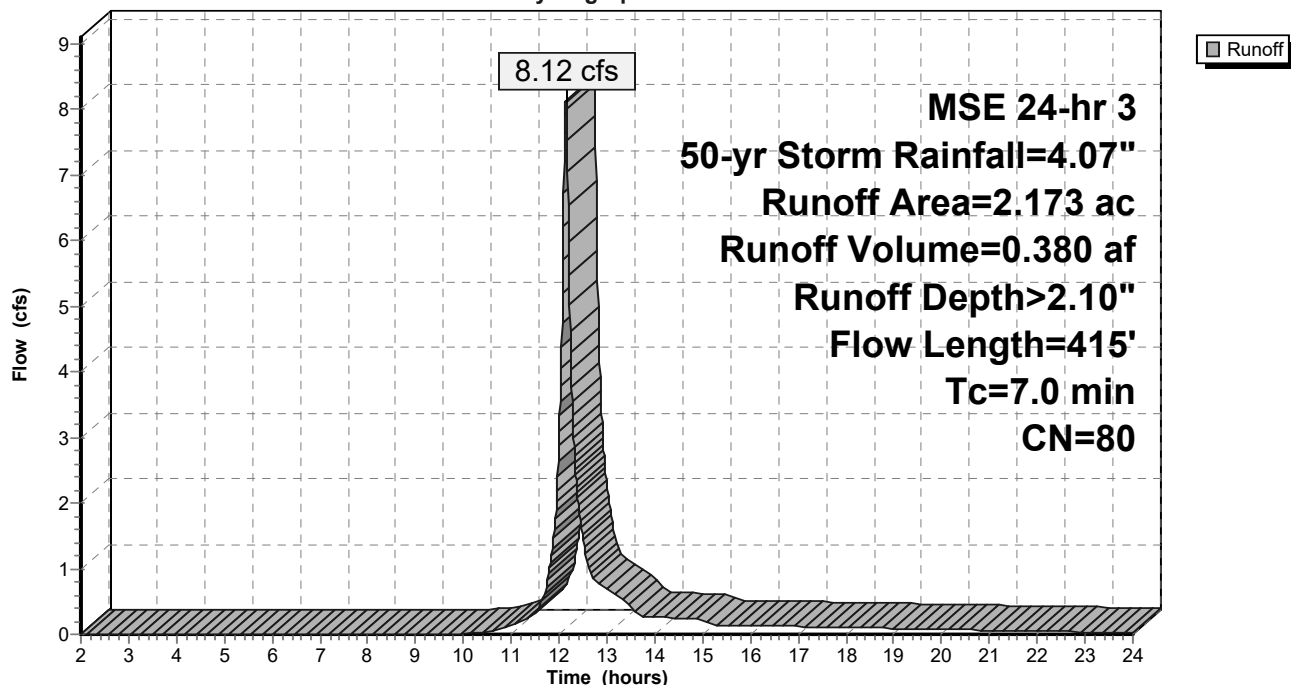
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.582	98	Paved parking, HSG C
1.591	74	>75% Grass cover, Good, HSG C
2.173	80	Weighted Average
1.591		73.22% Pervious Area
0.582		26.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	65	0.1540	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.2	111	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	239	0.0126	2.28		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.0	415	Total			

Subcatchment A-1:

Hydrograph



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Summary for Subcatchment A-10:

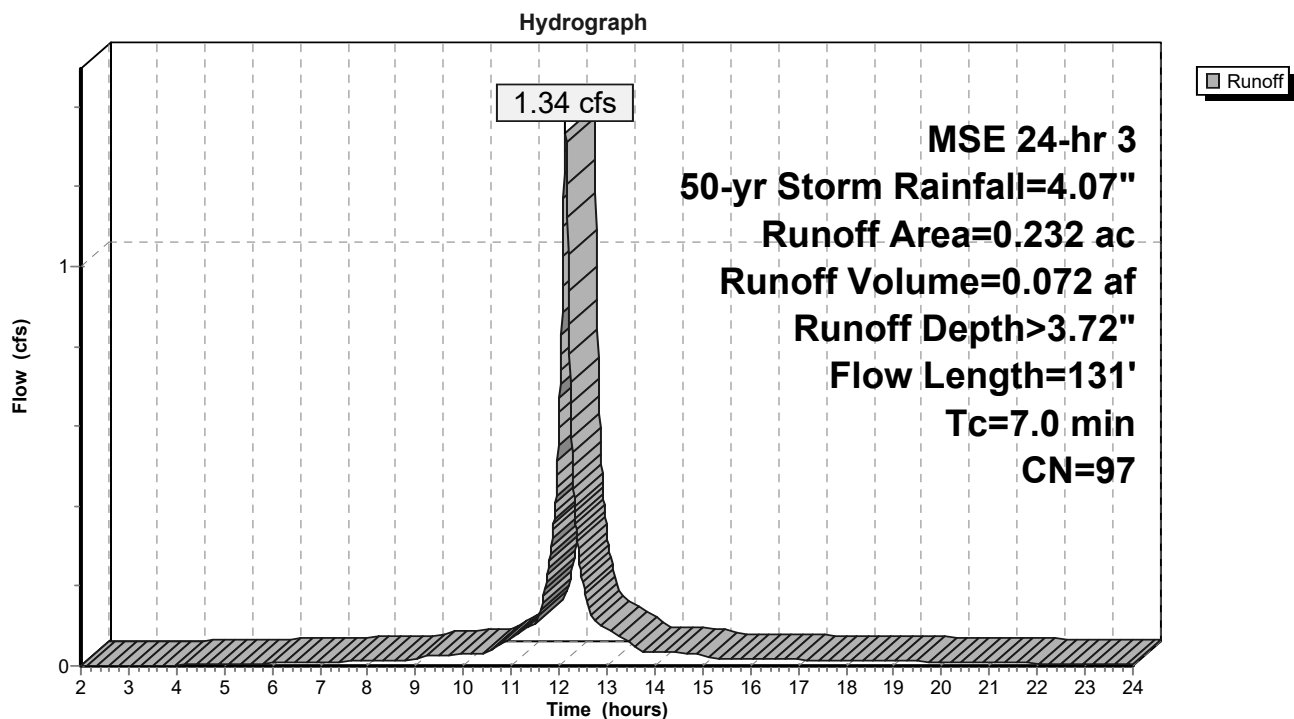
Runoff = 1.34 cfs @ 12.14 hrs, Volume= 0.072 af, Depth> 3.72"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



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Summary for Subcatchment A-11:

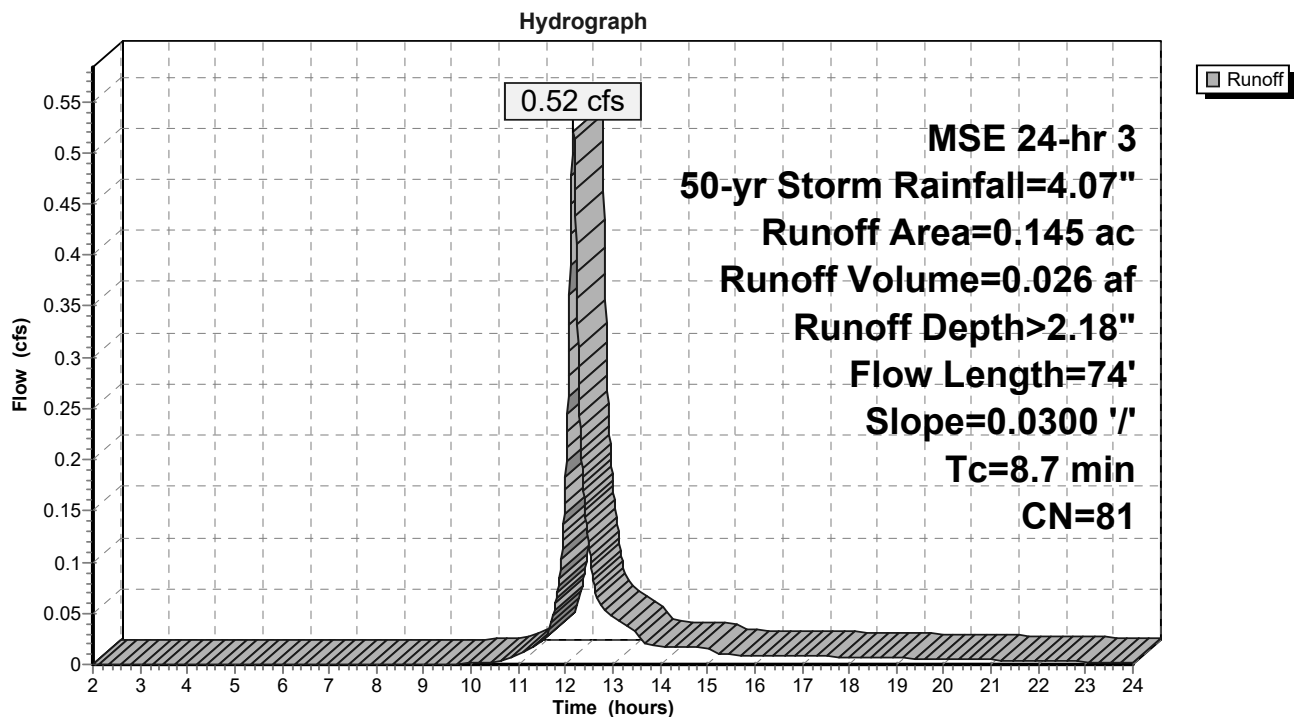
Runoff = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af, Depth> 2.18"
Routed to Pond 11P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:



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Summary for Subcatchment A-2:

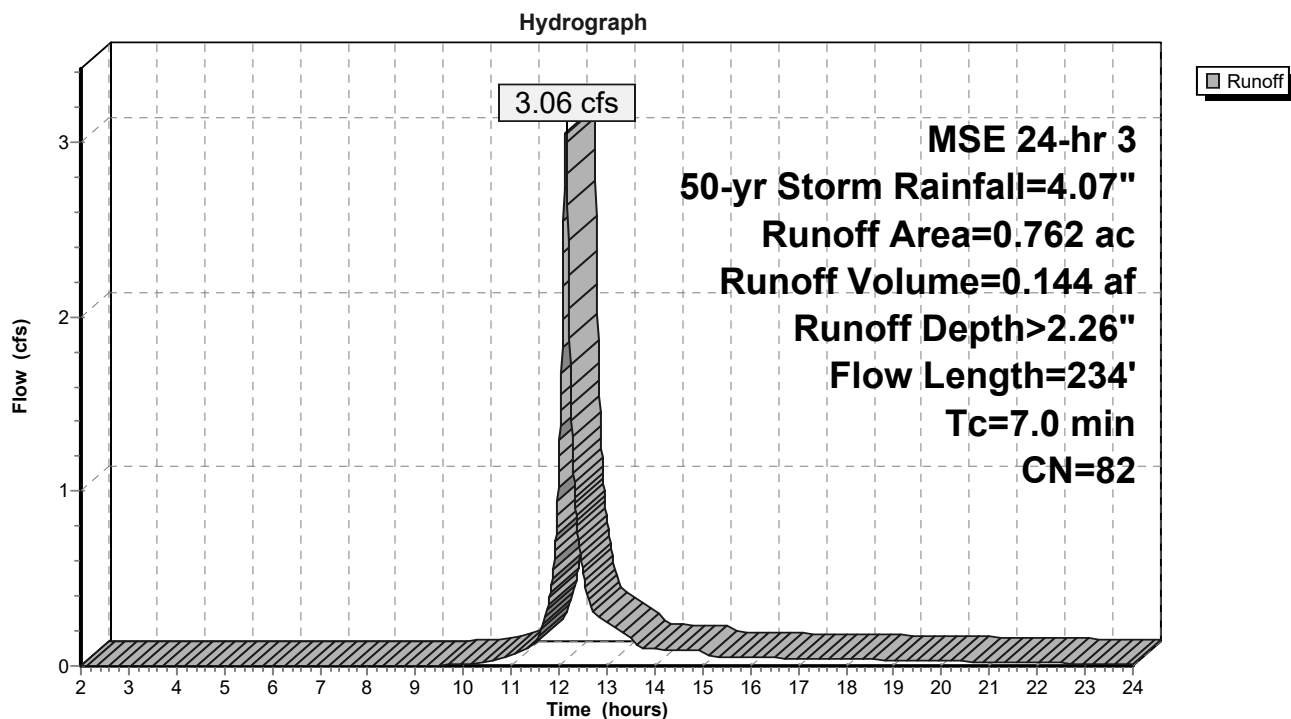
Runoff = 3.06 cfs @ 12.14 hrs, Volume= 0.144 af, Depth> 2.26"
Routed to Pond 2P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.267	98	Paved parking, HSG C
0.495	74	>75% Grass cover, Good, HSG C
0.762	82	Weighted Average
0.495		64.96% Pervious Area
0.267		35.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	234		0.56		Direct Entry, Minimum

Subcatchment A-2:



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Summary for Subcatchment A-3:

Runoff = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af, Depth> 1.65"
 Routed to Pond 3P : Inlet

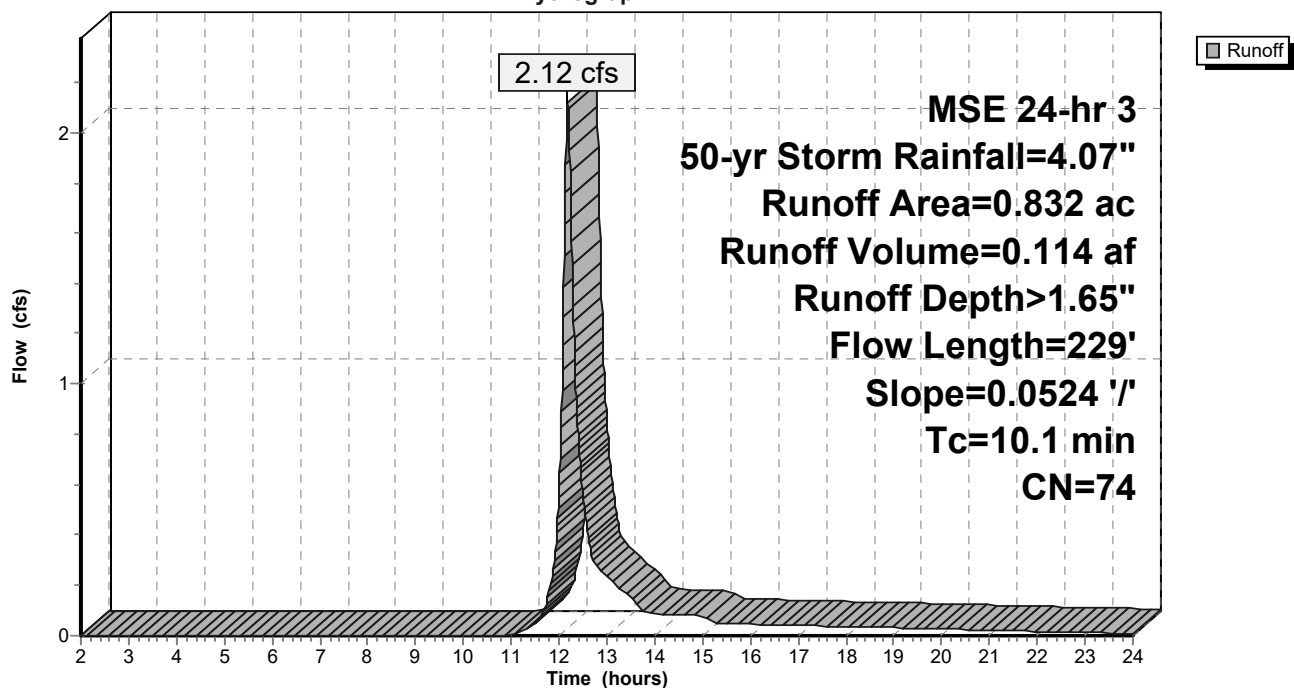
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-4:

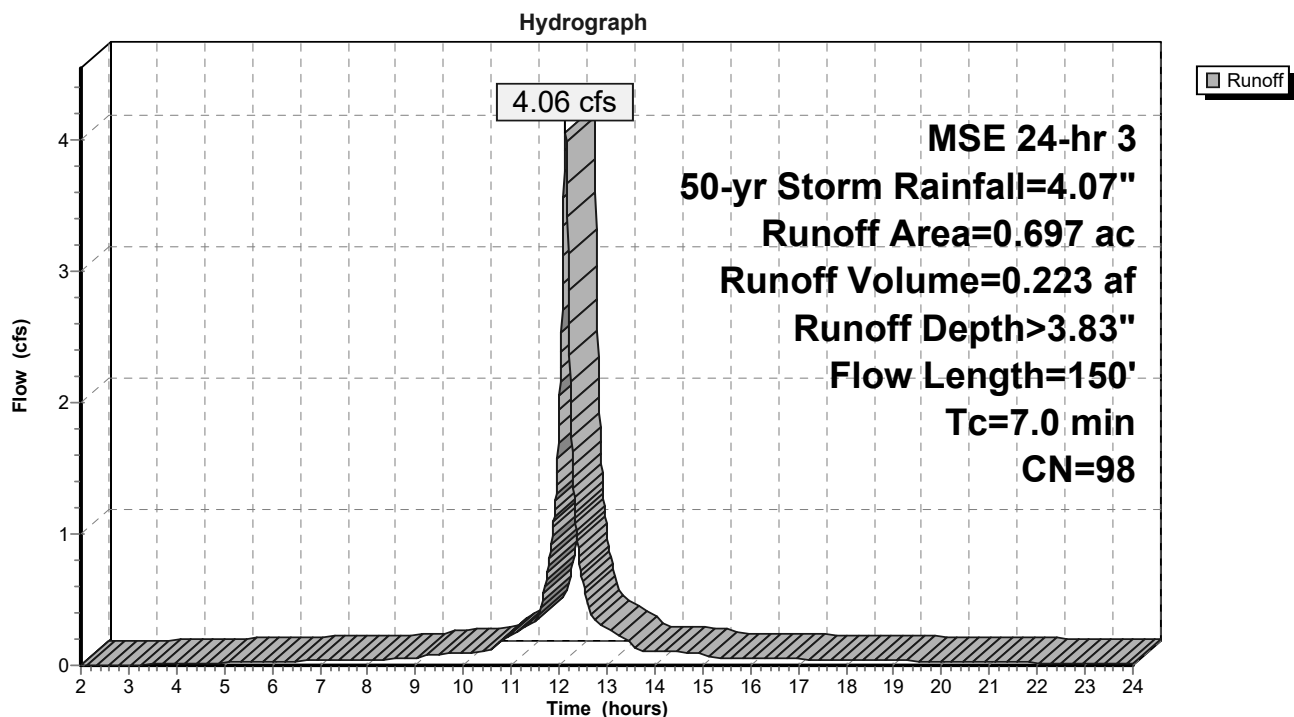
Runoff = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af, Depth> 3.83"
Routed to Pond 4P : Roof Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-5:

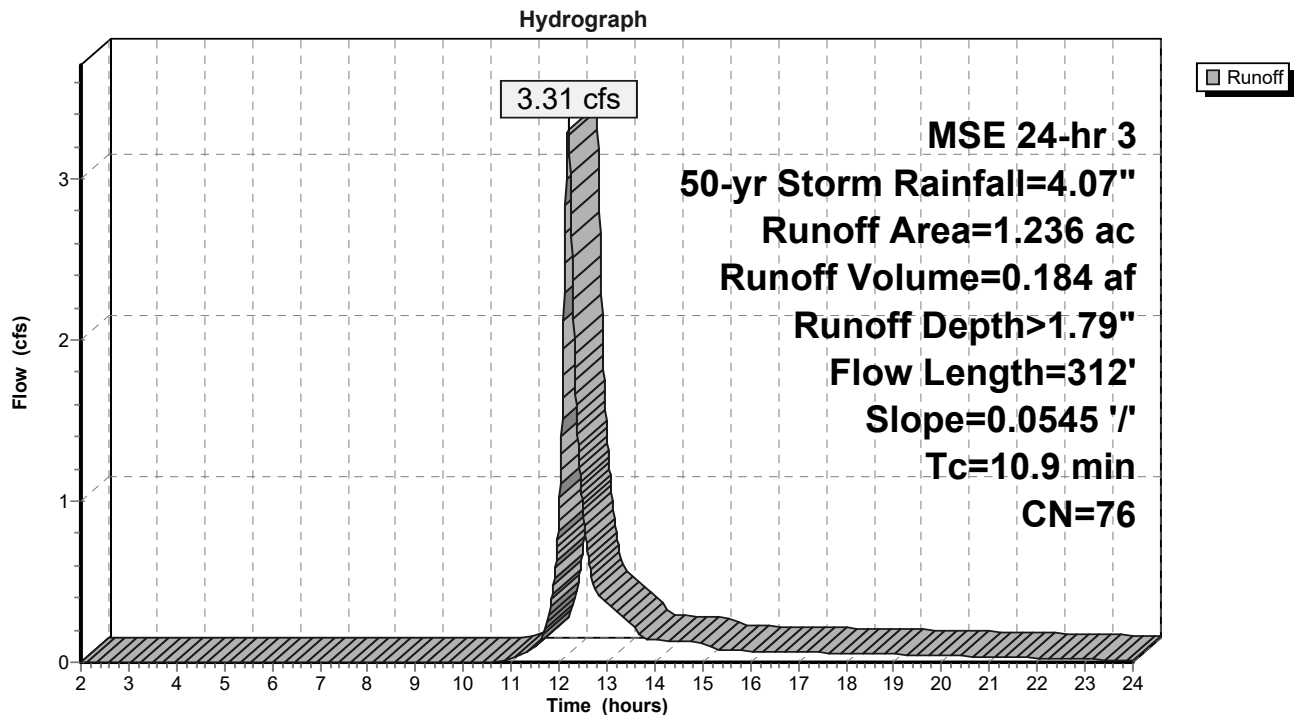
Runoff = 3.31 cfs @ 12.19 hrs, Volume= 0.184 af, Depth> 1.79"
Routed to Pond 5P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-6:

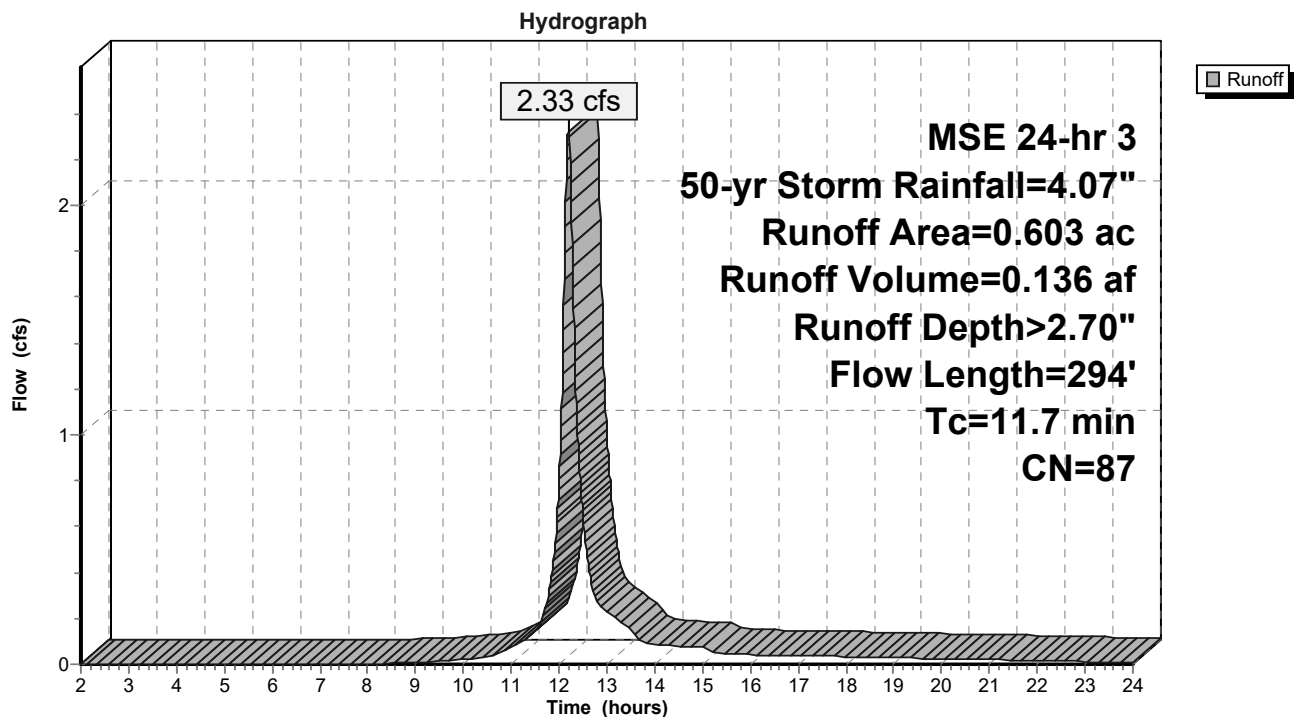
Runoff = 2.33 cfs @ 12.19 hrs, Volume= 0.136 af, Depth> 2.70"
Routed to Pond 6P : DI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-7:

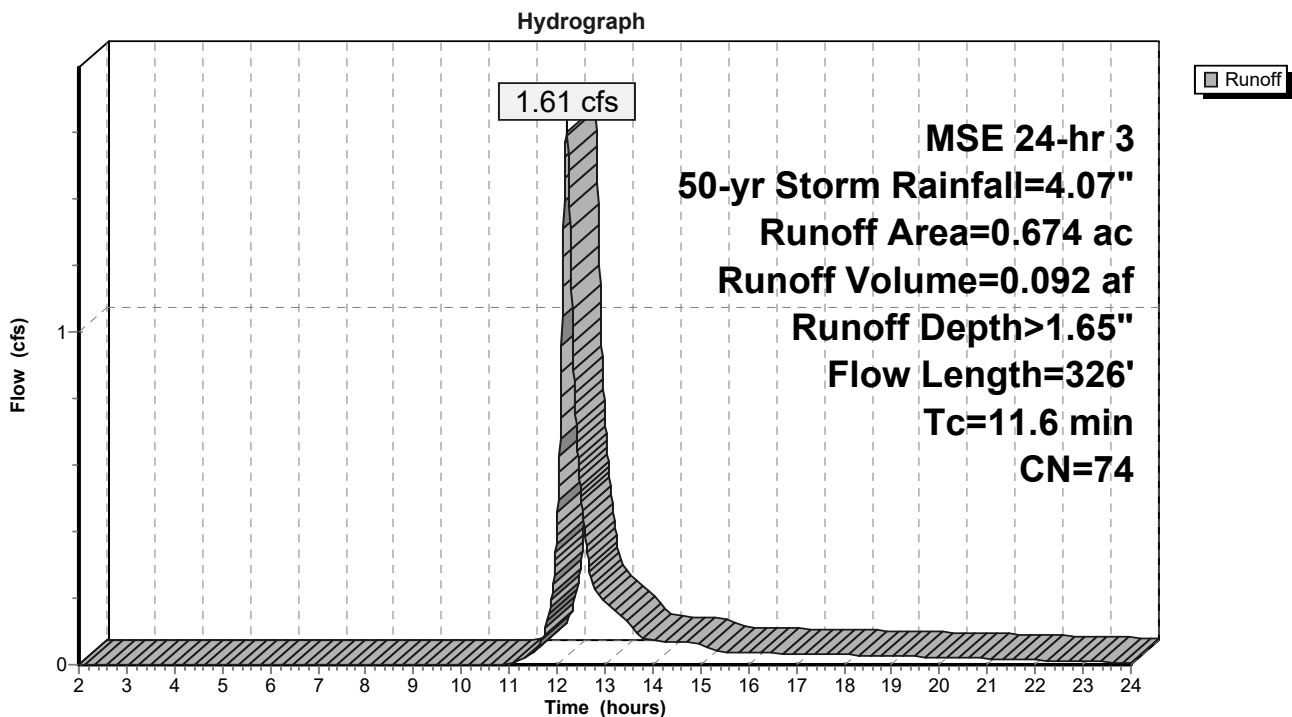
Runoff = 1.61 cfs @ 12.20 hrs, Volume= 0.092 af, Depth> 1.65"
Routed to Pond 7P : Existing Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.674	74	>75% Grass cover, Good, HSG C
0.674		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-8:

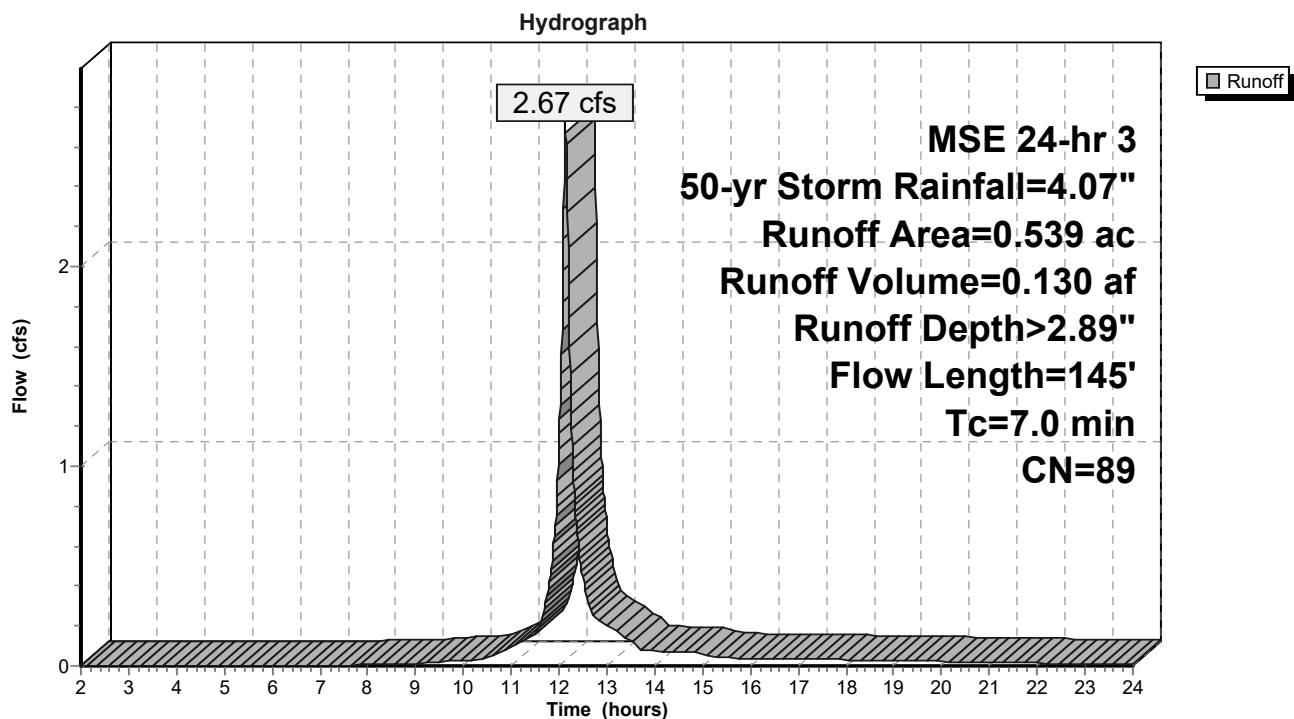
Runoff = 2.67 cfs @ 12.14 hrs, Volume= 0.130 af, Depth> 2.89"
Routed to Pond 8P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-9:

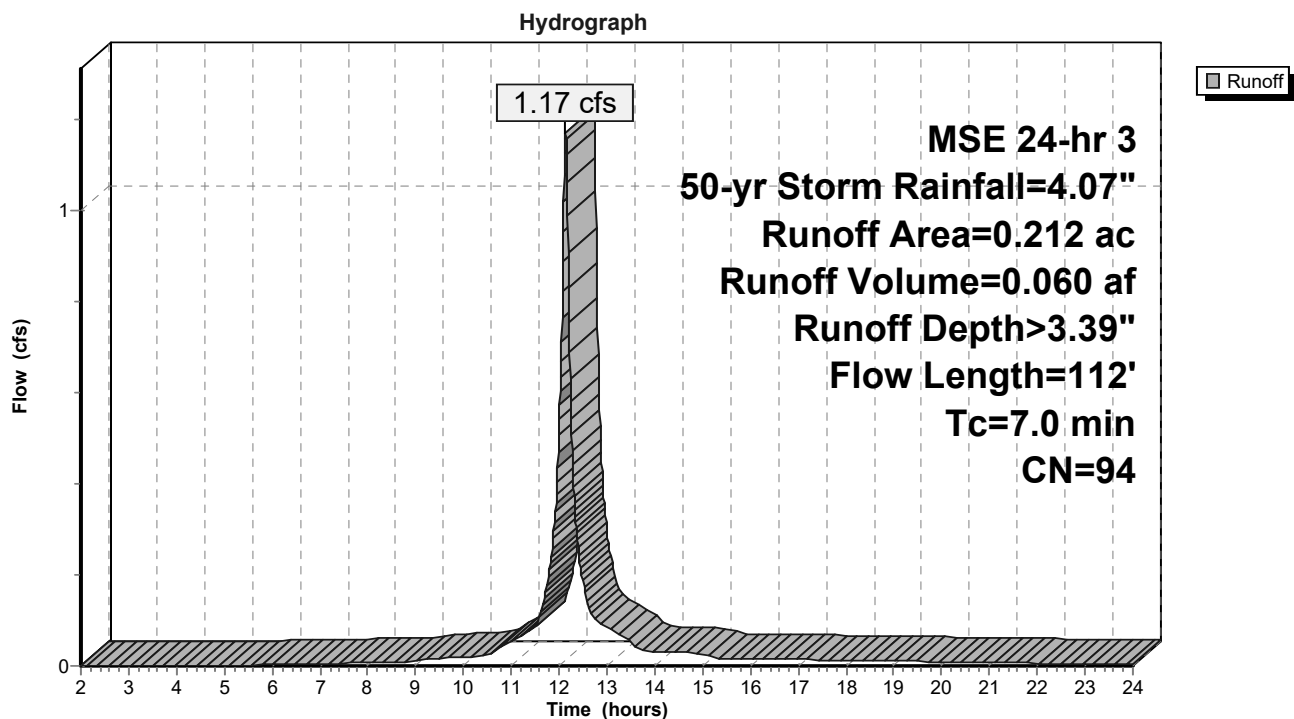
Runoff = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af, Depth> 3.39"
Routed to Pond 9P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:



StandleyLake_Existing

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 1P: CB

Inflow Area = 2.173 ac, 26.78% Impervious, Inflow Depth > 2.10" for 50-yr Storm event
Inflow = 8.12 cfs @ 12.14 hrs, Volume= 0.380 af
Outflow = 8.12 cfs @ 12.14 hrs, Volume= 0.380 af, Atten= 0%, Lag= 0.0 min
Primary = 8.12 cfs @ 12.14 hrs, Volume= 0.380 af
Routed to Pond 8P : CB

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

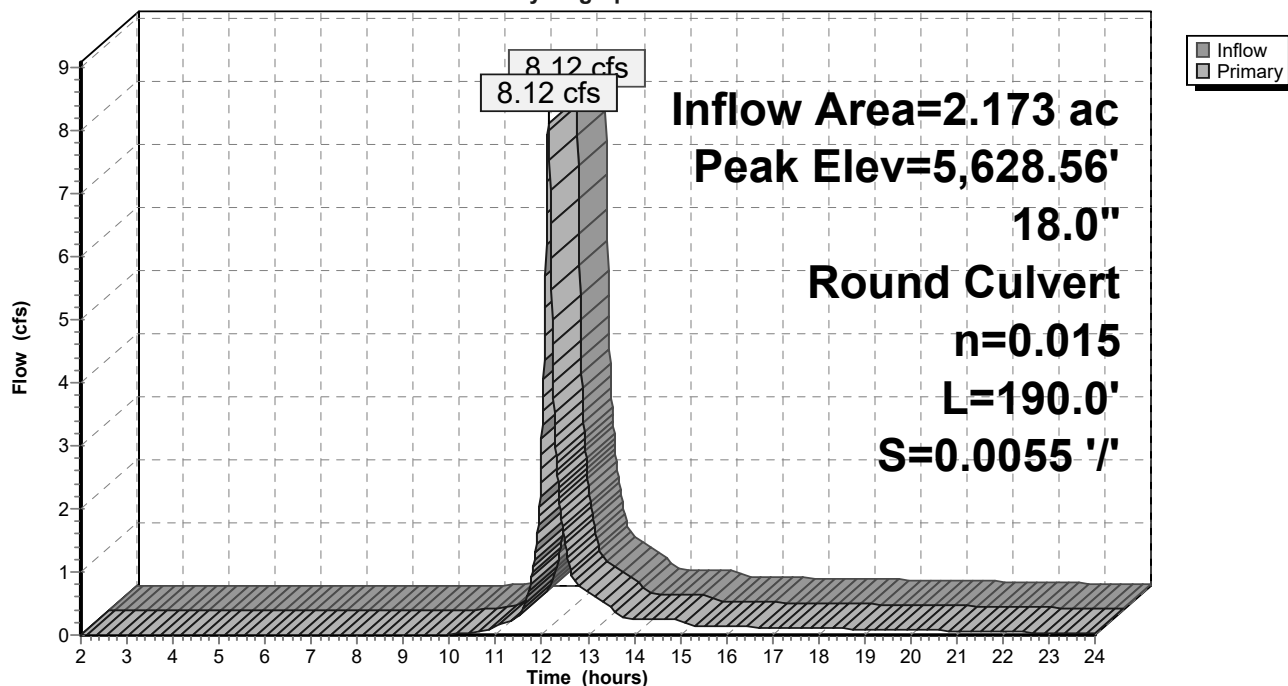
Peak Elev= 5,628.56' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=7.94 cfs @ 12.14 hrs HW=5,532.80' TW=5,530.88' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 7.94 cfs @ 4.50 fps)

Pond 1P: CB

Hydrograph



StandleyLake_Existing

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 2P: CB

Inflow Area = 1.594 ac, 16.75% Impervious, Inflow Depth > 1.94" for 50-yr Storm event
Inflow = 5.03 cfs @ 12.15 hrs, Volume= 0.258 af
Outflow = 5.03 cfs @ 12.15 hrs, Volume= 0.258 af, Atten= 0%, Lag= 0.0 min
Primary = 5.03 cfs @ 12.15 hrs, Volume= 0.258 af
Routed to Pond 10P : Inlet

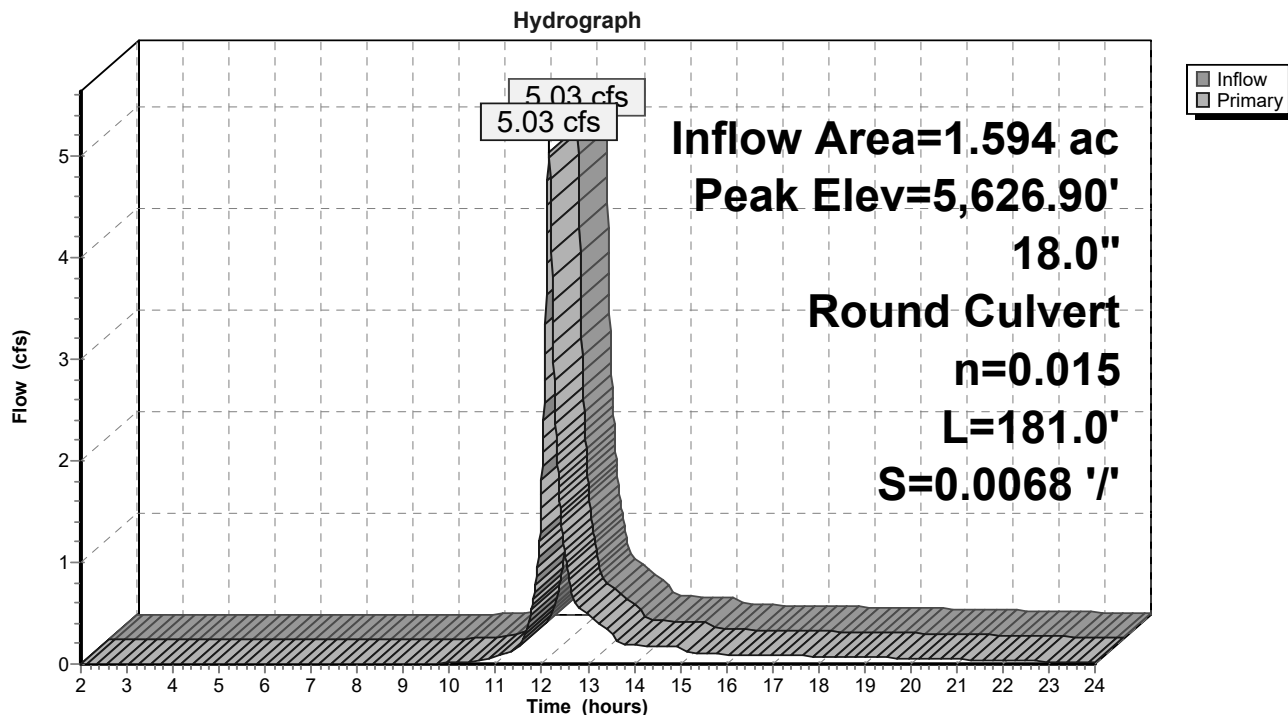
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,626.90' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=4.76 cfs @ 12.15 hrs HW=5,528.21' TW=5,527.55' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 4.76 cfs @ 2.69 fps)

Pond 2P: CB



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 1.65" for 50-yr Storm event
Inflow = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af
Outflow = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Primary = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af
Routed to Pond 2P : CB

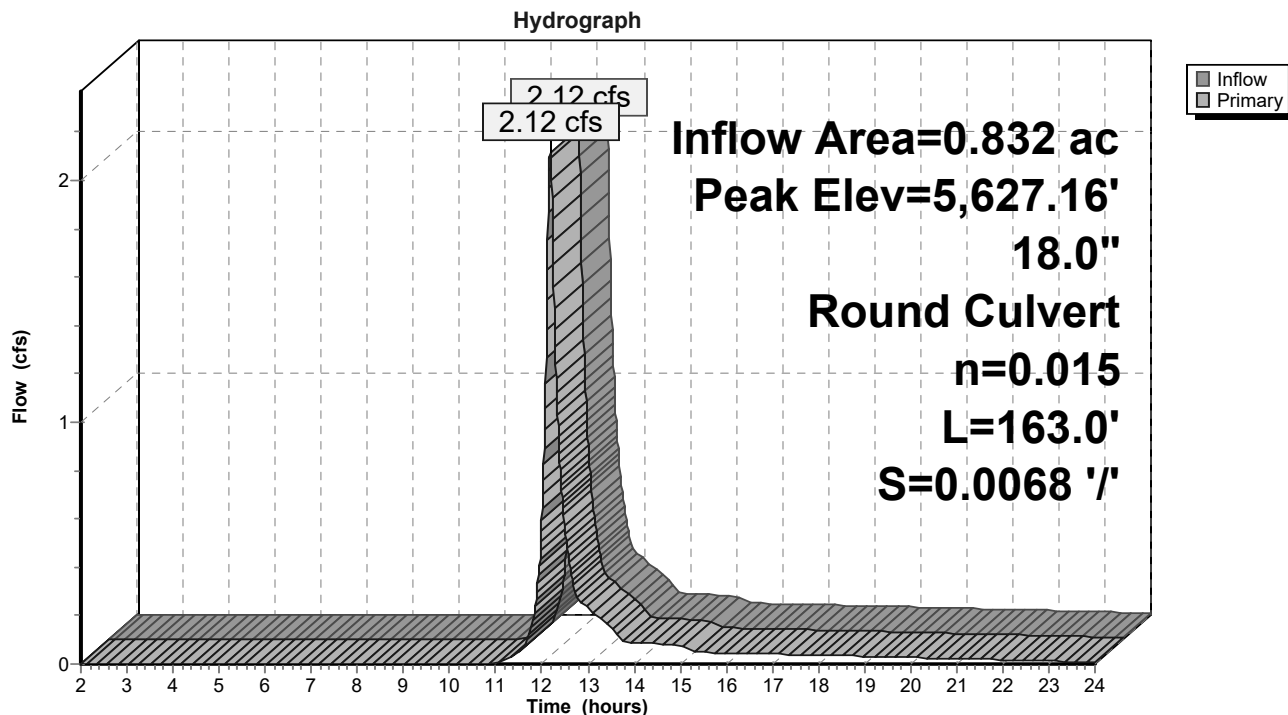
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,627.16' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.00 cfs @ 12.18 hrs HW=5,528.35' TW=5,528.08' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.00 cfs @ 1.93 fps)

Pond 3P: Inlet



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 3.83" for 50-yr Storm event
Inflow = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af
Outflow = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min
Primary = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af
Routed to Pond 5P : Inlet

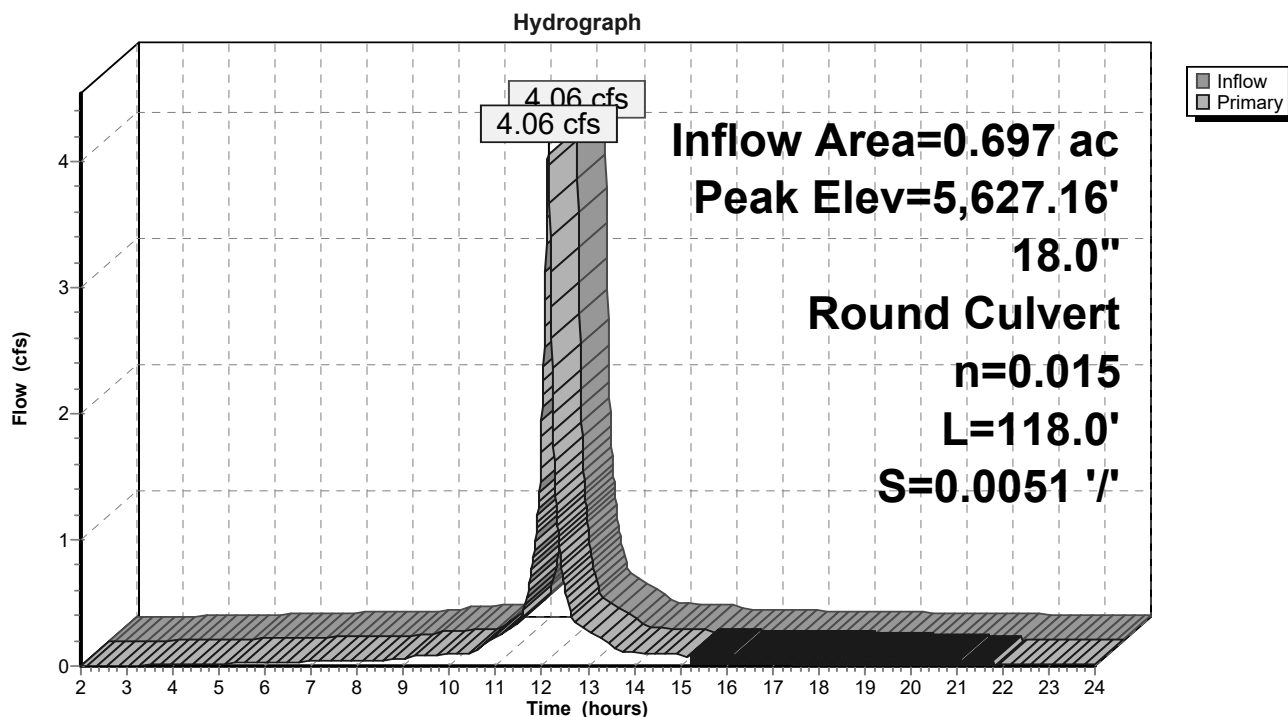
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,627.16' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.58 cfs @ 12.14 hrs HW=5,527.92' TW=5,527.64' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.58 cfs @ 2.03 fps)

Pond 4P: Roof Drain



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 2.53" for 50-yr Storm event
Inflow = 7.02 cfs @ 12.15 hrs, Volume= 0.407 af
Outflow = 7.02 cfs @ 12.15 hrs, Volume= 0.407 af, Atten= 0%, Lag= 0.0 min
Primary = 7.02 cfs @ 12.15 hrs, Volume= 0.407 af
Routed to Pond 6P : DI

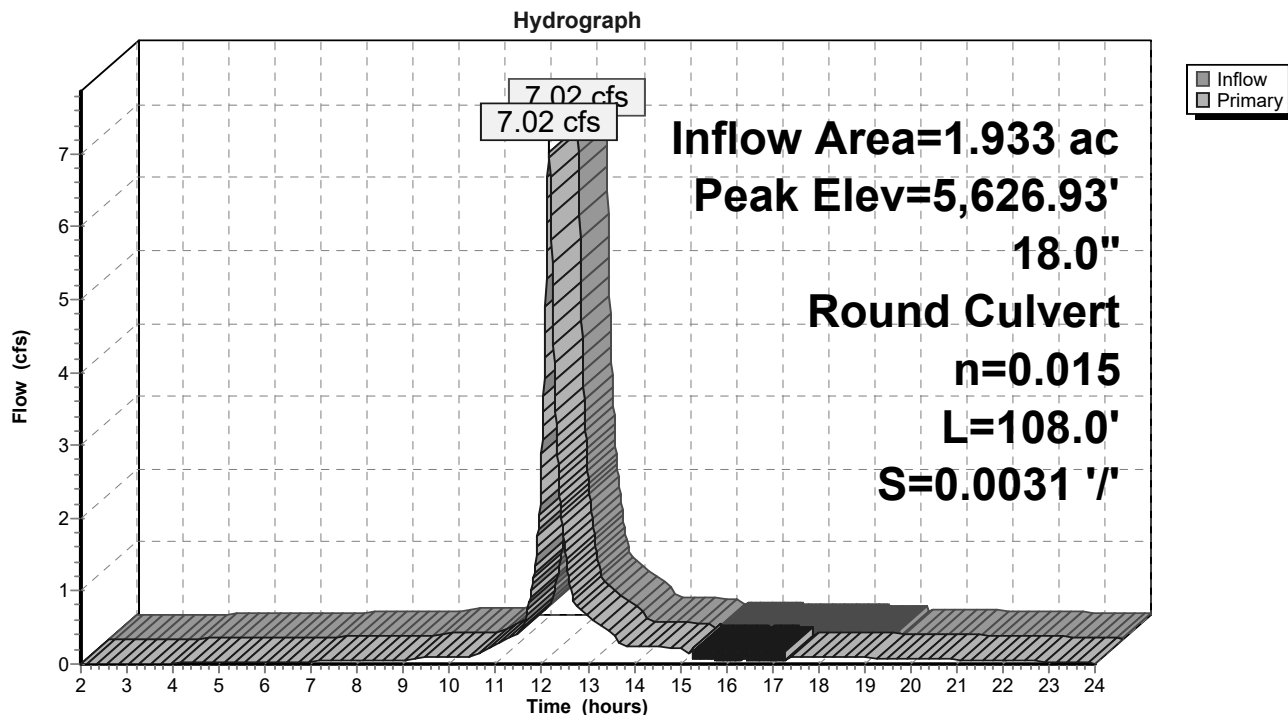
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,626.93' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=6.74 cfs @ 12.15 hrs HW=5,527.85' TW=5,526.92' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 6.74 cfs @ 3.82 fps)

Pond 5P: Inlet



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 2.57" for 50-yr Storm event
Inflow = 9.20 cfs @ 12.16 hrs, Volume= 0.543 af
Outflow = 9.20 cfs @ 12.16 hrs, Volume= 0.543 af, Atten= 0%, Lag= 0.0 min
Primary = 9.20 cfs @ 12.16 hrs, Volume= 0.543 af
Routed to Pond 7P : Existing Pond

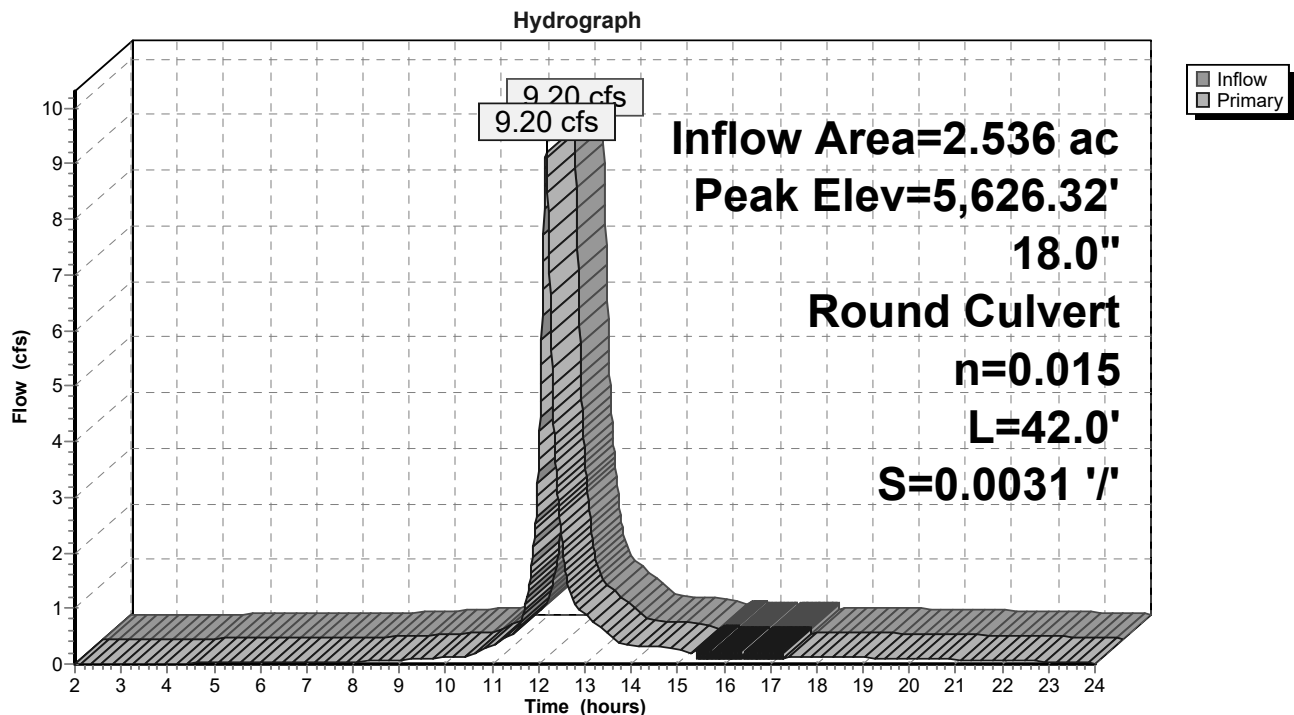
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,626.32' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=9.19 cfs @ 12.16 hrs HW=5,526.98' TW=5,525.81' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 9.19 cfs @ 5.20 fps)

Pond 6P: DI



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 7P: Existing Pond

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 2.31" for 50-yr Storm event
 Inflow = 29.27 cfs @ 12.15 hrs, Volume= 1.561 af
 Outflow = 36.78 cfs @ 12.20 hrs, Volume= 1.495 af, Atten= 0%, Lag= 2.9 min
 Primary = 36.78 cfs @ 12.20 hrs, Volume= 1.495 af
 Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 5,625.33' @ 12.20 hrs Surf.Area= 0.279 ac Storage= 0.347 af

Plug-Flow detention time= 43.9 min calculated for 1.494 af (96% of inflow)
 Center-of-Mass det. time= 22.0 min (817.0 - 795.0)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.347 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.007	0.004	0.004
5,524.00	0.043	0.025	0.029
5,525.00	0.157	0.100	0.129
5,526.00	0.279	0.218	0.347

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

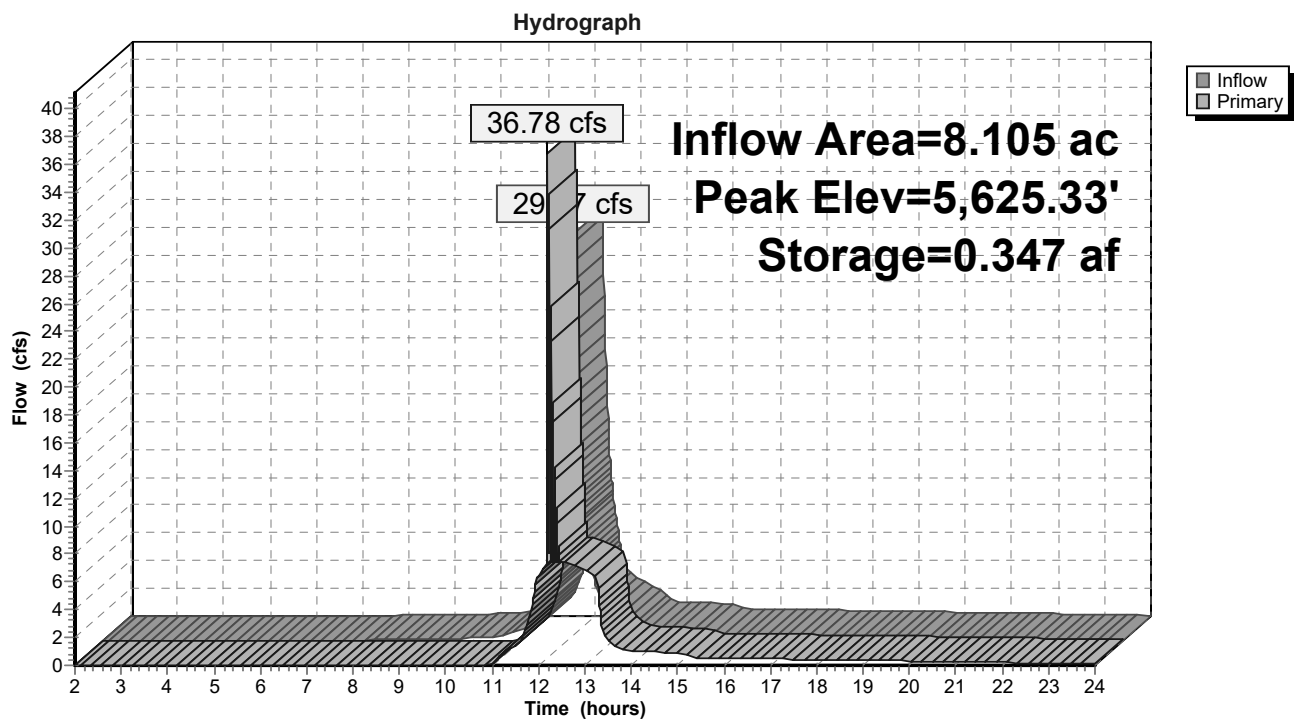
Primary OutFlow Max=36.24 cfs @ 12.20 hrs HW=5,622.44' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 36.24 cfs of 80.75 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 36.24 cfs @ 48.32 fps)

↑ **1=Orifice/Grate** (Passes 36.24 cfs of 583.74 cfs potential flow)

Pond 7P: Existing Pond



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 8P: CB

Inflow Area = 2.924 ac, 37.76% Impervious, Inflow Depth > 2.34" for 50-yr Storm event
Inflow = 11.96 cfs @ 12.14 hrs, Volume= 0.570 af
Outflow = 11.96 cfs @ 12.14 hrs, Volume= 0.570 af, Atten= 0%, Lag= 0.0 min
Primary = 11.96 cfs @ 12.14 hrs, Volume= 0.570 af
Routed to Pond 7P : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

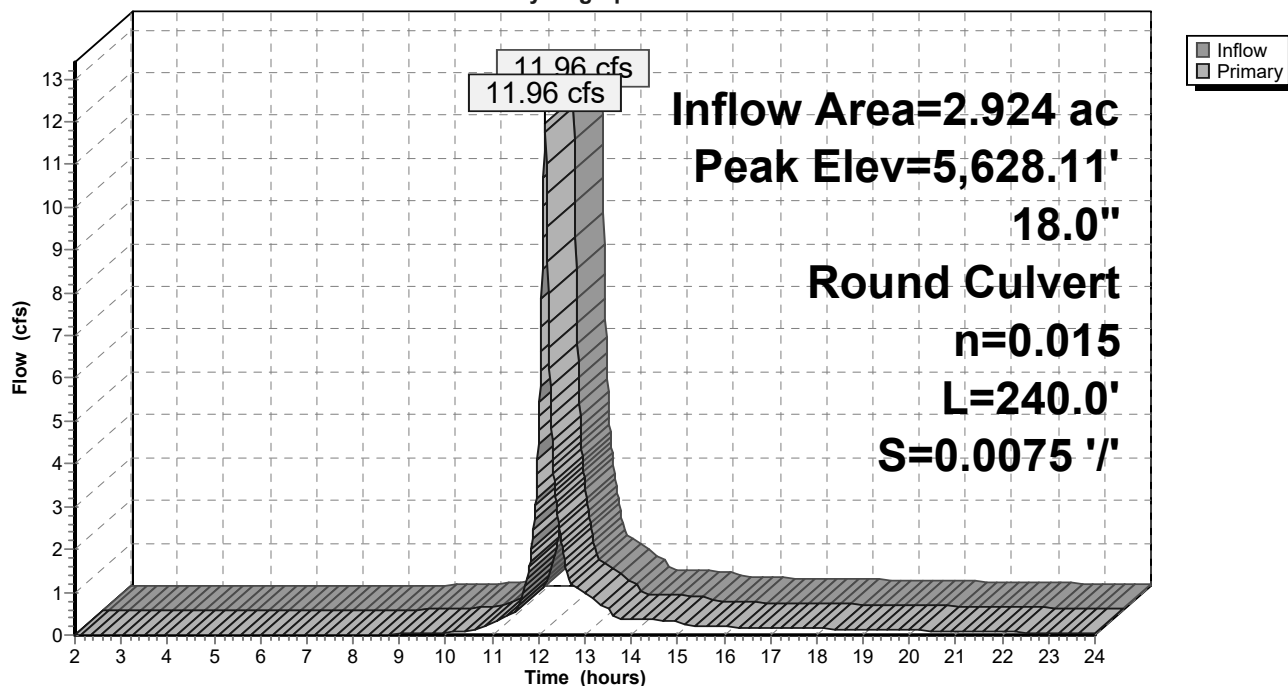
Peak Elev= 5,628.11' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=11.93 cfs @ 12.14 hrs HW=5,530.87' TW=5,525.68' (Dynamic Tailwater)
↑**1=RCP_Round 18"** (Outlet Controls 11.93 cfs @ 6.75 fps)

Pond 8P: CB

Hydrograph



StandleyLake_Existing

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 3.39" for 50-yr Storm event
Inflow = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af
Outflow = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
Primary = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af
Routed to Pond 8P : CB

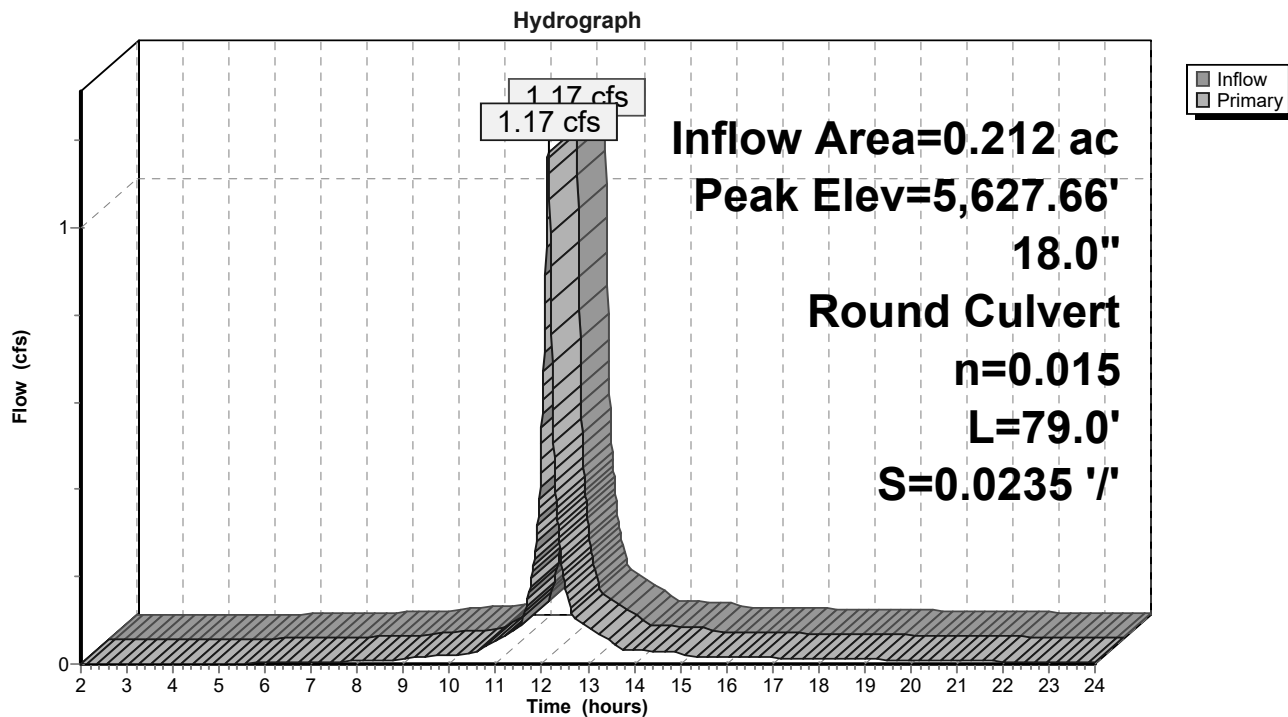
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,627.66' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=5,530.81' TW=5,530.86' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 9P: CB



StandleyLake_Existing

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 10P: Inlet

Inflow Area = 1.971 ac, 26.28% Impervious, Inflow Depth > 2.17" for 50-yr Storm event
Inflow = 6.85 cfs @ 12.15 hrs, Volume= 0.356 af
Outflow = 6.85 cfs @ 12.15 hrs, Volume= 0.356 af, Atten= 0%, Lag= 0.0 min
Primary = 6.85 cfs @ 12.15 hrs, Volume= 0.356 af
Routed to Pond 7P : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

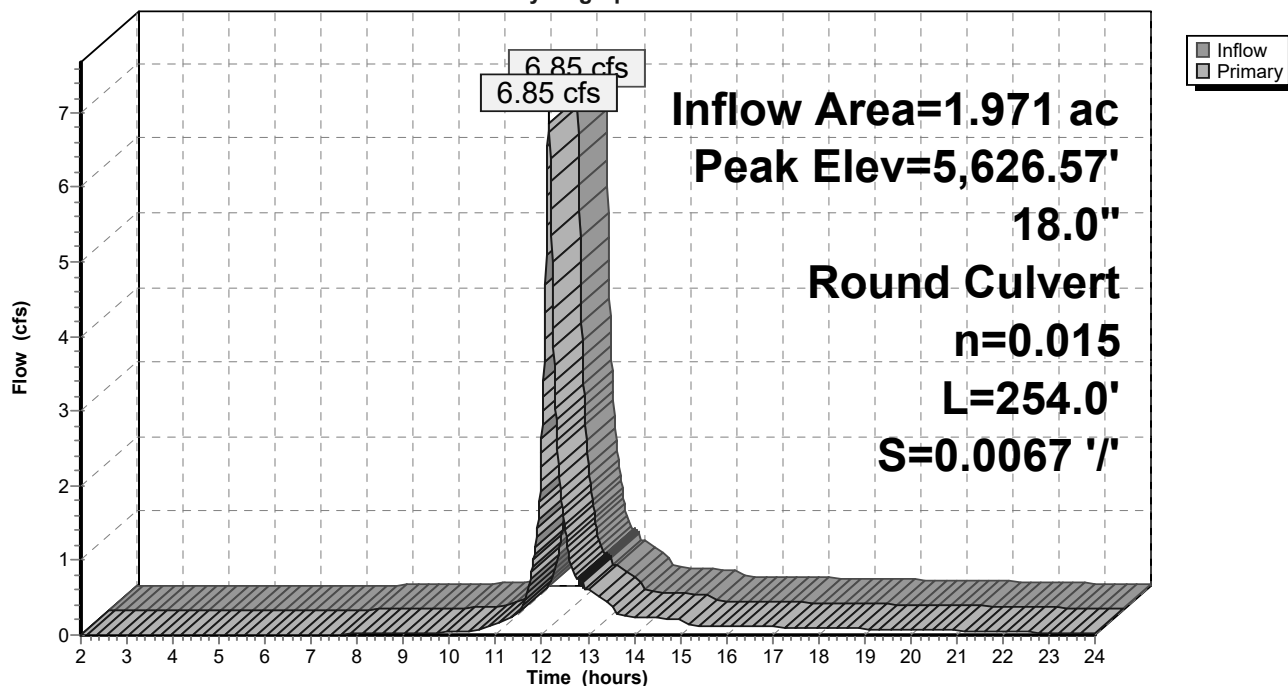
Peak Elev= 5,626.57' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=6.84 cfs @ 12.15 hrs HW=5,527.53' TW=5,525.74' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 6.84 cfs @ 3.87 fps)

Pond 10P: Inlet

Hydrograph



StandleyLake_Existing

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 11P: Inlet

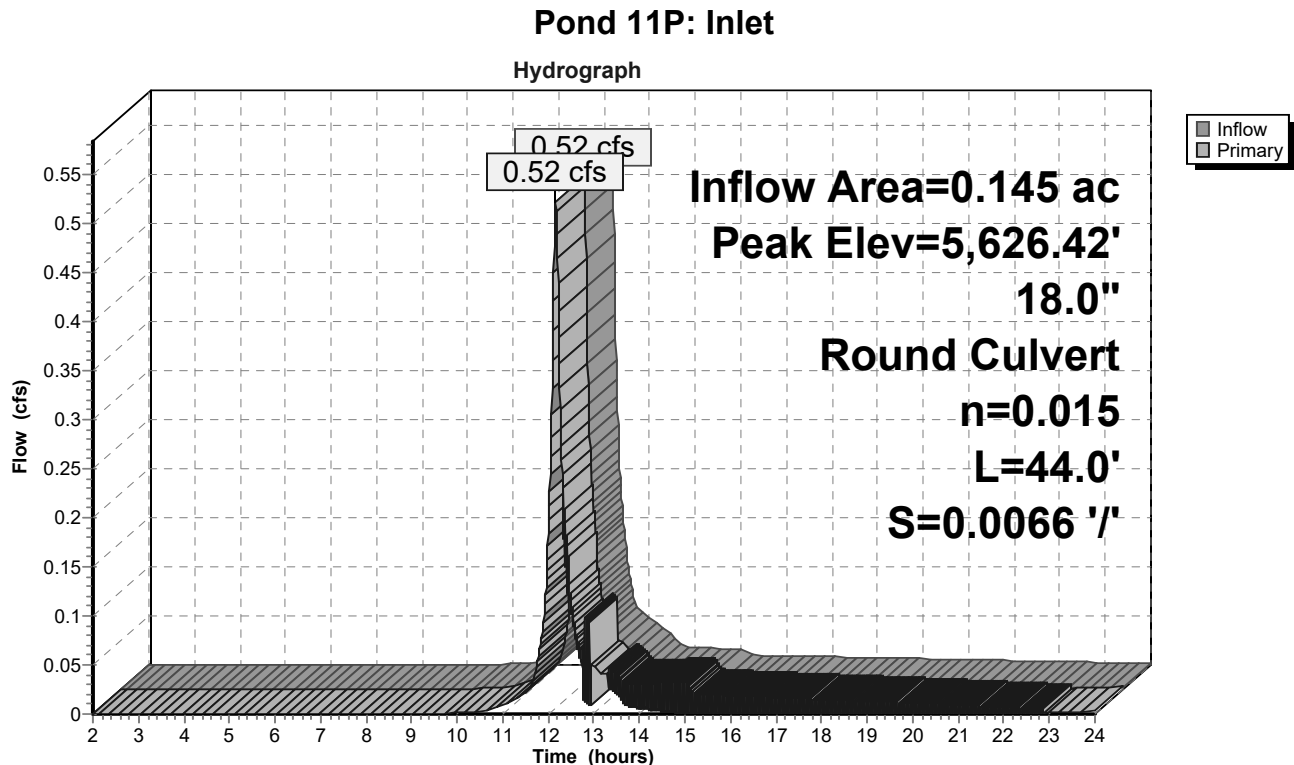
Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 2.18" for 50-yr Storm event
Inflow = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af
Outflow = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Primary = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,626.42' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

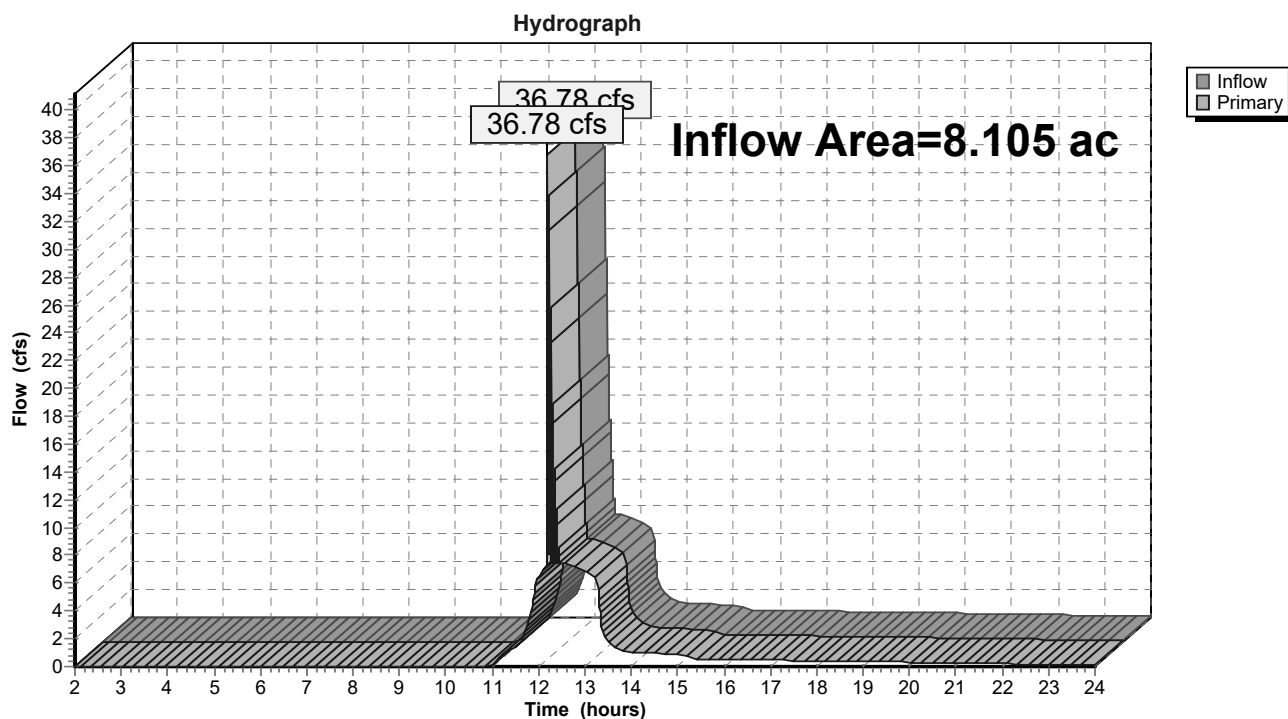
Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=5,527.50' TW=5,527.57' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)



Summary for Link 1L: Street Sewer

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 2.21" for 50-yr Storm event
Inflow = 36.78 cfs @ 12.20 hrs, Volume= 1.495 af
Primary = 36.78 cfs @ 12.20 hrs, Volume= 1.495 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Time span=2.00-24.00 hrs, dt=0.01 hrs, 2201 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A-1: Runoff Area=2.173 ac 26.78% Impervious Runoff Depth>2.60"
Flow Length=415' Tc=7.0 min CN=80 Runoff=10.01 cfs 0.470 af

Subcatchment A-10: Runoff Area=0.232 ac 90.52% Impervious Runoff Depth>4.31"
Flow Length=131' Tc=7.0 min CN=97 Runoff=1.54 cfs 0.083 af

Subcatchment A-11: Runoff Area=0.145 ac 28.28% Impervious Runoff Depth>2.69"
Flow Length=74' Slope=0.0300 '/ Tc=8.7 min CN=81 Runoff=0.64 cfs 0.032 af

Subcatchment A-2: Runoff Area=0.762 ac 35.04% Impervious Runoff Depth>2.78"
Flow Length=234' Tc=7.0 min CN=82 Runoff=3.73 cfs 0.176 af

Subcatchment A-3: Runoff Area=0.832 ac 0.00% Impervious Runoff Depth>2.09"
Flow Length=229' Slope=0.0524 '/ Tc=10.1 min CN=74 Runoff=2.71 cfs 0.145 af

Subcatchment A-4: Runoff Area=0.697 ac 100.00% Impervious Runoff Depth>4.42"
Flow Length=150' Tc=7.0 min CN=98 Runoff=4.65 cfs 0.257 af

Subcatchment A-5: Runoff Area=1.236 ac 7.12% Impervious Runoff Depth>2.26"
Flow Length=312' Slope=0.0545 '/ Tc=10.9 min CN=76 Runoff=4.18 cfs 0.232 af

Subcatchment A-6: Runoff Area=0.603 ac 55.89% Impervious Runoff Depth>3.25"
Flow Length=294' Tc=11.7 min CN=87 Runoff=2.78 cfs 0.163 af

Subcatchment A-7: Runoff Area=0.674 ac 0.00% Impervious Runoff Depth>2.09"
Flow Length=326' Tc=11.6 min CN=74 Runoff=2.05 cfs 0.118 af

Subcatchment A-8: Runoff Area=0.539 ac 63.27% Impervious Runoff Depth>3.45"
Flow Length=145' Tc=7.0 min CN=89 Runoff=3.15 cfs 0.155 af

Subcatchment A-9: Runoff Area=0.212 ac 85.38% Impervious Runoff Depth>3.97"
Flow Length=112' Tc=7.0 min CN=94 Runoff=1.36 cfs 0.070 af

Pond 1P: CB Peak Elev=5,777.53' Inflow=10.01 cfs 0.470 af
18.0" Round Culvert n=0.015 L=190.0' S=0.0055 '/ Outflow=10.01 cfs 0.470 af

Pond 2P: CB Peak Elev=5,772.05' Inflow=6.26 cfs 0.322 af
18.0" Round Culvert n=0.015 L=181.0' S=0.0068 '/ Outflow=6.26 cfs 0.322 af

Pond 3P: Inlet Peak Elev=5,772.37' Inflow=2.71 cfs 0.145 af
18.0" Round Culvert n=0.015 L=163.0' S=0.0068 '/ Outflow=2.71 cfs 0.145 af

Pond 4P: Roof Drain Peak Elev=5,771.89' Inflow=4.65 cfs 0.257 af
18.0" Round Culvert n=0.015 L=118.0' S=0.0051 '/ Outflow=4.65 cfs 0.257 af

Pond 5P: Inlet Peak Elev=5,771.50' Inflow=8.43 cfs 0.489 af
18.0" Round Culvert n=0.015 L=108.0' S=0.0031 '/ Outflow=8.43 cfs 0.489 af

StandleyLake_Existing*MSE 24-hr 3 100-yr Storm Rainfall=4.66"*

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Pond 6P: DI

Peak Elev=5,770.10' Inflow=11.05 cfs 0.652 af
18.0" Round Culvert n=0.015 L=42.0' S=0.0031 '/' Outflow=11.05 cfs 0.652 af

Pond 7P: Existing Pond

Peak Elev=5,768.41' Storage=0.347 af Inflow=35.59 cfs 1.903 af
Outflow=56.72 cfs 1.836 af

Pond 8P: CB

Peak Elev=5,775.61' Inflow=14.51 cfs 0.695 af
18.0" Round Culvert n=0.015 L=240.0' S=0.0075 '/' Outflow=14.51 cfs 0.695 af

Pond 9P: CB

Peak Elev=5,774.95' Inflow=1.36 cfs 0.070 af
18.0" Round Culvert n=0.015 L=79.0' S=0.0235 '/' Outflow=1.36 cfs 0.070 af

Pond 10P: Inlet

Peak Elev=5,771.07' Inflow=8.40 cfs 0.437 af
18.0" Round Culvert n=0.015 L=254.0' S=0.0067 '/' Outflow=8.40 cfs 0.437 af

Pond 11P: Inlet

Peak Elev=5,770.95' Inflow=0.64 cfs 0.032 af
18.0" Round Culvert n=0.015 L=44.0' S=0.0066 '/' Outflow=0.64 cfs 0.033 af

Link 1L: Street Sewer

Inflow=56.72 cfs 1.836 af
Primary=56.72 cfs 1.836 af

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-1:

Runoff = 10.01 cfs @ 12.14 hrs, Volume= 0.470 af, Depth> 2.60"
Routed to Pond 1P : CB

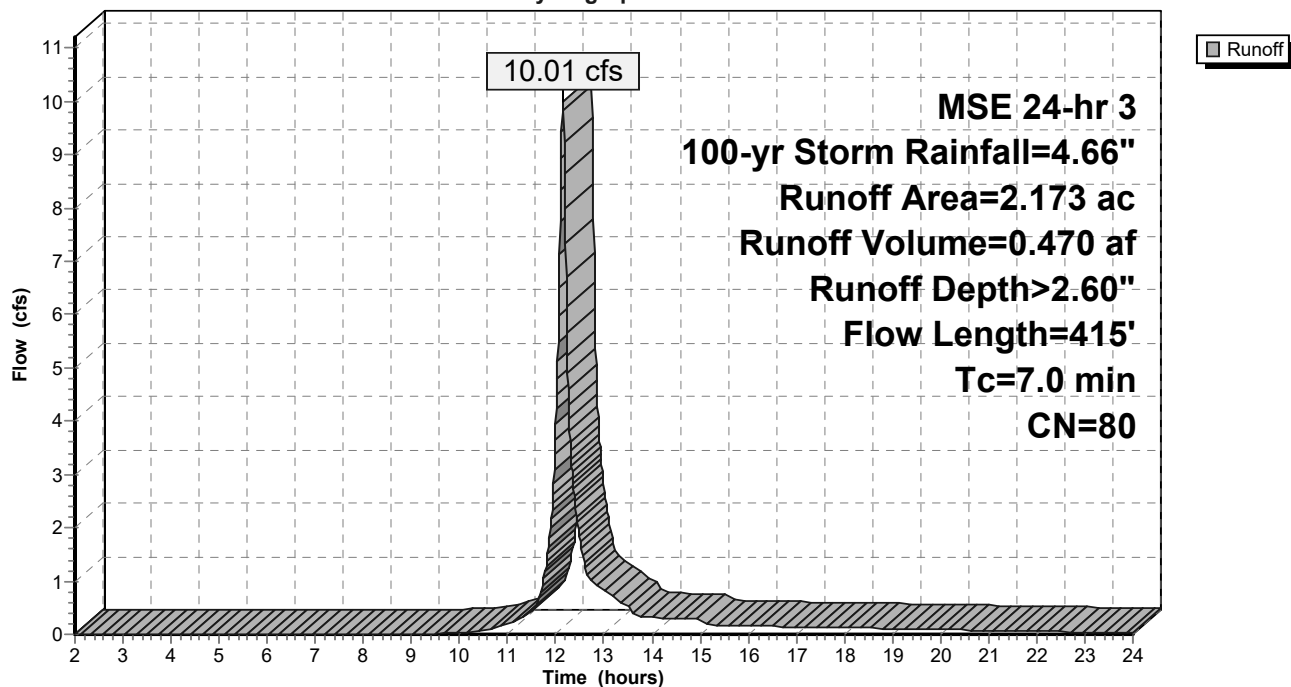
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.582	98	Paved parking, HSG C
1.591	74	>75% Grass cover, Good, HSG C
2.173	80	Weighted Average
1.591		73.22% Pervious Area
0.582		26.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	65	0.1540	0.27		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.2	111	0.0450	1.48		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	239	0.0126	2.28		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.0	415	Total			

Subcatchment A-1:

Hydrograph



StandleyLake_Existing

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-10:

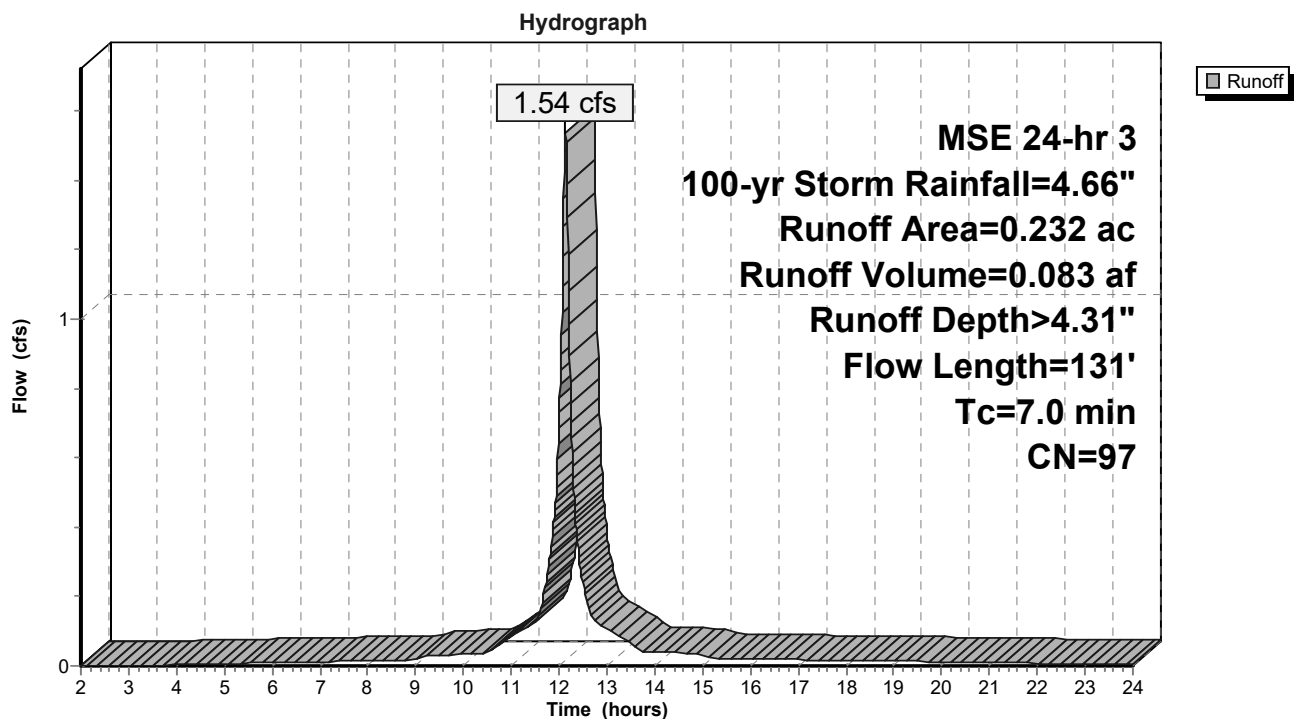
Runoff = 1.54 cfs @ 12.14 hrs, Volume= 0.083 af, Depth> 4.31"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-11:

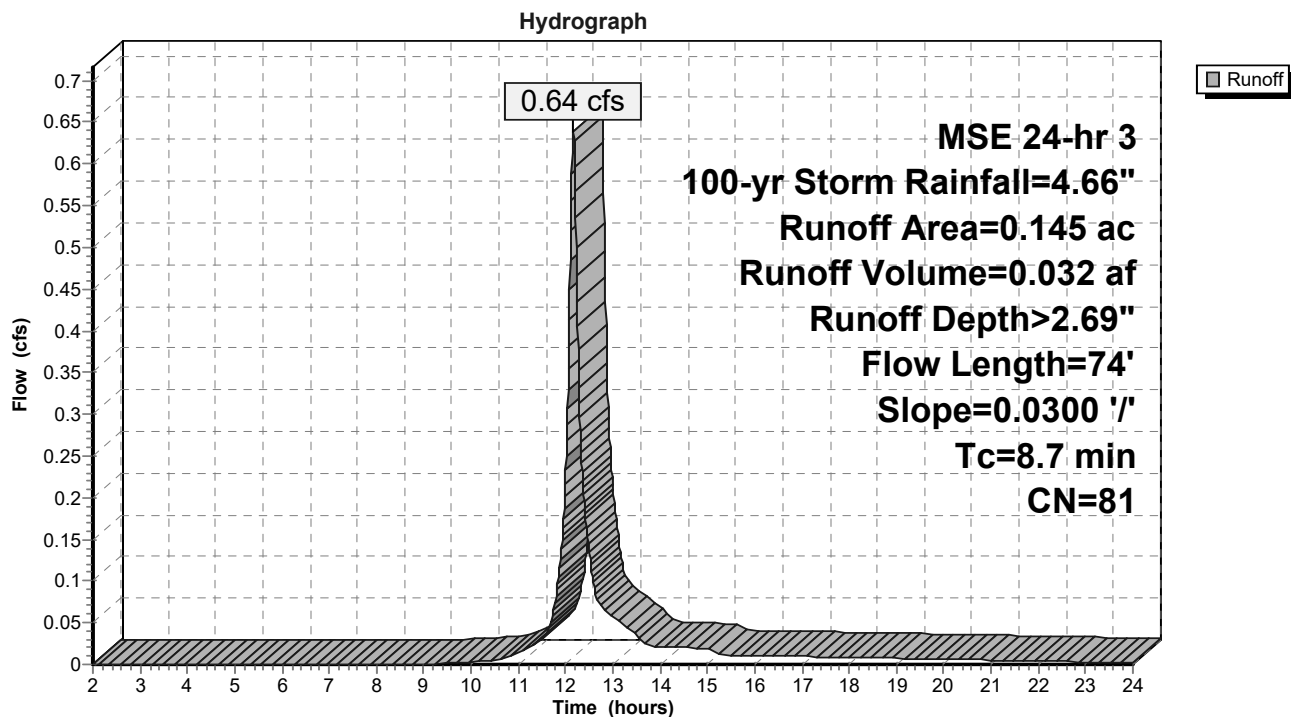
Runoff = 0.64 cfs @ 12.16 hrs, Volume= 0.032 af, Depth> 2.69"
Routed to Pond 11P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-2:

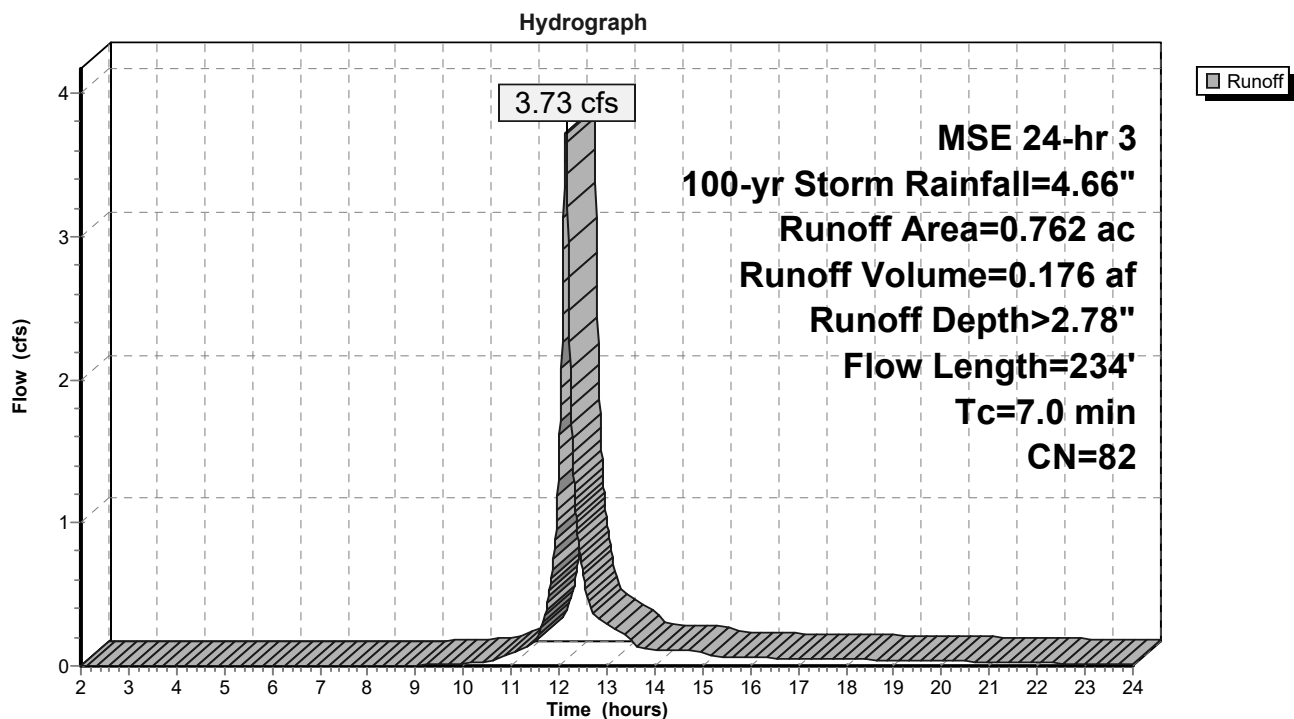
Runoff = 3.73 cfs @ 12.14 hrs, Volume= 0.176 af, Depth> 2.78"
Routed to Pond 2P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.267	98	Paved parking, HSG C
0.495	74	>75% Grass cover, Good, HSG C
0.762	82	Weighted Average
0.495		64.96% Pervious Area
0.267		35.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	234		0.56		Direct Entry, Minimum

Subcatchment A-2:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-3:

Runoff = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af, Depth> 2.09"
 Routed to Pond 3P : Inlet

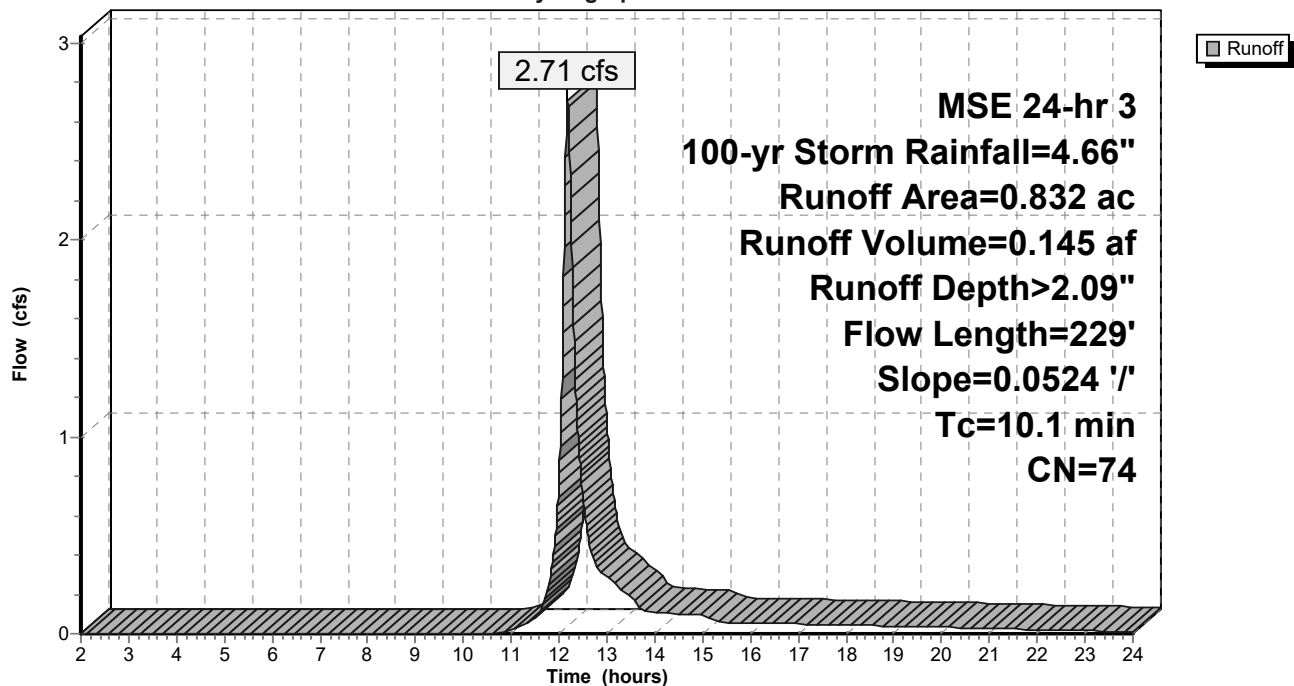
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
 MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-4:

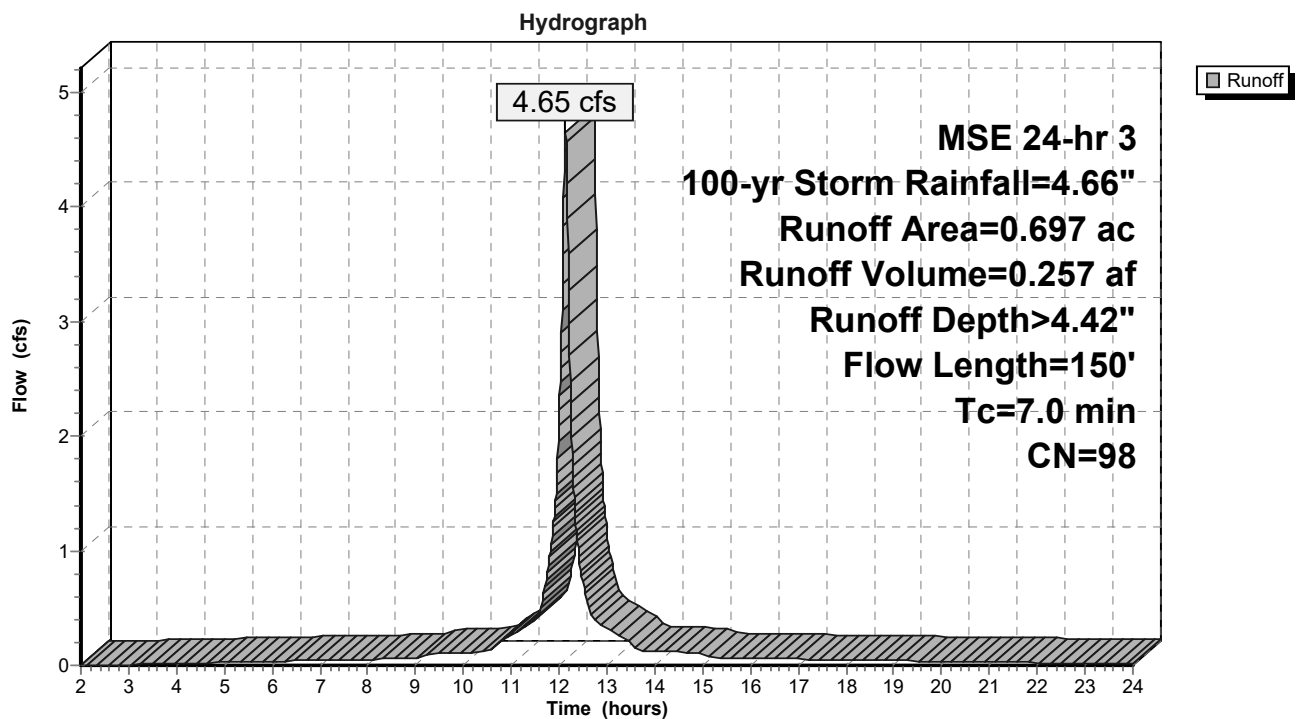
Runoff = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af, Depth> 4.42"
Routed to Pond 4P : Roof Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-5:

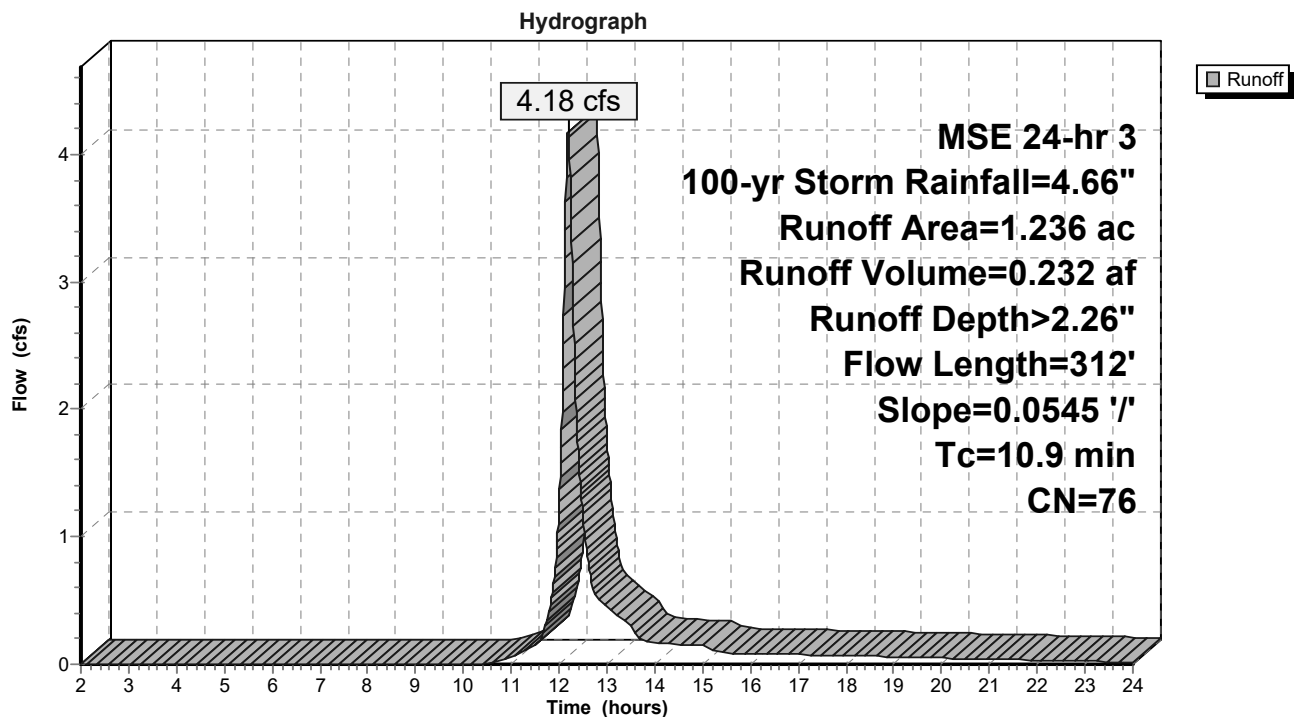
Runoff = 4.18 cfs @ 12.19 hrs, Volume= 0.232 af, Depth> 2.26"
Routed to Pond 5P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-6:

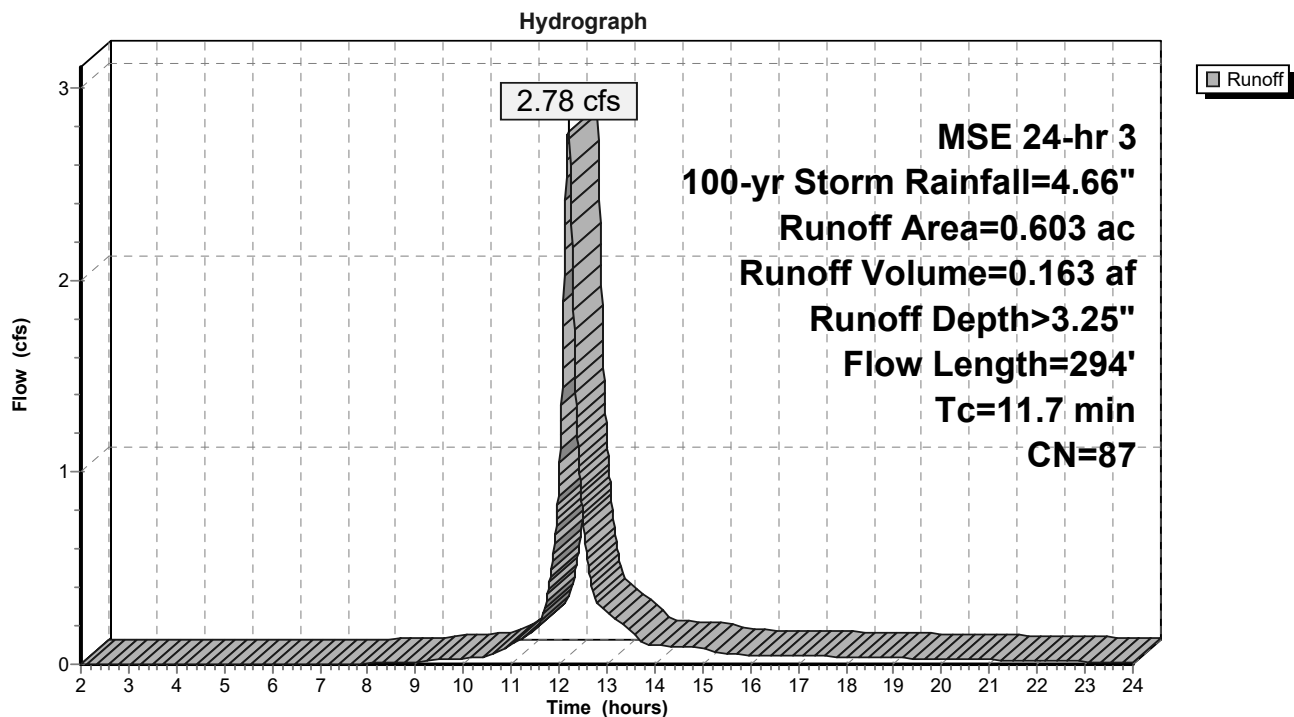
Runoff = 2.78 cfs @ 12.19 hrs, Volume= 0.163 af, Depth> 3.25"
Routed to Pond 6P : DI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-7:

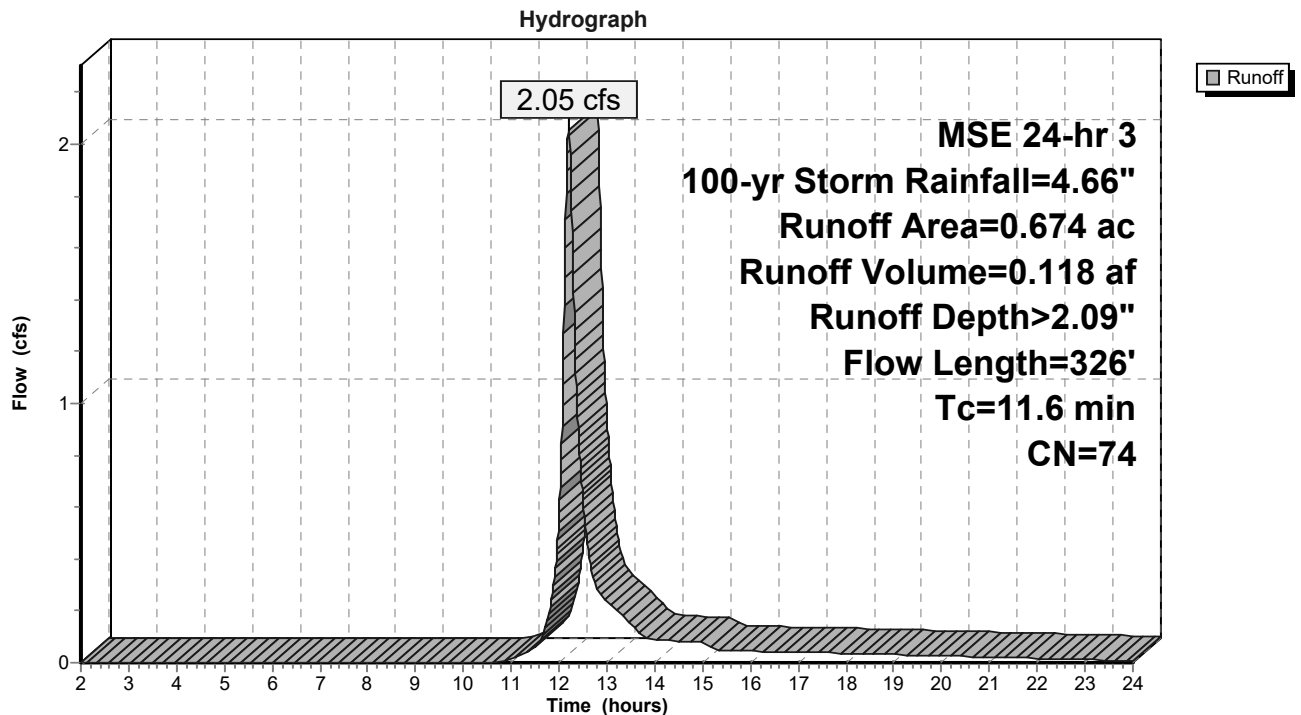
Runoff = 2.05 cfs @ 12.20 hrs, Volume= 0.118 af, Depth> 2.09"
Routed to Pond 7P : Existing Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.674	74	>75% Grass cover, Good, HSG C
0.674		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-8:

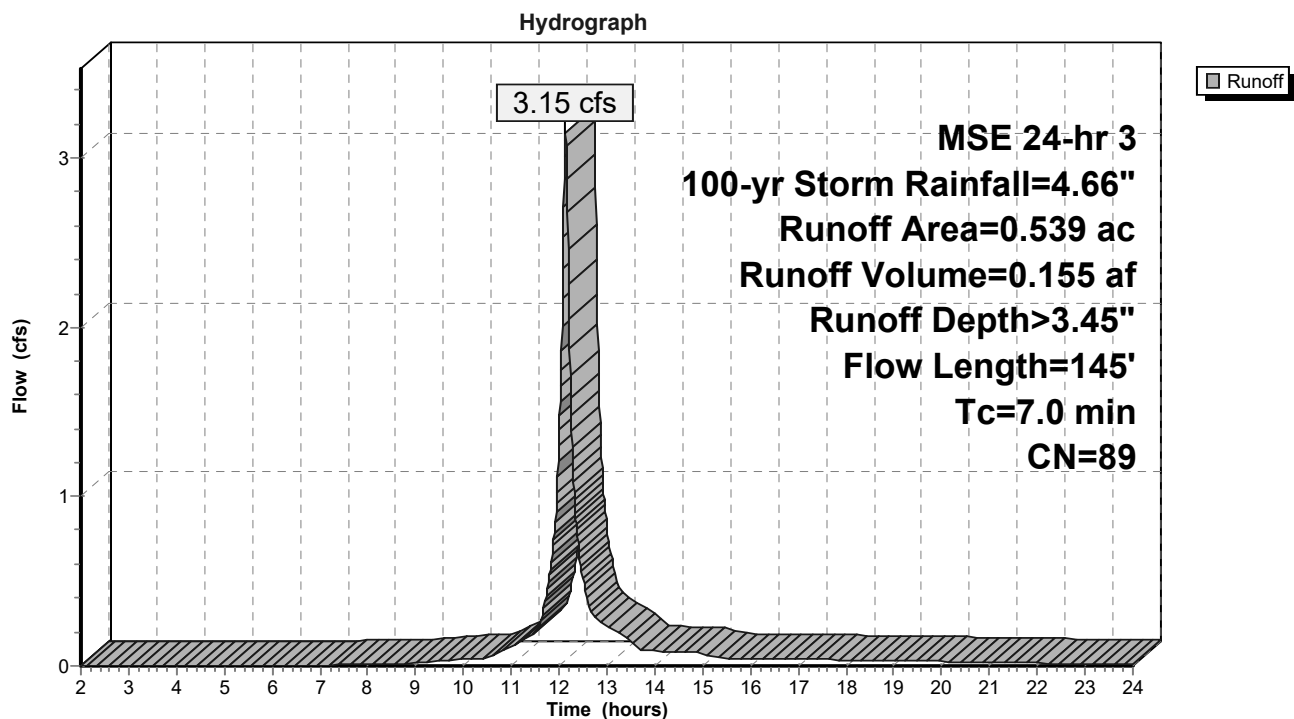
Runoff = 3.15 cfs @ 12.14 hrs, Volume= 0.155 af, Depth> 3.45"
Routed to Pond 8P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:



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Summary for Subcatchment A-9:

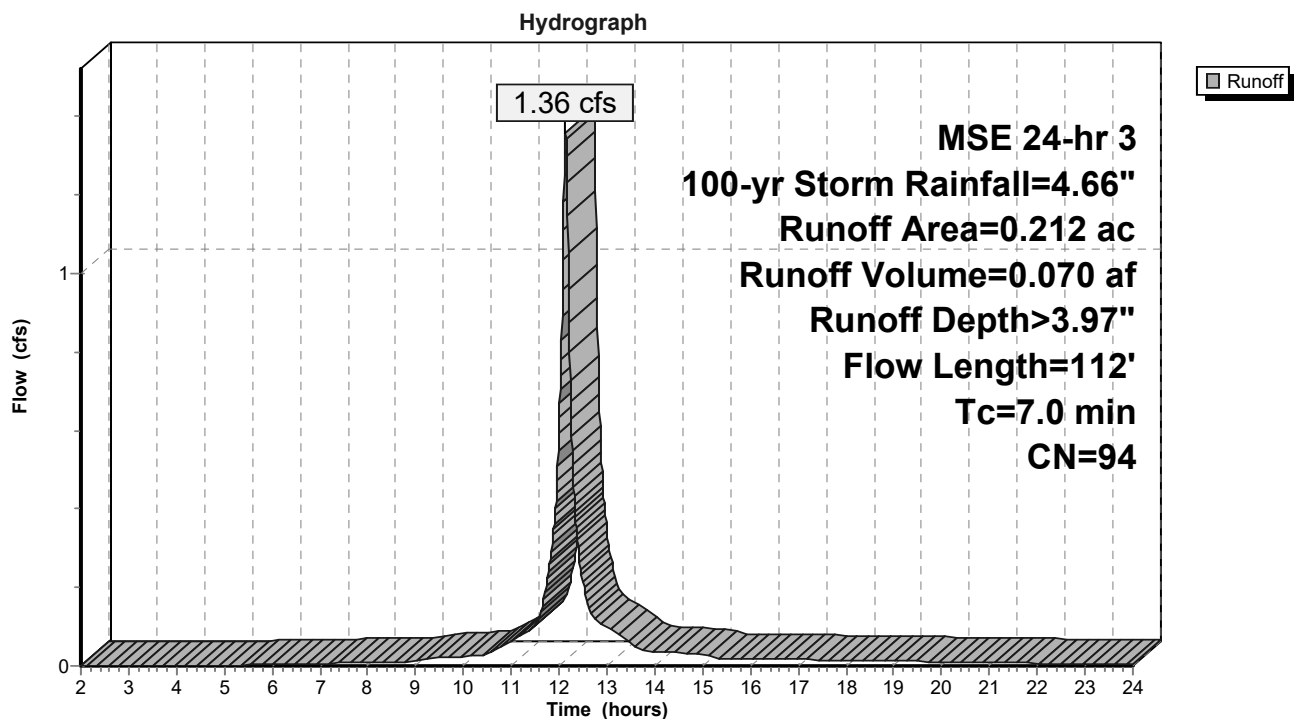
Runoff = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af, Depth> 3.97"
Routed to Pond 9P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 1P: CB

Inflow Area = 2.173 ac, 26.78% Impervious, Inflow Depth > 2.60" for 100-yr Storm event
Inflow = 10.01 cfs @ 12.14 hrs, Volume= 0.470 af
Outflow = 10.01 cfs @ 12.14 hrs, Volume= 0.470 af, Atten= 0%, Lag= 0.0 min
Primary = 10.01 cfs @ 12.14 hrs, Volume= 0.470 af
Routed to Pond 8P : CB

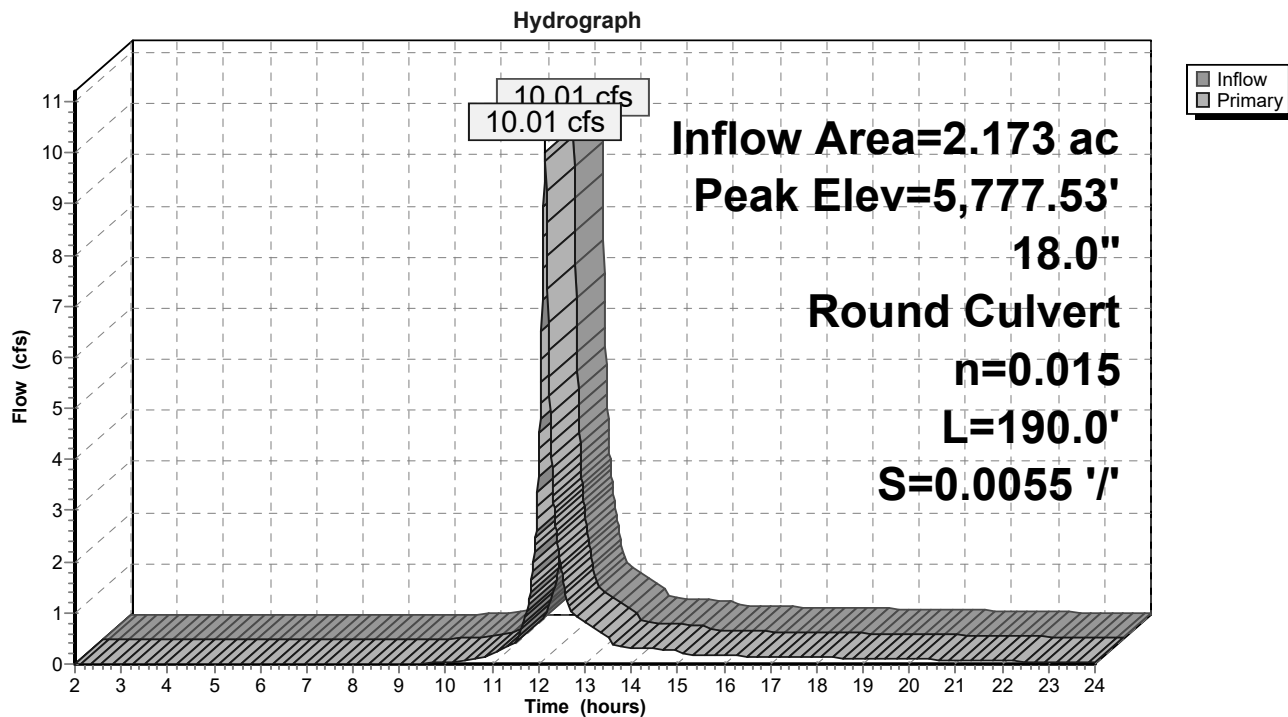
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,777.53' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=5,536.55' TW=5,537.83' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 1P: CB



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 2P: CB

Inflow Area = 1.594 ac, 16.75% Impervious, Inflow Depth > 2.42" for 100-yr Storm event
Inflow = 6.26 cfs @ 12.15 hrs, Volume= 0.322 af
Outflow = 6.26 cfs @ 12.15 hrs, Volume= 0.322 af, Atten= 0%, Lag= 0.0 min
Primary = 6.26 cfs @ 12.15 hrs, Volume= 0.322 af
Routed to Pond 10P : Inlet

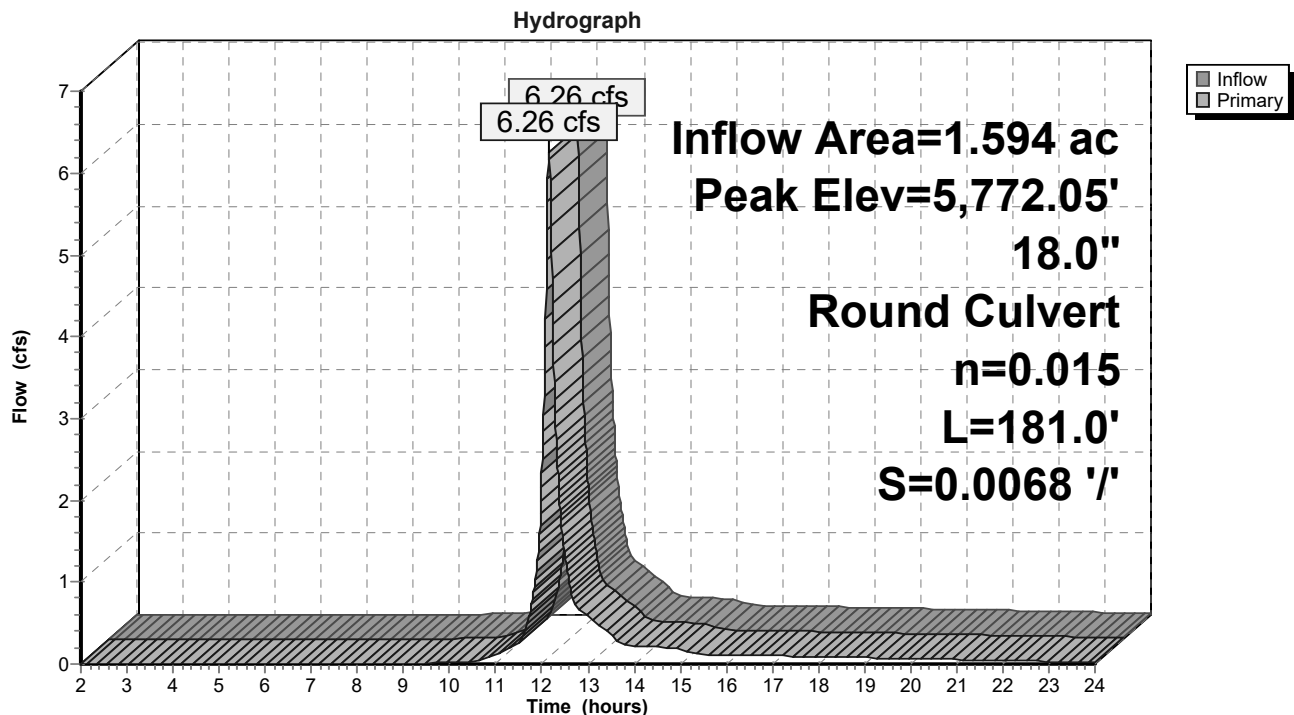
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,772.05' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.15 hrs HW=5,534.78' TW=5,643.07' (Dynamic Tailwater)
↑**1=RCP_Round 18"** (Controls 0.00 cfs)

Pond 2P: CB



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 2.09" for 100-yr Storm event
Inflow = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af
Outflow = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min
Primary = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af
Routed to Pond 2P : CB

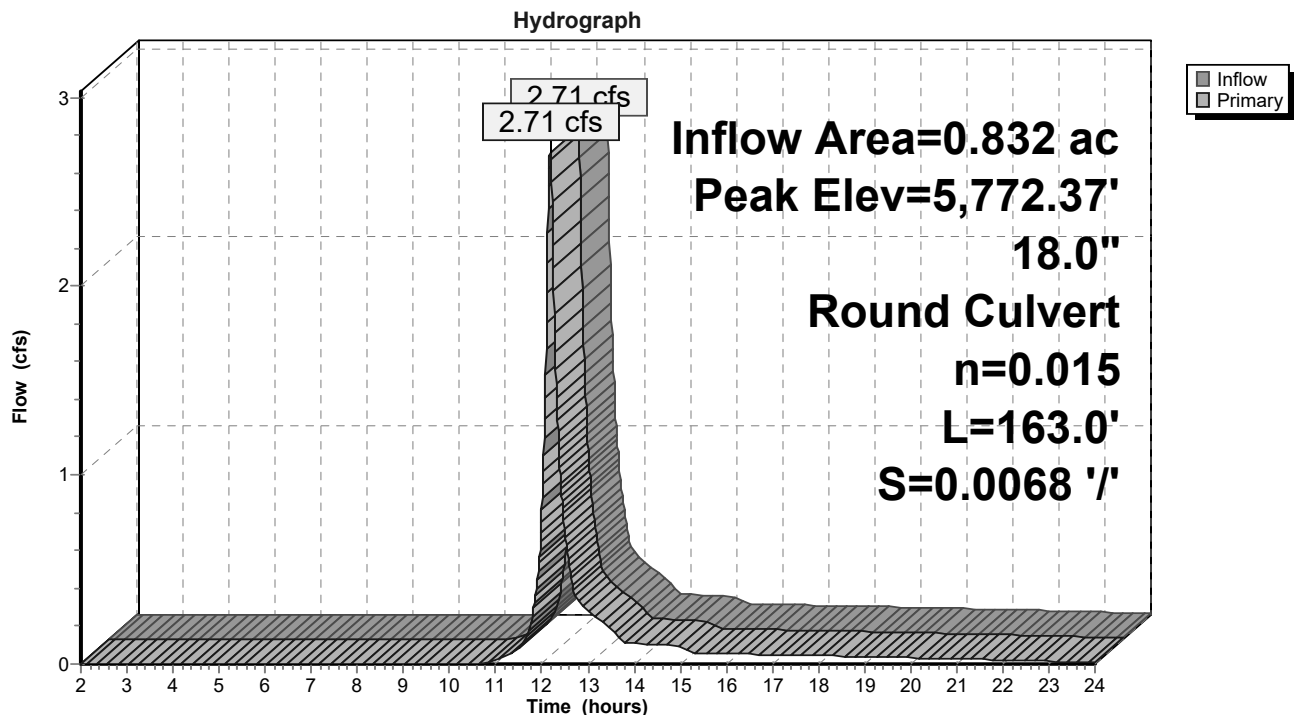
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,772.37' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.80 cfs @ 12.18 hrs HW=5,546.70' TW=5,546.31' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.80 cfs @ 2.15 fps)

Pond 3P: Inlet



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 4.42" for 100-yr Storm event
Inflow = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af
Outflow = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af, Atten= 0%, Lag= 0.0 min
Primary = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af
Routed to Pond 5P : Inlet

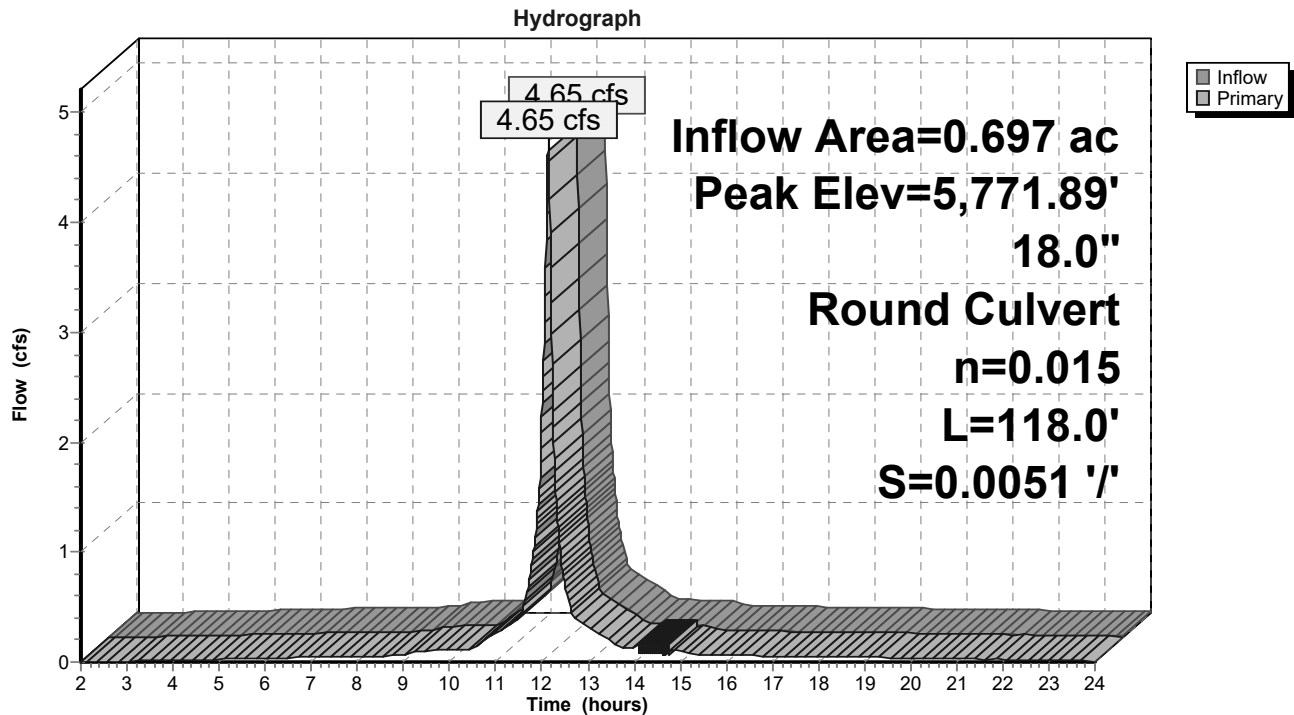
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,771.89' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=4.06 cfs @ 12.14 hrs HW=5,529.16' TW=5,528.81' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 4.06 cfs @ 2.30 fps)

Pond 4P: Roof Drain



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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 3.04" for 100-yr Storm event
Inflow = 8.43 cfs @ 12.16 hrs, Volume= 0.489 af
Outflow = 8.43 cfs @ 12.16 hrs, Volume= 0.489 af, Atten= 0%, Lag= 0.0 min
Primary = 8.43 cfs @ 12.16 hrs, Volume= 0.489 af
Routed to Pond 6P : DI

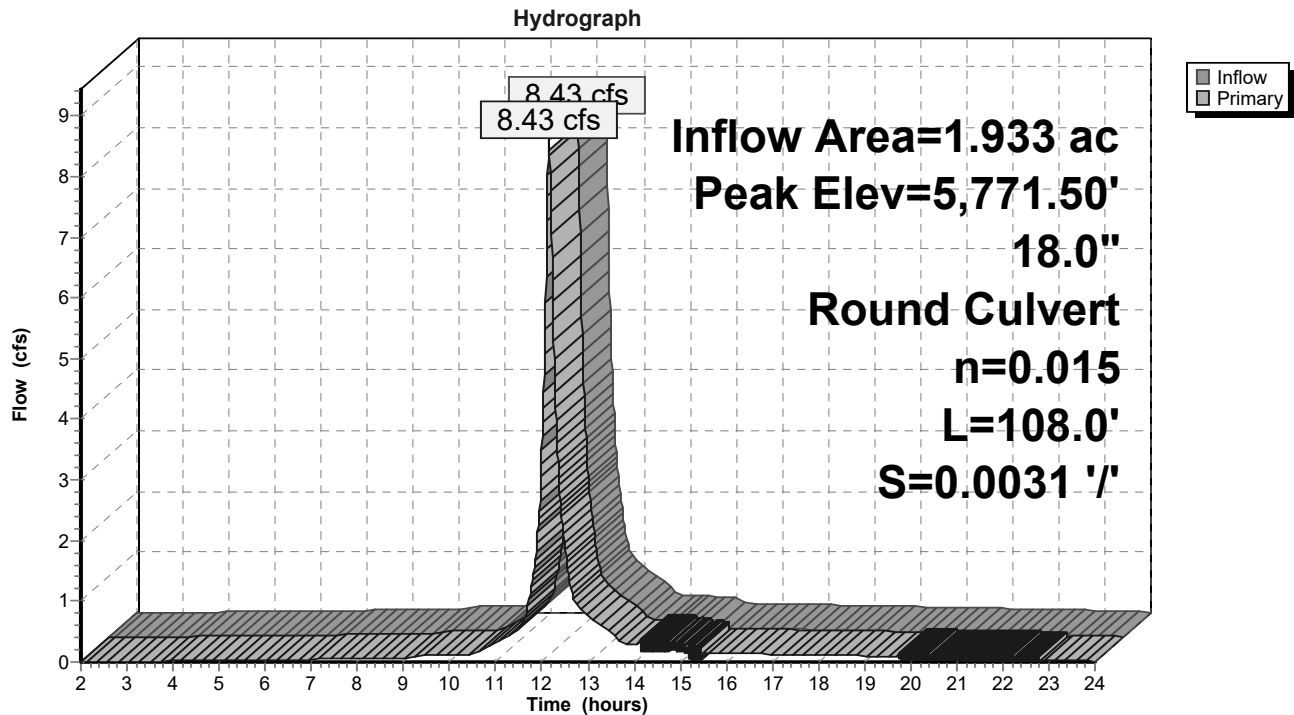
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,771.50' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=5,534.90' TW=5,658.95' (Dynamic Tailwater)
↑**1=RCP_Round 18"** (Controls 0.00 cfs)

Pond 5P: Inlet



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 3.09" for 100-yr Storm event
Inflow = 11.05 cfs @ 12.16 hrs, Volume= 0.652 af
Outflow = 11.05 cfs @ 12.16 hrs, Volume= 0.652 af, Atten= 0%, Lag= 0.0 min
Primary = 11.05 cfs @ 12.16 hrs, Volume= 0.652 af
Routed to Pond 7P : Existing Pond

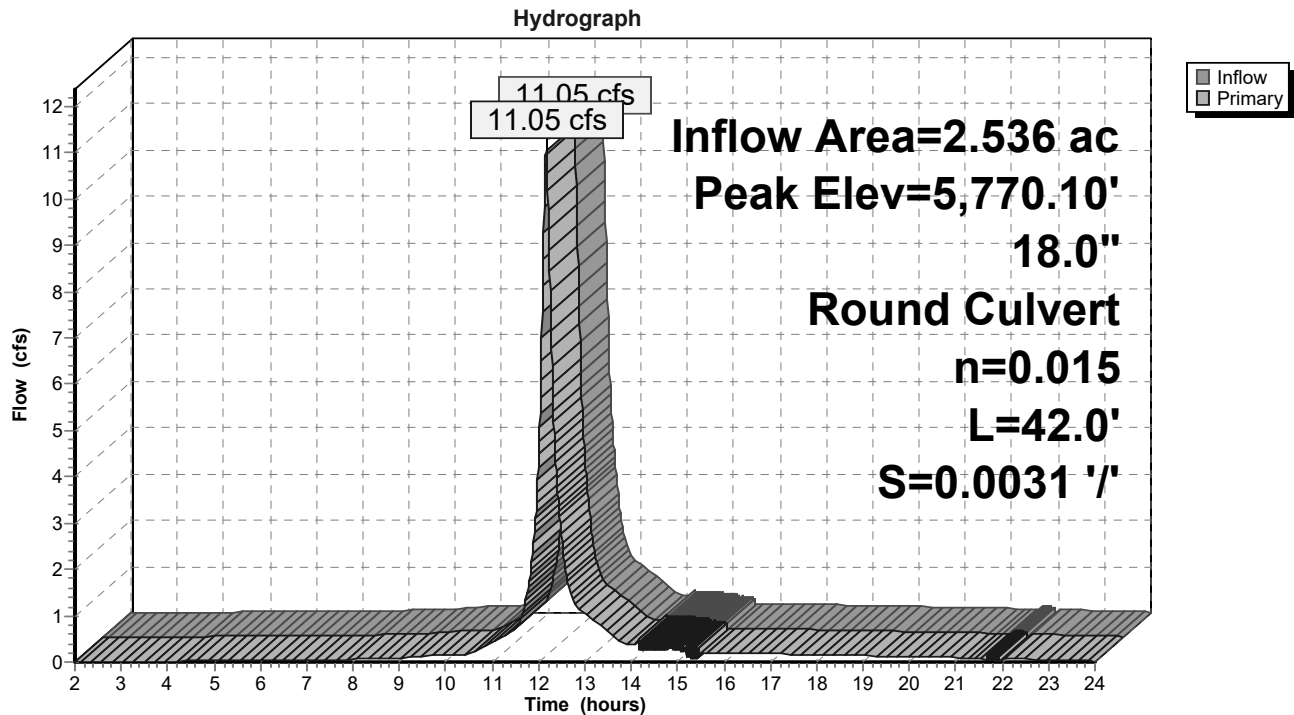
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,770.10' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=11.04 cfs @ 12.16 hrs HW=5,724.16' TW=5,722.47' (Dynamic Tailwater)
↑**1=RCP_Round 18"** (Inlet Controls 11.04 cfs @ 6.25 fps)

Pond 6P: DI



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Summary for Pond 7P: Existing Pond

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 2.82" for 100-yr Storm event
 Inflow = 35.59 cfs @ 12.15 hrs, Volume= 1.903 af
 Outflow = 56.72 cfs @ 12.16 hrs, Volume= 1.836 af, Atten= 0%, Lag= 0.5 min
 Primary = 56.72 cfs @ 12.16 hrs, Volume= 1.836 af
 Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 5,768.41' @ 12.16 hrs Surf.Area= 0.279 ac Storage= 0.347 af

Plug-Flow detention time= 38.8 min calculated for 1.836 af (96% of inflow)
 Center-of-Mass det. time= 20.2 min (812.1 - 792.0)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.347 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.007	0.004	0.004
5,524.00	0.043	0.025	0.029
5,525.00	0.157	0.100	0.129
5,526.00	0.279	0.218	0.347

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

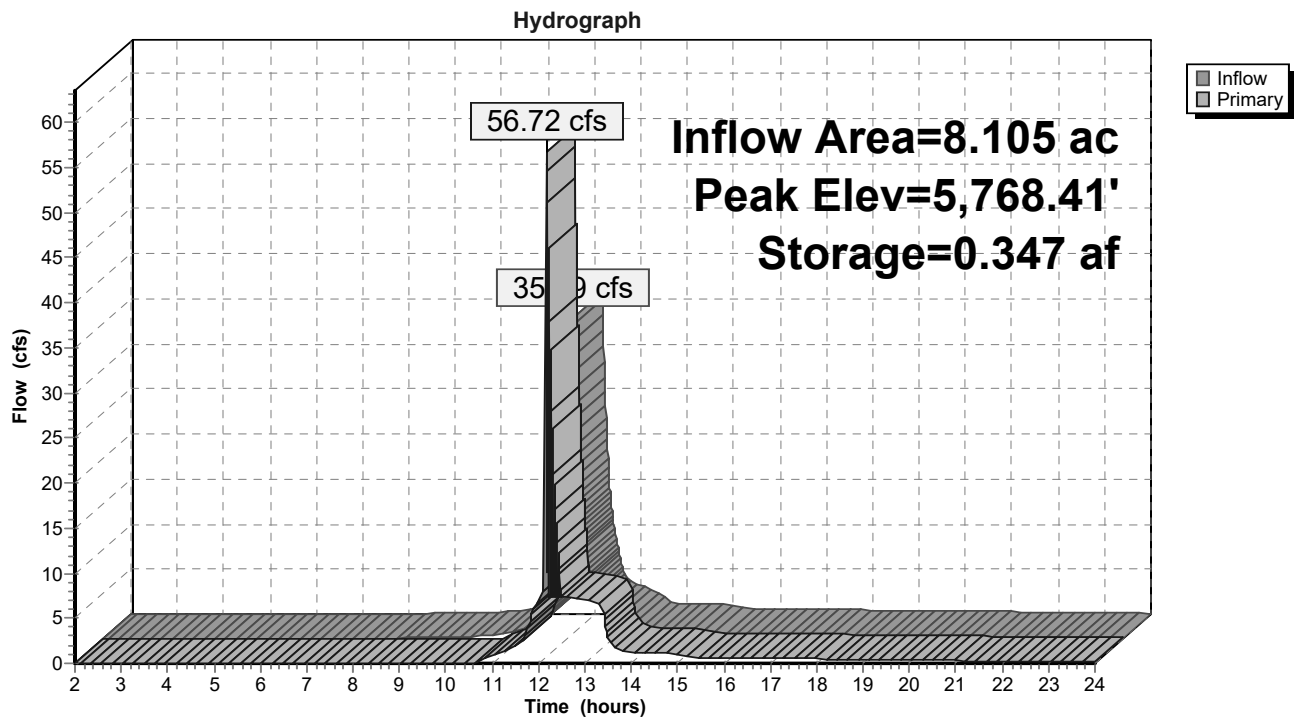
Primary OutFlow Max=56.72 cfs @ 12.16 hrs HW=5,768.41' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 56.72 cfs of 126.66 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 56.72 cfs @ 75.62 fps)

↑ **1=Orifice/Grate** (Passes 56.72 cfs of 921.18 cfs potential flow)

Pond 7P: Existing Pond



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Summary for Pond 8P: CB

Inflow Area = 2.924 ac, 37.76% Impervious, Inflow Depth > 2.85" for 100-yr Storm event
Inflow = 14.51 cfs @ 12.14 hrs, Volume= 0.695 af
Outflow = 14.51 cfs @ 12.14 hrs, Volume= 0.695 af, Atten= 0%, Lag= 0.0 min
Primary = 14.51 cfs @ 12.14 hrs, Volume= 0.695 af
Routed to Pond 7P : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

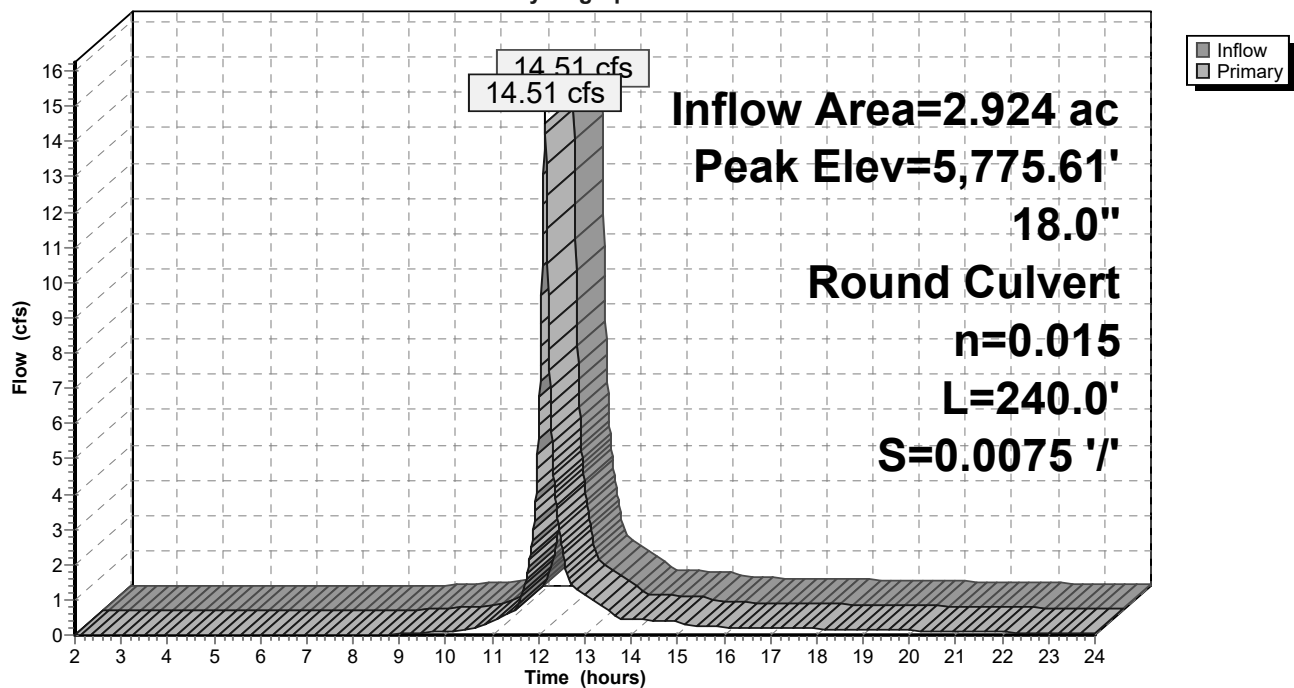
Peak Elev= 5,775.61' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=14.48 cfs @ 12.14 hrs HW=5,536.80' TW=5,529.15' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 14.48 cfs @ 8.19 fps)

Pond 8P: CB

Hydrograph



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 3.97" for 100-yr Storm event
Inflow = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af
Outflow = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min
Primary = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af
Routed to Pond 8P : CB

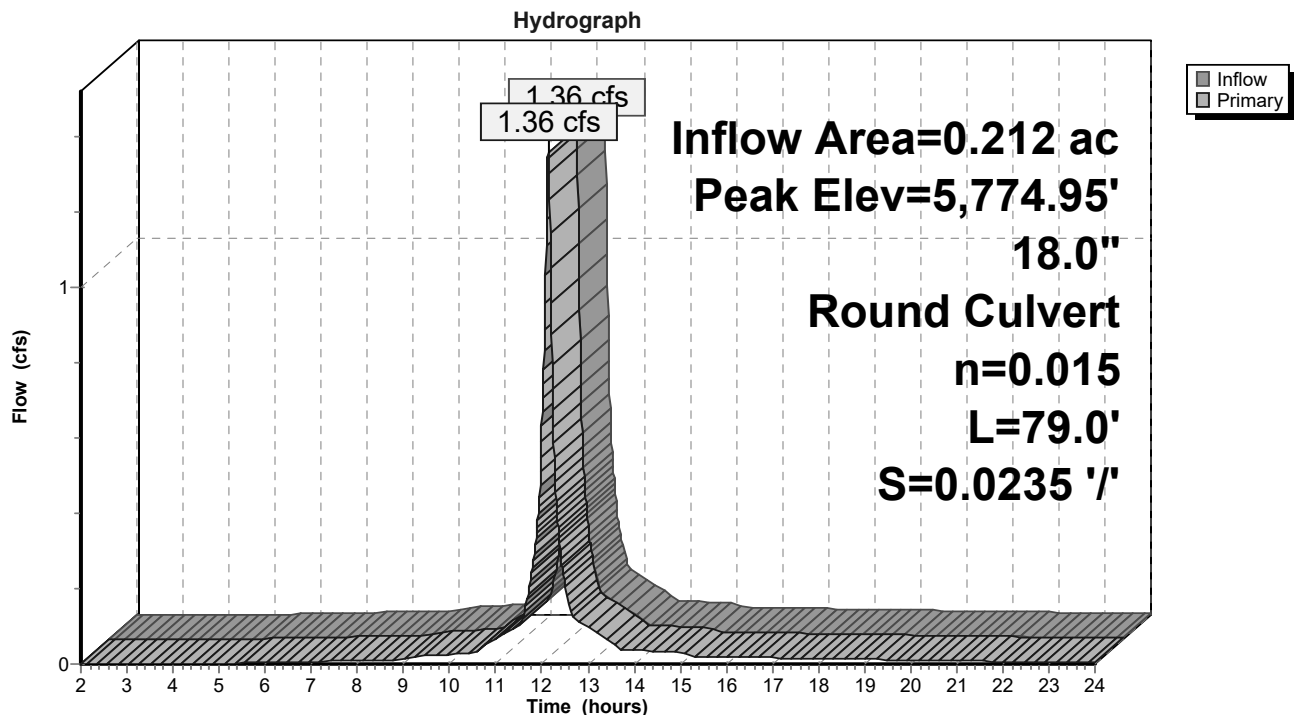
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,774.95' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=5,533.54' TW=5,533.60' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 9P: CB



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 10P: Inlet

Inflow Area = 1.971 ac, 26.28% Impervious, Inflow Depth > 2.66" for 100-yr Storm event
Inflow = 8.40 cfs @ 12.15 hrs, Volume= 0.437 af
Outflow = 8.40 cfs @ 12.15 hrs, Volume= 0.437 af, Atten= 0%, Lag= 0.0 min
Primary = 8.40 cfs @ 12.15 hrs, Volume= 0.437 af
Routed to Pond 7P : Existing Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

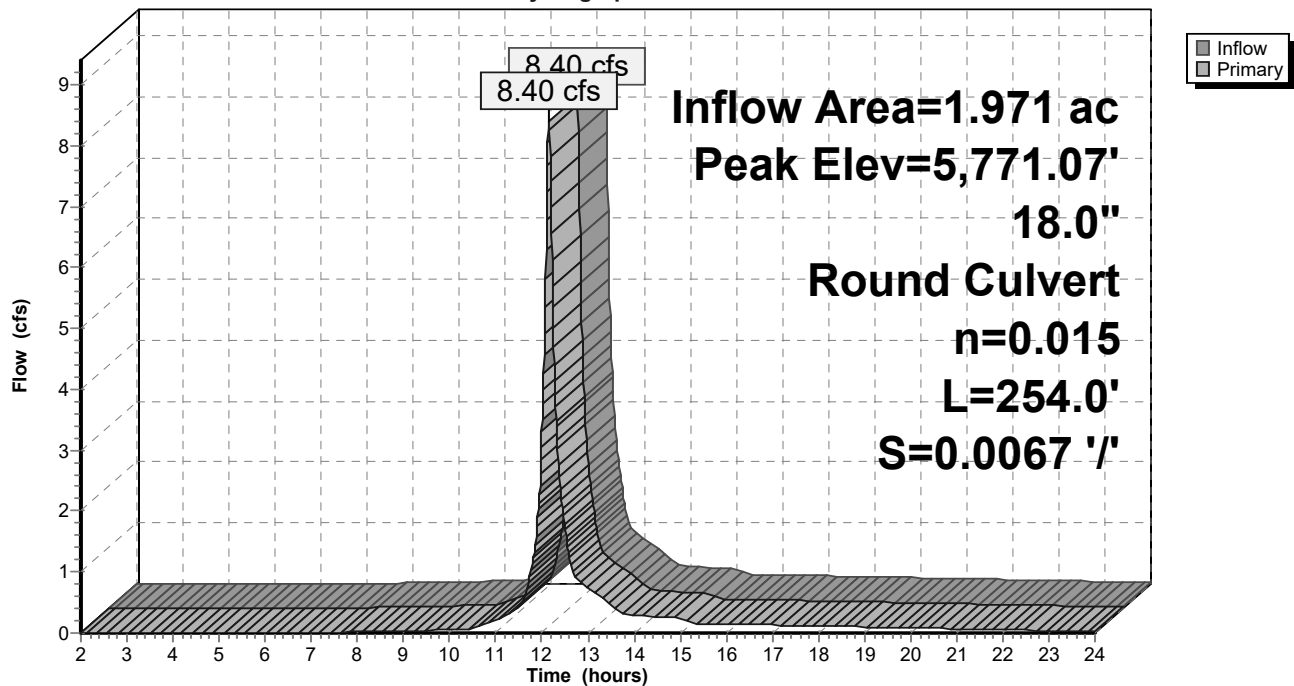
Peak Elev= 5,771.07' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=8.39 cfs @ 12.15 hrs HW=5,582.64' TW=5,579.95' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 8.39 cfs @ 4.75 fps)

Pond 10P: Inlet

Hydrograph



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 11P: Inlet

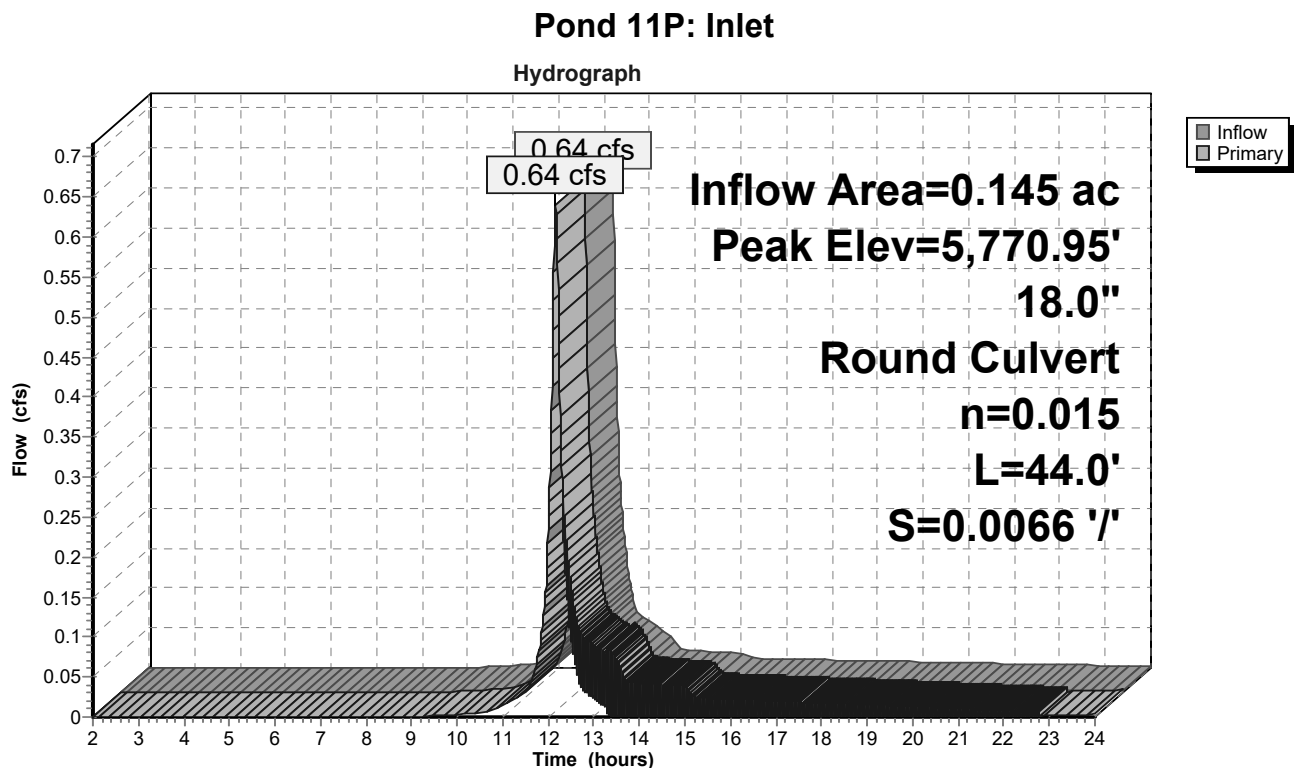
Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 2.69" for 100-yr Storm event
Inflow = 0.64 cfs @ 12.16 hrs, Volume= 0.032 af
Outflow = 0.64 cfs @ 12.16 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Primary = 0.64 cfs @ 12.16 hrs, Volume= 0.033 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs / 2

Peak Elev= 5,770.95' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

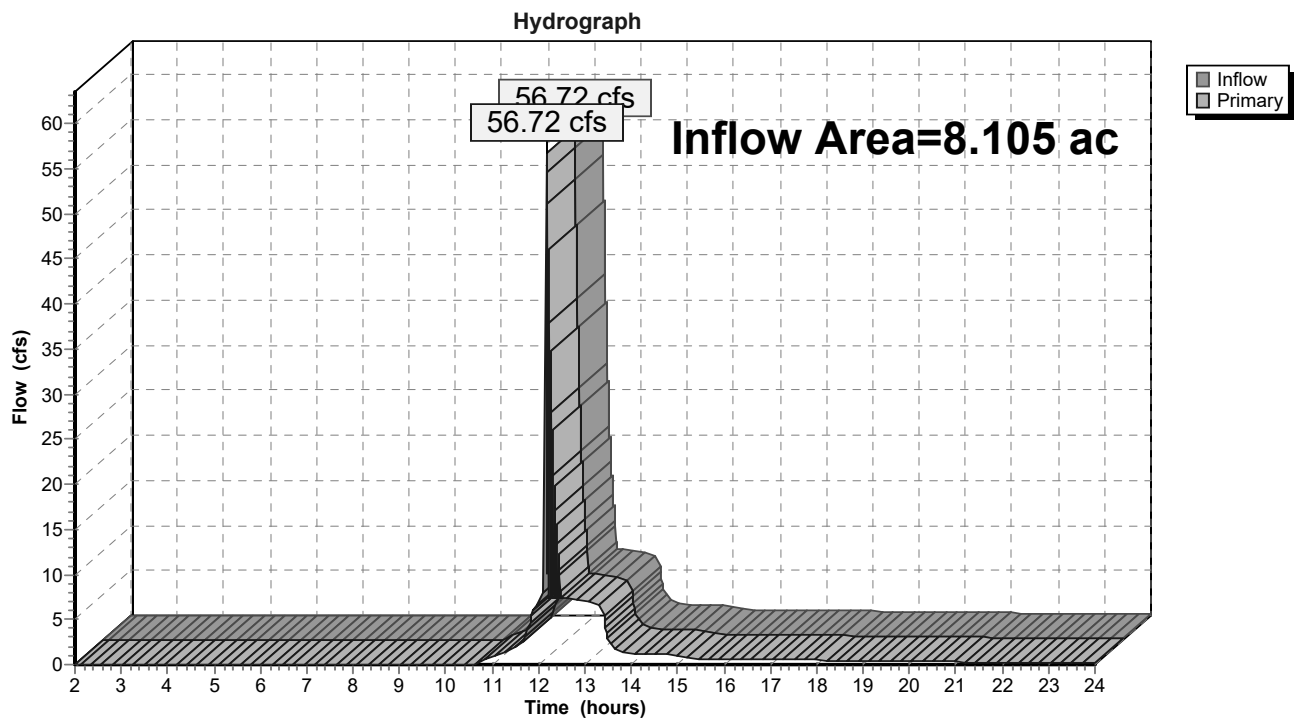
Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=5,588.01' TW=5,722.38' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)

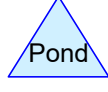
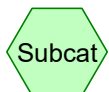
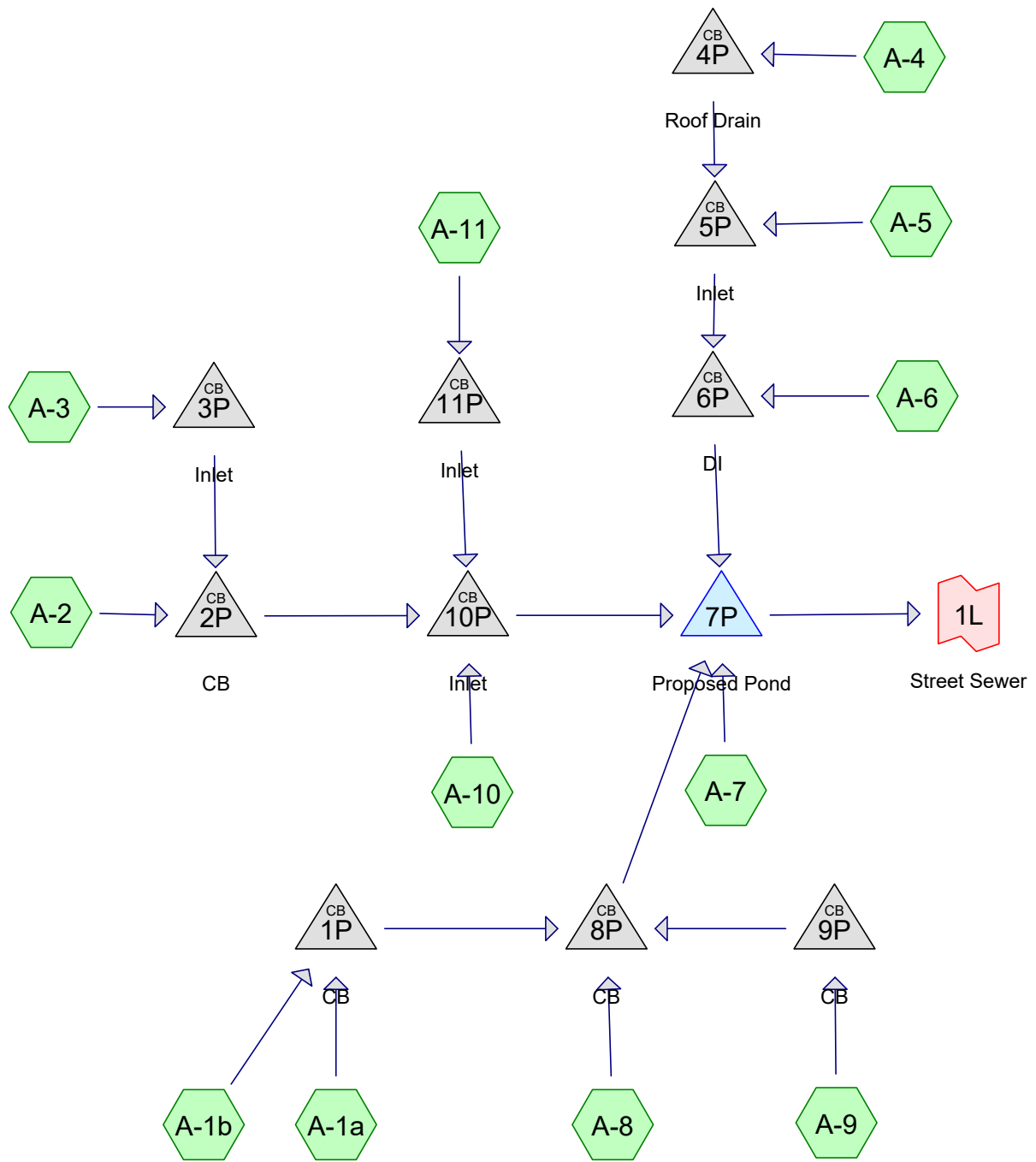


Summary for Link 1L: Street Sewer

Inflow Area = 8.105 ac, 33.86% Impervious, Inflow Depth > 2.72" for 100-yr Storm event
Inflow = 56.72 cfs @ 12.16 hrs, Volume= 1.836 af
Primary = 56.72 cfs @ 12.16 hrs, Volume= 1.836 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer



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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr Storm	MSE 24-hr	3	Default	24.00	1	1.82	2
2	5-yr Storm	MSE 24-hr	3	Default	24.00	1	2.35	2
3	10-yr Storm	MSE 24-hr	3	Default	24.00	1	2.82	2
4	50-yr Storm	MSE 24-hr	3	Default	24.00	1	4.07	2
5	100-yr Storm	MSE 24-hr	3	Default	24.00	1	4.66	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.022	86	<50% Grass cover, Poor, HSG C (A-10)
4.847	74	>75% Grass cover, Good, HSG C (A-11, A-1a, A-1b, A-2, A-3, A-5, A-6, A-7, A-8, A-9)
0.177	96	Gravel surface, HSG C (A-1a, A-1b)
2.380	98	Paved parking, HSG C (A-10, A-11, A-1a, A-1b, A-2, A-5, A-6, A-7, A-8, A-9)
0.697	98	Roofs, HSG C (A-4)
8.123	84	TOTAL AREA

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-10:

Runoff = 0.57 cfs @ 12.14 hrs, Volume= 0.029 af, Depth> 1.49"
Routed to Pond 10P : Inlet

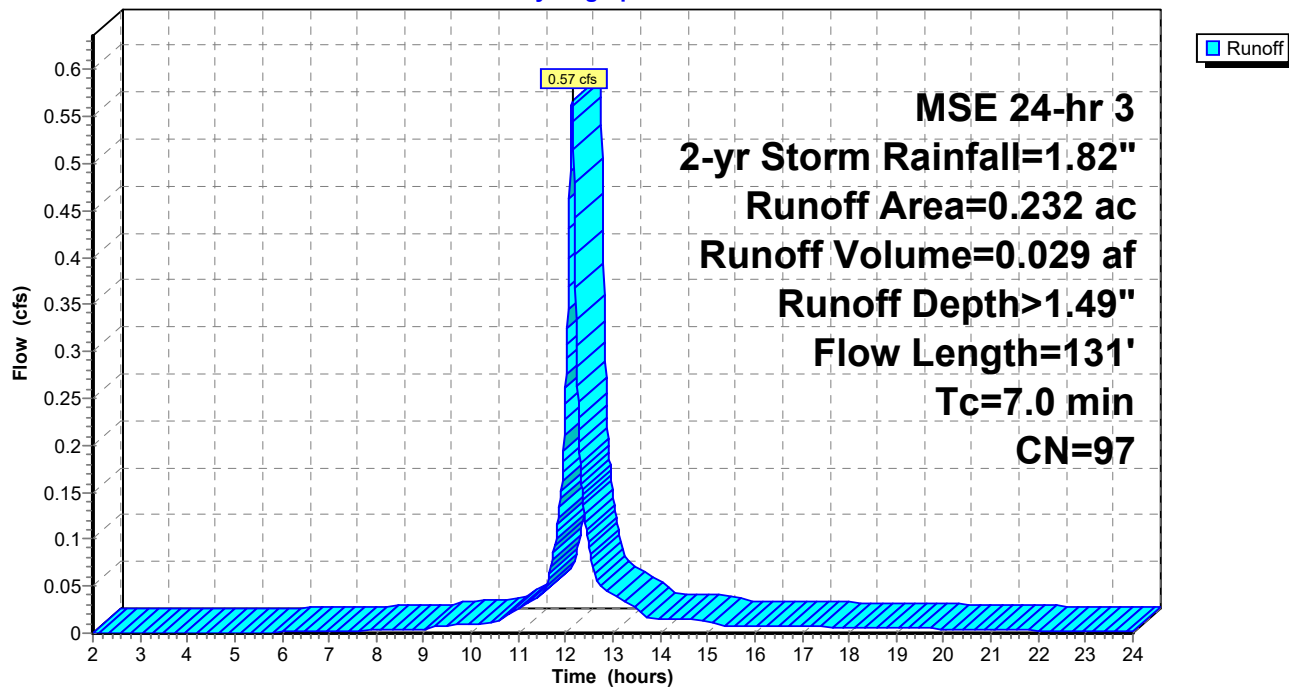
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-11:

Runoff = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af, Depth> 0.49"
Routed to Pond 11P : Inlet

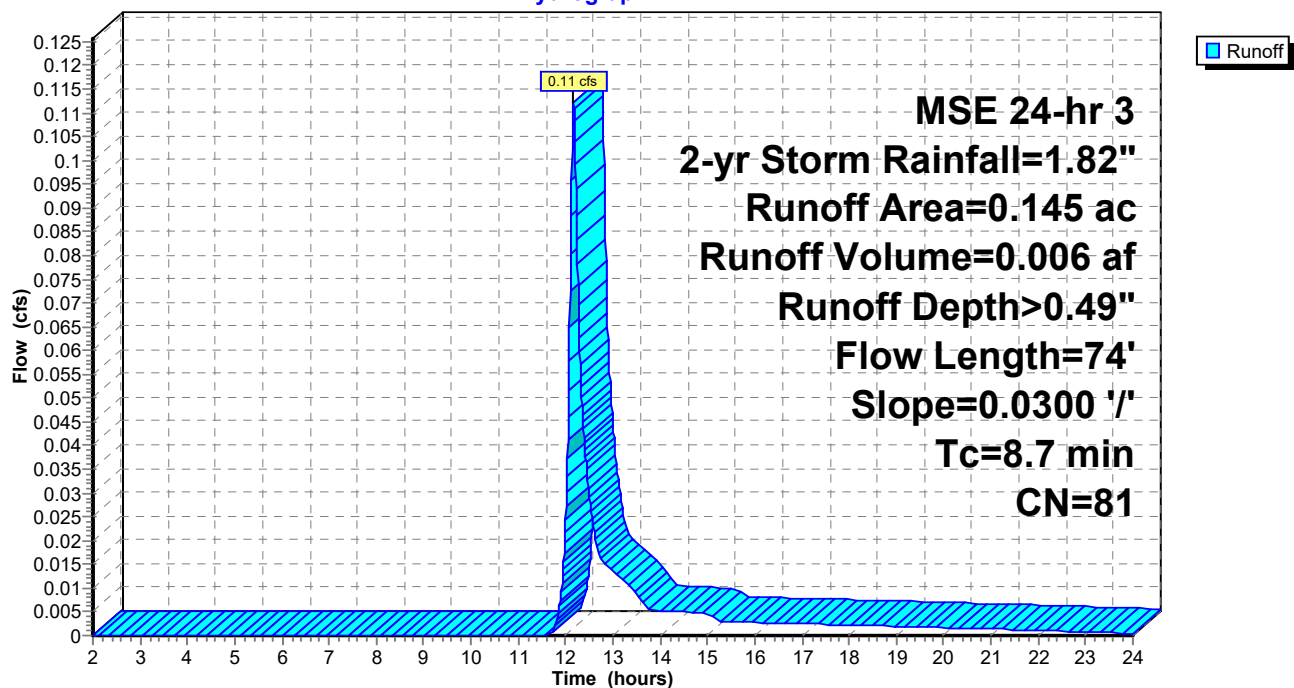
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-1a:

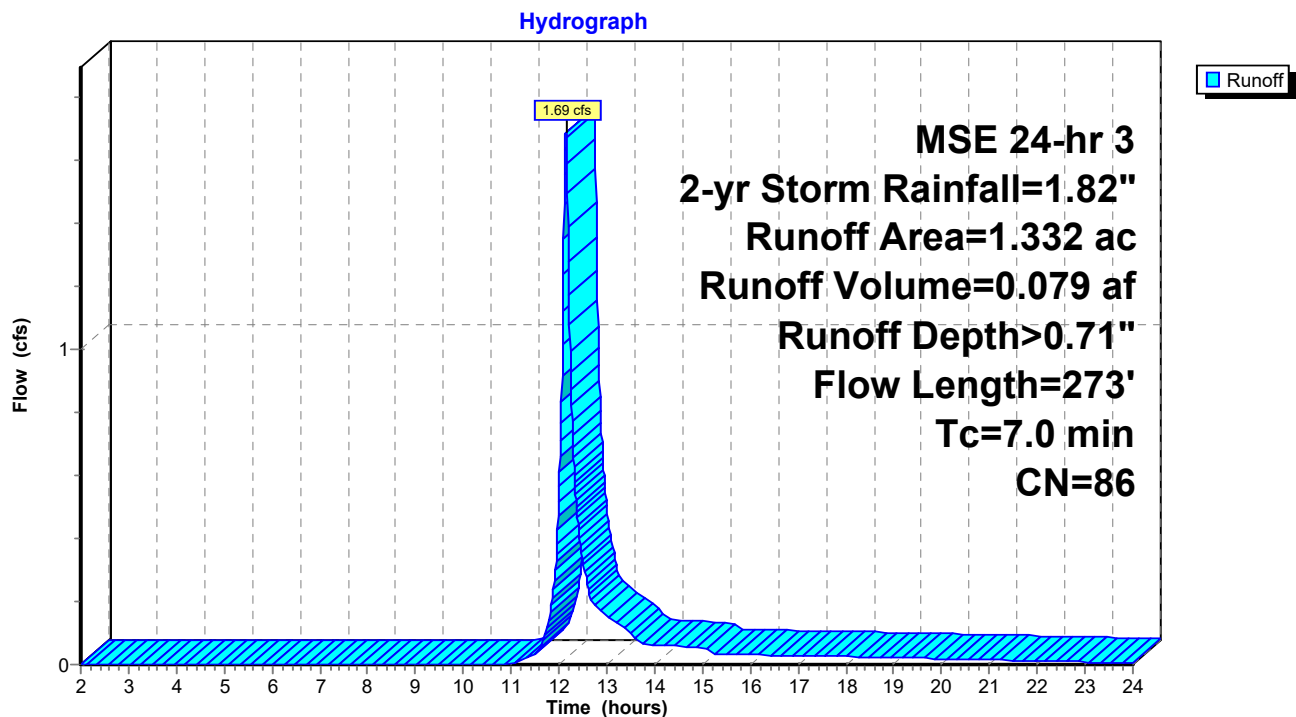
Runoff = 1.69 cfs @ 12.15 hrs, Volume= 0.079 af, Depth> 0.71"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.596	98	Paved parking, HSG C
0.674	74	>75% Grass cover, Good, HSG C
0.062	96	Gravel surface, HSG C
1.332	86	Weighted Average
0.736		55.26% Pervious Area
0.596		44.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	273		0.65		Direct Entry, Minimum

Subcatchment A-1a:



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-1b:

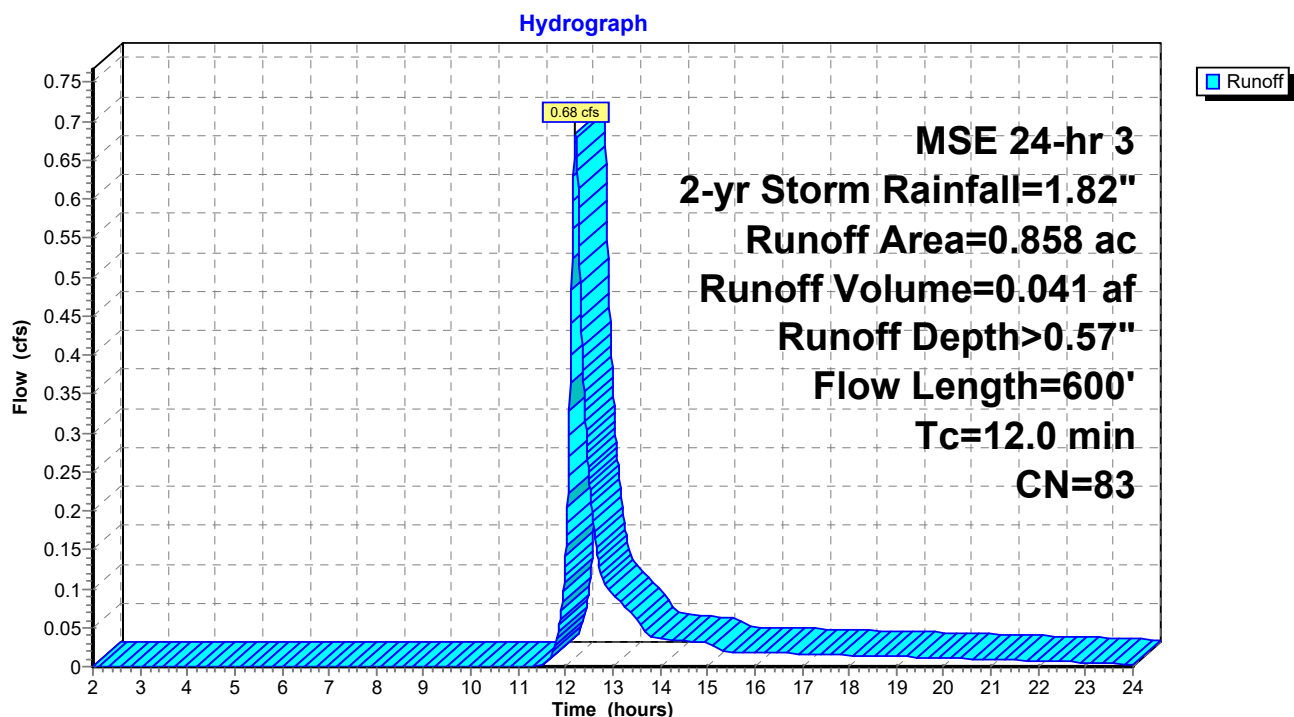
Runoff = 0.68 cfs @ 12.21 hrs, Volume= 0.041 af, Depth> 0.57"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.222	98	Paved parking, HSG C
0.115	96	Gravel surface, HSG C
0.521	74	>75% Grass cover, Good, HSG C
0.858	83	Weighted Average
0.636		74.13% Pervious Area
0.222		25.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	73	0.1096	0.24		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
5.2	297	0.0185	0.95		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	230	0.0130	2.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.0	600	Total			

Subcatchment A-1b:



StandleyLake_Prop2

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-2:

Runoff = 0.72 cfs @ 12.18 hrs, Volume= 0.039 af, Depth> 0.62"
Routed to Pond 2P : CB

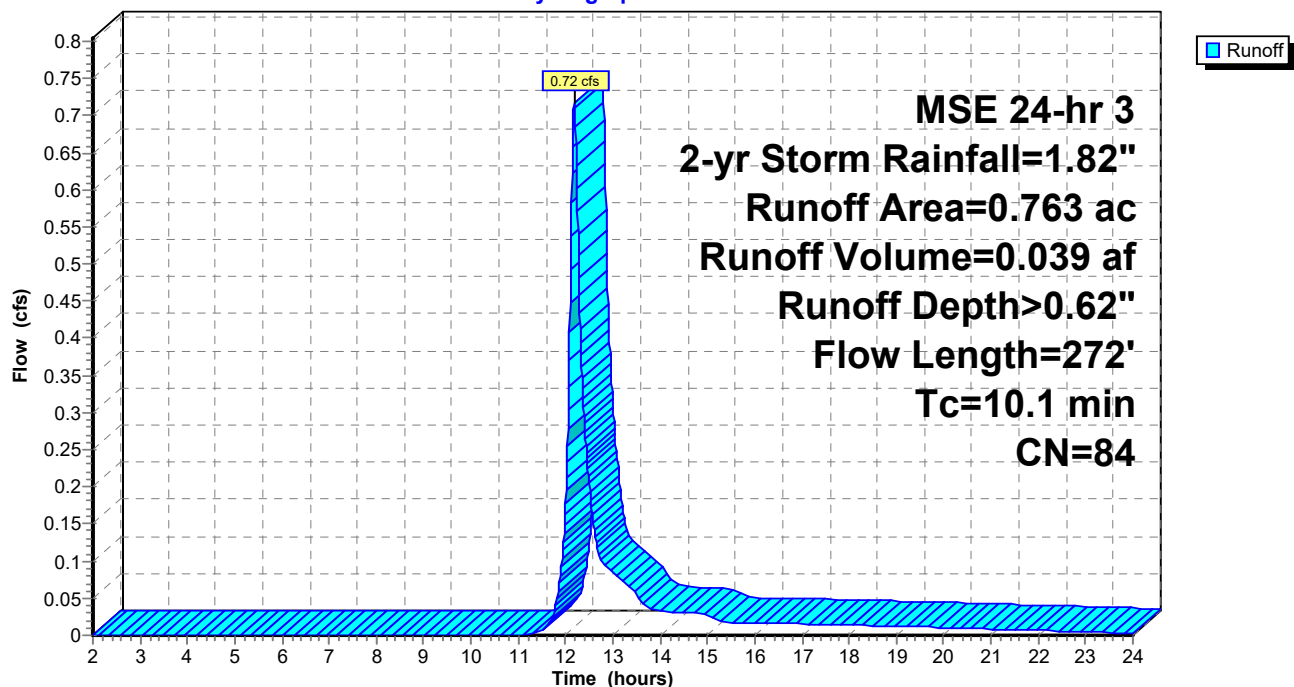
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.321	98	Paved parking, HSG C
0.442	74	>75% Grass cover, Good, HSG C
0.763	84	Weighted Average
0.442		57.93% Pervious Area
0.321		42.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	139	0.0899	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
0.8	133	0.0188	2.78		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.1	272	Total			

Subcatchment A-2:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-3:

Runoff = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af, Depth> 0.27"
Routed to Pond 3P : Inlet

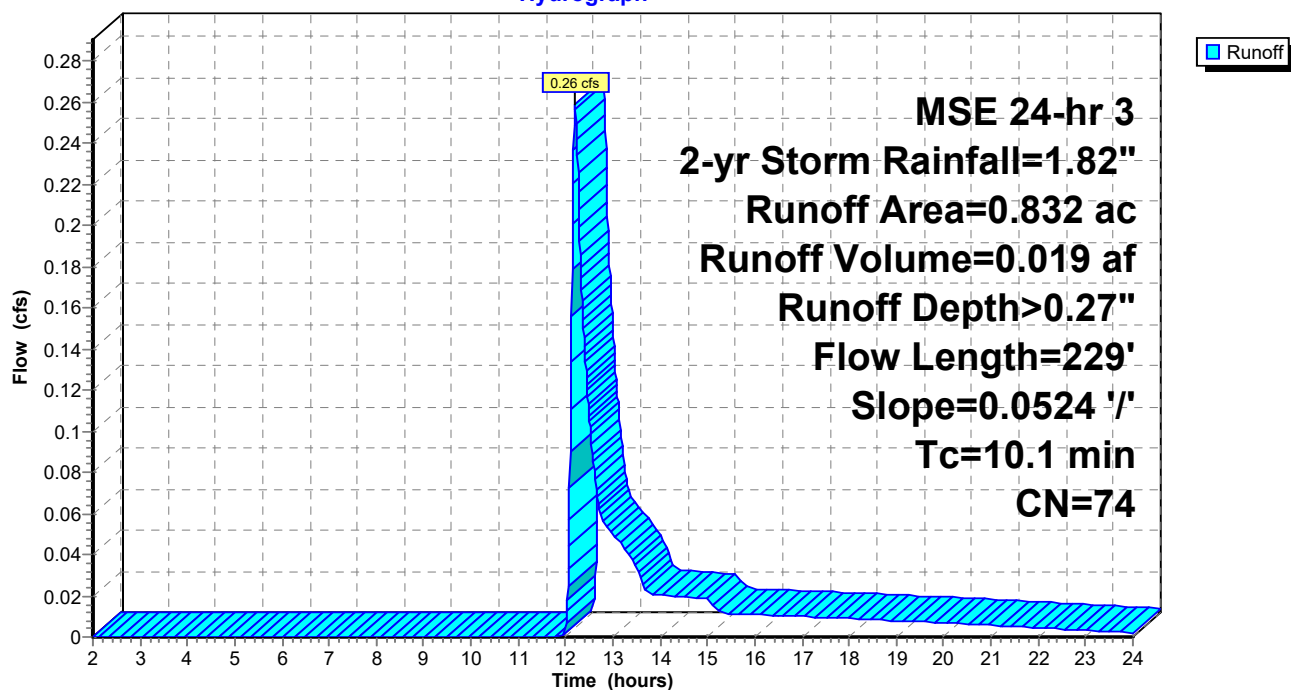
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-4:

Runoff = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af, Depth> 1.60"
Routed to Pond 4P : Roof Drain

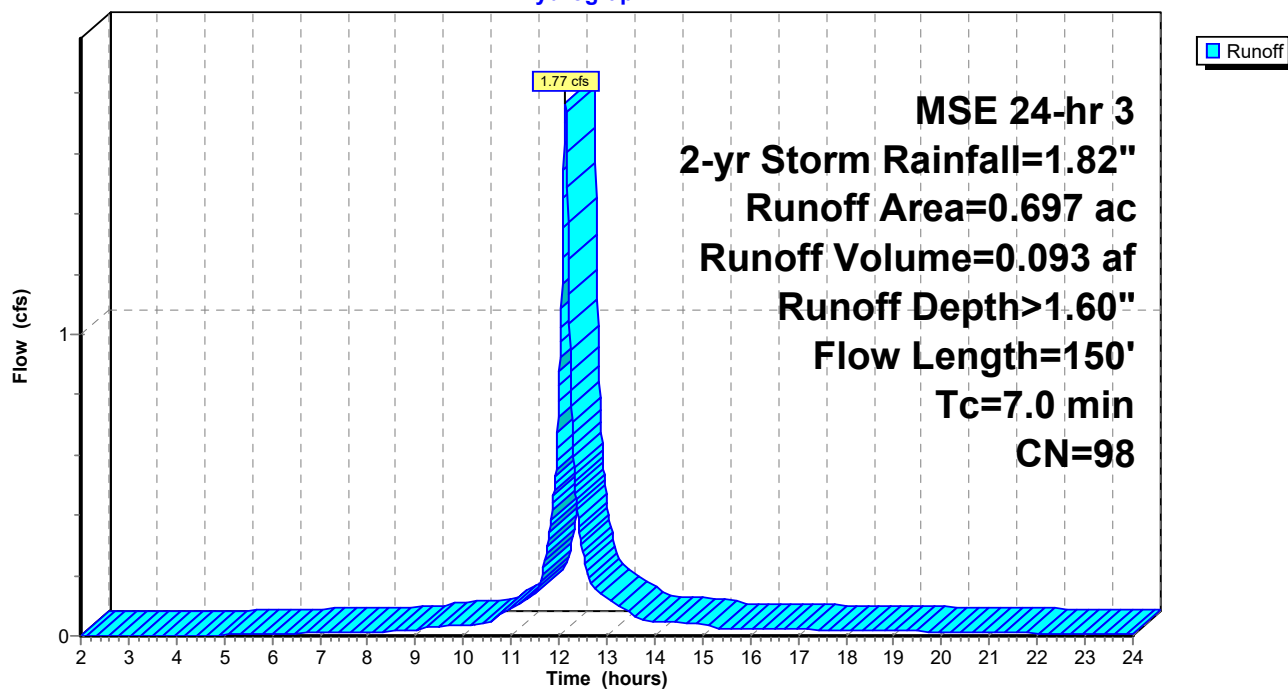
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-5:

Runoff = 0.49 cfs @ 12.21 hrs, Volume= 0.033 af, Depth> 0.32"
Routed to Pond 5P : Inlet

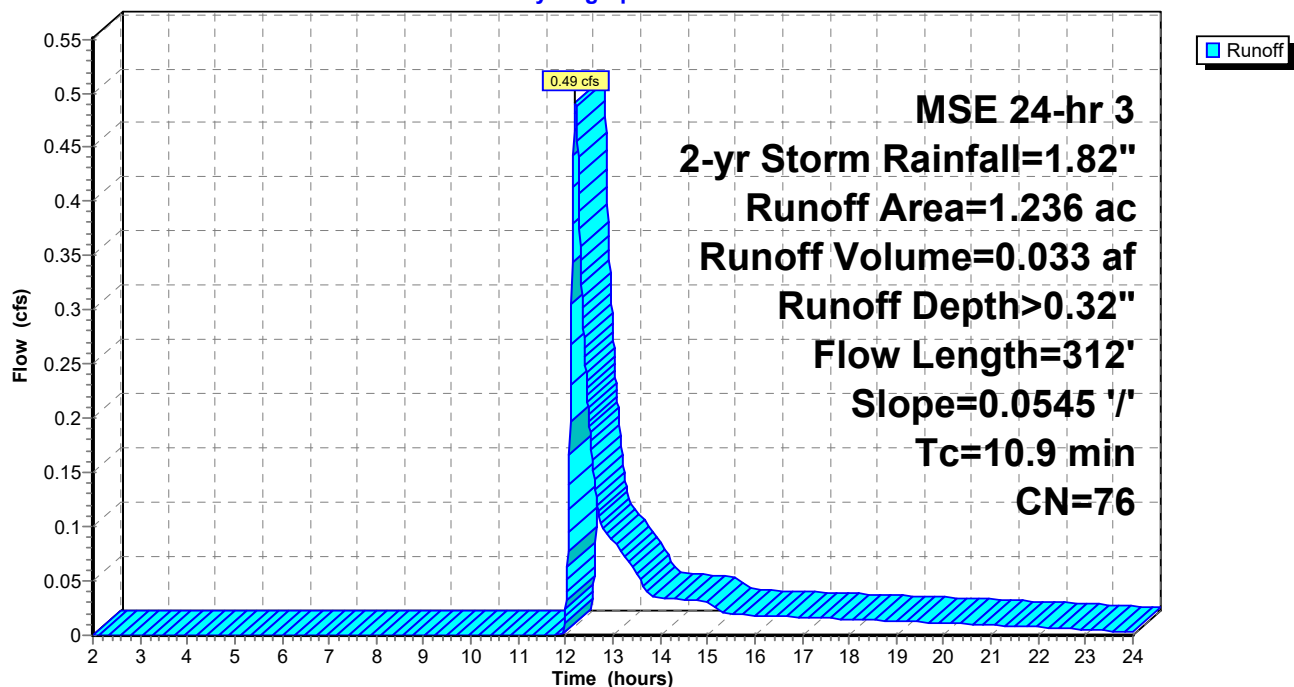
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-6:

Runoff = 0.67 cfs @ 12.20 hrs, Volume= 0.039 af, Depth> 0.77"
Routed to Pond 6P : DI

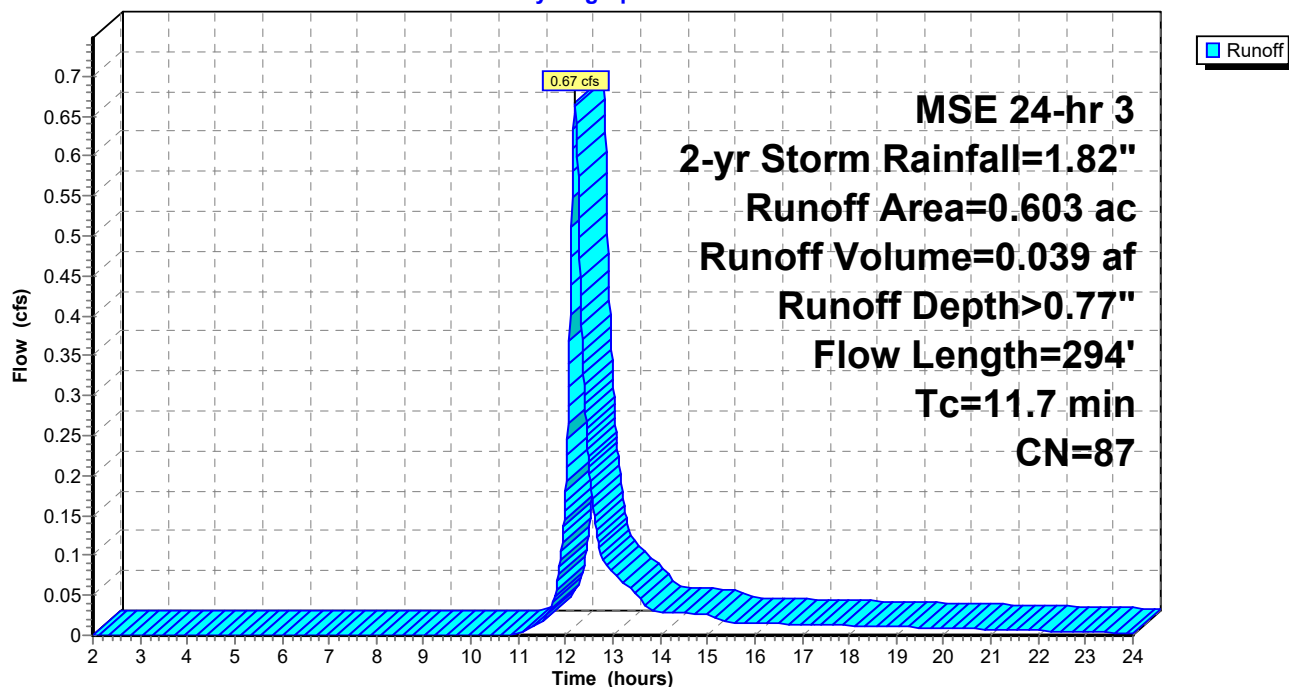
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-7:

Runoff = 0.26 cfs @ 12.22 hrs, Volume= 0.018 af, Depth> 0.32"
Routed to Pond 7P : Proposed Pond

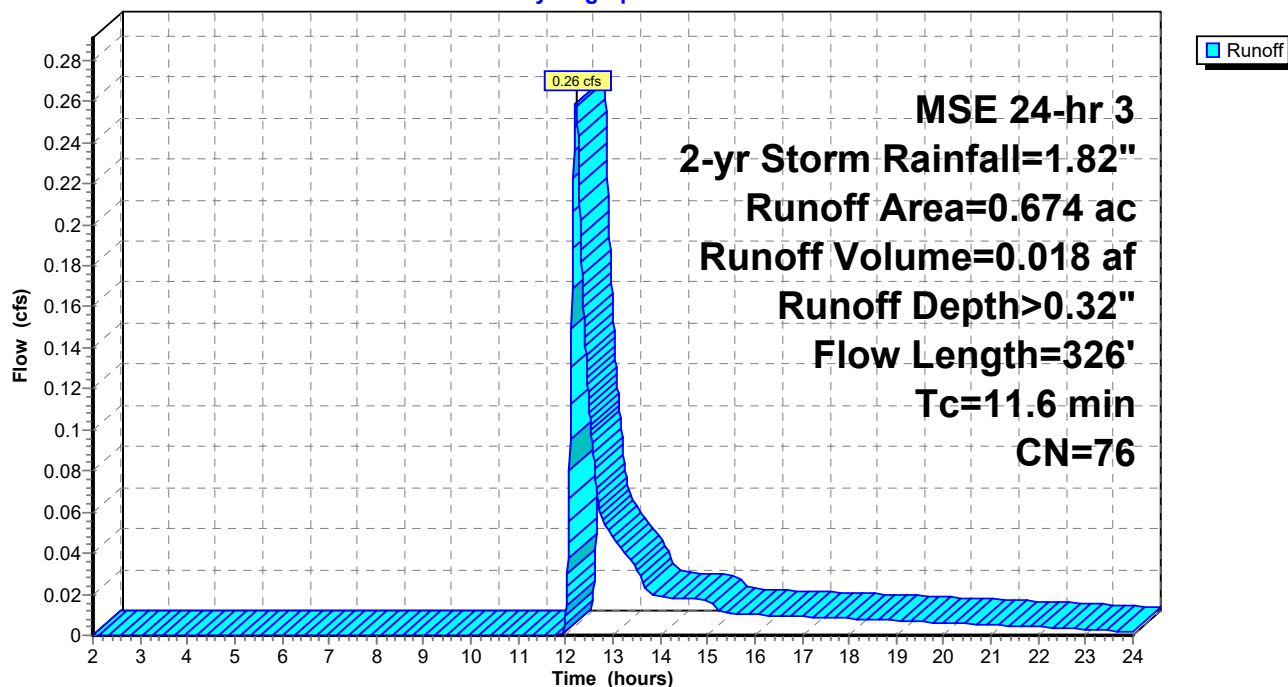
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.631	74	>75% Grass cover, Good, HSG C
0.043	98	Paved parking, HSG C
0.674	76	Weighted Average
0.631		93.62% Pervious Area
0.043		6.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-8:

Runoff = 0.85 cfs @ 12.15 hrs, Volume= 0.040 af, Depth> 0.88"
Routed to Pond 8P : CB

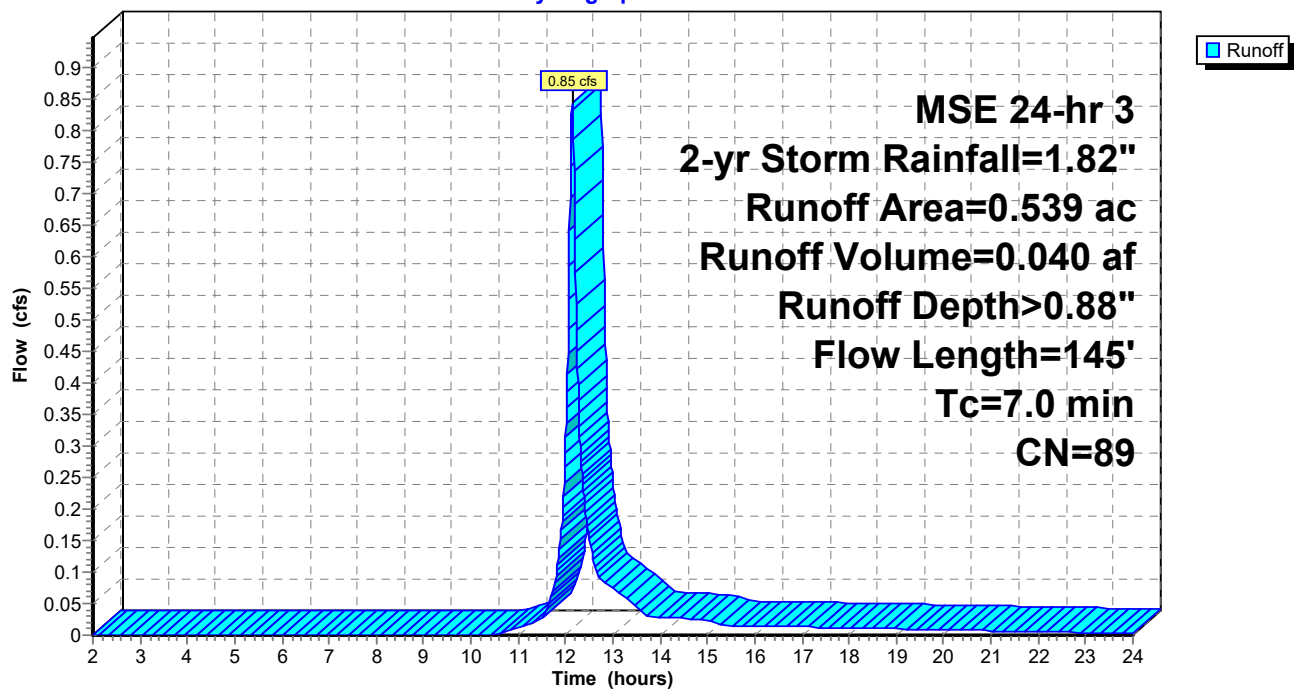
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Subcatchment A-9:

Runoff = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af, Depth> 1.23"
Routed to Pond 9P : CB

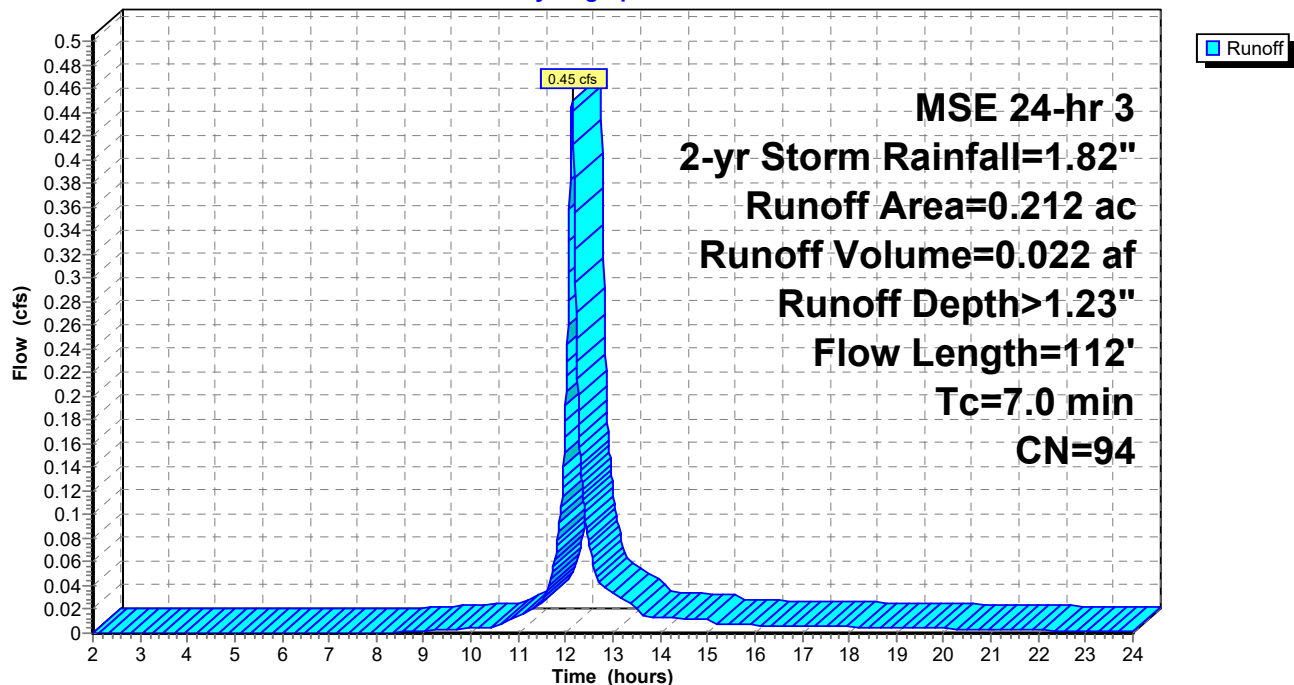
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Storm Rainfall=1.82"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 1P: CB

Inflow Area = 2.190 ac, 37.35% Impervious, Inflow Depth > 0.66" for 2-yr Storm event
Inflow = 2.26 cfs @ 12.16 hrs, Volume= 0.120 af
Outflow = 2.26 cfs @ 12.16 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min
Primary = 2.26 cfs @ 12.16 hrs, Volume= 0.120 af
Routed to Pond 8P : CB

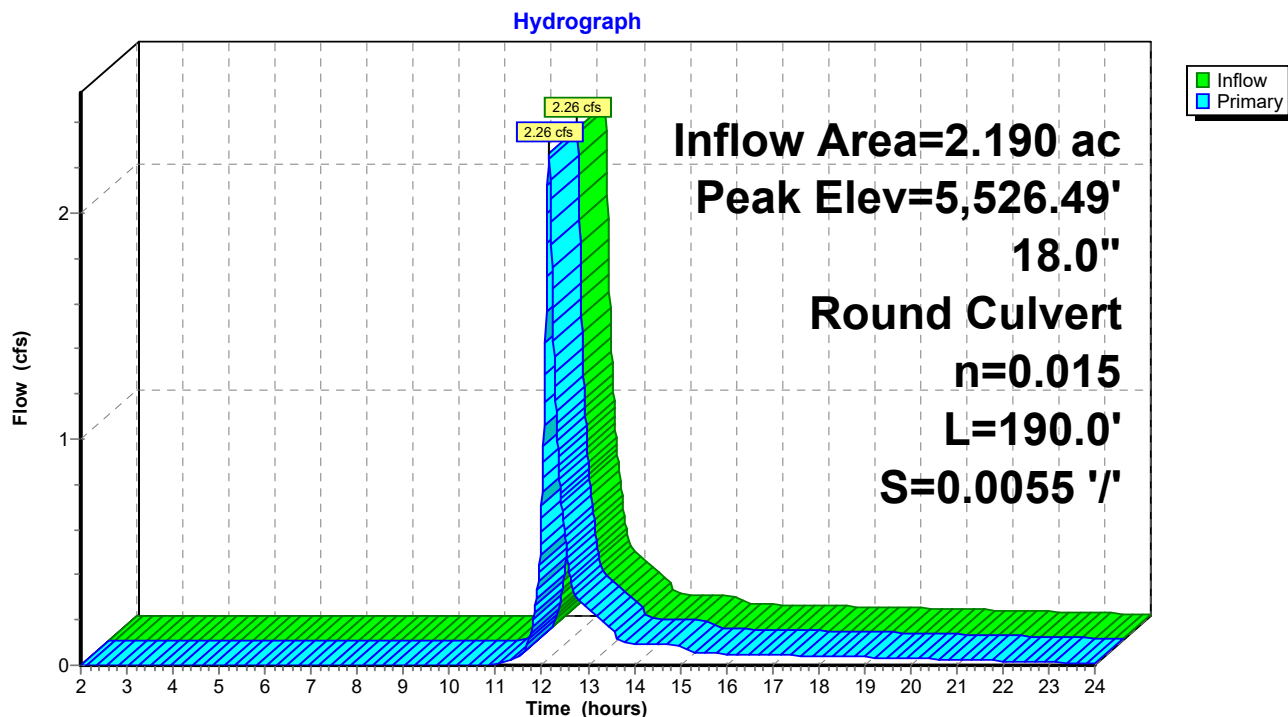
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.49' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.24 cfs @ 12.16 hrs HW=5,526.49' TW=5,525.63' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.24 cfs @ 2.90 fps)

Pond 1P: CB



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Summary for Pond 2P: CB

Inflow Area = 1.595 ac, 20.13% Impervious, Inflow Depth > 0.44" for 2-yr Storm event
Inflow = 0.97 cfs @ 12.19 hrs, Volume= 0.058 af
Outflow = 0.97 cfs @ 12.19 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.19 hrs, Volume= 0.058 af
Routed to Pond 10P : Inlet

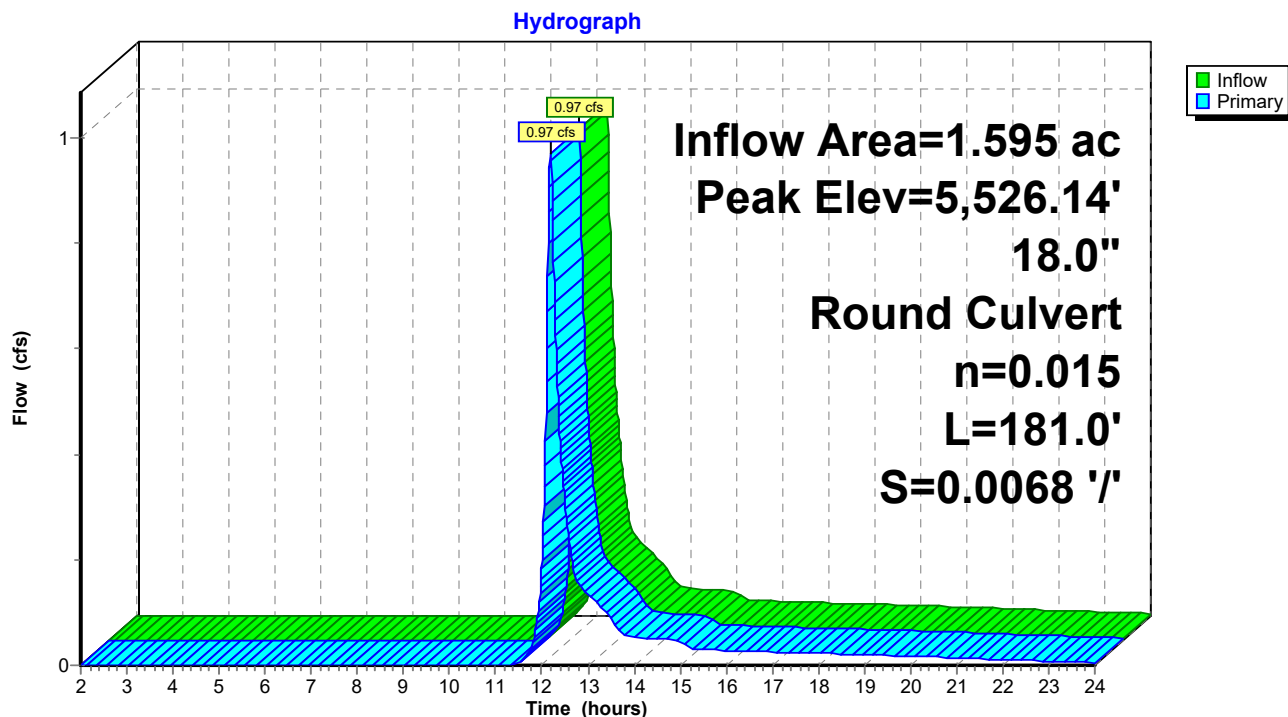
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.14' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.97 cfs @ 12.19 hrs HW=5,526.14' TW=5,525.21' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.97 cfs @ 2.49 fps)

Pond 2P: CB



StandleyLake_Prop2

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 0.27" for 2-yr Storm event
Inflow = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af
Outflow = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.20 hrs, Volume= 0.019 af
Routed to Pond 2P : CB

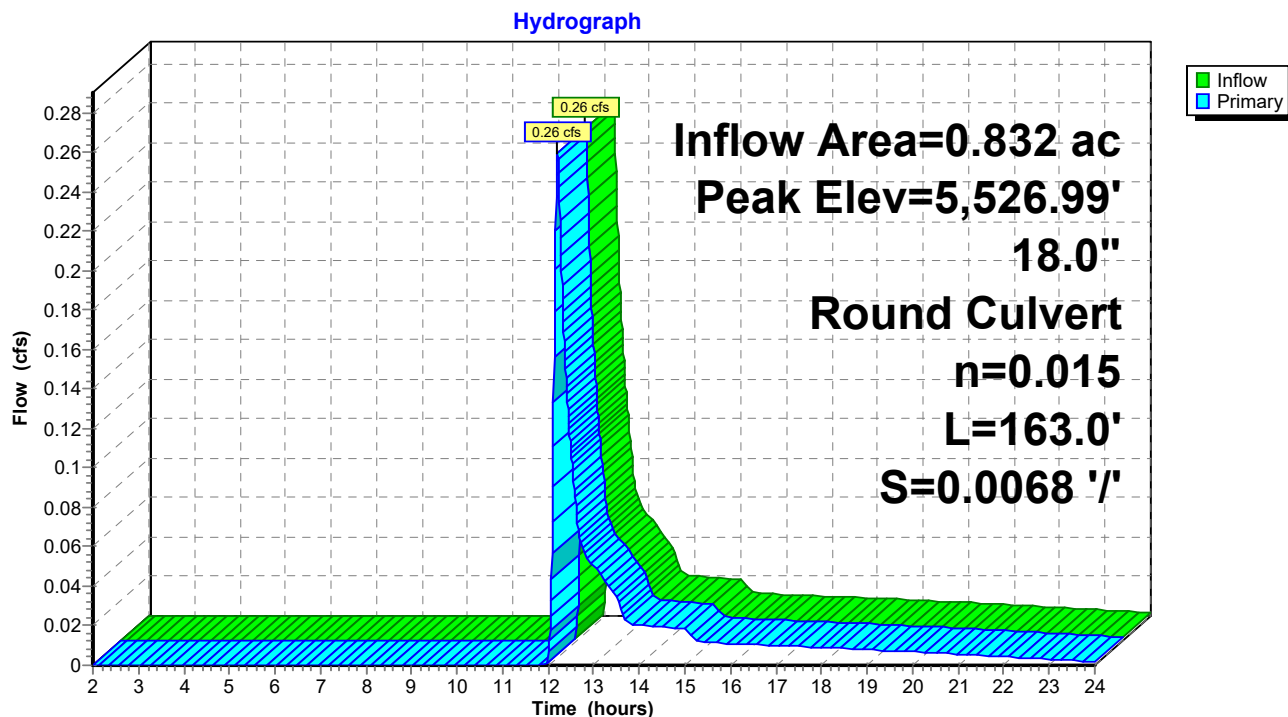
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.99' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.26 cfs @ 12.20 hrs HW=5,526.99' TW=5,526.14' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.26 cfs @ 1.75 fps)

Pond 3P: Inlet



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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 1.60" for 2-yr Storm event
Inflow = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af
Outflow = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.77 cfs @ 12.14 hrs, Volume= 0.093 af
Routed to Pond 5P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

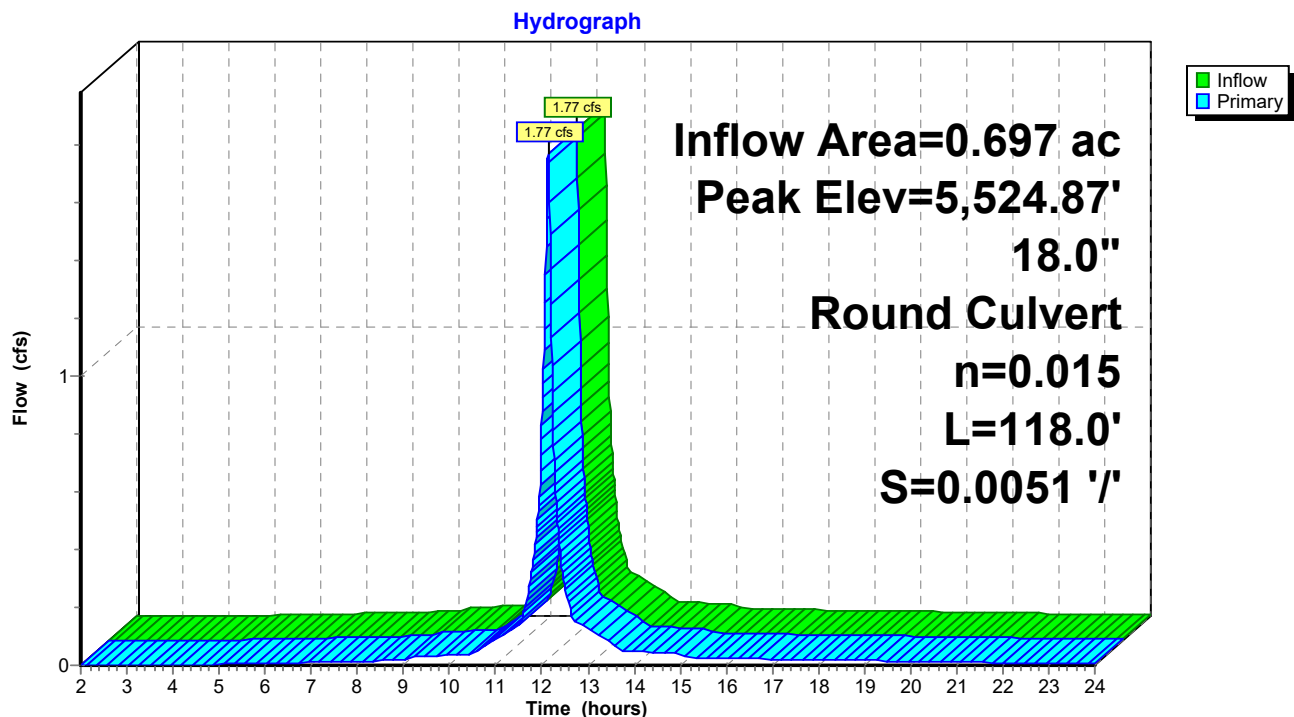
Peak Elev= 5,524.87' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 ' S= 0.0051 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.63 cfs @ 12.14 hrs HW=5,524.82' TW=5,524.52' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 1.63 cfs @ 2.05 fps)

Pond 4P: Roof Drain



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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 0.78" for 2-yr Storm event
Inflow = 2.13 cfs @ 12.15 hrs, Volume= 0.126 af
Outflow = 2.13 cfs @ 12.15 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min
Primary = 2.13 cfs @ 12.15 hrs, Volume= 0.126 af
Routed to Pond 6P : DI

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

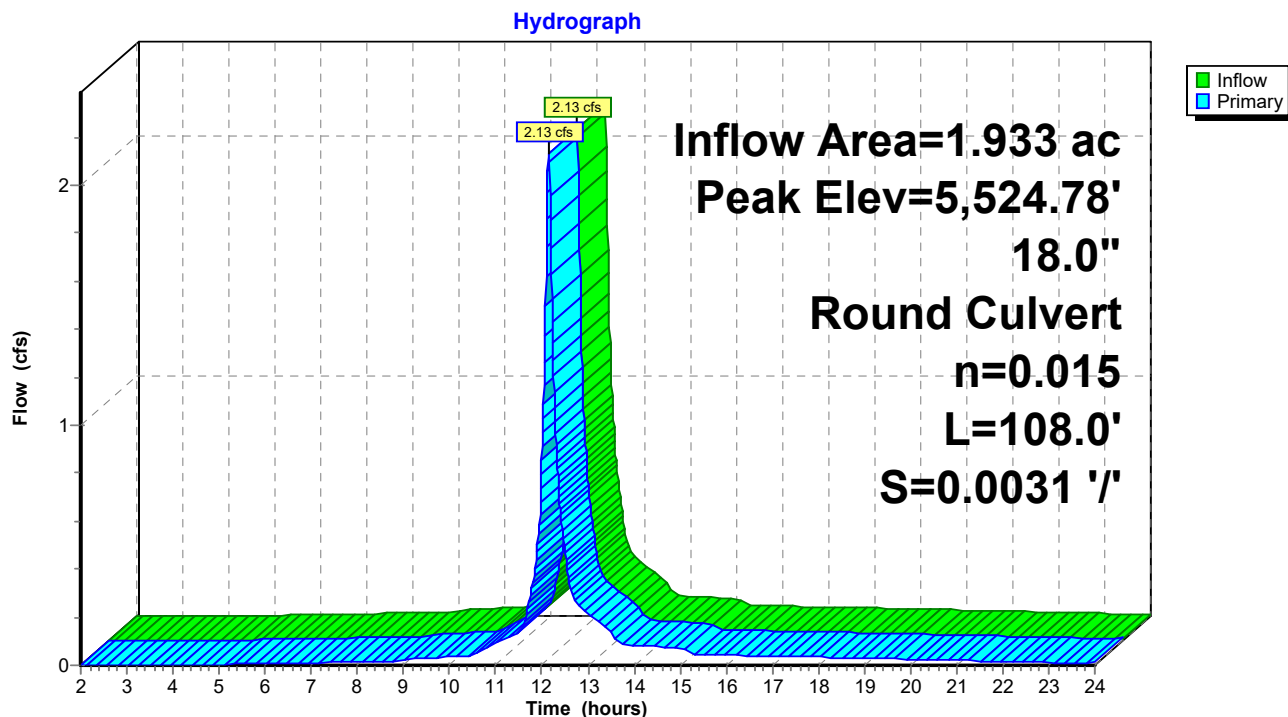
Peak Elev= 5,524.78' @ 12.26 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 ' S= 0.0031 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.51 cfs @ 12.15 hrs HW=5,524.57' TW=5,524.51' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 1.51 cfs @ 0.98 fps)

Pond 5P: Inlet



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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 0.78" for 2-yr Storm event
Inflow = 2.72 cfs @ 12.16 hrs, Volume= 0.165 af
Outflow = 2.72 cfs @ 12.16 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min
Primary = 2.72 cfs @ 12.16 hrs, Volume= 0.165 af
Routed to Pond 7P : Proposed Pond

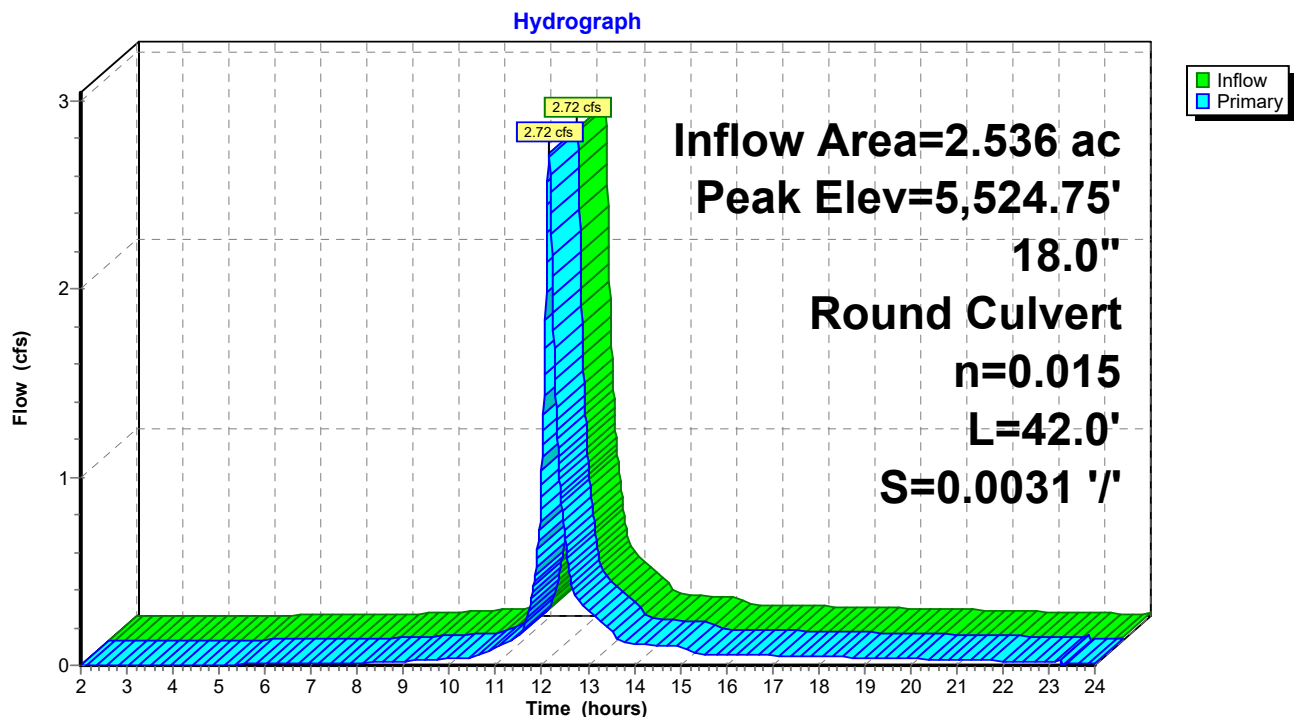
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,524.75' @ 12.26 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.00 cfs @ 12.16 hrs HW=5,524.55' TW=5,524.49' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 2.00 cfs @ 1.13 fps)

Pond 6P: DI



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Summary for Pond 7P: Proposed Pond

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 0.68" for 2-yr Storm event
Inflow = 8.01 cfs @ 12.16 hrs, Volume= 0.457 af
Outflow = 4.61 cfs @ 12.28 hrs, Volume= 0.327 af, Atten= 42%, Lag= 7.4 min
Primary = 4.61 cfs @ 12.28 hrs, Volume= 0.327 af
Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 5,524.72' @ 12.28 hrs Surf.Area= 0.170 ac Storage= 0.163 af

Plug-Flow detention time= 131.9 min calculated for 0.327 af (72% of inflow)
Center-of-Mass det. time= 51.8 min (863.9 - 812.1)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.464 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.026	0.013	0.013
5,524.00	0.088	0.057	0.070
5,525.00	0.203	0.146	0.216
5,526.00	0.293	0.248	0.464

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 ' / ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

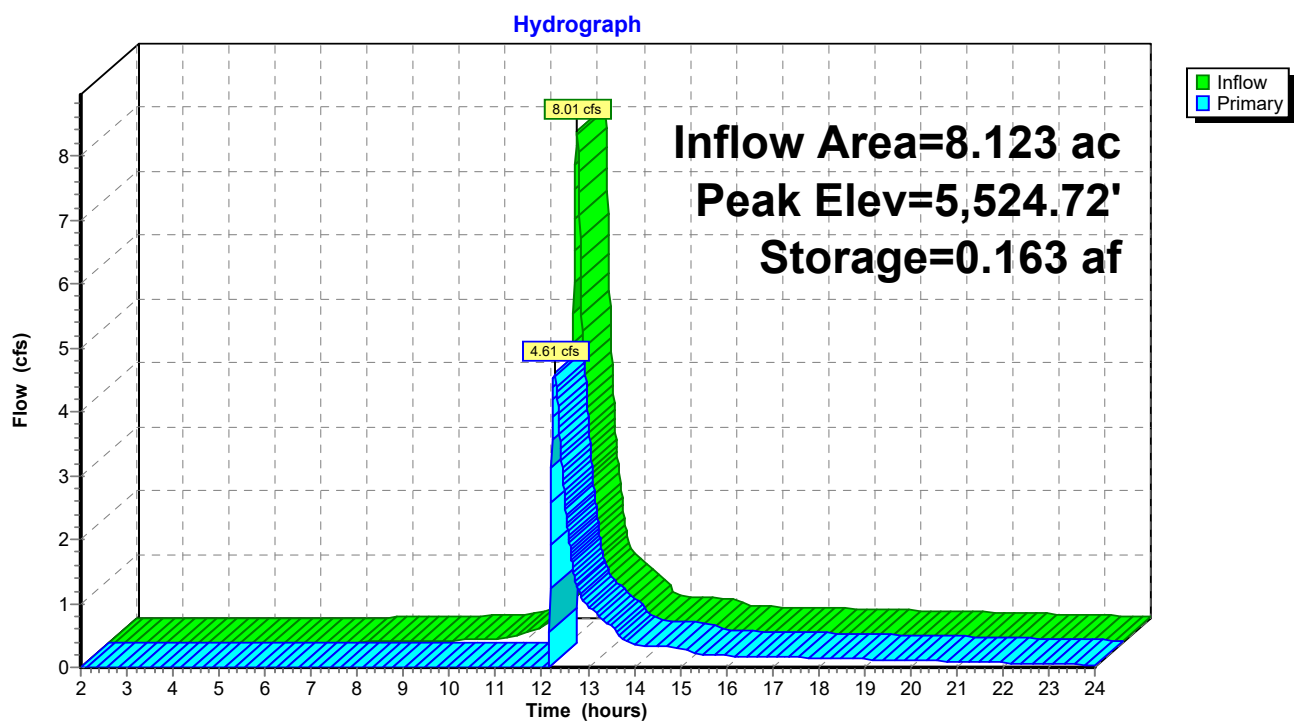
Primary OutFlow Max=4.61 cfs @ 12.28 hrs HW=5,524.72' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 4.61 cfs of 12.02 cfs potential flow)

↑ **2=Orifice/Grate** (Passes 4.61 cfs of 6.24 cfs potential flow)

↑ **1=Orifice/Grate** (Weir Controls 4.61 cfs @ 1.52 fps)

Pond 7P: Proposed Pond



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Summary for Pond 8P: CB

Inflow Area = 2.941 ac, 45.56% Impervious, Inflow Depth > 0.74" for 2-yr Storm event
Inflow = 3.55 cfs @ 12.15 hrs, Volume= 0.182 af
Outflow = 3.55 cfs @ 12.15 hrs, Volume= 0.182 af, Atten= 0%, Lag= 0.0 min
Primary = 3.55 cfs @ 12.15 hrs, Volume= 0.182 af
Routed to Pond 7P : Proposed Pond

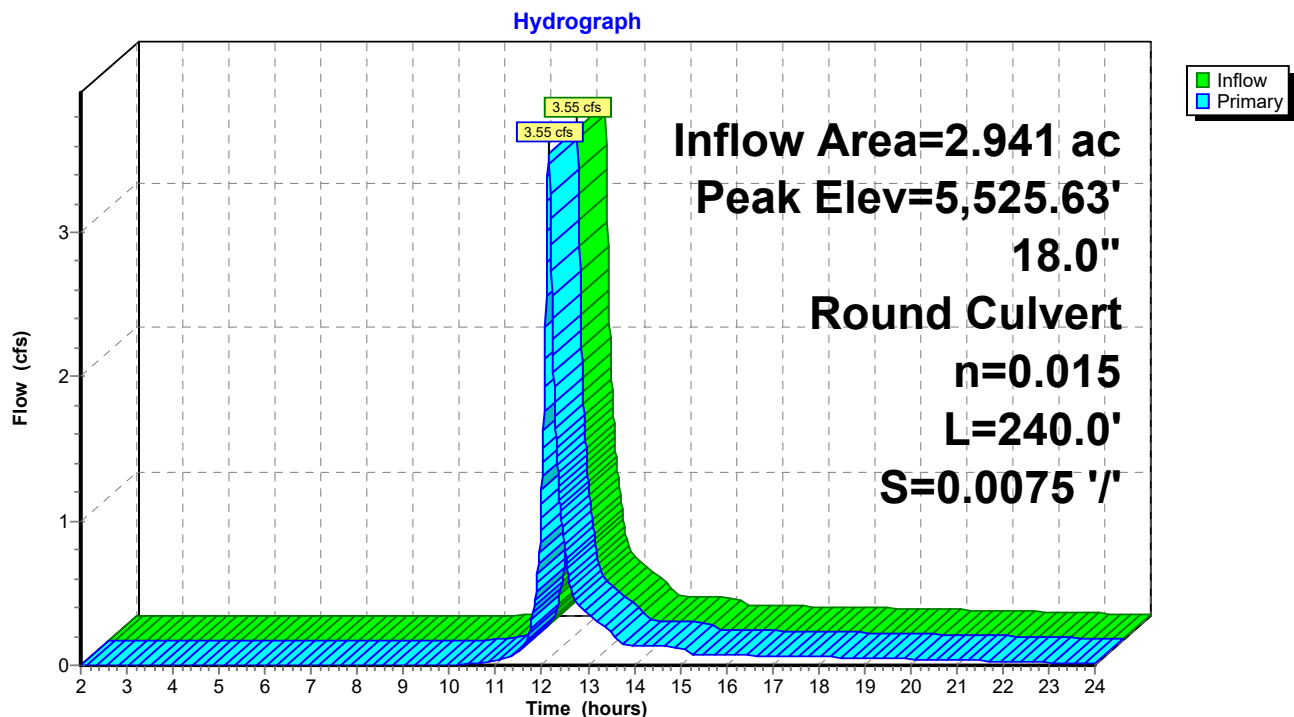
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,525.63' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.47 cfs @ 12.15 hrs HW=5,525.63' TW=5,524.47' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.47 cfs @ 3.32 fps)

Pond 8P: CB



StandleyLake_Prop2

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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 1.23" for 2-yr Storm event
Inflow = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af
Outflow = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min
Primary = 0.45 cfs @ 12.14 hrs, Volume= 0.022 af
Routed to Pond 8P : CB

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

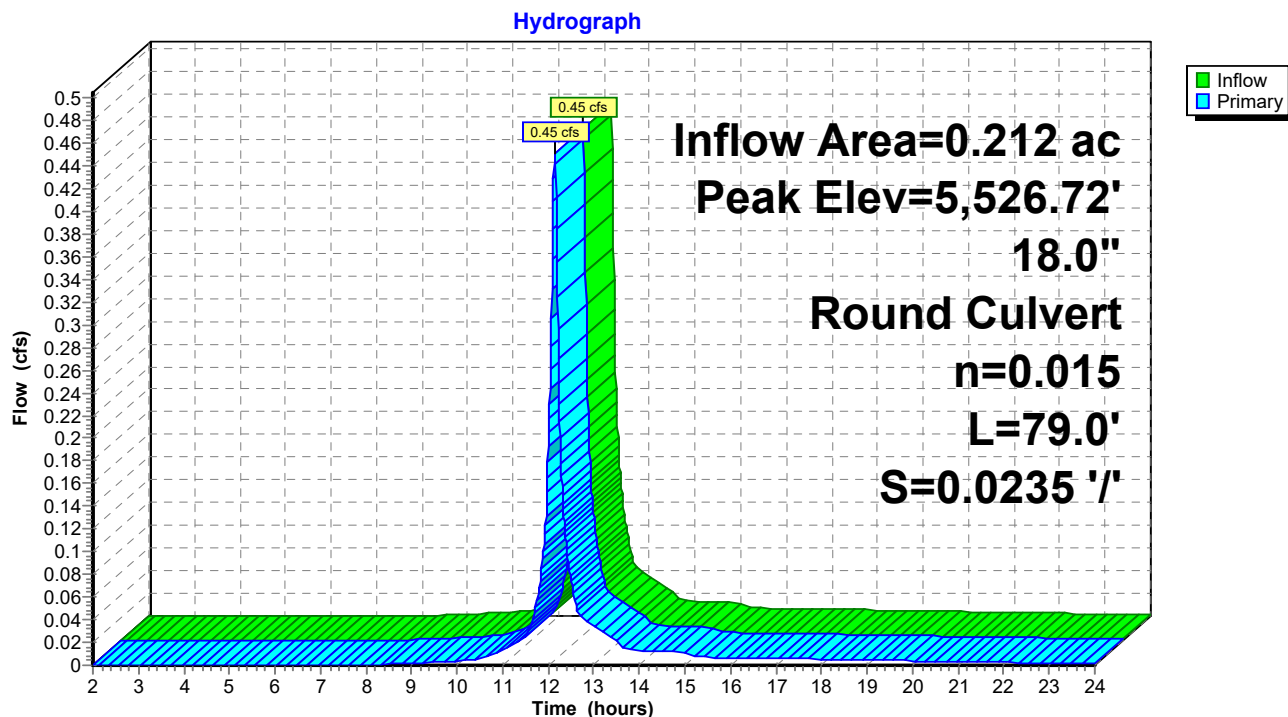
Peak Elev= 5,526.72' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.45 cfs @ 12.14 hrs HW=5,526.72' TW=5,525.61' (Dynamic Tailwater)

↑1=RCP_Round 18" (Inlet Controls 0.45 cfs @ 1.84 fps)

Pond 9P: CB



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 10P: Inlet

Inflow Area = 1.972 ac, 29.01% Impervious, Inflow Depth > 0.57" for 2-yr Storm event
Inflow = 1.57 cfs @ 12.17 hrs, Volume= 0.093 af
Outflow = 1.57 cfs @ 12.17 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min
Primary = 1.57 cfs @ 12.17 hrs, Volume= 0.093 af
Routed to Pond 7P : Proposed Pond

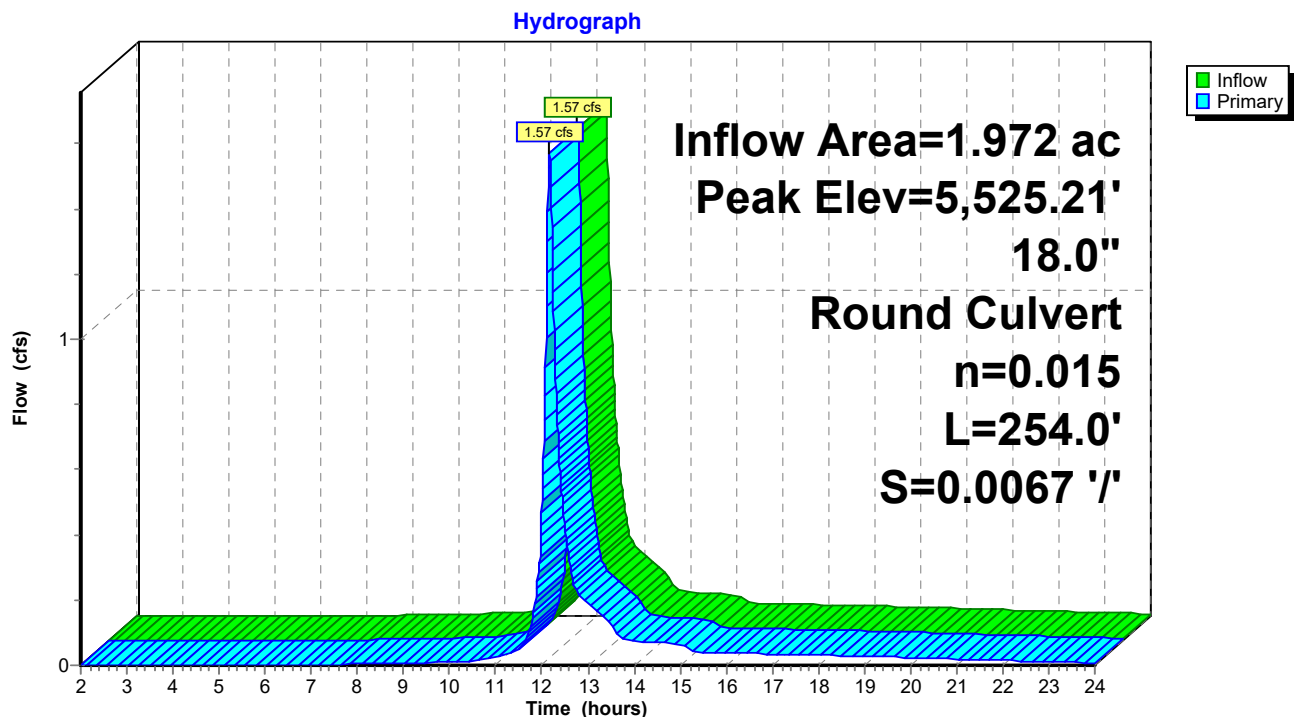
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,525.21' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 ' S= 0.0067 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.52 cfs @ 12.17 hrs HW=5,525.20' TW=5,524.55' (Dynamic Tailwater)
1=RCP_Round 18" (Outlet Controls 1.52 cfs @ 2.19 fps)

Pond 10P: Inlet



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Pond 11P: Inlet

Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 0.49" for 2-yr Storm event
Inflow = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af
Outflow = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.17 hrs, Volume= 0.006 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,525.22' @ 12.20 hrs

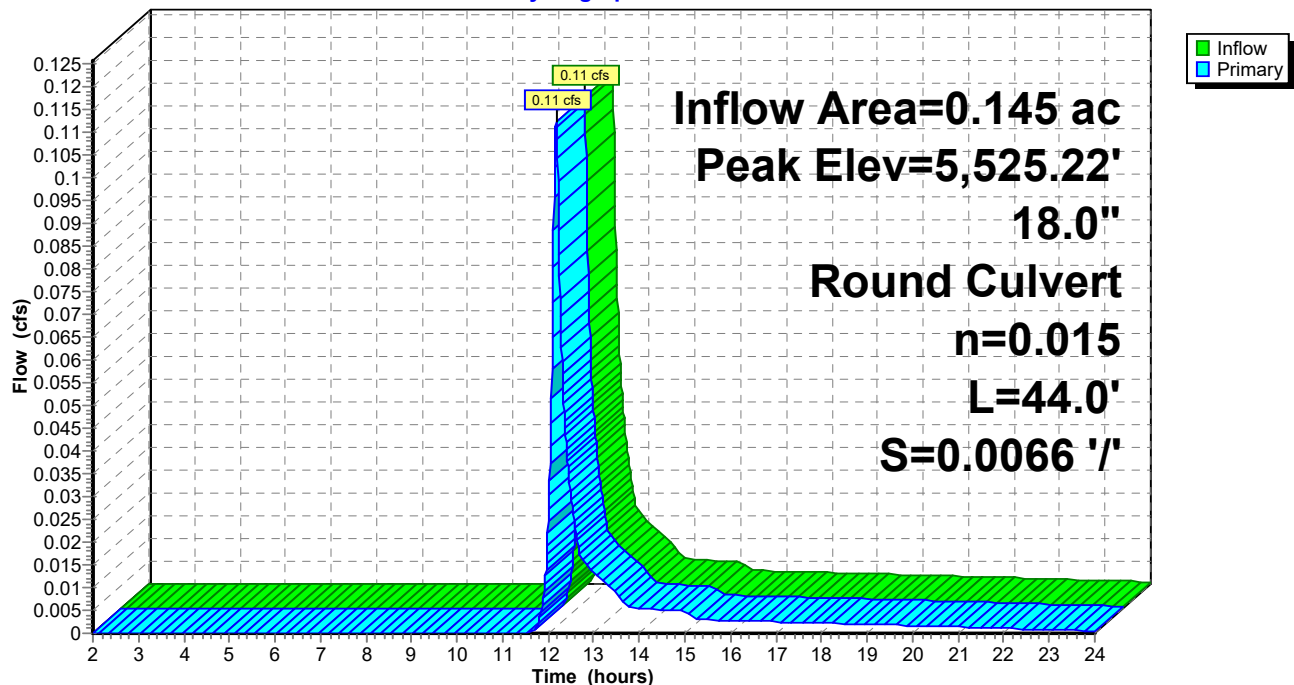
Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=5,525.20' TW=5,525.20' (Dynamic Tailwater)

↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 11P: Inlet

Hydrograph



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MSE 24-hr 3 2-yr Storm Rainfall=1.82"

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Summary for Link 1L: Street Sewer

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 0.48" for 2-yr Storm event

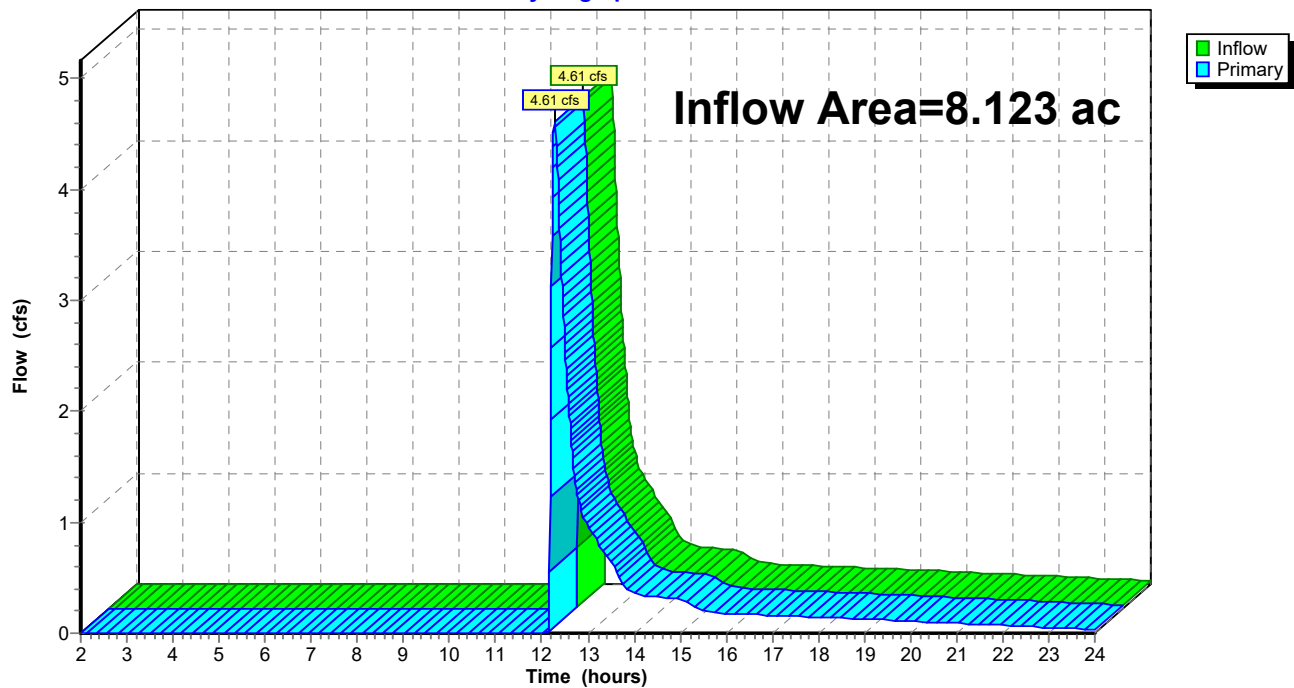
Inflow = 4.61 cfs @ 12.28 hrs, Volume= 0.327 af

Primary = 4.61 cfs @ 12.28 hrs, Volume= 0.327 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-10:

Runoff = 0.75 cfs @ 12.14 hrs, Volume= 0.039 af, Depth> 2.02"
Routed to Pond 10P : Inlet

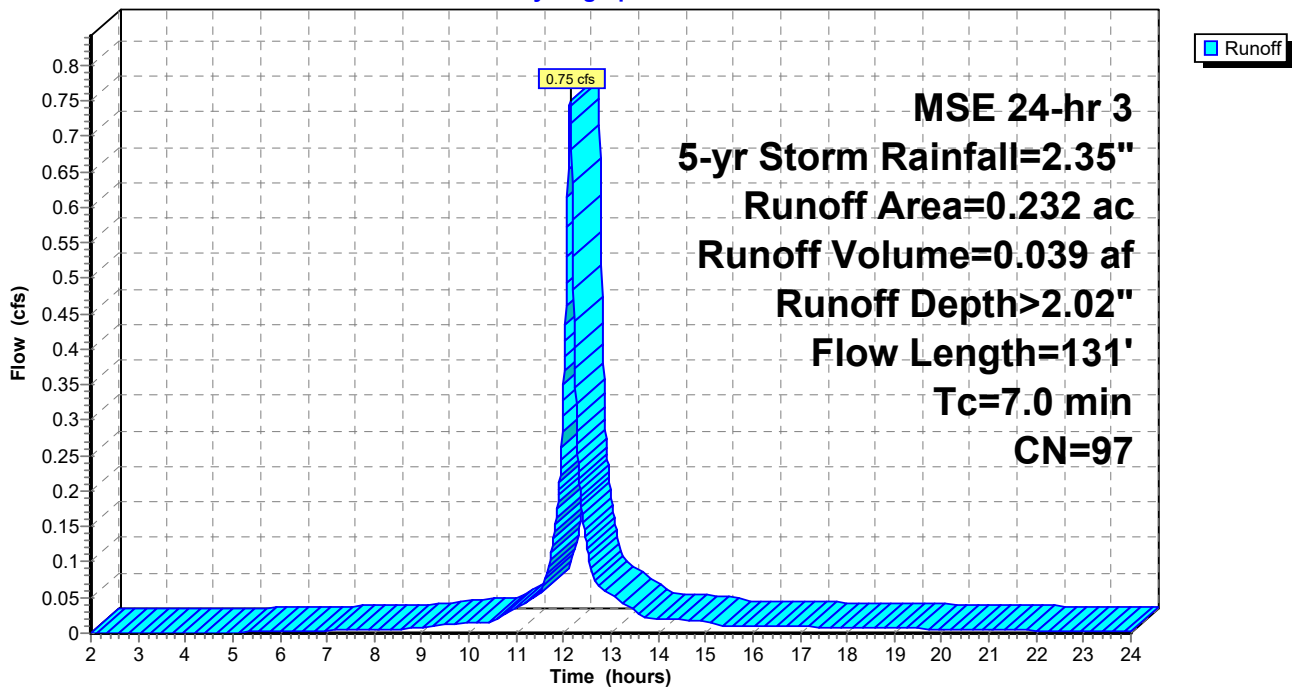
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-11:

Runoff = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af, Depth> 0.84"
Routed to Pond 11P : Inlet

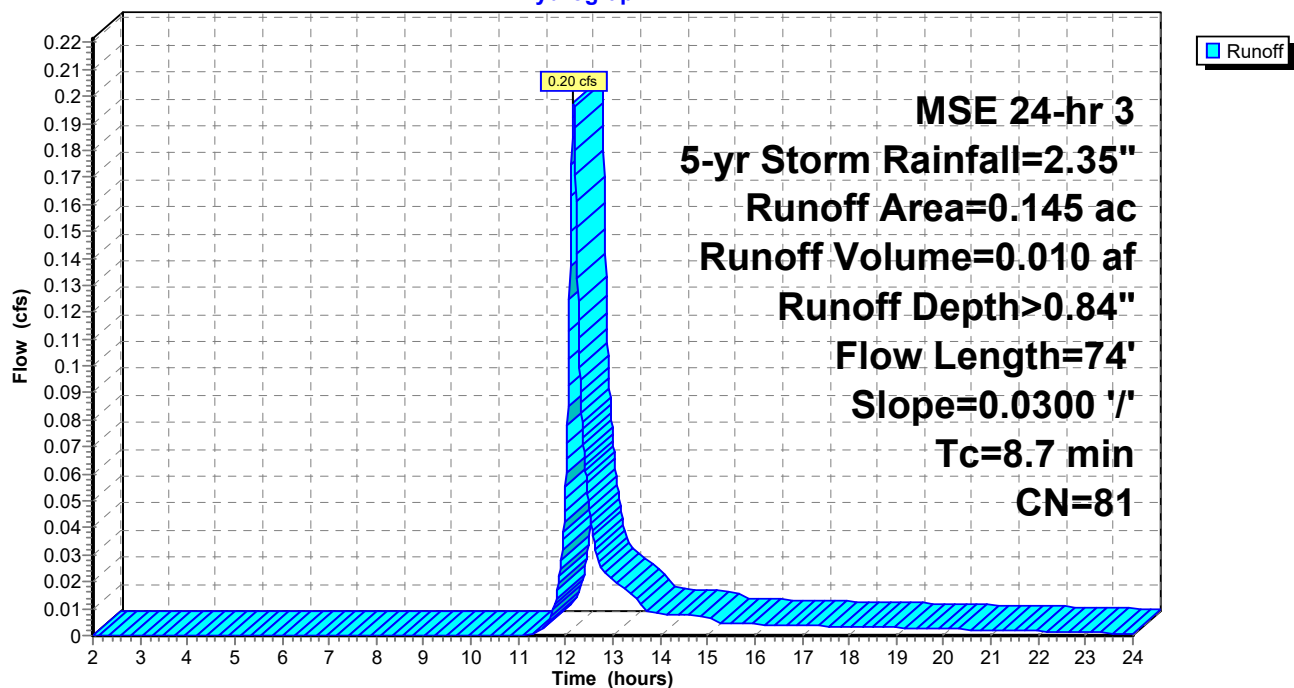
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-1a:

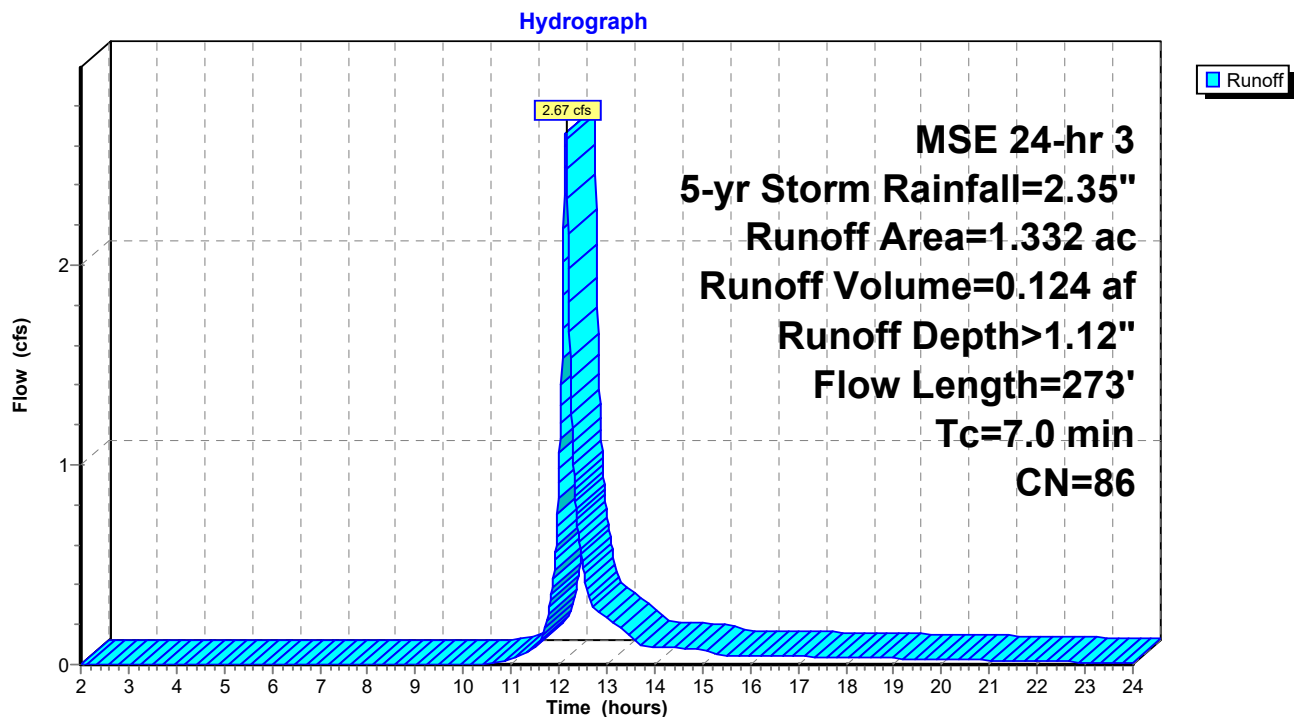
Runoff = 2.67 cfs @ 12.15 hrs, Volume= 0.124 af, Depth> 1.12"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.596	98	Paved parking, HSG C
0.674	74	>75% Grass cover, Good, HSG C
0.062	96	Gravel surface, HSG C
1.332	86	Weighted Average
0.736		55.26% Pervious Area
0.596		44.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	273		0.65		Direct Entry, Minimum

Subcatchment A-1a:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-1b:

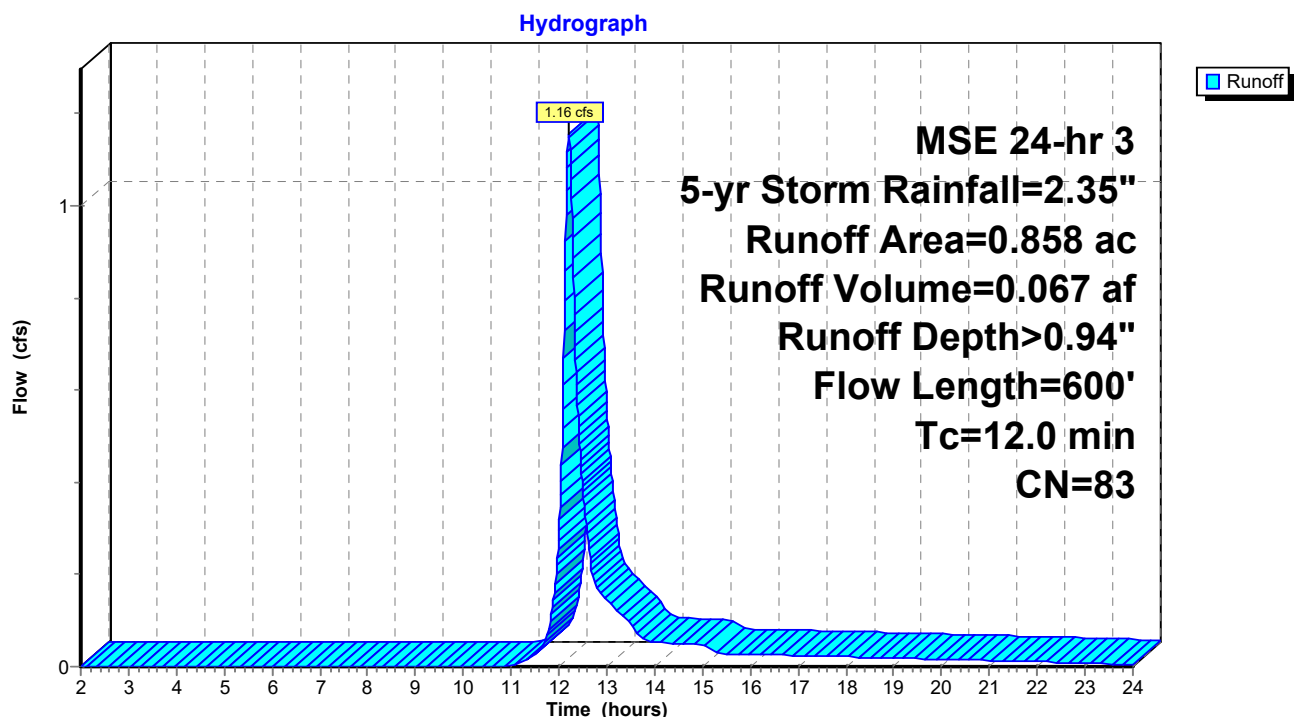
Runoff = 1.16 cfs @ 12.20 hrs, Volume= 0.067 af, Depth> 0.94"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.222	98	Paved parking, HSG C
0.115	96	Gravel surface, HSG C
0.521	74	>75% Grass cover, Good, HSG C
0.858	83	Weighted Average
0.636		74.13% Pervious Area
0.222		25.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	73	0.1096	0.24		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
5.2	297	0.0185	0.95		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	230	0.0130	2.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.0	600	Total			

Subcatchment A-1b:



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-2:

Runoff = 1.18 cfs @ 12.18 hrs, Volume= 0.064 af, Depth> 1.00"
Routed to Pond 2P : CB

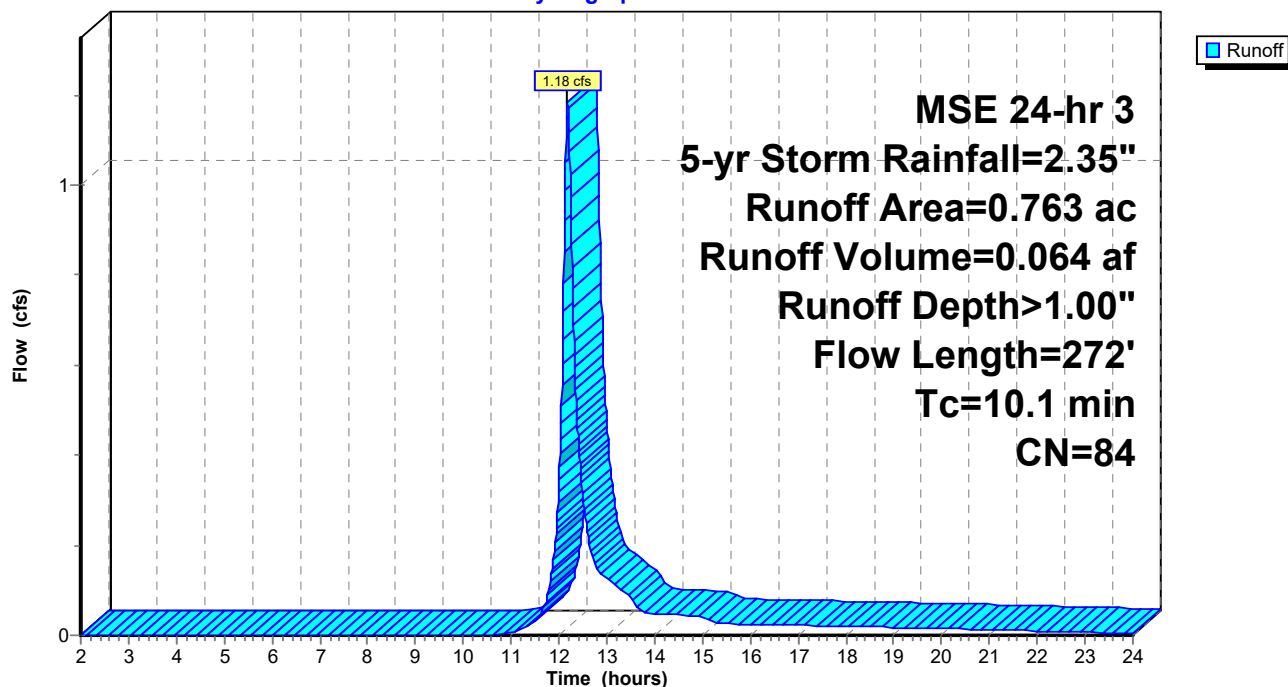
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.321	98	Paved parking, HSG C
0.442	74	>75% Grass cover, Good, HSG C
0.763	84	Weighted Average
0.442		57.93% Pervious Area
0.321		42.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	139	0.0899	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
0.8	133	0.0188	2.78		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.1	272	Total			

Subcatchment A-2:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-3:

Runoff = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af, Depth> 0.53"
Routed to Pond 3P : Inlet

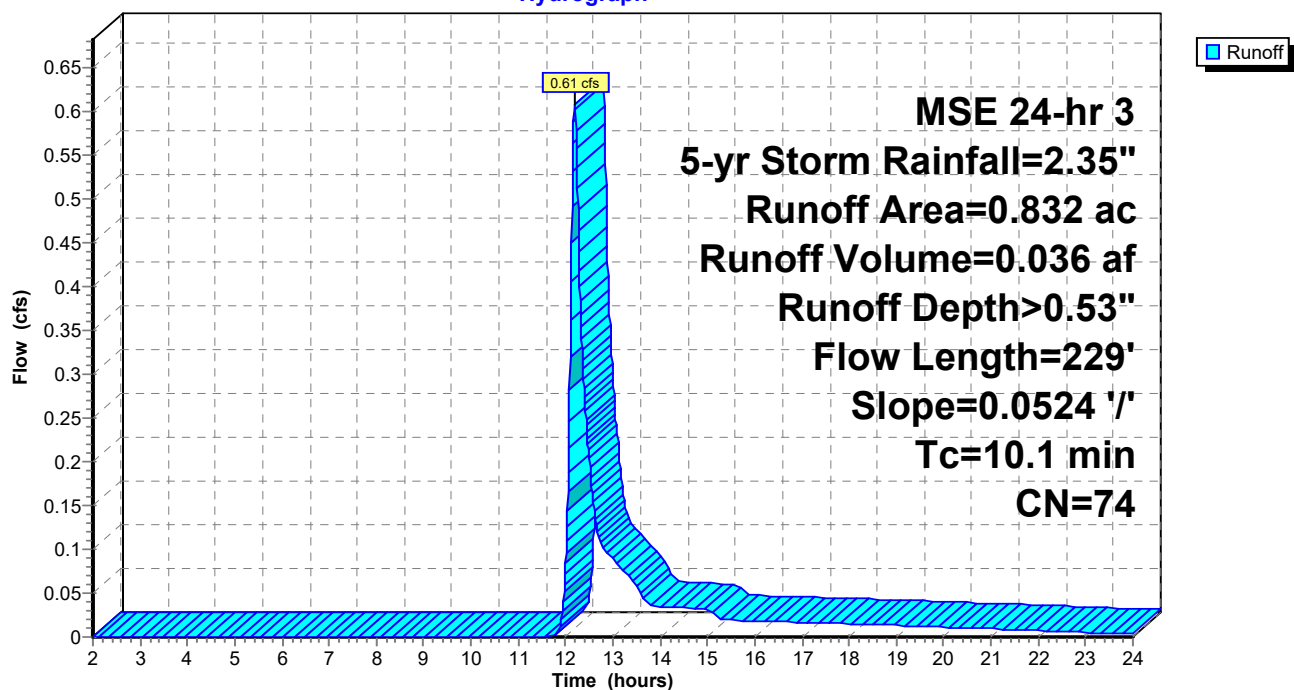
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-4:

Runoff = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af, Depth> 2.12"
Routed to Pond 4P : Roof Drain

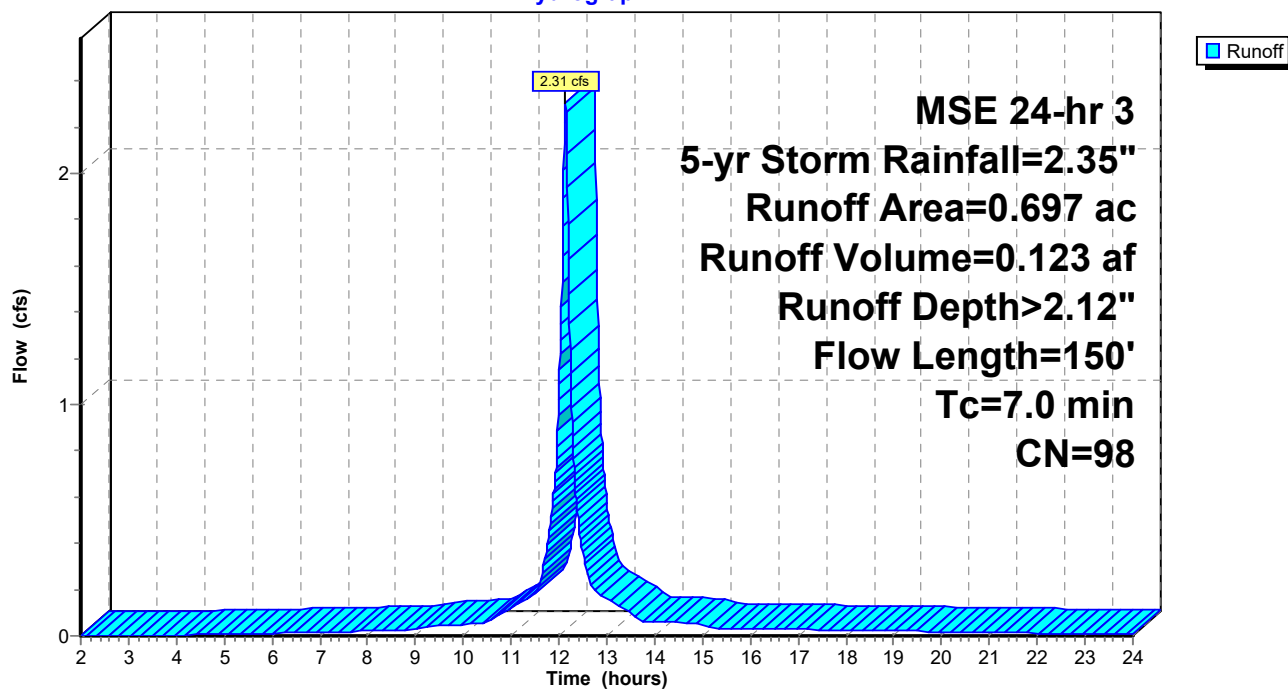
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-5:

Runoff = 1.04 cfs @ 12.20 hrs, Volume= 0.062 af, Depth> 0.60"
Routed to Pond 5P : Inlet

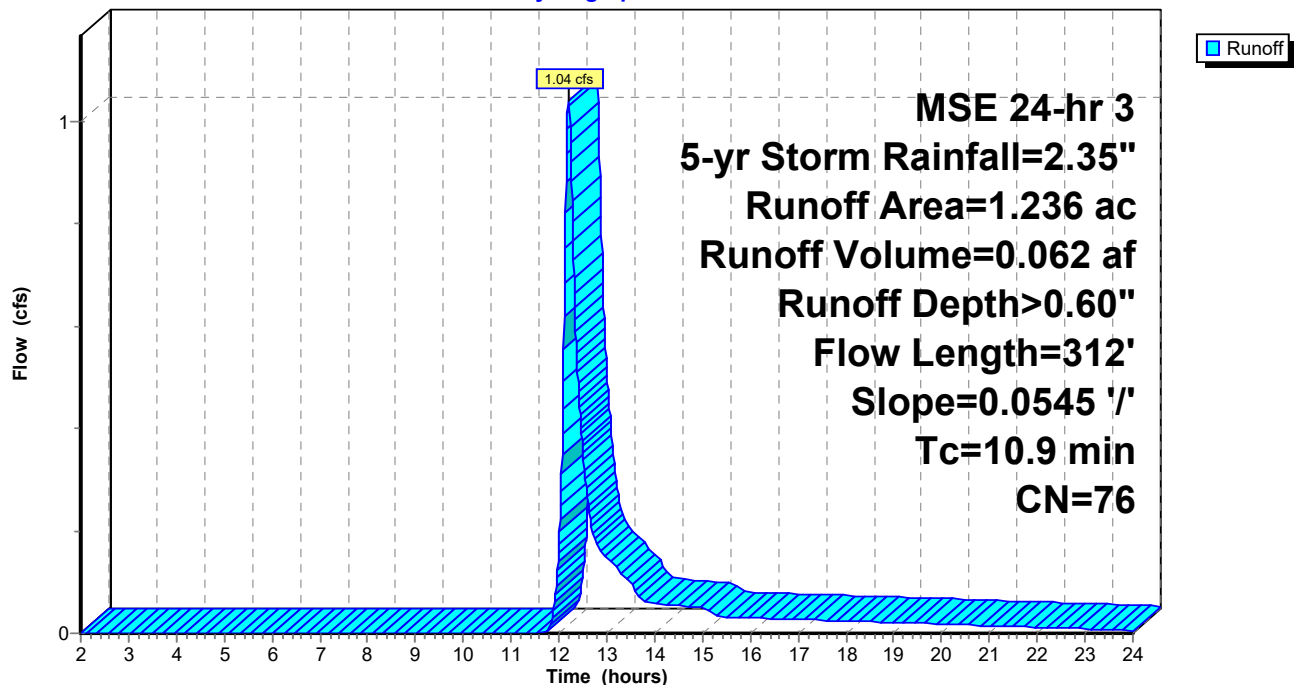
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-6:

Runoff = 1.04 cfs @ 12.20 hrs, Volume= 0.060 af, Depth> 1.19"
Routed to Pond 6P : DI

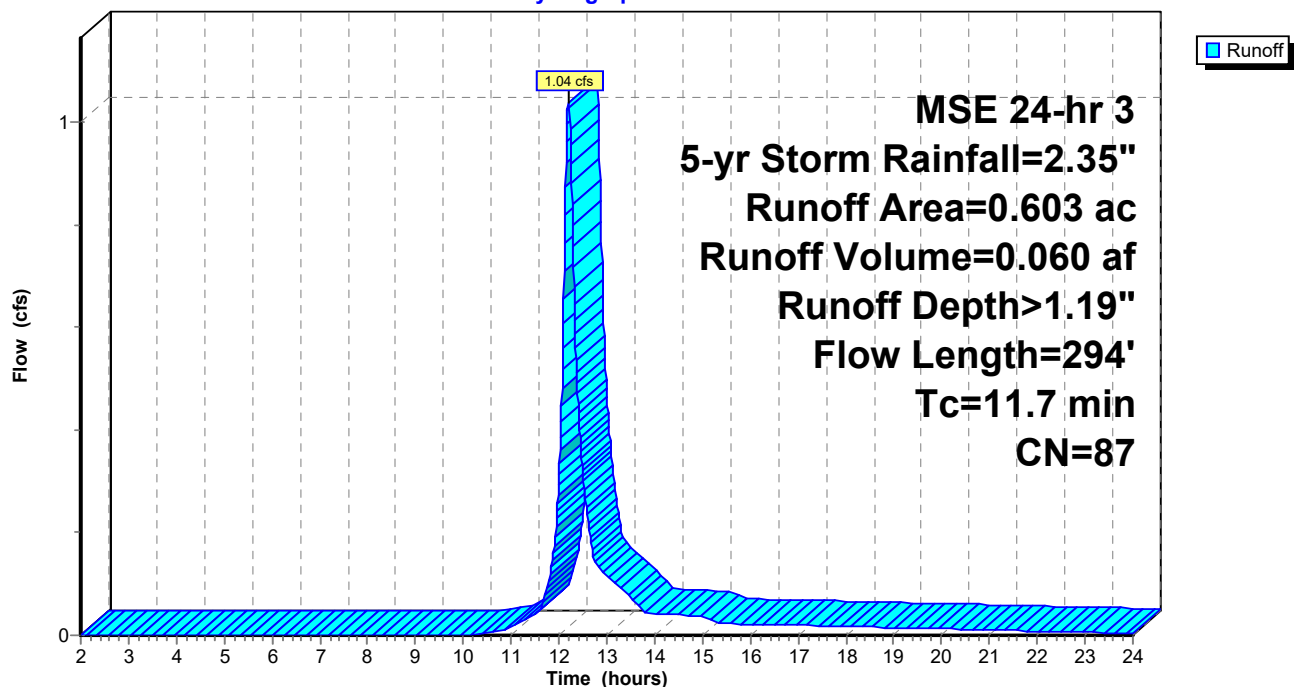
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-7:

Runoff = 0.55 cfs @ 12.21 hrs, Volume= 0.034 af, Depth> 0.60"
Routed to Pond 7P : Proposed Pond

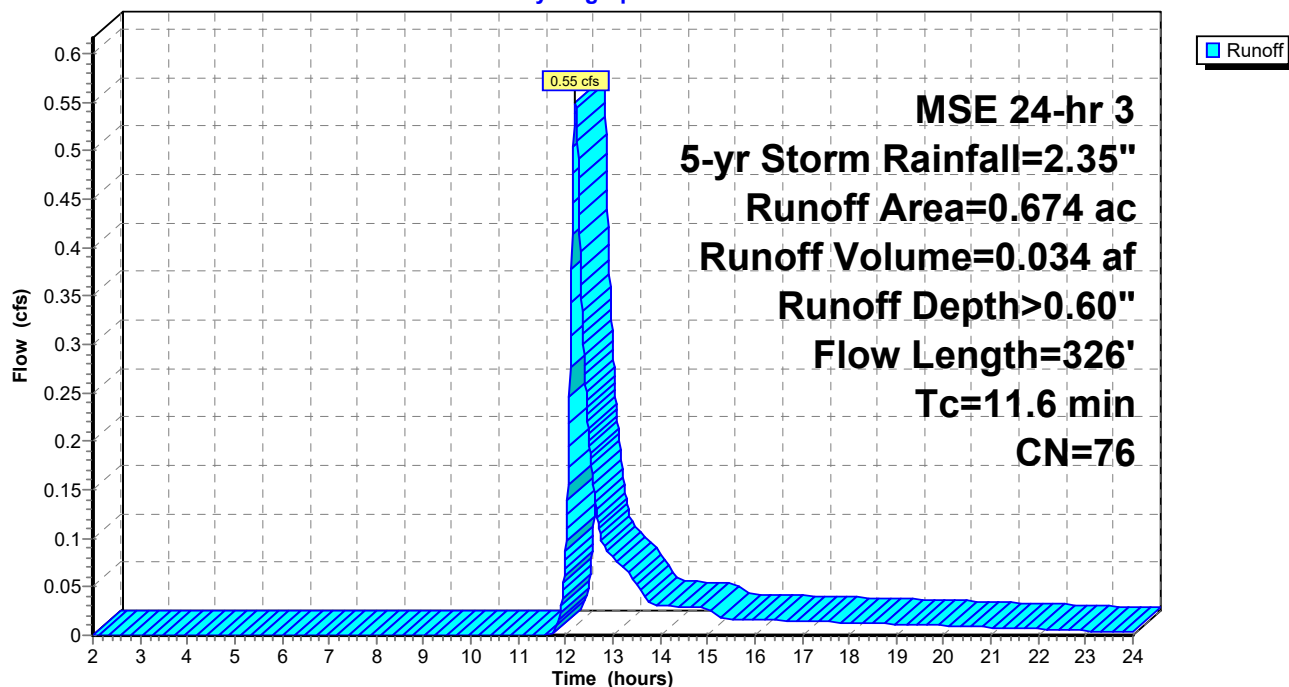
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.631	74	>75% Grass cover, Good, HSG C
0.043	98	Paved parking, HSG C
0.674	76	Weighted Average
0.631		93.62% Pervious Area
0.043		6.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-8:

Runoff = 1.26 cfs @ 12.14 hrs, Volume= 0.059 af, Depth> 1.32"
Routed to Pond 8P : CB

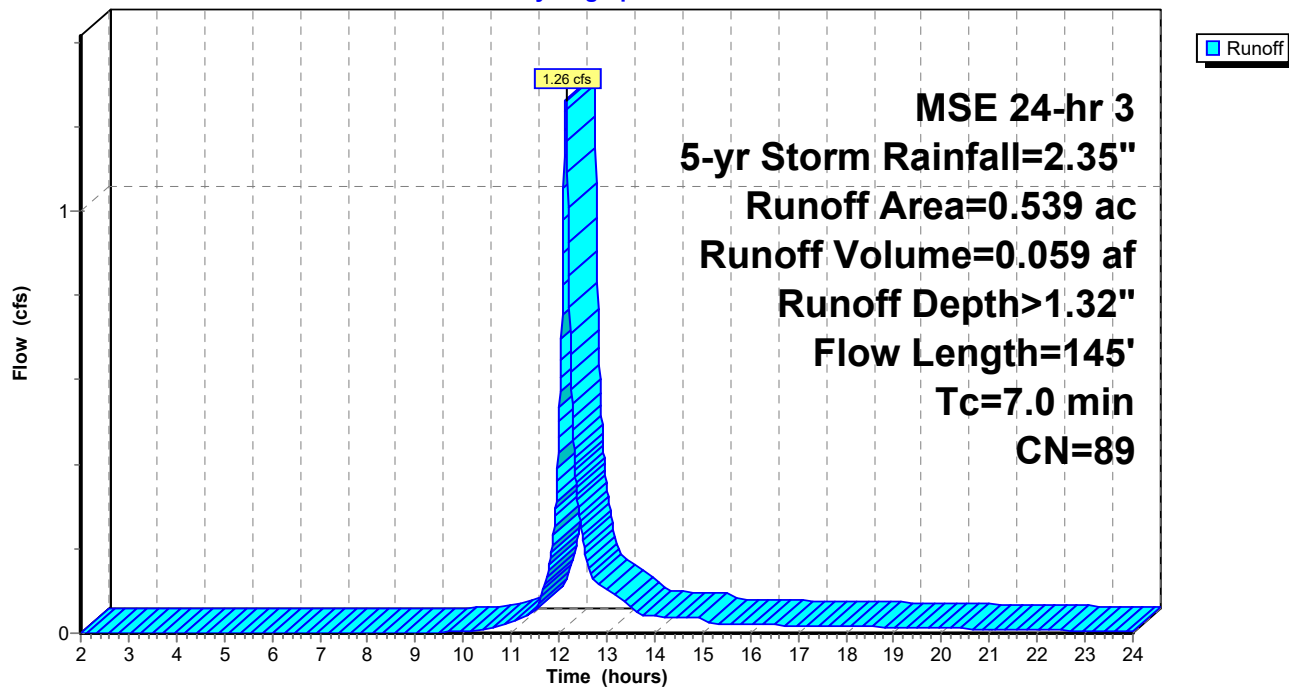
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Subcatchment A-9:

Runoff = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af, Depth> 1.73"
Routed to Pond 9P : CB

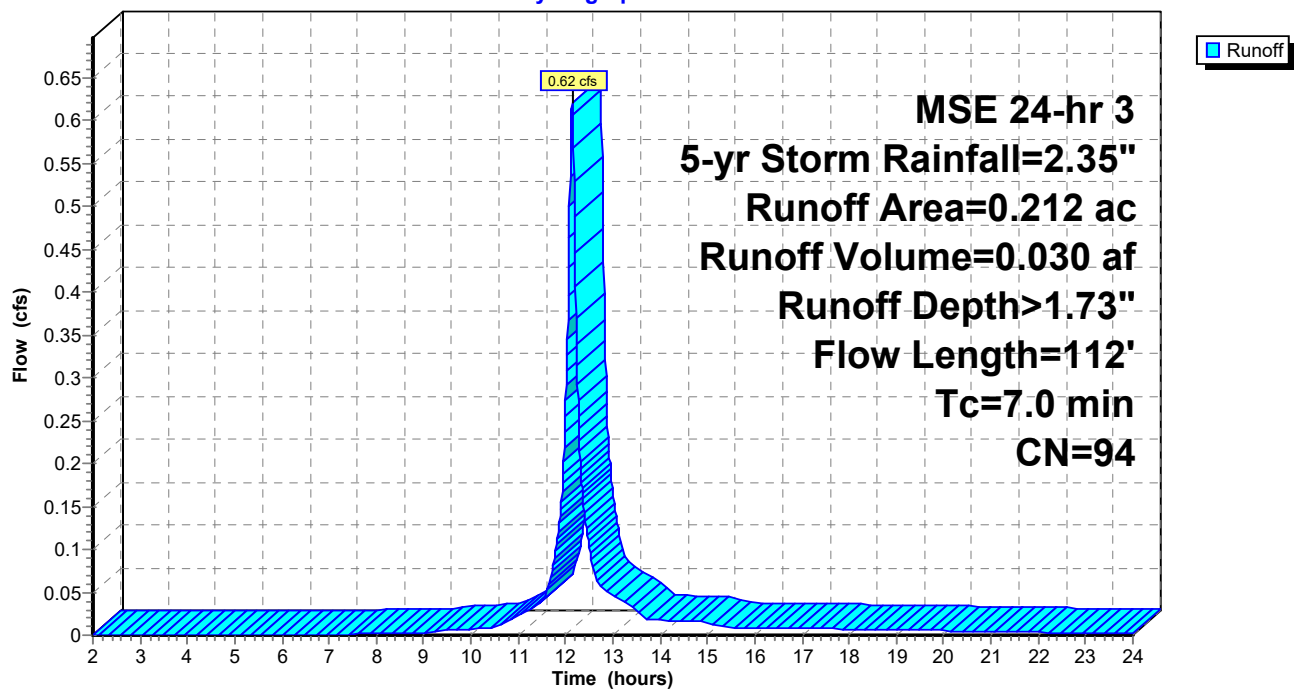
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 5-yr Storm Rainfall=2.35"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:

Hydrograph



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 1P: CB

Inflow Area = 2.190 ac, 37.35% Impervious, Inflow Depth > 1.05" for 5-yr Storm event
Inflow = 3.65 cfs @ 12.15 hrs, Volume= 0.192 af
Outflow = 3.65 cfs @ 12.15 hrs, Volume= 0.192 af, Atten= 0%, Lag= 0.0 min
Primary = 3.65 cfs @ 12.15 hrs, Volume= 0.192 af
Routed to Pond 8P : CB

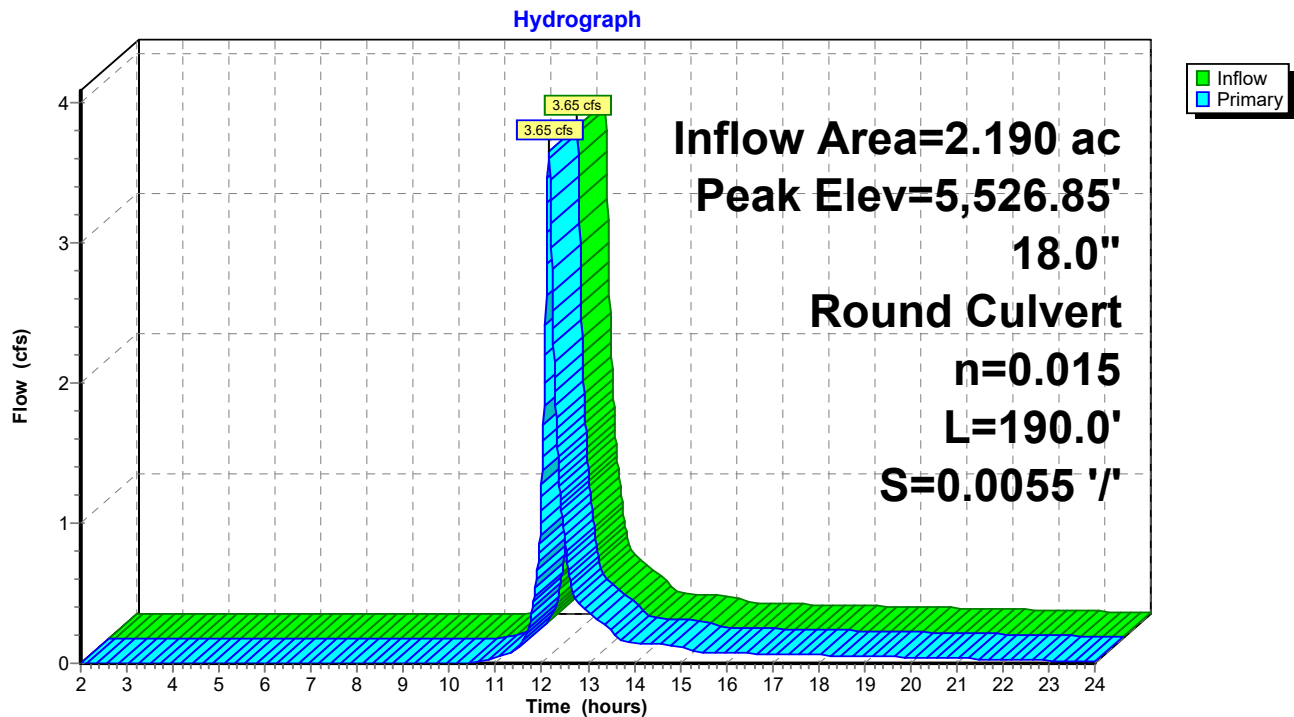
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.85' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.61 cfs @ 12.15 hrs HW=5,526.85' TW=5,526.06' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.61 cfs @ 3.08 fps)

Pond 1P: CB



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 2P: CB

Inflow Area = 1.595 ac, 20.13% Impervious, Inflow Depth > 0.75" for 5-yr Storm event
Inflow = 1.79 cfs @ 12.18 hrs, Volume= 0.100 af
Outflow = 1.79 cfs @ 12.18 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Primary = 1.79 cfs @ 12.18 hrs, Volume= 0.100 af
Routed to Pond 10P : Inlet

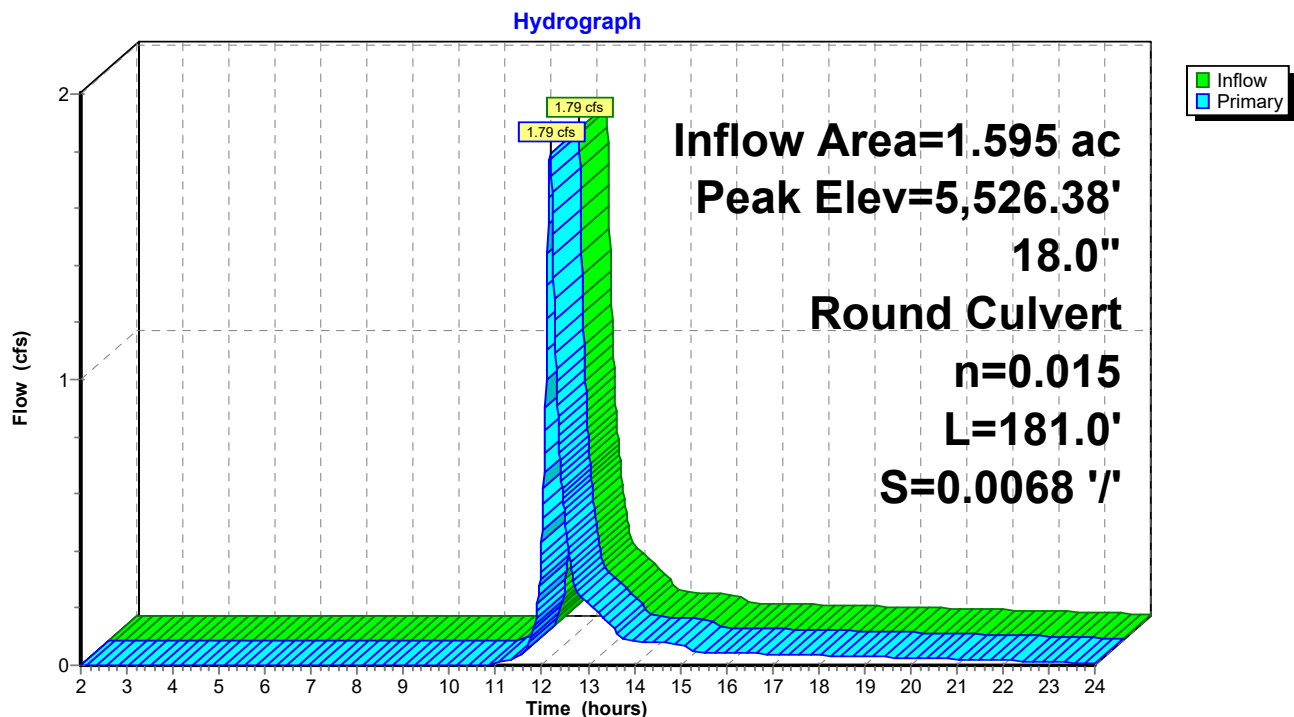
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.38' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.78 cfs @ 12.18 hrs HW=5,526.38' TW=5,525.53' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.78 cfs @ 2.79 fps)

Pond 2P: CB



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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 0.53" for 5-yr Storm event
Inflow = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af
Outflow = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.19 hrs, Volume= 0.036 af
Routed to Pond 2P : CB

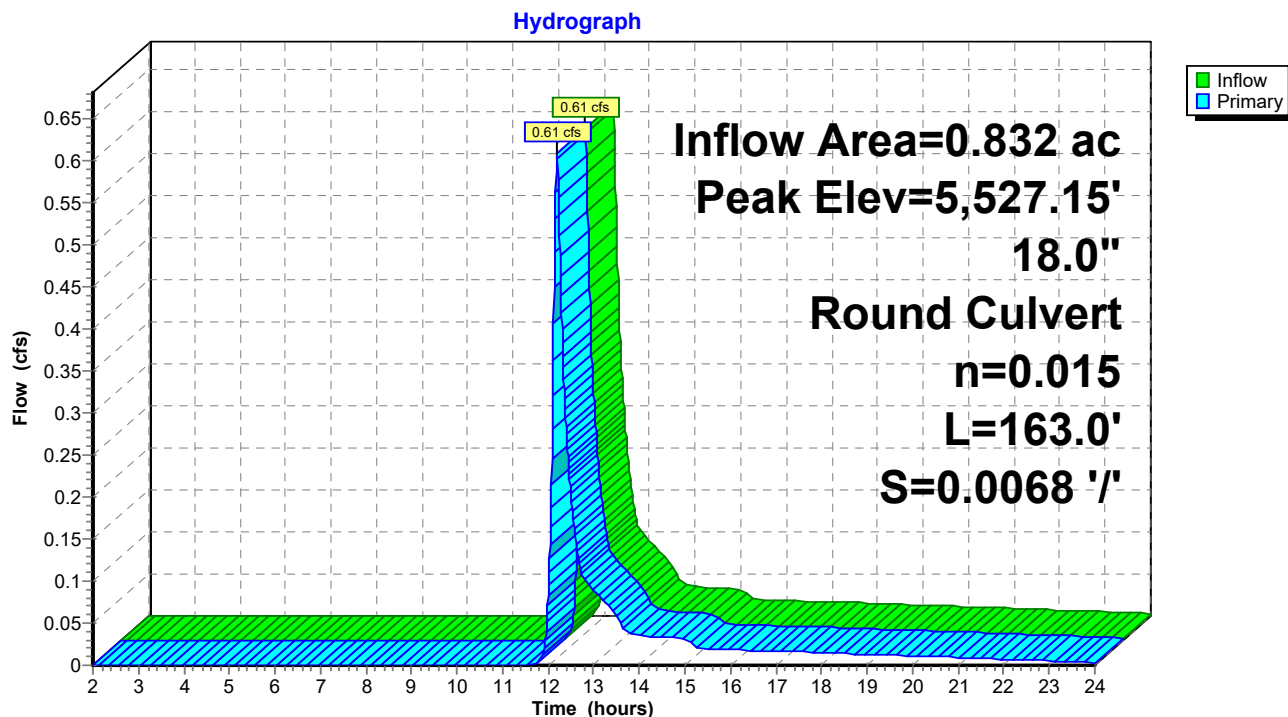
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,527.15' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.61 cfs @ 12.19 hrs HW=5,527.15' TW=5,526.38' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.61 cfs @ 2.13 fps)

Pond 3P: Inlet



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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 2.12" for 5-yr Storm event
Inflow = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af
Outflow = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min
Primary = 2.31 cfs @ 12.14 hrs, Volume= 0.123 af
Routed to Pond 5P : Inlet

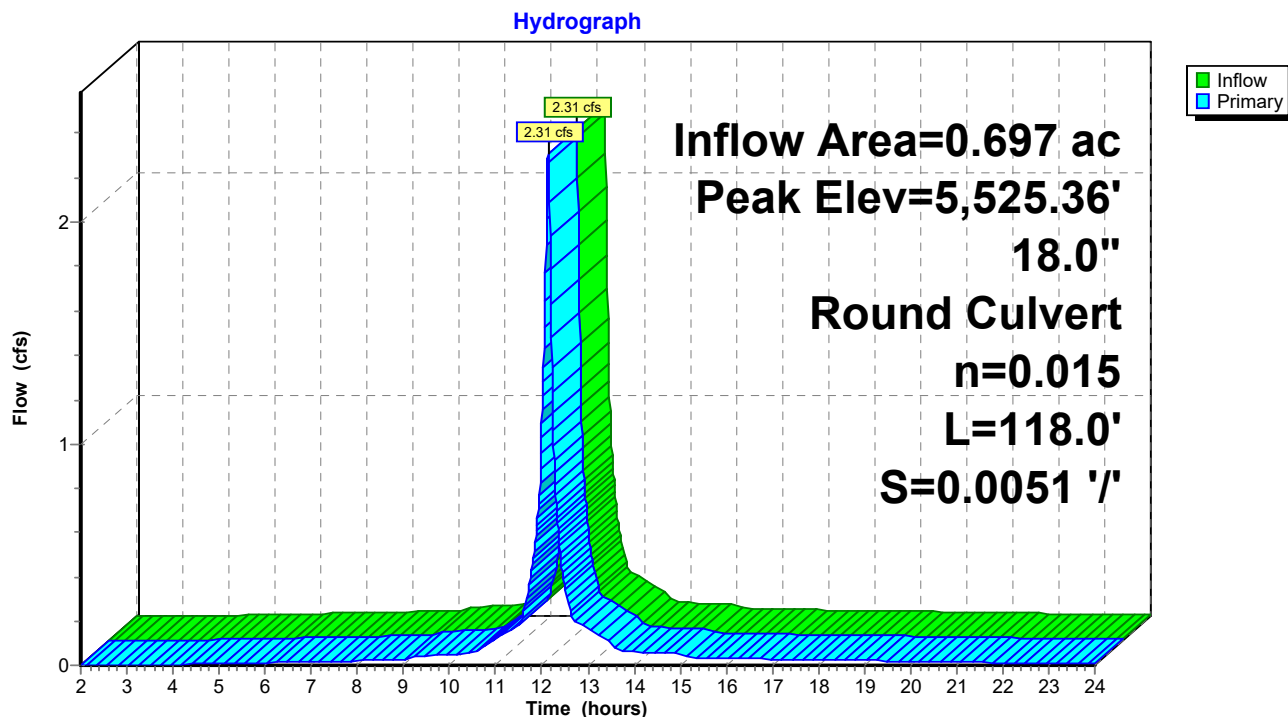
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,525.36' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 ' S= 0.0051 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.90 cfs @ 12.14 hrs HW=5,525.26' TW=5,525.13' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.90 cfs @ 1.48 fps)

Pond 4P: Roof Drain



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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 1.15" for 5-yr Storm event
Inflow = 3.17 cfs @ 12.15 hrs, Volume= 0.186 af
Outflow = 3.17 cfs @ 12.15 hrs, Volume= 0.185 af, Atten= 0%, Lag= 0.0 min
Primary = 3.17 cfs @ 12.15 hrs, Volume= 0.185 af
Routed to Pond 6P : DI

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

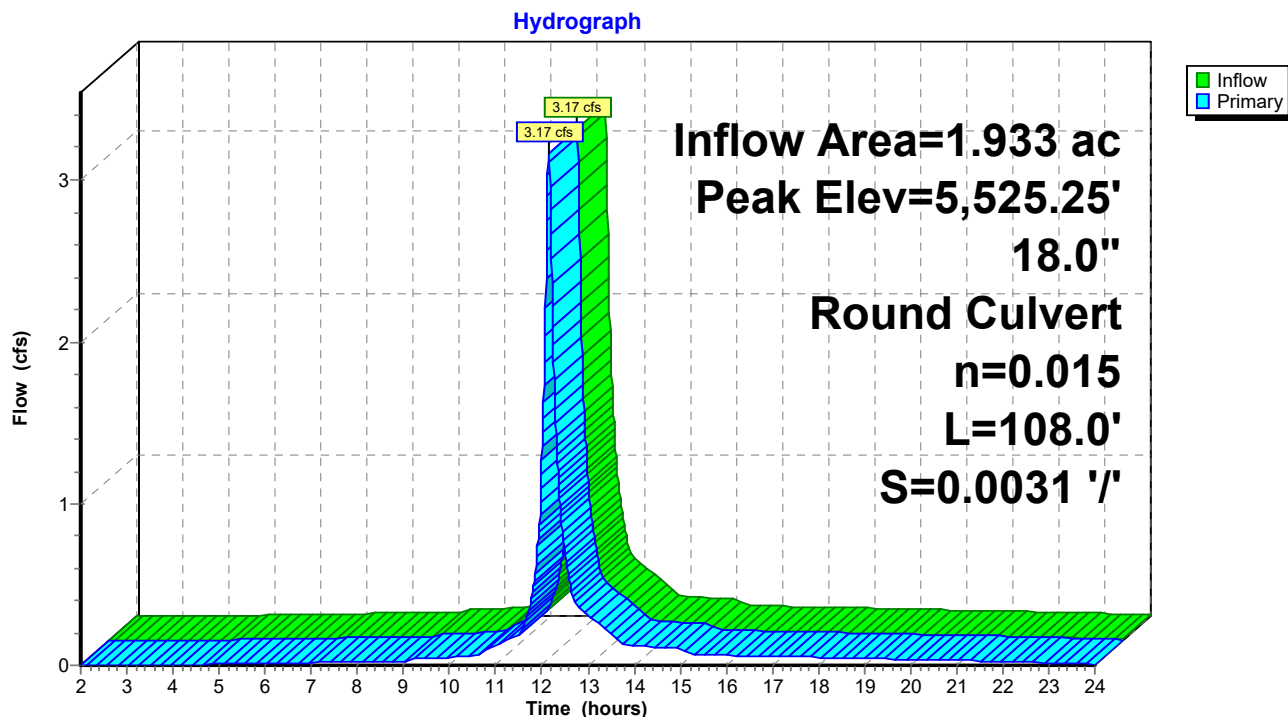
Peak Elev= 5,525.25' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 ' S= 0.0031 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.87 cfs @ 12.15 hrs HW=5,525.19' TW=5,525.02' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 2.87 cfs @ 1.62 fps)

Pond 5P: Inlet



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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 1.16" for 5-yr Storm event
Inflow = 4.11 cfs @ 12.16 hrs, Volume= 0.245 af
Outflow = 4.11 cfs @ 12.16 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.0 min
Primary = 4.11 cfs @ 12.16 hrs, Volume= 0.245 af
Routed to Pond 7P : Proposed Pond

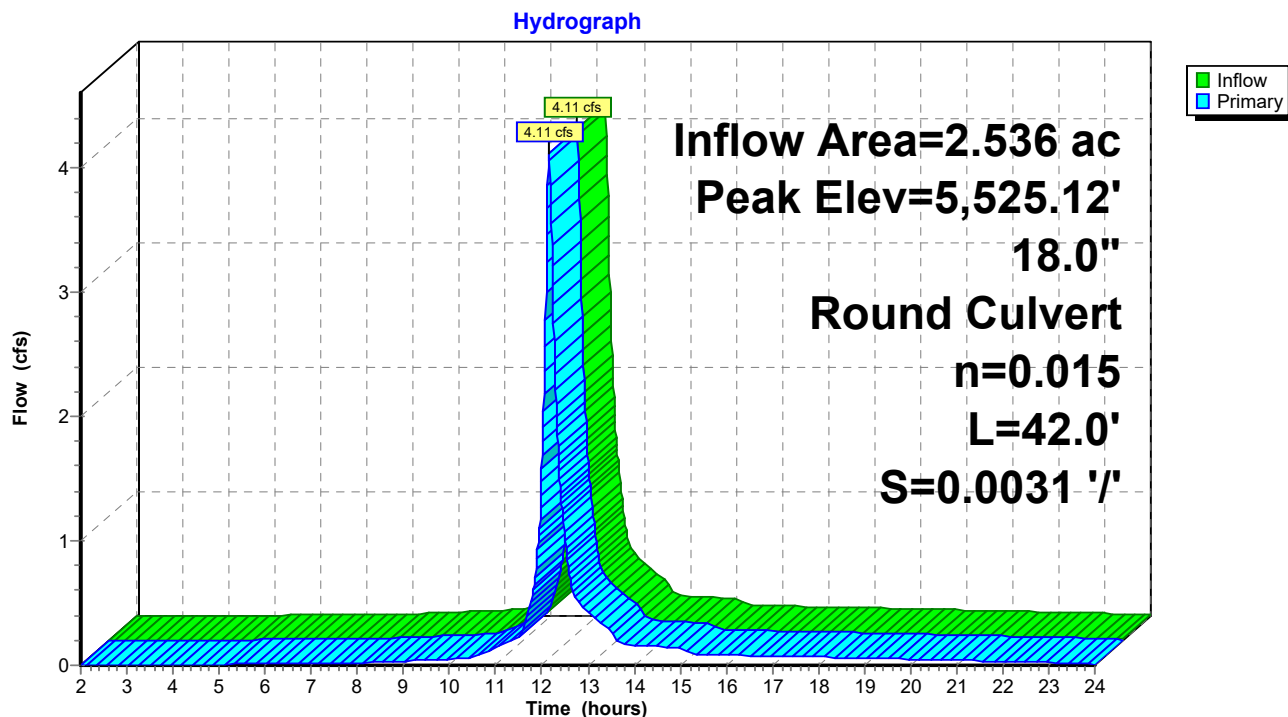
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,525.12' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.85 cfs @ 12.16 hrs HW=5,525.04' TW=5,524.84' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 3.85 cfs @ 2.18 fps)

Pond 6P: DI



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Summary for Pond 7P: Proposed Pond

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 1.05" for 5-yr Storm event
Inflow = 12.68 cfs @ 12.16 hrs, Volume= 0.710 af
Outflow = 6.56 cfs @ 12.30 hrs, Volume= 0.580 af, Atten= 48%, Lag= 8.6 min
Primary = 6.56 cfs @ 12.30 hrs, Volume= 0.580 af
Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 5,525.03' @ 12.30 hrs Surf.Area= 0.206 ac Storage= 0.222 af

Plug-Flow detention time= 99.3 min calculated for 0.580 af (82% of inflow)
Center-of-Mass det. time= 35.5 min (841.3 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.464 af	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.026	0.013	0.013
5,524.00	0.088	0.057	0.070
5,525.00	0.203	0.146	0.216
5,526.00	0.293	0.248	0.464

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 ' / ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

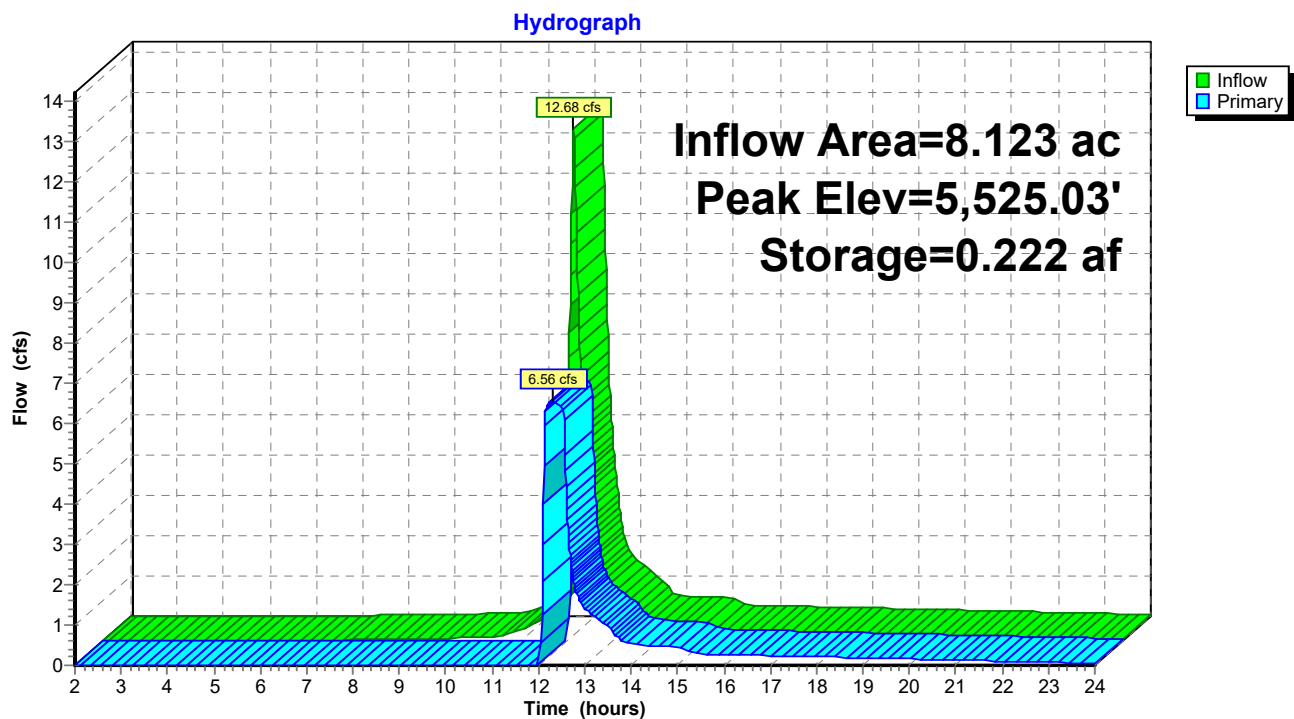
Primary OutFlow Max=6.56 cfs @ 12.30 hrs HW=5,525.03' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 6.56 cfs of 12.85 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 6.56 cfs @ 8.74 fps)

↑ **1=Orifice/Grate** (Passes 6.56 cfs of 17.66 cfs potential flow)

Pond 7P: Proposed Pond



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Summary for Pond 8P: CB

Inflow Area = 2.941 ac, 45.56% Impervious, Inflow Depth > 1.15" for 5-yr Storm event
Inflow = 5.52 cfs @ 12.15 hrs, Volume= 0.282 af
Outflow = 5.52 cfs @ 12.15 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.0 min
Primary = 5.52 cfs @ 12.15 hrs, Volume= 0.282 af
Routed to Pond 7P : Proposed Pond

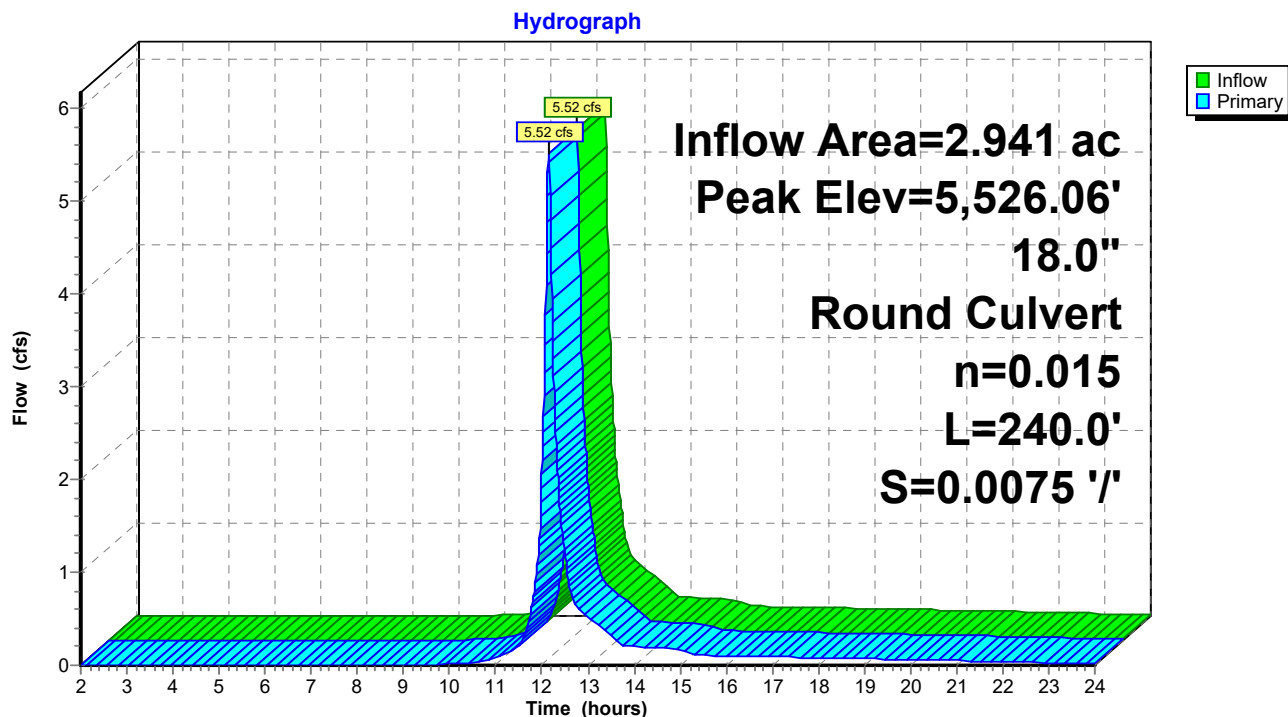
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.06' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=5.45 cfs @ 12.15 hrs HW=5,526.06' TW=5,524.81' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 5.45 cfs @ 3.65 fps)

Pond 8P: CB



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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 1.73" for 5-yr Storm event
Inflow = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af
Outflow = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min
Primary = 0.62 cfs @ 12.14 hrs, Volume= 0.030 af
Routed to Pond 8P : CB

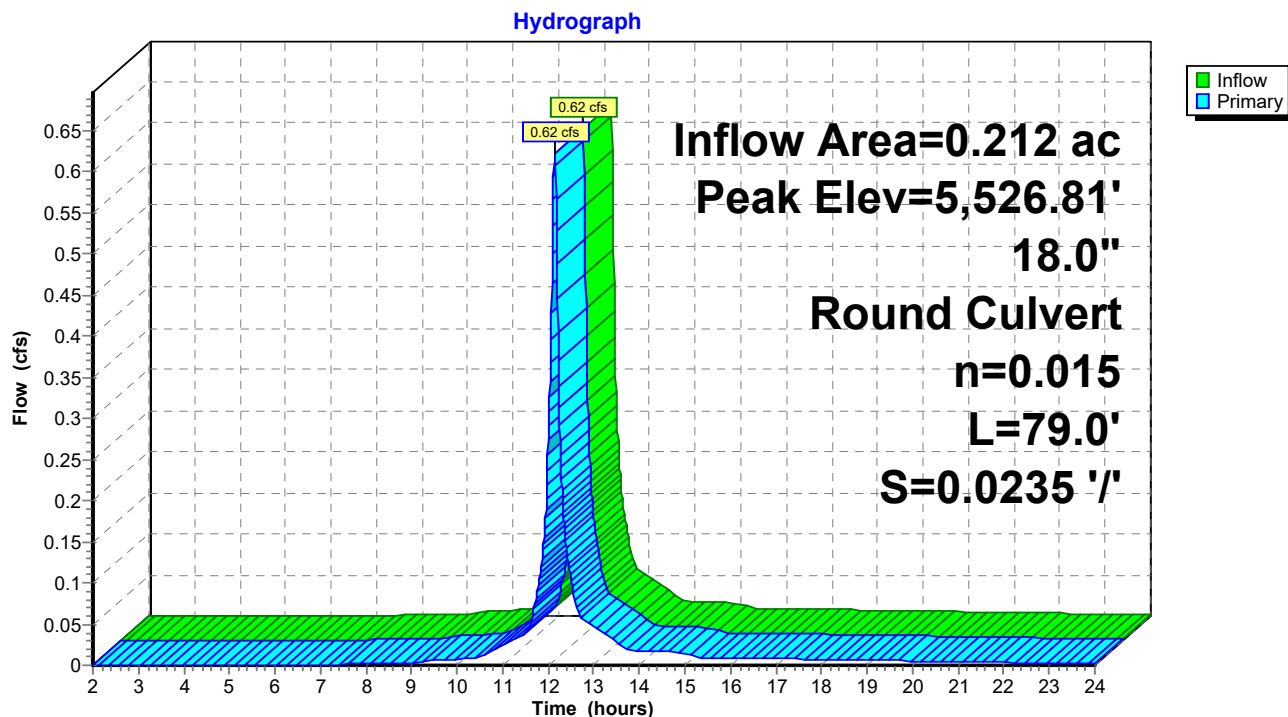
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.81' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.61 cfs @ 12.14 hrs HW=5,526.80' TW=5,526.04' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.61 cfs @ 2.65 fps)

Pond 9P: CB



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MSE 24-hr 3 5-yr Storm Rainfall=2.35"

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Summary for Pond 10P: Inlet

Inflow Area = 1.972 ac, 29.01% Impervious, Inflow Depth > 0.91" for 5-yr Storm event
Inflow = 2.64 cfs @ 12.17 hrs, Volume= 0.149 af
Outflow = 2.64 cfs @ 12.17 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min
Primary = 2.64 cfs @ 12.17 hrs, Volume= 0.149 af
Routed to Pond 7P : Proposed Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

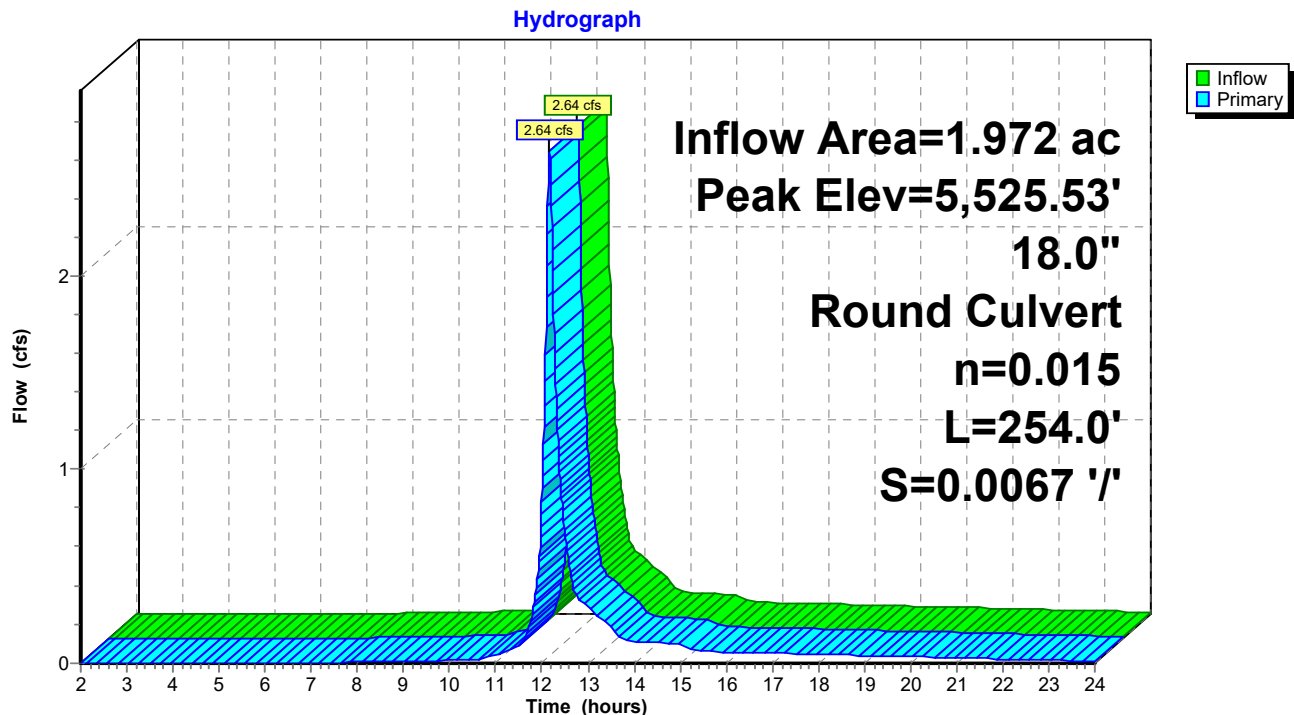
Peak Elev= 5,525.53' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.59 cfs @ 12.17 hrs HW=5,525.52' TW=5,524.87' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 2.59 cfs @ 2.45 fps)

Pond 10P: Inlet



StandleyLake_Prop2

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Summary for Pond 11P: Inlet

Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 0.84" for 5-yr Storm event
Inflow = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af
Outflow = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.17 hrs, Volume= 0.010 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

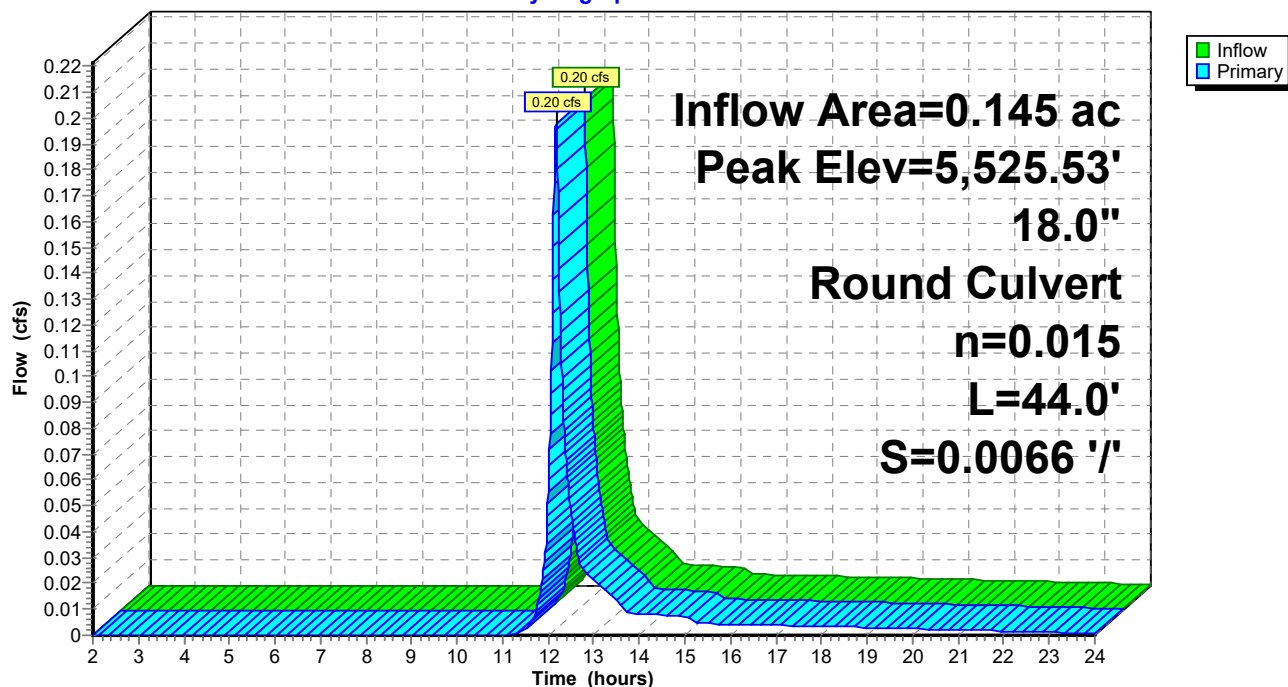
Peak Elev= 5,525.53' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=5,525.51' TW=5,525.52' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 11P: Inlet

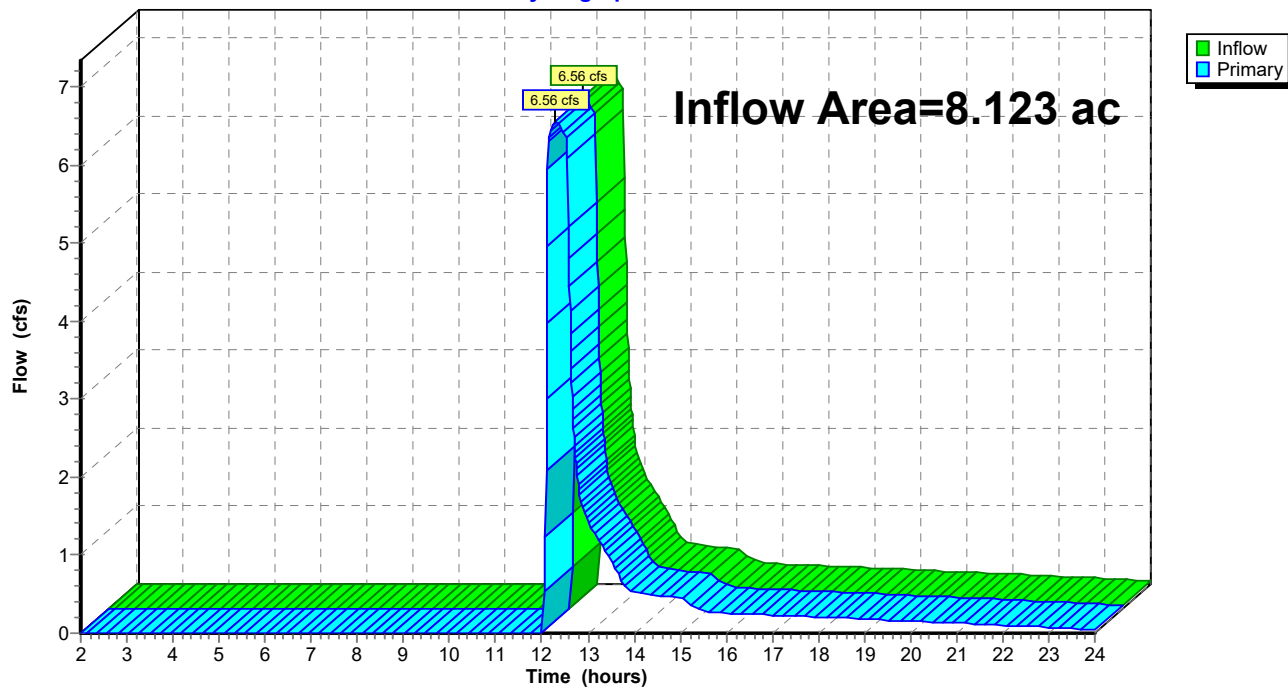
Hydrograph



Summary for Link 1L: Street Sewer

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 0.86" for 5-yr Storm event
Inflow = 6.56 cfs @ 12.30 hrs, Volume= 0.580 af
Primary = 6.56 cfs @ 12.30 hrs, Volume= 0.580 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer**Hydrograph**

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-10:

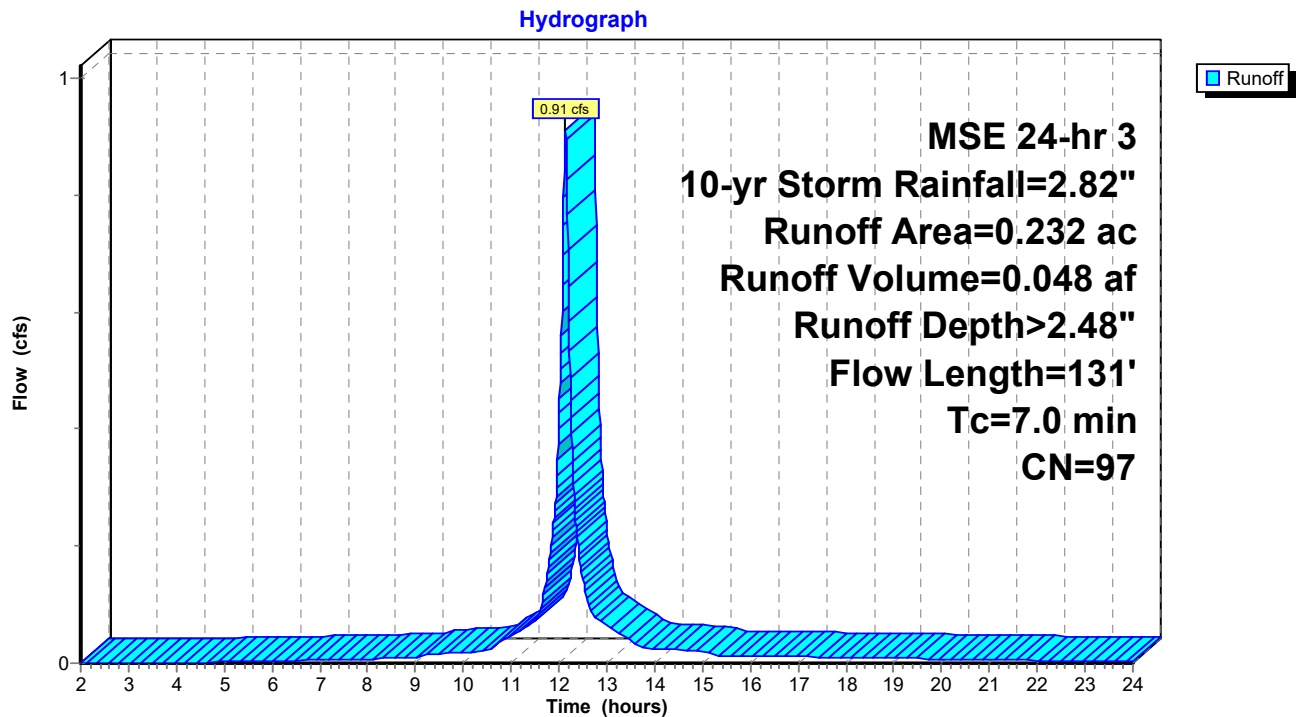
Runoff = 0.91 cfs @ 12.14 hrs, Volume= 0.048 af, Depth> 2.48"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



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Summary for Subcatchment A-11:

Runoff = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af, Depth> 1.18"
Routed to Pond 11P : Inlet

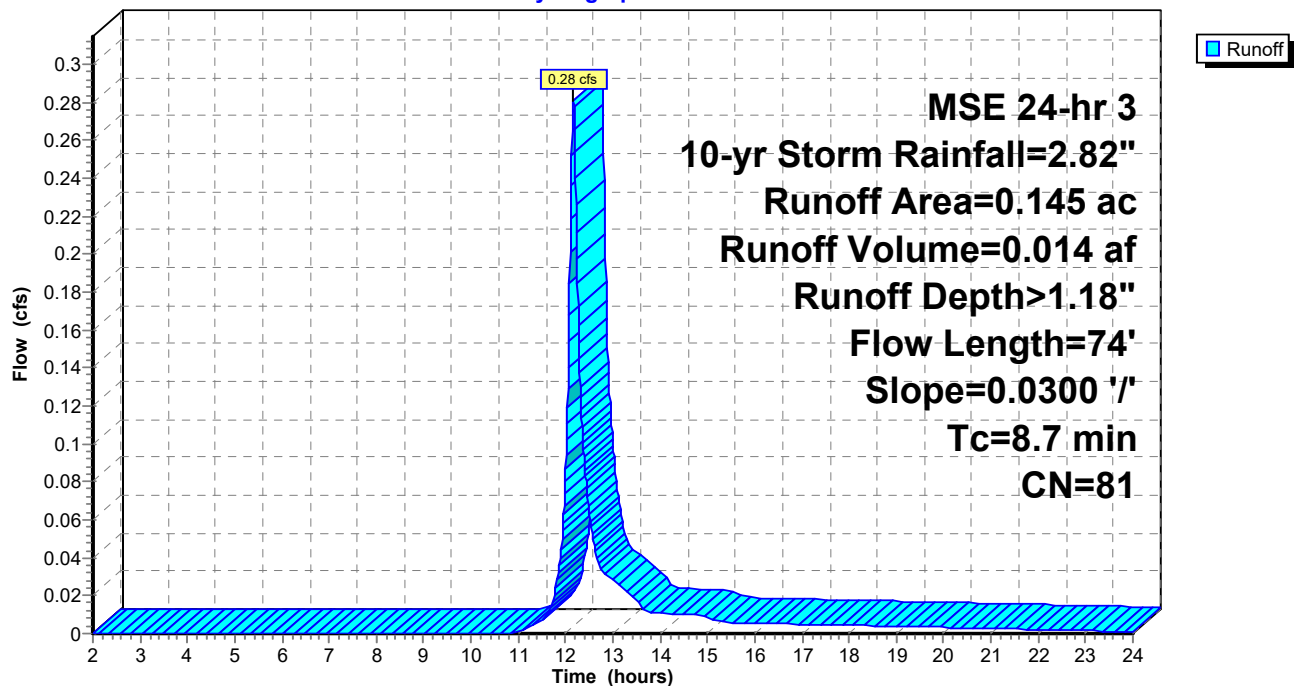
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-1a:

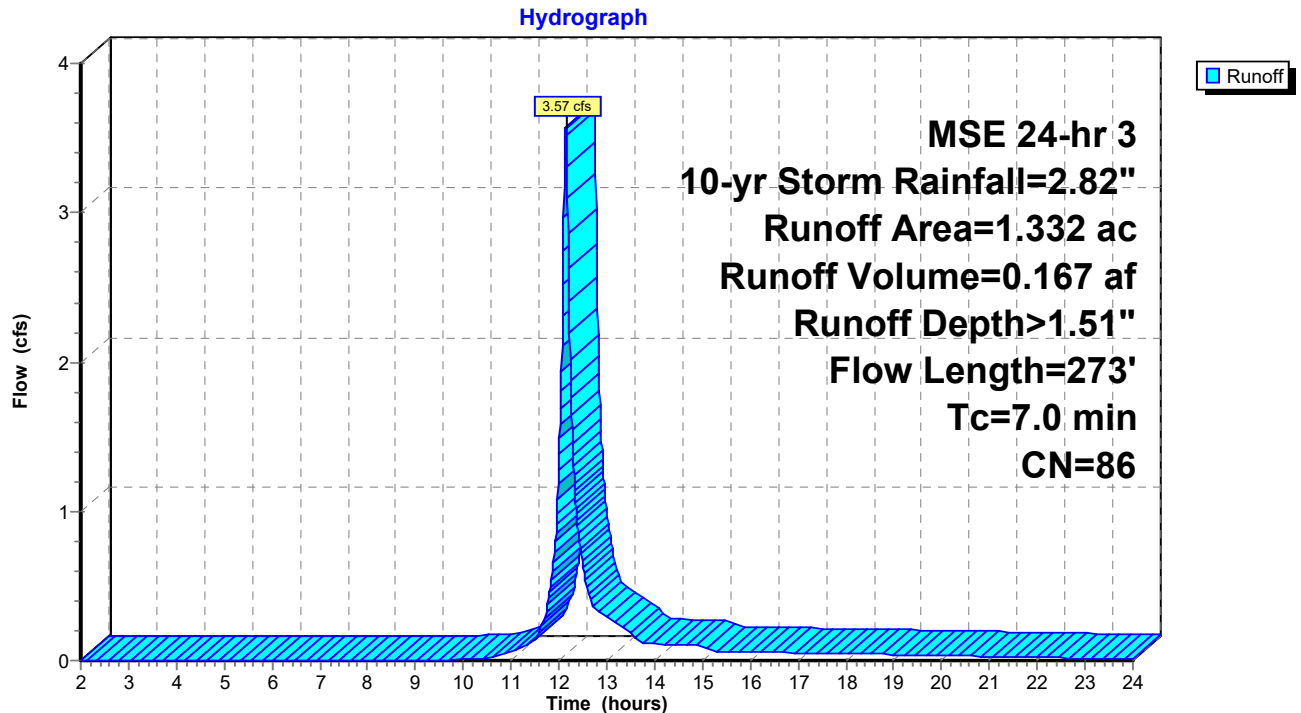
Runoff = 3.57 cfs @ 12.14 hrs, Volume= 0.167 af, Depth> 1.51"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.596	98	Paved parking, HSG C
0.674	74	>75% Grass cover, Good, HSG C
0.062	96	Gravel surface, HSG C
1.332	86	Weighted Average
0.736		55.26% Pervious Area
0.596		44.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	273		0.65		Direct Entry, Minimum

Subcatchment A-1a:



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-1b:

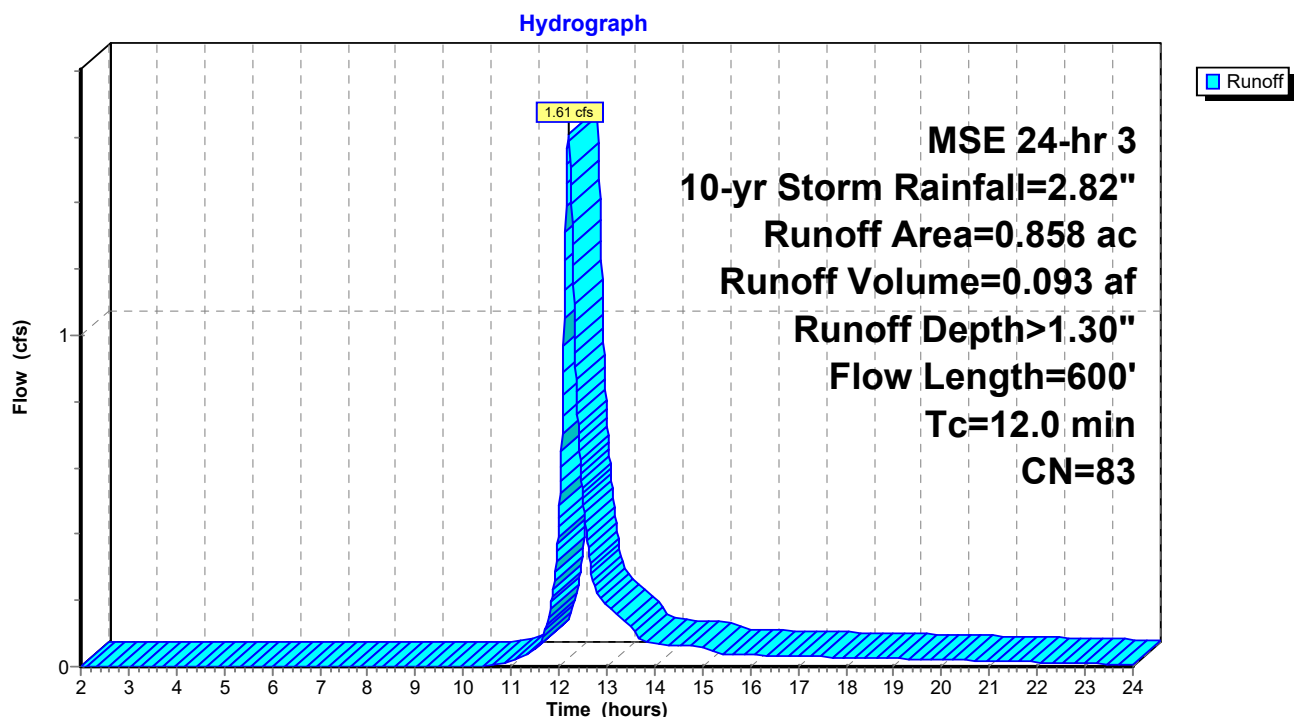
Runoff = 1.61 cfs @ 12.20 hrs, Volume= 0.093 af, Depth> 1.30"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.222	98	Paved parking, HSG C
0.115	96	Gravel surface, HSG C
0.521	74	>75% Grass cover, Good, HSG C
0.858	83	Weighted Average
0.636		74.13% Pervious Area
0.222		25.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	73	0.1096	0.24		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
5.2	297	0.0185	0.95		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	230	0.0130	2.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.0	600	Total			

Subcatchment A-1b:



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-2:

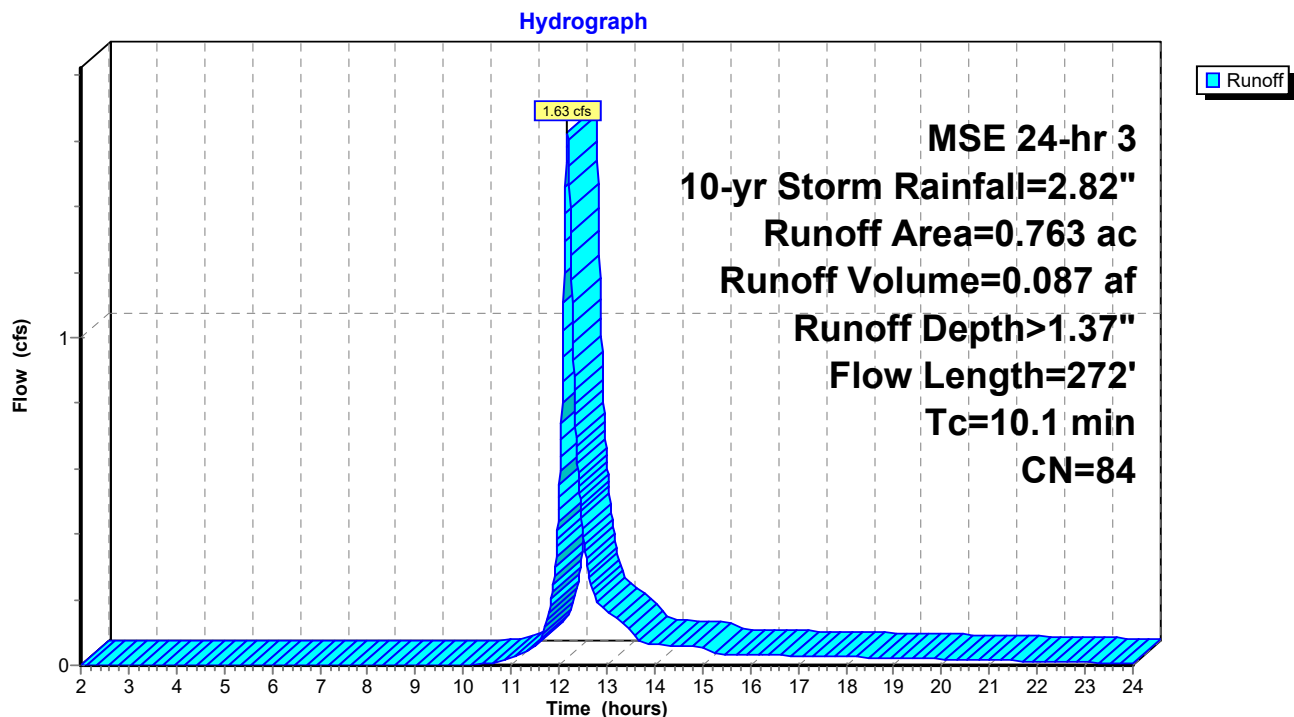
Runoff = 1.63 cfs @ 12.18 hrs, Volume= 0.087 af, Depth> 1.37"
Routed to Pond 2P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.321	98	Paved parking, HSG C
0.442	74	>75% Grass cover, Good, HSG C
0.763	84	Weighted Average
0.442		57.93% Pervious Area
0.321		42.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	139	0.0899	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
0.8	133	0.0188	2.78		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.1	272	Total			

Subcatchment A-2:



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-3:

Runoff = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af, Depth> 0.80"
Routed to Pond 3P : Inlet

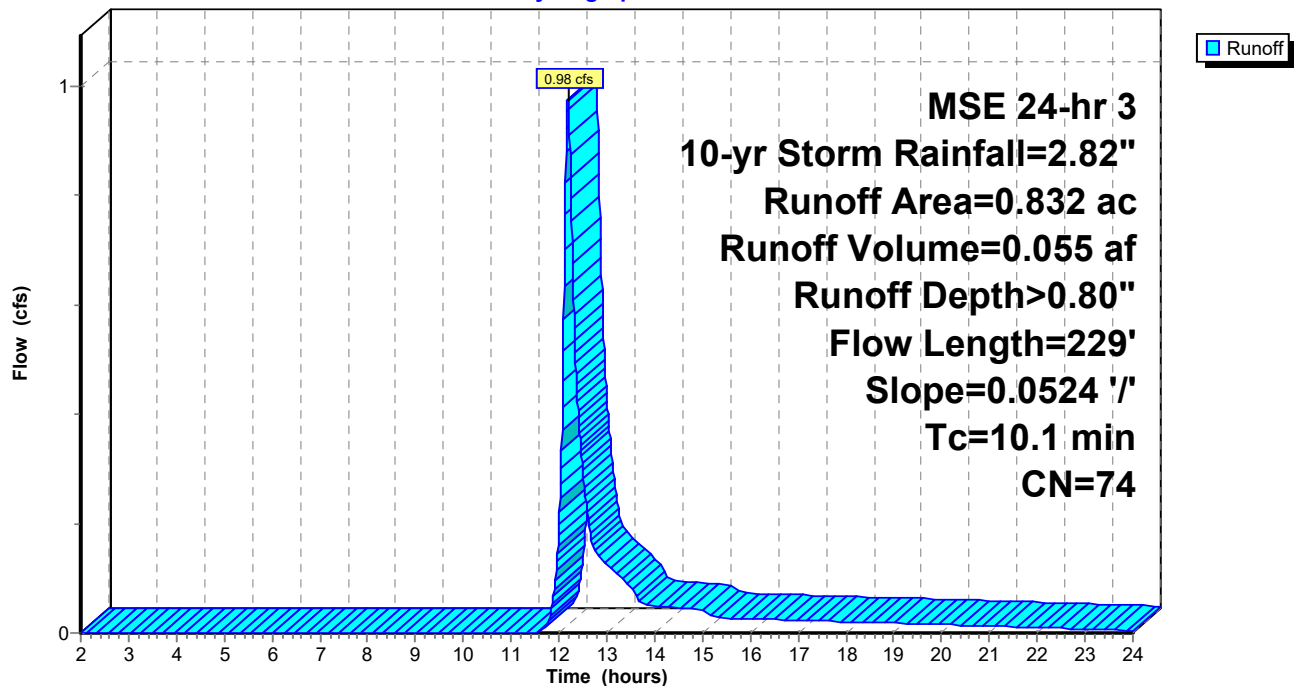
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-4:

Runoff = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af, Depth> 2.59"
Routed to Pond 4P : Roof Drain

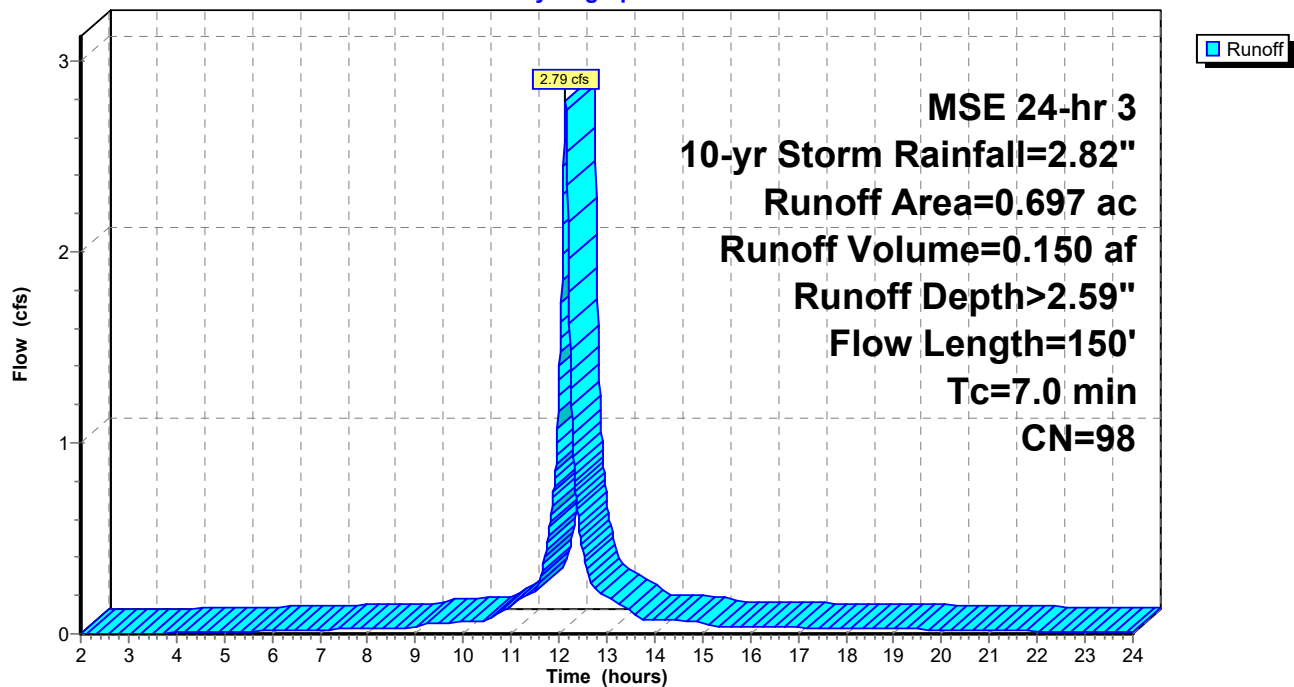
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:

Hydrograph



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Summary for Subcatchment A-5:

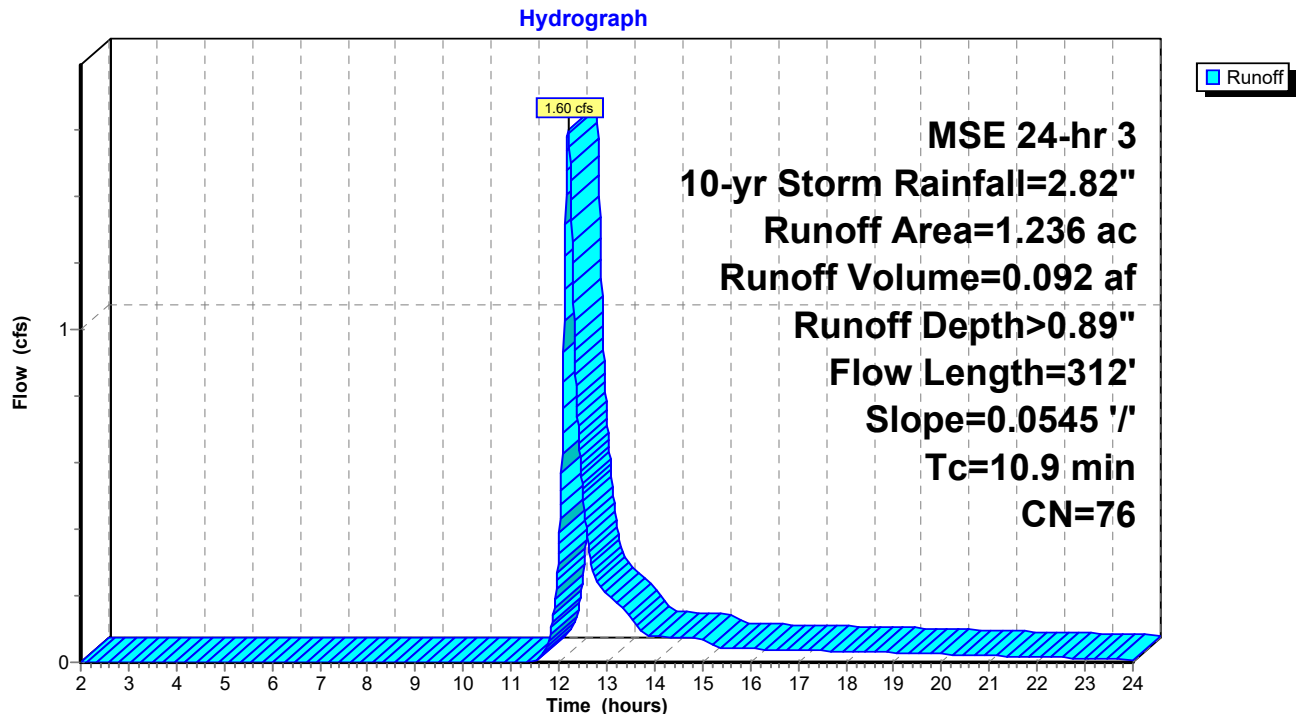
Runoff = 1.60 cfs @ 12.20 hrs, Volume= 0.092 af, Depth> 0.89"
Routed to Pond 5P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-6:

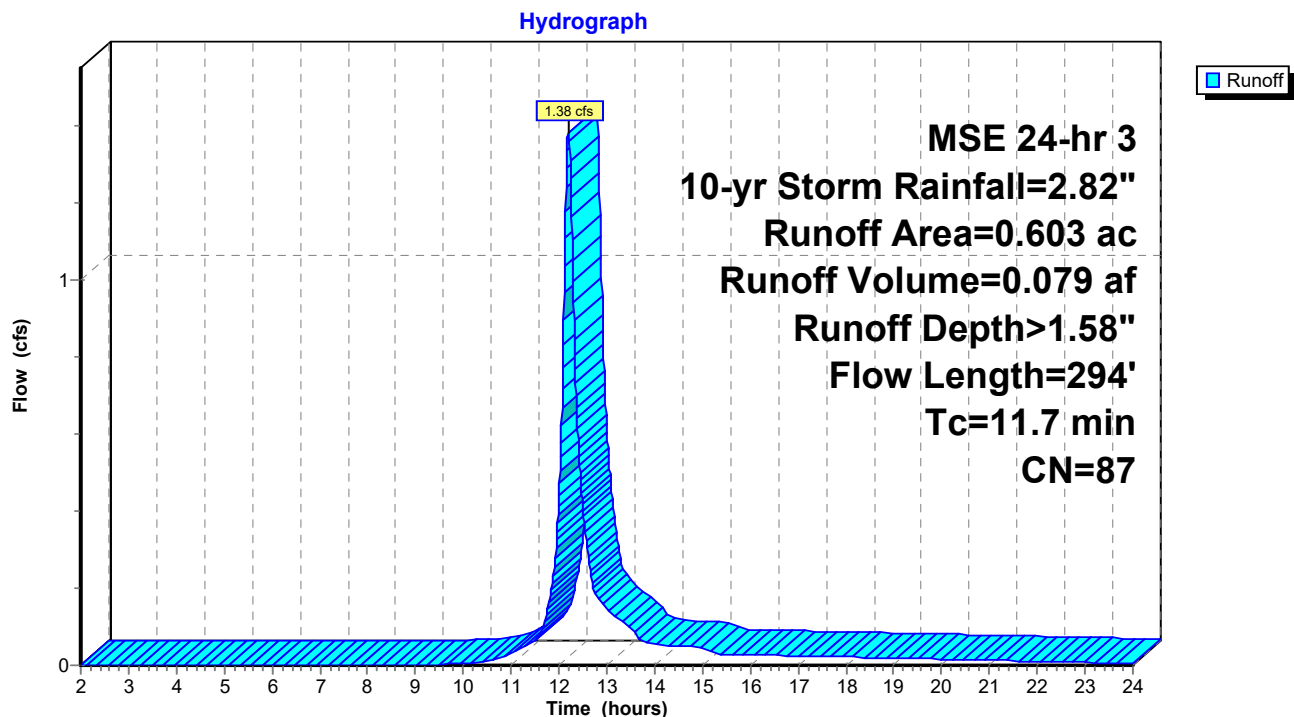
Runoff = 1.38 cfs @ 12.20 hrs, Volume= 0.079 af, Depth> 1.58"
Routed to Pond 6P : DI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:



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Summary for Subcatchment A-7:

Runoff = 0.85 cfs @ 12.20 hrs, Volume= 0.050 af, Depth> 0.89"
Routed to Pond 7P : Proposed Pond

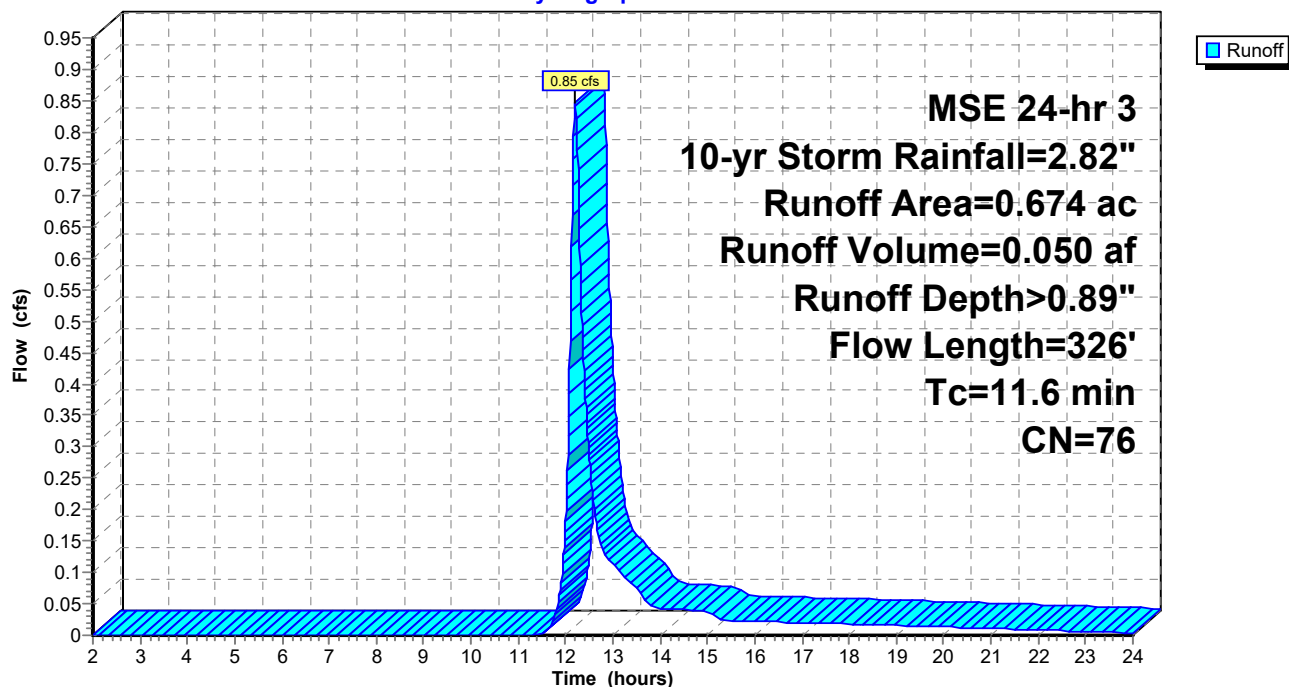
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.631	74	>75% Grass cover, Good, HSG C
0.043	98	Paved parking, HSG C
0.674	76	Weighted Average
0.631		93.62% Pervious Area
0.043		6.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



StandleyLake_Prop2

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Summary for Subcatchment A-8:

Runoff = 1.64 cfs @ 12.14 hrs, Volume= 0.078 af, Depth> 1.74"
Routed to Pond 8P : CB

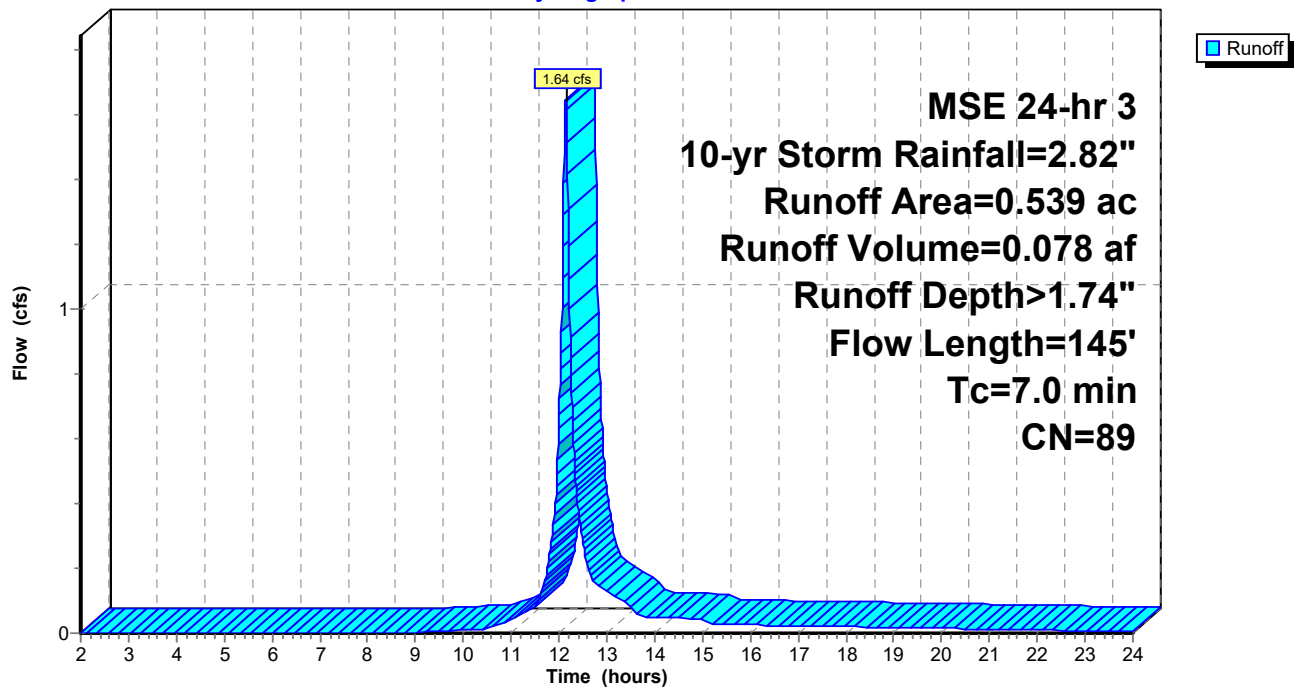
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:

Hydrograph



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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Subcatchment A-9:

Runoff = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af, Depth> 2.18"
Routed to Pond 9P : CB

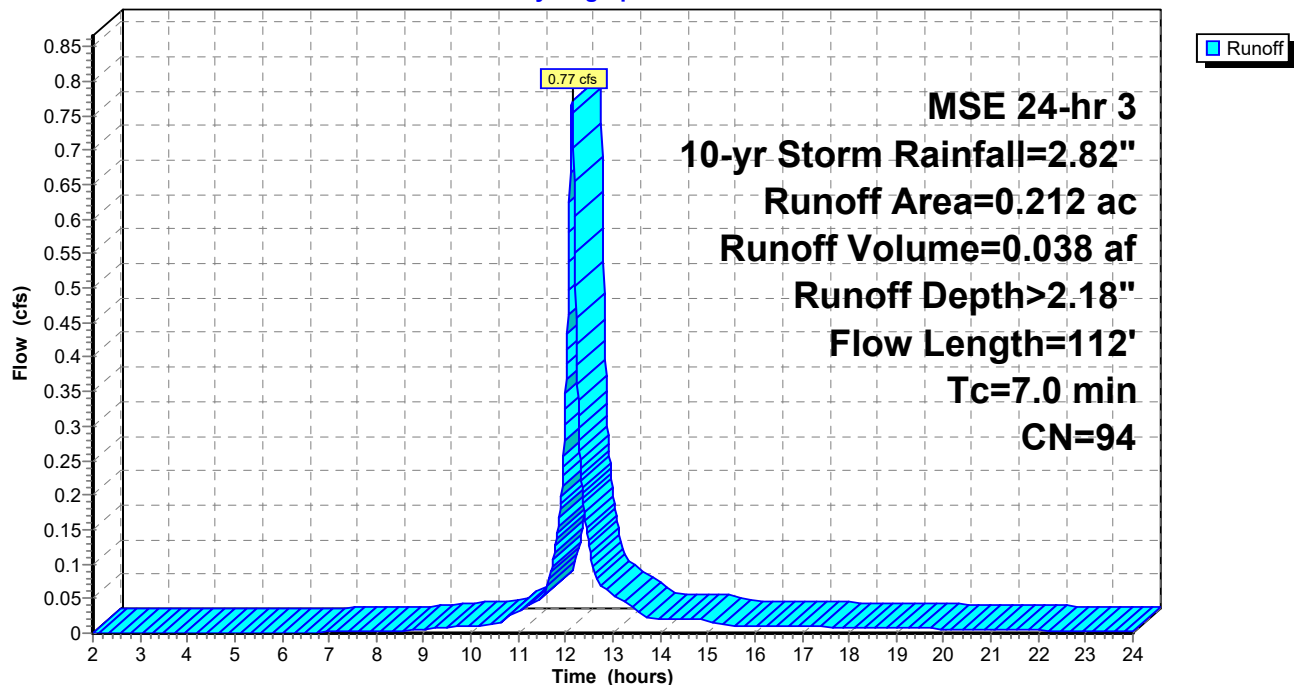
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Storm Rainfall=2.82"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:

Hydrograph



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Summary for Pond 1P: CB

Inflow Area = 2.190 ac, 37.35% Impervious, Inflow Depth > 1.43" for 10-yr Storm event
Inflow = 4.95 cfs @ 12.15 hrs, Volume= 0.261 af
Outflow = 4.95 cfs @ 12.15 hrs, Volume= 0.261 af, Atten= 0%, Lag= 0.0 min
Primary = 4.95 cfs @ 12.15 hrs, Volume= 0.261 af
Routed to Pond 8P : CB

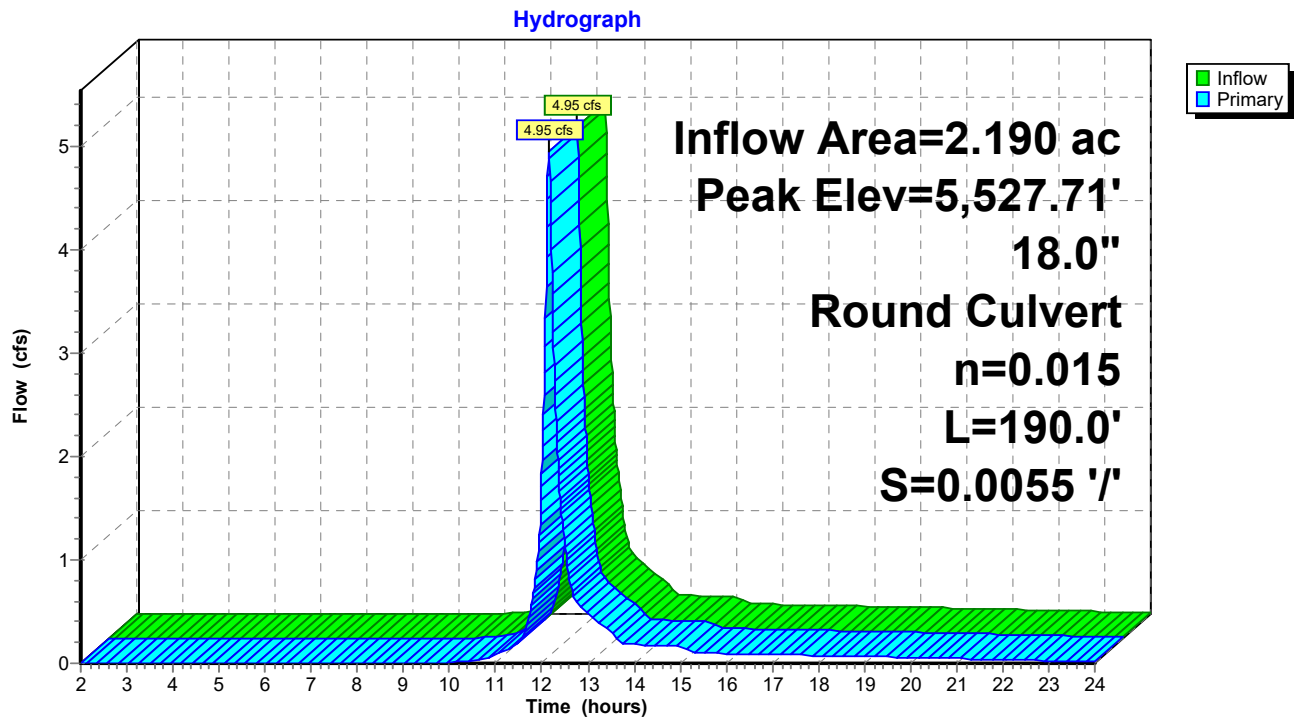
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,527.71' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=4.78 cfs @ 12.15 hrs HW=5,527.66' TW=5,526.96' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 4.78 cfs @ 2.70 fps)

Pond 1P: CB



StandleyLake_Prop2

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Summary for Pond 2P: CB

Inflow Area = 1.595 ac, 20.13% Impervious, Inflow Depth > 1.07" for 10-yr Storm event
Inflow = 2.60 cfs @ 12.18 hrs, Volume= 0.142 af
Outflow = 2.60 cfs @ 12.18 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min
Primary = 2.60 cfs @ 12.18 hrs, Volume= 0.142 af
Routed to Pond 10P : Inlet

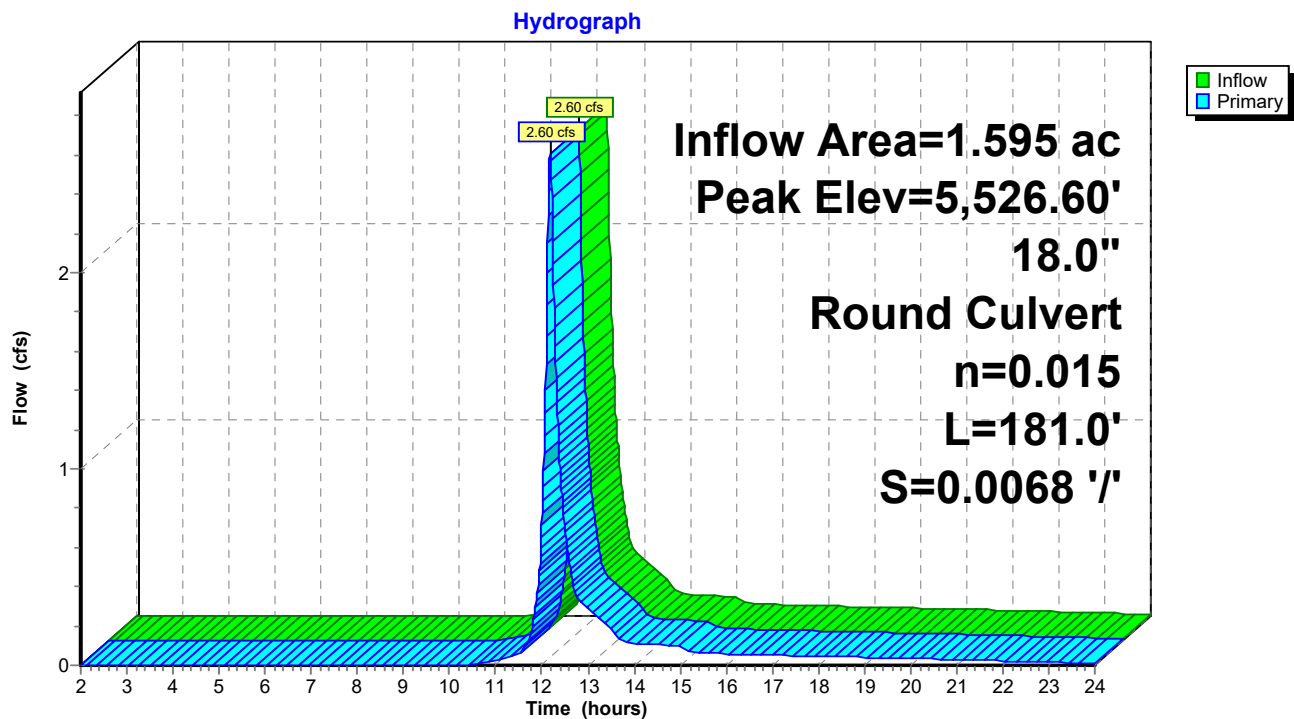
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.60' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.58 cfs @ 12.18 hrs HW=5,526.60' TW=5,525.82' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 2.58 cfs @ 2.92 fps)

Pond 2P: CB



StandleyLake_Prop2

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 0.80" for 10-yr Storm event
Inflow = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af
Outflow = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min
Primary = 0.98 cfs @ 12.19 hrs, Volume= 0.055 af
Routed to Pond 2P : CB

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

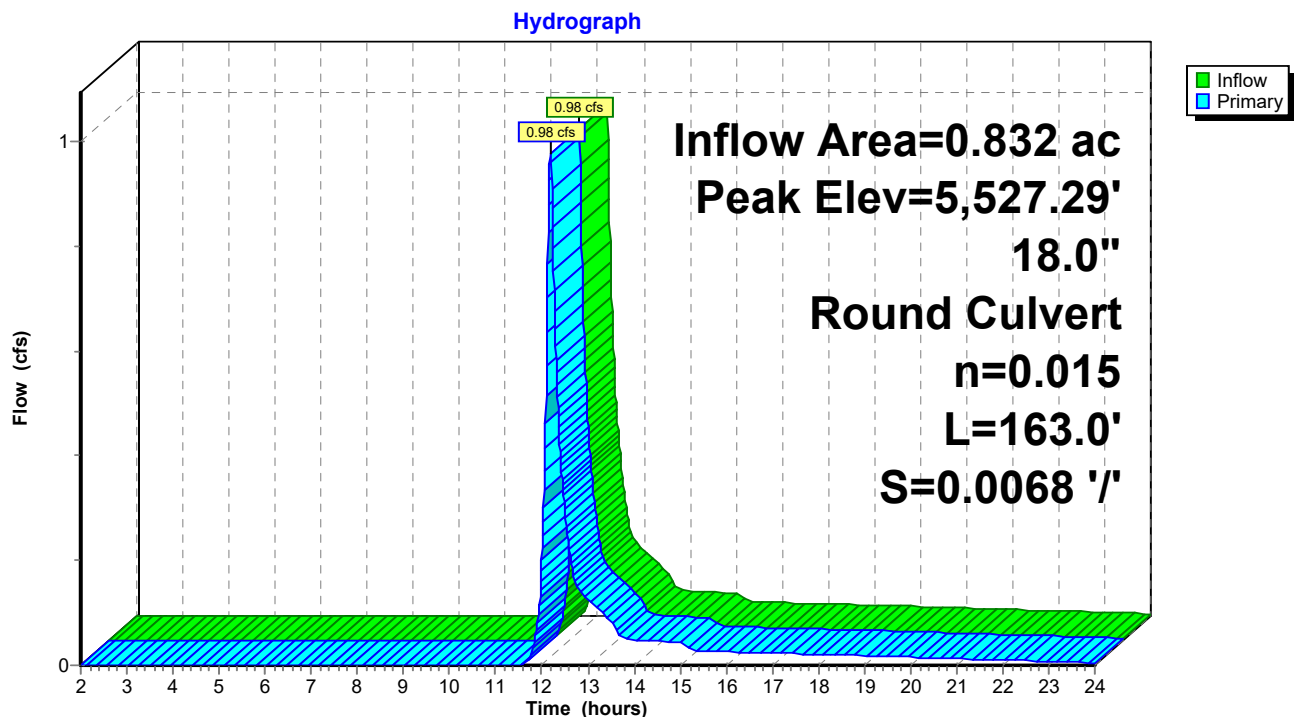
Peak Elev= 5,527.29' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.97 cfs @ 12.19 hrs HW=5,527.29' TW=5,526.60' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 0.97 cfs @ 2.30 fps)

Pond 3P: Inlet



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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 2.59" for 10-yr Storm event
Inflow = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af
Outflow = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min
Primary = 2.79 cfs @ 12.14 hrs, Volume= 0.150 af
Routed to Pond 5P : Inlet

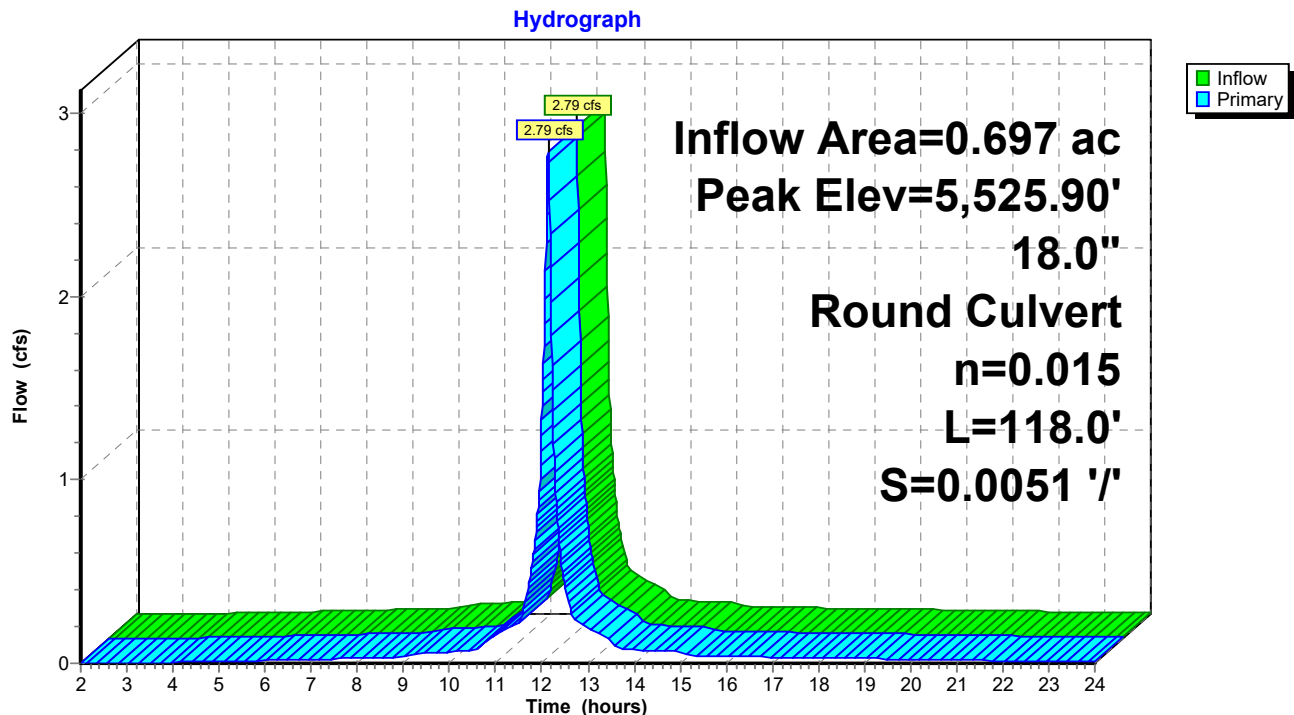
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,525.90' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 ' S= 0.0051 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.87 cfs @ 12.14 hrs HW=5,525.68' TW=5,525.61' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.87 cfs @ 1.12 fps)

Pond 4P: Roof Drain



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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 1.51" for 10-yr Storm event
Inflow = 4.16 cfs @ 12.15 hrs, Volume= 0.243 af
Outflow = 4.16 cfs @ 12.15 hrs, Volume= 0.243 af, Atten= 0%, Lag= 0.0 min
Primary = 4.16 cfs @ 12.15 hrs, Volume= 0.243 af
Routed to Pond 6P : DI

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

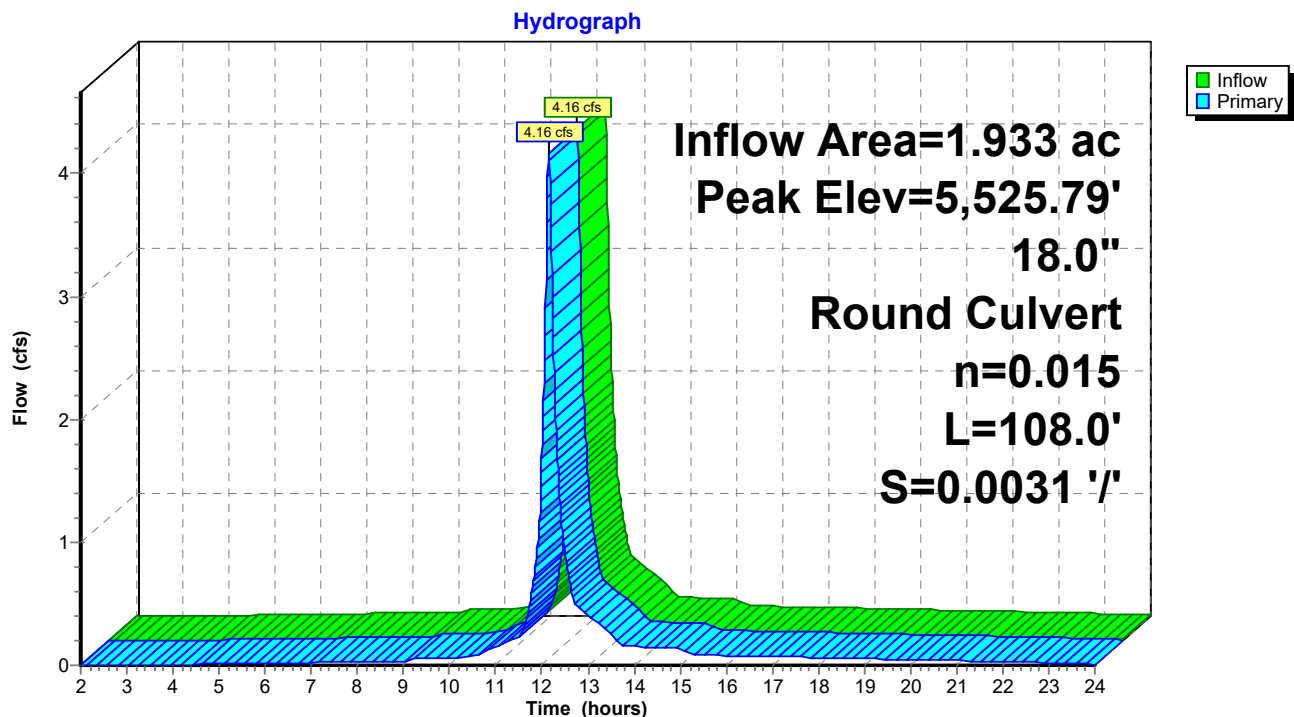
Peak Elev= 5,525.79' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.82 cfs @ 12.15 hrs HW=5,525.71' TW=5,525.41' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 3.82 cfs @ 2.16 fps)

Pond 5P: Inlet



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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 1.52" for 10-yr Storm event
Inflow = 5.44 cfs @ 12.16 hrs, Volume= 0.322 af
Outflow = 5.44 cfs @ 12.16 hrs, Volume= 0.322 af, Atten= 0%, Lag= 0.0 min
Primary = 5.44 cfs @ 12.16 hrs, Volume= 0.322 af
Routed to Pond 7P : Proposed Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

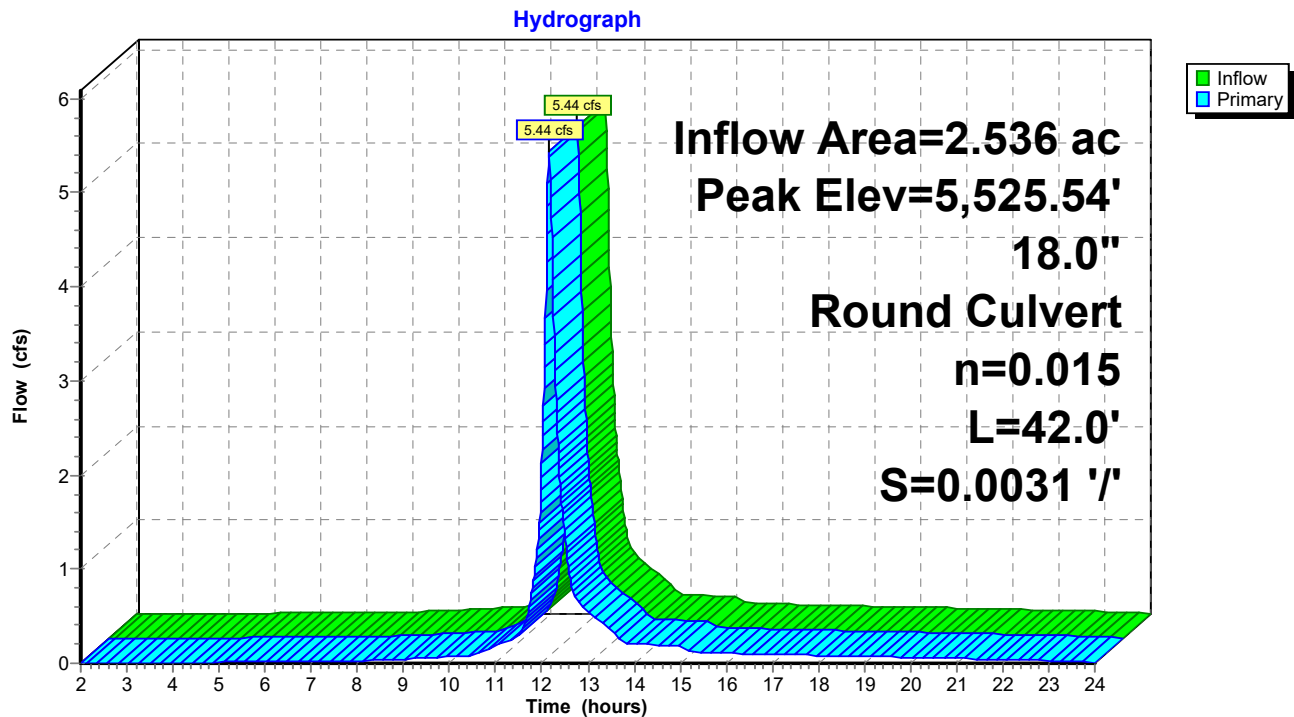
Peak Elev= 5,525.54' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=5.15 cfs @ 12.16 hrs HW=5,525.44' TW=5,525.07' (Dynamic Tailwater)

↑1=RCP_Round 18" (Inlet Controls 5.15 cfs @ 2.91 fps)

Pond 6P: DI



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Summary for Pond 7P: Proposed Pond

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 1.41" for 10-yr Storm event
Inflow = 17.13 cfs @ 12.16 hrs, Volume= 0.954 af
Outflow = 6.93 cfs @ 12.35 hrs, Volume= 0.823 af, Atten= 60%, Lag= 11.8 min
Primary = 6.93 cfs @ 12.35 hrs, Volume= 0.823 af
Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 5,525.42' @ 12.35 hrs Surf.Area= 0.240 ac Storage= 0.308 af

Plug-Flow detention time= 85.4 min calculated for 0.823 af (86% of inflow)
Center-of-Mass det. time= 32.2 min (833.6 - 801.4)

Volume	Invert	Avail.Storage	Storage Description
#1	5,522.00'	0.464 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.026	0.013	0.013
5,524.00	0.088	0.057	0.070
5,525.00	0.203	0.146	0.216
5,526.00	0.293	0.248	0.464

Device	Routing	Invert	Outlet Devices
#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 ' / ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

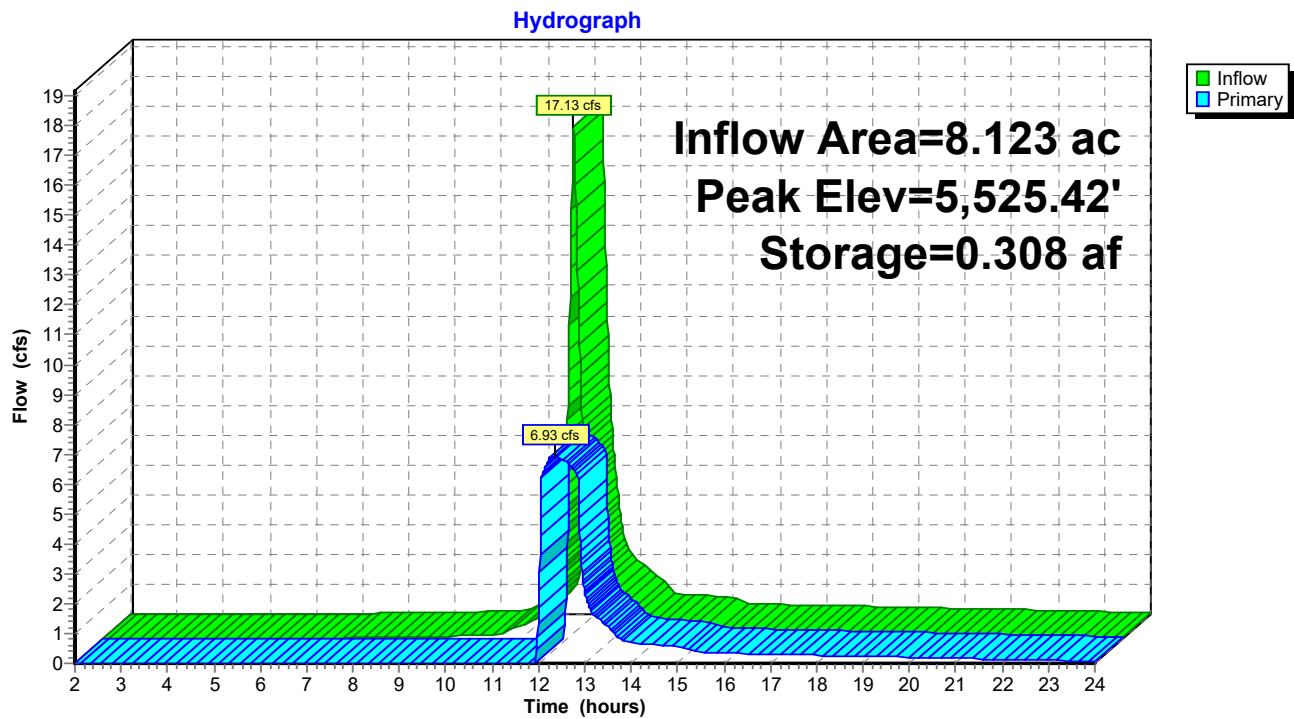
Primary OutFlow Max=6.93 cfs @ 12.35 hrs HW=5,525.42' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 6.93 cfs of 13.79 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 6.93 cfs @ 9.24 fps)

↑ **1=Orifice/Grate** (Passes 6.93 cfs of 40.16 cfs potential flow)

Pond 7P: Proposed Pond



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Summary for Pond 8P: CB

Inflow Area = 2.941 ac, 45.56% Impervious, Inflow Depth > 1.54" for 10-yr Storm event
Inflow = 7.35 cfs @ 12.15 hrs, Volume= 0.377 af
Outflow = 7.35 cfs @ 12.15 hrs, Volume= 0.377 af, Atten= 0%, Lag= 0.0 min
Primary = 7.35 cfs @ 12.15 hrs, Volume= 0.377 af
Routed to Pond 7P : Proposed Pond

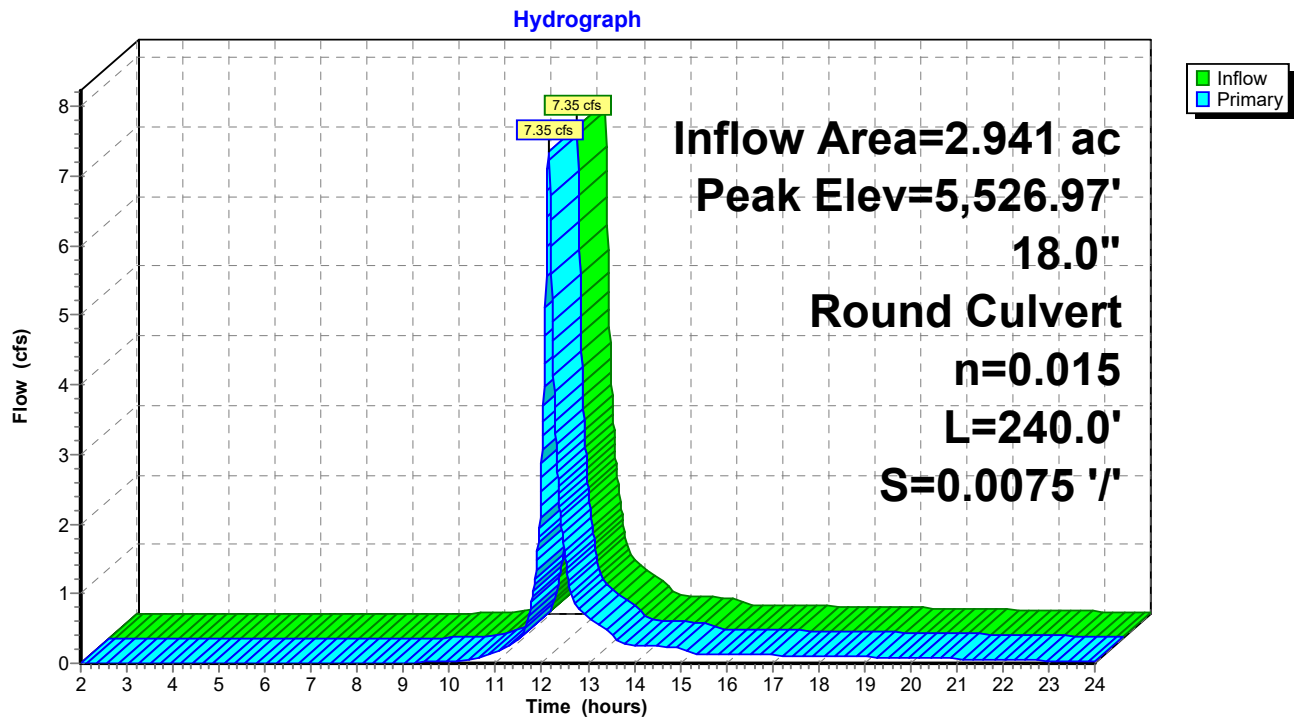
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,526.97' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=7.26 cfs @ 12.15 hrs HW=5,526.96' TW=5,525.03' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 7.26 cfs @ 4.11 fps)

Pond 8P: CB



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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 2.18" for 10-yr Storm event
Inflow = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af
Outflow = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.14 hrs, Volume= 0.038 af
Routed to Pond 8P : CB

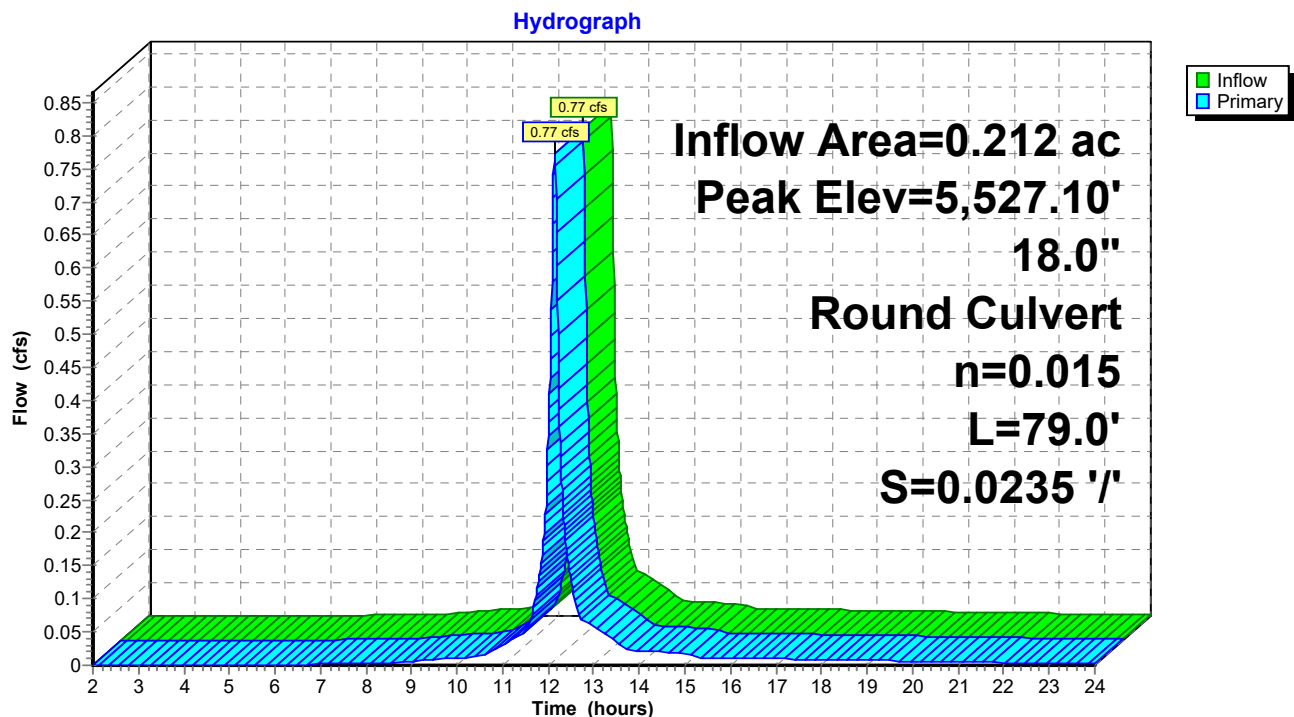
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,527.10' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.52 cfs @ 12.14 hrs HW=5,527.01' TW=5,526.90' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 0.52 cfs @ 1.23 fps)

Pond 9P: CB



StandleyLake_Prop2

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 10P: Inlet

Inflow Area = 1.972 ac, 29.01% Impervious, Inflow Depth > 1.24" for 10-yr Storm event
Inflow = 3.68 cfs @ 12.17 hrs, Volume= 0.204 af
Outflow = 3.68 cfs @ 12.17 hrs, Volume= 0.204 af, Atten= 0%, Lag= 0.0 min
Primary = 3.68 cfs @ 12.17 hrs, Volume= 0.204 af
Routed to Pond 7P : Proposed Pond

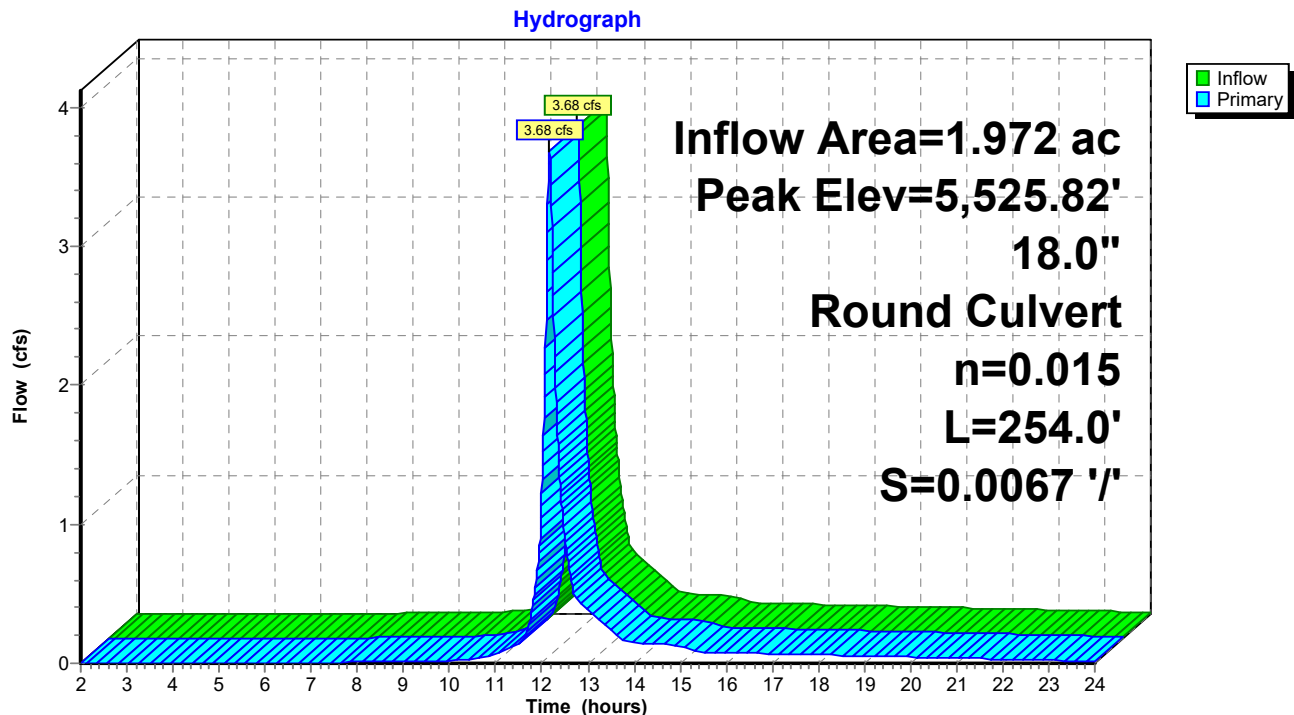
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,525.82' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 ' S= 0.0067 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=3.57 cfs @ 12.17 hrs HW=5,525.80' TW=5,525.11' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 3.57 cfs @ 2.64 fps)

Pond 10P: Inlet



StandleyLake_Prop2

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MSE 24-hr 3 10-yr Storm Rainfall=2.82"

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Summary for Pond 11P: Inlet

Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 1.18" for 10-yr Storm event
Inflow = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af
Outflow = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.17 hrs, Volume= 0.014 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

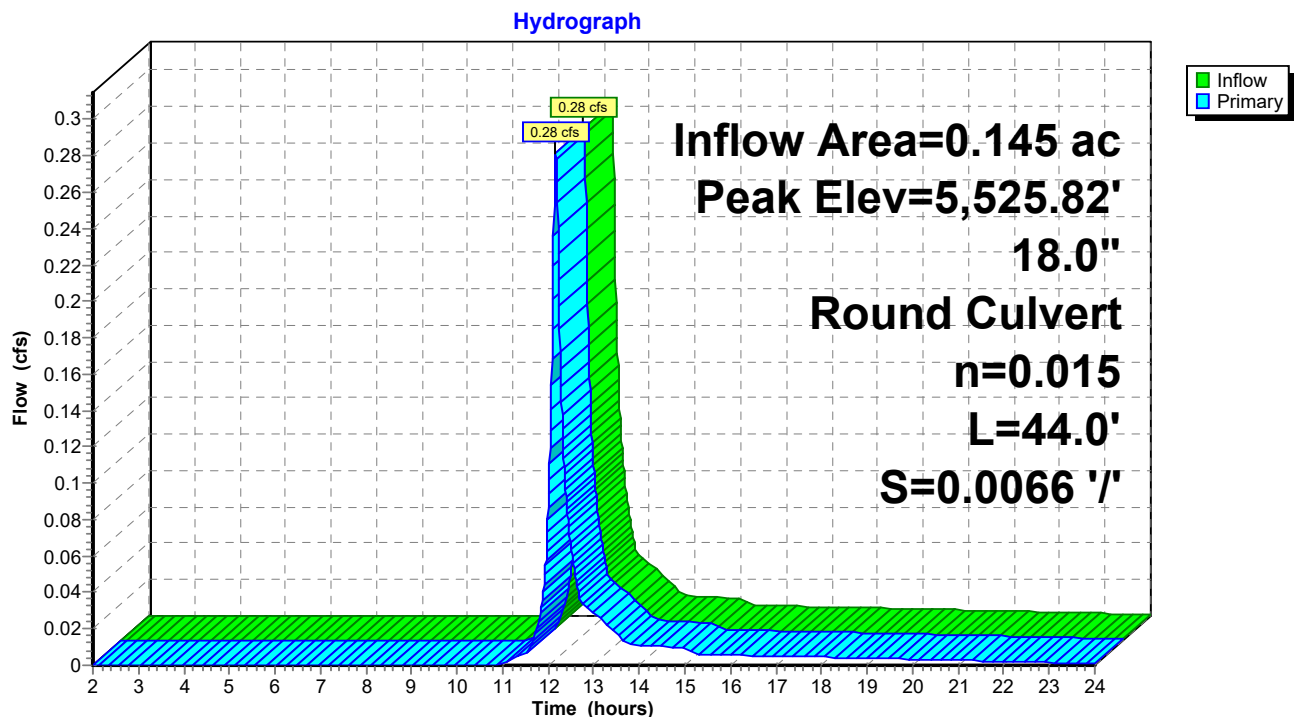
Peak Elev= 5,525.82' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/ Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=5,525.77' TW=5,525.80' (Dynamic Tailwater)

↑1=RCP_Round 18" (Controls 0.00 cfs)

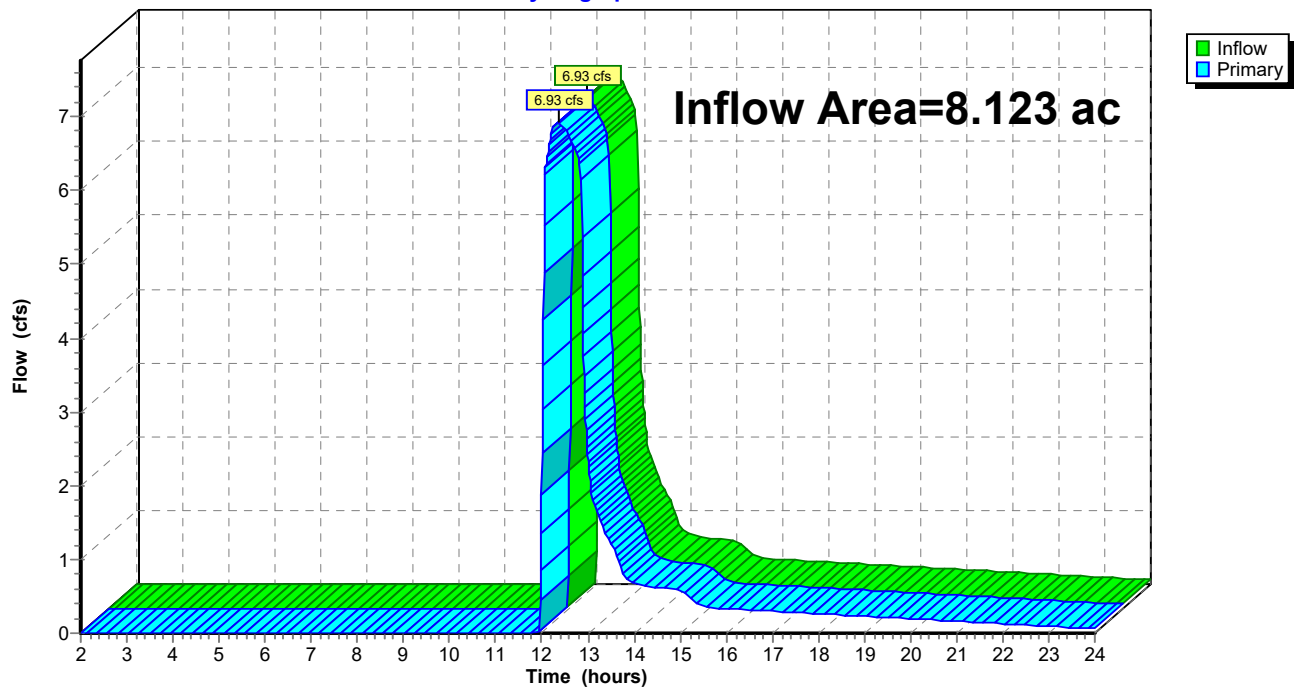
Pond 11P: Inlet



Summary for Link 1L: Street Sewer

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 1.22" for 10-yr Storm event
Inflow = 6.93 cfs @ 12.35 hrs, Volume= 0.823 af
Primary = 6.93 cfs @ 12.35 hrs, Volume= 0.823 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer**Hydrograph**

StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-10:

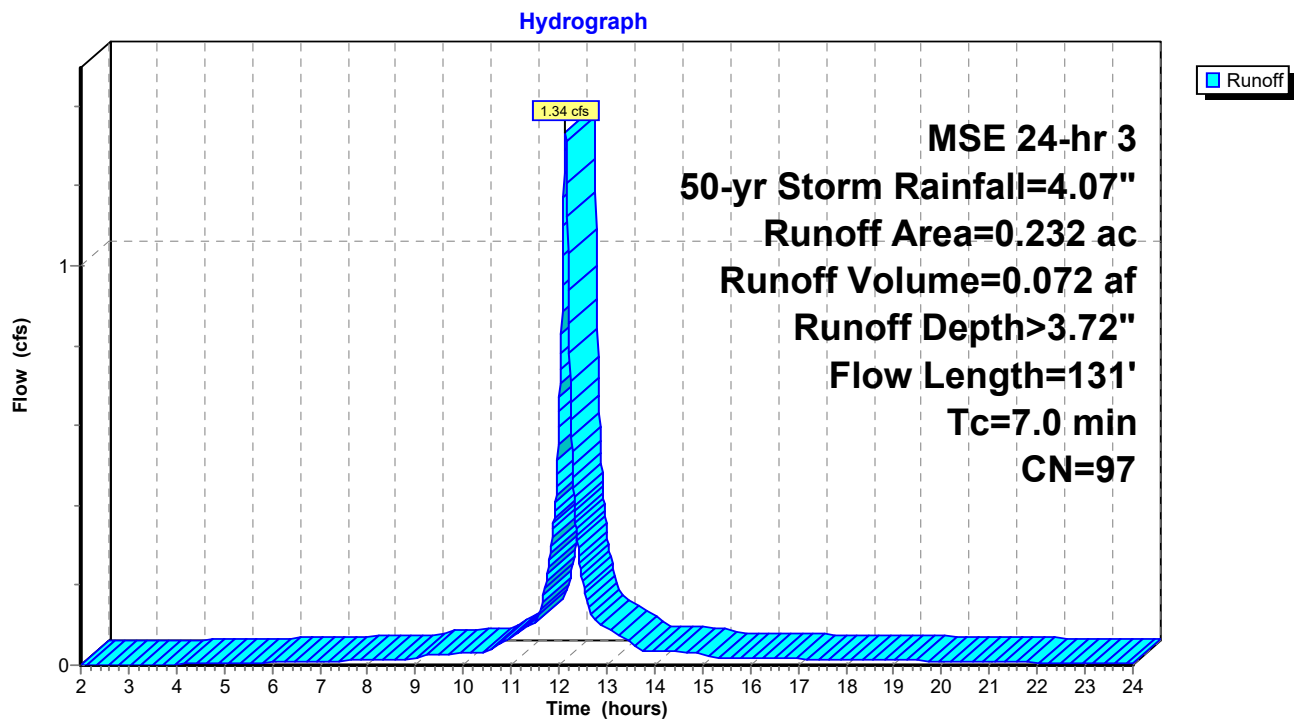
Runoff = 1.34 cfs @ 12.14 hrs, Volume= 0.072 af, Depth> 3.72"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-11:

Runoff = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af, Depth> 2.18"
Routed to Pond 11P : Inlet

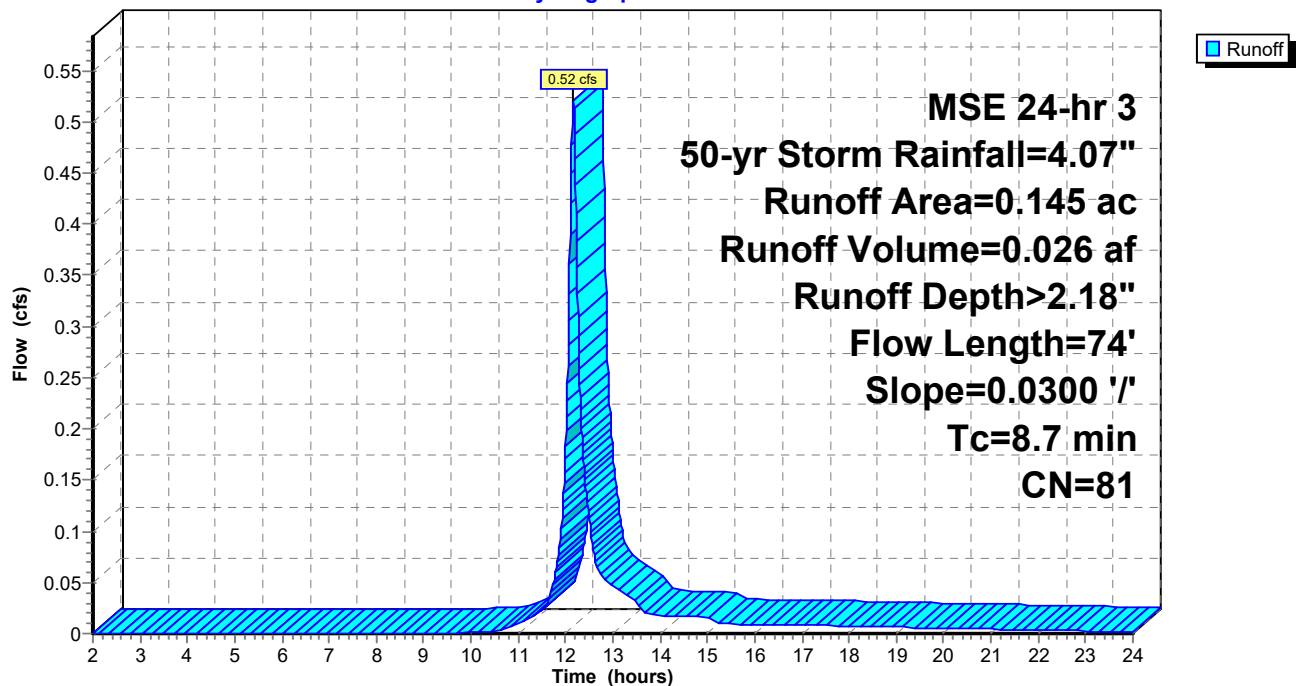
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-1a:

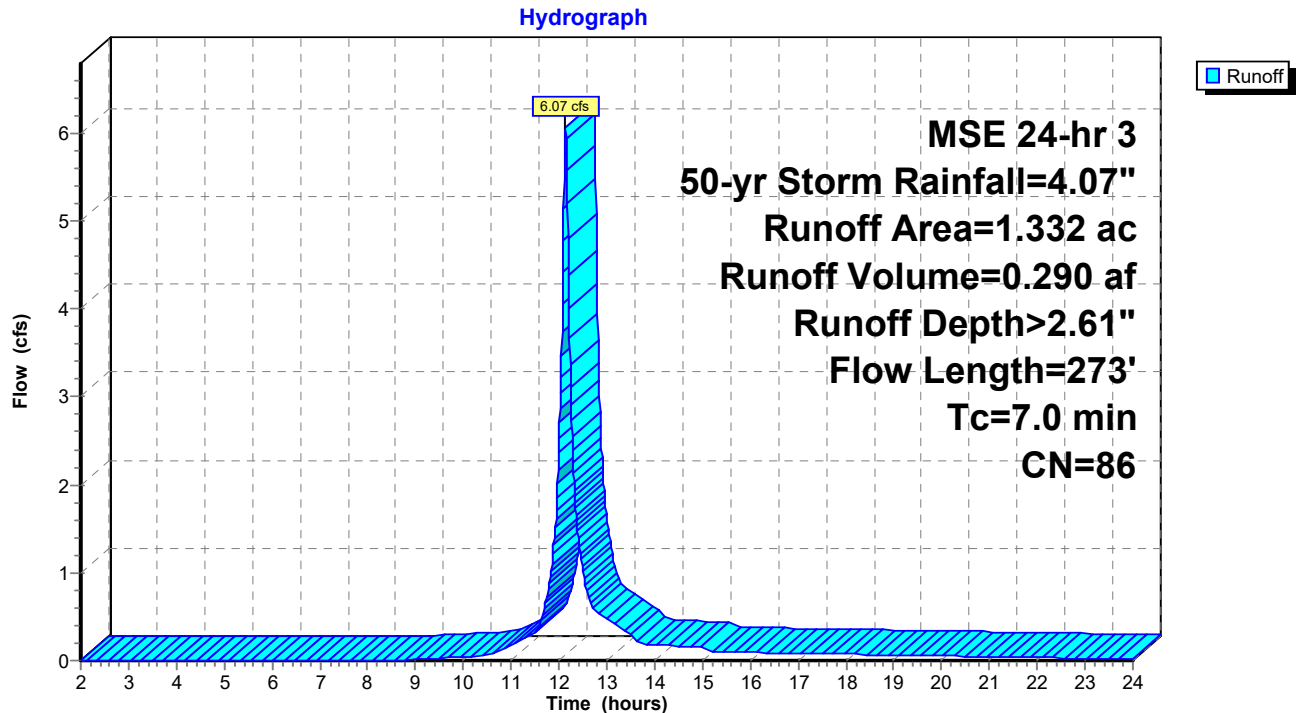
Runoff = 6.07 cfs @ 12.14 hrs, Volume= 0.290 af, Depth> 2.61"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.596	98	Paved parking, HSG C
0.674	74	>75% Grass cover, Good, HSG C
0.062	96	Gravel surface, HSG C
1.332	86	Weighted Average
0.736		55.26% Pervious Area
0.596		44.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	273		0.65		Direct Entry, Minimum

Subcatchment A-1a:



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-1b:

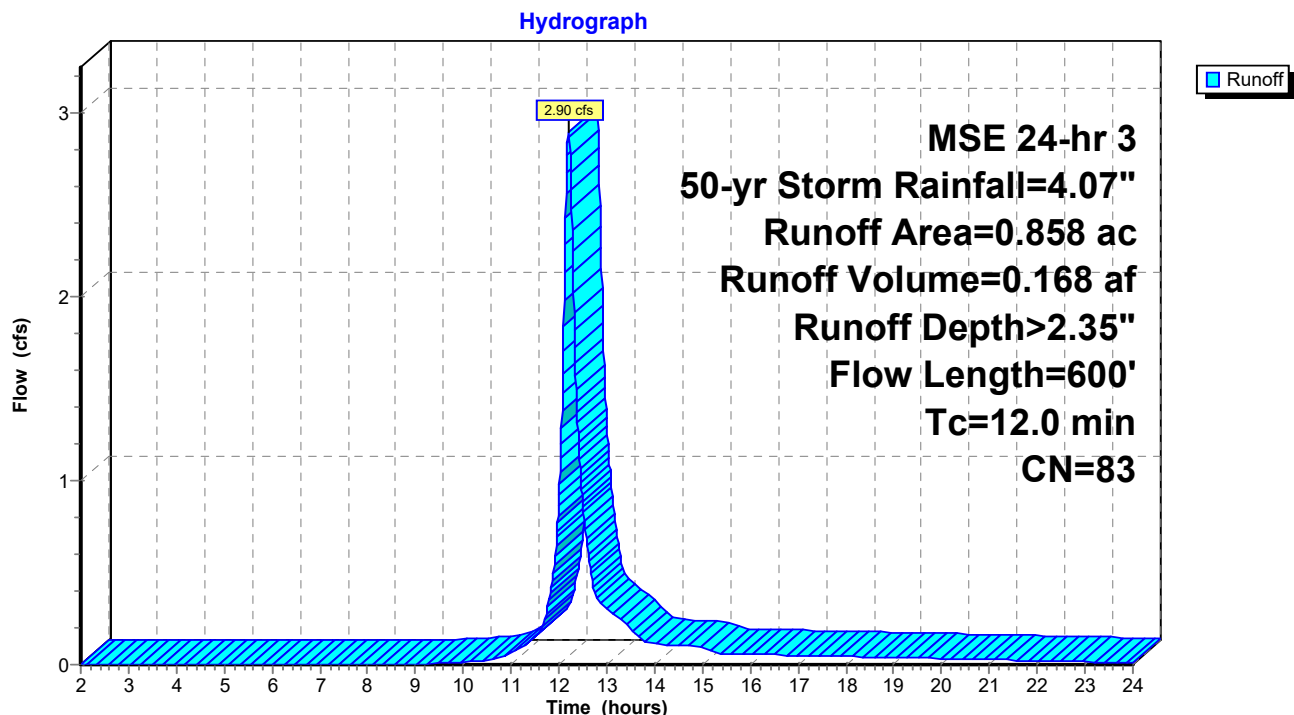
Runoff = 2.90 cfs @ 12.20 hrs, Volume= 0.168 af, Depth> 2.35"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.222	98	Paved parking, HSG C
0.115	96	Gravel surface, HSG C
0.521	74	>75% Grass cover, Good, HSG C
0.858	83	Weighted Average
0.636		74.13% Pervious Area
0.222		25.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	73	0.1096	0.24		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
5.2	297	0.0185	0.95		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	230	0.0130	2.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.0	600	Total			

Subcatchment A-1b:



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-2:

Runoff = 2.87 cfs @ 12.18 hrs, Volume= 0.155 af, Depth> 2.43"
Routed to Pond 2P : CB

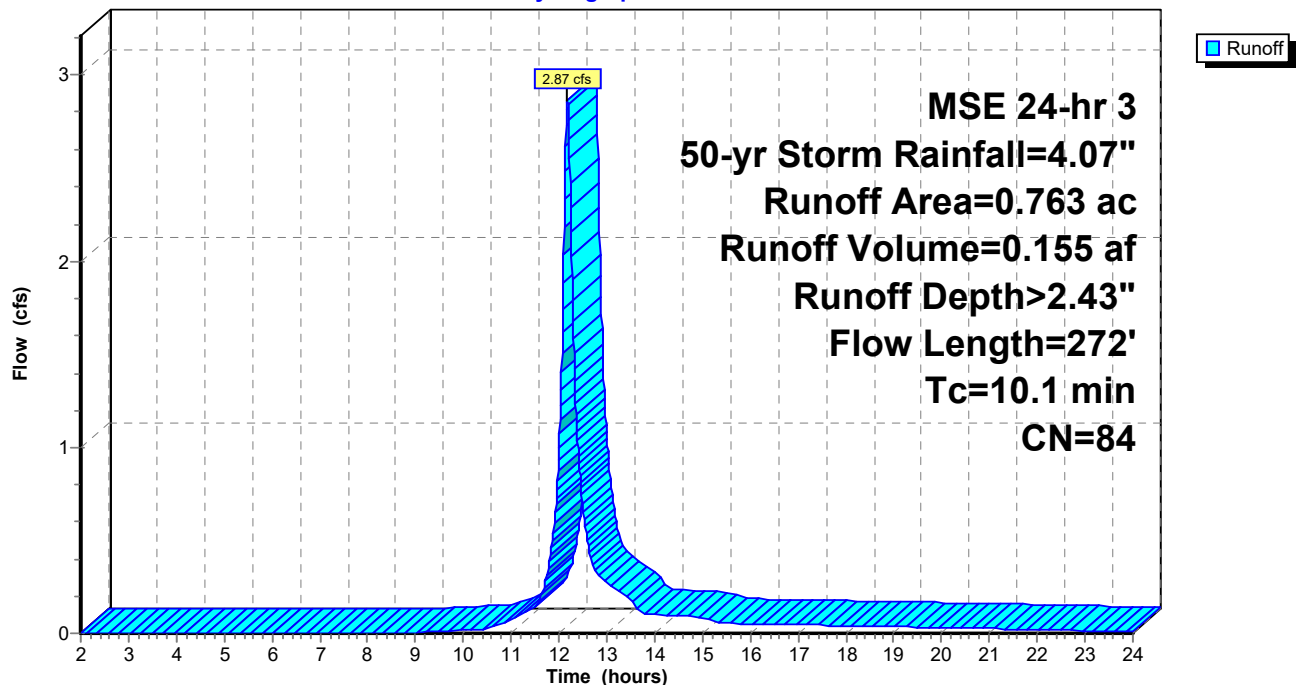
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.321	98	Paved parking, HSG C
0.442	74	>75% Grass cover, Good, HSG C
0.763	84	Weighted Average
0.442		57.93% Pervious Area
0.321		42.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	139	0.0899	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
0.8	133	0.0188	2.78		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.1	272	Total			

Subcatchment A-2:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-3:

Runoff = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af, Depth> 1.65"
Routed to Pond 3P : Inlet

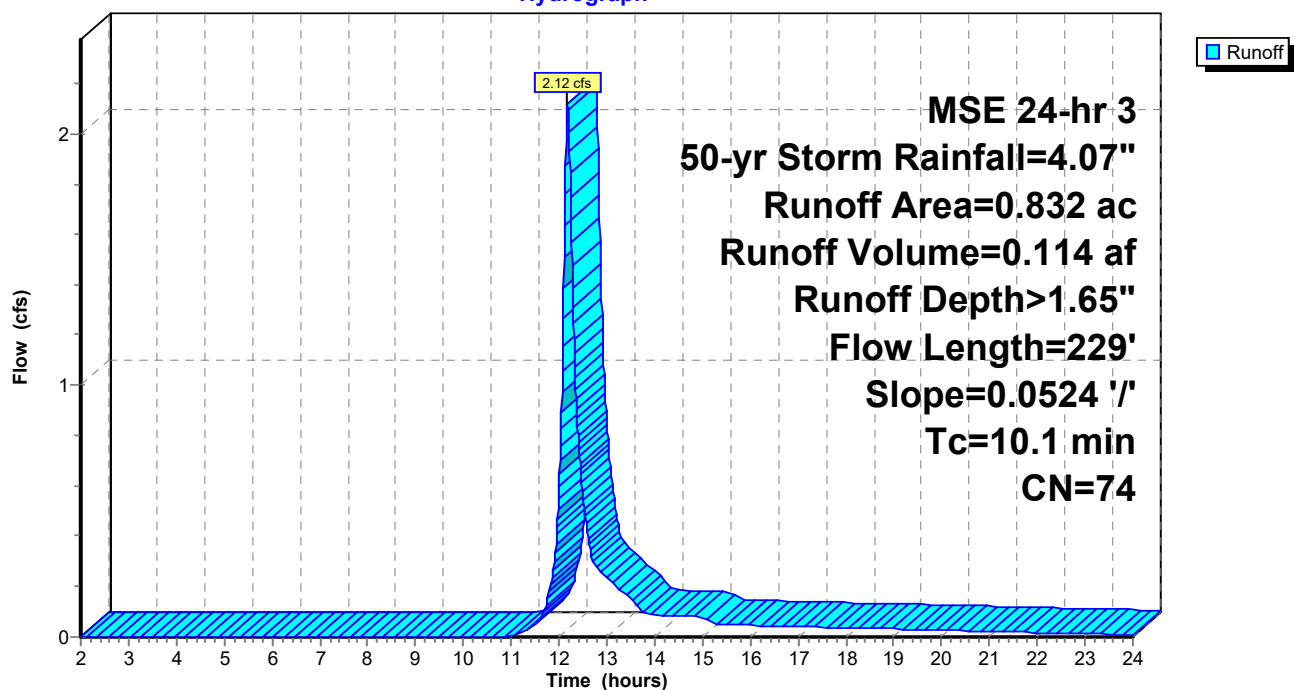
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-4:

Runoff = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af, Depth> 3.83"
Routed to Pond 4P : Roof Drain

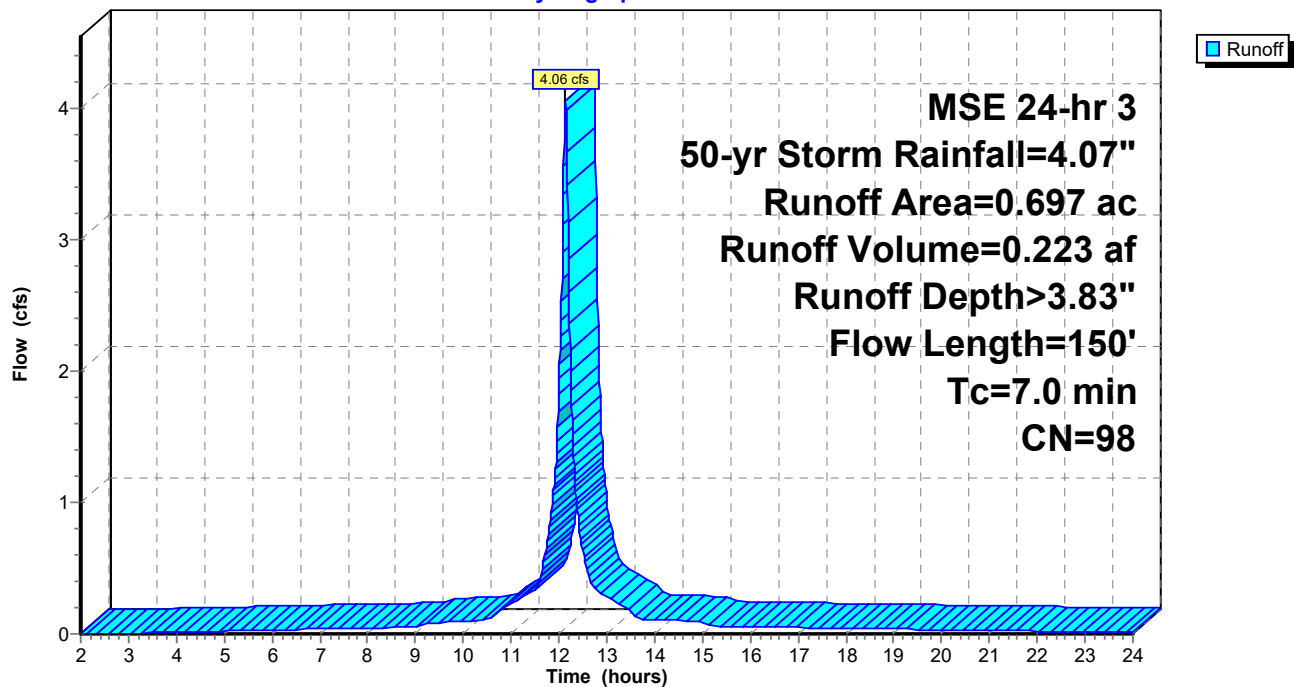
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-5:

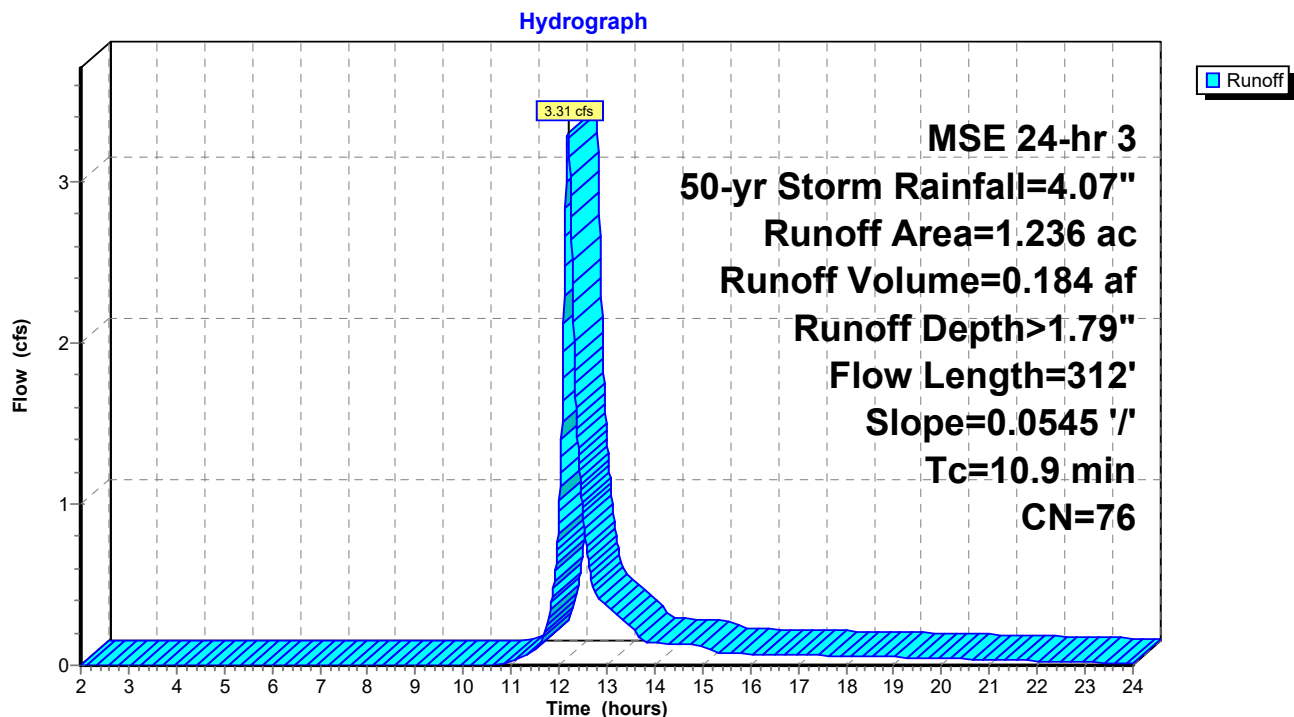
Runoff = 3.31 cfs @ 12.19 hrs, Volume= 0.184 af, Depth> 1.79"
Routed to Pond 5P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-6:

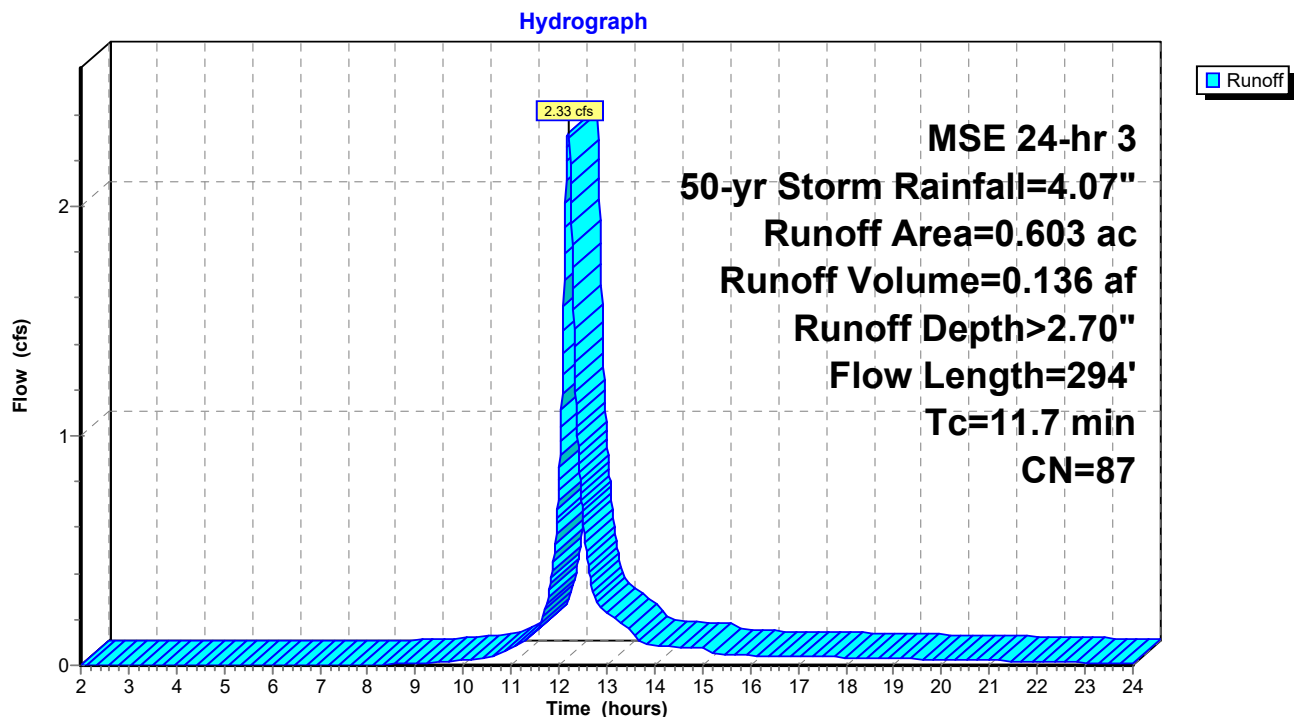
Runoff = 2.33 cfs @ 12.19 hrs, Volume= 0.136 af, Depth> 2.70"
Routed to Pond 6P : DI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-7:

Runoff = 1.75 cfs @ 12.20 hrs, Volume= 0.101 af, Depth> 1.79"
Routed to Pond 7P : Proposed Pond

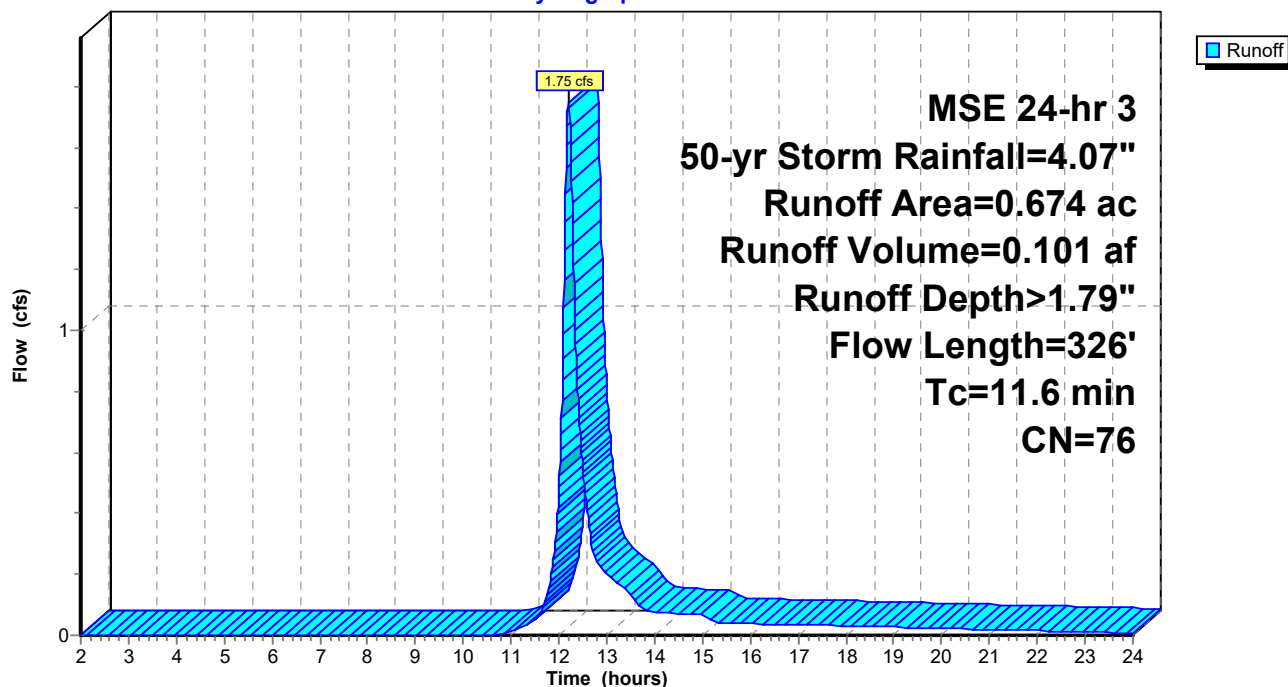
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.631	74	>75% Grass cover, Good, HSG C
0.043	98	Paved parking, HSG C
0.674	76	Weighted Average
0.631		93.62% Pervious Area
0.043		6.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-8:

Runoff = 2.67 cfs @ 12.14 hrs, Volume= 0.130 af, Depth> 2.89"
Routed to Pond 8P : CB

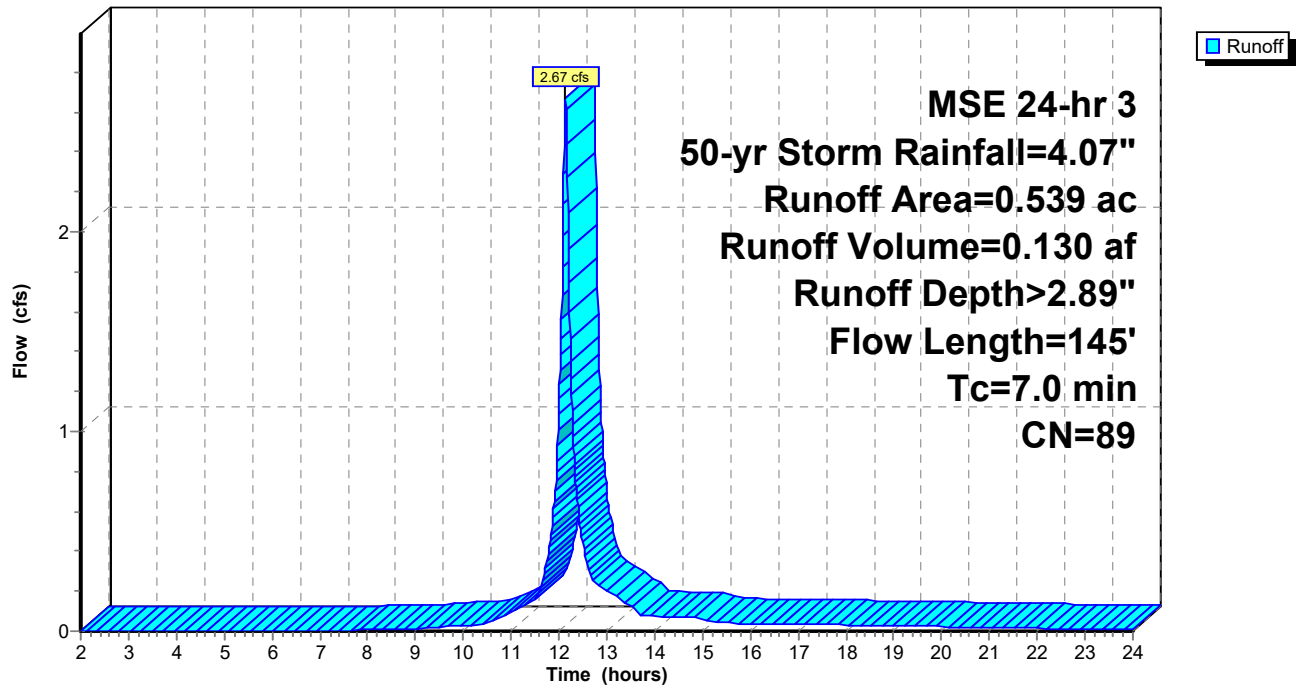
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:

Hydrograph



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Subcatchment A-9:

Runoff = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af, Depth> 3.39"
Routed to Pond 9P : CB

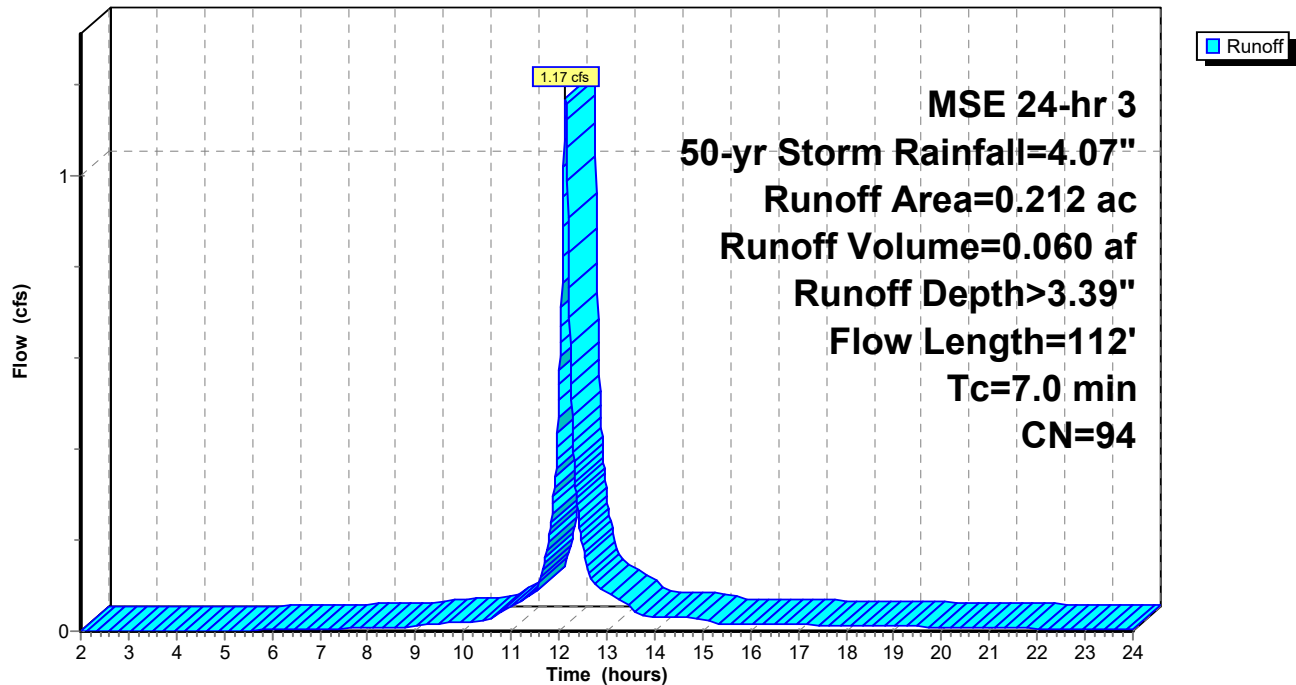
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 50-yr Storm Rainfall=4.07"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 1P: CB

Inflow Area = 2.190 ac, 37.35% Impervious, Inflow Depth > 2.51" for 50-yr Storm event
Inflow = 8.59 cfs @ 12.15 hrs, Volume= 0.457 af
Outflow = 8.59 cfs @ 12.15 hrs, Volume= 0.457 af, Atten= 0%, Lag= 0.0 min
Primary = 8.59 cfs @ 12.15 hrs, Volume= 0.457 af
Routed to Pond 8P : CB

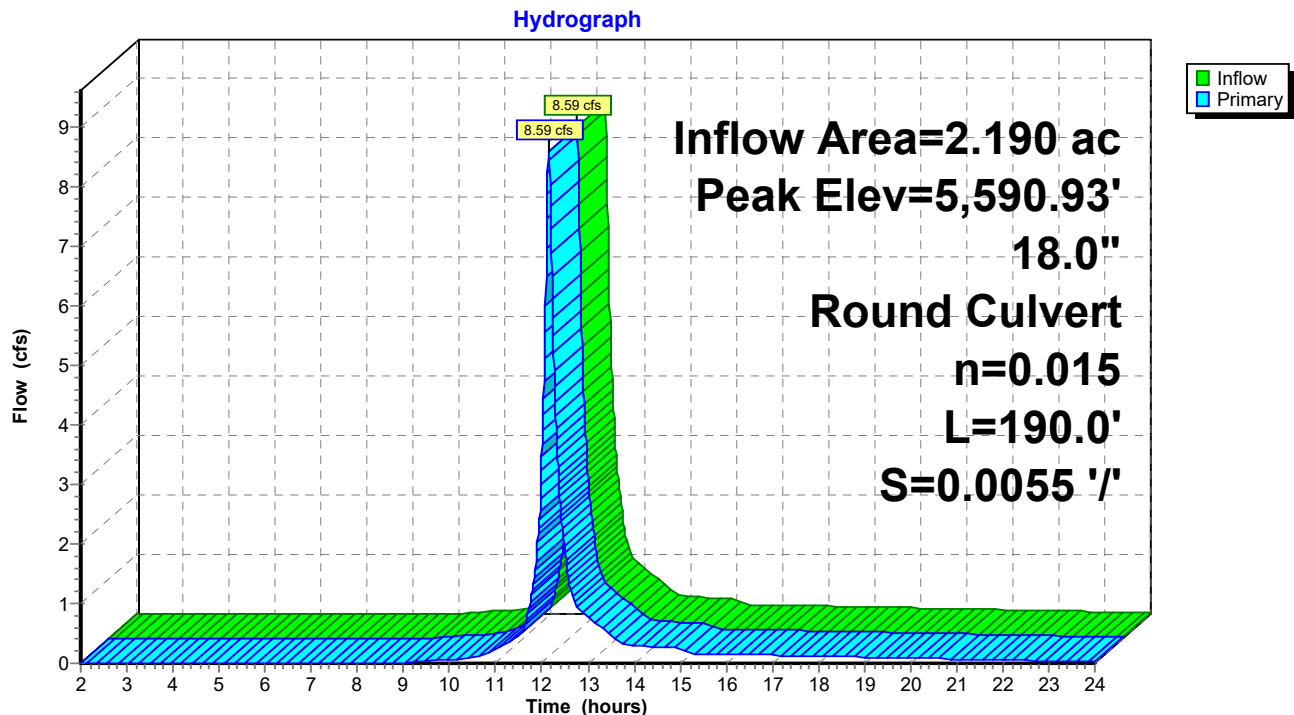
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,590.93' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=8.39 cfs @ 12.15 hrs HW=5,533.27' TW=5,531.13' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 8.39 cfs @ 4.75 fps)

Pond 1P: CB



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 2P: CB

Inflow Area = 1.595 ac, 20.13% Impervious, Inflow Depth > 2.02" for 50-yr Storm event
Inflow = 4.98 cfs @ 12.18 hrs, Volume= 0.269 af
Outflow = 4.98 cfs @ 12.18 hrs, Volume= 0.269 af, Atten= 0%, Lag= 0.0 min
Primary = 4.98 cfs @ 12.18 hrs, Volume= 0.269 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

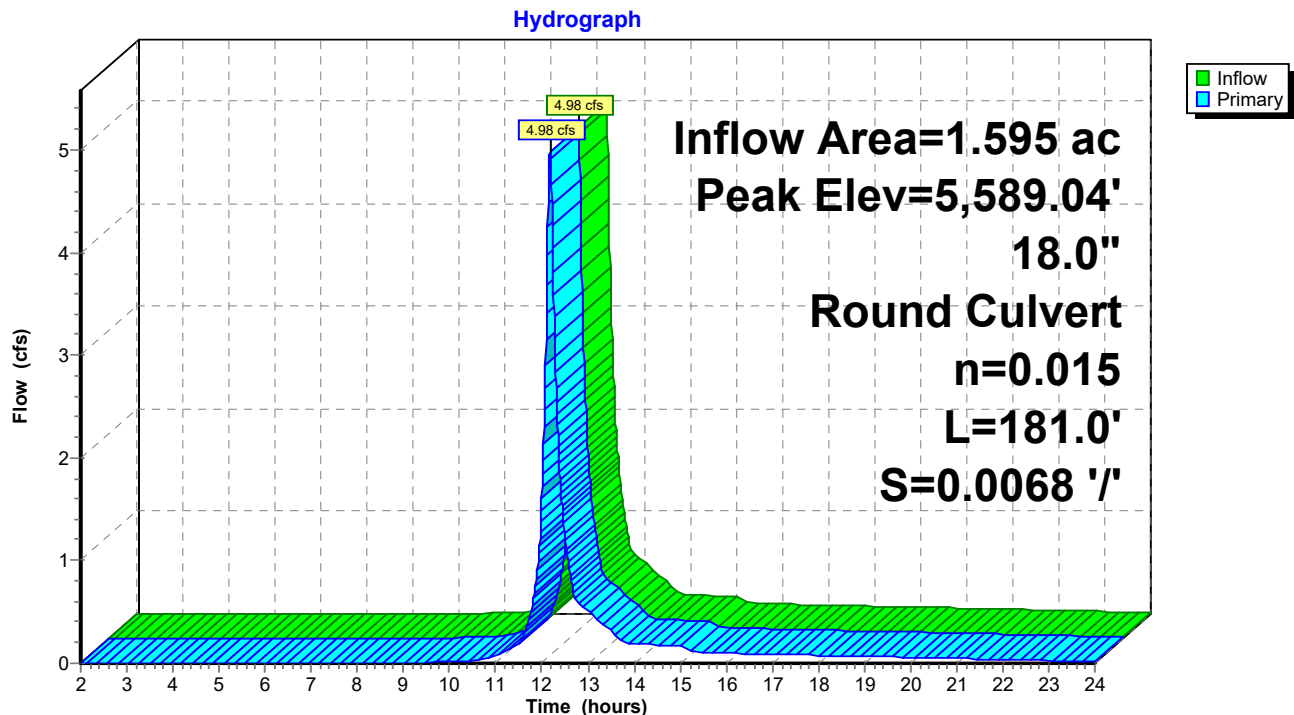
Peak Elev= 5,589.04' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=4.84 cfs @ 12.18 hrs HW=5,528.10' TW=5,527.41' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 4.84 cfs @ 2.74 fps)

Pond 2P: CB



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 1.65" for 50-yr Storm event
Inflow = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af
Outflow = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min
Primary = 2.12 cfs @ 12.18 hrs, Volume= 0.114 af
Routed to Pond 2P : CB

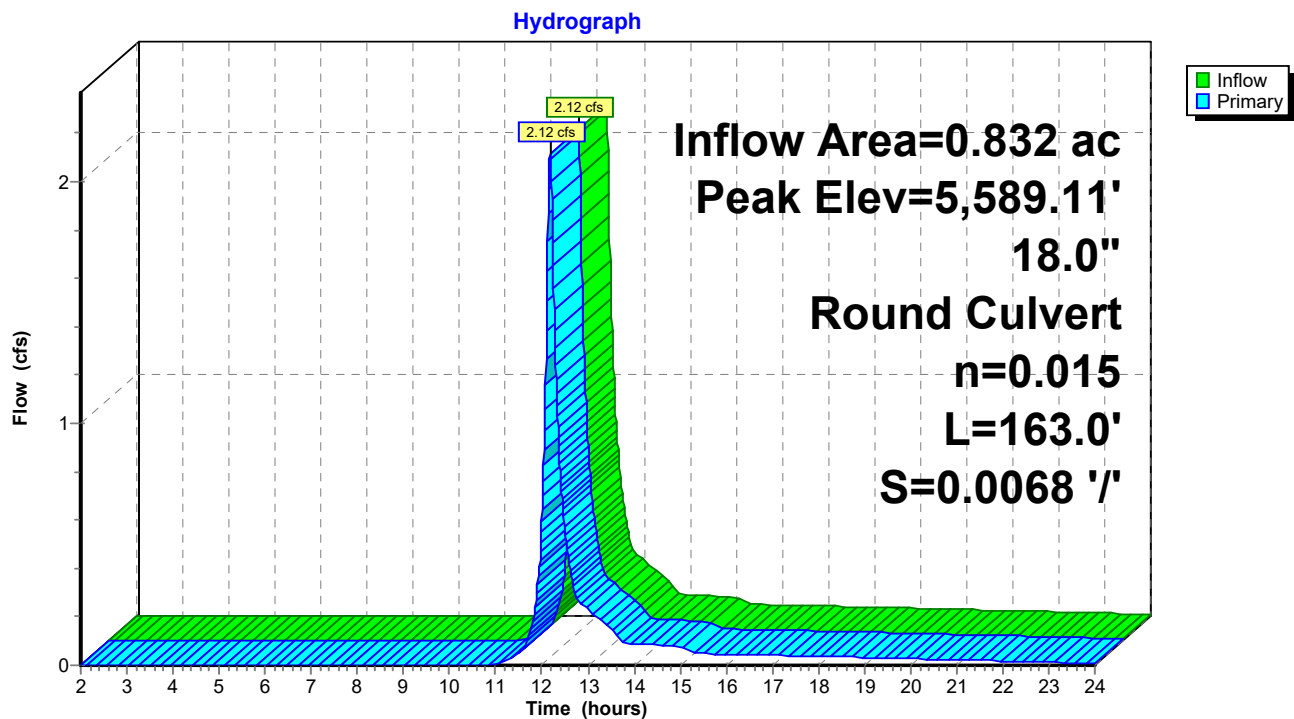
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,589.11' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.45 cfs @ 12.18 hrs HW=5,528.19' TW=5,528.11' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 1.45 cfs @ 1.03 fps)

Pond 3P: Inlet



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 3.83" for 50-yr Storm event
Inflow = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af
Outflow = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min
Primary = 4.06 cfs @ 12.14 hrs, Volume= 0.223 af
Routed to Pond 5P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

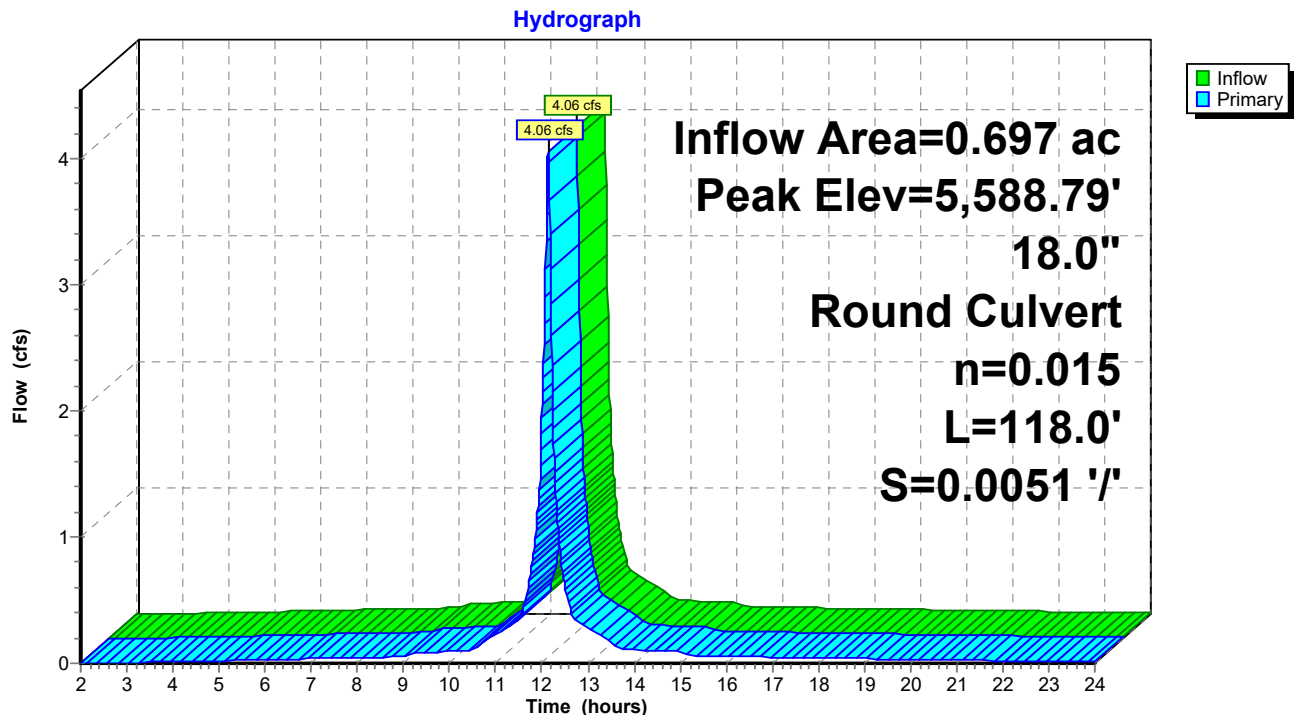
Peak Elev= 5,588.79' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.50 cfs @ 12.14 hrs HW=5,527.51' TW=5,527.37' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 2.50 cfs @ 1.42 fps)

Pond 4P: Roof Drain



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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 2.53" for 50-yr Storm event
Inflow = 7.02 cfs @ 12.15 hrs, Volume= 0.407 af
Outflow = 7.02 cfs @ 12.15 hrs, Volume= 0.407 af, Atten= 0%, Lag= 0.0 min
Primary = 7.02 cfs @ 12.15 hrs, Volume= 0.407 af
Routed to Pond 6P : DI

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

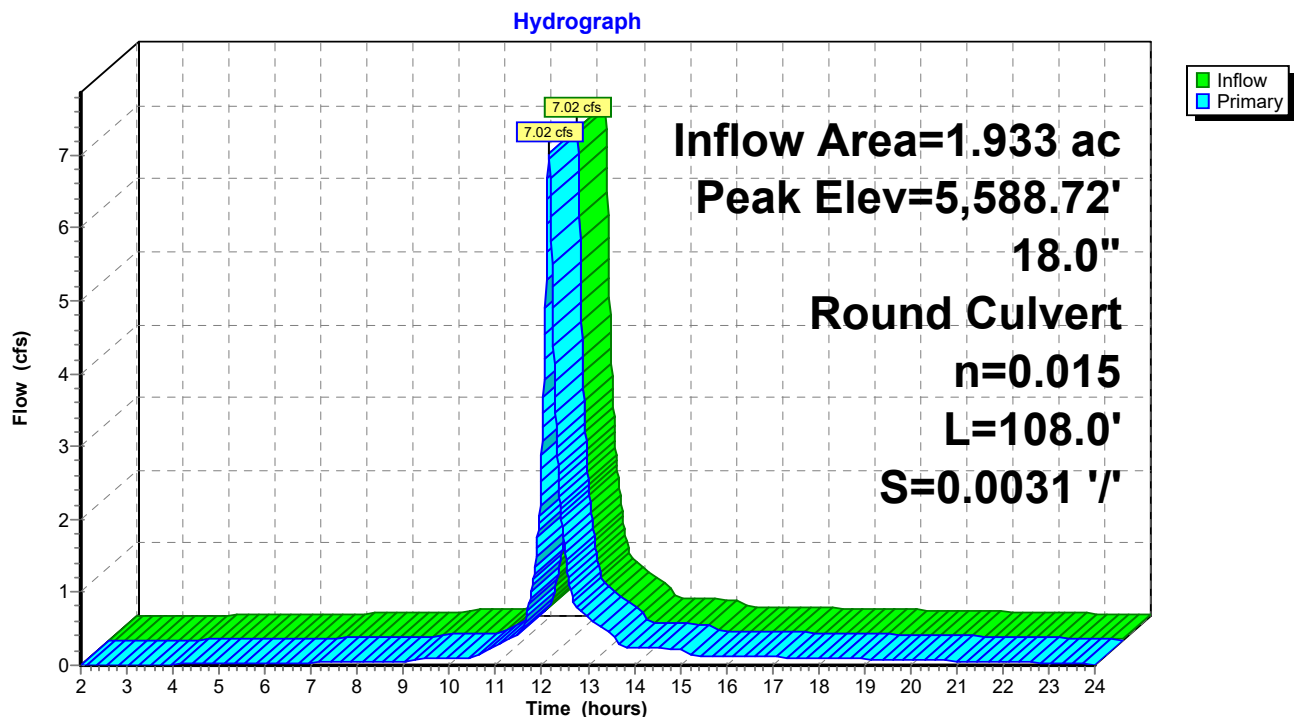
Peak Elev= 5,588.72' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 ' /' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=6.61 cfs @ 12.15 hrs HW=5,527.62' TW=5,526.72' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 6.61 cfs @ 3.74 fps)

Pond 5P: Inlet



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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 2.57" for 50-yr Storm event
Inflow = 9.20 cfs @ 12.16 hrs, Volume= 0.543 af
Outflow = 9.20 cfs @ 12.16 hrs, Volume= 0.543 af, Atten= 0%, Lag= 0.0 min
Primary = 9.20 cfs @ 12.16 hrs, Volume= 0.543 af
Routed to Pond 7P : Proposed Pond

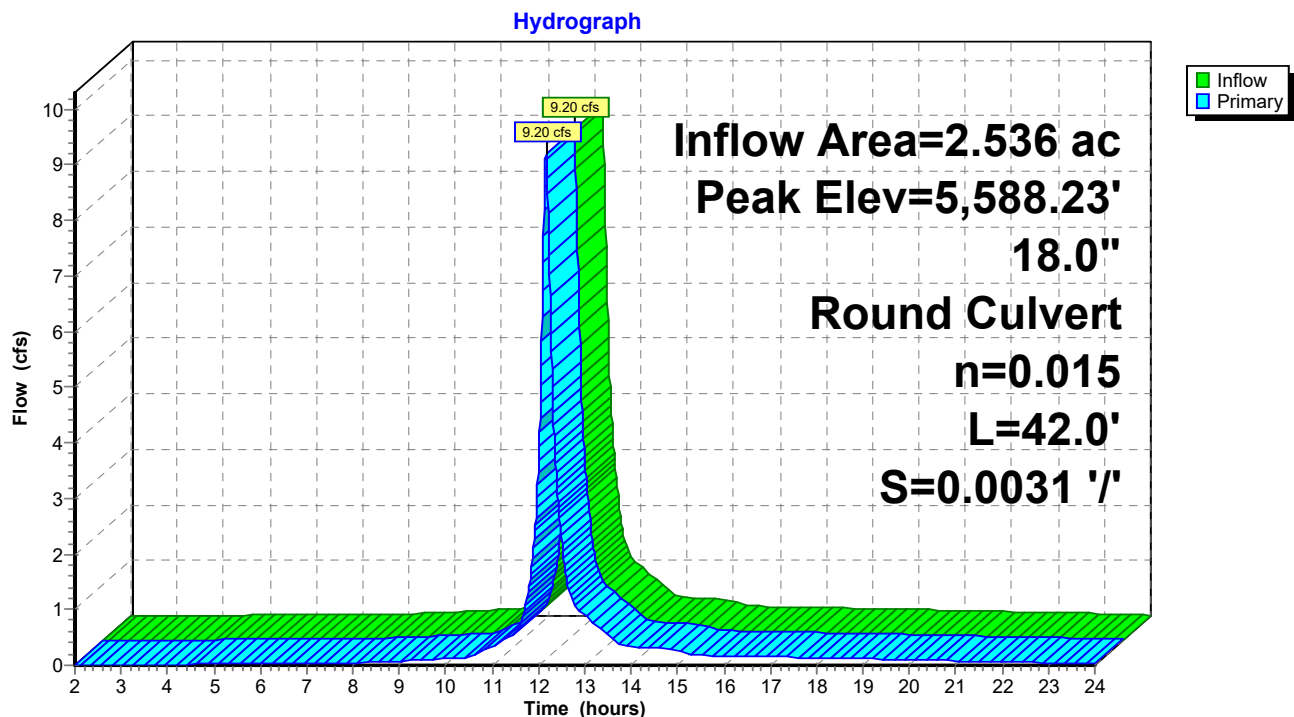
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,588.23' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=8.91 cfs @ 12.16 hrs HW=5,526.78' TW=5,525.69' (Dynamic Tailwater)
↑1=RCP_Round 18" (Inlet Controls 8.91 cfs @ 5.04 fps)

Pond 6P: DI



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Summary for Pond 7P: Proposed Pond

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 2.45" for 50-yr Storm event
Inflow = 29.71 cfs @ 12.16 hrs, Volume= 1.657 af
Outflow = 29.55 cfs @ 12.22 hrs, Volume= 1.526 af, Atten= 1%, Lag= 3.8 min
Primary = 29.55 cfs @ 12.22 hrs, Volume= 1.526 af
Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 5,587.48' @ 12.22 hrs Surf.Area= 0.293 ac Storage= 0.464 af

Plug-Flow detention time= 66.2 min calculated for 1.525 af (92% of inflow)
Center-of-Mass det. time= 30.3 min (823.2 - 792.8)

Volume	Invert	Avail.Storage	Storage Description
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#1	5,522.00'	0.464 af	Custom Stage Data (Prismatic) Listed below (Recalc)
----	-----------	----------	--

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.026	0.013	0.013
5,524.00	0.088	0.057	0.070
5,525.00	0.203	0.146	0.216
5,526.00	0.293	0.248	0.464

Device	Routing	Invert	Outlet Devices
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#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
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#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
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#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 ' / ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf
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Primary OutFlow Max=27.76 cfs @ 12.22 hrs HW=5,580.82' TW=0.00' (Dynamic Tailwater)

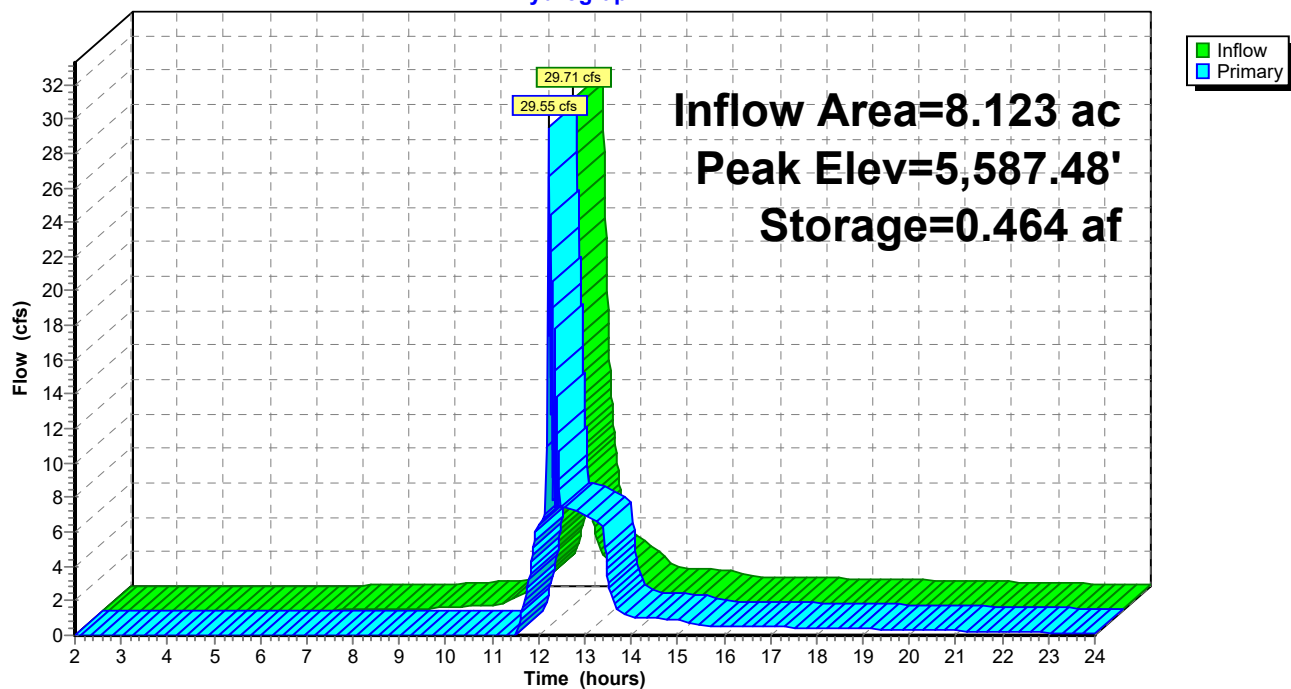
↑ **3=RCP_Round 18"** (Passes 27.76 cfs of 61.69 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 27.76 cfs @ 37.01 fps)

↑ **1=Orifice/Grate** (Passes 27.76 cfs of 442.67 cfs potential flow)

Pond 7P: Proposed Pond

Hydrograph



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 8P: CB

Inflow Area = 2.941 ac, 45.56% Impervious, Inflow Depth > 2.64" for 50-yr Storm event
Inflow = 12.40 cfs @ 12.15 hrs, Volume= 0.647 af
Outflow = 12.40 cfs @ 12.15 hrs, Volume= 0.647 af, Atten= 0%, Lag= 0.0 min
Primary = 12.40 cfs @ 12.15 hrs, Volume= 0.647 af
Routed to Pond 7P : Proposed Pond

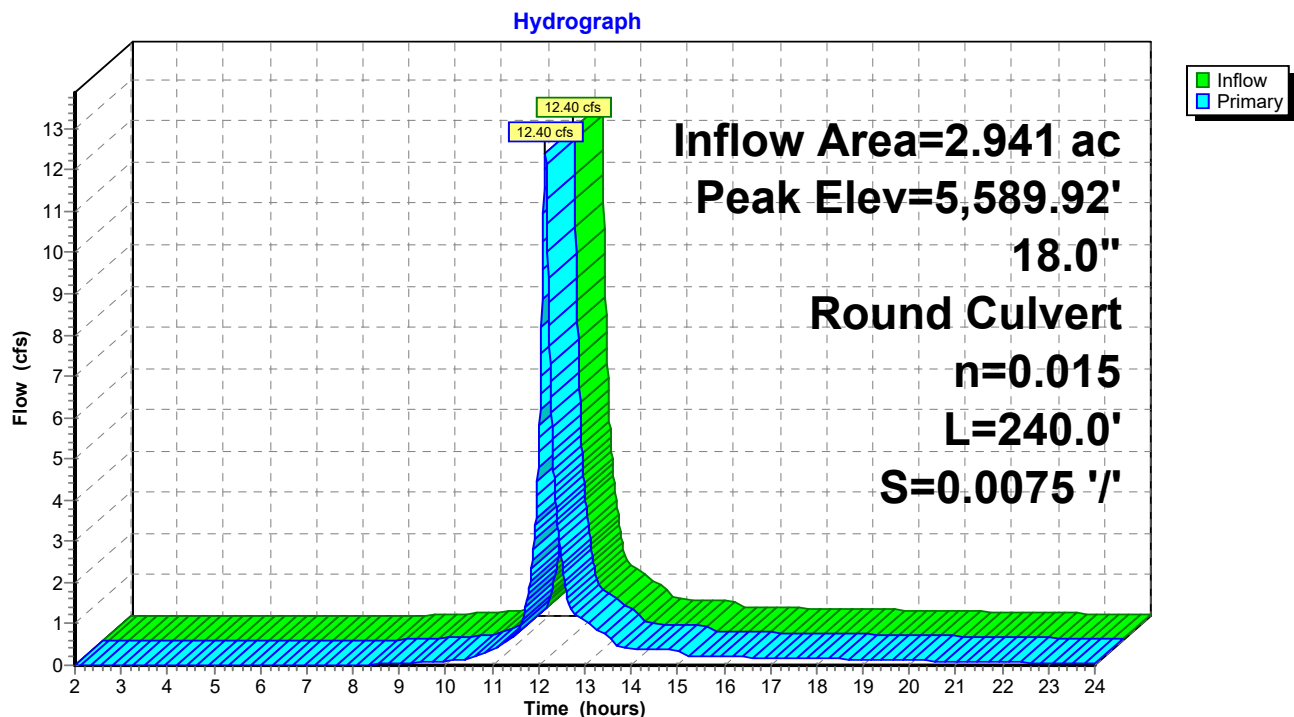
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,589.92' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=12.30 cfs @ 12.15 hrs HW=5,531.11' TW=5,525.59' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 12.30 cfs @ 6.96 fps)

Pond 8P: CB



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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 3.39" for 50-yr Storm event
Inflow = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af
Outflow = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
Primary = 1.17 cfs @ 12.14 hrs, Volume= 0.060 af
Routed to Pond 8P : CB

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

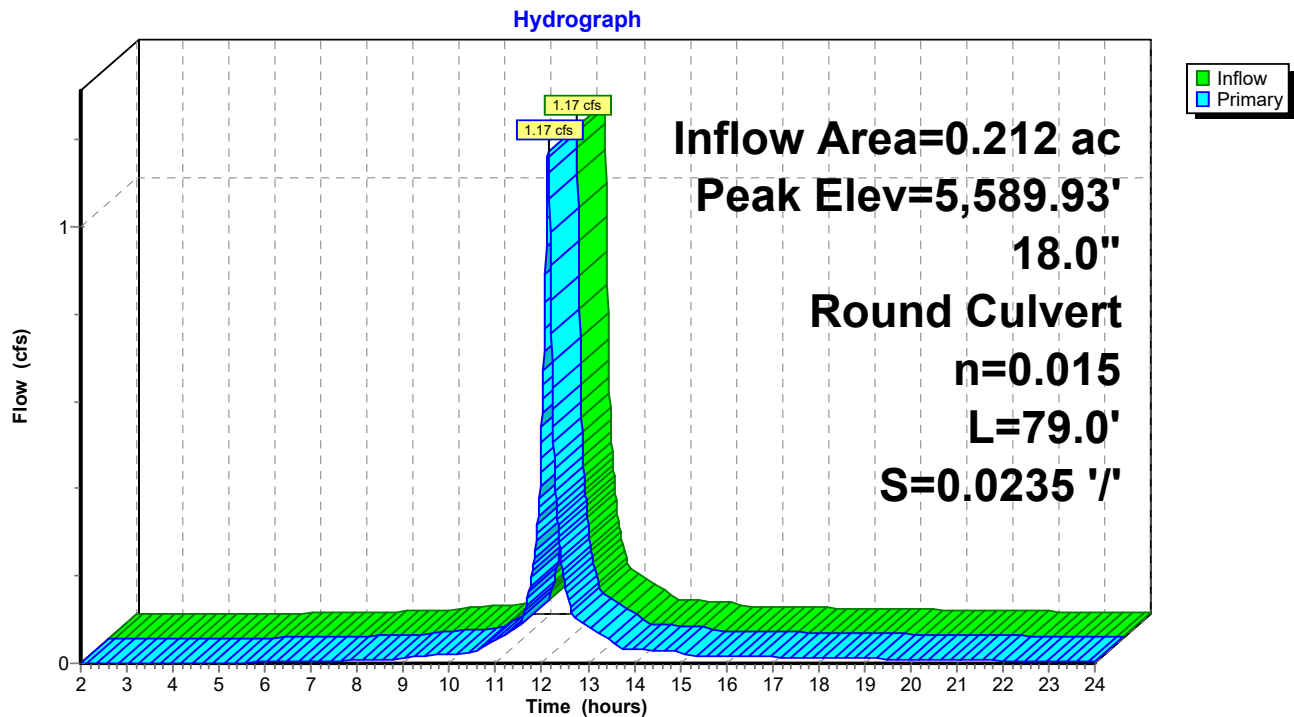
Peak Elev= 5,589.93' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=5,530.70' TW=5,531.01' (Dynamic Tailwater)

↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 9P: CB



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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 10P: Inlet

Inflow Area = 1.972 ac, 29.01% Impervious, Inflow Depth > 2.23" for 50-yr Storm event
Inflow = 6.69 cfs @ 12.17 hrs, Volume= 0.367 af
Outflow = 6.69 cfs @ 12.17 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min
Primary = 6.69 cfs @ 12.17 hrs, Volume= 0.367 af
Routed to Pond 7P : Proposed Pond

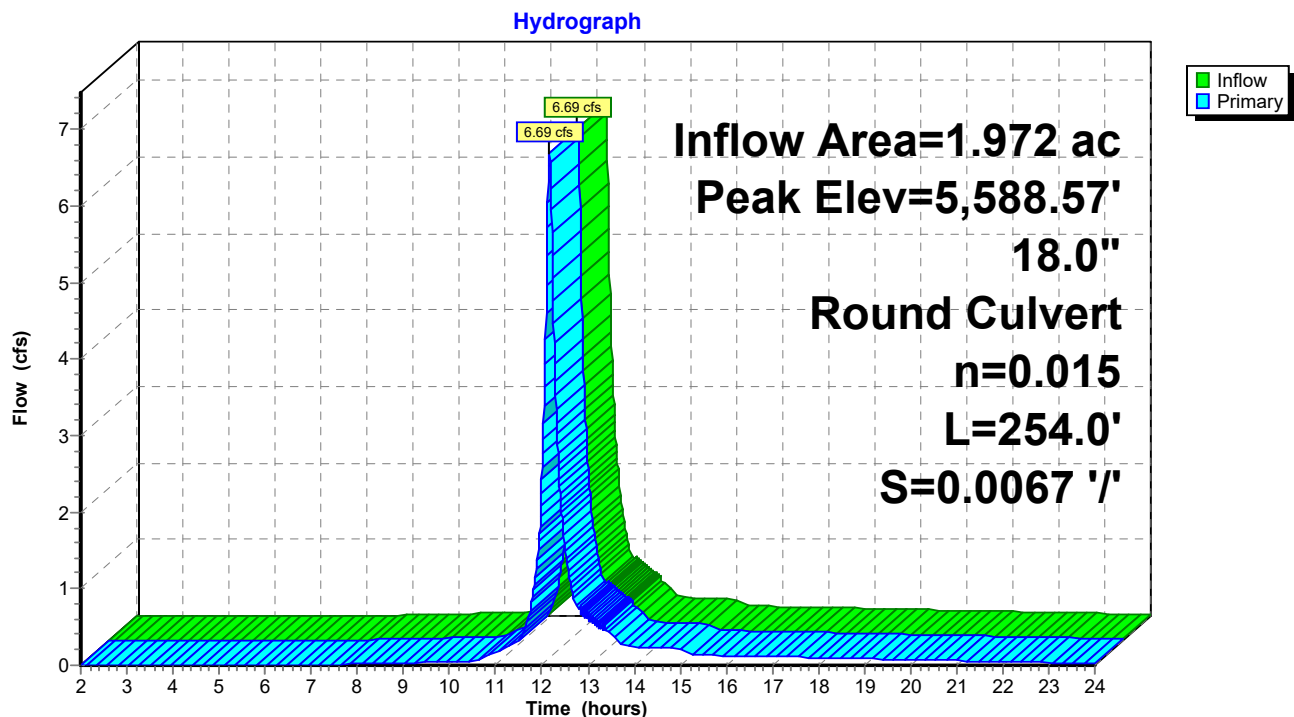
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,588.57' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 ' / Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=6.54 cfs @ 12.17 hrs HW=5,527.36' TW=5,525.73' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 6.54 cfs @ 3.70 fps)

Pond 10P: Inlet



StandleyLake_Prop2

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MSE 24-hr 3 50-yr Storm Rainfall=4.07"

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Summary for Pond 11P: Inlet

Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 2.18" for 50-yr Storm event
Inflow = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af
Outflow = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Primary = 0.52 cfs @ 12.16 hrs, Volume= 0.026 af
Routed to Pond 10P : Inlet

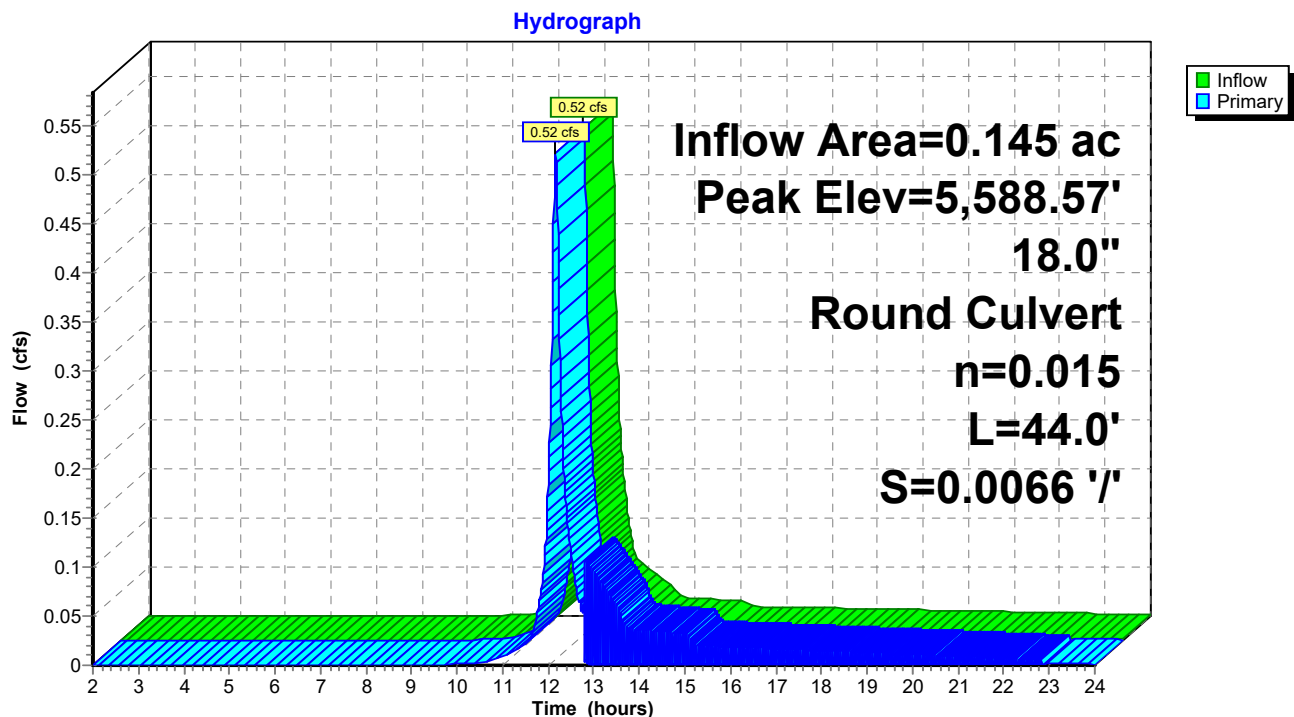
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,588.57' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=5,527.21' TW=5,527.32' (Dynamic Tailwater)
↑1=RCP_Round 18" (Controls 0.00 cfs)

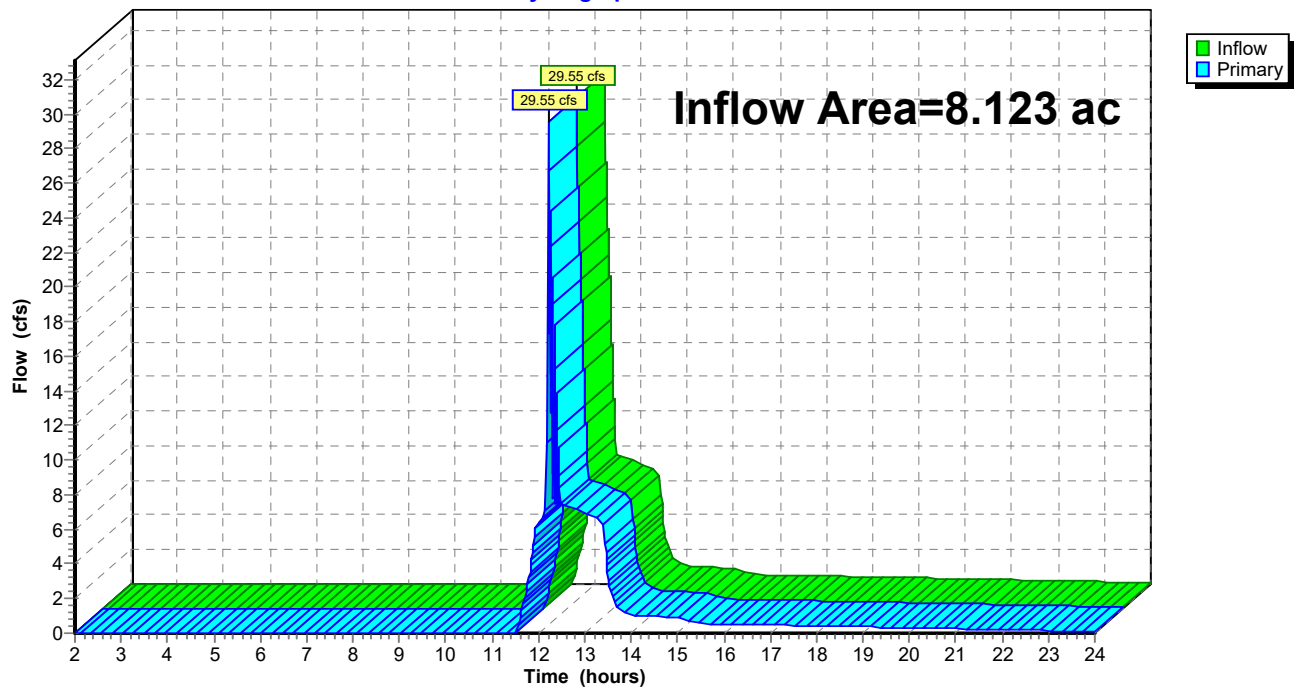
Pond 11P: Inlet



Summary for Link 1L: Street Sewer

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 2.25" for 50-yr Storm event
Inflow = 29.55 cfs @ 12.22 hrs, Volume= 1.526 af
Primary = 29.55 cfs @ 12.22 hrs, Volume= 1.526 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer**Hydrograph**

StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-10:

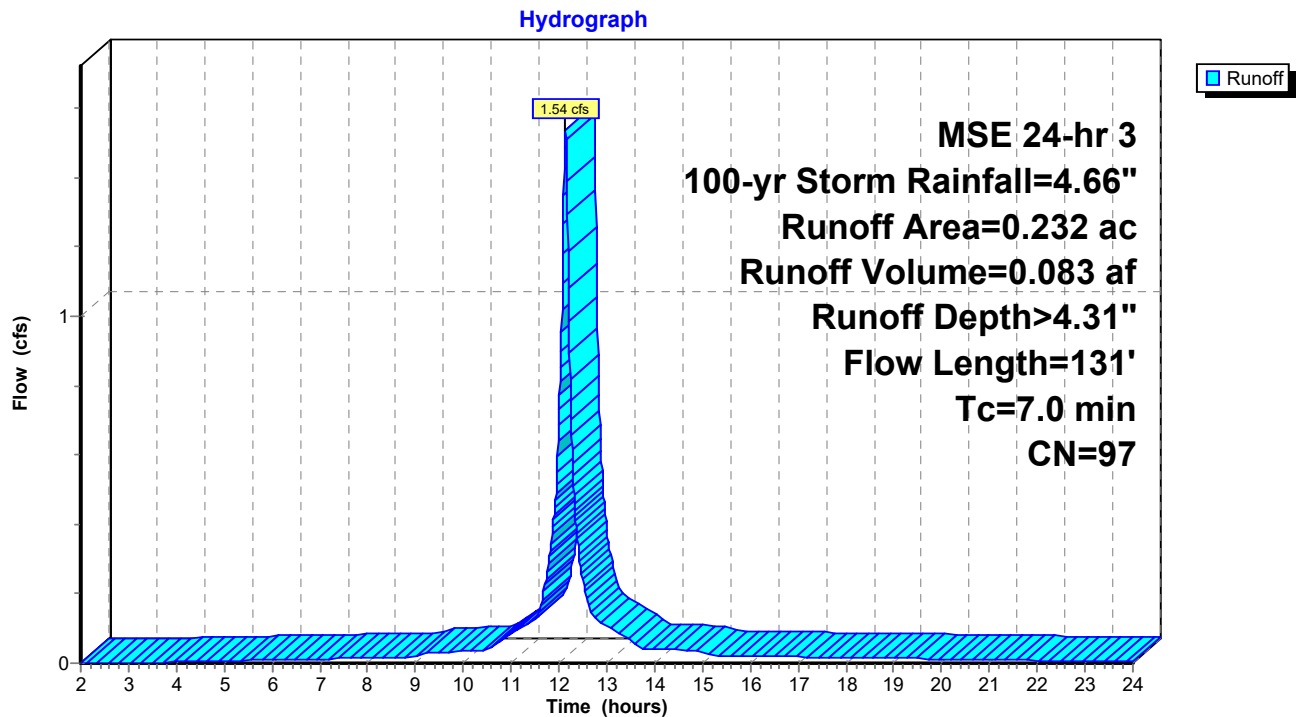
Runoff = 1.54 cfs @ 12.14 hrs, Volume= 0.083 af, Depth> 4.31"
Routed to Pond 10P : Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.210	98	Paved parking, HSG C
0.022	86	<50% Grass cover, Poor, HSG C
0.232	97	Weighted Average
0.022		9.48% Pervious Area
0.210		90.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	131		0.31		Direct Entry, Minimum

Subcatchment A-10:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-11:

Runoff = 0.64 cfs @ 12.16 hrs, Volume= 0.032 af, Depth> 2.69"
Routed to Pond 11P : Inlet

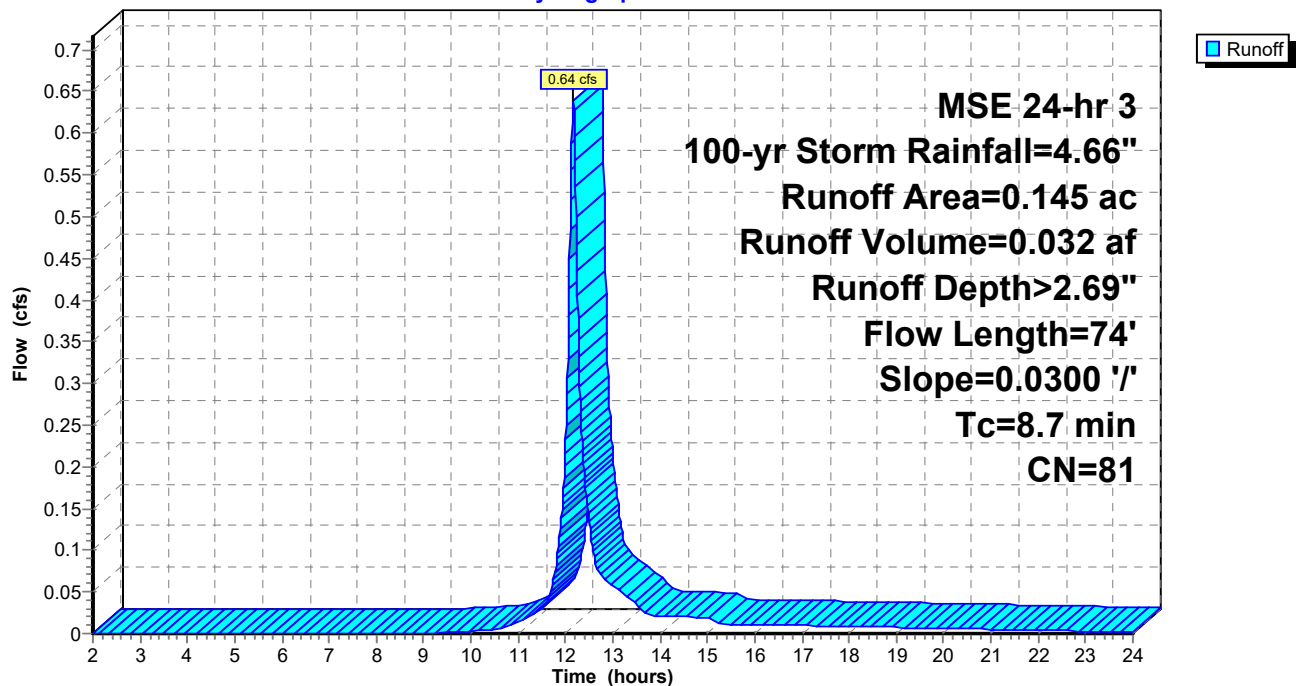
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.041	98	Paved parking, HSG C
0.104	74	>75% Grass cover, Good, HSG C
0.145	81	Weighted Average
0.104		71.72% Pervious Area
0.041		28.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	74	0.0300	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"

Subcatchment A-11:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-1a:

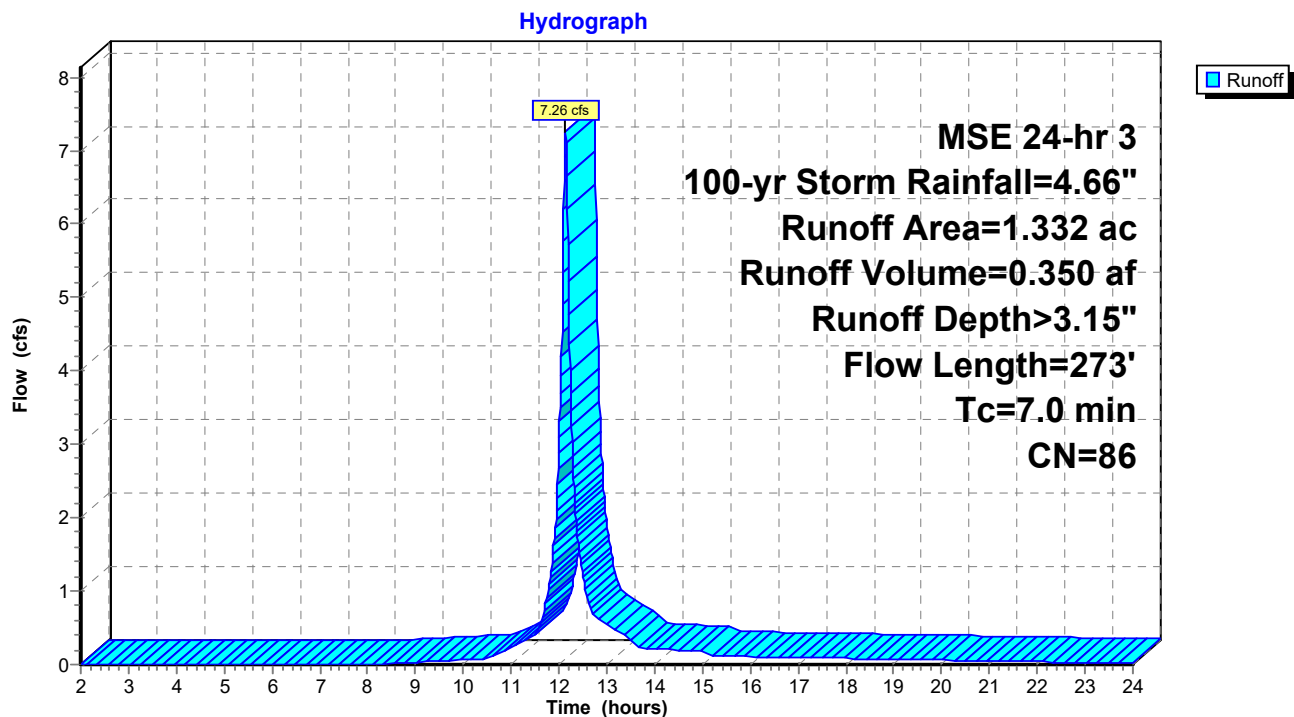
Runoff = 7.26 cfs @ 12.14 hrs, Volume= 0.350 af, Depth> 3.15"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.596	98	Paved parking, HSG C
0.674	74	>75% Grass cover, Good, HSG C
0.062	96	Gravel surface, HSG C
1.332	86	Weighted Average
0.736		55.26% Pervious Area
0.596		44.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	273		0.65		Direct Entry, Minimum

Subcatchment A-1a:



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-1b:

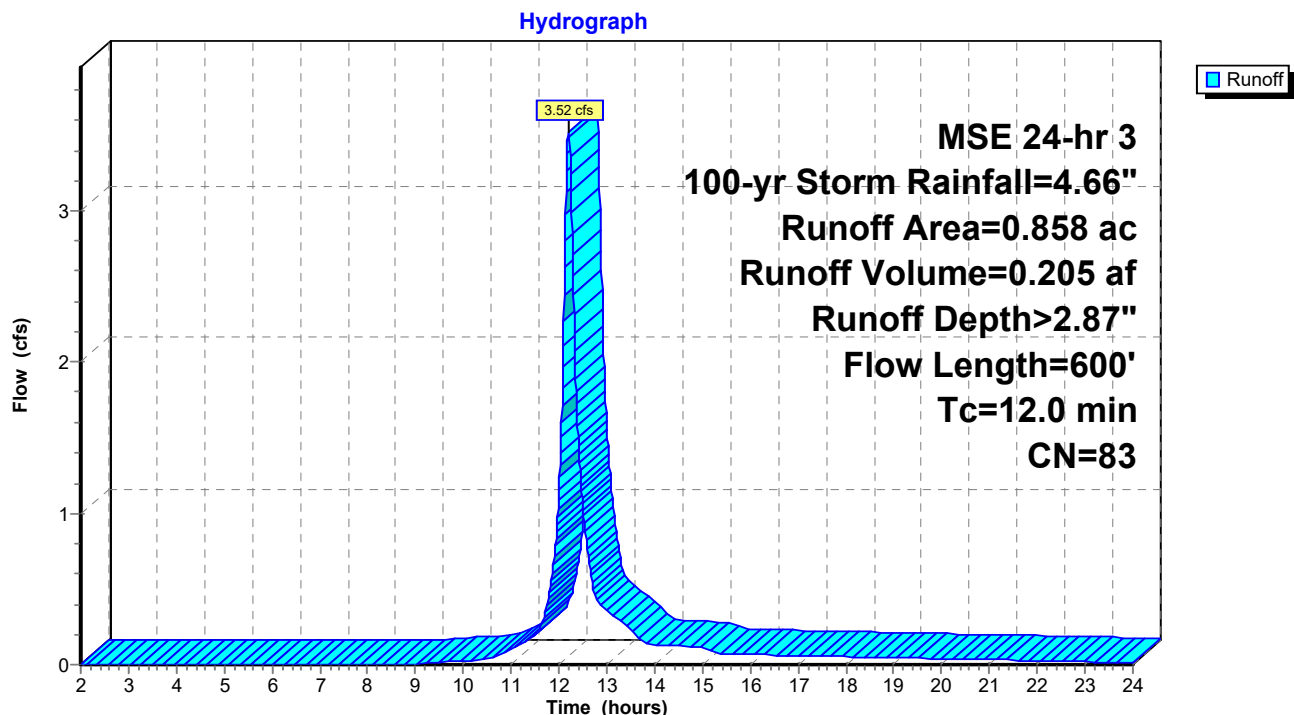
Runoff = 3.52 cfs @ 12.20 hrs, Volume= 0.205 af, Depth> 2.87"
Routed to Pond 1P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.222	98	Paved parking, HSG C
0.115	96	Gravel surface, HSG C
0.521	74	>75% Grass cover, Good, HSG C
0.858	83	Weighted Average
0.636		74.13% Pervious Area
0.222		25.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	73	0.1096	0.24		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
5.2	297	0.0185	0.95		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	230	0.0130	2.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.0	600	Total			

Subcatchment A-1b:



StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-2:

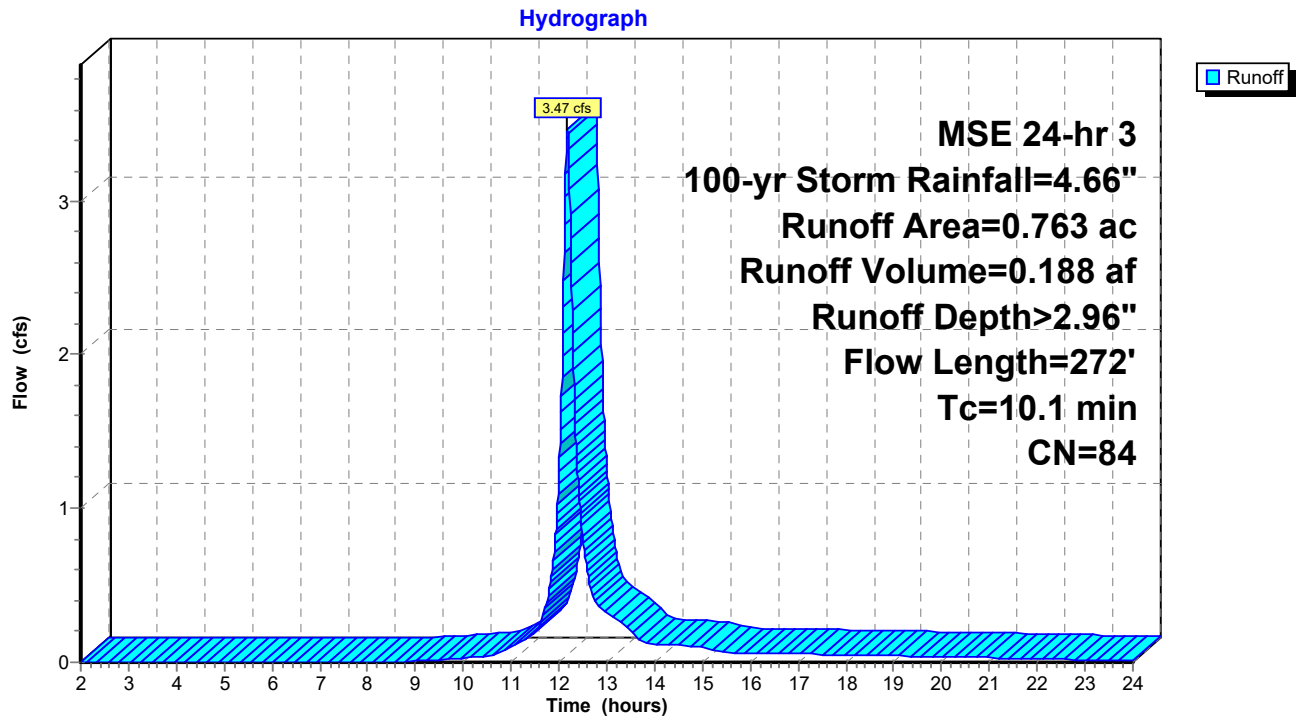
Runoff = 3.47 cfs @ 12.18 hrs, Volume= 0.188 af, Depth> 2.96"
Routed to Pond 2P : CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.321	98	Paved parking, HSG C
0.442	74	>75% Grass cover, Good, HSG C
0.763	84	Weighted Average
0.442		57.93% Pervious Area
0.321		42.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	139	0.0899	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
0.8	133	0.0188	2.78		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.1	272	Total			

Subcatchment A-2:



StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-3:

Runoff = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af, Depth> 2.09"
Routed to Pond 3P : Inlet

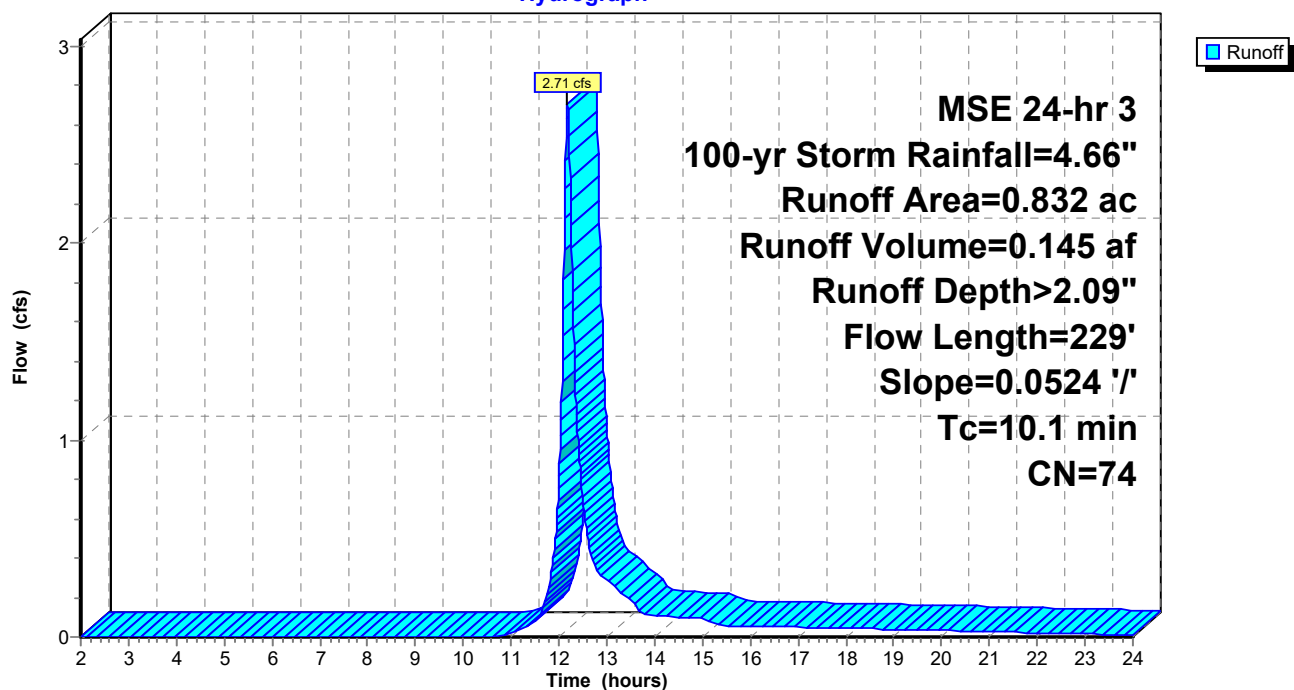
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.832	74	>75% Grass cover, Good, HSG C
0.832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0524	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.3	129	0.0524	1.60		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.1	229	Total			

Subcatchment A-3:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-4:

Runoff = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af, Depth> 4.42"
Routed to Pond 4P : Roof Drain

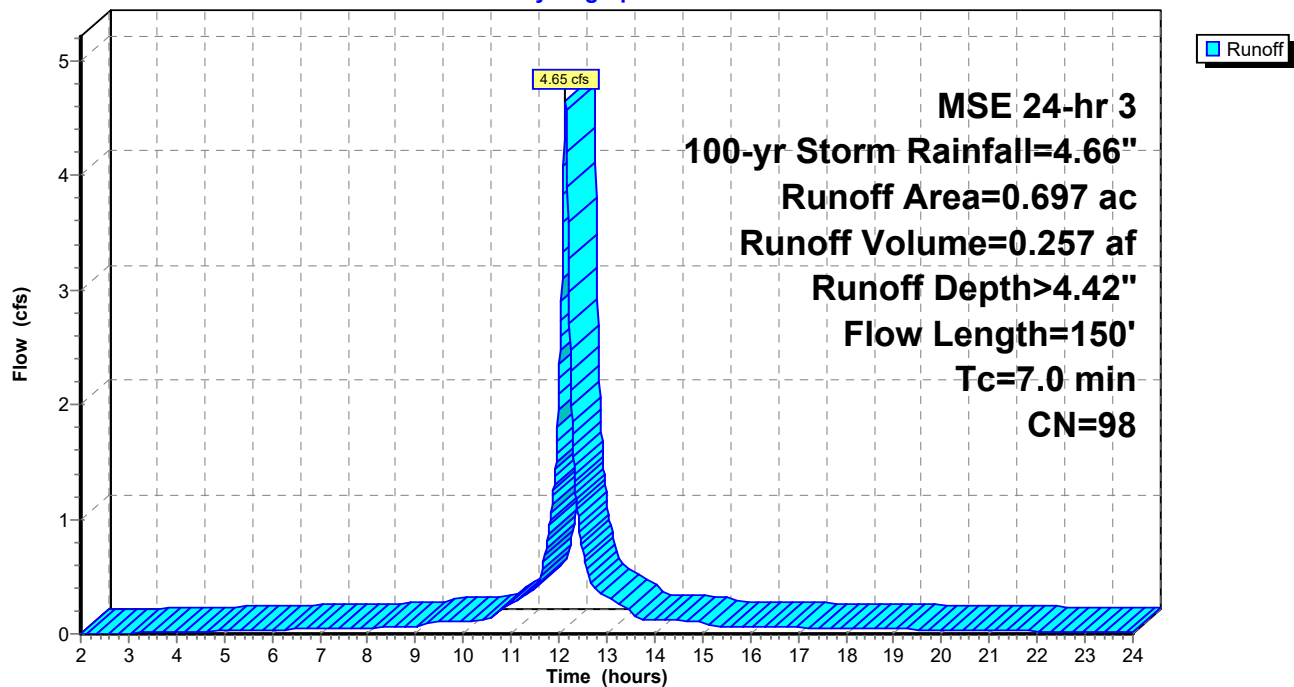
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.697	98	Roofs, HSG C
0.697		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150		0.36		Direct Entry, Minimum

Subcatchment A-4:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-5:

Runoff = 4.18 cfs @ 12.19 hrs, Volume= 0.232 af, Depth> 2.26"
Routed to Pond 5P : Inlet

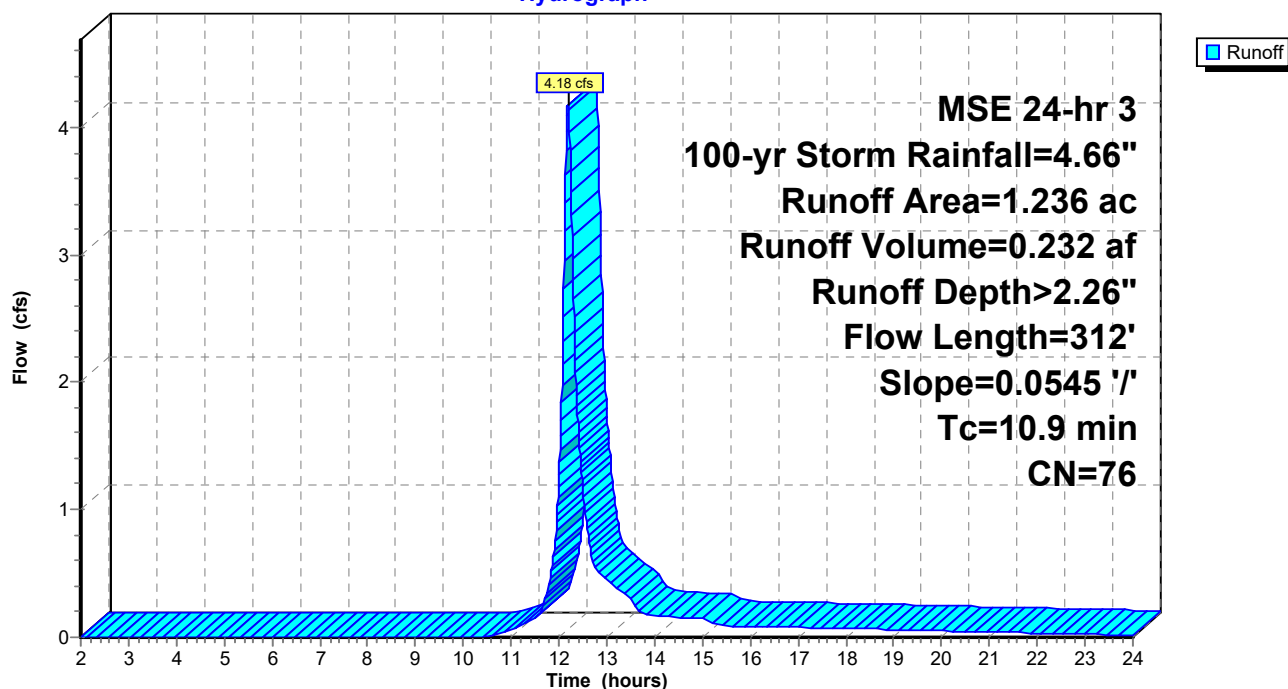
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.088	98	Paved parking, HSG C
1.148	74	>75% Grass cover, Good, HSG C
1.236	76	Weighted Average
1.148		92.88% Pervious Area
0.088		7.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0545	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
2.2	212	0.0545	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
10.9	312	Total			

Subcatchment A-5:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-6:

Runoff = 2.78 cfs @ 12.19 hrs, Volume= 0.163 af, Depth> 3.25"
Routed to Pond 6P : DI

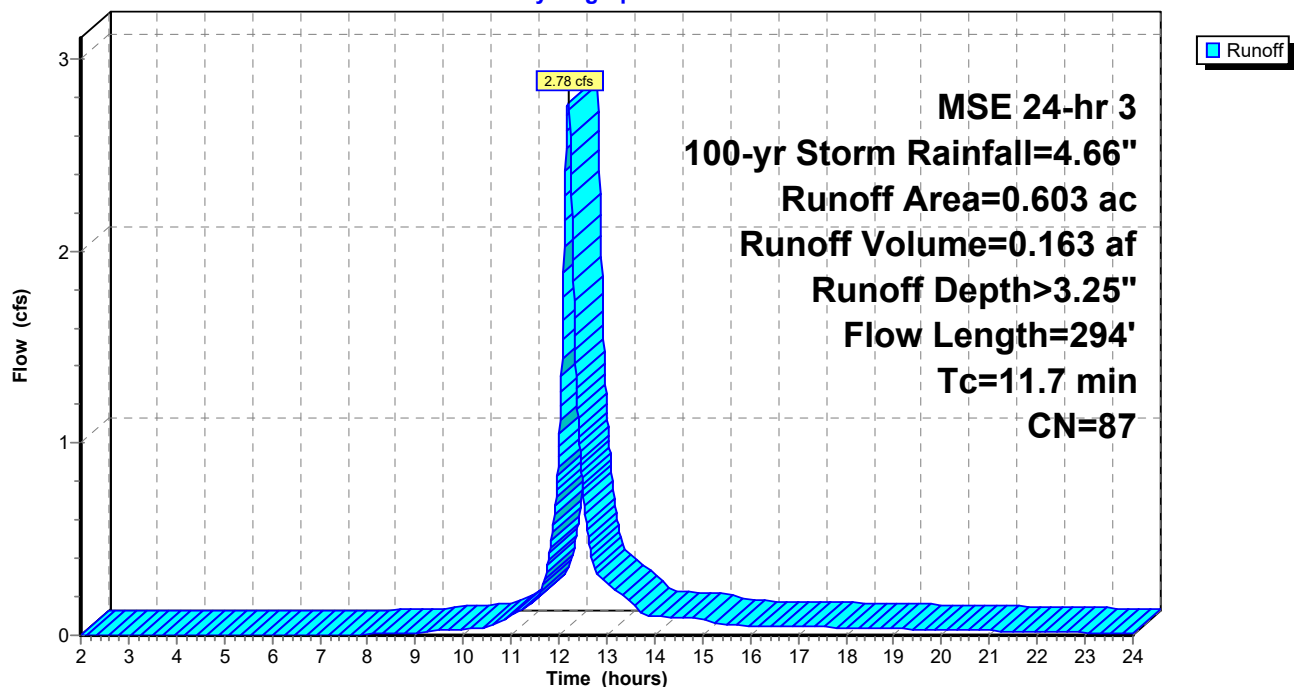
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.337	98	Paved parking, HSG C
0.266	74	>75% Grass cover, Good, HSG C
0.603	87	Weighted Average
0.266		44.11% Pervious Area
0.337		55.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	92	0.0280	0.14		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
1.1	202	0.0213	2.96		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.7	294	Total			

Subcatchment A-6:

Hydrograph



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-7:

Runoff = 2.22 cfs @ 12.20 hrs, Volume= 0.127 af, Depth> 2.26"
Routed to Pond 7P : Proposed Pond

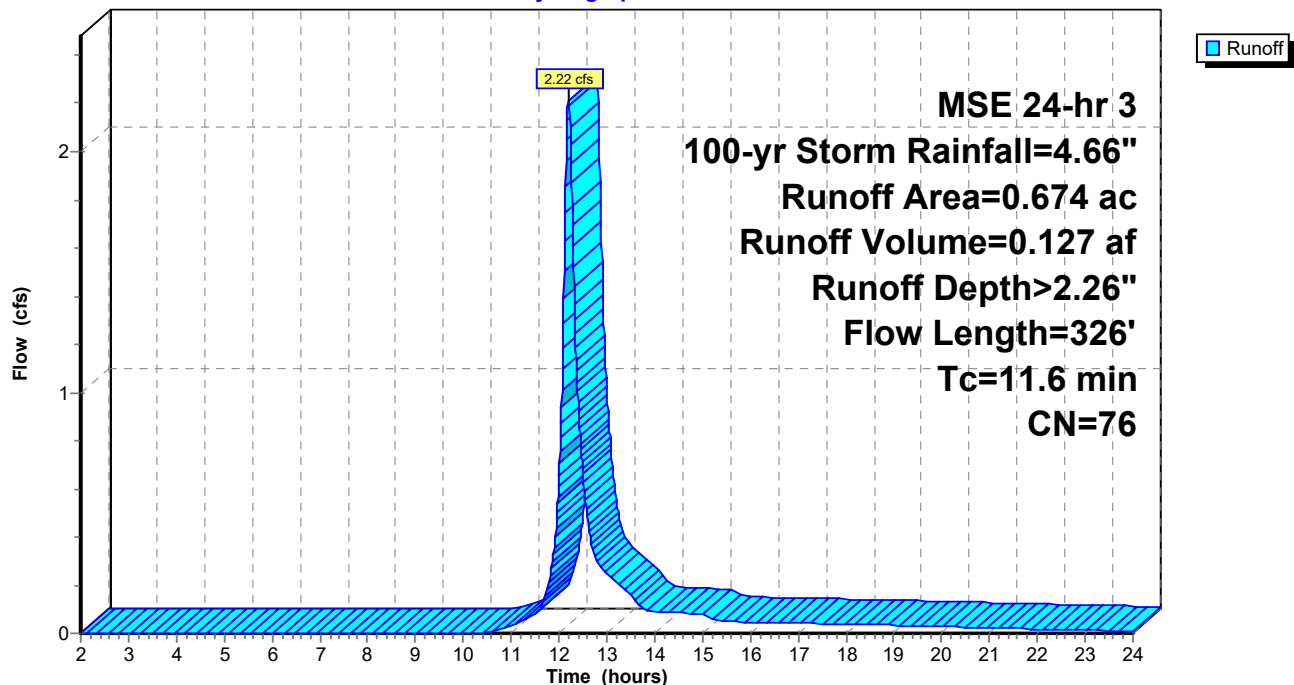
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.631	74	>75% Grass cover, Good, HSG C
0.043	98	Paved parking, HSG C
0.674	76	Weighted Average
0.631		93.62% Pervious Area
0.043		6.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	74	0.0405	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 1.82"
3.9	252	0.0238	1.08		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
11.6	326	Total			

Subcatchment A-7:

Hydrograph



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-8:

Runoff = 3.15 cfs @ 12.14 hrs, Volume= 0.155 af, Depth> 3.45"
Routed to Pond 8P : CB

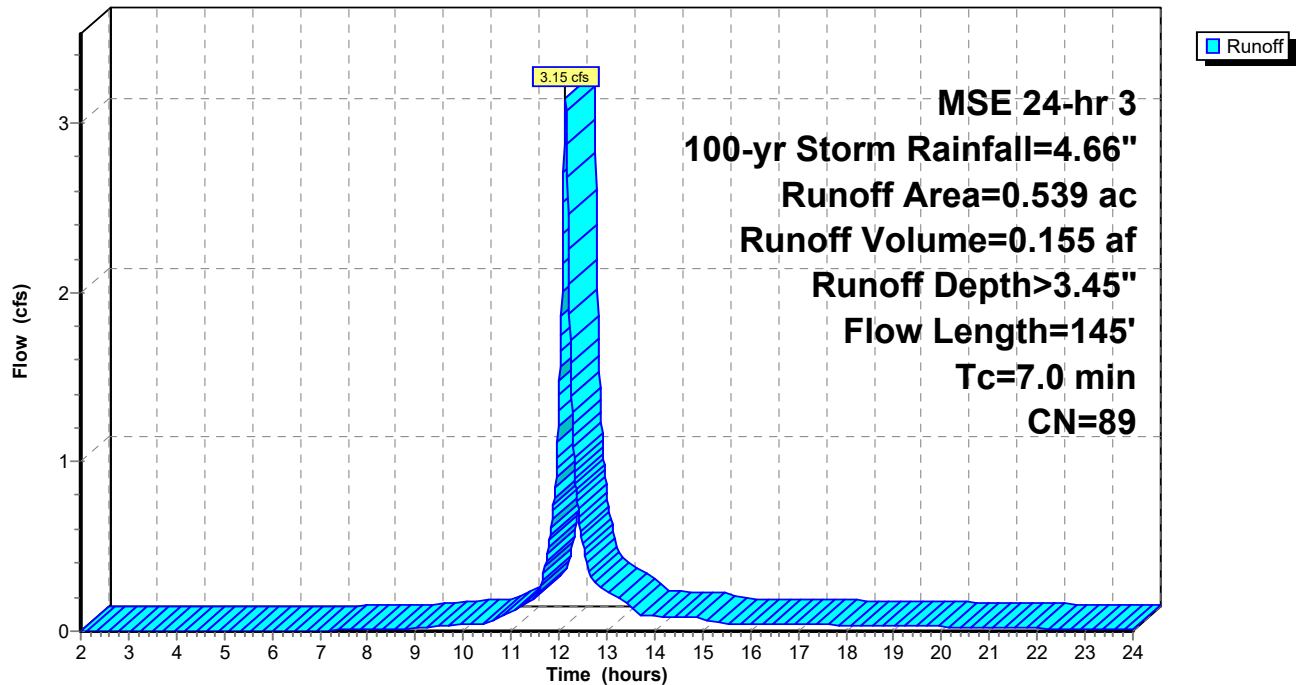
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.341	98	Paved parking, HSG C
0.198	74	>75% Grass cover, Good, HSG C
0.539	89	Weighted Average
0.198		36.73% Pervious Area
0.341		63.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	145		0.35		Direct Entry, Minimum

Subcatchment A-8:

Hydrograph



StandleyLake_Prop2

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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Subcatchment A-9:

Runoff = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af, Depth> 3.97"
Routed to Pond 9P : CB

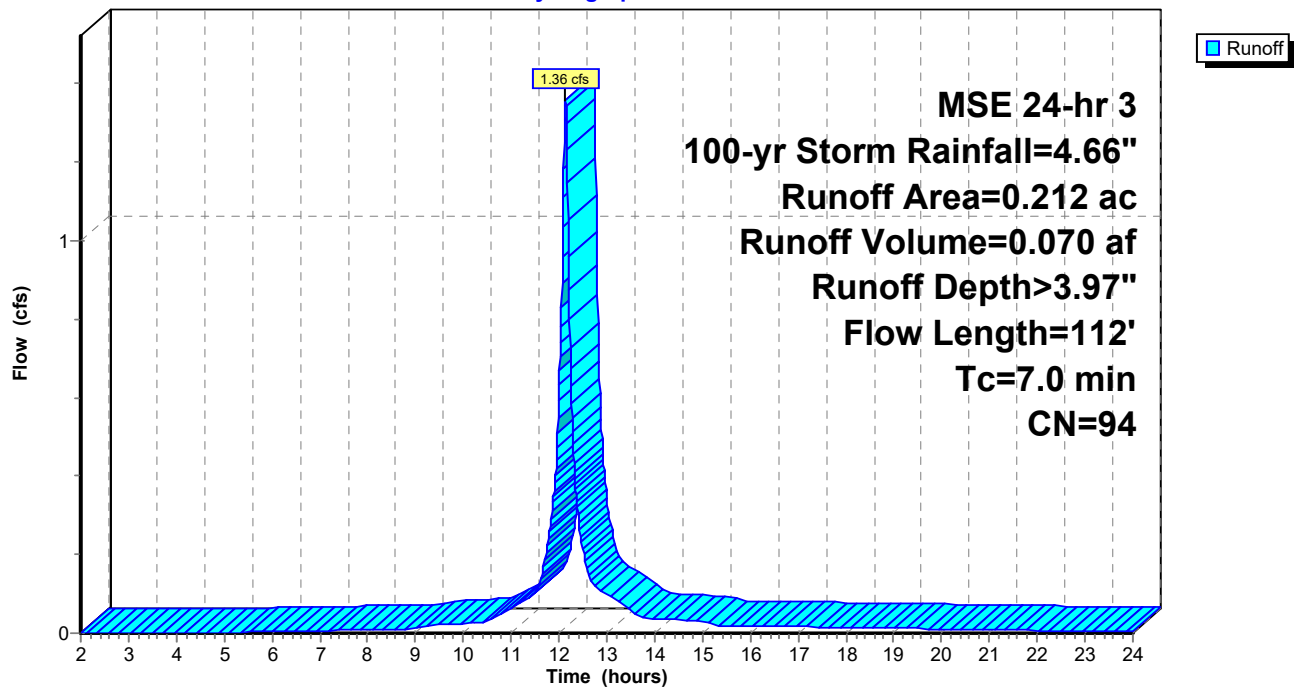
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Area (ac)	CN	Description
0.181	98	Paved parking, HSG C
0.031	74	>75% Grass cover, Good, HSG C
0.212	94	Weighted Average
0.031		14.62% Pervious Area
0.181		85.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	112		0.27		Direct Entry, Minimum

Subcatchment A-9:

Hydrograph



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 1P: CB

Inflow Area = 2.190 ac, 37.35% Impervious, Inflow Depth > 3.04" for 100-yr Storm event
Inflow = 10.34 cfs @ 12.15 hrs, Volume= 0.555 af
Outflow = 10.34 cfs @ 12.15 hrs, Volume= 0.555 af, Atten= 0%, Lag= 0.0 min
Primary = 10.34 cfs @ 12.15 hrs, Volume= 0.555 af
Routed to Pond 8P : CB

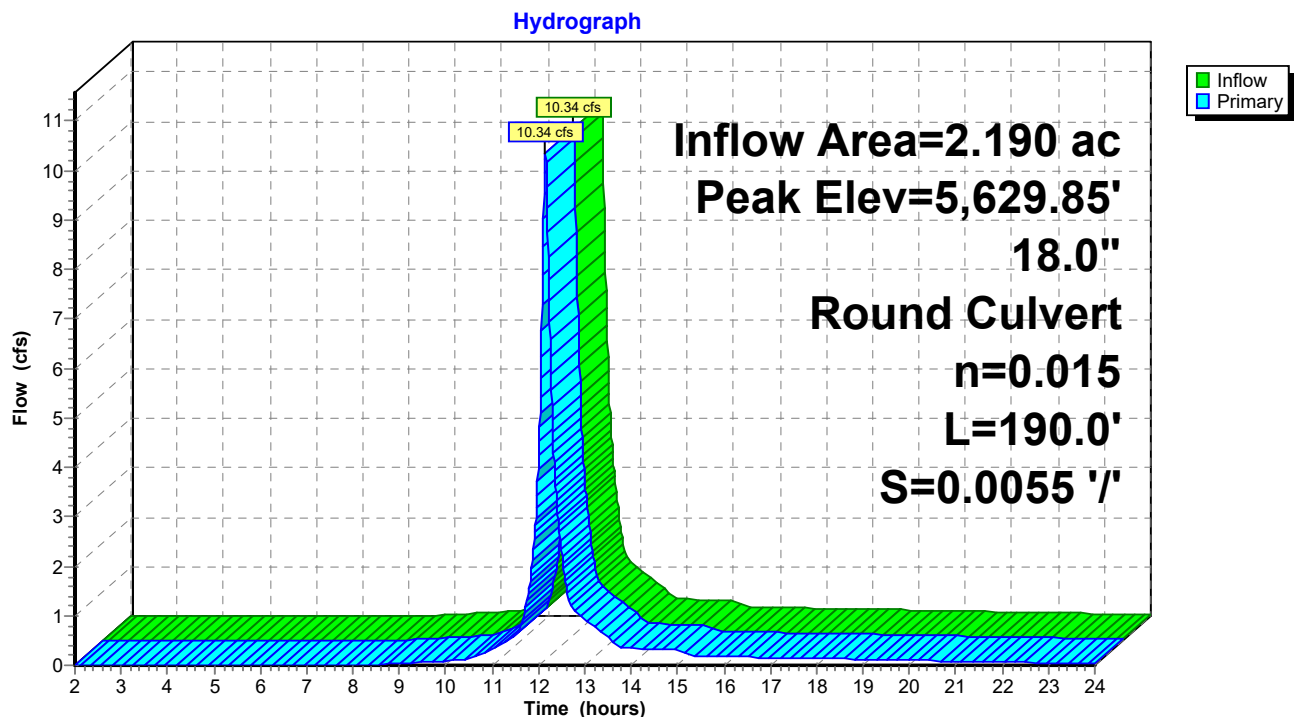
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,629.85' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.59'	18.0" Round RCP_Round 18" L= 190.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.59' / 5,524.54' S= 0.0055 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=10.13 cfs @ 12.15 hrs HW=5,536.91' TW=5,533.78' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 10.13 cfs @ 5.73 fps)

Pond 1P: CB



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 2P: CB

Inflow Area = 1.595 ac, 20.13% Impervious, Inflow Depth > 2.51" for 100-yr Storm event
Inflow = 6.18 cfs @ 12.18 hrs, Volume= 0.333 af
Outflow = 6.18 cfs @ 12.18 hrs, Volume= 0.333 af, Atten= 0%, Lag= 0.0 min
Primary = 6.18 cfs @ 12.18 hrs, Volume= 0.333 af
Routed to Pond 10P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

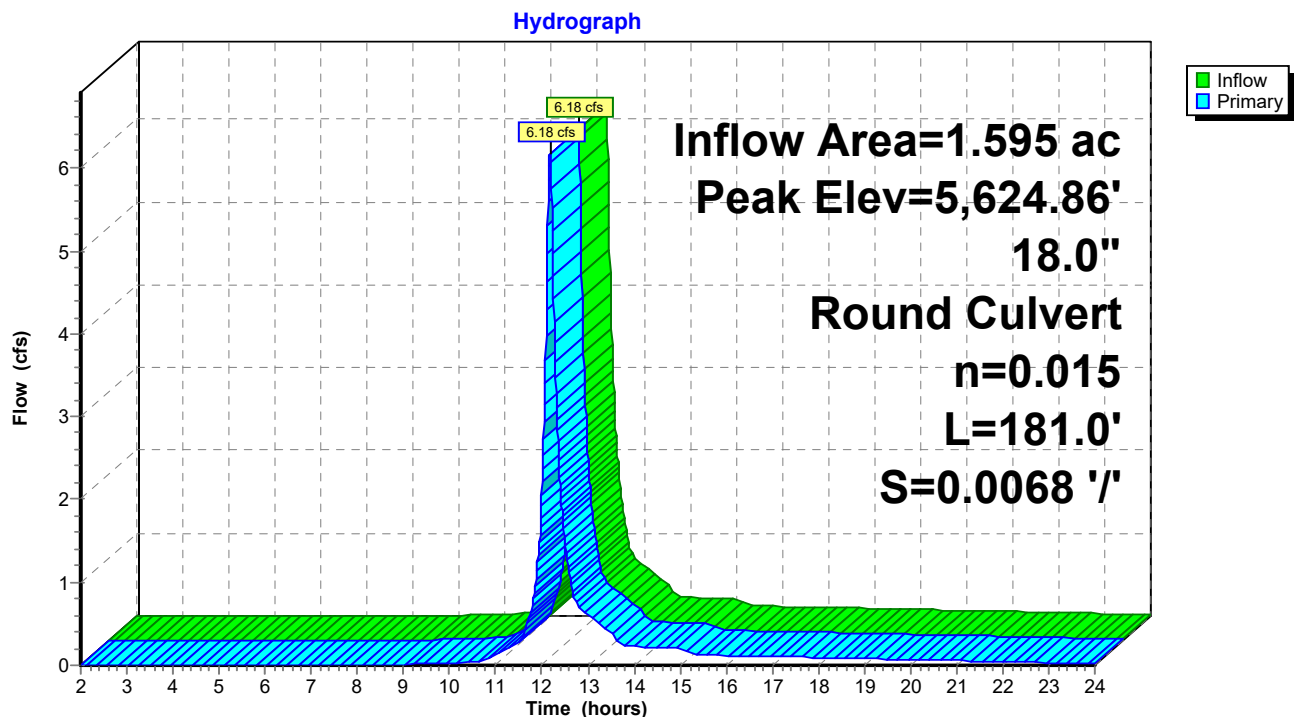
Peak Elev= 5,624.86' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,525.60'	18.0" Round RCP_Round 18" L= 181.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,525.60' / 5,524.37' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.18 hrs HW=5,529.60' TW=5,592.30' (Dynamic Tailwater)

↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 2P: CB



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 3P: Inlet

Inflow Area = 0.832 ac, 0.00% Impervious, Inflow Depth > 2.09" for 100-yr Storm event
Inflow = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af
Outflow = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min
Primary = 2.71 cfs @ 12.18 hrs, Volume= 0.145 af
Routed to Pond 2P : CB

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

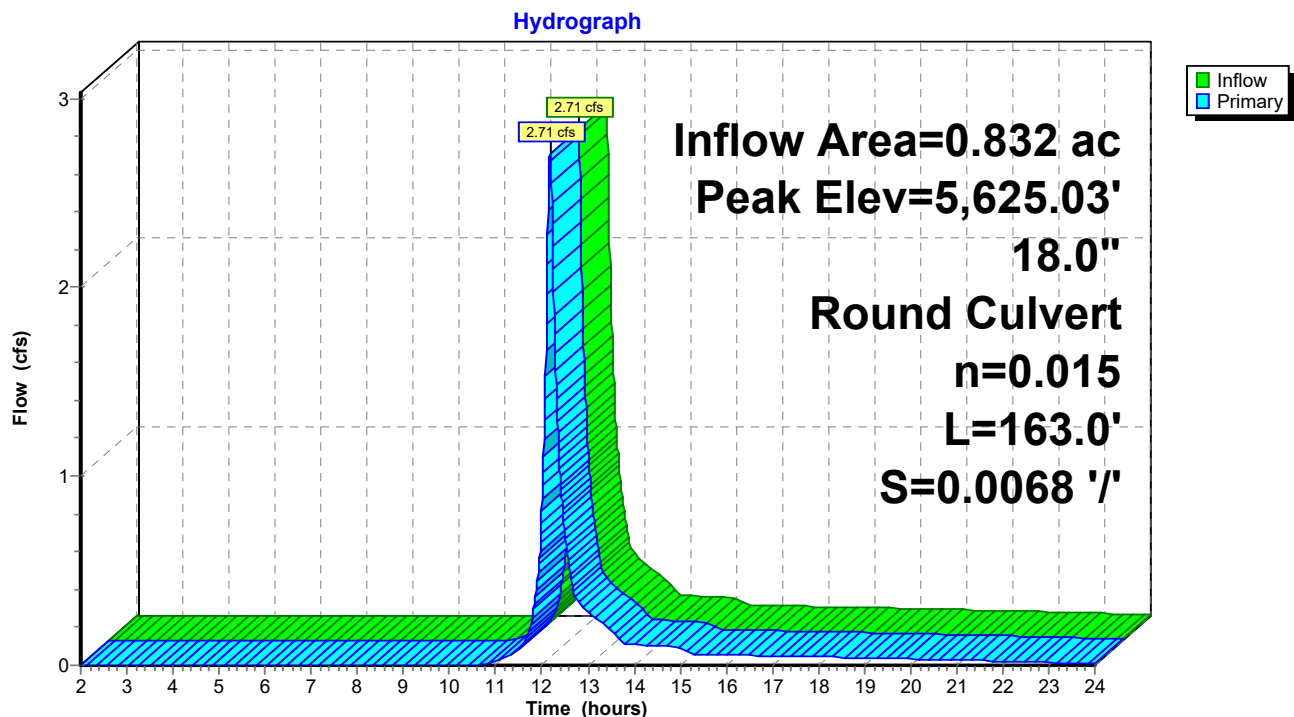
Peak Elev= 5,625.03' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.71'	18.0" Round RCP_Round 18" L= 163.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.71' / 5,525.60' S= 0.0068 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=1.78 cfs @ 12.18 hrs HW=5,529.71' TW=5,529.63' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 1.78 cfs @ 1.01 fps)

Pond 3P: Inlet



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 4P: Roof Drain

Inflow Area = 0.697 ac, 100.00% Impervious, Inflow Depth > 4.42" for 100-yr Storm event
Inflow = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af
Outflow = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af, Atten= 0%, Lag= 0.0 min
Primary = 4.65 cfs @ 12.14 hrs, Volume= 0.257 af
Routed to Pond 5P : Inlet

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

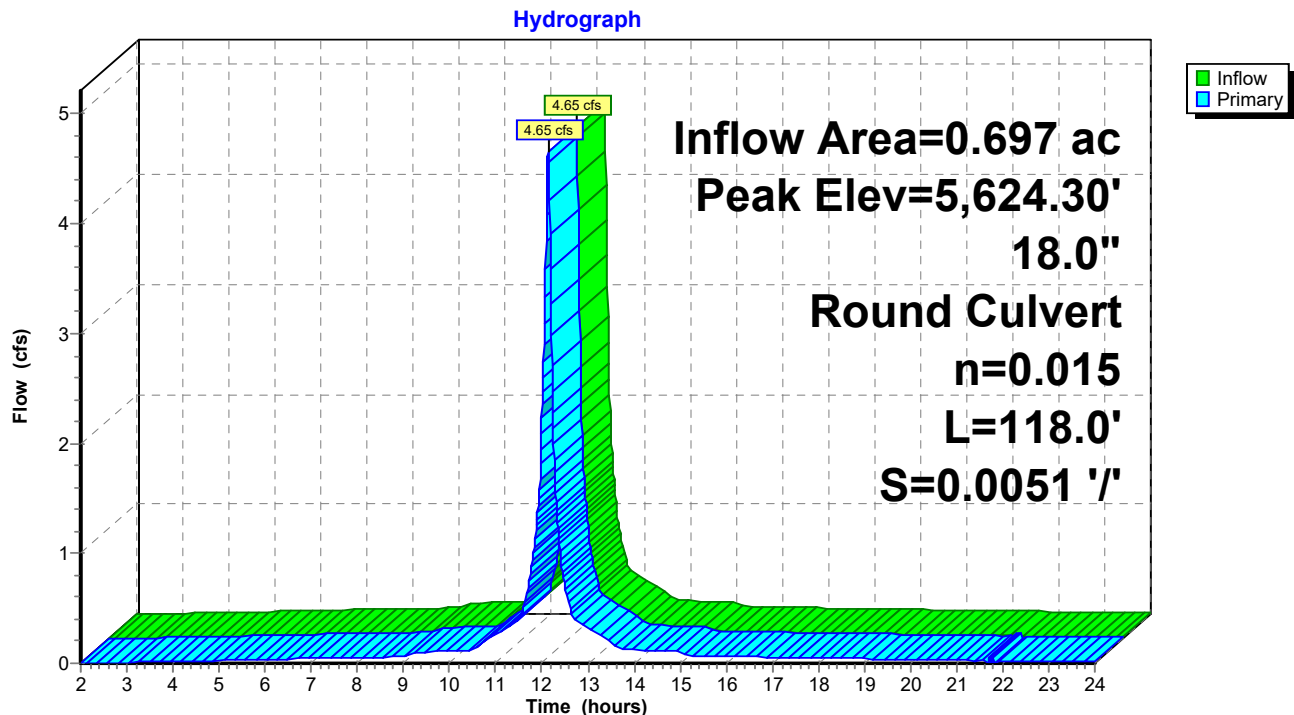
Peak Elev= 5,624.30' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,523.90'	18.0" Round RCP_Round 18" L= 118.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,523.90' / 5,523.30' S= 0.0051 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=2.80 cfs @ 12.14 hrs HW=5,528.65' TW=5,528.48' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 2.80 cfs @ 1.58 fps)

Pond 4P: Roof Drain



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 5P: Inlet

Inflow Area = 1.933 ac, 40.61% Impervious, Inflow Depth > 3.04" for 100-yr Storm event
Inflow = 8.43 cfs @ 12.16 hrs, Volume= 0.489 af
Outflow = 8.43 cfs @ 12.16 hrs, Volume= 0.489 af, Atten= 0%, Lag= 0.0 min
Primary = 8.43 cfs @ 12.16 hrs, Volume= 0.489 af
Routed to Pond 6P : DI

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

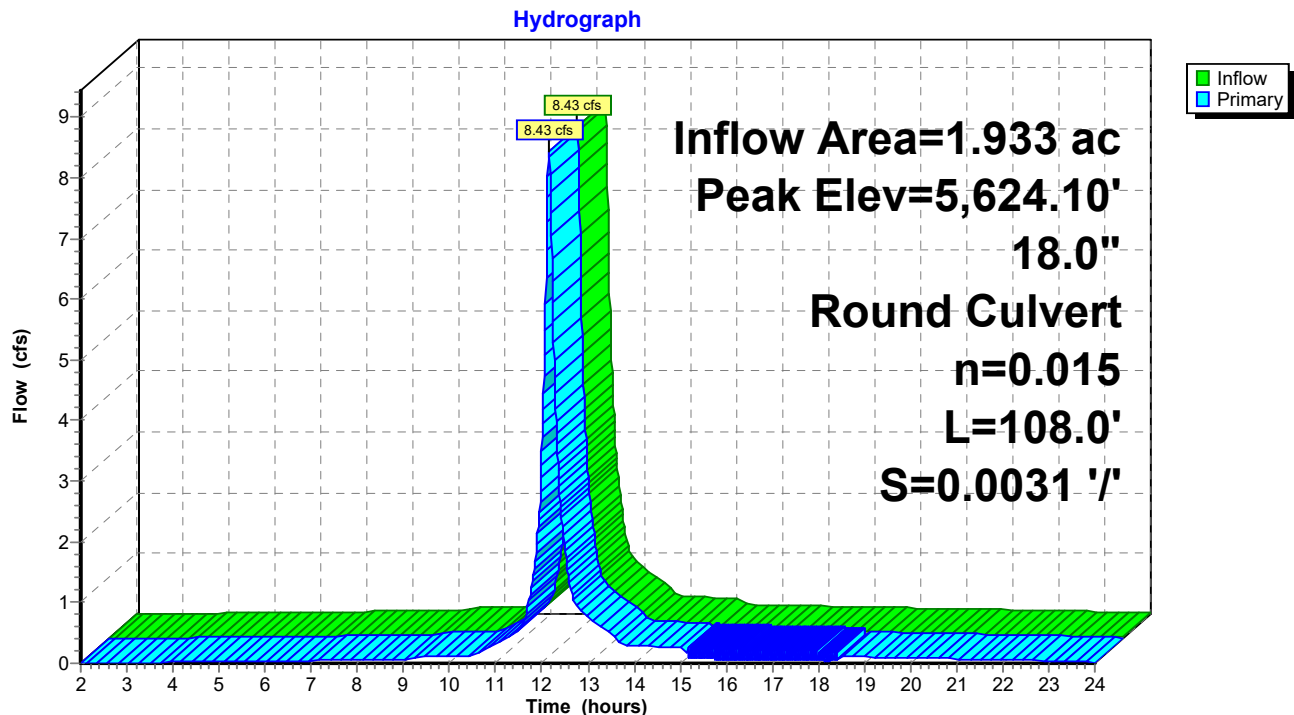
Peak Elev= 5,624.10' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.94'	18.0" Round RCP_Round 18" L= 108.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.94' / 5,522.61' S= 0.0031 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=8.02 cfs @ 12.16 hrs HW=5,528.83' TW=5,527.51' (Dynamic Tailwater)

↑1=RCP_Round 18" (Outlet Controls 8.02 cfs @ 4.54 fps)

Pond 5P: Inlet



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Summary for Pond 6P: DI

Inflow Area = 2.536 ac, 44.24% Impervious, Inflow Depth > 3.09" for 100-yr Storm event
Inflow = 11.05 cfs @ 12.16 hrs, Volume= 0.652 af
Outflow = 11.05 cfs @ 12.16 hrs, Volume= 0.652 af, Atten= 0%, Lag= 0.0 min
Primary = 11.05 cfs @ 12.16 hrs, Volume= 0.652 af
Routed to Pond 7P : Proposed Pond

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

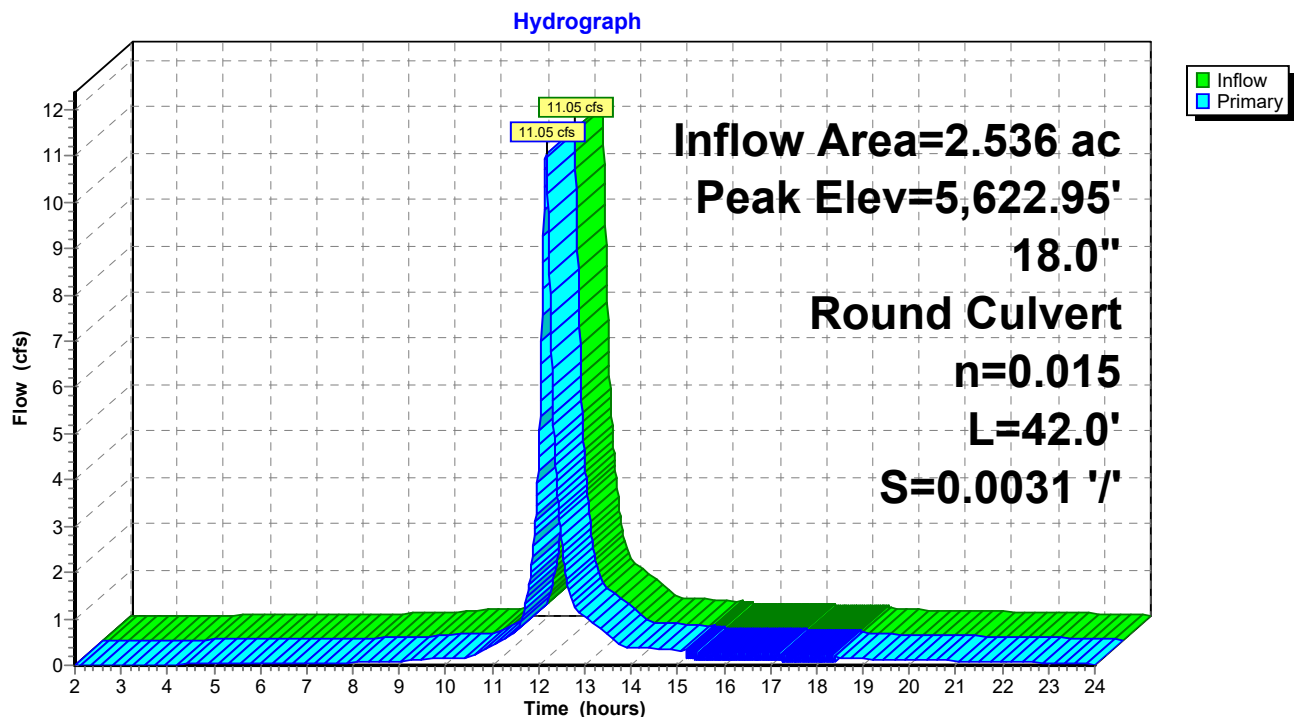
Peak Elev= 5,622.95' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,522.61'	18.0" Round RCP_Round 18" L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,522.61' / 5,522.48' S= 0.0031 ' S= 0.0031 ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=5,527.57' TW=5,542.62' (Dynamic Tailwater)

↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 6P: DI



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 7P: Proposed Pond

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 2.97" for 100-yr Storm event
Inflow = 35.87 cfs @ 12.16 hrs, Volume= 2.008 af
Outflow = 36.06 cfs @ 12.18 hrs, Volume= 1.876 af, Atten= 0%, Lag= 1.3 min
Primary = 36.06 cfs @ 12.18 hrs, Volume= 1.876 af
Routed to Link 1L : Street Sewer

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 5,621.40' @ 12.18 hrs Surf.Area= 0.293 ac Storage= 0.464 af

Plug-Flow detention time= 58.9 min calculated for 1.876 af (93% of inflow)
Center-of-Mass det. time= 27.7 min (817.5 - 789.8)

Volume	Invert	Avail.Storage	Storage Description
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#1	5,522.00'	0.464 af	Custom Stage Data (Prismatic) Listed below (Recalc)
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Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,522.00	0.001	0.000	0.000
5,523.00	0.026	0.013	0.013
5,524.00	0.088	0.057	0.070
5,525.00	0.203	0.146	0.216
5,526.00	0.293	0.248	0.464

Device	Routing	Invert	Outlet Devices
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#1	Device 2	5,524.50'	42.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#2	Device 3	5,521.48'	18.0" W x 6.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	5,521.40'	18.0" Round RCP_Round 18" L= 65.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,521.40' / 5,521.00' S= 0.0062 ' / ' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

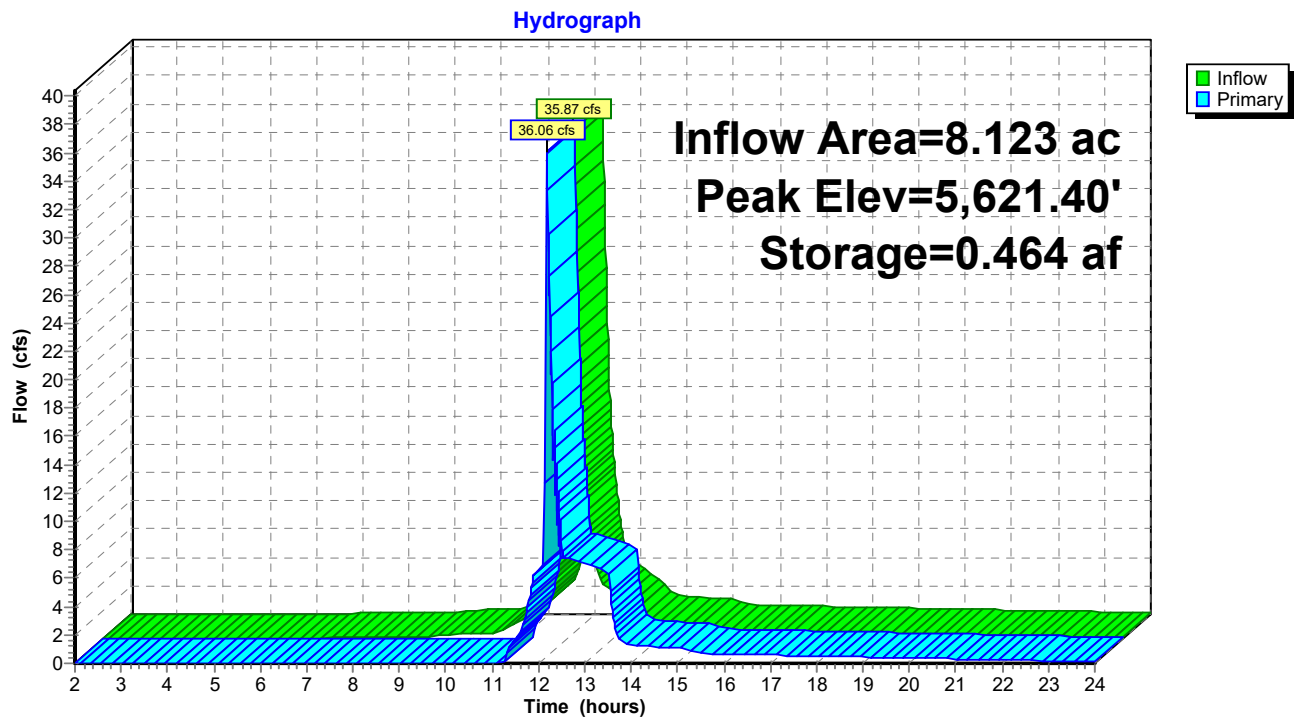
Primary OutFlow Max=35.65 cfs @ 12.18 hrs HW=5,619.17' TW=0.00' (Dynamic Tailwater)

↑ **3=RCP_Round 18"** (Passes 35.65 cfs of 79.42 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 35.65 cfs @ 47.53 fps)

↑ **1=Orifice/Grate** (Passes 35.65 cfs of 573.91 cfs potential flow)

Pond 7P: Proposed Pond



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 8P: CB

Inflow Area = 2.941 ac, 45.56% Impervious, Inflow Depth > 3.18" for 100-yr Storm event
Inflow = 14.82 cfs @ 12.15 hrs, Volume= 0.780 af
Outflow = 14.82 cfs @ 12.15 hrs, Volume= 0.780 af, Atten= 0%, Lag= 0.0 min
Primary = 14.82 cfs @ 12.15 hrs, Volume= 0.780 af
Routed to Pond 7P : Proposed Pond

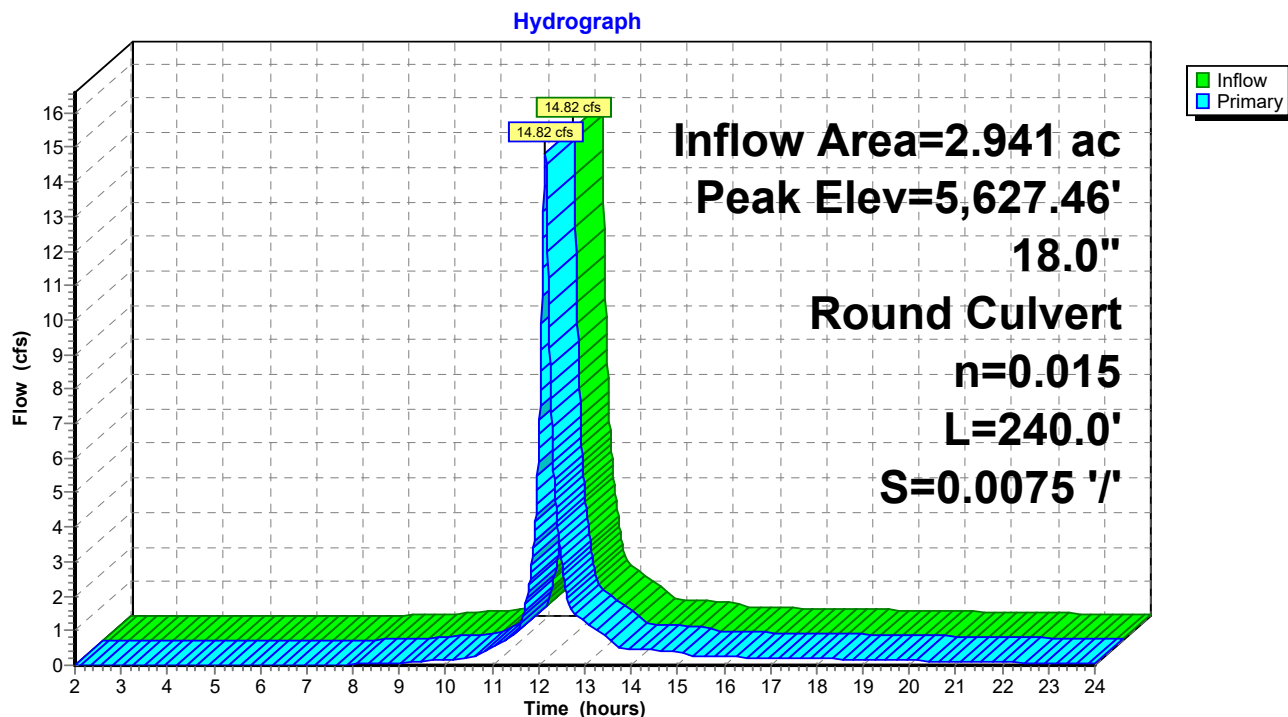
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,627.46' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.48'	18.0" Round RCP_Round 18" L= 240.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.48' / 5,522.69' S= 0.0075 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=14.71 cfs @ 12.15 hrs HW=5,533.76' TW=5,525.85' (Dynamic Tailwater)
↑1=RCP_Round 18" (Outlet Controls 14.71 cfs @ 8.33 fps)

Pond 8P: CB



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 9P: CB

Inflow Area = 0.212 ac, 85.38% Impervious, Inflow Depth > 3.97" for 100-yr Storm event
Inflow = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af
Outflow = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min
Primary = 1.36 cfs @ 12.14 hrs, Volume= 0.070 af
Routed to Pond 8P : CB

Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

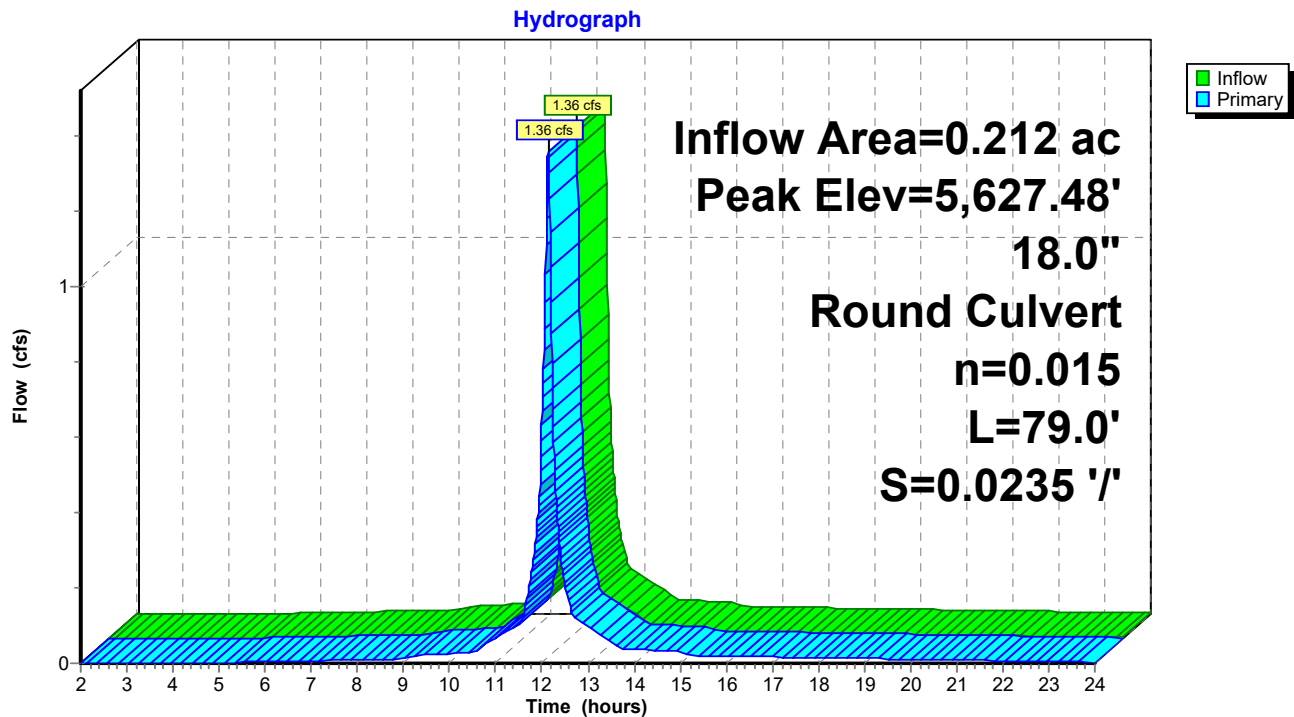
Peak Elev= 5,627.48' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,526.43'	18.0" Round RCP_Round 18" L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,526.43' / 5,524.57' S= 0.0235 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.14 hrs HW=5,533.23' TW=5,533.64' (Dynamic Tailwater)

↑1=RCP_Round 18" (Controls 0.00 cfs)

Pond 9P: CB



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MSE 24-hr 3 100-yr Storm Rainfall=4.66"

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Summary for Pond 10P: Inlet

Inflow Area = 1.972 ac, 29.01% Impervious, Inflow Depth > 2.73" for 100-yr Storm event
Inflow = 8.18 cfs @ 12.17 hrs, Volume= 0.449 af
Outflow = 8.18 cfs @ 12.17 hrs, Volume= 0.449 af, Atten= 0%, Lag= 0.0 min
Primary = 8.18 cfs @ 12.17 hrs, Volume= 0.449 af
Routed to Pond 7P : Proposed Pond

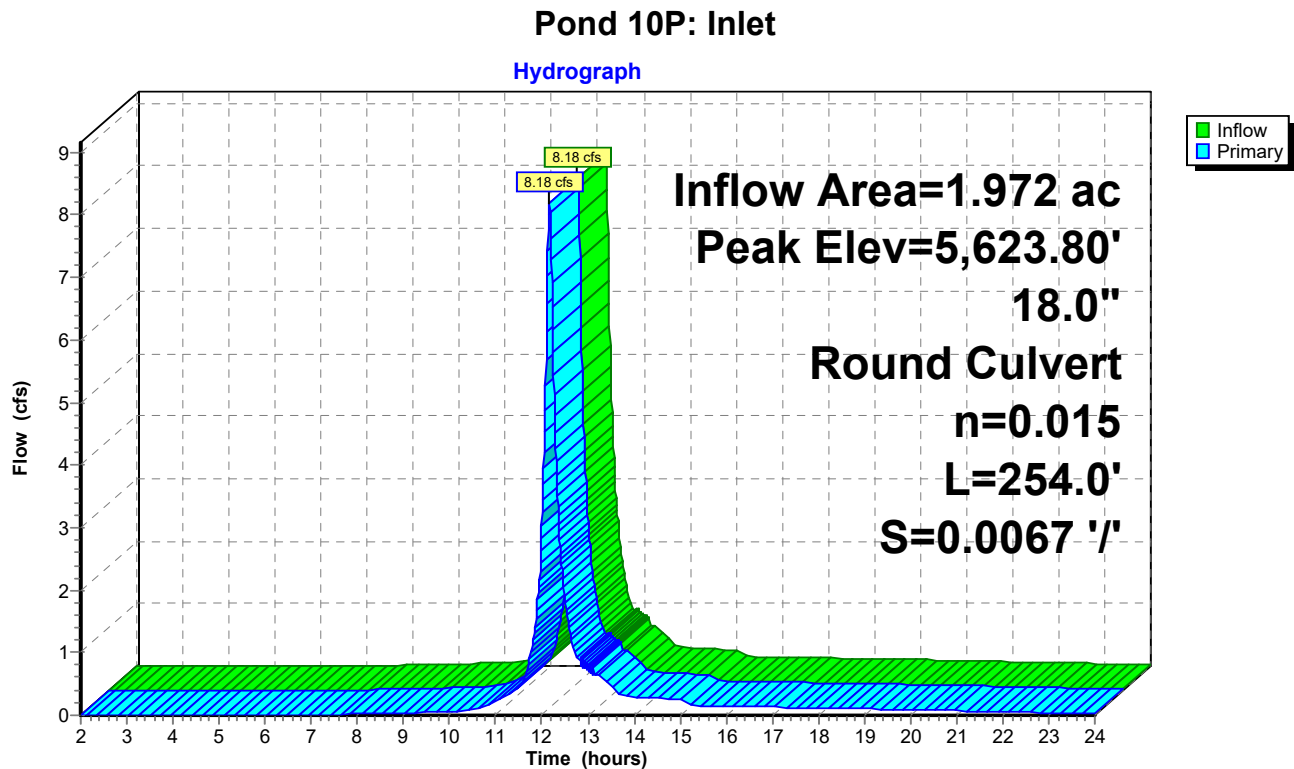
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,623.80' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.37'	18.0" Round RCP_Round 18" L= 254.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.37' / 5,522.67' S= 0.0067 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.17 hrs HW=5,528.49' TW=5,589.33' (Dynamic Tailwater)

↑1=RCP_Round 18" (Controls 0.00 cfs)



StandleyLake_Prop2

Prepared by KLJ Engineering

HydroCAD® 10.10-7a s/n 05334 © 2021 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Storm Rainfall=4.66"

Printed 6/22/2023

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Summary for Pond 11P: Inlet

Inflow Area = 0.145 ac, 28.28% Impervious, Inflow Depth > 2.69" for 100-yr Storm event
Inflow = 0.64 cfs @ 12.16 hrs, Volume= 0.032 af
Outflow = 0.64 cfs @ 12.16 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min
Primary = 0.64 cfs @ 12.16 hrs, Volume= 0.032 af
Routed to Pond 10P : Inlet

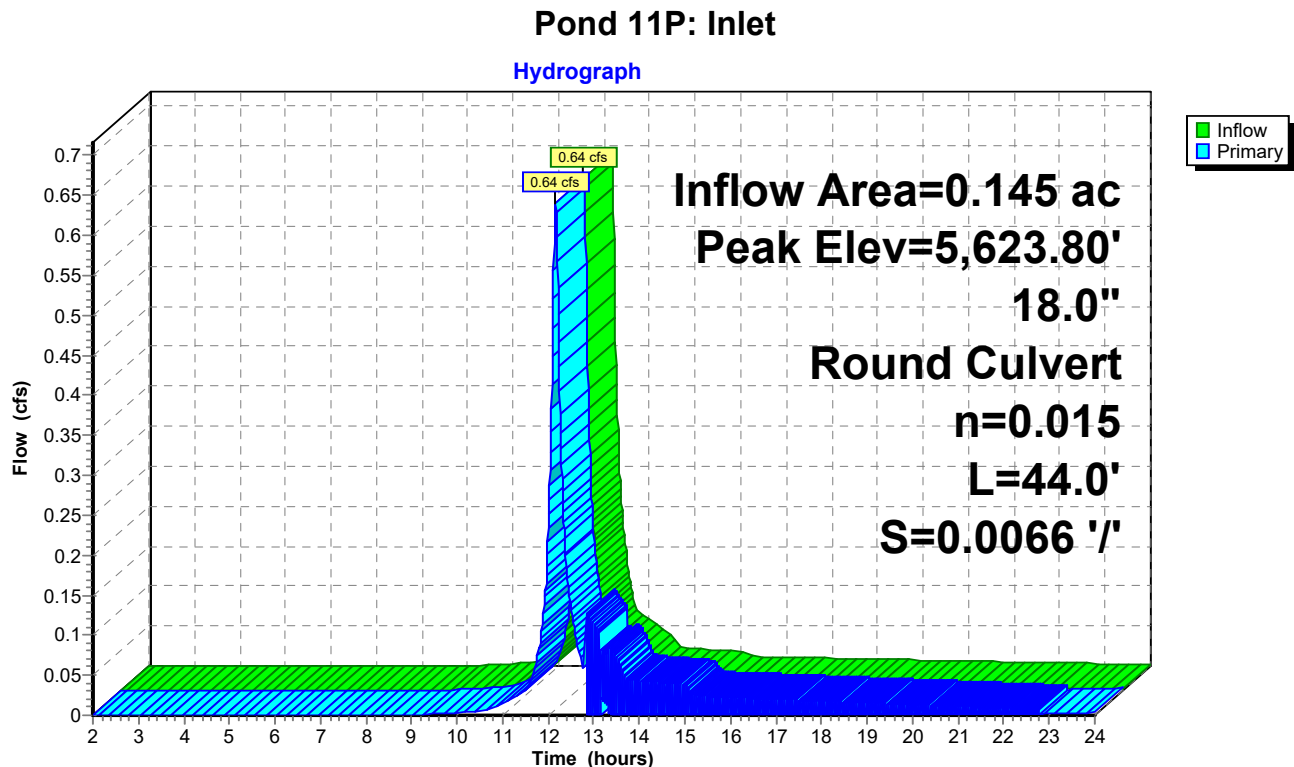
Routing by Dyn-Stor-Ind method, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 5,623.80' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5,524.66'	18.0" Round RCP_Round 18" L= 44.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 5,524.66' / 5,524.37' S= 0.0066 '/' Cc= 0.900 n= 0.015 Concrete sewer w/manholes & inlets, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.16 hrs HW=5,528.28' TW=5,528.43' (Dynamic Tailwater)

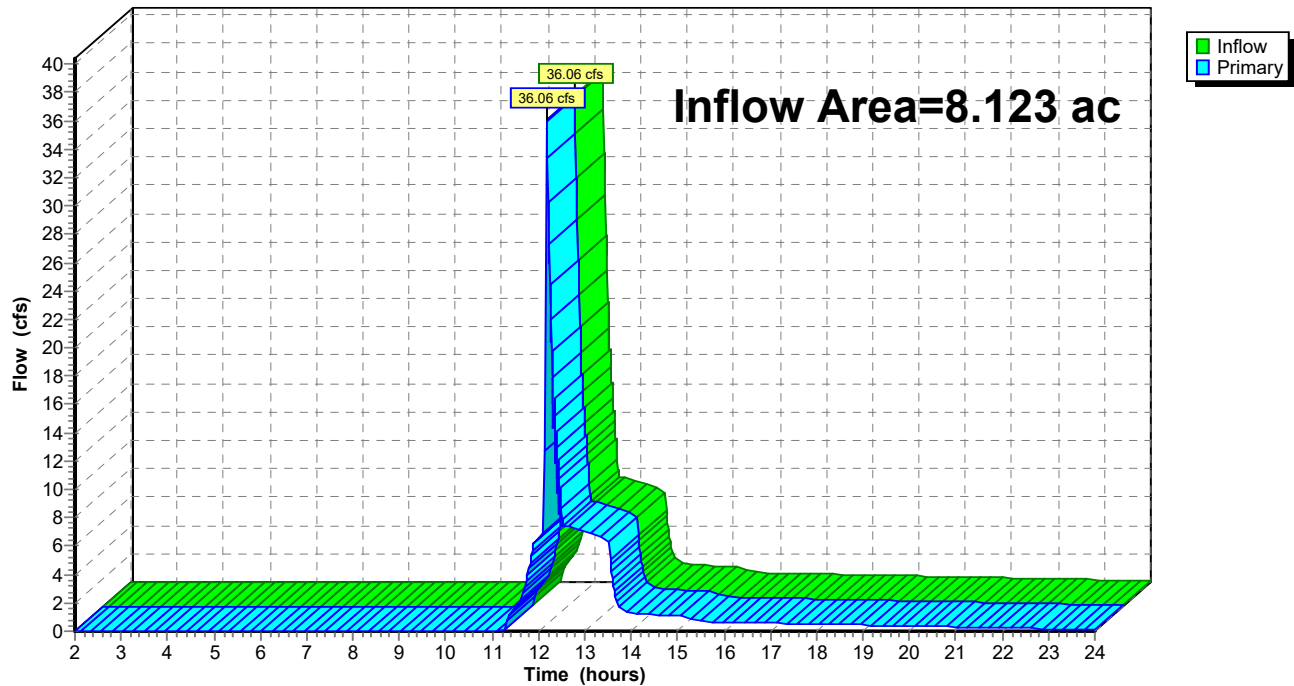
↑1=RCP_Round 18" (Controls 0.00 cfs)



Summary for Link 1L: Street Sewer

Inflow Area = 8.123 ac, 37.88% Impervious, Inflow Depth > 2.77" for 100-yr Storm event
Inflow = 36.06 cfs @ 12.18 hrs, Volume= 1.876 af
Primary = 36.06 cfs @ 12.18 hrs, Volume= 1.876 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 2.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Street Sewer**Hydrograph**

APPENDIX D DRAINAGE REPORT CHECKLIST

DRAINAGE REPORT CHECKLIST

OVERVIEW

Drainage reports must meet all state and county requirements in addition to city requirements listed below. In situations where a previous drainage report was conducted and is still applicable, a drainage conformance letter may be submitted in place of the Drainage Report, at the discretion of the City Engineer. Complete the checklist below, marking those items as they are included in your application submittal, and sign at the end. The checklist is intended to assist the applicant in collecting all of the required materials and to assist the Community and Economic Development staff in determining that all of the application requirements are met.

REPORT CHECKLIST

Checkbox	Items/Description
GENERAL REQUIREMENTS	
✓	Cover Page - Provide a cover page with the project name, number, location, and date. Include the developer's and design engineer's information.
✓	Certification - Provide the Engineer's Certification and Responsibility Statement: <i>"This Drainage Report for the design of the _____ development was prepared by me or under my direct supervision in accordance with the City of Arvada Engineering Code of Standards and Specifications and acceptable professional practices of the industry. I acknowledge that the City of Arvada's review of this Drainage Report is only for general conformance with submittal requirements, current design criteria and standard engineering principles and practices and that the design and concept remains the responsibility of the professional engineer whose stamp and signature appear hereon."</i> - The seal and signature of the Professional Engineer responsible for preparing the report shall follow this statement.
✓	Table of Contents
✓	Introduction - Vicinity Map - Project location and description with acreage, existing topography, existing flood designation, ground cover, use, site characteristics, NRCS soil classification, Major/Minor drainageways, Floodplains, irrigation canals or ditches, Significant geologic features, etc..
✓	Major Drainage Basins (Include an existing/historical section and a proposed/developed section) - Description of each basin - On site and Off site major drainage basin characteristics and flow patterns and paths - Existing and proposed land uses within the basins

	4. Discussion of all drainageway planning or floodplain delineation studies that affect the major drainageways. 5. Discussion of the condition of the channel within or adjacent to the development, including existing condition, need for improvements, and impact on proposed development 6. Discussion of the impacts of the offsite flow patterns and paths, under fully developed conditions
✓	Minor Drainage Basins (Include an existing/historical section and a proposed/developed section) 1. Description of each basin 2. On site and Off site minor drainage basin characteristics and flow patterns and paths under historic and developed conditions 3. Existing and proposed land uses within the basins 4. Discussion of irrigation facilities that will influence or be impacted by the site drainage 5. Discussion of the impacts of the off site flow patterns and paths, under fully developed conditions
✓	DRAINAGE DESIGN CRITERIA 1. State the criteria used in the design 2. Discuss previous drainage studies, master plans, or adjacent developments that influence the stormwater facility designs 3. Discuss impacts to stormwater management facility design, caused by site constraints, such as streets, utilities, light rail rapid transit, existing structures, etc. 4. Hydrology methods for runoff, storm recurrence, rainfall, storage, release rates, etc.. 5. Hydraulic methods for conveyance, capacities, water surface profiles, etc.. 6. Water Quality
✓	STORMWATER MANAGEMENT FACILITY DESIGN - Conveyance 1. Discuss general conveyance concepts 2. Discuss proposed drainage paths and patterns 3. Discuss storm sewer design, including inlet and pipe locations and sizes, tributary basins and areas, peak flow rates at design points, hydraulic grade lines, etc 4. Discuss storm sewer outfall locations and design, including method of energy dissipation 5. Discuss how runoff is conveyed from all outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway 6. Discussion of open channel and swale designs, including dimensions, alignments, tributary basins and areas, peak flow rates at design points, stabilization and grade control improvements, low flow or trickle channel capacities, water surface elevations, etc 7. Discuss allowable street capacities 8. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater conveyance purposes 9. Discussion of the facilities needed offsite for the conveyance of minor and major flows to the major drainageway
✓	STORMWATER MANAGEMENT FACILITY DESIGN - Storage 1. Discuss detention pond designs, including release rates, storage volumes and water surface elevations for the 5 year, 100 year, and emergency overflow conditions, outlet structure design, emergency spillway design, etc 2. Discuss pond outfall locations and design, including method of energy dissipation 3. Discuss how runoff is conveyed from all pond outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway 4. Discuss maintenance aspects of the design and easements and tracts that are required for stormwater storage purposes
	STORMWATER MANAGEMENT FACILITY DESIGN - Water Quality 1. Discuss how the project is meeting MS4 standards.

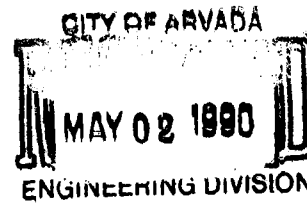
✓	- Discuss the design of all structural water quality BMPs, including tributary areas, sizing, treatment volumes, design features, etc - Discuss how runoff is conveyed from all pond outfalls to the nearest major drainageway, including a discussion of the flow path and capacity downstream of the outfall to the nearest major drainageway - Discuss the operation and maintenance aspects of the design and easements and tracts that are required for stormwater quality enhancement purposes - Discuss the source controls that are necessary to prevent the potential for illicit discharge from site activities
✓	STORMWATER MANAGEMENT FACILITY DESIGN - Floodplain - Discuss resources and methodology for delineation of floodplain. - Discuss the source of the floodplain information and level of detail (MHFD Flood Hazard Area Delineation or FEMA Flood Insurance Rate Maps) - Discuss details of floodplain modifications, including level of encroachment, velocities, depths, stabilization measures, water surface elevations, etc. - Discuss Floodplain Modification Studies, including Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) requirements - Discuss floodplain development regulations and permits
✓	CONCLUSIONS - Discuss compliance with all applicable standards - Identify provisions by section number for which a variance will be requested. - Provide justification for each variance requested. - Discuss overall effectiveness of stormwater management design to properly convey, store, and treat stormwater - Discuss the impact of proposed improvements. Discussion shall include benefits and adverse impacts with solutions to mitigate impacts.
	REFERENCES Reference all criteria, master plans, reports, or other technical information used in development of the concepts discussed in the drainage report
ATTACHMENTS / APPENDICES	
✓	MS4 Worksheet - Attach completed MS4 worksheet
✓	Hydrologic Computations (historic and proposed) - Determination of runoff coefficients and times of concentration - Land use assumptions for off site areas - Peak flow rate calculations for the minor and major storms - Rainfall Information - Hydrograph data - Connectivity diagram showing relationship/connectivity of basins, conveyance facilities, detention ponds, and design points - Floodplain hydrology
✓	Hydraulic Computations (historic and proposed) - Culvert Capacities - Storm sewer capacities and hydraulic grade lines, including the loss coefficients - Street capacities - Inlet capacities - Open channel or swale capacities - Low flow and trickle channels - Stabilization and grade control improvements - Water surface profiles - Stage storage discharge determination for detention ponds

	10. Urban Drainage/Mile High Flood District Worksheets based on the BMP/drainage facility being proposed. 11. Detention pond routing calculations 12. Emergency spillway sizing calculations 13. Downstream/outfall capacity to the nearest major drainageway 14. Energy dissipation at pipe outfalls 15. Floodplain modeling
	Water Quality Enhancement Best Management Practices - Design and sizing
✓	Historic Drainage Map 1. Existing basin designations, design points, flow rates, volumes, release rates, etc. 2. Existing (dashed or screened) contours with a 2 foot maximum contour interval. Contour must extend a minimum of 100 feet beyond property lines. 3. Existing utilities and structures 4. All existing property lines and easements with type of easements noted 5. Adjacent developments or ownerships 6. Existing streets and roadways with ROW and flow line widths, type of curb and gutter or roadside swale, slopes, flow directions, and crosspans 7. Existing drainage basin and subbasin limits 8. Existing stormwater management facilities, including irrigation ditches, roadside swales, open channels and drainageways, storm sewers, culverts, detention ponds, water quality enhancement structures or features, etc. 9. Location and elevation of all existing 100 year floodplain boundaries, including the source of designation. All floodplain designations that exist for the site should be included. 10. Existing Summary Runoff Table
✓	Proposed Drainage Plan/Map 1. Basin designations, design points, cumulative flow rates, volumes, release rates, etc. 2. Existing (dashed or screened) and proposed (solid) contours with a 2 foot maximum contour interval. In terrain where the slope exceeds 15%, the maximum interval is 5 feet. Contour must extend a minimum of 100 feet beyond property lines. 3. Existing utilities and structures 4. All property lines and easements with type of easements noted 5. Adjacent developments or ownerships 6. Streets and roadways with ROW and flow line widths, type of curb and gutter or roadside swale, slopes, flow directions, and crosspans 7. Drainage basin and subbasin limits 8. Existing and proposed stormwater management facilities, including irrigation ditches, roadside swales, open channels and drainageways, storm sewers, culverts, detention ponds, water quality enhancement structures or features, etc. Information must be included regarding materials, sizes, shapes, and slopes 9. Proposed outfall points and existing or proposed facilities to convey runoff to the nearest major drainageway, without damage to downstream properties 10. Location and elevation of all existing and proposed 100 year floodplain boundaries, including the source of designation. All floodplain designations that exist for the site should be included. 11. Summary Runoff Table (include routed flows for each design point) 12. Detention Basin Summary Table
	Operations and Maintenance Manual
	Referenced Information - Copies of pertinent portions of all referenced materials or drainage reports.

APPENDIX E PREVIOUS DRAINAGE STUDY

DSW

. . .



City of Arvada, Colorado

MAY 2 1990

Planning Department

Final Storm Drainage Study

for

STANDLEY LAKE LIBRARY
PLANNED UNIT DEVELOPMENT

Prepared for

JEFFERSON COUNTY PUBLIC LIBRARY

By

Design Studios West, Inc.

DESIGN STUDIOS WEST, INC.

Planning Engineering Landscape Architecture
1425 Market Street, Suite 100 Denver, Colorado 80202
(303) 623-3465 Fax (303) 623-3758
Sarasota Denver

I. Introduction

The purpose of this report is to present the developer with a proposed series of improvements which will provide for proper management of storm water runoff from the proposed Standley Lake Library P.U.D.

II. Study Area

The area on which this study is focused is the proposed Standley Lake Library P.U.D. which is currently platted as the Brae Moor Subdivision Filing No. 1. It is located in the Northeast Quarter of Section 28, Township 2 South, Range 69 West, City of Arvada, Jefferson County, Colorado. It is approximately located at the intersection of Kipling Street and West 84th Avenue.

III. Existing Conditions

The site is bounded on the east by Kipling Street, which in this area is a two-lane roadway transitioning to a four-lane divided roadway to the south. On the south is the MacArthur Park development, a "zero" lot line single family residential project, which is approximately 50% developed. The west boundary of the site is the Croke Canal. On the northern boundary of the site is undeveloped property with one residence and several out-buildings. No portion of the site is contained within a 100-year floodway as defined by the City of Arvada.

The topography of the site slopes from the west and northwest to the southeast corner. Slopes range from 2.0% to 3.5%. At the southeast corner is a depression which collects and holds surface drainage from the site as well as runoff which is piped into the depression from MacArthur Park. Most of this depression lies within the dedicated Kipling Street right-of-way. Water is outleted from this depression to the east side of Kipling by an existing 18" pipe.

IV. Design Criteria and Requirements

The initial and the major drainage system make up the storm runoff drainage system for an urban area. The initial drainage system should be designed to accommodate the runoff from a 3.5-year storm by utilizing the maximum capacity of the streets, overland swales and, if necessary underground conduits. The major drainage system must be design to handle a 100-year storm without extensive property damage or loss of life. Areas which may be susceptible to flooding must be examined. Floor elevations should be set to allow proper drainage between and around structures without flooding.

This site will limit its runoff to the amount resulting from a 100-year frequency storm occurring while the site is in its natural state. To accomplish this, detention ponds will be utilized which will have a storage capacity of the maximum difference between the 100-year storm runoff from the developed area and the 100-year historical flow. An outlet structure is designed to limit the flow.

Runoff quantities have been calculated based on the Rational Method as detailed in the Urban Storm Drainage Criterion Manual (Urban Drainage and Flood Control District). Calculations were performed using the HYDRA Hydraulic Analysis Computer Program. Individual calculations and printouts are included in the Technical Appendix of this report.

V. Drainage Plan

Stormwater in Drainage Basin "A" will be collected by means of curb and gutter and routed to one of five curb inlets located throughout the parking lot. The water will then be carried by storm sewer to the detention pond located on the south side of the site entrance. Stormwater in Drainage Basin "B" will be collected by means of surface swales and routed into detention pond located on the north side of the site entrance. Additionally, water from the library's roof and perimeter drains will be piped directly into this detention pond.

The north detention pond will be directly connected into the south detention pond. The detention ponds will be sized so that the maximum top elevation of both ponds will be 5527.75. Stormwater will accumulated in the ponds at roughly the same rate; therefore, there will minimal fluctuation in the head between the two ponds. In the instance of an overflow of the ponds during a storm in excess of the 100-year frequency, water will flow accross Kipling to the southeast in the historical drainage way and be collected in Pomona Reservoir.

VI. Additional Considerations

The existing outlet pipe from MacArthur Park will be extended north in the Kipling Street ROW and will connect directly to the proposed STSMH1 and 21" pipe.

Runoff from the west side of Kipling Street (improved to 4-lane divided w/20' wide median as part of this project) will sheet flow into curb and gutter fronting the site and will empty into a curb inlet connected to the proposed 21" pipe in Kipling Street.

TECHNICAL APPENDIX

Release Rate Calculation

Assume release rate equals the historic 100 year runoff rate using a storm duration of 30 minutes.

Average Intensity = 3.64 in/hr (Arvada Table 105-II)

Historic Discharge = $Q = (Cf)(C)(i)(A)$

$Cf = 1.25$; $C = 0.20$; $i = 3.64$; $A = 10.0$ acres

$Q = (1.25)(0.20)(3.64)(10.0) = 9.10$ cfs (allowable release rate from site)

Orifice Sizing

Maximum discharge = 9.10 cfs at 4 feet head

$Q = CA((2gh)^{1/2})$

$C = 0.97$ (round-edged entrance)

$Q = 9.10$; $g = 32.2$

$h = \text{varies} = 0\text{-}4$ feet

$A = 0.58$ sf

$r = 0.43$ ft

Orifice opening = 10.32" (0.86 ft)

Required Detention Storage

Storage = 20,000 cf (see 100 yr Inflow vs. Outflow graph)

```

LINE   --- H Y D R A   Commands --- sltswr3.rat
10: JOB Standley Lake Library Storm Sewer Design (Rational Method) - 3.5 year storm
20: REM Pipe Data
30: PDA .013 3 2 1.5 2 .00001
40: REM Storm Data - 100 yr
50: RAI 10/3.84 20/2.61 30/2.04 40/1.67 50/1.43 60/1.26 70/1.12+
51:      80/1.02 90/0.93 100/0.86 110/0.80 120/0.75 130/0.70 140/0.66+
52:      150/0.63 160/0.60 170/0.58 180/0.55 190/0.55
60: NEW STSWR3
70: REM CB6,CB5,CB4
75: REM CB6
80: STO 0.41 .025 5542 5529 120 0.0
    TIME= 9.58729 MINUTES
90: PIP 161.13 5529 5529.75 5527.02 5526.43 18
95: REM CB5
100: STO 0.82 0.45 5539 5533 135 5532.5 5529.75 120
    TIME= 8.685223 MINUTES
110: PIP 179.77 5529.75 5529 5526.18 5525.04 18
120: REM CB4
130: STO 0.49 0.66 5532.5 5531.5 50 5531.5 5530.5 111
    TIME= 5.055069 MINUTES
140: PIP 257.55 5530.5 5530.5 5524.74 5523.00 18
145: HOL 1
146: NEW STSWR1
150: REM CB2,CB1,CB3
155: REM CB2
156: STO 1.89 0.51 5539 5533 140 5532.5 5529 280
    TIME= 9.044085 MINUTES
157: PIP 192.03 5529 5527 5526.00 5525.0 18
160: HOL 2
165: NEW CB3
175: REM CB3
180: STO 0.11 0.76 5532.5 5532 30 5531.5 5530.5 100
    TIME= 3.348553 MINUTES
190: PIP 77.41 5530.5 5527 5526.5 5524.5 18
200: HOL 3
210: NEW CB1
220: REC 3
230: REC 2
235: REM CB1
240: STO 0.58 0.71 5532 5530 50 5529.5 5527 165
    TIME= 3.826659 MINUTES
250: PIP 235.64 5527 5524.5 5524.66 5523.00
260: HOL 4
270: NEW BLDG ROOF DRAIN
280: REM ROOF DRAIN FROM BLDG
290: STO 0.67 0.95 5.00
300: PIP 130.00 5532 5526 5528 5524
330: REM STSWR4 W/DIRECT FLOW INTO NORTH POND
340: STO 2.98 0.25 5540 5524 400 5528 5524 140
    TIME= 19.71708 MINUTES
400: PIP 151.15 5526 5526 5523.5 5523 -18
410: HOL 6
420: NEW DIRECT FLOW INTO SOUTH POND
425: REM DIRECT FLOW INTO SOUTH POND
430: STO 1.00 0.25 5532.5 5528 200 0.0
    TIME= 16.51694 MINUTES

```

```

LINE  --- H Y D R A  Commands --- slstswr3.rat
440: CHA 270 5528 5522.5 0.035 3 1 3
450: HOL 7
460: NEW STSWR5 (OUTFLOW FROM SOUTH POND)
465: REM MAX 9.10 CFS
476: FLO 9.10
480: PIP 69.98 5524 5524 5522.5 5521.0
490: REM FLOW FROM KIPLING @ KIPINLET
500: STO 1.74 0.82 5532.5 5529 75 5528.5 5523 275
    TIME= 3.626039  MINUTES
510: REM KIPINLET TO OUTLET EAST
520: PIP 170.99 5523 5520 5520.7 5516.82
530: END

```

***** END OF COMMAND FILE *****

***** S U M M A R Y *****

Total Rational storm acres = 10.7

Feet of pipe = 1,625.7
Feet of ditch = 270.0

HOLD register number 1 saved at line 145 not REcalled
HOLD register number 4 saved at line 260 not REcalled
HOLD register number 6 saved at line 410 not REcalled
HOLD register number 7 saved at line 450 not REcalled

***** H Y D R A - Computations *****

```

===COMMAND===> 30 PDA Read from c:slstswr3.rat
===COMMAND===> 52 RAI Read from c:slstswr3.rat
===COMMAND===> 60 NEW Read from c:slstswr3.rat
===COMMAND===> 80 STO Read from c:slstswr3.rat
===COMMAND===> 90 PIP Read from c:slstswr3.rat
Initial Rational Configuration:
Sum C*A      Time  Intensity  Flow CFS
0.01         9.59   3.891     0.04
0.01                                     0.04

```

```

===COMMAND===> 100 STO Read from c:slstswr3.rat
===COMMAND===> 110 PIP Read from c:slstswr3.rat
Initial Rational Configuration:
Sum C*A      Time  Intensity  Flow CFS
0.37         8.69   4.002     1.48
0.01        22.66   2.458     0.03
0.38                                     1.50

```

```

Adjusted Rational Configuration:
Sum C*A      Time  Intensity  Flow CFS
0.37         8.69   4.002     1.48
0.00         8.69   4.002     0.02
0.37                                     1.49

```

===COMMAND===> 130 STO Read from c:slstswr3.rat

===COMMAND===> 140 PIP Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.32	5.06	4.448	1.44
0.37	9.53	3.897	1.45
0.70			2.89

Adjusted Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.32	9.53	3.897	1.26
0.37	9.53	3.897	1.45
0.70			2.71

===COMMAND===> 145 HOL Read from c:slstswr3.rat

===COMMAND===> 146 NEW Read from c:slstswr3.rat

===COMMAND===> 156 STO Read from c:slstswr3.rat

===COMMAND===> 157 PIP Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.96	9.04	3.958	3.81
0.96			3.81

===COMMAND===> 160 HOL Read from c:slstswr3.rat

===COMMAND===> 165 NEW Read from c:slstswr3.rat

===COMMAND===> 180 STO Read from c:slstswr3.rat

===COMMAND===> 190 PIP Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.08	3.35	4.658	0.39
0.08			0.39

===COMMAND===> 200 HOL Read from c:slstswr3.rat

===COMMAND===> 210 NEW Read from c:slstswr3.rat

===COMMAND===> 220 REC Read from c:slstswr3.rat

===COMMAND===> 230 REC Read from c:slstswr3.rat

===COMMAND===> 240 STO Read from c:slstswr3.rat

===COMMAND===> 250 PIP Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.41	3.83	4.599	1.89
0.08	4.09	4.567	0.38
0.96	9.80	3.864	3.72
1.46			6.00

Adjusted Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.41	9.80	3.864	1.59
0.08	9.80	3.864	0.32
0.96	9.80	3.864	3.72
1.46			5.64

===COMMAND===> 260 HOL Read from c:slstswr3.rat

===COMMAND===> 270 NEW Read from c:slstswr3.rat

===COMMAND===> 290 STO Read from c:slstswr3.rat

===COMMAND===> 300 PIP Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.64	5.00	4.455	2.84
0.64			2.84

===COMMAND===> 340 STO Read from c:slstswr3.rat

===COMMAND===> 400 PIP Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.75	19.72	2.645	1.97
0.64	5.28	4.421	2.81
1.38			4.78

Adjusted Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.20	5.28	4.421	0.88
0.64	5.28	4.421	2.81
0.84			3.70

===COMMAND===> 410 HOL Read from c:slstswr3.rat

===COMMAND===> 420 NEW Read from c:slstswr3.rat

===COMMAND===> 430 STO Read from c:slstswr3.rat

===COMMAND===> 440 CHA Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.25	16.52	3.038	0.76
0.25			0.76

===COMMAND===> 450 HOL Read from c:slstswr3.rat

===COMMAND===> 460 NEW Read from c:slstswr3.rat

===COMMAND===> 476 FLO Read from c:slstswr3.rat

===COMMAND===> 480 PIP Read from c:slstswr3.rat

===COMMAND===> 500 STO Read from c:slstswr3.rat

===COMMAND===> 520 PIP Read from c:slstswr3.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
1.43	3.63	4.624	6.60
1.43			6.60

05-02-1990

Standley Lake Library Storm Sewer Design (Rational Method) - 3.5 year storm

Page 1

*** STSWR3

Pipe Design

Link	Length	Diam	Invert Up/Dn	Slope	Depth Up/Dn	Min Velocity Cover	C.F.S. Act/Ful	Estimated Cost
1	161	18	5,527.02	0.00366	2.0	0.4	0.2	0
			5,526.43		3.3		3.6	
2	180	18	5,526.18	0.00634	3.6	1.9	3.5	0
			5,525.04		4.0		4.7	
3	258	18	5,524.74	0.00676	5.8	4.1	4.2	0
			5,523.00		7.5		4.9	
Lateral Length=					598	Upstream Length=		598

*** STSWR1

Pipe Design

Link	Length	Diam	Invert Up/Dn	Slope	Depth Up/Dn	Min Velocity Cover	C.F.S. Act/Ful	Estimated Cost
4	192	18	5,526.00	0.00521	3.0	0.4	4.2	0
			5,525.00		2.0		4.3	
Lateral Length=					192	Upstream Length=		192

*** CB3

Pipe Design

Link	Length	Diam	Invert Up/Dn	Slope	Depth Up/Dn	Min Velocity Cover	C.F.S. Act/Ful	Estimated Cost
5	77	18	5,526.50	0.02584	4.0	0.9	1.7	0
			5,524.50		2.5		9.6	
Lateral Length=					77	Upstream Length=		77

*** CB1

Pipe Design

Link	Length	Diam	Invert Up/Dn	Slope	Depth Up/Dn	Min Velocity Cover	C.F.S. Act/Ful	Estimated Cost
6	236	18	5,524.66	0.00705	2.3	-0.1	5.3	0
			5,523.00		1.5		5.0	
Lateral Length=					236	Upstream Length=		505

05-02-1990

Standley Lake Library Storm Sewer Design (Rational Method) - 3.5 year storm

Page 2

*** BLDG ROOF DRAIN

Pipe Design

Link	Length	Diam	Invert Up/Dn	Slope	Depth Up/Dn	Min Velocity Cover	C.F.S. Act/Ful	Estimated Act/Ful	Cost
7	130	10	5,528.00	0.03077	4.0	1.1	7.8	2.8	0
			5,524.00		2.0		7.1	3.9	

*** BLDG ROOF DRAIN

Analysis of Existing Pipes

Link	Length	Dia	Invert Up/Dn	Slope Ft/Ft	Depth Up/Dn	Cover Up/Dn	--Vel-- Act/Ful	--CFS-- Act/Ful	% Load	Solutions Remov Dia
8	151	18	5,523.50	0.00331	2.50	0.9	3.6	3.7	61	
			5,523.00		3.00	1.4	3.4	6.1		

Lateral Length= 281 Upstream Length= 281

*** DIRECT FLOW INTO SOUTH POND

Ditch

Link	Length	Left	Center	Right	--Ditch Shape-- Slope	--Invert Surface Up/Dn	Width Up/Dn	Depth	--Flow-- In CFS	Vel
9	270	3.0	1.0	3.0	0.0204	5,528.00	5,528.25	2.5	0.8	1.9
						5,522.50	5,522.75	0.3		

Lateral Length= 270 Upstream Length= 270

*** STSWR5 (OUTFLOW FROM SOUTH POND)

Pipe Design

Link	Length	Diam	Invert Up/Dn	Slope	Depth Up/Dn	Min Velocity Cover	C.F.S. Act/Ful	Estimated Act/Ful	Cost
10	70	15	5,522.50	0.02143	1.5	0.1	8.9	9.1	0
			5,521.00		3.0		7.7	9.5	
11	171	18	5,520.70	0.02269	2.3	0.7	10.4	15.7	0
			5,516.82		3.2		9.0	15.9	

Lateral Length= 241 Upstream Length= 241

```

LINE   --- H Y D R A   Commands --- sltswr1.rat
10: JOB Standley Lake Library Storm Sewer Design (Rational Method) - 100 year storm
20: REM Pipe Data
30: PDA .013 3 2 1.5 2 .00001
40: REM Storm Data - 100 yr
50: RAI 10/6.84 20/4.53 30/3.64 40/3.00 50/2.56 60/2.25 70/2.01+
51:      80/1.82 90/1.67 100/1.54 110/1.43 120/1.35 130/1.26 140/1.20+
52:      150/1.14 160/1.08 170/1.03 180/0.99 190/0.99
60: NEW STSWR3
70: REM CB6,CB5,CB4
75: REM CB6
80: STO 0.41 .025 5542 5529 120 0.0
    TIME= 9.58729 MINUTES
90: PIP 161.13 5529 5529.75 5527.02 5526.43 18
95: REM CB5
100: STO 0.82 0.45 5539 5533 135 5532.5 5529.75 120
    TIME= 8.685223 MINUTES
110: PIP 179.77 5529.75 5529 5526.18 5525.04 18
120: REM CB4
130: STO 0.49 0.66 5532.5 5531.5 50 5531.5 5530.5 111
    TIME= 5.055069 MINUTES
140: PIP 257.55 5530.5 5530.5 5524.74 5523.00 18
145: HOL 1
146: NEW STSWR1
150: REM CB2,CB1,CB3
155: REM CB2
156: STO 1.89 0.51 5539 5533 140 5532.5 5529 280
    TIME= 9.044085 MINUTES
157: PIP 192.03 5529 5527 5526.00 5525.0 18
160: HOL 2
165: NEW CB3
175: REM CB3
180: STO 0.11 0.76 5532.5 5532 30 5531.5 5530.5 100
    TIME= 3.348553 MINUTES
190: PIP 77.41 5530.5 5527 5526.5 5524.5 18
200: HOL 3
210: NEW CB1
220: REC 3
230: REC 2
235: REM CB1
240: STO 0.58 0.71 5532 5530 50 5529.5 5527 165
    TIME= 3.826659 MINUTES
250: PIP 235.64 5527 5524.5 5524.66 5523.00
260: HOL 4
270: NEW BLDG ROOF DRAIN
280: REM ROOF DRAIN FROM BLDG
290: STO 0.67 0.95 5.00
300: PIP 130.00 5532 5526 5528 5524
330: REM STSWR4 W/DIRECT FLOW INTO NORTH POND
340: STO 2.98 0.25 5540 5524 400 5528 5524 140
    TIME= 19.71708 MINUTES
400: PIP 151.15 5526 5526 5523.5 5523 -18
410: HOL 6
420: NEW DIRECT FLOW INTO SOUTH POND
425: REM DIRECT FLOW INTO SOUTH POND
430: STO 1.00 0.25 5532.5 5528 200 0.0
    TIME= 16.51694 MINUTES

```

```

LINE   --- H Y D R A   Commands --- slstswr1.rat
440: CHA 270 5528 5522.5 0.035 3 1 3
450: HOL 7
460: NEW STSWR5 (OUTFLOW FROM SOUTH POND)
465: REM MAX 9.10 CFS
476: FLO 9.10
480: PIP 69.98 5524 5524 5522.5 5521.0
490: REM FLOW FROM KIPLING @ KIPINLET
500: STO 1.74 0.82 5532.5 5529 75 5528.5 5523 275
      TIME= 3.626039 MINUTES
510: REM KIPINLET TO OUTLET EAST
520: PIP 170.99 5523 5520 5520.7 5516.82
530: END

```

***** END OF COMMAND FILE *****

***** S U M M A R Y *****

Total Rational storm acres = 10.7

Feet of pipe = 1,625.7
Feet of ditch = 270.0

HOLd register number 1 saved at line 145 not RECalled
HOLd register number 4 saved at line 260 not RECalled
HOLd register number 6 saved at line 410 not RECalled
HOLd register number 7 saved at line 450 not RECalled

***** H Y D R A - Computations *****

```

===COMMAND===> 30 PDA Read from slstswr1.rat
===COMMAND===> 52 RAI Read from slstswr1.rat
===COMMAND===> 60 NEW Read from slstswr1.rat
===COMMAND===> 80 STO Read from slstswr1.rat
===COMMAND===> 90 PIP Read from slstswr1.rat

```

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.01	9.59	6.935	0.07
0.01			0.07

```

===COMMAND===> 100 STO Read from slstswr1.rat
===COMMAND===> 110 PIP Read from slstswr1.rat

```

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.37	8.69	7.144	2.64
0.01	17.40	5.130	0.05
0.38			2.69

Adjusted Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.37	8.69	7.144	2.64
0.01	8.69	7.144	0.04
0.37			2.67

===COMMAND===> 130 STO Read from sltswr1.rat
===COMMAND===> 140 PIP Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.32	5.06	7.982	2.58
0.37	9.41	6.976	2.61
0.70			5.19

Adjusted Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.32	9.41	6.976	2.26
0.37	9.41	6.976	2.61
0.70			4.87

===COMMAND===> 145 HOL Read from sltswr1.rat
===COMMAND===> 146 NEW Read from sltswr1.rat
===COMMAND===> 156 STO Read from sltswr1.rat
===COMMAND===> 157 PIP Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.96	9.04	7.061	6.81
0.96			6.81

===COMMAND===> 160 HOL Read from sltswr1.rat
===COMMAND===> 165 NEW Read from sltswr1.rat
===COMMAND===> 180 STO Read from sltswr1.rat
===COMMAND===> 190 PIP Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.08	3.35	8.376	0.70
0.08			0.70

===COMMAND===> 200 HOL Read from sltswr1.rat
===COMMAND===> 210 NEW Read from sltswr1.rat
===COMMAND===> 220 REC Read from sltswr1.rat
===COMMAND===> 230 REC Read from sltswr1.rat
===COMMAND===> 240 STO Read from sltswr1.rat
===COMMAND===> 250 PIP Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.41	3.83	8.266	3.40
0.08	3.80	8.272	0.69
0.96	9.70	6.910	6.66
1.46			10.76

Adjusted Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.41	9.70	6.910	2.85
0.08	9.70	6.910	0.58
0.96	9.70	6.910	6.66
1.46			10.08

===COMMAND===> 260 HOL Read from sltswr1.rat
===COMMAND===> 270 NEW Read from sltswr1.rat
===COMMAND===> 290 STO Read from sltswr1.rat
===COMMAND===> 300 PIP Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.64	5.00	7.995	5.09
0.64			5.09

===COMMAND===> 340 STO Read from sltswr1.rat

===COMMAND===> 400 PIP Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.75	19.72	4.595	3.42
0.64	5.24	7.939	5.05
1.38			8.48

Adjusted Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.20	5.24	7.939	1.57
0.64	5.24	7.939	5.05
0.83			6.63

===COMMAND===> 410 HOL Read from sltswr1.rat

===COMMAND===> 420 NEW Read from sltswr1.rat

===COMMAND===> 430 STO Read from sltswr1.rat

===COMMAND===> 440 CHA Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
0.25	16.52	5.335	1.33
0.25			1.33

===COMMAND===> 450 HOL Read from sltswr1.rat

===COMMAND===> 460 NEW Read from sltswr1.rat

===COMMAND===> 476 FLO Read from sltswr1.rat

===COMMAND===> 480 PIP Read from sltswr1.rat

===COMMAND===> 500 STO Read from sltswr1.rat

===COMMAND===> 520 PIP Read from sltswr1.rat

Initial Rational Configuration:

Sum C*A	Time	Intensity	Flow CFS
1.43	3.63	8.312	11.86
1.43			11.86

OUTFLOW FROM DETENTION POND

3.5 YR STORM

TIME (MIN)	VOLUME IN	TIME (SEC)	Qout	VOLUME OUT
0		0	0	0
10	0	600	0	0
30	8,525	1800	5.93	10,680
50	13,586	3000	6.62	19,854
70	15,873	4200	6.80	28,565
90	17,405	5400	6.92	37,389
110	18,581	6600	7.02	46,320
130	19,536	7800	7.09	55,338
150	20,202	9000	7.15	64,332
170	20,979	10200	7.21	73,544
180	21,889	10800	7.28	78,658

INFLOW TO DETENTION POND

100 YR STORM

TIME (MIN)	CfCA	i	TIME (SEC)	VOLUME
0	4.63	6.84	0	0
10	4.63	6.84	600	18,981
30	4.63	3.64	1800	30,303
50	4.63	2.56	3000	35,520
70	4.63	2.01	4200	39,044
90	4.63	1.67	5400	41,708
110	4.63	1.43	6600	43,651
130	4.63	1.26	7800	45,455
150	4.63	1.14	9000	47,452
170	4.63	1.03	10200	48,590
180	4.63	0.99	10800	49,451

OUTFLOW FROM DETENTION POND

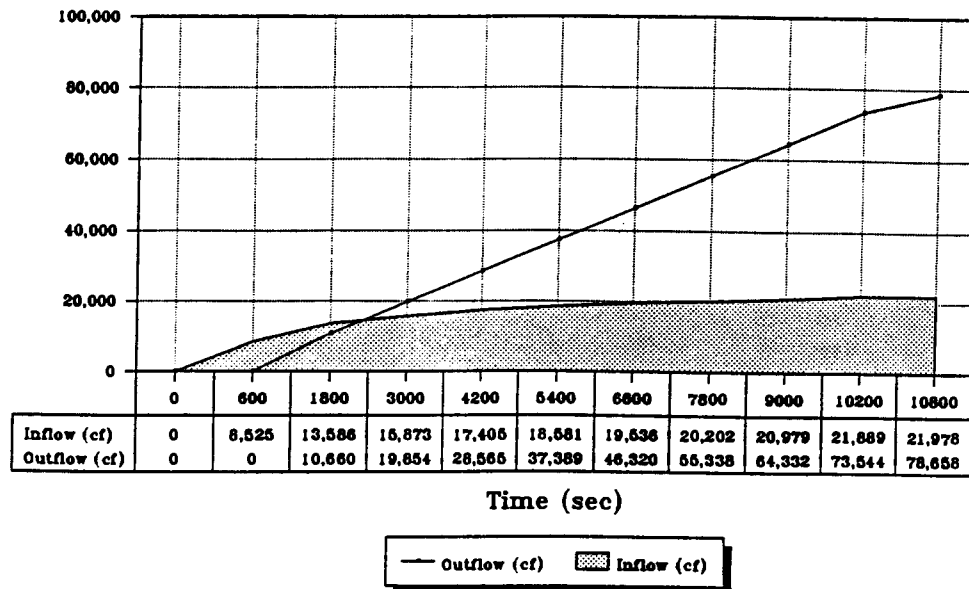
100 YR STORM

TIME (MIN)	VOLUME IN	TIME (SEC)	Qout	VOLUME OUT
0	0	0	0.00	0
10	0	600	0.00	0
30	18,981	1800	7.05	12,690
50	30,303	3000	7.90	23,696
70	35,520	4200	8.14	34,181
90	39,044	5400	8.30	44,821
110	41,708	6600	8.42	55,589
130	43,651	7800	8.51	66,392
150	45,455	9000	8.59	77,352
170	47,452	10200	8.69	88,602
180	48,590	10800	8.74	94,378

Standley Lake Library PUD

3.5 yr Storm Event

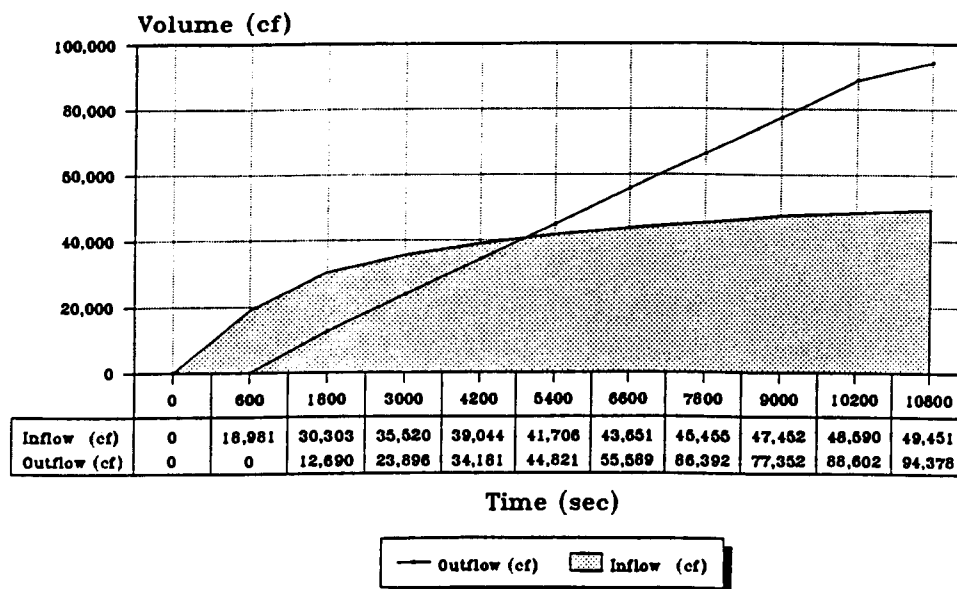
Inflow vs. Outflow (Detention Sizing)



Standley Lake Library PUD

100 yr Storm Event

Inflow vs. Outflow (Detention Sizing)



CONSTRUCTION DOCUMENTS

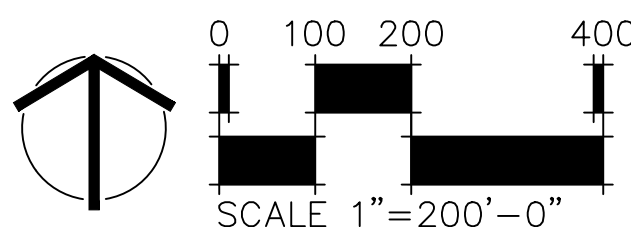
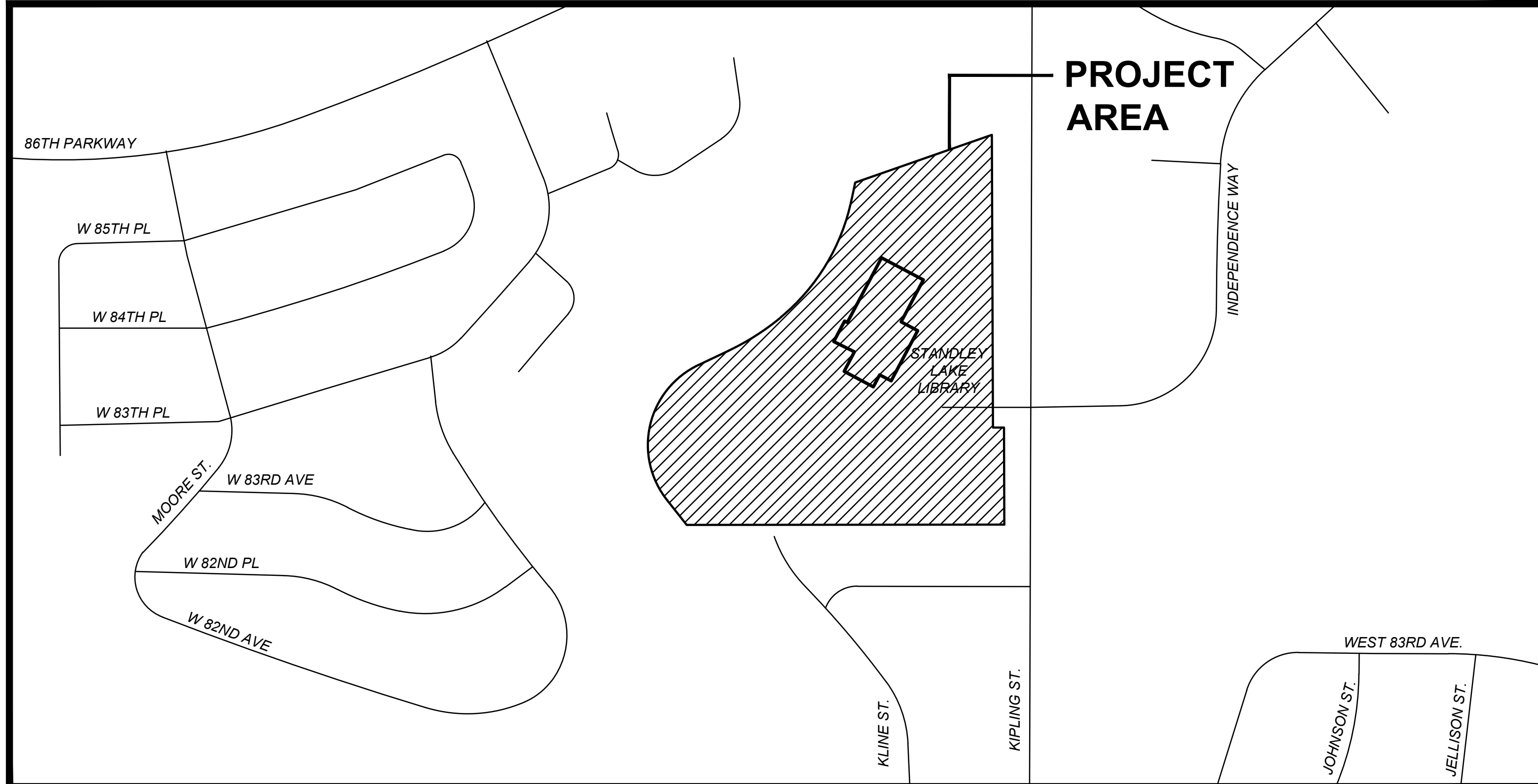
STANDLEY LAKE LIBRARY TRAILHEAD

EXHIBIT
I
PLANS

8485 KIPLING STREET, ARVADA, CO, 80005

A PARCEL OF LAND LOCATED IN THE NE 1/4 OF SECTION 28, T02S, R69W OF THE 6TH PRINCIPAL MERIDIAN
CITY OF ARVADA, COUNTY OF JEFFERSON, STATE OF COLORADO

VICINITY MAP



OWNER

CITY OF ARVADA PARKS AND OPEN SPACE
CITY OF ARVADA, COLORADO
8101 RALSTON ROAD
ARVADA, COLORADO 80002
PHONE: 720-898-7000
CONTACT: DARIN DELAY

PROJECT TEAM

LANDSCAPE ARCHITECT

DHM DESIGN CORPORATION
900 S BROADWAY, SUITE 300
DENVER, CO 80209
PHONE: 303-892-5566
CONTACT: MATTHEW WHIPPLE

CIVIL ENGINEER & SURVEYOR

KLJ ENGINEERING
400 IVERNESS PARKWAY, SUITE 425
ENGLEWOOD, CO 80112-5830
PHONE: 303-643-3877
CONTACT: RYAN SUNDBERG

ELECTRICAL ENGINEER

AE DESIGN
1900 WAZEE STREET, SUITE 205
DENVER, CO 80202
PHONE: 303-296-3537
CONTACT: MIO STANLEY

IRRIGATION DESIGNER

HYDROSYSTEMS | KDI
13949 WEST COLFAX AVENUE, SUITE 260
LAKEWOOD, CO 80401
PHONE: 303-980-5327
CONTACT: ED PRICE

CERTIFICATION STATEMENT

"THESE LANDSCAPE ARCHITECTURE PLANS FOR THE STANDLEY LAKE LIBRARY TRAILHEAD PROJECT WERE PREPARED BY ME (OR UNDER MY DIRECT SUPERVISION) IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS'."

Matthew Whipple

NAME: MATTHEW WHIPPLE
FIRM: DHM DESIGN CORPORATION

"THESE CIVIL ENGINEERING AND SURVEY PLANS FOR THE STANDLEY LAKE LIBRARY TRAILHEAD PROJECT WERE PREPARED BY ME (OR UNDER MY DIRECT SUPERVISION) IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS'."

Ryan Sundberg

NAME: RYAN SUNDBERG (P.E. #0052574)
FIRM: KLJ ENGINEERING

"THESE ELECTRICAL ENGINEERING PLANS FOR THE STANDLEY LAKE LIBRARY TRAILHEAD PROJECT WERE PREPARED BY ME (OR UNDER MY DIRECT SUPERVISION) IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS'."

Mio Stanley

NAME: MIO STANLEY
FIRM: AE DESIGN

"THESE IRRIGATION DESIGN PLANS FOR THE STANDLEY LAKE LIBRARY TRAILHEAD PROJECT WERE PREPARED BY ME (OR UNDER MY DIRECT SUPERVISION) IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS'."

Ed Price

NAME: ED PRICE
FIRM: HYDROSYSTEMS KDI

SURVEY INFO

LEGAL DESCRIPTION

A PARCEL OF LAND BEING A PORTION OF A TRACT OF LAND LOCATED IN THE NORTHEAST ONE-QUARTER OF THE NORTHEAST ONE-QUARTER OF SECTION 28, TOWNSHIP 2 SOUTH, RANGE 69 WEST OF THE SIXTH PRINCIPAL MERIDIAN, CITY OF ARVADA, COUNTY OF JEFFERSON, STATE OF COLORADO.

SURVEY NOTES

DISTANCES SHOWN ARE GRID DISTANCES. COMBINED SCALE FACTOR = 0.997560034941175 TO GO FROM GRID DISTANCE TO GROUND DISTANCE.

ALL TIES TO TREES ARE TO CENTER OF TRUNK, LIGHT POSTS ARE TO CENTER OF POST, ETC.

LEGAL DESCRIPTION AS PROVIDED BY COUNTY ASSESSOR:
GOVERNMENT TRACT # 110 NE 1/4 SECTION 28 T02S R 69 W

BENCHMARK

CONVERSION IS THE AVERAGE OF CITY OF ARVADA BENCHMARKS 220 AND 478 FROM SHOT DATUM TO COA DATUM IS $\pm 0.06'$.

PROJECT NARRATIVE

STANDLEY LAKE LIBRARY TRAILHEAD FEATURES IMPROVEMENTS THAT INCLUDE BUT ARE NOT LIMITED TO: A CONCRETE TRAIL WITH CONNECTIONS TO THE ROCKY MOUNTAIN GREENWAY AND THE ADJACENT JEFFERSON COUNTY PUBLIC LIBRARY. THE PROJECT WILL FEATURE ENVIRONMENTAL EDUCATION, WAYFINDING, PEDESTRIAN AND BICYCLE USER ENHANCEMENTS LOCATED IN AN OUTDOOR GATHERING AREA SUITABLE FOR OUTDOOR EVENTS USED BY BOTH THE PUBLIC AND THE LIBRARY.

SHEET INDEX

LANDSCAPE ARCHITECTURE

SHEET NAME	SHEET TITLE
---	COVER SHEET
L0.1	GENERAL NOTES
L1.0	EXISTING SITE CONDITIONS & DEMOLITION PLAN
L2.0	BOUNDARY PLAN
L2.1	OVERALL SITE PLAN
L3.0	OVERALL LAYOUT AND MATERIALS PLAN
L3.1-L3.3	LAYOUT AND MATERIALS ENLARGEMENT PLAN
L4.0	OVERALL GRADING PLAN
L4.1-L4.3	GRADING ENLARGEMENT PLAN
L5.0	OVERALL PLANTING PLAN
L5.1-L5.3	PLANTING ENLARGEMENT PLAN
L5.4	PLANTING DETAILS AND SCHEDULE
L6.0-L6.5	SITE DETAILS

CIVIL ENGINEERING

L0.1	GENERAL NOTES
L6.0-L6.2	SITE DETAILS
C1.0	INITIAL EROSION CONTROL
C1.1	INTERIM EROSION CONTROL
C1.2	FINAL EROSION CONTROL
C1.3	EROSION CONTROL STANDARD DETAILS
C2.0	DRAINAGE IMPROVEMENTS
C2.1	OUTLET STRUCTURE MODIFICATION

ELECTRICAL ENGINEERING

E0.0	ELECTRICAL COVER SHEET
E1.0	ELECTRICAL SITE POWER & LIGHTING PLAN
E2.0	ELECTRICAL ONE-LINE & SCHEDULES

IRRIGATION DESIGN

IR1.0	IRRIGATION NOTES & SCHEDULE
IR2.0-IR2.3	IRRIGATION PLANS
IR3.0-IR3.1	IRRIGATION DETAILS

SITE DATA TABLE

ZONING	OS
PROPERTY CLASS	POLITICAL/SUBD NON-RESIDENTIAL
ACREAGE	11,192 AC. TOTAL PARK SITE 2.47 AC. IMPROVEMENT AREA
ACTIVITIES/USE	RECREATION
BUILDING COVERAGE	20,893 SF (EXISTING REC. CENTER)
OPEN SPACE	86.5% COVERAGE

MATERIALS QUANTITIES TABLE

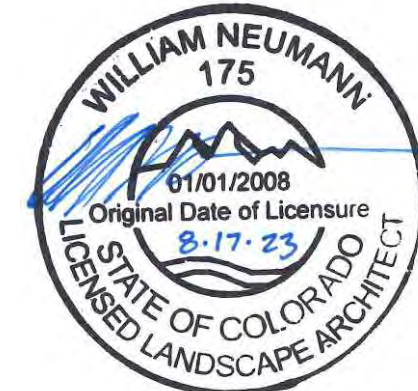
NOT APPLICABLE - NO WORK IS BEING PROPOSED WITHIN THE CITY RIGHT OF WAY

CITY OF ARVADA RESPONSIBILITY STATEMENT

THE CITY OF ARVADA IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN OR DIMENSIONS AND ELEVATIONS ON THE PLANS. THE CITY OF ARVADA'S REVIEW IS FOR GENERAL COMPLIANCE WITH THE CITY OF ARVADA "ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS." THE CITY OF ARVADA, THROUGH ACCEPTANCE OF THE CONSTRUCTION PLAN OR DRAINAGE REPORT, ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THE CONSTRUCTION PLAN OR DRAINAGE REPORT. THE CITY DOES NOT ACCEPT LIABILITY FOR FACILITIES DESIGNED BY OTHERS.

DHM DESIGN

900 S. Broadway, Suite 300
Denver, Co. 80209
303.892.5566
www.dhmdesign.com



APPROVED:

Christa Jones 11/22/23 DA2023-0024
DIRECTOR OF VIBRANT COMMUNITY & NEIGHBORHOODS DATE JOB NUMBER

REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA "ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION. SOLE RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THESE DOCUMENTS SHALL REMAIN WITH THE REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT SEALING THESE PLANS. THE CITY DOES NOT ACCEPT LIABILITY FOR FACILITIES DESIGNED BY OTHERS.

APPROVED:

Amey Wolfschlag PE 11/20/23 DA2023-0024
City Engineer Date Job Number

Review is for general compliance with the City of Arvada "Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements", latest edition. Sole responsibility for completeness and/or accuracy of these documents shall remain with the Registered Professional Engineer sealing these plans, if applicable. The City does not accept liability for facilities designed by others.

DATE: 10-04-2023

CITY OF ARVADA STANDARD NOTES:

- STANDARD NOTES
GENERAL NOTES
- A. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS', LATEST EDITION, UNLESS OTHERWISE SPECIFIED HEREIN.
- B. ALL CONTRACTORS AND SUBCONTRACTORS SHALL BE LICENSED WITH THE CITY OF ARVADA ENGINEERING DIVISION.
- C. ALL WORK WILL REQUIRE A CITY OF ARVADA ENGINEERING DIVISION PUBLIC IMPROVEMENT PERMIT PRIOR TO THE START OF CONSTRUCTION. ALL CONTRACTORS AND SUBCONTRACTORS MUST OBTAIN A SEPARATE PERMIT FOR THE WORK BEING COMPLETED BY THE PARTICULAR CONTRACTOR OR SUBCONTRACTOR. ANY CONSTRUCTION WITHIN THE COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) RIGHT-OF-WAY WILL REQUIRE A CDOT CONSTRUCTION PERMIT PRIOR TO ANY WORK IN THEIR RIGHT-OF-WAY.
- D. ALL CONTRACTORS AND SUBCONTRACTORS SHALL HAVE A SET OF APPROVED DRAWINGS SIGNED BY THE CITY ENGINEER OR DESIGNEE AND A PRINTED COPY OF THE CURRENT CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS' ON SITE AT ALL TIMES.
- E. THE CITY OF ARVADA ENGINEERING DIVISION SHALL BE NOTIFIED (PHONE # 720-898- 7640) A MINIMUM OF 24 HOURS PRIOR TO THE START OF ANY CONSTRUCTION.
- F. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR BURIED UTILITIES. THE CONTRACTOR IS RESPONSIBLE TO VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION AND TO PROTECT THEM DURING CONSTRUCTION.
- G. THE CONTRACTOR IS RESPONSIBLE FOR ALL PROJECT SAFETY INCLUDING, BUT NOT LIMITED TO, TRENCH EXCAVATION AND SHORING, TRAFFIC CONTROL AND SECURITY.
- H. BENCHMARK LOCATION, ELEVATION AND DATUM ARE AS NOTED.
- I. AS-BUILT DRAWINGS SHOWING ALL CHANGES FROM THE APPROVED CONSTRUCTION DRAWINGS SHALL BE SUBMITTED TO THE CITY ENGINEER OR DESIGNEE PRIOR TO INITIATION OF THE REQUIRED TWO YEAR WARRANTY PERIOD. UTILITY AS-BUILTS SHALL INCLUDE STATIONING OF ALL FITTINGS, SERVICES AND PERTINENT ELEVATIONS. CERTIFICATES OF OCCUPANCY FOR ANY BUILDINGS OR STRUCTURES WITHIN THE DEVELOPMENT WILL NOT BE ISSUED UNTIL THE AS-BUILTS HAVE BEEN RECEIVED, REVIEWED AND APPROVED BY THE CITY OF ARVADA ENGINEERING DIVISION.
- J. A CITY OF ARVADA TAX CERTIFICATION FORM MUST BE COMPLETED BY ALL CONTRACTORS AND SUBCONTRACTORS PERFORMING WORK ON THIS PROJECT. THIS FORM DETAILS ALL MATERIALS WHICH HAVE BEEN INCLUDED IN THE WORK BY CONTRACTORS AND SUBCONTRACTORS. COPIES OF ALL PAID INVOICES FOR MATERIALS SHALL BE ATTACHED TO THE FORM. CERTIFICATES OF OCCUPANCY FOR ANY BUILDINGS OR STRUCTURES WITHIN THE DEVELOPMENT WILL NOT BE ISSUED UNTIL THIS FORM HAS BEEN RECEIVED, REVIEWED AND APPROVED BY THE CITY OF ARVADA ENGINEERING DIVISION.
- K. OWNER/DEVELOPER SHALL OBTAIN A STORMWATER CONSTRUCTION PERMIT FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY CONTROL DIVISION, PRIOR TO CLEARING, GRADING, OR EXCAVATING A SITE OF ONE (1) ACRE OR MORE OR LESS THAN ONE ACRE AND PART OF A LARGER DEVELOPMENT. A COPY OF THE APPROVED PERMIT MUST BE SUBMITTED TO THE CITY OF ARVADA ENGINEERING DIVISION PRIOR TO THE START OF CLEARING, GRADING OR EXCAVATING OF THE SITE. A COPY OF THE APPROVED PERMIT MUST ALSO BE AVAILABLE ON THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
- L. CONTRACTOR SHALL OBTAIN A COLORADO STATE CONSTRUCTION DEWATERING DISCHARGE PERMIT FROM THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT FOR ALL AREAS WHERE DEWATERING IS REQUIRED FROM AN EXCAVATION AND WATER IS DISCHARGED INTO A STORM SEWER, CHANNEL, IRRIGATION DITCH OR ANY WATERS OF THE UNITED STATES. A COPY OF THE APPROVED PERMIT MUST BE SUBMITTED TO THE CITY OF ARVADA ENGINEERING DIVISION PRIOR TO THE START OF ANY DEWATERING. A COPY OF THE APPROVED PERMIT MUST ALSO BE AVAILABLE ON THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION.
- M. ALL CURB RAMPS SHALL COMPLY WITH THE LATEST ADA STANDARD. CONTRACTOR TO CHECK WITH THE CITY OF ARVADA ENGINEERING DIVISION TO VERIFY THE LATEST CURB RAMP STANDARD PRIOR TO CONSTRUCTION OF ANY RAMP.
- N. ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION BY THE CITY OF ARVADA ENGINEERING DIVISION. THE CITY RESERVES THE RIGHT TO ACCEPT OR REJECT ANY SUCH MATERIALS AND WORKMANSHIP THAT DOES NOT CONFORM TO ITS 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS' FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS'.
- O. A PLAN FOR TRAFFIC CONTROL DURING CONSTRUCTION SHALL BE SUBMITTED TO THE CITY OF ARVADA ENGINEERING DIVISION FOR ACCEPTANCE WITH THE PUBLIC IMPROVEMENTS PERMIT APPLICATION. A PUBLIC IMPROVEMENTS CONSTRUCTION PERMIT WILL NOT BE ISSUED WITHOUT AN APPROVED TRAFFIC CONTROL PLAN FOR TRAFFIC CONTROL ON EXISTING ROADS DURING CONSTRUCTION.

SUPPLEMENTAL NOTES:

SITE DEMOLITION NOTES:

1. CONTRACTOR TO REVIEW AND FOLLOW ALL CITY OF ARVADA STANDARDS & SPECIFICATIONS AS WELL AS REVIEW PROJECT SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS. CITY STANDARDS & SPECIFICATIONS SHALL TAKE PRECEDENCE OVER PROJECT STANDARDS & SPECIFICATIONS. IN INSTANCES OF CONFLICTING INFORMATION, CONTRACTOR SHALL COORDINATE WITH OWNER AND LANDSCAPE ARCHITECT.
2. THE LOCATION OF EXISTING UTILITIES AS SHOWN ON THE PLAN MAY VARY FROM THE ACTUAL CONDITIONS; ADDITIONAL UTILITIES, NOT SHOWN ON PLANS, MAY ALSO EXIST. CONTRACTOR TO FIELD VERIFY ALL UTILITIES, PRIOR TO CONSTRUCTION AND BRING ANY DISCREPANCIES TO THE ATTENTION OF THE OWNER AND LANDSCAPE ARCHITECT IMMEDIATELY FOR FURTHER DIRECTION.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ANY DAMAGE TO EXISTING UTILITIES, WALKWAYS, PAVING, LANDSCAPE IMPROVEMENTS, IRRIGATION, OTHER EXISTING STRUCTURES AND IMPROVEMENTS & CONDITIONS THAT ARE TO REMAIN, AS A RESULT OF THE CONTRACTOR'S WORK. THE REPAIR OF SUCH DAMAGE WILL BE AT NO ADDITIONAL COST TO THE OWNER.
4. IT IS THE CONTRACTORS RESPONSIBILITY TO DOCUMENT AND PHOTOGRAPH ALL EXISTING DAMAGES AND BRING TO THE ATTENTION OF THE OWNER AND LANDSCAPE ARCHITECT PRIOR TO BEGINNING WORK. ANY DAMAGES NOT DOCUMENTED, PHOTOGRAPHED AND BROUGHT TO THE ATTENTION OF THE OWNER AND LANDSCAPE ARCHITECT PRIOR TO BEGINNING ANY WORK, SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE OWNER.
5. THE EXISTING CONDITIONS AND DEMOLITION PLAN INDICATES THE APPROXIMATE LOCATIONS OF WORK ITEMS WHICH WILL BE REQUIRED AS PART OF THIS CONTRACT. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO FULLY FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS, PROPERTY LINES AND EASEMENTS PRIOR TO START OF THE PROJECT. ANY DISCREPANCIES BETWEEN EXISTING SITE CONDITIONS AND THIS PLAN MUST BE BROUGHT TO THE ATTENTION OF THE OWNER AND LANDSCAPE ARCHITECT PRIOR TO BIDDING FOR CONSIDERATION OF SCOPE MODIFICATION.
6. ALL ITEMS, MATERIALS AND EQUIPMENT TO BE DEMOLISHED AND REMOVED MUST BE DISPOSED OF OFFSITE BY THE CONTRACTOR UNLESS OTHERWISE NOTED AS PART OF THE BID AND AT NO ADDITIONAL EXPENSE TO THE OWNER.
7. ALL TREES TO REMAIN MUST HAVE TREE PROTECTION. TREE PROTECTION TO EXTEND TO DRIPLINE OF TREE CANOPIES WHERE POSSIBLE. CONTRACTOR TO NOTIFY THE LANDSCAPE ARCHITECT AND OWNER TO DISCUSS CONDITIONS WHERE THIS IS NOT POSSIBLE AND RECEIVE PERMISSION TO REDUCE AREA OF TREE PROTECTION.
8. CONTRACTOR IS RESPONSIBLE FOR REPLACING ALL DISTURBED EXISTING SURVEY MONUMENT MARKERS AND RECORDING NEW LOCATION INFORMATION WITH ALL APPROPRIATE AGENCIES.

SITE LAYOUT NOTES:

1. CONTRACTOR TO REVIEW AND FOLLOW ALL CITY OF ARVADA STANDARDS & SPECIFICATIONS AS WELL AS REVIEW PROJECT SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS FOR SITE LAYOUT. CITY STANDARDS & SPECIFICATIONS SHALL TAKE PRECEDENCE OVER PROJECT STANDARDS & SPECIFICATIONS. IN INSTANCES OF CONFLICTING INFORMATION, CONTRACTOR SHALL COORDINATE WITH OWNER AND LANDSCAPE ARCHITECT.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL STAKING BOTH LINE AND GRADE. ANY DISCREPANCIES, ERRORS OR OMISSIONS ON THE ON THE SURVEY AND/OR CONSTRUCTION DRAWINGS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER AND LANDSCAPE ARCHITECT IMMEDIATELY PRIOR TO MOVING FORWARD WITH ANY WORK. FAILURE TO IMMEDIATELY NOTIFY THE OWNER AND LANDSCAPE ARCHITECT FOR DIRECTION ON HOW TO PROCEED WILL RESULT IN THE CONTRACTOR TAKING FULL RESPONSIBILITY FOR ADJUSTMENTS TO THE DESIGN, AT NO ADDITIONAL COST TO THE OWNER OR DESIGN TEAM.
3. THE CONTRACTOR SHALL STAKE ALL KEY AREAS TO BE REVIEWED BY THE OWNER AND LANDSCAPE ARCHITECT PRIOR TO PROCEEDING WITH CONSTRUCTION.
4. REFER TO SITE SURVEY FOR ADDITIONAL INFORMATION. CONTRACTOR TO REVIEW ALL PROJECT AND SURVEY INFORMATION AND FIELD VERIFY EXISTING CONDITIONS PRIOR TO BIDDING ON PROJECT AND PERFORMING ANY CONSTRUCTION OPERATIONS.
5. PROVIDE PROTECTIVE BARRIERS, FENCING, ETC., AS REQUIRED BY THE CITY OF ARVADA STANDARDS, PLANS AND SPECIFICATIONS, AS PART OF ORIGINAL BID.
6. BEFORE CONSTRUCTION, CONTRACTOR SHALL LOCATE ALL PUBLIC AND PRIVATE UNDERGROUND UTILITIES WITH RESPECTIVE UTILITY COMPANIES AND BECOME FAMILIAR WITH ALL EXISTING UTILITY CONDITIONS. CONTRACTOR TO REVIEW AND COMPARE SURVEY INFORMATION AND UTILITY LOCATES FOR DISCREPANCIES, ERRORS AND OMISSIONS AND BRING TO THE ATTENTION OF THE OWNER AND THE LANDSCAPE ARCHITECT IMMEDIATELY.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL MATERIALS TESTING AND TESTING FREQUENCY, AS REQUIRED BY THE CITY OF ARVADA. ALL RESULTS SHALL BE IMMEDIATELY SUBMITTED TO THE OWNER AND LANDSCAPE ARCHITECT REVIEW.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY PERMITS OR LICENSES REQUIRED FOR THE PERFORMANCE OF THE WORK AS APPLICABLE TO THIS PROJECT.
9. ADDITIONAL CAD LAYOUT INFORMATION WILL BE PROVIDED TO THE SELECTED CONTRACTOR PRIOR TO CONSTRUCTION FOR LAYOUT PURPOSES.
10. DUE TO SCALE OF DRAWINGS, NOT ALL CONDITIONS/ITEMS CARRY A DETAIL CALLOUT OR NOTATION ON THE PLAN. THIS DOES NOT EXCLUDE THIS CONDITION/ITEM FROM THE PROJECT. QUESTIONS OR CONCERNS REGARDING WHAT IS INCLUDED WITHIN THIS PROJECT SHOULD BE BROUGHT TO THE ATTENTION OF THE OWNER AND LANDSCAPE ARCHITECT PRIOR TO BIDDING OTHERWISE ALL ELEMENTS, FEATURES, UTILITIES, ETC. AS SHOWN ON THE PLAN SHALL BE INCLUDED WITHIN THE ORIGINAL BID.
11. CONTRACTOR TO REFER TO GEOTECHNICAL AND CIVIL PLANS AND REPORTS FOR ADDITIONAL INFORMATION.
12. CONTRACTOR TO RELOCATE ANY EXISTING SITE UTILITIES THAT MAY CAUSE CONFLICT WITH WALLS, FOOTINGS, SITE ELEMENTS AND GRADING AT NO ADDITIONAL COST TO THE PROJECT. CONTRACTOR TO COORDINATE WITH OWNER AND LANDSCAPE ARCHITECT WITH CONCERNS OF EXISTING UTILITIES.

STREET

- A. CONTRACTOR SHALL HAVE ON SITE A COPY OF THE CITY OF ARVADA APPROVED SUBGRADE SOILS AND PAVEMENT DESIGN REPORT SHOWING MINIMUM REQUIRED SUBGRADE PREPARATION REQUIREMENTS AND MINIMUM REQUIRED PAVEMENT THICKNESSES.
- B. ALL TRENCH BACKFILL AND SUBGRADE PREPARATION SHALL BE TESTED TO ENSURE COMPLIANCE WITH CITY OF ARVADA STANDARDS AND SHALL BE TESTED AT CITY REQUIRED FREQUENCIES BY A CITY APPROVED PRIVATE SOILS TESTING FIRM. TEST RESULTS SHALL BE SUBMITTED TO, REVIEWED, AND APPROVED BY, THE CITY OF ARVADA ENGINEERING DIVISION PRIOR TO INSTALLING BASE COURSE, ASPHALT OR CONCRETE ON PREPARED SUBGRADE. ALL BASE COURSE DENSITY SHALL ALSO BE TESTED BY THE PRIVATE SOILS FIRM AT CITY REQUIRED FREQUENCIES TO ENSURE COMPLIANCE WITH CITY OF ARVADA REQUIREMENTS. BASE COURSE TEST RESULTS SHALL ALSO BE APPROVED BY THE CITY OF ARVADA ENGINEERING DIVISION PRIOR TO INSTALLING PAVEMENT. ALL CONCRETE AND ASPHALT PLACED SHALL BE TESTED IN ACCORDANCE WITH CITY OF ARVADA MINIMUM MATERIALS TESTING STANDARDS. TEST RESULTS SHALL BE REVIEWED AND APPROVED BY THE CITY OF ARVADA ENGINEERING DIVISION PRIOR TO INITIATION OF THE REQUIRED TWO YEAR WARRANTY PERIOD.
- C. THE SUBGRADE MATERIAL SHALL BE REMOVED TO A DEPTH REQUIRED BY THE CITY OF ARVADA ACCORDING TO INFORMATION OBTAINED FROM LABORATORY TESTS AND/OR AS REQUIRED IN THE PAVEMENT DESIGN REPORT. ADDITIVES OR APPROVED MATERIAL MAY BE REQUIRED IF THE NATIVE MATERIAL IS UNSATISFACTORY. THE SUBGRADE SHALL BE COMPACTED TO A MINIMUM DENSITY DETERMINED IN ACCORDANCE WITH AASHTO DESIGNATION T180 OR T99 AND IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS SECTION 203.07.
- D. THE CONTRACTOR SHALL PROOF ROLL ALL SUBGRADE AND BASE COURSE IN A MANNER ACCEPTABLE TO THE CITY OF ARVADA IN ACCORDANCE WITH THE CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS.' PROOF ROLLING SHALL BE INSPECTED AND ACCEPTED BY THE CITY PRIOR TO INSTALLATION OF PAVEMENT AND/OR CONCRETE FLATWORK.
- E. ALL CONCRETE CURB, GUTTER, SIDEWALK AND OTHER FLATWORK WITHIN THE CITY RIGHT OF WAY SHALL BE MINIMUM 6" THICKNESS. CROSSPANS SHALL BE MINIMUM 8" THICKNESS AND MINIMUM 8 FOOT WIDTH. ALL CONCRETE SHALL BE MINIMUM 4000 PSI DESIGN STRENGTH REINFORCED WITH 1.5 LBS/CY FIBERMESH IN ACCORDANCE WITH THE CITY OF ARVADA ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS.
- IRRIGATION
- A. CONTRACTOR IS TO NOTIFY AFFECTED IRRIGATION COMPANY A MINIMUM OF 24 HOURS PRIOR TO BEGINNING ANY CONSTRUCTION IN IRRIGATION EASEMENTS OR ON IRRIGATION DITCHES.
- B. ALL IRRIGATION PIPE JOINTS SHALL BE WATERTIGHT AND PASS A LOW AIR PRESSURE TEST.
- UTILITIES
- A. CONTRACTOR SHALL NOTIFY ALL AFFECTED PARTIES, CITY OF ARVADA UTILITY AND ENGINEERING DIVISIONS, A MINIMUM OF 24 HOURS PRIOR TO ANY WATER OR SEWER SERVICE INTERRUPTION.
- B. CONTRACTOR IS TO COORDINATE THE OPERATION OF ALL WATER VALVES, FIRE HYDRANTS, AND OTHER APPURTENANCES WITH THE CITY'S WATER OPERATIONS DIVISION THROUGH THE CITY'S ENGINEERING INSPECTOR.
- C. ALL FIRE HYDRANT BRANCH PIPE SHALL BE CLASS 200 AWWA C900 PVC OR CLASS 150 AWWA C909 PVC. ALL FIRE LINES TO BUILDINGS WITH INTERIOR SPRINKLER SYSTEMS SHALL BE CLASS 200 AWWA C900 PVC PIPE OR CLASS 200 AWWA C909 PVC PIPE ONLY.
- D. ALL METALLIC FITTINGS SHALL BE WRAPPED WITH MINIMUM 8 MIL THICKNESS POLYETHYLENE ENCASEMENT.
- E. ALL PVC WATER MAINS SHALL BE INSTALLED WITH WHITE #12 TYPE UF OR USE CABLE SINGLE COPPER CONDUCTOR AS A TRACER WIRE SPIRALLY WRAPPED AROUND THE PIPE. TRACER WIRE TO EXTEND FROM MAIN TO A CATHODIC PROTECTION BOX LOCATED ON THE RIGHT SIDE OF ALL FIRE HYDRANTS. TRACER WIRE SHALL BE CONNECTED TO EXISTING TRACER WIRE WHERE POSSIBLE. WHERE NO TRACER WIRE EXISTS, ENDS OF TRACER WIRE SHALL BE STRIPPED AND GROUNDING INTO NATIVE SOIL A MINIMUM OF 12" DEEP.
- F. ALL METER PITS SHALL BE 24 INCH DIAMETER CONCRETE OR PLASTIC IN ACCORDANCE WITH SECTION 30 OF THE CITY OF ARVADA 'ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS' FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS.
- G. STORM, SANITARY AND WATER MANHOLE COVERS SHALL SAY "CITY OF ARVADA STORM, WATER OR SANITARY" WHERE APPLICABLE IN ACCORDANCE WITH THE CITY'S STANDARD LD DETAIL.
- H. BLOW-OFFS, BOTH PERMANENT AND TEMPORARY, SHALL BE IN ACCORDANCE WITH CITY OF ARVADA STANDARD DETAIL DRAWINGS.
- I. ALL SANITARY SEWER MAINS INSTALLED SHALL BE HIGH PRESSURE JET CLEANED AFTER COMPLETION OF THE FINAL LIFT OF ASPHALT PLACEMENT AND PRIOR TO REQUIRED TELEVISION INSPECTION BY THE CITY'S WASTEWATER DIVISION.

EROSION CONTROL

- A. THE CITY OF ARVADA STORMWATER INSPECTOR MUST BE MET ON SITE AND PROVIDED WITH A STORMWATER MANAGEMENT PLAN AFTER INSTALLATION OF TEMPORARY BEST MANAGEMENT PRACTICES (BMPs), BUT BEFORE CONSTRUCTION OR GRADING BEGINS.
- B. THERE SHALL BE NO EARTH-DISTURBING ACTIVITY OUTSIDE THE LIMITS DESIGNATED IN THE ACCEPTED PLANS.
- C. ALL REQUIRED PERIMETER SILT AND CONSTRUCTION FENCING SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITY (STOCKPILING, STRIPPING, GRADING, ETC.). ALL OTHER REQUIRED EROSION CONTROL MEASURES SHALL BE INSTALLED AT THE APPROPRIATE TIME IN THE CONSTRUCTION SEQUENCE AS INDICATED IN THE APPROVED PROJECT SCHEDULE, CONSTRUCTION PLANS, AND STORMWATER MANAGEMENT PLAN.
- D. AT ALL TIMES DURING CONSTRUCTION, THE DEVELOPER SHALL BE RESPONSIBLE FOR PREVENTING AND CONTROLLING ON-SITE EROSION INCLUDING KEEPING THE PROPERTY SUFFICIENTLY WATERED SO AS TO MINIMIZE WINDBLOWN SEDIMENT. THE DEVELOPER SHALL ALSO BE RESPONSIBLE FOR INSTALLING AND MAINTAINING ALL EROSION CONTROL FACILITIES SHOWN HEREIN.
- E. PRE-DISTURBANCE VEGETATION SHALL BE PROTECTED AND RETAINED WHEREVER POSSIBLE. REMOVAL OR DISTURBANCE OF EXISTING VEGETATION SHALL BE LIMITED TO THE AREA(S) REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATIONS, AND FOR THE SHORTEST PRACTICAL PERIOD OF TIME.
- F. ALL SOILS EXPOSED DURING LAND DISTURBING ACTIVITY (STRIPPING, GRADING, UTILITY INSTALLATIONS, STOCKPILING, FILLING, ETC.) SHALL BE KEPT IN A ROUGHENED CONDITION BY RIPPIING OR DISKING ALONG LAND CONTOURS UNTIL MULCH, VEGETATION, OR OTHER PERMANENT EROSION CONTROL BMPs ARE INSTALLED. NO DISTURBED AREAS, EXCEPT THOSE WITHIN THE PROJECT STREET RIGHTS-OF-WAY, SHALL REMAIN EXPOSED FOR MORE THAN THIRTY (30) DAYS BEFORE TEMPORARY OR PERMANENT EROSION CONTROL (E.G. SEED/MULCH, LANDSCAPING, ETC.) IS INSTALLED, UNLESS OTHERWISE APPROVED BY THE CITY OF ARVADA STORMWATER INSPECTOR.
- G. IN ORDER TO MINIMIZE EROSION POTENTIAL, ALL TEMPORARY (STRUCTURAL) EROSION CONTROL MEASURES SHALL:
- BE INSPECTED AT A MINIMUM OF ONCE EVERY FOURTEEN (14) DAYS AND AFTER EACH SIGNIFICANT STORM EVENT AND REPAIRED OR RECONSTRUCTED AS NECESSARY IN ORDER TO ENSURE THE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION.
- REMAIN IN PLACE UNTIL SUCH TIME AS ALL THE SURROUNDING DISTURBED AREAS ARE SUFFICIENTLY STABILIZED. THE CITY OF ARVADA STORMWATER INSPECTOR MUST BE NOTIFIED PRIOR TO REMOVAL.
- BE REMOVED WHEN THEY ARE NO LONGER FUNCTIONAL OR AFTER THE SITE HAS BEEN SUFFICIENTLY STABILIZED AS DETERMINED BY THE STORMWATER INSPECTOR. THE CITY OF ARVADA STORMWATER INSPECTOR MUST BE NOTIFIED PRIOR TO REMOVAL.
- H. WHEN TEMPORARY EROSION CONTROL MEASURES ARE REMOVED, THE DEVELOPER SHALL BE RESPONSIBLE FOR THE CLEAN UP AND REMOVAL OF ALL SEDIMENT AND DEBRIS FROM ALL DRAINAGE INFRASTRUCTURE AND OTHER PUBLIC FACILITIES.
- I. THE CONTRACTOR SHALL IMMEDIATELY CLEAN UP ANY CONSTRUCTION MATERIALS INADVERTENTLY DEPOSITED ON EXISTING STREETS, SIDEWALKS, OR OTHER PUBLIC RIGHTS OF WAY, AND MAKE SURE STREETS AND WALKWAYS ARE CLEANED AT THE END OF EACH WORKING DAY.
- J. ALL SOIL STOCKPILES SHALL NOT BE PLACED WITHIN ONE HUNDRED (100) FEET OF DRAINAGEWAY, WHERE POSSIBLE, AND SHALL BE PROTECTED FROM SEDIMENT TRANSPORT BY APPROPRIATE EROSION CONTROL METHODS. ANY SOIL STOCKPILE THAT WILL BE DORMANT FOR OVER THIRTY (30) DAYS SHALL BE SEEDED.
- K. THE STORMWATER VOLUME CAPACITY OF DETENTION PONDS WILL BE RESTORED AND STORM SEWER LINES WILL BE CLEANED UPON COMPLETION OF THE PROJECT AND BEFORE TURNING THE MAINTENANCE OVER TO THE PROPERTY OWNER OR HOMEOWNERS ASSOCIATION (HOA).
- L. CITY ORDINANCE REQUIREMENTS MAKE IT UNLAWFUL TO DISCHARGE OR ALLOW THE DISCHARGE OF ANY POLLUTANT OR CONTAMINATED WATER FROM CONSTRUCTION SITES. POLLUTANTS INCLUDE, BUT ARE NOT LIMITED TO DISCARDED BUILDING MATERIALS, CONCRETE TRUCK WASHOUT, CHEMICALS, OIL AND GAS PRODUCTS, LITTER, AND SANITARY WASTE. THE DEVELOPER SHALL AT ALL TIMES TAKE WHATEVER MEASURES ARE NECESSARY TO ASSURE THE PROPER CONTAINMENT AND DISPOSAL OF POLLUTANTS ON THE SITE IN ACCORDANCE WITH ANY AND ALL APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS.
- M. A DESIGNATED AREA SHALL BE PROVIDED ON SITE FOR CONCRETE TRUCK CHUTE WASHOUT. THE AREA SHALL BE CONSTRUCTED SO AS TO CONTAIN WASHOUT MATERIAL AND LOCATED AT LEAST FIFTY (50) FEET AWAY FROM ANY WATERWAY DURING CONSTRUCTION. UPON COMPLETION OF CONSTRUCTION ACTIVITIES THE CONCRETE WASHOUT MATERIAL WILL BE REMOVED AND PROPERLY DISPOSED OF PRIOR TO THE AREA BEING RESTORED.
- N. MASONRY ACTIVITIES WILL BE CONTAINED WITH APPROPRIATE LOT-SPECIFIC BMPs, SUCH AS STOCKPILE PERIMETER CONTROL AND BERMED WASHOUT PITS. ALL WASTE PRODUCTS FROM MASONRY ACTIVITIES WILL BE REMOVED AND DISPOSED OF PROPERLY.
- O. TO ENSURE THAT SEDIMENT DOES NOT MOVE OFF OF INDIVIDUAL LOTS SEDIMENT/EROSION CONTROL BMPs SHALL BE INSTALLED AND MAINTAINED AT ONE OR MORE OF THE FOLLOWING LOCATIONS UNTIL THE LOTS ARE LANDSCAPED.
- 1.BELOW ALL GUTTER DOWNSPOUTS.
2. OUT TO DRAINAGE SWALES.
3. ALONG LOT PERIMETER.
4. OTHER LOCATIONS, IF NEEDED.
- P. A VEHICLE TRACKING PAD SHALL BE INSTALLED WHEREVER IT IS NECESSARY FOR CONSTRUCTION EQUIPMENT INCLUDING BUT NOT LIMITED TO PERSONAL VEHICLES EXITING EXISTING UNPAVED AREAS ONTO ROADWAYS. NO EARTHEN MATERIALS, I.E., STONE, DIRT, ETC., SHALL BE PLACED IN THE CURB & GUTTER OR ROADWAY AS A RAMP TO ACCESS TEMPORARY STOCKPILES, CONSTRUCTION MATERIALS AND/OR BUILDING SITES.
- Q. CONDITIONS IN THE FIELD MAY WARRANT EROSION CONTROL MEASURES IN ADDITION TO WHAT IS SHOWN ON THESE PLANS. THE DEVELOPER SHALL IMPLEMENT WHATEVER MEASURES ARE DETERMINED NECESSARY, AS DIRECTED BY THE CITY OF ARVADA.

GRADING NOTES:

1. CONTRACTOR TO REVIEW AND FOLLOW ALL CITY OF ARVADA STANDARDS & SPECIFICATIONS AS WELL AS REVIEW PROJECT SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS FOR BOTH SITE ROUGH GRADING AND FINE GRADING. CITY STANDARDS & SPECIFICATIONS SHALL TAKE PRECEDENCE OVER PROJECT STANDARDS & SPECIFICATIONS. IN INSTANCES OF CONFLICTING INFORMATION, CONTRACTOR SHALL COORDINATE WITH OWNER AND LANDSCAPE ARCHITECT.
2. THE CONTRACTOR SHALL REMOVE ALL SEDIMENT, MUD, AND CONSTRUCTION DEBRIS THAT MAY ACCUMULATE IN THE FLOW LINES AND PUBLIC RIGHT-OF-WAYS AS A RESULT OF THIS PROJECT. SAID REMOVAL SHALL BE CONDUCTED IN A TIMELY MANNER.
3. SPOT ELEVATIONS SHALL TAKE PRECEDENCE OVER CONTOURS. CONTRACTOR SHALL PROVIDE A SMOOTH FINISH GRADE THROUGHOUT THE ENTIRE PROJECT FREE OF RUTS, DEPRESSIONS AND IRREGULARITIES. POSITIVE DRAINAGE SHALL BE MAINTAINED AT ALL TIMES. ALL SWALES, DEPRESSIONS, ETC. NOT SHOWN ON THE PLANS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER AND LANDSCAPE ARCHITECT IMMEDIATELY IN WRITING.
4. THE CONTRACTOR SHALL ENSURE THAT ALL LOADS OF CUT AND FILL MATERIAL IMPORTED TO OR EXPORTED FROM THIS SITE SHALL BE PROPERLY COVERED TO PREVENT LOSS OF MATERIAL DURING TRANSPORT ON PUBLIC RIGHT-OF-WAYS.
5. CONTRACTOR SHALL RECEIVE WRITTEN APPROVAL FOR FINAL GRADES FROM OWNER AND LANDSCAPE ARCHITECT PRIOR TO ANY SEEDING AND PLACEMENT OF LANDSCAPE MATERIAL IN BEDS TAKING PLACE ON SITE - 3 DAYS PRIOR NOTICE IS REQUIRED FOR REVIEW BY OWNER AND/OR LANDSCAPE ARCHITECT.
6. ALL SLOPES EXCEEDING 4:1 SHALL REQUIRE EROSION CONTROL SLOPE BLANKET. CONTRACTOR TO SUBMIT INFORMATION AND SMALL PRODUCT SAMPLES FOR REVIEW AND APPROVAL.
7. REFER TO CIVIL PLANS FOR STORMWATER MANAGEMENT / EROSION CONTROL STANDARD NOTES AND DETAILS.

APPROVED:

Jenny Wolfshley PE
City Engineer

11/20/23
Date

DA2023-0024
Job Number

Review is for general compliance with the City of Arvada "Engineering Code of Standards and Specifications for the Design and Construction of Public Improvements", latest edition. Sole responsibility for completeness and/or accuracy of these documents shall remain with the Registered Professional Engineer sealing these plans, if applicable. The City does not accept liability for facilities designed by others.

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO

PROJECT NUMBER: 22039
DATE: 10-04-2023

DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
GENERAL NOTES

SHEET NUMBER:

L0.1



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NOTES

1. REFER TO GENERAL NOTES SHEET FOR ADDITIONAL INFORMATION.
2. REFER TO PLANTING DETAILS SHEET FOR TREE PROTECTION DETAIL.
3. REFER TO STAMPED SURVEY SHEET FOR ADDITIONAL INFORMATION.
4. REMOVE EXISTING CONCRETE AT CLOSEST EXISTING JOINT, WHERE FEASIBLE. COORDINATE WITH OWNER AND LANDSCAPE ARCHITECT PRIOR TO REMOVAL.
5. EASEMENT LINEWORK WAS OBTAINED FROM PUBLICLY AVAILABLE CITY DATA AND THEREFORE THE ACCURACY IS NOT VERIFIED.

EXISTING TREE INVENTORY

TREE #	COMMON NAME	SPECIES	EV. SIZE (ht. in ft.)	EV. SIZE (caliper)	DEC. SIZE (caliper)	CONDITION	NOTES	UNACCEPTABLE TREE RECOMMENDED FOR REMOVAL	REMOVED FOR CONSTRUCTION	TREE PRESERVATION CREDIT
01	Honeylocust	Gleditsia triacanthos			14	Good				2
02	Black Cottonwood	Populus trichocarpa			24	Good			Yes	
03	Russian Olive	Elaeagnus angustifolia			24	Fair	Invasive	Yes		
04	Ponderosa Pine	Pinus ponderosa	25	18		Good			Yes	
05	Ponderosa Pine	Pinus ponderosa	23	14		Good			Yes	
06	Black Cottonwood	Populus trichocarpa			16	Good				3
07	Russian Olive	Elaeagnus angustifolia			10	Fair	Invasive	Yes		
08	Siberian Elm	Ulmus pumila			15	Poor	Invasive	Yes		
09	Siberian Elm	Ulmus pumila			15	Poor	Invasive	Yes		
10	Siberian Elm	Ulmus pumila			15	Poor	Invasive	Yes		
11	Russian Olive	Elaeagnus angustifolia			10	Good	Invasive	Yes		
12	Russian Olive	Elaeagnus angustifolia			10	Good	Invasive	Yes		
13	Russian Olive	Elaeagnus angustifolia			10	Poor	Invasive	Yes		
14	Black Cottonwood	Populus trichocarpa			10	Fair				2
15	Black Cottonwood	Populus trichocarpa			10	Good			Yes	
16	Black Cottonwood	Populus trichocarpa			10	Good				2
17	Norway Spruce	Picea abies	35	18		Good				4
18	Norway Spruce	Picea abies	30	20		Good				4
19	Black Cottonwood	Populus trichocarpa			10	Good			Yes	
20	Black Cottonwood	Populus trichocarpa			18	Good			Yes	
21	Ponderosa Pine	Pinus ponderosa	25	18		Good				4
22	Ponderosa Pine	Pinus ponderosa	15	10		Good				3
23	Ponderosa Pine	Pinus ponderosa	15	16		Good				3
24	Ponderosa Pine	Pinus ponderosa	20	12		Good				4
25	Ponderosa Pine	Pinus ponderosa	25	24		Good				4
26	Ponderosa Pine	Pinus ponderosa	25	24		Good				4
TOTAL TREE PRESERVATION CREDITS:										39

Total caliper of existing evergreen trees removed (non-exempt): 32
Total caliper of existing evergreen trees preserved: 142
Total caliper of existing deciduous trees removed (non-exempt): 62
Total caliper of existing deciduous trees preserved: 50
Total caliper of existing trees removed (non-exempt): 94
Total caliper of existing trees preserved: 192
Caliper difference (removed vs. preserved): 98

TREE PRESERVATION CREDIT REQUIREMENTS

SMALL DECIDUOUS TREES	LARGE DECIDUOUS TREES	EVERGREEN TREES
Small Trees 1.5" or greater = 1 Tree	Large Trees and Street Trees 1.5" - 9.9" = 1 Tree 10" - 14.9" = 2 Trees 15" - 19.9" = 3 Trees 20" or greater = 5 Trees	5' - 7.9' = 1 Tree 8' - 14.9' = 2 Trees 15' - 19.9' = 3 Trees 20' or greater = 4 Trees

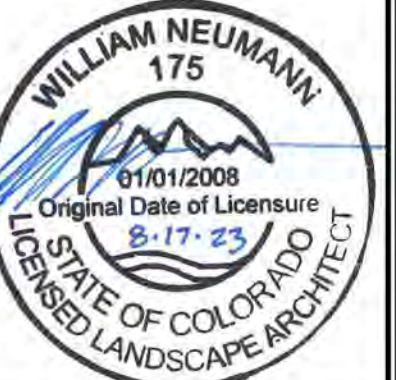
LEGEND

---	PROPERTY LINE
---	EASEMENT LINE
ST	EX. STORMWATER SEWER LINE
X	EX. FENCE
o	EX. LIGHT POLE
□	EX. POWER POLE
▲	EX. SURVEY MARKER
⊙	EX. MANHOLE
⊕	EX. TELEPHONE POLE
⊞	EX. ELECTRICAL BOX
○	EX. EDGE OF BLUEGRASS
○	EX. DECIDUOUS TREE
○	EX. EVERGREEN TREE
---	EX. CONTOUR - MAJOR
---	EX. CONTOUR - MINOR
---	LIMITS OF DISTURBANCE
---	AREA TO BE REMOVED
---	TREE PROTECTION

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO.

PROJECT NUMBER: 22039 DATE: 10-04-2023

DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
EXISTING SITE
CONDITIONS &
DEMOLITION PLAN

SHEET NUMBER:

L1.0

APPROVED:

City Engineer

11/20/23
Date

DA2023-0024
Job Number

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IMAGES
Images provided for boundary map
Images provided for boundary map
Images provided for boundary map

PROJECT: STANDLEY LAKE LIBRARY TRAILHEAD
SHEET: 1
DATE: 11/20/23
DRAWN: KD
CHECKED: MTW
SIGNATURE: [Signature]
SCALE: 1"=50'-0"

FILE NAME: STANDLEY LAKE LIBRARY TRAILHEAD
PROJECT: STANDLEY LAKE LIBRARY TRAILHEAD
SHEET: 1
DATE: 11/20/23
DRAWN: KD
CHECKED: MTW
SIGNATURE: [Signature]
SCALE: 1"=50'-0"



0 25 100
12.5 50
SCALE: 1"=50'-0"

APPROVED:

[Signature]
City Engineer

11/20/23
Date

DA2023-0024
Job Number

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 22039
DATE: 10-04-2023
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CHECKED: MTW

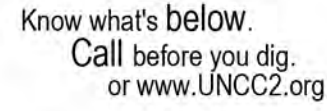
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
BOUNDARY
PLAN

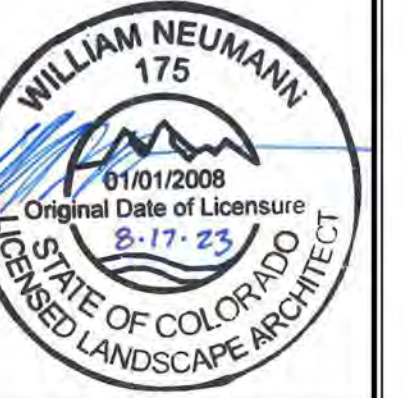
SHEET NUMBER:

L2.0



1. REFER TO GENERAL NOTES SHEET FOR ADDITIONAL INFORMATION.
2. EASEMENT LINEWORK WAS OBTAINED FROM PUBLICLY AVAILABLE CITY DATA AND THEREFORE THE ACCURACY IS NOT VERIFIED.

 PROPERTY LINE
 EASEMENT LINE
 ST ST EX. STORMWATER SEWER LINE
 X X EX. FENCE
 EX. LIGHT POLE
 EX. POWER POLE
 EX. SURVEY MARKER
 EX. MANHOLE
 EX. TELEPHONE POLE
 EX. ELECTRICAL BOX
 EX. EDGE OF BLUEGRASS
 EX. DECIDUOUS TREE
 EX. EVERGREEN TREE
 LIMITS OF DISTURBANCE
 CONCRETE PAVING
 CONCRETE EDGER
 LANDSCAPE BOULDER
 BLUEGRASS SOD
 NATIVE SEED
 ORNAMENTAL TREE
 EVERGREEN
 DECIDUOUS TREE



8485 Kipling St.
City of Arvada, CO,

SIGNED: KD
DRAWN: KD
CHECKED: MTW

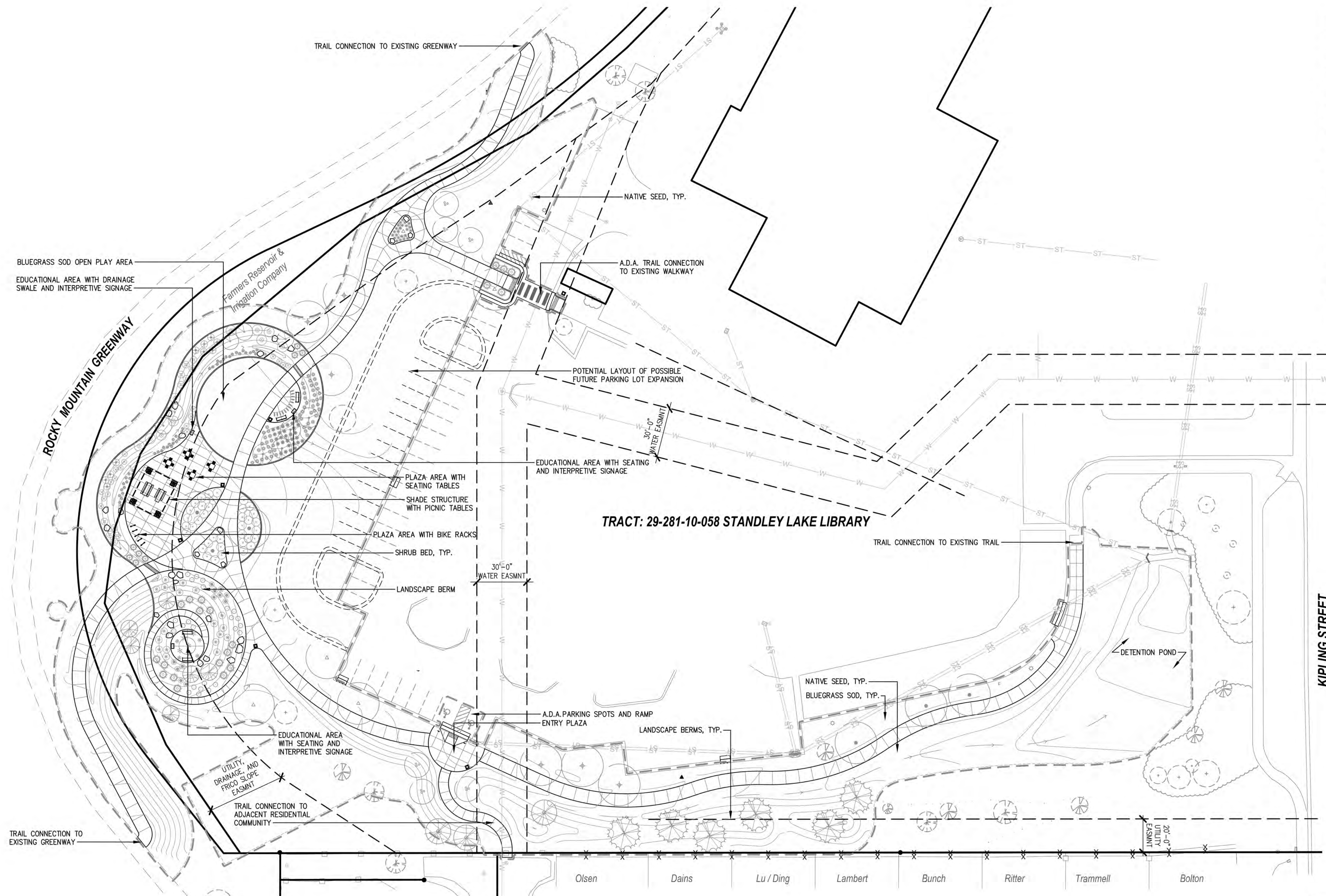
PROVISIONS:

B DESCRIPTION:
CONSTRUCTION
DOCUMENTS

MEET TITLE:
OVERALL SITE
PLAN

SHEET NUMBER: _____

2.1

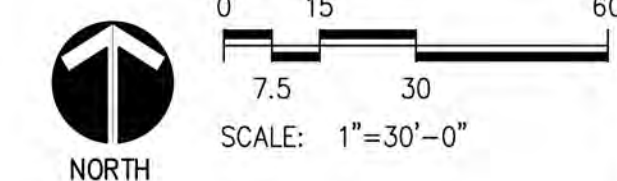


APPROVED:

Jenny Wolfeschlag PE.
City Engineer

11/20/23	DA2023-0024
Date	Job Number

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NOTES

1. REFER TO GENERAL NOTES SHEET FOR ADDITIONAL INFORMATION.
2. CONTRACTOR TO DETERMINE LOCATION OF CONTROL JOINTS VS. CONSTRUCTION JOINTS (COLD JOINTS) TO PREVENT CRACKING OF CONCRETE AT END OF CONTROL JOINTS.
3. ALL FLATWORK SCORING MUST TERMINATE PERPENDICULAR TO EDGE OF CONCRETE, NO EXCEPTIONS UNLESS ADVISED BY OWNER AND/OR LANDSCAPE ARCHITECT.
4. ALL CONCRETE TRAIL CONTROL JOINTS TO BE SAW-CUT. ALL CONCRETE PLAZA CONTROL JOINTS TO BE HAND-TOOLED.
5. CONTRACTOR TO COORDINATE WITH LANDSCAPE ARCHITECT PRIOR TO POURING ANY CONCRETE REVIEW SCORING/SAW-CUTTING.
6. CURVED CONCRETE FORM-WORK SHALL PROVIDE SMOOTH, CONSISTANT AND CONTINUOUS CURVES AS INDICATED IN PLANS.

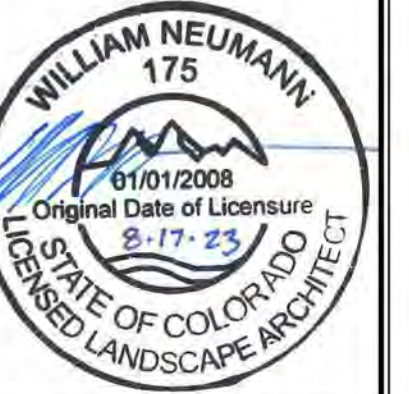
LEGEND

- PROPERTY LINE
- EASEMENT LINE
- EX. STORMWATER SEWER LINE
- EX. FENCE
- EX. LIGHT POLE
- EX. POWER POLE
- EX. SURVEY MARKER
- EX. MANHOLE
- EX. TELEPHONE POLE
- EX. ELECTRICAL BOX
- EX. EDGE OF BLUEGRASS
- EX. DECIDUOUS TREE
- EX. EVERGREEN TREE
- LIMITS OF DISTURBANCE
- COLORADO CONCRETE PAVING
- CONCRETE PAVING
- CONCRETE EDGER
- LANDSCAPE BOULDER
- EJ: EXPANSION JOINT
- CJ: CONTROL JOINT
- CTJ: CONSTRUCTION JOINT

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 22039
DATE: 10-04-2023
DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
OVERALL
LAYOUT AND
MATERIALS PLAN

SHEET NUMBER:

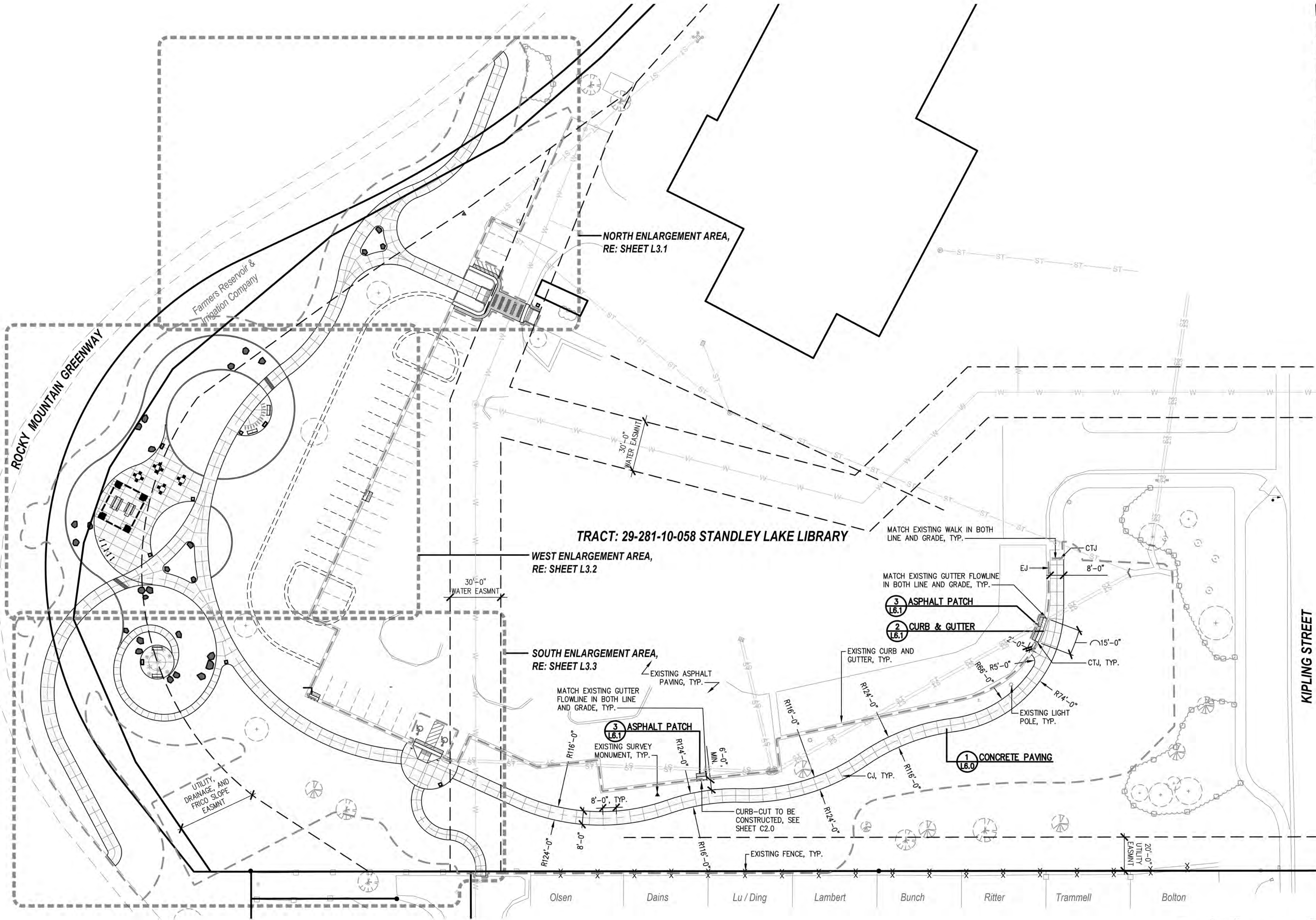
L3.0

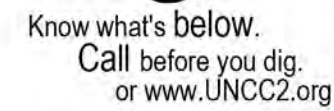
APPROVED:

Amey Wolkeley PE
City Engineer

11/20/23
Date
DA2023-0024
Job Number

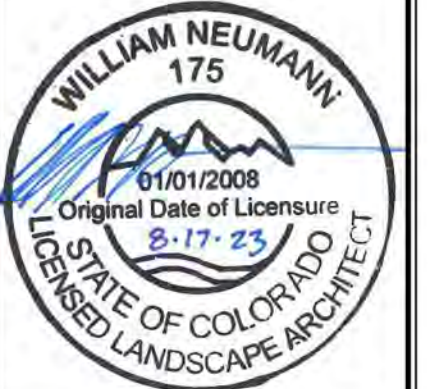
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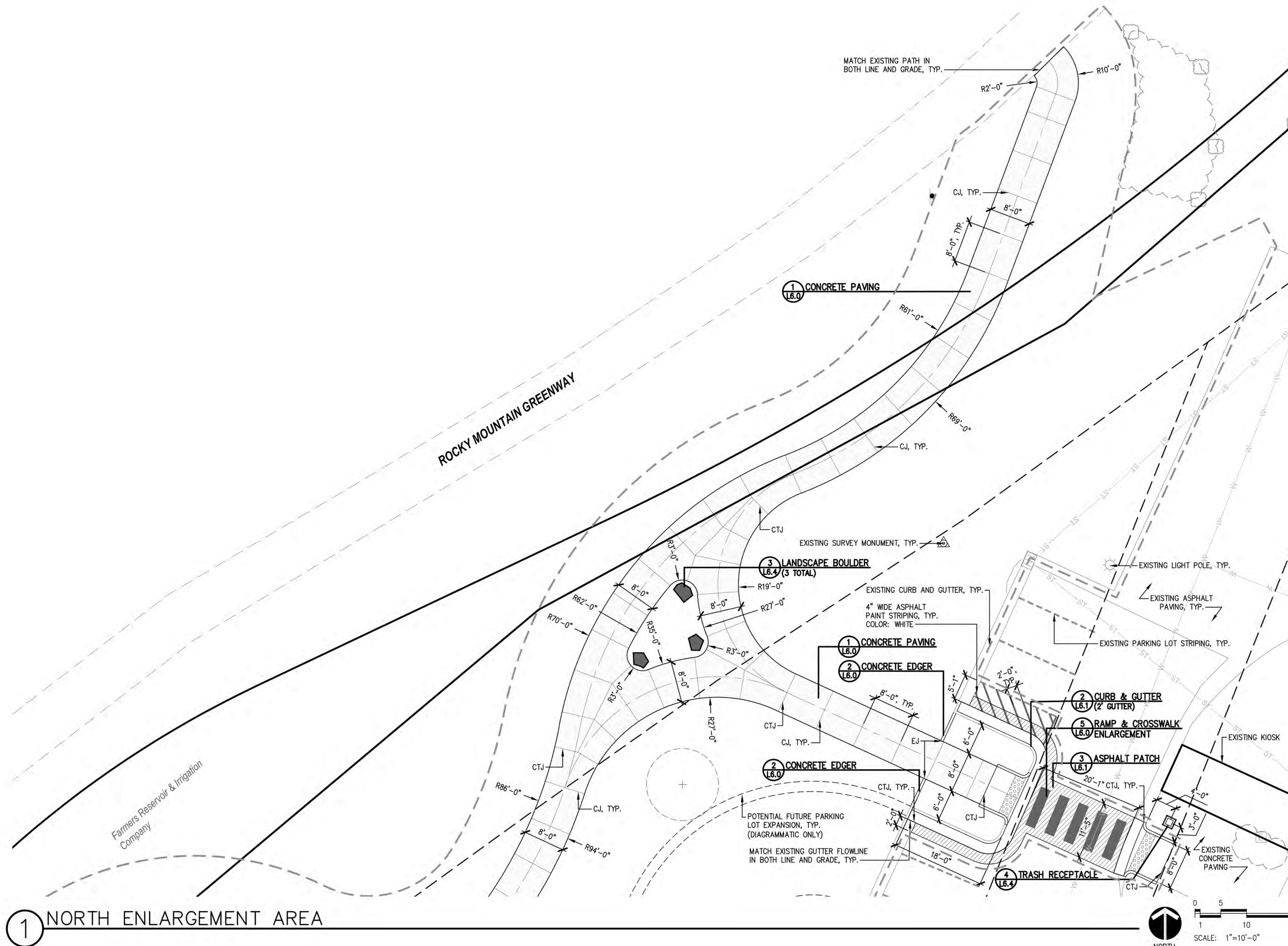
	PROPERTY LINE
	EASEMENT LINE
	EX. STORMWATER SEWER LINE
	EX. FENCE
	EX. LIGHT POLE
	EX. POWER POLE
	EX. SURVEY MARKER
	EX. MANHOLE
	EX. TELEPHONE POLE
	EX. ELECTRICAL BOX
	EX. EDGE OF BLUEGRASS
	EX. DECIDUOUS TREE
	EX. EVERGREEN TREE
	LIMITS OF DISTURBANCE
	COLORADO CONCRETE PAVING
	CONCRETE PAVING
	CONCRETE EDGER
	LANDSCAPE BOULDER
EX: EXPANSION JOINT C&: CONTROL JOINT CT&: CONSTRUCTION JOINT	



8485 Kipling St.
City of Arvada, CO,

SHEET NUMBER:

L3.1



11/20/23	DA2023-0024
<u>Date</u>	<u>Job Number</u>

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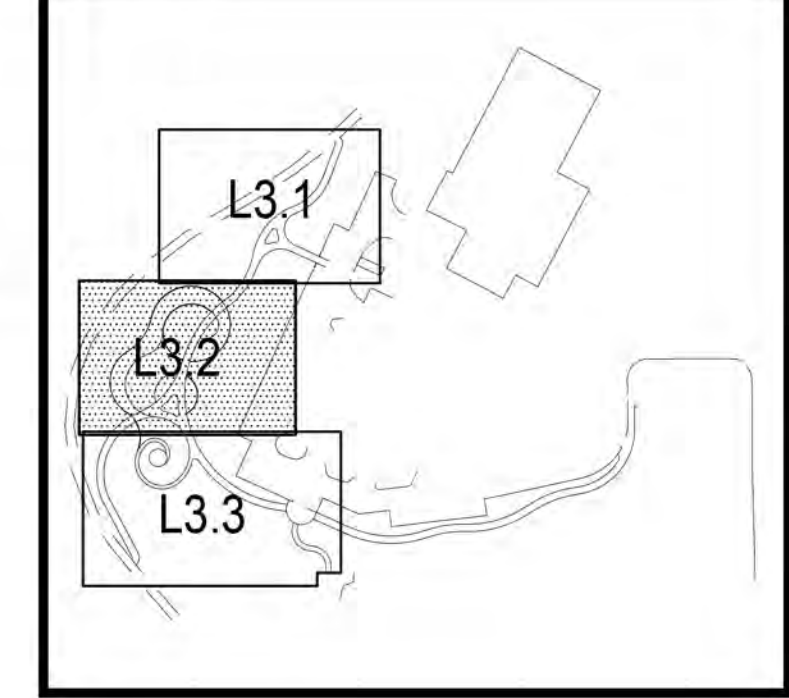


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NOTES

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KEYMAP



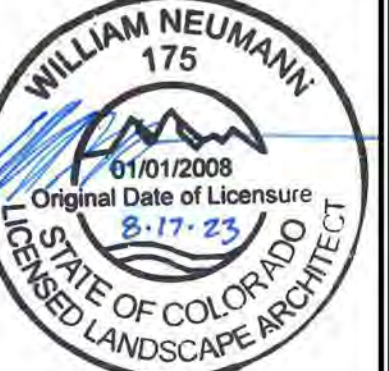
LEGEND

---	PROPERTY LINE
---	EASEMENT LINE
ST	EX. STORMWATER SEWER LINE
X	EX. FENCE
o	EX. LIGHT POLE
□	EX. POWER POLE
▲	EX. SURVEY MARKER
⊙	EX. MANHOLE
⊕	EX. TELEPHONE POLE
⊞	EX. ELECTRICAL BOX
---	EX. EDGE OF BLUEGRASS
○	EX. DECIDUOUS TREE
⊙	EX. EVERGREEN TREE
---	LIMITS OF DISTURBANCE
---	COLORLED CONCRETE PAVING
---	CONCRETE PAVING
---	CONCRETE EDGER
---	LANDSCAPE BOULDER
EJ	EXPANSION JOINT
CJ	CONTROL JOINT
CTJ	CONSTRUCTION JOINT

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Standley Lake Library Trailhead

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City of Arvada, CO.

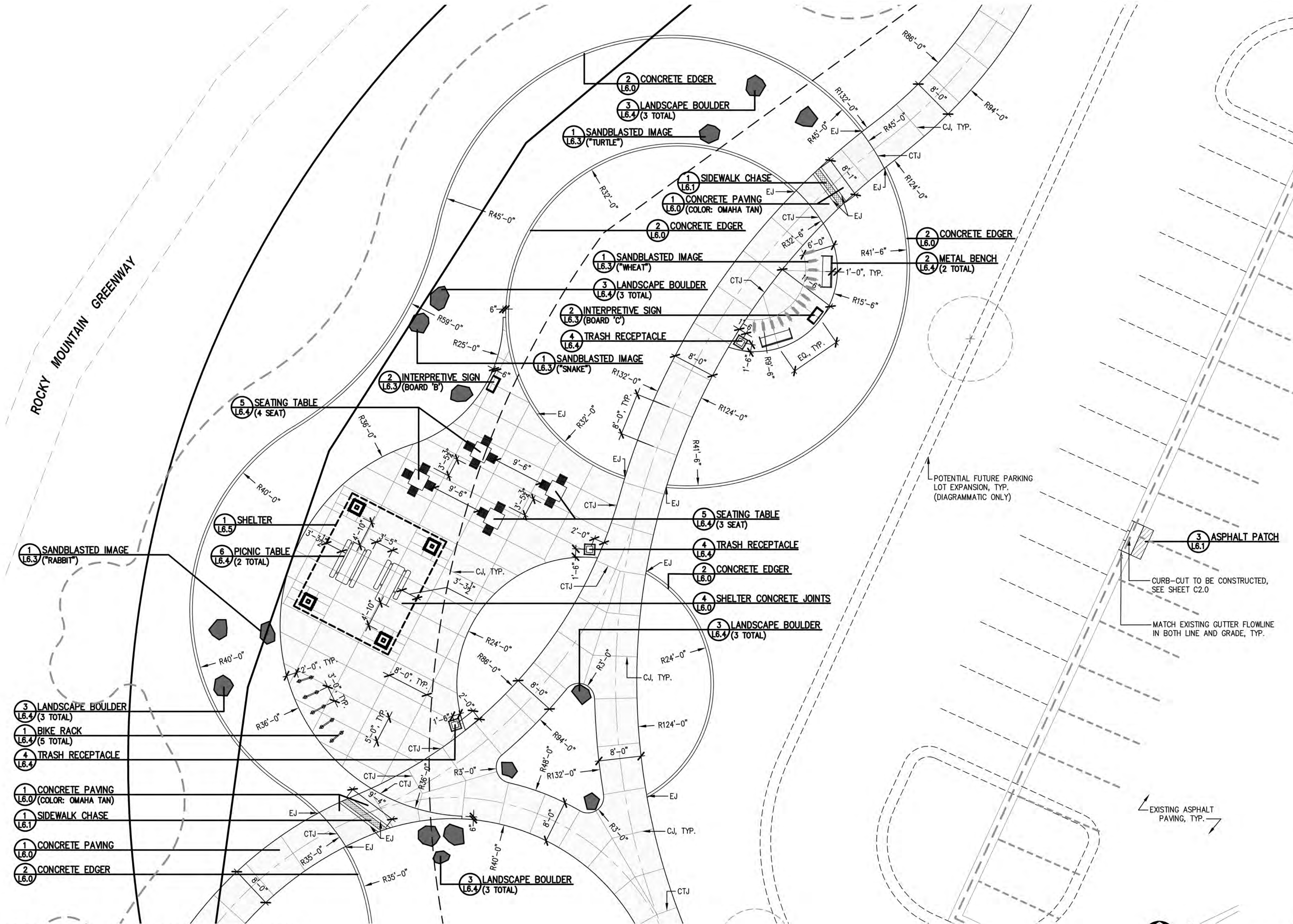
PROJECT NUMBER:	22039	DATE	10-04-2023
DESIGNED:	KD		
DRAWN:	KD		
CHECKED:	MTW		

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

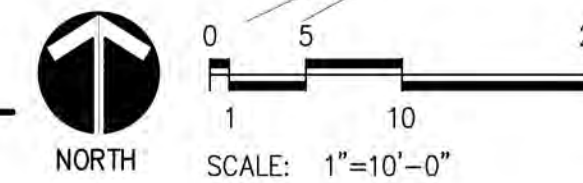
SHEET TITLE:
LAYOUT AND
MATERIALS
ENLARGEMENT
PLAN

SHEET NUMBER:

L3.2



1 WEST ENLARGEMENT AREA



APPROVED:	11/20/23	DA2023-0024
City Engineer	Date	Job Number

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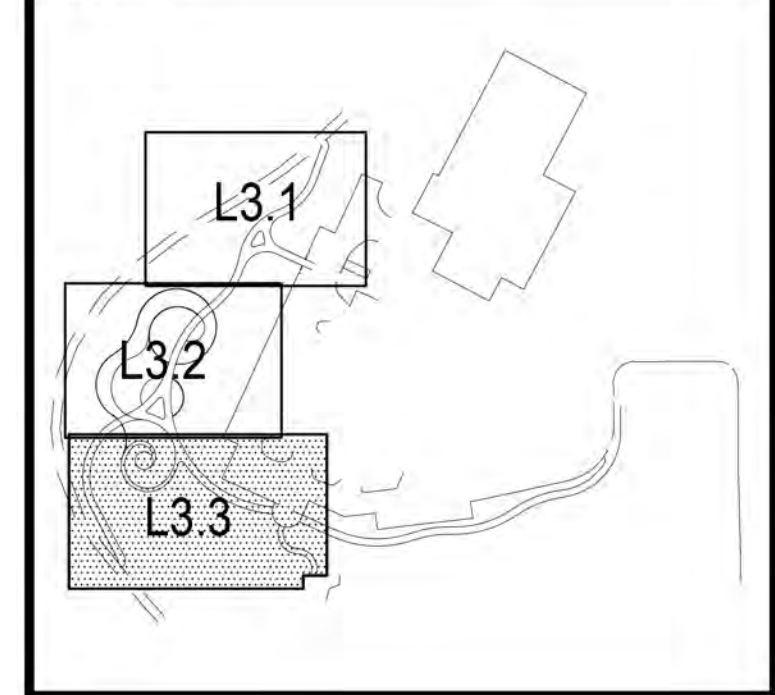
NOTES

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6. CURVED CONCRETE FORM-WORK SHALL PROVIDE SMOOTH, CONSISTANT AND CONTINUOUS CURVES AS INDICATED IN PLANS.

LEGEND

—	PROPERTY LINE	—	LIMITS OF DISTURBANCE
- - -	EASEMENT LINE	[Pattern]	COLORLED CONCRETE PAVING
- - -	EX. STORMWATER SEWER LINE	[Pattern]	CONCRETE PAVING
- X - X -	EX. FENCE	[Pattern]	CONCRETE EDGER
○	EX. LIGHT POLE	[Pattern]	LANDSCAPE BOULDER
□	EX. POWER POLE	[Pattern]	EJ: EXPANSION JOINT
△	EX. SURVEY MARKER	[Pattern]	CJ: CONTROL JOINT
⊙	EX. MANHOLE	[Pattern]	CTJ: CONSTRUCTION JOINT
⊙	EX. TELEPHONE POLE		
⊠	EX. ELECTRICAL BOX		
—	EX. EDGE OF BLUEGRASS		
○	EX. DECIDUOUS TREE		
⊙	EX. EVERGREEN TREE		

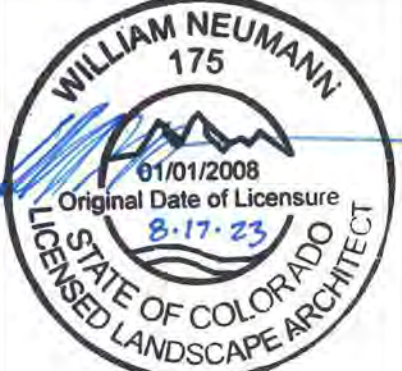
KEYMAP



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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 22039
DATE: 10-04-2023
DESIGNED: KD
DRAWN: KD
CHECKED: MTW

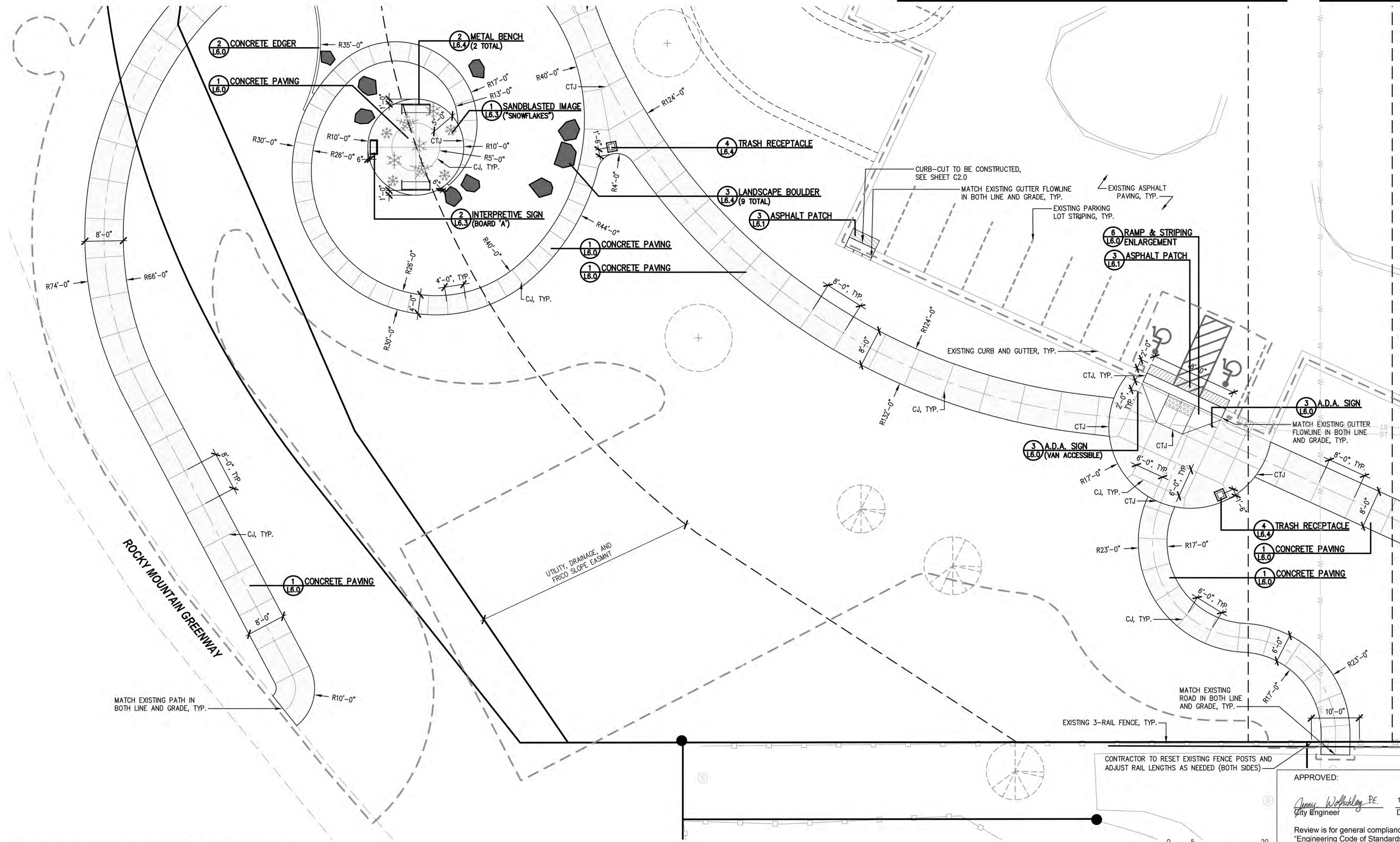
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
LAYOUT AND
MATERIALS
ENLARGEMENT
PLAN

SHEET NUMBER:

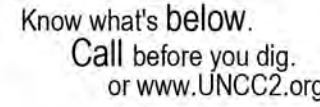
L3.3



1 SOUTH ENLARGEMENT AREA

APPROVED:
Jimmy W. Winkley, PE.
City Engineer
Date: 11/20/23
Job Number: DA2023-0024

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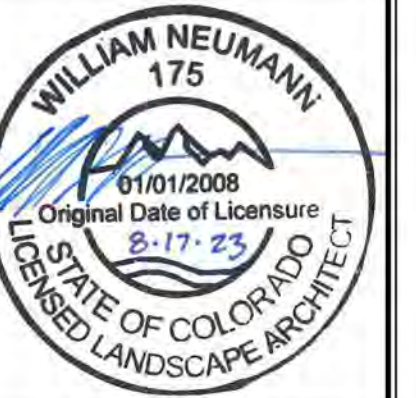


1. REFER TO GENERAL NOTES SHEET FOR ADDITIONAL INFORMATION.
2. ALL SPOT ELEVATIONS ARE AT "FINISHED GRADE".
3. ALL SHRUB BEDS ARE TO BE FINE GRADED AND MOUNDED TO PROVIDE POSITIVE DRAINAGE, UNLESS SHOWN OTHERWISE ON THE GRADING PLANS.
4. ALL TRAILS SHALL HAVE A 1' MINIMUM SHOULDER AT SAME GRADE AS THE ADJACENT TRAIL.
5. ENSURE ALL GRADING MEETS THE EXISTING GRADES WITH A SMOOTH TRANSITION.
6. OWNER'S REPRESENTATIVE AND LANDSCAPE ARCHITECT TO REVIEW ALL FINISHED GRADES PRIOR TO POURING ANY CONCRETE, UNLESS NOTIFIED OTHERWISE. CONTRACTOR TO PROVIDE NOTICE AT LEAST (2) FULL BUSINESS DAYS PRIOR CONCRETE WORK.
7. A MINIMUM OF 4 FEET OF COVER ABOVE ALL CITY-OWNED UTILITIES WITHIN THE LIMITS OF CONSTRUCTION WILL BE MAINTAINED THROUGHOUT ALL CONSTRUCTION OPERATIONS.

 PROPERTY LINE
 EASEMENT LINE
 EX. STORMWATER SEWER LINE
 EX. FENCE
 EX. LIGHT POLE
 EX. POWER POLE
 EX. SURVEY MARKER
 EX. MANHOLE
 EX. TELEPHONE POLE
 EX. ELECTRICAL BOX
 EX. EDGE OF BLUEGRASS
 EX. DECIDUOUS TREE
 EX. EVERGREEN TREE
 EX. CONTOUR - MAJOR
 EX. CONTOUR - MINOR
 LIMITS OF DISTURBANCE
 COLORED CONCRETE PAVING
 CONCRETE PAVING
 CONCRETE EDGER
 LANDSCAPE BOULDER
 CONTOUR - MINOR
 CONTOUR - MAJOR
 EXISTING SPOT ELEVATION
 FL: FLOW LINE
 BOC: BACK OF CURB
 HP: HIGH POINT
 LP: LOW POINT

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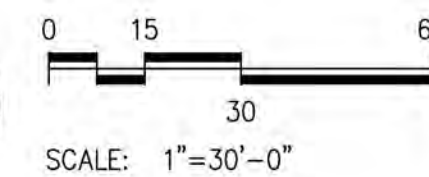
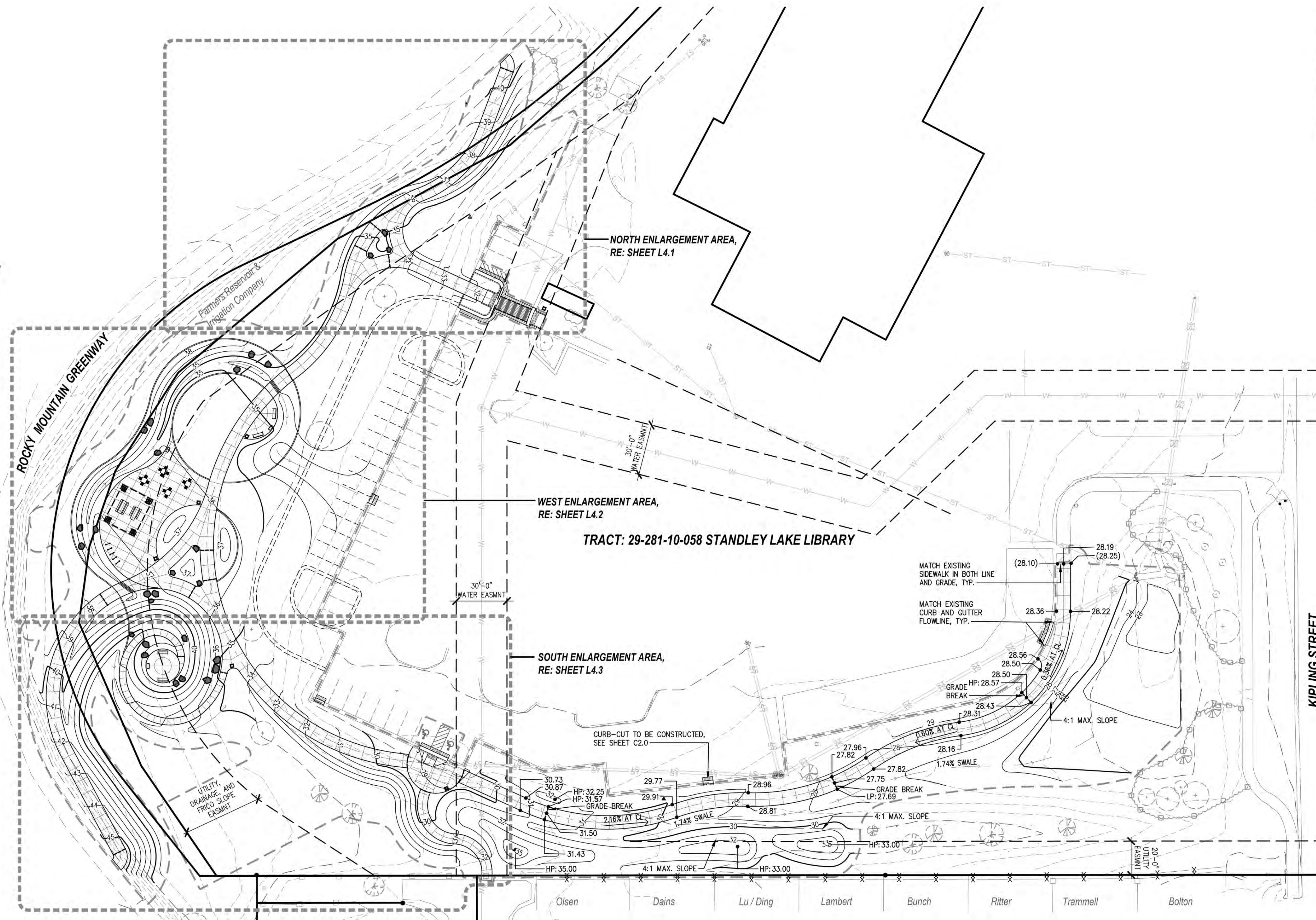


8485 Kipling St.
City of Arvada, CO,

REVISIONS:

SHEET TITLE:
OVERALL
GRADING
PLAN

L4.0



Jenny Wolschlag PE.
City Engineer

11/20/23	DA2023-0024
Date	Job Number

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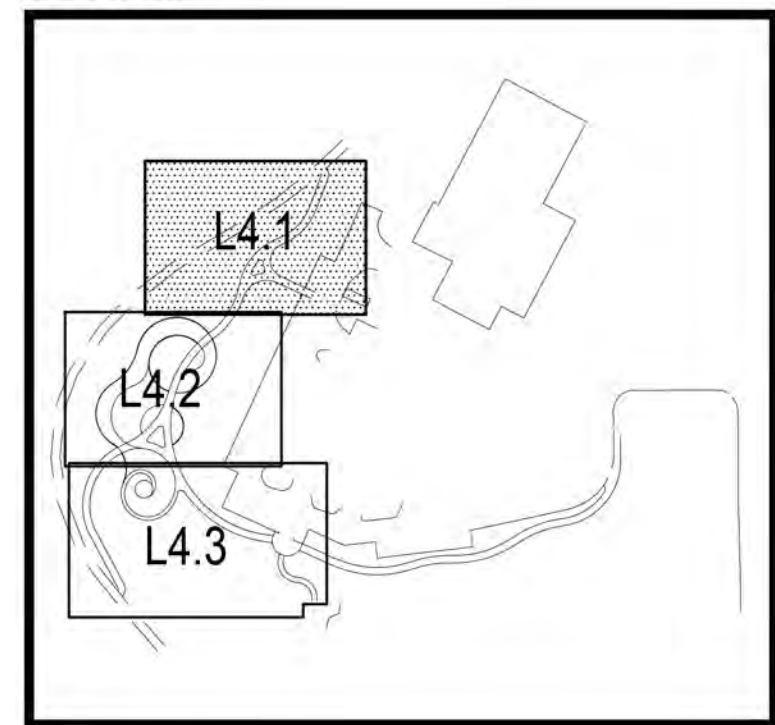


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NOTES

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KEYMAP



LEGEND

—	PROPERTY LINE
—	EASEMENT LINE
— ST — ST	EX. STORMWATER SEWER LINE
— X — X	EX. FENCE
○	EX. LIGHT POLE
□	EX. POWER POLE
▲	EX. SURVEY MARKER
⊙	EX. MANHOLE
⊕	EX. TELEPHONE POLE
⊞	EX. ELECTRICAL BOX
—	EX. EDGE OF BLUEGRASS
○	EX. DECIDUOUS TREE
⊙	EX. EVERGREEN TREE
—	EX. CONTOUR - MAJOR
—	EX. CONTOUR - MINOR
—	LIMITS OF DISTURBANCE
▨	COLORLED CONCRETE PAVING
▨	CONCRETE PAVING
—	CONCRETE EDGER
⬢	LANDSCAPE BOULDER
—	CONTOUR - MINOR
—	CONTOUR - MAJOR
(...)	EXISTING SPOT ELEVATION
FL	FLOW LINE
BOC	BACK OF CURB
HP	HIGH POINT
LP	LOW POINT

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO

PROJECT NUMBER: 22039 DATE: 10-04-2023

DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:

GRADING
ENLARGEMENT
PLAN

SHEET NUMBER:

L4.1

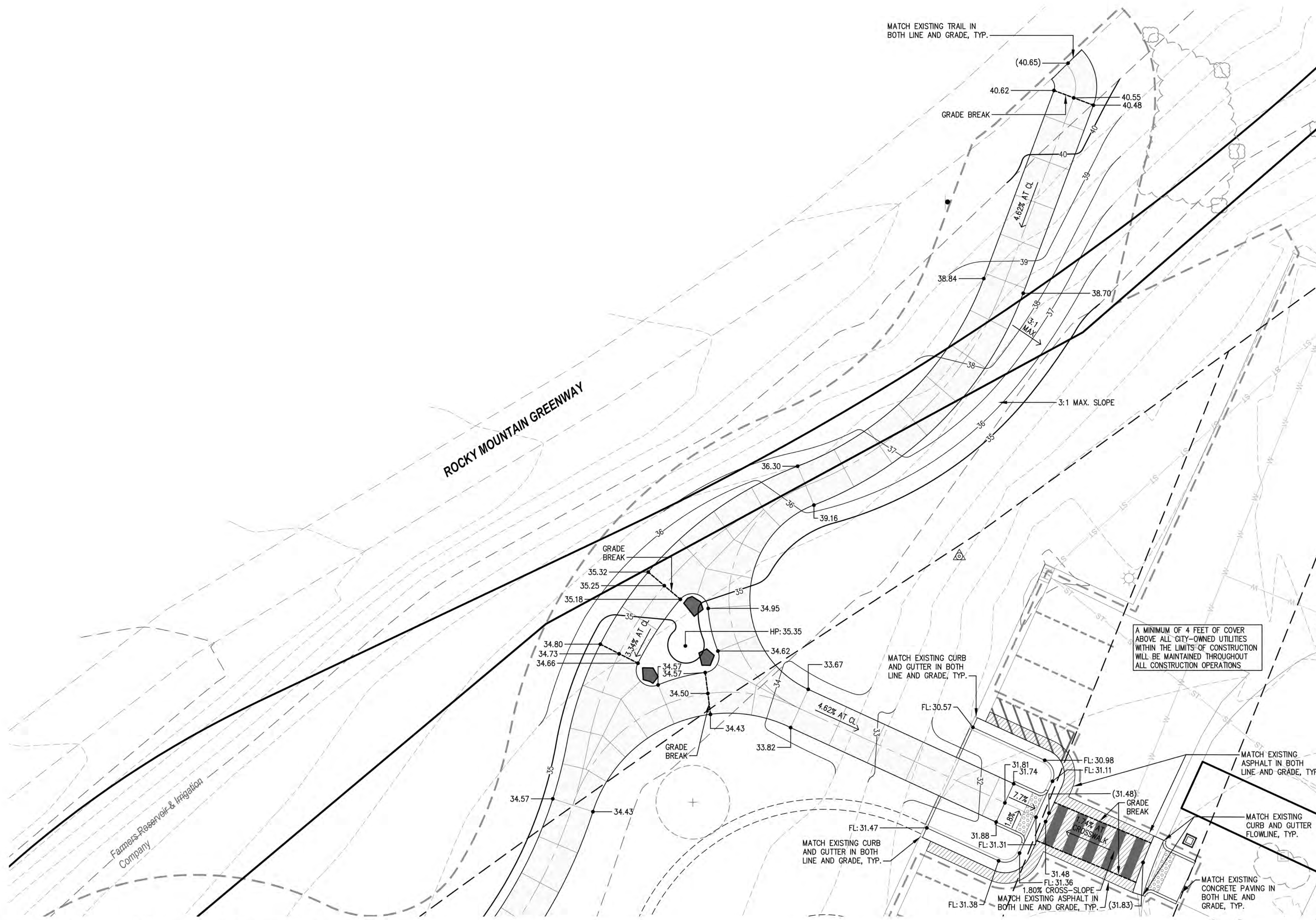
APPROVED:

James W. Schley, P.E.
City Engineer

11/20/23
Date

DA2023-0024
Job Number

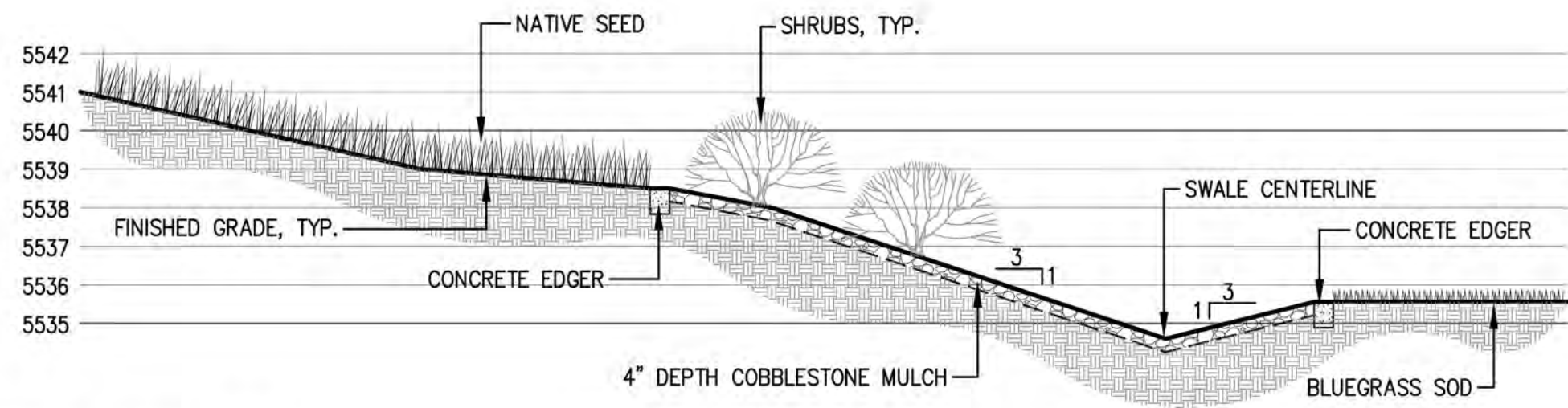
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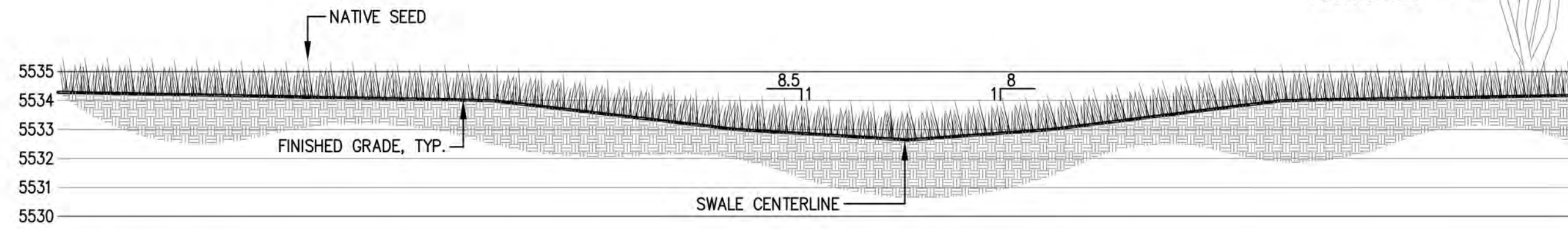
1 NORTH ENLARGEMENT AREA



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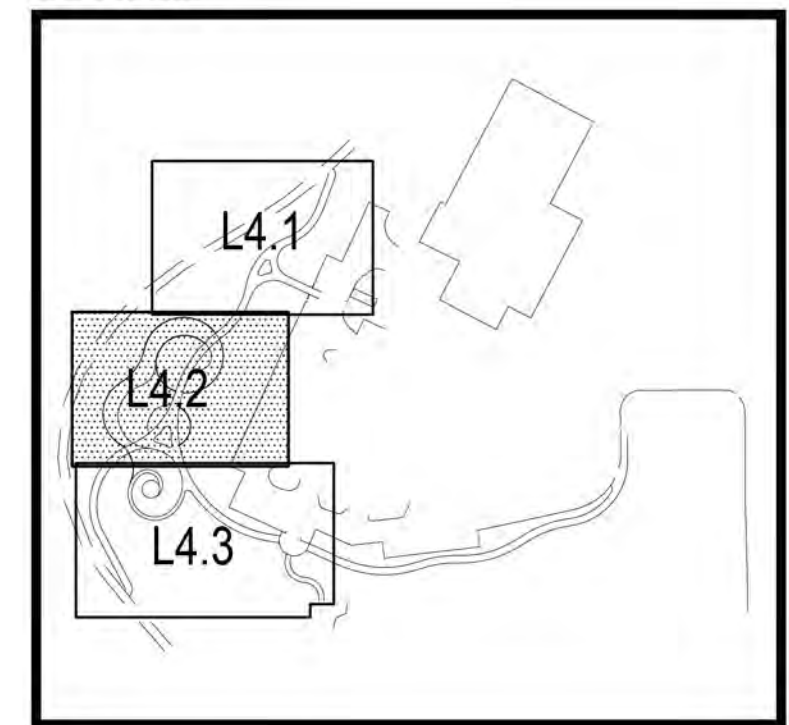


SECTION 'A'



SECTION 'B'

KEYMAP



LEGEND

---	PROPERTY LINE
---	EASEMENT LINE
ST	EX. STORMWATER SEWER LINE
X	EX. FENCE
o	EX. LIGHT POLE
□	EX. POWER POLE
▲	EX. SURVEY MARKER
⊙	EX. MANHOLE
⊕	EX. TELEPHONE POLE
⊞	EX. ELECTRICAL BOX
---	EX. EDGE OF BLUEGRASS
○	EX. DECIDUOUS TREE
⊙	EX. EVERGREEN TREE
---	EX. CONTOUR - MAJOR
---	EX. CONTOUR - MINOR
---	LIMITS OF DISTURBANCE
▨	COLOR-CONCRETE PAVING
▨	CONCRETE PAVING
---	CONCRETE EDGER
●	LANDSCAPE BOULDER
---	CONTOUR - MINOR
---	CONTOUR - MAJOR
(...)	EXISTING SPOT ELEVATION
FL	FLOW LINE
BOC	BACK OF CURB
HP	HIGH POINT
LP	LOW POINT

NOTES

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4. ALL TRAILS SHALL HAVE A 1' MINIMUM SHOULDER AT SAME GRADE AS THE ADJACENT TRAIL.
5. ENSURE ALL GRADING MEETS THE EXISTING GRADES WITH A SMOOTH TRANSITION.
6. OWNER'S REPRESENTATIVE AND LANDSCAPE ARCHITECT TO REVIEW ALL FINISHED GRADES PRIOR TO POURING ANY CONCRETE, UNLESS NOTIFIED OTHERWISE. CONTRACTOR TO PROVIDE NOTICE AT LEAST (2) FULL BUSINESS DAYS PRIOR CONCRETE WORK.
7. A MINIMUM OF 4 FEET OF COVER ABOVE ALL CITY-OWNED UTILITIES WITHIN THE LIMITS OF CONSTRUCTION WILL BE MAINTAINED THROUGHOUT ALL CONSTRUCTION OPERATIONS.

APPROVED:

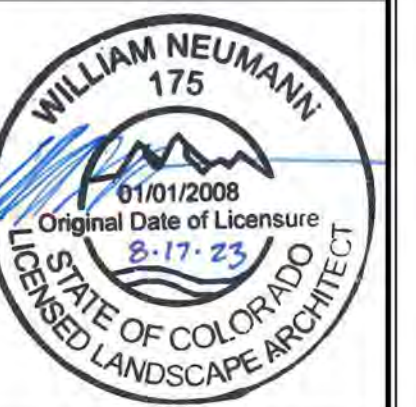
Jenny Woloshay PE 11/20/23 DA2023-0024
City Engineer Date Job Number

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 22039 DATE: 10-04-2023
DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

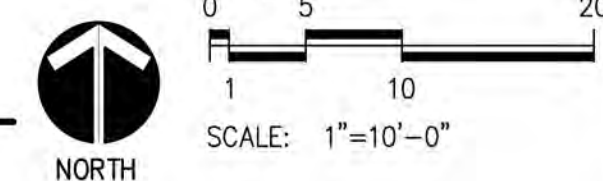
JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
GRADING
ENLARGEMENT
PLAN

SHEET NUMBER:

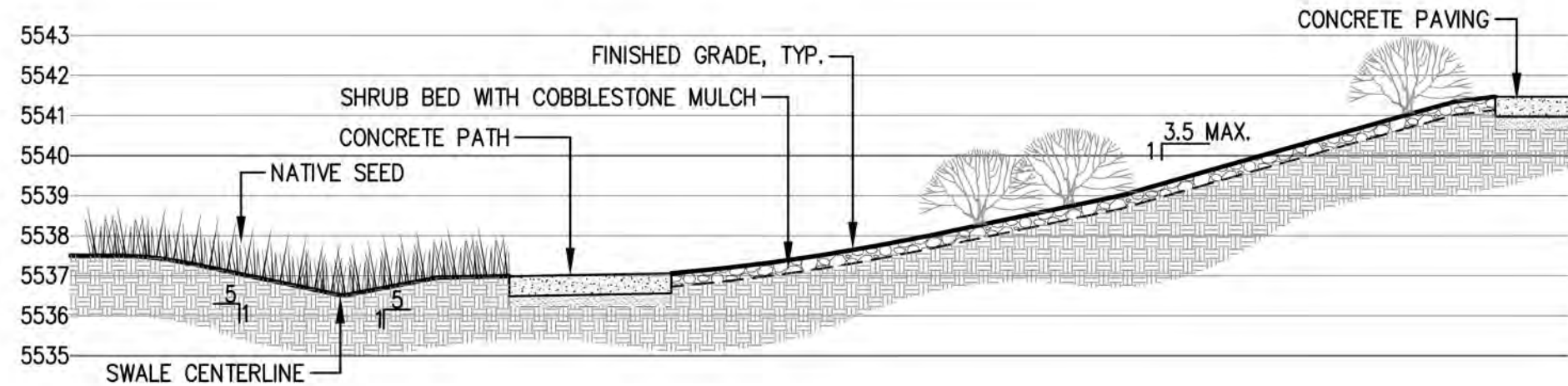
L4.2

1 WEST ENLARGEMENT AREA





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SECTION 'C'

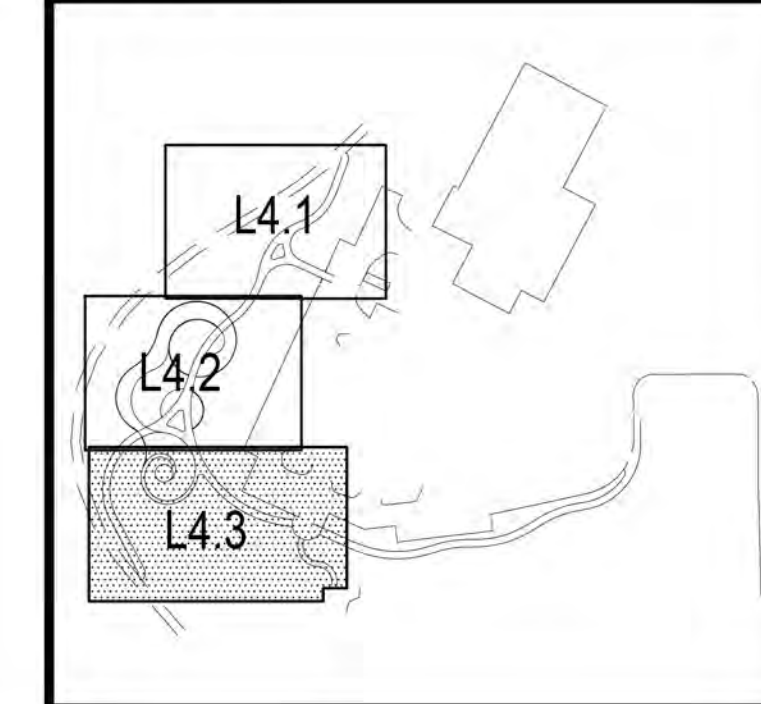
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LEGEND

---	PROPERTY LINE	---	LIMITS OF DISTURBANCE
- - - -	EASEMENT LINE	COLORED CONCRETE PAVING	
-ST- ST-	EX. STORMWATER SEWER LINE	CONCRETE PAVING	
X X	EX. FENCE	CONCRETE EDGER	
o	EX. LIGHT POLE	LANDSCAPE BOULDER	
□	EX. POWER POLE	CONTOUR - MINOR	
▲	EX. SURVEY MARKER	CONTOUR - MAJOR	
⊗	EX. MANHOLE	EXISTING SPOT ELEVATION	
⊕	EX. TELEPHONE POLE	FL: FLOW LINE	
⊞	EX. ELECTRICAL BOX	BOC: BACK OF CURB	
⊞	EX. EDGE OF BLUEGRASS	HP: HIGH POINT	
⊞	EX. DECIDUOUS TREE	LP: LOW POINT	
⊞	EX. EVERGREEN TREE		
- - - -	EX. CONTOUR - MAJOR		
- - - -	EX. CONTOUR - MINOR		

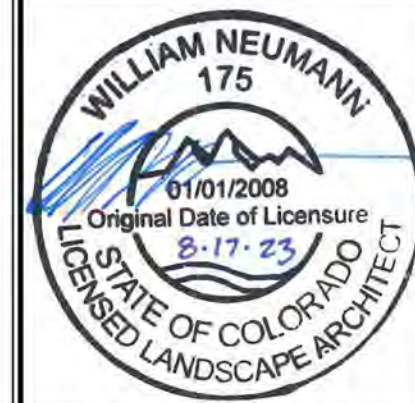
KEYMAP



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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 22039
DATE: 10-04-2023
DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

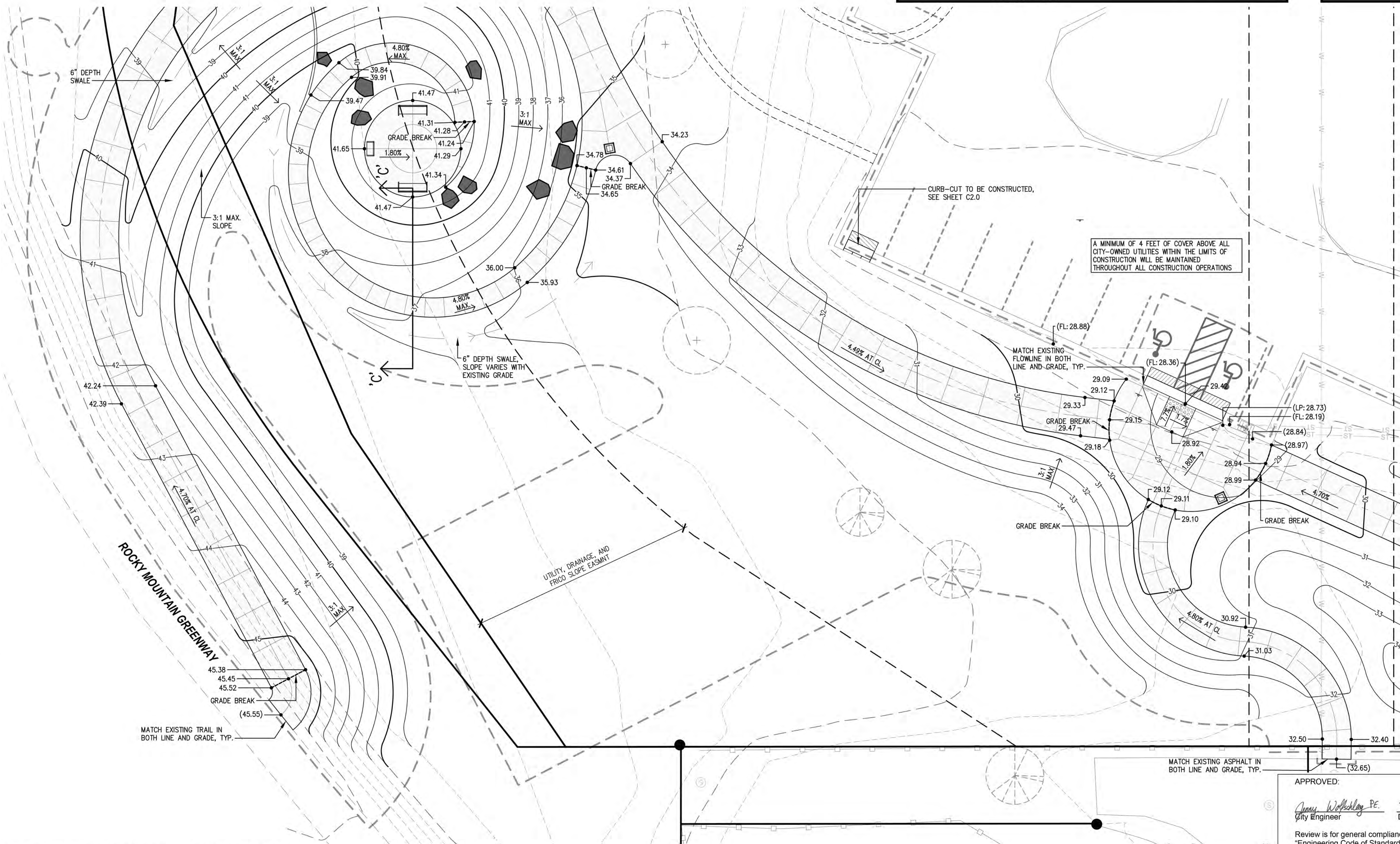
JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
GRADING
ENLARGEMENT
PLAN

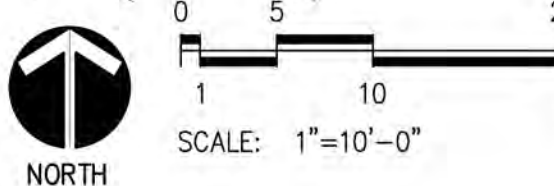
SHEET NUMBER:

L4.3

1 SOUTH ENLARGEMENT AREA



APPROVED:
Janey Woloshay PE
City Engineer
11/20/23
Date
DA2023-0024
Job Number
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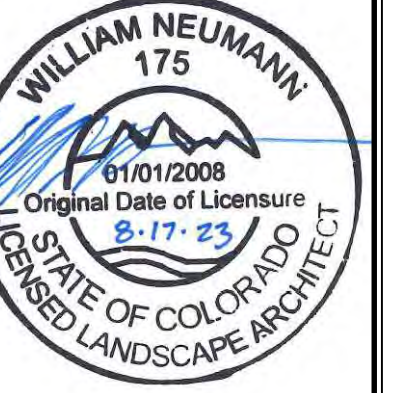
LEGEND

---	PROPERTY LINE
---	EASEMENT LINE
ST	EX. STORMWATER SEWER LINE
X	EX. FENCE
o	EX. LIGHT POLE
□	EX. POWER POLE
▲	EX. SURVEY MARKER
⊙	EX. MANHOLE
⊕	EX. TELEPHONE POLE
⊞	EX. ELECTRICAL BOX
---	EX. EDGE OF BLUEGRASS
○	EX. DECIDUOUS TREE
⊙	EX. EVERGREEN TREE
---	EX. CONTOUR - MAJOR
---	EX. CONTOUR - MINOR
---	LIMITS OF DISTURBANCE
---	CONCRETE EDGER
■	LANDSCAPE BOULDER
---	CONTOUR - MINOR
---	CONTOUR - MAJOR
▨	BLUEGRASS SOD
▨	NATIVE SEED
▨	COBBLESTONE MULCH
○	ORNAMENTAL TREE
⊙	EVERGREEN
+	DECIDUOUS TREE

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Standley Lake Library Trailhead

8485 Kipling St.
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PROJECT NUMBER: 22039
DESIGNED: KD
DRAWN: KD
CHECKED: MTW

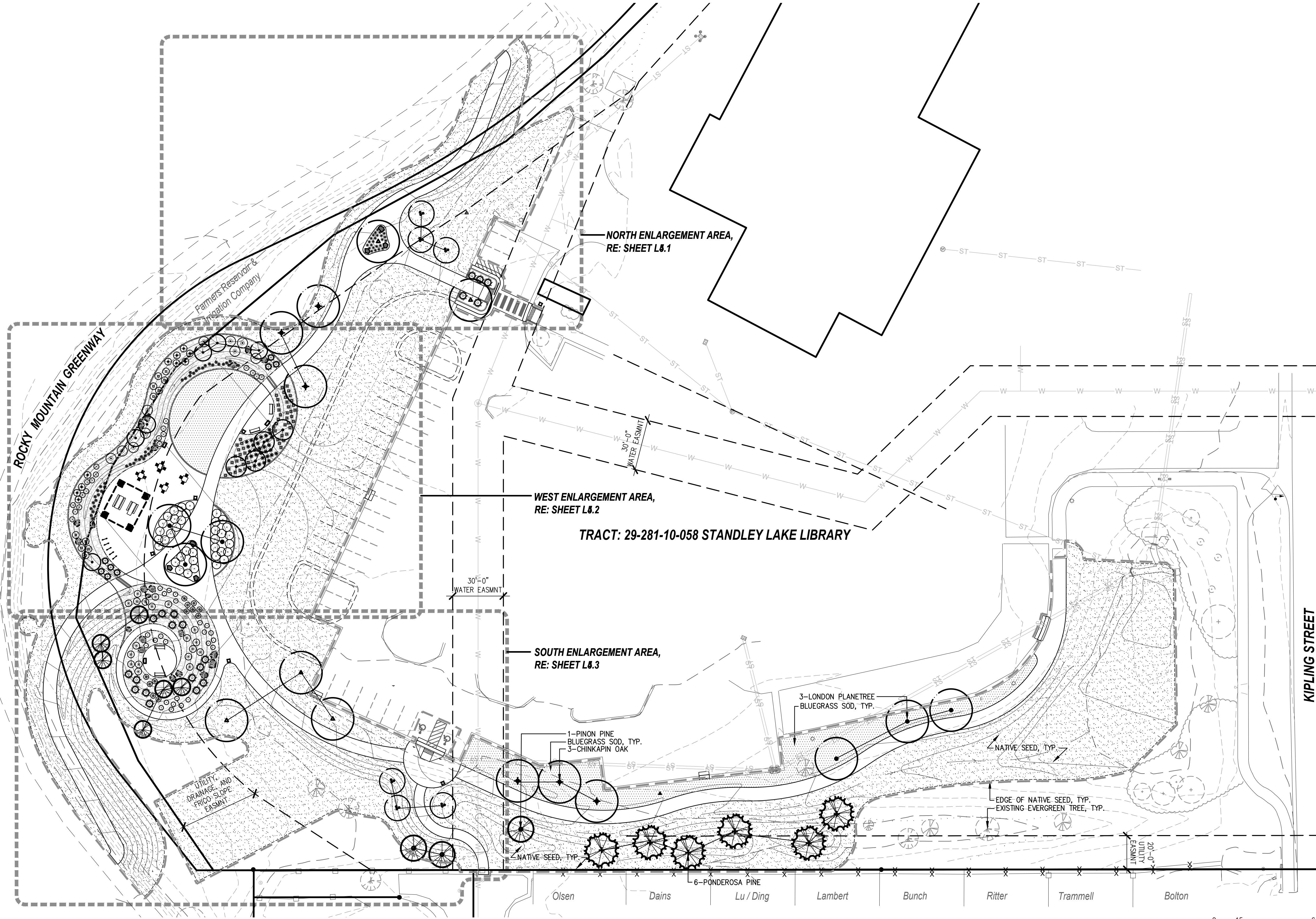
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
OVERALL
PLANTING PLAN

SHEET NUMBER:

L5.0



APPROVED:
Cressa Jones
DIRECTOR OF VIBRANT
COMMUNITY & NEIGHBORHOODS

11/22/23
DATE

DA2023-0024
JOB NUMBER

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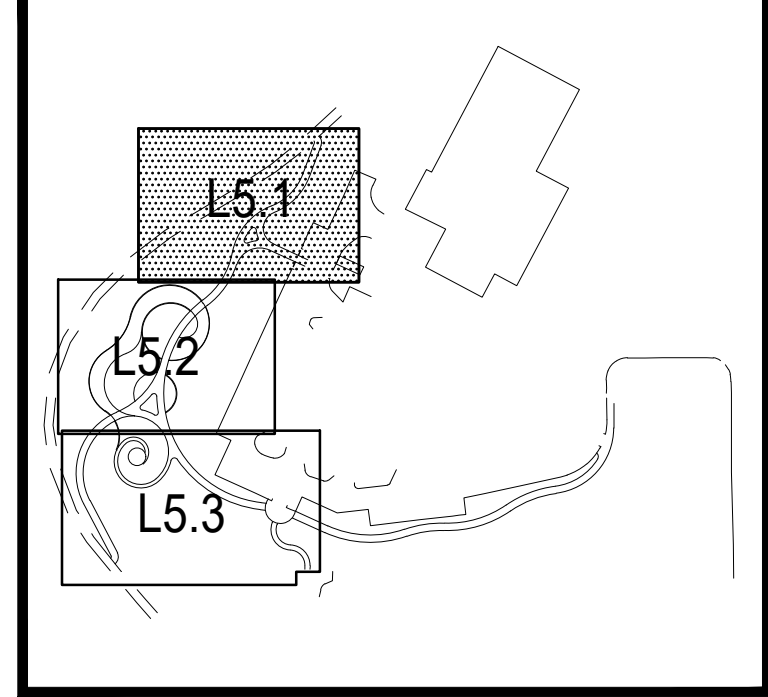


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KEYMAP



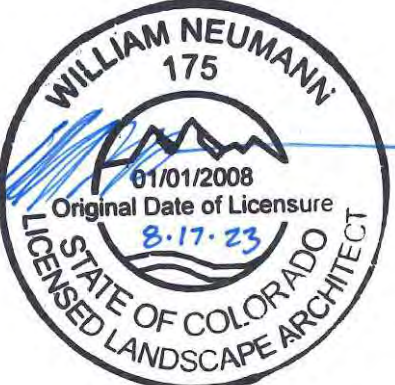
LEGEND

---	PROPERTY LINE
- - - -	EASEMENT LINE
ST	EX. STORMWATER SEWER LINE
X	EX. FENCE
⊙	EX. LIGHT POLE
⊠	EX. POWER POLE
▲	EX. SURVEY MARKER
⊙	EX. MANHOLE
⊙	EX. TELEPHONE POLE
⊠	EX. ELECTRICAL BOX
---	EX. EDGE OF BLUEGRASS
⊙	EX. DECIDUOUS TREE
⊙	EX. EVERGREEN TREE
---	EX. CONTOUR - MAJOR
---	EX. CONTOUR - MINOR
---	LIMITS OF DISTURBANCE
---	CONCRETE EDGER
⬢	LANDSCAPE BOULDER
---	CONTOUR - MINOR
---	CONTOUR - MAJOR
---	BLUEGRASS SOD
---	NATIVE SEED
---	COBBLESTONE MULCH
⊙	ORNAMENTAL TREE
⊙	EVERGREEN
⊙	DECIDUOUS TREE

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO

PROJECT NUMBER: 22039
DATE: 10-04-2023
DESIGNED: KD
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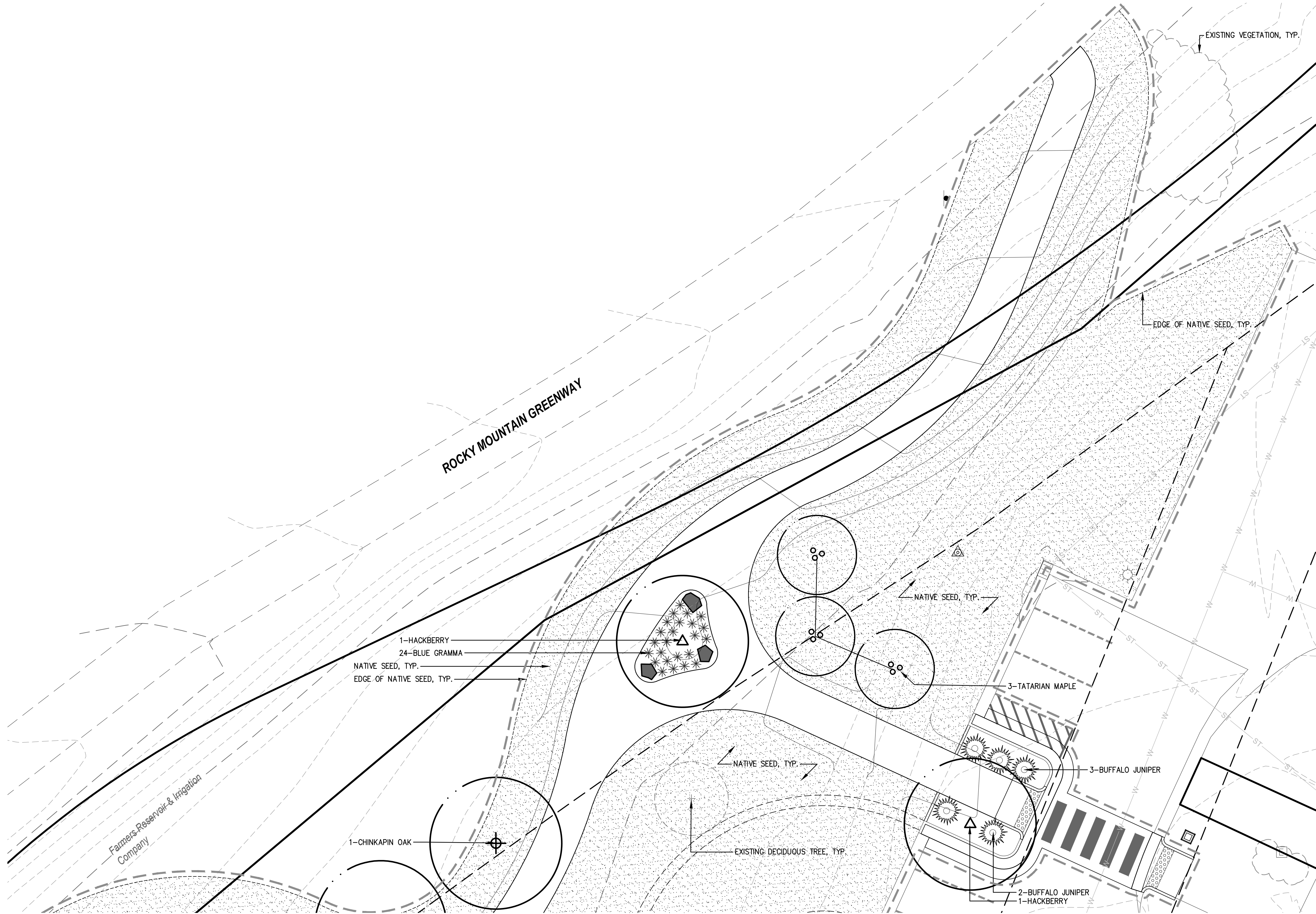
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION DOCUMENTS

SHEET TITLE:
PLANTING ENLARGEMENT PLAN

SHEET NUMBER:

L5.1



1 NORTH ENLARGEMENT AREA



0 5 20
1 10
SCALE: 1"=10'-0"

APPROVED:
Cressa Jones
DIRECTOR OF VIBRANT COMMUNITY & NEIGHBORHOODS
DATE: 11/22/23
JOB NUMBER: DA2023-0024

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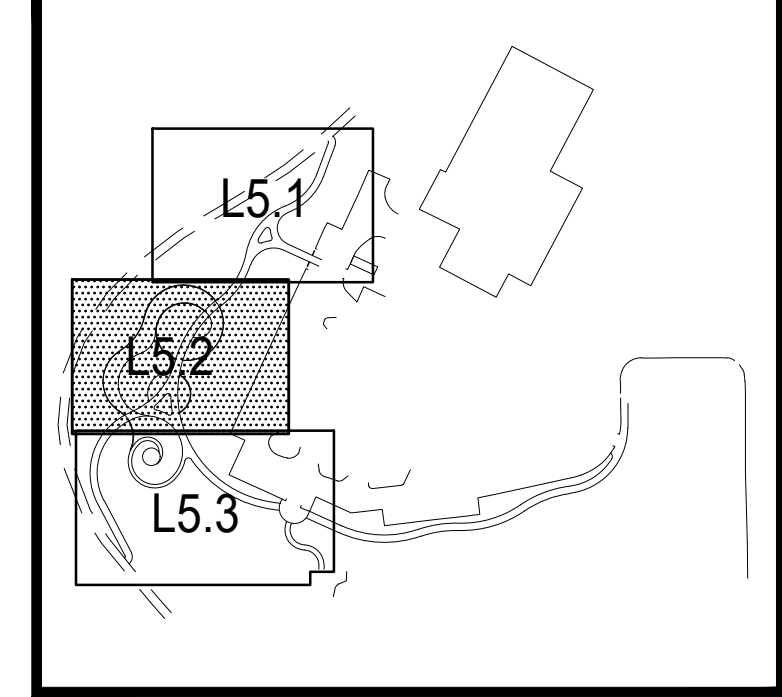


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KEYMAP



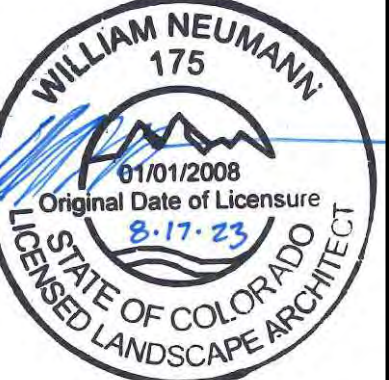
LEGEND

---	PROPERTY LINE
---	EASEMENT LINE
ST	EX. STORMWATER SEWER LINE
X	EX. FENCE
⊙	EX. LIGHT POLE
⊠	EX. POWER POLE
▲	EX. SURVEY MARKER
⊙	EX. MANHOLE
⊙	EX. TELEPHONE POLE
⊠	EX. ELECTRICAL BOX
---	EX. EDGE OF BLUEGRASS
⊙	EX. DECIDUOUS TREE
⊙	EX. EVERGREEN TREE
---	EX. CONTOUR - MAJOR
---	EX. CONTOUR - MINOR
---	LIMITS OF DISTURBANCE
---	CONCRETE EDGER
⬢	LANDSCAPE BOULDER
---	CONTOUR - MINOR
---	CONTOUR - MAJOR
⬢	BLUEGRASS SOD
⬢	NATIVE SEED
⬢	COBBLESTONE MULCH
⊙	ORNAMENTAL TREE
⊙	EVERGREEN
⊙	DECIDUOUS TREE

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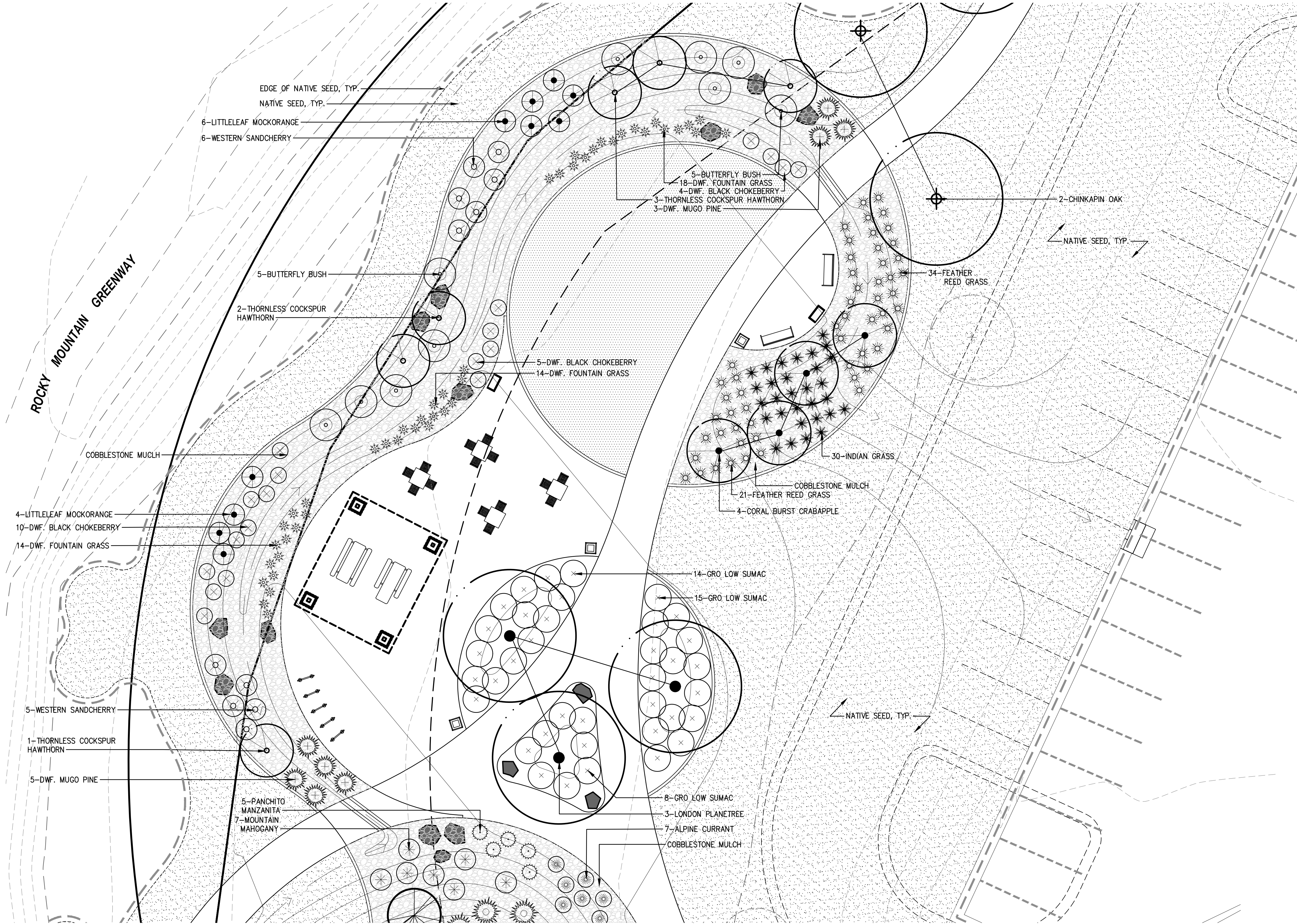
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JOB DESCRIPTION:
CONSTRUCTION
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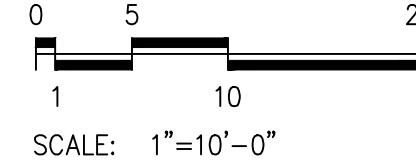
SHEET TITLE:
PLANTING
ENLARGEMENT
PLAN

SHEET NUMBER:

L5.2



1 WEST ENLARGEMENT AREA



APPROVED:
Cressa Jones
DIRECTOR OF VIBRANT
COMMUNITY & NEIGHBORHOODS
DATE: 11/22/23
JOB NUMBER: DA2023-0024

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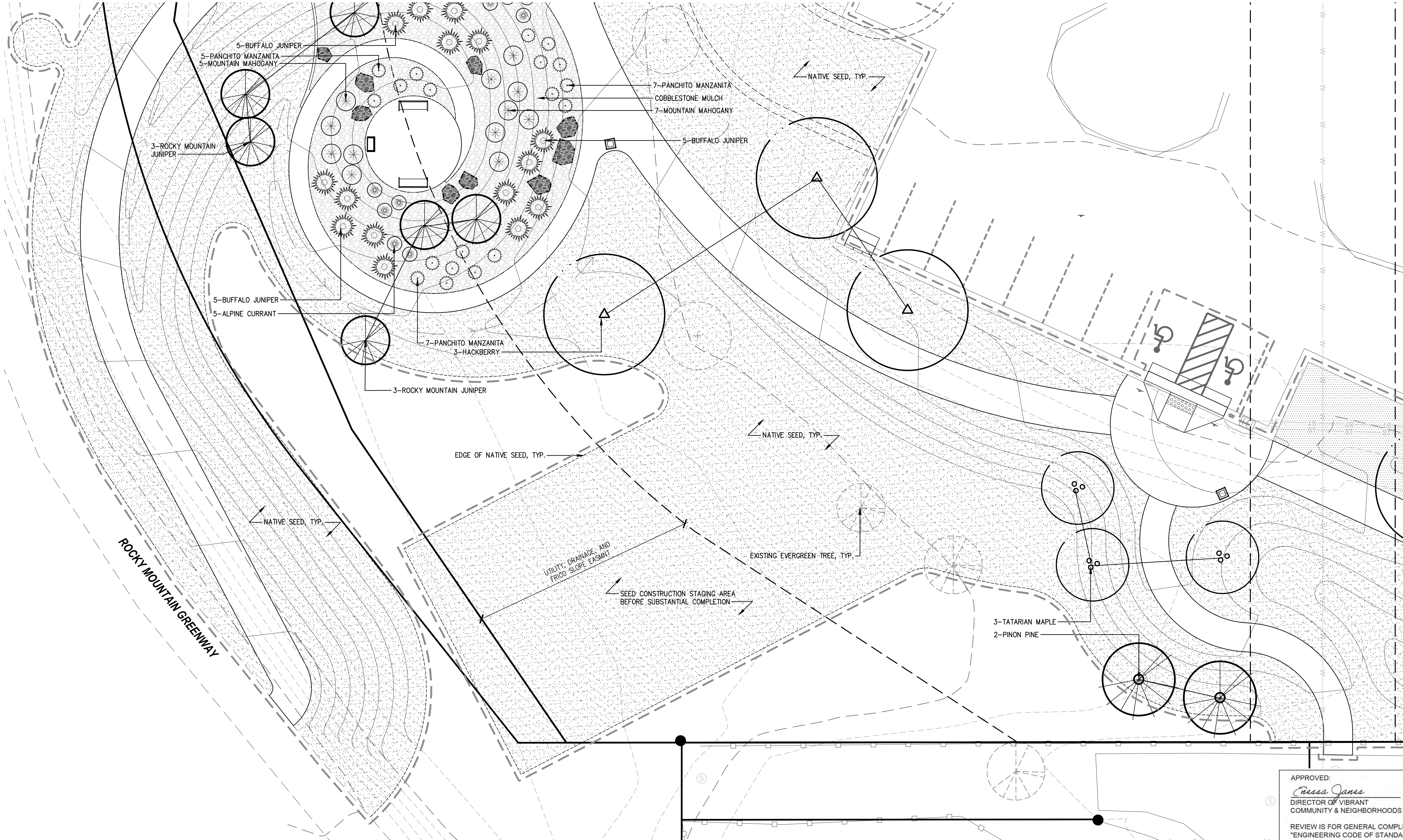
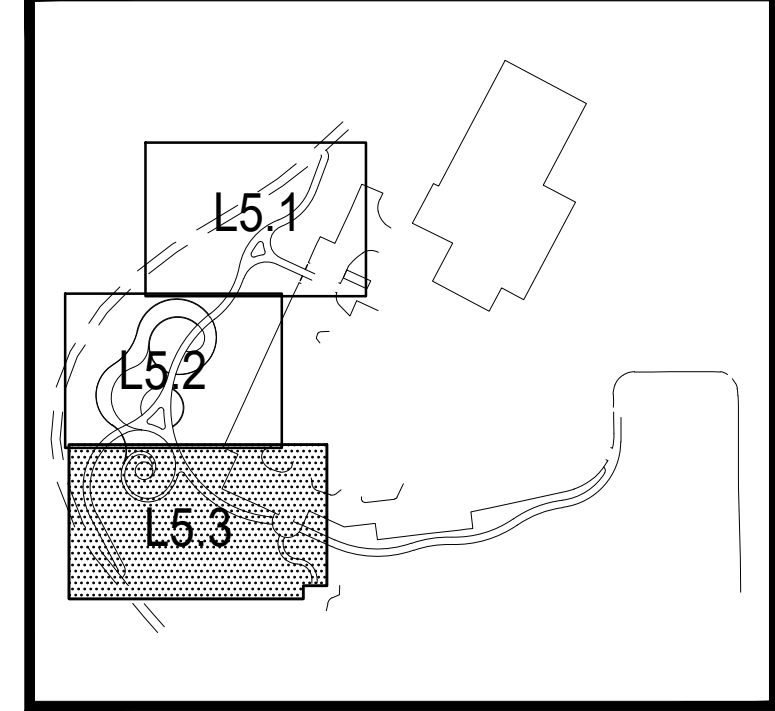
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LEGEND

— — — — —	PROPERTY LINE	— — — — —	LIMITS OF DISTURBANCE	○	ORNAMENTAL TREE
— — — — —	EASEMENT LINE	=====	CONCRETE EDGER	⊗	EVERGREEN
— ST — ST —	EX. STORMWATER SEWER LINE	◆ ◆ ◆	LANDSCAPE BOULDER	○	DECIDUOUS TREE
— X — X —	EX. FENCE	— — — — —	CONTOUR — MINOR		
○	EX. LIGHT POLE	— — — — —	CONTOUR — MAJOR		
□	EX. POWER POLE	[Pattern]	BLUEGRASS SOD		
▲	EX. SURVEY MARKER	[Pattern]	NATIVE SEED		
⊙	EX. MANHOLE	[Pattern]	COBBLESTONE MULCH		
⊕	EX. TELEPHONE POLE				
⊞	EX. ELECTRICAL BOX				
— — — — —	EX. EDGE OF BLUEGRASS				
○	EX. DECIDUOUS TREE				
⊗	EX. EVERGREEN TREE				
— — — — —	EX. CONTOUR — MAJOR				
— — — — —	EX. CONTOUR — MINOR				

KEYMAP



1 SOUTH ENLARGEMENT AREA

APPROVED:
Cressa Jones
DIRECTOR OF VIBRANT
COMMUNITY & NEIGHBORHOODS

11/22/23
DATE

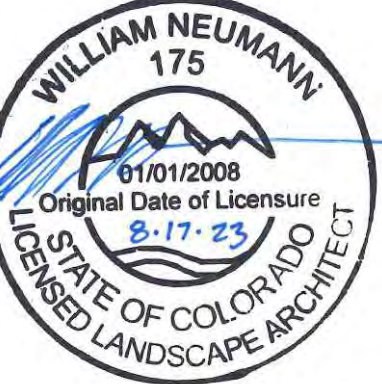
DA2023-0024
JOB NUMBER

REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA "ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION. SOLE RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THESE DOCUMENTS SHALL REMAIN WITH THE REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT SEALING THESE PLANS. THE CITY DOES NOT ACCEPT LIABILITY FOR FACILITIES DESIGNED BY OTHERS.

DHM DESIGN

900 S. Broadway
Suite 300
Denver, CO 80209
303.892.5566
www.dhmdesign.com

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professional service and shall not
be used for any other project
without written authorization of
DHM Design Corp.



Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO

PROJECT NUMBER:
22039

DATE
10-04-2023

DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

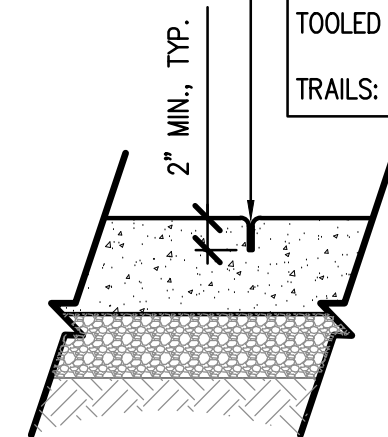
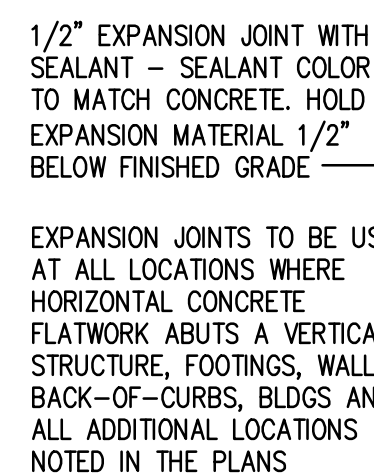
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CONSTRUCTION
DOCUMENTS

SHEET TITLE:
PLANTING
ENLARGEMENT
PLAN

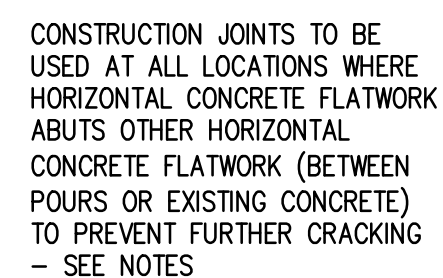
SHEET NUMBER:

L5.3

1. REFER TO THE CITY'S STANDARD SPECIFICATIONS FOR CONCRETE MIX AND TESTING REQUIREMENTS.
2. APPLY **MEDIUM BROOM FINISH** PERPENDICULAR TO TRAFFIC FLOW.
3. CONCRETE TO BE COLOR: **STANDARD GRAY**. AT CERTAIN LOCATIONS SHOWN ON THE PLANS, CONCRETE COLOR TO BE: **DAVIS COLOR OMAHA TAN 5084**. ALL FINISH SURFACES TO DRAIN AT 1.8% MAXIMUM CROSS SLOPE, UNLESS OTHERWISE NOTED.
4. CONTRACTOR TO DETERMINE LOCATION OF CONTROL JOINTS (TOOLED JOINTS TO CONTROL CRACKING) VS. CONSTRUCTION JOINTS (SEPARATE POURS TO CONTROL CRACKING) TO PREVENT CRACKS FROM FOLLOWING THROUGH AT END OF CONTROL JOINTS.
5. ALL FLATWORK SCORING MUST TERMINATE PERPENDICULAR TO EDGE OF CONCRETE, NO EXCEPTIONS UNLESS ADVISED BY OWNER AND/OR LANDSCAPE ARCHITECT
6. CONTRACTOR TO COORDINATE WITH LANDSCAPE ARCHITECT PRIOR TO POURING ANY CONCRETE TO REVIEW SCORING/SAW-CUTTING
7. LANDSCAPE ARCHITECT TO REVIEW FORMS PRIOR TO POURING OF ANY CONCRETE UNTIL NOTIFIED OTHERWISE.



CONTROL JOINT



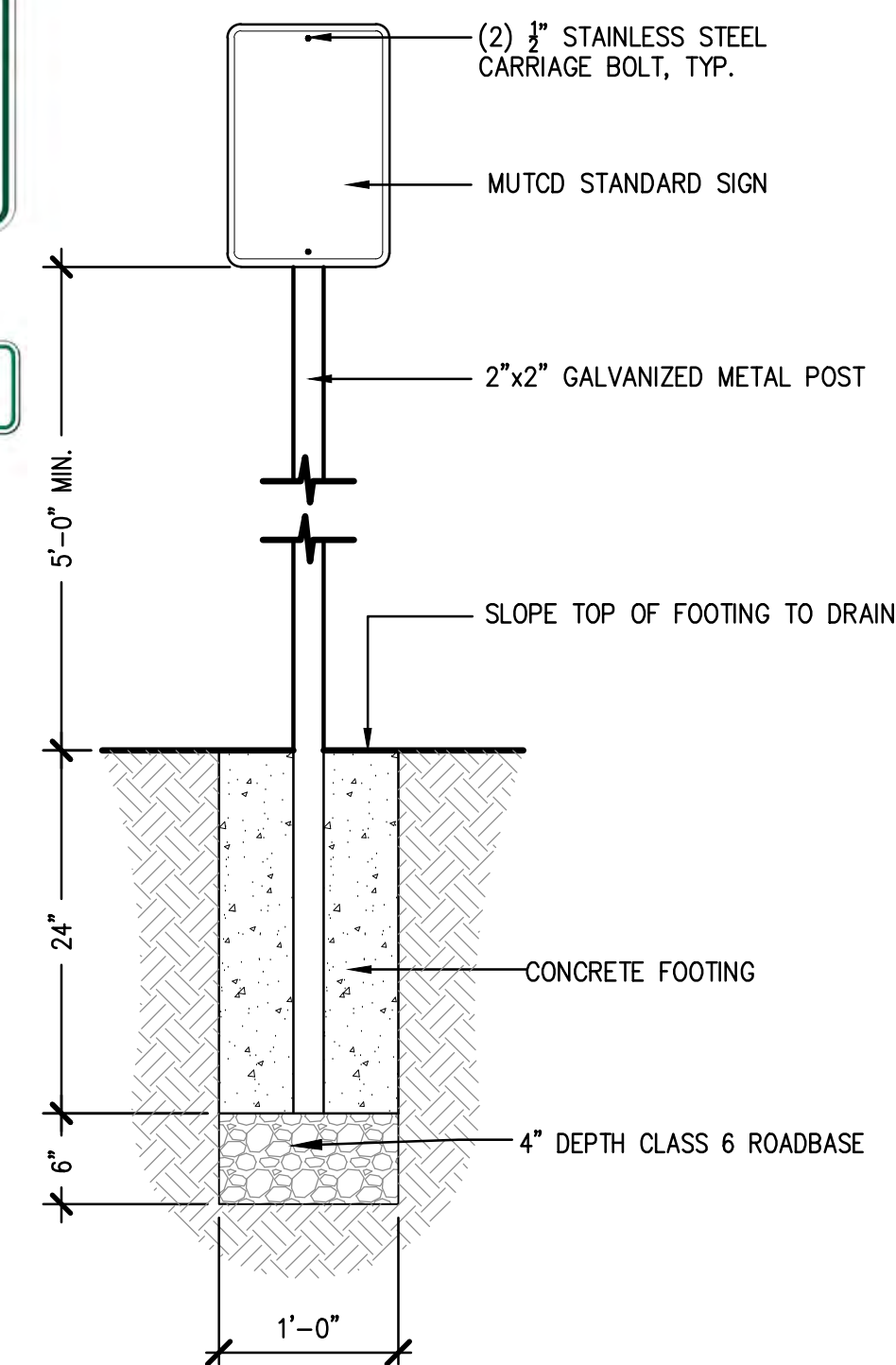
1. 4000 PSI CONCRETE
2. PROVIDE SAW-CUT CONTROL JOINTS AS SHOWN ON PLANS, 4'-0" O.C., TYP
3. ALL #4 REBAR TO BE EPOXY COATED
4. ALL CONCRETE EDGER COLOR TO BE GRAY



R7-8



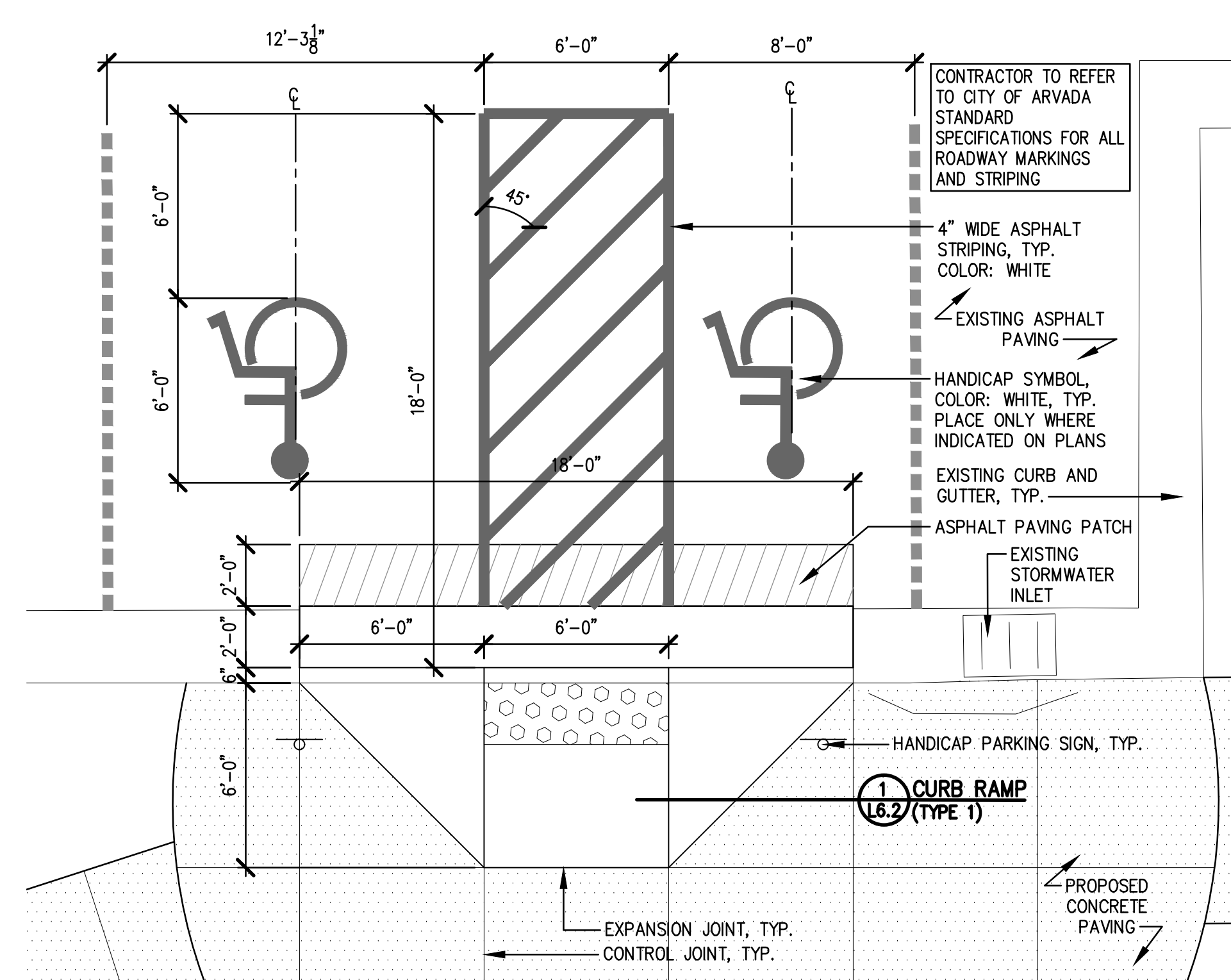
R7-8



SCALE: NTS

SCALE: NTS

SCALE: NTS



SCALE: NTS

SCALE: NTS

SCALE: NTS

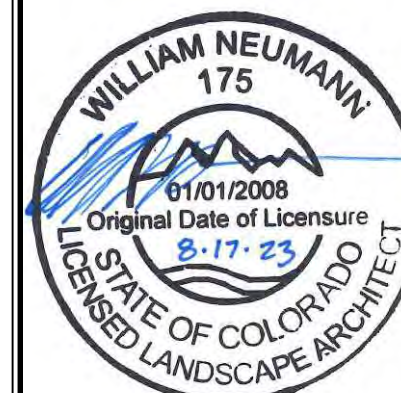
Jenny Wolschlag PE.
City Engineer

11/20/23	DA2023-0024
<u>Date</u>	<u>Job Number</u>

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER:	DATE
22039	10-04-2023

DESIGNED: KD
DRAWN: KD
CHECKED: MTW

REVISIONS:

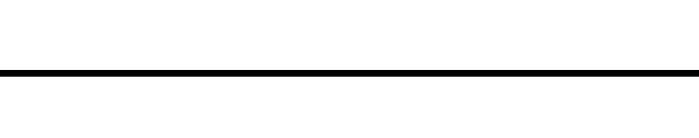
JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
SITE DETAILS

SHEET NUMBER:

L6.0

FILE NAME
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PLOT DATE: Oct 02, 2023 - 11:41am

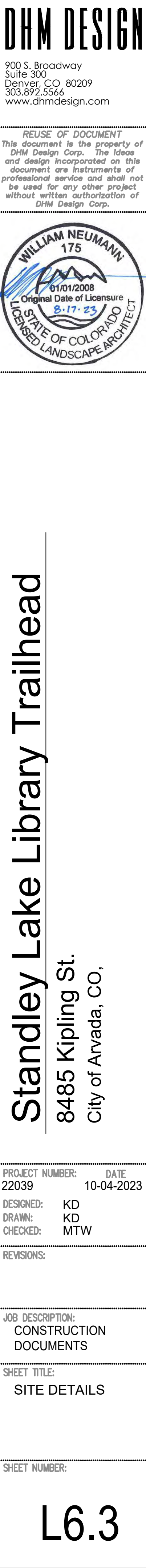
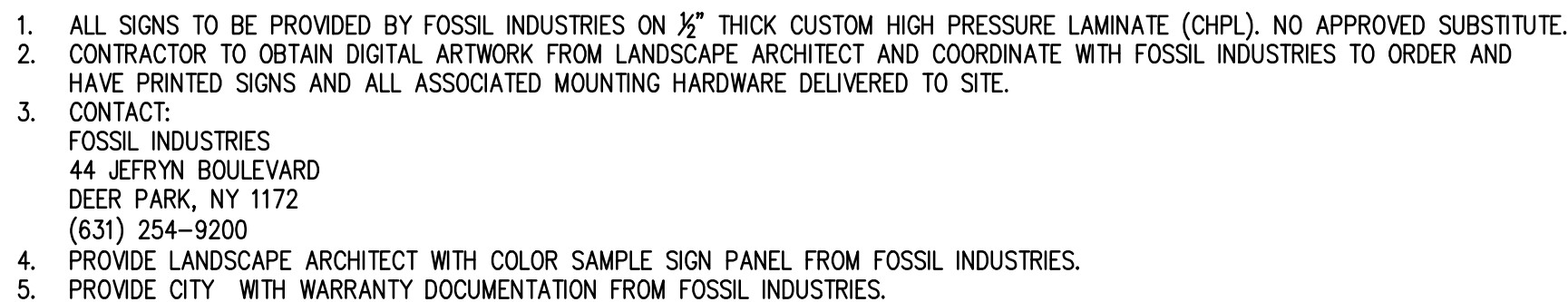


SCALE: NTS

8485 Kipling St.
City of Arvada, CO,

L6.1

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FILE NAME P:\Power\ARWIDA-STANLEY LAKE LIBRARY TRAILHEAD-22039\7_CD\JMD\Sheet\09-22039-SITE DETAILS.dwg

SCALE: NTS

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REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA
"ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR
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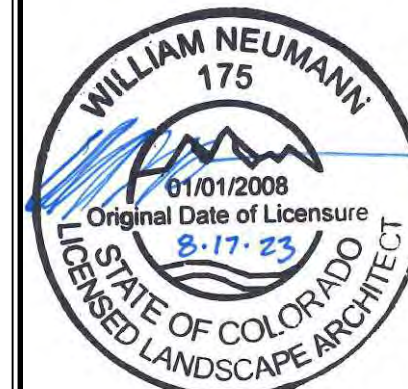


MANUFACTURER: MYTCOAT
MODEL: 8' RECTANGULAR PORTABLE TABLE,
PUNCHED STEEL, INDUSTRY STANDARD COATING
#TRT08-D-01-00 (QTY. 1) AND
#TRT08-D-01-01 ACCESSIBLE (QTY. 1)
COLOR: BLACK
INSTALL: SURFACE MOUNT WITH ANCHORING KIT

MANUFACTURER: MYTCOAT
MODEL: 8' RECTANGULAR PORTABLE TABLE,
PUNCHED STEEL, INDUSTRY STANDARD COATING
#TRT08-D-01-00 (QTY. 1) AND
#TRT08-D-01-01 ACCESSIBLE (QTY. 1)
COLOR: BLACK
INSTALL: SURFACE MOUNT WITH ANCHORING KIT

REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA
"ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR
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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 22039 DATE 10-04-2023

DESIGNED: KD
DRAWN: KD
CHECKED: MTW

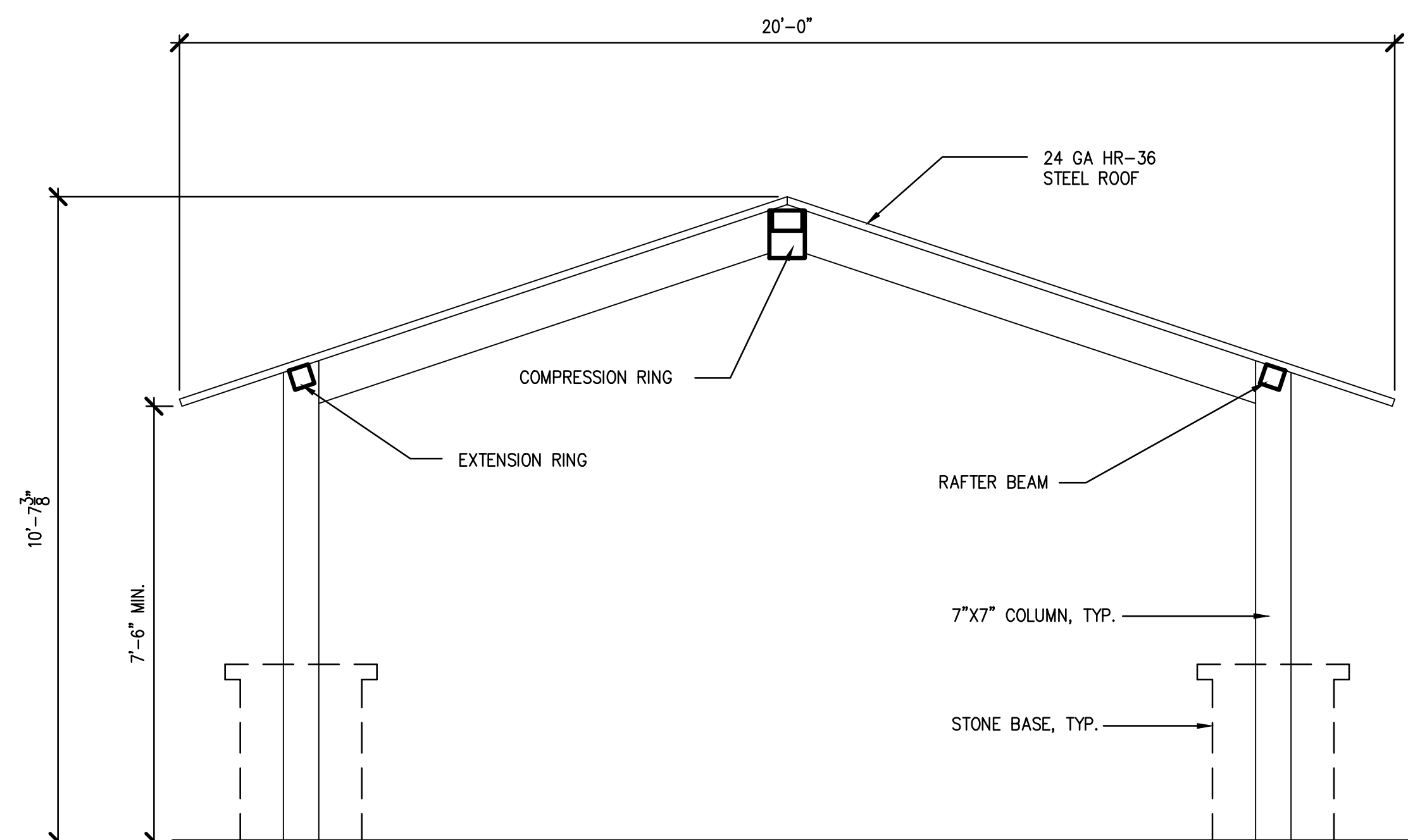
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
SITE DETAILS

SHEET NUMBER:

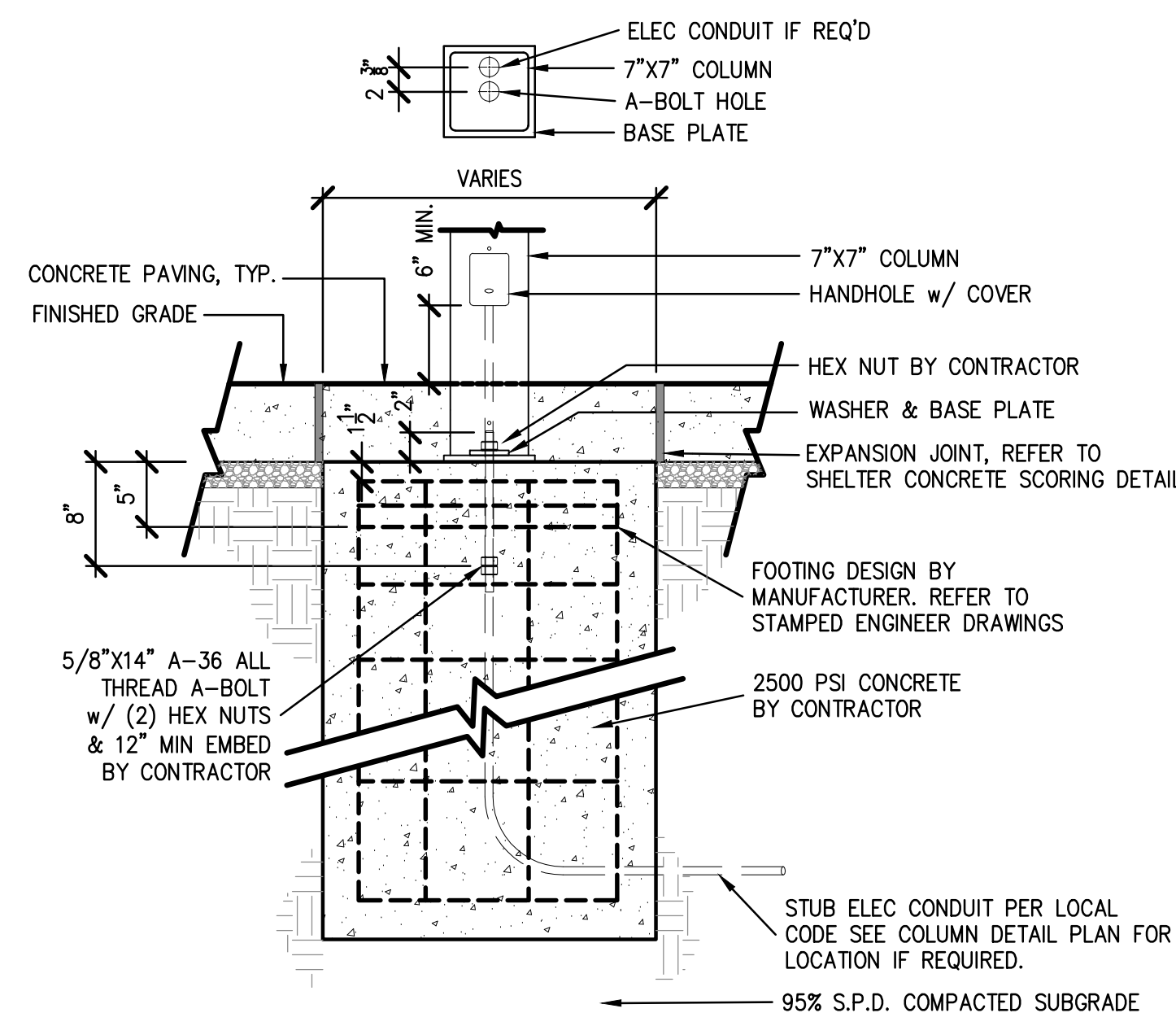
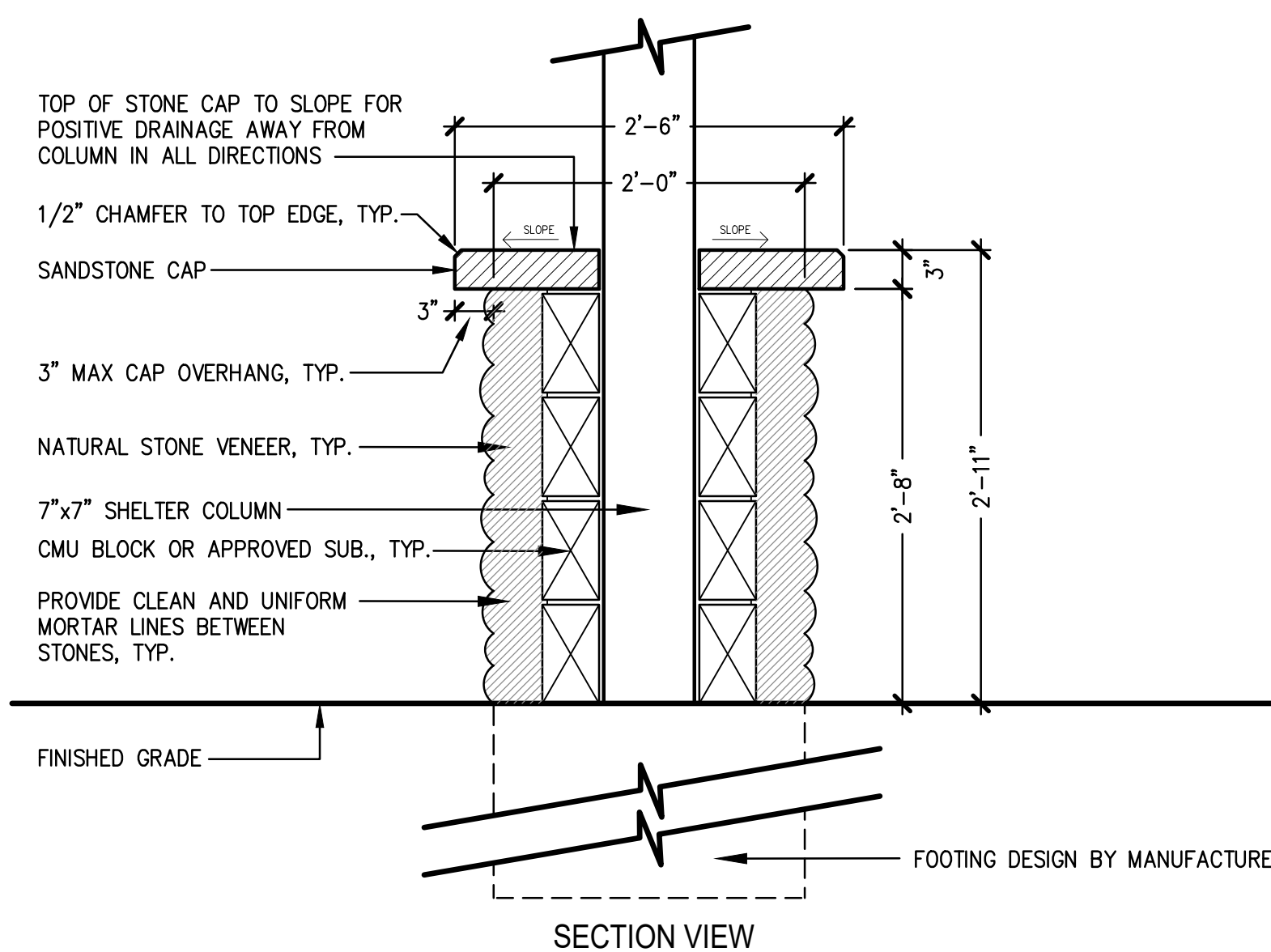
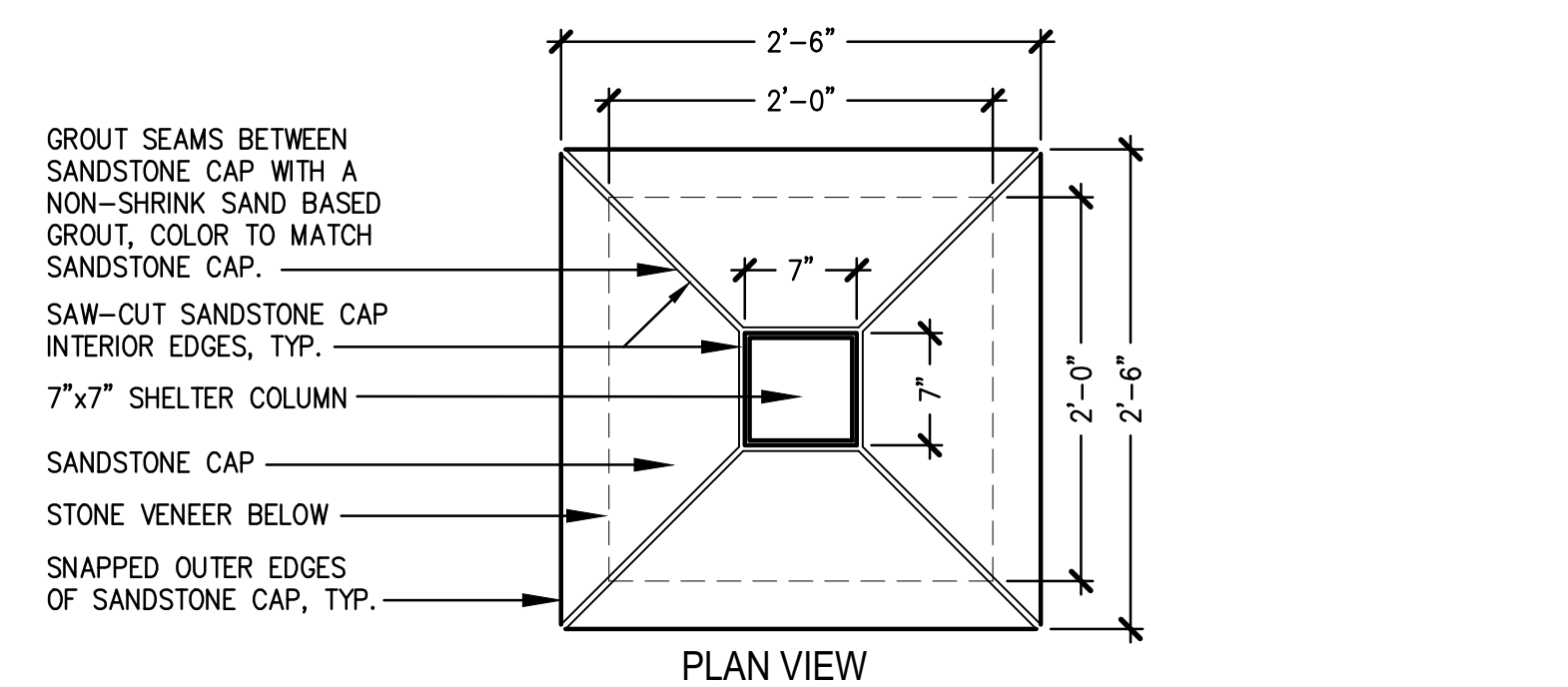
L6.5



NOTE:

1. NATURAL STONE VENEER TO BE SPLIT 4"-8" DIAMETER ROUNDED RIVER ROCK COBBLESTONE VENEER, COLOR: BUFF/TAN. CONTRACTOR TO PROVIDE SAMPLES FOR APPROVAL TO LANDSCAPE ARCHITECT AND OWNER REPRESENTATIVE.
2. UPON FINAL DECISION OF STONE VENEER COLOR, CONTRACTOR TO PROVIDE A 36"x36" STONE VENEER SAMPLE BOARD FOR OWNER AND LANDSCAPE ARCHITECT APPROVAL. NO VENEER SHALL BE PURCHASED OR PLACED UNTIL THIS SAMPLE BOARD IS PREPARED AND OWNER HAS SELECTED FINAL COLOR.
3. CONTRACTOR TO PROVIDE CLEAN MORTAR LINES ON FACE OF STONE VENEER AND MINIMIZE VISUAL IMPACT. REMOVE EXCESS MORTAR FROM FACE OF STONE.
4. MORTAR TO BE COLOR: GRAY

- **NOTES:**
 - **CONTRACTOR TO COORDINATE WITH MANUFACTURER TO ENSURE A MINIMUM CLEARANCE OF 7'-6" FROM FINISHED GRADE TO LOWEST POINT ON ROOF. ADJUST SHELTER POST HEIGHT TO ACCORD WITH PROPOSED SLOPE.**
 - **CONTRACTOR TO COORDINATE WITH MANUFACTURER TO ENSURE MINIMUM CLEARANCE OF 6" FROM FINISHED GRADE TO BOTTOM OF POST HANDHOLE COVER.**
 - **CONTRACTOR TO COORDINATE WITH MANUFACTURER TO ENSURE (1) GFCI ELECTRICAL OUTLET MOUNTED TO INSIDE FACE OF (1) COLUMN AT 6' HEIGHT.**
 - **CONTRACTOR TO ADJUST FOOTING DEPTH FOR LOCAL FROST CONDITIONS.**
 - **CONTRACTOR TO SUBMIT STAMPED ENGINEERED DRAWINGS TO OWNER AND LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO ORDERING.**



1 SHELTER

BY: CLASSIC RECREATION

BY: CLASSIC RECREATION SYSTEMS INC.
MODEL: ORLANDO 20x24
COLOR: FRAME-RAL 7042 (TRAFFIC GREY), ROOF-COLONIAL RED
SUBMIT SHOP DRAWINGS AND COLOR SAMPLES TO OWNER'S REPRESENTATIVE FOR APPROVAL
SUPPLIED BY: G.R. MAROLT & ASSOCIATES, LLC (303)-762-1090
NO APPROVED SUBSTITUTE

SCALE: NTS

STONE BASE

SCALE: NTS

APPROVED:

Enessa Jones
DIRECTOR OF VIBRANT
COMMUNITY & NEIGHBORHOODS

$$-\frac{11}{DA}$$

11/22/23	DA2023-0024
DATE	JOB NUMBER

REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA
"ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR
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SEALING THESE PLANS. THE CITY DOES NOT ACCEPT LIABILITY
FOR FACILITIES DESIGNED BY OTHERS.



Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 2204-00356 DATE 10.02.2023

DESIGNED: JMS
DRAWN: RRS
CHECKED: RRS

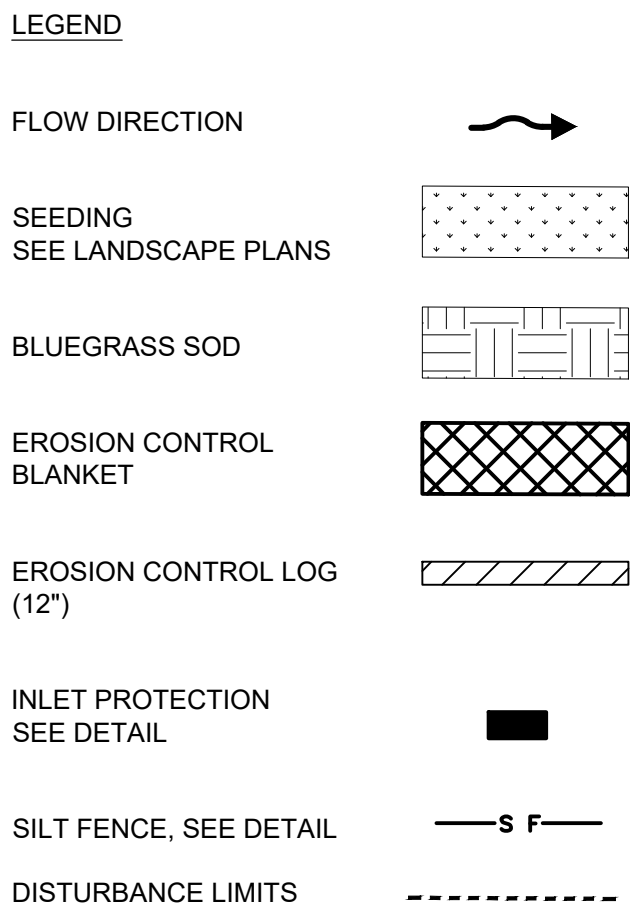
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
INITIAL EROSION CONTROL

SHEET NUMBER

C1.0



QUANTITIES	
CUT (CU YD)	1449
FILL (CU YD)	1155
DISTURBANCE AREA (SQ FT)	83,667

NOTES

1. CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEIPTALDS AND PORTABLE TOILETS UP TO CONTRACTOR. CONTRACTOR TO OBTAIN APPROVED CONTRACTOR STAGING AREA. CONTRACTOR TO VERIFY AND PROTECT ALL DOWN-GRADIENT DRAINAGE FROM STAGING AREA.
2. EROSION CONTROL BLANKET IS SHOWN AND TO BE INSTALLED ON ALL SLOPES STEEPER THAN OR EQUAL TO 3:1V:H.
3. CONTRACTOR SHALL UTILIZE A VEHICLE TRACK PAD FOR ALL PROPOSED VEHICLE EQUIPMENT ACCESS POINTS. IT IS INTENDED FOR IT TO BE USED FOR CONTRACTOR TO UTILIZE THE APPROVED STAGING AREA. ACCESS POINTS OUTSIDE OF THIS LOCATION NEED TO BE REQUESTED IN WRITING AND APPROVED PRIOR TO INSTALLATION AND USE. VEHICLE TRACK PADS ARE CONSIDERED INCIDENTAL TO THE BID ITEM "EROSION CONTROL MANAGEMENT".

STORM SEWER OUTLET
POMONA RESERVOIR
INV OUT = 5516.82

INFORMATION OBTAINED FROM 1991
STANDLEY LAKE LIBRARY FINAL
GRADING/DRAINAGE PLAN-AS BUILT

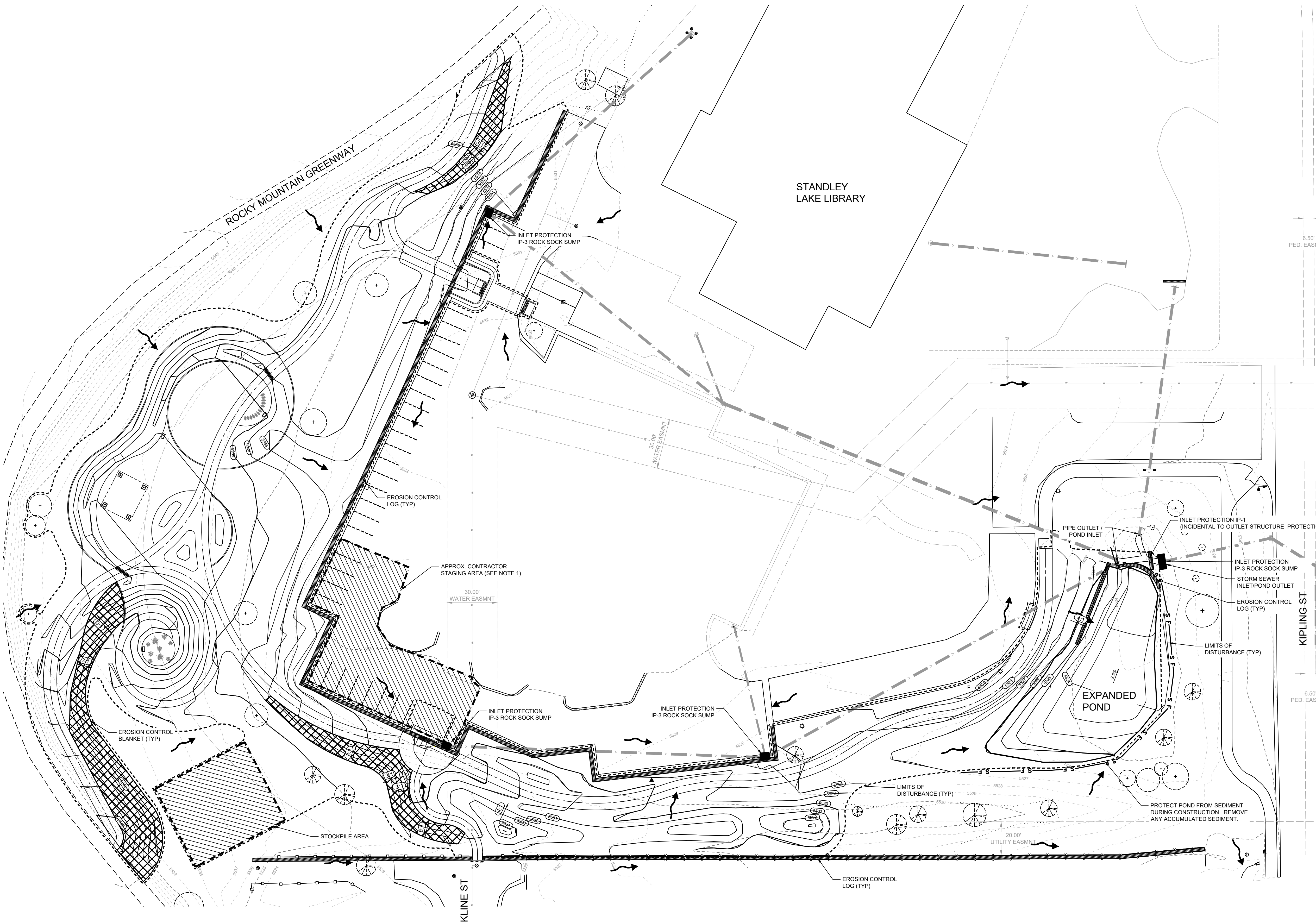


APPROVED:

Jenny Wolschlag PE
City Engineer

11/20/23	DA2023-0024
<u>Date</u>	<u>Job Number</u>

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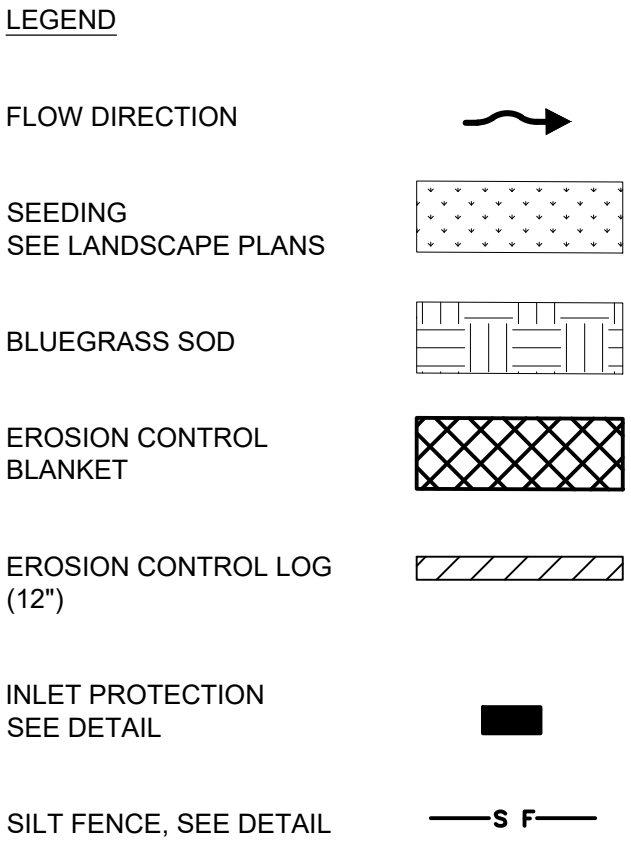
8485 Kipling St.
City of Arvada, CO,

SIGNED: JMS
AWN: RRS
CHECKED: RRS

B DESCRIPTION
CONSTRUCTION
DOCUMENTS

EET NUMBER:

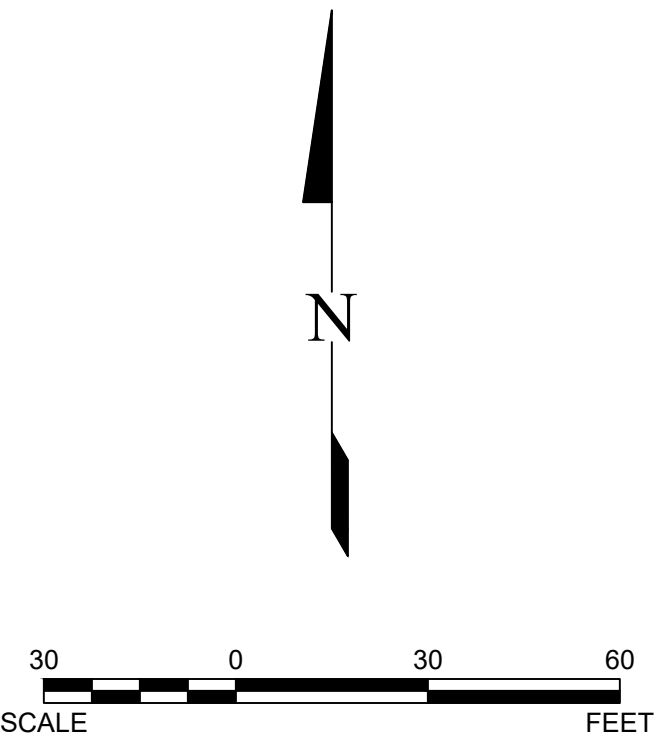
C1.1



QUANTITIES	
CUT (CU YD)	1449
FILL (CU YD)	1155
DISTURBANCE AREA (SQ FT)	83,667

NOTES

1. CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEIPTS/ACCESSIBLE AND PORTABLE TOILETS UP TO CONTRACTOR. CONTRACTOR SHALL OBTAIN APPROVED CONTRACTOR STAGING AREA. CONTRACTOR TO VERIFY AND PROTECT ALL DOWN-GRADIENT DRAINAGE FROM STAGING AREA.
2. EROSION CONTROL BLANKET IS SHOWN AND TO BE INSTALLED ON ALL SLOPES STEEPER THAN OR EQUAL TO 3H:1V.
3. CONTRACTOR SHALL UTILIZE A VEHICLE TRUCK PAD FOR ALL PROPOSED VEHICLE/EQUIPMENT ACCESS POINTS. IT IS INTENDED FOR THE CONTRACTOR TO UTILIZE THE APPROVED STAGING AREA. ACCESS POINTS OUTSIDE OF THIS LOCATION NEED TO BE REQUESTED IN WRITING AND APPROVED PRIOR TO INSTALLATION AND USE. VEHICLE TRUCK PADS ARE CONSIDERED INCIDENTAL TO THE BID ITEM "EROSION CONTROL MANAGEMENT".



APPROVED:

Jenny Wolschlag PE.
City Engineer

11/20/23
Date

DA2023-0024

Job Number

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8485 Kipling St.
City of Arvada, CO,

SIGNED: JMS
AWN: RRS
CHECKED: RRS

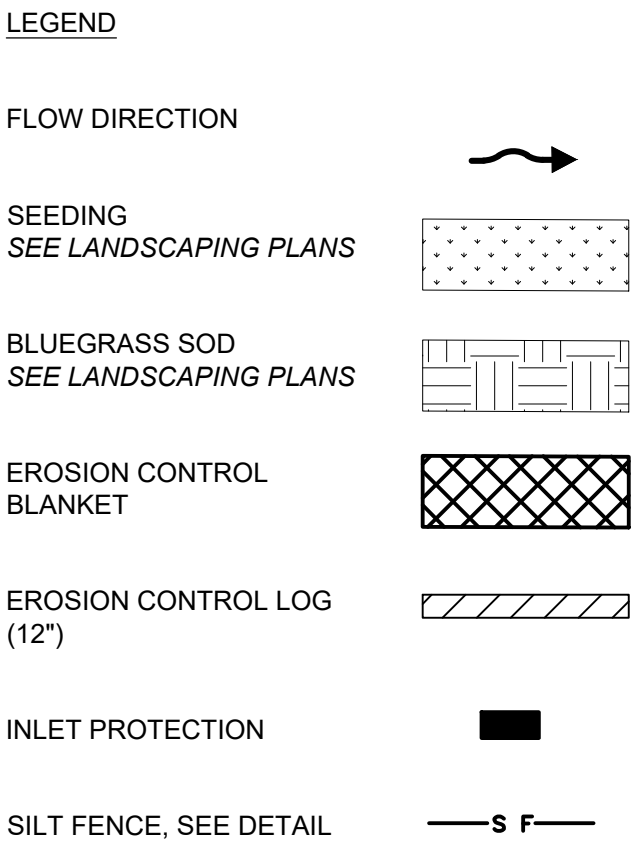
VISIONS:

B DESCRIPTION:
CONSTRUCTION
DOCUMENTS

PROJECT TITLE: WATER EROSION CONTROL

EET NUMBER:

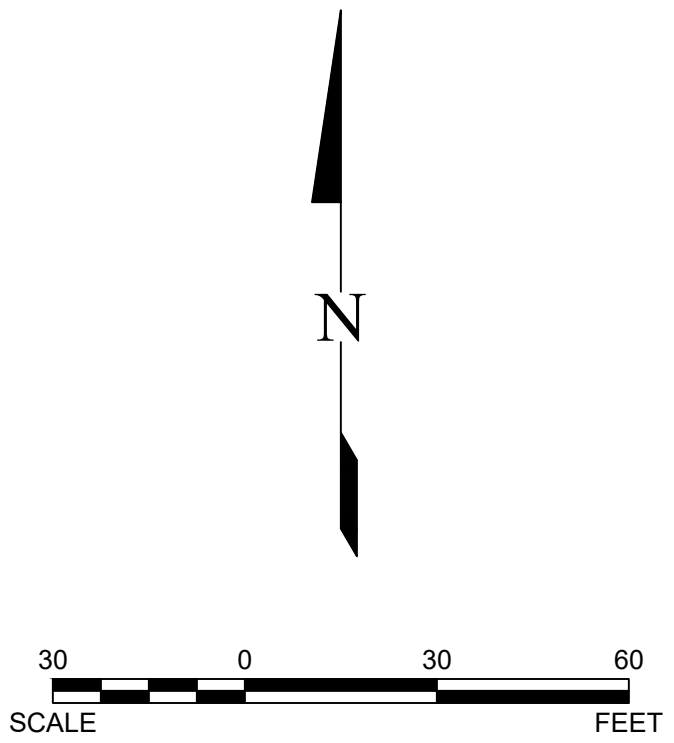
C1.2



QUANTITIES	
CUT (CU YD)	1449
FILL (CU YD)	1155
DISTURBANCE AREA (SQ FT)	83,667

NOTES

1. CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEPTABLES AND PORTABLE TOILETS UP TO CONTRACTOR TO OBTAIN PERMITS FROM CITY AND LIBRARY. CONTRACTOR STAGING AREA. CONTRACTOR TO VERIFY AND PROTECT ALL DOWN-GRADIENT DRAINAGE FROM STAGING AREA.
2. EROSION CONTROL BLANKET IS SHOWN AND TO BE INSTALLED ON ALL SLOPES STEEPER THAN 1:1 TO 3H:1V.
3. CONTRACTOR SHALL UTILIZE A VEHICLE TRACK PAD FOR ALL PROPOSED VEHICLE/EQUIPMENT ACCESS POINTS. IT IS INTENDED FOR THE CONTRACTOR TO UTILIZE THE APPROVED STAGING AREA. ACCESS POINTS OUTSIDE OF THIS LOCATION NEED TO BE REQUESTED IN WRITING AND APPROVED PRIOR TO INSTALLATION AND USE. VEHICLE TRACK PADS ARE CONSIDERED INCIDENTAL TO THE BID ITEM "VEHICLE EROSION CONTROL MANAGEMENT".



APPROVED:

Jenny Wolschlag PE.
City Engineer

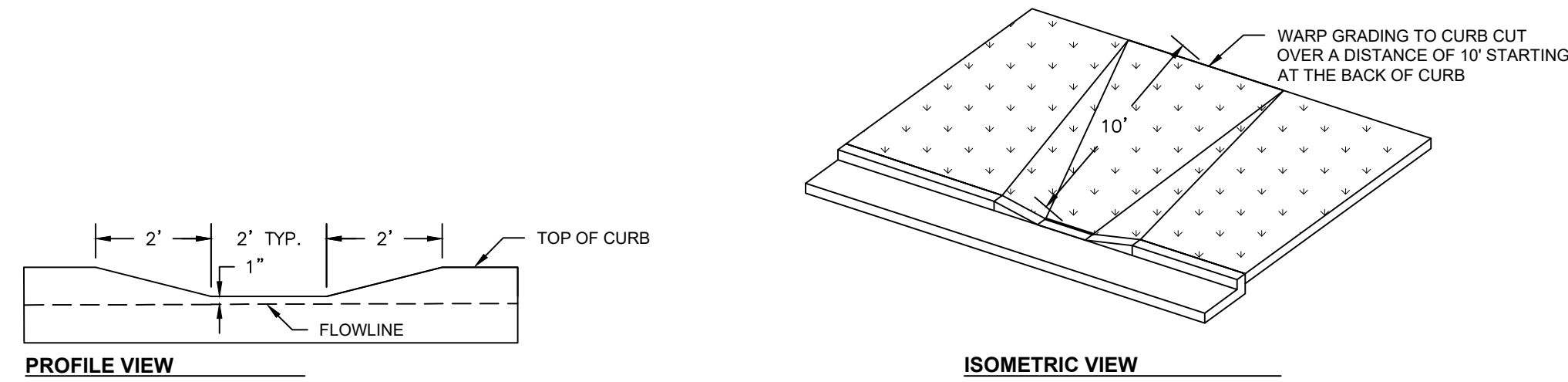
Date 11/20/

DA2023-0024

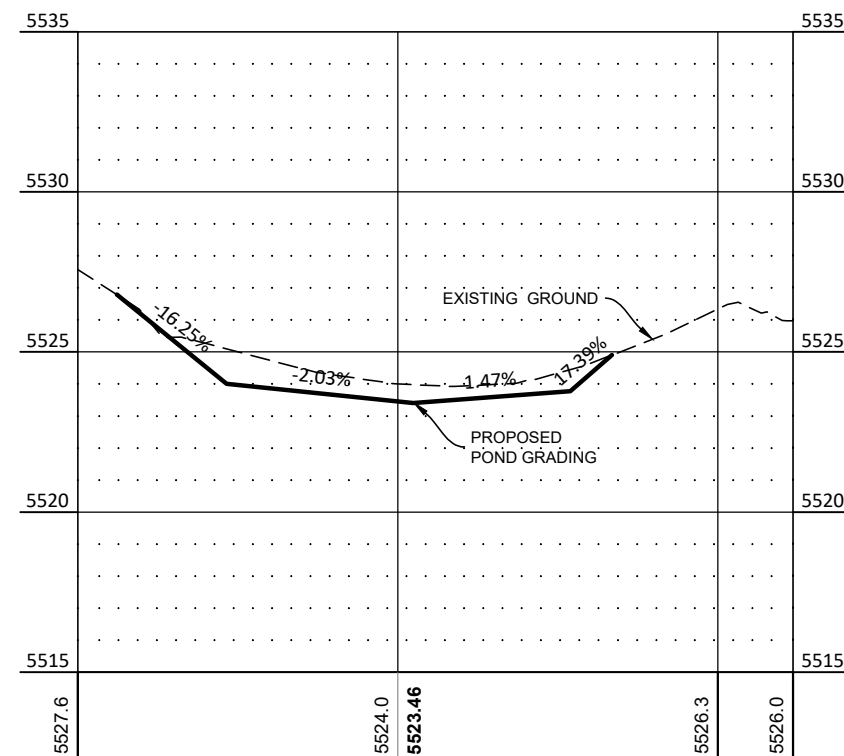
Job Number

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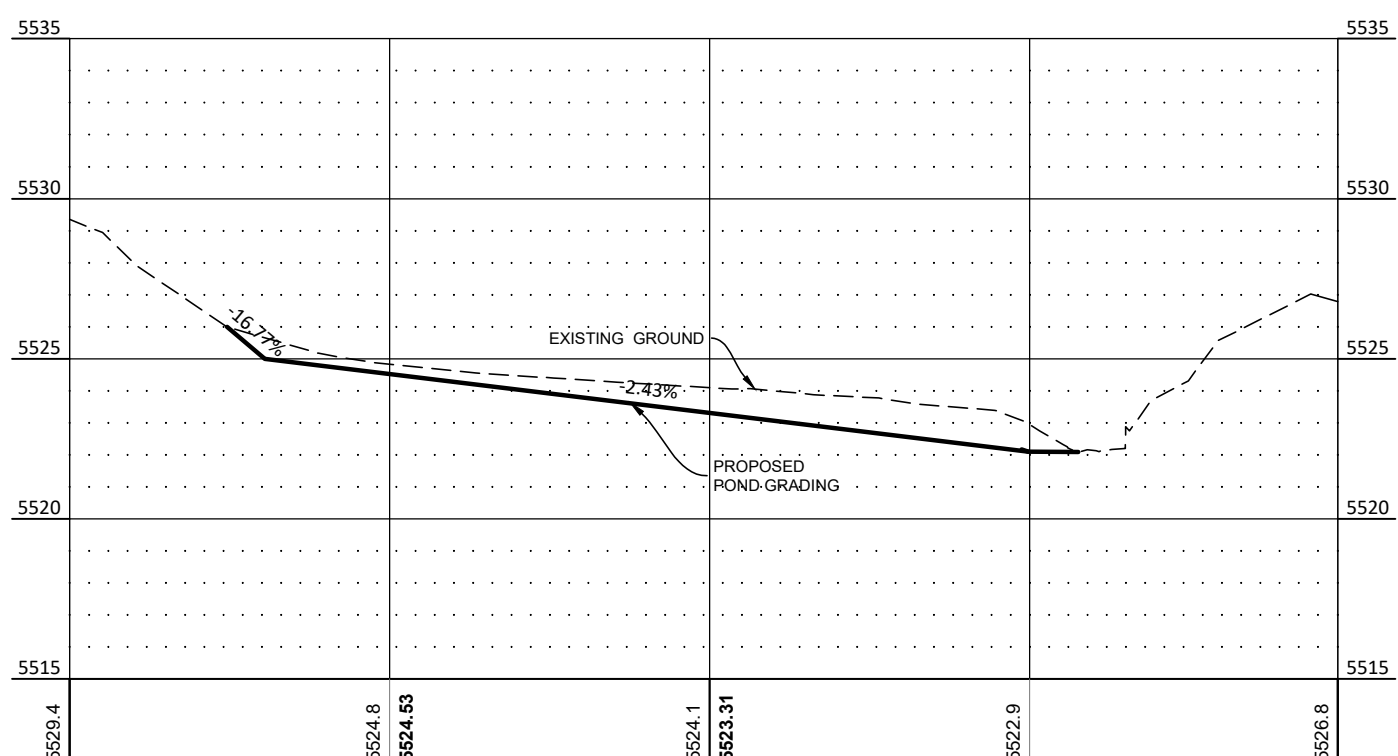
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DRAINAGE CURB CUT DETAIL



SECTION A-A



SECTION B-B

LEGEND

PROPOSED ELEV

XXX.XX

FLOW DIRECTION



NOTES

- CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEPTACLES AND PORTABLE TOILETS UP TO CONTRACTOR'S DISCRETION, WITHIN APPROVED CONTRACTOR STAGING AREA.

Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO

PROJECT NUMBER: 2204-00356 DATE 10.02.2023

DESIGNED: JMS
DRAWN: RRS
CHECKED: RRS

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
DRAINAGE IMPROVEMENTS

SHEET NUMBER:

C2.0

APPROVED:

City Engineer

11/20/23

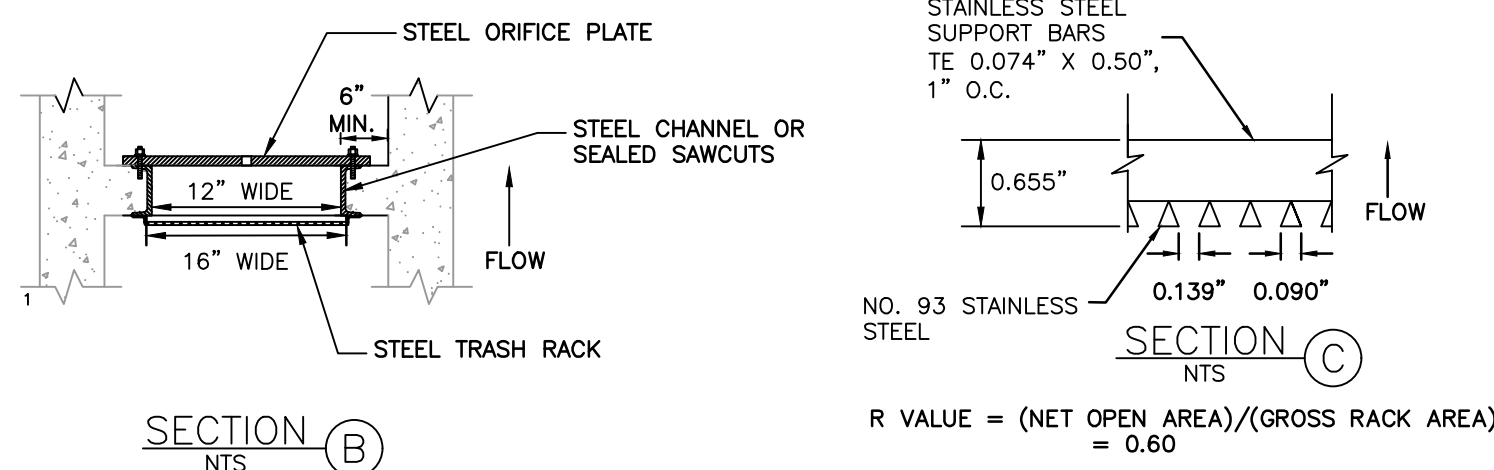
Date

DA2023-0024
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8485 Kipling St.
City of Arvada, CO,

C2.1



OUTLET STRUCTURE NOTES:

1. CONTRACTOR SHALL PROPERLY SECURE AND SUPPORT SAFETY GRATE.
2. CONTRACTOR SHALL SAWCUT VERTICAL CUTS TO REMOVE THE EXISTING ORIFICE. THIS REMOVAL SHALL CREATE A 12" WIDE OPENING.

GENERAL STRUCTURE NOTES:

1. ANY NEW COMPONENTS ON THE OUTLET STRUCTURE SHALL MEET THE REQUIREMENTS IN "T-12 OUTLET STRUCTURES" FROM THE MILE HIGH FLOOD DISTRICT (MHFD) DETAILS ON OUTLET STRUCTURES. MATERIALS SHOWN ABOVE WERE REFERENCED FROM THE MHFD DETAILS.

APPROVED:

 PE.	11/20/23	DA2023-0024
City Engineer	Date	Job Number

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DISTRIBUTION AND RACEWAY	
	MAIN DISTRIBUTION CENTER (MDC)
	SURFACE MTD PANELBOARD
	RECESSED PANELBOARD
	TRANSFORMER
	BRANCH CIRCUIT HOMERUN
	CONDUIT CONCEALED IN FLOOR OR UNDERGROUND
	CONDUIT EXPOSED OR CONCEALED IN WALL OR CEILING
	RACEWAY UP
	RACEWAY DOWN
	CAPPED CONDUIT
	CURRENT TRANSFORMER
	CIRCUIT BREAKER SWITCH
	FUSED SWITCH
	GROUNDING ELECTRODE CONDUCTOR
	METER
	GROUND FAULT PROTECTION

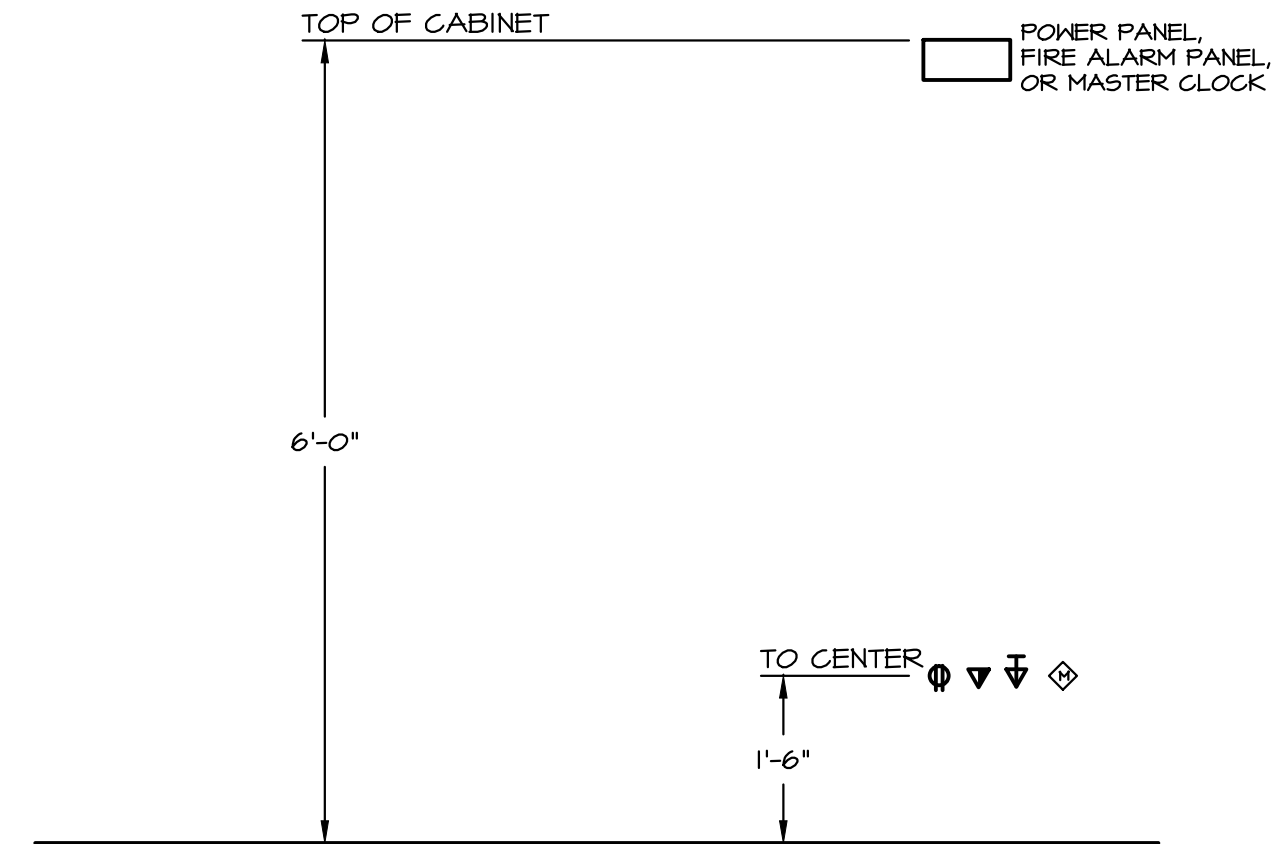
ABBREVIATIONS AND SYMBOLS	
A	AMPERE(S)
AC	ABOVE COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
AIC	AMPERES INTERRUPTING CAPACITY
ATS	AUTOMATIC TRANSFER SWITCH
BFF	BELOW FINISHED FLOOR
C	CONDUIT
CATV	CABLE TELEVISION
CB	CIRCUIT BREAKER
CCT	CORRELATED COLOR TEMPERATURE
CL6	CEILING
CT	CURRENT TRANSFORMER
DED	DEDICATED CIRCUIT
DISC	DISCONNECT
DW	DISHWASHER
DWS(S)	DRAWING(S)
(E)	EXISTING TO REMAIN
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
(ER)	EXISTING TO BE RELOCATED
EM	EMERGENCY
EPO	EMERGENCY POWER OFF
EWG	ELECTRIC WATER COOLER
F	FUSE
FLA	FULL LOAD AMPS
G	GROUND
GC	GENERAL CONTRACTOR
GD	GARBAGE DISPOSAL
GFI	GROUND FAULT CIRCUIT INTERRUPTER
GFP	GROUND FAULT PROTECTION
HP	HORSEPOWER
IDF	INTERMEDIATE DISTRIBUTION FACILITY
IG	ISOLATED GROUND
ISC	SHORT CIRCUIT CURRENT
KVA	KILOVOLT AMPERE(S)
KW	KILOWATT(S)
LTS	LIGHTING
MCA	MINIMUM CIRCUIT AMPERE(S)
MCB	MAIN CIRCUIT BREAKER
MDP	MAIN DISTRIBUTION CENTER
MDF	MAIN DISTRIBUTION FACILITY
MLO	MAIN LUGS ONLY
MTS	MANUAL TRANSFER SWITCH
MW	MICROWAVE
NC	NORMALLY CLOSED
NL	NIGHT LIGHT - SEE GENERAL NOTES
NO	NORMALLY OPEN
OAE	OR APPROVED EQUAL
OH	OVERHEAD
P	POLE
PART	PARTIAL CIRCUIT
PH, Ø	PHASE
PNL	PANEL
(R)	REMOVED, EXISTING TO BE REMOVED
RCPT	RECEPTACLE
REF	REFRIGERATOR
(RL)	RELOCATED LOCATION
SPD	SURGE PROTECTION DEVICE
UC	UNDER COUNTER/CABINET
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
V	VOLT(S)
W	WATT(S) OR WIRE
WG	WIRE GUARD
WP	WEATHERPROOF
XFMR	TRANSFORMER
	POOL EQUIPMENT SCHEDULE NOTATION
	KITCHEN EQUIPMENT SCHEDULE NOTATION
	MECHANICAL EQUIPMENT SCHEDULE NOTATION
	DETAIL NOTE
	DELTA REVISION NOTE
	ELECTRICAL WIRE SIZE
	LIGHTING CONTROLS SEQUENCE OF OPERATION
	DETAIL REFERENCE TAG
	CENTER LINE DESIGNATION

LIGHTING FIXTURES	
	LUMINAIRE TYPE, REFERENCING LUMINAIRE SCHEDULE, TYPICAL ALL FIXTURES. SUBSCRIPT, IF SHOWN, REFERENCES WALL SWITCH OR RELAY/ZONE CONTROL.
	WALL MOUNTED LUMINAIRE
	SURFACE OR PENDANT MOUNTED LUMINAIRE
	RECESSED LUMINAIRE
	DOWNLIGHT LUMINAIRE
	SURFACE CEILINGS LUMINAIRE
	PENDANT LUMINAIRE
	ARROW INDICATES DIRECTIONAL LUMINAIRE
	MONOPOINT LUMINAIRE
	SURFACE OR PENDANT TRACK LUMINAIRE REFER TO FIXTURE SCHEDULE FOR HEAD QTY.
	LED TAPE LUMINAIRE
	FESTOON LIGHTING
	RECESSED MULTI-HEAD LUMINAIRE
	FLOOR OR TABLE LAMP
	EXIT LUMINAIRE - SHADED INDICATES FACE/DIRECTIONAL ARROWS AS SHOWN.
	BATTERY PACK EMERGENCY LUMINAIRE
	HATCH INDICATES EMERGENCY LUMINAIRE
	PORCELAIN KEYLESS LAMP HOLDER
	STEP LIGHT TYPE LUMINAIRE
	IN-GRADE UPLIGHT
	BOLLARD
	PEDESTRIAN POLE OR POST TOP LUMINAIRE
	EXTERIOR AREA LIGHT

WIRING DEVICES	
	DUPLEX RECEPTACLE
	FOUR PLEX RECEPTACLE
	SINGLE RECEPTACLE
	COMBO RECEPTACLE/SWITCH
	SWITCHED DUPLEX RECEPTACLE
	SPECIAL PURPOSE RECEPTACLE
	FLOOR MOUNTED SPECIAL PURPOSE RECEPTACLE
	FLOOR MOUNTED RECEPTACLE DUPLEX/QUAD
	SURFACE RACEWAY
	CLOCK RECEPTACLE
	JUNCTION BOX
	WALL MOUNTED J-BOX
	FLOOR MOUNTED JUNCTION BOX
	MOLDED CASE CIRCUIT BREAKER IN ENCLOSURE
	NON-FUSED DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH
	MAGNETIC CONTROLLER (STARTER)
	COMBINATION STARTER/DISCONNECT SWITCH
	MOTOR
	RELAY
	TIME CLOCK
	PHOTOCELL
	THERMAL OVERLOAD SWITCH
	SINGLE POLE SWITCH
	3-WAY SWITCH
	4-WAY SWITCH
	KEY OPERATED SWITCH
	DIMMER SWITCH
	RECESSED DOOR SWITCH
	LIGHTING CONTROL DEVICE. REFER TO DETAILS FOR CONTROL INTENT.

ELECTRICAL GENERAL NOTES

- THE CONTRACTOR SHALL PROVIDE ALL LABOR AND MATERIAL NECESSARY FOR A COMPLETE AND FUNCTIONING ELECTRICAL SYSTEM.
- MATERIALS AND INSTALLATION SHALL COMPLY WITH CODES, LAWS AND ORDINANCES OF FEDERAL, STATE AND LOCAL GOVERNING BODIES HAVING JURISDICTION.
- MATERIALS AND EQUIPMENT SHALL BE LISTED AND/OR LABELED BY UL, ETL, CSA OR ANOTHER RECOGNIZED TESTING LAB.
- ALL WORK REQUIRED FOR THE INSTALLATION AS SHOWN ON DRAWINGS INCLUDING LABOR, EQUIPMENT AND MATERIALS SHALL BE IN STRICT COMPLIANCE WITH THE BUILDING STANDARDS, EXCEPT AS NOTED OTHERWISE.
- THE CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS, GOVERNMENTAL FEES, TAXES AND LICENSES NECESSARY FOR THE PROPER EXECUTION AND COMPLETION OF THE ELECTRICAL WORK.
- THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER/OWNER OF ANY MATERIALS OR APPARATUS BELIEVED TO BE INADEQUATE, UNSUITABLE, IN VIOLATION OF LAWS, ORDINANCES, RULES OR REGULATIONS OF AUTHORITIES HAVING JURISDICTION.
- FOR ALL JOBS THAT INCLUDE DEMOLITION WORK BY THE ELECTRICAL CONTRACTOR, DURING AND AFTER DEMOLITION, EC SHALL MAINTAIN CIRCUIT CONTINUITY TO ALL EXISTING DEVICES THAT ARE TO REMAIN. EC SHALL REMOVE, RELOCATE, AND/OR REWORK ANY CONDUIT AND WIRING TO FACILITATE THE NEW CONSTRUCTION SCOPE OF WORK. FOR ALL LUMINAIRES THAT ARE EXISTING TO REMAIN OR EXISTING TO BE RELOCATED, EC SHALL CLEAN LENSES AND REPLACE ALL EXTINGUISHED LAMPS, UON.
- THE CONTRACTOR SHALL CAREFULLY EXAMINE THE CONTRACT DOCUMENTS, VISIT THE SITE, AND THOROUGHLY BECOME FAMILIAR WITH THE BUILDING STANDARDS AND LOCAL CONDITIONS RELATING TO THE WORK. FAILURE TO DO SO WILL NOT RELIEVE THE CONTRACTOR OF THE OBLIGATIONS OF THE CONTRACT.
- ALL MATERIALS, AND EQUIPMENT SHALL BE ERECTED, INSTALLED, CONNECTED, CLEANED, ADJUSTED, TESTED, CONDITIONED, AND PLACED IN SERVICE IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS AND RECOMMENDATIONS.
- ALL CUTTING, DRILLING AND PATCHING OF MASONRY, STEEL OR IRON WORK BELONGING TO THE BUILDING MUST BE DONE BY THIS CONTRACTOR IN ORDER THAT THEIR WORK MAY BE PROPERLY INSTALLED, BUT UNDER NO CONDITIONS MAY STRUCTURAL WORK BE CUT, EXCEPT AT THE DIRECTION OF THE ARCHITECT-DESIGNER OR THEIR REPRESENTATIVE.
- SHOP DRAWINGS SHALL INCLUDE MANUFACTURER'S NAMES, CATALOG NUMBERS, CUTS, DIAGRAMS AND OTHER SUCH DESCRIPTIVE DATA AS MAY BE REQUIRED TO IDENTIFY AND REVIEW THE EQUIPMENT. SUBMITTALS SHALL BE IN LOGICAL GROUPS, FOR EXAMPLE, ALL LIGHTING FIXTURES, PARTIAL SUBMITTALS WILL NOT BE REVIEWED.
- SUBMIT DIGITAL COPIES OF THE FOLLOWING SHOP DRAWINGS FOR REVIEW.
A. LIGHT FIXTURES
B. PROVIDE "AS-BUILT" DRAWINGS AND SUBMIT TO ARCHITECT/DESIGNER.
- ALL MATERIAL, EQUIPMENT, WIRING DEVICES, ETC. SHALL BE NEW, UNLESS SPECIFICALLY INDICATED AS EXISTING TO BE REUSED.
- ALL NEW CIRCUIT BREAKERS FOR NEW OR EXISTING PANELBOARDS SHALL MATCH EXISTING BUILDING PANELBOARD MANUFACTURER AND BREAKER TYPE. THE CONTRACTOR SHALL PROVIDE NEW TYPE WRITTEN PANEL DIRECTORIES FOR ALL NEW PANELS AND EXISTING PANELS WHICH HAVE CHANGED. PANELBOARD SHALL BE MARKED WHERE THE SOURCE OF POWER SUPPLY ORIGINATES, AND IF SERIES COMBINATION SYSTEMS ARE UTILIZED AND THEIR LISTED AMPERE RATINGS.
- DO NOT SHARE NEUTRAL CONDUCTORS FOR MULTIWIRE BRANCH CIRCUITS. WHERE SHARED NEUTRAL CONDUCTORS ARE REQUIRED (SUCH AS POWERED FURNITURE SYSTEMS), HANDLE TIES SHALL BE PROVIDED ON THE CIRCUIT BREAKERS WITH SHARED NEUTRALS SUCH THAT IT WILL SIMULTANEOUSLY DISCONNECT ALL UNGROUNDED CONDUCTORS. ALL HANDLE TIES ARE REQUIRED TO BE INDICATED ON THE PANELBOARD SHOP DRAWINGS.
- SHOULD ACTUAL FIELD CONDITIONS REQUIRE INDICATED CIRCUIT DESIGNATIONS TO VARY, INDICATE THE CIRCUIT NUMBER USED ON THE "AS-BUILT" DRAWINGS.
- PROVIDE COMPLETE METAL RACEWAY SYSTEMS AND ENCLOSURES FOR ALL WIRING THROUGHOUT THE EXTENT OF THE REQUIRED DISTRIBUTION SYSTEM.
A. UTILIZE RIGID POLYVINYL CHLORIDE CONDUIT (PVC) IN THE FOLLOWING LOCATIONS:
a. UNDERGROUND
B. UTILIZE ELECTRICAL METALLIC TUBING (EMT), MINIMUM SIZE OF 3/4", IN THE FOLLOWING LOCATIONS:
a. SERVICE AND FEEDERS
b. POWER CIRCUIT HOMERUN
c. BRANCH CIRCUITS IN CONCEALED OR EXPOSED LOCATIONS
- ALL NEW CIRCUITS SHALL HAVE A GROUND WIRE INSTALLED.
- ALL WIRING NOT INSTALLED IN CONDUIT AND INSTALLED IN THE CEILING SPACE SHALL BE PLENUM RATED.
- ELECTRICAL CONTRACTOR SHALL PROVIDE ALL SPECIAL OUTLET BOXES THAT MAY BE REQUIRED TO ENCLOSE RECEPTACLES.
- EACH SWITCH, LIGHT, RECEPTACLE AND OTHER MISCELLANEOUS DEVICE SHALL BE PROVIDED WITH A GALVANIZED OR PRESSED STEEL OUTLET BOX OF THE KNOCKOUT TYPE, OF NOT LESS THAN NO. 14 U.S. GAUGE STEEL. CONDUITS SHALL BE FASTENED WITH LOCKNUTS AND BUSHINGS AND ALL UNUSED KNOCKOUTS MUST BE LEFT SEALED. THERE MUST BE SUFFICIENT ROOM FOR WIRES AND BUSHINGS AND DEEP BOXES SHALL BE INSTALLED WHERE REQUIRED. BOXES SHALL BE SECURELY AND ADEQUATELY SUPPORTED.
- IN EXPOSED AND SUSPENDED CEILING APPLICATIONS, ROUTE CONDUIT AS CLOSE TO STRUCTURAL SLAB OR DECK AS POSSIBLE, AND SUPPORT CONDUIT AND JUNCTION BOXES DIRECTLY FROM THE STRUCTURAL SLAB, DECK, OR FRAMING PROVIDED FOR THAT PURPOSE. LIGHTING BRANCH CIRCUIT CONDUITS SHALL NOT BE CLIPPED TO THE CEILING SYSTEM HAS BEEN SPECIFICALLY DESIGNED FOR THAT PURPOSE.
- ALL EXPOSED CONDUIT SHALL BE CONCEALED TO THE GREATEST EXTENT POSSIBLE, AND SHALL BE INSTALLED PARALLEL AND CLOSE TO STRUCTURAL MEMBERS. GENERAL CONTRACTOR SHALL PAINT CONDUIT TO MATCH ADJACENT FINISHES.
- ALL RECEPTACLES SHALL BE SPECIFICATION GRADE NEMA 5-20R, UNLESS OTHERWISE NOTED.
- ALL LIGHT SWITCHES SHALL BE SPECIFICATION GRADE, QUIET OPERATION RATED 120/277 VOLT, 20 AMPS, UNLESS OTHERWISE NOTED.
- ALL FACE PLATE AND DEVICE COLORS SHALL BE APPROVED BY ARCHITECT OR OWNER/LEASEE.
- ALL DIMMED LIGHTING CIRCUITS ARE TO RECEIVE DEDICATED NEUTRALS. DO NOT SHARE NEUTRALS ON DIMMED LIGHTING CIRCUITS.
- PROVIDE OWNER WITH A COMPLETE LISTING OF ALL LAMPS/FIXTURES UTILIZED ON THE PROJECT INCLUDING MANUFACTURER AND CATALOG INFORMATION. PROVIDE A SUGGESTED SOURCE, INCLUDING CONTACT NAME AND PHONE NUMBER, FOR REORDERING.
- THE CONTRACTOR SHALL VERIFY THE CEILING TYPE BEFORE ORDERING LIGHTING FIXTURES.
- ALL EXISTING ELECTRICAL SERVICES NOT SPECIFICALLY INDICATED TO BE REMOVED OR ALTERED SHALL REMAIN AS THEY PRESENTLY EXIST.
- G.C. SHALL INCLUDE IN HIS COST THE REMOVAL OF ALL EXISTING ELECTRICAL DEVICES, CONDUITS, FIXTURES AND EQUIPMENT. TURN EQUIPMENT OVER TO OWNER AS INDICATED OR RECYCLE/DISCARD ALL EQUIPMENT AS REQUIRED. E.C. SHALL BE RESPONSIBLE FOR DISCONNECTING PRIMARY SERVICE AND TEMPORARY POWER.
- IDENTIFY EACH RECEPTACLE WITH PANELBOARD IDENTIFICATION AND CIRCUIT NUMBER. USE HOT, STAMPED, OR ENGRAVED MACHINE PRINTING WITH BLACK-FILLED LETTERING ON FACE OF PLATE, AND DURABLE WIRE MARKERS OR TAGS INSIDE OUTLET BOXES.
- UNLESS OTHERWISE NOTED, ALL GFCI RECEPTACLES SHALL HAVE TEST/RESET SWITCHES INTEGRAL TO RECEPTACLE DEVICE.



- NOTES:
- WHERE MULTIPLE LINE VOLTAGE DEVICES ARE SHOWN ADJACENT TO EACH OTHER, THEY ARE ALL TO SHARE THE SAME JUNCTION BOX, UP TO FOUR GANGS.
 - WHERE MORE THAN FOUR DEVICES ARE SHOWN ADJACENT TO EACH OTHER, DEVICES ARE TO STACK VERTICALLY ABOVE ONE ANOTHER IN TWO ROWS IN AS SMALL OF GANG BOXES AS POSSIBLE. I.E. SIX DEVICES WILL USE TWO THREE GANG BOXES, FIVE DEVICES WILL USE ONE THREE GANG AND ONE TWO GANG BOX.
 - BACK-TO-BACK JUNCTION BOXES IN COMMON WALLS ARE NOT PERMITTED. JUNCTION BOXES SHALL BE SEPARATED BY AT LEAST ONE STUD WHEREVER POSSIBLE.
 - AUDIBLE/VISUAL FIRE ALARM DEVICES SHOWN ARE TO BE MOUNTED AT 90" OR 6" BELOW CEILINGS, WHICHEVER IS LOWER. ADA STROBES TO BE MOUNTED AT 80" AFF OR 6" BELOW CEILING, WHICHEVER IS LOWER.
 - THE E.C. SHALL REFER TO INTERIOR DESIGN ELEVATIONS TO COORDINATE ALL COUNTER HEIGHTS. ALL "AC" DEVICES SHALL HAVE BOTTOM OF BACK-BOX MOUNTED 4" ABOVE THE BACK/SIDE SPLASH.

1 | MOUNTING HEIGHTS DETAIL

8.0 SCALE: N.T.S.

DHM DESIGN

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COLORADO LICENSE
STANLEY LAKE LIBRARY TRAILHEAD
62405
08/14/2023
PROFESSIONAL ENGINEER

Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO.

PROJECT NUMBER: 220339
DESIGNED: JESSE JAMES
DRAWN: JESSE JAMES
CHECKED: JESSE JAMES
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
ELECTRICAL COVER
SHEET

SHEET NUMBER:

E0.0

AE DESIGN

Integrated Lighting, Technology, and Electrical Solutions
1900 Wazee Street #205 | Denver, CO 80202 | 303.296.3034
aedesign-inc.com Project #1306.00

APPROVED:	11/22/23	DA2023-0024
	DATE	JOB NUMBER
DIRECTOR OF VIBRANT COMMUNITY & NEIGHBORHOODS		

REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA "ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION. SOLE RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THESE DOCUMENTS SHALL REMAIN WITH THE REGISTERED PROFESSIONAL ENGINEER SEALING THESE PLANS. THE CITY DOES NOT ACCEPT LIABILITY FOR FACILITIES DESIGNED BY OTHERS.

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 22039 DATE: 07-12-2023

DESIGNED:
DRAWN:
CHECKED:

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
ELECTRICAL SITE
POWER & LIGHTING
PLAN

SHEET NUMBER

E1.0

KEYNOTE LEGEND	
KEY	
VALUE	
	
1.	EC SHALL MOUNT DUPLEX RECEPTACLE ON POLE OF STRUCTURE. RECEPTACLE SHALL BE PROVIDED WITH IN-USE, WEATHER-PROOF, FLAP-STYLE COVER.
2.	EC SHALL EXTEND EXISTING SITE RECEPTACLE CIRCUIT TO FEED NEW SHADE STRUCTURE DUPLEX RECEPTACLE.
3.	EC SHALL PROVIDE 3/4" CONDUIT SCOUTED UP COLUMN, INSIDE VERTICAL POST, AND ALONG ROOF OF STRUCTURE, OUTSIDE OF THE ROOF JOIST, TO SURFACE MOUNTED LIGHT IN CENTER.
4.	EC SHALL EXTEND EXISTING SITE LIGHTING CIRCUIT AND LIGHTING CONTROL TO NEW SHADE STRUCTURE LIGHT. LIGHT SHALL TURN ON/OFF WITH REST OF PARKING LOT LIGHTING.



1 | ELECTRICAL SITE POWER & LIGHTING PLAN
 E1.0 | SCALE: 1" = 30'

2	ENLARGED PLAN AT SHADE STRUCTURE
E1.0	SCALE: 1/8" = 1'-0"



APPROVED: _____

Cressa J. Jones _____

DIRECTOR OF VIBRANT COMMUNITY & NEIGHBORHOODS

11/22/23 _____

DATE _____

DA2023-0024 _____

JOB NUMBER _____

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E2.0

SPECIFIC NOTES:
1. EC SHALL MOUNT FIXTURE TO SHELTER CEILING SURFACE.
2. CONFIRM FIXTURE FINISH WITH ARCHITECT/OWNER.

PANEL 'H2'													
VOLTAGE L-L: VOLTAGE L-N: TYPE: MOUNTING: NOTES:			460 2TT 3PH/4W SURFACE EXISTING PANEL			LOCATION: BUS RATING, MAIN CB: FED FROM: AIC RATING:			ELECTRICAL ROOM 200 AMP MLO SDC FULLY RATED AT LEAST EQUAL TO			1HK AIG	
GIR NO.	LOAD TYPE	LOAD VA	LOAD DESCRIPTION (NOTE N#)	CIRCUIT BREAKER POLE	TRIP TYPE	BUS	CIRCUIT BREAKER TYPE	TRIP POLE	LOAD DESCRIPTION (NOTE N#)	LOAD VA	LOAD TYPE	GIR NO.	
1	L	1200	CHILDREN OUTED (N)	I	20	A	20		CORRIDOR DOWN (N)	1200	L	2	
3	L	1200	CHILDREN IBN (N)	I	20	A	20		CORRIDOR UP (N)	1200	L	4	
7	L	1200	CHILDREN OUTED (N)	I	20	A	20		CORRIDOR DOWN (N)	1200	L	6	
1	L	1200	READING OUTED (N)	I	20	A	20		CORRIDOR UP (N)	1200	L	8	
4	L	1200	READING INBD (N)	I	20	B	20		MTG RM / STRS / WORK (N)	1200	L	10	
11	L	1200	READING OUTED (N)	I	20	C	20		SPARE (N)	1200	L	12	
13	L	1200	CHILDREN THROUGH (N)	I	20	A	20		FTU 11 (N)	200 M	M	14	
15	L	1200	READING DOWNLIGHTS (N)	I	20	B	20		FTU 12 (N)	200 M	M	16	
17	L	1200	READING THROUGH (N)	I	20	A	20		FTH 9 (N)	200 M	M	18	
19	L	1200	CHILDREN THROUGH (N)	I	20	A	20		FTU 8 (N)	200 M	M	20	
21	L	500	SPARE (N)	I	20	B	20		SPARE (N)	1200	L	22	
23	L	1200	RELAY CABINET CONTR. (N)	I	20	C	20		BIM OFF 4' 5M MECH RM (N)	200 M	M	24	
25	M	200	FTU T (N)	I	20	A	20		SPARE (N)	1200	L	26	
27	M	200	FTU B (N)	I	20	B	20		SPARE (N)	1200	L	28	
29	M	200	FTU S (N)	I	20	C	20		BUSSED SPACE			30	
31			SPARE (N)	I	20	A	20		BUSSED SPACE			32	
33			SPARE (N)	I	20	B	20		BUSSED SPACE			34	
35			SPARE (N)	I	20	C	20		PARK 4 ENTRY DRIVE (N)	1000	L	36	
37			BUSSED SPACE	I	20	A	20		SHADE STRUCT LIGHT (N2)	1434	L	38	
39			BUSSED SPACE	I	20	B	20		SOFFITT 4 ENTRY DN (N)	600	L	40	
41			BUSSED SPACE	I	20	C	20		WALL EXT EXTERIOR (N)	1000	L	42	
LOAD TYPE: L=LIGHTING, R=RECEPTACLE, M=MOTOR, LM=LARGEST MOTOR, E=EQUIPMENT, KE=KITCHEN EQUIPMENT, C=CONTINUOUS, S=SUBFEED PANEL. CB TYPE: GFCI=5mA GROUND FAULT CIRCUIT INTERRUPTER, GFPEP=30mA GROUND FAULT PROTECTION FOR EQUIPMENT, AFCI=ARC FAULT CIRCUIT INTERRUPTER CAFCH=COMBINATION ARC FAULT & 5mA GROUND FAULT CIRCUIT INTERRUPTER, ST=STANDARD TRIP WITH HANDLE THE WITH GROUPINGS # HC=HANDLE CLAMP # LOCKING IN ON/OFF POSITION, LOCK=PERMANENTLY LOCKABLE BREAKER													
LOAD TYPE:	LOAD VA	MULT	DEMAND LOAD						TOTAL CONNECTED LOADS				
RECEPTACLE:	29134	1.25	29134	O	1.0				A	B	C		
OVER 10KI:		O	0.5	O	VA				VA	1000	8400		
MOTOR:	1400	1.0	1400	VA					TOTAL DEMANDED LOADS				
LIGHT MOTOR:		O	1.25	O	VA				A	B	C		
EQUIPMENT:		O	1.0	O	VA				VA	11468	8650	11025	
KITCH EQUIP:		O	0	O	VA				AIG	41	40		
CONTINUOUS		O	1.25	O	VA				TOTAL ON PANEL:				
SUBFEED PNL:		O	1.0	O	VA						31 KVA	31 AMPS	
NOTES:													
N1. EXISTING LOAD ON EXISTING CIRCUIT BREAKER.													
N2. NEW LOAD ON EXISTING CIRCUIT BREAKER.													
N3. NEW LOAD ON NEW CIRCUIT BREAKER. CIRCUIT BREAKER TYPE AND AIC RATINGS TO MATCH EXISTING.													

[illegible]

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1. DRAWINGS AND BASE INFORMATION - ALL BASE AND PLANTING INFORMATION HAVE BEEN PROVIDED BY DHM. THE CONTRACTOR IS RESPONSIBLE TO NOTIFY HYDROSYSTEMS/KDI OF ANY DISCREPANCIES BETWEEN THE UTILITY OR PLANTING PLANS AND THE IRRIGATION PLAN. IF CONTRACTOR FAILS TO NOTIFY HYDROSYSTEMS/KDI AND MAKES CHANGES TO THE IRRIGATION SYSTEM DESIGN, THEY ASSUME ALL COSTS AND LIABILITIES ASSOCIATED WITH THOSE FIELD CHANGES. REFER TO SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS. CONTACT IRRIGATION CONSULTANT FOR CURRENT SPECIFICATIONS IF NOT PROVIDED.

2. SYSTEM PRESSURE - HYDROSYSTEMS*CDI HAS REVIEWED THE EXISTING TAP AND BOOSTER PUMP. THE STATIC WATER PRESSURE IN THE MECHANICAL ROOM IS 60 PSI. THE BOOSTER PUMP IS CONFIRMED TO ADD 35 PSI TO THE SYSTEM. THE CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY PRESSURE PRIOR TO COMMENCING ANY CONSTRUCTION AND NOTIFY HYDROSYSTEMS*CDI OF ANY VARIANCE FROM THE STATIC PRESSURE IMMEDIATELY. THE NOTIFICATION DOCUMENTATION MUST BE SUBMITTED TO HYDROSYSTEMS*CDI PRIOR TO HYDROSYSTEMS*CDI AT CONSTRUCTION ONSET. IF CONTRACTOR FAILS TO FIELD VERIFY PRESSURE AND/OR NOTIFY HYDROSYSTEMS*CDI OF ANY VARIATIONS FROM THIS PRESSURE, THEN THEY ASSUME ALL CONSTRUCTION AND ENGINEERING COSTS ASSOCIATED WITH SYSTEM MODIFICATIONS REQUIRED TO ACCOMMODATE ACTUAL SITE PRESSURE. REFER TO POINT OF CONNECTION 4 CONTROLLER DATA MATRIX BELOW FOR REQUIRED PRESSURE AT EACH POINT OF CONNECTION. THE POINT OF CONNECTION NEEDS FOR SPECIFIC PRESSURE REQUIRED AT THAT LOCATION. THIS SYSTEM HAS BEEN DESIGNED FOR A REQUIRED STATIC PRESSURE OF 45 PSI MINIMUM.

3. IRRIGATION SYSTEM OPERATION INTENT - THIS IRRIGATION SYSTEM HAS BEEN DESIGNED TO IRRIGATE THE ESTABLISHED LANDSCAPE WITHIN A THREE NIGHT PER WEEK, 16 HOUR PER NIGHT WATERING WINDOW. ESTABLISHMENT WATERING WILL REQUIRE UP TO TWICE AS MUCH IRRIGATION FOR A FOUR TO SIX WEEK PERIOD. THE DESIGN IS BASED ON THE FOLLOWING ASSUMPTIONS AND WILL BE APPLIED RATIONALLY AFTER ESTABLISHMENT - THESE FIGURES ARE BASED ON A 30-YEAR AVERAGE WEATHER DATA AND WILL NEED TO BE ADJUSTED DUE TO SEASONAL CHANGES AND WEATHER CONDITIONS ABOVE AND BELOW THE AVERAGE VALUES UTILIZED.
- | | |
|----------------------|--|
| BLUEGRASS TURF | 1.95" PER WEEK PEAK SEASON |
| ORNAMENTAL PLANTINGS | 0.78" PER WEEK PEAK SEASON |
| NATIVE SEED MIXES | 0.65" PER WEEK PEAK SEASON (TWO SEASONS) |
- NOTE: IT IS THE INTENT OF THIS DESIGN THAT NATURAL ASSETS SHOULD ONLY BE IRRIGATED FOR ESTABLISHMENT. SYSTEM WILL REMAIN FOR USE DURING YEARS WITH LESS THAN NORMAL RAINFALL.

4. EQUIPMENT INSTALLATION - IT IS THE INTENT OF THIS DESIGN THAT ALL IRRIGATION EQUIPMENT BE INSTALLED WITHIN PROPERTY LIMITS AND WITHIN LANDSCAPED AREAS. INSTALLATION SHALL BE COORDINATED WITH OTHER UTILITY WORK. ALL OTHER UTILITIES SHALL TAKE PRECEDENCE OVER IRRIGATION LOCATION. ANY EQUIPMENT OTHER THAN VALVE BOXES OR SLEEPING THAT CONTAINS PIPE OR WIRES SHOWN OUTSIDE OF THESE LIMITS IS SHOWN IN THAT LOCATION FOR GRAPHICAL CLARITY ONLY. ALL VALVE BOXES SHALL BE INSTALLED A MINIMUM OF 2'-0" FROM EDGE OF ANY PAVED SURFACES UNLESS SPECIFICALLY INDICATED ON PLANS. BOXES INSTALLED IN OPEN TURF AREAS SHALL BE KEPT TO EDGES AND STAKED FOR REVIEW IF ALONG HIGH TRAFFIC AREAS. ALL VALVE BOXES SHALL BE PLACED A MINIMUM OF 3'-0" FROM THE CENTERLINE OF ANY DRAINAGE SWALE. ALL VALVE BOXES WITHIN PAVEMENT SHALL BE TIER 15 RATED BOXES FOR HEAVY DUTY. UNPAVED HIGH TRAFFIC BOX LID COLOR SHALL MATCH ADJACENT MATERIALS. GREEN IN TURF, TAN IN WOOD MULCH, GRAY IN STONE MULCH, PURPLE FOR RECLAIMED WATER SYSTEMS (IF REQUIRED). REFER TO LANDSCAPE PLANS FOR MATERIAL COLORS AND TYPES. ALL BOXES SHALL BE INSTALLED TO BE FLUSH WITH GRADE AND IN AN ORDERLY MANNER. WHERE MORTAR PAVING LIDS ARE INSTALLED ABOVE BOXES, IRRIGATION BOX WITH LID SHALL BE LOWERED TO ACCOMMODATE PAVING LID. REFER TO LANDSCAPE FOR ADDITIONAL INFORMATION. TO BE INSTALLED PER MANUFACTURER RECOMMENDATIONS.

5. PIPING INSTALLATION/IRRIGATION PIPING SHALL MAINTAIN A MINIMUM DISTANCE FROM BUILDING FOUNDATIONS OF 5 FEET OR AS DESCRIBED IN SOILS REPORT, WHICHEVER IS GREATER. NO SPRAY IRRIGATION SHALL OCCUR WITHIN 10 FEET OF THE FOUNDATION. NO DRIP IRRIGATION SHALL OCCUR WITHIN 5 FEET OF THE FOUNDATION UNLESS SOIL MOISTURE SENSORS ARE INSTALLED ON VALVES SERVICING THESE AREAS. ALL IRRIGATION PIPING AND EMISSION DEVICES LOCATED ON TOP OF OR WITHIN BUILDING STRUCTURE SHALL CONFORM TO WATERPROOFING CONSULTANT REQUIREMENTS. PIPE ROUTING MAY BE SHOWN WITHIN THESE DISTANCES FOR GRAPHICAL CLARITY ONLY.

6. MANUAL DRAIN VALVES CONTRACTOR TO INSTALL ONE MANUAL DRAIN VALVE ON PRESSURE SUPPLY LINE DIRECTLY DOWNSTREAM OF BACKFLOW PREVENTER AND AT ALL LOW POINTS AND DEAD ENDS OF PRESSURE SUPPLY PIPING TO ENSURE COMPLETE DRAINAGE OF SYSTEM. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THESE LOCATIONS IN-FIELD AND INSTALLATION LOCATIONS SHALL BE NOTED ON AS-BUILTS.

7. POP-UP SPRAY NOZZLES - CONTRACTOR TO INSTALL PLASTIC NOZZLES ON ALL POP-UP SPRAY HEADS. INSTALL 15 SERIES NOZZLES ON ALL HEADS SPACED AT 12" TO 14". INSTALL 12 SERIES NOZZLES ON ALL HEADS SPACED 10" TO 11". INSTALL 10 SERIES NOZZLES ON ALL HEADS SPACED AT 8" TO 9". INSTALL 8 SERIES NOZZLES ON ALL HEADS SPACED AT 6" TO 7". INSTALL SIDE STRIP NOZZLES ON ALL HEADS WITH AN "S" OR "P" DESIGNATION AND RIGHT AND LEFT CORNER STRIP NOZZLES ON ALL HEADS WITH AN "L" OR "R" DESIGNATION. VARIABLE ARC NOZZLES SHOULD BE UTILIZED ADJACENT TO CURVILINEAR SHRUB BEDS OR FOR ANY ANGLES THAT ARE NOT A STANDARD NOZZLE ANGLE.

8. DRIP IRRIGATION - REFER TO IRRIGATION DETAIL SHEET FOR DRIP EMITTER QUANTITIES / DRIP TUBING FLOW AND PLACEMENT.

9. UNLABELED PIPING - ALL UNLABELED LATERAL PIPING SHALL BE 1" MINIMUM UNLESS OTHERWISE NOTED.

10. SLEEVING - ALL SLEEVING UNDER PAVED SURFACES SHOWN ON PLANS IS BY CONTRACTOR UNLESS OTHERWISE NOTED. SLEEVING SHALL BE INSTALLED IN THE SIZES AND QUANTITIES SHOWN ON PLANS OR BASED ON THE SCHEDULE BELOW. WHERE SLEEVES ARE SHOWN, BUT NOT LABELED, FOLLOW THE SCHEDULE BELOW. ALL MAINLINE, CONTROL WIRES AND DRIP LINES UNDER PAVED SURFACES ARE TO BE INSTALLED IN SLEEVING. ALL MAINLINE SLEEVE LOCATIONS TO INCLUDE A SEPARATE WIRE SLEEVE.

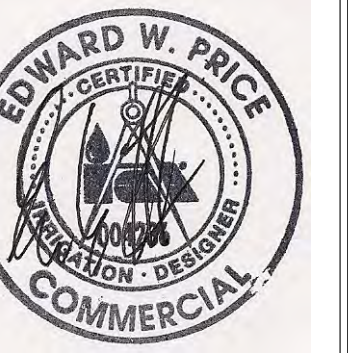
- | | |
|----------------------|------------|
| 3/4" - 1 1/4" PIPING | 2" PVC (1) |
| 1 1/2" - 2" PIPING | 4" PVC (1) |
| 1-25 CONTROL WIRES | 2" PVC (1) |
| COMMUNICATION CABLE | 2" PVC (1) |

1. INSTALL ALL MATERIALS AND EQUIPMENT AS SHOWN ON THE PLANS AND DETAILS. NO SUBSTITUTIONS SHALL BE ACCEPTED WITHOUT PRIOR WRITTEN APPROVAL BY THE CONSULTANT AND/OR OWNER. THE IRRIGATION CONTRACTOR MAY BE REQUIRED TO REMOVE AND REPLACE ALL UNAPPROVED SUBSTITUTED EQUIPMENT AT HIS OWN COST IF SO DIRECTED BY THE CITY OF ARVADA.
2. UNLESS PROVIDED IN THESE PLANS OR SPECIAL CONDITIONS, THE CONTRACTOR SHALL COMPLY WITH THE MOST CURRENT CITY OF ARVADA STANDARDS.
3. FOR THE CITY OF ARVADA PORTION OF THE PROJECT, A CONTROLLER WILL BE SUPPLIED, INSTALLED AND OPERATED BY THE CONTRACTOR DURING CONSTRUCTION AND UNTIL ANY CONTRACT-RELATED TURF/LANDSCAPE IS ESTABLISHED AND APPROVED BY THE CITY. UPON COMPLETION AND CITY ACCEPTANCE OF A CITY OWNED PROJECT, THE CONTRACTOR WILL REMOVE THE INSTALLED CONTROLLER AND INSTALL THE CITY'S OWN CONTROLLER. UNLESS OTHERWISE SPECIFIED, THE CITY'S CONTROLLER WILL BE PURCHASED BY THE CITY FOR WHICH THE DEVELOPER WILL REIMBURSE THE CITY AS A CONDITION OF APPROVAL FOR THE IRRIGATION SYSTEM OR AS OTHERWISE APPROVED IN A DEVELOPMENT AGREEMENT BETWEEN THE CITY AND THE DEVELOPER.
4. CITY OF ARVADA APPROVAL PROCESS -
 - 4.1. CONTRACTOR IS REQUIRED TO DO AND PASS THE CITY'S PRESSURE TEST.
 - 4.2. CONTRACTOR IS REQUIRED TO DO AND PASS THE CITY'S LEAK TEST.
 - 4.3. CONTRACTOR MUST NOTIFY CITY OF ARVADA PARKS DEPARTMENT FOR ANNUAL MAINTENANCE AND INSPECTIONS.
 - 4.4. MAINTENANCE PRIOR TO FINAL ACCEPTANCE (TO MEET CAPITAL MAINTENANCE APPROVED PLANS).

SYMBOL	MANUFACTURER	MODEL NO.	DESCRIPTION	DETAIL NO.
	RAIN BIRD	RD-06-S-P30 WITH MATCHED PRECIPITATION RATE SERIES NOZZLE	POPOP SPRAY HEAD	7
	RAIN BIRD	RD-06-S-P30 WITH SST, CORNER SERIES NOZZLE	POPOP SPRAY HEAD	7
	RAIN BIRD	RD-12-S-P30 WITH HE-VAN SERIES NOZZLE	HI-POP SPRAY HEAD	8
	RAIN BIRD	RD-12-S-P30 WITH SST, CORNER SERIES NOZZLE	HI-POP SPRAY HEAD	8
	HUNTER	I-20-06-S5 WITH #MPR25 MATCHED PRECIPITATION NOZZLE (RED)	GEAR DRIVEN ROTOR	9
	HUNTER	I-20-06-S5 WITH #MPR30 MATCHED PRECIPITATION NOZZLE (GREEN)	GEAR DRIVEN ROTOR	9
	HUNTER	I-20-06-S5 WITH #MPR35 MATCHED PRECIPITATION NOZZLE (TAN)	GEAR DRIVEN ROTOR	9
	HUNTER	I-20-12 WITH #MPR25 MATCHED PRECIPITATION NOZZLE (RED)	HI-POP GEAR DRIVEN ROTOR	10
	HUNTER	I-20-12 WITH #MPR30 MATCHED PRECIPITATION NOZZLE (GREEN)	HI-POP GEAR DRIVEN ROTOR	10
	HUNTER	I-20-12 WITH #MPR35 MATCHED PRECIPITATION NOZZLE (TAN)	HI-POP GEAR DRIVEN ROTOR	10
	RAIN BIRD	PEB	ELECTRIC CONTROL VALVE	6
	RAIN BIRD	44-LRC	QUICK COUPLING VALVE	2
	WEATHERMATIC	SMARTLINE SL4500- 36 STATION CONTROLLER	ELECTRIC CONTROLLER	5
N/S	OLDCASTLE / CARSON	REFER TO SPECIFICATIONS AND DETAILS	VALVE BOXES	VARIOUS
N/S	AY MACDONALD	76001 - 1/4 TURN - 1"	MANUAL DRAIN VALVE	
		LINE SIZE - 2½" AND SMALLER	GATE VALVE	1
	RAIN BIRD	PEB	MASTER CONTROL VALVE	4
	CST	FSI-T20-001-2"	FLOW SENSOR	3
		CLASS 200 BE - 2½" & SMALLER	PVC MAINLINE	15
		CLASS 200 BE	PVC LATERAL	15
		CLASS 160	PVC SLEEVING	14
	RAIN BIRD	XGZ-100-FRB-COM	DRIP VALVE ASSEMBLY	11
	TORO	BLUE STRIPE	POLY DRIP TUBING - 3/4" MIN. WIDTH	12
N/S	RAIN BIRD	XBCV - XERI-BUG WITH CHECK VALVE	DRIP EMITTERS	12
			DRIP LINE BLOW-OUT STUB	13
			EXISTING BACKFLOW DEVICE	N/A
			EXISTING CONTROLLER	N/A
			EXISTING MAINLINE	N/A
			CONTROLLER & STATION NO.	
			CONTROL VALVE SIZE	
	NUMBER OF SPARE WIRES - 2 CONTROL AND 1 SPARE WIRES TO INDICATED CONTROLLER - SEE CONSTRUCTION NOTES			

IRRIGATION DETAILS

IR3.0 - IR3.1



Standley Lake Library Trailhead
9185 Kipling St

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER:	DATE
0039	07-12-2023

SIGNED: EWP
DRAWN: EWP
CHECKED: KD

VISIONS:

B DESCRIPTION:
CONSTRUCTION
DOCUMENTS

IRRIGATION PLAN

EET NUMBER:

R2.0

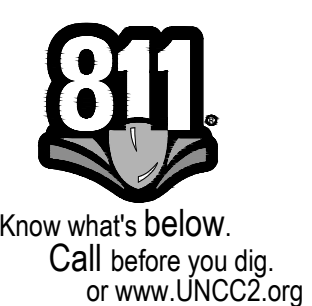
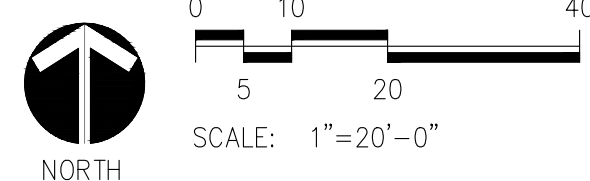


MATCHLINE: SEE SHEET IR2.3

- A** 2" BACKFLOW PREVENTER IN MECHANICAL ROOM. BASED ON EXISTING 2" TYPE K COPPER SERVING BACKFLOW, ASSUMED MAXIMUM FLOW RATE IS 50 GPM. THERE IS 60 PSI STATIC PRESSURE AND AN EXISTING 35 PSI BOOSTER PUMP IN THE MECHANICAL ROOM PROVIDES
- B** EXISTING CONTROLLER IS 48 STATION WEATHERMATIC WITH AIRGARD, NO AVAILABLE STATIONS; REPLACE EXISTING WEATHERMATIC AIRGARD WITH NEW CELLULAR MODEL
- C** FIELD LOCATE 2" CLASS 200 PVC MAINLINE AT THIS APPROXIMATE LOCATION, MAKE NEW 2" CLASS 200 PVC MAINLINE CONNECTION AND ROUTE NEW MAINLINE AS SHOWN TO CONNECTIONS TO EXISTING MAINLINE LOOP AS SHOWN AT NOTE D. FIELD LOCATE EXISTING MASTER VALVE AND FLOW SENSOR AND RELOCATE THEM TO THIS NEW POC, VERIFY WIRING BACK TO EXISTING CONTROLLER. CARE SHALL BE TAKEN TO IDENTIFY EXISTING CONTROLLING WIRING TO NEW ZONES TO BE ADDED. MAKE NEW CONTROL WIRE CONNECTIONS IN SPLICER BOX AND ROUTE NEW CONTROL WIRES WITH NEW MAINLINE AND RECONNECT AT NOTE D
- D** FIELD LOCATE 1.5" CLASS 200 PVC MAINLINE AT THIS APPROXIMATE LOCATION AND MAKE NEW MAINLINE CONNECTION AS SHOWN. INSTALL NEW CONTROL WIRES TO SERVICE EXISTING ZONES TO REMAIN WITH NEW MAINLINE AND MAKE CONNECTIONS TO EXISTING CONTROL WIRES IN A SPLICER BOX AT THIS LOCATION
- E** INSTALL NEW 26-STATION WEATHERMATIC SMARTLINE CONTROLLER WITH CELLULAR AIRGARD. INSTALL NEW CONTROL WIRES FROM NEW CONTROLLER TO NEW MAINLINE CONNECTION AND WITH NEW MAINLINE TO NEW CONTROL VALVES.

DIRECTORY

IRRIGATION SCHEDULE	IR1.0
IRRIGATION NOTES	IR1.0
IRRIGATION PLANS	IR2.0 - IR2.3
IRRIGATION DETAILS	IR3.0 - IR3.1



APPROVED: *Nessa Jones* 11/22/23 DA2023-0024

DIRECTOR OF VIBRANT DATE JOB NUMBER

COMMUNITY & NEIGHBORHOODS

REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA "ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION. SOLE RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THESE DOCUMENTS SHALL REMAIN WITH THE PROVIDING PROFESSIONAL LANDSCAPE ARCHITECT SEALING THESE PLANS. THE CITY DOES NOT ACCEPT LIABILITY FOR FACILITIES DESIGNED BY OTHERS.



Standley Lake Library Trailhead
9185 Kipling St

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER:	DATE
0039	07-12-2023

SIGNED: EWP
DRAWN: EWP
CHECKED: KD

VISIONS:

B DESCRIPTION:
CONSTRUCTION
DOCUMENTS

IRRIGATION PLAN

EET NUMBER:

R2.1

APPROVED:

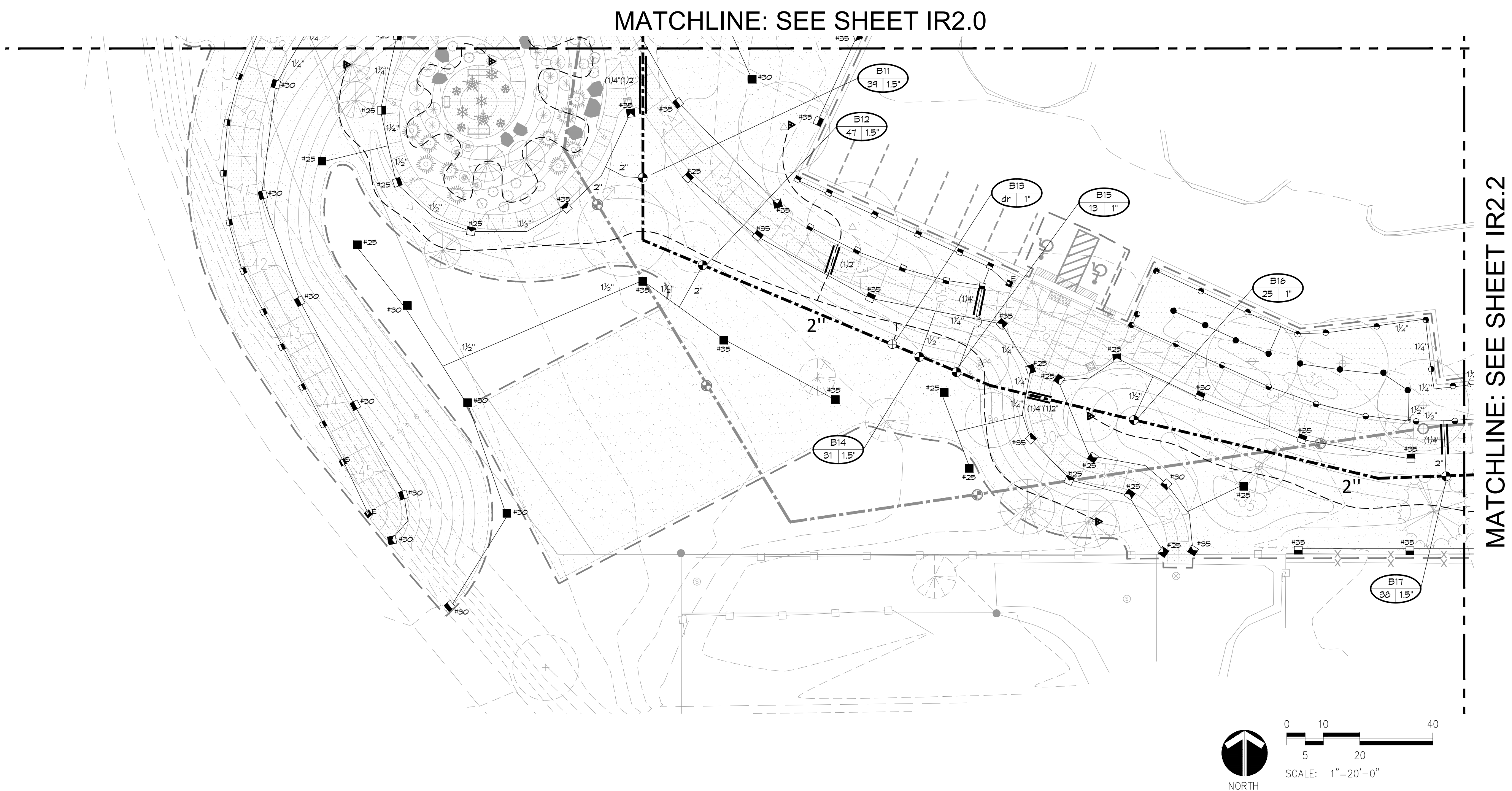
Enessa Jones
 DIRECTOR OF VIBRANT
 COMMUNITY & NEIGHBORHOODS

11/22/23
DATE

DA2023-0024

OB NUMBER

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0 10 40

5 20

SCALE: 1" = 20' - 0"



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Irrigation Consulting & Water Management
13949 W. Colfax Ave, Suite 260 Lakewood, Colorado 80401
o: 303.980.5327 www.hydrosystemskdi.com

DIRECTORY

IRRIGATION SCHEDULE	IR1.0
IRRIGATION NOTES	IR1.0
IRRIGATION PLANS	IR2.0 - IR2.3
IRRIGATION DETAILS	IR3.0 - IR3.1



Standley Lake Library Trailhead
9185 Kipling St

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER:	DATE
0039	07-12-2023

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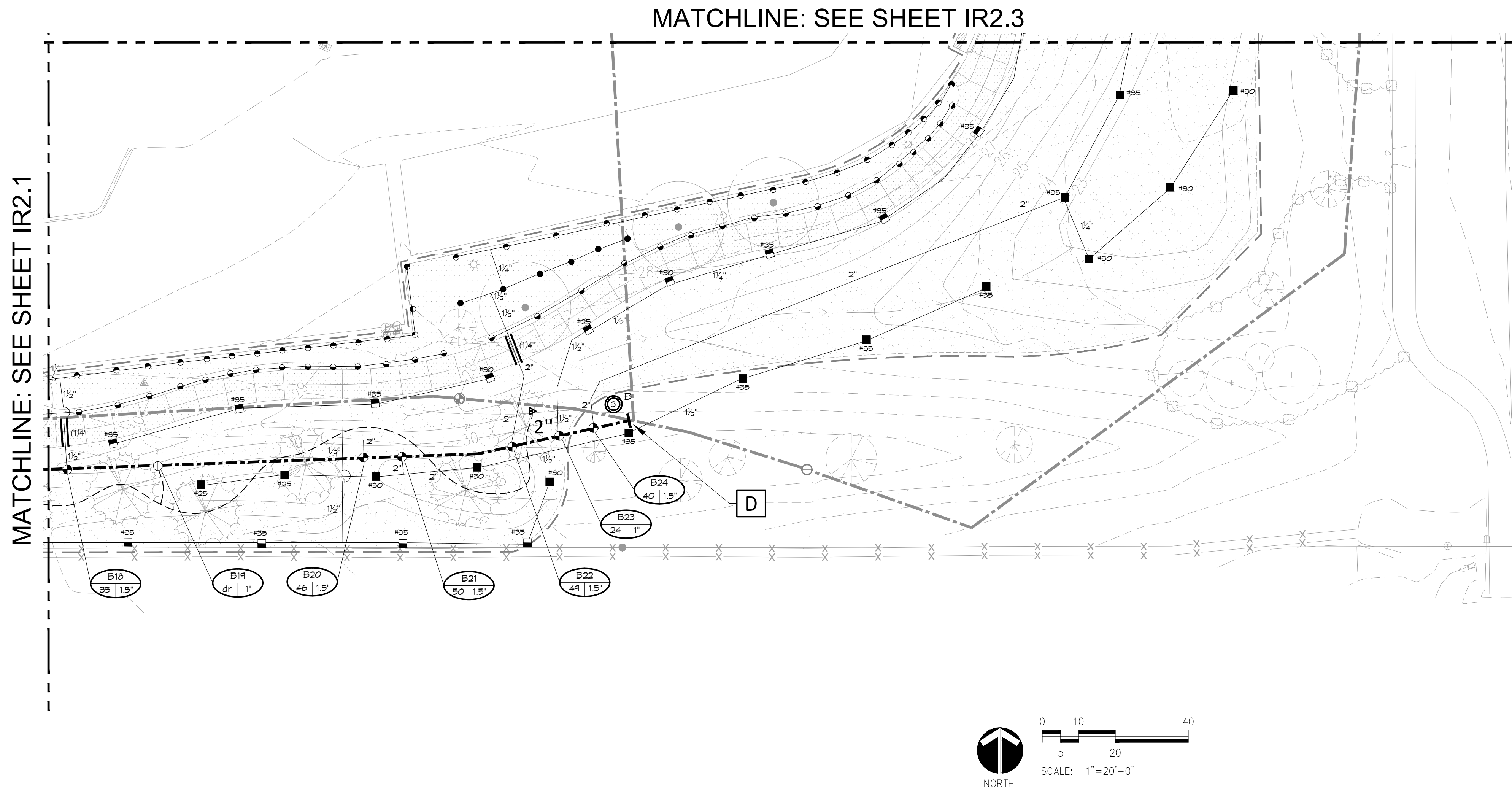
VISIONS:

B DESCRIPTION:
CONSTRUCTION
DOCUMENTS

IRRIGATION PLAN

EET NUMBER:

R2.2



DIRECTORY	
IRRIGATION SCHEDULE	IR1.0
IRRIGATION NOTES	IR1.0
IRRIGATION PLANS	IR2.0 - IR2.3
IRRIGATION DETAILS	IR3.0 - IR3.1



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APPROVED:

Enessa Jones
DIRECTOR OF VIBRANT
COMMUNITY & NEIGHBO

11/22/23
DATE

DA2023-0024

JOB NUMBER

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 222039 DATE 07-12-2023

DESIGNED: EWP
DRAWN: EWP
CHECKED: KD

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
IRRIGATION PLAN

SHEET NUMBER:

IR2.3

APPROVED:

Enessa Jones
DIRECTOR OF VIBRANT
COMMUNITY & NEIGHBORHOODS

11/22/23
DATE

DA2023-0024

JOB NUMBER

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MATCHLINE: SEE SHEET IR2.2



0 10 40

5 20

SCALE: 1"=20'-0"



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DIRECTORY

IRRIGATION SCHEDULE

IRRIGATION NOTES

IRRIGATION PLANS

IRRIGATION DETAILS

IR1.0

IR1.0

IR2.0 - IR2.3

IR3.0 - IR3.1

MATCHLINE: SEE SHEET IR2.0

A

2" BACKFLOW PREVENTER IN MECHANICAL ROOM. BASED ON EXISTING 2" TYPE K COPPER SERVING BACKFLOW, ASSUMED MAXIMUM FLOW RATE IS 50 GPM. THERE IS 60 PSI STATIC PRESSURE AND AN EXISTING 35 PSI BOOSTER PUMP IN THE MECHANICAL ROOM PROVIDES

B

EXISTING CONTROLLER IS 48 STATION WEATHERMATIC WITH AIRCARD, NO AVAILABLE STATIONS; REPLACE EXISTING WEATHERMATIC AIRCARD WITH NEW CELLULAR MODEL

C

FIELD LOCATION 2: CLASS 200 PVC MAINLINE AT THIS APPROXIMATE LOCATION, MAKE NEW 2" CLASS 200 PVC MAINLINE CONNECTION AND ROUTE NEW MAINLINE AS SHOWN TO CONNECTIONS TO EXISTING MAINLINE LOOP AS SHOWN AT NOTE D. FIELD LOCATION EXISTING MASTER VALVE AND FLOW SENSOR AND RELOCATE THEM TO THIS NEW PVC, VERIFY WIRING BACK TO EXISTING CONTROLLER. CARE SHALL BE TAKEN TO IDENTIFY EXISTING CONTROL WIRES SERVING ZONES TO REMAIN, MAKE NEW CONTROL WIRE CONNECTIONS IN SPLICE BOX AND ROUTE NEW CONTROL WIRES WITH NEW MAINLINE AND RECONNECT AT NOTE D

D

FIELD LOCATE 1.5" CLASS 200 PVC MAINLINE AT THIS APPROXIMATE LOCATION AND MAKE NEW MAINLINE CONNECTION AS SHOWN. INSTALL NEW CONTROL WIRES TO SERVE EXISTING ZONES TO REMAIN WITH NEW MAINLINE AND MAKE CONNECTIONS TO EXISTING CONTROL WIRES IN A SPLICE BOX AT THIS LOCATION

E

INSTALL NEW 26-STATION WEATHERMATIC SMARTLINE CONTROLLER WITH CELLULAR AIRCARD. INSTALL NEW CONTROL WIRES FROM NEW CONTROLLER TO NEW MAINLINE CONNECTION AND WITH NEW MAINLINE TO NEW CONTROL VALVES.

[illegible]

FILE NAME
I:\7600-7699 Jobs\7647 - Stanley Lake Trailhead\7647 - Stanley Lake Library Trailhead-688-CD 2023.07.12 REV.dwg
PLOT DATE: Aug 15, 2023 - 3:46pm



STORMWATER MANAGEMENT PLAN

Standley Lake Library Trailhead

Date of Preparation: September 28, 2023

Arvada Site Disturbance Permit: (_____)
CDPS Number: (_____)

Property Owner:
Board of Trustees of the Jefferson County Library

SWMP Preparer:
KLJ Engineering
Jonathan Simmons / Ryan Sundberg
400 Inverness Pkwy
Ste 150
Englewood, CO 80112

**SWMP NEEDS TO BE COMPLETED BY THE CONTRACTOR AND
UPDATED THROUGHOUT CONSTRUCTION**

STORMWATER MANAGEMENT PLAN

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APPENDICES

Appendix A – CDPS Construction Permit
Appendix B – Erosion and Sediment Control Plans, BMP Details and Landscape Plan
Appendix C – Soils Report
Appendix D – National Flood Hazard Layer - FIRMette
Appendix E – Inspection Forms

1.0 INTRODUCTION

This SWMP identifies possible pollutant sources at this construction site that may contribute pollutants to stormwater, and identifies control measures that, when implemented in accordance with good engineering, hydrologic, and pollution control practices, will reduce or eliminate any possible water quality impacts. A copy of this SWMP will be available onsite or will be easily accessible via an electronic format. This SWMP will be revised, as necessary, when site conditions change.

This SWMP was prepared in accordance with good engineering, hydrologic and pollution control practices. Changes or additions may be required to address changes in conditions at the project. If such changes are made, this SWMP will be updated accordingly. This SWMP will be implemented as written and updated from commencement of construction activity until final stabilization is achieved. This SWMP was developed to meet the Colorado Discharge Permit System (CDPS) General Permit for Stormwater Discharges Associated with Construction Activity (Permit No. COR-400000, effective April 1, 2019) authorizing stormwater discharges from construction activities that result in a total land disturbance of one acre or greater or if a project is less than an acre but part of a larger common plan of development. This SWMP was also developed to meet the City of Arvada's requirements. The City regulates stormwater through its Site Development Permit (SDP). A copy of the CDPS Construction Permit for this project is included in **Appendix A**.

2.0 PROJECT SITE LOCATION AND DESCRIPTION

The location of the project site is Jefferson County Public Library, located on Kipling Street in the city of Arvada, south of Standley Lake and directly west of Pond Lake.

- Total Area of Construction Limits: 1.92 acres
- Total Area of Disturbance Limits: 1.92 acres

The City of Arvada is working in collaboration with Jefferson County Public Library (JCPL) on a project to build a trailhead serving the Rocky Mountain Greenway (RMG) on JCPL property. The trailhead will provide access from Standley Lake Library, existing parking area, and Kipling Street to a central public trailhead. Included in the project are a concrete trailhead, site grading, ADA ramps, a stormwater pond, and landscaping.

Erosion and Sediment Control Plans are included in **Appendix B**.

3.0 SITE CONTACT INFORMATION

Owner:

Name: Darin DeLay

Title: Parks & Urban Design Manager

Address: 8101 Ralston Road, Arvada CO 80002

Phone: (720) 898-7391

Email: ddelay@arvada.org

Operator

Name:

Title:

Address:

Phone:

Email:

Project Manager/Site Supervisor:

Name:

Title:

Address:

Phone:

Email:

Qualified Stormwater Manager:

Name:

Title:

Address:

Phone:

Email:

Control Measure Contractor:

Name:

Title:

Address:

Phone:

Email:

Other:

Name:

Title:

Address:

Phone:

Email:

4.0 PROPOSED SEQUENCE FOR MAJOR CONSTRUCTION ACTIVITIES

Project Phase	Estimate Date	Controls to be implemented during each phase*
Pre-Disturbance/Site Preparation		• Construction Fencing, Good Housekeeping
Construction: Clearing and Grubbing Grading Trailhead Work		• Concrete Washout Area, Construction Fencing, Construction Phasing, Good Housekeeping, Inlet Protection, Rock Socks, Sediment Control Logs, Silt Fencing, Stabilized Staging Area, Stockpile Management, Street Sweeping, Vehicle Tracking Control
Final Stabilization		• Construction Fencing, Erosion Control Blanket, Good Housekeeping, Seeding and Mulching

5.0 EXISTING SOIL DATA

No geological survey of the site was conducted, but available information from the United States Department of Agriculture (USDA) shows the existing soil to be primarily clay loam, Hydrologic Soil Group C. This indicates low potential for infiltration.

A copy of the soils report is included in **Appendix C**.

6.0 EXISTING VEGETATION

Visual inspection of the site shows that the project site is primarily grass. There are some existing trees. The site is well-covered, over 75 percent.

7.0 RECEIVING WATERS

7.1 Immediate and Ultimate Receiving Waters

The project site discharges into the City of Arvada storm sewer system from the stormwater pond located at the southeast corner of the property. The storm sewer system outlets to Pomona Lake Number 1/Pond Lake.

This construction project is within the City of Arvada, which has a Phase II Municipal Separate Storm Sewer System (MS4) Permit from the State of Colorado.

Are their anticipated wetland impacts (Circle)? Yes ☒ No
Stream impacts (Circle)? Yes ☒ No

The property is not within a floodplain according to FEMA data dated January 20, 2016.

A copy of the flood insurance rate map (FIRM) for this site (FIRMette) is included in **Appendix D**.

7.2 Stream Crossings

There are no stream crossings located within the project site.

7.3 Impaired Waters

There are no waters on the project site listed as being impaired.

8.0 POTENTIAL POLLUTANT SOURCES

Potential Source of Pollution	Potential Exists for this Project?	Description of Activities & Control Measures Used
Disturbed and stored soils - Stockpiled soils (e.g. topsoil, embankments, wetland, spoils, etc.) - Disturbed soils (exposed areas, staging areas, parking, etc.)	y	Potential during all phases of construction activities, including but not limited to excavating, grading, cutting, filling, landscaping, etc. Potential pollutants include disturbed eroded sediment entering state waterways, inlets and sewers, and off right of way.

Potential Source of Pollution	Potential Exists for this Project?	Description of Activities & Control Measures Used
		<u>Control Measures</u>- Sediment control and stockpile containment includes usage of silt fence, sediment control logs, and inlet protection as outlined in the SWMP narratives. Erosion control includes seeding/ mulching and vegetative protection. Administrative BMPs include site management and limiting number and location of stockpiles.
Vehicle tracking of sediments	y	Potential during all construction activities. <u>Control Measures</u> - Sediment control including vehicle tracking pads, street sweeping, and inlet protection. Minimize the number of entry and exit points, add orange perimeter fence to define construction entries/exits and establish perimeter control, and require equipment to be cleaned prior to arrival on site.
Management of contaminated soils	y	No known contaminated soils are expected to be encountered during this project. If contaminated soils/water are encountered, all activity shall be stopped until the situation can be assessed. The owner will be contacted.
Loading and unloading operations	y	Potential during delivery and staging of materials, equipment, soil, debris, etc. <u>Control Measures</u> - Loading and unloading operations shall occur within the disturbance limits of the project using designated vehicle tracking pads. Administrative controls include site management to minimize the number of areas at which loading/unloading occurs. Education as to where access points are on the project to prevent vehicle tracking.
Outdoor storage activities (erodible building materials, fertilizers, chemicals, etc.)	y	Potential during all phases of construction activities including delivery, staging/storage and use of various materials. <u>Control Measures</u> – Containment of the storage or staging areas using temporary berms or plastic/metal containment structures. Use of secondary containment

Potential Source of Pollution	Potential Exists for this Project?	Description of Activities & Control Measures Used
		device for storage of chemicals and petroleum products. Chemicals shall not be used, stored or stockpiled within 50 feet of state waters. Administrative controls including site management to ensure limited amount of materials are stored on site and are placed in proper designated areas.
Vehicle and equipment maintenance and fueling	y	Fueling of equipment or vehicles and equipment or vehicle repair activities may occur during all phases of construction activity. <u>Control Measures</u> – Limit areas where fueling occurs (no less than 50 feet from any state water, inlet, flow line). Ensure spill response kit is accessible where fueling is taking place. Use of plastic sheeting, drip pans, dirt berms and other measures to contain fluids. Immediate clean-up and disposal of spoils as detailed in the Spill Prevention, Control and Countermeasure Plan (Section 13). Secondary containment will be provided for containers 55 gallons or greater. Administrative controls include site management to limit equipment and vehicle maintenance that occurs on site.
Significant dust or particulate generating processes (e.g., saw cutting material, including dust)	y	Potential during clearing and grubbing, cut/fill activities, saw cutting/sanding work and final stabilization. <u>Control Measures</u> – Water truck on site for use as needed to minimize dust production. Use of pickup broom or vacuum during or immediately following saw cutting projects.
Routine maintenance activities including fertilizers, pesticides, herbicides, detergents, fuels, solvents, oils, etc.	y	Very few routine maintenance activities will occur on site. See Vehicle and Equipment maintenance for activities associated with those items. <u>Control Measures</u> – See Vehicle and Equipment Maintenance
On-site waste management practices (waste piles, liquid wastes, dumpsters)	y	All activities including clear and grubbing, demolition activities, et.

Potential Source of Pollution	Potential Exists for this Project?	Description of Activities & Control Measures Used
		<u>Control Measures</u> – Trash receptacles will be placed on site and garbage disposed of when full. Public trash will be routinely picked up around the site and disposed of in proper containers. Waste piles shall be placed a minimum of 50 feet from state waters, contained by earthen berms, silt fence, erosion logs, and landforms. Waste piles shall be placed in areas where stormwater runoff would not result in contamination of state waters. Liquid wastes will be contained and removed from site and properly disposed of by the subcontractors/contractor generating wastes in accordance with the Spill Prevention, Control and Countermeasure Plan (Section 13).
Concrete truck/equipment washing, including washing of the concrete truck chute and associated fixtures and equipment	y	Activities associated with this pollution source are concrete pours. <u>Control Measures</u> – Dedicated concrete washout areas that are clearly marked and maintained.
Dedicated asphalt, concrete batch plants and masonry mixing stations	n	Not applicable for this site. If these activities are added, then the SWMP will be amended.
Non-industrial waste sources such as worker trash and portable toilets	y	Potential throughout construction. <u>Control Measures</u> – See onsite waste management. Cleanup of trash will occur daily. A dumpster will be placed on site, at our office trailer. This will be emptied on a weekly basis, and more often, if waste amounts warrant extra pick-ups. Portable toilets will be located a minimum of 50 feet from state waters. They shall be adequately staked and cleaned on a weekly basis. They will be inspected daily for spills. Administrative controls will include site management practices to ensure workers are placing trash in the appropriate dumpsters. Monitoring to ensure trash dumpsters are removed from the site when full. Monitoring to ensure portable toilets are cleaned as needed, and repaired or removed if found to be leaking.

Potential Source of Pollution	Potential Exists for this Project?	Description of Activities & Control Measures Used
Other areas or procedures where spills can occur	y	Potential throughout construction. <u>Control Measures</u> – See onsite waste management. Portable toilets and all fuel will be located a minimum of 50 feet from state waters. Toilets shall be adequately staked and cleaned on a weekly basis. They will be inspected daily for spills. Administrative controls will include monitoring to ensure portable toilets are cleaned as needed, and repaired or removed if found to be leaking.

9.0 NON-STORMWATER DISCHARGES

Potential Non-Stormwater Discharges	Potential Exists for this Project?	Description of Activities & Control Measures Used
Discharges from uncontaminated springs that do not originate from an area of land disturbance	n	Not applicable for this site. If these activities are added, then the SWMP will be amended.
Discharges to the ground of concrete washout water associated with the washing of concrete tools and concrete mixer chutes. Discharges of concrete washout water must not leave the site as surface runoff or reach receiving waters	y	A concrete wash-out area will be utilized to capture wastewater and waste products resulting from the cleaning of concrete and masonry equipment.
Discharges of landscape irrigation return flow	y	Irrigation activities shall avoid or minimize discharges to the MS4. <u>BMPs</u> – Avoid directing irrigation flows directly on erodible surfaces if runoff will enter Receiving Waters or MS4 facilities. If possible, apply irrigation waters so that runoff will flow over vegetated areas.

Potential Non-Stormwater Discharges	Potential Exists for this Project?	Description of Activities & Control Measures Used
Discharges from emergency fire-fighting activities	y	To the extent allowed by the circumstances at the scene and without compromising the health and safety of personnel or the public, emergency firefighting activities should be performed in a manner that avoids or minimizes discharges to the MS4. <u>BMPs</u> – If possible, avoid directing firefighting flows directly on erodible surfaces if runoff will enter Receiving Waters or MS4 facilities. If possible, apply fire-fighting flows so that runoff will flow over vegetated areas.
Dewatering activities meeting a low-risk discharge guidance	n	Not applicable for this site. If these activities are added, then the SWMP will be amended.
Discharges covered under other CDPS discharge permits?	n	Not applicable for this site. If these activities are added, then the SWMP will be amended.

10.0 EFFLUENT LIMITATIONS

10.1 Control Measure Details

This section includes the narrative description of appropriate control measures that will be implemented before, during, and after construction activities. Both structural and non-structural control measures will be described.

Control Measure Name	Description	Phase
Concrete Washout Area	Designating and properly managing a specific area of the construction site as a concrete washout area. Designed to receive wash water from washing of tools and concrete mixer chutes, liquid concrete waste from dump trucks, mobile batch mixers, or pump trucks. <u>Surface discharges of concrete washout water from construction sites are prohibited.</u>	Trailhead construction
Construction Fencing	Restricts site access to designated entrances and exits, delineates construction site boundaries, and keeps	All phases

Control Measure Name	Description	Phase
	construction out of sensitive areas such as natural areas to be preserved as open space, wetlands and riparian areas.	
Construction Phasing	Attention to construction phasing, scheduling, and sequencing of land disturbing activities. Erosion and sediment controls needs adjustment as the project progresses and should be documented in the SWMP.	All phases
Erosion Control Blanket	Temporary or permanently installed manufactured products designed to control erosion and enhance vegetation establishment and survivability, particularly on slopes and in channels.	Final stabilization
Good House-keeping	Prevents pollution associated with solid, liquid and hazardous construction-related materials and wastes.	All phases
Inlet Protection	Permeable barriers installed around an inlet to filter runoff and remove sediment prior to entering a storm drain inlet. Inlet protection can be constructed from rock socks, sediment control logs, silt fence, block and rock socks, or other materials.	Clearing and grubbing, grading and trailhead construction
Rock Socks	Used either as a perimeter control or as part of inlet protection. Traps sediment from stormwater runoff that flows onto roadways as a result of construction activities. Constructed of gravel that has been wrapped by wire mesh or a geotextile to form an elongated cylindrical filter.	Clearing and grubbing, grading and trailhead construction
Sediment Control Log	A linear roll made of natural materials such as straw, coconut fiber, or other fibrous material trenched into the ground and held with a wooden stake. They are used as a sediment barrier to intercept sheet flow runoff from disturbed areas.	Clearing, grubbing, grading and trailhead construction
Seeding and Mulching	Seeding is used to stabilize disturbed areas that will be inactive for an extended period or at final grade that will not be otherwise stabilized. Effective seeding includes preparation of a seedbed, selection of an appropriate seed mixture, proper planting techniques, and protection of the seeded area with mulch, geotextiles, or other appropriate measures. Mulching consists of evenly applying straw, hay, shredded wood mulch, rock, bark or compost to disturbed soils and securing the mulch by crimping, tackifiers, netting or other measures. Reduces erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.	Final stabilization
Silt Fencing	Geotextile fabric installed using stakes on down-gradient side and trenched into soil. Provides sediment control by reducing runoff velocity. Used as perimeter control and back of curb control	Clearing and grubbing, grading and trailhead construction

Control Measure Name	Description	Phase
Stabilized Staging Area	A clearly designated area where construction equipment and vehicles, stockpiles, waste bins, and other construction-related materials are stored. The contractor office trailer may also be located in this area.	Clearing, grubbing, grading and trailhead construction
Stockpile Management	Minimizes erosion and sediment transport from soil stockpiles. Should be used when soils or other erodible materials are stored at the construction site. Special attention should be given to stockpiles in close proximity to natural or manmade storm systems.	Clearing, grubbing, grading and trailhead construction
Street Sweeping	Uses mechanical pavement cleaning practices to reduce sediment, litter and other debris washed into storm sewers by runoff. Reduces pollutant loading to receiving waters and in some cases reduces clogging of storm sewers and prolong the life of infiltration oriented BMPs and reduce clogging of outlet structures in detention BMPs.	All phases; as needed
Vehicle Tracking Control	Provides stabilized construction site access where vehicles exit the site onto paved public roads. Helps remove sediment (mud or dirt) from vehicles, reducing tracking onto the paved surface. Constructed from angular rock or other proprietary materials.	Clearing, grubbing, grading and trailhead construction

10.2 Other Effluent Limitations

Additional controls measures:

- Soil Compaction – Soil compaction must be minimized for areas where infiltration control measures will occur or where final stabilization will be achieved through vegetative cover.
- Topsoil Preservation – Unless infeasible, topsoil will be preserved for those areas of a site that will utilize vegetative final stabilization. Topsoil preservation may include the following measures:
 - Limit construction disturbance area including those used for access by installing construction fence or other means to limit impacts to existing topsoil.
 - In areas of grading or excavation, strip and segregate topsoil separately from other excavated materials.
 - In areas with construction traffic where topsoil is likely to mix with subsoil, strip and stockpile topsoil.
- Minimize Disturbances – Disturbances will be minimized to the extent feasible especially on steep slopes.
- Temporary Stabilization – Temporary stabilization must be implemented for earth disturbing activities on any portion of the site where ground disturbing construction activity has permanently ceased, or temporarily ceased for more than 14 calendar days. Temporary stabilization methods may include, but are not limited to, surface roughening, tarps, soil tackifier, and hydroseed and although not specifically outlined in the permit

may also include temporary hard surfaces. During the seasons when seeding does not produce vegetative cover, temporary stabilization will occur. The permittee may exceed the 14-day schedule when either the function of the specific area of the site requires it to remain disturbed, or, physical characteristics of the terrain and climate prevent stabilization. The SWMP must document the constraints necessitating the alternative schedule, provide the alternate stabilization schedule, and identify all locations where the alternative schedule is applicable on the site map.

- Construction activities will be limited to those areas within the limits of disturbance as shown on the plans. Construction activities in addition to normal construction procedures will include the on-site parking of vehicles or equipment, on-site staging, on-site batch plants, haul roads or work access and any other action which would disturb existing conditions. Off road staging areas or stockpiles must be pre-approved by the City of Arvada. Disturbances beyond these limits will be restored to original condition.

Other controls related to final stabilization, bulk storage, spill prevention, and protection of vegetation within 50 feet of receiving waters are covered in other sections of this SWMP.

11.0 MATERIALS HANDLING

This section includes the narrative description of all potential pollutants other than sediment that will be handled and disposed of in an appropriate manner that does not contaminate stormwater.

Material/Waste Product Name	Description and Intended Use and Associated Control Measure	Phase
Concrete Curing Compounds	Used for concrete work. Containers will be kept intact with no leakage and in an area with good housekeeping practices to avoid spills	During concrete pouring activities
Diesel	Used to fuel equipment. Containers will be kept intact with no leakage and in an area with good housekeeping practices to avoid spills	All phases when heavy equipment is in use
Diesel Engine Antifreeze Coolant	Used in equipment. Containers will be kept intact with no leakage and in an area with good housekeeping practices to avoid spills	All phases when heavy equipment is in use
Hydraulic Oil	Used in equipment. Containers will be kept intact with no leakage and in an area with good housekeeping practices to avoid spills	All phases when heavy equipment is in use
Motor Oil	Used in equipment. Containers will be kept intact with no leakage and in an area with good housekeeping practices to avoid spills	All phases when heavy equipment is in use

Material/Waste Product Name	Description and Intended Use and Associated Control Measure	Phase
Unleaded Gasoline	Used to fuel equipment. Containers will be kept intact with no leakage and in an area with good housekeeping practices to avoid spills	All phases when heavy equipment is in use
Port-o-lets	Used as sanitation facilities. Containers will be kept intact with no leakage and in an area with good housekeeping practices to avoid spills	All phases of construction
Trash	Cleanup of trash will occur daily. A dumpster will be placed on site which will be emptied on a weekly basis.	All phases of construction

12.0 CONTROL MEASURE MAINTENANCE

All erosion and sediment control practices and other protective measures identified in the SWMP will be maintained in effective operating condition. Control measures that are not adequately maintained in accordance with good engineering, hydrologic and pollution control practices, including removal of collected sediment outside the acceptable tolerances of the control measures are considered to be no longer operating effectively and must be addressed.

Assessment of control measures will be performed as part of the comprehensive inspection. Where site assessment results in the determination that new or replacement control measures are necessary, the control measures must be installed to ensure ongoing compliance with this SWMP. Where control measures have failed or are otherwise non-compliant, they must be addressed immediately or an alternative schedule with rationale will be supplied in the inspection corrective action log. See control measures details and specification for specific maintenance information

13.0 SPILL PREVENTION AND RESPONSE PLAN

13.1 Spill Prevention

All parties on site will take all measures necessary to prevent spills that could negatively impact stormwater quality. The following general spill prevention methods should be used on site:

- Ensuring personal safety for all personnel affected by the spill;
- Proper storage of all materials;
- Proper maintenance of all containers;
- Bulk storage, 55 gallons or greater, for petroleum products and other liquid chemicals must have secondary containment or equivalent;
- Train employees in spill prevention and cleanup;
- Designate responsible individuals to oversee and enforce control measures;
- Spills should be covered and protected from stormwater run-on during rainfall to the extent that it doesn't compromise cleanup activities;
- Do not bury or clean/wash spills with water without using a wet vacuum;

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material properly;
- Do not allow water used for cleaning and decontamination to enter storm drains or waterways;
- Contain water overflow or minor water spillage and do not allow it to discharge into storm drains or waterways;
- Loading and unloading of chemicals should be observed by on site personnel at all times;
- Do not store chemicals within 50 feet of a storm drain or waterway; and
- All spills must be documented and properly cleaned up immediately.

13.2 Spill Prevention and Response Training

Prior to project startup, personnel and contractors will be trained in the following spill control procedures by the Erosion Control Specialist/Qualified Stormwater Manager.

- Chemicals planned to be used on site;
- Spill control;
- Containment, vessel, tank, and piping inspection and maintenance;
- Spill response, containment, and clean-up; and
- Company policies on reporting and responding to spills.

13.3 Environmental Sensitive Areas

There are no environmentally sensitive areas in the work area.

13.4 Spill Reporting and Cleanup Contacts

All responsible personnel and their corresponding contact information are presented in the table below.

Responsibility	Name and Title	Phone Number
Emergency Local Fire, Police, & Ambulance	N/A	911
EPA National Response Center	N/A	1-800-424-8802
CDPHE Spill Reporting Hotline	N/A	1-877-518-5608
Primary Contact for Spills		
Secondary Contact for Spills		
On-Site Spill Responder		
Arvada Stormwater Team	Jake Moyer/Stormwater Administrator	720-898-7812

13.5 Location of Spill Kits

The kit will contain an absorbent boom, absorbent rags, absorbent litter and an over-pack drum to storm the material. Spill kit materials should be replenished after use in the field. Spill kits should be inspected regularly to check if materials need to be replenished.

Type of Spill Kit	Location

Type of Spill Kit	Location

13.6 Quantities of Chemical and Locations Stored On-Site

The following is a table of chemical quantities and where they are located on site. (Note: Also refer to the Potential Pollutants list and evaluation in Section 8 of this SWMP.)

Material	Quantity	Staging/Storage Location

13.7 Chemical Container Labeling

Any products/chemicals that are located or stored on site shall be properly labeled as to the contents of the material. The Safety Data Sheet (SDS) for all products/chemicals utilized on site can be found in a notebook at the project trailer.

13.8 Minor Spills (less than 5 gallons)

Notification and cleanup procedures to be implemented in the event of a spill for spills which do not enter state waters or are under reporting limits of the chemical of concern (e.g. diesel fuel, hydraulic fluid, motor oil, used hydraulic fluid and motor oil, tack oil).

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spills.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
 - o Contain the spread of the spill.
 - o Recover spilled materials.
 - o Clean the contaminated area and properly dispose of contaminated materials.
- Keep within permitted area.
- It must not threaten any stormwater conveyance.

13.9 Major Spills (greater than 5 gallons)

Significant spill procedures for spills of any size that enter state waters or have the potential to do so and can be controlled by the first responder along with the aid of other trained personnel. Section 13.4 above contains spill notification contacts and phone numbers. This response may require all work to stop. Spills must be clean up immediately

- Contain spread of the spill.
- Notify the project foreman immediately.

- If the spill occurs on paved or impermeable surfaces, clean up using dry methods. Contain the spill by encircling with absorbent materials and do not let the spill spread. Make sure nearby storm drains and waterways are protected.
- If the spill occurs in a dirt area, immediately contain the spill by constructing an earthen berm. Dig up and properly disposed of contaminated soil.
- If the spill occurs during a rain event, cover the spill with tarps, visqueen or similar material to prevent contaminating runoff. Make sure nearby storm drains and waterways are protected.

13.10 Notification of Regulatory Agencies

For non-hazardous materials which may endanger health or the environment; spills or discharge of hazardous substance or oil, which may cause pollution of the waters of the state; the following measures shall be implemented:

- Contact the CDPHE Environmental Emergency Spill Reporting Line (1-877-518-5608) within 24 hours of the spill event. A written notification to the CDPHE-EMP is necessary within 5 days.
- Contact the Colorado State Patrol 24-hour hotline (1-303-239-4501) if the spill is on a state highway.
- Report spill to the Project Engineer.
- Call the Arvada Stormwater Hotline (720-898-7811) if spilled material spreads to a Arvada storm drain or a waterway.

For spills involving hazardous materials, the following measures shall be implemented:

- Contact the local emergency response team by dialing 911.
- Contact the CDPHE Environmental Emergency Spill Reporting Line (1-877-518-5608) within 24 hours of the spill event. A written notification to the CDPHE-EMP is necessary within 5 days.
- Contact the Colorado State Patrol 24-hour hotline (1-303-239-4501) if the spill is on a state highway.
- Call the Arvada Stormwater Hotline (720-898-7811) if spilled material spreads to a Arvada storm drain or a waterway.

14.0 FINAL STABILIZATION

14.1 Establishing Final Stabilization

Final stabilization is reached when all ground surface disturbing activities at the construction site are complete; and, for all areas of ground surface disturbing activities, a uniform vegetative cover with an individual plant density of at least 70 percent (uniform) of what would have been provided by native vegetation in a local, undisturbed area.

14.2 Final Stabilization Measures

Final stabilization shall include:

- a) Seeding & Mulching: Apply native seed mix according to the latest edition of the City of Arvada Engineering Code of Standards and Specifications. Use appropriate sediment control measures until final stabilization is achieved.
- b) Erosion Control Blanket: Apply on slopes greater than 4:1 and in swales according to City of Arvada specifications.

- c) Unless infeasible, topsoil shall be preserved for those areas of a site that will utilize vegetative final stabilization.

All final stabilization methods shall be in accordance with Section 1000 of the City of Arvada's Engineering Standards and Specifications

14.2.1 Seeding Plan

- Areas to be irrigated shown on erosion control plans in Appendix B
- Areas to be seeded shown on erosion control plans in Appendix B
- Native seed mix and application rate shown on landscape plans in Appendix B
- Mulching application - mulching application to areas seeded according to City of Arvada specifications
- Stabilization of slopes and ditches
- Soil conditioning and fertilizer - fertilizer application to areas seeded according to City of Arvada specifications

14.2.2 Reseeding Operations /Corrective Stabilization

Areas where seed has not germinated after one season will be evaluated by the City. Areas that have not germinated will have seed, mulch and mulch tackifier (or blanket) reapplied in accordance with Section 1000 of the City's Engineering Standards and Specifications.

14.3 Long-Term/Permanent Stormwater Control Measures

Permanent stormwater control measures used on the project site include extending the existing detention pond and adding vegetated swales to the property. The existing pond will be expanded according to the grading shown in Appendix B to treat stormwater from the additional impervious area. The vegetated swales will assist in rate control and sediment removal prior to entering the storm sewer system.

15.0 INSPECTIONS

During construction the site will be inspected by a Qualified Stormwater Manager at one of the following frequencies approved by the CDPHE:

- At least one inspection every 7 calendar days
- At least one inspection every 14 calendar days including post storm inspections within 24 hours of a storm that causes surface erosion.

The City of Arvada allows a 14-day and post storm inspection frequency.

Inspect the following areas for evidence of, or the potential for, pollutants leaving the construction site boundaries, entering the stormwater drainage system, or discharging to state waters:

- Construction site perimeter;
- All disturbed areas;

- Designated haul routes;
- Material and waste storage areas exposed to precipitation;
- Locations where stormwater has the potential to discharge offsite; and
- Locations where vehicles exit the site.

A reduced frequency inspection schedule may be followed with approval from the City of Arvada for the following site conditions:

- Inspections at completed sites that are awaiting final stabilization
- Winter conditions exclusion

A copy of a blank inspection form is included in **Appendix E**. Completed inspection forms must be kept on site or be easily accessible via an electronic format.

16.0 RECORDKEEPING

A copy of this SWMP and all inspection records must be retained for three years from the permit termination date.

APPENDIX A

CDPS Construction Permit

APPENDIX B

EROSION AND SEDIMENT CONTROL PLANS, GRADING AND DRAINAGE PLANS, BMP DETAILS, AND LANDSCAPE PLAN



Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER: 2204-00356 DATE 10.02.2023

DESIGNED: JMS
DRAWN: RRS
CHECKED: RRS

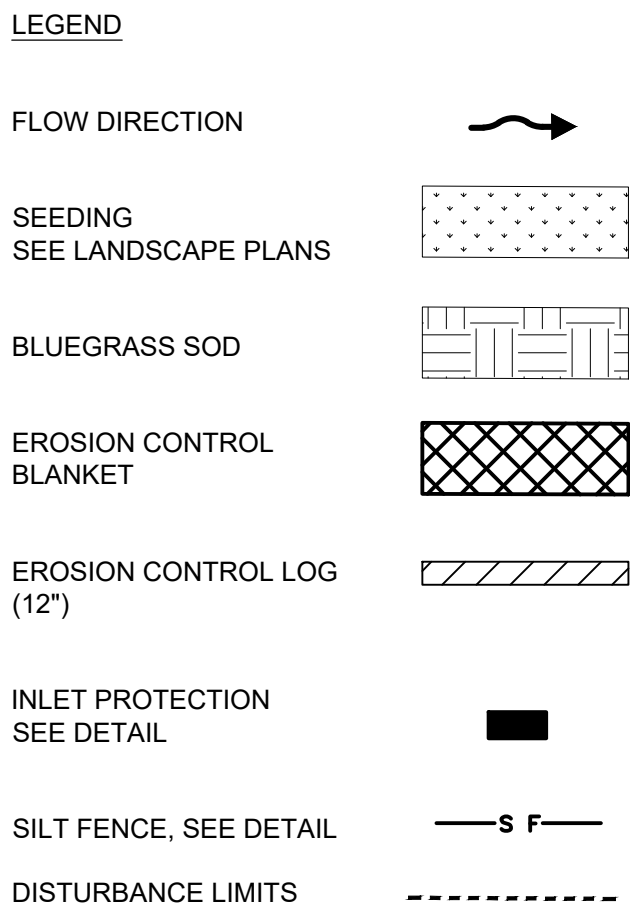
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
INITIAL EROSION CONTROL

SHEET NUMBER

C1.0



QUANTITIES	
CUT (CU YD)	1449
FILL (CU YD)	1155
DISTURBANCE AREA (SQ FT)	83,667

NOTES

1. CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEIPTS/ABLES AND PORTABLE TOILETS UP TO CONTRACTOR. CONTRACTOR TO OBTAIN APPROVED CONTRACTOR STAGING AREA. CONTRACTOR TO VERIFY AND PROTECT ALL DOWN-GRADIENT DRAINAGE FROM STAGING AREA.
2. EROSION CONTROL BLANKET IS SHOWN AND TO BE INSTALLED ON ALL SLOPES STEEPER THAN OR EQUAL TO 3:1V:H.
3. CONTRACTOR SHALL UTILIZE A VEHICLE TRACK PAD FOR ALL PROPOSED VEHICLE EQUIPMENT ACCESS POINTS. IT IS INTENDED FOR IT TO BE USED FOR CONTRACTOR TO UTILIZE THE APPROVED STAGING AREA. ACCESS POINTS OUTSIDE OF THIS LOCATION NEED TO BE REQUESTED IN WRITING AND APPROVED PRIOR TO INSTALLATION AND USE. VEHICLE TRACK PADS ARE CONSIDERED INCIDENTAL TO THE BID ITEM "EROSION CONTROL MANAGEMENT".

STORM SEWER OUTLET
POMONA RESERVOIR
INV OUT = 5516.82

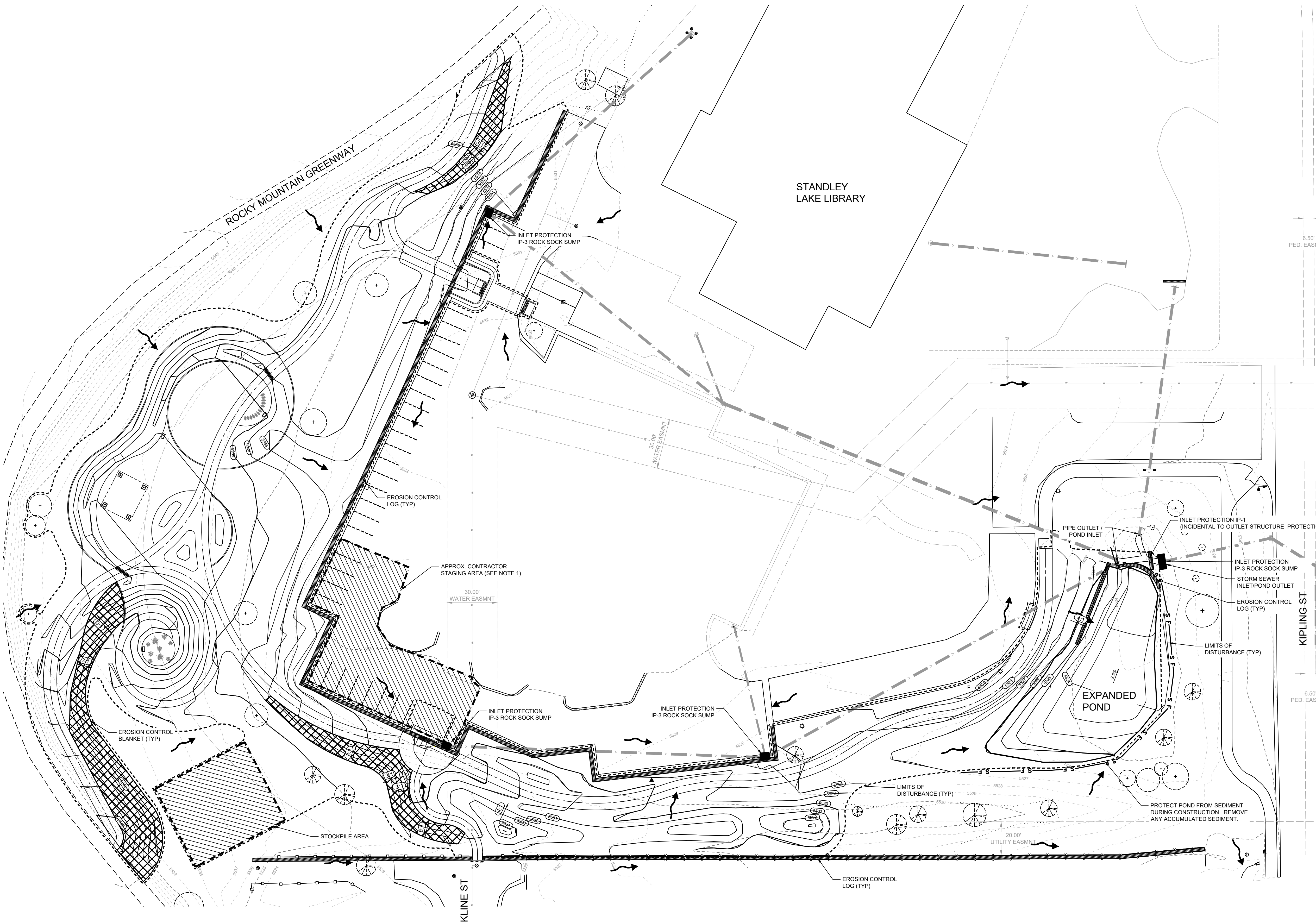
INFORMATION OBTAINED FROM 1991
STANDLEY LAKE LIBRARY FINAL
GRADING/DRAINAGE PLAN-AS BUILT



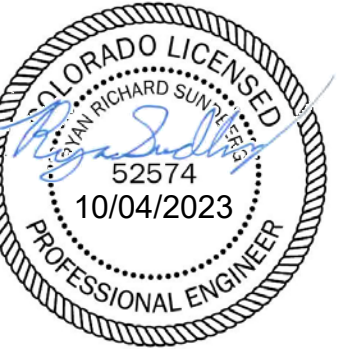
APPROVED:

CITY ENGINEER	DATE	JOB NUMBER
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REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA "ENGINEERING CODE OF STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS", LATEST EDITION. SOLE RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THESE DOCUMENTS SHALL REMAIN WITH THE REGISTERED PROFESSIONAL ENGINEER SEALING THESE PLANS. THE CITY DOES NOT ACCPET LIABILITY FOR FACILITIES DESIGNED BY OTHERS.

[illegible]

E NAME
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8485 Kipling St.
City of Arvada, CO,

DESIGNED: JMS
DRAWN: RRS
CHECKED: RRS

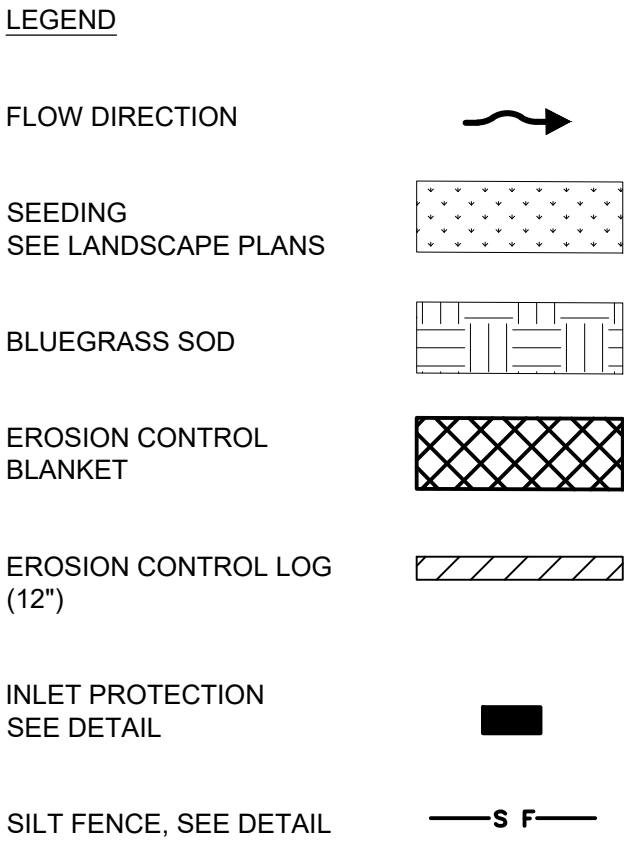
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
INTERIM EROSION CONTROL

SHEET NUMBER:

C1.1



QUANTITIES	
CUT (CU YD)	1449
FILL (CU YD)	1155
DISTURBANCE AREA (SQ FT)	83,667

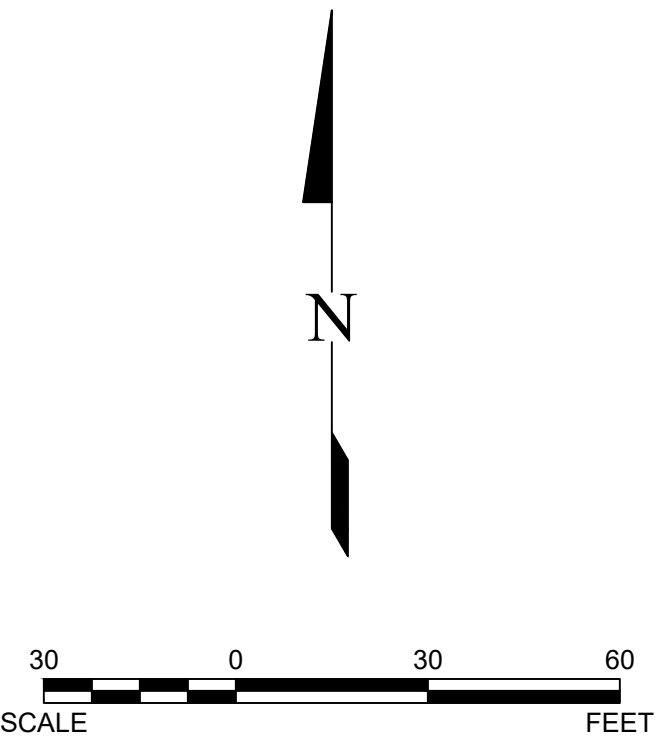
NOTES

1. CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEPTABLES AND PORTABLE TOILETS UP TO CONTRACTOR TO OBTAIN APPROVED STAGING AREA. CONTRACTOR TO VERIFY AND PROTECT ALL DOWN-GRADIENT DRAINAGE FROM STAGING AREA.
2. EROSION CONTROL BLANKET IS SHOWN AND TO BE INSTALLED ON ALL SLOPES STEEPER THAN OR EQUAL TO 3H:1V.
3. CONTRACTOR SHALL UTILIZE A VEHICLE TRACK PAD FOR ALL PROPOSED VEHICLE/EQUIPMENT ACCESS POINTS. IF IT IS INTENDED FOR THE CONTRACTOR TO UTILIZE THE APPROVED STAGING AREA, ACCESS POINTS OUTSIDE OF THIS LOCATION NEED TO BE REQUESTED IN WRITING AND APPROVED PRIOR TO INSTALLATION AND USE. VEHICLE TRACK PADS ARE CONSIDERED INCIDENTAL TO THE BID ITEM "EROSION CONTROL MANAGEMENT".

APPROVED:

CITY ENGINEER	DATE	JOB NUMBER
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REVIEW IS FOR GENERAL COMPLIANCE WITH CITY OF ARVADA
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OTHERS.





Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO,

PROJECT NUMBER:	DATE
04-00356	10.02.2023

SIGNED: JMS
DRAWN: RRS
CHECKED: RRS

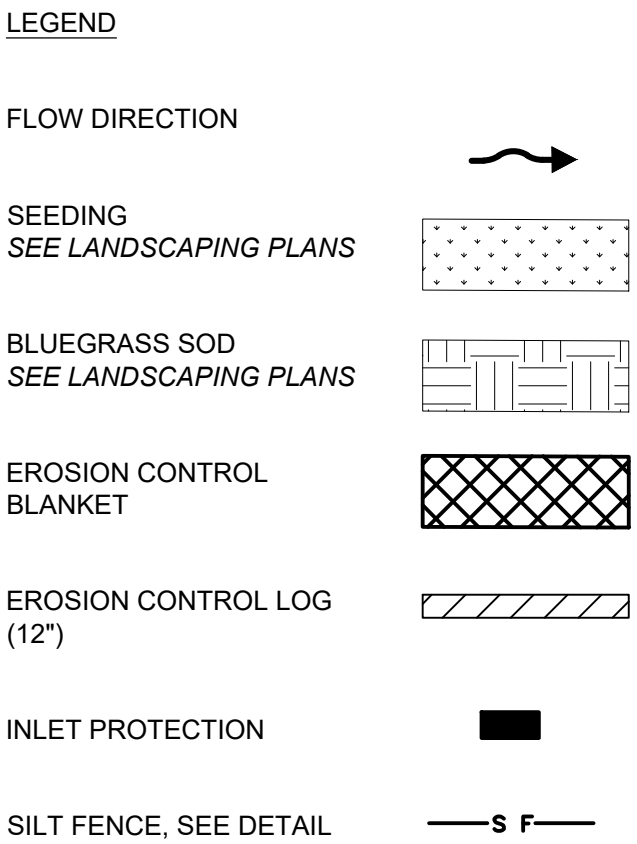
VISIONS:

B DESCRIPTION:
CONSTRUCTION
DOCUMENTS

PROJECT TITLE: WATER EROSION CONTROL

EET NUMBER:

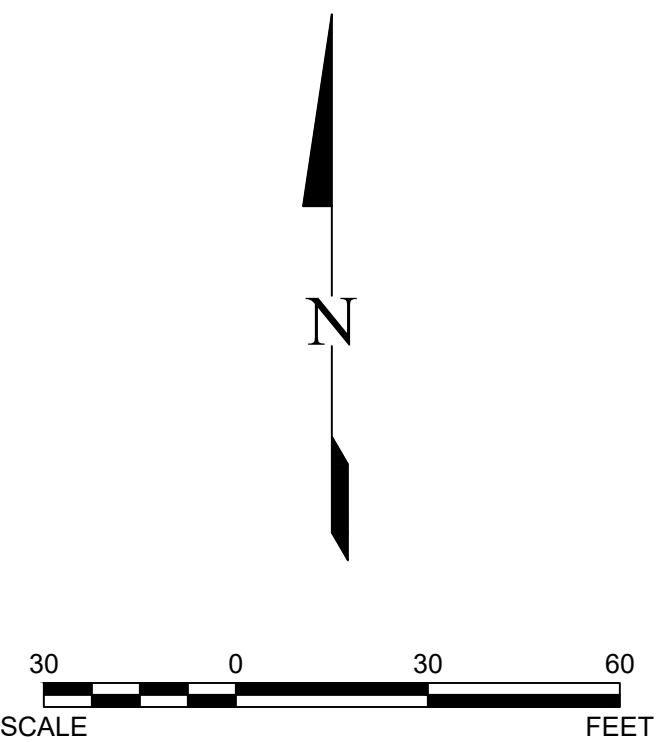
C1.2



QUANTITIES	
CUT (CU YD)	1449
FILL (CU YD)	1155
DISTURBANCE AREA (SQ FT)	83,667

NOTES

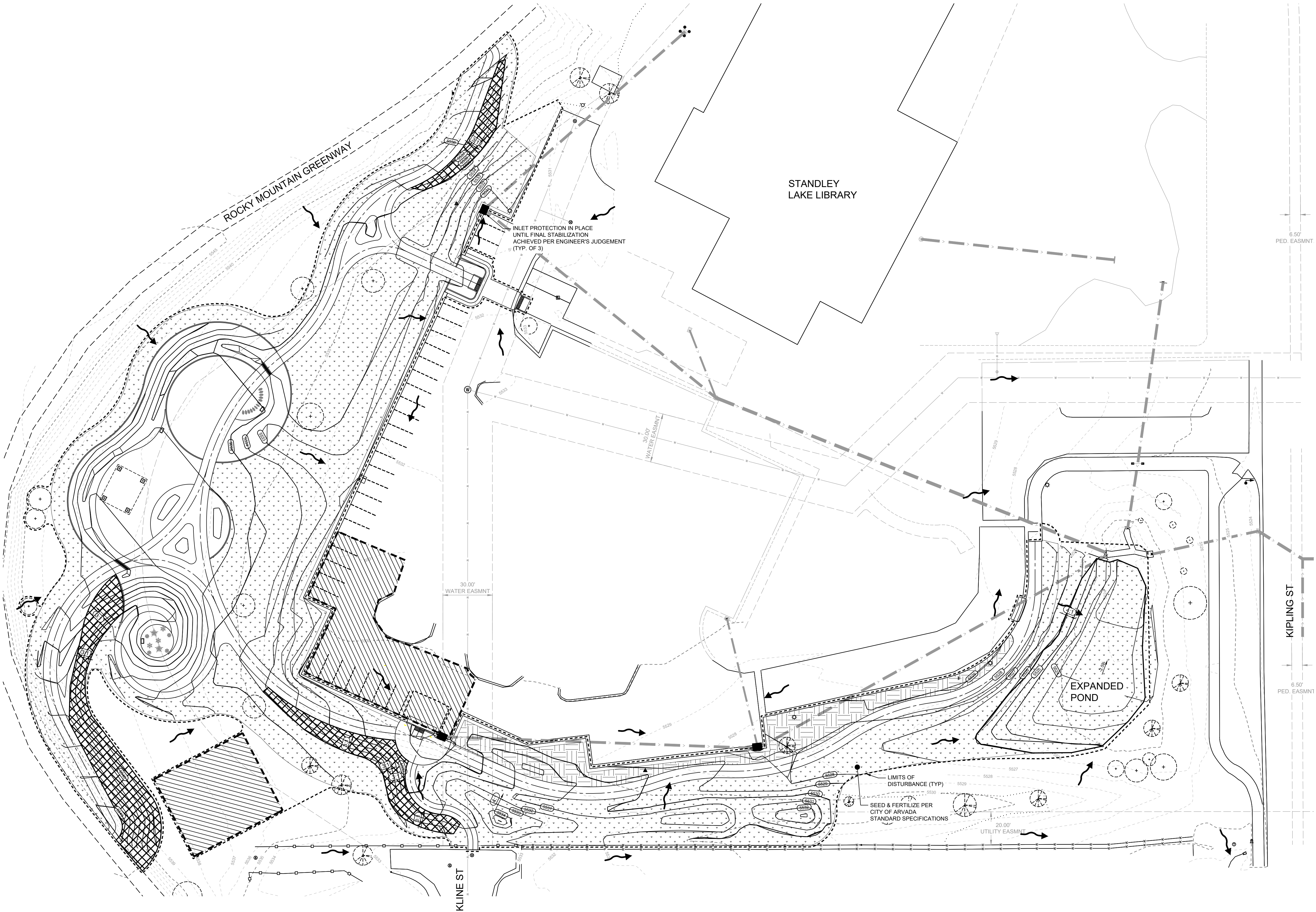
1. CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEPTACLES AND PORTABLE TOILETS UP TO CONTRACTOR. CONTRACTOR SHALL PROVIDE APPROVED CONTRACTOR STAGING AREA. CONTRACTOR TO VERIFY AND PROTECT ALL DOWN-GRADIENT DRAINAGE FROM STAGING AREA.
2. EROSION CONTROL BLANKET IS SHOWN AND TO BE INSTALLED ON ALL SLOPES STEEPER THAN OR EQUAL TO 3H:1V.
3. CONTRACTOR SHALL UTILIZE A VEHICLE TRACK PAD FOR ALL PROPOSED VEHICLE/EQUIPMENT ACCESS POINTS. IT IS INTENDED FOR THE CONTRACTOR TO UTILIZE THE APPROVED STAGING AREA. ACCESS POINTS OUTSIDE OF THIS LOCATION NEED TO BE REQUESTED IN WRITING AND APPROVED PRIOR TO INSTALLATION AND USE. VEHICLE TRACK PADS ARE CONSIDERED INCIDENTAL TO THE BID ITEM "EROSION CONTROL MANAGEMENT".



APPROVED:

CITY ENGINEER	DATE	JOB NUMBER
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E NAME
Users\RYANSU-1\MyAppData\Local\Temp\AcPublish_9100\2284-00356_StandbyJob_Planet.dwg

RS-2 Urban Drainage and Flood Control District November 2010
 Urban Storm Drainage Criteria Manual Volume 3

November 2010 Urban Drainage and Flood Control District SF-3
Urban Storm Drainage Criteria Manual Volume 3

SCL-4 Urban Drainage and Flood Control District November 2015
 Urban Storm Drainage Criteria Manual Volume 3

IP-4	Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual Volume 3	August 2013
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November 2010 Urban Drainage and Flood Control District CWA-3
Urban Storm Drainage Criteria Manual Volume 3

August 2013
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3
IP-5

August 2013
Urban Drainage and Flood Control District
Urban Storm Drainage Criteria Manual Volume 3
IP-7

1. CONTRACTOR SHALL REFER TO THE LATEST EDITION OF THE MILE HIGH FLOOD DISTRICT (MHFD) SPECIFICATIONS PRIOR TO INSTALLATION OF ANY EROSION CONTROL MEASURES. MHFD SPECIFICATIONS SHALL SUPERCEDE CITY OF ARVADA NOTES AND SPECIFICATIONS.

CITY ENGINEER	DATE	JOB NUMBER
---------------	------	------------

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO

PROJECT NUMBER: 2204-00356 DATE 10.02.2023

DESIGNED: JMS
DRAWN: RRS
CHECKED: RRS

REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
DRAINAGE IMPROVEMENTS

SHEET NUMBER:

C2.0

LEGEND
PROPOSED ELEV XXX.XX
FLOW DIRECTION

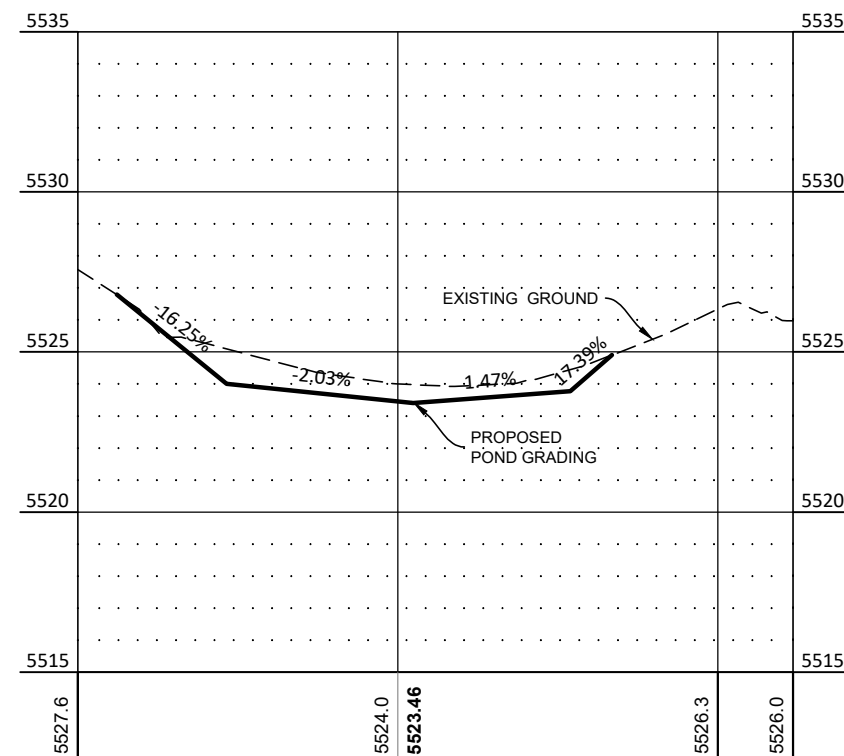
- NOTES
- CONTRACTOR SHALL COORDINATE WITH CITY AND LIBRARY PRIOR TO START OF CONSTRUCTION. LOCATION OF WASTE RECEPTACLES AND PORTABLE TOILETS UP TO CONTRACTOR'S DISCRETION, WITHIN APPROVED CONTRACTOR STAGING AREA.

STORM SEWER OUTLET
POMONA RESERVOIR
INV OUT = 5516.82
INFORMATION OBTAINED FROM 1991
STANDLEY LAKE LIBRARY FINAL
GRADING/DRAINAGE PLAN-AS BUILT

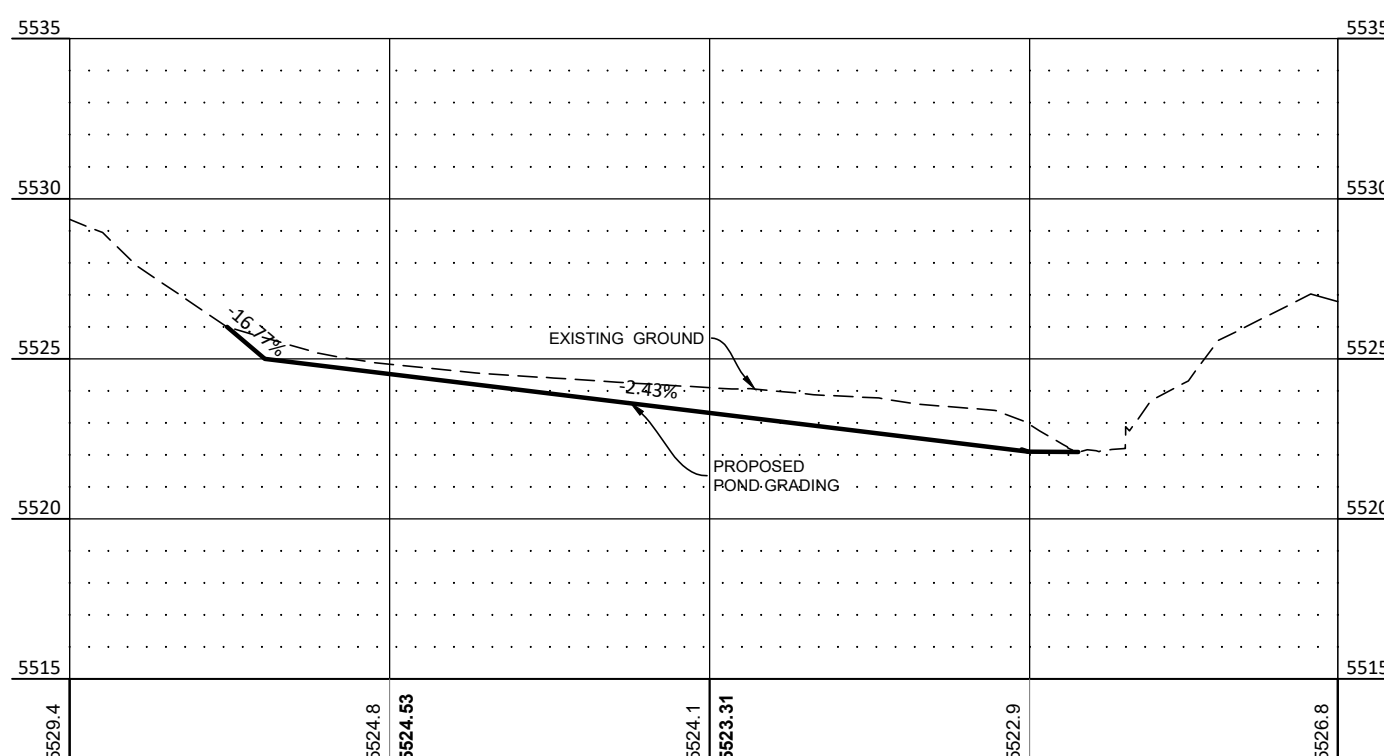
30 0 30 60
SCALE FEET

APPROVED:
CITY ENGINEER DATE JOB NUMBER

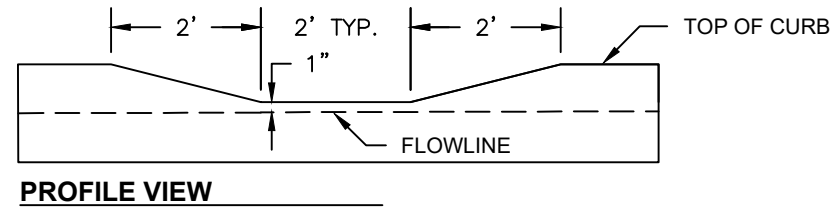
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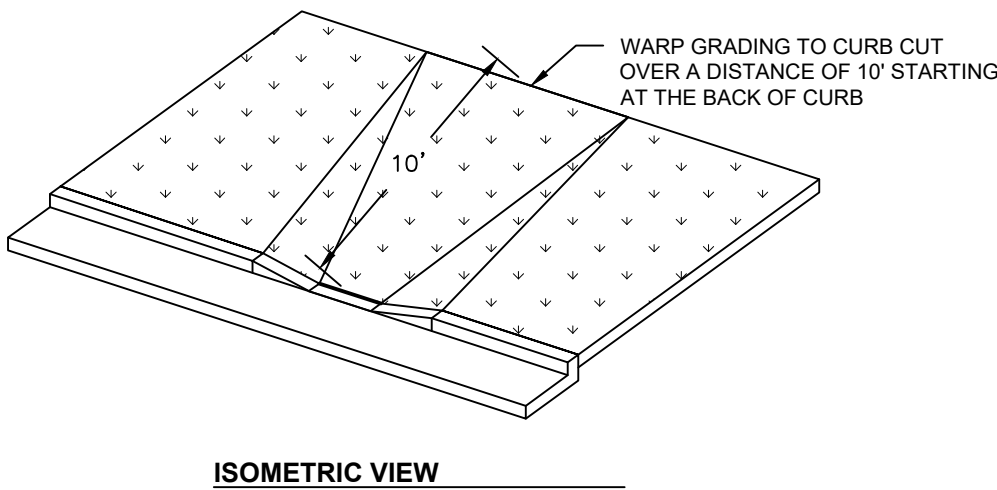
SECTION A-A



SECTION B-B

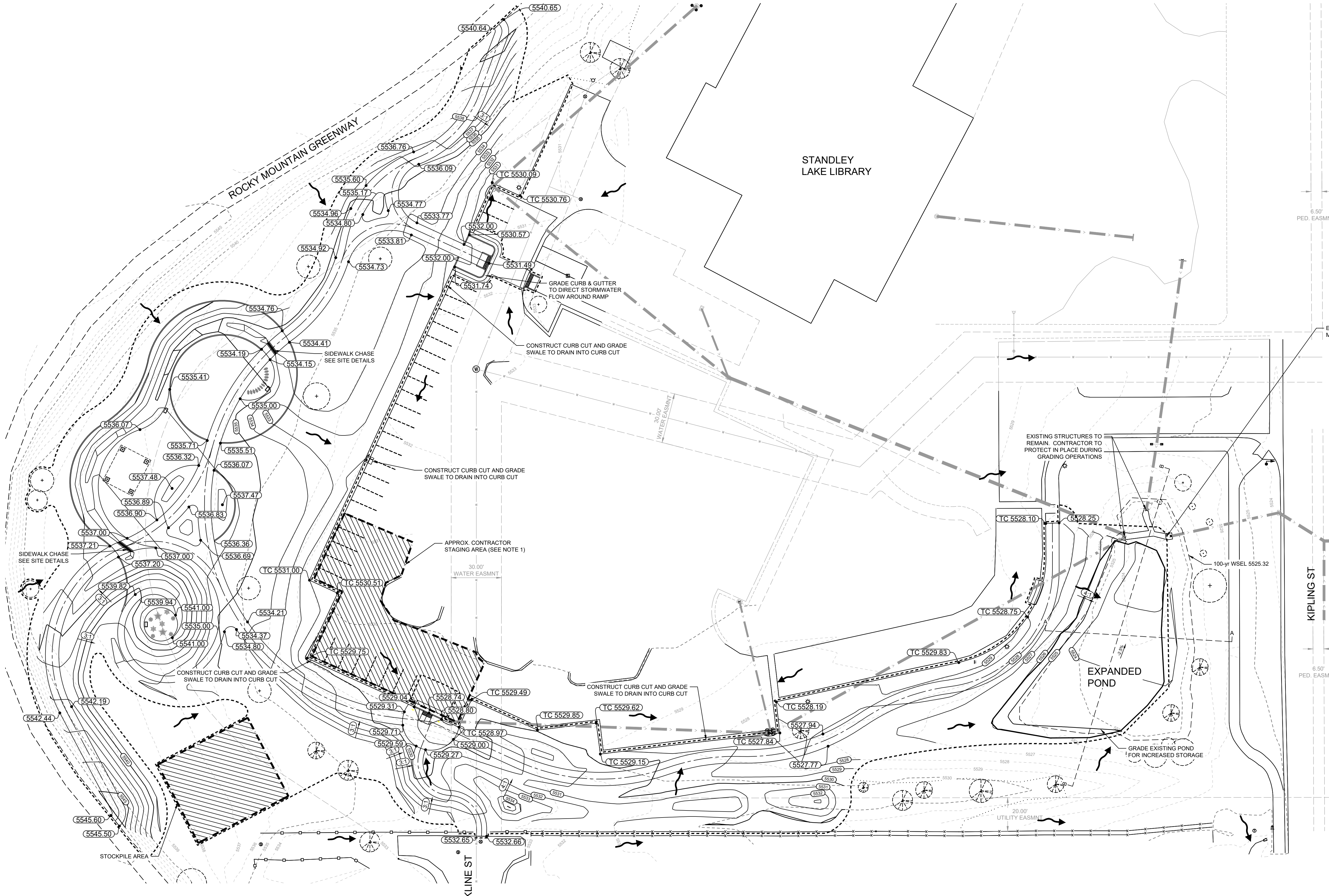


PROFILE VIEW



ISOMETRIC VIEW

DRAINAGE CURB CUT DETAIL



EXISTING STRUCTURE TO REMAIN. STRUCTURE TO BE
MODIFIED. SEE SHEET C2.1 FOR ADDITIONAL INFORMATION.

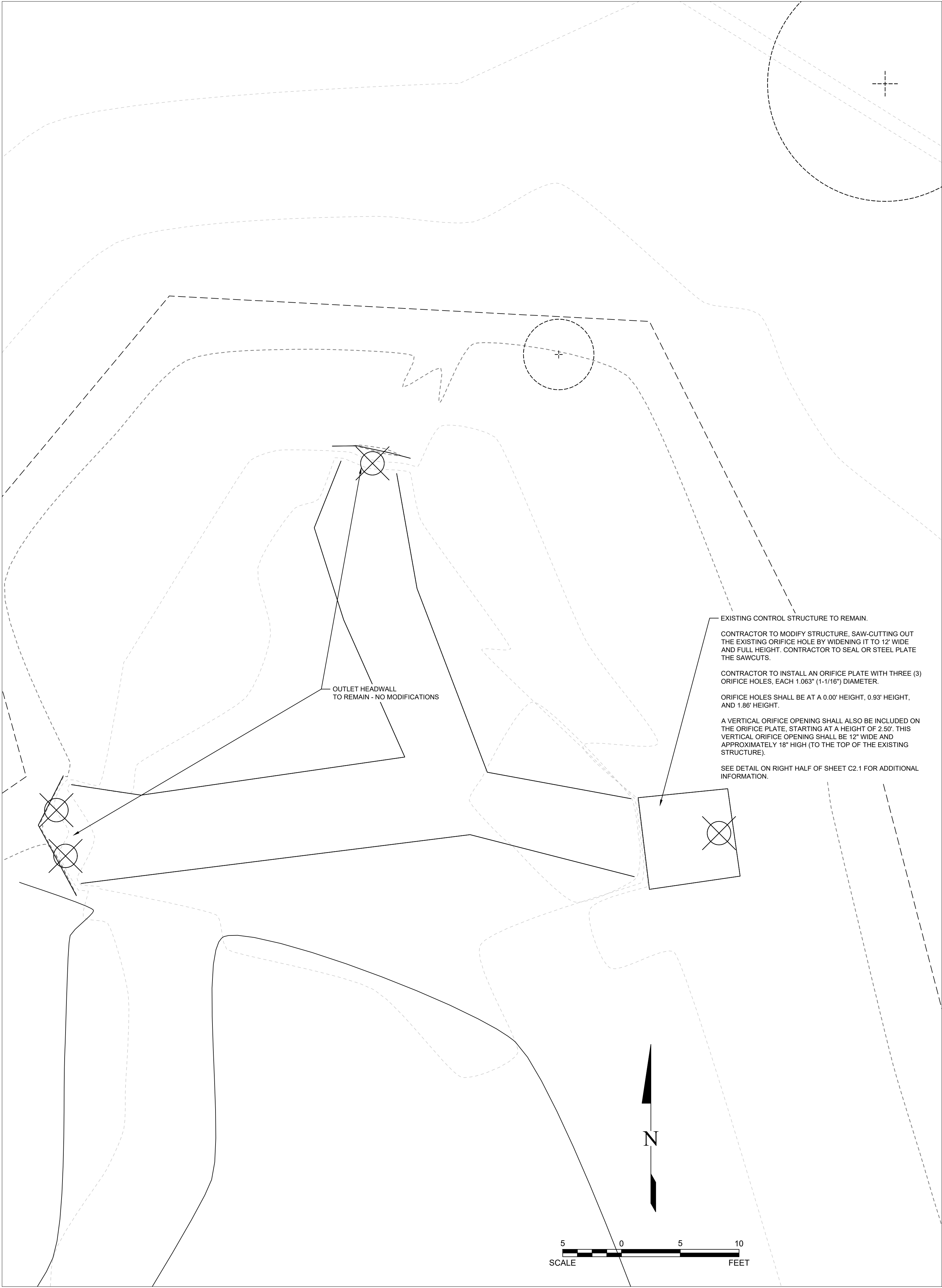


6.50' PED. EASMT
KIPLING ST

KLING ST

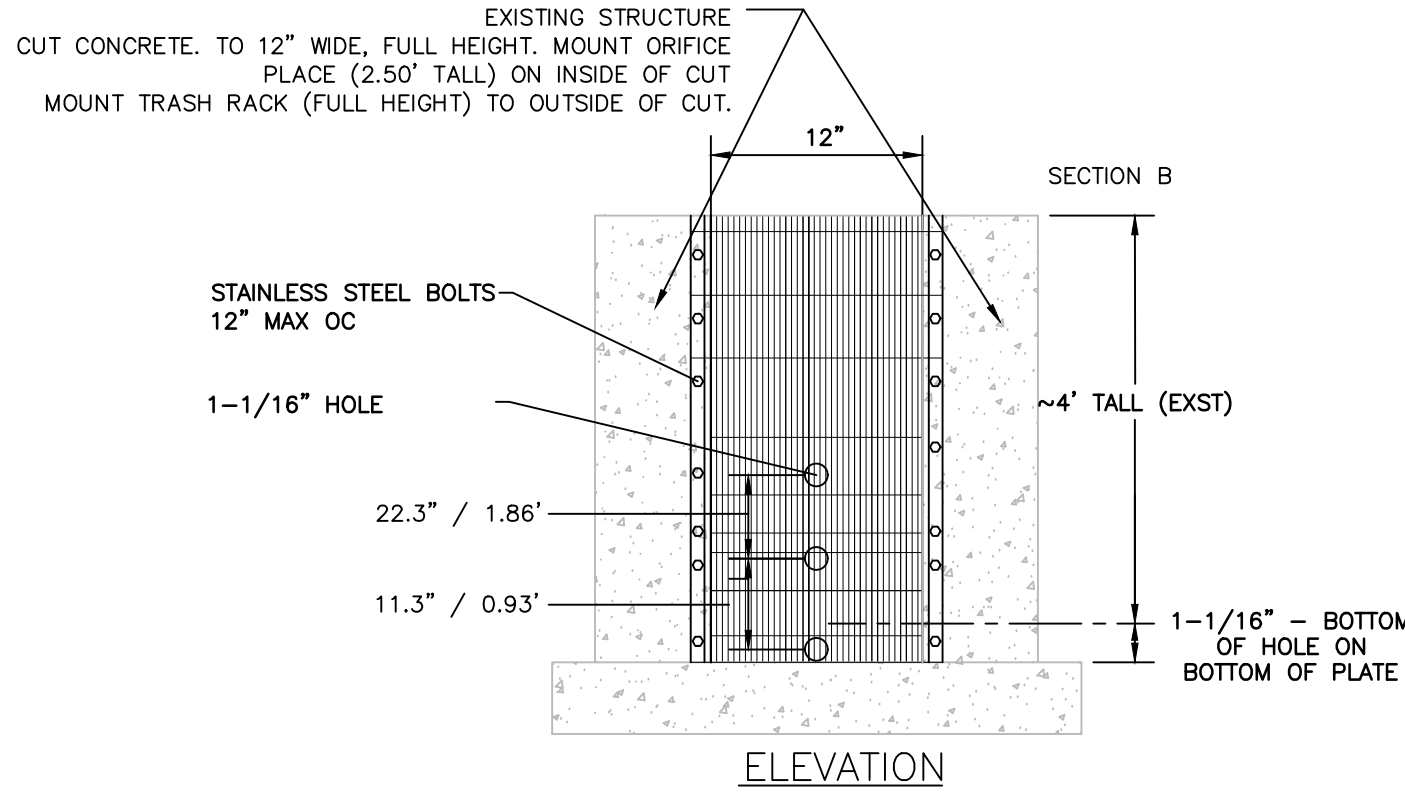
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E NAME
PROJECT: Standley Lake Library Trailhead Modification
DATE: 10/04/2023
DRAWN: RRS
CHECKED: RRS
REVISIONS:
JOB DESCRIPTION:
CONSTRUCTION DOCUMENTS
SHEET TITLE:
OUTLET STRUCTURE MODIFICATION
SHEET NUMBER:
C2.1



GENERAL STRUCTURE NOTES:

1. ANY NEW COMPONENTS ON THE OUTLET STRUCTURE SHALL MEET THE REQUIREMENTS IN "T-12 OUTLET STRUCTURES" FROM THE MILE HIGH FLOOD DISTRICT (MHFD). DETAILS ON OUTLET STRUCTURES, MATERIALS SHOWN ABOVE WERE REFERENCED FROM THE MHFD DETAILS.

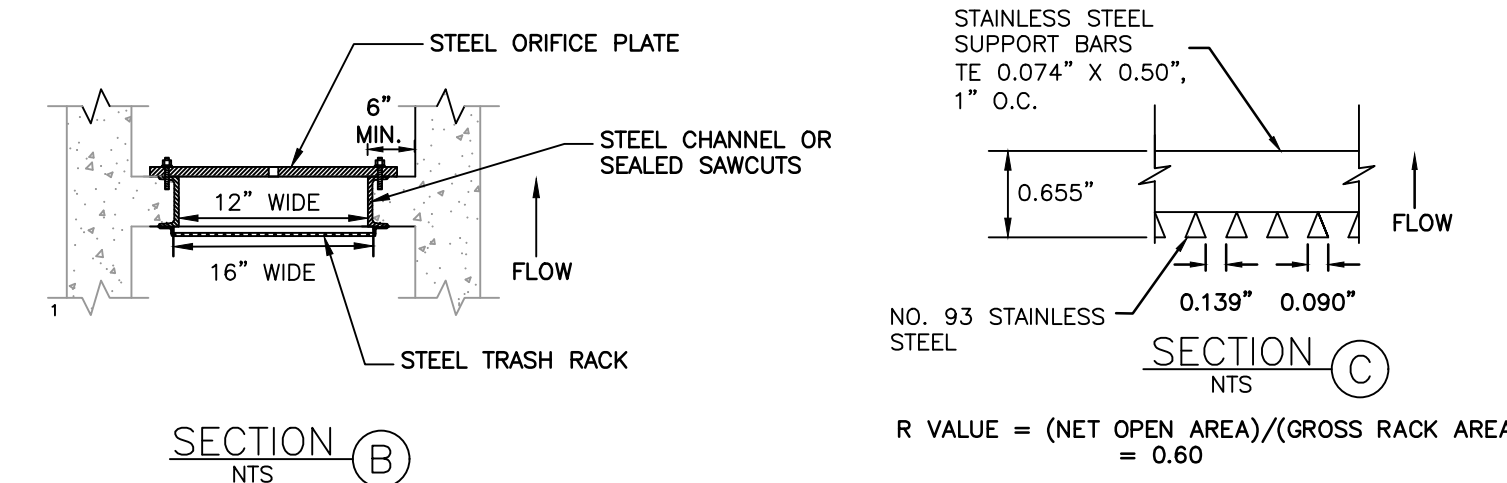
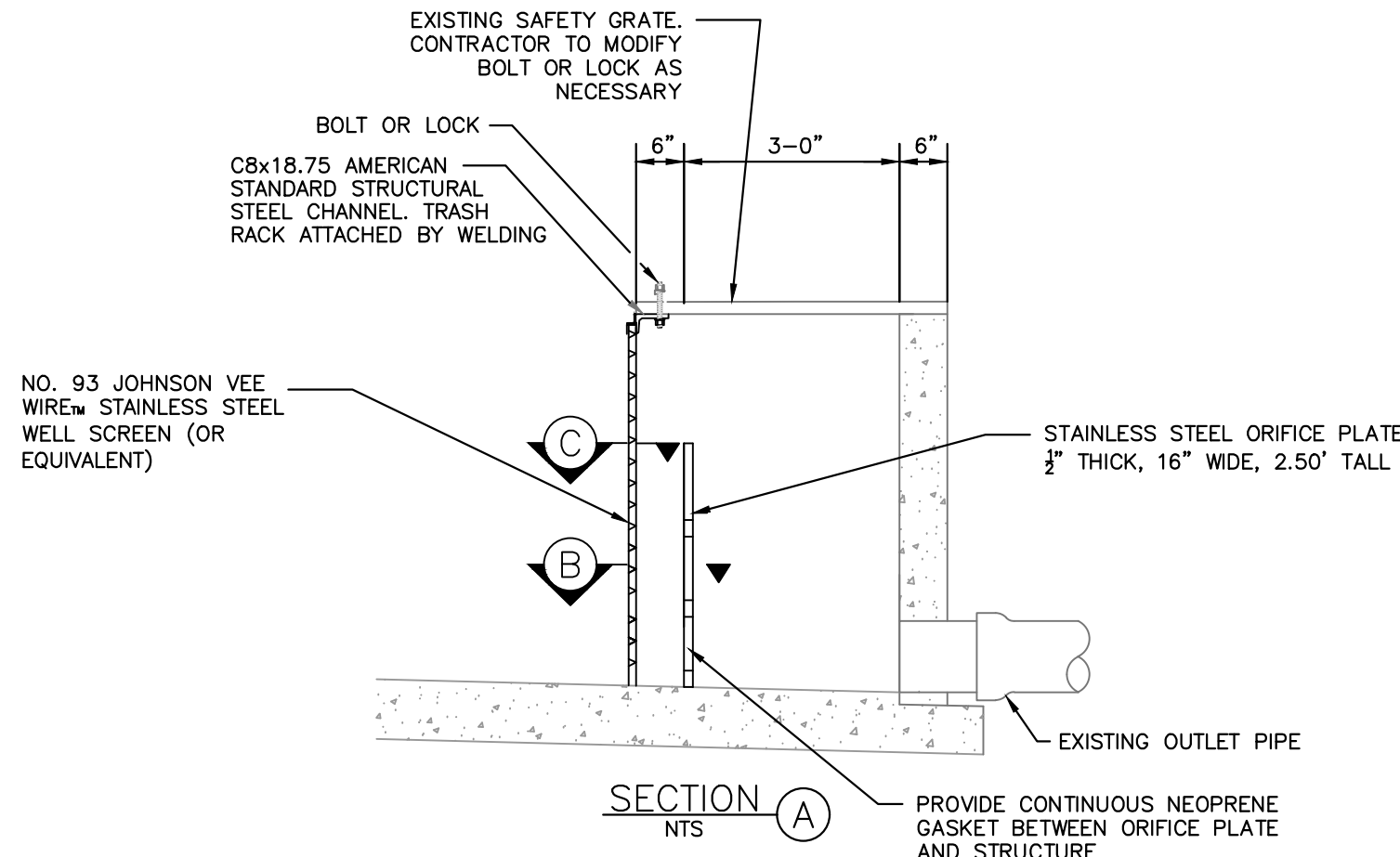


ORIFICE PLATE NOTES:

1. PROVIDE CONTINUOUS NEOPRENE GASKET MATERIAL BETWEEN THE ORIFICE PLATE AND CONCRETE.
2. BOLT PLATE TO CONCRETE 12\"/>
3. PLATE TO BE 2.50' TALL, FROM BOTTOM OF CONCRETE STRUCTURE TO TOP OF ORIFICE PLATE. STRUCTURE SHOULD BE OPEN ABOVE THIS, ACTING AS A VERTICAL WEIR.

OVERFLOW SAFETY GRATES:

1. SAFETY GRATE SHALL BE THE INPLACE GRATE. CONTRACTOR TO MODIFY AS NECESSARY FOR SECURING/BOLTING THE GRATE TO THE EXISTING STRUCTURE.



OUTLET STRUCTURE
SECTION VIEWS

OUTLET STRUCTURE NOTES:

1. CONTRACTOR SHALL PROPERLY SECURE AND SUPPORT SAFETY GRATE.
2. CONTRACTOR SHALL SAWCUT VERTICAL CUTS TO REMOVE THE EXISTING ORIFICE. THIS REMOVAL SHALL CREATE A 12\"/>

APPROVED:

CITY ENGINEER _____ DATE _____ JOB NUMBER _____

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Standley Lake Library Trailhead

8485 Kipling St.
City of Arvada, CO

PROJECT NUMBER: 2204-00356 DATE 10.02.2023

DESIGNED: JMS
DRAWN: RRS
CHECKED: RRS

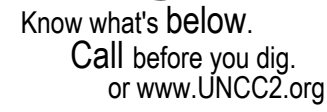
REVISIONS:

JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:
OUTLET STRUCTURE MODIFICATION

SHEET NUMBER:

C2.1

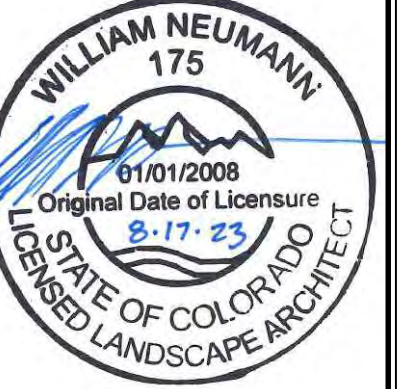


1. REFER TO GENERAL NOTES SHEET FOR ADDITIONAL INFORMATION.
2. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL PLANT QUANTITIES. SYMBOLS ON ALL SHRUBS AND TREES SHALL TAKE PRECEDENCE OVER WRITTEN QUANTITIES FOUND ON PLANS.
3. REFER TO CIVIL PLANS FOR ALL EROSION CONTROL INFORMATION.
4. SOD SHALL BE LAID WITH TIGHT JOINTS WITH NO SPACE BETWEEN SOD ROLLS OR STRIPS. SOD SHALL BE ROLLED AFTER INSTALLATION.
5. OWNER'S REPRESENTATIVE AND LANDSCAPE ARCHITECT TO REVIEW ALL FINISHED GRADES PRIOR TO INSTALLING ANY GROUND COVER UNLESS NOTIFIED OTHERWISE. CONTRACTOR TO PROVIDE NOTICE AT LEAST (2) FULL BUSINESS DAYS PRIOR GROUND COVER WORK.
6. ALL DISTURBED AREAS ARE TO BE SEEDED OR RECEIVE SAME GROUND COVER AS ADJACENT AREA AS SHOWN ON THE PLANTING PLANS.
7. CONTRACTOR TO ENSURE 10' MINIMUM SPACING BETWEEN CENTER OF PROPOSED TREES AND EDGE OF UNDERGROUND WET UTILITY LINES.

	PROPERTY LINE
	EASEMENT LINE
	EX. STORMWATER SEWER LINE
	EX. FENCE
	EX. LIGHT POLE
	EX. POWER POLE
	EX. SURVEY MARKER
	EX. MANHOLE
	EX. TELEPHONE POLE
	EX. ELECTRICAL BOX
	EX. EDGE OF BLUEGRASS
	EX. DECIDUOUS TREE
	EX. EVERGREEN TREE
	EX. CONTOUR - MAJOR
	EX. CONTOUR - MINOR
	LIMITS OF DISTURBANCE
	CONCRETE EDGER
	LANDSCAPE BOULDER
	CONTOUR - MINOR
	CONTOUR - MAJOR
	BLUEGRASS SOD
	NATIVE SEED
	COBBLESTONE MULCH
	ORNAMENTAL TREE
	EVERGREEN
	DECIDUOUS TREE

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City of Arvada, CO,

PROJECT NUMBER:	DATE
2039	10-04-2023
DESIGNED:	KD
DRAWN:	KD
CHECKED:	MTW

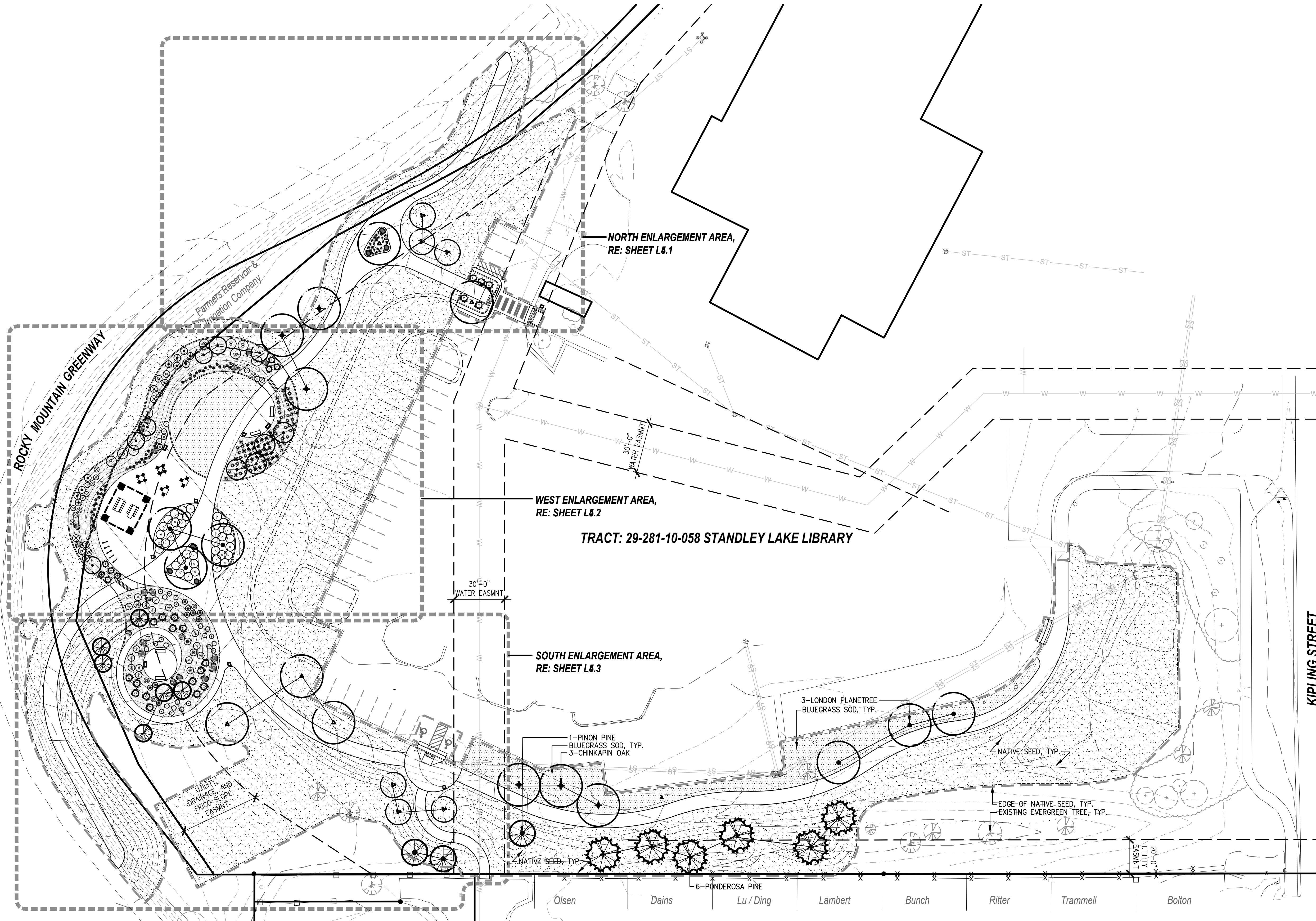
JOB DESCRIPTION:
CONSTRUCTION
DOCUMENTS

SHEET TITLE:

OVERALL
PLANTING PLAN

SHEET NUMBER:

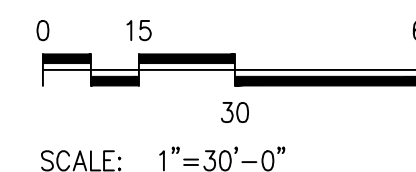
L5.0



APPROVED:

DIRECTOR OF VIBRANT COMMUNITY & NEIGHBORHOODS	DATE	JOB NUMBER
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APPENDIX C
SOILS REPORT

**Limited Geotechnical Evaluation
Stanley Lake Library Trailhead
Arvada, Colorado**



Prepared For:

DHM Design

**900 S. Broadway
Denver, Colorado 80209**

Attention: Mr. Kyle Davis

Job Number: 22-3018

June 14, 2022

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Summary of Laboratory Test Results	Tables 1 & 2

**Standley Lake Library Trailhead
Arvada, Colorado**

PURPOSE AND SCOPE OF STUDY

This report presents the results of a limited geotechnical evaluation performed by GROUND Engineering Consultants, Inc. (GROUND) in support of the design and construction of the proposed trailhead gathering area west of the Standley Lake Library, located west of Kipling and Independence Way in Arvada, Colorado. Our study was conducted in general accordance with GROUND's Proposal Number 2202-0261R dated February 15, 2022.

A field exploration program was conducted to obtain information on the subsurface conditions. Material samples obtained during the subsurface exploration were tested in the laboratory to provide data on the classification and engineering characteristics of the on-site soils. The results of the field exploration and laboratory testing are presented herein.

This report has been prepared to summarize the data obtained and to present our findings and conclusions based on the proposed development/improvements and the subsurface conditions encountered. Design parameters and a discussion of engineering considerations related to the proposed improvements are included herein. This report should be understood and utilized in its entirety; specific sections of the text, drawings, graphs, tables, and other information contained within this report are intended to be understood in the context of the entire report. This includes the *Closure* section of the report which outlines important limitations on the information contained herein.

This report was prepared for design purposes of the DHM Design, based on our understanding of the project at the time of preparation of this report. The data, conclusions, opinions, and geotechnical parameters provided herein should not be construed to be sufficient for other purposes, including the use by contractors, or any other parties for any reason not specifically related to the design of the project. Furthermore, the information provided in this report was based on the exploration and testing methods described below. Deviations between what was reported herein and the actual surface and/or subsurface conditions may exist, and in some cases those deviations may be significant.

**Standley Lake Library Trailhead
Arvada, Colorado**

PROPOSED CONSTRUCTION

Based on the provided Request for Proposal,¹ we understand that present plans call for a shade structure, paved plaza, seating, bicycle racks and repair station, drinking foundation/water bottle fill station, and associated signage at or near the trailhead. Other improvements were identified in the RFP, but we understand that only the shade structure should be included in our geotechnical evaluation.

For the shade structure, we anticipate that structural loads will be relatively low, typical of this type of construction, and that no below grade levels are planned at this time. We understand that grade changes near the shade structure will be relatively limited, on the order of 3 feet or less, to achieve project lines and grades, and that retaining walls are not planned at this time.

If our described understanding/interpretation of the proposed project is incorrect or project elements differ in any way from that expressed above, including changes to improvement locations, dimensions, orientations, loading conditions, elevations/grades, etc., and/or additional buildings/structures/site improvements are incorporated into this project, either after the original information was provided to us or after the date of this report, GROUND or another geotechnical engineer must be retained to re-evaluate the conclusions and parameters presented herein.

Performance Expectations Based on our experience with other, similar projects, we understand that post-construction, structure movements on the order of 2 inches are acceptable to, and anticipated by the owner, as are the resultant distress and maintenance measures. Similarly, we anticipate that movements of somewhat greater magnitude (on the order of 3 or more inches) are acceptable and anticipated for the flatwork, although movement estimates closer to 2 inches may be preferable near the structure. GROUND will be available to discuss the risks and remedial approaches outlined in this report, as well as other potential approaches, upon request if post-construction movements of these magnitudes are not acceptable and anticipated.

¹ City of Arvada, 2021, Request for Proposal, *Standley Lake Library Trailhead on Rocky Mountain Greenway Trail*, dated January 27.

**Standley Lake Library Trailhead
Arvada, Colorado**

SITE CONDITIONS

At our time of subsurface exploration, the project site consisted largely of a largely undeveloped portion of the Standley Lake Library. The project site was bordered by a parking lot to the east, a reach of the existing Rocky Mountain Greenway Trail and the Croke Canal to the south, west, and north. Single-family residences, Standley Lake, and the other bodies of water and waterways further surrounded the site.



The project site generally consisted of grasses, weeds, and other relatively small vegetation. Mature trees and shrubs were observed locally as well. Slopes on the project site were generally gentle and displayed about 5 feet of relief across the project site descending to the south and east. About 1 to 2 feet of relief was observed across the shade structure footprint. However, a relatively moderate to steep slope was observed descending from the trail alignment to the project site. That slope displayed about 10 feet of relief.

Based on cursory observations, the existing parking lot, flatwork, and library building appeared to be performing in a relatively satisfactory manner given their apparent ages. Minor to moderate cracking and displacements were observed in the site pavement and flatwork.

Review of historical Google Earth aerial imagery indicated that site development had remained relatively unchanged since the early 1990s (earliest available aerial images). Though local construction appears to have occurred periodically in the greater project area since that time.

SUBSURFACE EXPLORATION

Subsurface exploration for the project was conducted in April 2022. Two test holes were drilled with a buggy-mounted drilling rig advancing 4-inch diameter solid stem continuous flight auger to evaluate the subsurface conditions and retrieve samples for laboratory testing. One test hole was advanced in the approximate shade structure footprint and the remaining



test hole was advanced in the northern portion of the site, near proposed flatwork improvements. The test holes were advanced to depths of about 30 and 20 feet below existing grades. A GROUND engineer directed the subsurface exploration, logged the test holes in the field, and prepared the samples for transport to our laboratory.

Samples of the subsurface materials were retrieved with a 2-inch inner diameter California liner sampler. The sampler was driven into the substrata with blows from a 140-pound hammer falling 30 inches, a procedure similar to the Standard Penetration Test described by ASTM Method D1586. Penetration resistance values, when properly evaluated, indicate the relative density or consistency of soils. Depths at which the samples were obtained and associated penetration resistance values are shown on the test hole logs.

The approximate locations of the test holes are shown in Figure 1. Logs of the test holes are shown in Figure 2. A legend and notes are provided on Figure 3. Detailed logs of the test holes are shown in *Appendix A*.

LABORATORY TESTING

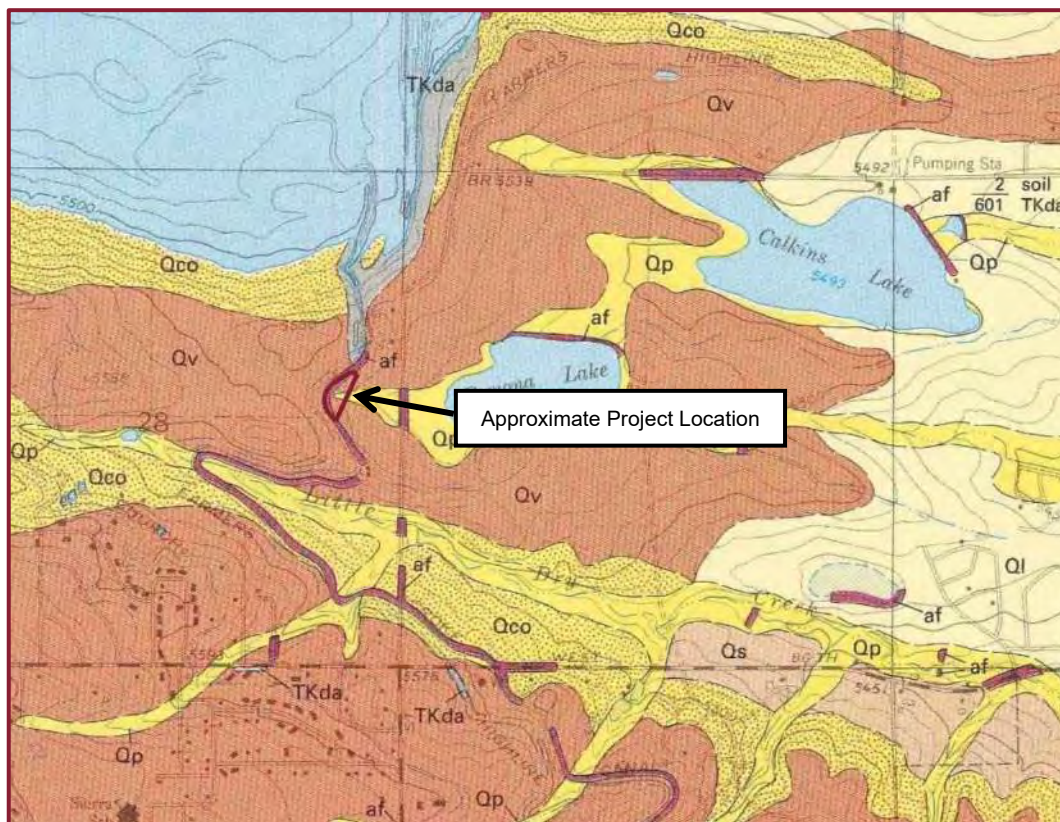
Samples retrieved from our test holes were examined and visually classified in the laboratory by the project engineer. Laboratory testing of soil samples included standard property tests, such as natural moisture contents, dry unit weights, grain size analyses, and Atterberg limits. Swell – consolidation, water-soluble sulfate content, and a suite of corrosivity tests were completed on selected samples, as well. Laboratory tests were

Standley Lake Library Trailhead Arvada, Colorado

performed in general accordance with applicable ASTM protocols. Results of the laboratory testing program are summarized in Tables 1 and 2. A gradation plot is provided in Figure 4.

SUBSURFACE CONDITIONS

Geologic Setting - Published geologic maps, e.g., Lindvall (1979)² depict the site as underlain by artificial fill (**af**), Holocene Piney Creek Alluvium (**Qp**), and Pleistocene Verdos Alluvium (**Qv**). These surficial deposits are mapped as being underlain by the Paleocene and Upper Cretaceous Denver and Arapahoe Formations (**TKda**). A portion of that map is reproduced below.



The geologic map describes artificial fills as including “clay, silts, sand grave and a variety of debris consisting of concrete, brick wood, metal, plastic, glass, vegetation, and other

² Lindvall, R.M, 1979, Geologic map of the Arvada quadrangle, Adams, Denver, and Jefferson Counties, Colorado, U.S. Geological Survey, Geologic Quadrangle Map GQ-1453, 1:24,000.

**Standley Lake Library Trailhead
Arvada, Colorado**

trash.” These fills include engineer and controlled fills (building, highways, dams, etc.) as well as undocumented and uncontrolled fills, including landfills.

Alluvial deposits, in the project area, commonly consist of silt, fine to coarse grained sands, gravels, and local cobbles and boulders. Clays are also present locally. These deposits can include relatively large clasts that may be awkward or difficult to handle or clasts that may not be suitable for use in project fills.

The Denver and Arapahoe Formations, in the project area, typically consists of fine to coarse grained sandstones, claystones, and siltstones, interbedded on various scales. The claystones and siltstones can be moderately to highly expansive and the formation includes well-cemented beds that can be very hard and can be difficult to excavate.

Local Conditions In general, the test holes penetrated about 4 inches of topsoil³ before penetrating fill soils that were recognized to depths of about 8 feet below existing grade. Claystone, siltstone, and sandstone was encountered beneath the fill soils and extended to the depths explored. The upper portion of the bedrock was relatively severely weathered. The weathered zone extended to the depths explored in Test Hole 2.

We interpret the fill materials to be materials placed during the construction of the existing canal and surrounding development. We interpret the underlying bedrock to be Arapahoe Formation materials.

Fill materials were recognized in the test holes and are likely are present elsewhere at the site. (See the *Site Conditions* section of this report.) These fill soils may contain coarse gravels and cobbles, as well as similarly sized pieces of construction debris even though these items were not recognized in the test holes. Delineation of the complete lateral and vertical extents of the fills at the site and their compositions was beyond our present scope of services. If more detailed information regarding fill extents and compositions at the site are of significance, they should be evaluated using test pits.

³ ‘Topsoil’ as used herein is defined geotechnically. The materials so described may or may not be suitable for landscaping or as a growth medium for plants that may be proposed for the project.

**Standley Lake Library Trailhead
Arvada, Colorado**

Similarly, coarse gravel and larger clasts are not well represented in small diameter liner samples collected from the test holes. Therefore, such materials may be present even where not called out in the material descriptions herein.

Fill consisted of fine to coarse sands and clays. It was moist to very moist, very soft to stiff and very loose to medium dense, moderately to highly plastic, and brown to gray in color.

Weathered Claystones, Siltstones, and Sandstones consisted weathered, interbedded claystones, siltstones, and sandstones. They were very moist, moderately plasticity to highly plastic, weathered to medium hard, and gray to brown in color. Iron staining were noted commonly.

Claystones, Siltstones, and Sandstones consisted of interbedded claystones, siltstones, and sandstones. They were moist to very moist, moderately to highly plastic, hard, and gray to brown in color. Iron staining was noted locally.

Groundwater was encountered in Test Hole 2 at the time of drilling at a depth of about 6 feet below existing grade. In Test Hole 1, groundwater was measured to be at a depth of 27 feet below existing grade at the end of drilling operations. The test holes were backfilled upon drilling completion per Code of Colorado Regulations (2 CCR 402-2). Groundwater levels can be expected to fluctuate, however, in response to annual and longer-term cycles of precipitation, irrigation, surface drainage, land use, and the development of transient, perched water conditions. At this site we anticipate the groundwater level will tend to rise and fall with the stage of the adjacent canal and other bodies of water, such as Standley Lake.

Swell-Consolidation Testing of selected samples of on-site fill and native soils recovered from the test holes indicated swells up to about 0.9 percent under surcharge loads approximating in-place overburden pressure. Significant consolidations were not measured in the samples against loads approximating in-place overburden pressures. (See Table 1.)

SEISMIC CLASSIFICATION

Based on extrapolation of available data to depth and our experience in the project area, we consider the site likely to meet the criteria for a Seismic Site Classification of **D** according to the ASCE 7-16 (Table 20.3-1). (Exploration and/or shear wave velocity testing to a depth of 100 feet or more was not part of our present scope of services.) If, however, a quantitative assessment of the site seismic properties is desired, then shear wave velocity testing should be performed. GROUND can provide a fee estimate for shear wave velocity testing upon request. We consider the likelihood of achieving a Site Class C to be relatively low.

Using longitude and latitude coordinates obtained from Google Earth and the Applied Technology Council's Hazard by Location Tool (<https://hazards.atcouncil.org/#>), the project area is indicated to possess an S_{DS} value of **0.237** and an S_{D1} value of **0.096** for the site latitude and longitude and a Site Class of D.

GEOTECHNICAL CONSIDERATIONS FOR DESIGN

The conclusions and parameters provided in this report were based on the data presented herein, our experience in the general project area with similar structures, and our engineering judgment with regard to the applicability of the data and methods of forecasting future performance. A variety of engineering parameters were considered as indicators of potential future soil movements.

Our parameters and conclusions were based on our judgment of "likely movement potentials," (i.e., the amount of movement likely to be realized if site drainage is generally effective, estimated to a reasonable degree of engineering certainty) as well as our assumptions about the owner's willingness to accept geotechnical risk. "Maximum possible" movement estimates necessarily will be larger than those presented herein. They also have a significantly lower likelihood of being realized, in our opinion, and generally require more expensive measures to address.

We encourage the DHM Design, upon receipt of this report, to discuss these risks and the geotechnical alternatives with us. In addition to the risks and remedial approaches presented in this report, the DHM Design, also must understand the risk-cost trade-offs

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addressed by the civil and structural engineering disciplines in order to direct his design team to the portion of the Higher Cost / Lower Risk – Lower Cost / Higher Risk spectrum in which this project should be designed. If the DHM Design does not understand these risks, it is critical that additional information or clarification be requested so that the owner's expectations reasonably can be met.

General Geotechnical Risk In GROUND's opinion, the primary source of geotechnical risk at this site is the presence of undocumented fill soils. Near the location of the proposed shade structure undocumented fill soils were recognized to a depth of about 8 feet below existing grade. Given the history of the site and the antecedent topography, greater depths of fill could be encountered at the site. Undocumented fill soils are considered to be geotechnically unsuitable in their present state to support new construction because of their unknown composition and consistency. Where they are present beneath the proposed shade structure, undocumented fill soils will need to be removed and replaced as properly compacted fill or the effects of undocumented fill soils otherwise mitigated.

Although some of these soils may have been placed in a controlled manner, testing records for the fill placement was not available for GROUND to review at this time. Additionally, these soils were placed in landscaped areas, and in our experience, fill placed in these areas commonly are not placed to the same standards as materials supporting buildings. The low and variable penetration resistance values of the fill soils, ranging from 2 blows for 12 inches of penetration to 11 blows for 12 inches of penetration, also suggest that the fills were not placed in a controlled manner or to compaction criteria suitable for fill beneath a structure. Commonly, materials with penetration resistance values as low as 2 blows for 12 inches of penetration are not able to provide adequate support for shallow foundations without excessive settlements.

Due to these reasons, GROUND considers the site fill materials to be undocumented fill soils at this time.

An additional source of geotechnical risk at the site is presence siltstones and claystones at relatively shallow depths – about 8 feet below existing grades. These materials are mapped as and interpreted by GROUND to be Arapahoe Formation materials. The siltstones and claystones of the Arapahoe Formation, like those encountered in the test

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holes, are known to be moderately to highly expansive. Damaging post-construction movements have occurred where improvements have been supported directly on these materials.

However, the swell-consolidation test results for the selected samples of fill and bedrock were less than 1 percent swell or consolidation. This suggest that the risk of post-construction movements from volume change of the undocumented fill soils and site bedrock appears to be lower than other similar sites. Additionally, if the DHM Design is aware of grading and fill placement documentation and testing, these records should be provided to GROUND so appropriate report revisions can be made.

Likely Post-construction Movements Based on our data, the selected depth of wetting, and our experience with similar sites, we estimate improvements supported directly on the existing site soils are subject to likely, post-construction, vertical movements of 1½ to 3 inches where improvements bear directly on the existing site earth materials. Lateral movements will result, as well. Foundation and slab/flatwork movements of these magnitudes can result in significant damage. Nearly all of the proposed improvements are vulnerable in this regard.

Movements of these magnitudes have been encountered previously in the project area and significant maintenance measures should be anticipated. In this setting, maintenance measures will include the periodic removal and replacement of improvements bearing on undocumented fill soils.

Structure Foundation and Floor Types In GROUND's opinion, supporting the proposed structure on a drilled pier foundation system will provide the lowest estimates of likely post-construction foundation movement (about ½ inch, with similar differential movements over spans of about 40 feet) and will provide the least risk of excessive foundation movements. Drilled piers should bear in the bedrock beneath the site at a depth below the depth of wetting (20 feet below existing grade). However, we understand that drilled piers may not be practical given the anticipated structural loads and the anticipated tolerance of post-construction movement for the proposed structures. Geotechnical parameters for drilled pier foundations can be provided upon request, however.

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Constructing the slab/flatwork as a structural floor, also supported on drilled piers, will yield similarly low post-construction floor movement estimates. For similar reasons as stated above, a structural floor may not be practical for the proposed construction. Geotechnical parameters for structural floors can be provided upon request, however.

Helical piers or micropiles also could be used for the proposed structure, and could provide similar post-construction movements estimates to a drilled pier foundation. Helical piers and micropiles are proprietary foundation systems that are designed and installed by specialty design builders. We anticipate that the information provided in this report should be sufficient for them to complete their designs. We suggest contacting the following contractors, but other qualified contractors may be available:

- **D&B Engineering Contractors** (Wheat Ridge, Colorado) 303 / 423 – 6834 for ‘helical piers.’
- **Hayward Baker** (Broomfield, Colorado) 303 / 469 – 1136 for ‘helical piles,’ ‘micropiles’ and other systems.
- **Park Range Construction** (Englewood, Colorado) 303 / 395 – 3234 for ‘helical piers’ and other systems.
- **Schnabel Foundation Company** (Aurora, Colorado) 303 / 696 – 7268 for ‘micropiles’ and other systems.

Constructing a remedial fill section could be used to reduce estimates of post-construction movement. In order to reduce estimates of post-construction movements to about **1 inch**, a fill section that removes and replaces all of the undocumented fill soils would be needed. Based on the depth of fill recognized in the test holes, we anticipate that a fill section about 8 feet in thickness would be necessary. However, such a fill section may not be practical given the depth to groundwater (as shallow as about 6 feet below existing grade) and that the structure is anticipated to be more tolerant of post-construction movements.

Partial removal and replacement of the undocumented fill will result in a decreased estimate of potential movements. GROUND estimates that a remedial fill section that extends to a depth of about 2 feet below footing bottom elevation (about 5 feet below existing grade) will decrease the movement potential to about **2 inches** of total movement.

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It should be noted, however, that where undocumented fill soils are not completely removed and replaced as properly compacted fill, then there will exist a greater risk of the estimated post-construction movements being exceeded. This risk is low, in GROUND's opinion, but is not zero.

If the proposed shade structure is tolerant of about **3 inches** of post-construction movement, the shade structure may be supported on spread footings bearing directly on the existing site soils.

Additional parameters regarding the construction of shallow foundations and slab-on-grade floors are provided in the *Shallow Foundations* and *Slab-on-Grade Floors* section of this report.

SHALLOW FOUNDATIONS

The geotechnical parameters below may be used for design of foundations for the proposed shade structure.

Geotechnical Parameters for Shallow Foundation Design

- 1) Footings should bear on firm, existing soils or properly compacted fill as discussed in the *Geotechnical Considerations for Design* section of this report.

The fill section, if selected, beneath the shade structure should extend at full thickness across the footprint and at least **2 feet** laterally beyond the footing margins where site derived fill section is used.

Considerations for fill placement and compaction are provided in the *Project Earthwork* section of this report.

The fill section beneath the shade structure should be laterally consistent and of uniform depth to reduce differential, post-construction foundation movements. A differential fill section will tend to increase differential movements.

The contractor should provide survey data of the excavation beneath each structure indicating the depth and lateral extents of the remedial excavation.

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- 2) Footings bearing on a section of properly compacted fill may be designed for an allowable soil bearing pressure of **2,000 psf** for footings up to **8 feet in width**.

Footings bearing on firm, existing site soils may be designed for an allowable soil bearing pressure of **1,200 psf** for footings up to **8 feet in width**.

This value may be increased by $\frac{1}{3}$ for transient loads such as wind or seismic loading. For larger footings, a lower allowable bearing pressure may be appropriate.

Immediate compression of the bearing soils for the provided allowable bearing pressure is estimated to be about $\frac{3}{4}$ inch, based on an assumption of drained foundation conditions. If foundation soils are subjected to an increase/fluctuation in moisture content, however, the effective bearing capacity will be reduced and greater post-construction movements than those estimated above may result.

This estimate of foundation movement from immediate compression of the foundation soils is a component of the likely post-construction movement estimated for the structures at this site. It is in addition to movements from post-construction volume change in the native soils underlying the site and from densification of the fill section constructed beneath the structure, as discussed above.

To reduce differential settlements between footings or along continuous footings, footing loads should be as uniform as possible. Differentially loaded footings will settle differentially.

- 3) Spread footings should have a minimum lateral dimension of **16 or more inches** for linear strip footings and **24 or more inches** for isolated pad footings. Actual footing dimensions should be determined by the structural engineer.
- 4) Footings should bear at an elevation **3 or more feet** below the lowest adjacent exterior finish grades to have adequate soil cover for frost protection.
- 5) Continuous foundation walls should be reinforced as designed by a structural engineer to span an unsupported length of at least **10 feet**.

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- 6) Geotechnical parameters for lateral resistance to foundation loads are provided in the *Lateral Loads* section of this report.
- 7) Connections of all types must be flexible and/or adjustable to accommodate the anticipated, post-construction movements of the structure.

Shallow Foundation Construction

- 8) The contractor should take adequate care when making excavations not to compromise the bearing or lateral support for nearby improvements.
- 9) Care should be taken when excavating the foundations to avoid disturbing the supporting materials particularly in excavating the last few inches.
- 10) Footing excavation bottoms may expose loose, organic, or otherwise deleterious materials, including debris. Firm materials may become disturbed by the excavation process. All such unsuitable materials should be excavated and replaced with properly compacted fill or the foundation deepened.
- 11) Foundation-supporting soils may be disturbed or deform excessively under the wheel loads of heavy construction vehicles as the excavations approach footing bearing levels. Construction equipment should be as light as possible to limit development of this condition. The movement of vehicles over proposed foundation areas should be restricted.
- 12) All foundation subgrade should be compacted prior to placement of concrete.
- 13) The contractor should account for the potential for differential settlement along or between footings due to temporary loading during placement on concrete panels.
- 14) In areas of shallow groundwater where footing excavations expose wet soils, a layer of lean concrete or gravel should be placed in the bottom of foundation excavations prior to steel and concrete placement. This "mud mat" will reduce disturbance of the natural soils caused by construction operations. Disturbing the native soils will increase potential settlements

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- 15) Foundation elevations at a number of the proposed lots (noted above) appear to be only slightly above local groundwater levels. Therefore, it may be necessary to dewater some footing excavations during construction. Dewatering should not be conducted by pumping from inside footing excavations. This may decrease the supporting capacity of the soils.
- 16) Fill placed against the sides of the footings should be properly compacted in accordance with the *Project Earthwork* section of this report.

LATERAL LOADS

Values for equivalent fluid pressures and the coefficient for frictional resistance to sliding are provided below. These values were based on moist unit weight (γ') of 122 pcf and an angle of internal friction (ϕ) of 24 degrees for site soils and bedrock re-worked as properly compacted fill and are unfactored. Appropriate factors of safety should be included in design calculations.

Shallow Elements Resisting Lateral Loads A friction coefficient of **0.30** between a foundation element and the site soils may be used for design of shallow foundations and thrust blocks resisting lateral loads.

Passive soil pressure at this site may be estimated using an equivalent fluid pressure of **250 pcf** for drained conditions, to a **maximum of 2,500 psf**. The upper 1 foot of embedment should be neglected for passive resistance, however. Where passive soil pressure is used to resist lateral loads, it should be understood that significant lateral strains will be required to mobilize the full value indicated above, likely 1 inch or more. A reduced passive pressure can be used for reduced anticipated strains, however.

At-Rest and Active Lateral Earth Pressures Site soils placed as backfill against a structure in an **at-rest** condition may be considered to exert an equivalent fluid unit weight of **73 pcf**.

Site soils placed as backfill where the full, **active** earth pressure condition applies may be considered to exert an equivalent fluid unit weight of **52 pcf**.

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Proprietary Foundations Resisting Lateral Loads Based on the data obtained for this study and our experience with similar sites and conditions, lateral load analysis using the “L-Pile” or a similar computer program should use the following geotechnical parameters for input. The parameters are based on a simplified soil / bedrock profile. The parameters are based on a simplified soil / bedrock profile. These include, unit wet weights (γ'), undrained shear strength (C_u), and strain at 50 percent of failure stress (ϵ_{50}) for the earth materials. Resistance to lateral loads should be neglected in the upper **3 feet** of soils, whether fill or native.

GEOTECHNICAL PARAMETERS FOR LATERAL LOAD ANALYSIS USING L-PILE

Soil / Bedrock Material	Approximate Depth Range	Parameter	Value
Existing Fill (model as Soft Clay without Free Water)	3 feet below FFE – 8 feet below existing grade	γ'	122 pcf (0.071 pci)
		C_u	200 psf (1.39 psi)
		ϵ_{50}	0.025
Weathered Claystone, Siltstone, and Sandstone (model as Stiff Clay without Free Water)	8 feet – 22 feet below existing grade	γ'	125 pcf (0.072 pci)
		C_u	1,000 psf (6.94 psi)
		ϵ_{50}	0.012
Claystone, Siltstone, and Sandstone Bedrock (model as Stiff Clay without Free Water)	> 22 feet below existing grade	γ'	125 pcf (0.072 pci)
		C_u	3,000 psf (20.8 psi)
		ϵ_{50}	0.008

WATER-SOLUBLE SULFATES

The concentration of water-soluble sulfates measured in a selected sample of site soils was approximately 0.13 percent by weight. (See Table 2.) Such a concentration of soluble sulfates represents a **moderately** environment for sulfate attack on concrete exposed to these materials. Degrees of attack are based on the scale of 'negligible,' 'moderate,' 'severe' and 'very severe' as described in the “Design and Control of Concrete Mixtures,” published by the Portland Cement Association (PCA). The Colorado Department of

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Transportation (CDOT) utilizes a corresponding scale with four classes of severity of sulfate exposure (Class 0 to Class 3) as described in the table below.

REQUIREMENTS TO PROTECT AGAINST DAMAGE TO
CONCRETE BY SULFATE ATTACK FROM EXTERNAL SOURCES OF SULFATE

Severity of Sulfate Exposure	Water-Soluble Sulfate (SO₄²⁻) In Dry Soil (%)	Sulfate (SO₄) In Water (ppm)	Water Cementitious Ratio (maximum)	Cementitious Material Requirements
Class 0	0.00 to 0.10	0 to 150	0.45	Class 0
Class 1	0.11 to 0.20	151 to 1500	0.45	Class 1
Class 2	0.21 to 2.00	1501 to 10,000	0.45	Class 2
Class 3	2.01 or greater	10,001 or greater	0.40	Class 3

Based on our test results and PCA and CDOT guidelines, cement exposed site soils and bedrock should conform to one of the following Class 1 requirements:

Class 1 (Moderate)

- 1) ASTM C150 Type II or V.
- 2) ASTM C595 Type IP(MS) or IP(HS).
- 3) ASTM C150 Type III. Type III shall have no more than 8 percent C3A.
- 4) ASTM C595 Type IL(MS), IL(HS), IT(MS), or (HS).

Class C fly ash shall not be substituted for cement.

In addition, all concrete used shall have a minimum compressive strength of 4,000 psi.

SOIL CORROSIVITY

Data were obtained to support an initial assessment of the potential for corrosion of ferrous metals in contact with earth materials at the site, based on the conditions at the time of GROUND's evaluation. The test results are summarized in Table 2.

Reduction-Oxidation testing indicated a red-ox potential of approximately -27 millivolts. Such a low potential typically creates a more corrosive environment.

Sulfide Reactivity testing indicated “positive” result in the local soils. The presence of sulfides in the soils suggests a more corrosive environment.

Soil Resistivity In order to assess the “worst case” for mitigation planning, samples of materials retrieved from the test holes were tested for resistivity in the laboratory, after being saturated with water, rather than in the field. Resistivity also varies inversely with temperature. Therefore, the laboratory measurements were made at a controlled temperature. Measurement of electrical resistivity indicated a value of approximately 4,106 ohm-centimeters in a sample of site soils.

pH Where pH is less than 4.0, soil serves as an electrolyte; the pH range of about 6.5 to 7.5 indicates soil conditions that are optimum for sulfate reduction. In the pH range above 8.5, soils are generally high in dissolved salts, yielding a low soil resistivity.⁴ Our testing indicated a pH value of about 7.5.

Corrosivity Assessment The American Water Works Association (AWWA) has developed a point system scale used to predict corrosivity. The scale is intended for protection of ductile iron pipe but is valuable for project steel selection. When the scale equals 10 points or higher, protective measures for ductile iron pipe are indicated. The AWWA scale is presented below.

The soil characteristics refer to the conditions at and above pipe installation depth. We anticipate that drainage at the site after construction will be effective. Nevertheless, based on the values obtained for the soil parameters, the fill soils appear to comprise a severely corrosive environment for ferrous metals (11½ points).

If additional information or evaluation is needed regarding soil corrosivity, then the American Water Works Association or a corrosion engineer should be contacted. It should be noted, however, that changes to the site conditions during construction, such as the

⁴ American Water Works Association ANSI/AWWA C105/A21.5-05 Standard.

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import of other soils, or the intended or unintended introduction of off-site water, might alter corrosion potentials significantly.

Table A.1 Soil-Test Evaluation

<u>Soil Characteristic / Value</u>	<u>Points</u>
Redox Potential	
< 0 (negative values)	5
0 to +50 mV	4
+50 to +100 mV	3½
> +100 mV	0
Sulfide Reactivity	
Positive	3½
Trace	2
Negative	0
Soil Resistivity	
<1,500 ohm-cm	10
1,500 to 1,800 ohm-cm	8
1,800 to 2,100 ohm-cm	5
2,100 to 2,500 ohm-cm	2
2,500 to 3,000 ohm-cm	1
>3,000 ohm-cm	0
pH	
0 to 2.0	5
2.0 to 4.0	3
4.0 to 6.5	0
6.5 to 7.5	0 *
7.5 to 8.5	0
>8.5	3
Moisture	
Poor drainage, continuously wet	2
Fair drainage, generally moist	1
Good drainage, generally dry	0

* If sulfides are present and low or negative redox-potential results (< 50 mV) are obtained, add three (3) points for this range.

PROJECT EARTHWORK

The earthwork criteria below are based on our interpretation of the geotechnical conditions encountered in the test holes. Where these criteria differ from applicable municipal specifications, e.g., for trench backfill compaction along a public utility line, the latter should be considered to take precedence.

General Considerations Project grading should be performed as early as possible in the construction sequence to allow settlement of fills and surcharged ground to be realized to the greatest extent prior to subsequent construction.

Prior to earthwork construction, existing construction debris, vegetation, and other deleterious materials should be removed and disposed of off-site. Relic underground utilities should be abandoned in accordance with applicable regulations, removed as necessary, and properly capped.

Topsoil present on-site should be incorporated into ordinary fills. Instead, topsoil should be stockpiled during initial grading operations for placement in areas to be landscaped or for other approved uses.

Tree trunks and roots may be present within, under, or adjacent to the proposed structure footprint. The contractor should take care to assure that all tree roots, where present, are removed prior to filling or construction of foundations, floors or other improvements. Relatively deep excavations may be required to accomplish proper removal of roots and associated organic materials.

Use of Existing Fill Soils Fill materials were recognized in the test holes during subsurface exploration and are likely are present elsewhere on the site, given it's the apparent prior grading. Because not all the fill soils were sampled and tested, it is possible that some of the fill soils may not be suitable for re-use as compacted fill, due to the presence of deleterious materials such as trash, organic material, coarse cobbles and boulders, or construction debris. Therefore, excavated fill materials should be evaluated and tested, as appropriate, with regard to re-use. Environmental evaluation of the existing fill soil was not part of our scope of services, and should an environmental assessment of the site fill soils be needed, an environmental consultant should be retained.

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Fragments of rock and cobbles, (as well as inert construction debris, e.g., concrete or asphalt) up to **3 inches** in maximum dimension may be included in project fills, in general. Such materials should be evaluated on a case-by-case basis, where identified during earthwork.

Use of Existing Native Soils Based on the samples retrieved from the test holes, we anticipate that the existing site soils that are free of organic materials, coarse cobbles, boulders, or other deleterious materials will be suitable, in general, for re-use as compacted fill.

Imported Fill Materials Materials imported to the site as (common) fill should be free of organic material, and other deleterious materials. Imported material should exhibit **75 percent or less** passing the No. 200 Sieve and a plasticity index of **15 or less**. Materials proposed for import should be approved prior to transport to the site.

Fill Platform Preparation Prior to filling, the top **12 inches** of in-place materials on which fill soils will be placed (except for utility trench bottoms where bedding will be placed) should be scarified, moisture conditioned and properly compacted in accordance with the criteria below to provide a uniform base for fill placement.

General Considerations for Fill Placement Fill soils should be thoroughly mixed to achieve a uniform moisture content, placed in uniform lifts not exceeding 8 inches in loose thickness, and properly compacted.

Excavated bedrock materials, including those present in the existing fill, will require a well-coordinated effort to moisture treat, process, place, and compact properly. In-place bedrock deposits were hard to very hard, and should be broken down in to a soil-like mass. Greater than typical watering, and compaction equipment that aids in breaking down such material (e.g., a Caterpillar 825 compactor-roller), likely will be needed. Crushing or other methods should be anticipated to sufficiently reduce sandstone bedrock where encountered. Applied water will be taken up into the structures of the claystone. The contractor should anticipate that handling and processing the excavated bedrock more than once may be necessary to achieve the requirements herein.

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Excavated bedrock, include those present in the existing fill, to be used as trench backfill, will require additional moisture conditioning and processing in an open area outside of trenches prior to placement as backfill.

No fill materials should be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Where soils on which foundation elements will be placed are exposed to freezing temperatures or repeated freeze – thaw cycling during construction – commonly due to water ponding in foundation excavations – bearing capacity typically is reduced and/or settlements increased due to the loss of density in the supporting soils. After periods of freezing conditions, the contractor should re-work areas affected by the formation of ice to re-establish adequate bearing support.

Care should be taken with regard to achieving and maintaining proper moisture contents during placement and compaction. Materials that are not properly moisture conditioned may exhibit significant pumping, rutting, and deflection at moisture contents near optimum and above. The contractor should be prepared to handle soils of this type, including the use of chemical stabilization, if necessary.

Compaction areas should be kept separate, and no lift should be covered by another until relative compaction and moisture content within the specified ranges are obtained.

Compaction Criteria Soils that classify as **GP, GW, GM, GC, SP, SW, SM, or SC** in accordance with the USCS classification system (granular materials) should be compacted to **95 or more percent** of the maximum dry density at moisture contents **within 2 percent** of the optimum moisture content as determined by ASTM D1557, the ‘modified Proctor.’

Soils that classify as **ML, MH, CL, or CH** should be compacted to **at least 95 percent** of the maximum dry density at moisture contents between **1 percent below and 3 percent above** the optimum moisture content as determined by ASTM D698, the ‘standard Proctor.’

Use of Squeegee Relatively uniformly graded fine gravel or coarse sand, i.e., “squeegee,” or similar materials commonly are proposed for backfilling foundation excavations, utility

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trenches (excluding approved pipe bedding), and other areas where employing compaction equipment is difficult. In general, this procedure should not be followed for the following reasons.

Although commonly considered “self-compacting,” uniformly graded granular materials require densification after placement, typically by vibration. The equipment to densify these materials is not available on many job-sites.

Even when properly densified, uniformly graded granular materials are permeable and allow water to reach and collect in the lower portions of the excavations backfilled with those materials. This leads to wetting of the underlying soils and resultant potential loss of bearing support as well as increased local heave or settlement.

Wherever possible, excavations should be backfilled with approved, on-site soils placed as properly compacted fill. Where achieving adequate compaction is difficult, then Controlled Low Strength Material” (CLSM), i.e., a lean, sand-cement slurry (“flowable fill”) or a similar material should be used for backfilling.

Where “squeegee” or similar materials are proposed for use by the Contractor, the design team should be notified by means of a request for information (RFI), so that the proposed use can be considered on a case-by-case basis. Where “squeegee” meets the project requirements for pipe bedding material, however, it is acceptable for that use.

Settlements Settlements will occur in newly filled ground, typically on the order of 1 to 2 percent of the fill depth. This is separate from settlement of the existing soils left in place. For a 6-foot fill, for example, that corresponds to a total settlement of about 1 inch. If fill placement is performed properly and is tightly controlled, in GROUND’s experience the majority (on the order of 60 to 80 percent) of that settlement typically will take place during earthwork construction, provided the contractor achieves the compaction levels indicated herein. The remaining potential settlements likely will take several months or longer to be realized, and may be exacerbated if these fills are subjected to changes in moisture content.

Cut and Filled Slopes Permanent, unretained, graded slopes supported by local soils up to **5 feet** in height should be constructed no steeper than **3 : 1** (horizontal : vertical).

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Minor raveling or surficial sloughing should be anticipated on slopes cut at this angle until vegetation is well re-established. Surface drainage should be designed to direct water away from slope faces into designed drainage pathways or structures.

Steeper slope angles and heights may be possible but will require detailed slope stability analysis based on final proposed grading plans. A geotechnical engineer should be retained to evaluate this on a case-by-case basis.

Additionally, project grading that affects the canal its banks/levee may require additional analysis.

EXCAVATION CONSIDERATIONS

Excavation Difficulty Test holes for the subsurface exploration were advanced to the depths indicated on the test hole logs by means of a buggy-mounted drilling rig without any unusual difficulties. However, given the inherent nature of undocumented fill soils, materials that may be awkward or otherwise difficult to handle (e.g., relatively large pieces of construction debris) may be encountered the undocumented fill soils including any demolition fills that may be generated. The contractor and the project team should be prepared to handle such materials.

Additionally, very hard and resistant beds of bedrock have been encountered in the greater project area. Excavations into the site bedrock may encounter very hard materials, such as those described above, as well as materials harder than the materials encountered in the test holes. The contractor and project team should be prepared to process and handle these materials as necessary, where excavation extend into stie bedrock.

Temporary Excavations and Personnel Safety Excavations in which personnel will be working must comply with all applicable OSHA Standards and Regulations, particularly CFR 29 Part 1926, OSHA Standards-Excavations, adopted March 5, 1990. The contractor's "responsible person" should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. GROUND has provided the information in this report solely as a service to the DHM Design, and is not assuming responsibility for construction site safety or the contractor's activities.

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The contractor should take care when making excavations not to compromise the bearing or lateral support for any adjacent, existing improvements.

Temporary, un-shored excavation slopes up to **10 feet** in height, in general, should be cut no steeper than **1½ : 1** (horizontal : vertical) in the on-site soils in the absence of seepage. Some surface sloughing may occur on the slope faces at these angles. Should site constraints prohibit the use of the above-indicated slope angle, temporary shoring should be used. GROUND is available to provide shoring design upon request. Stockpiling of materials should not be permitted closer to the tops of temporary slopes than 5 feet or a distance equal to the depth of the excavation, whichever is greater.

Groundwater Groundwater was encountered a shallowly as 6 feet below existing grade at the time of drilling. Therefore, based on conditions at the time of this subsurface exploration, we anticipate that relatively shallow project excavations could encounter groundwater and/or soft, wet, and unsuitable soils at depths as shallow as about 3 feet below existing grade. Limited volumes of perched groundwater could be encountered locally at shallower depths, as well.

Where excavations extend below a depth of 3 feet below existing grade, dewatering measures may be necessary. For planning purposes, a steady state flow into an excavation about the anticipated size of the proposed shade structure of about 5 gpm may be used. (Flows generated during initial draw-down may be significantly higher.)

Actual dewatering systems should be designed for the contractor by a qualified engineer. Additional data to evaluate shallow groundwater flow rates should be collected in support of that design.

Should seepage or flowing groundwater be encountered in project excavations, the slopes should be flattened as necessary to maintain stability or a geotechnical engineer should be retained to evaluate the conditions. The risk of slope instability will be significantly increased in areas of seepage along excavation slopes.

Surface Water The contractor should take pro-active measures to control surface waters during construction and maintain good surface drainage conditions to direct waters away from excavations and into appropriate drainage structures. A properly designed drainage

**Standley Lake Library Trailhead
Arvada, Colorado**

swale should be provided at the tops of the excavation slopes. In no case should water be allowed to pond near project excavations.

Temporary slopes should also be protected against erosion. Erosion along the slopes will result in sloughing and could lead to a slope failure.

SURFACE DRAINAGE

The site soils are relatively stable with regard to moisture content – volume relationships at their existing moisture contents. Other than the anticipated, post-placement settlement of fills, post-construction soil movements will result primarily from the introduction of water into the soils underlying the proposed structure, hardscaping and pavements. Based on the site surface and subsurface conditions encountered in this study, we do not anticipate a rise in the local water table sufficient to approach foundation or floor elevations. Therefore, local saturation of project foundation soils likely will result from infiltrating surface waters (precipitation, irrigation, etc.), and water flowing along constructed pathways such as bedding in utility pipe trenches.

The following drainage measures should be followed both for during construction and as part of project design. The facility should be observed periodically to evaluate the surface drainage and identify areas where drainage is ineffective. Routine maintenance of site drainage should be undertaken throughout the design life of the proposed facility. Maintenance should be anticipated to include removal and replacement of sidewalk stones, curb and gutter, sections of pavement, etc., to restore effective drainage. If these measures are not implemented and maintained effectively, the movement estimates provided in this report could be exceeded.

- 1) Wetting or drying of the underslab areas should be avoided during and after construction. Permitting increases/variations in moisture to the adjacent or supporting soils may result in increased total and/or differential movements.
- 2) Measures for positive surface drainage away from the structure should be provided and maintained to reduce water infiltration into foundation soils. Underdrains should not be relied upon in surface drainage design to collect and discharge surface waters.

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A minimum slope of **12 inches in the first 10 feet** in the areas not covered with pavement or concrete slabs should be established. For areas covered with asphalt pavement or concrete slabs, slopes **should comply with ADA requirements where required**. Increasing slopes to **a minimum of 3 percent in the first 10 feet** in the areas covered with pavement or concrete slabs will reduce, but not eliminate, the potential for moisture infiltration and subsequent volume change of the underling soils.

In no case should water be allowed to pond near or adjacent to foundation elements, hardscaping, etc.

- 3) Drainage also should be established and maintained to direct water away from sidewalks and other hardscaping as well as utility trench alignments which are not tolerant of increased post-construction movements.

The ground surface near foundation elements should be able to convey water away readily. Cobbles or other materials that tend to act as baffles and restrict surface flow should not be used to cover the ground surface near the foundations.

Where the ground surface does not convey water away readily, additional post-construction movements and distress should be anticipated.

- 4) In GROUND's experience, it is common during construction that in areas of partially completed paving or hardscaping, bare soil behind curbs and gutters, and utility trenches, water is allowed to pond after rain or snow-melt events. Wetting of the subgrade can result in loss of subgrade support and increased settlements. By the time final grading has been completed, significant volumes of water can already have entered the subgrade, leading to subsequent distress and failures. The contractor should maintain effective site drainage throughout construction so that water is directed into appropriate drainage structures.
- 5) In no case should water be permitted to pond adjacent to or on sidewalks, hardscaping, or other improvements as well as utility trench alignments, which are likely to be adversely affected by moisture-volume changes in the underlying soils or flow of infiltrating water.

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- 6) Roof downspouts and drains, if used, should discharge well beyond the perimeter of the structure foundation, or be provided with positive conveyance off-site for collected waters. Downspouts should not be routed to discharge into an underdrain system.

If roof downspouts and drains are not used, then surface drainage design should anticipate concentrated volumes of water adjacent to the structures.

- 7) Irrigation water – both that applied to landscaped areas and over-spray – commonly is a significant cause of distress to improvements. Where (near-) saturated soil conditions are sustained, distress to nearby improvements should be anticipated.

To reduce to potential for such distress, vegetation requiring watering should be located **10 or more feet** from the structure perimeter, flatwork, or other improvements. Irrigation sprinkler heads should be deployed so that applied water is not introduced near or into foundation/subgrade soils. Landscape irrigation should be limited to the minimum quantities necessary to sustain healthy plant growth.

Use of drip irrigation systems can be beneficial for reducing over-spray beyond planters. Drip irrigation also can be beneficial for reducing the amounts of water introduced to structure foundation soils, but only if the total volumes of applied water are controlled with regard to limiting that introduction. Controlling rates of moisture increase beneath the foundations, floors and other improvements should take higher priority than minimizing landscape plant losses.

Where plantings are desired within 10 feet of the structure, plants should be placed in water-tight planters, constructed either in-ground or above-grade, to reduce moisture infiltration in the surrounding subgrade soils. Planters should be provided with positive drainage and landscape underdrains.

As an alternative involving only a limited increase in risk, the use of water-tight planters may be replaced by local, shallow underdrains beneath the planter beds.

- 8) Plastic membranes should not be used to cover the ground surface near the structure without careful consideration of other components of project drainage. Plastic membranes can be beneficial to directing surface waters away from the structure and toward drainage structures. However, they effectively preclude evaporation and transpiration of shallow soil moisture. Therefore, soil moisture tends to increase beneath a continuous membrane. Where plastic membranes are used, additional shallow, subsurface drains should be installed.

Perforated “weed barrier” membranes that allow ready evaporation from the underlying soils may be used.

SUBSURFACE DRAINAGE

As a component of project civil design, properly functioning, subsurface drain systems (“underdrains”) can be beneficial for collecting and discharging saturated subsurface waters. Although the subsurface drainage system anticipated for this project may consist of perimeter underdrains along the structure perimeter and underdrains constructed beneath floor system, they are addressed as underdrains herein.

Underdrains will not collect water infiltrating under unsaturated (vadose) conditions, or moving via capillarity, however. In addition, if not properly constructed and maintained, underdrains can transfer water into foundation soils, rather than remove it. This will tend to induce heave or settlement of the subsurface soils, and may result in distress. Underdrains can, however, provide an added level of protection against relatively severe post-construction movements by draining saturated conditions near individual structures should they arise, and limiting the volume of wetted soil.

It is GROUND’s opinion that it will be beneficial to include a perimeter underdrain system to help limit wetting of the foundation bearing soils. However, we understand that the owner and project team may consider that the reduction of risk provided by a properly constructed and maintained underdrain system does not justify the costs associated with including an underdrain. In such a case, an underdrain system can be excluded. If an underdrain system is excluded, then there will be an increased risk of the likely post-construction movements estimated in this report being exceeded. Where an underdrain system is excluded, extra care should be taken to establish and maintain effective surface

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drainage, identify and repair wet utility leaks in a timely manner, seal open cracks joints, and restore effective surface drainage as necessary to limit the volume of water infiltrating the site.

GROUND is available to discuss the above options and as well as other underdrain alternatives upon request. Geotechnical parameters and details also can be provided upon request.

PEDESTRIAN FLATWORK

We anticipate that portions of the site will be provided with concrete flatwork. Like other site improvements, flatwork will experience post-construction movements as soil moisture contents increase after construction and distress likely will result. The following measures will help to reduce damages to these improvements, but will not prevent all movements. Critical flatwork, which may include flatwork at entrances and exits, should be constructed as a slab-on-grade floor in a similar manner to project floors. Such areas should be identified by the owner.

We anticipate that portions of the site will be provided with concrete flatwork. Like other site improvements, flatwork will experience post-construction movements as soil moisture contents increase after construction and distress likely will result. The following measures will help to reduce damages to these improvements, but will not prevent all movements. Critical flatwork, which may include flatwork at entrances and exits, should be constructed as a slab-on-grade floor in a similar manner to project floors. Such areas should be identified by the owner.

- 1) In order to reduce post-construction movements, site flatwork should be constructed on a section of properly moisture-conditioned and compacted to a depth of **at least 36 inches or a depth that removes and replaces all soft, wet, otherwise unsuitable soils (including the undocumented fill), whichever is greater.** This section assumes the facility owner will be tolerant of significant total and differential pavement post-construction movements (on the order of several inches) and the associated maintenance costs that are necessary to re-establish effective drainage, replace distressed flatwork, etc.

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We understand, however, that it may not be practical remove and replace all the undocumented fill soils or soft, yielding, or otherwise deleterious soils as properly compacted fill due the presence of utility lines and the proximity of existing improvements. Therefore, if the owner opts to reduce the fill section beneath the flatwork, additional post-construction movements, accelerated flatwork distress, and additional maintenance should be anticipated. We suggest remedial earthwork should be performed to no less than 24 inches in such a case. Similarly, where existing utility lines or other site constraints limit the depth to which remedial earthwork can be accomplished, additional maintenance should be anticipated.

In general, increasing the depth of fill beneath the pavements will decrease the risk of post-construction movements.

- 2) Prior to placement of flatwork, a proof roll should be performed to identify areas that exhibit instability and deflection. The deleterious soils in these areas should be removed and replaced with properly compacted fill. The contractor should take care to achieve and maintain compaction behind curbs to reduce differential sidewalk settlements. Passing a proof roll is an additional requirement to placing and compacting the subgrade fill soils within the specified ranges of moisture content and relative compaction in the *Project Earthwork* section of this report. Subgrade stabilization may be cost-effective in this regard.
- 3) Flatwork should be provided with control joints extending to an effective depth and spaced no more than **10 feet** apart, both ways. Narrow flatwork, such as sidewalks, likely will require more closely spaced joints.
- 4) In no case should exterior flatwork extend to under any portion of the structure where there is less than **2 inches** of vertical clearance between the flatwork and any element of the structure. Exterior flatwork in contact with brick, rock facades, or any other element of the structure can cause damage to the structure if the flatwork experiences movements.

Concrete Scaling Climatic conditions in the project area including relatively low humidity, large temperature changes and repeated freeze – thaw cycles, make it likely that project sidewalks and other exterior concrete will experience surficial scaling or spalling. The

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likelihood of concrete scaling can be increased by poor workmanship during construction, such as 'over-finishing' the surfaces. In addition, the use of de-icing salts on exterior concrete flatwork, particularly during the first winter after construction, will increase the likelihood of scaling. Even use of de-icing salts on nearby roadways, from where vehicle traffic can transfer them to newly placed concrete, can be sufficient to induce scaling. Typical quality control / quality assurance tests that are performed during construction for concrete strength, air content, etc., do not provide information with regard to the properties and conditions that give rise to scaling.

We understand that some municipalities require removal and replacement of concrete that exhibits scaling, even if the material was within specification and placed correctly. The contractor should be aware of the local requirements and be prepared to take measures to reduce the potential for scaling and/or replace concrete that scales.

In GROUND's experience, the measures below can be beneficial for reducing the likelihood of concrete scaling. Which measures, if any, used should be based on cost and the owner's tolerance for risk and maintenance. It must be understood, however, that because of the other factors involved, including weather conditions and workmanship, surface damage to concrete can develop, even where all of these measures were followed. Also, the mix design criteria should be coordinated with other project requirements including criteria for sulfate resistance presented in the *Water-Soluble Sulfates* section of this report.

- 1) Maintaining a maximum water/cement ratio of 0.45 by weight for exterior concrete mixes.
- 2) Include Type F fly ash in exterior concrete mixes as 20 percent of the cementitious material.
- 3) Specify a minimum, 28-day, compressive strength of 4,500 psi for all exterior concrete.
- 4) Including 'fibermesh' in the concrete mix also may be beneficial for reducing surficial scaling.

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- 5) Cure the concrete effectively at uniform temperature and humidity. This commonly will require fogging, blanketing and/or tenting, depending on the weather conditions. As long as 3 to 4 weeks of curing may be required, and possibly more.
- 6) Avoid placement of concrete during cold weather so that it is not exposed to freeze-thaw cycling before it is fully cured.
- 7) Avoid the use of de-icing salts on given reaches of flatwork through the first winter after construction.

We understand that sometimes it is not practical to implement some of these measures for reducing scaling due to safety considerations, project scheduling, etc. In such cases, where these measures are not implemented, additional costs for flatwork maintenance or reconstruction should be incorporated into project budgets.

Frost and Ice Considerations Nearly all soils other than relatively coarse, clean, granular materials are susceptible to loss of density if allowed to become saturated and exposed to freezing temperatures and repeated freeze – thaw cycling. The formation of ice in the underlying soils can result in heaving of pavements, flatwork, and other hardscaping (“ice jacking”) in sustained cold weather up to 2 inches or more. This heaving can develop relatively rapidly. A portion of this movement typically is recovered when the soils thaw, but due to loss of soil density, some degree of displacement will remain. This can result even where the subgrade soils were prepared properly.

Where hardscape movements are a design concern, replacement of the subgrade soils with 3 or more feet of clean, coarse sand or gravel should be considered or supporting the element on foundations similar to the structure and spanning over a void. Detailed guidance in this regard can be provided upon request. It should be noted that where such open graded granular soils are placed, water can infiltrate and accumulate in the subsurface relatively easily, which can lead to increased settlement or heave from factors unrelated to ice formation. Therefore, where a section of open graded granular soils are placed, a local underdrain system should be provided to discharge collected water. GROUND will be available to discuss these concerns upon request.

CLOSURE

Geotechnical Review The author of this report or a GROUND principal should be retained to review project plans and specifications to evaluate whether they comply with the intent of the measures discussed in this report. The review should be requested in writing.

The geotechnical conclusions and parameters presented in this report are contingent upon observation and testing of project earthworks by representatives of GROUND. If another geotechnical consultant is selected to provide materials testing, then that consultant must assume all responsibility for the geotechnical aspects of the project by concurring in writing with the parameters in this report, or by providing alternative parameters.

Materials Testing the DHM Design should consider retaining a geotechnical engineer to perform materials testing during construction. The performance of such testing or lack thereof, however, in no way alleviates the burden of the contractor or subcontractor from constructing in a manner that conforms to applicable project documents and industry standards. The contractor or pertinent subcontractor is ultimately responsible for managing the quality of his work; furthermore, testing by the geotechnical engineer does not preclude the contractor from obtaining or providing whatever services that he deems necessary to complete the project in accordance with applicable documents.

Limitations This report has been prepared for the DHM Design as it pertains to design and construction of the proposed park improvements as described herein. It may not contain sufficient information for other parties or other purposes.

In addition, the DHM Design has assumed that project construction will commence by spring 2023. Any changes in project plans or schedule should be brought to the attention of a geotechnical engineer, in order that the geotechnical conclusions in this report may be re-evaluated and, as necessary, modified. **If our described understanding/interpretation of the proposed project is incorrect or project elements differ in any way from that expressed herein, including changes to improvement locations, dimensions, orientations, loading conditions, elevations/grades, etc., and/or additional buildings/structures/site improvements are incorporated into this project, either after the original information was provided**

to us or after the date of this report, GROUND or another geotechnical engineer must be retained to re-evaluate the conclusions and parameters presented herein.

The geotechnical conclusions in this report relied upon subsurface exploration at limited number of exploration points, as shown in Figure 1, as well as the means and methods described herein. Subsurface conditions were interpolated between and extrapolated beyond these locations. It is not possible to guarantee the subsurface conditions are as indicated in this report. Actual conditions exposed during construction may differ from those encountered during site exploration.

If during construction, surface, soil, bedrock, or groundwater conditions appear to be at variance with those described herein, a geotechnical engineer should be retained at once, so that re-evaluation of the conclusions for this site may be made in a timely manner. In addition, a contractor who obtains information from this report for development of his scope of work or cost estimates may find the geotechnical information in this report to be inadequate for his purposes or find the geotechnical conditions described herein to be at variance with his experience in the greater project area. The contractor is responsible for obtaining the additional geotechnical information that is necessary to develop his workscope and cost estimates with sufficient precision. This includes current depths to groundwater, etc.

ALL DEVELOPMENT CONTAINS INHERENT RISKS. It is important that ALL aspects of this report, as well as the estimated performance (and limitations with any such estimations) of proposed improvements are understood by the DHM Design. Utilizing these criteria and measures herein for planning, design, and/or construction constitutes understanding and acceptance of the conclusions with regard to risk and other information provided herein, associated improvement performance, as well as the limitations inherent within such estimates.

If any information referred to herein is not well understood, then the DHM Design or members of the design team, should contact the author or a GROUND principal immediately. We will be available to meet to discuss the risks and remedial approaches presented in this report, as well as other potential approaches, upon request.

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GROUND makes no warranties, either expressed or implied, as to the professional data, opinions or conclusions contained herein. This document, together with the concepts and conclusions presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Re-use of, or improper reliance on this document without written authorization and adaption by GROUND Engineering Consultants, Inc., shall be without liability to GROUND Engineering Consultants, Inc.

GROUND appreciates the opportunity to complete this portion of the project and welcomes the opportunity to provide the DHM Design with a proposal for construction observation and materials testing.

Sincerely,

GROUND Engineering Consultants, Inc.



Ben Fellbaum, P.G., E.I.



Reviewed by Brian H. Reck, P.G., C.E.G., P.E.



1
 Indicates test hole number and approximate location.

NOT TO SCALE

SITE PLAN PROVIDED BY CLIENT

GROUND ENGINEERING	JOB NO.: 22-3018
	FIGURE: 1
LOCATION OF TEST HOLES	

CLIENT: DHM Design
JOB NO: 22-3018

PROJECT NAME: Stanley Lake Library Trailhead
PROJECT LOCATION: Arvada, CO



Figure 2

CLIENT: DHM Design

PROJECT NAME: Stanley Lake Library Trailhead

JOB NO: 22-3018

PROJECT LOCATION: Arvada, CO

MATERIAL SYMBOLS



TOPSOIL



FILL



WEATHERED SILTSTONE, CLAYSTONE, and SANDSTONE



CLAYSTONE and SANDSTONE BEDROCK

SAMPLER SYMBOLS



Modified California Liner Sampler

23 / 12 Drive sample blow count indicates 23 blows of a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.

NOTES

1. Test holes were drilled on 4/13/2022 with 6" solid stem auger.
2. Locations of the test holes were determined approximately by pacing from features shown on the site plan provided.
3. Elevations of the test holes were not measured and the logs of the test holes are drawn to depth. Nominal elevation of "100 feet" indicates existing ground level at the test hole at the time of drilling.
4. The test hole locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between materials shown on the test hole logs represent the approximate boundaries between material types and the transitions may be gradual.
6. Groundwater level readings shown on the logs were made at the time and under the conditions indicated. Fluctuations in the water level may occur with time.
7. The material descriptions on these logs are for general classification purposes only. See full text of this report for descriptions of the site materials & related information.
8. All test holes were immediately backfilled upon completion of drilling, unless otherwise specified in this report.

NOTE: See Detailed Logs for Material descriptions.

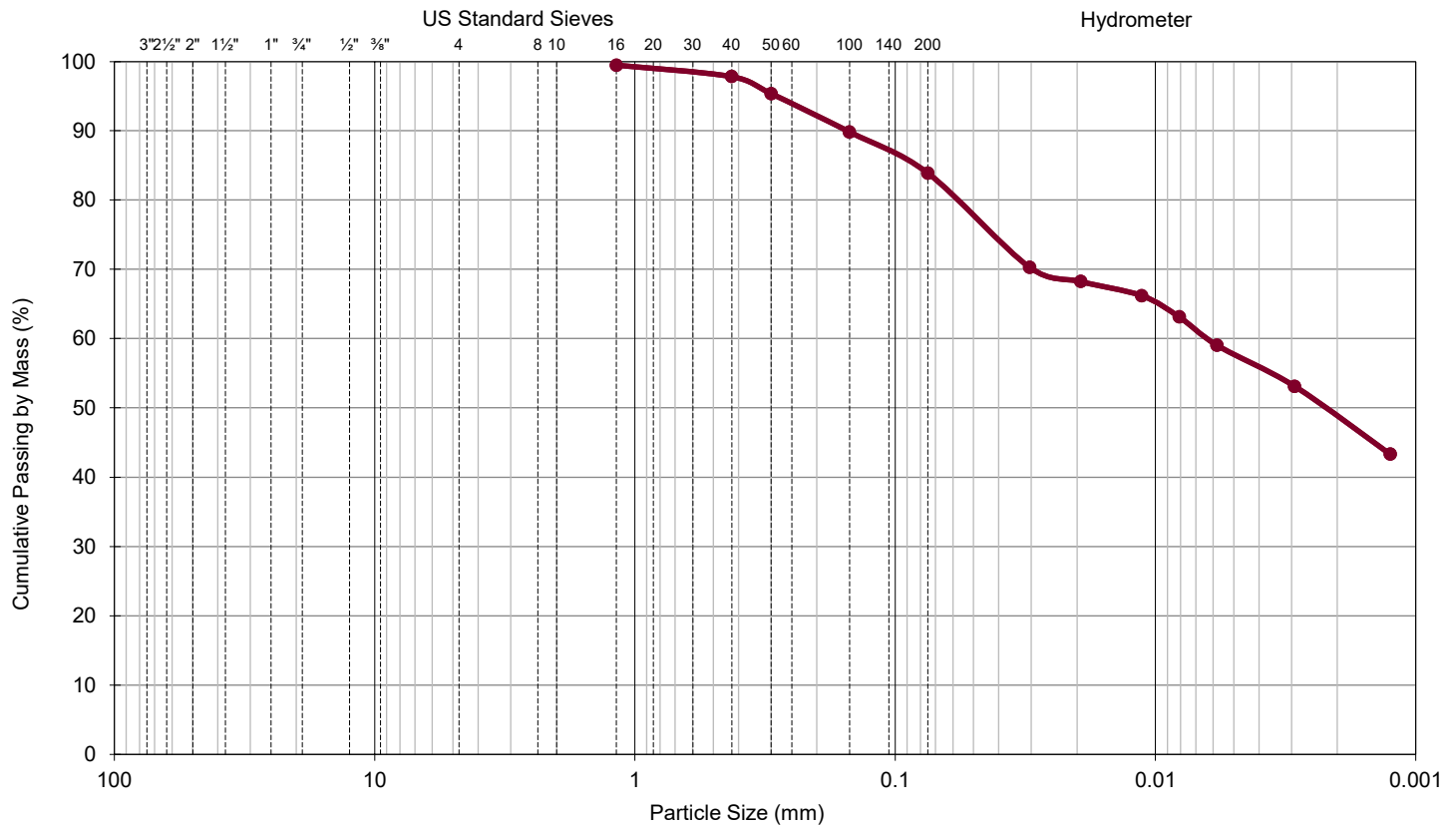
ABBREVIATIONS

- ▼ Water Level at Time of Drilling, or as Shown
- ▼ Water Level at End of Drilling, or as Shown
- ▼ Water Level After 24 Hours, or as Shown

NV No Value
NP Non-Plastic

Standley Lake Library Trailhead

Gradation and Hydrometer (ASTM D422-63[2007])



Coarse Gradation			Fine Gradation			Hydrometer		Grading	
US Standard Sieve	Particle Size (mm)	Passing by Mass (%)	US Standard Sieve	Particle Size (mm)	Passing by Mass (%)	Particle Size (mm)	Passing by Mass (%)	Coefficient	Value
6 in	150	-	No. 4	4.75	-	0.030	70	D90	0.153
5 in	125	-	No. 8	2.36	-	0.019	68	D85	0.085
4 in	100	-	No. 10	2.00	-	0.011	66	D80	-
3 in	75	-	No. 16	1.18	99	0.008	63	D60	-
2.5 in	63	-	No. 20	0.85	-	0.006	59	D50	-
2 in	50	-	No. 30	0.60	-	0.003	53	D40	-
1.5 in	37.5	-	No. 40	0.425	98	0.001	43	D30	-
1 in	25.0	-	No. 50	0.300	95	-	-	D15	-
3/4 in	19.0	-	No. 60	0.250	-	-	-	D10	-
1/2 in	12.5	-	No. 100	0.150	90	-	-	D05	-
3/8 in	9.5	-	No. 140	0.106	-	-	-	Cu	-
No. 4	4.75	-	No. 200	0.075	83.9	-	-	Cc	-

Location: 1 at 4 feet
Description: FILL: CLAY with Sand

Classification: (CL)s / A-7-6 (19)
Liquid Limit: 46
Plasticity Index: 21
Activity: 0.4

Gravel (%): #N/A
Sand (%): #N/A
Silt/Clay (%): 84
< .002 mm (%): 49

Results apply only to the specific items and locations referenced and at the time of testing. For the hydrometer portion of the test, a composite temperature correction and meniscus correction were applied to each reading. This report should not be reproduced, except in full, without the written permission of GROUND Engineering Consultants, Inc.



Standley Lake Library Trailhead

TABLE 1: SUMMARY OF LABORATORY TEST RESULTS

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg Limits		Swell/Consolidation		USCS Equivalent Classification	AASHTO Equivalent Classification (Group Index)	Sample Description
Test Hole No.	Depth (feet)			Gravel (%)	Sand (%)	Fines (%)	Liquid Limit	Plasticity Index	Volume Change (%)	Surcharge Pressure (psf)			
1	4	34.3	81.6	0	16	83.9	46	21	-	-	(CL)s	A-7-6 (19)	FILL: CLAY with Sand
1	9	20.3	102.5	0	36	64.2	42	17	0.6	1,100	s(CL)	A-7-6 (10)	Weathered Claystone
1	19	28.6	92.5	0	27	73.5	61	23	0.8	2,350	(MH)s	A-7-5 (19)	SILTSTONE Bedrock
2	3	22.3	103.2	0	30	70.4	43	18	0.9	350	(CL)s	A-7-6 (12)	FILL: CLAY with Sand
2	8	20.7	106.2	3	50	47.5	33	10	-	-	SC	A-4 (2)	Weathered SANDSTONE
2	13	24.8	97.1	0	47	52.9	47	15	-	-	s(ML)	A-7-5 (6)	Weathered SILTSTONE

SD = Sample disturbed, NV = No value, NP = Non-plastic

Job No. 22-3018



Standley Lake Library Trailhead

TABLE 2: SUMMARY OF SOIL CORROSION TEST RESULTS

Sample Location		Water Soluble Sulfates (%)	pH	Redox Potential (mv)	Sulfide Reactivity	Resistivity (ohm-cm)	USCS Equivalent Classification	AASHTO Equivalent Classification (Group Index)	Sample Description
Test Hole No.	Depth (feet)								
2	8	0.13	7.5	- 27	Positive	4,106	SC	A-4 (2)	Weathered SANDSTONE

Job No. 22-3018

Appendix A

Detailed Logs of the Test Holes

CLIENT: DHM Design

PROJECT NAME: Stanley Lake Library Trailhead

JOB NO: 22-3018

PROJECT LOCATION: Arvada, CO

Elevation (ft)	Depth (ft)	Graphic Log	Material Descriptions and Drilling Notes	Sample Type	Blow Count	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits		Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS Equivalent Classification
									Liquid Limit	Plasticity Index			
100	0		TOPSOIL										
			FILL: Fine to coarse sands and clays. It was moist to very moist, very soft to stiff and very loose to medium dense, moderately to highly plastic, and brown to gray in color.										
95	5			2/12	34.3	81.6	84	46	21				(CL)s
90	10		WEATHERED CLAYSTONES, SILTSTONES, and SANDSTONES: Weathered, interbedded claystones, siltstones, and sandstones. They were very moist, moderately plasticity to highly plastic, weathered to medium hard, and gray to brown in color. Iron staining were noted commonly.	17/12	20.3	102.5	64	42	17	0.6 (1100)			s(CL)
85	15			50/12									
80	20			27/12	28.6	92.5	74	61	23	0.8 (2350)			(MH)s
75	25		CLAYSTONES, SILTSTONES, and SANDSTONES: Interbedded claystones, siltstones, and sandstones. They were moist to very moist, moderately to highly plastic, hard, and gray to brown in color. Iron staining was noted locally.	50/11									
			Groundwater encountered at 27 feet approximately 4 hours after drilling.										
				50/5									

Bottom of borehole at Approx. 29.42 feet.

CLIENT: DHM Design

PROJECT NAME: Stanley Lake Library Trailhead

JOB NO: 22-3018

PROJECT LOCATION: Arvada, CO

Elevation (ft)	Depth (ft)	Graphic Log	Material Descriptions and Drilling Notes	Sample Type	Blow Count	Natural Moisture Content (%)	Natural Dry Density (pcf)	Percent Passing No. 200 Sieve	Atterberg Limits		Swell/Consolidation (%) at Surcharge Pressure (psf)	Unconfined Compressive Strength (ksf)	USCS Equivalent Classification
									Liquid Limit	Plasticity Index			
100	0		TOPSOIL										
			FILL: Fine to coarse sands and clays. It was moist to very moist, very soft to stiff and very loose to medium dense, moderately to highly plastic, and brown to gray in color.										
				11/12	22.3	103.2	70	43	18	0.9 (350)			(CL)s
95	5		Groundwater encountered at 6 feet at time of drilling.										
				18/12	20.7	106.2	48	33	10				SC
90	10		WEATHERED CLAYSTONES, SILTSTONES, and SANDSTONES: Weathered, interbedded claystones, siltstones, and sandstones. They were very moist, moderately plasticity to highly plastic, weathered to medium hard, and gray to brown in color. Iron staining were noted commonly.										
				37/12	24.8	97.1	53	47	15				s(ML)
85	15												
				25/12									

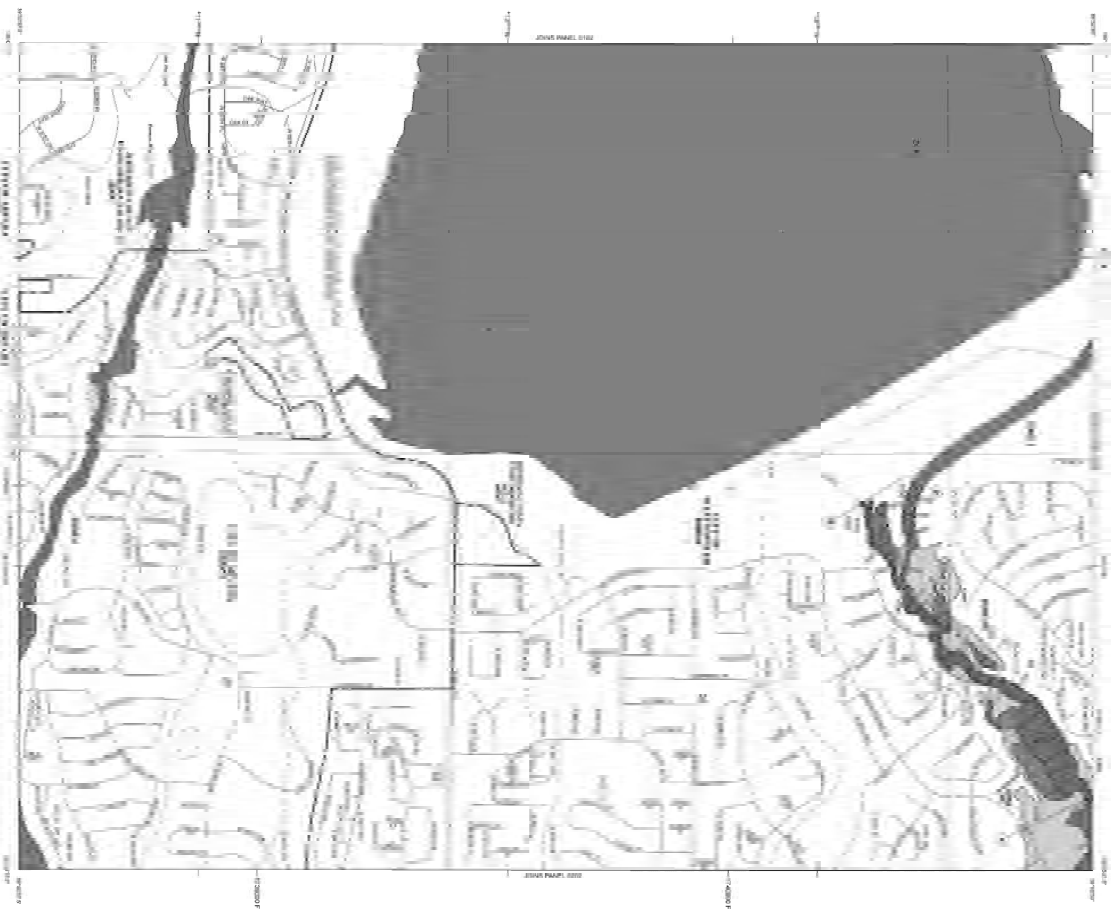
Bottom of borehole at Approx. 19 feet.

APPENDIX D

NATIONAL FLOOD HAZARD LAYER – FIRMette

NOTES TO USER

The information contained in this report is based on the data and information provided to the Engineer by the client. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer.



LEGEND

The information contained in this report is based on the data and information provided to the Engineer by the client. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer.

The information contained in this report is based on the data and information provided to the Engineer by the client. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer.

FIRM
FLOOD INSURANCE RISK MAP
JULY 1995
CIVIL ENGINEERS
1000 LAKESHORE DRIVE
LAKESHORE, IL 60045

NOTES:
1. This map was prepared for the purpose of showing the flood insurance risk for the property shown on the map.
2. The map was prepared using the data and information provided to the Engineer by the client.
3. The Engineer is not responsible for the accuracy or completeness of the data and information provided to the Engineer.

APPENDIX E
INSPECTION FORMS

STORMWATER CONSTRUCTION SITE INSPECTION REPORT

GENERAL INFORMATION

Project Name:

Location:

Date of Inspection:

Start/End Time:

Inspector's Name:

Inspector's Title:

Inspector's Contact Information:

Describe present phase of construction:

Type of Inspection:

☐ Regular ☐ Pre-storm event ☐ During storm event ☐ Post-storm event

WEATHER INFORMATION

Has there been a storm event since the last inspection? ☐ Yes ☐ No

If yes, provide:

Storm Start Date & Time:

Storm Duration (hrs):

Approximate Amount of Precipitation (in):

Weather at time of this inspection?

☐ Clear ☐ Cloudy ☐ Rain ☐ Sleet ☐ Fog ☐ Snowing ☐ High Winds
☐ Other: Temperature:

Have any discharges occurred since the last inspection? ☐ Yes ☐ No

If yes, describe:

Are there any discharges at the time of inspection? ☐ Yes ☐ No

If yes, describe:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Inspector

Printed Name and Title

Date

OVERALL SITE ISSUES

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1. All inactive slopes and disturbed areas have been stabilized.	☐ Yes ☐ No	☐ Yes ☐ No	
2. Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	☐ Yes ☐ No	☐ Yes ☐ No	
3. Are all sanitary waste receptacles placed in secondary containment and free of leaks?	☐ Yes ☐ No	☐ Yes ☐ No	
4. Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	☐ Yes ☐ No	☐ Yes ☐ No	
5. Are discharge points and receiving waters free of any sediment deposits?	☐ Yes ☐ No	☐ Yes ☐ No	
6. Are storm drain inlets properly protected?	☐ Yes ☐ No	☐ Yes ☐ No	
7. Is the construction exit preventing sediment from being tracked into the street?	☐ Yes ☐ No	☐ Yes ☐ No	
8. Is trash/litter from work areas collected and placed in covered dumpsters?	☐ Yes ☐ No	☐ Yes ☐ No	
9. Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	☐ Yes ☐ No	☐ Yes ☐ No	
10. Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	☐ Yes ☐ No	☐ Yes ☐ No	
11. Are materials that are potential stormwater contaminants stored inside or under cover?	☐ Yes ☐ No	☐ Yes ☐ No	
12. Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	☐ Yes ☐ No	☐ Yes ☐ No	
13. (Other)	☐ Yes ☐ No	☐ Yes ☐ No	



REPORT TO CITY COUNCIL RESOLUTION

AGENDA ITEM
8.A.2.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to Accommodate an Accessible Pedestrian Ramp for the Tenant Space at 7357 Grandview Avenue, Unit A, within Public Right of Way

Report in Brief

Grandview Station LLC, the owner of the commercial units in the Grandview Station Building at 7357 Grandview, is requesting approval of a revocable encroachment license to construct an accessible pedestrian ramp within City of Arvada right-of-way to serve 7357 Grandview Avenue, Unit A. The proposed revocable encroachment license agreement includes language that requires the building owner to construct an accessible pedestrian ramp within unit A and remove the ramp located within City right-of-way with the next tenant change, with a significant tenant improvement permit, or within ten years of approval of the revocable license agreement, whichever occurs first.

The Arvada team recommends that City Council approve R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to accommodate an accessible pedestrian ramp for the tenant space at 7357 Grandview Avenue, Unit A, within public right of way.

Financial Impact

There is no financial impact.

Background

7357 Grandview Avenue, Unit A, is one of three commercial tenant spaces within the mixed-use building located at 7357 Grandview Avenue, also known as Grandview Station. Construction on the core and shell of the building, including all residential units, was completed in 2023. During a routine building inspection, it was discovered that the pedestrian access off of Grandview Avenue did not comply with accessibility standards. At that time, construction within the tenant space was nearly complete; requiring the accessible ramp within the building would have required a complete redesign and reconstruction of the tenant space.

Discussion

It is the responsibility of the applicant to justify the requested land use application. The City Council should make a determination regarding the granting of the license based on its findings regarding the approval criteria shown in the table(s) below. The City team has evaluated the request and determined that the license will not impact City infrastructure and is acceptable.

Community and Economic Development team members performed an analysis of the proposal, based on the approval criteria listed in Section 3 of the Land Development Code, and presents the following findings:

Div. 8-3-5-8B Revocable Right-of-Way License Agreement	Finding	Rationale
1. The applicant agrees to the terms of a Revocable Right-of-Way License Agreement in a form approved by the City Attorney, including any insurance provision and provision that	Complies	The applicant has signed the Revocable Right-of-Way License Agreement.

SUBJECT: R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to Accommodate an Accessible Pedestrian Ramp for the Tenant Space at 7357 Grandview Avenue, Unit A, within Public Right of Way

PAGE: 2
ITEM: 8.A.2.

indemnify and hold the City harmless from future damages or liability claims.

2. The proposed sign, structure, or use complies with all applicable use, development, and design standards set forth in this LDC and the City of Arvada Municipal Code that have not otherwise been modified or waived.

Complies

The proposed accessible pedestrian ramp will comply with all applicable standards and serve a future tenant space at 7357 Grandview Avenue, Unit A. The proposed accessible ramp will bring the pedestrian access from the Grandview Avenue sidewalk into compliance with all applicable accessibility requirements.

3. The proposed sign, structure, or use shall not interfere with street intersection visibility, materially impede access to utilities or other facilities, or in any other way adversely affect the public health, safety, or welfare.

Complies

The proposed accessible pedestrian ramp will not interfere with street intersection visibility and will not affect any utility infrastructure or adversely affect public health, safety, or welfare. The footprint of the proposed pedestrian accessible ramp is similar to outdoor dining encroachments in Olde Town and there will remain sufficient sidewalk width for pedestrian circulation.

Public Contact

Posting of the City Council agenda

Commission Recommendation

A Planning Commission public hearing is not required by the Land Development Code for this type of application.

Strategic Alignment

The recommended action aligns with the Community and Economic Development Priority Area of the City Council Strategic Plan.

Alternative Courses of Action

N/A

Recommendation for Action

The Arvada team recommends that City Council approve R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to accommodate an accessible pedestrian ramp for the tenant space at 7357 Grandview Avenue, Unit A, within public right of way.

Suggested Motion:

I move that R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to Accommodate an Accessible Pedestrian Ramp for the Tenant Space at 7357 Grandview Avenue, Unit A, within Public Right of Way, be (approved) (rejected).

Prepared by:
Dixielee Rodriguez, Administrative Specialist

SUBJECT: R24-019, A Resolution Approving an Agreement By and Between the City of Arvada and Grandview Station LLC for the Grant of a Revocable Encroachment License to Accommodate an Accessible Pedestrian Ramp for the Tenant Space at 7357 Grandview Avenue, Unit A, within Public Right of Way

PAGE: 3
ITEM: 8.A.2.

Reviewed by:

Approved by:

Jacob Nitchals, Senior Planner	1/24/2024
Josie Suk, Development Systems and Administrative Manager	1/25/2024
Rob Smetana, Planning Manager	1/26/2024
Jessica Garner, Director of Community and Economic Development	1/26/2024
Gail Walker, Legal Specialist-Contracts	1/29/2024
Emily Grogg, Senior Assistant City Attorney	1/29/2024
Rachel Morris, City Attorney	1/31/2024
Linda Haley, Deputy City Manager	1/31/2024
Lorie Gillis, City Manager	1/31/2024

Enclosure, exhibits & attachments required to support the report

RESOLUTION NO. R24-019

A RESOLUTION APPROVING AN AGREEMENT BY AND BETWEEN THE CITY OF ARVADA AND GRANDVIEW STATION, LLC FOR THE GRANT OF A REVOCABLE ENCROACHMENT LICENSE TO ACCOMMODATE AN ACCESSIBLE PEDESTRIAN RAMP FOR THE TENANT SPACE AT 7357 GRANDVIEW AVENUE, UNIT A, WITHIN PUBLIC RIGHT OF WAY

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ARVADA, COLORADO:

Section 1. The Mayor or Mayor Pro Tem is authorized to sign and the City Clerk to attest, in form approved by the City Attorney, a Revocable Encroachment License, which is in substantially the same form as that attached hereto, by and between the City of Arvada and Grandview Station LLC.

Section 2. The City of Arvada hereby accepts a grant of a revocable encroachment license to accommodate an accessible pedestrian ramp within public right of way at 7357 Grandview Avenue, Unit A, Arvada, Colorado 80002.

Section 3. This resolution shall be effective upon its approval by the City Council.

APPROVED AND ADOPTED this 12th day of February, 2024.

Lauren Simpson, Mayor

ATTEST:

City Clerk

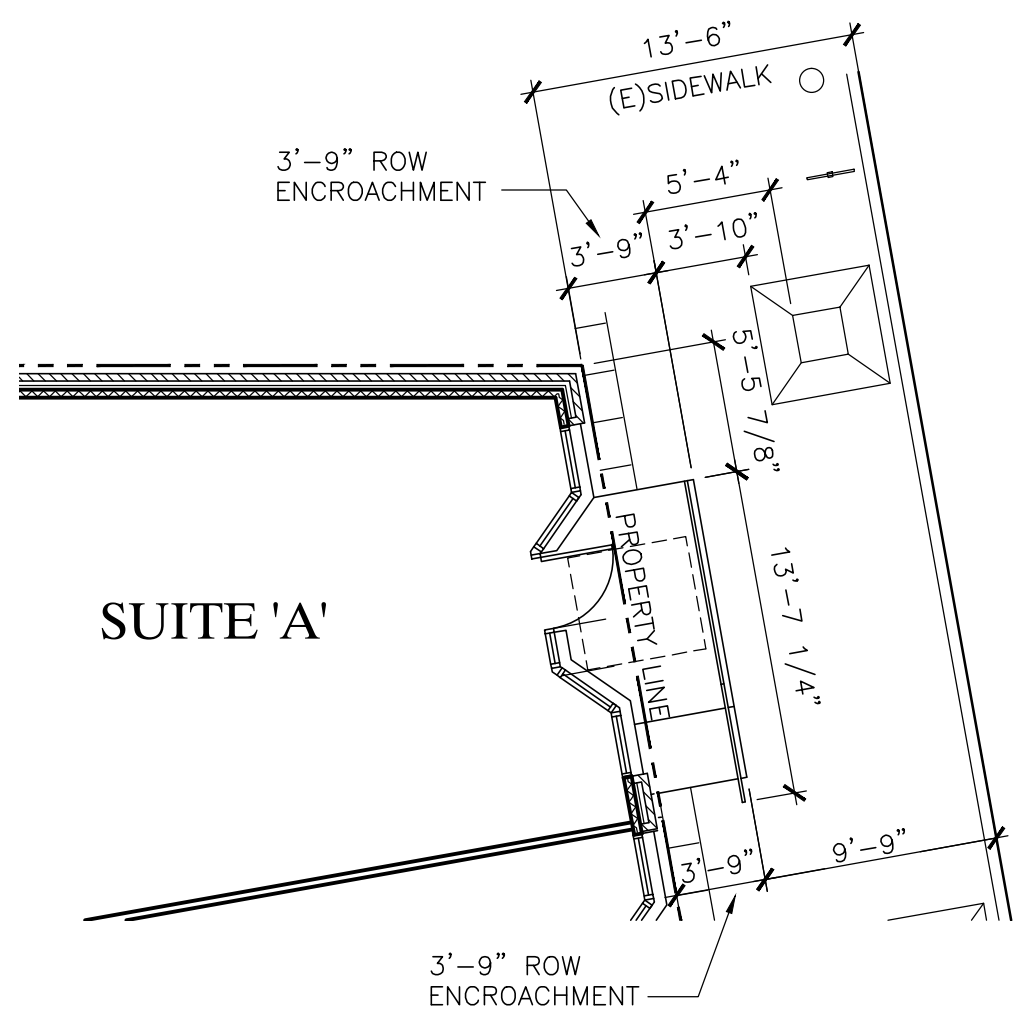
APPROVED AS TO FORM:
Rachel A. Morris, City Attorney

By: _____

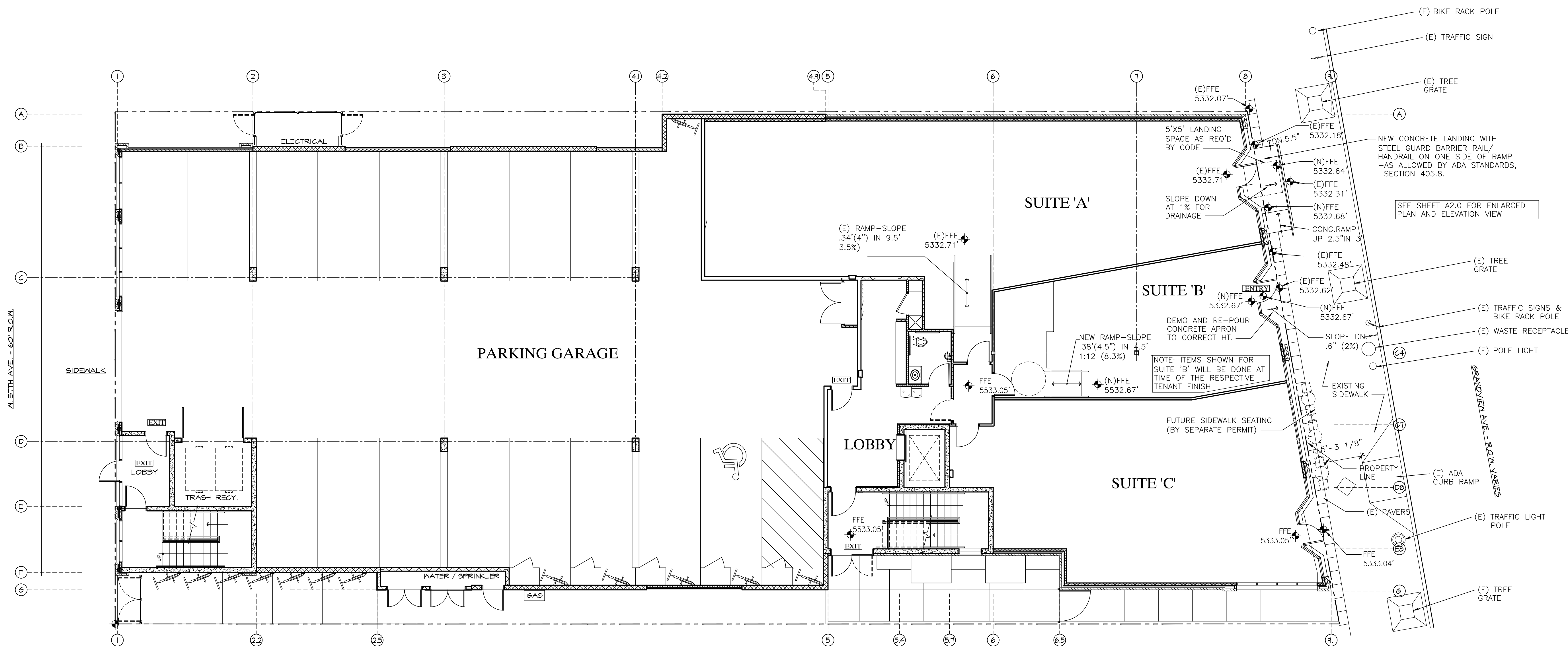
EXHIBIT A

**AN AGREEMENT BY AND BETWEEN THE CITY OF ARVADA
AND GRANDVIEW STATION LLC FOR THE GRANT OF A
REVOCABLE ENCROACHMENT LICENSE TO ACCOMMODATE AN
ACCESSIBLE PEDESTRIAN RAMP FOR THE TENANT SPACE AT 7357
GRANDVIEW AVENUE, UNIT A, WITHIN PUBLIC RIGHT OF WAY**

Exhibit A

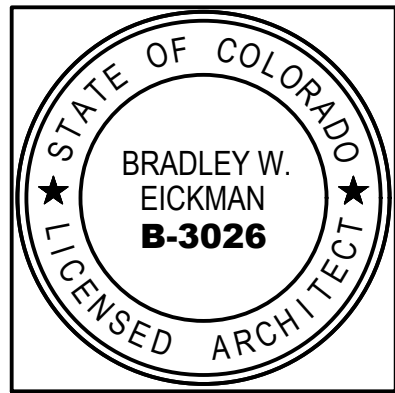


⊕ DIMENSIONS AT ROW ENCROACHMENT
1/8" = 1'-0"



⊕ GRANDVIEW STATION PROPOSED ADA ACCESS CHANGES
1/8" = 1'-0"

revision		
no.	date	by



M-A ARCHITECTS
ARCHITECTURE & PLANNING
THE LITTLETON
OFFICE BUILDING
2329 WEST MAIN
STREET SUITE 301
LITTLETON, CO 80120
TEL 303 730 7300
FAX 303 730 8300

GRANDVIEW STATION
7357 Grandview Avenue
Arvada, Colorado 80002

sheet title	FLOOR PLAN
date	1-22-2024
drawn	
checked	
sheet	A1.0

**AN AGREEMENT BY AND BETWEEN THE CITY OF ARVADA
AND GRANDVIEW STATION LLC FOR THE GRANT OF A REVOCABLE
ENCROACHMENT LICENSE TO ACCOMMODATE AN ACCESSIBLE
PEDESTRIAN RAMP FOR THE TENANT SPACE AT 7357 GRANDVIEW
AVENUE, UNIT A, WITHIN PUBLIC RIGHT OF WAY**

1.0 **PARTIES.** The parties to this Agreement are the City of Arvada, a Colorado municipal corporation ("Arvada") at 8101 Ralston Road, Arvada, Colorado 80002 and Grandview Station LLC, owners of the property ("Licensee") at 7357 Grandview Avenue, Unit A, Arvada, Colorado 80002.

2.0 **RECITALS AND PURPOSE.**

2.1 Licensee is the owner of property addressed as 7357 Grandview Avenue, Unit A, in the City of Arvada; more particularly described as a portion of the Commercial Unit/s of the Condominium Map of Grandview Station Condos, recorded at reception number 2022096178 ("Licensee's Property").

2.2 Arvada is the owner of properties, or has some interest in properties, located adjacent to Licensee's Property at 7357 Grandview Avenue, as more particularly described in Exhibit A, attached and incorporated herein ("Arvada's Property").

2.3 The Licensee has expressed a desire for Arvada to recognize, accommodate, and permit certain minor encroachments upon a specific and limited portion of Arvada's Property; to wit, an accessible pedestrian ramp upon Arvada's Property described in Exhibit A.

2.4 Arvada is willing to grant an encroachment license to the Licensee under the terms and conditions as hereinafter specified in this Agreement.

3.0 **TERMS AND CONDITIONS.** In consideration of Arvada's agreement to permit the Licensee to encroach upon Arvada's Property, and in consideration of the mutual promises and covenants contained herein, the sufficiency and adequacy of consideration being acknowledged by the parties, Arvada and Licensee agree as follows:

3.1 Arvada hereby grants to the Licensee a ten-year License for the encroachments as described above, with such limitations as are set forth herein, including, but not limited to:

3.1.1 The License shall be revoked before the **10-year license period** if there is a tenant change or upon issuance of a permit for a significant tenant improvement, as determined at the sole discretion of the Director of Community and Economic Development. Upon revocation of the license agreement, the Licensee shall be responsible for constructing an accessible pedestrian ramp within unit A or provide accessibility to the Property in some other manner as deemed acceptable by Arvada.

3.1.2 Any improvements allowed by this Agreement to be kept upon Arvada's Property shall be so kept at Licensee's sole expense and Licensee agrees to maintain any such improvement in good repair during the period of this License.

3.1.3 Licensee understands and agrees that Arvada shall not be liable or

responsible for any costs related to any damage, maintenance, repair, or removal of any structures kept upon Arvada's Property pursuant to this Agreement.

3.2 The license as granted in paragraph 3.1 above shall continue from the date of this Agreement to the time that this Agreement is terminated. In addition to the enumerated reasons in paragraph 3.1.1, Arvada may terminate this License if an essential City function related to the right-of-way requires revocation to fulfill the City's obligation. The revocation could occur at any time by giving written notice to the Licensee 10 days in advance of the effective date of termination and specifying the date of termination therein and, in the event this License is terminated as to such encroachments, Licensee expressly agrees to remove such from Arvada's Property and to return Arvada's Property to as close to its original condition as reasonably possible, within 30 days of said date of termination.

3.3 Licensee expressly agrees to indemnify and hold harmless Arvada and any of its officers or employees from any and all claims, damages, liability, or court awards, including costs and attorney's fees that are or may be awarded as a result of any loss, injury or damage sustained or claimed to have been sustained by anyone, including, but not limited to, any person, firm, partnership, or corporation, in connection with, arising out of, or related to the issuance of this License or any omission or act of commission by Licensee or any of its employees, agents, representatives, or contractors in encroaching upon Arvada's Property.

3.4 Licensee agrees that it will never institute any action or suit at law or in equity against Arvada or any of its officers or employees, nor institute, prosecute, or in any way aid in the institution or prosecution of any claim, demand, or compensation for or on account of any damages, loss, or injury either to person or property, or both, known or unknown, past, present, or future, arising from the license granted to Licensee herein.

3.5 Licensee agrees to provide, secure, and maintain at all times during the term of this License commercial general liability insurance of at least \$1,000,000 per occurrence, with an annual aggregate limit of \$2,000,000, naming Arvada as an additional insured on the policy. Failure to maintain sufficient insurance shall not terminate, modify, preclude or limit the obligations of Licensee under this License or limit in any way Licensee's liability to or indemnification of Arvada for any reason. Arvada does not waive, nor shall anything herein be construed as a waiver of, any of the rights, privileges, or immunities granted to it under the Colorado Governmental Immunity Act, Section 24-10-101 *et seq.*, C.R.S., as amended.

3.6 Licensee agrees to repair and reconstruct any damage to Arvada's Property prior to or immediately upon termination of this Agreement for any reason and return Arvada's Property to its original condition at the expense of Licensee and at no expense to Arvada.

4.0 **ASSIGNMENT.** Except as may be the legal consequence, pursuant to paragraph 10 hereof, of a conveyance of Licensee's Property, this Agreement shall not be assigned by Licensee without the prior written consent of Arvada which may withhold its consent for any reason.

5.0 **NOTICES.** Any notice required or permitted by this Agreement shall be in writing and shall be deemed to have been sufficiently given for all purposes if personally served or if sent by facsimile transmission or by U.S. mail, postage and fees prepaid, addressed to the party to whom such notice is to be given at the address set forth on the signature page below, or at such other address as

have been previously furnished in writing, to the other party and parties. Notice shall be deemed to have been given when deposited in the United States mail.

6.0 **EXHIBITS.** All exhibits, if any, referred to in this Agreement are, by reference, incorporated herein for all purposes.

7.0 **INTEGRATION AND AMENDMENT.** This Agreement represents the entire agreement between the parties and there are no oral or collateral agreements or understandings. This Agreement may be amended only by an instrument in writing signed by the parties. If any other provision of this Agreement is held invalid or unenforceable, no other provision shall be affected by such holding, and all of the remaining provisions of this Agreement shall continue in full force and effect.

8.0 **GOVERNING LAW AND VENUE.** This Agreement shall be governed by the laws of the State of Colorado. Venue for any action arising under this Agreement or for the enforcement of this Agreement shall be in the appropriate court for Jefferson County, Colorado.

9.0 **WAIVER OF BREACH.** A waiver by any party of this Agreement of the breach of any term or provision of this Agreement shall not operate or be construed as a waiver of any subsequent breach of either party.

10.0 **BINDING EFFECT.** This Agreement shall inure to the benefit of, and be binding upon, the parties, their respective legal representatives, successors, heirs, and assigns and shall constitute covenants running with Licensee's Property. Either party may record this Agreement with the Clerk and Recorder's Office of Jefferson County, Colorado.

11.0 **NO THIRD PARTY BENEFICIARIES.** It is expressly understood and agreed that enforcement of the terms and conditions of this Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to Arvada and the Licensee, and nothing contained in this Agreement shall give or allow any such claim or right of action by any other third party on such Agreement. It is the express intention of Arvada and the Licensee that any person other than Arvada or the Licensee receiving services or benefits under this Agreement shall be deemed to be an incidental beneficiary only.

DATED this _____ day of _____, 2024.

CITY OF ARVADA, a Colorado municipal corporation

Lauren Simpson, Mayor
8101 Ralston Road
Arvada, CO 80002

ATTEST:

City Clerk

APPROVED AS TO FORM:

Rachel A. Morris, City Attorney

By: _____

LICENSEE:

GRANDVIEW STATION LLC

a Colorado limited liability company

Keane Palmer, Manager

STATE OF COLORADO)
) ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me this ____ day of _____, 2024, by _____, in their capacity as Manager of Grandview Station LLC, the owner of the property at 7357 Grandview Avenue, Unit A.

Witness my hand and official seal.

Notary Public

My commission expires: _____



REPORT TO CITY COUNCIL RESOLUTION

AGENDA ITEM
8.A.3.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: R24-020, A Resolution Authorizing Change Order No. 5 to An Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for Construction of 18-ST-40 Ralston Road - Yukon Street to Garrison Street in an Amount not to Exceed \$17,724,045.35

Report in Brief

Change Order No. 5 will expand the scope of services of the Original Agreement to account for additional erosion control as well as revisions and adjustments to several unknown and known utilities. Additionally, Change Order No. 5 increases the compensation amount the City could pay to Hamon Infrastructure, Inc. by \$634,410.86 for a revised total contract amount not to exceed \$17,724,045.35.

The Arvada team recommends that the City Council approve R24-020, A Resolution Authorizing Change Order No. 5 to “An Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for Construction of 18-ST-40 Ralston Road – Yukon Street to Garrison Street in an Amount not to Exceed \$17,724,045.35.”

Financial Impact

This Change Order No. 5 will add \$634,410.86 to the Original Agreement for Construction Services for the Ralston Road Phase 2 project (18-ST-40) revising the total contract not to exceed amount to \$17,724,045.35 that was budgeted for through the remaining bond issue completed earlier this year.

Background

On March 1, 2021, Arvada and Hamon Infrastructure, Inc. (“Contractor”) entered into an agreement (the "Original Agreement") whereby Contractor would complete the reconstruction of Ralston Road between Yukon Street to Garrison Street as a four-lane arterial roadway with a center median or two-way left turn and eight-foot detached or ten-foot attached sidewalk (the “Project”). The Project included relocation of utilities, associated storm drainage system, waterline, curb and gutter, traffic signal replacement, and streetscape elements. During construction, the Contractor encountered several unknown utility conflicts and additional revisions were required. In addition, the erosion control and maintenance budget was not accounted fully which also saw significant overruns than the initial allotted budget on the project.

Discussion

Utility Adjustment:

During the Ralston Rd II project construction, contractors encountered unforeseen utility conflicts arising during the construction phase. These unanticipated conflicts have necessitated additional adjustments in utilities, resulting in unplanned expenses. Moreover, the inclusion of a supplementary scope focused on stormwater system work also required adjustments. These adjustments include fire hydrant relocations, water line relocations, sanitary sewer line repairs, and modifications to manholes and inlets, among other items. Numerous city utilities that conflicted with the roadway construction had to be adjusted to facilitate progress on the Project. While the initial budget allocated through force account in this category was \$75,000, the current costs under this item have escalated to nearly \$550,000 due to the number of utility conflicts that arose during the Project construction. As part of this change order, the City team is seeking an additional \$474,918.10 to cover the overruns in this category. A detailed breakdown of month-wise utility adjustment costs and descriptions of each item is shown in **Exhibit A**.

Erosion control:

In the context of the Project's erosion control activities, various tasks such as sediment removal, dewatering, and the installation of dandy bags for inlet protection are undertaken to ensure compliance with established standards. Erosion control was not initially specified as a unit item in the bidding process; it was included under the force account item with a budget allocation of \$15,000. This budget was exceeded due to the absence of other unit items related to erosion control or daily erosion control maintenance in the bid items. The current costs associated with erosion control are approximately \$175,000. As part of this change order, the City team is seeking an additional \$159,492.8 to cover the overruns in this category. A detailed breakdown of the erosion control costs on a month-by-month basis is provided in **Exhibit B**.

The following table shows all the additional cost and the total amount for the above-mentioned items.

Item	Description	Amount (\$)	Current Hamon's Contract PO	Total with this change order
1	Utilities Adjustment	\$474,918.10	\$17,089,634.49	\$17,724,045.35
2	Erosion Control	\$159,492.76		
	Total	634,410.86		

Public Contact

N/A

Commission Recommendation

N/A

Strategic Alignment

This action aligns with the City Council Strategic Plan Priority Area of Infrastructure. The 2015-2016 Citizen Capital Improvement Plan Committee ranked Ralston Road as the number one transportation priority due to the corridor's narrow two-way left turn lane and travel lanes, a higher rate of side-swipe and intersection crashes compared to similar arterials, and the narrow width of sidewalks for pedestrians and bicyclists.

Alternative Courses of Action

N/A

Recommendation for Action

The Arvada team recommends that the City Council approve R24-020, A Resolution Authorizing Change Order No. 5 to “An Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for Construction of 18-ST-40 Ralston Road – Yukon Street to Garrison Street in an Amount not to Exceed \$634,410.86 for a revised total contract amount not to exceed \$17,724,045.40.”

Suggested Motion:

I move that R24-020, A Resolution Authorizing Change Order No. 5 to An Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for Construction of 18-ST-40 Ralston Road – Yukon Street to Garrison Street in an Amount not to Exceed \$724,045.35, be (approved) (rejected).

Prepared by:
Padmini Gudipudi, Civil Engineer III

Reviewed by:

SUBJECT: R24-020, A Resolution Authorizing Change Order No. 5 to An Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for Construction of 18-ST-40 Ralston Road - Yukon Street to Garrison Street in an Amount not to Exceed \$17,724,045.35

PAGE: 3
ITEM: 8.A.3.

Approved by:

Jenny Wolfschlag, City Engineer	1/14/2024
Jacqueline Rhoades, Public Works Director	1/24/2024
Bryan Archer, Director of Finance	1/25/2024
Tammy Hedlund, Legal Specialist	1/25/2024
Erika Pierce, Litigation Paralegal	1/25/2024
Kelsy Sargent, Assistant City Attorney	1/26/2024
Rachel Morris, City Attorney	1/31/2024
Don Wick, Deputy City Manager	1/31/2024
Lorie Gillis, City Manager	1/31/2024

Enclosure, exhibits & attachments required to support the report

RESOLUTION NO. R24-020

A RESOLUTION AUTHORIZING CHANGE ORDER NO. 5
TO “AN AGREEMENT BY AND BETWEEN THE CITY OF ARVADA AND HAMON
INFRASTRUCTURE, INC. FOR CONSTRUCTION OF 18-ST-40
RALSTON ROAD – YUKON STREET TO GARRISON STREET” IN AN AMOUNT NOT TO
EXCEED \$634,410.86 FOR A REVISED TOTAL CONTRACT AMOUNT NOT TO EXCEED
\$17,724,045.35

WHEREAS, on or about March 10, 2021, the City of Arvada and Hamon Infrastructure, Inc. entered into an Agreement whereby Contractor would provide construction services related to the expansion of Ralston Road from Yukon Street (“the Project”); and

WHEREAS, during the construction of the Project, unanticipated utility conflicts as well as the inclusion of the supplementary stormwater work necessitated adjustments in utilities and increased unplanned expenses; and

WHEREAS, also during construction a challenge arose regarding erosion control within the project as erosion control maintenance was not initially specified as a unit item in the bidding process causing the budget to be quickly surpassed; and

WHEREAS, pursuant to Section 4.5 of the Original Agreement, Arvada “may, by written order signed by Arvada, at any time, and without notice to any surety, and subject to all appropriate adjustments, make changes within the general scope of this Contract in any one or more of the following: (a) changes in scope of services; (b) completion date; (c) contract amount; (d) any applicable material modifications; and, (e) any other matters that the parties deem necessary”; and

WHEREAS, the purpose of this Change Order No. 5 is to expand the scope of work and increase the not to exceed amount to account for: (1) utility adjustments in the amount of \$474,918.10; and (2) erosion control in the amount of \$159,492.76; and

WHEREAS, Arvada desires to increase the Original Agreement’s not to exceed amount by \$634,410.86 for a revised total not to exceed amount of \$17,724,045.36 while noting Contractor must comply with the requirements of the Original Agreement’s Section 6.2, Payment for Services, to obtain payment.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ARVADA, COLORADO:

Section 1. The Mayor or Mayor Pro Tem is authorized to sign and the City Clerk to attest, in form approved by the City Attorney, a Change Order No. 5, which is in substantially the same form as that attached hereto, to an Agreement by and between the City of Arvada and Hamon Infrastructure, Inc. for construction of 18-ST-40 Ralston Road – Yukon Street to Garrison Street.

Section 2. This resolution shall be effective upon its approval by the City Council.

APPROVED AND ADOPTED this 12th day of February, 2024.

Lauren Simpson, Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:
Rachel A. Morris, City Attorney

By: _____

CHANGE ORDER NO. 5
TO “AN AGREEMENT BY AND BETWEEN THE CITY OF ARVADA AND HAMON
INFRASTRUCTURE, INC. FOR CONSTRUCTION OF 18-ST-40
RALSTON ROAD – YUKON STREET TO GARRISON STREET” IN AN AMOUNT NOT
TO EXCEED \$634,410.86 FOR A REVISED TOTAL CONTRACT AMOUNT NOT TO
EXCEED \$17,724,045.35

This Change Order made this ____ day of _____, 2024, by the City of Arvada, a home rule municipal corporation (“Arvada” and/or “City”) regarding the March 10, 2021 Agreement with Hamon Infrastructure, Inc. (“Contractor”), jointly (“the Parties.”)

WITNESSETH: That upon City Approval, the Work and Contract Documents for City of Arvada, Project No. 18-ST-40, entitled Ralston Road - Yukon Street to Garrison Street, shall be adjusted as provided herein:

1.0 RECITALS AND PURPOSE.

1.1 On or about March 10, 2021, the City of Arvada (“Arvada” or “City”) and Hamon Infrastructure, Inc. (“Contractor”) entered into an Agreement (“the Original Agreement”) whereby Contractor would provide construction services related to the expansion of Ralston Road from Yukon Street (“the Project”).

1.2 On or about August 31, 2021, the City agreed to a proposal from Contractor dated August 19, 2021, which resulted in a net savings to the Project of \$52,930.00 (referred to herein as “Change Order No. 1”). On or about May 19, 2022, the Parties executed an agreement titled “Change Order No. 2” whereby Contractor would perform delineated utility construction improvements for the Van Horn Development for a cost of \$400,000.00 and Van Horn Development would pay Arvada the full cost within 60 days of completion of the improvements.

1.3 On or about October 23, 2023, the City executed Change Order No. 3 to address the modifications and additions to the storm sewer design that Contractor constructed between July 2022 and September 2023 with documentation through use of Force Account methods thereby expanding the scope of work and increasing the Original Agreement’s not to exceed amount by \$3,577,701.82.

1.4 On or about November 29, 2023, the City executed Change Order No. 4 to address the testing, collection, and transportation of contaminated soil along the south side of Ralston Road, the removal of unsuitable soft soil materials and stabilization with aggregate material, and the water line revisions and increased quantity of fusible pipe thereby increasing the Original Agreement’s not to exceed amount by \$805,166.86.

1.5 The Original Agreement and Change Orders No. 1, No. 2, No. 3, and No. 4 are not attached herein but incorporated by reference.

1.6 Pursuant to Section 4.5 of the Original Agreement, Arvada “may, by written

order signed by Arvada, at any time, and without notice to any surety, and subject to all appropriate adjustments, make changes within the general scope of this Contract in any one or more of the following: (a) changes in scope of services; (b) completion date; (c) contract amount; (d) any applicable material modifications; and, (e) any other matters that the parties deem necessary.”

1.7 During the construction of the Project, unanticipated utility conflicts as well as the inclusion of supplementary stormwater work necessitated adjustments in utilities and increased unplanned expenses. The City team is seeking additional \$474,918.10 to cover the overruns in this category, as detailed in **Exhibit A**.

1.8 Additionally, erosion control maintenance was not initially specified as a unit item in the bidding process but rather was included under the force account. As such, the budget for that item was surpassed due to the absence of other unit items related to erosion control. The city team is seeking an additional \$159,492.76 to cover the overruns in this category, as detailed in **Exhibit B**.

1.9 The purpose of this Change Order No. 5 is to expand the scope of work and increase the not to exceed amount to account for: (1) utility adjustments in the amount of \$474,918.10; and (2) erosion control in the amount of \$159,492.76.

1.10 The following Table 1 shows the additional cost and amount for each of the above-mentioned items addressed in this Change Order No. 5.

Table 1. Change Order No. 4 Scope of Work & Cost Summary

Item	Description	Amount (\$)	Current Not To Exceed	Revised Not to Exceed
1	Utilities Adjustment	\$474,918.10	\$17,089,634.49	\$17,724,045.35
2	Erosion Control	\$159,492.76		
	Total	\$634,410.86		

1.11 Pursuant to Section 4.5, Arvada now desires to amend the Original Agreement to expand the scope of work to include the utility adjustments and erosion control as detailed in **Exhibit A** and **Exhibit B**.

2.0 CONTRACT DOCUMENTS AND EXHIBITS. The Contract Documents shall consist of the Original Agreement, Change Order No. 1, No. 2, No. 3, No. 4, and this Change Order No. 5 together with the following:

Exhibit A: Utility Adjustment Summary (2 page);

Exhibit B: Erosion Control Summary (3 pages).

All exhibits referred to in this Agreement are attached hereto and are, by reference, incorporated herein for all purposes. In the event any matter, term, provision, or condition that is the subject of this Agreement requires clarification or is in dispute, or is the subject of a difference of

opinion, the purpose and intent of the Agreement shall be first ascertained by reference to the Contract Documents in their entirety. In the event of any future dispute or differences between the respective documents that constitute the Contract Documents, then Contractor shall secure the written instructions from Arvada before proceeding with the performance of the services affected by such conflicts, omissions, or discrepancies.

3.0 COMPLETION DATE UNDER CHANGE ORDER NO. 5. The project completion date is not being modified by this Change Order No. 5.

4.0 COMPENSATION FOR SERVICES UNDER CHANGE ORDER NO. 5. The Agreement terms are amended to increase the Original Agreement's not to exceed amount by **\$634,410.86** for a revised total not to exceed amount of **\$17,724,045.35**. While Arvada is increasing the overall not to exceed amount, Contractor must comply with the requirements of the Original Agreement's Section 6.2, Payment for Services, to obtain payment.

5.0 FULL FORCE AND EFFECT. All other terms and conditions shall be as set forth in the Original Agreement executed by the Parties on March 10, 2021. As such, all existing components of the Original Agreement and Contract Documents referenced and incorporated in this Change Order No. 5, shall be adhered to and are fully enforceable by the City Project Inspector, City Project Manager, Deputy City Project Manager, Engineering Manager, or any other representative of the City that the City Engineer designates in writing.

6.0 SEVERABILITY. If any other provision of this Change Order No. 5 is held invalid or unenforceable, no other provision shall be affected by such holding, and all of the remaining provisions of this Change Order No. 5 shall continue in full force and effect.

7.0 COUNTERPARTS, ELECTRONIC SIGNATURES AND ELECTRONIC RECORDS. This Change Order No. 5 may be executed in counterparts, each of which shall be deemed to be an original, but all of which shall together constitute one and the same document. Facsimile signatures shall be accepted as originals. Arvada consents to the use of electronic signatures by Arvada. Arvada does not object to the admissibility of this Change Order No. 5 in the form of an electronic record, a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the grounds that it is an electronic record or an electronic signature or that it is not in its original form or is not an original.

8.0 EXHIBITS INCORPORATED. All exhibits attached hereto are incorporated herein by this reference.

9.0 EFFECTIVE DATE. This Agreement shall be effective on the date of execution below.

EFFECTIVE this _____ day of _____, 2024.

Signatures on the following page.

CITY OF ARVADA, a Colorado home rule
municipal corporation

Lauren Simpson, Mayor
8101 Ralston Road
Arvada, CO 80002

ATTEST:

City Clerk

APPROVED AS TO FORM:

Rachel A. Morris, City Attorney

By: _____

Exhibit A Utility Adjustment Monthly Cost

Utilities Adjustment		Allotted amount in bid
April	\$109,148.45	\$75,000.00
May	\$32,240.89	
June	\$1,748.54	
July	\$29,539.99	
August	\$212.06	
September	\$7,699.47	
October	\$38,594.63	
November	\$16,652.01	
December	\$2,667.04	
January	-	
February	\$4,860.39	
March	\$124,665.59	
April	\$7,486.09	
May	\$42,839.69	
June	\$642.11	
July	\$10,869.55	
August	\$11,074.68	
September	\$7,863.96	
October	\$61,112.96	
Rest of the project time (estimated)	\$40,000	
Total per Item	\$549,918.10	
Overrun	\$474,918.10	

	CATEGORY	QTY	UNIT	UNIT PRICE	AMNT	TOTAL COMPLETE
MINOR SPRINKLER REPAIR FOR JUNE 2023	IRRIGATION SYSTEM REPAIRS	1.000	LS	\$1,009.68	\$1,009.68	\$1,009.68
SUBTOTAL ITEM 230 - IRRIGATION SYSTEM REPAIR						\$24,549.91

Exhibit A- Utility Adjustment Monthly Cost (With Description)

		1.000	EA	\$75,000.00	\$75,000.00	TOTAL COMPLETE
F/A 05 UTILITY ADJUSTMENT						
PA # 4 - 20210629 - Removal of Existing CMP Abandoned	STORM					\$389.92
PA # 4 - 20210701 - Sanitary Sewer & Appliance Center Repair	SANITARY					\$3,816.53
PA # 4 - 20210719 - Remove Existing CMP (Shown to remain) Rusted Out	STORM					\$1,162.91
PA # 5 - 20210812 - Removal of Existing CMP	STORM					\$332.42
REMOVAL OF EXISTING STORM DRAIN (6-IN TO 18-IN DIAM)	STORM	800.000	LF	\$20.00	\$16,000.00	\$8,040.00
REMOVAL OF EXISTING STORM DRAIN (20-IN TO 36-IN DIAM)	STORM	600.000	LF	\$50.00	\$30,000.00	\$23,000.00
PA # 7 - 20210923 - Yak & Yeti Sanitary Sewer Replacement	SEWER					\$10,381.67
AMMONS STORM DRAINAGE MODIFICATIONS - 02/09 (RFI 76)	STORM	1.000	LS	\$14,500.00	\$14,500.00	\$14,500.00
MODIFICATIONS TO M9	STORM	1.000	LS	\$36,200.00	\$36,200.00	\$36,200.00
MODIFICATIONS TO J9	STORM	1.000	LS	\$11,325.00	\$11,325.00	\$11,325.00
FA - Rebuild Sanitary Sewer Manhole east of Allison - May 2022	SANITARY	1.000	LS	\$12,543.91	\$12,543.91	\$12,543.91
FA - Waterline Delay at Everett - May 2022	WATER	1.000	LS	\$2,015.67	\$2,015.67	\$2,015.67
FA - Waterline Delay at Dudley - May 2022	WATER	1.000	LS	\$2,669.22	\$2,669.22	\$2,669.22
FA - Waterline Delay and Relocate Fire Hydrant at Dover - May 2022	WATER	1.000	LS	\$15,012.09	\$15,012.09	\$15,012.09
FA - Adjust Sanitary Sewer Manholes to Present Grade - June 2022	SANITARY	1.000	LS	\$1,748.54	\$1,748.54	\$1,748.54
FA - Replace 8" Gate Valve on Carr Street - July 2022	WATER	1.000	LS	\$4,471.52	\$4,471.52	\$4,471.52
FA - Modify Top of Manhole K1 - July 2022	STORM	1.000	LS	\$6,482.94	\$6,482.94	\$6,482.94
FA - Repair Sanitary Sewer at Noodle House - July 2022	SANITARY	1.000	LS	\$11,476.99	\$11,476.99	\$11,476.99
Health and Safety Billings for Noodle House testing of Suspect Materials	CONTAMINATED MATERIAL	1.000	LS	\$1,186.70	\$1,186.70	\$1,186.70
UNKNOWN CREDIT IN JULY 2022	MISC	1.000	LS	\$921.84	\$921.84	\$921.84
FA - Repair Sanitary Sewer at Noodle House - August 2022	SANITARY	1.000	LS	\$212.06	\$212.06	\$212.06
FA - Switch out Fire Hydrant at Noodle House - Sept 2022	WATER	1.000	LS	\$6,097.46	\$6,097.46	\$6,097.46
FA - Adjust Sanitary Sewer and Storm Manholes to Grade - Sept 2022	STORM	1.000	LS	\$1,602.01	\$1,602.01	\$1,602.01
FA - Water Services south side of Ralston - October 2022	WATER	1.000	LS	\$38,594.63	\$38,594.63	\$38,594.63
FA - Water Services south side of Ralston - November 2022	WATER	1.000	LS	\$16,652.01	\$16,652.01	\$16,652.01
FA -FIRE HYDRANT, SW CORNER OF DOVER- December 2022	WATER	1.000	LS	\$583.98	\$583.98	\$583.98
FA -WATER SERVICES SOUTH SIDE OF RALSTON- December 2022	WATER	1.000	LS	\$1,353.04	\$1,353.04	\$1,353.04
FA -FIRE HYDRANT AT WOLFF PARK- December 2022	WATER	1.000	LS	\$730.02	\$730.02	\$730.02
FA -WATERLINE AT ALISON TIE-IN- FEBRUARY 2023	WATER	1.000	LS	\$4,860.39	\$4,860.39	\$4,860.39
FA -WATERLINE AT ALLISON TIE-IN- MARCH 2023	WATER	1.000	LS	\$81,331.00	\$81,331.00	\$81,331.00
FA - FIRE HYDRANT AT ALLISON - MARCH 2023	WATER	1.000	LS	\$24,444.43	\$24,444.43	\$24,444.43
FA - FIRE HYDRANT AT WOLFF PARK - MARCH 2023	WATER	1.000	LS	\$7,881.38	\$7,881.38	\$7,881.38
FA -WATER SERVICES, SOUTH SIDE OF RALSTON- MARCH 2023	WATER	1.000	LS	\$11,009.21	\$11,009.21	\$11,009.21
FA -ADJUST UTILITIES TO PRESENT DAY GRADE - APRIL 2023	MISC	1.000	LS	\$905.05	\$905.05	\$905.05
FA - FIRE HYDRANT AT YARROW - APRIL 2023	WATER	1.000	LS	\$989.34	\$989.34	\$989.34
FA - SANITARY SEWER AT SINCLAIR - APRIL 2023	SANITARY	1.000	LS	\$225.40	\$225.40	\$225.40
FA -IRRIGATION CONNECTION TO L1- APRIL 2023	IRRIGATION	1.000	LS	\$5,366.30	\$5,366.30	\$5,366.30
FA -IRRIGATION CONNECTION TO L1- MAY 2023	IRRIGATION	1.000	LS	\$12,312.71	\$12,312.71	\$12,312.71
FA -ADJUST UTILITIES TO GRADE- MAY 2023	MISC	1.000	LS	\$29,542.18	\$29,542.18	\$29,542.18
FA -ADJUST WATER SERVICE PIT SOUTH OF RALSTON- MAY 2023	WATER	1.000	LS	\$984.80	\$984.80	\$984.80
FA -IRRIGATION CONNECTION TO L1- JUNE 2023	IRRIGATION	1.000	LS	\$642.11	\$642.11	\$642.11
FA -ADJUST UTILITIES TO PRESENT DAY GRADE - JULY 2023	MISC	1.000	LS	\$6,069.52	\$6,069.52	\$6,069.52
FA -WATER SERVICES, SOUTH SIDE OF RALSTON- JULY 2023	WATER	1.000	LS	\$0.00	\$0.00	\$0.00

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QTY	AMNT

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	CATEGORY	QTY	UNIT	UNIT PRICE	AMNT	TOTAL COMPLETE
FA -IRRIGATION CONNECTION TO L1- JULY 2023	IRRIGATION	1.000	LS	\$4,800.03	\$4,800.03	\$4,800.03
FA -FIRE HYDRANT AT YARROW- JULY 2023	WATER	1.000	LS	\$0.00	\$0.00	\$0.00
FA-Ajdust Utilities August 2023	MISC	1.000	LS	\$11,074.68	\$11,074.68	\$11,074.68
FA -ADJUST UTILITIES TO PRESENT DAY GRADE - September 2023	MISC	1.000	LS	\$7,863.96	\$7,863.96	\$7,863.96
FA -FIRE HYDRANT AT YARROW- MAY AND JUNE REBILL ON OCTOBER 2023	WATER	1.000	LS	\$59,702.38	\$59,702.38	\$59,702.38
FA-ADJUST UTILITIES - WATER VALVES OCTOBER 2023	MISC	1.000	LS	\$1,410.58	\$1,410.58	\$1,410.58
FA-Ajdust Utilities August 2023 (NOV 2023 REBILL)	MISC	1.000	LS	\$11,074.68	\$11,074.68	\$11,074.68
FA -ADJUST UTILITIES TO PRESENT DAY GRADE - September 2023 (NOV REBILL)	MISC	1.000	LS	\$7,863.96	\$7,863.96	\$7,863.96
FA-ADJUST UTILITIES - WATER VALVES OCTOBER 2023 (NOVEMBER REBILL)	MISC	1.000	LS	\$1,410.58	\$1,410.58	\$1,410.58
SUBTOTAL ITEM 231 - UTILITY ADJUSTMENT						\$525,267.75

Exhibit B Erosion Control Monthly cost

Erosion Control		Allotted amount in bid
April (2022)	\$46,196.38	\$15,000.00
May	\$10,943.44	
June	\$4,255.06	
July	\$3,815.54	
August	\$5,386.48	
September	\$2,328.19	
October	\$1,571.40	
December	\$783.04	
January (2023)	-	
February	\$6,299.53	
March	\$13,254.85	
April	\$9,716.60	
May	\$8,107.58	
June	\$13,378.74	
July	\$9,640.43	
August	\$8,646.38	
September	\$2,831.89	
October	\$5,929.27	
November	\$8,887.96	
December	\$2,520.00	
Rest of the project time (estimated)	\$10,000.00	
Total per Item	\$174,492.76	
Overrun	\$159,492.76	

Exhibit B Erosion Control Month Wise Cost (With Description)

F/A 02 EROSION CONTROL		1.000	EA	\$15,000.00	\$15,000.00		
PA # 3 - 5-25-21 - Remove Sediment & Clean Gutters	ADDITIONAL EROSION CONTROL	1.000	LS	\$1,037.18	\$1,037.18	\$1,037.18	
PA # 4 - 20210628 - Sediment Removal & Disposal	ADDITIONAL EROSION CONTROL	1.000	LS	\$734.79	\$734.79	\$734.79	
PA # 4 - 20210629 - Sediment Removal & Disposal	ADDITIONAL EROSION CONTROL	1.000	LS	\$1,367.50	\$1,367.50	\$1,367.50	
PA # 4 - 20210630 - Sediment Removal & Disposal	ADDITIONAL EROSION CONTROL	1.000	LS	\$1,040.95	\$1,040.95	\$1,040.95	
DANDY BAGS FOR GRATE INLET PROTECTION	ADDITIONAL EROSION CONTROL	50.000	EA	\$350.00	\$17,500.00	\$37,450.00	
Swadley Ditch Dewatering - Dec 17 to Dec 23	ADDITIONAL EROSION CONTROL	1.000	LS	\$2,188.62	\$2,188.62	\$2,188.62	
Erosion Control - Sediment removal for April 2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$2,377.34	\$2,377.34	\$2,377.34	
Erosion Control - Sediment removal for May 2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$10,943.44	\$10,943.44	\$10,943.44	
Erosion Control - Sediment removal for June2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$4,255.06	\$4,255.06	\$4,255.06	
Erosion Control - Sediment removal for July 2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$3,815.54	\$3,815.54	\$3,815.54	
FA - Erosion Control - Sediment removal for AUGUST 2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$5,386.48	\$5,386.48	\$5,386.48	
FA - Erosion Control - Sediment removal for SEPT 2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$2,328.19	\$2,328.19	\$2,328.19	
FA - Erosion Control - Sediment removal for October 2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$1,571.40	\$1,571.40	\$1,571.40	
FA -SEDIMENT REMOVAL- December 2022	ADDITIONAL EROSION CONTROL	1.000	LS	\$783.04	\$783.04	\$783.04	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - FEBRUARY 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$6,299.53	\$6,299.53	\$6,299.53	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - MARCH 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$13,254.85	\$13,254.85	\$13,254.85	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - APRIL 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$9,716.60	\$9,716.60	\$9,716.60	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - MAY 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$8,107.58	\$8,107.58	\$8,107.58	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - JUNE 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$13,378.74	\$13,378.74	\$13,378.74	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - JULY 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$9,640.43	\$9,640.43	\$9,640.43	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - AUGUST 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$8,646.38	\$8,646.38	\$8,646.38	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - SEPT 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$2,831.89	\$2,831.89	\$2,831.89	
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - OCTOBER 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$5,929.27	\$5,929.27	\$5,929.27	

CATEGORY	QTY	UNIT	UNIT PRICE	AMNT	TOTAL COMPLETE
FA -SEDIMENT REMOVAL FOR SWMP COMPLIANCE - NOVEMBER 2023	ADDITIONAL EROSION CONTROL	1.000	LS	\$8,887.96	\$8,887.96
SUBTOTAL ITEM 228 - EROSION CONTROL					\$161,972.76

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QTY	AMNT
1.00	\$8,887.96
\$8,887.96	



REPORT TO CITY COUNCIL RESOLUTION

AGENDA ITEM
8.B.1.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: R24-021, A Resolution Authorizing a Second Amendment to the Master Intergovernmental Agreement By and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex (Presenter: Enessa Janes, Director of Vibrant Community and Neighborhoods)

Report in Brief

PRESENTER: Enessa Janes, Director of Vibrant Community and Neighborhoods

The City of Arvada and Apex Park and Recreation District (Apex) entered into a Master Intergovernmental Agreement governing the lease and maintenance of certain facilities and parks and amending the ground lease for the indoor turf fields on the Stenger/Lutz Sports Complex on June 28, 2022 ("Master IGA").

The partners (Apex and Arvada) now wish to amend the Master IGA for the following purposes: (1) to increase the square footage leased to Apex for an archery range from approximately 10,400 square feet to 13,100 square feet; (2) to grant a nonexclusive revocable license to Apex for first priority use of Arvada's outdoor tennis courts; and (3) to delegate and assign responsibilities related to the maintenance of Ralston Central Splash Pad.

The Arvada team recommends that the City Council approve R24-021, A Resolution Authorizing the Second Amendment to the Master Intergovernmental Agreement by and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex.

Financial Impact

Up until 2019, the Apex Park and Recreation District paid for and provided maintenance and upkeep of the splash pad play area at Ralston Central Park. This included covering the cost of chemicals for the splash pad, maintaining the chemical balance of the water, cleaning out the systems, mechanical maintenance, cleaning out and maintaining the restrooms, and cleaning and maintaining the exterior shower. The City of Arvada was responsible for all other expenses and maintenance, including ensuring the structural integrity of the restrooms and maintenance building, the maintenance and upkeep for all grounds, maintenance of the park landscaping, playgrounds, pavilions, parking lots and park lights. Arvada also paid for all water and power utility costs for the entire park, including restrooms and the splash pad.

In 2020, the City of Arvada Parks Maintenance Division took over all maintenance, management and upkeep responsibilities of the splash pad play area at the Ralston Central Park. This was an un-budgeted expense.

Authorization of the second amendment to the Master IGA establishes the following maintenance responsibilities for the partners:

- Apex and Arvada agree to evenly split (50/50) the cost of chemicals for the splash pad.
- Arvada will maintain, clean, and be responsible for the upkeep of the bathrooms and trash cans.
- Apex agrees to maintain the chemical balance of the water daily during the operating season.
- Apex agrees to clean out the systems, perform mechanical maintenance, and clean and maintain the exterior shower.

SUBJECT: R24-021, A Resolution Authorizing a Second Amendment to the Master Intergovernmental Agreement By and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex (Presenter: Enessa Janes, Director of Vibrant Community and Neighborhoods)

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- If mechanical repairs or replacements are necessary, Apex will arrange for, pay for, and execute such repairs or replacements. In the event a capital repair or replacement exceeds \$10,000.00, Apex will notify Arvada of such necessary capital repair or replacement as soon as practicable. Apex and Arvada shall evenly split (50/50) the cost of any capital repair or replacement in excess of \$10,000.00.
- Arvada shall be responsible for all other expenses and maintenance including but not limited to ensuring the structural integrity of the restroom and maintenance building; the maintenance and upkeep for all grounds; snow removal for all sidewalks, parking lots, and walking paths; maintenance of the park landscaping, playgrounds, pavilions, parking lots, and park lights. Arvada will also pay for all water and power utility costs for the operation of the entire park, including the restrooms and Splash Pad.

The second amendment to the Master IGA reduces the amount of un-budgeted expenditures associated with the maintenance of the splash pad by \$15,000. This does not completely offset the additional costs incurred by the City of Arvada starting in 2020.

Background

Discussion

On April 19, 2023, the Parties amended the Master IGA in the First Amendment to add: (1) a lease agreement of certain property located on Arvada's Gibbs West Community Park to Apex for the purpose of constructing, maintaining, and operating an archery range; and (2) a use agreement for Apex's property located at 13200 W 72nd Avenue to the Arvada Police Department for police training.

The Parties now wish to amend the Master IGA a second time for the following purposes: (1) to increase the square footage leased to Apex for the archery range from approximately 10,400 square feet to approximately 13,100 square feet; (2) to grant a nonexclusive revocable license to Apex for first priority use of Arvada's outdoor tennis courts; and (3) to delegate and assign responsibilities related to the maintenance of Ralston Central Splash Pad.

Public Contact

Posting of the City Council agenda.

Commission Recommendation

N/A

Strategic Alignment

This work supports the following Principle in the Vibrant Community and Neighborhoods Priority Area of the City Council Strategic Plan:

- *Fosters strategic partnerships to advance quality of life and achieve an inclusive, equitable, diverse, resilient and sustainable community.*

Alternative Courses of Action

Alternative No. 1: Approve R24-021, A Resolution Authorizing the Second Amendment to the Master Intergovernmental Agreement by and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex.

SUBJECT: R24-021, A Resolution Authorizing a Second Amendment to the Master Intergovernmental Agreement By and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex (Presenter: Enessa Janes, Director of Vibrant Community and Neighborhoods)

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ITEM: 8.B.1.

Alternative No. 2: Do not approve R24-021, A Resolution Authorizing the Second Amendment to the Master Intergovernmental Agreement by and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex.

Recommendation for Action

The Arvada team recommends that the City Council approve Alternative No. 1.

Suggested Motion:

I move that R24-021, A Resolution Authorizing a Second Amendment to the Master Intergovernmental Agreement By and Between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex, be (approved) (rejected).

Prepared by:

Enessa Janes, Director of Vibrant Community and Neighborhoods

Reviewed by:

Approved by:

Enessa Janes, Director of Vibrant Community and Neighborhoods	1/18/2024
Bryan Archer, Director of Finance	1/18/2024
Gail Walker, Legal Specialist-Contracts	1/24/2024
Kylie Justus, Assistant City Attorney	1/24/2024
Don Wick, Deputy City Manager	1/24/2024
Rachel Morris, City Attorney	1/31/2024
Lorie Gillis, City Manager	1/31/2024

Enclosure, exhibits & attachments required to support the report

RESOLUTION NO. R24-021

A RESOLUTION AUTHORIZING A SECOND AMENDMENT TO THE MASTER INTERGOVERNMENTAL AGREEMENT BY AND BETWEEN APEX PARK AND RECREATION DISTRICT AND THE CITY OF ARVADA GOVERNING THE LEASE AND MAINTENANCE OF CERTAIN FACILITIES AND PARKS AND AMENDING THE GROUND LEASE FOR THE INDOOR TURF FIELDS ON THE STENGER/LUTZ SPORTS COMPLEX

WHEREAS, Article XIV, Section 18(2) of the Constitution of the State of Colorado encourages and authorizes intergovernmental agreements; and

WHEREAS, C.R.S. § 29-1-203 permits local governments to make the most efficient and effective use of their powers and responsibilities by cooperating and contracting with other local governments in order to provide any lawfully authorized function, service, or facility; and

WHEREAS, Arvada and Apex Park and Recreation District (“Apex”) entered into a Master IGA on June 28, 2022; and

WHEREAS, Arvada and Apex subsequently amended the Master IGA on April 19, 2023, through the executed First Amendment; and

WHEREAS, Apex and Arvada now desire to amend the Master IGA a second time to: (1) increase the square footage leased to Apex for the archery range from approximately 10,400 square feet to 13,100 square feet; (2) grant a nonexclusive revocable license to Apex for first priority use of Arvada’s outdoor tennis courts; and (3) delegate and assign responsibilities related to the maintenance of Ralston Central Splash Pad; and

WHEREAS, the above additions will be mutually beneficial to the Parties and the residents of Arvada; and

WHEREAS, the Parties are desirous of continuing their cooperative relationship, which aims to provide a wide-variety of recreational resources for the community.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ARVADA, COLORADO:

Section 1. The Mayor or Mayor Pro Tem is authorized to sign and the City Clerk to attest, in form approved by the City Attorney, the Second Amendment to a Master Intergovernmental Agreement, which is in substantially the same form as that attached hereto.

Section 2. This resolution shall be effective upon its approval by the City Council.

APPROVED AND ADOPTED this 12th day of February, 2024.

Lauren Simpson, Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:

Rachel A. Morris, City Attorney

By: _____

**SECOND AMENDMENT TO THE MASTER INTERGOVERNMENTAL AGREEMENT
BY AND BETWEEN APEX PARK AND RECREATION DISTRICT AND THE CITY OF
ARVADA GOVERNING THE LEASE AND MAINTENANCE OF CERTAIN
FACILITIES AND PARKS AND AMENDING THE GROUND LEASE FOR THE
INDOOR TURF FIELDS ON THE STENGER/LUTZ SPORTS COMPLEX**

1.0 PARTIES. The parties to this Second Amendment are the Apex Park and Recreation District, a Colorado political subdivision and quasi-municipal corporation organized pursuant to Title 32, C.R.S, 13150 W. 72nd Ave., Arvada, CO 80005 ("Apex"), and the City of Arvada, a Colorado home rule municipal corporation, 8101 Ralston Road, Arvada, CO 80002 ("Arvada"), referred to individually as a "Party" and collectively referred to as "Parties." The Parties agree as follows:

2.0 PURPOSE AND RECITALS.

2.1 Arvada and Apex entered into a *Master Intergovernmental Agreement by and between Apex Park and Recreation District and the City of Arvada Governing the Lease and Maintenance of Certain Facilities and Parks and Amending the Ground Lease for the Indoor Turf Fields on the Stenger/Lutz Sports Complex* on June 28, 2022 ("Master IGA").

2.2 On April 19, 2023, the Parties amended the Master IGA in the First Amendment to add: (1) a lease agreement of certain property located on Arvada's Gibbs West Community Park to Apex for the purpose of constructing, maintaining, and operating an archery range; and (2) a use agreement for Apex's property located at 13200 W 72nd Avenue to the Arvada Police Department for police training.

2.3 The Parties now wish to amend the Master IGA a second time for the following purposes: (1) to increase the square footage leased to Apex for the archery range from approximately 10,400 square feet to 13,100 square feet; (2) to grant a nonexclusive revocable license to Apex for first priority use of Arvada's outdoor tennis courts; and (3) to delegate and assign responsibilities related to the maintenance of Ralston Central Splash Pad.

3.0 TERMS AND CONDITIONS

3.1 The Parties hereby amend **Section 6.8.1** to increase the size of Gibbs West Community Park leased to Apex for the archery range from approximately 10,400 square feet to approximately 13,100 square feet. The remaining terms of **Sec. 6.8.1** shall remain unchanged.

3.2 The Parties hereby add **Section 6.10** to the Master IGA which states as follows:

“6.10 ARVADA’S OUTDOOR TENNIS COURTS.

6.10.1 For the term described in **Sec. 4.1**, Arvada hereby grants Apex a nonexclusive revocable license for first priority use of Arvada’s outdoor tennis courts over all other users. The license is granted to Apex at no cost to Apex. Apex understands that the outdoor courts are not exclusively reserved for Apex and may be used by any member of the public when Apex does not have scheduled programming.

6.10.2 Apex shall be responsible for all tennis programming and the costs associated with such programming.

6.10.3 Arvada shall continue to be responsible for the maintenance of Arvada’s outdoor courts. Arvada grants the license for the courts to Apex *as is* and cannot guarantee the quality or playability of the courts at any given time.

6.10.4 Arvada may, in its sole discretion, revoke the license granted by this **Sec. 6.10** upon 60 days’ notice to Apex.

6.10.5 Apex will be legally and financially responsible for any losses, incidents, and liabilities that may occur as the result of Apex’s actions or omissions during its use of the outdoor courts.”

3.3 The Parties hereby add **Section 6.11** to the Master IGA which states as follows:

“6.11 RALSTON CENTRAL SPLASH PAD.

6.11.1 For the term described in **Sec. 4.1** of the Master Agreement, the Parties agree to assist in maintaining the Ralston Central Splash Pad located at 5850 Garrison Street, Arvada, CO 80002 (“Splash Pad”) as described in this **Sec. 6.11**.

6.11.2 Apex and Arvada agree to evenly split (50/50) the cost of chemicals for the Splash Pad. Apex agrees to order the chemicals and invoice Arvada for its share of the cost. Arvada shall pay the invoice NET 30 from the date of receipt.

6.11.3 Arvada will maintain, clean, and be responsible for the upkeep of the bathrooms and trash cans.

6.11.4 Apex agrees to daily maintain the chemical balance of the water during the operating season (Memorial Day weekend through Labor Day weekend, 10am – 8pm). Apex agrees to clean out the systems, perform mechanical maintenance, and clean and maintain the exterior shower. All chemical checks and splash pad maintenance activities will adhere to and comply with state regulations as set forth in 5 CCR 1003-5.

- 6.11.5** If mechanical repairs or replacements are necessary, Apex will arrange for, pay for, and execute such repairs or replacements. In the event a capital repair or replacement exceeds \$10,000.00, Apex will notify Arvada of such necessary capital repair or replacement as soon as practicable. Apex and Arvada shall evenly split (50/50) the cost of any capital repair or replacement in excess of \$10,000.00.
- 6.11.6** Arvada shall be responsible for all other expenses and maintenance including but not limited to ensuring the structural integrity of the restroom and maintenance building; the maintenance and upkeep for all grounds; snow removal for all sidewalks, parking lots, and walking paths; maintenance of the park landscaping, playgrounds, pavilions, parking lots, and park lights. Arvada will also pay for all water and power utility costs for the operation of the entire park, including the restrooms and Splash Pad.
- 6.11.7** In the event any repair, maintenance, or other issue requires that the Splash Pad be closed to the public, the Party first becoming aware of the issue shall notify Arvada's Director of Vibrant Community and Neighborhoods and Apex's Executive Director. The email shall be sent as soon as possible after discovery of the issue, but in no event shall be delayed more than 24 hours after discovery. Arvada's Director of Vibrant Community and Neighborhoods shall retain the ultimate discretion on the length and necessity of the closure."

4.0 DOCUMENTS OTHERWISE UNCHANGED. Except as specifically provided in this Second Amendment, the Master IGA and First Amendment remain unchanged and in full force and effect in accordance with their terms.

5.0 SEVERABILITY. If any other provision of this Second Amendment is held invalid or unenforceable, no other provision shall be affected by such holding, and all of the remaining provisions of this Second Amendment shall continue in full force and effect.

6.0 BINDING AUTHORITY. The Parties represent and affirm that the signature page hereof accurately states their full legal name, contains all requisite signature(s) on behalf of the Parties, and in all other respects are effective to bind the Parties, in accordance with all applicable statutes, regulations, resolutions, rules, bylaws, agreements, or similar sources of authority or limitation. This First Amendment may be executed in counterpart(s), each of which shall be deemed to be an original, and all of which, taken together, shall constitute one instrument.

DATED this ____ day of _____, 2024.

CITY OF ARVADA, a Colorado home rule
municipal corporation

Lauren Simpson, Mayor

ATTEST:

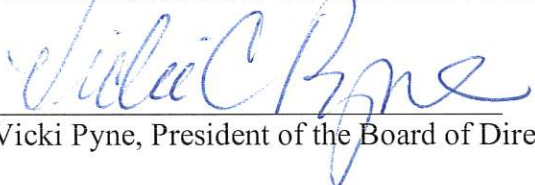
City Clerk

APPROVED AS TO FORM:

Rachel A. Morris, City Attorney

By: _____

APEX PARKS AND RECREATION DISTRICT



Vicki Pyne, President of the Board of Directors

ATTEST:



Rich Garrimone, Apex Secretary/Treasurer



REPORT TO CITY COUNCIL RESOLUTION

AGENDA ITEM
8.B.2.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: R24-022, A Resolution Authorizing an Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line (Presented by Sharon Israel, Director of Utilities)

Report in Brief

Presenter: Sharon Israel, Director of Utilities

As planned development expands in the northwest portion of the City, new infrastructure is needed to add capacity to our water system. This resolution and IGA concern the addition of a new water line expansion in Indiana Street north of Highway 72.

This project will also improve resilience in service of finished water to the pumped zones in northwest Arvada. In particular, the City has identified providing looping to the Candelas Pump Station and Candelas tank as a priority system improvement. The beneficiaries of this improvement are all customers in Zone 5 (purple zone) and the areas within the pumped zones that are north of Colorado Highway 72, generally the area of the Jefferson Center Metropolitan District (JCMD).

The Arvada team has negotiated an Intergovernmental Agreement (IGA) with JCMD that provides for a fair cost-sharing of the project that represents the benefits to the City and to JCMD. This IGA provides for financing of engineering services and construction. The Arvada team recommends that the City Council approve R24-022, A Resolution Authorizing an Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line.

Financial Impact

The City will provide 35% of the funding, and any portion above \$3,100,000. The estimated City portion is \$1,085,000. JCMD will provide \$2,015,000. The City portion of the funds are available in Project 97615.

Background

The western portion of the Arvada water service area is generally higher in elevation than both water treatment plants. As such, these areas are served by pump stations and are collectively referred to as the pumped zones. As these areas have grown in residents, the need to provide better resilience in service is needed. The proposed purple line in Indiana provides resilience for much of the pumped zones, particularly those areas west of Indiana and north of Highway 72, an area generally within the collective JCMD.

The Arvada team worked with JCMD to identify multiple alignments for a new water line to serve this area. The chosen alignment is the alignment preferred by the Arvada team; this alignment provides fewer secondary benefits to the JCMD team and is a longer route than other alignments. As such, the Arvada team recommends that the City provide a portion of the project cost as detailed in the IGA.

Discussion

SUBJECT: R24-022, A Resolution Authorizing an Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line (Presented by Sharon Israel, Director of Utilities)

PAGE: 2
ITEM: 8.B.2.

The Arvada team has contracted with J&T Consulting Engineers to provide engineering services for the design of the purple line. J&T Consulting was competitively selected using City procurement processes.

The Arvada team anticipates bidding the purple line project to select a contractor before the end of April 2024. The financing portion from JCMD identified in the IGA is needed to fully finance the construction of the purple line.

The estimated total cost of the project is \$3,100,000. The City portion is estimated at \$1,085,000. The total cost to the City will be known after the project has been awarded to a contractor.

Public Contact

Posting of the City Council agenda.

Commission Recommendation

N/A

Strategic Alignment

This action aligns with the Infrastructure Priority Area of the City Council Strategic Plan. Specifically, the recommended actions support the following principle within the Infrastructure Priority Area:

Provides the community with a safe, reliable, high-quality water supply, drainage system, and wastewater disposal services for full city build-out, as defined by the Comprehensive Plan.

Alternative Courses of Action

N/A

Recommendation for Action

The Arvada team recommends that the City Council approve R24-022, A Resolution Authorizing an Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line.

Suggested Motion:

I move that R24-022, A Resolution Authorizing an Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line, be (approved) (rejected).

Prepared by:
Sharon Israel, Director of Utilities

Reviewed by:

Approved by:

Sharon Israel, Director of Utilities

1/25/2024

SUBJECT: R24-022, A Resolution Authorizing an Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line (Presented by Sharon Israel, Director of Utilities)

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ITEM: 8.B.2.

Bryan Archer, Director of Finance	1/25/2024
Tammy Hedlund, Legal Specialist	1/25/2024
Erika Pierce, Litigation Paralegal	1/26/2024
Jessica Morales, Assistant City Attorney	1/29/2024
Rachel Morris, City Attorney	1/31/2024
Don Wick, Deputy City Manager	1/31/2024
Lorie Gillis, City Manager	1/31/2024

Enclosure, exhibits & attachments required to support the report

RESOLUTION NO. R24-022

A RESOLUTION AUTHORIZING AN INTERGOVERNMENTAL AGREEMENT
BY AND BETWEEN THE CITY OF ARVADA AND THE JEFFERSON CENTER
METROPOLITAN DISTRICT NO. 1 FOR FINANCING OF THE DESIGN,
PRECONSTRUCTION SERVICES, CONSTRUCTION ADMINISTRATION, AND
CONSTRUCTION OF THE PURPLE LINE

WHEREAS, the City of Arvada and the Jefferson Center Metropolitan District No. 1 (“JCMD1”) may enter intergovernmental agreements pursuant to C.R.S. §§ 29-1-201 *et. seq.*; and

WHEREAS, the Purple Line Project, also known as the Indiana Waterline Project, will be an extension and expansion of Arvada’s water distribution system, generally located along Indiana Street, from 86th Parkway to W. 91st Drive (the “Purple Line”); and

WHEREAS, the Purple Line is necessary to serve and support continued growth and development in the Candelas master-planned community, which is located within the current boundaries of JCMD1; and

WHEREAS, the City of Arvada desires to manage the design, preconstruction services, construction administration, and construction of the Purple Line; and

WHEREAS, the City of Arvada and JCMD1 will both contribute funds to finance the design, preconstruction services, construction administration, and construction of the Purple Line; and

WHEREAS, the City of Arvada and the JCMD1 agree that it is in the best interests of both to come together for the purpose of defining the roles and responsibilities of each party in the financing of the design, preconstruction services, construction administration, and construction of the Purple Line.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF ARVADA, COLORADO:

Section 1. The Mayor or Mayor Pro Tem is authorized to sign and the City Clerk to attest, in form approved by the City Attorney, an Intergovernmental Agreement, which is in substantially the same form as that attached hereto by and between the City of Arvada and the Jefferson Center Metropolitan District No. 1.

Section 2. This resolution shall be effective upon its approval by the City Council.

APPROVED AND ADOPTED this 12th day of February, 2024.

Lauren Simpson, Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:
Rachel A. Morris, City Attorney

By: _____

**INTERGOVERNMENTAL AGREEMENT
BY AND BETWEEN THE CITY OF ARVADA AND THE
JEFFERSON CENTER METROPOLITAN DISTRICT NO. 1
FOR FINANCING OF THE DESIGN, PRECONSTRUCTION
SERVICES, CONSTRUCTION ADMINISTRATION, AND
CONSTRUCTION OF THE PURPLE LINE**

1.0. PARTIES. The parties to this Intergovernmental Agreement By and Between the City of Arvada and the Jefferson Center Metropolitan District No. 1 for Financing of the Design, Preconstruction Services, Construction Administration, and Construction of the Purple Line (“**Agreement**”) are the City of Arvada, a Colorado home rule municipal corporation, whose principal business address is 8101 Ralston Road, Arvada, Colorado 80002 (“**Arvada**”), and the Jefferson Center Metropolitan District No. 1, a Colorado political subdivision and quasi-municipal corporation of the State of Colorado, whose principal business address is 141 Union Boulevard, Suite 150, Lakewood, Colorado 80228 (“**JCMD1**”), referred to individually as a “Party” and collectively referred to as “Parties.” The Parties agree as follows:

2.0. RECITALS.

- 2.1.** Arvada is a Colorado home rule municipal corporation. JCMD1 is a political subdivision and quasi-municipal corporation duly organized and existing as a metropolitan district under Title 32, Article 1, C.R.S.
- 2.2.** Article XIV, Section 18(2)(a) of the Constitution of the State of Colorado encourages and authorizes intergovernmental agreements.
- 2.3.** C.R.S. §29-1-203 permits local governments to make the most efficient and effective use of their powers and responsibilities by cooperating and contracting with other local governments in order to provide any lawfully authorized function, service, or facility.
- 2.4.** The Purple Line Project, also known as the Indiana Waterline Project, will be an extension and expansion of Arvada’s water distribution system, generally located along Indiana Street, from 86th Parkway to W. 91st Drive, as illustrated in **Exhibit A** (the “**Purple Line**”).
- 2.5.** The Purple Line is necessary to serve and support continued growth and development in the Candelas master-planned community, which is located within the current boundaries of JCMD1, as depicted in **Exhibit B** (the “**JCMD1 Boundaries**”).
- 2.6.** The Parties agree that it is in the best interest of the Parties to execute this Agreement to clearly define the responsibilities of the Parties relative to the design, preconstruction, construction administration, and construction services necessary to construct the Purple Line. As such the Parties are desirous of affecting a cooperative

relationship, which will achieve maximum community benefits while avoiding duplication of services, expenses, and efforts wherever possible as more fully set forth below.

2.7. The foregoing recitals are hereby incorporated into and made a part of the Agreement.

3.0. PURPOSE.

3.1. The Purple Line is necessary to serve and support continued growth and development in the Candelas master-planned community, which is located within the JCMD1 Boundaries.

3.2. It is the mutual intent of Arvada and JCMD1 that the Parties enter into this Agreement for the purpose of defining the roles and responsibilities of each Party in the financing of the design, preconstruction services, construction administration, and construction of the Purple Line.

4.0. **TERM AND TERMINATION.** The term of this Agreement is from the date of execution by all Parties (the “**Effective Date**”) to initial acceptance by Arvada of the Purple Line into the two-year warranty. Arvada shall promptly provide JCMD1 written notice of its initial acceptance of the Purple Line.

5.0. PURPLE LINE FINANCING.

5.1. The estimated total cost for the design services, preconstruction services, construction administration, and construction services to be performed for the Purple Line is \$3,100,000.00 (the “**Estimated Construction Costs**”). The Estimated Construction Costs are only an estimate and final, actual amounts, may be more or less than the Estimated Construction Costs.

5.1.1. The Parties acknowledge that in accordance with Arvada’s Purchasing Ordinance, Arvada will enter into a contract with a consultant for engineering design services for the Purple Line and into a contract with a contractor for the construction of the Purple Line (collectively, the “**Contracts**”). These Contracts and any amendments to the Contracts will determine the final cost of the design, preconstruction, construction administration, and construction of the Purple Line (“**Final Cost**”).

5.2. JCMD1 will provide financing for 65% of the Final Cost (“**JCMD1’s Funding Obligation**”). Arvada will provide financing for the remaining 35% of the Final Cost (“**Arvada’s Funding Obligation**”). This allocation of financing will apply to any and all amendments to the Contracts entered into to procure the design, preconstruction services, construction administration, and construction of the Purple Line.

- 5.2.1. Notwithstanding the above, the Parties agree that JCMD1's Funding Obligation for the Purple Line is capped at 65% of \$3,100,000.00 (\$2,015,000.00) (the "**JCMD1 Cap**"). If the Final Cost exceeds \$3,100,000.00, Arvada agrees to finance the excess amount.

6.0. FINANCING TIMELINE.

- 6.1. JCMD1 will make an initial payment to Arvada in the amount of \$1,000,000.00 (the "**Initial Payment Obligation**") to be applied towards JCMD1's Funding Obligation. JCMD1 will pay the Initial Payment Obligation to Arvada within thirty (30) days of the execution of this Agreement.
- 6.2. Arvada will provide written notice and documentation supporting its request for payment to JCMD1 once a contract is executed with a contractor for the construction of the Purple Line. Such request will be in the amount of 65% of the design, preconstruction services, construction administration and construction costs for the Purple Line as established by the Contracts, less the amount of the Initial Payment Obligation (the "**Second Payment Amount**"). Within thirty (30) days of receipt of the written notice and request for payment from Arvada, JCMD1 will make a second payment to Arvada for the Second Payment Amount ("**Second Payment Obligation**"). Notwithstanding, JCMD1's Funding Obligation shall not exceed the JCMD1 Cap.
- 6.2.1. The Initial Payment Obligation and Second Payment Obligation will amount to 65% of that portion of the Final Cost, consistent with section 5.0.
- 6.2.2. If the Initial Payment Obligation and Second Payment Obligation equal the JCMD1 Cap, as stated in section 5.2.1., then the Second Payment Obligation will be JCMD1's final payment obligation.
- 6.2.3. If the Initial Payment Obligation and Second Payment Obligation are less than the JCMD1 Cap, as stated in section 5.2.1., JCMD1's Funding Obligation will continue to be 65% of the remaining Final Cost, which will include any and all amendments to the Contracts entered into to procure the design, preconstruction services, construction administration, and construction of the Purple Line, up to the JCMD1 Cap of \$2,015,000.00 (the "**Final Payment Amount**"). JCMD1 will make one (1) final payment to Arvada for the Final Payment Amount within thirty (30) days of receiving written notice from Arvada requesting payment.
- 6.3. Arvada shall keep an accounting of all costs associated with the design, preconstruction services, construction administration, and construction associated with the Purple Line. In the event that JCMD1 has paid more to Arvada than JCMD1's Funding Obligation, Arvada shall refund to JCMD1 the moneys paid in excess within thirty (30) days of initial acceptance by Arvada of the Purple Line into the two-year warranty.

- 6.4.** Arvada shall utilize all payments made by JCMD1 hereunder for costs associated with the design, preconstruction, construction administration, and construction of the Purple Line and for no other purpose.
- 7.0. CONSULTANT AND CONTRACTOR AGREEMENTS.** Arvada will have full control over the selection and management of the Contracts.
- 8.0. DESIGN AND CONSTRUCTION PHASES.** Arvada will have full control over managing, deciding, and implementing all phases of the design and construction of the Purple Line.
- 9.0. CONSTRUCTION TIMELINE.** The construction timeline will be as set by Arvada through consultation with the chosen consultant and contractor.
- 10.0. JCMD1 SPECIFIC IMPACT FEE.**
- 10.1.** Proposed future developments may benefit from the Purple Line. In acknowledgement of JCMD1's financial contribution to the Purple Line, Arvada agrees it shall impose a JCMD1 specific impact fee (the "**JCMD1 Fee**") on any development that connects to the Purple Line located within areas identified on **Exhibit B** (the "**JCMD1 Fee Area**"). Arvada will remit the JCMD1 Fee to JCMD1. Arvada shall have sole discretion in calculating and setting the JCMD1 Fee. The JCMD1 Fee will take into consideration the actual percentage of the Final Cost of the Purple Line that was paid by each Party.
- 10.2.** Arvada's obligation to impose the JCMD1 Fee shall commence upon the Effective Date of this Agreement and shall terminate once the JCMD1 Fee is no longer necessary to defray the projected impacts to the Purple Line caused by proposed development. Notwithstanding the preceding sentence, under no circumstance will Arvada's obligation to impose and remit the JCMD1 Fee extend past twenty (20) years after the Effective Date of this Agreement.
- 10.3.** The JCMD1 Fee is separate and apart from any other impact fee imposed by Arvada, including, but not limited to the impact fees established in the Intergovernmental Agreement by and between the City of Arvada and JCMD1 for Financing of the Design, Preconstruction Services, and Construction of the Upgrades and Improvements of the Alkire Lift Station dated August 16, 2022, by and between Arvada and JCMD1.
- 11.0. NOTICES.** All notices, demands, requests or other communications to be sent by one Party to the other hereunder or required by law shall be in writing and shall be deemed to have been validly given or served by delivery of same in person to the addressee or by courier delivery via FedEx or other nationally recognized overnight air courier service, by

If to JCMD1: Jefferson Center Metropolitan District No. 1
c/o Special District Management Services, Inc.
141 Union Boulevard, Suite 150
Lakewood, Colorado 80228
dsolin@sdmsi.com

If to Arvada: Arvada City Manager
City of Arvada
8101 Ralston Road
Arvada, CO 80001

With a copy to:

Arvada City Attorney
City of Arvada
8101 Ralston Road
Arvada, CO 80001

12.1. Each Party to this Agreement will be required to, at its own expense, keep in full force and effect during the term of this Agreement, and during the term of any extension or amendment of the same, insurance reasonably sufficient to insure against the liability assumed by that Party pursuant to the provisions of this Agreement.

13.0. MISCELLANEOUS.

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information during reasonable business hours and until the latter of three (3) years after the final payment under the Agreement or expiration of the applicable statute of limitations.

- 13.2. SEVERABILITY.** If any term, section or other provision of this Agreement shall, for any reason, be held to be invalid or unenforceable, the invalidity or unenforceability of such term, section or other provision shall not affect any of the remaining provisions of this Agreement, and to this end, each term, section and other provision of this Agreement shall be severable and continue in full force and effect.
- 13.3. AMENDMENTS.** This Agreement may be amended only by a written document approved by formal authority of the governing bodies of the Parties. Course of conduct, no matter how long, shall not constitute an amendment to this Agreement.
- 13.4. RELATIONSHIP OF PARTIES.** This Agreement does not create a partnership, joint venture or agency relationship between the Parties. None of the Parties shall have any authority to bind any other Party to any agreement, understanding or other instrument, in any manner whatsoever.
- 13.5. NO THIRD-PARTY BENEFICIARIES.** Nothing in this Agreement shall be deemed to create any third-party benefits or beneficiaries or create a right or cause of action for the enforcement of its terms, in any entity or person not a Party to this Agreement.
- 13.6. SUBCONTRACTORS.** A Party may subcontract any task it is required to perform under the terms of this Agreement without the prior written consent of the other Party.
- 13.7. EMPLOYEES, AGENTS, CONTRACTORS, AND VOLUNTEERS.** Employees, agents, contractors, and volunteers of each Party will remain so of that Party. Nothing in this Agreement requires any Party to fund the activities of another Party.
- 13.8. ASSIGNMENT.** Neither Party shall assign this Agreement without the prior written consent of the other Party.
- 13.9. AVAILABILITY OF FUNDS AND CONSTITUTIONAL LIMITATIONS ON DEBT.** Financial obligations of any one Party that is a Colorado governmental entity or governmental subdivision ("**Governmental Party**") payable after the current Municipal Fiscal Year or District Fiscal Year are contingent upon funds for that purpose being appropriated, budgeted, or otherwise made available. A Governmental Party may also be relying on state or federal funding to satisfy its payment obligations under the Agreement. The Governmental Parties' payment obligations under the Agreement are subject to and conditioned upon the continuing availability of all funding for the purposes set forth in the Agreement. In the event funds are not appropriated, budgeted or otherwise made available, a Governmental Party may terminate the Agreement as of the last day of the period for which funds were

appropriated or monies made available for such purposes. All payments of the Governmental Parties under this Agreement constitute currently budgeted expenditures and do not constitute or give rise to a general obligation, indebtedness, or multiple-fiscal year direct or indirect debt or other financial obligation within the meaning of any constitutional or statutory provision or limitation. No provision of this Agreement shall be construed to pledge or to create a lien on any class or source of the Governmental Parties' monies.

13.10. GOVERNMENTAL IMMUNITY. This Agreement is not intended, and shall not be construed, as a waiver of the limitations on damages or any of the privileges, immunities, or defenses provided to, or enjoyed by, the Parties, and their past and present directors, officers, employees and volunteers, under federal or state constitutional, statutory or common law, including but not limited to the Colorado Governmental Immunity Act, Section 24-10-101, C.R.S., *et seq.*, as may be amended.

13.11. COOPERATION BY THE PARTIES.

13.11.1. Each Party will use its best efforts to cooperate in the fulfillment of this Agreement.

13.11.2. The Parties agree that in the event any claim or suit is brought against either or both Parties by any third party as a result of the operation of this Agreement, both Parties will cooperate with each other, and with the insuring entities of both Parties, in defending such claim or suit.

13.12. COMPLIANCE WITH LAWS. The Parties shall comply with all laws that apply to performance under the Agreement.

13.13. WAIVER. Any waiver by any Party hereto of a breach of any provision of this Agreement shall not operate as or be construed to be a waiver of any other breach of such provision or of any breach of any other provision of this Agreement. To be effective, any waiver must be in writing. Failure by any Party hereto to insist upon strict adherence to any term of this Agreement on one or more occasions shall not be considered a waiver or deprive such Party of the right thereafter to insist upon strict adherence to that term or any other term of this Agreement.

13.14. FORCE MAJEURE. No Party will be liable for any failure or delay in performing an obligation under this Agreement that is due to any of the following causes, to the extent beyond its reasonable control (which events and/or circumstances are hereinafter referred to as "**Force Majeure**"): acts of God, accident, riots, war, terrorist act, epidemic, pandemic (except for the COVID-19 pandemic), quarantine, civil commotion, breakdown of communication facilities, breakdown of web host, breakdown of internet service provider, natural catastrophes, governmental acts or omissions, changes in laws or regulations, national strikes, fire, explosion, and generalized lack of availability of raw materials or energy.

- 13.15. ENTIRE AGREEMENT.** This Agreement contains the entire understanding between the Parties hereto relating to the subject matter contained herein and supersedes any and all prior agreements, arrangements, communications, or representations, whether oral or written.
- 13.16. GOVERNING LAW AND VENUE.** The laws of the State of Colorado shall govern this Agreement. Venue for any action arising under this Agreement or for the enforcement of this Agreement shall be in the appropriate court for Jefferson County, Colorado.
- 13.17. PARAGRAPH CAPTIONS.** The captions of the paragraphs are set forth only for convenience and reference and are not intended in any way to define, limit or describe the scope or intent of this Agreement.
- 13.18. JCMD1 SERVICE PLAN.** The Parties agree that this Agreement in no way provides JCMD1 with any financial or operational authority beyond that described in its Service Plan.
- 14.0. COUNTERPARTS, ELECTRONIC SIGNATURES AND ELECTRONIC RECORDS.** This Agreement may be executed in counterparts, each of which shall be deemed to be an original, but all of which shall together constitute one and the same document. Facsimile signatures shall be accepted as originals. The Parties consent to the use of electronic signatures by each of the Parties. The Parties agree not to object to the admissibility of this Agreement in the form of an electronic record, a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the grounds that it is an electronic record or an electronic signature or that it is not in its original form or is not an original.
- 15.0. EXHIBITS INCORPORATED.** All exhibits attached hereto are incorporated herein by this reference.
- 16.0. BINDING EFFECT AND AUTHORITY.** This Agreement shall inure to the benefit of, and be binding upon, the Parties, their respective legal representatives, successors, and assigns; provided, however, that nothing in this paragraph shall be construed to permit the assignment of this Agreement except as otherwise expressly authorized herein. The undersigned to this Agreement warrant that each has the authority to execute and enter into this Agreement, that their signatures are authorized and binding, and that all actions and approvals necessary for the execution and delivery of the Agreement have been properly taken by their respective governing boards.
- 17.0. COMMUNICATIONS/MEETINGS.** The Parties shall hold periodic meetings at mutually agreeable times to discuss the matters related to this Agreement.
- 18.0. EFFECTIVE DATE.** This Agreement shall be effective on the date of execution, below.

(Signatures on next page.)

DONE this _____ day of _____, 2024.

**JEFFERSON CENTER
METROPOLITAN DISTRICT NO. 1**

Gregg A. Bradbury, President

ATTEST:

Secretary or Assistant Secretary

CITY OF ARVADA, a Colorado home rule
municipal corporation

Lauren Simpson, Mayor
8101 Ralston Road
Arvada, CO 80002

ATTEST:

City Clerk

APPROVED AS TO FORM:

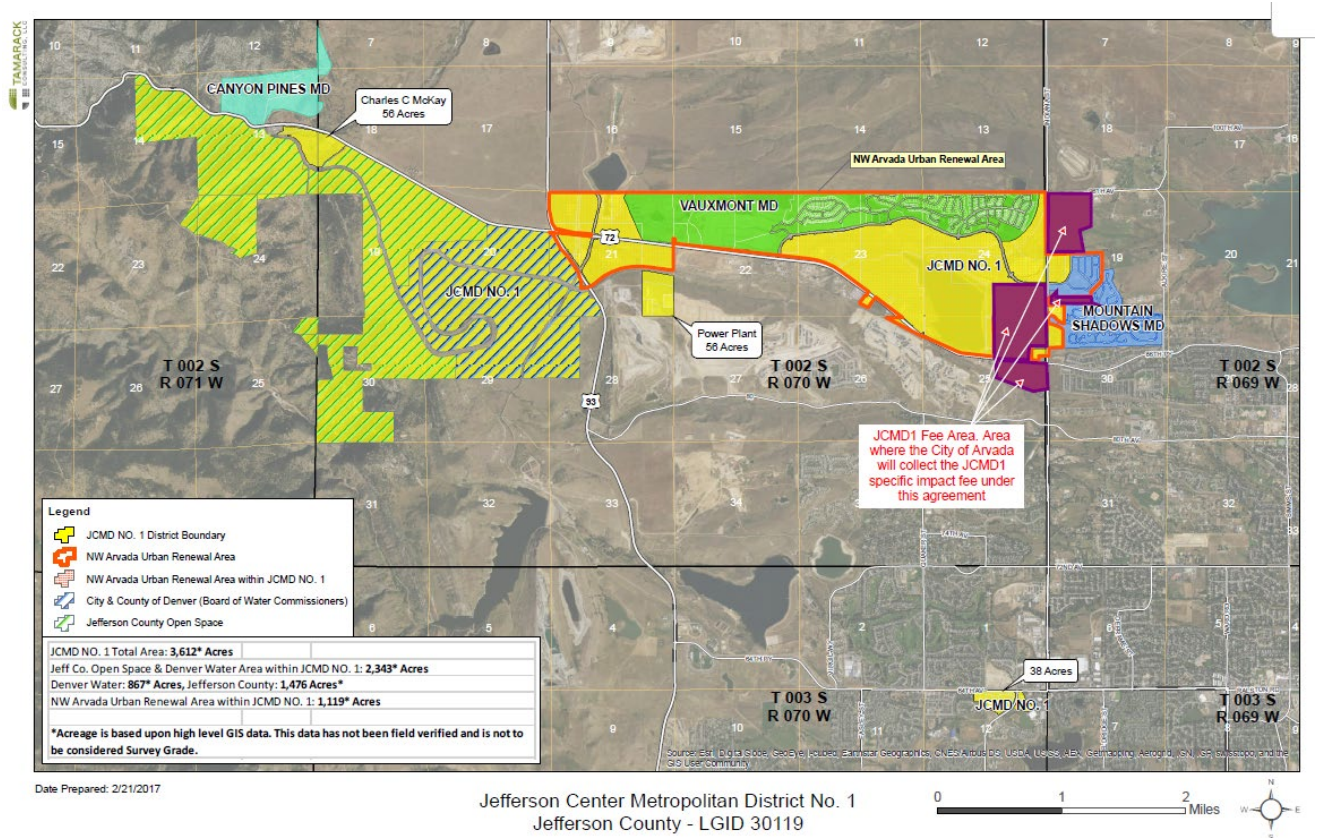
Rachel A. Morris, City Attorney

By: _____

EXHIBIT A
PURPLE LINE



EXHIBIT B JCMD1 BOUNDARIES AND JCMD1 FEE AREA





REPORT TO CITY COUNCIL ORDINANCE FIRST READING

AGENDA ITEM
8.C.1.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code (Public Hearing to be set for March 4, 2024 at 6:15 p.m.) (Presenter: Sharon Israel, Director of Utilities)

Report in Brief

PRESENTER: Sharon Israel

New federal and state regulations require the City of Arvada's public water system to take action to reduce the risk from lead water service lines. Under these regulations, the City is required to consider certain galvanized steel service lines to be regulated the same as true lead service lines. The City is currently performing a service line inventory project, and we estimate about 100-250 private service lines will require replacement. At this time, we have not found any true lead service lines, but we have found galvanized lines that will require replacement.

This ordinance explicitly prohibits active lead or certain galvanized drinking water service lines (LSL) to be utilized within Arvada's water service area, according to the definition of LSL provided in the ordinance. It also establishes a Lead Service Line Replacement Program that will fund and manage private LSL replacements through 2026. The ordinance also establishes a financial penalty for non-compliance beginning January 1, 2027.

The Arvada team recommends that City Council approve CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code.

Financial Impact

The new ordinance will establish the Lead Service Line Replacement Program, which will include city-funded private side replacements through 2026 for any LSL identified through the service line investigation project. It is anticipated that 100-250 lines will be replaced before the end of 2026, with an average estimated cost of \$8,000-\$10,000 each. Ongoing financial assistance funding after 2026 is anticipated to be less than \$100,000 each year until there are no remaining LSL or Unknowns. The ordinance also establishes a financial penalty beginning in 2027 for non-compliance, which could contribute funds back to the Water Enterprise Fund.

This is a Capital Improvement Project with project number 97613. Approximately \$150,000 is remaining in this budget from 2023. \$2,300,000 is currently budgeted for 2024. Additional funding may be requested in 2025 if more money is needed to complete the project.

Background

The ordinance being proposed meets the requirements of new state and federal regulations that apply to the City of Arvada's public water system.

In December 2021, the EPA promulgated an updated version of the Lead and Copper Rule (LCR) under the Safe Drinking

SUBJECT: CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code (Public Hearing to be set for March 4, 2024 at 6:15 p.m.) (Presenter: Sharon Israel, Director of Utilities)

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ITEM: 8.C.1.

Water Act, known as the Lead and Copper Rule Revisions. This federal mandate requires all large public water systems to identify and categorize all public and private drinking water service lines, to make a public-facing map of the service line inventory, to create a Service Line Replacement Plan if any active lead service lines are discovered (as defined in 40 CFR 141 which includes most galvanized lines requiring replacement), and to provide financing solutions for the replacement of private LSL. Further updates to the LCR released in late 2023 will require a mandatory 10-year maximum replacement timeframe for all LSLs (after the compliance date is set). All these efforts are being made in order to reduce drinking water pathways of exposure to lead, and to increase public health especially among children and vulnerable populations.

The City team has been working with homeowners and contractors on the service line inventory ("service line investigation project"). Many Arvada residents are familiar with the ongoing project, and have provided valuable assistance and information. The city hired AGL Construction Company in October 2023 through competitive Bid no. 23-UTS-066 for potholing services, as a prelude to the next stage of this project. Although no lead lines have been found yet, we have found galvanized service lines that need to be treated as LSL per the ordinance and will require replacement.

Discussion

The new ordinance is one part of a multi-faceted approach the Infrastructure work system has taken to ensure the EPA LCR mandates are fulfilled and to increase public health and safety by reducing a source of lead exposure. The ordinance has three (3) primary components: 1) explicitly prohibit the use of a Lead Service Line (as defined in the ordinance) to convey finished drinking water to any structure in Arvada's water system; 2) establish a Lead Service Line Replacement Program (LSLRP), with LSL replacements funded and overseen by the City through 2026; and 3) creating a financial penalty for non-compliance beginning in 2027.

The City team strives to ensure that our residents feel confident that their water supply is safe for consumption and to know that their health and safety is a priority. This work increases environmental justice and equity concerns surrounding drinking water in our region, and it provides financial and logistical support. The Arvada team is committed to finding and replacing all LSLs in the service area as quickly and efficiently as possible. If the City does not meet the deadline for full LSL replacement within 10 years of the compliance date, we will become subject to penalties from the federal and state government.

It is estimated that 100-250 service lines will need to be replaced through 2026, at an average rate of \$8,000-\$10,000 per replacement. The replacement phase of the project will have an estimated cost of \$0.8-2.5 million dollars. These funds have already been allocated in the approved 2023 and 2024 budgets.

Public Contact

Posting of the City Council agenda.

Commission Recommendation

n/a

Strategic Alignment

This action aligns with the Infrastructure Priority Area of the City Council Strategic Plan. Specifically, the recommended actions support the following principle within the Infrastructure Priority Area:

Provides the community with a safe, reliable, high-quality water supply, drainage system, and wastewater disposal services for full city build-out, as defined by the Comprehensive Plan.

Alternative Courses of Action

SUBJECT: CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code (Public Hearing to be set for March 4, 2024 at 6:15 p.m.) (Presenter: Sharon Israel, Director of Utilities)

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1. Approve the addition of Ordinance No. CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code. This alternative is the best way to ensure identification and removal of any remaining LSLs and to maintain compliance with federal and state requirements.
2. Do not approve the ordinance, thereby allowing active LSLs to remain in the city's water system. This alternative is not recommended because it would increase the risk the City will be unable to comply with new state and federal regulations. This alternative could also result in increasing risk of lead exposure and erosion of trust with the public.
3. Approve the ordinance with amendments to place the responsibility of LSL replacement in full or in part on private property owners. This alternative is not recommended because it would add financial hardship to property owners with LSLs that require replacement. This would also increase the administrative burden on the City team to enforce compliance and will increase the risk the City will be unable to comply with new state and federal regulations. This alternative could also result in increasing risk of lead exposure and erosion of trust with the public.

Recommendation for Action

City staff recommends that City Council approve Alternative No. 1, CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code.

Suggested Motion:

I move that CB24-003, An Ordinance Adding Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code, be (approved on first reading, ordered published in full, and a public hearing set for March 4, 2024 at 6:15 p.m.) (rejected).

Prepared by:
Evelyn Rhodes, Water Quality Administrator

Reviewed by:

Approved by:

Sharon Israel, Director of Utilities	1/29/2024
Bryan Archer, Director of Finance	1/29/2024
Jessica Morales, Assistant City Attorney	1/29/2024
Tammy Hedlund, Legal Specialist	1/30/2024
Rachel Morris, City Attorney	1/31/2024
Don Wick, Deputy City Manager	1/31/2024
Lorie Gillis, City Manager	1/31/2024

Enclosure, exhibits & attachments required to support the report

COUNCIL BILL NO. 24-003
ORDINANCE NO. ____

AN ORDINANCE ADDING ARTICLE VII, PROHIBITION OF LEAD DRINKING WATER
SERVICE LINES AND ESTABLISHMENT OF ARVADA'S LEAD SERVICE LINE
REPLACEMENT PROGRAM, TO CHAPTER 102, UTILITIES, OF THE ARVADA CITY
CODE

WHEREAS, lead exposure, especially in young children, is known to cause serious health effects, including lower IQ, hyperactivity, slow growth, behavioral issues, learning impairments, and anemia; and

WHEREAS, lead drinking water service lines ("LSL") can be an exposure pathway to lead and can pose a health and safety hazard to the general public; and

WHEREAS, in 2021, the U.S. Environmental Protection Agency ("EPA") published the Lead and Copper Rule Revisions ("LCRR") which included significant changes to the current Lead and Copper Rule ("LCR"), and which aims to protect communities from lead exposure in drinking water; and

WHEREAS, the EPA plans to finalize additional updates to the LCR, through the Lead and Copper Rule Improvements ("LCRI"), in late 2024 to further reduce lead exposure in drinking water; and

WHEREAS, the LCRR and the LCRI will require water systems to identify and replace lead drinking water service lines; and

WHEREAS, on August 14, 2023, the Colorado Water Quality Control Commission voted unanimously to take final action on the proposal to adopt the updated requirements of the LCR into the Colorado Primary Drinking Water Regulations at 5 C.C.R. 1002-11, as may be amended from time to time ("Regulation 11"); and

WHEREAS, among other things, Regulation 11 now requires water systems to develop an inventory to identify the materials of service lines connected to the public water distribution system, with lead and some galvanized service lines requiring replacement; and

WHEREAS, Arvada does not have complete records of previously replaced drinking water service line materials, and therefore all active galvanized service lines that were installed prior to 1960 are treated as lead according to federal regulation and state policy; and

WHEREAS, Arvada's Engineering Code of Standards and Specifications stopped allowing lead to be used as a service line material in 1980, but does not explicitly require replacing lead materials; and

WHEREAS, Council now desires to explicitly prohibit LSL within the City of Arvada's water

service area; and

WHEREAS, implementation of a full Lead Service Line Replacement Program (for both public and private portions) within the city's water service area is essential to protect public health, safety, and welfare, and to reduce developmental, behavioral, and neurological impacts due to lead exposure; and

WHEREAS, the Lead Service Line Replacement Program will commence after May 1, 2024; and

WHEREAS, the city aims to identify and replace all LSL by December 31, 2026; and

WHEREAS, the cost of private LSL replacement is an obstacle for many customers, preventing them from eliminating this risk of exposure to lead; and

WHEREAS, financing solutions or financial assistance for replacements will be a component of the city's Lead Service Line Replacement Program; and

WHEREAS, after December 31, 2026, a property owner with a presumed, known remaining, or newly discovered LSL, will be required to replace, at their expense, the private portion of the LSL, and will be subject to penalty in situations of non-compliance; and

WHEREAS, the City Council has determined it is in the best interest of the city to pass an ordinance which aligns with the EPA Regulations and Regulation 11.

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF ARVADA, COLORADO:

Section 1. Article VII, Prohibition of Lead Drinking Water Service Lines and Establishment of Arvada's Lead Service Line Replacement Program, to Chapter 102, Utilities, of the Arvada City Code is hereby enacted to read as follows:

**“ARTICLE VII. PROHIBITION OF LEAD DRINKING WATER SERVICE LINES AND
ESTABLISHMENT OF ARVADA'S LEAD SERVICE LINE REPLACEMENT
PROGRAM**

Sec. 102-401. Legislative intent and purpose.

The City Council has determined that the presence of lead drinking water service lines (“LSL”) can be an exposure pathway to lead and can pose a health and safety hazard to the general public. It is the intent of the City Council to prohibit the presence of LSL within the city's water service area, and to establish the Lead Service Line Replacement Program to provide financing solutions or financial assistance for replacement of LSL. The purpose of this Ordinance is to comply with updates to the U.S. Environmental Protection Agency's Lead and Copper Rule (40 CFR 141 Subpart I), and with updates to the Colorado Primary Drinking Water Regulations at 5 C.C.R.

1002-11.

Sec. 102-402. Authority.

The authority to prohibit LSL and establish and implement a Lead Service Line Replacement Program is derived from the city's powers and authority as a home rule city under Article XX of the Colorado Constitution, and under article 15 of Title 31 of the Colorado Revised Statutes.

Sec. 102-403. Applicability.

This Ordinance applies to any existing or future drinking water service line connections to buildings or structures that receive water service directly from the city's water utility and does not apply to structures within consecutive water systems receiving city finished water or city residents not on city water.

Sec. 102-404. Definitions.

Connector means a short section of piping, typically not exceeding two feet, which can be bent and used for connections between rigid service piping. Also referred to as a gooseneck or pigtail. Connectors are not considered to be part of the service line but may require replacement.

Consecutive System means a public water system that receives some or all of its finished water from one or more wholesale systems. Delivery may be through a direct connection or through the distribution system of one or more consecutive systems.

Customer-Owned Service Line means the portion of the drinking water service line from the meter (typically located in a meter pit) to the point of entry or the foundation of the home or building. The property owner is responsible for maintenance. Also referred to as the "private" or "user" side.

Director means the Director of Utilities or designee thereof.

Lead Service Line ("LSL") means a portion of pipe that is made of lead, which connects the drinking water main to the building inlet, not including connectors. A galvanized service line is considered a lead service line if it ever was or is currently downstream of any lead service line or service line of unknown material. For the purposes of this ordinance, any galvanized water service line installed before 1960 will be treated as an LSL, requiring replacement.

Point of Entry means the location where the water service line enters the structure (home or building) at the foundation; the junction where it ties into the premise plumbing.

Premise Plumbing means the drinking water supply plumbing materials located within a property (in-house or in-building), past the point of entry and leading to each internal tap or appurtenance.

Service Line means a drinking water supply pipe from the water main to the meter, or the meter to the point of entry of the structure. This definition does not apply to irrigation lines or fire protection lines.

Engineering Standards means the city's Engineering Code of Standards and Specifications, as may be amended from time to time.

System-Owned Service Line means the portion of the drinking water service line from the water main to the meter pit, maintained by the city, also referred to as the "public" side.

Sec. 102-405. Lead service lines prohibited.

- (a) LSL shall be prohibited for use as service line material as of the effective date of this ordinance. All LSL must be identified and replaced in full by December 31, 2026. Penalties for non-compliance will be assessed after December 31, 2026. Partial replacement of LSL is not permitted.
- (b) No new water service connections will be permitted to a property with an LSL. A new service line must be installed to any rebuilt structure if existing services do not meet the Engineering Standards.

Sec. 102-406. Lead drinking water service line replacement responsibilities.

- (a) The city shall be responsible for replacement of the system-owned portion of any LSL and lead connectors between the water main and the meter.
- (b) The property owner shall be responsible for the replacement of the customer-owned portion of an LSL from the meter to the property point of entry, in compliance with the Engineering Standards.
- (c) The material used in service lines must be investigated to determine whether the service lines are lead or non-lead. Service lines that have not been verified as lead or non-lead, will be treated as LSL under this Article VII.
- (d) From May 1, 2024, to December 31, 2026, with consent from the property owner, the city will replace the customer-owned portion of an LSL from the meter to the property point of entry, according to the Lead Service Line Replacement Program protocols.
- (e) The division of responsibilities between the city and a property owner in this section shall apply only to replacement of an LSL. Repair and replacement of service lines in all other circumstances shall be governed by the Engineering Standards. Premise plumbing replacement is not applicable to this ordinance and remains the responsibility of the property owner.
- (f) All LSL replacements must be performed according to the Engineering Standards.

Sec. 102-407. Lead service line replacement program.

- (a) The Lead Service Line Replacement Program will go into effect on May 1, 2024.
- (b) The Lead Service Line Replacement Program will delineate applicability, financial responsibilities, financing solutions, and any other necessary topics.
- (c) The Lead Service Line Replacement Program details will be publicized by the director and be made available on the city's website.

Sec. 102-408. Failure to comply; compliance procedures.

- (a) *Notice and order.* After December 31, 2026, the director shall give written notice to any property owner who is presumed to have an LSL on their property under sec. 102-406(c), or who have confirmed LSL on their property, informing such property owner they have been found to be in violation of the city's prohibition on LSL.
 - (1) Contents of notice and order. The notice and order shall set forth any order or orders stating the actions necessary to verify the presence of LSL and/or to replace confirmed LSL.
 - (i) Presumed LSL process. A property owner whose property contains presumed LSL shall be allowed 63 days from the date of the notice and order to submit documentation to the director demonstrating whether the presumed LSL is LSL or not. The documentation must comply with the requirements set forth in the notice and order.
 - (a) If a presumed LSL is confirmed to be an LSL, the property owner must replace the LSL and submit to the director proof of the replacement within 182 days after submission of documentation confirming the presence of LSL. Such documentation must comply with the requirements set forth in the notice and order, and with the Engineering Standards. Replacement of LSL on or after January 1, 2027, shall be done at the property owner's expense.
 - (b) Extension of the time frames in sec. 102-408(a)(1)(i) and sec. 102-408(a)(1)(i)(a), shall be at the sole discretion of the director, and may only be granted one time. A property owner requesting an extension must submit a written request to the director, explaining the reasons for the request, at least 28 days prior to the end of these time frames above.
 - (ii) Confirmed LSL process. A property owner whose property contains

confirmed LSL, whether previously known or newly discovered, must replace the LSL and submit to the director proof of replacement within 182 days from the date of the notice and order. Such documentation must comply with the requirements set forth in the notice and order, and with the Engineering Standards. Replacement of LSL on or after January 1, 2027, shall be done at the property owner's expense.

- (a) Extension of the 182-day time frame in sec. 102-408(a)(1)(ii) shall be at the sole discretion of the director and may only be granted one time. A property owner requesting an extension must submit a written request to the director, explaining the reasons for the request, at least 28 days prior to the end of the time frame above.
- (b) *Violation notice.* If a property owner fails to comply with the order or orders of the director within the time frame specified in the notice and order issued under sec. 102-408(a) above, the director shall send a violation notice to the property owner. The violation notice shall be sent to the property owner within 21 days after the property owner's compliance period has expired.
 - (1) Contents. The violation notice shall re-state the order or orders stating the actions necessary to verify the presence of LSL and to replace confirmed LSL. The notice of violation shall remind the property owner of the obligation to comply with the order or orders of the director. The notice of violation will include notice of the civil penalty that will be imposed under sec. 102-409 for failure to comply.
 - (2) Subsequent violation notice. A property owner who has not complied with the order or orders of the direction within one year from the date of the notice and order, shall be sent a notice of violation every year until compliance is attained. Each subsequent notice of violation shall impose an additional civil penalty imposed under sec. 102-409 for the continued failure to comply.
- (c) *Mailing and posting of notices.* Each notice and order or violation notice issued under this section shall be mailed to the property owner by first class U.S. Mail, at the address on file with the applicable county tax assessor's office or alternate address provided by the property owner. Each notice must state any appeal available. The city's inability to comply strictly with the time deadlines set forth herein for the mailing or posting of a notice and order or a violation notice shall not impact the enforcement action.

Sec. 102-409. Civil penalties; continuing non-compliance.

- (a) *Civil Penalties.* Property owners who do not comply with sec. 102-408 shall be assessed a civil penalty of \$1,000.00. An additional \$1,000.00 civil penalty shall

be assessed for each subsequent year of continued non-compliance in accordance with sec. 102-408.

- (b) If at any time after a violation notice has been issued, a property owner replaces LSL in compliance with this article and the Engineering Standards, and provides documentation sufficient to establish the same, the director is authorized to forgive the civil penalty assessment for the year that the documentation is submitted. Civil penalties for previous years, as well as liens for those amounts, shall remain in place.

Sec. 102-410. Fines to be lien upon property.

- (a) *Debt due and owing.* Unless paid within 63 days of the date of the assessment notice, all penalties imposed by the city under this article constitute a debt due and owing to the city, and the city has the right to recover on any such debt in the manner provided by law in any court of competent jurisdiction.
- (b) *Lien.* Unless paid within 63 days of the date of the assessment notice, all penalties imposed by the city under this article constitute a perpetual lien on and against the property served, and any such lien may be foreclosed by the city at any time in the manner as provided by the laws of the state for the foreclosure of mechanics' liens or in accordance with chapter 59 of this Code entitled "Municipal Liens." Such lien foreclosure by the city is subject to all rights of redemption granted by C.R.S. §38-39-101 *et seq.*, as amended.

Sec. 102-411. Appeals of a determination or order of the director.

- (a) *Filing; timeliness.* A property owner who is aggrieved by a notice or order of the director issued under sec. 102-408 may appeal that order on a form prescribed by the city and available from the director on the city's website or by hard copy. The appeal must be in writing and be submitted to the city clerk within 14 days of the date of the director's order. An appeal form that is not complete in all respects or that does not state the grounds for appeal shall be promptly returned by the clerk to the property owner. The property owner may resubmit an appeal form deemed incomplete by the clerk, and the clerk shall accept it, if the resubmitted form is complete and submitted to the clerk within the deadline set forth in this subsection. Compliance with the 14-day time limit noted in this subsection (a) shall be a jurisdictional prerequisite to any appeal brought under this article. Failure to comply shall bar any such appeal.
- (b) *Grounds.* The appeal shall be based on a claim that:
 - (1) The provisions of this article do not apply; or
 - (2) The true intent of this article has been incorrectly interpreted by the director; or

- (3) The property owner has previously filed with the director written documentation outlining the replacement of LSL or request for extension of time which has been rejected by the director.
- (c) *Procedure.* The appeal form, and any other documentation submitted to the city clerk by the property owner, as well as any response or documentation submitted by the director, will be submitted by the city clerk to the city manager or designee thereof for review. Notwithstanding any other provision of this Code, the appeal of the director's order shall consist of a review of all relevant documentation on file with the city in the case, as well as the appeal form and any accompanying materials. All documents may be reviewed electronically. The city bears the burden of proof in an appeal to establish that the director's action or determination was reasonable in light of the intent of this article, that the terms of this article applied to the property owner in question. The city manager or designee thereof shall review the information submitted, and within 14 days of the date of the filing of the appeal, issue a written decision on the appeal. The decision must contain the reason or reasons for the decision. The decision must set forth appeal rights, if any. The decision may be mailed by first class U.S. Mail or furnished to the property owner electronically. Should the city manager or designee thereof fail to issue a written decision on the appeal within the time frame set forth herein, the claim shall be deemed denied, and the property owner may proceed as if an adverse decision has been issued.
- (d) *Appeal of city manager's decision.* The city manager's decision, or denial of an appeal as a result of the manager's failure to issue a written decision, shall be considered a final agency decision. The appeal may proceed under Rule 106 of the Colorado Rules of Civil Procedure.

Secs. 102-412 – 450. Reserved.”

Section 2. Severability. Should any provision of this ordinance be declared by a court to be unconstitutional or invalid, such decision shall not affect the validity of the ordinance as a whole, or any part thereof, other than the part so declared unconstitutional or invalid. The City Council declares it would have adopted this ordinance and each part or parts hereof irrespective of the fact that any one part or parts be declared unconstitutional or invalid.

Section 3. This ordinance shall be effective five days after publication following final passage.

INTRODUCED, READ, AND ORDERED PUBLISHED this 12th day of February, 2024.

PASSED, ADOPTED AND APPROVED this ____ day of _____, 2024.

Lauren Simpson, Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:
Rachel A. Morris, City Attorney:

BY: _____

Publication Dates: February 15, 2024



REPORT TO CITY COUNCIL PUBLIC HEARING

AGENDA ITEM
10.A.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: CB24-001, An Ordinance Amending Various Provisions of Arvada's Land Development Code Pertaining to Floodplain Regulation (Ordinance No. 4867) (Presenter: Melanie Walter, Floodplain Administrator)

Report in Brief

PRESENTER: Melanie Walter, Floodplain Administrator

Council Action is requested to update the Land Development Code related to Floodplain Regulations to conform with local, state, and federal practices, reflect current City practices, and allow for real-time floodplain boundaries to be shown in city mapping.

The Arvada team recommends that the City Council approve CB24-001, An Ordinance Amending Various Provisions of Arvada's Land Development Code Pertaining to Floodplain Regulation.

Financial Impact

None

Background

City Council adopted the Arvada Land Development Code on May 18, 2020 pursuant to CB20-012. While City Council has adopted certain Flood Insurance Studies and related Flood Insurance Rate Maps since the Land Development Code's initial adoption, there have not been any substantive revisions to the Floodplain Regulations contained within the Land Development Code. City staff therefore proposes several edits to the Land Development Code in order to update current Floodplain Regulations to align with current City practices as well as regulations established by the Mile High Flood District and provide for general cleanup of the Floodplain Regulations.

On January 16, 2024, staff presented the proposed edits to the Land Development Code to the Planning Commission. The Planning Commission unanimously approved the proposed edits, finding that the proposed amendments are consistent with the Arvada Comprehensive Plan and the intent and purposes of the Land Development Code. However, during the public hearing, the Planning Commission raised concerns that the proposed edit to Section 4-1-2-6 (E) removing the table related to fencing allowed within the Regulatory Floodplain and replacing it with more broad, discretionary language may not provide enough notice to readers as to what types of fencing may or may not be approved. City staff took this concern into consideration and revised the proposed edit to Section 4-1-2-6(E) so the fencing table remains in the code but the language also allows the Floodplain Administrator to evaluate and approve proposed fencing on a case-by-case basis pursuant to certain criteria. The purpose of this recent revision is to provide a reader of the code with more information and notice as to what type of fencing may be approved.

Discussion

The proposed edits to the Land Development Code address the following four main topics: 1) elimination of the City's Official Floodplain Map 2) the addition of a prohibition on makeshift structures within certain areas of the floodplain where having

such structures would be particularly dangerous 3) allowing more flexibility to evaluate the fencing constructed within the floodplain, and 4) allowing the City to impose floodplain regulations in areas that may be at high-risk for flooding, but may not be reflected in FEMA's current floodplain boundaries. Each major revision topic is discussed in-depth below. In addition to these four main topic revisions, the proposed edits also clean up and streamline some of the language within the Floodplain Regulations.

The first major proposed edit to the Land Development Code eliminates the City's Official Floodplain Map. The City's Official Floodplain Map is a static snapshot in time showing when Council has adopted Flood Insurance Studies (FIS) as required by FEMA. There is no state or federal requirement that municipalities adopt an official city-wide floodplain map. Under the current Land Development Code, the Official Floodplain Map can only be amended with Council approval. The approval is typically sought as a result of a FIS update and will include any Letters of Map Revision (LOMR) that were accepted by FEMA since the last adoption. While FEMA requires the City to officially adopt all FIS and related Flood Insurance Rate Map (FIRM) panels, FEMA does not require the City to officially adopt LOMRs. This discrepancy results in an Official Floodplain Map that may be inaccurate because it does not reflect issued LOMRs since the last adoption. Staff therefore proposes that Council eliminate the Official Floodplain Map and instead establish the boundaries of the City's floodplain directly from FEMA which includes all LOMRs as they become effective. Council approval will still be required any time FEMA issues a new FIS and related FIRM panels, as required by federal law, but Council approval will not be required when there are minor changes from a LOMR. Elimination of the Official Floodplain Map will allow the City's floodplain boundaries to change dynamically as they are modified by FEMA and the City's GIS team will be able to update the City's digital maps more quickly.

The second major proposed edit to the Land Development Code adds a prohibition on makeshift structures meant for human habitation within high-risk flood-prone areas. The purpose of this addition is to align the Land Development Code with Mile High Flood District (MHFD) regulations, which contain the same prohibition. The intent of the prohibition is to protect the lives of those living in the structures and the lives of the first responders. Debris resulting from these structures during a flooding event could also cause clogging of bridge and culvert openings, exacerbating flooding, and endangering the adjacent neighborhoods. In addition, the byproducts of human habitation pollute the waters with fecal bacteria and other hazardous substances, endangering the rest of the community and the communities downstream. By default, the City has adopted these regulations because we are within MHFD boundaries, however directly codifying the regulation into the Land Development Code clarifies such adoption and aligns the Land Development Code with MHFD regulations.

The third major proposed edit adds language to the current fencing criteria to allow the Floodplain Administrator to evaluate and approve proposed fencing on a case-by-case basis. The current Land Development Code indicates that certain fences will be allowed if the bottom is set at the flood depth elevation or higher, but in some cases that would mean the fence bottom would be three feet from the ground, which is impractical. The current Land Development Code also does not take into consideration existing fences already accounted for in the floodplain modeling when the floodplain boundaries were originally established. The proposed edits allow flexibility for the Floodplain Administrator to evaluate and approve fencing on a case-by-case basis given the characteristics of the proposed fencing. This discretionary language prevents the rigid and impractical application of the current standards.

The final major proposed edit allows the City the ability to regulate areas within the City that may not be included in the regulatory floodplain identified by FEMA but are identified by the MHFD and designated by the Colorado Water Conservation Board as areas susceptible to being inundated as a result of a flood. In these flood-susceptible areas, the City would be able to impose all floodplain regulations even if such area is outside the boundary established by FEMA. The ability to regulate in these additional high-risk areas will ensure measures are in place to protect the safety of residential, commercial, or critical facilities in the event of a flood.

City staff believes that these proposed edits are consistent with the Arvada Comprehensive Plan because the proposed edits will ensure that the community and developers can clearly understand and interpret the Land Development Code as it pertains to floodplain regulations. City staff further believe that these proposed edits are consistent with the intent and purposes of the Land Development Code because the updated regulations will promote the public health, safety, convenience, comfort, prosperity, and general welfare of the City. The Planning Commission unanimously approved the proposed edits (excluding the most recent change to Section 4-1-2-6(E)) under this criteria at the January 16, 2024 Planning Commission meeting.

Public Contact

Posting of the City Council agenda

Commission Recommendation

The Planning Commission recommended approval of this item during their January 16, 2024 Public Hearing with a vote of 5-0 (2 absent).

Strategic Alignment

This action supports the principle for providing the community with a safe, resilient, high-quality drainage system for full city build out.

Alternative Courses of Action

N/A

Recommendation for Action

The Arvada team recommends that the City Council approve CB24-001, An Ordinance Amending Various Provisions of Arvada's Land Development Code Pertaining to Floodplain Regulation.

Suggested Motion:

I move that CB24-001, An Ordinance Amending Various Provisions of Arvada's Land Development Code Pertaining to Floodplain Regulation, be (approved on final reading, numbered 4867 and ordered published by title only) (rejected).

Prepared by:
Heidi Van Gieson, Administrative Specialist

Reviewed by:

Approved by:

Jenny Wolfschlag, City Engineer	1/22/2024
Jacqueline Rhoades, Public Works Director	1/24/2024
Josie Suk, Development Systems and Administrative Manager	1/25/2024
Jessica Garner, Director of Community and Economic Development	1/25/2024
Bryan Archer, Director of Finance	1/29/2024
Tammy Hedlund, Legal Specialist	1/29/2024
Laura Hemler, Assistant City Attorney	1/29/2024
Rachel Morris, City Attorney	1/31/2024
Don Wick, Deputy City Manager	1/31/2024
Lorie Gillis, City Manager	1/31/2024

SUBJECT: CB24-001, An Ordinance Amending Various Provisions of Arvada's Land Development Code Pertaining to Floodplain Regulation (Ordinance No. 4867) (Presenter: Melanie Walter, Floodplain Administrator)

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Enclosure, exhibits & attachments required to support the report

COUNCIL BILL NO. 24-001
ORDINANCE NO.4867

AN ORDINANCE AMENDING VARIOUS PROVISIONS OF ARVADA’S LAND
DEVELOPMENT CODE PERTAINING TO FLOODPLAIN REGULATION

WHEREAS, the City of Arvada, Colorado, (“City”), is a home rule municipality, organized and existing under Article XX, Section 6 of the Colorado Constitution; and

WHEREAS, on or about May 18, 2020, the City adopted the Arvada Land Development Code (“LDC”) pursuant to CB20-012;

WHEREAS, the LDC contains the City’s floodplain rules and regulations; and

WHEREAS, the Arvada City Council now wishes to update the floodplain regulations contained within the LDC to conform with state and federal laws in addition to current City practices.

NOW THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF ARVADA, COLORADO:

Section 1. Section 2-1-2-5, “Official floodplain maps,” of Division 2-1-2, “Establishment of Zoning Districts” of Article 2-1, “Zoning Districts and Lot and Building Standards” of Chapter 2, “Zoning Districts” of the Arvada Land Development Code is hereby repealed and reenacted to read as follows:

“Sec. 2-1-2-5. Reserved.”

Section 2. Article 4-1, “Environmental Quality” of Chapter 4, “Environmental and Site Design,” of the Arvada Land Development Code is hereby repealed and reenacted to read as follows:

“ARTICLE 4-1. ENVIRONMENTAL QUALITY

DIVISION 4-1-1. PURPOSE AND APPLICATION OF ARTICLE

Sec. 4-1-1-1. -Purpose of article.

The purpose of this Article is to promote and maintain environmental quality and livability in the City, and to mitigate natural hazards to life, safety, and property using standards that regulate the location and design of development.

Sec. 4-1-1-2. -Application of article.

- A. *Generally.* The Divisions within this Article are applied as follows:
1. Division 4-1-2, Floodplain Regulations, establishes standards for development within the Regulatory Floodplain, in order to reduce and mitigate flood hazards.
 2. Division 4-1-3, Stormwater and Drainage Control, establishes design principles for grading and drainage system design.
 3. Division 4-1-4, Natural Hazards and Environmentally-Sensitive Areas, establishes standards for avoiding or mitigating natural hazard areas and for protecting environmentally-sensitive areas from the impacts of development.
 4. Division 4-1-5, Irrigation Canals and Ditches, establishes standards for development near irrigation canals and irrigation ditches.
- B. *Relationship to Other Standards of this Code.* The standards of this Article, particularly Division 4-1-2, Floodplain Regulations, and Division 4-1-5, Irrigation Canals and Ditches, may restrict development on certain locations of a subject property. When the application of these standards would result in exceptional hardship to the Applicant upon a determination that the variance is the minimum necessary, a variance may be permissible to allow development on other parts of the subject property pursuant to Section 8-3-11-2, Variances.

DIVISION 4-1-2. FLOODPLAIN REGULATIONS

Sec. 4-1-2-1. -Statutory authorization.

The Legislature of the State of Colorado has, in C.R.S. Title 29, Article 20, delegated the responsibility of local government units to adopt regulations designated to minimize flood losses. Therefore, the City Council of Arvada, Colorado, does hereby adopt the following floodplain management regulations.

Sec. 4-1-2-2. -Findings of fact.

- A. Flood hazard areas of the City are subject to periodic inundation, which can result in loss of life and property, health and safety hazards, disruption of commerce and government services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the health, safety, and general welfare of the public.
- B. These flood losses are created by the cumulative effect of obstruction in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed, or otherwise protected from flood damage.

Sec. 4-1-2-3. -Purpose and definitions.

- A. This Division is intended to provide the means and the regulations to promote the health, safety, and general welfare of the public, and to minimize public and private losses due to flood conditions in specific areas subject to flood hazards, and to promote wise use of the floodplain. This Division has been established with the following purposes intended:
1. To reduce the hazards of flood to human life, health, and property;
 2. To alert floodplain occupants, or potential occupants, to flood damages which may result from their own, or others' land use;
 3. To minimize damage to critical facilities, infrastructure, and other public facilities and utilities such as water, sewer, and gas mains; electrical and communications facilities; and streets and bridges located in the regulatory floodplain;
 4. To minimize prolonged business interruptions caused by flooding;
 5. To minimize the expenditure of public money for costly flood control projects;
 6. To minimize the need for rescue and relief efforts associated with flooding, which are generally undertaken at the expense of the public;
 7. To help maintain stable tax base by providing for the sound use and development of the regulatory floodplain, so as to minimize future flood blight areas;
 8. To ensure potential buyers are notified if properties are in a regulatory floodplain; and
 9. To encourage and facilitate urban water resources management techniques for the reduction of pollution and the enhancement of the urban environment.
- B. Terms used in this Division 4-1-2 shall have the meanings set forth in section 11-3-3-1 of this Code if specifically defined.

Sec. 4-1-2-4. -Methods of reducing flood losses.

- A. In order to accomplish its purposes, this Division includes methods and provisions for:
1. Requiring all construction of permitted buildings to be in compliance with the City of Arvada Building Code;

2. Restricting or prohibiting land uses that are a) dangerous to public life, health, safety, and property in times of flooding, or b) result in damaging increases in erosion, flood heights, or velocities;
3. Requiring land uses vulnerable to floods, including facilities that serve such uses, be protected against floods at the time of initial construction or substantial improvements;
4. Regulating the manner in which a structure or building may be constructed in Special Flood Hazard areas;
5. Regulating the method of construction of water supply and sanitation systems so as to reduce disease, contamination, and unsanitary conditions;
6. Delineating and describing areas that could be inundated by floods;
7. Regulating the method of construction and pattern of development within all uses in the regulatory floodplain;
8. Regulating the alteration of natural floodplains, stream channels, and natural protective barriers, that help accommodate or channel flood waters;
9. Regulating or prohibiting filling, grading, development, dredging, and unnecessary encroachments that may increase flood damage;
10. Encouraging uses such as greenbelt, open space, agricultural, recreation facilities, and riding trails in floodplain areas;
11. Preventing or regulating the construction of flood barriers that will unnaturally divert flood waters or that may increase flood hazards in other areas; and
12. Prohibiting makeshift structures, enclosures, or other shelters used for human habitation in floodplain areas, except in locations expressly permitted by the City and having adequate sanitation facilities and approved flood evacuation plans.

Sec. 4-1-2-5. -Adoption of official DFIRMs and related FISs and basis for establishing the Regulatory Floodplain.

A. *Official FIS and accompanying FIS adopted; revisions.*

1. *Adoption.* The City hereby adopts the following flood insurance studies and their accompanying flood insurance rate maps provided to the City by FEMA and any revisions thereto as the applicable FISs and FIRMs for the City:

- a. The Flood Insurance Study, Jefferson County, Colorado and Incorporated Areas and its accompanying FIRM and DFIRM dated January 15, 2021, and
 - b. The Flood Insurance Study, Adams County, Colorado and Incorporated Areas and its accompanying FIRM and DFIRM dated September 28, 2018.
2. *Revisions through LOMR.* Any revisions issued by FEMA to the maps and studies adopted in section 4-1-2-5(A) through a LOMR, together with all explanatory notations and matter thereon, are automatically adopted by the City upon the effective date of the LOMR without amendment to this Code and declared to be a part of this Code.
 3. *Amendments.* In the event FEMA provides the City with new, updated FISs or FIRMs, this section must be amended to adopt the most current FIRM and its accompanying FIS. The Floodplain Administrator shall keep a copy of the FIS, DFIRMs and FIRMs adopted by this Code on file and available for public inspection.

B. *Basis for establishing the Regulatory Floodplain.*

1. *Regulatory Floodplain.* The Regulatory Floodplain consists of all the Special Flood Hazard Areas (SFHAs) within the City as designated as such by the official FIS adopted in subsection A of this 4-1-2-5. This Regulatory Floodplain is the minimum area within the City subject to the applicability of this Code and may be supplemented by studies designated and approved by the City.
2. *Boundaries.* The boundaries of the Regulatory Floodplain, the Flood Fringe Sub-Zone, the Floodway Sub-Zone within City land, shall be determined from the current effective FEMA DFIRMs and related FISs adopted by the City pursuant to subsection A of this section 4-1-2-5. The boundary lines on the map shall be determined by using the scale appearing on the map. For the purpose of final determination of the Regulatory Floodplain boundaries, the base flood elevations on the 100-year flood profile shall control. The base flood elevations shall be shown on the flood profiles and tabulations in the adopted FISs and DFIRMs, as may be amended by FEMA through a LOMR or PMR.
3. *Conflict.* Where there is a conflict between the boundary lines illustrated on the map and actual field conditions, the dispute shall be settled according to Section 8-3-11-7, Official Interpretations.

4. *Lack of information.*

- (a) If the boundaries of an area are unclear based on the currently adopted FIRMs and FISs, and no other information is available by which to determine the boundaries of an area (i.e., site specific studies as provided by the property owner), the boundaries shall be determined by scaling distances on the maps provided in the FIS. Where interpretation is needed as to the exact location of the boundaries, the Floodplain Administrator shall make the necessary interpretation utilizing information deemed relevant by the Floodplain Administrator. In all cases, the base flood elevation as provided in the FIS shall be the governing factor in locating the boundary on any property.
- (b) When base flood elevation data has not been provided in accordance with these regulations, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation data and floodway data available from a federal, state, or other sources, in order to administer the applicable provisions of Division 4-1-2, Floodplain Regulations.
- (c) For waterways with base flood elevations for which a regulatory floodway has not been designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within zones A1-30 and AE on the FIRM adopted pursuant to section 4-1-2-5, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one-half foot at any point within the community.

5. *District Types.* A SFHA is not a separate Zoning District, but is an overlay over an existing Zoning District. The Regulatory Floodplain is subdivided into the Flood Fringe Sub-Zone (defined in section 4-1-2-7) and the Floodway Sub-Zone (defined in section 4-1-2-8). In addition to meeting the conditions of the underlying Zoning District, any property to be developed in the Regulatory Floodplain must meet the conditions of the applicable Floodway Sub-Zone and Flood Fringe Sub-Zone. For those areas where base flood elevation has not been determined, including Flood Zone A within the Flood Fringe Sub-Zone, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation data from federal, state, or other source as criteria for determining

final floodplain areas boundaries and administering rules, regulations and requirements within the Regulatory Floodplain.

6. *Other Areas.* Areas outside of the Regulatory Floodplain but within the City and susceptible to being inundated as the result of a flood, including FHAD studies produced through the Urban Drainage and Flood Control District and designated by the Colorado Water Conservation Board, and the area of land over which flood water would flow from the spillway of a reservoir, shall be referred to as floodplain areas generally. Floodplain areas are still subject to the requirements of this Code.
7. *Areas Removed from the Regulatory Floodplain by Fill or Amendment.* For purposes of this Article, areas removed from the Regulatory Floodplain include all existing and proposed LOMR-F and LOMA areas, if the LOMR-F or LOMA area has not previously been superseded by a standard LOMR.

Sec. 4-1-2-6. -Regulatory floodplain – General standards.

- A. *Generally.* The general standards of this Section apply to all areas within the Regulatory Floodplain and all floodplain areas as defined in Section 4-1-2-5(6).
- B. *Anchoring.*
 1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure, and capable of resisting the hydrostatic and hydrodynamic loads.
 2. All manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement and must be capable of resisting the hydrostatic and hydrodynamic loads. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces. Specific requirements may be:
 - a. Over-the-top ties provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than 50 feet long requiring only one additional tie per side; and
 - b. Frame ties provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than 50 feet long requiring four additional ties per side; and

- c. All components of the anchoring system must be capable of carrying a force of 4,800 pounds; and
- d. Any additions to the manufactured home be similarly anchored.

C. *Construction Materials and Methods.*

- 1. All new construction and substantial improvements shall be constructed with utility equipment resistant to flood damage and using materials and methods that minimize flood damage.
- 2. All new construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
- 3. New construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access, or storage in an area other than a basement and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered Colorado Professional Engineer or architect, or meet or exceed the following minimum criteria:
 - a. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - b. The bottom of all openings shall be no higher than one foot above lowest adjacent grade (LAG).
 - c. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

D. *Utilities.*

- 1. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
- 2. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.

3. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

E. *Fences.*

1. Fences may be permitted in the Regulatory Floodplain depending on the type and use of the fence at the discretion of the Floodplain Administrator. Any proposed fence in the Regulatory Floodplain shall require review by the Floodplain Administrator and issuance of a Floodplain Development Permit, in addition to other required permit(s). Table 4-1-2-4 is a guideline to provide assistance with understanding and selecting appropriate fencing in a floodplain, however exceptions may be made on a case-by-case basis upon the Floodplain Administrator's evaluation of the following: the proposed location of the fence and the designation of the location (i.e. whether the location is within the Flood Fringe Sub-Zone, Floodway Sub-Zone, Shallow Flooding Zone, etc...), the materials used for the fence (i.e. wire, rails, chain link, pickets, masonry, etc...), the dimension and length of the fence, and whether the fence is being replaced in kind.

Table 4-1-2-6: Fence Use Allowed by SFHA Sub-Zone			
FENCE TYPE	FLOOD FRINGE Zones A, AE, and AO	FLOODWAY Zone AE	SHALLOW FLOODING Zone X
Open barbed or barbless wire ¹	Yes	Yes, unless the proposed is to contain livestock within a corral	Yes
Open pipe or rail fencing (i.e. corrals) ²	Yes	Yes, with limited cross fencing ⁴ ; not allowed in main channel	Yes
Other wire, pipe, or rail fencing (i.e. field fence, welded wire, chicken wire) ³	Yes, if elevated to or above the flood height	Case by case review	Yes, if elevated to or above the flood height
Chain link	Case by case review	No	Yes
Picket fencing (50% opaque ⁵)	Case by case review	No	Yes
Alternating board / shadow box (80% opaque)	Case by case review	No	Yes
Solid board fencing or masonry walls	Case by case review – design required	No	Yes, if elevated to or above flood height or adequate openings are provided ⁴
Collapsible or breakaway fencing	Case by case review-design required		
TABLE NOTES:			
¹ Barbed or barbless wire is considered open if there is no more than one (1) horizontal strand per foot of height and no more than one (1) vertical wire or post every six (6) feet.			
² Open pipe or rail fencing shall be 90% open and have posts placed no closer than eight (8) feet part.			
³ Other wire, pipe, or rail fencing that is not considered “open” shall include minimum spacing of not less than six-inch by six-inch (6”x6”) square openings.			
⁴ Determination of cross-fencing requirement and/or adequate opening size and number shall be made by the Floodplain Administrator. Adequate openings shall allow the free-flow of floodwaters without increasing the depth of water at all.			
⁵ Opacity is the degree to which light or views are blocked. With reference to fencing, it is measured perpendicular to the fence for each fence section between supports.			

F. *Subdivision Proposals.*

1. All subdivision proposals and other new development, including manufactured home parks or subdivisions, shall be reviewed by the appropriate City officials to determine whether the proposed development will be reasonably safe from flooding. Any such proposals in the Regulatory Floodplain shall be reviewed to ensure that:
 - a. The proposal is consistent with the need to minimize flood damage;

- b. The proposal has public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;
- c. The proposal has adequate drainage provided to reduce exposure to flood damage; and
- d. Base flood elevation data is provided. All subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is lesser, shall include within such proposals base flood elevation data.

G. *Flood-Proofing.* All-flood proofing measures mandated in this Section shall be subject to the requirements of this code regarding the establishment of floodplain development permits, and regarding nonresidential structures. A professional engineer registered in the State of Colorado shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this Section and the design is consistent with the flood protection elevations for the particular area as shown by the flood profile, flood velocities, and other factors associated with the flood protection elevation. Such certifications shall be provided to the Floodplain Administrator as set forth in subsection 8-1-1-4, Floodplain administrator. In addition to the flood-proofing measures described elsewhere in this Section, others may include:

- 1. Installation of watertight doors, bulkheads and shutters,
- 2. Reinforcement of walls to resist water pressure,
- 3. Use of paints, membranes, or mortars to reduce seepage of water through walls,
- 4. Addition of mass or weight to structures to resist flotation,
- 5. Installation of pumps to lower water levels in structures,
- 6. Addition or design of pumping facilities for subsurface drainage systems of buildings to relieve external foundation, wall, and basement floor pressures,
- 7. Construction to resist rupture or collapse caused by water pressure or floating debris, and
- 8. Installation of cutoff valves on sewer lines or the elimination of gravity flow basement drains.

Sec. 4-1-2-7. -Flood fringe sub-zone standards.

- A. *Generally.* The Flood Fringe Sub-Zone represents the area that is inundated in the 100-year flood that may serve as a temporary storage area for the flood waters and is the area that lies landward of the floodway.
- B. *Special Provisions.*
1. No fill, structure, deposit, or other floodplain uses are permitted in the flood fringe sub-zone that adversely affect the efficiency of any channels or floodways of any tributaries to the main stream or river; drainage ditches; or any other drainage facilities or systems. Tents and other makeshift structures, enclosures, or other similar shelters used for human habitation are also prohibited in the flood fringe sub-zone.
 2. If a property has been issued a LOMR-F and the property has been filled so as to remove it from the floodplain, no building permit shall be issued for a new structure to be constructed that would result in a finished floor elevation, including the basement, below the previously existing base flood elevation.
 3. *Residential Construction.* New construction and substantial improvement of any residential structure within or moved into the Regulatory Floodplain shall have the lowest floor (including the basement and any mechanical equipment or attendant utilities) constructed at or above the flood protection elevation of two feet above the base flood elevation. If such new construction or substantial improvement of a residential structure is within Flood Zone AO, then the lowest floor of the residential structure (including the basement and any mechanical equipment or attendant utilities) must be constructed at or above a point two feet above the depth number specified in feet on the DFIRM, and the depth number shall be at least two feet if it is not specified on the DFIRM. For new construction and substantial improvements of residential structures within Zones AH and AO in the Regulatory Floodplain, adequate drainage paths shall be constructed all around the structures on slopes to guide flood waters around and away from the structures. If neither base flood elevation nor depth number is available, the flood protection elevation shall be at least four feet above the highest adjacent grade.
 4. *Nonresidential Construction.* New construction and substantial improvements of any commercial, industrial, or other non-residential structure within or moved into the Regulatory Floodplain shall either:
 - a. Have the lowest floor (including basement and any mechanical equipment or attendant utilities) constructed at or above the flood protection elevation of one foot above the base flood elevation, or at or above a point one foot above the depth number if within Flood Zone AO, and as specified in feet

on the DFIRM (the depth number shall be at least two feet if it is not specified on the maps). If neither base flood elevation nor depth number is available, the flood protection elevation shall be at least three feet above the highest adjacent grade; or

- b. Together with attendant utility and sanitary facilities shall:
 - i. Be flood-proofed to or above the flood protection elevation, such that the structure is watertight with walls substantially impermeable to the passage of water;
 - ii. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and
 - iii. Be certified by a Colorado registered professional engineer that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this paragraph. Such certifications shall be provided to the Floodplain Administrator as set forth in subsection 8-1-1-4.
- c. For non residential construction within Zones AH and AO in the Regulatory Floodplain, adequate drainage paths shall be constructed all around structures on slopes to guide flood waters around and away from the structures.

5. *Manufactured Homes.* Manufactured homes shall be anchored in accordance with Section 4-1-2-6(B), Anchoring.

- a. All manufactured homes that are placed or substantially improved on a site in Zones A1-30, AH, or AE on the DFIRM shall be elevated on a permanent foundation such that the lowest floor of the manufactured home, together with mechanical equipment and attendant utilities, is constructed at or above a point two feet above the base flood elevation, and shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement, if the manufactured home is:
 - i. Outside of a manufactured home park or subdivision;
 - ii. In a new manufactured home park or subdivision;
 - iii. In an expansion to an existing manufactured home park or subdivision; or

- iv. In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood.
- b. All manufactured homes that are placed or substantially improved on sites in existing manufactured home parks or subdivisions that are not subject to the provisions in subsection (a) above, shall be elevated so that either:
 - i. The lowest floor of the manufactured home, together with mechanical equipment and attendant utilities, is constructed at or above a point two feet above the base flood elevation; or
 - ii. The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and are securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement of the foundation from hydrostatic and hydrodynamic loads, including buoyancy.
- c. Any manufactured home park or manufactured home subdivision within the limits of the Regulatory Floodplain shall file an evacuation plan with the appropriate disaster preparedness authority indicating alternate vehicular access and escape routes.

6. *Recreational Vehicles.*

- a. A recreational vehicle ("RV") is a vehicle which is:
 - i. Built on a single chassis;
 - ii. 400 square feet or less when measured at the largest horizontal projection;
 - iii. Designed to be self-propelled or permanently towable by a light duty truck; and
 - iv. Designed primarily not for use as a permanent dwelling but as a temporary living quarters for recreational, camping, travel, or seasonal use.
- b. All RVs shall either:
 - i. Be on the site for fewer than 180 consecutive days;

- ii. Be fully licensed and ready for highway use (meaning the RV is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities, and has no permanently attached additions); or
 - iii. Meet the permit requirements and elevation and anchoring requirements for a manufactured home for resisting flotation, collapse, and lateral movement from hydrostatic and hydrodynamic loads, including buoyancy.
- 7. *Critical Facilities.* New construction and substantial improvements of any facility classified as a critical facility within or moved into the Regulatory Floodplain shall have the lowest floor (including basement and any mechanical equipment or attendant utilities) constructed at or above a point two feet above the base flood elevation. New critical facilities shall, when practicable as determined by the Floodplain Administrator, have continuous non-inundated access (ingress and egress for evacuation and emergency services) during a 100-year flood event.
- 8. *Materials Storage and Processing.* The storage or processing of materials that are buoyant, flammable, explosive, or in times of flooding could be injurious to human, animal, or plant life, shall be at or above a point two feet above the base flood elevation for a particular area, or adequately flood-proofed in accordance with provisions in this Division.
- 9. *Approvals.* Building plans for all projects or construction, regardless of the type of structure, that will be placed, altered, or constructed within the Flood Fringe Sub-Zone must be submitted to the Floodplain Administrator, for approval, in accordance with Section 8-3-5-6, Floodplain Development Permit, to ensure that said project or construction will not adversely affect the Regulatory Floodplain and is in compliance with the requirements of this code pertaining to the Regulatory Floodplain.
- 10. *Anchoring.* Any structure permitted in the Flood Fringe Sub-Zone pursuant to this Section shall be firmly anchored to prevent the structure or building from floating away and thus threatening to restrict bridge openings and other restricted sections of the stream or river.
- C. *Permitted Uses.* Any uses permitted by the underlying zoning district, in conformance with the provisions in the above subsection (B), may be permitted by the Floodplain Administrator, subject to the following conditions:

1. If the Floodplain Administrator disallows a requested use through a Floodplain Development Permit that is permitted in the underlying zoning district, and that is in conformance with the provisions in the above subsection (B), the Applicant may follow the procedures outlined in Section 8-3-11-6 Floodplain Variance, or Section 8-2-5, Administrative Appeals.
 2. The Floodplain Administrator may also require the Applicant to follow the procedure outlined in Section 8-3-5-6, Floodplain Development Permit for certain uses in the Flood Fringe Sub-Zone, when said action appears to be in the public interest, and where the health, safety, and welfare of the public may be in question.
- D. *Watercourse.* In riverine situations, adjacent communities and the state coordinating agency, which is the Colorado Water Conservation Board, should be notified prior to any alteration or relocation of a watercourse, and submit evidence of such notification to FEMA in order to ensure that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained. The applicant is responsible for submitting such notification.

Sec. 4-1-2-8. -Floodway sub-zone standards.

- A. *Generally.* Floodways are extremely dangerous areas due to the velocity of floodwaters that carry debris, potential projectiles, and have significant erosion potential.
- B. *Special Provisions.* The following regulations shall apply to all uses within the Floodway Sub-Zone, notwithstanding that such uses may be specifically permitted under the terms of this LDC:
1. The flood protection elevation or height shall correspond to a point one foot (two feet for residential structures) above the base flood elevation shown on or attached to the flood map for a particular area.
 2. No structure or temporary structure, fill, including fill for roads and levees, deposit, obstruction, storage of materials, or other floodplain uses which acting alone or in combination with existing or future floodplain uses, shall be permitted that affects the efficiency of the floodplains based on the assumption that there will be an equal degree of encroachment extending for a significant reach on both sides of the stream. Tents, makeshift structures, enclosures, or other shelters used for human habitation are prohibited in their entirety, regardless of the impact on the efficiency of the floodplain, unless expressly allowed by the City.

3. No floodplain uses shall affect the efficiency of or restrict the capacity of the channel or floodways of any tributaries to the main stream, drainage ditches, or any other drainage facilities or systems.
4. No developments or improvements shall be allowed within the Floodway Sub-Zone that would result in any increase in flood levels during the occurrence of the base flood discharge within the City.
5. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, the City may approve certain development in Zones A1-30, AE, AH, on the City's FIRM which increases the water surface elevation of the base flood by more than one-half foot, provided that the City, or other appointed entity, first applies for a conditional FIRM revision through a CLOMR); fulfills the requirements for such revisions as established under the provisions of Section 65.12; and receives FEMA approval.

C. *Description of Permitted Uses.* The following open uses shall be permitted within the Floodway Sub-Zone to the extent that they are also permitted in a particular area by the underlying zoning district:

1. Agricultural uses such as: general farming, pasture, truck farming, sod farming, and wild crop harvesting;
2. Industrial-Commercial uses such as: parking areas and airport landing strips;
3. Public and private recreation uses not requiring permanent or temporary structures designed for human habitation, such as: parks, golf courses, driving ranges, picnic grounds, wildlife and nature preserves, shooting preserves, target ranges, trap and skeet ranges, hunting, fishing and biking areas;
4. Utility facilities such as: transmission lines, excluding above ground support facilities; underground pipelines; water monitoring devices; roadways and bridges; and
5. Uses very similar in nature to permitted uses may be allowed provided that they are consistent with the provisions of this Section.

D. *Description of Permitted Structures.* Temporary and permanent structures accessory to open uses permitted in Subsection (C), above, shall be permitted subject to submittal of building plans to the Floodplain Administrator for approval in accordance with Section 8-3-5-6, Floodplain Development Permit, which:

1. Will not be designed for human habitation;

2. Will have a low flood damage potential;
3. If permitted, will be constructed and placed on the building site so as to offer the minimum obstruction to the flow waters:
 - a. Whenever possible, structures will be constructed with the longitudinal axis parallel to the direction of the flow of flood waters, and
 - b. Insofar as feasible, structures will be placed so their longitudinal axis is approximately on the same line as those of adjoining structures; and
4. Will be firmly anchored to prevent the structure or building from floating away, thus threatening to further restrict bridge openings and other restricted sections of the stream or river.

Sec. 4-1-2-9. -Abrogation and greater restrictions.

This Division is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this Division or another Division, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

Sec. 4-1-2-10. -Warning and disclaimer of liability.

The degree of flood protection required by this Division is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. On rare occasions greater floods can occur and will occur. Flood heights may be increased by manmade or natural causes.

This Division does not imply that land outside the Regulatory Floodplain or uses permitted within such areas will be free from flooding or flood damages. This Division shall not create liability on the part of the City or any official or employee thereof for any flood damages that result from reliance on this Division or any administrative decision lawfully made thereunder.

Sec. 4-1-2-11. -Severability.

This Division and various parts thereof are hereby declared to be severable. Should any section of this Division be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the Division as a whole, or any portion thereof other than the section so declared to be unconstitutional or invalid.

DIVISION 4-1-3. STORMWATER AND DRAINAGE CONTROL

Sec. 4-1-3-1. -Purpose.

This Division has been established with the following purposes intended:

1. Promote the public health, safety, and welfare by minimizing flood losses and the inconvenience and damage resulting from uncontrolled and unplanned stormwater runoff in the City;
2. Minimize increases in stormwater runoff as a result of development;
3. Reduce pollutants in stormwater discharges from construction activity;
4. Minimize increases in non-point source pollution cause by stormwater runoff;
5. Reduce flooding, siltation, stream bank erosion, and channel degradation; and
6. Ensure that stormwater management controls are properly maintained.

Sec. 4-1-3-2. -Applicability.

- A. This Division shall apply to all construction in the City that disturbs 10,000 square feet or more of land surface. Water quality standards and detention apply to all new development and redevelopment that disturbs one acre or more. Erosion control shall apply to all land and efforts to prevent, mitigate, and control accelerated soil erosion and shall include the design, installation, and implementation of temporary erosion control measures prior to any earth disturbance activities.

Sec. 4-1-3-3. -Storm drainage facilities design.

- A. *Storm Drainage Facilities.* Design of storm drainage facilities, including but not limited to best management practices for permanent stormwater quality, shall be based upon the Urban Storm Drainage Criteria Manual of the Urban Drainage and Flood Control District, the City of Arvada Engineering Code of Standards and Specifications, and the City's Municipal Separate Storm Sewer System Permit requirements, as may be amended from time to time.
- B. *On-Site Drainage Control.* The best management practices for on-site drainage should be selected and designed to avoid or minimize, to the extent practicable, adverse water quality impacts of stormwater discharged from the development. Unless a regional drainage solution is required, the following shall apply:
 1. *On-Site Drainage Facilities.* Drainage facilities shall be provided on-site to control drainage, storm and surface waters within the development, and all drainage originating off-site traversing or flowing adjacent to the development.

2. *Detention.* Designs shall provide detention facilities on-site to contain all stormwaters generated which are in excess of historic flows. These detention facilities shall be designed so that the peak flow from the property is as nearly equal, as practicable, to that which is deemed historic. Detention shall not be constructed within the 100-year floodplain.
3. *Underground Water Quality and Detention Facilities.* Although surface stormwater quality and detention is encouraged, in some cases underground appurtenances are desired and allowed. Water quality must meet the City's Municipal Separate Storm Sewer System requirements to be approved for installation. Written verification of successful installation shall be submitted to the City Engineer from the manufacturer of the underground appurtenance prior to the first Certificate of Occupancy for the development.
4. *Management Practices.* Permanent stormwater quality control shall be maintained by the property owner consistent with an Operations and Maintenance Manual (O&M Manual) submitted with the final site plan review. If not maintained, the City can access, maintain, and shall receive reimbursement from the property owner for maintenance conducted, or a lien will be placed on the property.
5. *Regional Drainage Solutions.* Regional drainage solutions may be required for the development as determined by the City Engineer.

Sec. 4-1-3-4. -Limitations on site disturbance.

- A. *Generally.* A site disturbance permit must be obtained in accordance with Chapter 50 of the City Code.
- B. *Exemptions.* This Section does not apply to agriculture and irrigation ditch or reservoir maintenance activities and is limited to only routine maintenance activities that are excluded from being an “applicable construction site” under the City’s Municipal Separate Storm Sewer System (MS4) Permit.
- C. *Limitation on Disturbed Area.* Cuts, fills, grading, excavation, vegetation removal, and building construction shall be confined to the footprint of the proposed building, plus a working area of not more than 30 feet around each such footprint, plus any site disturbance necessary for installation and maintenance of utilities, access ways, trails, irrigation ditches, and fences, and for landscaping, agriculture, and similar activities.
- D. *Erosion Control Plans and State Permits.*
 1. All erosion control plans shall comply with applicable standards adopted by the Urban Drainage and Flood Control District, the City of Arvada Engineering Code

of Standards and Specifications, and City Code Article IV, Section 50-70 through 79 as may be amended from time to time.

2. A Stormwater Management Plan is required in accordance with Chapter 50 of the Arvada City Code. A permit from the Colorado Discharge Permit System-Stormwater may be required from the Colorado Department of Public Health and Environment, Water Quality Control Division, prior to start of construction.

Sec. 4-1-3-5. -Low-impact development practices.

- A. *Purpose.* The purpose of this Section is to encourage the incorporation of Low-Impact Development (LID) practices into site designs in order to mitigate the impacts of increased runoff and stormwater pollution from new development, redevelopment, and infill development as close to the source as practicable. LID practices, if designed and constructed correctly, help preserve permeable surfaces, remove pollutants, regenerate groundwater supply, and encourage the use of native plants.
- B. *Low-Impact Development Options.* The options below are encouraged to implement LID at the time of site development or redevelopment. The options are not intended to be prescriptive or to inhibit creative design. To implement the LID in order to reduce water quality treatment of stormwater runoff, the City's Municipal Separate Storm Sewer System Permit conditions must be met.
- C. Further descriptions and examples of LID options are in the Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual, Volume 3 for the following:
 1. Bioswales are vegetated swales planted with wet tolerant species of plants or ornamental grasses. They transport, store, and allow infiltration of water, and can be designed as a landscape feature. Bioswales are not grassed, but are planted with a variety of plant species that can withstand occasional water inundation for short periods of time.
 2. Grassed swales are designed conveyance devices used to transport water over the surface of the ground to a point of disposal that may be a catch basin, ditch, or water body that will filter, infiltrate, evaporate, and clean water of total suspended solids, solid waste, and other pollutants. Swales are often appropriate along property lines, public streets, and around buildings.
 3. Rain gardens are small, shallow depressions planted with a variety of native or ornamental plants that can treat small amounts of runoff to improve water quality.

Rain gardens are generally small collections of water-loving plants planted on a low site area to collect rainfall.

4. Permeable pavers and porous surfaces allow water seepage through the joints and the gravel base beneath the pavers. This allows for the infiltration of rainwater, thereby reducing the runoff leaving a site. When used in conjunction with street tree planting, this allows for air circulation around tree roots and can easily be removed in order to trim tree roots and to regrade a walkable surface. Use of permeable pavers or porous pavement shall not be permitted in locations required for fire and emergency access unless specifically allowed by the City Engineer.
5. Sand filters are depressions, trenches, barriers, or sand lenses constructed of porous matter that improves ground water recharge to filter, clean, and trap waterborne pollutants.
6. Other Options.
 - a. Other options include extended detention basins that may be used in open space tracts to treat the runoff from multiple lots, roads, and trails.
 - b. Other LID options may be allowed as approved by the City Engineer.

Figure 4-1-3-5 : Low-Impact Development Options



Bioswale



Grass Bioswale



Native Grass Bioswale



Rain Garden



Combined Options



Permeable Pavers

DIVISION 4-1-4. NATURAL HAZARDS AND ENVIRONMENTALLY-SENSITIVE AREAS

Sec. 4-1-4-1. -Purpose.

- A. *Generally.* New construction shall comply with the standards of this Division, unless compliance with a particular standard would prevent the construction of any permanent structure for a primary use on the land, or require the construction to violate another requirement of this LDC. Where more than one buildable site exists on a subject property and all buildable sites would violate at least one of the standards of this Division, the construction shall be located so as to comply with as many standards as possible.

- B. *Disclaimer.* These standards are considered reasonable for regulatory purposes and do not create liability on the part, or a cause of action against, the City.

Sec. 4-1-4-2. -Limits of development.

- A. The Limits of Development ("LOD") shall indicate the specific areas of a subdivision within which the development activity shall be contained in order to avoid areas identified in Section 4-1-4-3, Natural Hazard Areas, and features identified in Section 4-1-4-4, Significant Natural Features. LODs shall be indicated by the Applicant on the plat, and shall be reviewed and approved by the City as part of the development approval process based on:
1. A visual analysis of the location and apparent extent of areas affected by natural hazards and significant natural features;
 2. Site topography, including but not limited to such characteristics such as steepness of slopes, existing drainage features, rock outcroppings, river and stream terraces, valley walls, ridgelines, and scenic topographic features;
 3. Any recommendations made by any other reviewing agency, including without limitation the U.S. Fish and Wildlife Service or the Colorado Division of Wildlife; and
 4. The practical needs of proposed construction activity in terms of ingress and egress to the developed project and necessary staging and operational areas.

Sec. 4-1-4-3. -Natural hazard areas.

- A. If the subject property contains potential areas of natural or geologic hazard (such as unstable or potentially unstable slopes, faulting, landslides, or rockfalls) or soil conditions (including without limitation all expansive soils) unfavorable to development, or floodplains, the Applicant shall:
1. Identify, on the plat, the LOD (as defined in Section 4-1-4-2, Limits of Development) and include a plat note that those areas are not available for development; or
 2. Provide a report from a geotechnical engineer licensed in Colorado identifying the mitigation measures or engineering precautions necessary to make such areas safe for development and occupancy, and include a plat note stating that development will be subject to those mitigation measures and engineering precautions; or
 3. Incorporate into the plat some combination of subsections (1) and (2) above.

Sec. 4-1-4-4. -Significant natural features.

- A. *Generally.* If the subject property contains significant natural features (such as corridors, bluffs, ridges, steep slopes, stands of mature trees, rock outcroppings—including without limitation the Ralston Buttes—wetlands, native upland ecosystems, riparian areas, and wildlife corridors identified by the Colorado Division of Wildlife) or water features (such as drainages, washes, canals, ditches, lakes, natural ponds, and retention and detention ponds), the Applicant shall identify on the plat the Limits of Development as illustrated by Section 4-1-4-2, Limits of Development, include a plat note that areas outside the Limits of Development are not available for development, and incorporate measures to mitigate any visual, functional, or environmental impact of nearby development on such features.
- B. *Groundwater Recharge.* Any area providing groundwater recharge to bedrock aquifers shall be identified at the time of the development review, and the design of the proposed development shall preserve the total amount and the quality of naturally occurring recharge.

Sec. 4-1-4-5. -Steep slopes and hazardous building conditions.

- A. *Generally.* New lots shall not be created on lands containing an average slope of 25 percent, as measured from the points with highest and lowest elevation within 25 feet of any portion of a proposed building, unless such lots designate a building envelope located to avoid such steep slope areas, and the location of the principal building is restricted to the building envelope. Roads and driveways leading to any primary or accessory structure may not be located on slopes in excess of 25 percent.
- B. *Unstable Slopes and other Hazards.* No new principal building, and no new accessory structure (except mini-structures), shall be constructed in any location that shows evidence of slope instability, landslides, avalanche, flooding, or other natural or man-made hazards. If the City makes a preliminary determination that such evidence exists, the Applicant shall demonstrate, to the City's satisfaction, that the slope's ground surface and subsurface are not unstable, that the proposed development will not cause instability or increase the potential for slope failure, and that the development of the slope will not increase the degree of hazards.

Sec. 4-1-4-6. -Ridgeline protection.

Residential dwellings on ridgelines identified through the development review process shall be sited and the buildings designed so as to not be prominent above any such ridgeline. A reduction in bulk or massing of the dwelling may be required, including limiting the height to

one story and other suitable methods. Maintaining existing on-lot vegetation to provide a continuous screen or backdrop for the dwelling is also a suitable method.

DIVISION 4-1-5. IRRIGATION CANALS AND DITCHES

Sec. 4-1-5-1. -Protection of irrigation canals and ditches.

Where an irrigation canal or irrigation ditch is adjacent to or traverses a subject property, the City may require the Applicant to install walls, fences, or other methods for protective covering separating the lot or lots therefrom.

Sec. 4-1-5-2. -Agreement required.

- A. *Generally.* The City does not adjudicate the relative interests of landowners and owners of irrigation canals and irrigation ditches (i.e., whether such interests are fee-simple or easement interests). As such, where development has the potential to impact an irrigation canal or irrigation ditch (e.g., by installation of an overhead, surface, or subterranean crossing); installation of infrastructure or improvements that may increase seepage (e.g., detention ponds in close proximity to the canal or ditch, or subsurface drainage systems); grading that could result in changes to the amount of stormwater runoff or pollution that reaches the canal or ditch; or improvements that increase the risk of trespass onto canal or ditch infrastructure or rights-of-way, including service roads), the Applicant shall provide to the City a fully executed agreement between the Applicant and the owner of the canal or ditch that is satisfactory to the City and addresses the impacts of the development on the canal or ditch.
- B. *Street or Water and Sewer Utility Crossings.* Any agreement related to crossing an irrigation canal or ditch for the purpose of providing public street access or accessing or obtaining water or sewer service from the City shall identify the City as an approved assignee and require prior written approval (or right to cure defaults in the event of provisions that allow for termination in the event of default) by the City for any modification or termination prior to said assignment.

Sec. 4-1-5-3. -Irrigation ditch or canal crossings.

Technical design of irrigation ditch or canal crossings shall be approved by the City and unless the City or another entity is exercising its power of eminent domain to acquire the property interests necessary to install the crossing, the affected owner of the irrigation canal or irrigation ditch, prior to commencement of construction of the crossing.

DIVISION 4-1-6. CONSTRUCTION ACTIVITIES

Sec. 4-1-6-1. -Restrictions on construction activities.

- A. *Generally.* The standards of this Section shall apply to all construction sites. The City Engineer may modify the requirements of Subsection B(1), E(3), E(4), F, and G, if the City Engineer finds that such modifications are necessary to provide for efficient, expeditious, and safe construction.
- B. *Temporary Facilities.*
1. Temporary structures, portable offices, and other comparable buildings and structures shall be maintained in good repair and arranged in a compact and organized manner on the construction site, in a location that minimizes their visual impacts when viewed from the public street or adjacent properties.
 2. The timing of installation and removal of such facilities is subject to Section 3-1-4-3, Contractor Offices and Temporary Construction Uses.
- C. *Tracking Control.*
1. Mud, dirt, or other debris deposited on the public or common roadway at construction access points shall be removed daily to avoid compaction and damage to the roadway and to minimize drainage system impacts.
 2. Cleaning of any construction equipment or tools on public streets, rights of way, or other vacant land is strictly prohibited.
- D. *Debris Control.*
1. Construction debris shall be immediately placed into containers and screened to the extent possible during construction. Trash containers shall be emptied when full and on a regular basis, but not less than weekly.
 2. Dumping, burial of construction debris, debris pits, and burning of debris at any location is prohibited.
 3. After construction is completed, temporary barriers, surplus materials and all trash, debris and rubbish shall be promptly removed from the site.
 4. All backfill shall be cleared of building material, stone and rubbish prior to placement.
- E. *Erosion, Siltation, and Dust Control.*
1. Precautions for controlling water and wind erosion and sedimentation are required during construction and shall be conducted as an integral part of the construction operation.

2. Dust from topsoil and fill material that is stockpiled on site, as well as any areas disturbed by construction operations, shall be strictly controlled. All disturbed areas shall be stabilized.
 3. The City may require temporary diversion ditches, dikes, silt fences, filter boxes, tackifiers, and comparable facilities, in order to protect the site from erosion prior to completion of construction and establishment of permanent landscaping.
 4. Permanent surface and subsurface drainage systems shall not be used during construction unless entering water has been treated to remove suspended soil particles and other debris. To accomplish this, silting basins shall be installed at all locations necessary to intercept water before it enters catch basins and outfall locations. Silting basins shall be cleaned after each substantial rainstorm.
- F. *Parking.* No construction equipment shall be parked on the streets.
- G. *Materials Storage.* If equipment and materials are stored at the construction site, storage areas shall be unobtrusive when viewed from public streets and adjacent properties.

Sec. 4-1-6-2. -Restoration of disturbed areas.

Disturbed areas shall be restored in accordance with City of Arvada Engineering Code of Standards and Specifications as may be amended from time to time.”

Section 3. Section 4-2-1-3, “Protection of existing vegetation, wildlife areas and natural features,” of Division 4-2-1, “Subdivision Standards” of Article 4-1, “Environmental Quality” of Chapter 4, “Environmental and Site Design” of the Arvada Land Development Code is hereby amended to read as follows:

“Sec. 4-2-1-3. -Protection of existing vegetation, wildlife areas and natural features.

A. *General Requirements.*

1. The general layout of lots, roads, driveways, utilities, drainage facilities, and other services within all proposed subdivisions shall be designed in a manner that minimizes land disturbance and preserves existing trees, vegetation, watercourses, wildlife areas, and other natural features that would add value to the proposed development. The development standards set forth in Division 4-6-2, Tree Removal and Replacement, shall be considered in the layout of the subdivision in order to avoid creating lots or patterns of lots that will make compliance with such standards difficult or infeasible.

2. Existing Trees On-Site. The determination of which existing site trees are to be saved, replaced, or relocated shall be made by the City, pursuant to Division 4-6-2, Tree Preservation and Replacement. No trees shall be removed from any subdivision or any change of grade of the land effected until approval of the plat has been granted. All trees on the platted area required to be retained shall be preserved, and all trees where required shall be welled and protected against change of grade.

B. *Geologic Hazard Areas and Protection of Natural Lands.*

1. *General Requirements.*

- a. All subdivisions shall comply with the standards in Division 4-1-4, Natural Hazards and Environmentally-Sensitive Areas.
- b. All subdivision plats shall be laid out with due regard to geologic hazards, including but not limited to existing soils, conditions, and slope stability. All subdivisions shall evidence design and use compatibility with existing soils, particularly in regard to topography, drainage, bearing capacity, and erosion potential. All subdivision design shall ensure adequate protection from potentially hazardous or undesirable soils or geological conditions on the development site.
- c. No subdivision shall be approved where the design or related facilities clearly constitute the creation of a hazardous circumstance or lack of provision for the public safety.

2. *Hazard Areas within Platted Lots.*

- a. To the maximum extent feasible, lands that contain steep slopes (an average of 30 percent slope or greater as measured from the points with highest and lowest elevation within 25 feet of any portion of the proposed structure) or that show evidence of slope instability, landslides, avalanches, or other natural or man-made hazards shall not be included in platted lots, or alternately, shall not be included within the plats and/or an individual lot's identified Limits of Development. See Section 4-1-4-2, Limits of Development.
- b. Alternately, platted lots may contain such hazard areas only if an acceptable mitigation and remedial plan, prepared by a Colorado-licensed geotechnical engineer, is approved by the City Engineer. Such mitigation plans shall be judged by generally accepted principles of engineering adapted to the particular circumstances of the subdivision site. If

approved, the plat shall include a plat note that all development in the subdivision shall be carried out in conformity with such mitigation and remedial plans.

3. *Floodplain.*

- a. All subdivisions containing lands within the 100-year floodplain, as shown on the most current FIRM and FIS, shall comply with Division 4-1-2, Floodplain Regulations.”

Section 4. Section 8-1-1-4, “Floodplain administrator” of Division 8-1-1, “City Staff and Referral Agencies” of Article 8-1, “Development Review Bodies” of Chapter 8, “Development Review Process” of the Arvada Land Development Code is hereby repealed and reenacted to read as follows:

“Sec. 8-1-1-4. -Floodplain administrator.

- A. *Generally.* The City Engineer, or their designated representative, shall be the Floodplain Administrator and shall administer the floodplain regulation set forth in Division 4-1-2, Floodplain Regulations.
- B. *Duties and Responsibilities.* The Floodplain Administrator's powers and duties under this LDC are set out in this Subsection.
 1. *Floodplain Development Permits.* The Floodplain Administrator shall review Floodplain Development Permit applications to determine if the applicable permit requirements of Division 4-1-2, Floodplain Regulations, have been satisfied and take final action to approve, approve with conditions, or deny such applications. In so doing, the Floodplain Administrator shall ensure that all other necessary permits have been obtained from those governmental agencies from which prior approval is required by federal or state law and make a determination that the proposed building site, including placement of mobile homes, will be reasonably safe from flooding.
 2. *Mapping and Boundary Interpretations.* The Floodplain Administrator shall make interpretations regarding the FIRM boundaries of the Flood Regulatory Floodplain, Floodway, and Flood Fringe Sub-Zones and regarding final floodplain boundaries in accordance with Section 4-1-2-5(B).
 3. *Reports to Hearing Officer on Appeals and Variances.* The Floodplain Administrator shall prepare reports to assist the Floodplain Hearing Officer in his

or her consideration of Administrative Reviews (appeals) and Floodplain Variances.

4. *Other Matters.* The Floodplain Administrator shall have the following other duties and responsibilities:
 - a. Obtain and Maintain Floodplain Information:
 - i. Obtain and record the actual elevation (in relation to mean sea level) of all new or substantially improved structures within the Regulatory Floodplain, whether or not the structure contains a basement.
 - ii. For all new or substantially improved flood-proofed structures:
 - (1) Verify and record the actual elevations (in relation to mean sea level) to which the structure has been flood-proofed.
 - (2) Maintain the flood-proofing certification required in Section 4-1-2-6, Regulatory Floodplain - General Standards.
 - iii. Maintain for public inspection all records pertaining to the provisions of the floodplain regulations, including appeals and variances.
 - (1) Report variances to FEMA upon request.
 - b. For Any Alteration of Watercourses:
 - i. Notify the Colorado Water Conservation Board, Urban Drainage and Flood Control District ("UDFCD"), U.S. Army Corps of Engineers ("USACE"), and adjacent communities prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the FEMA.
 - ii. Require that maintenance is provided within the altered or relocated portion of said watercourse so that flood-carrying capacity is not diminished.
 - iii. Ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained.

- iv. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, the City may approve certain development in zones A1-30, AE, AH, on the City's FIRM which increases the water surface elevation of the base flood by more than one-half foot, provided that the Applicant first applies for a conditional FIRM revision through FEMA (CLOMR); fulfills the requirements for such revisions as established under the provisions of Section 65.12; and receives FEMA approval.”

Section 5. Division 8-1-1, “City Staff and Referral Agencies” of Article 8-1, “Development Review Bodies” of the Arvada Land Development Code is hereby amended to add section 8-1-1-7, City Engineer, which shall read as follows:

“Sec. 8-1-1-7. -City Engineer.

- A. *Generally.* The City Engineer is a member of City Staff who is principally responsible for overseeing, directing, and controlling all engineering operations of the city. In addition to any duties and responsibilities established in this Code or the Arvada City Code, or assigned by the City Manager, the City Engineer shall have the duties and responsibilities set out in this Section.
- B. *Duties and Responsibilities.* The City Engineer or their designee shall create, modify, and enforce the Engineering Code of Standards and Specifications and other similar guidelines and standards adopted by the city. The City Engineer or their designee also has the authority to grant variances or exceptions to such guidelines and standards where the City Engineer or their designee determines it is appropriate to do so.”

Section 6. Section 8-3-4-4, “Amendments to the Official Floodplain Map” of Division 8-3-4, “Zoning and Rezoning” of Article 8-3, “Specific Review Provisions” of Chapter 8, “Development Review Process” of the Arvada Land Development Code is hereby repealed and reenacted to read as follows:

“Sec. 8-3-4-4. Reserved.”

Section 7. Section 11-2-2, “Table of Acronyms” of Division 11-2-2, “Acronyms” of Article 11-2, “Acronyms” of Chapter 11, “Measurements, Rules of Construction, and Definitions” of the Arvada Land Development Code is hereby amended to add the acronym stated herein. Any listed acronyms in Section 11-2-2 not listed herein, remain unchanged.

DFIRM	Digital Flood Insurance Rate Map
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Section 8. Section 11-3-3-1, “Definitions” of Division 11-3-3, “Definitions” of Article 11-3, “Definitions” of Chapter 11, “Measurements, Rules of Construction, and Definitions” of the Arvada Land Development Code is hereby amended or added to read as follows, all defined words specifically stated herein. Any defined words in Section 11-3-3-1 not listed herein, remain unchanged.

“Sec. 11-3-3-1. -Definitions.

Addition. Any activity that expands the enclosed footprint or increases the square footage of an existing structure.

Digital Flood Insurance Rate Map (DFIRM). The FEMA digital floodplain map. These digital maps serve as “regulatory floodplain maps” for insurance and floodplain management purposes.

FEMA. The Federal Emergency Management Agency, the agency responsible for administering the National Flood Insurance Program and emergency management.

Flood Hazard Area Delineation (FHAD). A study produced by the Urban Drainage and Flood Control District d/b/a the Mile High Flood District to identify and update flood risk potential and floodplain boundaries due to both natural and development related changes that occur over time. Such study may or may not be submitted to FEMA for a Physical Map Revision.

Flood Fringe Sub-Zone. The area that is inundated in the 100-year flood that may serve as a temporary storage area for the flood waters and is the area that lies landward of the floodway.

Floodway Sub-Zone or floodway. The channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The Colorado statewide standard for the designated height to be used for all newly studied reaches shall be one-half foot (six inches). All letters of map revision to existing floodway delineations will use the one-half foot designated height floodway criteria and tie back into existing floodway delineations with transitions of not more than 2000 feet.

Letter of Map Amendment. FEMA’s amendment, by letter, to an effective FIRM stating that an existing structure or parcel of land—that is on naturally high ground and has not been elevated by fill—would not be inundated by the base flood.

Physical Map Revisions (PMR). FEMA’s action whereby one or more map panels are physically revised and republished. A PMR is used to change flood risk zones, floodplain and/or floodway delineations, flood elevations, and/or planimetric features.

Regulatory Floodplain. The Special Flood Hazard Areas identified on the Flood Insurance Studies, Flood Insurance Rate Maps, and Flood Hazard Area Delineations as designated by FEMA and/or the Colorado Water Conservation Board and adopted by the city.

Residential structure. Any structure which is designed for human habitation.

Special flood hazard areas or flood hazard areas (SFHA). The land in the floodplain within the City subject to a one percent or greater change of flooding in any given year, i.e., the 100-year floodplain.

Substantial improvement. Any reconstruction, rehabilitation, addition, or other improvement of a structure taking place during a consecutive five-year period, the cumulative cost of which equals or exceeds 50 percent of the market value of the structure before “start of construction” of the improvement. The value of the structure shall be determined by the local jurisdiction having land use authority in the area of interest. This includes structures which have incurred “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the code enforcement official and which are the minimum necessary improvements; or
2. Any alteration of a “historic structure,” provided that the alteration will not preclude the structure’s continued designation as a “historic structure.””

Section 9. The Arvada City Council hereby finds that the amendments in Sections 1-8 are consistent with the Arvada Comprehensive Plan because the amendments will ensure that the community and developers can clearly understand and interpret the Land Development Code. The Arvada City Council also finds that the amendments are consistent with the purposes of the Land Development Code because the regulations will promote the public health, safety, convenience, comfort, prosperity, and general welfare of the City.

Section 10. Severability. Should any provision of this ordinance be declared by a court to be unconstitutional or invalid, such decision shall not affect the validity of the ordinance as a whole, or any part thereof, other than the part so declared unconstitutional or invalid. The City Council declares it would have adopted this ordinance and each part or parts hereof irrespective of the fact that any one part or parts be declared unconstitutional or invalid.

Section 11. This ordinance shall be effective five days after publication following final passage.

INTRODUCED, READ, AND ORDERED PUBLISHED this 8th day of January, 2024.

PASSED, ADOPTED AND APPROVED this 12th day of February, 2024.

Lauren Simpson, Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:
Rachel A. Morris, City Attorney:

BY: _____

Publication Dates: January 11, 2024
 February 15, 2024

~~REDLINE/STRIKEOVER VERSION~~

FOR INFORMATION ONLY -- NOT PART OF THE ORDINANCE

Underlined indicates new material
~~Strikethrough~~ indicates deleted material

Sec. 2-1-2-5. ~~Official floodplain maps.~~ Reserved.

~~¶~~

~~A. *Official Floodplain Maps Adopted.* The location and boundaries of the Regulatory Floodplain designated in Division 4-1-2 Floodplain Regulations of this Code are hereby established as shown on the map prepared by Public Works entitled "Official Floodplain Map," and hereafter referred to as the Official Floodplain Maps, as may be amended. The boundaries of the Regulatory Floodplain, Flood Fringe Sub-Zone, and Floodway Sub-Zone are based upon technical data in scientific and engineering reports produced by the Federal Emergency Management Agency (FEMA) entitled, "Flood Insurance Study, Jefferson County, Colorado and Incorporated Areas," and the accompanying Flood Insurance Rate Maps dated January 15, 2021, and "Flood Insurance Study, Adams County, Colorado and Incorporated Areas" and the accompanying Flood Insurance Rate Maps dated September 28, 2018. This information is incorporated on the Official Floodplain Map of the City of Arvada, which is hereby adopted into this Code. Said map and studies, together with everything shown thereon and all amendments thereto, shall be as much a part of this Section as if fully set forth and described herein. Each change in the Official Floodplain Map shall be subject to the amendment procedure as required in Section 8-3-4 of this Code.~~ ~~¶~~

~~¶~~

~~B. *Adopted by reference.* The Official Floodplain Map, together with all explanatory notations and matter thereon, is hereby adopted by reference and declared to be a part of this Code.~~ ~~¶~~

~~¶~~

~~C. *Status of Official Floodplain Map.* The Official Floodplain Map that is on file at the City shall be the final authority as to the zoning status of all floodplain areas in the City."~~

“ARTICLE 4-1. ENVIRONMENTAL QUALITY

DIVISION 4-1-1. PURPOSE AND APPLICATION OF ARTICLE

Sec. 4-1-1-1. -Purpose of article.

The purpose of this Article is to promote and maintain environmental quality and livability in the City, and to mitigate natural hazards to life, safety, and property using standards that regulate the location and design of development.

Sec. 4-1-1-2. -Application of article.

A. *Generally.* The Divisions within this Article are applied as follows:

1. Division 4-1-2, Floodplain Regulations, establishes standards for development within the ~~Regulatory Floodplain Overlay District~~, in order to reduce and mitigate flood hazards.
2. Division 4-1-3, Stormwater and Drainage Control, establishes design principles for grading and drainage system design.
3. Division 4-1-4, Natural Hazards and Environmentally-Sensitive Areas, establishes standards for avoiding or mitigating natural hazard areas and for protecting environmentally-sensitive areas from the impacts of development.
4. Division 4-1-5, Irrigation Canals and Ditches, establishes standards for development near irrigation canals and irrigation ditches.

B. *Relationship to Other Standards of this Code.* The standards of this Article, particularly Division 4-1-2, Floodplain Regulations, and Division 4-1-5, Irrigation Canals and Ditches, may restrict development on certain locations of a subject property. When the application of these standards would result in exceptional hardship to the Applicant upon a determination that the variance is the minimum necessary, a variance may be permissible to allow development on other parts of the subject property pursuant to Section 8-3-11-2, Variances.

DIVISION 4-1-2. FLOODPLAIN REGULATIONS

Sec. 4-1-2-1. -Statutory authorization.

The Legislature of the State of Colorado has, in C.R.S. Title 29, Article 20, delegated the responsibility of local government units to adopt regulations designated to ~~minimized~~ **minimize** flood losses. Therefore, the City Council of Arvada, Colorado, does hereby adopt the following floodplain management regulations.

Sec. 4-1-2-2. -Findings of fact.

- A. Flood hazard areas of the City are subject to periodic inundation, which can result in loss of life and property, health and safety hazards, disruption of commerce and government services, and extraordinary public expenditures for flood protection and relief, all of which adversely affect the health, safety, and general welfare of the public.
- B. These flood losses are created by the cumulative effect of obstruction in floodplains which cause an increase in flood heights and velocities, and by the occupancy of flood hazard areas by uses vulnerable to floods and hazardous to other lands because they are inadequately elevated, floodproofed, or otherwise protected from flood damage.

Sec. 4-1-2-3. -Purpose and definitions.

—A. This Division is intended to provide the means and the regulations to promote the public health, safety, and general welfare of the public, and to minimize public and private losses due to flood conditions in specific areas subject to flood hazards, and to promote wise use of the floodplain. This Division has been established with the following purposes intended:

- 1. To reduce the hazards of flood to human life, health, and property;
- 2. To alert floodplain occupants, or potential occupants, to flood damages which may result from their own, or others' land use;
- 3. To minimize damage to critical facilities, infrastructure, and other public facilities and utilities such as water, sewer, and gas mains; electrical and communications facilities; and streets and bridges located in the regulatory floodplain;
- 4. To minimize prolonged business interruptions caused by flooding;
- 5. To minimize the expenditure of public money for costly flood control projects;
- 6. To minimize the need for rescue and relief efforts associated with flooding, which are generally undertaken at the expense of the public;
- 7. To help maintain stable tax base by providing for the sound use and development of the regulatory floodplain, so as to minimize future flood blight areas;
- 8. To ensure potential buyers are notified if properties are in a regulatory floodplain; and
- 9. To encourage and facilitate urban water resources management techniques for the reduction of pollution and the enhancement of the urban environment.

- B. Terms used in this Division 4-1-2 shall have the meanings set forth in section 11-3-3-1 of this Code if specifically defined.

Sec. 4-1-2-4. -Methods of reducing flood losses.

- A. In order to accomplish its purposes, this Division includes methods and provisions for:
1. Requiring all construction of permitted buildings to be in compliance with the City of Arvada Building Code;
 2. Restricting or prohibiting land uses that are ~~1a~~) dangerous to public life, health, safety, and property in times of flooding, or ~~2b~~) result in damaging increases in erosion, flood heights, or velocities;
 3. Requiring land uses vulnerable to floods, including facilities that serve such uses, be protected against floods at the time of initial construction or substantial improvements;
 4. Regulating the manner in which a structure or building may be constructed in Special Flood Hazard areas;
 5. Regulating the method of construction of water supply and sanitation systems so as to reduce disease, contamination, and unsanitary conditions;
 6. Delineating and describing areas that could be inundated by floods;
 7. Regulating the method of construction and pattern of development within all uses in the regulatory floodplain;
 8. Regulating the alteration of natural floodplains, stream channels, and natural protective barriers, that help accommodate or channel flood waters;
 9. Regulating or prohibiting filling, grading, development, dredging, and unnecessary encroachments that may increase flood damage;
 10. Encouraging uses such as greenbelt, open space, agricultural, recreation facilities, and riding trails in floodplain areas; ~~and~~
 11. Preventing or regulating the construction of flood barriers that will unnaturally divert flood waters or that may increase flood hazards in other areas~~;~~ ~~and~~
 12. Prohibiting makeshift structures, enclosures, or other shelters used for human habitation in floodplain areas, except in locations expressly permitted by the City and having adequate sanitation facilities and approved flood evacuation plans.

Sec. 4-1-2-5. -Adoption of official DFIRMs and related FISs and basis for establishing the Regulatory Floodplain.

A. *Official FIS and accompanying FIS adopted; revisions.*

1. *Adoption.* The City hereby adopts the following flood insurance studies and their accompanying flood insurance rate maps provided to the City by FEMA and any revisions thereto as the applicable FISs and FIRM for the City:
 - a. The Flood Insurance Study, Jefferson County, Colorado and Incorporated Areas and its accompanying FIRM and DFIRM dated January 15, 2021, and
 - b. The Flood Insurance Study, Adams County, Colorado and Incorporated Areas and its accompanying FIRM and DFIRM dated September 28, 2018.
2. *Revisions through LOMR.* Any revisions issued by FEMA to the maps and studies adopted in section 4-1-2-5(A) through a LOMR, together with all explanatory notations and matter thereon, are automatically adopted by the City upon the effective date of the LOMR without amendment to this Code and declared to be a part of this Code.
3. *Amendments.* In the event FEMA provides the City with new, updated FISs or FIRM, this section must be amended to adopt the most current FIRM and its accompanying FIS. The Floodplain Administrator shall keep a copy of the FIS, DFIRM and FIRM adopted by this Code on file and available for public inspection.

B. *Basis for establishing ~~areas of~~ the Regulatory Floodplain.*

1. *Regulatory Floodplain.* The Regulatory Floodplain consists of all the special flood hazard areas (SFHAs) within the City as designated as such by the official FIS adopted in subsection A of this 4-1-2-5. This Regulatory Floodplain is the minimum area within the City subject to the applicability of this Code and may be supplemented by studies designated and approved by the City.

~~Special Flood Hazard Areas (SFHAs) shall be known as the Regulatory Floodplain and may be referred to as the floodplain. ¶~~

2. *Boundaries.* The boundaries of the ~~SFHAs and the floodway~~ Regulatory Floodplain, the Flood Fringe Sub-Zone, the Floodway Sub-Zone within City land, shall be determined from ~~information on the Official Floodplain Map and the~~

~~Flood Insurance Study that are kept on file in Public Works.~~the current effective FEMA DFIRMs and related FISs adopted by the City pursuant to subsection A of this section 4-1-2-5. The boundary lines on the map shall be determined by ~~the use of~~using the scale appearing on the map. For the purpose of final determination of the ~~SFHA~~Regulatory Floodplain boundaries, the base flood elevations on the 100-year flood profile shall control. The base flood elevations shall be shown on the flood profiles and tabulations in the ~~Flood Insurance Study (FIS) as revised, and on the Official Floodplain Map.~~adopted FISs and DFIRMs, as may be amended by FEMA through a LOMR or PMR.

3. *Conflict.* Where there is a conflict between the boundary lines illustrated on the map and actual field conditions, the dispute shall be settled according to Section 8-3-11-76 ~~C~~, Official Interpretations, ~~(Subsection C)~~.
4. *Lack of information.*
 - (a) If the boundaries of an area are unclear based on the currently adopted FIRMs and FISs, and no other information is available by which to determine the boundaries of an area (i.e., site specific studies as provided by the property owner), the boundaries shall be determined by scaling distances on the maps provided in the FIS. Where interpretation is needed as to the exact location of the boundaries, the Floodplain Administrator shall make the necessary interpretation utilizing information deemed relevant by the Floodplain Administrator. In all cases, the base flood elevation as provided in the FIS shall be the governing factor in locating the boundary on any property.
 - ~~—~~(b) When base flood elevation data has not been provided in accordance with these regulations, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation data and floodway data available from a federal, state, or other sources, in order to administer the applicable provisions of Division 4-1-2, Floodplain Regulations.
 - (c) For waterways with base flood elevations for which a regulatory floodway has not been designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within zones A1-30 and AE on the FIRM adopted pursuant to section 4-1-2-5, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not

increase the water surface elevation of the base flood more than one-half foot at any point within the community.

5. *District Types.* ~~An SFHA~~ A SFHA is not a separate Zoning District, but is an overlay over an existing Zoning District. The ~~SFHA~~Regulatory Floodplain is subdivided into the Flood Fringe Sub-Zone (defined in section 4-1-2-7) and the Floodway Sub-Zone: (defined in section 4-1-2-8). In addition to meeting the conditions of the underlying Zoning District, any property to be developed in the ~~SFHA~~Regulatory Floodplain must meet the conditions of the applicable Floodway Sub-Zone and Flood Fringe Sub-Zone. For those areas where base flood elevation has not been determined, including Flood Zone A within the Flood Fringe Sub-Zone, the Floodplain Administrator shall obtain, review, and reasonably utilize any base flood elevation data from federal, state, or other source as criteria for determining final floodplain areas boundaries and administering rules, regulations and requirements within the ~~floodplain~~Regulatory Floodplain.

~~b. The boundaries of the SFHAs and the floodway shall be determined from information presented in the Flood Insurance Study (FIS). In the absence of other information (i.e., site specific studies as provided by the property owner), boundaries shall be determined by scaling distances on the maps provided in the FIS. Where interpretation is needed as to the exact location of the boundaries, the Floodplain Administrator shall make the necessary interpretation. In all cases, the base flood elevation as provided in the FIS shall be the governing factor in locating the boundary on any property.¶¶~~

- ~~2. Other Areas. Other areas are subject to inundation by the base flood are delineated in floodplain maps that have been adopted for regulatory use by the City in accordance with Section 2-1-2-5.¶¶~~
36. *Other Areas.* Areas outside of the Regulatory Floodplain but within the City and susceptible to being inundated as the result of a flood, including FHAD studies produced through the Urban Drainage and Flood Control District and designated by the Colorado Water Conservation Board as an area of land over which flood water would flow from the spillway of a reservoir, shall be referred to as floodplain areas generally. Floodplain areas are still subject to the requirements of this Code.
7. *Areas Removed from the ~~SFHA~~Regulatory Floodplain by Fill.* ~~These areas are identified by FEMA by issuance of a Letter of Map Revision based on Fill~~

~~(LOMR-F).~~ *or Amendment.* For purposes of this Article, ~~this includes areas removed from the Regulatory Floodplain include~~ all existing and proposed LOMR-F and LOMA areas, if the LOMR-F or LOMA area has not previously been superseded by a standard LOMR.

Sec. 4-1-2-6. -Regulatory floodplain – General standards.

- A. *Generally.* ~~In The general standards of this Section apply to all areas within the 100-year Regulatory Floodplain and all floodplain areas as designated defined in the Official Floodplain Map which includes the Floodway Sub Zone and the Flood Fringe Sub Zone, the general standards of this Section shall apply.~~ Section 4-1-2-5(6).
- B. *Anchoring.*
1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure, and capable of resisting the hydrostatic and hydrodynamic loads.
 2. All manufactured homes must be elevated and anchored to resist flotation, collapse, or lateral movement and **must be** capable of resisting the hydrostatic and hydrodynamic loads. Methods of anchoring may include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable ~~State~~ state and local anchoring requirements for resisting wind forces. Specific requirements may be:
 - a. Over-the-top ties ~~be~~ provided at each of the four corners of the manufactured home, with two additional ties per side at intermediate locations, with manufactured homes less than 50 feet long requiring only one additional tie per side; and
 - b. Frame ties ~~be~~ provided at each corner of the home with five additional ties per side at intermediate points, with manufactured homes less than 50 feet long requiring four additional ties per side; and
 - c. All components of the anchoring system **must** be capable of carrying a force of 4,800 pounds; and
 - d. Any additions to the manufactured home be similarly anchored.
- C. *Construction Materials and Methods.*

1. All new construction and substantial improvements shall be constructed with utility equipment resistant to flood damage and using materials and methods that minimize flood damage.
2. All new construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
3. New construction and substantial improvements, with fully enclosed areas below the lowest floor that are usable solely for parking of vehicles, building access, or storage in an area other than a basement and which are subject to flooding, shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a registered Colorado Professional Engineer or architect, or meet or exceed the following minimum criteria:
 - a. A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.
 - b. The bottom of all openings shall be no higher than one foot above lowest adjacent grade (LAG).
 - c. Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.

D. *Utilities.*

1. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;.
2. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters; ~~and.~~
3. On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

E. *Fences.*

1. Fences may be permitted in the ~~Regulatory Floodplain SFHA~~ depending on the type and use of the fence ~~at the discretion of the Floodplain Administrator. In some cases, fencing is not permitted in the SFHA.~~ Any proposed fence in the ~~Regulatory Floodplain SFHAs~~ shall require review by the Floodplain Administrator and issuance of a Floodplain Development Permit, in addition to other required permit(s). Table 4-1-2-4 is ~~a guideline to provided for~~ assistance with understanding and selecting appropriate fencing in a floodplain, ~~however exceptions may be made on a case-by-case basis upon the Floodplain Administrator's evaluation of the following: the proposed location of the fence and designation of the location (i.e. whether the location is within the Flood Fringe Sub-Zone, Floodway Sub-Zone, Shallow Flooding Zone, etc...), the materials used for the fence (i.e. wire, rails, chain link, pickets, masonry, etc...), the dimension and length of the fence, and whether the fence is being replaced in kind.~~

Table 4-1-2-6: Fence Use Allowed by SFHA Sub-Zone			
FENCE TYPE	FLOOD FRINGE Zones A, AE, and AO	FLOODWAY Zone AE	SHALLOW FLOODING Zone X
Open barbed or barbless wire ¹	Yes	Yes, unless the proposed is to contain livestock within a corral	Yes
Open pipe or rail fencing (i.e. corrals) ²	Yes	Yes, with limited cross fencing ⁴ ; not allowed in main channel	Yes
Other wire, pipe, or rail fencing (i.e. field fence, welded wire, chicken wire) ³	Yes, if elevated to or above the flood height	Case by case review	Yes, if elevated to or above the flood height
Chain link	Case by case review	No	Yes
Picket fencing (50% opaque ⁵)	Case by case review	No	Yes
Alternating board / shadow box (80% opaque)	Case by case review	No	Yes
Solid board fencing or masonry walls	Case by case review – design required	No	Yes, if elevated to or above flood height or adequate openings are provided ⁴
Collapsible or breakaway fencing	Case by case review-design required		
TABLE NOTES:			
¹ Barbed or barbless wire is considered open if there is no more than one (1) horizontal strand per foot of height and no more than one (1) vertical wire or post every six (6) feet.			
² Open pipe or rail fencing shall be 90% open and have posts placed no closer than eight (8) feet part.			
³ Other wire, pipe, or rail fencing that is not considered “open” shall include minimum spacing of not less than six-inch by six-inch (6”x6”) square openings.			
⁴ Determination of cross-fencing requirement and/or adequate opening size and number shall be made by the Floodplain Administrator. Adequate openings shall allow the free-flow of floodwaters without increasing the depth of water at all.			
⁵ Opacity is the degree to which light or views are blocked. With reference to fencing, it is measured perpendicular to the fence for each fence section between supports.			

F. *Subdivision Proposals.*

1. All subdivision proposals and other new development, including manufactured home parks or subdivisions, shall be reviewed **by the appropriate City officials** to determine whether the proposed development will be reasonably safe from flooding. Any such proposals in the **SFHA Regulatory Floodplain** shall be reviewed to **assure** that:
 - a. The proposal is consistent with the need to minimize flood damage;

- b. The proposal has public utilities and facilities such as sewer, gas, electrical, and water systems located and constructed to minimize flood damage;
- c. The proposal has adequate drainage provided to reduce exposure to flood damage; and
- d. Base flood elevation data is provided. All subdivision proposals and other proposed developments (including proposals for manufactured home parks and subdivisions) greater than 50 lots or 5 acres, whichever is lesser, shall include within such proposals base flood elevation data.

G. *Flood-Proofing.* All-flood proofing measures mandated in this Section shall be subject to the requirements of this ~~Code~~ regarding ~~Establishment~~ the establishment of ~~Floodplain Development Permit~~ floodplain development permits, and regarding ~~Nonresidential Structures~~ nonresidential structures. A ~~Professional Engineer~~ professional engineer registered in the State of Colorado shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this Section and the design is consistent with the flood protection elevations for the particular area as shown by the flood profile, flood velocities, and other factors associated with the flood protection elevation. Such certifications shall be provided to the Floodplain Administrator as set forth in subsection 8-1-1-4a ~~Obtain and Maintain~~4, Floodplain ~~Information~~ administrator. In addition to the flood-proofing measures described elsewhere in this Section, others may include:

- 1. Installation of watertight doors, bulkheads and shutters~~;~~,
- 2. Reinforcement of walls to resist water pressure~~;~~,
- 3. Use of paints, membranes, or mortars to reduce seepage of water through walls~~;~~,
- 4. Addition of mass or weight to structures to resist flotation~~;~~,
- 5. Installation of pumps to lower water levels in structures~~;~~,
- 6. ~~Pumping~~ Addition or design of pumping facilities for subsurface drainage systems of ~~building~~ buildings to relieve external foundation, wall, and basement floor pressures~~;~~,
- 7. Construction to resist rupture or collapse caused by water pressure or floating debris~~;~~ and

8. ~~Cutoff~~ Installation of cutoff valves on sewer lines or the elimination of gravity flow basement drains. ¶

H. ~~Construction on Filled Floodplains.~~ No permit shall be issued for the construction of a new building on a property that has been removed from the floodplain by the issuance of a FEMA Letter of Map Revision Based on Fill ("LOMR-F") with a floor elevation placed below the base flood elevation (including one foot of freeboard) that existed prior to the placement of fill.

Sec. 4-1-2-7. -Flood fringe sub-zone standards.

A. *Generally.* The Flood Fringe Sub-Zone represents the area that is inundated in the 100-year flood that may serve as a temporary storage area for the flood waters and is the area that lies landward of the floodway.

B. *Special Provisions.*

1. ~~Generally.~~ No fill, structure, deposit, or other floodplain uses shall be permitted in the flood fringe sub-zone that adversely affects affect the efficiency of any channels or floodways of any tributaries to the main stream or river; drainage ditches; or any other drainage facilities or systems. Tents and other makeshift structures, enclosures, or other similar shelters used for human habitation are also prohibited in the flood fringe sub-zone.

2. ~~All Construction.~~ If a property has been issued a Letter of Map Revision based on Fill (LOMR-F) from FEMA and the property has been filled so as to remove it from the floodplain, no building permit shall be issued for a new structure to be constructed that would result in a finished floor elevation, including the basement, below the previously existing base flood elevation.

3. *Residential Construction.* ¶

a. ~~A residential structure shall be any structure which is designed for human habitation.~~ New construction and substantial improvement of any residential structure within or moved into the SFHA Regulatory Floodplain shall have the lowest floor, (including the basement and any mechanical equipment or attendant utilities) constructed at or above a point the flood protection elevation of two feet above the base flood elevation, or, if. If such new construction or substantial improvement of a residential structure is within Flood Zone AO, then the lowest floor of the residential structure (including the basement and any mechanical equipment or attendant utilities) must be constructed at or above a point two feet above the depth number specified in feet on the Official Floodplain Map, DFIRM,

and the depth number shall be at least two feet if it is not specified on the ~~map.~~
~~Within~~DFIRM. For new construction and substantial improvements of residential structures within Zones AH and AO in the ~~SFHA~~Regulatory Floodplain, adequate drainage paths shall be constructed all around the structures on slopes to guide flood waters around and away from ~~proposed~~the structures. If neither base flood elevation nor depth number is available, the flood protection elevation shall be at least four feet above the highest adjacent grade.

4. *Nonresidential Construction.* New construction and substantial improvements of any commercial, industrial, or other non-residential structure within or moved into the ~~SFHA~~Regulatory Floodplain shall either:
 - a. Have the lowest floor (including basement ~~and any mechanical equipment or attendant utilities~~) constructed at or above ~~a point~~the flood protection elevation of one foot above the base flood elevation, or at or above a point one foot above the depth number if within Flood Zone AO, and as specified in feet on the ~~Official Floodplain Maps~~DFIRM (the depth number shall be at least two feet if it is not specified on the maps). If neither base flood elevation nor depth number is available, the flood protection elevation shall be at least three feet above the highest adjacent grade; or
 - b. Together with attendant utility and sanitary facilities shall:
 - i. Be flood-proofed to or above the ~~Flood Protection Elevation~~flood protection elevation, such that the structure is watertight with walls substantially impermeable to the passage of water;
 - ii. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and
 - iii. Be certified by a Colorado registered professional engineer that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of this paragraph. Such certifications shall be provided to the Floodplain Administrator as set forth in subsection 8-1-1-4-4.a ~~Obtain and Maintain Floodplain Information.~~
 - c. ~~Within~~For non residential construction within Zones AH and AO in the ~~SFHA~~Regulatory Floodplain, adequate drainage paths shall be constructed all around structures on slopes to guide flood waters around and away from ~~proposed~~the structures.

5. *Manufactured Homes*. Manufactured homes shall be anchored in accordance with ~~Subsection~~ *Section 4-1-2-6(B-), Anchoring*.
- a. All manufactured homes that are placed or substantially improved on a site in Zones A1-30, AH, or AE on the ~~FIRM~~ *FIRM* shall be elevated on a permanent foundation such that the lowest floor of the manufactured home, together with mechanical equipment and attendant utilities, is constructed at or above a point two feet above the base flood elevation, and shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement, if the manufactured home is:
 - i. Outside of a manufactured home park or subdivision;
 - ii. In a new manufactured home park or subdivision;
 - iii. In an expansion to an existing manufactured home park or subdivision; or
 - iv. In an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood.
 - b. All manufactured homes that are placed or substantially improved on sites in existing manufactured home parks or subdivisions that are not subject to the provisions in ~~Subsection~~ *subsection (a:)* above, shall be elevated so that either:
 - i. The lowest floor of the manufactured home, together with mechanical equipment and attendant utilities, is constructed at or above a point two feet above the base flood elevation; or
 - ii. The manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and are securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement of the foundation from hydrostatic and hydrodynamic loads, including buoyancy.
 - c. Any manufactured home park or manufactured home subdivision within the limits of the ~~SFHA~~ *Regulatory Floodplain* shall file an evacuation plan with the appropriate ~~Disaster Preparedness Authority~~ *disaster preparedness authority* indicating alternate vehicular access and escape routes.

6. *Recreational Vehicles.*

- a. A recreational vehicle (“RV”) is a vehicle which is:
 - i. Built on a single chassis;
 - ii. 400 square feet or less when measured at the largest horizontal projection;
 - iii. Designed to be self-propelled or permanently towable by a light duty truck; and
 - iv. Designed primarily not for use as a permanent dwelling but as a temporary living quarters for recreational, camping, travel, or seasonal use.
- b. All ~~recreational vehicles~~ (RVs) shall either:
 - i. ~~be~~Be on the site for fewer than 180 consecutive days;
 - ii. Be fully licensed and ready for highway use (meaning the RV is on its wheels or jacking system, is attached to the site only by quick disconnect type utilities, and has no permanently attached additions); or
 - iii. Meet the permit requirements and elevation and anchoring requirements for a manufactured home for resisting flotation, collapse, and lateral movement from hydrostatic and hydrodynamic loads, including buoyancy.

7. *Critical Facilities.* New construction and substantial improvements of any facility classified as a critical facility within or moved into the ~~SFHA Zone~~**Regulatory Floodplain** shall have the lowest floor (including basement **and any mechanical equipment or attendant utilities**) constructed at or above a point two feet above the base flood elevation. New ~~Critical Facilities~~**critical facilities** shall, when practicable as determined by the Floodplain Administrator, have continuous non-inundated access (ingress and egress for evacuation and emergency services) during a 100-year flood event.

8. *Materials Storage and Processing.* The storage or processing of materials that are buoyant, flammable, explosive, or in times of flooding could be injurious to human, animal, or plant life, shall be at or above a point two feet above the base

flood elevation for a particular area, or adequately flood-proofed in accordance with provisions in this Division.

9. *Approvals.* Building plans for ~~any project~~ **all projects** or construction, **regardless of the type of structure, that will be placed, altered, or constructed** within the Flood Fringe Sub-Zone must be submitted to the Floodplain Administrator, for approval, in accordance with Section 8-3-~~5-6~~, Floodplain Development Permit, to ~~insure~~ **ensure** that said project or construction will not adversely affect the ~~Flood-Regulatory District~~ **Floodplain and is in compliance with the requirements of this code pertaining to the Regulatory Floodplain.**
 10. *Anchoring.* Any structure permitted in the Flood Fringe Sub-Zone pursuant to this Section shall be firmly anchored to prevent the structure or building from floating away and thus threatening to restrict bridge openings and other restricted sections of the stream or river.
- C. *Permitted Uses.* Any uses permitted by the underlying ~~Zoning District~~ **zoning district**, in conformance with the ~~preceding Special Provisions~~ **provisions in the above subsection (B)**, may be permitted by the Floodplain Administrator, subject to the following conditions:
1. If the Floodplain Administrator disallows a requested use through a Floodplain Development Permit that is permitted in the underlying zoning district, and that is in conformance with the ~~preceding Special Conditions~~ **provisions in the above subsection (B)**, the Applicant may follow the procedures outlined in Section 8-3-11-6; Floodplain Variance, or Section 8-2-5, **Administrative Appeals.**
 2. The Floodplain Administrator may also require the Applicant to follow the procedure outlined in Section 8-3-5-6, Floodplain Development Permit; for certain uses in the Flood Fringe Sub-Zone, when said action appears to be in the public interest, and where the health, safety, and welfare of the public may be in question.
- D. *Watercourse.* In riverine situations, adjacent communities and the ~~State Coordinating Agency~~ **state coordinating agency**, which is the Colorado Water Conservation Board, should be notified prior to any alteration or relocation of a watercourse, and submit evidence of such notification to FEMA. ~~Ensure in order to ensure~~ **that the flood carrying capacity within the altered or relocated portion of any watercourse is maintained. The applicant is responsible for submitting such notification.**

Sec. 4-1-2-8. -Floodway sub-zone standards.

- A. ~~Generally. The Floodway Sub-Zone may also be referred to as the "floodway." The floodway delineates the channel of a gulch or other watercourse and the adjacent land that must be reserved in order to discharge the 100-year flood without cumulatively increasing the base flood water surface elevation more than one-half foot at any one point.~~ *Generally.* Floodways are extremely dangerous areas due to the velocity of floodwaters that carry debris, potential projectiles, and have significant erosion potential.
- B. *Special Provisions.* The following regulations shall apply to all uses within the Floodway Sub-Zone, notwithstanding that such uses may be specifically permitted under the terms of this LDC:
1. The flood protection elevation or height shall correspond to a point one foot (two feet for residential structures) above the base flood elevation shown on or attached to the flood map for a particular area.
 2. No structure or temporary structure, fill, including fill for roads and levees, deposit, obstruction, storage of materials, or other floodplain uses which acting alone or in combination with existing or future floodplain uses, shall be permitted that affects the efficiency of the floodplains based on the assumption that there will be an equal degree of encroachment extending for a significant reach on both sides of the stream. *Tents, makeshift structures, enclosures, or other shelters used for human habitation are prohibited in their entirety, regardless of the impact on the efficiency of the floodplain, unless expressly allowed by the City.*
 3. No floodplain uses shall affect the efficiency of or restrict the capacity of the channel or floodways of any tributaries to the main stream, drainage ditches, or any other drainage facilities or systems.
 4. No developments or improvements shall be allowed within the Floodway Sub-Zone that would result in any increase in flood levels during the occurrence of the base flood discharge within the City.
 5. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, the City may approve certain development in Zones A1-30, AE, AH, on the City's FIRM which increases the water surface elevation of the base flood by more than one-half foot, provided that the City, or other appointed entity, first applies for a conditional FIRM revision through ~~FEMA (conditional letter of map revision,~~ a CLOMR); fulfills the requirements for such revisions as established under the provisions of Section 65.12; and receives FEMA approval.

- C. *Description of Permitted Uses.* The following open uses shall be permitted within the Floodway Sub-Zone to the extent that they are also permitted in a particular area by the underlying ~~Zoning District~~: **zoning district**:
1. Agricultural uses such as: general farming, pasture, truck farming, sod farming, and wild crop harvesting;
 2. Industrial-Commercial uses such as: parking areas and airport landing strips;
 3. Public and private recreation uses not requiring permanent or temporary structures designed for human habitation, such as: parks, golf courses, driving ranges, picnic grounds, ~~wild life~~ **wildlife** and nature preserves, shooting preserves, target ranges, trap and skeet ranges, hunting, fishing and biking areas;
 4. Utility facilities such as: transmission lines, excluding above ground support facilities; underground pipelines; water monitoring devices; roadways and bridges; **and**
 5. Uses very similar in nature to permitted uses may be allowed provided that they are consistent with the provisions of this Section.
- D. *Description of Permitted Structures.* Temporary and permanent structures accessory to open uses permitted in Subsection (C-), above, shall be permitted subject to submittal of building plans to the Floodplain Administrator for approval in accordance with Section 8-3-5-6, Floodplain Development Permit, which:
1. Will not be designed for human habitation;
 2. Will have a low flood damage potential;
 3. If permitted, will be constructed and placed on the building site so as to offer the minimum obstruction to the flow waters:
 - a. Whenever possible, structures will be constructed with the longitudinal axis parallel to the direction of the flow of flood waters, and
 - b. Insofar as feasible, structures will be placed so their longitudinal axis is approximately on the same line as those of adjoining structures; and
 4. Will be firmly anchored to prevent the structure or building from floating away, thus threatening to further restrict bridge openings and other restricted sections of the stream or river.

Sec. 4-1-2-9. -Abrogation and greater restrictions.

This Division is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this Division or another Division, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

Sec. 4-1-2-10. -Warning and disclaimer of liability.

The degree of flood protection required by this Division is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. On rare occasions greater floods can occur and will occur. Flood heights may be increased by manmade or natural causes.

This Division does not imply that land outside the ~~SEHA~~ **Regulatory Floodplain** or uses permitted within such areas will be free from flooding or flood damages. This Division shall not create liability on the part of the City or any official or employee thereof for any flood damages that result from reliance on this Division or any administrative decision lawfully made thereunder.

Sec. 4-1-2-11. -Severability.

This Division and various parts thereof are hereby declared to be severable. Should any section of this Division be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the Division as a whole, or any portion thereof other than the section so declared to be unconstitutional or invalid.

DIVISION 4-1-3. STORMWATER AND DRAINAGE CONTROL

Sec. 4-1-3-1. -Purpose.

This Division has been established with the following purposes intended:

1. Promote the public health, safety, and welfare by minimizing flood losses and the inconvenience and damage resulting from uncontrolled and unplanned stormwater runoff in the City;
2. Minimize increases in stormwater runoff as a result of development;
3. Reduce pollutants in stormwater discharges from construction activity;
4. Minimize increases in non-point source pollution cause by stormwater runoff;
5. Reduce flooding, siltation, stream bank erosion, and channel degradation; and
6. Ensure that stormwater management controls are properly maintained.

Sec. 4-1-3-2. -Applicability.

- A. This ~~Section~~ Division shall apply to all construction in the City that disturbs 10,000 square feet or more of land surface. Water quality standards and detention apply to all new development and redevelopment that disturbs one acre or more. Erosion control shall apply to all land and efforts to prevent, mitigate, and control accelerated soil erosion and shall include the design, installation, and implementation of temporary erosion control measures prior to any earth disturbance activities.

Sec. 4-1-3-3. -Storm drainage facilities design.

- A. *Storm Drainage Facilities.* Design of storm drainage facilities, including but not limited to best management practices for permanent stormwater quality, shall be based upon the Urban Storm Drainage Criteria Manual of the Urban Drainage and Flood Control District, the City of Arvada Engineering Code of Standards and Specifications, and the City's Municipal Separate Storm Sewer System Permit requirements, *as may be amended from time to time.*
- B.— *On-Site Drainage Control.* The best management practices for on-site drainage should be selected and designed to avoid or minimize, to the extent practicable, adverse water quality impacts of stormwater discharged from the development. Unless a regional drainage solution is required, the following shall apply:
1. *On-Site Drainage Facilities.* Drainage facilities shall be provided on-site to control drainage, storm and surface waters within the development, and all drainage originating off-site traversing or flowing adjacent to the development.
 2. *Detention.* Designs shall provide detention facilities on-site to contain all stormwaters generated which are in excess of historic flows. These detention facilities shall be designed so that the peak flow from the property is as nearly equal, as practicable, to that which is deemed historic. Detention shall not be constructed within the 100-year floodplain.
 3. *Underground Water Quality and Detention Facilities.* Although surface stormwater quality and detention is encouraged, in some cases underground appurtenances are desired and allowed. Water quality must meet the City's Municipal Separate Storm Sewer System requirements to be approved for installation. Written verification of successful installation shall be submitted to ~~Director~~ *the City Engineer* from the manufacturer of the underground appurtenance prior to the first Certificate of Occupancy for the development.

4. *Management Practices.* Permanent stormwater quality control shall be maintained by the ~~Owner~~property owner consistent with an Operations and Maintenance Manual (O&M Manual) submitted with the final site plan review. If not maintained, the City can access, maintain, and shall receive reimbursement from the ~~Owner~~property owner for maintenance conducted, or a lien will be placed on the property.
5. *Regional Drainage Solutions.* Regional drainage solutions may be required for the development as determined by the ~~Director~~City Engineer.

Sec. 4-1-3-4. -Limitations on site disturbance.

- A. *Generally.* ~~Any site disturbances that exceed 10,000 square feet must obtain a Site Disturbance Permit from the City. Limits of disturbance must be defined on the Grading Plan. A site disturbance permit must be obtained in accordance with Chapter 50 of the City Code.~~
- B. *Exemptions.* This Section does not apply to agriculture and irrigation ditch or reservoir maintenance activities ~~(whether routine, such as weed control, or major, such as reshaping a ditch channel or cleaning out a reservoir).~~and is limited to only routine maintenance activities that are excluded from being an “applicable construction site” under the City’s Municipal Separate Storm Sewer System (MS4) Permit.
- C. *Limitation on Disturbed Area.* Cuts, fills, grading, excavation, vegetation removal, and building construction shall be confined to the footprint of the proposed building, plus a working area of not more than 30 feet around each such footprint, plus any site disturbance necessary for installation and maintenance of utilities, access ways, trails, irrigation ditches, and fences, and for landscaping, agriculture, and similar activities.
- D. *Erosion Control Plans and State Permits.*
 1. All erosion control plans shall comply with applicable standards adopted by the Urban Drainage and Flood Control District, the City of Arvada Engineering Code of Standards and Specifications, and City Code Article IV, Section 50-70 through 79 as may be amended from time to time.
 2. A Stormwater Management Plan is required ~~if~~in accordance with Chapter 50 of the ~~development disturbs 10,000 square feet or more of land surface~~Arvada City Code. A permit from the Colorado Discharge Permit System-Stormwater may be required from the Colorado Department of Public Health and Environment, Water Quality Control Division, prior to start of construction.

Sec. 4-1-3-5. -Low-impact development practices.

- A. *Purpose.* The purpose of this Section is to encourage the incorporation of low-impact development (LID) practices into site designs in order to mitigate the impacts of increased runoff and stormwater pollution from new development, redevelopment, and infill development as close to the source ~~as practicable~~. LID practices, if designed and constructed correctly, ~~will~~ help preserve permeable surfaces, remove pollutants, regenerate groundwater supply, and encourage the use of native plants.
- B. *Low-Impact Development Options.* The options below are encouraged to implement LID at the time of site development or redevelopment. The options are not intended to be prescriptive or to inhibit creative design. To implement the LID in order to reduce water quality treatment of stormwater runoff, the City's Municipal Separate Storm Sewer System Permit conditions must be met.
- C. Further descriptions and examples of LID options are in the Urban Drainage and Flood Control District, Urban Storm Drainage Criteria Manual, Volume 3 for the following:
1. Bioswales are vegetated swales planted with wet tolerant species of plants or ornamental grasses. They transport, store, and allow infiltration of water, and can be designed as a landscape feature. Bioswales are not grassed, but are planted with a variety of plant species that can withstand occasional water inundation for short periods of time.
 2. Grassed swales are designed conveyance devices used to transport water over the surface of the ground to a point of disposal that may be a catch basin, ditch, or water body that will filter, infiltrate, evaporate, and clean water of total suspended solids, solid waste, and other pollutants. Swales are often appropriate along property lines, public streets, and around buildings.
 3. Rain gardens are small, shallow depressions planted with a variety of native or ornamental plants ~~than~~~~that~~ can treat small amounts of runoff to improve water quality. Rain gardens are generally small collections of water-loving plants planted on a low site area to collect rainfall.
 4. Permeable pavers and porous surfaces allow water seepage through the joints and the gravel base beneath the pavers. This allows for the infiltration of rainwater, thereby reducing the runoff leaving a site. When used in conjunction with street tree planting, this allows for air circulation around tree roots and can easily be removed in order to trim tree roots and to regrade a walkable surface. Use of permeable pavers or porous pavement shall not be permitted in locations required for fire and emergency access unless specifically allowed by the ~~Director~~~~City~~ Engineer.

5. Sand filters are depressions, trenches, barriers, or sand lenses constructed of porous matter that improves ground water recharge to filter, clean, and trap waterborne pollutants.
6. Other Options.
 - a. Other options include extended detention basins that may be used in open space tracts to treat the runoff from multiple lots, roads, and trails.
 - b. Other LID options may be allowed as approved by the ~~Director~~**City Engineer**.

Figure 4-1-3-5 : Low-Impact Development Options



Bioswale



Grass Bioswale



Native Grass Bioswale



Rain Garden



Combined Options



Permeable Pavers

DIVISION 4-1-4. NATURAL HAZARDS AND ENVIRONMENTALLY-SENSITIVE AREAS

Sec. 4-1-4-1. -Purpose.

- A. *Generally.* New construction shall comply with the standards of this Division, unless compliance with a particular standard would prevent the construction of any permanent structure for a primary use on the land, or require the construction to violate another requirement of this LDC. Where more than one buildable site exists on a subject property and all buildable sites would violate at least one of the standards of this Division, the construction shall be located so as to comply with as many standards as possible.
- B. *Disclaimer.* These standards are considered reasonable for regulatory purposes and do not create liability on the part, or a cause of action against, the City.

Sec. 4-1-4-2. -Limits of development.

- A. The Limits of Development ("LOD") shall indicate the specific areas of a subdivision within which the development activity shall be contained in order to avoid areas identified in Section 4-1-4-3, Natural Hazard Areas, and features identified in Section 4-1-4-4, Significant Natural Features. LODs shall be indicated by the Applicant on the plat, and shall be reviewed and approved by the City as part of the development approval process based on:
 - 1. A visual analysis of the location and apparent extent of areas affected by natural hazards and significant natural features;
 - 2. Site topography, including but not limited to such characteristics *such* as steepness of slopes, existing drainage features, rock outcroppings, river and stream terraces, valley walls, ridgelines, and scenic topographic features;
 - 3. Any recommendations made by any other reviewing agency, including without limitation the U.S. Fish and Wildlife Service or the Colorado Division of Wildlife; and
 - 4. The practical needs of proposed construction activity in terms of ingress and egress to the developed project and necessary staging and operational areas.

Sec. 4-1-4-3. -Natural hazard areas.

- A. If the subject property contains potential areas of natural or geologic hazard (such as unstable or potentially unstable slopes, faulting, landslides, or rockfalls) or soil conditions (including without limitation all expansive soils) unfavorable to development, or floodplains, the Applicant shall:

1. Identify, on the plat, the LOD (as defined in Section 4-1-4-2, Limits of Development) and include a plat note that those areas are not available for development; or
2. Provide a report from a geotechnical engineer licensed in Colorado identifying the mitigation measures or engineering precautions necessary to make such areas safe for development and occupancy, and include a plat note stating that development will be subject to those mitigation measures and engineering precautions; or
3. Incorporate into the plat some combination of subsections (1) and (2) above.

Sec. 4-1-4-4. -Significant natural features.

- A. *Generally.* If the subject property contains significant natural features (such as corridors, bluffs, ridges, steep slopes, stands of mature trees, rock outcroppings—including without limitation the Ralston Buttes—wetlands, native upland ecosystems, riparian areas, and wildlife corridors identified by the Colorado Division of Wildlife) or water features (such as drainages, washes, canals, ditches, lakes, natural ponds, and retention and detention ponds), the Applicant shall identify on the plat the Limits of Development (~~see Section as illustrated by Section~~ 4-1-4-2, Limits of Development), include a plat note that areas outside the Limits of Development are not available for development, and incorporate measures to mitigate any visual, functional, or environmental impact of nearby development on such features.
- B. *Groundwater Recharge.* Any area providing groundwater recharge to bedrock aquifers shall be identified at the time of the development review, and the design of the proposed development shall preserve the total amount and the quality of naturally occurring recharge.

Sec. 4-1-4-5. -Steep slopes and hazardous building conditions.

- A. *Generally.* New lots shall not be created on lands containing an average slope of 25 percent, as measured from the points with highest and lowest elevation within 25 feet of any portion of a proposed building, unless such lots designate a building envelope located to avoid such steep slope areas, and the location of the principal building is restricted to the building envelope. Roads and driveways leading to any primary or accessory structure may not be located on slopes in excess of 25 percent.
- B. *Unstable Slopes and other Hazards.* No new principal building, and no new accessory structure (except mini-structures), shall be constructed in any location that shows evidence of slope instability, landslides, avalanche, flooding, or other natural or man-made hazards. If the City makes a preliminary determination that such evidence

exists, the Applicant shall demonstrate, *to the City's satisfaction*, that the slope's ground surface and subsurface are not unstable, that the proposed development will not cause instability or increase the potential for slope failure, and that the development of the slope will not increase the degree of hazards.

Sec. 4-1-4-6. -Ridgeline protection.

Residential dwellings on ridgelines identified through the development review process shall be sited and the buildings designed so as to not be prominent above any such ridgeline. A reduction in bulk or massing of the dwelling may be required, including limiting the height to one story and other suitable methods. Maintaining existing on-lot vegetation to provide a continuous screen or backdrop for the dwelling is also a suitable method.

DIVISION 4-1-5. IRRIGATION CANALS AND DITCHES

Sec. 4-1-5-1. -Protection of irrigation canals and ditches.

Where an irrigation canal or irrigation ditch is adjacent to or traverses a subject property, the City may require the Applicant to install walls, fences, or other methods for protective covering separating the lot or lots therefrom.

Sec. 4-1-5-2. -Agreement required.

- A. *Generally.* The City does not adjudicate the relative interests of landowners and owners of irrigation canals and irrigation ditches (i.e., whether such interests are fee-simple or easement interests). As such, where development has the potential to impact an irrigation canal or irrigation ditch (e.g., by installation of an overhead, surface, or subterranean crossing); installation of infrastructure or improvements that may increase seepage (e.g., detention ponds in close proximity to the canal or ditch, or subsurface drainage systems); grading that could result in changes to the amount of stormwater runoff or pollution that reaches the canal or ditch; or improvements that increase the risk of trespass onto canal or ditch infrastructure or rights-of-way, including service roads), the Applicant shall provide to the City a fully executed agreement between the Applicant and the owner of the canal or ditch that is satisfactory to the City and addresses the impacts of the development on the canal or ditch.
- B. *Street or Water and Sewer Utility Crossings.* Any agreement related to crossing an irrigation canal or ditch for the purpose of providing public street access or accessing or obtaining water or sewer service from the City shall identify the City as an approved assignee and require prior written approval (or right to cure defaults in the event of provisions that allow for termination in the event of default) by the City for any modification or termination prior to said assignment.

Sec. 4-1-5-3. -Irrigation ditch or canal crossings.

Technical design of irrigation ditch or canal crossings shall be approved by the City and unless the City or another entity is exercising its power of eminent domain to acquire the property interests necessary to install the crossing, the affected owner of the irrigation canal or irrigation ditch, prior to commencement of construction of the crossing.

DIVISION 4-1-6. CONSTRUCTION ACTIVITIES

Sec. 4-1-6-1. -Restrictions on construction activities.

- A. *Generally.* The standards of this Section shall apply to all construction sites. The ~~Director~~City Engineer may modify the requirements of Subsection B~~(1.)~~, E~~(3.)~~, E~~(4.)~~, F~~(.)~~, and G~~(.)~~, if the ~~Director~~City Engineer finds that such modifications are necessary to provide for efficient, expeditious, and safe construction.
- B. *Temporary Facilities.*
1. Temporary structures, portable offices, and other comparable buildings and structures shall be maintained in good repair and arranged in a compact and organized manner on the construction site, in a location that minimizes their visual impacts when viewed from the public street or adjacent properties.
 2. The timing of installation and removal of such facilities is subject to Section 3-1-4-3, Contractor Offices and Temporary Construction Uses.
- C. *Tracking Control.*
1. Mud, dirt, or other debris deposited on the public or common roadway at construction access points shall be removed daily to avoid compaction and damage to the roadway and to minimize drainage system impacts.
 2. Cleaning of any construction equipment or tools on public streets, rights of way, or other vacant land is strictly prohibited.
- D. *Debris Control.*
1. Construction debris shall be immediately placed into containers and screened to the extent possible during construction. Trash containers shall be emptied when full and on a regular basis, but not less than weekly.
 2. Dumping, burial of construction debris, debris pits, and burning of debris at any location is prohibited.

3. After construction is completed, temporary barriers, surplus materials and all trash, debris and rubbish shall be promptly removed from the site.
4. All backfill shall be cleared of building material, stone and rubbish prior to placement.

E. *Erosion, Siltation, and Dust Control.*

1. Precautions for controlling water and wind erosion and sedimentation are required during construction and shall be conducted as an integral part of the construction operation.
2. Dust from topsoil and fill material that is stockpiled on site, as well as any areas disturbed by construction operations, shall be strictly controlled. All disturbed areas shall be stabilized.
3. The City may require temporary diversion ditches, dikes, silt fences, filter boxes, tackifiers, and comparable facilities, in order to protect the site from erosion prior to completion of construction and establishment of permanent landscaping.
4. Permanent surface and subsurface drainage systems shall not be used during construction unless entering water has been treated to remove suspended soil particles and other debris. To accomplish this, silting basins shall be installed at all locations necessary to intercept water before it enters catch basins and outfall locations. Silting basins shall be cleaned after each substantial rainstorm.

F. *Parking.* No construction equipment shall be parked on the streets.

G. *Materials Storage.* If equipment and materials are stored at the construction site, storage areas shall be unobtrusive when viewed from public streets and adjacent properties.

Sec. 4-1-6-2. -Restoration of disturbed areas.

Disturbed areas shall be restored ~~as natural appearing landforms, with curves that blend in with adjacent undisturbed slopes. Abrupt angular transitions and linear slopes shall be avoided. As necessary, cuts and fills shall be supported by retaining walls made of materials permitted in Section 4-7-2-2, Retaining Walls. Areas disturbed by grading shall be contoured so they can be re-vegetated and shall be re-vegetated within one growing season after construction, using native species similar to those growing on the site when such re-vegetation does not contribute to hazards. Topsoil shall be stockpiled and placed on disturbed areas.~~ in accordance with City of Arvada Engineering Code of Standards and Specifications as may be amended from time to time.

Sec. 4-2-1-3. -Protection of existing vegetation, wildlife areas and natural features.

A. *General Requirements.*

1. The general layout of lots, roads, driveways, utilities, drainage facilities, and other services within all proposed subdivisions shall be designed in a manner that minimizes land disturbance and preserves existing trees, vegetation, watercourses, wildlife areas, and other natural features that would add value to the proposed development. The development standards set forth in Division 4-6-2, Tree Removal and Replacement, shall be considered in the layout of the subdivision in order to avoid creating lots or patterns of lots that will make compliance with such standards difficult or infeasible.
2. **Existing Trees On-Site.** The determination of which existing site trees are to be saved, replaced, or relocated shall be made by the City, pursuant to Division 4-6-2, Tree Preservation and Replacement. No trees shall be removed from any subdivision or any change of grade of the land effected until approval of the plat has been granted. All trees on the platted area required to be retained shall be preserved, and all trees where required shall be welled and protected against change of grade.

B. *Geologic Hazard Areas and Protection of Natural Lands.*

1. *General Requirements.*

- a. All subdivisions shall comply with the standards in Division 4-1-4, Natural Hazards and Environmentally-Sensitive Areas.
- b. All subdivision plats shall be laid out with due regard to geologic hazards, including but not limited to existing soils, conditions, and slope stability. All subdivisions shall evidence design and use compatibility with existing soils, particularly in regard to topography, drainage, bearing capacity, and erosion potential. All subdivision design shall ensure adequate protection from potentially hazardous or undesirable soils or geological conditions on the development site.
- c. No subdivision shall be approved where the design or related facilities clearly constitute the creation of a hazardous circumstance or lack of provision for the public safety.

2. *Hazard Areas within Platted Lots.*

- a. To the maximum extent feasible, lands that contain steep slopes (an average of 30 percent slope or greater as measured from the points with highest and lowest elevation within 25 feet of any portion of the proposed structure) or that show evidence of slope instability, landslides, avalanches, or other natural or man-made hazards shall not be included in platted lots, or alternately, shall not be included within the plats and/or an individual lot's identified Limits of Development. ~~See Section~~ See Section 4-1-4-2, Limits of Development. —
- b. Alternately, platted lots may contain such hazard areas only if an acceptable mitigation and remedial plan, prepared by a Colorado-licensed geotechnical engineer, is approved by the ~~Director~~ City Engineer. Such mitigation plans shall be judged by generally accepted principles of engineering adapted to the particular circumstances of the subdivision site. If approved, the plat shall include a plat note that all development in the subdivision shall be carried out in conformity with such mitigation and remedial plans.

3. *Floodplain.*

- a. All subdivisions containing lands within the 100-year floodplain, as shown on the ~~Official Floodplain Map~~ most current FIRM and FIS, shall comply with Division 4-1-2, Floodplain Regulations.

Sec. 8-1-1-4. -Floodplain administrator.

- A. *Generally.* The ~~Director of Public Works~~ City Engineer, or his or her ~~her~~ their designated representative, shall be the Floodplain Administrator and shall administer the floodplain regulation set forth in Division 4-1-2, Floodplain Regulations.
- B. *Duties and Responsibilities.* The Floodplain Administrator's powers and duties under this LDC are set out in this Subsection.
 - 1. *Floodplain Development Permits.* The Floodplain Administrator shall review Floodplain Development Permit applications to determine if the applicable permit requirements of Division 4-1-2, Floodplain Regulations, have been satisfied and take final action to approve, approve with conditions, or deny such applications. In so doing, the Floodplain Administrator shall ensure that all other necessary permits have been obtained from those governmental agencies from which prior

approval is required by ~~Federal~~ federal or ~~State~~ state law and make a determination that the proposed building site, including placement of mobile homes, will be reasonably safe from flooding.

2. *Mapping and Boundary Interpretations.* The Floodplain Administrator shall make interpretations regarding ~~Official Floodplain Map~~ the FIRM boundaries of the Flood Regulatory Floodplain, Floodway, and Flood Fringe Sub-Zones and regarding final floodplain boundaries: in accordance with Section 4-1-2-5(B).

~~a. When base flood elevation data has not been provided in accordance with these regulations, the Floodplain Administrator shall obtain, review and reasonably utilize any base flood elevation data and floodway data available from a federal, state, or other source, in order to administer the applicable provisions of this Code.~~

~~b. For waterways with base flood elevations for which a regulatory floodway has not been designated, no new construction, substantial improvements, or other development (including fill) shall be permitted within zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one-half foot at any point within the community.~~

3. *Reports to Hearing Officer on Appeals and Variances.* The Floodplain Administrator shall prepare reports to assist the Floodplain Hearing Officer in his or her consideration of Administrative Reviews (appeals) and Floodplain Variances.

4. *Other Matters.* The Floodplain Administrator shall have the following other duties and responsibilities:

- a. Obtain and Maintain Floodplain Information.

- i. Obtain and record the actual elevation (in relation to mean sea level) of all new or substantially improved structures within the ~~Special Flood Hazard Area~~ Regulatory Floodplain, whether or not the structure contains a basement.

- ii. For all new or substantially improved flood-proofed structures:

- (1) Verify and record the actual elevations (in relation to mean sea level) to which the structure has been flood-proofed.

- (2) Maintain the flood-proofing certification required in Section 4-1-2-6, Regulatory Floodplain - General Standards.
- iii. Maintain for public inspection all records pertaining to the provisions of the floodplain regulations, including appeals and variances.
 - (1) Report variances to FEMA upon request.
- b. For Any Alteration of Watercourses:
 - i. Notify the Colorado Water Conservation Board, Urban Drainage and Flood Control District ("UDFCD"), U.S. Army Corps of Engineers ("USACE"), and adjacent communities prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the ~~Federal Emergency Management Agency ("FEMA")~~ **FEMA**.
 - ii. Require that maintenance is provided within the altered or relocated portion of said watercourse so that flood-carrying capacity is not diminished.
 - iii. Ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained.
 - iv. Under the provisions of 44 CFR Chapter 1, Section 65.12, of the National Flood Insurance Program regulations, the City may approve certain development in zones A1-30, AE, AH, on the City's FIRM which increases the water surface elevation of the base flood by more than one-half foot, provided that the **City Applicant** first applies for a conditional FIRM revision through FEMA (~~conditional letter of map revision~~ **CLOMR**); fulfills the requirements for such revisions as established under the provisions of Section 65.12; and receives FEMA approval.

Sec. 8-1-1-7. -City Engineer.

A. Generally. The City Engineer is a member of City Staff who is principally responsible for overseeing, directing, and controlling all engineering operations of the city. In addition to any duties and responsibilities established in this Code or the Arvada City

Code, or assigned by the City Manager, the City Engineer shall have the duties and responsibilities set out in this Section.

- B. *Duties and Responsibilities.* The City Engineer or their designee shall create, modify, and enforce the Engineering Code of Standards and Specifications and other similar guidelines and standards adopted by the city. The City Engineer or their designee also has the authority to grant variances or exceptions to such guidelines and standards where the City Engineer or their designee determines it is appropriate to do so.
-

Sec. 8-3-4-4. ~~Amendments to the official floodplain map.~~Reserved.”

~~¶~~

- A. ~~*Generally.* Amendments to the Official Floodplain Map shall be made when errors to the Official Floodplain Map are found, when development of land occurs which changes the floodplain, or when the City, Urban Drainage and Flood Control District (UDFCD), or Federal Emergency Management Agency (FEMA) perform an update of either the hydrology or hydraulics, which changes the floodplain.~~¶

- B. ~~*Applicability.*~~¶

- ~~1. The property owner, his designee, the City, UDFCD, or FEMA may initiate amendments.~~¶
 - ~~2. Applicants shall submit to the Floodplain Administrator all information required by FEMA for a Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA). The Floodplain Administrator shall review and sign the application and then submit the application to FEMA for review and approval.~~¶
 - ~~3. Map amendments other than to correct errors in the Official Floodplain Maps may be approved by City Council after approval by FEMA of a LOMR, LOMA, or issuance of new Flood Insurance Rate Maps by FEMA.~~¶
 - ~~4. Official Floodplain Map Amendments shall be approved by ordinance, unless otherwise provided in this ordinance.”~~
-

Sec. 11-2-2. -Table of Acronyms.

~~¶~~

DFIRM	Digital Flood Insurance Rate Map
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Sec. 11-3-3-1. -Definitions.

Addition. Any activity that expands the enclosed footprint or increases the square footage of an existing structure.

Digital Flood Insurance Rate Map (DFIRM). The FEMA digital floodplain map. These digital maps serve as “regulatory floodplain maps” for insurance and floodplain management purposes.

FEMA. The Federal Emergency Management Agency, the agency responsible for administering the National Flood Insurance Program and emergency management.

Flood Hazard Area Delineation (FHAD). A study produced by the Urban Drainage and Flood Control District d/b/a the Mile High Flood District to identify and update flood risk potential and floodplain boundaries due to both natural and development related changes that occur over time. Such study may or may not be submitted to FEMA for a Physical Map Revision.

Flood Fringe Sub-Zone. The area that is inundated in the 100-year flood that may serve as a temporary storage area for the flood waters and is the area that lies landward of the floodway.

Floodway Sub-Zone or floodway. The channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. The Colorado statewide standard for the designated height to be used for all newly studied reaches shall be one-half foot (six inches). All letters of map revision to existing floodway delineations will use the one-half foot designated height floodway criteria and tie back into existing floodway delineations with transitions of not more than 2000 feet.

Letter of Map Amendment. FEMA’s amendment, by letter, to an effective FIRM stating that an existing structure or parcel of land—that is on naturally high ground and has not been elevated by fill—would not be inundated by the base flood.

Physical Map Revisions (PMR). FEMA’s action whereby one or more map panels are physically revised and republished. A PMR is used to change flood risk zones, floodplain and/or floodway delineations, flood elevations, and/or planimetric features.

Regulatory Floodplain. The Special Flood Hazard Areas identified on the Flood Insurance Studies, Flood Insurance Rate Maps, and Flood Hazard Area Delineations as designated by FEMA and/or the Colorado Water Conservation Board and adopted by the city.

Residential structure. Any structure which is designed for human habitation.

Special flood hazard areas or flood hazard area (SFHA). The land in the floodplain within the City subject to a one percent or greater change of flooding in any given year, i.e., the 100-year floodplain.

Substantial ~~Improvement~~:improvement. Any reconstruction, rehabilitation, addition, or other improvement of a structure,~~the~~ taking place during a consecutive five-year period, the cumulative cost of which equals or exceeds 50 percent of the market value of the structure before “start of construction” of the improvement. The value of the structure shall be determined by the local jurisdiction having land use authority in the area of interest. This includes structures which have incurred “substantial damage,” regardless of the actual repair work performed. The term does not, however, include either:



1. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the code enforcement official and which are the minimum necessary improvements; or



2. Any alteration of a “historic structure,” provided that the alteration will not preclude the structure’s continued designation as a “historic structure.””



Floodplain Land Development Code Changes

Feb 12, 2024

Summary of changes

- Simplify procedures for updating floodplain boundaries in digital mapping
- Prohibition of makeshift structures meant for human habitation in high-risk flooding areas
- Allow flexibility in fencing restrictions in floodplains
- Allow staff to regulate to non-FEMA high-risk flooding areas
- Stormwater division edited to refer to Chapter 50 of the Arvada City Code in preparation for changes to that chapter
- Other miscellaneous clarifications

Mapping and Data Management:

- Official Floodplain Map elimination
- “Auto adopt” all boundary changes resulting from a LOMR
 - FEMA only requires Council to adopt Flood Insurance Studies that update FIRM panels impacting Arvada
 - Enables our GIS floodplain boundaries to reflect all LOMRs on their effective date
- Digital Flood Insurance Rate Map (DFIRM) obtained from FEMA will replace all references to the “Official Floodplain Map” throughout the LDC

LOMR = Letter of Map Revision
FEMA = Federal Emergency Management Agency
FIRM = Flood Insurance Rate Map
LDC = Land Development Code

Makeshift Structures / Fencing / Non-FEMA High-Risk Zones

- Adding language to prohibit makeshift structures meant for human habitation in high-risk flood zones (already in Mile High Flood District regulations)
- Keeping guidelines for fences in high-risk flood zones while providing flexibility in some cases
- Applying floodplain regulations to non-FEMA high-risk flood zones:
 - Studies generated in partnership with Mile High Flood District
 - Accepted by Colorado Water Conservation Board (CWCB)

Miscellaneous

- Edited language of the Stormwater and Drainage Control Division to reference Chapter 50 of the Arvada City Code, which will be updated later this year
- Clarifying that mechanical equipment of new or Substantial Improvement (SI) structures must also be placed at an elevation in accordance to LDC (CRS credit requirement)
- Defining SI to mean cumulative improvements made over the course of 5-years (CRS credit requirement and current practice)
- Shifting supervisory responsibilities from the CED Director to City Engineer to align with current supervisory hierarchy
- References to Regulatory Floodplain consistent throughout the LDC

CRS = Community Rating System
CED = Community and Economic Development

Conclusion

Division 8-3-2 Approval Criteria (05-18-20)	Finding	Rationale
A. The proposed amendment is consistent with the Arvada Comprehensive Plan, or reflects conditions that have changed since the adoption of the Comprehensive Plan.	Complies	The proposed amendment is consistent with the Arvada Comprehensive Plan because the proposed amendments will ensure that the community and developers can clearly understand and interpret the LDC.
B. The proposed amendment is consistent with the Purposes of the Code set out in Section 1-1-1-2, Purpose and Intent, of the LDC.	Complies	The proposed LDC amendments are consistent with the intent and purposes of the Code because the regulations will promote the public health, safety, convenience, comfort, prosperity, and general welfare of the City.



SUMMARY MINUTES OF PLANNING COMMISSION ACTION HELD
January 16, 2024

Planning Commission meeting minutes are not an exact transcript and represent key points and the basis of discussion.

1. **CALLED MEETING TO ORDER– By Michael P. Griffith at 6:16 P.M.**
2. **PLEDGE OF ALLEGIANCE**
3. **ROLL CALL OF MEMBERS**

Those present: Michael P. Griffith, Tom Aljinovich, Doug Magee, Steve Hannan, Tim Knapp

THOSE ABSENT

Brandon Figliolino, Andrew Gay

ALSO PRESENT: Jessica Garner; Director of Community and Economic Development, Rob Smetana, City Planning Manager; Laura Hemler, Ass't. City Attorney; Josie Suk, Development Systems and Administrative Manager; Melanie Walter, Engineering Manager, Dixielee Rodriguez, Recording Secretary.

Michael Griffith made a motion to excuse Brandon Figliolino and Andrew gay

Those voting Yes: Griffith, Hannan, Ajinovich, Magee, Knapp

Those voting No:

Those absent: Figliolino, Gay

The motion carried 5-0

4. **APPROVAL OF MINUTES**

November 21, 2023. The minutes stand approved as printed.

5. **GENERAL BUSINESS**

None

6. **REPORTS**

None

7. **PUBLIC COMMENT**

There being no one wishing to speak, Public Comment was closed.

8. PUBLIC HEARINGS

8.A. OTH2023-0004 Major Land Development Code Amendment Associated with the Floodplain Regulations

Mr. Griffith opened the public hearing.

Mr. Griffith asked if all of the required documents were in order.

Mr. Smetana stated yes with publication and posting of the meeting agenda.

Mr Griffith stated the staff report has been submitted and made part of the permanent record.

Mr. Griffith asked Mr. Smetana to introduce the project.

Mr. Smetana introduced Melanie Walter, the City's Floodplain Administrator Manager to introduce the project.

Ms. Walter introduced the project, stating that proposed changes are to simplify data management. Three changes are proposed, 1) elimination of the City's Official Floodplain Map 2) the addition of a prohibition on makeshift structures within certain areas of the floodplain where having such structures would be particularly dangerous 3) allowing more flexibility to evaluate the fencing constructed within the floodplain, and 4) allowing the City to impose floodplain regulations in areas that may be at high-risk for flooding, but may not be reflected in FEMA's current floodplain boundaries. The changes proposed will also shift supervisor responsibilities from the CED Director to the City Engineer to align with the current supervisory hierarchy.

Mr. Magee asked how often FEMA updates floodplain maps?

Ms. Walter stated not very frequently, the last required flood insurance study update was 2021 and she doesn't anticipate another one for a number of years.

PUBLIC COMMENT

N/A

IN FAVOR

IN OPPOSITION

There being no one wishing to speak, Public Comment was closed.

APPLICANT REBUTTAL

QUESTIONS FROM THE COMMISSION

Mr. Aljinovich asked, with all new contraction does this change the floodplain area?

Ms. Walter stated if they propose to change the floodplain boundaries they have to obtain a letter of map revision.

Mr. Aljinovich restated/asked his question with new construction and hard surfaces, water runoff, does that change the existing floodplain?

Ms. Walter stated that the City requires detention as pre developed conditions, that is our stormwater regulations.

Mr. Aljinovich asked if all egress routes were established for evacuation for the 100 year flood?

Ms. Walter stated yes and we have an emergency management plan, it is not part of the floodplain regulations but part of our (City of Arvada) emergency management report.

Mr. Hannan asked about fencing. How is this different, and improving our scores, are we allowing any and all fences to be put up?

Ms. Walter stated that if someone is proposing a fence in the floodplain, she will review each case-by-case for fencing permits, what type of fence they are proposing and material the customer is proposing to use.

Mr. Hannan asked, does the wording on "temporary structures" in the floodplain include tents?

Ms. Walter stated new language says to prohibit makeshift structures meant for human habitation in high-risk flood zones.

Mr. Magee asked is it only named creeks that have a floodplain?

Ms. Walter stated most of them do, there are other areas that don't like tributaries. Most are creeks.

Mr. Magee asked canals and ditches included in floodplains?

Ms. Walter stated No, only if they are shown in the model to intercept the flood flows. Most of them are not included.

Mr. Magee asked will other areas be affected negatively with these changes?

Ms. Walter stated no, they will not.

Mr. Knapp asked are we losing anything when pulling in these documents, are we losing any data?

Ms. Walter stated the boundaries are pulled directly from FEMA, real time. Keeping current maps we are losing data.

Mr. Knapp asked why are we allowing fences at all in the floodplain, if this blocks the flow of water? Are we allowing more fences to be installed?

Ms. Walter stated if the fence exists more or less reviewing the type of material. If the proposed fence is in a Floodway there is no way she would allow a new fence.

Mr. Knapp asked, are new structures allowed?

Ms. Walter states new structures are not allowed unless they meet a certain elevation. They must meet the code.

Mr. Knapp asked in the redline section 4-1-2-6a, what are the impacts of these proposed changes?

Ms Hemler asked is it about Flood insurance adopted?

Mr. Knapp stated no.

Mr. Knapp asked what is this dealing with? Is the 100 year floodplain or floodplain areas. Now it is talking about the regulatory floodplain.

Ms. Walter stated she believes it's the auto-adopting language. It was inconsistently referred to as floodplain and so they just changed it in the definition to be consistent.

Mr. Knapp asked about section 4-1-2-6e more of a note then anything else, this is the chart has been deleted and just now 4 points. These are considerations taken into account by Ms. Walter.

Ms. Walter stated she would take it into consideration and certainly take a look at it and review that with the City Attorney's office.

MOTION FOR 8.A.

It was moved by Mr. Magee That a Major Land Development Code Amendment Associated with the Floodplain Regulations located in the City of Arvada be recommended to City Council for approval.

This motion is based on the findings of fact and approval criteria on Page(s) 3 of the Staff Report.

Mr Griffith stated this is a pretty complicated thing to put together, and he appreciates the level of detail that was put into it. He is always glad to see more staff in these meetings. and Thank you for all your hard work.

DISCUSSION OF MOTION

Those voting Yes: Griffith, Hannan, Ajinovich, Magee, Knapp

Those voting No:

Those absent: Figliolino, Gay

The motion carried 5-0

8. OTHER ITEMS

There will be no meeting on the February 6th agenda.

Mr. Magee, brought up when meetings are canceled by staff not by a motion. That we have no procedure on how staff cancels the meetings. We need to address that, and/or review and update our By-Laws.

Mr Smetana we will address this with Emily Groog how to handle the canceling of meetings.

Mr. Magee asked Can we discuss this at the February 20th workshop meeting?

Mr. Smetana stated yes we can.

It was moved by Mr. Magee that we cancel the February 6th meeting.

Those voting Yes: Griffith, Hannan, Ajinovich, Magee, Knapp

Those voting No:

Those absent: Figliolino, Gay

The motion carried 5-0

10. **ADJOURNED** at 6:48 P.M.

Michael P. Griffith, Chair

Tim Knapp, Secretary

Dixielee Rodriguez, Recording Secretary



REPORT FROM CITY COUNCIL

AGENDA ITEM
12.A.

DATE: February 12, 2024

SUBJECT: Council Committee Reports

Report in Brief

City Council members are appointed to various committees and boards as set out on the attached listing. As meetings are held, individual council members will report back to the full City Council any relevant discussions and issues that occurred.

Prepared by:
Chris Koch, CCO Admin

Lauren Simpson	Arvada City Attorney Committee Arvada Municipal Court/Judicial Committee Arvada Urban Renewal Authority Arvada Visitors Center Committee *Metro Mayors' Caucus Urban Drainage and Flood Control District West Connect Coalition E-470 Authority (Alternate) Olde Town Business Improvement (BID) (Alternate)
Shawna Ambrose	Adams County Regional Economic Partnership (ACREP) Arvada Audit Committee Bond Oversight Committee Jefferson County R-1 Schools Coordinating Committee Arvada Visitors Center Committee (Alternate)
Sharon Davis	Apex Coordinating Committee Arvada Municipal Court/Judicial Committee Arvada Parks Advisory Committee CML Policy Committee Jefferson Economic Development Council (JDEC) Denver Regional Council of Governments (DRCOG) (Alternate) E-470 Authority (Alternate) Jeffco Transportation Action & Advisory Group (JEFFTAAG) (Alternate) Jefferson County Community Corrections Board and West Connect Coalition (Alternate)

Lisa Feret	Arvada Chamber of Commerce Government Affairs Committee Arvada Fire Protection District Coordinating Committee Denver Regional Council of Governments (DRCOG) Housing Advisory Committee Jeffco Transportation Action & Advisory Group (JEFFTAAG) Jefferson County Community Corrections Board Smart City Advisory Committee Adams County Regional Economic Partnership (ACREP) (Alternate)
Bob Fifer	Apex Coordinating Committee Arvada City Attorney Committee Arvada Fire Protection District Coordinating Committee Arvada Transportation Committee Jefferson County R-1 Schools Coordinating Committee Jefferson Parkway Public Highway Authority Smart City Advisory Committee Northwest Parkway Authority (Alternate)
John Marriott	Arvada Economic Development Association Board Bond Oversight Committee Olde Town Business Improvement (BID) Rocky Mountain Metropolitan Airport Community Noise Roundtable
Randy Moorman	Arvada Audit Committee Arvada Center for the Arts and Humanities Arvada Sustainability Committee CML Policy Committee Jefferson Parkway Public Highway Authority The Rocky Flats Stewardship Council Northwest Parkway Authority (Alternate)

*asterisked committees are not appointed by Council



REPORT TO CITY COUNCIL

AGENDA ITEM
13.A.

TO: THE HONORABLE CITY COUNCIL

DATE: February 12, 2024

SUBJECT: Review of Future Workshops and Presentations

Report in Brief

The City Manager's Office maintains a list of upcoming workshops and presentations to be scheduled for City Council meetings. During City Manager Reports, at the end of City Council business meetings, City Manager, Lorie Gillis, will review with City Council the tentative schedule and make any adjustments necessary.

Prepared by:
Chris Koch, CCO Admin

Reviewed by:

Approved by:

Rachel Morris, City Attorney 1/22/2024

Lorie Gillis, City Manager 1/31/2024

Enclosure, exhibits & attachments required to support the report

2024 CITY COUNCIL WORKSHOPS, STUDY SESSIONS, PRESENTATIONS AND RETREATS (TENTATIVE)

WORKSHOPS	Date	Lead
Police Staffing @Business meeting	Mar 4	CMO
Traffic Speed Management @Business meeting The traffic team will present citywide speed data and discuss Arvada's speed management framework. Highlights of the framework elements including processes for data analysis, risk and safety analysis, technology assessment, enforcement, roadway design, and education/communications will be discussed.	Mar 4	PW
Pool Facility Naming @Business Meeting The Public Works team is following the City's process for naming the new pool facility (currently known as the Meyer's Pool). During the March 4 workshop, the Public Works and CMO team will present information about the naming process the team has used, and the potential names for the new pool for the Council to consider. Next Steps: On March 18, the team will take the final list of names to the Council for a vote and approval on the final name for the new facility.	Mar 4	PW
Canceled	Mar 11	
DEI @Business Meeting	Mar 18	CMO
Quarterly Bond Projects Update The Public Works engineering team will provide the City Council with an update on the bond projects for streets and utilities.	Mar 25	PW
Housing Strategic Plan	Mar 25	CED
Utilities Project Planning and Financial Strategies	Apr 8	Utilities
Waste Hauling Program Overview	Apr 8	Utilities
2024-2030 City Council Strategic Plan Provide City Council with an overview of the new 2024-2030 City Council Strategic Plan. The City Team will highlight the new structure and elements and review the new results and goals.	Apr 22	CMO
Sustainability @Business meeting The Arvada Sustainability Division will provide the City Council with an overview of division projects since the inception of the program in January 2023. The workshop will highlight achievements from 2023 and provide a vision for the future of Arvada Sustainability, with a focus on upcoming city-wide sustainability and climate action planning efforts.	Apr 22	VCN
Park Maintenance Standards Arvada Parks will provide the City Council with an overview of the City's Park Maintenance Standards. The workshop will highlight community survey data, key methodologies and emerging best practices/innovations.	May 6	VCN
CDOT 101 CDOT will present "CDOT 101" to the Council. CDOT 101 is designed to provide a basic overview of CDOT, its responsibilities, and how CDOT works with local agencies.	May 13	
Waste Hauling Fees	May 13	Utilities
Quarterly Bond Projects Update The Public Works engineering team will provide the City Council with an update on the bond projects for streets and utilities.	Jun 10	PW
	July 8	
Water, Wastewater & Stormwater 2025 Rates/Fees	July 22	Utilities
	Aug 12	
Water, Wastewater & Stormwater 2025 Rates/Fees	Aug 26	Utilities
Quarterly Bond Projects Updates The Public Works engineering team will provide the City Council with an update on the bond	Sept 23	PW

projects for streets and utilities.		
Budget Workshop		
Final Water, Wastewater & Stormwater 2025 Rates/Fees	Sept 23	Utilities
Budget Workshop		
Transportation System Plan The traffic team will present the outcomes of the Transportation System plan, including future development opportunities, transportation funding and financial strategies, and a capital improvement plan.	Oct 14	PW
Updated ADA Transition Plan The draft plan will be updated in a comprehensive document that outlines strategies and actions to ensure accessibility for individuals with disabilities, addressing areas of improvement and accommodating their needs.	Oct 28	PW
	Nov 11	
	Dec 9	
PRESENTATIONS		
STUDY SESSIONS		
Transportation Systems Existing Conditions @4 The traffic team will present a summary of the existing conditions for Arvada's transportation systems. The workshop will cover a review of travel trends, evaluation of safety conditions, an assessment findings of the existing roadway, transit, and freight rail networks. The team will discuss Intelligent Transportation Systems and highlight ongoing and upcoming projects and system maintenance plans.	Feb 12	PW
BID and Chamber funding	TBD	
WORKSHOP TBD's		
Pavement Management The Pavement Management Team will provide an update on 2023 and looking ahead to 2024 pavement projects.	TBD	PW
Right of Way Acquisition	TBD	CED
Water Infrastructure for Fire Protection	TBD	Utilities
Smart Meters Update	TBD	Utilities
Capital Campaign Update and Strategy Discussion	TBD	CMO/Fin
Community Engagement	TBD	CMO
Fleet Electrification	TBD	Utilities
Pre-Sentencing/One Small Step	TBD	Courts
Meyers Pool Provide City Council an update on the VCN's SR3: By 12/2025 develop a maintenance and reinvestment plan to ensure a sustainable, resilient and beautiful community of parks, trails, open space and medians in alignment with our diverse, changing and growing community and VCN's SR3 Milestone [M3H] By 7/2024 replace Meyer's Pool with a new 50 meter natatorium.	TBD	CMO
Financial Scenarios for Street Maintenance Deficit/Options for Increasing Maintenance Funds Engage City Council in a discussion around the current street maintenance needs and how the City might fund them. This will include revenue enhancements, future allocations and expenditure realignments.	TBD	PW/Fin/ CMO
Fiber Master Plan The Fiber Master Plan which is also called Arvada Fiber Optic Network (AFON), was first presented to City Council 4/10/2017. City Councils had set a strategic goal to build a fiber network to enable high speed/real-time connectivity to city facilities and assets in order to enhance city operations. This workshop is intended to brief City Council as to the progress of the AFON build out. Updates are intended to cover conduit installation progress, fiber installation	TBD	PW

progress, current co-locate opportunities, IGA member updates, and connections to current assets (city buildings, traffic, signals, utilities, radio, etc.).		
Problem Properties	TBD	P.D.
Activation of Historical Assets	TBD	VCN
Customer Service Philosophy	TBD	CMO
Ask Arvada Update	TBD	CMO
COUNCIL JOINT MEETINGS/DINNERS:		
Denver Water Board Apex Board AURA Board Arvada Center Board—Per Coop Agreement - Annually after October 1 of each year Jefferson Parkway Meeting with Jeffco and Broomfield Council Annual Retreat		